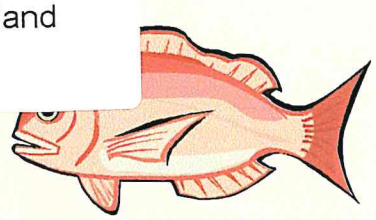

MINISTERIAL COUNCIL ON FORESTRY, FISHERIES AND AQUACULTURE

STANDING COMMITTEE ON FORESTRY

RESEARCH PRIORITIES AND CO-ORDINATION COMMITTEE

RESEARCH WORKING GROUP 7
FOREST HEALTH

Annual Pest, Disease and Quarantine Status Report for Australia and New Zealand 2000-2001

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Contents

INTRODUCTION

1. This report presents the annual statement of forest pest and disease conditions throughout Australia and New Zealand for the year 2000-2001, and also incorporates the pest disease quarantine statement for the two countries. It comprises the third combined pest and disease report under RWG 7 (Forest Health). Individual state and country reports are attached in Annex A.

PURPOSE

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

CONSIDERATION

AUSTRALIA

PLANTATIONS

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

Sirex wood wasp (Sirex noctilio)

3. In South Australia aerial inspection in late June 2001, revealed very few deaths in any forest areas. In the Green Triangle Region (South East of the state), on time thinning of young plantations and a continuing nematode inoculation program have reduced the numbers of *Sirex*. Infestation levels remain low, with adults only occasionally sighted by staff and contractors near logging and pruning areas. Most trap trees were affected by bluestain, with only two trees showing any sign of *Sirex* infestation. Five trap tree plots (50 trees) were established in November 2000. *Ibalia* adults have emerged from billets collected in August 2000. In the Ranges Region, (previously Central and Northern), Sirex infestations are also at a low level. Monitoring is continuing in all areas, as is the nematode inoculation program.

4. In Western Australia, pest management within the Commission Plantations Branch (CPB) of the Forest Products Commission has been incorporated into the Environmental Management

System (EMS) branch, as an identified aspect relating to plantation establishment and tending. This means that, as an aspect, pest incursion into CPB estate is recognised as an environmental problem of significance, should it occur. To control the environmental impact associated with such incursions, CPB has created, in EMS section 4.3.3, the objective of *Monitoring and responding to pest incursions in plantation estate.* Should an incursion occur, the response will be based on CPB EMS section 4.4.7 that outlines an Emergency Preparedness and Response Plan. This plan uses the *Generic Incursion Management Plan for the Australian Forest Sector* as the basis for the emergency response. Achievement of the *Sirex* monitoring target is indicated by the number of *Sirex* plots established and monitored. These are measured from the number of plots listed n the CPB *Sirex* plot register. Monitoring of success in achieving the target is done by a yearly review of the register which is aligned to RWG 7 reporting dates In November 2000, 55 plots were established throughout the south-west between Wanneroo and Manjimup. Most plots had 5 trees per plot and were setup according to specifications given by the National Sirex Control Strategy using Dicamba as the tree stressing agent. Monitoring of the plots at the end of January 2001 showed no evidence of Sirex activity. In November 2001, an additional 45 plots (plus others to make up for dead or harvested trees) will be established to reach the branch target of 100 plots by December 2001.

5. In Victoria, the incidence of Sirex over summer 2000-2001 remained low despite the drier than average conditions that have been experienced over the past three to four years persisting, especially in the north-east of the state. Growers are continuing to thin susceptible stands to relieve moisture stress and reduce the risk of attack, as well as placing increased numbers of trap tree plots in unthinned stands to both monitor Sirex, nematode and parasitoid levels and assist in the spread of the preferred strain of parasitic nematode (Kamona strain). Nematode samples collected from the field have also been forwarded to Canberra to identify the strains of nematode currently present in Victorian plantations, in order to determine their infectivity and whether additional inoculations with the preferred strain are required.

6. The incidence of naturally struck trees remains low in State Forests of NSW pine plantations, with mainly suppressed trees attacked. There were two areas where incidence of mortality was higher (up to 3%): in ~300 ha in Hume Region (Buccleuch SF) and ~200 ha in Macquarie Region (Pennsylvania SF). This was an increase in these areas from previous years. Several State Forests had compartments with very low levels of *Sirex* in suppressed trees, including Glen Allen (Monaro Region), Maragle and Bago (Hume Region), Canobolas, Glenwood, Vittoria, Roseberg and Kinross (Macquarie Region), and Hanging Rock (Northern Region). There were no detection's in areas where *Sirex* was previously unrecorded. Inverell remains the northern most distribution of *Sirex*.

Forest Health Survey Unit held a national *Sirex* workshop in early October 2000 in Tumut. Twenty-eight participants attended from both government and private organisations. The workshop consisted of three phases: lecture, laboratory and field. The lecture phase included information on the history, biology and life cycle of *Sirex*, host susceptibility, attack recognition, survey and control methods. There were also presentations on the CSIRO nematode program and the National Sirex Co-ordination Committee. The laboratory phase enabled microscopic examination of nematodes and viewing of emergence drums located at State Forests' research facility at Tumut. The field phase, conducted at Buccleuch State Forest, enabled participants to observe *Sirex* attack symptoms, *Sirex* larvae, pupae of *Megarhyssa nortoni*, trap tree establishment and nematode inoculation methodology. A session was also conducted on forest health survey and monitoring techniques.

7. Very low numbers of *Sirex* killed trees were found during the past year in Tasmania. All were in unthinned compartments. Several trees were located at Scamander State Forest, which has a long history of *Sirex* occupation. Chip tests showed that nematodes introduced in 1990 are no longer present. A private planting of 15ha in NW Tasmania had 2% of trees over ten years old attacked by *Sirex* both last year and currently. All of those trees have been manually removed and burnt. A developing outbreak on Flinders Island has had nematodes inoculated in August 2001. Several coupes at this privately owned site have *Sirex* present and attacked tree levels may be high in these unsurveyed coupes. The permanent plots at Tower Hill and Branchs Creek do not have *Sirex* present.

8. 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 plots and ground surveillance have been increased in the border area. Six staff attended the NSCC/State Forests NSW Sirex workshop at Tumut in November 2000, and arrangements are being made for training of more DPI Forestry District staff on detection and management of this pest. Investigations into the susceptibility of *Pinus caribaea* and F1 and F2 hybrids are continuing.

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

8. In South Australia, *Ips* has been a serious problem this year in the Ranges Region – possibly as a result of the exceptionally dry conditions that have occurred over the last few years. Live trees have been attacked and killed throughout the forest at Wirrabara in the north and Mt Crawford in the Adelaide Hills. Young trees up to 10 - 12 years old have been the most severely

affected. Current management practices are being examined to see if the incidence of *Ips* attack can be reduced.

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

10. Apart from isolated minor outbreaks involving small plots of trees, *Ips grandicollis* and other bark beetle species (*Hylurgus* and *Hylastes*) have not presented a major problem *in P. radiata* plantations in Victoria during 2000-2001.

11. There were no significant outbreaks of *Ips* in the New South Wales pine plantations surveyed in 2001.

12. The Five Spined Bark Beetle (*Ips grandicollis*) has not yet been detected in Tasmania. *Hylastes ater* adult stem feeding at Scamander killed several hectares of planted one-year-old Pinus radiata seedlings. At several other coupes where wildlings have been thinned to rows deaths caused by *Hylastes* is evident. In both cases old unthinned stands and sites with heavy debris remaining from harvesting provides a source of *Hylastes* to attack second rotation stock.

13. *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)

14. *Essigella* numbers have been high throughout South Australia this year. This, together with very dry conditions has resulted in yellowing and defoliation. However severe defoliation has not occurred. Monitoring is continuing. Ladybird numbers have been high in the South East in all areas except Caroline, which suffered the worst defoliation. Ladybirds were collected from other areas and released at Caroline.

15. On the 27th of June 2000, the Environmental Officer from CPB located the first samples of *Essigella californica* in Western Australia. The aphid seemed to be associated with broadscale yellowing of young *Pinus radiata* in the Blackwood Valley region of Western Australia. The CALMScience entomologist was then involved and a response formulated to the incursion. A survey was conducted throughout south-west Western Australia and found that the aphid had already spread to almost every plantation in the region. It was then concluded that control and eradication was unfeasible and that a monitoring program be instated to monitor the population

dynamics and effect on tree productivity and therefore plantation economic value in line with other states where the aphid has also established itself. CALMScience then produced the monitoring proposal. CPB committed to the establishment and monitoring of 9 research plots. The CPB Environmental Officer established these plots in December 2000 in line with the science project plan that required the location of plots to take account for site quality and species differences. Plots have been monitored continually on a monthly basis since they were established. At this stage monthly monitoring by CPB will continue until December 2002. Populations of the aphid have remained relatively low this past season, peaking at 10-100 aphids per sample at only 2 sites in March 2001, with little apparent canopy damage. In July 2001, few aphids could be found in the field. In addition to aphid population monitoring, samples of potential predators and foliage (from tree and ground) are taken. Foliage samples are analysed for the presence of *Cyclaneusma*. Five positive confirmations of the fungus were made from Dec 2000 to April 2001, out of 25 samples. Since May 2001 all sites sampled have been positive for *Cyclaneusma*. Only dead needles have tested positive to the fungus.

16. *Essigella* populations have been high again this year, with significant defoliation occurring in north-east Victoria and in the states south-west on the border with South Australia, predominantly within 15 year-old thinned stands of P. radiata. Some defoliation within younger trees (<10 years) has also been recorded. Aphid populations appeared to occur later this year than in previous years, which may coincide with the milder than average winter temperatures experienced to date. Monitoring is continuing on both aphid population and defoliation levels at a number of sites around the state.

17. State Forests of NSW maintained seven Monterey pine aphid monitoring sites during 2000-2001. The population levels of *Essigella californica* during this period were significantly higher compared to the previous period. The increase occurred in both number of aphids per affected tree and in the number of trees affected. This increase was especially evident in the sites in Hume Region, which encompasses both Tumut and Tumbarumba pine plantations. A slight increase in aphid numbers was also observed in the pine plantations near Bombala (Monaro Region). Another trend seen for the first time this year was the increased length of aphid activity, in past years aphid numbers had dropped significantly by June. However, in the 2001 season the numbers remained high throughout June. The monitoring sites are in younger age classes (1994-1997) and all showed no significant levels of either yellowing needles or defoliation. However, widespread yellowing, especially of older needles, was observed across older age classes in Macquarie, Monaro, and Hume Regions, with Hume Region having the highest incidence and severity. The number of aphid monitoring sites will be reduced from seven to two sites from June 2001. The two sites to be maintained are both in Carabost State Forest,

near Tumbarumba (Hume Region). This area has had the longest consistent monitoring history for the state and appears to be a "hot spot" for aphid activity given previous monitoring results. State Forests of NSW continues to contribute to funding for the PhD studies of Trudi Wharton, on the "Biology and ecology of *Essigella californica* (Hemiptera: Aphididae: Lachininae) on *Pinus radiata*".

18. *Essigella californica* is now widely distributed in southern Tasmania. There are no reports of sightings in the north of the State. Damage levels appear to be lower than the initial infestation in the Plenty Valley. Most *Pinus* species in the Royal Tasmanian Botanical Gardens in Hobart carry the aphid but without noticeable damage as yet.

19. (Tropical pine species): This aphid is spreading rapidly. It is present in all pine plantations in southern Queensland and has extended its distribution through all exotic pine plantations north to Byfield. The aphid all but disappeared in southern areas after exceptionally hot weather in late summer, but numbers increased again in Autumn. In June it was found in very low numbers at Dampier Ck, near Cardwell. Extensive yellowing/ browning of needles and needle loss have not been seen in Queensland. (Temperate pine species): 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.

Eulachnus thunbergii (Pine Aphid)

20. Victoria has not recorded any *E. thunbergii* to date.

21. The distribution of *Eulachnus thunbergii* has not changed in NSW in 2000-2001. *E. thunbergii* is not considered a significant pest of pines in NSW. However, in recent years there has been an increase in the collections of this insect, mainly as a by-catch from monitoring for the Monterey Pine Aphid (*Essigella californica*).

22. Not recorded from Tasmania.

23. (Tropical pine species): This aphid is present in all coastal areas up to Kuranda in north Queensland (inland from Cairns). No damage has been observed. (Temperate pine species): 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.

Other Pests of Pine

24. Some minor damage to young *P. radiata* was reported in northern Victoria from wild pigs and cockatoos. The wingless grasshopper *Phaulicridium vittatum* also caused some minor damage to newly established stands during summer 2000-2001. Localised minor wallaby damage was also reported from Gippsland in young stands of *P. radiata.*

25. In New South Wales, here were no serious outbreaks of the wingless grasshopper *Phaulacridium vittatum* in the pines this year. Damage from this insect was observed in the young *P. radiata* in Hume Region (Tumut/Tumbarumba) this year. Moderate levels of defoliation were observed, but only on isolated trees, similar to last year. This is not considered a significant pest of pine plantations in NSW. Possum damage was the main problem in Monaro Region in 2000. Possums had caused significant damage to pines in Bondi S.F., Coolangubra S.F. and Nalbaugh S.F. The area of plantation affected by possums in Monaro Region has not changed significantly from 1999. The incidence of damaged trees, however, has decreased from previous years, with fewer trees having fresh damage. Counts were made of both previous and current possum damage in many compartments. In most cases, there were higher levels of previous damage (identified as trees with old dead tops) than trees identified as having fresh damage (within approximately the last 6-12 months). Previous damage by possums has resulted in multiple leaders and heavy branching in many trees, which can reduce timber yield. Other areas in NSW had very low levels of possum damage, including Camira SF, Clouds Creek SF and Eden Creek SF (Northern Region). Localised areas in Yabbra SF (Northern Region) had up to 10% damage from possums. Browsing from wallabies was a problem in young stands in several compartments in 2000. In most cases levels were <1% incidence (Bondi SF & Coolangubra SF in Monaro Region, Dog Rocks SF, Jenolan SF, Vulcan SF & Sunny Corner SF in Macquarie Region), although up to 30% incidence in one compartment in Jenolan SF.

26. In Tasmania, defoliation by the wingless grasshopper, *Phaulacridium vittatum* was evident throughout the Midlands on shelterbelts and woodlots with severe damage restricted to young trees or the lower branches of mature trees. The Arctiid moth *Spilosoma glatignyi* was reared from early instar stage to adult on *P. radiata* foliage. The larvae are commonly found on foliage but have not caused severe defoliation. The Painted apple moth, *Teia anartoides,* is another common species on young *P. radiata* trees causing severe defoliation to roadside edge trees.

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

Bursaphelenchus (pine nematode)

27. *Bursaphelenchus* (Pine Wilt) nematode was first reported from Victoria in July 2000. A national alert was raised with sampling proposed from each state for rapidly killed or dying trees. Fifty samples were proposed for Western Australia however suspicious deaths were not common enough to provide 50 samples over the sampling period. CPB committed itself in March 2000 to providing 1 sample per month for nematode extraction with sample details recorded in the CPB *Bursaphelenchus* sample register. To date 4 samples have been collected and recorded with no positive extraction of the Pine Wilt Nematode.

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

- *Bursaphelenchus*' nematodes have been extracted from 31 pine trees that have died rapidly (generally over a 6-12 week period). All 31 trees have been destroyed by either burning or deep burial.
- There were two nematodes isolated, a *Bursaphelenchus* sp (similar to *hunanensis*) and a possible *Ektaphelenchus* sp. that are closely related to the genus *Bursaphelenchus*. No *Bursaphelenchus xylophilus* were isolated from any of the samples collected. This was confirmed by DNA extraction.
- These '*Bursaphelenchus*' type nematodes have only been isolated from dying trees within Melbourne and outer environs. No samples from interstate contained these nematodes. A different *Bursaphelenchus* sp. was isolated from Queensland and is believed to be similar to a species isolated from *Ips grandicolis* beetles in NSW in 1989.
- While some trees have had high numbers of nematodes within them (up to 7000/10g wood) most have had only a few (<10/10g wood). However this may reflect different stages in the life cycle. The dispersive stage may be difficult to pick up within the tree.
- Koch's postulates have not been proven in pathogenicity tests. Culturing of the nematode has not been successful. Wood samples and nematodes extracted from affected trees and placed back into healthy trees have not as yet produced any symptoms.

- No vector has yet been found. *Arophalus rusticus* have been detected in 4 trees, and *Ips grandicolis* recovered from branches from many of the removed trees. No '*Bursaphelenchus*' type nematodes were isolated from these beetles.
- No *Monochamus* species were detected in either light or pheromone traps deployed, although recent advice is that *Monochamus* species are not attracted to light.
- Pine trees affected have generally been large and over 40 years of age. Most over 60 years.
- Rapid deaths of pine trees have also occurred in over 196 trees from which no '*Bursaphelenchus*' were isolated. However there may be a issue involving the stage of life cycle being sampled.
- Other nematodes were isolated from 93 of the 196 trees from which no '*Bursaphelenchus*' spp. were isolated. These nematodes have been preserved for further identification at a later date. They are believed to be secondary species feeding on blue-stain fungi.
- Although other conifers have also died (particularly Cypress Pines), no nematodes have been isolated from them.
- Other factors involved in the tree deaths have included drought, poison, soil disturbance/root damage, high salinity, *Sphaeropsis* (for the pines) and Cypress canker (for the Cypresses).
- It's possible that the population of nematodes present in Melbourne is not a breeding population because the vector may have failed to establish. On this basis the number of infested trees should drop sharply over the next 2 years (approximate maximun lifespan of the nematodes).
- While the identity and pathogenicity of the '*Bursaphelenchus*' spp. isolated is still unclear, it would appear that only 13% of trees that have died with the characteristic observed rapid death, contain the nematode, and at levels that could be considered not to be the primary cause of death. However, the isolation frequency and population levels may reflect the stage of the life cycle of the nematode.
- It is probable that other factors such as drought/salinity may be the predisposing factor that is leading to tree deaths by other causes such as nematodes, *Sphaeropsis*, etc.
- A continued program has been recommended by the National Coordinating Committee.

The program is to include:

- Continued monitoring for nematodes within any further dying pine trees within the Melbourne area to determine if eradication has been successful and/or that the population of the nematode has not established.
- Complete the rearing of any insects from the wood samples collected from trees that have been removed and check them for nematodes.
- Continued trapping over Spring/Summer 2001/2002 to check for the presence of *Monochamus* beetles.
- Investigation of funding for a post-graduate scholarship to undertake the identification and or classification of the nematodes isolated from the trees, their culture and pathogenicity, and the development of PCR based identification tests for *Bursaphelenchus* nematodes.

29. Samples from about 150 dead and dying *Pinus* trees in New South Wales were tested for presence of *B. hunanensis* &/or *Ektaphelenchus*. All samples were negative. Another as yet undescribed species of *Bursaphelenchus* is associated with *Ips grandicollis* in N.S.W. but is not pathogenic to *Pinus*.

Sphaeropsis sapinea (Diplodia)

30. *Sphaeropsis* has again been a problem in south east South Australia this year as a result of a warmer and wetter spring than usual. Deaths have been widespread, though minor compared with last year. All trees affected by *Sphaeropsis* showed evidence of damage from logging operations.

31. Diplodia in association with drought, is causing dead topping and death of trees in south-west Victoria.

32. In New South Wales, drought-related *Sphaeropsis* infections of butts and stems caused significant mortality in the Casino southern pine (*P. elliottii* & *P. taeda*) plantations in Northern Region in the later half of 2000. Aerial and ground surveys were conducted in November 2000 and an estimated 1600 ha were observed with damage, with trees either dead or dying, and damage levels from 1% to up to 50% incidence in certain sections (Figure 1). Many of the severely affected stands had high stocking (over 1200 sph) and were due for thinning, although this was not always the case. *Sphaeropsis* was consistently isolated form dead and dying trees.

Rainfall in the area was ~60% lower than average in the first half of the year and ~40% lower in the later half of 2000 (Bureau of Meteorology, 2000). The majority of the damaged areas are now being salvaged logged.

Figure 1. Extensive mortality in southern pines at Smith's Section, near Urbenville, in Northern Region.

Significant *Sphaeropsis* damage was also observed in *P. radiata* plantations in other areas in NSW. In ~300 ha in Buccleuch SF (Hume Region) levels of mortality associated with drought stress and *Sphaeropsis* were up to 4% of trees. In Northern Region, plantations of *P. radiata* around Copeton Dam (~ 300 ha) had up to 15% mortality. Recently thinned compartments had significantly less damage. *Sphaeropsis* dieback was also observed in hail damaged *P. radiata* in Armidale SF in Northern Region.

33. In Tasmania, shoot blight caused by *Sphaeropsis sapinea* was detected at very low incidence (<0.1%) throughout northern plantations. About 20 trees in an area of 0.1 ha in one 3-year-old compartment Sphaeropsis shoot blight affected up to 80% of shoots. The undiagnosed stem gall problem continues to be found at low incidences in new areas throughout northern Tasmania. A total of 33 affected plants from 18 compartments were detected during this year's health survey. Galls are continuing to form because some of the galls occurred on wood that had been produced after the initial detection in June 1999.

34. In Queensland, Diplodia dieback (*Sphaeropsis sapinea*) was damaging on *P.radiata* at Passchendaele/Amiens State Forests (Stanthorpe area) especially during drought periods resulting in staining of timber and dieback of trees. It is widespread in Queensland on other host species (Pinus) and is frequently associated with tree malformation and loss of leaders especially in young trees.

Dothistroma septospora

35. Due to the dry conditions in Victoria, *Dothistroma septospora* continued to show low levels of disease, and no spray programs were conducted in the State for 2000/2001.

36. *Dothistroma* needle blight was again a significant problem in the *P. radiata* plantations on the Northern Tablelands of NSW. High levels of *Dothistroma* (>30% severity) were observed in the Walcha plantations (Northern Region) with over 1800 ha severely affected in Nundle SF, Hanging Rock SF, Nowendoc SF and Riamukka SF, and ~100 ha in Koreelah SF. Disease levels were similar to last year. More than 2500 ha in Northern Region were sprayed with copper oxychloride in November-December 2000 to control *Dothistroma*. In Hume Region levels of *Dothistroma* were higher than previous years, with over 500 ha in Bago SF, and 500 ha in Buccleuch SF affected. Smaller localised areas were observed in Carabost SF (~50 ha) and several areas in Green Hills SF (~300 ha). High levels of infection were also observed in Buccleuch SF during summer-spring in 2001. Thinning operations are planned in Hume Region, which will alleviate the *Dothistroma* needle-cast problem. Levels of *Dothistroma* were also lower in Monaro Region than previous years. There was little current infection, but moderate levels of defoliation from previous infection in Coolangubra SF and Nalbaugh SF. Low levels of *Dothistroma* were observed in several localised areas in Macquarie Region.

37. In Tasmania, *Dothistroma* was more prevalent this year than in 1999-2000 and was detected in 25% (by area) of the 3-year-old plantations included in health status surveys. However more than 75% of trees with *Dothistroma* were assessed to have only low levels of infection (<25% of crown infected).

38. Dothistroma Needle Blight (*Eruptio pini*) continues to defoliate *Pinus radiata* in the small plantation area at Gambubal in Queensland. It does not affect other tropical pines in Queensland. PCH is highly susceptible given wet conditions in SE Queensland could spread into other areas (Bruce Brown Pers.Comm.)

Other Diseases of Pine

39. *Cyclaneusma minus* was not a significant problem in the pine plantation in NSW in 2000-2001. *Armillaria* was also not a significant problem in the pine plantations in Northern Region this year.

40. In Tasmania, status of Spring needle cast (SNC) remains unchanged from previous year although there has been some additional substitution of *P. radiata* by *E. nitens* on high altitude, SNC-prone sites in north-eastern Tasmania. Comparison of New Zealand needle-cast (Cyclaneusma) selections with Tasmanian SNC selections found useful correlations among highly susceptible and highly resistant selections. *Pestalotiopsis maculans* was isolated from two young trees with symptoms of mottling, yellowing and premature shedding. This is the first record of this fungus from Tasmania. Affected needles were also heavily colonised by *Cyclaneusma minus*. No root disease problems were detected in *P. radiata* during the past year's health surveys.

41. (Tropical pine species): Phytophthora Root Rot (*Phytophthora cinnamomi)* is widespread giving rise to scattered deaths in young and old plantations of hybrid PCH x PEE in SE Queensland especially on excessively wet sites. Phytophthora is most likely present in all Pinus plantations in Queensland planted pre 1960(B.Brown Pers.Comm.) Phytophthora is frequently associated with mature pines affected by windthrow. Scattered mortality in young stands of **F1 Pinus** clones is associated with poor root configuration of the trees. (Temperate pine species): Phytophthora Root Rot (*Phytophthora cinnamomi)* is widespread and giving rise to scattered deaths in newly established and young plantations of *Pinus radiata* in the Passchendaele/Amiens State Forest districts, especially on wet sites. *Armillaria* sp is also causing root rot in Pinus radiata in isolated patches of Gambubal State Forest (Warwick area).

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

42. Of great concern throughout south east South Australia, has been the widespread deaths of pines and cypresses due to salt toxicity. Older trees in particular have been badly affected, both in plantations and windbreaks. Analysis of needles has shown chloride levels to be up to 3-4% in some cases (the toxic level for pines is 0.35%). This situation is thought to be due to climatic factors which occur infrequently. The last such event was in the late 1940's when there was a series of very dry years followed by a very wet winter – as has occurred in the South East over the last few years.

43. Southern Victoria and in particular the Western District, are still being affected by rainfall deficiencies. High salinity is also causing deaths of shelterbelts, particularly in costal areas of Western Victoria and South Gippsland.

43. In New South Wales, high levels of needle chlorosis associated with drought and accelerated senescence were observed in the Casino plantations (mainly *P. taeda* and *P. elliottii*) during autumn 2000, but no mortality (see related section on *Sphaeropsis*, observed later in 2000). Frost had caused low levels of mortality and needle necrosis (<1% incidence) in several state forest in Macquarie Region, with the highest levels in Vulcan SF and Mount David SF. Hail damage in November was observed in pine plantations north of Bombala. About 300 ha of young privately owned plantations had to be replanted. About 100 ha of older trees in the adjacent Glen Allen SF were also damaged including ~75 ha with over 75% mortality. A severe snowstorm that deposited over 30 cm of snow in the Tumut and Tumbarumba area in May 2000 caused extensive damage to the pines in Bago, Buccleuch and Green Hills State Forests. Another large snowfall in June 2000 exacerbated the problem. The snow was wet, and associated with high winds, which caused more damage than usual. Extensive damage was observed in many compartments. Over 2400 ha were affected in Bago SF, approximately 1200 ha in Buccleuch SF and 1500 ha in Green Hills SF (this damage ranged from 1% of dead tops to whole areas flattened). Damage ranged from broken branches and tree tops in older trees (>20-year-old), broken branches and trees broken in half in mid-age trees, to snow literally flattening young trees. Young trees covered in snow should recover, as they are quite supple (young age class compartments were surveyed in March and trees had recovered). Areas and numbers of trees affected were not large enough to warrant salvage logging. There was lower levels of damage (flattened whorls) in several state forests in Macquarie Region.

(Establishment): New plantings of *P. radiata* in Hume Region suffered low levels of mortality due to poor site conditions (waterlogging, rocky site) and infection with *Macrophomina phaseolina*.

(Weeds): Weeds, especially *Acacia* regrowth, were a significant problem in younger age classes in Bondi SF, Nalbaugh SF and Belanglo SF (Monaro Region), Koreelah SF (exacerbating *Dothistroma* needle blight), Mount Mitchell SF and Riamukka SF (Northern Region). Localised areas in Bungongo SF, Carabost SF, Mannus SF, Seymours, Green Hills SF, Bago SF, and Blowering Dam, (Hume Region) were also affected. *Acacia* and grasses were a problem in younger age classes in Carabost SF, Vulcan SF and Jenolan SF (Macquarie Region). Blackberries were a problem in several areas in Hume Region (Bungongo SF).

(Nutrient disorders): Boron deficiency was the main problem observed, mainly in younger age classes grown on ex-pasture sites, eg in Hume (Carabost SF and Maragle SF) and Monaro (Oak Range) Regions. Boron excess (needle burn) was observed in Hume Region in recently fertilised plantations (Bungongo SF). The 3-year-old plantations had been fertilised with Ulexite (10%

boron, at 80 kg/ha) after signs of boron deficiency were observed in the previous year. Samples were collected during the 2000 forest health survey and foliar analysis by the Analytical Laboratory at Research & Development Division revealed that affected needles had up to ten times the normal levels of boron. Fertiliser application and rates are being investigated.

44. Needle scorch leading to defoliation and eventual tree death was causing severe damage to several mature *P. radiata* shelterbelts and small block plantings at Woolnorth in the far north west of Tasmania. It is considered most likely that the problem is the result of deposition by salt-laden westerly winds.

45. In Queensland, drought conditions have had significant effects on tree decline in Passchendaele/Amiens State Forest. Large expanses of *Pinus radiata* has been effected by prolonged drought conditions resulting in tree decline.

PLANTATIONS (Hoop Pine – Araucaria cunninghamii)

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

47. While the hoop pine plantations throughout Queensland were generally free of any insect pest problems during this last year, areas of young plantations at Gallangowan and Jimna were severely damaged by native rats. Trees were chewed on the lower trunk and roots, and soil around the roots was extensively tunnelled. Root Rot/Mortality, caused by the fungi *Rigidoporus vinctus, Phellinus noxius & Rosellinia* sp., continues to affect young 2R plantations in south east Queensland and north Queensland. *P.noxius* is widespread in northern Queensland in 2R plantations and is also responsible for considerable deaths in 1R plantations in both southern and northern Queensland. *R. vinctus* was uncommon within 1R hoop pine plantations but now causes considerable mortality in 2R plantings up to age 6 years especially in SE Queensland. Dothiorella Dieback (*Botryosphaeria ribis*) continued to occur on young branches and causes losses of a number of whorls from the leader down. This disease is frequently associated with sites not conducive to optimal growth ie. wet low lying sites and dry shallow soils.

PLANTATIONS

PESTS (*Eucalyptus* species)

Autumn Gum Moth (Mnesampela privata)

48. Continues to be the major problem in young plantations in South Australia. Numbers have been particularly high this autumn/winter – possibly due to mild winter temperatures.

49. Autumn gum moth has not been a significant pest during 2001 in Western Australia. Several plantations established east of Albany (especially near Cheyne Beach) in 2000 had high infestations and were controlled with an insecticide application of alpha-cypermethrin.

50. Minor outbreaks of *Mnesampela privata* have occurred throughout Victoria during winter 2000 and late autumn 2001 with the most notable outbreak occurring on one-year-old E. globulus trees in Gippsland during winter 2000.

51. There were no high populations recorded in any Forestry Tasmania plantation although 30% and 14% of 18 month-old plantations in Bass and Murchison Districts, respectively, had low levels of damage. AGM was the most significant insect pest problem in Gunns plantation in northern Tasmania and 940 ha were sprayed in spring 2000. There was also a localised outbreak in plantations at Buckland in the southeast. Comalco Aluminium carbon credit planting's of *E. globulus* in NE Tasmania suffered moderate damage from an autumn emergence in 2001.

52. Autumn Gum Moth was observed defoliating *E. globulus maidenii* at Paschendaele in May 2001. This is the first record of this important pest species in a trial in Queensland

Leaf beetles

53. These are responsible for some damage in most plantations in South Australia but so far are not of major concern. No control measures are taken.

54. Several species of *Chrysophtharta* caused some damage to plantations two years and older throughout the plantation estate in Western Australia. Species of *Paropsis* were extremely rare in all ages of plantations. The cryptocephaline *Cadmus excrementarius* caused extensive defoliation between January and March 2001 to several young plantations established during

2000. Older plantations were also damaged by this species but not as severely. *Cadmus excrementarius* is concentrated mainly in the Rocky Gully and Mt Barker areas, and is only a minor problem in other areas. The insect mainly occurs in the area bound by the jarrah (*Eucalyptus marginata*) forest, where it may persist on flooded gum (*Eucalyptus rudis*) and, to a lesser extent, marri (*Corymbia calophylla*). A project has been initiated in conjunction with Curtin University of Technology and a manuscript is in preparation [N. dos Anjos, J.D. Majer and A.D. Loch (in prep.) Occurrence of the eucalypt leaf beetle, *Cadmus excrementarius* Suffrian (Coleoptera: Chrysomelidae: Cryptocephalinae), in Western Australia.].

55. Species of leaf beetle including *Chrysophtharta agricola* and *C. variicollis* caused moderate defoliation of young *E. globulus* and *E. viminalis* stands in the Gippsland region of Victoria with damage predominant in the upper 50% of the tree crown.

56. In most cases, damage from chrysomelids was much lower this year. However, high numbers of *Paropsis atomaria* were observed causing significant defoliation in *E. grandis* near Albury. Both *Chrysophtharta cloelia* and *Paropsis atomaria* are still amongst the most destructive pests in young eucalypt plantations in northern NSW.

57. Routine monitoring of Forestry Tasmania *E.nitens* and *E. globulus* plantations was conducted using the methodology set out in the Leaf Beetle IPM Technical Bulletin. Aerial spraying using synthetic pyrethroids was done on 167ha that exceeded population thresholds. *C. agricola* damage to 18 month-old plantations was confined mainly to northwestern Tasmania where 30 and 60% of compartments in Murchison and Mersey districts, respectively, had low levels (<25% defoliation) affecting between 5-10% of trees. Trees with moderate damage (25-50% defoliation) were rare although one compartment in Murchison District the incidence reached 24% of trees. No trees with economically significant damage (>50% defoliation) were detected in health surveys. *C. bimaculata* damage in 18-month-old plantations affected the same areas as *C. agricola* but at a 50% lower incidence. Monitoring of Gunns plantations reported the lowest populations for several years. Aerial spraying was done on 340 ha. Autumn surveys of Gunns plantations found little damage from late seasons populations in their northwestern estate.

58. In Queensland, numbers of the two main leaf beetle species (*Paropsis atomaria* and *Chrysophtharta cloelia*) were very low early in summer 2000/2001 after very high numbers and significant defoliation was recorded at the end of summer 2000. Numbers of *P. atomaria* had recovered by late summer and significant damage was observed in several joint-venture plantations of *Eucalyptus cloeziana*. With very mild winter conditions in some plantations, adults

and larvae have continued to feed over the winter months. Under normal conditions, adults enter a quiescent state and larvae are not found on trees after about June.

Beetles (Christmas, scarab, spring, etc)

59. African black beetle continues to be a major establishment pest in wetter areas of south-Western Australia. Trials in 2000 showed broad-spray insecticide applications to be inconsistent. Degradable plastic mesh barriers placed around the roots and lower stem of seedlings were the most effective seedling protection in trials and this method has gone into commercial use in 2001 plantings. Larval damage to the roots of seedlings by *H. elongatus*, one of the 'spring' beetles, has been widespread in the south coastal region. Damage is often characterised by complete removal of the potting medium and much of the seedling's roots. Prediction of at-risk sites is difficult and there are no satisfactory control methods. Spring beetles, *Liparetrus* spp: these small, abundant insects swarm onto seedlings from adjacent forest and can defoliate them very quickly. The unpredictability of swarming and rapid damage makes this pest difficult to manage. Two unidentified species of scarab beetles were observed feeding in large numbers at night on all ages of plantations in the Wellstead area, east of Albany. Both species were feeding preferentially on the new season's juvenile and adult foliage and causing 50-100% defoliation to such foliage.

60. Low levels of Christmas beetles (*Anoplognathus* spp.) have been observed defoliating young one-year old *E. globulus* plantations in the Latrobe Valley region of Victoria during summer 2000-2001. Spring beetles (*Heteronyx* sp.) were observed damaging newly planted *E. globulus* seedling roots in the south-west of Victoria, although damage was confined to a small number of seedlings (<40).

61. There were no significant outbreaks of *Monolepta australis* this year in New South Wales. Damage from Christmas beetles was significant in many *E. dunnii* and *E. grandis* x *E. camaldulensis* hybrid plantations in November to December 2000 around Wauchope, Gloucester and Taree, in many cases causing severe defoliation. Little beetle activity was observed after Christmas. A Christmas beetle exclusion trial in an *E. dunnii* plantation was established by State Forests to quantify the impact of severe and continued defoliation by these insects. Trees recovered after initial defoliation in November-December, but we were hoping for further damage. Data are being analysed.

62. Populations of *Heteronyx* were lower than in previous years, possibly because of drought conditions in northern Tasmania. Spraying to control *Heteronyx* was done on 360 ha of recent plantings in the Surrey Hills area (Gunns). Damage form scarabs remains minor in Forestry

Tasmania plantations. Several young *E. globulus* plantations in low rainfall areas of south eastern Tasmania had low levels of damage from Christmas beetles (*Xylonchus piliger*).

63. Swarming scarabs (mostly *Automolus* spp.) continue to be occasional pests in southeast Queensland (SEQ), mostly causing damage to trees in the first year of growth. Effects on both form and early season loss of growth are common. Christmas beetles (mainly *Anoplognathus porosus* & *A. boisduvali*) have caused moderate defoliation to some joint-venture and trial plantings. The most common species planted in SEQ, *E. cloeziana*, appears to be resistant to christmas beetles and relatively tolerant of swarming scarabs.

Sawflies

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

65. Sawfly numbers are low in plantations in Western Australia. *Perga schioedtei* is one of the main species encountered.

66. *Perga affinis affinis* has caused moderate defoliation of *E. globulus, E. camaldulensis* and *E. occidentalis* in north-central Victoria during autumn/winter 2001. Damage was generally confined to the upper crown although in extreme cases, whole trees up to 15m were totally defoliated. Monitoring will continue to assess further damage over the winter period, as well as in autumn next year to determine if populations are again on the increase.

67. Gregarious sawfly larvae caused extensive and significant defoliation in several plantations in New South Wales from March onwards in 2001. Little insect activity was observed during forest health surveys from December to February. By late April and May, a number of plantations around Coffs Harbour, Taree and Kyogle had significant numbers of trees almost completely defoliated. The *E. grandis* hybrids were the most severely damaged, followed by *E. grandis*.

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

69. *Pergagrapta polita* in Far North Queensland continues to be the most common defoliator in eucalypt plantations and trials. Hosts include *E. pellita*, *E. microcorys*, and *E. grandis* and its hybrids. Overall damage has not been severe, though some individual trees have been

completely defoliated. No outbreaks of sawflies have yet been recorded in SEQ, although they are commonly found in plantations and trials.

Borers

70. No significant damage from stem boring insects has been observed in Victoria during 2000-2001.

71. Stem borers were again the most significant insect pest of young hardwood plantations in northern NSW. Plantations over 2-3 years old are the most susceptible, with *E. grandis* the most susceptible host. In some cases up to 45% of trees in a plantation have been attacked. *Corymbia variegata* on poor sites in drought conditions have had up to 20% trees attacked in 2000-2001. SFNSW is conducting research into the impact of stem degrade in hardwoods and possible management strategies.

72. Scattered mortality (<1% of trees) caused by *Phoracantha mastersii* was detected in a 12-years-old pruned *E. nitens* plantation in the Tasmanian northeast. *Phoracantha* attack resulted in scattered stem breakage in a 2-year-old *E. globulus* plantation in the Circular Head area. The incidence of stem damage by the transverse weevil, *Pelororhinus transversus*, is common in *E. globulus* and *E. nitens* planting's aged 8 years or older. Thickness of bark is an important criterion for tunnelling by this weevil species. The impact on timber quality for sawn timber may be important when these trees are harvested.

73. Surveys of trial plantations in south-east Queensland are showing relatively high rates of stem borer attack (*Phoracantha* spp longicorns and *Endoxyla* spp. cossid wood moths). Incidence of attack on some eucalypt taxa in trials has been as high as 60% at age 3 years, with attacks commencing from age 1.5 - 2. A significant positive correlation between tree diameter and incidence of attack has been found for both wood moths and longicorns, although this relationship is stronger for the former. Thus, the larger, faster growing trees in a plantation tend to be the first attacked. The most susceptible taxa appear to be *E. grandis* and hybrids, *E. dunnii* (wood moth and longicorns), and *E. pilularis* (longicorns).

Psyllids

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

75. *Cardiaspina retator* has caused significant defoliation to *E. grandis* and *E. camaldulensis* plantings in northern Victoria during autumn 2001 although this damage was confined to individual plantations and not widespread across the region.

76. *Creiis liturata* has caused more extensive damage in several young *E. dunnii* plantations on the north coast of New South Wales. The area of damage has approximately doubled to 200 ha with severe damage. The number of sites with damage has also increased, with one plantation south of Casino newly recording the psyllid (to add to those west and north of Casino). A collaborative project with Research & Development Division, Planted Forests Division and Southern Cross University is under-way to study various aspects of the *Creiis* psyllid. A PhD student will study the biology of the insect, including its life cycle, as well as investigating various control strategies, including site factors affecting damage, host tolerance and chemical control. *Cardiaspina* species were not significant pests in the northern plantations this year. However, significant damage by *Cardiaspina albitextura* to young *E. camaldulensis* plantations occurred around Deniliquin and Albury.

77. *Cardiaspina squamula* was detected in an *E. nitens* plantation in the upper Derwent Valley in Tasmania. Although the outbreak resulted in obvious leaf reddening little defoliation occurred.

Other Pests of Eucalypts

78. Several 1-2 year old plantations in the Albany area of Western Australia have up to 50% damage to juvenile foliage as a result of leafblister sawfly. Exclusion trials are in place to assess the economic impact of this species. *Gonipterus scutellatus* was again the most significant insect pest of all *Eucalyptus globulus* plantations two years and older resulting in aerial spraying of large areas. Larvae and adults caused significant defoliation in the range of 50-100% to growing tips over spring and summer. Again, the parasitoid *Anaphes nitens* parasitised egg masses at very low rates (<5%) in early spring, with parasitism rates rising to almost 100% by summer. Leaf-tiers have caused some defoliation and shoot mortality, especially in plantations grown in the Albany region. Trees in their first year of growth are most vulnerable to damage.

79. Minor damage to juvenile *E. grandis* foliage was recorded by the leafblister sawfly in north central Victoria over summer. The wingless grasshopper also caused low levels of defoliation in newly established *E. globulus* plantations in south-west Victoria although the attack was patchy, with defoliation coinciding with high levels of grass/weed control in certain sections of the plantation during the establishment phase. No significant mortality was recorded.

80. Leaf blister sawfly (*Phylacteophaga froggatti*) larvae had caused significant damage to *E. grandis* in several plantations around Deniliquin in New South Wales. These plantations had suffered high levels of damage the previous year. *Phylacteophaga froggatti* was not a significant pest in the northern plantings this year. Gum tree scale (*Eriococcus* spp.) was observed at very low levels in young plantations (<1% incidence), and often infested trees were on waterlogged sites and/or under stress. The majority of hosts were *E. grandis*. Several plantations had higher levels of damage.

81. Moderate populations of Gum leaf skeletoniser (*Uraba lugens*) occurred in *E. globulus* plantations in the lower rainfall areas of northern Tasmania. In Gunns aerially sprayed 152 ha of their plantations in which high populations were detected. Large populations of the wingless grasshopper (*Phaulacridium vittatum*) were detected in young *E. nitens* plantations in the Surrey Hills area in January 2001 prompting 593 ha being aerially sprayed.

82. Western white gum (*E. argophloia*) is a promising species for the lower rainfall areas in southeast Queensland. Over the first 2 years of planting this species has been relatively resistant to most insect pests. Surveillance has detected a chalcidoid leaf-galling wasp that seems to be specific to *E. argophloia*. Galls formed by this wasp become conjoined to form gall masses plate galls), which have been observed as being very destructive to leaves. Damage (minor to moderate) was initially restricted to the lower canopy but follow-up inspections revealed that severity increased with time and progressed up throughout the canopy.

DISEASES (*Eucalyptus* species)

83. There have been no reports of diseases affecting eucalypt plantations in South Australia this year.

84. No major problems reported in Western Australia. Research continues on *Mycosphaerella* leaf blights and *Endothia gyrosa* and other cankers in *Eucalyptus globulus* plantations.

85. *Mycosphaerella* spp. have caused defoliation of juvenile foliage in 2 y-old *E. globulus* plantations in South Gippsland in Victoria and has led to an increase in weed competition due to increased available light. Leaf blotches that occurred on *E. globulus* in Western Victoria in Autumn 2001 are under investigation. Trials evaluating pruning wounds on *E.globulus* and *E.grandis* showed little development of decay in irrigated plantations in Central Victoria. Observations of alcoholic flux, first reported in March 1998 on the stems of 3/4 year-old

Eucalyptus nitens in north-east Victoria, was again observed in plantations in north-east and south west Victoria and for the first time in East Gippsland on 9-y-old *E. nitens* and *E. globulus*.

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

Phaeophleospora epicoccoides (= Hendersonia grandispora, Phaeoseptoria eucalypti, Kirramyces epicoccoides) caused significant defoliation in several E. grandis plantations in northern NSW this year. Defoliation occurred from the ground up, and often resulted in over 50% and up to 95% defoliation of trees. The majority of trees affected were in lower lying areas. The defoliation often left trees with a red appearance (red colour of branches and branchlets), giving diseased plantations the appearance of a "red tide" (Fig. 2), and this is what the "locals" termed the disease. The disease was also observed in several E. dunnii plantations and E. grandis hybrid trials. This is the first major damage caused by this pathogen in the young eucalypt plantations in northern NSW since the start of the Forest Health Survey program. More commonly this pathogen is observed at very low levels on older senescing foliage of E. grandis. High humidities are suspected to predispose trees to this disease.

Figure 2. *Phaeophleospora epicoccoides* causing defoliation in *E. grandis.* Note "red tide" appearance to plantation.

Mycosphaerella leaf diseases were not observed in significant levels during the forest health surveys in northern NSW this year (December 2000-April 2001). However, high levels of *M. cryptica* were reported from several *E. pilularis* and *E. grandis* x *E. camaldulensis* plantations in early autumn (there were large rainfalls in April and May). Flood irrigated *E. camaldulensis* plantations had moderate levels of leaf spot caused by *M. cryptica,* resulting in moderate defoliation while the adjacent native bush had high levels of *M. cryptica.*

Coniella fragariae was not significant pathogen in New South Wales this year.

The new genus *Quambalaria* J. A. Simpson was described for this pathogen of species of *Corymbia* and *Angophora*. Observed levels of Ramularia blight in *Corymbia* plantations were low during forest health surveys in summer and early autumn this year. However, severity was higher in plantations surveyed during late autumn. Many older plantations (>3-year-old) that previously had Ramularia blight have recovered, with little infection observed.

Several plantations that had *Phytophthora* in previous years were inspected in April after heavy rains during summer. None of these showed signs of mortality from root rot fungi.

A collar rot associated with presence of a species of *Phomopsis* caused extensive mortality in newly established (3-week-old) *E. dunnii* and *C. maculata* in two plantations near Grafton. Up to 50% of seedlings died. This pathogen was also isolated from nursery stock. Studies to determine the identity of the species of *Phomopsis* and to confirm pathogenicity are in progress.

Mistletoe was observed at significant levels in several 5-year-old *C. variegata* plantations north of Casino. In one, the level of mistletoe infection had considerably increased from 5% in 1999-2000 to just over 20% in 2000-2001. Mistletoe has not been observed in other hosts in the young plantations in northern NSW.

87. Leaf blight due to *Mycosphaerella nubilosa* was responsible for severe defoliation (70-90% leaf loss) throughout Forestry Tasmania's 2 and 3-year-old *E. globulus* plantations in the Circular Head area. In 18-month-old *E. globulus* plantation in the same area defoliation was rare but leaf spotting was prevalent (average incidence 32% of trees). Gunns' young *E. globulus* plantations in the Woolnorth area are also suffering heavy infection and defoliation. A high altitude (450-500m) *E. globulus* plantation in the northeastern Tasmania (Gunns) has suffered heavy defoliation from *Mycosphaerella*.

There was a high incidence (39% of trees) of *M. cryptica* infection of 18-month-old Forestry Tasmania *E. nitens* plantations on high altitude sites in north eastern Tasmania. Defoliation was rare but nearly 5% of trees (maximum incidence 40%) in this area had necrotic lesions that effectively "defoliated" up to 25% of current seasons foliage. *M. cryptica* leaf spotting is also widespread in Gunns' *E. nitens* plantation throughout northern Tasmania.

Phaeopleospora (Kirramyces) eucalypti was uncommon in young (18 month-old) Forestry Tasmania plantations (incidence < 1% in all compartment). In older plantations of E. nitens P. eucalypti leaf spotting is widespread by not severe (no defoliation).

Fungal shoot diseases were uncommon during the past year. One 18 month-old plantation in Mersey District suffered *Botrytis cinerea* blight of the apical shoot on 4% of trees.

Scattered top death, initially thought to be *Botryoshpaeria dothidea*, was found in an 18-month-old *E. globulus* plantation in Temma Block (western Tasmania). Only the weakly pathogenic species, *Endothia gyrosa* and *Cytospora eucalypticola* could be isolated from affected stems. The primary cause of this problem remains unknown. Small patch deaths reported in three young (<2-years-old) plantations in northwestern Tasmania.

88. Ramularia Shoot Blight (*Quambalaria pitereka* (J. Walker &Bertus) J.A. Simpson) was seen on several *Corymbia* spp. throughout the period in SE Queensland. Blight resistant trees are apparent in most provenances, but are much more common in wet coastal provenances.

Cylindrocladium Leaf Blight (*Cylindrocladium quinqueseptata)* caused severe defoliation and mortality in many *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.

Leaf Crinkle (*Mycosphaerella spp*) has been quite common and damaging in SE & Far north Queensland, affecting both immature and mature juvenile foliage of a number of *Eucalyptus* spp. and hybrids. *E.globulus, E.grandis, E.tereticornis, E.camaldulensis, E. cloeziana* (*Mycosphaerella* sp. yet to confirmed) 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 on various Eucalypts associated with leaf necrosis on isolated trees, or at low levels on senescent foliage. These include the following:-

- Purple Leaf Spot (*Mycosphaerella suttoniae*)
- Leaf Blotch (*Coniella fragariae* or *Cryptosporiopsis eucalypticola)*
- Various Leaf Spots (*Mycosphaerella* spp., *Hainesia lythri, Dichomera eucalypti* , *Coniothyrium* spp., *Aulographina eucalyptii* etc.

Bacterial Wilt (*Ralstonia solanacearum)* was encountered on young *E.pellita* near Cardwell and Innisfail this year causing the death of a few scattered trees. Ralstonia was also found to be associated with wilt/death within a *E. urophylla* plantation in Kuranda north Queensland. This eucalypt plantation was a particularly wet site surrounded by extensive *Pinus* plantations.

Stem Cankers associated with copious flows of kino occur on young *Corymbia variegata* in various 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 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.

Armillaria sp. has been associated with a number of tree deaths in *E. cloeziana* in SE Queensland.

ENVIRONMENTAL AND SITE RELATED PROBLEMS (*Eucalyptus* species)

89. Drought and hot winds had caused significant damage to a 5-year-old *C. variegata* plantation in 2000 in New South Wales. Leaves on many trees had been 'burnt' and died. In many cases 50-100% of leaves on trees had been damaged, leading to almost total defoliation of trees. Approximately 30 ha had been affected. The plantation was inspected several times to follow the recovery of trees. By April 2001 5% of trees had not recovered and had died. However, the majority of trees recovered after rain and though previously heavily defoliated were producing new shoots. Frost damage had occurred in the Fletcher Property Purchase site near Wauchope. Low lying areas of *E. grandis* and *E. pilularis* were both affected. This damage was particularly severe to the *E. pilularis*, 10% of which would probably not recover.

90. In Tasmania, wind damage was prevalent in young *E. nitens* and to a lesser extent, *E. globulus* plantations. Breakage of succulent young shoots, often leading to forks, affected 9% of trees in 18 month-old plantations, statewide. Damage was particularly prevalent in Districts establishing plantations on high altitude sites, exposed to westerly winds. Other types of damage attributed to wind, including leaf shredding, flattening of the crown and sweep were also prevalent in young plantations on exposed, windy sites. Severe wind damage (windthrow and stem breakage) occurred in a young *E. globulus* plantation (Gunns) in the Circular Head area. One young (12 month-old) plantation on an exposed site in northeastern Tasmania suffered extensive leaf scorch due to desiccation from cold, dry winds.

Symptoms of frost damage (leaf reddening leading to scorching and premature senescence) affected trees planted on the margins of flat, grassy plains in a young (1-year-old) *E. nitens* plantation at West Takone (south of Wynyard). Mortality was rare although some of the more severely affected trees suffered heavy leaf loss leading to stunting. Widespread symptoms of frost damage occurred in another 18 month-old *E. nitens* plantation on a high altitude site. A high

proportion of trees in this compartment had characteristic leaf morphology of southern N.S.W. provenances, which are known to be less cold-tolerant than Victorian provenances.

The severe drought conditions in south eastern Tasmania persisted until autumn 2001. Some Gunn's E. globulus plantations in low rainfall areas in the southeast suffered severe wilting and some mortality but recovery since autumn rains has been good. No drought deaths were seen in Forestry Tasmania plantations but the incidence of several symptoms attributed to water stress was higher than normal. Mild leaf scorch (<25% crown affected) affected 1.3% of trees in 18 month-old plantations statewide, but was particularly prevalent Derwent District where 4.5% of trees and 35% of compartments were affected. Moderate and severe leaf scorch affected 1.1 and 0.3% of trees in 18 month-old plantations respectively. Symptoms of microphylly (putative zinc deficiency), leaf cupping and undulating leaf margins were also more common than in previous years. Water stress symptoms were magnified on ex-pasture sites where grass control was inadequate.

PLANTATIONS (Other hardwood species: Red Cedar – *Toona ciliata*)

91. Mortality caused by *Rigidoporus vinctus* has been recorded in a research plot in SE Queensland in *Toona ciliata* planted on old 1R hoop pine plantation sites. This root disease has also affected plantings of *Cedrela odorata*, *Khaya senegalensis* and *Grevillia robusta* in the same research plot.

MANAGED NATURAL FORESTS (*Eucalyptus* species)

Pests and Diseases

92. In Western Australia, Jarrah leaf miner is still in outbreak in some areas of the northern Jarrah forest. Cutout boundary surveys were not conducted over this past season. It is anticipated that the next survey will be conducted in three years. A project investigating the control of Jarrah leaf miner through selective retention of resistant trees has been initiated. (A. Wills, T Burbidge). 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). Jarrah logs infested with *P. semipunctata* were reported from Dean Mill near Manjimup. Logs were awaiting processing and infestation was thought to occur at the felling site. (JF, A. Loch)

In Western Australia Jarrah forests, 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).

93. In Victoria, an outbreak of *Didymuria violescens* has caused damage to Alpine ash and mixed species forests in the Kiewa area of north-east Victoria. Aerial surveys are currently underway to determine the extent and severity of the defoliation. Few diseases were reported from native forest. A study continues on the possible toxic effect of eucalypt bark on eucalypt seedling regeneration.

94. An outbreak of phasmatids (*Didymuria violescens*) has caused significant damage to native state forests in Hume Region (Tumut/Tumbarumba) of New South Wales, similar to 1999 where approximately 8570 ha in three state forests were damaged. The main eucalypt species attacked were *E. radiata* and *E. dalrympleana,* but *E. delegatensis* and *E. pauciflora* were also damaged. Total defoliation of some trees was observed. Aerial surveys will be conducted in August 2001 to determine the extent and severity of damage.

The presence of bell miner (*Manoria melanophrys*) colonies can result in eucalypts in moist sclerophyll forest becoming unhealthy, with often tree death occurring amongst the susceptible eucalypt species. Bell miners are insectivorous social birds that aggressively defend their territories against other insectivorous bird species and predators. Eucalypt trees with crown dieback tended to have high levels of foliar damage caused by a range of different herbivorous insects. Presence of the bell miners appears to interfere with the effectiveness of both vertebrate and invertebrate natural enemies of some herbivorous insects (e.g. other insectivorous birds, insect parasitoids and spiders). This results in elevated populations of a diverse range of herbivorous insects on the foliage of susceptible eucalypt species, including numerous species of psyllid, leaf chewing Coleoptera and leaf-mining Lepidoptera.

During the 1998/99 year two large plots were established in Olney SF and comprehensive base-line data sets on tree condition were obtained, in addition, to several other parameters such as floral surveys and bird counts. Since establishment, annual assessments have been made of over 2000 trees. The fourth and final assessment is planned for November 2001. This site is unique for Australia, in terms of the opportunities it represents for future studies relating to forest ecosystem health and vitality.

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

95. Protracted drought conditions continued until autumn 2001 in south eastern and eastern Tasmania causing widespread scattered mortality of eucalypts on slopes and patch deaths of eucalypts and understorey shrubs on shallow soils overlying sheet rock. Eucalypts (particularly *E. gunnii* and *E. delegatensis*) across extensive areas of the Central Plateau have experienced a steady deterioration in crown health (crown thinning, dieback and epicormic production) over the past few years. The cause(s) of this deteriorating crown condition has not been investigated.

NURSERIES

Pest, Disease and Environmental Disorders

96. There have been salt problems in one nursery in the South East of South Australia due to the high salt content of the water used to irrigate seedlings.

97. No major problems have been reported in either hardwood or conifer seedlings in nurseries in Western Australia.

98. Monitoring of nurseries in Victoria for *Phytophthora cinnamomi* remains a high priority so as to reduce the further spread of disease. Again a scorching of the tops of cuttings/seedlings was investigated but no cause of damage could be ascertained. *Botrytis* was the main pathogen causing disease in eucalypt nurseries in Victoria. Nutrient deficiencies also were prevalent.

99. Apart from an outbreak of *Dothistroma septosporum* in conifer stool beds no noteworthy disease outbreaks were reported this year in New South Wales. *Phomopsis* sp. was isolated from *E. dunnii* and *C. variegata* in the Grafton eucalypt nursery, and high levels of mortality of newly planted seedlings from this nursery observed in two plantations.

100. In Tasmania, damping-off of recent *P. radiata* germinants due to *Fusarium* was more prevalent this year than in previous years. Later than normal sowing (2 month delay) was implicated as a contributing factor. *Botrytis cinerea* was more prevalent this year than in recent years although losses were relatively small (<1%). There was a definite elevated susceptibility to *Botrytis* infection in certain *E. globulus* seedlots. No insect pest problems were observed in forest nurseries during the year.

101. In Queensland, mortality/red needle of cuttings 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 (*Botryosphaeria ribis*) 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 (*Phytophthora cinnamomi*) following over-watering of heavily-pruned, pot-bound stock plants under glasshouse conditions. Shoot blight, caused by the fungus *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.

NATIVE PLANT COMMUNITIES

Pests

102. In Western Australia, monitoring of crown decline and recovery using time series photography of *Eucalyptus wandoo* crowns suffering crown decline in Talbot forest block continued to autumn 2001. Leaf insect populations remained low and are not implicated as contributors to this decline of wandoo that is now extensive in southwest Western Australia. (A. Wills)

Eucalyptus rudis

Clay, R and J.D. Majer (2001). Flooded Gum (*Eucalyptus rudis*) decline in the Perth Metropolitan Area: A Preliminary Assessment. *School of Environmental Biology Bulletin No. 19.* Curtin University of Technology.

Summary and Recommendations

This study presents the results, conclusions and recommendations of a study of decline (dieback) in flooded gum (*Eucalyptus rudis*), conducted in the Perth metropolitan area in spring and early summer of 1999.

Dieback is characterised by progressive decline in tree health, which includes cycles of defoliation and regrowth. Over time, a tree's reserves become depleted and the regrowth phase is likely to become less vigorous. If the causal factors continue to operate, tree death may eventuate, although this may occur some years after the first round of defoliation is observed. We found dieback to be widespread in 1999, however its occurrence was very variable and we failed to discern any pattern in the distribution of tree decline. Most trees that were affected had a high proportion of discoloured leaves and were shedding leaves. In some instances we observed trees that were completely defoliated, and in others we observed regrowth. We did not observe any trees that we considered to be dead. We concluded that the dieback was a recent phenomenon, which was in its first cycle of defoliation. Casual, and more systematic, observation showed that there were higher densities of lerps (*Creiis periculosa*) on leaves of declining trees than on healthy ones. There also was an association between the type of ground cover under the trees and tree condition. Healthy trees occurred in disproportionately large numbers over ground covers that contained some native plant species, as opposed to weedy or mown grass ground covers. We suggest that the more natural ground covers provide more food and shelter for the predators and parasitoids of foliage feeding insects, and therefore assist in natural control.

Apart from the association with lerps, no association was found between dieback and other types of biological damage, e.g. insect galls, leaf chewing, leaf mining and bacterial/fungal attack. This was shown both by subjective assessments of trees, and by measurements of leaf area loss. Canopy invertebrates were extremely abundant, but highly variable from tree to tree, regardless of tree health or the location of the trees. Only one invertebrate group, psyllid nymphs, were in significantly higher numbers on declining trees than healthy ones. For all other types of invertebrate groups there was no significant difference between healthy and declining trees. However, the extreme tree to tree variability, and the small sample size, made it difficult to show significant differences.

A large number of physical and biological factors have been suggested as the primary cause of the flooded gum dieback in Perth. However, it must also be recognised that no single factor may be involved, and that interactions between two or more factors may be responsible for triggering decline. Considering the complex nature of tree decline, it is not surprising that this preliminary study was unable to determine the primary cause(s). Nevertheless, we can suggest that some factors are less likely causal agents than others. We do not believe that changing water-tables, either rising or falling, are likely agents, nor do we believe that increasing salinity is a likely cause in the Perth area. Nutrient enrichment of waterbodies, a common phenomenon in Australia, may be a causal agent by contributing to higher concentrations of nutrients, particularly nitrogen, in

tree foliage. These elevated concentrations may, in turn, encourage the outbreak of foliage feeding insects, for example, the high psyllid densities that we have observed. However, it must be stressed that we found no significant difference in nitrogen levels between healthy and declining trees, although there were significantly higher phosphorus levels in declining trees than in healthy ones.

Our examination of some possible biological causal factors, has made all agents very unlikely, except for psyllid insects. These have a very clear association with declining trees, and are undoubtedly contributing to the decline in tree health. Whether, or not, psyllids are the primary cause of the dieback is another matter, however. Some researchers believe that infestations by psyllids, and other insects, only occur when trees are under stress, and that it is the factors creating stress that are the primary causal factors. Other researcher workers do not support this theory, and suggest a primary role for insects. We were unable to distinguish between these two possibilities on the basis of our results

We expected that most, if not all, trees observed to be in decline in 1999 would have produced epicormic growth by the time of writing of this report. Casual observations in spring, 2000 support this expectation. The critical question is whether this will lead to permanent recovery, or whether there will be another cycle of defoliation and epicormic growth, thus establishing the typical pattern or dieback observed in other eucalypt species in other parts of the country. The answer to this question requires a sophisticated understanding of the causal factor(s), and we do not have that understanding.

In the short-term, there are measures that may control psyllid numbers on individual trees, but broad-scale control is impractical. Control on individual trees may be achieved by injection into the trunk of systemic insecticides but, of necessity, an experimental approach must be adopted for such treatment. Experimentation with fertiliser application may also have some effect. In the longer-term, since psyllids are an important contributing factor to flooded gum decline, there are some strategies that could be implemented to reduce their impact.

- If trees can be located that are resistant to decline, seeds for plantings should be harvested from resistant trees in preference to those of susceptible trees.

- Apart from this limitation, seeds should come from a variety of sources to maintain genetic variability.

- Single-species plantings (monocultures) should be avoided.

- Re-establish native shrubs, herbs and grasses in the understorey of established flooded gum stands and in plantings.

Finally, further monitoring and research are required to determine the cause of flooded gum decline, and to examine ways of alleviating it. We have made a number of suggestions for further study.

Revegetation programs

Majer, J.D., H.F. Recher, R. Graham and A. Watson (2001). The potential of revegetation programs to encourage invertebrates and insectivorous birds. *School of Environmental Biology Bulletin No. 20.* Curtin University of Technology.

Abstract

There are extensive revegetation programs in the wheatbelt of Western Australia. Revegetation has many objectives including lowering water tables to combat water logging and soil salinisation, improving agricultural productivity, and producing a commercial crop of trees for harvesting. Trees are planted by farmers, conservation groups and Government authorities to rehabilitate, beautify and manage degraded agricultural land, parks and road verges. In addition to improving plant diversity and restoring ecosystem functions, revegetation is an opportunity to provide food and habitat for wildlife and to conserve regional biodiversity.

The objective of this recent study was to investigate whether the tree species planted in the wheatbelt are colonized by invertebrates and whether the abundance and variety of invertebrates on planted trees differs between tree species and between revegetation and remnant native vegetation. The study also investigated the use of revegetation by birds and compared this to bird communities in remnant vegetation. Invertebrates were sampled on trees planted along the Great Eastern Highway as part of the Main Roads Department 'Ribbons of Green' program, as well as trees planted by community groups and Greening Western Australia. We asked whether the best species of trees were being planted to restore and enhance regional biodiversity.

The canopy invertebrate fauna of 10 trees of each of eight species of *Eucalyptus* and jam wattle (*Acacia acuminata*) was sampled by chemical knockdown. Jam wattle and three of the eucalypts, including wandoo (*E. wandoo*), are indigenous to the Northam District. Three of the eucalypts are indigenous to the south coast of Western Australia, one to northwestern Western Australia, and the eighth is indigenous to coastal South Australia. Wandoo was sampled in both

revegetation and remnant natural vegetation. In addition to sampling invertebrates, leaf toughness and levels of foliar nutrients (NPK) were sampled for all tree species. Leaf toughness and foliar nutrients were measured as other studies had found relationships between toughness and nutrients, with the abundance and variety of canopy invertebrates.

Moderate to high invertebrate densities were found on all tree species. Indigenous trees tended to support the most diverse and abundant invertebrate faunas: species originating from southern coastal regions and northwestern Western Australia supported the least. Wandoo trees in revegetation tended to have higher populations of some insects than wandoo growing in remnant vegetation. Leaf toughness appeared to affect the size of invertebrate populations on some eucalypt species, but the effects of foliar nutrients were inconsistent, possibly because nutrient levels were elevated as a result of fertiliser applications.

During winter (June), three patches of remnant vegetation and seven replanted areas were surveyed for birds. Twenty-five species of birds were recorded of which three were found only in remnant vegetation and six were found only on the replanted areas. However, all species recorded are widely distributed throughout the Western Australian wheatbelt and, with the possible exception of the White-browed Babbler (*Pomatostomus supercilosus*), no significance can be attributed to the differences in bird species composition between remnant and replanted areas: at least in winter, birds are as likely to use revegetated areas as remnant vegetation. The absence of the babbler from revegetated areas is possibly due to the lack of logs and woody debris on the planted sites. Sixteen of the 25 bird species are predominantly insectivorous, four are nectarivores, four are seed-eaters, and one is a frugivore. This suggests that a similar range of foraging resources are available in both remnant vegetation and revegetation.

To restore and enhance regional biodiversity, we recommend that revegetation programs, including commercial plantings, should use a variety of tree species and emphasise regional species. Where this is not possible, species from nearby regions should be used. Planted areas should also be diversified by using a variety of indigenous shrubs and herbs, as well as trees, and by adding logs and coarse woody debris to the area planted. Provision of nest boxes would accelerate the colonization of revegetated areas by hole-nesting birds.

103. A large number of urban trees around Sydney (New South Wales) have been severely damaged by a true bug [Hemiptera] from the suborder Heteroptera, family Thaumastocoridae. Gerry Cassis, entomologist at the Australian Museum, has untaken the task of identifying the species, which may well turn out to be a new species. As this stage only two *Eucalytpus* species

are thought to be attacked, *E. scoparia* and *E. nicholli*, both of which have been used as street plantings for the last 30-40 years. The symptoms of attack are foliage turning brown or bronze and then falling. Complete defoliation has been reported in some cases. Affected trees do produce new growth and trees defoliated last year have grown new canopies the following spring. However, the long-term effects of this insect on the urban tree resource are yet to be determined.

Diseases

104. A canker disease in a small population of *Eucalyptus phylacis* south of Busselton in Western Australia is presently being monitored. Cultures of putitive pathogens have been isolated, but are as yet unidentified. This canker development has conservation significance, as *E. phylacis* is a WA endemic and is listed as an Endangered species (R. Robinson, M. Souter and K. Wiliams -CALM).

105. Few diseases were reported from native forest communities in Victoria during 2000/2001.

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

107. Leaf Crinkle, caused by the fungus *Mycosphaerella cryptica* was detected on coppice shoots in native forest of *E.tereticornis* near Childers in Queensland. This species, which is widespread in SE Queensland, 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 *Racospermyces tierneyi* (J. Walker & R.G. Shivas) was collected during FHS surveys of native forests (*Acacia harpophylla*) in western Queensland during the year. Gall rust affecting the pods of *A.glaucocarpa* has also been noted in seed orchard stock at Byfield recently.

URBAN AND RURAL

Pests

108. The White Cedar Moth, *Leptocneria reducta* outbreak in suburban Perth, Western Australia has subsided and no enquires have been received on this insect this past year. (T. Burbidge)

Diseases

109. Monitoring of Mundella yellows has continued in Western Australia. Symptoms have been noted in several eucalypt species. 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 or paddock stands. It has not been recorded within bushland areas (whether logged or not), nor in plantations. It is widespread on the Swan Coastal Plain (alkaline sands) in both urban and rural locations, and has now been recorded at several inland sites in the south-west of the state as well (M.Stukely- CALM).

110. Cypress canker continued to be identified from dieback of Cypress shelterbelts from several locations in Victoria. High salinity also caused deaths of Cypress shelterbelts in several coastal locations in Victoria, particularly Western Victoria.

The City of Melbourne continued to support surveys for Dutch Elm Disease in the main gardens and boulevards under their management. Symptoms resembling DED were attributed to ringbarking of branches by possums and elm bark beetles. The fungus could not be isolated from wood of any trees exhibiting flagging due to beetles. A draft contingency plan for the disease was put out for comment and suggestions received for improvement have been included in the document. A decision on who would coordinate any potential eradication program in each State needs to be clarified.

111. Additional eucalypts showing symptoms consistent with Mundulla Yellows were found in street plantings in Hobart, Tasmania. RNA associated with Mundualla Yellows has been isolated from several samples collected for assay by Adelaide University.

112. Disease samples were received from other government bodies and private individuals from both urban and rural areas during the year in Queensland. Reports on dieback of a number of *Ficus* spp (*Ganoderma* sp. cf. *lucidum*) and *Brachychiton* sp. (*Rigidoporus lineatus*) were made to local government authorities. Phellinus noxius has commonly been associated with tree decline/death within urban situations. Common hosts were *Araucaria* spp., *Ficus* spp., *Jacaranda* sp. and *Delonix* sp.

NEW ZEALAND

PLANTATIONS

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

Weather conditions

113. New Zealand experienced dry conditions during the past year. Most of the country received less than average rainfall, and drought conditions prevailed in eastern parts of the North Island (Hawke's Bay, Manawatu) and the northeast of the South Island (Marlborough).

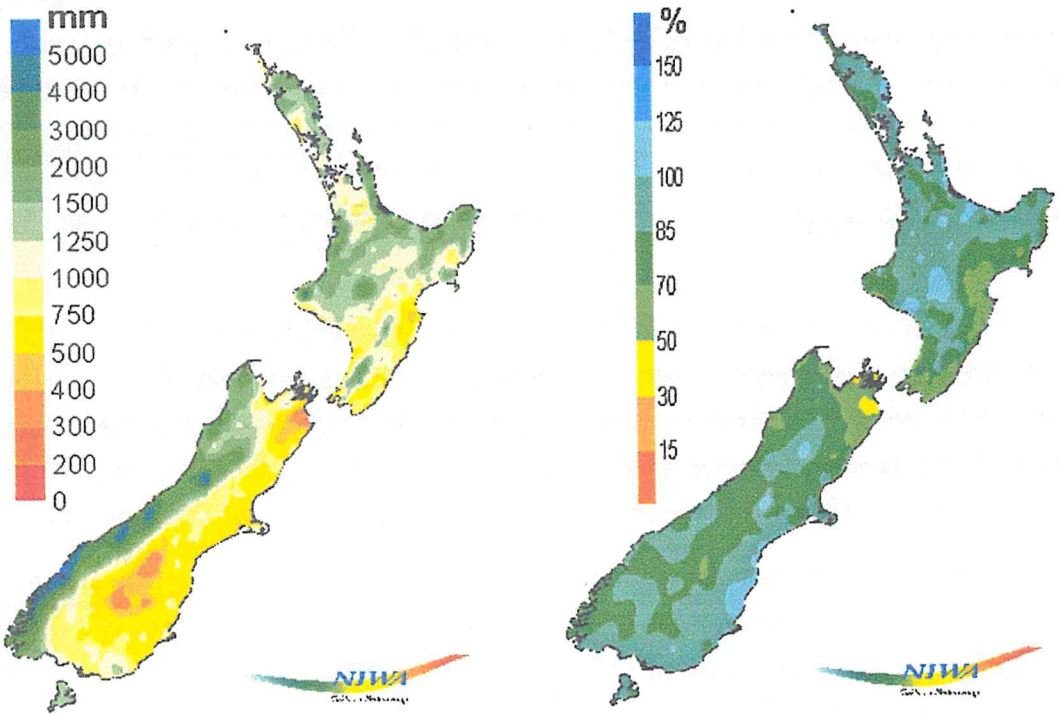


Figure: New Zealand rainfall for the year 1 August 2000 to 31 July 2001 (total rainfall, left, and percentage of average, right)

Essigella californica

114. *Essigella californica*, which was first found in New Zealand in 1998, has now spread throughout the country. In October, 2000, a programme was begun to monitor populations of the aphid in *Pinus radiata* forests in the Bay of Plenty region and in Hawkes Bay. The aphid first appeared in Bay of Plenty study sites in mid February, and since then moderate population levels have been maintained through to early May. At this stage it appears that higher aphid population numbers are found in older stands (more than 10 years) in lower elevation forests (below 300 m above sea level). The aphid has not yet been found in stands more than 600 m above sea level in Kaingaroa Forest, although it has been recorded at this altitude in previous years.

Aphids also appear to be more numerous in yellowing trees exhibiting signs of mineral deficiency or pathogen attack. A high soluble nitrogen content in such trees may attract the aphids, and this possibility makes it difficult to determine the extent to which *Essigella* is influencing tree condition. Results from study sites indicate that the aphid appears to be behaving similarly in both Hawkes Bay and Bay of Plenty. Overall, the aphid populations are currently at a relatively low to moderate level.

Heliothis armigera conferta

115. In January, 2001 unusual defoliation of 1984 planted *Pinus radiata* over an area of about 20 hectares in a forest in the Nelson region was reported by the local forest health surveillance officer. The trees had been pruned to 6 metres, so collecting samples was not easy and no causal agent was evident. The damage was reported as similar to that caused by *Heliothis armigera conferta* (Noctuidae). *Heliothis* can be a problem on small pine trees in the first few years after establishment but in our experience does not defoliate trees of this size. Because of the area involved the site was examined again a few days later by a Forest Research entomologist. The damage to the trees consisted of a noticeable browning of many of the needles close to the terminal bud, over much of the lower crown. In most trees the damage was confined to branches in the lower third of the canopy, but on some it extended up into the top third. Inspection of the affected terminals revealed that the browning was caused by the desiccation of partly severed needles. No causal agent was evident. It was found that the damage, although obvious and widespread, was quite light, and that the trees were actually in good condition. In general, less than half of the most recently flushed needles were affected. The wounds on these needles were very small (<1mm) and just sufficient to cause the distal end of the needle to die off and eventually to drop. Newly flushed needles on the affected trees were still tender, whereas those on unaffected trees within the block appeared to have hardened off. It was deduced that

the defoliation of *P. radiata* in the affected area was attributable to feeding by adult bronze beetles, *Eucolaspis brunnea* (Chrysomelidae). This insect is an indigenous species that has been recorded before from *P. radiata*, but not from trees of this size; it is normally found feeding on far smaller trees. No beetles were found, but adult maturation feeding by *E. brunnea* is ephemeral and probably occurred about a month previously. The population must have been quite large, but apparently only trees with newly-flushed foliage suitable for feeding at the time of the attack were affected. The trees quickly recovered.

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

Dothistroma

116. There were 837 records of *Dothistroma pini* needle blight; this year, almost the same as in the previous year. More than half the records of *Dothistroma* were from the central North Island (Bay of Plenty and Taupo Biological Regions, 62% of records), with a significant incidence also in the Gisborne and Nelson regions. An area of 68,000 ha of diseased forest was aerially sprayed with copper fungicide during 2000-01, 57,000 ha being in the North Island and the remainder in the South Island (3,000 ha received a second application, approximately 2,000 ha in the North Island and 1,000 ha in the South Island). The area treated this year was considerably greater than in 1999-2000 (47,000 ha), but substantially less than in 1998-99 (over 90,000 ha). The area sprayed is a rough independent indicator of the annual impact and extent of *Dothistroma* throughout the whole country, but is also influenced by other forces driving company activities.

Cyclaneusma

117. Records of *Cyclaneusma minus* needle cast totalled 1353, more than half as many as last year. This disease was again significant through much of the country, particularly in the central North Island, Gisborne and Northland (Bay of Plenty, Taupo, and Northland Biological Regions, 77% of records).

Strasseria

118. Instances of severe defoliation of *Pinus radiata* associated with *Strasseria* (and other fungi) occurred again in the spring of 2000. Almost complete defoliation occurred in some older trees. Symptoms are usually preceded by unusually high rainfall over a prolonged period. Experience has shown that recovery will occur once rainfall patterns return to normal, although there will be a period during which trees will have thin crowns.

Sphaeropsis

119. Reports of Diplodia dieback (*Sphaeropsis sapinea*) totalled 333, significantly more than in the previous year. Records were distributed through much of the country, the majority being from Northland, the central North Island, Wanganui, and northern Canterbury (together making up 60% of records).

Armillaria

120. There were 428 records of Armillaria root disease (*Armillaria novae-zelandiae* and *A. limonea*), this year, significantly fewer than last year. This year the great majority were from the central North Island (Bay of Plenty and Taupo regions, 71% of records). Most records were of low-incidence mortality in young stands, since chronic infection is not readily identified during surveys.

Other Diseases of Pine

121. A mortality centre caused by *Peniophora sacrata* was identified in the northern part of the South Island.

122. A condition known as "crown wasting" has been observed in stands of *Pinus radiata* about five years old in Gisborne and Hawke's Bay. Symptoms of yellowing and thinning in the upper crown are accompanied by severe distortion of the stem and branches. The condition is being monitored to see if it relates to site, nutrition, or genetics.

PLANTATIONS (Douglas Fir – *Pseudotsuga menziesii*)

123. Records of Swiss needle cast disease (*Phaeocryptopus gaeumannii*) totalled 128, this year, a slight increase on the previous year. Approximately half (51%) were from the South Island). Among North Island records the bulk were from the central area (Bay of Plenty and Taupo regions, 45% of all records).

124. Considerable mortality of 1-, 2- and 3-year-old Douglas fir has been recorded in the South Island. *Phytopthora cinnamomi* root rot has been an important factor, in association with difficult site conditions in some locations and poor mycorrhizal root formation.

PLANTATIONS

PESTS (*Eucalyptus* species)

Heliothrips haemorrhoidalis

125. Over the past two years the health and growth of *Eucalyptus nitens* and *E. fastigata* have been systematically monitored in selected locations in the Bay of Plenty. A variety of insect and fungal disorders have already been documented, especially at the lowland coastal site near Kawerau. Of particular note was extensive infection by the leaf pathogen *Aulographina eucalypti* in the lower crowns of young *E. fastigata* trees during the visit made at stand age 3.0 years. A subsequent visit at age 3.8 years found that by late summer the infected leaves had been shed. However, remaining foliage on the same trees had now become severely infested with *Heliothrips haemorrhoidalis* (Thripidae). This thrips attacks a wide range of horticultural and tree crops, but serious infestations are unusual in young plantation-grown eucalypts, particularly in stands of *E. fastigata*, and the cause of this outbreak was unclear. It is possible that the trees were made more susceptible by the effects of earlier *Aulographina eucalypti* infection, or perhaps the unusually wet summer of 2000/2001 facilitated development of the thrips population. It is of interest that this outbreak roughly coincided with the first releases in New Zealand of a biological control organism specifically targeted against this insect pest. HortResearch holds great hopes that the control agent, a parasitoid wasp, *Thripobius semiluteus* (Eulophidae), will successfully establish itself in this country and prove effective in controlling *H. haemorrhoidalis*.

Paropsis charybdis

126. A Western Australian strain of the egg parasitoid *Enoggera nassaui* was released in 1987/88 to control *Paropsis charybdis*, the eucalyptus tortoise beetle. *E. nassaui* proved successful in controlling *P. charybdis* over much of New Zealand except in colder areas. As part of a larger eucalypt leaf beetle research programme Forest Research is studying the efficacy of a cold climate Tasmanian strain of *E. nassaui*. If approved for release, the Tasmanian strain will be offered to those growers with defoliation problems caused by *P. charybdis*. This will be a reciprocal arrangement, as growers will be required to send in *E. nassaui* samples before and

one year after the release of the Tasmanian strain. These samples will be used to characterise the genetic structure of the *E. nassaui* population in New Zealand before and after these new releases, to determine if the Tasmanian insects have become established.

***Nambouria* sp. (Pteromalidae)**

127. The *Nambouria* sp. (Pteromalidae) first found in New Zealand in October 1999 and mentioned in this report last year is still confined to Auckland although it has expanded its range slightly. A description of the new species will be published shortly and work is continuing on its biology.

***Uraba lugens* (Nolidae)**

128. *Uraba lugens* (Nolidae) which was first found in New Zealand in 1997 and still remains confined to a very small area at Mount Maunganui was last found alive in October 2000. Just a few larvae were found and the infested tree was sprayed with insecticide. In January 2001 some old larval exuviae were found and there were signs of typical "grazing" damage. Nothing has been found since then and there are still hopes that this struggling population might be yet eradicated.

***Acrocercops laciniella* (Gracillariidae)**

129. *Acrocercops laciniella* (Gracillariidae) was first recorded in Auckland in January, 1999. It is a significant pest in coastal New South Wales, where it causes outbreaks of damage from time to time on blackbutt (*Eucalyptus pilularis*). *Acrocercops laciniella* has a wide host range, which also extends to species within the eucalypt sub-genus *Symphyomyrtus.* In the past year it has rapidly extended its range to include Waikato, Coromandel, Bay of Planty and Hawkes Bay. The numbers of leaf mines on trees can be quite high but defoliation is not noticeable and their growth remains vigorous. The situation is being monitored.

***Trachymela sloanei* (Chrysomelidae)**

130. *Trachymela sloanei* (Chrysomelidae), which was first found in New Zealand in Auckland in 1976, has continued to spread throughout the North Island wherever suitable eucalypt hosts are found. In April of this year it was found on *Eucalyptus viminalis* at Picton in the Marlborough Sounds. This is the first record of this species from the South Island.

Ogmograptis (Bacculatricidae)

131. It would seem likely that another Australian insect has been added to the New Zealand fauna. In May 2000 distinctive "scribbles" were observed on *Eucalyptus racesmosa* in a forest in Northland. These were again noted in November 2000. No larvae or moths have been found but it was felt that damage was probably caused by a species of *Ogmograptis* (Bacculatricidae). Ted Edwards (CSIRO) has seen photos of the scribbles and says he felt they were different from any scribble moth mines that he knew of in Australia. The known scribbles in Australia are narrower and more sharply defined with larger amplitude. Edwards suspects that the New Zealand insect might not be *Ogmograptis*. To establish whether the scribbles are being created by either an Australian insect or an opportunistic New Zealand insect it will be necessary to rear it. As yet this has not been accomplished.

DISEASES (*Eucalyptus* species)

Summary

132. The most common leaf spot fungi recorded on eucalypts this year were *Aulographina eucalypti* (19 records), *Fairmaniella leprosa*, *Mycosphaerella* species (particularly *M. cryptica*), *Phaeophleospora eucalypti* (synonyms, *Kirramyces eucalypti*, *Septoria pulcherrima*; 27 records), *Phaeophleospora epicoccoides*, *Pseudocercospora eucalyptorum*, and *Sonderhenia eucalyptorum*. As in previous years, most of these fungi had limited host impact, but *Phaeophleospora eucalypti* continued to affect *Eucalyptus nitens* in warmer parts of the country.

Barron Road Syndrome

133. The eco-physiological disorder of ash eucalypts referred to in New Zealand as Barron Road Syndrome (so called because of the location of the first study site) has been identified in a number of locations this year. The disorder is characterised by abscission of new foliage, with the upper crown of badly affected trees gradually becoming totally bare. Emerging leaves exhibit small necrotic spots with shoots, stems, and petioles often roughened with small galls. Older retained leaves may also be distorted and exhibit extensive leaf spotting and galling. A suite of fungi has been found associated with the affected tissues of young trees. These include *Aulographina eucalypti*, *Elsinoe eucalypti, M. cryptica, M. swartii*, *P. eucalyptorum*, and a *Colletotrichum* species. Badly defoliated trees cease growth with many dying in locations where the disease has been most severe. Barron Road Syndrome is particularly severe on *E. regnans*.

Phytophthora

134. Defoliation and dieback of *Eucalyptus delegatensis* and *E. nitens* in Southland associated with foliar infection by species of *Phytophthora* has spread to new locations. The effect on *E. nitens* is minor but if these *E. delegatensis* stands mirror other earlier occurrences then severe defoliation could lead to tree death over a period of several years.

PESTS (*Acacia* species)

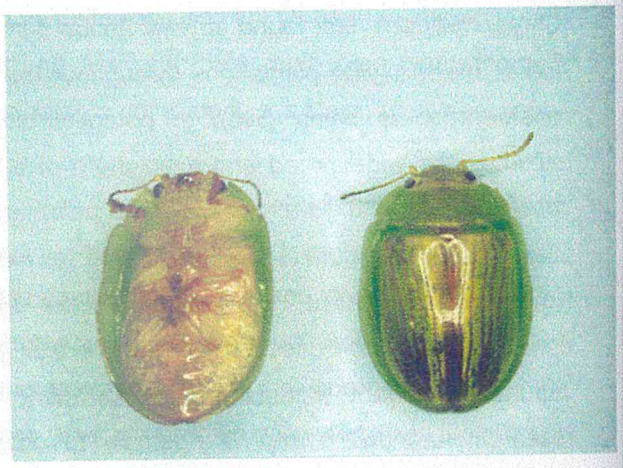
Dicranosterna semipunctata

135. Over the last few years the introduced Australian beetle *Dicranosterna semipunctata* (Chrysomelidae), first found in New Zealand in 1996, has been causing moderate defoliation of *Acacia melanoxylon* plantations throughout the greater Auckland region. To address this issue, consideration is being given to potential biological control options before *D. semipunctata* becomes too widespread and even more of a problem. Possible biocontrol agents include two species of parasitoid wasps, *Enoggera polita* and a species of *Neopolycystus*, which were found attacking *D. semipunctata* eggs during an investigation in northern New South Wales in November 1999. The Environmental Risk Management Authority (ERMA) requires us to demonstrate a good understanding of the biology of these egg parasitoids, before approving the importation of new organisms into quarantine. So in January and February this year, further research was undertaken in Australia to obtain essential information on the distribution of *D. semipunctata* and the life cycles of the parasitoids. The Australian distribution of *D. semipunctata* extends from Victoria through to northern NSW, with greatest numbers occurring on the tablelands in from the coast. Rearing the parasitoid wasps in the laboratory demonstrated that the life cycles are comparatively short, the period between egg and adult being completed in just over a week and half. It was also determined that the adults can be kept alive for up to five weeks. Between 33 - 60% of *D. semipunctata* eggs were found parasitised in the field. Attack by both egg parasitoids is restricted to the sub-family Chrysomelinae, which includes exotic genera such as *Trachymela*, and *Paropsis* which have species established in New Zealand. No hyperparasites were found in any of the *D. semipunctata* eggs, and we are optimistic about obtaining clearance for importing the parasitoids into quarantine. However, all the issues on the biocontrol and current pest status of *D. semipunctata* will be fully reviewed before an import application is submitted to ERMA.

Faex suturalis

136. During a routine port environs survey in October 2000 chrysomelid larvae were discovered on a small group of trees of *Acacia retinodes* in a park a few kilometres from Wellington airport. Adults were reared in containment and subsequently identified by Tom Weir (CSIRO, Canberra) as *Faex suturalis*, a species not previously known in New Zealand. It was not found on *Acacia longifolia* and a number of species of bipinnate acacias growing within 150 metres of the infested *A. retinodes* trees and because of the small number of trees involved the Ministry of Agriculture and Forestry decided to attempt eradication and all the infested trees were sprayed with Decis Forte three times at weekly intervals. Many dead larvae were found after the first spray but none after the subsequent sprays nor during follow-up inspections. The site is being monitored but delimiting surveys have not yet been carried out.

Faex suturalis (larva on *Acacia retinodes* phyllode)



Faex suturalis (adults)

NURSERIES

137. Basal swellings of *Pinus radiata* seedlings were recorded in a number of nurseries that had not previously experienced the disorder. Plants with minor swellings are probably unlikely to exhibit problems when planted out but the stems of plants with a large swelling often become brittle at that point and will readily snap. These plants have to be culled. The condition is abiotic in origin and is considered to be caused by a herbicide that is commonly used in many nurseries. Treatment does not always cause problems, and its adverse effect appears to depend on variables such as the seedling growth stage when applied, soil and environmental conditions, and accumulation in the soil, although these different aspects are not fully understood.

138. The colder than usual winter temperatures led to some instances of bacterial blight of *Pinus radiata* caused by the 'ice-nucleating' bacterium *Pseudomonas syringae* pathovar *syringae*. Temperatures have fluctuated this year, and the sudden frosts that followed mild conditions in locations where frosts are uncommon created a situation conducive to the disorder.

URBAN AND RURAL

139. The eradication campaign for Dutch elm disease in Auckland still continues and over the 2000/2001 season seven infected trees were found. In the previous season no new diseased trees were detected. This is the first season since 1995/96 where infection has been identified in the current wood. The asymptomatic survey continued and of more than 2400 trees sampled 11% had some form of staining in the wood. *Ophiostoma novo-ulmi* was isolated from one group of three trees. A limited pheromone trapping programme was carried out in Auckland City but none of the trapped beetles were contaminated with *O. novo-ulmi*. However, additional traps, which were placed where infected trees were found in Manukau City and the Papakura District, showed that 0.71% of the beetles caught were contaminated with the fungus. The future of the programme for the 2001/2002 season has yet to be decided.

CYPRESSES

140. The fungus *Kabatina thujae* was identified from tip dieback from a pair of large *Thuja plicata* in Timaru Botanical Gardens, a first record for New Zealand. *Kabatina thujae* is known in both Europe and North America, causing leaf tip death of a range of hosts in the genera *Cupressus, Chamaecyparis, Thuja* and *Juniperus*. Susceptible species include several of those cypresses commonly grown in plantations and shelter belts in New Zealand such as

Chamaecyparis lawsoniana, Cupressus sempervirens and *Cupressus arizonica*. The severity of the dieback varies with both host and location. Subsequent to the first record the fungus was found on *Chamaecyparis lawsoniana* and further afield, in Christchurch.

141. *Phyllosticta spinarum* has been recorded more widely and on several new hosts during the past year (see new distribution and host records). This fungus is associated with foliage dieback on a range of genera in the Cupressaceae (*Chamaecyparis, Cryptomeria, Cupressus, Juniperus, Libocedrus*, *Thuja, Thujopsis*) and *Sequoia sempervirens.*

OTHER HOST SPECIES (PESTS)

Painted apple moth (Teia anartoides)

142. In mid-January, 2001, a caterpillar of the painted apple moth (*Teia anartoides*), first recorded in New Zealand in 1999, was found in Titirangi some five kilometres from the closest known site in Kelston. The caterpillar was discovered and brought to the attention of Ministry of Agriculture and Forestry by a member of the public. A limited survey was conducted in the area but no more caterpillars were detected. However, live caged females placed around the site trapped a small number of males. Since then more females have been available for the trapping programme and the results from ground surveys have demonstrated that *T. anartoides* is still very much alive and well in the Kelston/Avondale/Titirangi area of west Auckland. In late May 2001 an independent report on the response by the Ministry of Agriculture and Forestry (MAF) to the painted apple moth incursion was published and copies were sent to all RWG 7 members who requested one. The report was very critical of some major aspects of the handling of the incursion.

Coscinoptycha improbana (Carposinidae)

143. An Australian guava moth, *Coscinoptycha improbana* (Carposinidae), was found in Northland 1999 but has only become public knowledge with the publication of a New Zealand Press Association article on 27 October 2000. No public disclosure was made for fear that it presence in New Zealand might be used as a non-tariff trade barrier. Little is known about the moth in Australia but its larvae are known to bore in the fruits of both native and introduced plants, including *Cassine australis* (Celastraceae), *Schizomeria ovata* (Cunoniaceae), citrus fruit (Rutaceae), guava and feijoa (both Myrtaceae). The Ministry of Agriculture and Forestry made the early decision that this was an Australian garden pest and only discussed the matter with the Northland fruit growers. This is despite the fact that there are important forestry and native tree

species in New Zealand related to the known hosts, including species of *Eucalyptus* (Myrtaceae) and native species such as *Metrosideros* spp. (Myrtaceae), *Weinmannia racemosa* (Cunoniaceae) and *Melicope simplex* (Rutaceae). This new introduction has only become public because the fruit growers have complained about the lack of response by MAF. The handling of this new incursion has cast doubts as to whether MAF is consulting widely enough when determining which sectors of New Zealand could potentially be affected.

Stegommata sulfuratella (Lyonetiidae)

144. Since it was first found on banksias in the Auckland region in April 1999, the leafminer *Stegommata sulfuratella* (Lyonetiidae) has steadily expanded its distribution range within the North Island and is now found as far south as Wellington. The most common host is *Banksia integrifolia* but it has also been found on *B. ashbyi, B. grandis, B. media, B. ornata, B. serrata* and *B. spinulosa.*

***Cryptoneossa triangula* (Psyllidae)**

145. Dieback and subsequent mortality of *Eucalypyus ficifolia,* recorded in urban environments in the North Island for a number of years have increased, but no definitive cause has yet been established. Insect defoliators are not involved but *Cryptoneossa triangula* (Psyllidae), a free-living psyllid contributes to the shedding of new foliage in spring and it also attacks the tender young stems, causing a warty spotty appearance. Leaf fungi associated with affected trees include *Cryptosporiopsis eucalypti* and *Stigmina eucalypti. Botryosphaeria dothidea* has been isolated from larger dying branches.

OTHER HOST SPECIES (DISEASES)

146. "Flagging" of plane trees (*Platanus* × *acerifolia*, *P. occidentalis*) caused by *Apiognomonia veneta*, and of redwood (*Sequoiadendron giganteum*) caused by *Botryosphaeria dothidea*, was again evident this year.

The leaf pathogen *Dothidasteromella systema-solare* was found in November causing spotting and tissue death on leaves of *Banksia integrifolia* growing at New Plymouth. About 10% of the green crowns were affected on all banksia

Dothidasteromella systema-solare on foliage of *Banksia integrifolia*

trees in the immediate vicinity. The fungus has not been found elsewhere in New Zealand, but monitoring is continuing.

NATIVE VEGETATION

Phytoplasma australiensis

147. Dieback and mortality of native cabbage trees in New Zealand (*Cordyline australis*, Agavaceae) has been attributed to the agent "*Candidatus* Phytoplasma australiensis", described from grapes affected by grape vine yellows disease in Australia (Landcare Research, HortResearch). This conclusion is based on the detection of the phytoplasma DNA in symptomatic but not healthy sapling and mature cabbage trees, the finding of phytoplasma cells in affected plant tissues using the transmission electron microscope, and one case of recovery after tetracyclene antibiotic injection. However, as yet there is no proven vector to explain how the phytoplasma is transmitted. This agent is responsible for yellow leaf disease in native flax, *Phormium tenax* (Agavaceae). It is postulated to cause disease in other native and horticultural plants.

QUARANTINE AND BIOSECURITY

AUSTRALIA

Pine pitch canker

148. An Australasian contingency plan for management of incursions of *F. circinatum (Pine pitch canker)* is in preparation in New South Wales.

European house borer, Hylotrupes bajulus

149. The exotic European house borer, *Hylotrupes bajulus*, was found in a piece of timber brought to R&DD by a pest controller in August. The timber, taken from a bowling alley at Top Ryde, Sydney, New South Wales, was showing signs of borer damage. It was dissected and insect larvae taken from it were identified as European house Borer. European house borer is a longicorn beetle native to North Africa. It now occurs in all continents except Australia and is a pest of major importance wherever it occurs. The pest frequently attacks housing timbers and its ability to attack seasoned softwoods distinguishes it from native longicorns. Since Australia is heavily reliant on radiata pine for housing construction, the economic impact if this pest were to become established would be severe. R&DD staff participated in inspections of the bowling alleys in conjunction with AQIS, and assisted with the formulation of a management strategy. AQIS are now implementing the necessary action to minimise the risk of the borer spreading to other areas.

West Indian drywood termite, Cryptotermes brevis

150. The exotic West Indian drywood termite, *Cryptotermes brevis*, was found in timber picture frames in a house in Belfield, Sydney, New South Wales. The discovery was made by a pest controller who brought the infested specimens to R&DD for identification. The infested frames were imported into Australia from New Caledonia approximately 20 years ago. The premises were inspected by R&DD staff in conjunction with AQIS and NSW Agriculture. As there were no signs of the termites having spread into other parts of the house, the only remedial action warranted was the disinfestation of the infested frames.

Formosan termite, Coptotermes formosanus

151. AQIS inspectors in New South Wales intercepted a shipment of timber from Taiwan infested with termites. The termites were identified as Formosan termite, *Coptotermes*

formosanus, by R&DD staff. In economic terms *C. formosanus* is the world's most important termite pest. The infestation was destroyed by fumigation.

Fusarium lateritium

152. Shoot dieback was found on several trees from 2-years-old plantation on a site with severe nutrient deficiencies in Tasmania. Affected shoots had copious resinosus, resin-soaked wood and salmon-coloured sporodochia producing typical *Fusarium* macroconidia. Because of the similarity of the field symptoms with those of pitch canker the plantation was immediately declared a quarantine area pending confident identification of the *Fusarium*. DNA tests done by FRI and University of Tasmania using RAPD's and a range of primers showed the species was distinct from *F. circinatum*. Based on cultural morphology the isolate has been tentatively identified as *F. lateritium*. In Tasmania, this species has only previously been recorded on *P. radiata* from nursery seedlings with damaping-off. Pathogenicity tests have so-far failed to reproduce symptoms in health plants so the probable diagnosis is saprophytic colonisation of moribund shoot tissue of severely nutrient-stressed trees.

Asian Gypsy Moth

153. Monitoring of three major Victorian ports (Melbourne, Geelong and Westernport) was conducted for the Asian Gypsy Moth over summer 2000-2001. No target insects were detected.

154. Monitoring of six Tasmanian ports was conducted for Asian Gypsy Moth between October and March. The target insect was not captured. At one site the use of sticky trap bands was used on some tree species to obtain a baseline collection of timber insects present within the port surrounds 5-kilometre area. This initial survey resulted in 44 species being captured including several new anobiid records for Tasmania. It is intended to expand this technique to the other port sites in the coming season.

Monochamus alternatus

155. In May 2001, AQIS detected live adult *Monochamus alternatus* at the Port of Brisbane in pallets from China. This longicorn beetle is known as a vector of the pinewood nematode *Bursaphelenchus xylophilus*, an important pest of *Pinus* spp in Japan, Korea and China. Other pallets from the same consignment had been sent to Swanbank west of Brisbane. These were located, found to be similarly infested, and were fumigated or deep buried. Surveys of the area showed that there were no pine trees within a radius of a few kilometers of the site. Dying pine

trees further away have been felled and sampled for nematodes - none were found. Pheromone traps have been placed at Swanbank and are checked fortnightly. No *M. alternatus* have been found to date.

Red imported fire ant - Solenopsis invincta

156. The exotic fire ant *Solenopsis invincta* was discovered in Brisbane in early 2001 at two loci. Emergency response was activated and scoping studies commenced, along with treatment of critical sites such as schools, parks, Port of Brisbane and residences. USDA experts visited Brisbane in June to advise on the situation. The Scientific Advisory Panel recommended eradication based on a benefit/ cost ratio of 18:1, estimated cost to the economy of $6.7 billion over 30 years and the present limited distribution of this insect in Brisbane. This recommendation was accepted by SCARM. Commonwealth /State cost sharing arrangements are in place and $123 million allocated to an eradication program over 5 years. The fire ant is a pest to human health, lifestyle, wildlife and some agricultural crops. RIFA does not do well in closed forest but woodland areas will be invaded. It particularly likes disturbed sites and could be expected to invade after clear fell and be a problem to forestry workers in early plantation establishment. It is likely to be a problem in recreational areas in forests.

Western drywood termite - Incisitermes minor

157. The exotic drywood termite *Incisitermes minor* was found in a yacht in Moreton Bay. This insect is a common interception in Queensland, frequently in boats. The yacht was ordered into quarantine for treatment of the infestation.

NEW ZEALAND

Asian Gypsy Moth

158. There has been a concern for many years over the continual interception of viable egg masses of *Lymantria dispar* (Lymantriidae) on cargo from Asia, and its possible establishment in Australia and New Zealand. A Forest Research entomologist (supported by MAF operational research funding) assessed the potential risk of establishment of this extremely polyphagous moth in collaboration with Australian entomologists from CSIRO. Using the known climatic preferences of AGM they predicted that the insect's potential geographic range included SE and SW Australia and New Zealand. In laboratory trials conducted at the CSIRO European Laboratory (Campus International de Baillarguet, Montferrier-sur-Lez, France) the research team tested three

populations of AGM and 73 Australasian plant species to examine the ability of AGM larvae to complete their development. Larval performance on at least five species of Australian native plants was as good as that on AGM's preferred host species (*Quercus humilis* and *Q. robur*). However, larval performance on Australasian *Nothofagus* species was poor. *Pinus radiata* was also included in the trial and proved to be moderately acceptable. Given the acceptability of some Australian plants and a climate suitable for the establishment of AGM, this insect should be treated as a quarantine threat, but more particularly to naturalised Northern Hemisphere host plants. Work carried out in the USA in conjunction with the US Forest Service has demonstrated that different advanced-selection families of *Pinus radiata* are moderately acceptable to, but not preferred hosts for *Lymantria dispar* (Lymantriidae).

Pine pitch canker

159. The use of biocontrol methods to protect *Pinus radiata* seedlings against infection with *Fusarium circinatum,* the causal agent of pine pitch canker were investigated in collaboration with HortResearch. Trials were carried out in the high security quarantine facility at NZFRI in Rotorua. The data indicate that elicitors appear to induce some resistance in *P. radiata* to pine pitch canker (reduced lesion length) and that the level of control can be further improved by the incorporation of a biocontrol agent. (NB: It was frightening to see how quickly the seedlings died back following inoculation).

Quarantine diagnosis

160. Diagnosis of quarantine samples is no longer the responsibility of Forest Research. For this reason there is no New Zealand quarantine report this year.

Formation of new Forest Biosecurity Consultative Forum

161. The Forest Biosecurity Advisory Committee met for the final time in Wellington on 11 October 2000. The Hon. Marian Hobbs, Minister for Biosecurity, decided that she no longer required an independent committee to advise her specifically on forest biosecurity matters. Accordingly, the terms of reference for the FBAC, which expired at the end of June 2000, were not renewed. The Minister met with Dr Gordon Hosking, Chair of the Committee, to explain her decision. In deciding not to renew the FBAC's terms of reference, the Minister reflected on her overall advisory structures. The Biosecurity Council is the Minister's primary adviser on biosecurity matters, and will also include representation from the environmental and primary production sectors. The Minister also receives advice from the Biosecurity Technical Forum (the

technical sub-committee of the Biosecurity Council), and the Biosecurity Consultative forum. The Consultative Forum meets quarterly in Wellington to discuss biosecurity policy issues of interest to all sectors, and membership is open to any industry or group that wishes to participate. The Ministry of Agriculture and Forestry's consultation on specific forest biosecurity issues will be conducted in accordance with the Biosecurity Authority's consultation policy. The Director of Forest Biosecurity, Dr Ruth Frampton, has established a new Forest Biosecurity Consultative Forum, which she chairs and administers. This forum had met on two occasions before the Minister's decision.

Review of the Management of Biosecurity Risks to the Environment

162. A report on biosecurity in New Zealand by the Parliamentary Commissioner for the Environment, Dr Morgan Williams, was released in December last year. The report identified weaknesses, and made recommendations to the Minister for Biosecurity. Besides risks to traditional primary production, a need was seen for improved protection to the New Zealand environment and natural biodiversity from tourism and trade. The report recommended increased funding, more explicit outcomes, improved monitoring and surveillance of indigenous habitats, clear funding commitment for biosecurity emergencies, revision of the roles and function of the Biosecurity Council, and an assessment of the effectiveness of the Biosecurity Act 1993. The report is available on http://www.pce.govt.nz.

FOREST HEALTH SURVEILLANCE AND DIAGNOSIS

AUSTRALIA

163. Monitoring for *Essigella* has been continued on a monthly basis in South Australia. No formal forest health surveillance is carried out apart from annual *Sirex* flights. Any unusual symptoms or deaths reported are investigated as necessary.

164. Surveys of approximately half of the hardwood /eucalypt Joint Venture and Land Purchase plantations were conducted during summer and autumn in New South Wales. 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 were not conducted this year.

Forest health surveys of all Softwood plantations were completed through winter and spring 2000. The Forest Health Survey Unit reported on the incidence, severity and extent of areas where pests, diseases, vertebrates, nutrients and weeds were limiting growth or affecting survival of pines. Recommendations on control or remedial actions for health problems were supplied to Softwood Plantations Division for consideration. These recommendations and related data can be used to assist to:

- predict wood volumes in affected stands (eg. possum or *Sphaeropsis* damaged stands),
- adjust management regimes to improve vigour of "unhealthy" stands (eg. to bring forward thinning in drought-affected, or nutrient-deficient, stands),
- apply fertilisers or control weeds to improve establishment, growth and survival of young trees,
- manage pest and disease outbreaks (e.g. control spray for *Dothistroma*).

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. ACT Forests has shown interest, and negotiations are under way.

165. In Western Australia, between July 2000 and June 2001, a total of 1462 samples were processed for *Phytophthora* identification by CALM's Vegetation Health Service (VHS). *P.cinnamomi* was detected in 533 samples, *P.citricola* (60), *P.cryptogea* (5), *P.megasperma* (1), *P.nicotianae* (1), and *Phytophthora* sp. (1). There were 21 samples (sandalwood, pine, eucalypt and others) sent to the VHS for general diagnosis in this period (F.Tay & M.Stukely-CALM).

NEW ZEALAND

166. In the year from 1 July 2000 to 30 June 2001, records of disorders of forest trees on the Forest Health Database totalled 9,138, slightly more than last year. Of these, 3,970 were fungal and 1511 insect pest disorders. Over this period the Forest Health Diagnostic Services processed 1001 pathology and 702 insect pest samples.

New records of fungi and algae

167. *Coryneum betulinum* on *Betula pendula*, Wellington Biogeographic Region
Cryptospora betulae on *Betula pendula*, Wellington Biogeographic Region

Dothidasteromella systema-solare on *Banksia integrifolia*, Taranaki Biogeographic Region
Kabatina thujae on *Thuja plicata*, South Canterbury Biogeographic Region

New Host

Cephaleuros aff. *parasiticus* on *Banksia serrata*, Wellington Biogeographic Region
Phaeophleospora epicoccoides on *Eucalyptus viminalis*, South Canterbury Biogeographic Region
Phaeophleospora eucalypti on *Eucalyptus camaldulensis*, Northland Biogeographic Region
Phyllosticta spinarum on *Thujopsis dolobrata*, Nelson Biogeographic Region
Phyllosticta spinarum on *Sequoia sempervirens*, Auckland Biogeographic Region
Phyllosticta spinarum on *Libocedrus plumosa*, Wellington Biogeographic Region
Cryptosporiopsis aff. *eucalypti* on *Dysoxylum spectabile*, Wellington Biogeographic Region
Cryptosporiopsis sp. on *Chamaecyparis pisifera*, Nelson Biogeographic Region
Fusarium merismoides on *Corokia cotoneaster*, Wellington Biogeographic Region
Fairmaniella leprosa on *Eucalyptus leucoxylon*, Wellington Biogeographic Region
Fairmaniella leprosa on *Eucalyptus ovata*, Buller Biogeographic Region
Harknessia globosa on *Podocarpus hallii*, Taranaki Biogeographic Region
Phaeophleospora epicoccoides on *Eucalyptus gunnii*, Buller Biogeographic Region
Sonderhenia eucalyptorum on *Eucalyptus leucoxylon* ssp. *leucoxylon*, Taupo Biogeographic Region
Kabatina thujae on *Chamaecyparis lawsoniana*, Mid Canterbury Biogeographic Region
Seiridium cardinale on *Thujopsis dolobrata*, Wellington Biogeographic Region
Sonderhenia eucalypticola on *Eucalyptus fraxinoides*, Taupo Biogeographic Region
Stigmina thujina on *Chamaecyparis pisifera*, Wellington Biogeographic Region

FOREST PRODUCTS

West Indian drywood termite (Cryptotermes brevis)

168. Eleven buildings and a boat in Brisbane, and 19 buildings in Maryborough were fumigated in 2000/01 to eradicate infestations of this pest. A further 16 buildings in Brisbane were discovered infested during recent surveys and require fumigation. All but 2 of these buildings were in known areas of infestation; most were re-infestations. Six buildings in the Maryborough Central Business District (CBD) which have been found infested during the past several years are yet to be fumigated. An infested boat has also been discovered in Maryborough. An

administrative review of the program was undertaken in late 2000. The outcomes of that review are yet to be announced.

Subterranean termites - Termite Standards

169. 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) have been published as performance-based documents. On 1 January 2001, the Queensland provisions of the Building Code of Australia (BCA) were amended to address the installation of termite management systems in class 1 (houses) and class 10 buildings (sheds, garages and the like). Specifically, the provisions incorporate durability of termite management systems in NEW BUILDINGS. Information on these provisions for NEW BUILDINGS can be found at: http://www.dcilgps.qld.gov.au/building_codes/

Lyctine pests

170. The paper: Peters, B.C., Creffield, J.W. and Eldridge, R.H. (in prep.) - Lyctine (Coleoptera: Bostrichidae) pests of timber in Australia: a literature review. nears completion for *Australian Forestry*. A review of the biology, behaviour and management of the most common lyctine species *Lyctus brunneus* (Stephens) in Australia was undertaken and selected literature is discussed. A sampling and testing protocol to establish lyctine-resistance of timber species is detailed in the paper.

RESEARCH AND DEVELOPMENT

Western Australia

171. Work under the following grants is in progress at Murdoch University. SPIRT Large. 2000-2003 at $200, 000 (Industry Partner-Integrated Tree Cropping). *Mycosphaerella* leaf blights 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). The focus of this project is disease epidemiology. Over the past year spore traps have been built and techniques for identifying *Mycosphaerella* spp. adhering to the Melanex tape developed. Spore traps have been placed at plantations where disease has been monitored. Data are accumulating on the conditions under which spores are released and disease may develop.

172. Small ARC: Interaction between *Endothia gyrosa* and *Eucalyptus globulus* micronutrient status and canker disease development. (G. Hardy and B. Dell-MU)

173. PhD Theses in progress at Murdoch University. *Mycosphaerella* leaf pathogens in *Eucalyptus globulus*. (Aaron Maxwell; Supervisors, B. Dell and G. Hardy-MU). This project examines the occurrence of *Mycosphaerella* leaf disease in *Eucalyptus globulus* plantations in southwestern Australia with the view to:

i. identify the *Mycosphaerella* spp. in plantations and adjacent eucalypts,

ii. investigate the population genetics of *Mycosphaerella nubilosa*

- Taxonomy and description of *Mycosphaerella* species present in WA. It has been established that MLB (*Mycosphaerella* Leaf Blotch) is a disease complex in WA involving a number of species. More than 2000 isolates of *Mycosphaerella* and other fungi have been identified from lesions of *E. globulus, E. marginata, E. calophylla* and *E. diversicolor*. The following species have been identified and described: *M. cryptica, M. lateralis, M. marksii, M. nubilosa,* and *M. suberosa*. Of these, one is a new Australian record and one a new record for Western Australia. Importantly, *M. nubilosa* the most destructive pathogen in eastern Australia has now been found in WA. Additionally, a number of isolates have been described but are proving difficult to fully identify and some may be new species.
- Biogeography of *Mycosphaerella* spp. on Eucalyptus in Western Australia. Following the surveys of 1999 which were designed to determine the pathogens present in *E. globulus* plantations and surrounding eucalypt vegetation, further surveys have been made this year. This systematic survey of March-June 2000 has enabled the elucidation of the relative importance of different *Mycosphaerella* spp. across the *E. globulus* estate.
- Molecular Taxonomy and Phylogeny of *Mycosphaerella* in WA. A culture collection and an ITS region sequence data base is being established for *Mycosphaerella* spp. present in WA.
- Population genetics of two important *Mycosphaerella* species. Both *M. cryptica* and *M. nubilosa* isolates from 30 sites are collected and ready for DNA analysis

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

174. Honours Projects in progress at Murdoch University. Infection process of *Mycosphaerella* leaf blotch (MLB) on eucalypts in WA (Sarah Jackson)

175. Honours Projects in progress at Murdoch University.
Canker fungi associated with deaths of *Corymbia calophylla* (marri). Trudy Paap (Supervisors: G.

Hardy-MU, Bryan Shearer-CALM and Jen McComb-MU)

176. Dieback-resistant jarrah (*Eucalyptus marginata*): The first stage of a production seed orchard of dieback resistant jarrah clones was established at the Forests Products Commission's Plant Propagation Centre near Manjimup in 2001. Field trials of jarrah clones selected for resistance to *Phytophthora cinnamomi* have continued (M.Stukely-CALM).

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

177. 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).

178. 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).

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

PhD Theses in progress at Murdoch University

180. 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).

181. 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).

182. 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).

Honours Projects in progress at Murdoch University

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

184. 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.

185. Armillaria root disease: Armillaria root disease (caused by *Armillaria luteobubalina*) is currently being monitored in a karri silvicultural thinning trial. Results after 15 years show that thinning has had a significant effect on infection levels and impact increased with thinning intensity (R. Robinson – CALM).

Native plant communities

186. Seventeen sites covering 95 hectares were aerially sprayed with phosphite during 2000/2001 financial year in the Albany, Esperance, Katanning and South West Capes districts. Nine *Phytophthora* -susceptible DRF (Declared rare Flora) species were treated in Albany district, 4 in South West Capes, one in Esperance and one in South West Capes district. Eight sites at Walpole and one at 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 two sprays with a single spray, autumn with spring and early season with late season applications. The results of this trial, which will compare levels of phosphite *in planta* are not available yet. (R. Smith - CALM).

Work under the following grants is in progress at Murdoch University

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

188. PhD Theses in progress at Murdoch University Sudden death in cutflower Proteaceae. (Chris Dunne; Supervisors, G.Hardy and B.Dell-MU).

189. 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).

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

191. Honours Projects in progress at Murdoch UniversitY. Insect pests of *Eucalyptus globulus* in Western Australia (Damien Cancilla).

Victoria

192. The effects of repeated defoliation on the growth of E. globulus in plantations in north central Victoria.

193. Ecology of invertebrates on heathland in East Gippsland and the Grampians.

194. Resistance of young planted eucalypts to damage by chrysomelid leaf beetles in east Gippsland

New South Wales

195. A number of eucalypt tree-improvement trials were assessed for pests and diseases this year. These have also been measured for growth and form characteristics.

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

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

198. Stem borer research in hardwood plantations is ongoing, and collaboration on impact of stem degrade continuing with QFRI

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

200. A Christmas beetle exclusion trial in an *E. dunnii* plantation was established by State Forests to quantify the impact of severe and continued defoliation by these insects. Trees recovered after initial defoliation in November-December, but we were hoping for further damage. Data is being analysed.

201. 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. Intensive foliar sampling has been conducted as part of the 'ground-truthing' project associated with the 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. This has now been written up. A similar study is planned for several *Pinus radiata* plantation sites in the Hume Region, with continued collaboration with CSIRO Forestry and Forest Products.

Tasmania

202. The research program has had emphasis on testing new insecticides for use against the eucalypt defoliator's *Chrysoptharta* spp., *Uraba lugens* and *Mnesampela privata*. The release of the technical bulletin 'Manual for managing leaf beetle defoliation in eucalypt plantations' is an important step in the development of the IPM program.

203. The invertebrate program in the Silvicultural Systems Trial in the Warra LTER site in southern Tasmania continues to be supported at a high level. The measurement of the impact of differing logging techniques and tree retention on biodiversity in wet eucalypt forests will be of major importance to the forest industry.

204. An economic analysis of the impact of Mycosphaerella leaf blight demonstrated considerable financial benefit if the disease can be effectively controlled using fungicides. Glasshouse trials have been established to screen potential fungicides and host defence promotants. A site for a field trial has been selected and will be established during the year to test the effectiveness of fungicide / defence promotants, with and without weed control, in preventing defoliation from MLB. The field trial site will also be used to: (i) investigate the physiological

response of the trees to infection as a means of better predicting impact using process-based models (subject to funding) and (ii) evaluating the potential for remotely sensing MLB infection and defoliation using CASI.

205. Research to support continual improvement in methods for conducting health surveys has focussed on addressing the issues of: (i) variability and its effect on the accuracy in measuring and reporting health status; (ii) assessment standards for premature leaf senescence; (iii) silvicultural prescriptions for plantations with variable health and performance.

206. Developed diagnostic keys to identify, illustrate and describe common health problems affecting eucalypt and pine plantations in Tasmania. The keys have been included in Farm Forestry Toolbox Version 3.

CSIRO Entomology

Insect – Eucalypt Interactions Symposium

207. The Symposium Issue of *Austral Ecology* on "Insect-Eucalypt Interactions", in which the 14 papers from the meeting held in 2000 are presented, will be published in October 2001 as Volume 26, Issue 5, of the journal. Martin Steinbauer supplied Blackwells with a list of symposium delegates as well as other colleagues interested in the topic. Blackwells will use this list to contact persons not already members of the Australian Ecological Society but who may be interested in purchasing this special issue. RWG7 members could also ensure that interested persons contact Blackwells to ensure they can obtain a copy of the issue.

Pheromones for monitoring autumn gum moth populations

208. The initial phase of this project is now nearing completion. The 3 compounds that comprise the sex pheromone of Autumn gum moth have been identified and confirmatory studies are all that are still required. In early 2001, Martin Steinbauer and Geoff Allen (University of Tasmania and the CRC for Sustainable Production Forestry) with industry support, prepared a funding application to the Australian Research Council to continue the pheromone research. If successful, this funding will enable Dr Fredrik Ostrand from Lund University, Sweden, to work in Australia on the project and advance it to the stage of field implementation. Martin is presently in British Columbia, Canada, talking to representatives of companies expert in the synthesis of insect sex pheromones with a view to establishing partnerships to produce the pheromone for

use in the field. Sometime prior to this stage of the process, issues concerning patenting will need resolution.

Parasitoids of autumn gum moth

209. Mark Short, Martin Steinbauer and Stefan Schmidt concluded their first season's field work using experimental trials established the preceeding year. Malaise and UV light traps were used to monitor populations of Autumn gum moth adults and populations of hymenopteran natural enemies of the moth in plantings of different levels of vegetational complexity/nectar availability. Data compilation is complete and initial analysis will be complete before the start of the 2001/2002 season.

Establishing new linkages with international experts

210. In December 2000 Martin Steinbauer was granted funding from the Australian Academy of Science to undertake 6 weeks research with Dr Allan Carroll at the Pacific Forestry Centre (PFC) in Victoria, British Columbia, during July and August 2002. The PFC is the research centre of the Canadian Forest Service on the west coast of Canada. Martin and Allan are studying oviposition preference for hosts of different nutritional qualities by the Phantom hemlock looper and Hemlock looper (Geometridae) – two very serious lepidopteran defoliators of conifers in north America which exhibit some life history similarities to Autumn gum moth. In addition, Martin has had the opportunity to see management practices for Mountain pine beetle as well as pheromone-based management practices for beetles and lepidopteran defoliators, both in the interior and coastal mountains of BC, respectively.

Assessment of the economic impact of the major insect defoliating pests of Eucalyptus globulus globulus in Western Australia

211. 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, established by Andrew Loch with support from the Western Australian Blue Gum Industry Pest Management Group (IPMG), will aid in the determination of economic thresholds for these various pests. Trials are proceeding well with early results indicating significant growth losses as a result of feeding by the eucalyptus weevil, C. *excrementarius* and autumn gum moth.

Seasonal phenology of the major defoliating pests of Eucalyptus globulus globulus in Western Australia

212. 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. Results so far show that the eucalyptus weevil has only one annual generation in southwestern Australia, and species of *Chrysophtharta* go through one to two generations per year. Critical surveillance, monitoring and control times for these pest species have been identified and are being incorporated into industry management systems.

Impact of aerially applied insecticides on weevil and chrysomelid pests and their natural enemies

213. 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. Results indicate that aerial insecticide applications cause virtually 100% mortality of both pests and natural enemies. Numbers of pests and natural enemies gradually increased post spraying as they re-entered the plantation from surrounding areas.

Biological control of the eucalyptus weevil, Gonipterus scutellatus, by the egg parasitoid Anaphes nitens.

214. 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. Results show that parasitism rates by *A. nitens* are extremely low (<5%) during early spring but increase to nearly 100% by summer.

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

215. Investigations into the biology and ecology of *Essigella californica*, with particular reference to the basic development and reproductive biology as well as aphid-plant interactions

are under way. Permanent aphid cultures have been established and maintained. To determine the rate of nymphal development, developmental studies at varying temperatures, 10°C, 15°C, 20°C and 25°C have been undertaken, as well as morphological studies into the number of larval instars of *E.californica.* . Three field monitoring sites have been set up in the ACT since February 2000, with population monitoring and sampling continuing. Suction traps have been placed in an old growth forest over autumn and winter of 2001 in the ACT, to monitor for sexual stages of *E.californica* in the field.

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

216. Field trials of Meliaceae tree species have been established in Australia (with QFRI) and South East Asia to assess genetic and silvicultural methods of control of the shoot borer, *Hypsipyla robusta*. Tree growth and insect damage has been assessed regularly for the last two years. This data is providing clues to the management of *Hypsipyla robusta* and the improvement of forestry. In parallel with this field activity we have conducted laboratory trials on mechanisms of resistance of *Toona ciliata* to *Hypsipyla robusta*. Experiments currently underway examine the role of plant chemistry in oviposition and feeding responses of *Hypsipyla*. We have recently discovered that leaves from trees that attract more *Hypsipyla* damage have a different chemical profile to leaves from less damaged trees. We are currently working to determine exactly what part of the chemical mix seems to influence insect attack. We have also determined that plants grown at lower light (such as in the understorey) are less attractive to ovipositing adult *Hypsipyla* than leaves of open-grown trees, even when offered in the same environment. This probably explains the apparent advantage to growing *Toona* under a canopy.

217. Marianne Horak's work on clarifying taxonomy of *Hypsipyla robusta* is continuing.

Insect diversity in farm forestry

218. We have completed 4 two-week invertebrate diversity surveys in farm forestry plantations and nearby natural vegetation in south west Australia. The material collected in the survey is currently being sorted and identified. This data will be used to quantify the role of vegetational diversity upon populations of herbivorous invertebrates as a potential component of sustainable farm forestry.

CSIRO - Pest reports from Western Australia

Eucalyptus weevil, Gonipterus scutellatus

219. *Gonipterus scutellatus* was again the most significant insect pest of all *Eucalyptus globulus* plantations two years and older resulting in aerial spraying of large areas. Larvae and adults caused significant defoliation in the range of 50-100% to growing tips over spring and summer. Again, the parasitoid *Anaphes nitens* parasitised egg masses at very low rates (<5%) in early spring, with parasitism rates rising to almost 100% by summer.

Chrysomelid beetles, Chrysophtharta spp., Paropsis spp. and Cadmus excrementarius

220. Several species of *Chrysophtharta* caused some damage to plantations two years and older throughout the plantation estate. Species of *Paropsis* were extremely rare in all ages of plantations. The cryptocephaline *Cadmus excrementarius* caused extensive defoliation between January and March 2001 to several young plantations established during 2000. Older plantations were also damaged by this species but not as severely. *Cadmus excrementarius* is concentrated mainly in the Rocky Gully and Mt Barker areas, and is only a minor problem in other areas.

Autumn gum moth, Mnesampela privata

221. Autumn gum moth has not been a significant pest during 2001. Several plantations established east of Albany (especially near Cheyne Beach) in 2000 had high infestations and were controlled with an insecticide application of alpha-cypermethrin.

Leafblister sawfly, Phylacteophaga froggatti

222. Several 1-2 year old plantations in the Albany area have up to 50% damage to juvenile foliage as a result of leafblister sawfly. Exclusion trials are in place to assess the economic impact of this species.

Leaf-tier moths

223. Leaf-tiers have caused some defoliation and shoot mortality, especially in plantations grown in the Albany region. Trees in their first year of growth are most vulnerable to damage.

Blue gum psyllid, Ctenarytaina eucalypti

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

African black beetle, Heteronychus arator

225. African black beetle continues to be a major establishment pest in wetter areas of south-western Australia. Trials in 2000 showed broad-spray insecticide applications to be inconsistent. Degradable plastic mesh barriers placed around the roots and lower stem of seedlings were the most effective seedling protection in trials and this method has gone into commercial use in 2001 plantings.

Heteronyx elongatus

226. Larval damage to the roots of seedlings by *H. elongatus*, one of the 'spring' beetles, has been widespread in the south coastal region. Damage is characterised by often complete removal of the potting medium and much of the seedling's roots. Prediction of at-risk sites is difficult and there are no satisfactory control methods.

Spring beetles, Liparetrus spp.

227. These small, abundant insects swarm onto seedlings from adjacent forest and can defoliate them very quickly. The unpredictability of swarming and rapid damage makes this pest difficult to manage.

EXTENSION LITERATURE AND RELATED MATERIAL

AUSTRALIA

Forest insect collection

228. In October 2000 a grant for databasing the Western Australia CALM Forest Insect Collection was submitted to the Gordon Reid Foundation for Conservation, which is a Lotteries Commission sub-entity. The grant for $30,250 was applied for through the Western Australian

Insect Study Society (Inc.) and was approved in June 2001. The database being used is a copy of the Access program used by the WA Department of Agriculture. (T. Burbidge)

NEW ZEALAND

An Introduction to the Diseases of Forest and Amenity Trees in New Zealand. Forest Research Bulletin No. 220. Authors: G. S. Ridley & M. A. Dick

229. This book has developed from notes prepared for teaching courses on forest and amenity tree diseases for tree health surveillance staff in government and industry, and is a basic introduction. Tree health surveillance in New Zealand concentrates on exotic plantation species and in particular *Pinus radiata*. However, knowledge of the diseases of some amenity and native species, especially in the urban landscape, is also required as surveillance staff may be required to carry out surveys for new disease introductions. The book falls into two sections: the first introduces some basic concepts in the study of plant diseases and fungal biology. Part two outlines a selection of tree diseases.

Forest Health News ten years on

230. Issue 109 (July, 2001) marked the tenth anniversary of the monthly news periodical produced by Forest Health, Forest Research, presenting pertinent information and discussion of current forest and tree pest and disease issues.

Forest pest and disease leaflets

231. *Forest Research* Forest Health Pest & Pathogen Leaflet information continues to be placed on the Web, and may be found on:

http://www.forestresearch.co.nz/largetext.cfm?page_id=1277&page_id=1277&CFID=545962&CFTOKEN=78831470

Courses in GPS and navigation technology, and helicopter surveillance

232. Two successful courses were delivered to industry as part of a study evaluating the application of Global Positioning System and navigation software technology to forest health surveillance. This project was conducted within the Forest Biosecurity and Protection (Forest Research) Public Good Science Fund programme. The participants on each course were

exposed to GPS theory and operation in both the classroom and field environment. This involved collecting their own data and manipulating it in navigation software programmes. The participants came from various forestry and resource management companies and from several institutes. A further course is planned, and additional courses are to be undertaken in low-level helicopter surveillance for the detection of pest and disease damage. These will include the use of navigational software in pre-flight planning. Preliminary evaluation has shown that to maximise the benefits from helicopter use, surveillance staff will require dedicated training in pre-flight planning and the use of navigation systems, which will lift their skill in the geo-referencing of observations.

CONCLUSION

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

RECOMMENDATIONS

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

FOR INFORMATION

Forest Health Research Working Group
(Nick Collett, Secretary and RWG7 members)
23 August 2001

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

ANNEX A.

FOREST PEST, DISEASE AND QUARANTINE SITUATION REPORTS 2000-2001 BY STATES AND COUNTRY

1. SOUTH AUSTRALIA 2000/2001 – PESTS AND DISEASES

Plantations

Pinus radiata:

Pests:

Sirex: Aerial inspection in late June 2001, revealed very few deaths in any forest areas. In the Green Triangle Region (South East of the state), on time thinning of young plantations and a continuing nematode inoculation program have reduced the numbers of *Sirex*. Infestation levels remain low, with adults only occasionally sighted by staff and contractors near logging and pruning areas. Most trap trees were affected by bluestain, with only two trees showing any sign of *Sirex* infestation. Five trap tree plots (50 trees) were established in November 2000. *Ibalia* adults have emerged from billets collected in August 2000. In the Ranges Region, (previously Central and Northern), Sirex infestations are also at a low level. Monitoring is continuing in all areas, as is the nematode inoculation program.

Ips: *Ips* has been a serious problem this year in the Ranges Region – possibly as a result of the exceptionally dry conditions that have occurred over the last few years. Live trees have been attacked and killed throughout the forest at Wirrabara in the north and Mt Crawford in the Adelaide Hills. Young trees up to 10 - 12 years old have been the most severely affected. Current management practices are being examined to see if the incidence of *Ips* attack can be reduced.

Monterey Pine Aphid (*Essigella*): *Essigella* numbers have been high throughout South Australia this year. This, together with very dry conditions has resulted in yellowing and defoliation. However severe defoliation has not occurred. Monitoring is continuing. Ladybird numbers have been high in the South East in all areas except Caroline, which suffered the worst defoliation. Ladybirds were collected from other areas and released at Caroline.

Diseases:

Sphaeropsis sapinea: *Sphaeropsis* has again been a problem in the South East this year as a result of a warmer and wetter spring than usual. Deaths have been widespread, though minor compared with last year. All trees affected by *Sphaeropsis* showed evidence of damage from logging operations.

Environmental:

Salt: Of great concern throughout the South East, has been the widespread deaths of pines and cypresses due to salt toxicity. Older trees in particular have been badly affected, both in plantations and windbreaks. Analysis of needles has shown chloride levels to be up to 3-4% in some cases (the toxic level for pines is 0.35%). This situation is thought to be due to climatic factors which occur infrequently. The last such event was in the late 1940's when there was a series of very dry years followed by a very wet winter – as has occurred in the South East over the last few years.

Eucalypts:

Pests:

Autumn Gum Moth: Continues to be the major problem in young plantations. Numbers have been particularly high this autumn/winter – possibly due to mild winter temperatures.

Chrysomelid Beetles: These are responsible for some damage in most plantations but so far are not of major concern. No control measures are taken.

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

Diseases:

There have been no reports of diseases affecting eucalypt plantations in South Australia this year.

Nurseries

Eucalypts: There have been salt problems in one nursery in the South East due to the high salt content of the water used to irrigate seedlings.

Forest Health Surveillance and Diagnosis

Monitoring for *Essigella* has been continued on a monthly basis. No formal forest health surveillance is carried out apart from annual *Sirex* flights. Any unusual symptoms or deaths reported are investigated as necessary.

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2. WESTERN AUSTRALIA 2000/2001 – PESTS

PLANTATIONS

Pinus radiata

Sirex: Pest management within the Commission Plantations Branch (CPB) of the Forest Products Commission has been incorporated into the Environmental Management System (EMS) branch, as an identified aspect relating to plantation establishment and tending. This means that, as an aspect, pest incursion into CPB estate is recognised as an environmental problem of significance, should it occur.

To control the environmental impact associated with such incursions, CPB has created, in EMS section 4.3.3, the objective of *Monitoring and responding to pest incursions in plantation estate.* Should an incursion occur, the response will be based on CPB EMS section 4.4.7 that outlines an Emergency Preparedness and Response Plan. This plan uses the *Generic Incursion Management Plan for the Australian Forest Sector* as the basis for the emergency response.

Achievement of the *Sirex* monitoring target is indicated by the number of *Sirex* plots established and monitored. These are measured from the number of plots listed n the CPB *Sirex* plot register. Monitoring of success in achieving the target is done by a yearly review of the register which is aligned to RWG 7 reporting dates

In November 2000, 55 plots were established throughout the south-west between Wanneroo and Manjimup. Most plots had 5 trees per plot and were setup according to specifications given by the National Sirex Control Strategy using Dicamba as the tree stressing agent. Monitoring of the plots at the end of January 2001 showed no evidence of Sirex activity. In November 2001, an additional 45 plots (plus others to make up for dead or harvested trees) will be established to reach the branch target of 100 plots by December 2001.

(S. Ward)

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

Monterey Pine Aphid: On the 27th of June 2000, the Environmental Officer from CPB located the first samples of *Essigella californica* in Western Australia. The aphid seemed to be associated with broadscale yellowing of young *Pinus radiata* in the Blackwood Valley region of Western Australia. The CALMScience entomologist was then involved and a response formulated to the incursion. A survey was conducted throughout south-west Western Australia and found that the aphid had already spread to almost every plantation in the region. It was then concluded that control and eradication was unfeasible and that a monitoring program be instated

to monitor the population dynamics and effect on tree productivity and therefore plantation economic value in line with other states where the aphid has also established itself. CALMScience then produced the monitoring proposal. CPB committed to the establishment and monitoring of 9 research plots. The CPB Environmental Officer established these plots in December 2000 in line with the science project plan that required the location of plots to take account for site quality and species differences. Plots have been monitored continually on a monthly basis since they were established. At this stage monthly monitoring by CPB will continue until December 2002.

Populations of the aphid have remained relatively low this past season, peaking at 10-100 aphids per sample at only 2 sites in March 2001, with little apparent canopy damage. In July 2001, few aphids could be found in the field. In addition to aphid population monitoring, samples of potential predators and foliage (from tree and ground) are taken. Foliage samples are analysed for the presence of *Cyclaneusma*. Five positive confirmations of the fungus were made from Dec 2000 to April 2001, out of 25 samples. Since May 2001 all sites sampled have been positive for *Cyclaneusma*. Only dead needles have tested positive to the fungus.
(S. Ward and JF)

***Bursaphelenchus hunanensis*:** *Bursaphelenchus* (Pine Wilt) nematode was first reported from Victoria in July 2000. A national alert was raised with sampling proposed from each state for rapidly killed or dying trees. Fifty samples were proposed for Western Australia however suspicious deaths were not common enough to provide 50 samples over the sampling period. CPB committed itself in March 2000 to providing 1 sample per month for nematode extraction with sample details recorded in the CPB *Bursaphelenchus* sample register. To date 4 samples have been collected and recorded with no positive extraction of the Pine Wilt Nematode. (S. Ward)

Eucalyptus globulus (A. Loch, J.D. Majer)

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

Autumn gum moth: Autumn gum moth has not been a significant pest during 2001. Several plantations established east of Albany (especially near Cheyne Beach) in 2000 had high infestations and were controlled with an insecticide application of alpha-cypermethrin.

Leaf beetles: Several species of *Chrysophtharta* caused some damage to plantations two years and older throughout the plantation estate. Species of *Paropsis* were extremely rare in all ages of

plantations. The cryptocephaline *Cadmus excrementarius* caused extensive defoliation between January and March 2001 to several young plantations established during 2000. Older plantations were also damaged by this species but not as severely. *Cadmus excrementarius* is concentrated mainly in the Rocky Gully and Mt Barker areas, and is only a minor problem in other areas. The insect mainly occurs in the area bound by the jarrah (*Eucalyptus marginata*) forest, where it may persist on flooded gum (*Eucalyptus rudis*) and, to a lesser extent, marri (*Corymbia calophylla*). A project has been initiated in conjunction with Curtin University of Technology and a manuscript is in preparation [N. dos Anjos, J.D. Majer and A.D. Loch (in prep.) Occurrence of the eucalypt leaf beetle, *Cadmus excrementarius* Suffrian (Coleoptera: Chrysomelidae: Cryptocephalinae), in Western Australia.].

Sawflies: Sawfly numbers are low in plantations. *Perga schioedtei* is one of the main species encountered.

Leaf Blister Sawfly: Several 1-2 year old plantations in the Albany area have up to 50% damage to juvenile foliage as a result of leafblister sawfly. Exclusion trials are in place to assess the economic impact of this species.

Weevils: *Gonipterus scutellatus* was again the most significant insect pest of all *Eucalyptus globulus* plantations two years and older resulting in aerial spraying of large areas. Larvae and adults caused significant defoliation in the range of 50-100% to growing tips over spring and summer. Again, the parasitoid *Anaphes nitens* parasitised egg masses at very low rates (<5%) in early spring, with parasitism rates rising to almost 100% by summer.

Leaf-tier moths: Leaf-tiers have caused some defoliation and shoot mortality, especially in plantations grown in the Albany region. Trees in their first year of growth are most vulnerable to damage.

African black beetle: African black beetle continues to be a major establishment pest in wetter areas of south-western Australia. Trials in 2000 showed broad-spray insecticide applications to be inconsistent. Degradable plastic mesh barriers placed around the roots and lower stem of seedlings were the most effective seedling protection in trials and this method has gone into commercial use in 2001 plantings.

Heteronyx elongatus: Larval damage to the roots of seedlings by *H. elongatus*, one of the 'spring' beetles, has been widespread in the south coastal region. Damage is often characterised

by complete removal of the potting medium and much of the seedling's roots. Prediction of at-risk sites is difficult and there are no satisfactory control methods.

Spring beetles, *Liparetrus* spp: These small, abundant insects swarm onto seedlings from adjacent forest and can defoliate them very quickly. The unpredictability of swarming and rapid damage makes this pest difficult to manage.

Scarabs (nocturnal feeding): Two unidentified species of scarab beetles were observed feeding in large numbers at night on all ages of plantations in the Wellstead area, east of Albany. Both species were feeding preferentially on the new season's juvenile and adult foliage and causing 50-100% defoliation to such foliage.

MANAGED NATURAL FORESTS

Eucalyptus marginata

Jarrah leaf miner: Jarrah leaf miner is still in outbreak in some areas of the northern Jarrah forest. Cutout boundary surveys were not conducted over this past season. It is anticipated that the next survey will be conducted in three years. A project investigating the control of Jarrah leaf miner through selective retention of resistant trees has been initiated. (A. Wills, 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)

***Phoracantha semipunctata*:** Jarrah logs infested with *P. semipunctata* were reported from Dean Mill near Manjimup. Logs were awaiting processing and infestation was thought to occur at the felling site. (JF, A. Loch)

NATIVE PLANT COMMUNITIES

Eucalyptus wandoo

Monitoring of crown decline and recovery using time series photography of *Eucalyptus wandoo* crowns suffering crown decline in Talbot forest block continued to autumn 2001. Leaf insect populations remained low and are not implicated as contributors to this decline of wandoo that is now extensive in southwest Western Australia. (A. Wills)

Eucalyptus rudis

Clay, R and J.D. Majer (2001). Flooded Gum (*Eucalyptus rudis*) decline in the Perth Metropolitan Area: A Preliminary Assessment. *School of Environmental Biology Bulletin No. 19.* Curtin University of Technology.

Summary and Recommendations

This study presents the results, conclusions and recommendations of a study of decline (dieback) in flooded gum (*Eucalyptus rudis*), conducted in the Perth metropolitan area in spring and early summer of 1999.

Dieback is characterised by progressive decline in tree health, which includes cycles of defoliation and regrowth. Over time, a tree's reserves become depleted and the regrowth phase is likely to become less vigorous. If the causal factors continue to operate, tree death may eventuate, although this may occur some years after the first round of defoliation is observed.

We found dieback to be widespread in 1999, however its occurrence was very variable and we failed to discern any pattern in the distribution of tree decline. Most trees that were affected had a high proportion of discoloured leaves and were shedding leaves. In some instances we observed trees that were completely defoliated, and in others we observed regrowth. We did not observe any trees that we considered to be dead. We concluded that the dieback was a recent phenomenon, which was in its first cycle of defoliation.

Casual, and more systematic, observation showed that there were higher densities of lerps (*Creiis periculosa*) on leaves of declining trees than on healthy ones. There also was an association between the type of ground cover under the trees and tree condition. Healthy trees occurred in disproportionately large numbers over ground covers that contained some native plant species, as opposed to weedy or mown grass ground covers. We suggest that the more natural ground covers provide more food and shelter for the predators and parasitoids of foliage feeding insects, and therefore assist in natural control.

Apart from the association with lerps, no association was found between dieback and other types of biological damage, e.g. insect galls, leaf chewing, leaf mining and bacterial/fungal attack. This was shown both by subjective assessments of trees, and by measurements of leaf area loss.

Canopy invertebrates were extremely abundant, but highly variable from tree to tree, regardless of tree health or the location of the trees. Only one invertebrate group, psyllid nymphs, were in

significantly higher numbers on declining trees than healthy ones. For all other types of invertebrate groups there was no significant difference between healthy and declining trees. However, the extreme tree to tree variability, and the small sample size, made it difficult to show significant differences.

A large number of physical and biological factors have been suggested as the primary cause of the flooded gum dieback in Perth. However, it must also be recognised that no single factor may be involved, and that interactions between two or more factors may be responsible for triggering decline. Considering the complex nature of tree decline, it is not surprising that this preliminary study was unable to determine the primary cause(s). Nevertheless, we can suggest that some factors are less likely causal agents than others. We do not believe that changing water-tables, either rising or falling, are likely agents, nor do we believe that increasing salinity is a likely cause in the Perth area. Nutrient enrichment of waterbodies, a common phenomenon in Australia, may be a causal agent by contributing to higher concentrations of nutrients, particularly nitrogen, in tree foliage. These elevated concentrations may, in turn, encourage the outbreak of foliage feeding insects, for example, the high psyllid densities that we have observed. However, it must be stressed that we found no significant difference in nitrogen levels between healthy and declining trees, although there were significantly higher phosphorus levels in declining trees than in healthy ones.

Our examination of some possible biological causal factors, has made all agents very unlikely, except for psyllid insects. These have a very clear association with declining trees, and are undoubtedly contributing to the decline in tree health. Whether, or not, psyllids are the primary cause of the dieback is another matter, however. Some researchers believe that infestations by psyllids, and other insects, only occur when trees are under stress, and that it is the factors creating stress that are the primary causal factors. Other researcher workers do not support this theory, and suggest a primary role for insects. We were unable to distinguish between these two possibilities on the basis of our results

We expected that most, if not all, trees observed to be in decline in 1999 would have produced epicormic growth by the time of writing of this report. Casual observations in spring, 2000 support this expectation. The critical question is whether this will lead to permanent recovery, or whether there will be another cycle of defoliation and epicormic growth, thus establishing the typical pattern or dieback observed in other eucalypt species in other parts of the country. The answer to this question requires a sophisticated understanding of the causal factor(s), and we do not have that understanding.

In the short-term, there are measures that may control psyllid numbers on individual trees, but broad-scale control is impractical. Control on individual trees may be achieved by injection into the trunk of systemic insecticides but, of necessity, an experimental approach must be adopted for such treatment. Experimentation with fertiliser application may also have some effect.

In the longer-term, since psyllids are an important contributing factor to flooded gum decline, there are some strategies that could be implemented to reduce their impact.

- If trees can be located that are resistant to decline, seeds for plantings should be harvested from resistant trees in preference to those of susceptible trees.
- Apart from this limitation, seeds should come from a variety of sources to maintain genetic variability.
- Single-species plantings (monocultures) should be avoided.
- Re-establish native shrubs, herbs and grasses in the understorey of established flooded gum stands and in plantings.

Finally, further monitoring and research are required to determine the cause of flooded gum decline, and to examine ways of alleviating it. We have made a number of suggestions for further study.

Revegetation programs

Majer, J.D., H.F. Recher, R. Graham and A. Watson (2001). The potential of revegetation programs to encourage invertebrates and insectivorous birds. *School of Environmental Biology Bulletin No. 20.* Curtin University of Technology.

Abstract

There are extensive revegetation programs in the wheatbelt of Western Australia. Revegetation has many objectives including lowering water tables to combat water logging and soil salinisation, improving agricultural productivity, and producing a commercial crop of trees for harvesting. Trees are planted by farmers, conservation groups and Government authorities to rehabilitate, beautify and manage degraded agricultural land, parks and road verges. In addition to improving plant diversity and restoring ecosystem functions, revegetation is an opportunity to provide food and habitat for wildlife and to conserve regional biodiversity.

The objective of this recent study was to investigate whether the tree species planted in the wheatbelt are colonized by invertebrates and whether the abundance and variety of invertebrates on planted trees differs between tree species and between revegetation and remnant native vegetation. The study also investigated the use of revegetation by birds and compared this to bird communities in remnant vegetation. Invertebrates were sampled on trees planted along the Great Eastern Highway as part of the Main Roads Department 'Ribbons of Green' program, as well as trees planted by community groups and Greening Western Australia. We asked whether the best species of trees were being planted to restore and enhance regional biodiversity.

The canopy invertebrate fauna of 10 trees of each of eight species of *Eucalyptus* and jam wattle (*Acacia acuminata*) was sampled by chemical knockdown. Jam wattle and three of the eucalypts, including wandoo (*E. wandoo*), are indigenous to the Northam District. Three of the eucalypts are indigenous to the south coast of Western Australia, one to northwestern Western Australia, and the eighth is indigenous to coastal South Australia. Wandoo was sampled in both revegetation and remnant natural vegetation. In addition to sampling invertebrates, leaf toughness and levels of foliar nutrients (NPK) were sampled for all tree species. Leaf toughness and foliar nutrients were measured as other studies had found relationships between toughness and nutrients, with the abundance and variety of canopy invertebrates.

Moderate to high invertebrate densities were found on all tree species. Indigenous trees tended to support the most diverse and abundant invertebrate faunas: species originating from southern coastal regions and northwestern Western Australia supported the least. Wandoo trees in revegetation tended to have higher populations of some insects than wandoo growing in remnant vegetation. Leaf toughness appeared to affect the size of invertebrate populations on some eucalypt species, but the effects of foliar nutrients were inconsistent, possibly because nutrient levels were elevated as a result of fertiliser applications.

During winter (June), three patches of remnant vegetation and seven replanted areas were surveyed for birds. Twenty-five species of birds were recorded of which three were found only in remnant vegetation and six were found only on the replanted areas. However, all species recorded are widely distributed throughout the Western Australian wheatbelt and, with the possible exception of the White-browed Babbler (*Pomatostomus supercilosus*), no significance can be attributed to the differences in bird species composition between remnant and replanted areas: at least in winter, birds are as likely to use revegetated areas as remnant vegetation. The absence of the babbler from revegetated areas is possibly due to the lack of logs and woody debris on the planted sites. Sixteen of the 25 bird species are predominantly

insectivorous, four are nectarivores, four are seed-eaters, and one is a frugivore. This suggests that a similar range of foraging resources are available in both remnant vegetation and revegetation.

To restore and enhance regional biodiversity, we recommend that revegetation programs, including commercial plantings, should use a variety of tree species and emphasise regional species. Where this is not possible, species from nearby regions should be used. Planted areas should also be diversified by using a variety of indigenous shrubs and herbs, as well as trees, and by adding logs and coarse woody debris to the area planted. Provision of nest boxes would accelerate the colonization of revegetated areas by hole-nesting birds.

URBAN AND RURAL TREES

Cape Lilac(White Cedar): The White Cedar Moth, *Leptocneria reducta* outbreak in suburban Perth has subsided and no enquires have been received on this insect tis past year. (T. Burbidge)

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT FOREST INSECT COLLECTION

In October 2000 a grant for databasing the CALM Forest Insect Collection was submitted to the Gordon Reid Foundation for Conservation, which is a Lotteries Commission sub-entity. The grant for $30,250 was applied for through the Western Australian Insect Study Society (Inc.) and was approved in June 2001. The database being used is a copy of the Access program used by the WA Department of Agriculture. (T. Burbidge)

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3. WESTERN AUSTRALIA 2000/2001 - DISEASES

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

Management of *Phytopthora* root disease in susceptible plant communities continues (see Research and Development)

A canker disease in a small population of *Eucalyptus phylacis* south of Busselton is presently being monitored. Cultures of putitive pathogens have been isolated, but are as yet unidentified. This canker development has conservation significance, as *E. phylacis* is a WA endemic and is listed as an Endangered species (R. Robinson, M. Souter and K. Wiliams -CALM).

Urban and rural

Diseases

Mundulla Yellows

Monitoring has continued. Symptoms have been noted in several eucalypt species. 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 or paddock stands. It has not been recorded within bushland areas (whether logged or not), nor in plantations. It is widespread on the Swan Coastal Plain (alkaline sands) in both urban and rural locations, and has now been recorded at several inland sites in the south-west of the state as well (M.Stukely- CALM).

Forest health surveillance and diagnosis

Dieback mapping

Between July 2000 and June 2001, a total of 1462 samples were processed for *Phytophthora* identification by CALM's Vegetation Health Service (VHS). *P.cinnamomi* was detected in 533 samples, *P.citricola* (60), *P.cryptogea* (5), *P.megasperma* (1), *P.nicotianae* (1), and *Phytophthora* sp. (1). There were 21 samples (sandalwood, pine, eucalypt and others) sent to the VHS for general diagnosis in this period (F.Tay & M.Stukely-CALM).

Research and development

Plantations

Eucalyptus globulus

Diseases

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

SPIRT Large. 2000-2003 at $200, 000 (Industry Partner-Integrated Tree Cropping). *Mycosphaerella* leaf blights 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). The focus of this project is disease epidemiology. Over the past year spore traps have been built and techniques for identifying *Mycosphaerella* spp. adhering to the Melanex tape developed. Spore traps have been placed at plantations where disease has been monitored. Data are accumulating on the conditions under which spores are released and disease may develop.

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). This project examines the occurrence of *Mycosphaerella* leaf disease in *Eucalyptus globulus* plantations in southwestern Australia with the view to:

i. identify the *Mycosphaerella* spp. in plantations and adjacent eucalypts,

ii. investigate the population genetics of *Mycosphaerella nubilosa*

- Taxonomy and description of *Mycosphaerella* species present in WA. It has been established that MLB (*Mycosphaerella* Leaf Blotch) is a disease complex in WA involving a number of species. More than 2000 isolates of *Mycosphaerella* and other fungi have been identified from lesions of *E. globulus, E. marginata, E. calophylla* and *E. diversicolor*. The following species have been identified and described: *M. cryptica, M. lateralis, M. marksii, M. nubilosa,* and *M. suberosa*. Of these, one is a new Australian record and one a new record for Western Australia. Importantly, *M. nubilosa* the most destructive pathogen in eastern Australia has now been found in WA. Additionally, a number of isolates have been described but are proving difficult to fully identify and some may be new species.
- Biogeography of *Mycosphaerella* spp. on Eucalyptus in Western Australia. Following the surveys of 1999 which were designed to determine the pathogens present in *E. globulus* plantations and surrounding eucalypt vegetation, further surveys have been made this year. This systematic survey of March-June 2000 has enabled the elucidation of the relative importance of different *Mycosphaerella* spp. across the *E. globulus* estate.
- Molecular Taxonomy and Phylogeny of *Mycosphaerella* in WA. A culture collection and an ITS region sequence data base is being established for *Mycosphaerella* spp. present in WA.
- Population genetics of two important *Mycosphaerella* species. Both *M. cryptica* and *M. nubilosa* isolates from 30 sites are collected and ready for DNA analysis

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

Honours Projects in progress at Murdoch University

Infection process of *Mycosphaerella* leaf blotch (MLB) on eucalypts in WA (Sarah Jackson)

Managed natural forests

Corymbia calophylla

Diseases

Honours Projects in progress at Murdoch University

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

Jarrah forest (Eucalyptus marginata)

Diseases

Dieback-resistant jarrah (*Eucalyptus marginata*): The first stage of a production seed orchard of dieback resistant jarrah clones was established at the Forests Products Commission's Plant Propagation Centre near Manjimup in 2001. Field trials of jarrah clones selected for resistance to *Phytophthora cinnamomi* have continued (M.Stukely-CALM).

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

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

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

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

PhD Theses in progress at Murdoch University

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

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

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).

Honours Projects in progress at Murdoch University

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

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.

Karri forest (*Eucalyptus diversicolor*)
Diseases

Armillaria root disease: Armillaria root disease (caused by *Armillaria luteobubalina*) is currently being monitored in a karri silvicultural thinning trial. Results after 15 years show that thinning has had a significant effect on infection levels and impact increased with thinning intensity (R. Robinson – CALM).

Native plant communities
Diseases

Seventeen sites covering 95 hectares were aerially sprayed with phosphite during 2000/2001 financial year in the Albany, Esperance, Katanning and South West Capes districts. Nine *Phytophthora* -susceptible DRF (Declared rare Flora) species were treated in Albany district, 4 in South West Capes, one in Esperance and one in South West Capes district. Eight sites at Walpole and one at 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 two sprays with a single spray, autumn with spring and early season with late season applications. The results of this trial, which will compare levels of phosphite *in planta* are not available yet. (R. Smith - CALM).

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

Honours Projects in progress at Murdoch University

Insect pests of *Eucalyptus globulus* in Western Australia (Damien Cancilla).

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4. VICTORIA 2000/2001 - PESTS

Plantations (Pinus spp.)

Sirex noctilio

In Victoria, the incidence of Sirex over summer 2000-2001 remained low despite the drier than average conditions that have been experienced over the past three to four years persisting, especially in the north-east of the state. Growers are continuing to thin susceptible stands to relieve moisture stress and reduce the risk of attack, as well as placing increased numbers of trap tree plots in unthinned stands to both monitor Sirex, nematode and parasitoid levels and assist in the spread of the preferred strain of parasitic nematode (Kamona strain). Nematode samples collected from the field have also been forwarded to Canberra to identify the strains of nematode currently present in Victorian plantations, in order to determine their infectivity and whether additional inoculations with the preferred strain are required.

Ips grandicollis

Apart from isolated minor outbreaks involving small plots of trees. Ips grandicollis and other bark beetle species (Hylugus and Hylastes have not presented a major problem in P. radiata plantations in Victoria during 2000-2001.

Essigella californica

Essigella populations have been high again this year, with significant defoliation occurring in north-east Victoria and in the states south-west on the border with South Australia, predominantly within 15 year-old thinned stands of P. radiata. Some defoliation within younger trees (<10 years) has also been recorded. Aphid populations appeared to occur later this year than in previous years, which may coincide with the milder than average winter temperatures experienced to date. Monitoring is continuing on both aphid population and defoliation levels at a number of sites around the state.

Eulachnus thunbergii (Pine Aphid)

Victoria has not recorded any E. thunbergii to date.

Plantations (Eucalyptus spp.)

Autumn Gum Moth

Minor outbreaks of *Mnesampela privata* have occurred throughout Victoria during winter 2000 and late autumn 2001 with the most notable outbreak occurring on one-year-old E. globulus trees in Gippsland during winter 2000.

Leaf beetles

Species of leaf beetle including *Chrysophtharta agricola* and *C. variicollis* caused moderate defoliation of young *E. globulus* and *E. viminalis* stands in the Gippsland region of Victoria with damage predominant in the upper 50% of the tree crown.

Other beetle species

Low levels of Christmas beetles (*Anoplognathus* spp.) have been observed defoliating young one-year old *E. globulus* plantations in the Latrobe Valley region of Victoria during summer 2000-2001. Spring beetles (*Heteronyx* sp.) were observed damaging newly planted *E. globulus* seedling roots in the south-west of Victoria, although damage was confined to a small number of seedlings (<40).

Sawflies

Perga affinis affinis has caused moderate defoliation of *E. globulus, E. camaldulensis* and *E. occidentalis* in north-central Victoria during autumn/winter 2001. Damage was generally confined to the upper crown although in extreme cases, whole trees up to 15m were totally defoliated. Monitoring will continue to assess further damage over the winter period, as well as in autumn next year to determine if populations are again on the increase.

Psyllids

Cardiaspina retator has caused significant defoliation to *E. grandis* and *E. camaldulensis* plantings in northern Victoria during autumn 2001 although this damage was confined to individual plantations and not widespread across the region.

Other Pests of Eucalypts

Minor damage to juvenile *E. grandis* foliage was recorded by the leafblister sawfly in north central Victoria over summer. The wingless grasshopper also caused low levels of defoliation in newly established *E. globulus* plantations in south-west Victoria although the attack was patchy, with defoliation coinciding with high levels of grass/weed control in certain sections of the plantation during the establishment phase. No significant mortality was recorded.

Managed Natural Forests (Eucalyptus spp.)

Didymuria violescens

In Victoria, an outbreak of *Didymuria violescens* has caused damage to Alpine ash and mixed species forests in the Kiewa area of north-east Victoria. Aerial surveys are currently underway to determine the extent and severity of the defoliation. Few diseases were reported from native forest. A study continues on the possible toxic effect of eucalypt bark on eucalypt seedling regeneration.

Research and Development

- The effects of repeated defoliation on the growth of E. globulus in plantations in north central Victoria.
- Ecology of invertebrates on heathland in East Gippsland and the Grampians.
- Resistance of young planted eucalypts to damage by chrysomelid leaf beetles in east Gippsland

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5. VICTORIA 2000/2001 - DISEASES

1. Plantations

1.1. *Pinus radiata and other species*

Bursaphelenchus

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

- *Bursaphelenchus*' nematodes have been extracted from 31 pine trees that have died rapidly (generally over a 6-12 week period). All 31 trees have been destroyed by either burning or deep burial.
- There were two nematodes isolated, a *Bursaphelenchus* sp (similar to *hunanensis*) and a possible *Ektaphelenchus* sp. that are closely related to the genus *Bursaphelenchus.* No *Bursaphelenchus xylophilus* were isolated from any of the samples collected. This was confirmed by DNA extraction.
- These '*Bursaphelenchus*' type nematodes have only been isolated from dying trees within Melbourne and outer environs. No samples from interstate contained these nematodes. A different *Bursaphelenchus* sp. was isolated from Queensland and is believed to be similar to a species isolated from *Ips grandicolis* beetles in NSW in 1989.
- While some trees have had high numbers of nematodes within them (up to 7000/10g wood) most have had only a few (<10/10g wood). However this may reflect different stages in the life cycle. The dispersive stage may be difficult to pick up within the tree.
- Koch's postulates have not been proven in pathogenicity tests. Culturing of the nematode has not been successful. Wood samples and nematodes extracted from affected trees and placed back into healthy trees have not as yet produced any symptoms.
- No vector has yet been found. *Arophalus rusticus* have been detected in 4 trees, and *Ips grandicolis* recovered from branches from many of the removed trees. No '*Bursaphelenchus*' type nematodes were isolated from these beetles.
- No *Monochamus* species were detected in either light or pheromone traps deployed, although recent advice is that *Monochamus* species are not attracted to light.
- Pine trees affected have generally been large and over 40 years of age. Most over 60 years.

- Rapid deaths of pine trees have also occurred in over 196 trees from which no '*Bursaphelenchus*' were isolated. However there may be a issue involving the stage of life cycle being sampled.
- Other nematodes were isolated from 93 of the 196 trees from which no '*Bursaphelenchus*' spp. were isolated. These nematodes have been preserved for further identification at a later date. They are believed to be secondary species feeding on blue-stain fungi.
- Although other conifers have also died (particularly Cypress Pines), no nematodes have been isolated from them.
- Other factors involved in the tree deaths have included drought, poison, soil disturbance/root damage, high salinity, *Sphaeropsis* (for the pines) and Cypress canker (for the Cypresses).
- It's possible that the population of nematodes present in Melbourne is not a breeding population because the vector may have failed to establish. On this basis the number of infested trees should drop sharply over the next 2 years (approximate maximun lifespan of the nematodes).
- While the identity and pathogenicity of the '*Bursaphelenchus*' spp. isolated is still unclear, it would appear that only 13% of trees that have died with the characteristic observed rapid death, contain the nematode, and at levels that could be considered not to be the primary cause of death. However, the isolation frequency and population levels may reflect the stage of the life cycle of the nematode.
- It is probable that other factors such as drought/salinity may be the predisposing factor that is leading to tree deaths by other causes such as nematodes, *Sphaeropsis*, etc.

A continued program has been recommended by the National Coordinating Committee.

The program is to include:

- Continued monitoring for nematodes within any further dying pine trees within the Melbourne area to determine if eradication has been successful and/or that the population of the nematode has not established.
- Complete the rearing of any insects from the wood samples collected from trees that have been removed and check them for nematodes.
- Continued trapping over Spring/Summer 2001/2002 to check for the presence of *Monochamus* beetles.

- Investigation of funding for a post-graduate scholarship to undertake the identification and or classification of the nematodes isolated from the trees, their culture and pathogenicity, and the development of PCR based identification tests for *Bursaphelenchus* nematodes.

Dothistroma

Due to the dry conditions in Victoria, *Dothistroma septospora* continued to show low levels of disease, and no spray programs were conducted in the State for 2000/2001.

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. High salinity is also causing deaths of shelterbelts, particularly in costal areas of Western Victoria and South Gippsland.

1.4. Eucalypts

Mycosphaerella spp. have caused defoliation of juvenile foliage in 2 y-old *E. globulus* plantations in South Gippsland and has led to an increase in weed competition due to increased available light. Leaf blotches that occurred on *E. globulus* in Western Victoria in Autumn 2001 are under investigation.

Trials evaluating pruning wounds on *E.globulus* and *E.grandis* showed little development of decay in irrigated plantations in Central Victoria.

Observations of alcoholic flux, first reported in March 1998 on the stems of 3/4 year-old *Eucalyptus nitens* in north-east Victoria, was again observed in plantations in north-east and south west Victoria and for the first time in East Gippsland on 9-y-old *E. nitens* and *E. globulus*.

2. Managed natural forests

2.1. *Eucalypts*

Few diseases were reported from native forest. A study continues 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. Again a scorching of the tops of cuttings/seedlings was investigated but no cause of damage could be ascertained.

3.2. Eucalypt

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

4. Native Plant Communities

Few diseases were reported from native forest communities during 2000/2001.

5. Urban

Cypress canker continued to be identified from dieback of Cypress shelterbelts from several locations in Victoria. High salinity also caused deaths of Cypress shelterbelts in several coastal locations in Victoria, particularly Western Victoria.

The City of Melbourne continued to support surveys for Dutch Elm Disease in the main gardens and boulevards under their management. Symptoms resembling DED were attributed to ringbarking of branches by possums and elm bark beetles. The fungus could not be isolated from wood of any trees exhibiting flagging due to beetles. A draft contingency plan for the disease was put out for comment and suggestions received for improvement have been included in the document. A decision on who would coordinate any potential eradication program in each State needs to be clarified.

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6. NEW SOUTH WALES 2000/2001 – PESTS AND DISEASES

PINUS RADIATA (AND OTHER TEMPERATE PINES)

PESTS

Sirex Wood Wasp (*Sirex noctilio*)

The incidence of naturally struck trees remains low in State Forests of NSW pine plantations, with mainly suppressed trees attacked. There were two areas where incidence of mortality was higher (up to 3%): in ~300 ha in Hume Region (Buccleuch SF) and ~200 ha in Macquarie Region (Pennsylvania SF). This was an increase in these areas from previous years. Several State Forests had compartments with very low levels of *Sirex* in suppressed trees, including Glen Allen (Monaro Region), Maragle and Bago (Hume Region), Canobolas, Glenwood, Vittoria, Roseberg and Kinross (Macquarie Region), and Hanging Rock (Northern Region). There were no

detection's in areas where *Sirex* was previously unrecorded. Inverell remains the northern most distribution of *Sirex*.

Forest Health Survey Unit held a national *Sirex* workshop in early October 2000 in Tumut. Twenty-eight participants attended from both government and private organisations. The workshop consisted of three phases: lecture, laboratory and field. The lecture phase included information on the history, biology and life cycle of *Sirex*, host susceptibility, attack recognition, survey and control methods. There were also presentations on the CSIRO nematode program and the National Sirex Co-ordination Committee. The laboratory phase enabled microscopic examination of nematodes and viewing of emergence drums located at State Forests' research facility at Tumut. The field phase, conducted at Buccleuch State Forest, enabled participants to observe *Sirex* attack symptoms, *Sirex* larvae, pupae of *Megarhyssa nortoni*, trap tree establishment and nematode inoculation methodology. A session was also conducted on forest health survey and monitoring techniques.

Five Spined Bark Beetle (*Ips grandicollis*)

There were no significant outbreaks of *Ips* in the pine plantations surveyed in 2001.

Wingless Grasshopper (*Phaulacridium vittatum*)

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

Monterey Pine Aphid (*Essigella californica*)

State Forests of NSW maintained seven Monterey pine aphid monitoring sites during 2000-2001. The population levels of *Essigella californica* during this period were significantly higher compared to the previous period. The increase occurred in both number of aphids per affected tree and in the number of trees affected. This increase was especially evident in the sites in Hume Region, which encompasses both Tumut and Tumbarumba pine plantations. A slight increase in aphid numbers was also observed in the pine plantations near Bombala (Monaro Region). Another trend seen for the first time this year was the increased length of aphid activity, in past years aphid numbers had dropped significantly by June. However, in the 2001 season the numbers remained high throughout June.

The monitoring sites are in younger age classes (1994-1997) and all showed no significant levels of either yellowing needles or defoliation. However, widespread yellowing, especially of older needles, was observed across older age classes in Macquarie, Monaro, and Hume Regions, with Hume Region having the highest incidence and severity.

The number of aphid monitoring sites will be reduced from seven to two sites from June 2001. The two sites to be maintained are both in Carabost State Forest, near Tumbarumba (Hume Region). This area has had the longest consistent monitoring history for the state and appears to be a "hot spot" for aphid activity given previous monitoring results.

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

Pine Aphid (*Eulachnus thunbergii*)

The distribution of *Eulachnus thunbergii* has not changed in NSW in 2000-2001. *E. thunbergii* is not considered a significant pest of pines in NSW. However, in recent years there has been an increase in the collections of this insect, mainly as a by-catch from monitoring for the Monterey Pine Aphid (*Essigella californica*).

Painted apple moth (*Teia anartoides*)

Damage from this insect was observed in the young *P. radiata* in Hume Region (Tumut/Tumbarumba) this year. Moderate levels of defoliation were observed, but only on isolated trees, similar to last year. This is not considered a significant pest of pine plantations in NSW.

DISEASES

Dothistroma septospora

Dothistroma needle blight was again a significant problem in the *P. radiata* plantations on the Northern Tablelands of NSW. High levels of *Dothistroma* (>30% severity) were observed in the Walcha plantations (Northern Region) with over 1800 ha severely affected in Nundle SF, Hanging Rock SF, Nowendoc SF and Riamukka SF, and ~100 ha in Koreelah SF. Disease levels were similar to last year. More than 2500 ha in Northern Region were sprayed with copper oxychloride in November-December 2000 to control *Dothistroma*.

In Hume Region levels of *Dothistroma* were higher than previous years, with over 500 ha in Bago SF, and 500 ha in Buccleuch SF affected. Smaller localised areas were observed in Carabost SF (~50 ha) and several areas in Green Hills SF (~300 ha). High levels of infection were also observed in Buccleuch SF during summer-spring in 2001. Thinning operations are planned in Hume Region, which will alleviate the *Dothistroma* needle-cast problem. Levels of *Dothistroma* were also lower in Monaro Region than previous years. There was little current infection, but

moderate levels of defoliation from previous infection in Coolangubra SF and Nalbaugh SF. Low levels of *Dothistroma* were observed in several localised areas in Macquarie Region.

Cyclaneusma minus

Cyclaneusma minus was not a significant problem in the pine plantation in NSW in 2000-2001.

Sphaeropsis sapinea

Drought-related *Sphaeropsis* infections of butts and stems caused significant mortality in the Casino southern pine (*P. elliottii* & *P. taeda*) plantations in Northern Region in the later half of 2000. Aerial and ground surveys were conducted in November 2000 and an estimated 1600 ha were observed with damage, with trees either dead or dying, and damage levels from 1% to up to 50% incidence in certain sections (Figure 1). Many of the severely affected stands had high stocking (over 1200 sph) and were due for thinning, although this was not always the case. *Sphaeropsis* was consistently isolated form dead and dying trees. Rainfall in the area was ~60% lower than average in the first half of the year and ~40% lower in the later half of 2000 (Bureau of Meteorology, 2000). The majority of the damaged areas are now being salvaged logged.

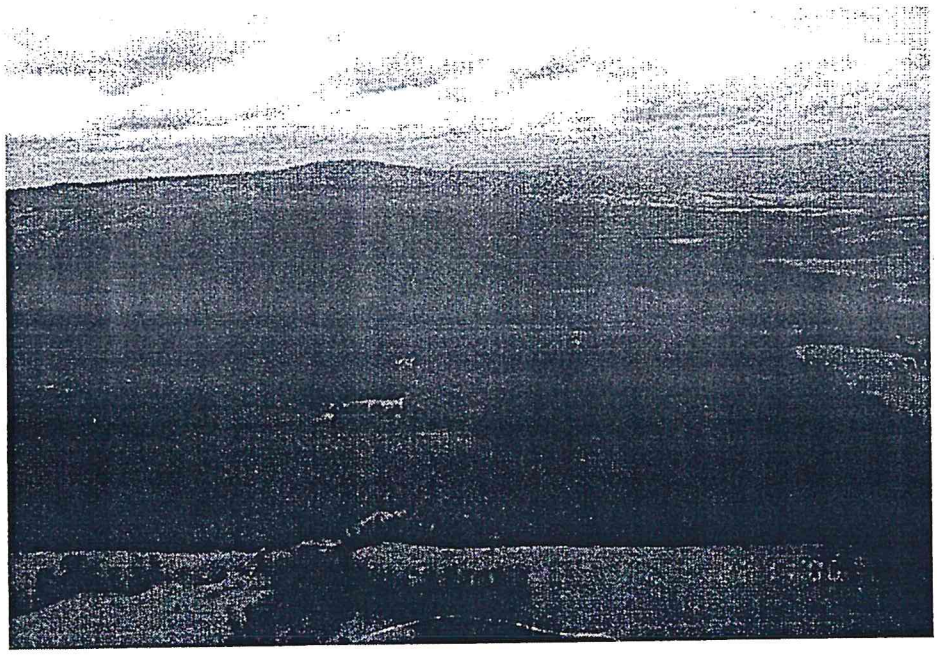

Figure 1. Extensive mortality in southern pines at Smith's Section, near Urbenville, in Northern Region.

Significant *Sphaeropsis* damage was also observed in *P. radiata* plantations in other areas in NSW. In ~300 ha in Buccleuch SF (Hume Region) levels of mortality associated with drought stress and *Sphaeropsis* were up to 4% of trees. In Northern Region, plantations of *P. radiata* around Copeton Dam (~ 300 ha) had up to 15% mortality. Recently thinned compartments had significantly less damage. *Sphaeropsis* dieback was also observed in hail damaged *P. radiata* in Armidale SF in Northern Region.

Armillaria

Armillaria was not a significant problem in the pine plantations in Northern Region this year.

Environmental

Drought

High levels of needle chlorosis associated with drought and accelerated senescence were observed in the Casino plantations (mainly *P. taeda* and *P. elliottii*) during autumn 2000, but no mortality (see related section on *Sphaeropsis*, observed later in 2000).

Frost

Frost had caused low levels of mortality and needle necrosis (<1% incidence) in several state forest in Macquarie Region, with the highest levels in Vulcan SF and Mount David SF.

Hail

Hail damage in November was observed in pine plantations north of Bombala. About 300 ha of young privately owned plantations had to be replanted. About 100 ha of older trees in the adjacent Glen Allen SF were also damaged including ~75 ha with over 75% mortality.

Snow

A severe snowstorm that deposited over 30 cm of snow in the Tumut and Tumbarumba area in May 2000 caused extensive damage to the pines in Bago, Buccleuch and Green Hills State Forests. Another large snowfall in June 2000 exacerbated the problem. The snow was wet, and associated with high winds, which caused more damage than usual. Extensive damage was observed in many compartments. Over 2400 ha were affected in Bago SF, approximately 1200 ha in Buccleuch SF and 1500 ha in Green Hills SF (this damage ranged from 1% of dead tops to whole areas flattened). Damage ranged from broken branches and tree tops in older trees (>20-year-old), broken branches and trees broken in half in mid-age trees, to snow literally flattening young trees. Young trees covered in snow should recover, as they are quite supple (young age class compartments were surveyed in March and trees had recovered). Areas and numbers of

trees affected were not large enough to warrant salvage logging. There was lower levels of damage (flattened whorls) in several state forests in Macquarie Region.

SITE RELATED PROBLEMS IN *P. RADIATA* PLANTATIONS

Establishment

New plantings of *P. radiata* in Hume Region suffered low levels of mortality due to poor site conditions (waterlogging, rocky site) and infection with *Macrophomina phaseolina.*

Weeds

Weeds, especially *Acacia* regrowth, were a significant problem in younger age classes in Bondi SF, Nalbaugh SF and Belanglo SF (Monaro Region), Koreelah SF (exacerbating *Dothistroma* needle blight), Mount Mitchell SF and Riamukka SF (Northern Region). Localised areas in Bungongo SF, Carabost SF, Mannus SF, Seymours, Green Hills SF, Bago SF, and Blowering Dam, (Hume Region) were also affected. *Acacia* and grasses were a problem in younger age classes in Carabost SF, Vulcan SF and Jenolan SF (Macquarie Region). Blackberries were a problem in several areas in Hume Region (Bungongo SF).

Nutrient disorders

Boron deficiency was the main problem observed, mainly in younger age classes grown on ex-pasture sites, eg in Hume (Carabost SF and Maragle SF) and Monaro (Oak Range) Regions. Boron excess (needle burn) was observed in Hume Region in recently fertilised plantations (Bungongo SF). The 3-year-old plantations had been fertilised with Ulexite (10% boron, at 80 kg/ha) after signs of boron deficiency were observed in the previous year. Samples were collected during the 2000 forest health survey and foliar analysis by the Analytical Laboratory at Research & Development Division revealed that affected needles had up to ten times the normal levels of boron. Fertiliser application and rates are being investigated.

VERTEBRATE PESTS

Possums

Possum damage was the main problem in Monaro Region in 2000. Possums had caused significant damage to pines in Bondi S.F., Coolangubra S.F. and Nalbaugh S.F. The area of plantation affected by possums in Monaro Region has not changed significantly from 1999. The incidence of damaged trees, however, has decreased from previous years, with fewer trees having fresh damage. Counts were made of both previous and current possum damage in many compartments. In most cases, there were higher levels of previous damage (identified as trees with old dead tops) than trees identified as having fresh damage (within approximately the last 6-

12 months). Previous damage by possums has resulted in multiple leaders and heavy branching in many trees, which can reduce timber yield. Other areas in NSW had very low levels of possum damage, including Camira SF, Clouds Creek SF and Eden Creek SF (Northern Region). Localised areas in Yabbra SF (Northern Region) had up to 10% damage from possums.

Wallabies

Browsing from wallabies was a problem in young stands in several compartments in 2000. In most cases levels were <1% incidence (Bondi SF & Coolangubra SF in Monaro Region, Dog Rocks SF, Jenolan SF, Vulcan SF & Sunny Corner SF in Macquarie Region), although up to 30% incidence in one compartment in Jenolan SF.

Hoop pine (*Araucaria cunninghamii*)

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

Eucalyptus species

Pests

Psyllids

Creiis liturata has caused more extensive damage in several young *E. dunnii* plantations on the north coast. The area of damage has approximately doubled to 200 ha with severe damage. The number of sites with damage has also increased, with one plantation south of Casino newly recording the psyllid (to add to those west and north of Casino). A collaborative project with Research & Development Division, Planted Forests Division and Southern Cross University is under-way to study various aspects of the *Creiis* psyllid. A PhD student will study the biology of the insect, including its life cycle, as well as investigating various control strategies, including site factors affecting damage, host tolerance and chemical control.

Cardiaspina species were not significant pests in the northern plantations this year. However, significant damage by *Cardiaspina albitextura* to young *E. camaldulensis* plantations occurred around Deniliquin and Albury.

Leaf beetles / Chrysomelids

In most cases, damage from chrysomelids was much lower this year. However, high numbers of *Paropsis atomaria* were observed causing significant defoliation in *E. grandis* near Albury. Both *Chrysophtharta cloelia* and *Paropsis atomaria* are still amongst the most destructive pests in young eucalypt plantations in northern NSW.

Monolepta beetles (*Monolepta australis*)

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

Sawflies (*Perga* spp.)

Gregarious sawfly larvae caused extensive and significant defoliation in several plantations from March onwards in 2001. Little insect activity was observed during forest health surveys from December to February. By late April and May, a number of plantations around Coffs Harbour, Taree and Kyogle had significant numbers of trees almost completely defoliated. The *E. grandis* hybrids were the most severely damaged, followed by *E. grandis*.

Christmas Beetles (*Anoplognathus* spp.)

Damage from Christmas beetles was significant in many *E. dunnii* and *E. grandis* x *E. camaldulensis* hybrid plantations in November to December 2000 around Wauchope, Gloucester and Taree, in many cases causing severe defoliation. Little beetle activity was observed after Christmas. A Christmas beetle exclusion trial in an *E. dunnii* plantation was established by State Forests to quantify the impact of severe and continued defoliation by these insects. Trees recovered after initial defoliation in November-December, but we were hoping for further damage. Data are being analysed.

Leaf Blister Sawfly (*Phylacteophaga froggatti*)

Leaf blister sawfly larvae had caused significant damage to *E. grandis* in several plantations around Deniliquin. These plantations had suffered high levels of damage the previous year. *Phylacteophaga froggatti* was not a significant pest in the northern plantings this year.

Gum tree scale

In most cases, gum tree scale (*Eriococcus* spp.) was observed at very low levels in young plantations (<1% incidence), and often infested trees were on waterlogged sites and/or under stress. The majority of hosts were *E. grandis*. Several plantations had higher levels of damage.

Stem borers

Stem borers were again the most significant insect pest of young hardwood plantations in northern NSW. Plantations over 2-3 years old are the most susceptible, with *E. grandis* the most susceptible host. In some cases up to 45% of trees in a plantation have been attacked. *Corymbia variegata* on poor sites in drought conditions have had up to 20% trees attacked in

2000-2001. SFNSW is conducting research into the impact of stem degrade in hardwoods and possible management strategies.

Diseases

Aulographina eucalypti

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

Phaeophleospora epicoccoides

Phaeophleospora epicoccoides (= *Hendersonia grandispora*, *Phaeoseptoria eucalypti*, *Kirramyces epicoccoides*) caused significant defoliation in several *E. grandis* plantations in northern NSW this year. Defoliation occurred from the ground up, and often resulted in over 50% and up to 95% defoliation of trees. The majority of trees affected were in lower lying areas. The defoliation often left trees with a red appearance (red colour of branches and branchlets), giving diseased plantations the appearance of a "red tide" (Fig. 2), and this is what the "locals" termed the disease. The disease was also observed in several *E. dunnii* plantations and *E. grandis* hybrid trials. This is the first major damage caused by this pathogen in the young eucalypt plantations in northern NSW since the start of the Forest Health Survey program. More commonly this pathogen is observed at very low levels on older senescing foliage of *E. grandis*. High humidities are suspected to predispose trees to this disease.

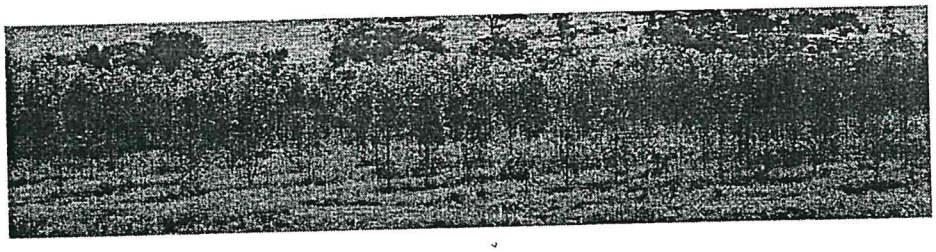

Figure 2. *Phaeophleospora epicoccoides* causing defoliation in *E. grandis*. Note "red tide" appearance to plantation.

***Mycosphaerella* leaf spots**

Mycosphaerella leaf diseases were not observed in significant levels during the forest health surveys in northern NSW this year (December 2000-April 2001). However, high levels of *M. cryptica* were reported from several *E. pilularis* and *E. grandis* x *E. camaldulensis* plantations in

early autumn (there were large rainfalls in April and May). Flood irrigated *E. camaldulensis* plantations had moderate levels of leaf spot caused by *M. cryptica,* resulting in moderate defoliation while the adjacent native bush had high levels of *M. cryptica*.

Coniella fragariae

This pathogen was not significant this year.

Ramularia leaf and shoot blight (*Quambalaria pitereka*)

The new genus *Quambalaria* J. A. Simpson was described for this pathogen of species of *Corymbia* and *Angophora*. Observed levels of Ramularia blight in *Corymbia* plantations were low during forest health surveys in summer and early autumn this year. However, severity was higher in plantations surveyed during late autumn. Many older plantations (>3-year-old) that previously had Ramularia blight have recovered, with little infection observed.

Phytophthora

Several plantations that had *Phytophthora* in previous years were inspected in April after heavy rains during summer. None of these showed signs of mortality from root rot fungi.

***Phomopsis* collar rot**

A collar rot associated with presence of a species of *Phomopsis* caused extensive mortality in newly established (3-week-old) *E. dunnii* and *C. maculata* in two plantations near Grafton. Up to 50% of seedlings died. This pathogen was also isolated from nursery stock. Studies to determine the identity of the species of *Phomopsis* and to confirm pathogenicity are in progress.

OTHER

Mistletoe

Mistletoe was observed at significant levels in several 5-year-old *C. variegata* plantations north of Casino. In one, the level of mistletoe infection had considerably increased from 5% in 1999-2000 to just over 20% in 2000-2001. Mistletoe has not been observed in other hosts in the young plantations in northern NSW.

ENVIRONMENTAL

Drought

Drought and hot winds had caused significant damage to a 5-year-old *C. variegata* plantation in 2000. Leaves on many trees had been 'burnt' and died. In many cases 50-100% of leaves on trees had been damaged, leading to almost total defoliation of trees. Approximately 30 ha had been affected. The plantation was inspected several times to follow the recovery of trees. By

April 2001 5% of trees had not recovered and had died. However, the majority of trees recovered after rain and though previously heavily defoliated were producing new shoots.

Frost

Frost damage had occurred in the Fletcher Property Purchase site near Wauchope. Low lying areas of *E. grandis* and *E. pilularis* were both affected. This damage was particularly severe to the *E. pilularis*, 10% of which would probably not recover.

MANAGED NATURAL FORESTS

EUCALYPTUS SPECIES

An outbreak of phasmatids (*Didymuria violescens*) has caused significant damage to native state forests in Hume Region (Tumut/Tumbarumba), similar to 1999 where approximately 8570 ha in three state forests were damaged. The main eucalypt species attacked were *E. radiata* and *E. dalrympleana,* but *E. delegatensis* and *E. pauciflora* were also damaged. Total defoliation of some trees was observed. Aerial surveys will be conducted in August 2001 to determine the extent and severity of damage.

Bell Miner Dieback

The presence of bell miner (*Manoria melanophrys*) colonies can result in eucalypts in moist sclerophyll forest becoming unhealthy, with often tree death occurring amongst the susceptible eucalypt species. Bell miners are insectivorous social birds that aggressively defend their territories against other insectivorous bird species and predators. Eucalypt trees with crown dieback tended to have high levels of foliar damage caused by a range of different herbivorous insects. Presence of the bell miners appears to interfere with the effectiveness of both vertebrate and invertebrate natural enemies of some herbivorous insects (e.g. other insectivorous birds, insect parasitoids and spiders). This results in elevated populations of a diverse range of herbivorous insects on the foliage of susceptible eucalypt species, including numerous species of psyllid, leaf chewing Coleoptera and leaf-mining Lepidoptera.

During the 1998/99 year two large plots were established in Olney SF and comprehensive base-line data sets on tree condition were obtained, in addition, to several other parameters such as floral surveys and bird counts. Since establishment, annual assessments have been made of over 2000 trees. The fourth and final assessment is planned for November 2001. This site is unique for Australia, in terms of the opportunities it represents for future studies relating to forest ecosystem health and vitality.

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

NURSERIES

CONIFER SPECIES

Apart from an outbreak of *Dothistroma septosporum* in stool beds no noteworthy disease outbreaks were reported this year.

EUCALYPTUS SPECIES

Phomopsis sp. was isolated from *E. dunnii* and *C. variegata* in the Grafton nursery, and high levels of mortality of newly planted seedlings from this nursery observed in two plantations (see above).

NATIVE PLANT COMMUNITIES

A large number of urban trees around Sydney have been severely damaged by a true bug [Hemiptera] from the suborder Heteroptera, family Thaumastocoridae. Gerry Cassis, entomologist at the Australian Museum, has untaken the task of identifying the species, which may well turn out to be a new species. As this stage only two *Eucalytpus* species are thought to be attacked, *E. scoparia* and *E. nicholli*, both of which have been used as street plantings for the last 30-40 years. The symptoms of attack are foliage turning brown or bronze and then falling. Complete defoliation has been reported in some cases. Affected trees do produce new growth and trees defoliated last year have grown new canopies the following spring. However, the long-term effects of this insect on the urban tree resource are yet to be determined.

No noteworthy disease outbreaks were recorded.

QUARANTINE

Pine pitch canker - *Fusarium circinatum*

An Australasian contingency plan for management of incursions of *F. circinatum* is in preparation.

Pine wilt nematode- *Bursaphelenchus hunanensis*

Samples from about 150 dead and dying *Pinus* trees were tested for presence of *B. hunanensis* &/or *Ektaphelenchus*. All samples were negative. Another as yet undescribed species of *Bursaphelenchus* is associated with *Ips grandicollis* in N.S.W. but is not pathogenic to *Pinus*.

European House Borer

The exotic European house borer, *Hylotrupes bajulus*, was found in a piece of timber brought to R&DD by a pest controller in August. The timber, taken from a bowling alley at Top Ryde, Sydney, was showing signs of borer damage. It was dissected and insect larvae taken from it were identified as European house Borer.

European house borer is a longicorn beetle native to North Africa. It now occurs in all continents except Australia and is a pest of major importance wherever it occurs. The pest frequently attacks housing timbers and its ability to attack seasoned softwoods distinguishes it from native longicorns. Since Australia is heavily reliant on radiata pine for housing construction, the economic impact if this pest were to become established would be severe.

R&DD staff participated in inspections of the bowling alleys in conjunction with AQIS, and assisted with the formulation of a management strategy. AQIS are now implementing the necessary action to minimise the risk of the borer spreading to other areas.

Drywood termite

The exotic West Indian drywood termite, *Cryptotermes brevis*, was found in timber picture frames in a house in Belfield, Sydney. The discovery was made by a pest controller who brought the infested specimens to R&DD for identification. The infested frames were imported into Australia from New Caledonia approximately 20 years ago.

The premises were inspected by R&DD staff in conjunction with AQIS and NSW Agriculture. As there were no signs of the termites having spread into other parts of the house, the only remedial action warranted was the disinfestation of the infested frames.

Formosan termite

AQIS inspectors intercepted a shipment of timber from Taiwan infested with termites. The termites were identified as Formosan termite, *Coptotermes formosanus*, by R&DD staff. In economic terms *C. formosanus* is the world's most important termite pest. The infestation was destroyed by fumigation.

Forest health surveillance and diagnosis

Surveys of approximately half 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 were not conducted this year.

Forest health surveys of all Softwood plantations were completed through winter and spring 2000. The Forest Health Survey Unit reported on the incidence, severity and extent of areas where pests, diseases, vertebrates, nutrients and weeds were limiting growth or affecting survival of pines. Recommendations on control or remedial actions for health problems were supplied to Softwood Plantations Division for consideration. These recommendations and related data can be used to assist to:

- predict wood volumes in affected stands (eg. possum or *Sphaeropsis* damaged stands),
- adjust management regimes to improve vigour of "unhealthy" stands (eg. to bring forward thinning in drought-affected, or nutrient-deficient, stands),
- apply fertilisers or control weeds to improve establishment, growth and survival of young trees,
- manage pest and disease outbreaks (e.g. control spray for *Dothistroma*).

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. ACT Forests has shown interest, and negotiations are under way.

RESEARCH AND DEVELOPMENT

1. A number of eucalypt tree-improvement trials were assessed for pests and diseases this year. These have also been measured for growth and form characteristics.
2. Studies on the impact of possums in Monaro Region, in collaboration with Research Division and Softwood Plantations Division, are ongoing.
3. A SPIRT application to study the damaging *Creiis* psyllid has been submitted, in collaboration with Southern Cross University, Hardwood Plantations Division and Research Division.
4. Stem borer research in hardwood plantations is ongoing, and collaboration on impact of stem degrade continuing with QFRI
5. Studies of the life cycle, host susceptibility and distribution of the unidentified Thaumastocoridae attacking urban trees has been proposed by The University of Sydney in collaboration with the Australian Museum.
6. A Christmas beetle exclusion trial in an *E. dunnii* plantation was established by State Forests to quantify the impact of severe and continued defoliation by these insects. Trees recovered after

initial defoliation in November-December, but we were hoping for further damage. Data is being analysed.

7. 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. Intensive foliar sampling has been conducted as part of the 'ground-truthing' project associated with the 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. This has now been written up. A similar study is planned for several *Pinus radiata* plantation sites in the Hume Region, with continued collaboration with CSIRO Forestry and Forest Products.

7. TASMANIA 2000/2001 – PESTS AND DISEASES

Pathology

Plantations

Pinus radiata

Foliage

Status of Spring needle cast (SNC) remains unchanged from previous year although there has been some additional substitution of *P. radiata* by *E. nitens* on high altitude, SNC-prone sites in north-eastern Tasmania. Comparison of New Zealand needle-cast (Cyclaneusma) selections with Tasmanian SNC selections found useful correlations among highly susceptible and highly resistant selections.

Dothistroma was more prevalent this year than in 1999-2000 and was detected in 25% (by area) of the 3-year-old plantations included in health status surveys. However more than 75% of trees with *Dothistroma* were assessed to have only low levels of infection (<25% of crown infected).

Pestalotiopsis maculans was isolated from two young trees with symptoms of mottling, yellowing and premature shedding. This is the first record of this fungus from Tasmania. Affected needles were also heavily colonised by *Cyclaneusma minus*.

Shoots and stems (including Diplodia dieback)

Shoot blight caused by *Sphaeropsis sapinea* was detected at very low incidence (<0.1%) throughout northern plantations. About 20 trees in an area of 0.1 ha in one 3-year-old compartment Sphaeropsis shoot blight affected up to 80% of shoots.

The undiagnosed stem gall problem continues to be found at low incidences in new areas throughout northern Tasmania. A total of 33 affected plants from 18 compartments were detected during this year's health survey. Galls are continuing to form because some of the galls occurred on wood that had been produced after the initial detection in June 1999.

Roots

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

Environmental

Needle scorch leading to defoliation and eventual tree death was causing severe damage to several mature *P. radiata* shelterbelts and small block plantings at Woolnorth in the far north west. It is considered most likely that the problem is the result of deposition by salt-laden westerly winds.

Eucalyptus species

Foliage

Leaf blight due to *Mycosphaerella nubilosa* was responsible for severe defoliation (70-90% leaf loss) throughout Forestry Tasmania's 2 and 3-year-old *E. globulus* plantations in the Circular Head area. In 18-month-old *E. globulus* plantation in the same area defoliation was rare but leaf spotting was prevalent (average incidence 32% of trees). Gunns' young *E. globulus* plantations in the Woolnorth area are also suffering heavy infection and defoliation. A high altitude (450-500m) *E. globulus* plantation in the northeastern Tasmania (Gunns) has suffered heavy defoliation from *Mycosphaerella*.

There was a high incidence (39% of trees) of *M. cryptica* infection of 18-month-old Forestry Tasmania *E. nitens* plantations on high altitude sites in north eastern Tasmania. Defoliation was rare but nearly 5% of trees (maximum incidence 40%) in this area had necrotic lesions that

effectively "defoliated" up to 25% of current seasons foliage. *M. cryptica* leaf spotting is also widespread in Gunns' *E. nitens* plantation throughout northern Tasmania.

Phaeopleospora (Kirramyces) eucalypti was uncommon in young (18 month-old) Forestry Tasmania plantations (incidence < 1% in all compartment). In older plantations of E. nitens P. eucalypti leaf spotting is widespread by not severe (no defoliation).

Shoots

Fungal shoot diseases were uncommon during the past year. One 18 month-old plantation in Mersey District suffered *Botrytis cinerea* blight of the apical shoot on 4% of trees.

Stems

Scattered top death, initially thought to be *Botryoshpaeria dothidea*, was found in an 18-month-old *E. globulus* plantation in Temma Block (western Tasmania). Only the weakly pathogenic species, *Endothia gyrosa* and *Cytospora eucalypticola* could be isolated from affected stems. The primary cause of this problem remains unknown.

Roots

Small patch deaths reported in three young (<2-years-old) plantations in northwestern Tasmania.

Environmental problems

Wind damage

Wind damage was prevalent in young *E. nitens* and to a lesser extent, *E. globulus* plantations. Breakage of succulent young shoots, often leading to forks, affected 9% of trees in 18 month-old plantations, statewide. Damage was particularly prevalent in Districts establishing plantations on high altitude sites, exposed to westerly winds. Other types of damage attributed to wind, including leaf shredding, flattening of the crown and sweep were also prevalent in young plantations on exposed, windy sites.

Severe wind damage (windthrow and stem breakage) occurred in a young *E. globulus* plantation (Gunns) in the Circular Head area.

One young (12 month-old) plantation on an exposed site in northeastern Tasmania suffered extensive leaf scorch due to desiccation from cold, dry winds.

Frost damage

Symptoms of frost damage (leaf reddening leading to scorching and premature senescence) affected trees planted on the margins of flat, grassy plains in a young (1-year-old) *E. nitens* plantation at West Takone (south of Wynyard). Mortality was rare although some of the more severely affected trees suffered heavy leaf loss leading to stunting. Widespread symptoms of frost damage occurred in another 18 month-old *E. nitens* plantation on a high altitude site. A high proportion of trees in this compartment had characteristic leaf morphology of southern N.S.W. provenances, which are known to be less cold-tolerant than Victorian provenances.

Drought stress

The severe drought conditions in south eastern Tasmania persisted until autumn 2001. Some Gunn's E. globulus plantations in low rainfall areas in the southeast suffered severe wilting and some mortality but recovery since autumn rains has been good. No drought deaths were seen in Forestry Tasmania plantations but the incidence of several symptoms attributed to water stress was higher than normal. Mild leaf scorch (<25% crown affected) affected 1.3% of trees in 18 month-old plantations statewide, but was particularly prevalent Derwent District where 4.5% of trees and 35% of compartments were affected. Moderate and severe leaf scorch affected 1.1 and 0.3% of trees in 18 month-old plantations respectively. Symptoms of microphylly (putative zinc deficiency), leaf cupping and undulating leaf margins were also more common than in previous years. Water stress symptoms were magnified on ex-pasture sites where grass control was inadequate.

Managed natural forests

Eucalyptus species

Protracted drought conditions continued until autumn 2001 in south eastern and eastern Tasmania causing widespread scattered mortality of eucalypts on slopes and patch deaths of eucalypts and understorey shrubs on shallow soils overlying sheet rock.

Eucalypts (particularly *E. gunnii* and *E. delegatensis*) across extensive areas of the Central Plateau have experienced a steady deterioration in crown health (crown thinning, dieback and epicormic production) over the past few years. The cause(s) of this deteriorating crown condition has not been investigated.

Nurseries

Conifer species

Damping-off of recent *P. radiata* germinants due to *Fusarium* was more prevalent this year than in previous years. Later than normal sowing (2 month delay) was implicated as a contributing factor.

Eucalyptus species

Botrytis cinerea was more prevalent this year than in recent years although losses were relatively small (<1%). There was a definite elevated susceptibility to *Botrytis* infection in certain *E. globulus* seedlots.

Urban and rural

Additional eucalypts showing symptoms consistent with Mundulla Yellows were found in street plantings in Hobart. RNA associated with Mundualla Yellows has been isolated from several samples collected for assay by Adelaide University.

Quarantine

Shoot dieback was found on several trees from 2-years-old plantation on a site with severe nutrient deficiencies. Affected shoots had copious resinosus, resin-soaked wood and salmon-coloured sporodochia producing typical *Fusarium* macroconidia. Because of the similarity of the field symptoms with those of pitch canker the plantation was immediately declared a quarantine area pending confident identification of the *Fusarium*. DNA tests done by FRI and University of Tasmania using RAPD's and a range of primers showed the species was distinct from *F. circinatum*. Based on cultural morphology the isolate has been tentatively identified as *F. lateritium*. In Tasmania, this species has only previously been recorded on *P. radiata* from nursery seedlings with damaping-off. Pathogenicity tests have so-far failed to reproduce symptoms in health plants so the probable diagnosis is saprophytic colonisation of moribund shoot tissue of severely nutrient-stressed trees.

Research and development

An economic analysis of the impact of Mycosphaerella leaf blight demonstrated considerable financial benefit if the disease can be effectively controlled using fungicides. Glasshouse trials have been established to screen potential fungicides and host defence promotants. A site for a field trial has been selected and will be established during the year to test the effectiveness of fungicide / defence promotants, with and without weed control, in preventing defoliation from MLB. The field trial site will also be used to: (i) investigate the physiological response of the trees to infection as a means of better predicting impact using process-based models (subject to funding) and (ii) evaluating the potential for remotely sensing MLB infection and defoliation using CASI.

Research to support continual improvement in methods for conducting health surveys has focussed on addressing the issues of: (i) variability and its effect on the accuracy in measuring and reporting health status; (ii) assessment standards for premature leaf senescence; (iii) silvicultural prescriptions for plantations with variable health and performance.

Developed diagnostic keys to identify, illustrate and describe common health problems affecting eucalypt and pine plantations in Tasmania. The keys have been included in Farm Forestry Toolbox Version 3.

Entomology

Plantations

Pinus radiata

Foliage

Defoliation by the wingless grasshopper, *Phaulacridium vittatum* was evident throughout the Midlands on shelterbelts and woodlots with severe damage restricted to young trees or the lower branches of mature trees.

The Arctiid moth *Spilosoma glatignyi* was reared from early instar stage to adult on *P. radiata* foliage. The larvae are commonly found on foliage but have not caused severe defoliation.

The Painted apple moth, *Teia anartoides,* is another common species on young *P. radiata* trees causing severe defoliation to roadside edge trees.

Shoots

Monterey Pine Aphid (E*ssigella californica*)
This aphid is now widely distributed in southern Tasmania. There are no reports of sightings in the north of the State. Damage levels appear to be lower than the initial infestation in the Plenty Valley. Most *Pinus* species in the Royal Tasmanian Botanical Gardens in Hobart carry the aphid but without noticeable damage as yet.

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

Stem

Sirex Wood Wasp (*Sirex noctilio*)
Very low numbers of *Sirex* killed trees were found during the past year. All were in unthinned compartments. Several trees were located at Scamander State Forest, which has a long history of *Sirex* occupation. Chip tests showed that nematodes introduced in 1990 are no longer present. A private planting of 15ha in NW Tasmania had 2% of trees over ten years old attacked by *Sirex* both last year and currently. All of those trees have been manually removed and burnt. A developing outbreak on Flinders Island has had nematodes inoculated in August 2001. Several coupes at this privately owned site have *Sirex* present and attacked tree levels may be high in these unsurveyed coupes. The permanent plots at Tower Hill and Branchs Creek do not have *Sirex* present.

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

Other Bark Beetle Species.
Hylastes ater adult stem feeding at Scamander killed several hectares of planted one-year-old Pinus radiata seedlings. At several other coupes where wildlings have been thinned to rows deaths caused by *Hylastes* is evident. In both cases old unthinned stands and sites with heavy debris remaining from harvesting provides a source of *Hylastes* to attack second rotation stock.

Eucalyptus species.

Foliage

Autumn Gum Moth (*Mnesampela privata*)

There were no high populations recorded in any Forestry Tasmania plantation although 30% and 14% of 18 month-old plantations in Bass and Murchison Districts, respectively, had low levels of damage. AGM was the most significant insect pest problem in Gunns plantation in northern Tasmania and 940 ha were sprayed in spring 2000. There was also a localised outbreak in plantations at Buckland in the southeast.

Comalco Aluminium carbon credit planting's of *E. globulus* in NE Tasmania suffered moderate damage from an autumn emergence in 2001.

Leaf Beetles (Chrysomelidae)

Routine monitoring of Forestry Tasmania *E.nitens* and *E. globulus* plantations was conducted using the methodology set out in the Leaf Beetle IPM Technical Bulletin. Aerial spraying using synthetic pyrethroids was done on 167ha that exceeded population thresholds. *C. agricola* damage to 18 month-old plantations was confined mainly to northwestern Tasmania where 30 and 60% of compartments in Murchison and Mersey districts, respectively, had low levels (<25% defoliation) affecting between 5-10% of trees. Trees with moderate damage (25-50% defoliation) were rare although one compartment in Murchison District the incidence reached 24% of trees. No trees with economically significant damage (>50% defoliation) were detected in health surveys. *C. bimaculata* damage in 18-month-old plantations affected the same areas as *C. agricola* but at a 50% lower incidence.

Monitoring of Gunns plantations reported the lowest populations for several years. Aerial spraying was done on 340 ha. Autumn surveys of Gunns plantations found little damage from late seasons populations in their northwestern estate.

Gum leaf skeletoniser (*Uraba lugens*)

Moderate populations occurred in *E. globulus* plantations in the lower rainfall areas of northern Tasmania. In Gunns aerially sprayed 152 ha of their plantations in which high populations were detected.

Sawflies (*Perga* spp.)

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

Scarabs (*Heteronyx* complex.)

Populations of *Heteronyx* were lower than in previous years, possibly because of drought conditions in northern Tasmania. Spraying to control *Heteronyx* was done on 360 ha of recent plantings in the Surrey Hills area (Gunns). Damage form scarabs remains minor in Forestry Tasmania plantations.

Other insect pests

Large populations of the wingless grasshopper (*Phaulacridium vittatum*) were detected in young *E. nitens* plantations in the Surrey Hills area in January 2001 prompting 593 ha being aerially sprayed.

Several young *E. globulus* plantations in low rainfall areas of south eastern Tasmania had low levels of damage from Christmas beetles (*Xylonchus piliger*).

Cardiaspina squamula was detected in an *E. nitens* plantation in the upper Derwent Valley. Although the outbreak resulted in obvious leaf reddening little defoliation occurred.

Stem

Stem borers

Scattered mortality (<1% of trees) caused by *Phoracantha mastersii* was detected in a 12-years-old pruned *E. nitens* plantation in the northeast. *Phoracantha* attack resulted in scattered stem breakage in a 2-year-old *E. globulus* plantation in the Circular Head area.

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

Nurseries

No insect pest problems were observed in forest nurseries during the year.

Quarantine

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

At one site the use of sticky trap bands was used on some tree species to obtain a baseline collection of timber insects present within the port surrounds 5-kilometre area. This initial survey resulted in 44 species being captured including several new anobiid records for Tasmania. It is intended to expand this technique to the other port sites in the coming season.

Research and Development

The research program has had emphasis on testing new insecticides for use against the eucalypt defoliator's *Chrysoptharta* spp., *Uraba lugens* and *Mnesampela privata*.

The release of the technical bulletin 'Manual for managing leaf beetle defoliation in eucalypt plantations' is an important step in the development of the IPM program.

The invertebrate program in the Silvicultural Systems Trial in the Warra LTER site in southern Tasmania continues to be supported at a high level. The measurement of the impact of differing logging techniques and tree retention on biodiversity in wet eucalypt forests will be of major importance to the forest industry.

8. QUEENSLAND 2000/2001 - PESTS

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 plots and ground surveillance have been increased in the border area. Six staff attended the NSCC/State Forests NSW Sirex workshop at Tumut in November 2000, and arrangements are being made for training of more DPI Forestry District staff on detection and management of this pest. Investigations into the susceptibility of *Pinus caribaea* and F1 and F2 hybrids are continuing.

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. It is present in all pine plantations in southern Queensland and has extended its distribution through all exotic pine plantations north to Byfield. The aphid all but disappeared in southern areas after exceptionally hot weather in late summer, but numbers increased again in Autumn. In June it was found in very low numbers at Dampier Ck, near Cardwell. Extensive yellowing/ browning of needles and needle loss have not been seen in Queensland.

Pine Aphid (*Eulachnus thunbergii*)

This aphid is present in all coastal areas up to Kuranda in north Queensland (inland from Cairns). No damage has been observed.

Hoop pine (*Araucaria cunninghamii*)

Pests

Rats

While the hoop pine plantations throughout Queensland were generally free of any insect pest problems during this last year, areas of young plantations at Gallangowan and Jimna were severely damaged by native rats. Trees were chewed on the lower trunk and roots, and soil around the roots was extensively tunnelled.

Eucalyptus species

Pests

Leaf beetles

Numbers of the two main leaf beetle species (*Paropsis atomaria* and *Chrysophtharta cloelia*) were very low early in summer 2000/2001 after very high numbers and significant defoliation was recorded at the end of summer 2000. Numbers of *P. atomaria* had recovered by late summer and significant damage was observed in several joint-venture plantations of *Eucalyptus cloeziana*. With very mild winter conditions in some plantations, adults and larvae have continued to feed over the winter months. Under normal conditions, adults enter a quiescent state and larvae are not found on trees after about June.

Swarming Scarabs (Spring beetles) and Christmas beetles

Swarming scarabs (mostly *Automolus* spp.) continue to be occasional pests in southeast Queensland (SEQ), mostly causing damage to trees in the first year of growth. Effects on both form and early season loss of growth are common. Christmas beetles (mainly *Anoplognathus porosus* & *A. boisduvali*) have caused moderate defoliation to some joint-venture and trial plantings. The most common species planted in SEQ, *E. cloeziana*, appears to be resistant to christmas beetles and relatively tolerant of swarming scarabs.

Sawflies

Pergagrapta polita in Far North Queensland continues to be the most common defoliator in eucalypt plantations and trials. Hosts include *E. pellita*, *E. microcorys*, and *E. grandis* and its hybrids. Overall damage has not been severe, though some individual trees have been completely defoliated. No outbreaks of sawflies have yet been recorded in SEQ, although they are commonly found in plantations and trials.

Stem borers

Surveys of trial plantations in SEQ are showing relatively high rates of stem borer attack (*Phoracantha* spp longicorns and *Endoxyla* spp. cossid wood moths). Incidence of attack on some eucalypt taxa in trials has been as high as 60% at age 3 years, with attacks commencing from age 1.5 - 2. A significant positive correlation between tree diameter and incidence of attack has been found for both wood moths and longicorns, although this relationship is stronger for the former. Thus, the larger, faster growing trees in a plantation tend to be the first attacked. The most susceptible taxa appear to be *E. grandis* and hybrids, *E. dunnii* (wood moth and longicorns), and *E. pilularis* (longicorns).

Other pests of eucalypt plantations

Western white gum (*E. argophloia*) is a promising species for the lower rainfall areas in southeast Queensland. Over the first 2 years of planting this species has been relatively resistant to most insect pests. Surveillance has detected a chalcidoid leaf-galling wasp that seems to be specific to *E. argophloia*. Galls formed by this wasp become conjoined to form gall masses plate galls), which have been observed as being very destructive to leaves. Damage (minor to moderate) was initially restricted to the lower canopy but follow-up inspections revealed that severity increased with time and progressed up throughout the canopy.

Autumn Gum Moth was observed defoliating *E. globulus maidenii* at Paschendaele in May 2001. This is the first record of this important pest species in a trial in Queensland

Quarantine

Pests

Japanese pine sawyer

In May 2001, AQIS detected live adult *Monochamus alternatus* at the Port of Brisbane in pallets from China. This longicorn beetle is known as a vector of the pinewood nematode *Bursaphelenchus xylophilus*, an important pest of *Pinus* spp in Japan, Korea and China. Other pallets from the same consignment had been sent to Swanbank west of Brisbane. These were located, found to be similarly infested, and were fumigated or deep buried. Surveys of the area showed that there were no pine trees within a radius of a few kilometers of the site. Dying pine trees further away have been felled and sampled for nematodes - none were found. Pheromone traps have been placed at Swanbank and are checked fortnightly. No *M. alternatus* have been found to date.

Red imported fire ant

The exotic fire ant *Solenopsis invincta* was discovered in Brisbane in early 2001 at two loci. Emergency response was activated and scoping studies commenced, along with treatment of critical sites such as schools, parks, Port of Brisbane and residences. USDA experts visited Brisbane in June to advise on the situation. The Scientific Advisory Panel recommended eradication based on a benefit/ cost ratio of 18:1, estimated cost to the economy of $6.7 billion over 30 years and the present limited distribution of this insect in Brisbane. This recommendation was accepted by SCARM. Commonwealth /State cost sharing arrangements are in place and $123 million allocated to an eradication program over 5 years. The fire ant is a pest to human health, lifestyle, wildlife and some agricultural crops. RIFA does not do well in closed forest but woodland areas will be invaded. It particularly likes disturbed sites and could be expected to invade after clear fell and be a problem to forestry workers in early plantation establishment. It is likely to be a problem in recreational areas in forests.

Western drywood termite

The exotic drywood termite *Incisitermes minor* was found in a yacht in Moreton Bay. This insect is a common interception in Queensland, frequently in boats. The yacht was ordered into quarantine for treatment of the infestation.

Forest Products

Pests

West Indian drywood termite (*Cryptotermes brevis*)

Eleven buildings and a boat in **Brisbane**, and 19 buildings in **Maryborough** were fumigated in 2000/01 to eradicate infestations of this pest. A further 16 buildings in **Brisbane** were discovered infested during recent surveys and require fumigation. All but 2 of these buildings were in known areas of infestation; most were re-infestations. Six buildings in the **Maryborough** Central Business District (CBD) which have been found infested during the past several years are yet to be fumigated. An infested boat has also been discovered in Maryborough.

An administrative review of the program was undertaken in late 2000. The outcomes of that review are yet to be announced.

Subterranean termites

Termite Standards

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) have been published as performance-based documents. On 1 January 2001, the Queensland provisions of the Building Code of Australia (BCA) were amended to address the installation of termite management systems in class 1 (houses) and class 10 buildings (sheds, garages and the like). Specifically, the provisions incorporate durability of termite management systems in NEW BUILDINGS. Information on these provisions for NEW BUILDINGS can be found at:

http://www.dcilgps.qld.gov.au/building_codes/

Lyctine pests

The paper: Peters, B.C., Creffield, J.W. and Eldridge, R.H. (in prep.) - Lyctine (Coleoptera: Bostrichidae) pests of timber in Australia: a literature review. nears completion for *Australian Forestry*.

A review of the biology, behaviour and management of the most common lyctine species *Lyctus brunneus* (Stephens) in Australia was undertaken and selected literature is discussed. A

sampling and testing protocol to establish lyctine-resistance of timber species is detailed in the paper.

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9. QUEENSLAND 2000/2001 - DISEASES

Plantations

***Pinus radiata* (and other temperate pines)**

Diseases

Foliage

Dothistroma Needle Blight (*Eruptio pini)*

Dothistroma Needle Blight (*Eruptio pini*) continues to defoliate *Pinus radiata* in the small plantation area at Gambubal. It does not affect other tropical pines in Queensland. PCH is highly susceptible given wet conditions in SE Queensland could spread into other areas (Bruce Brown Pers.Comm.)

Diplodia Dieback (*Sphaeropsis sapinea*)

Diplodia dieback (*Sphaeropsis sapinea*) was damaging on *P.radiata* at Passchendaele/Amiens State Forests (Stanthorpe area) especially during drought periods resulting in staining of timber and dieback of trees. It is widespread in Queensland on other host species (Pinus) and is frequently associated with tree malformation and loss of leaders especially in young trees.

Roots

Armillaria root rot (*Armillaria* sp.)

Armillaria sp causing root rot in Pinus radiata in isolated patches of Gambubal State Forest (Warwick area).

Phytopthora root rot (*Phytophthora cinnamomi*)

Phytophthora Root Rot (*Phytophthora cinnamomi)* is widespread and giving rise to scattered deaths in newly established and young plantations of *Pinus radiata* in the Passchendaele/Amiens State Forest districts, especially on wet sites.

Environmental

Drought

Drought conditions have had significant effects on tree decline in Passchendaele/Amiens State Forest. Large expanses of *Pinus radiata* has been effected by prolonged drought conditions resulting in tree decline.

Sub-tropical and tropical *Pinus* species

Diseases

Phytopthora root rot (*Phytophthora cinnamomi*)

Phytophthora Root Rot (*Phytophthora cinnamomi)* is widespread giving rise to scattered deaths in young and old plantations of hybrid PCH x PEE in SE Queensland especially on excessively wet sites. Phytophthora is most likely present in all Pinus plantations in Queensland planted pre 1960(B.Brown Pers.Comm.) Phytophthora is frequently associated with mature pines affected by windthrow.

POOR ROOT CONFIGURATION

Scattered mortality in young stands of **F1 Pinus** clones is associated with poor root configuration of the trees.

Hoop pine (*Araucaria cunninghamii*)

Diseases

Rigidoporus vinctus, Phellinus noxius, Rosellinia sp.

Root Rot/Mortality, caused by the fungi *Rigidoporus vinctus, Phellinus noxius & Rosellinia* sp., continues to affect young 2R plantations in south east Queensland and north Queensland. *P.noxius* is widespread in northern Queensland in 2R plantations and is also responsible for considerable deaths in 1R plantations in both southern and northern Queensland. *R. vinctus* was

uncommon within 1R hoop pine plantations but now causes considerable mortality in 2R plantings up to age 6 years especially in SE Queensland.

Dothiorella Dieback

Dothiorella Dieback (*Botryosphaeria ribis*) continued to occur on young branches and causes losses of a number of whorls from the leader down. This disease is frequently associated with sites not conducive to optimal growth ie. wet low lying sites and dry shallow soils.

Eucalyptus species

Diseases

Ramularia

Ramularia Shoot Blight (*Quambalaria pitereka* (J. Walker &Bertus) J.A. Simpson) was seen on several *Corymbia* spp. throughout the period in SE Queensland. Blight resistant trees are apparent in most provenances, but are much more common in wet coastal provenances.

Cylindrocladium Leaf Blight

Cylindrocladium Leaf Blight (*Cylindrocladium quinqueseptata)* caused severe defoliation and mortality in many *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.

Mycosphaerella Leaf Crinkle

Leaf Crinkle (*Mycosphaerella spp*) has been quite common and damaging in SE & Far north Queensland, affecting both immature and mature juvenile foliage of a number of *Eucalyptus* spp. and hybrids. *E.globulus, E.grandis, E.tereticornis, E.camaldulensis, E. cloeziana* (*Mycosphaerella* sp. yet to confirmed) 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 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 (*Mycosphaerella suttoniae*)
2. Leaf Blotch (*Coniella fragariae* or *Cryptosporiopsis eucalypticola)*
3. Various Leaf Spots (*Mycosphaerella* spp., *Hainesia lythri, Dichomera eucalypti* , *Coniothyrium* spp., *Aulographina eucalyptii* etc.

Bacterial Wilt

Bacterial Wilt (*Ralstonia solanacearum)* was encountered on young *E.pellita* near Cardwell and Innisfail this year causing the death of a few scattered trees. Ralstonia was also found to be associated with wilt/death within a *E. urophylla* plantation in Kuranda north Queensland. This eucalypt plantation was a particularly wet site surrounded by extensive *Pinus* plantations.

Stem Cankers associated with copious flows of kino occur on young *Corymbia variegata* in various 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 rot

Phytophthora Root 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.

Armillaria root disease

Armillaria sp. has been associated with a number of tree deaths in *E. cloeziana* in SE Queensland.

Red cedar (*Toona ciliata*)

Diseases

Rigidoporus vicntus

Mortality caused by *Rigidoporus vinctus* has been recorded in a research plot in SE Queensland in *Toona ciliata* planted on old 1R hoop pine plantation sites. This root disease has also affected plantings of *Cedrela odorata*, *Khaya senegalensis* and *Grevillia robusta* in the same research plot.

Nurseries, Conifer species

Diseases

Pinus hybrids

Mortality/Red Needle of 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

Shoot Blight (*Botryosphaeria ribis*)

Wollemi Pine were occasionally affected by Dothiorella Shoot Blight (*Botryosphaeria ribis*) 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 (*Phytophthora cinnamomi*) following over-watering of heavily-pruned, pot-bound stock plants under glasshouse conditions.

***Eucalyptus* species**

Shoot Blight (*Cylindrocladium scoparium*)

Shoot blight, caused by the fungus *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.

Native plant communities

Diseases

Mycosphaerella Leaf Crinkle

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 Queensland, is therefore regarded as a likely major source of inoculum for the outbreaks of the disease in research trials containing susceptible species.

Acacia Rusts

Acacia Rust, caused by a new species *Racospermyces tierneyi* (J. Walker & R.G. Shivas) was collected during FHS surveys of native forests (*Acacia harpophylla*) in western Queensland during the year. Gall rust affecting the pods of *A.glaucocarpa* has also been noted in seed orchard stock at Byfield recently.

Urban and rural

Disease samples were received from other government bodies and private individuals from both urban and rural areas during the year. Reports on dieback of a number of *Ficus* spp (*Ganoderma* sp. cf. *lucidum*) and *Brachychiton* sp. (*Rigidoporus lineatus*) were made to local government authorities. Phellinus noxius has commonly been associated with tree decline/death within urban situations. Common hosts were *Araucaria* spp., *Ficus* spp., *Jacaranda* sp. and *Delonix* sp.

10. NEW ZEALAND 2000/2001 – PESTS AND DISEASES

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

1. Weather conditions:

New Zealand experienced dry conditions during the past year. Most of the country received less than average rainfall, and drought conditions prevailed in eastern parts of the North Island (Hawke's Bay, Manawatu) and the northeast of the South Island (Marlborough).

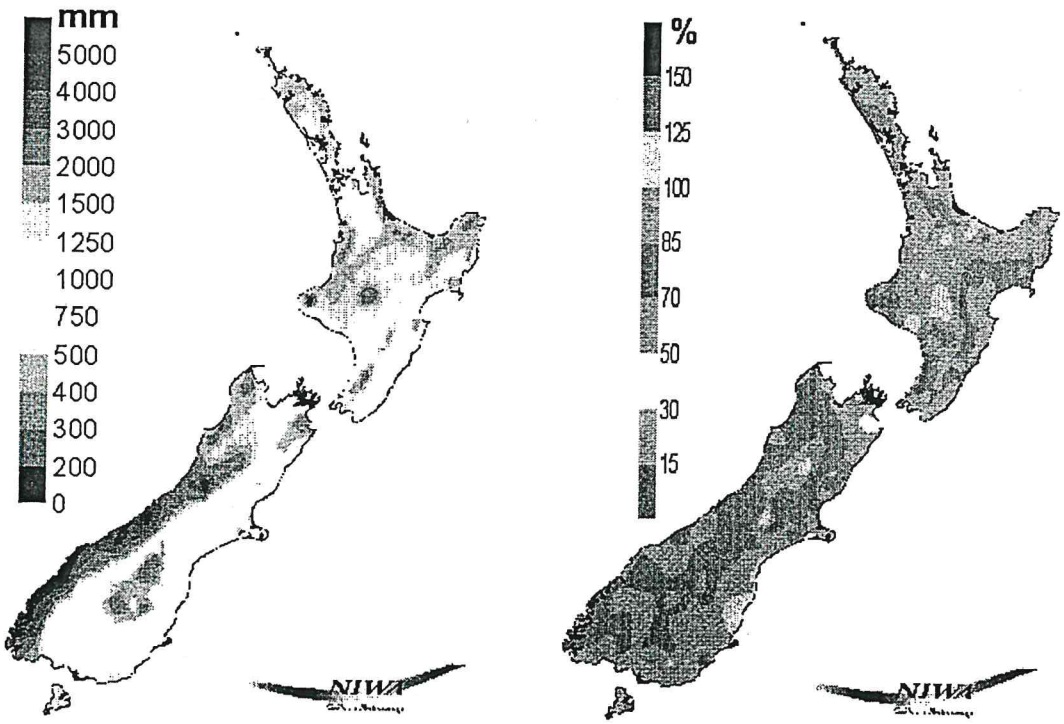


Figure: New Zealand rainfall for the year 1 August 2000 to 31 July 2001 (total rainfall, left, and percentage of average, right)

2. Plantations:

Pinus radiata:

Pests:

Foliage:

Essigella californica, which was first found in New Zealand in 1998, has now spread throughout the country. In October, 2000, a programme was begun to monitor populations of the aphid in *Pinus radiata* forests in the Bay of Plenty region and in Hawkes Bay. The aphid first appeared in Bay of Plenty study sites in mid February, and since then moderate population levels have been maintained through to early May. At this stage it appears that higher aphid population numbers are found in older stands (more than 10 years) in lower elevation forests (below 300 m above sea level). The aphid has not yet been found in stands more than 600 m above sea level in Kaingaroa Forest, although it has been recorded at this altitude in previous years.

Aphids also appear to be more numerous in yellowing trees exhibiting signs of mineral deficiency or pathogen attack. A high soluble nitrogen content in such trees may attract the aphids, and this possibility makes it difficult to determine the extent to which *Essigella* is influencing tree condition. Results from study sites indicate that the aphid appears to be behaving similarly in both Hawkes Bay and Bay of Plenty. Overall, the aphid populations are currently at a relatively low to moderate level.

In January, 2001 unusual defoliation of 1984 planted *Pinus radiata* over an area of about 20 hectares in a forest in the Nelson region was reported by the local forest health surveillance officer. The trees had been pruned to 6 metres, so collecting samples was not easy and no causal agent was evident. The damage was reported as similar to that caused by *Heliothis armigera conferta* (Noctuidae). *Heliothis* can be a problem on small pine trees in the first few years after establishment but in our experience does not defoliate trees of this size. Because of the area involved the site was examined again a few days later by a Forest Research entomologist. The damage to the trees consisted of a noticeable browning of many of the needles close to the terminal bud, over much of the lower crown. In most trees the damage was confined to branches in the lower third of the canopy, but on some it extended up into the top third. Inspection of the affected terminals revealed that the browning was caused by the desiccation of partly severed needles. No causal agent was evident. It was found that the damage, although obvious and widespread, was quite light, and that the trees were actually in good condition. In general, less than half of the most recently flushed needles were affected. The wounds on these needles were very small (<1mm) and just sufficient to cause the distal end of the needle to die off

and eventually to drop. Newly flushed needles on the affected trees were still tender, whereas those on unaffected trees within the block appeared to have hardened off. It was deduced that the defoliation of *P. radiata* in the affected area was attributable to feeding by adult bronze beetles, *Eucolaspis brunnea* (Chrysomelidae). This insect is an indigenous species that has been recorded before from *P. radiata*, but not from trees of this size; it is normally found feeding on far smaller trees. No beetles were found, but adult maturation feeding by *E. brunnea* is ephemeral and probably occurred about a month previously. The population must have been quite large, but apparently only trees with newly-flushed foliage suitable for feeding at the time of the attack were affected. The trees quickly recovered.

Diseases:

Foliage:

There were 837 records of *Dothistroma pini* needle blight, this year, almost the same as in the previous year. More than half the records of *Dothistroma* were from the central North Island (Bay of Plenty and Taupo Biological Regions, 62% of records), with a significant incidence also in the Gisborne and Nelson regions. An area of 68,000 ha of diseased forest was aerially sprayed with copper fungicide during 2000-01, 57,000 ha being in the North Island and the remainder in the South Island (3,000 ha received a second application, approximately 2,000 ha in the North Island and 1,000 ha in the South Island). The area treated this year was considerably greater than in 1999-2000 (47,000 ha), but substantially less than in 1998-99 (over 90,000 ha). The area sprayed is a rough independent indicator of the annual impact and extent of *Dothistroma* throughout the whole country, but is also influenced by other forces driving company activities.

Records of *Cyclaneusma minus* needle cast totalled 1353, more than half as many as last year. This disease was again significant through much of the country, particularly in the central North Island, Gisborne and Northland (Bay of Plenty, Taupo, and Northland Biological Regions, 77% of records).

Instances of severe defoliation of *Pinus radiata* associated with *Strasseria* (and other fungi) occurred again in the spring of 2000. Almost complete defoliation occurred in some older trees. Symptoms are usually preceded by unusually high rainfall over a prolonged period. Experience has shown that recovery will occur once rainfall patterns return to normal, although there will be a period during which trees will have thin crowns.

Stems, shoots:

Reports of Diplodia dieback (*Sphaeropsis sapinea*) totalled 333, significantly more than in the previous year. Records were distributed through much of the country, the majority being from Northland, the central North Island, Wanganui, and northern Canterbury (together making up 60% of records).

Roots:

There were 428 records of Armillaria root disease (*Armillaria novae-zelandiae* and *A. limonea*), this year, significantly fewer than last year. This year the great majority were from the central North Island (Bay of Plenty and Taupo regions, 71% of records). Most records were of low-incidence mortality in young stands, since chronic infection is not readily identified during surveys.

A mortality centre caused by *Peniophora sacrata* was identified in the northern part of the South Island.

Other:

A condition known as "crown wasting" has been observed in stands of *Pinus radiata* about five years old in Gisborne and Hawke's Bay. Symptoms of yellowing and thinning in the upper crown are accompanied by severe distortion of the stem and branches. The condition is being monitored to see if it relates to site, nutrition, or genetics.

Douglas fir (*Pseudotsuga menziesii*):

Diseases:

Foliage:

Records of Swiss needle cast disease (*Phaeocryptopus gaeumannii*) totalled 128, this year, a slight increase on the previous year. Approximately half (51%) were from the South Island). Among North Island records the bulk were from the central area (Bay of Plenty and Taupo regions, 45% of all records).

Roots:

Considerable mortality of 1-, 2- and 3-year-old Douglas fir has been recorded in the South Island. *Phytopthora cinnamomi* root rot has been an important factor, in association with difficult site conditions in some locations and poor mycorrhizal root formation.

***Eucalyptus* spp.:**

Pests (and diseases):

Foliage:

Over the past two years the health and growth of *Eucalyptus nitens* and *E. fastigata* have been systematically monitored in selected locations in the Bay of Plenty. A variety of insect and fungal disorders have already been documented, especially at the lowland coastal site near Kawerau. Of particular note was extensive infection by the leaf pathogen *Aulographina eucalypti* in the lower crowns of young *E. fastigata* trees during the visit made at stand age 3.0 years. A subsequent visit at age 3.8 years found that by late summer the infected leaves had been shed. However, remaining foliage on the same trees had now become severely infested with *Heliothrips haemorrhoidalis* (Thripidae). This thrips attacks a wide range of horticultural and tree crops, but serious infestations are unusual in young plantation-grown eucalypts, particularly in stands of *E. fastigata*, and the cause of this outbreak was unclear. It is possible that the trees were made more susceptible by the effects of earlier *Aulographina eucalypti* infection, or perhaps the unusually wet summer of 2000/2001 facilitated development of the thrips population. It is of interest that this outbreak roughly coincided with the first releases in New Zealand of a biological control organism specifically targeted against this insect pest. HortResearch holds great hopes that the control agent, a parasitoid wasp, *Thripobius semiluteus* (Eulophidae), will successfully establish itself in this country and prove effective in controlling *H. haemorrhoidalis*.

A Western Australian strain of the egg parasitoid *Enoggera nassaui* was released in 1987/88 to control *Paropsis charybdis*, the eucalyptus tortoise beetle. *E. nassaui* proved successful in controlling *P. charybdis* over much of New Zealand except in colder areas. As part of a larger eucalypt leaf beetle research programme Forest Research is studying the efficacy of a cold climate Tasmanian strain of *E. nassaui*. If approved for release, the Tasmanian strain will be offered to those growers with defoliation problems caused by *P. charybdis*. This will be a reciprocal arrangement, as growers will be required to send in *E. nassaui* samples before and one year after the release of the Tasmanian strain. These samples will be used to characterise the genetic structure of the *E. nassaui* population in New Zealand before and after these new releases, to determine if the Tasmanian insects have become established.

The *Nambouria* sp. (Pteromalidae) first found in New Zealand in October 1999 and mentioned in this report last year is still confined to Auckland although it has expanded its range slightly. A description of the new species will be published shortly and work is continuing on its biology.

Uraba lugens (Nolidae) which was first found in New Zealand in 1997 and still remains confined to a very small area at Mount Maunganui was last found alive in October 2000. Just a few larvae were found and the infested tree was sprayed with insecticide. In January 2001 some old larval exuviae were found and there were signs of typical "grazing" damage. Nothing has been found since then and there are still hopes that this struggling population might be yet eradicated.

Acrocercops laciniella (Gracillariidae) was first recorded in Auckland in January, 1999. It is a significant pest in coastal New South Wales, where it causes outbreaks of damage from time to time on blackbutt (*Eucalyptus pilularis*). *Acrocercops laciniella* has a wide host range, which also extends to species within the eucalypt sub-genus *Symphyomyrtus.* In the past year it has rapidly extended its range to include Waikato, Coromandel, Bay of Planty and Hawkes Bay. The numbers of leaf mines on trees can be quite high but defoliation is not noticeable and their growth remains vigorous. The situation is being monitored.

Trachymela sloanei (Chrysomelidae), which was first found in New Zealand in Auckland in 1976, has continued to spread throughout the North Island wherever suitable eucalypt hosts are found. In April of this year it was found on *Eucalyptus viminalis* at Picton in the Marlborough Sounds. This is the first record of this species from the South Island.

Stem bark:

It would seem likely that another Australian insect has been added to the New Zealand fauna. In May 2000 distinctive "scribbles" were observed on *Eucalyptus racesmosa* in a forest in Northland. These were again noted in November 2000. No larvae or moths have been found but it was felt that damage was probably caused by a species of *Ogmograptis* (Bacculatricidae). Ted Edwards (CSIRO) has seen photos of the scribbles and says he felt they were different from any scribble moth mines that he knew of in Australia. The known scribbles in Australia are narrower and more sharply defined with larger amplitude. Edwards suspects that the New Zealand insect might not be *Ogmograptis*. To establish whether the scribbles are being created by either an Australian insect or an opportunistic New Zealand insect it will be necessary to rear it. As yet this has not been accomplished.

Diseases :

Foliage:

The most common leaf spot fungi recorded on eucalypts this year were *Aulographina eucalypti* (19 records), *Fairmaniella leprosa*, *Mycosphaerella* species (particularly *M. cryptica*), *Phaeophleospora eucalypti* (synonyms, *Kirramyces eucalypti*, *Septoria pulcherrima*; 27 records), *Phaeophleospora epicoccoides*, *Pseudocercospora eucalyptorum*, and *Sonderhenia eucalyptorum*. As in previous years, most of these fungi had limited host impact, but *Phaeophleospora eucalypti* continued to affect *Eucalyptus nitens* in warmer parts of the country.

The eco-physiological disorder of ash eucalypts referred to in New Zealand as Barron Road Syndrome (so called because of the location of the first study site) has been identified in a number of locations this year. The disorder is characterised by the abscission of new foliage, with the upper crown of badly affected trees gradually becoming totally bare. Emerging leaves exhibit small necrotic spots with shoots, stems, and petioles often roughened with small galls. Older retained leaves may also be distorted and exhibit extensive leaf spotting and galling. A suite of fungi has been found associated with the affected tissues of young trees. These include *Aulographina eucalypti*, *Elsinoe eucalypti, M. cryptica, M. swartii*, *P. eucalyptorum*, and a *Colletotrichum* species. Badly defoliated trees cease to grow and many trees have died in locations where the disease has been most severe. In New Zealand Barron Road Syndrome has been particularly severe on *E. regnans*.

Defoliation and dieback of *Eucalyptus delegatensis* and *E. nitens* in Southland associated with foliar infection by species of *Phytophthora* has spread to new locations. The effect on *E. nitens* is minor but if these *E. delegatensis* stands mirror other earlier occurrences then severe defoliation could lead to tree death over a period of several years.

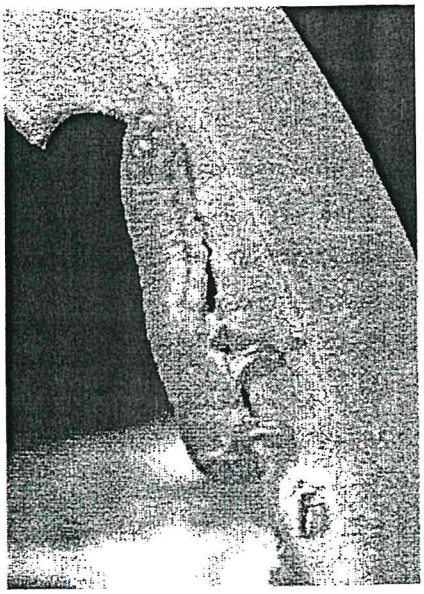
***Acacia* spp.:**

Pests:

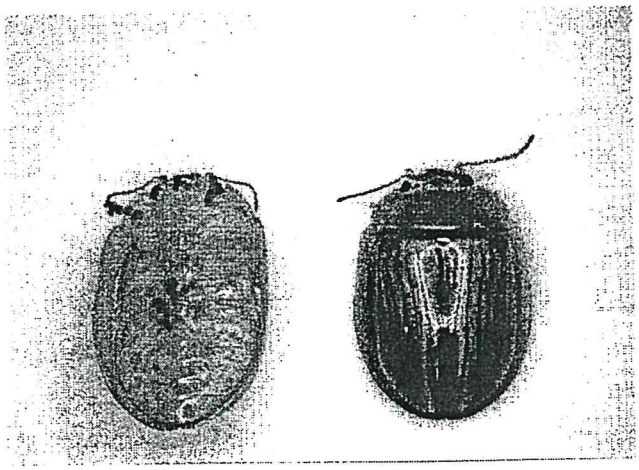
Over the last few years the introduced Australian beetle *Dicranosterna semipunctata* (Chrysomelidae), first found in New Zealand in 1996, has been causing moderate defoliation of *Acacia melanoxylon* plantations throughout the greater Auckland region. To address this issue, consideration is being given to potential biological control options before *D. semipunctata* becomes too widespread and even more of a problem. Possible biocontrol agents include two species of parasitoid wasps, *Enoggera polita* and a species of *Neopolycystus*, which were found attacking *D. semipunctata* eggs during an investigation in northern New South Wales in

November 1999. The Environmental Risk Management Authority (ERMA) requires us to demonstrate a good understanding of the biology of these egg parasitoids, before approving the importation of new organisms into quarantine. So in January and February this year, further research was undertaken in Australia to obtain essential information on the distribution of *D. semipunctata* and the life cycles of the parasitoids. The Australian distribution of *D. semipunctata* extends from Victoria through to northern NSW, with greatest numbers occurring on the tablelands in from the coast. Rearing the parasitoid wasps in the laboratory demonstrated that the life cycles are comparatively short, the period between egg and adult being completed in just over a week and half. It was also determined that the adults can be kept alive for up to five weeks. Between 33 - 60% of *D. semipunctata* eggs were found parasitised in the field. Attack by both egg parasitoids is restricted to the sub-family Chrysomelinae, which includes exotic genera such as *Trachymela*, and *Paropsis* which have species established in New Zealand. No hyperparasites were found in any of the *D. semipunctata* eggs, and we are optimistic about obtaining clearance for importing the parasitoids into quarantine. However, all the issues on the biocontrol and current pest status of *D. semipunctata* will be fully reviewed before an import application is submitted to ERMA.

During a routine port environs survey in October 2000 chrysomelid larvae were discovered on a small group of trees of *Acacia retinodes* in a park a few kilometres from Wellington airport. Adults were reared in containment and subsequently identified by Tom Weir (CSIRO, Canberra) as *Faex suturalis*, a species not previously known in New Zealand. It was not found on *Acacia longifolia* and a number of species of bipinnate acacias growing within 150 metres of the infested *A. retinodes* trees and because of the small number of trees involved the Ministry of Agriculture and Forestry decided to attempt eradication and all the infested trees were sprayed with Decis Forte three times at weekly intervals. Many dead larvae were found after the first spray but none after the subsequent sprays nor during follow-up inspections. The site is being monitored but delimiting surveys have not yet been carried out.



Faex suturalis (larva on *Acacia retinodes* phyllode)



Faex suturalis (adults)

3. Nurseries:

Diseases:

Basal swellings of *Pinus radiata* seedlings were recorded in a number of nurseries that had not previously experienced the disorder. Plants with minor swellings are probably unlikely to exhibit problems when planted out but the stems of plants with a large swelling often become brittle at that point and will readily snap. These plants have to be culled. The condition is abiotic in origin and is considered to be caused by a herbicide that is commonly used in many nurseries. Treatment does not always cause problems, and its adverse effect appears to depend on variables such as the seedling growth stage when applied, soil and environmental conditions, and accumulation in the soil, although these different aspects are not fully understood.

The colder than usual winter temperatures led to some instances of bacterial blight of *Pinus radiata* caused by the 'ice-nucleating' bacterium *Pseudomonas syringae* pathovar *syringae*. Temperatures have fluctuated this year, and the sudden frosts that followed mild conditions in locations where frosts are uncommon created a situation conducive to the disorder.

4. Urban and rural:

Dutch elm disease:

The eradication campaign for Dutch elm disease in Auckland still continues and over the 2000/2001 season seven infected trees were found. In the previous season no new diseased trees were detected. This is the first season since 1995/96 where infection has been identified in the current wood. The asymptomatic survey continued and of more than 2400 trees sampled 11% had some form of staining in the wood. *Ophiostoma novo-ulmi* was isolated from one group of three trees. A limited pheromone trapping programme was carried out in Auckland City but none of the trapped beetles were contaminated with *O. novo-ulmi.* However, additional traps, which were placed where infected trees were found in Manukau City and the Papakura District, showed that 0.71% of the beetles caught were contaminated with the fungus. The future of the programme for the 2001/2002 season has yet to be decided.

Cypresses:

Diseases:

The fungus *Kabatina thujae* was identified from tip dieback from a pair of large *Thuja plicata* in Timaru Botanical Gardens, a first record for New Zealand. *Kabatina thujae* is known in both Europe and North America, causing leaf tip death of a range of hosts in the genera *Cupressus, Chamaecyparis, Thuja* and *Juniperus.* Susceptible species include several of those cypresses commonly grown in plantations and shelter belts in New Zealand such as *Chamaecyparis lawsoniana, Cupressus sempervirens* and *Cupressus arizonica.* The severity of the dieback varies with both host and location. Subsequent to the first record the fungus was found on *Chamaecyparis lawsoniana* and further afield, in Christchurch.

Phyllosticta spinarum has been recorded more widely and on several new hosts during the past year (see new distribution and host records). This fungus is associated with foliage dieback on a range of genera in the Cupressaceae (*Chamaecyparis,Cryptomeria, Cupressus, Juniperus, Libocedrus*, *Thuja, Thujopsis*) and *Sequoia sempervirens.*

Other hosts:

Pests:

In mid-January, 2001, a caterpillar of the painted apple moth (*Teia anartoides*), first recorded in New Zealand in 1999, was found in Titirangi some five kilometres from the closest known site in Kelston. The caterpillar was discovered and brought to the attention of Ministry of Agriculture and Forestry by a member of the public. A limited survey was conducted in the area but no more caterpillars were detected. However, live caged females placed around the site trapped a small number of males. Since then more females have been available for the trapping programme and the results from ground surveys have demonstrated that *T. anartoides* is still very much alive and well in the Kelston/Avondale/Titirangi area of west Auckland. In late May 2001 an independent report on the response by the Ministry of Agriculture and Forestry (MAF) to the painted apple moth incursion was published and copies were sent to all RWG 7 members who requested one. The report was very critical of some major aspects of the handling of the incursion.

An Australian guava moth, *Coscinoptycha improbana* (Carposinidae), was found in Northland 1999 but has only become public knowledge with the publication of a New Zealand Press Association article on 27 October 2000. No public disclosure was made for fear that it presence in New Zealand might be used as a non-tariff trade barrier. Little is known about the moth in Australia but its larvae are known to bore in the fruits of both native and introduced plants, including *Cassine australis* (Celastraceae), *Schizomeria ovata* (Cunoniaceae), citrus fruit (Rutaceae), guava and feijoa (both Myrtaceae). The Ministry of Agriculture and Forestry made the early decision that this was an Australian garden pest and only discussed the matter with the Northland fruit growers. This is despite the fact that there are important forestry and native tree species in New Zealand related to the known hosts, including species of *Eucalyptus* (Myrtaceae) and native species such as *Metrosideros* spp. (Myrtaceae), *Weinmannia racemosa* (Cunoniaceae) and *Melicope simplex* (Rutaceae). This new introduction has only become public because the fruit growers have complained about the lack of response by MAF. The handling of this new incursion has cast doubts as to whether MAF is consulting widely enough when determining which sectors of New Zealand could potentially be affected.

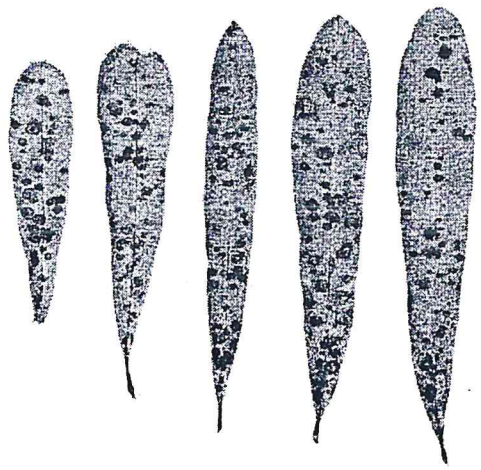
Since it was first found on banksias in the Auckland region in April 1999, the leafminer *Stegommata sulfuratella* (Lyonetiidae) has steadily expanded its distribution range within the North Island and is now found as far south as Wellington. The most common host is *Banksia integrifolia* but it has also been found on *B. ashbyi, B. grandis, B. media, B. ornata, B. serrata* and *B. spinulosa.*

Dieback and subsequent mortality of *Eucalypyus ficifolia,* recorded in urban environments in the North Island for a number of years have increased, but no definitive cause has yet been established. Insect defoliators are not involved but *Cryptoneossa triangula* (Psyllidae), a free-living psyllid contributes to the shedding of new foliage in spring and it also attacks the tender young stems, causing a warty spotty appearance. Leaf fungi associated with affected trees include *Cryptosporiopsis eucalypti* and *Stigmina eucalypti. Botryosphaeria dothidea* has been isolated from larger dying branches.

Diseases:

"Flagging" of plane trees (*Platanus* × *acerifolia*, *P. occidentalis*) caused by *Apiognomonia veneta*, and of redwood (*Sequoiadendron giganteum*) caused by *Botryosphaeria dothidea*, was again evident this year.

The leaf pathogen *Dothidasteromella systema-solare* was found in November causing spotting and tissue death on leaves of *Banksia integrifolia* growing at New Plymouth. About 10% of the green crowns were affected on all banksia trees in the immediate vicinity. The fungus has not been found elsewhere in New Zealand, but monitoring is continuing.



Dothidasteromella systema-solare on foliage of *Banksia integrifolia*

5. Native vegetation:

Dieback and mortality of native cabbage trees in New Zealand (*Cordyline australis*, Agavaceae) has been attributed to the agent "*Candidatus* Phytoplasma australiensis", described from grapes affected by grape vine yellows disease in Australia (Landcare Research, HortResearch). This conclusion is based on the detection of the phytoplasma DNA in symptomatic but not healthy sapling and mature cabbage trees, the finding of phytoplasma cells in affected plant tissues using the transmission electron microscope, and one case of recovery after tetracyclene antibiotic injection. However, as yet there is no proven vector to explain how the phytoplasma is transmitted. This agent is responsible for yellow leaf disease in native flax, *Phormium tenax* (Agavaceae). It is postulated to cause disease in other native and horticultural plants.

6. Diagnostics (Forest Research Forest Health Reference Laboratories):

In the year from 1 July 2000 to 30 June 2001, records of disorders of forest trees on the Forest Health Database totalled 9,138, slightly more than last year. Of these, 3,970 were fungal and 1511 insect pest disorders. Over this period the Forest Health Diagnostic Services processed 1001 pathology and 702 insect pest samples.

New records of fungi and algae:

New to New Zealand:

Coryneum betulinum on *Betula pendula*, Wellington Biogeographic Region
Cryptospora betulae on *Betula pendula*, Wellington Biogeographic Region
Dothidasteromella systema-solare on *Banksia integrifolia*, Taranaki Biogeographic Region
Kabatina thujae on *Thuja plicata*, South Canterbury Biogeographic Region

New Host:

Cephaleuros aff. *parasiticus* on *Banksia serrata*, Wellington Biogeographic Region
Phaeophleospora epicoccoides on *Eucalyptus viminalis*, South Canterbury Biogeographic Region
Phaeophleospora eucalypti on *Eucalyptus camaldulensis*, Northland Biogeographic Region
Phyllosticta spinarum on *Thujopsis dolobrata*, Nelson Biogeographic Region
Phyllosticta spinarum on *Sequoia sempervirens*, Auckland Biogeographic Region
Phyllosticta spinarum on *Libocedrus plumosa*, Wellington Biogeographic Region
Cryptosporiopsis aff. *eucalypti* on *Dysoxylum spectabile*, Wellington Biogeographic Region
Cryptosporiopsis sp. on *Chamaecyparis pisifera*, Nelson Biogeographic Region
Fusarium merismoides on *Corokia cotoneaster*, Wellington Biogeographic Region
Fairmaniella leprosa on *Eucalyptus leucoxylon*, Wellington Biogeographic Region
Fairmaniella leprosa on *Eucalyptus ovata*, Buller Biogeographic Region
Harknessia globosa on *Podocarpus hallii*, Taranaki Biogeographic Region
Phaeophleospora epicoccoides on *Eucalyptus gunnii*, Buller Biogeographic Region
Sonderhenia eucalyptorum on *Eucalyptus leucoxylon* ssp. *leucoxylon*, Taupo Biogeographic Region
Kabatina thujae on *Chamaecyparis lawsoniana*, Mid Canterbury Biogeographic Region
Seiridium cardinale on *Thujopsis dolobrata*, Wellington Biogeographic Region
Sonderhenia eucalypticola on *Eucalyptus fraxinoides*, Taupo Biogeographic Region
Stigmina thujina on *Chamaecyparis pisifera*, Wellington Biogeographic Region

7. Biosecurity preparedness:

Asian gypsy moth:

There has been a concern for many years over the continual interception of viable egg masses of *Lymantria dispar* (Lymantriidae) on cargo from Asia, and its possible establishment in Australia and New Zealand. A Forest Research entomologist (supported by MAF operational research funding) assessed the potential risk of establishment of this extremely polyphagous moth in collaboration with Australian entomologists from CSIRO. Using the known climatic preferences of AGM they predicted that the insect's potential geographic range included SE and SW Australia and New Zealand. In laboratory trials conducted at the CSIRO European Laboratory (Campus International de Baillarguet, Montferrier-sur-Lez, France) the research team tested three populations of AGM and 73 Australasian plant species to examine the ability of AGM larvae to complete their development. Larval performance on at least five species of Australian native plants was as good as that on AGM's preferred host species (*Quercus humilis* and *Q. robur*). However, larval performance on Australasian *Nothofagus* species was poor. *Pinus radiata* was also included in the trial and proved to be moderately acceptable. Given the acceptability of some Australian plants and a climate suitable for the establishment of AGM, this insect should be treated as a quarantine threat, but more particularly to naturalised Northern Hemisphere host plants.

Work carried out in the USA in conjunction with the US Forest Service has demonstrated that different advanced-selection families of *Pinus radiata* are moderately acceptable to, but not preferred hosts for *Lymantria dispar* (Lymantriidae).

Pine pitch canker:

The use of biocontrol methods to protect *Pinus radiata* seedlings against infection with *Fusarium circinatum,* the causal agent of pine pitch canker were investigated in collaboration with HortResearch. Trials were carried out in the high security quarantine facility at NZFRI in Rotorua. The data indicate that elicitors appear to induce some resistance in *P. radiata* to pine pitch canker (reduced lesion length) and that the level of control can be further improved by the incorporation of a biocontrol agent. (NB: It was frightening to see how quickly the seedlings died back following inoculation).

8. Administration and Policy:

Quarantine diagnosis:

Diagnosis of quarantine samples is no longer the responsibility of Forest Research. For this reason there is no New Zealand quarantine report this year.

Formation of new Forest Biosecurity Consultative Forum:

The Forest Biosecurity Advisory Committee met for the final time in Wellington on 11 October 2000. The Hon. Marian Hobbs, Minister for Biosecurity, decided that she no longer required an independent committee to advise her specifically on forest biosecurity matters. Accordingly, the terms of reference for the FBAC, which expired at the end of June 2000, were not renewed. The Minister met with Dr Gordon Hosking, Chair of the Committee, to explain her decision. In deciding not to renew the FBAC's terms of reference, the Minister reflected on her overall advisory structures. The Biosecurity Council is the Minister's primary adviser on biosecurity matters, and will also include representation from the environmental and primary production sectors. The Minister also receives advice from the Biosecurity Technical Forum (the technical sub-committee of the Biosecurity Council), and the Biosecurity Consultative forum. The Consultative Forum meets quarterly in Wellington to discuss biosecurity policy issues of interest to all sectors, and membership is open to any industry or group that wishes to participate. The Ministry of Agriculture and Forestry's consultation on specific forest biosecurity issues will be conducted in accordance with the Biosecurity Authority's consultation policy. The Director of Forest Biosecurity, Dr Ruth Frampton, has established a new Forest Biosecurity Consultative Forum, which she chairs and administers. This forum had met on two occasions before the Minister's decision.

Review of the Management of Biosecurity Risks to the Environment:

A report on biosecurity in New Zealand by the Parliamentary Commissioner for the Environment, Dr Morgan Williams, was released in December last year. The report identified weaknesses, and made recommendations to the Minister for Biosecurity. Besides risks to traditional primary production, a need was seen for improved protection to the New Zealand environment and natural biodiversity from tourism and trade. The report recommended increased funding, more explicit outcomes, improved monitoring and surveillance of indigenous habitats, clear funding commitment for biosecurity emergencies, revision of the roles and function of the Biosecurity Council, and an assessment of the effectiveness of the Biosecurity Act 1993. The report is available on http://www.pce.govt.nz.

Review of procedures for eradication of the painted apple moth (*Teia anartoides*):

Refer: 4. Urban and rural (Other hosts, Pests), above.

9. Extension:

***An Introduction to the Diseases of Forest and Amenity Trees in New Zealand.* Forest Research Bulletin No. 220. Authors: G. S. Ridley & M. A. Dick:**

This book has developed from notes prepared for teaching courses on forest and amenity tree diseases for tree health surveillance staff in government and industry, and is a basic introduction. Tree health surveillance in New Zealand concentrates on exotic plantation species and in particular *Pinus radiata*. However, knowledge of the diseases of some amenity and native species, especially in the urban landscape, is also required as surveillance staff may be required to carry out surveys for new disease introductions. The book falls into two sections: the first introduces some basic concepts in the study of plant diseases and fungal biology. Part two outlines a selection of tree diseases.

***Forest Health News* ten years on:**

Issue 109 (July, 2001) marked the tenth anniversary of the monthly news periodical produced by Forest Health, Forest Research, presenting pertinent information and discussion of current forest and tree pest and disease issues. Current and back issues of the leaflet are available on:

http://www.forestresearch.co.nz/largetext.cfm?page_id=1337&page_id=1337&CFID=545962&CFTOKEN=78831470

Forest pest and disease leaflets:

Forest Research Forest Health Pest & Pathogen Leaflet information continues to be placed on the Web, and may be found on:

http://www.forestresearch.co.nz/largetext.cfm?page_id=1277&page_id=1277&CFID=545962&CFTOKEN=78831470

Courses in GPS and navigation technology, and helicopter surveillance:

Two successful courses were delivered to industry as part of a study evaluating the application of Global Positioning System and navigation software technology to forest health surveillance. This project was conducted within the Forest Biosecurity and Protection (Forest Research) Public Good Science Fund programme. The participants on each course were exposed to GPS theory and operation in both the classroom and field environment. This involved collecting their own data and manipulating it in navigation software programmes. The participants came from various forestry and resource management companies and from several institutes. A further course is planned, and additional courses are to be undertaken in low-level helicopter surveillance for the detection of pest and disease damage. These will include the use of navigational software in pre-flight planning. Preliminary evaluation has shown that to maximise the benefits from helicopter use, surveillance staff will require dedicated training in pre-flight planning and the use of navigation systems, which will lift their skill in the geo-referencing of observations.

11. CSIRO 2000/2001 - PESTS

Research and Development
Pests
CSIRO Entomology

1. Insect – Eucalypt Interactions Symposium

The Symposium Issue of *Austral Ecology* on "Insect-Eucalypt Interactions", in which the 14 papers from the meeting held in 2000 are presented, will be published in October 2001 as Volume 26, Issue 5, of the journal. Martin Steinbauer supplied Blackwells with a list of symposium delegates as well as other colleagues interested in the topic. Blackwells will use this list to contact persons not already members of the Australian Ecological Society but who may be interested in purchasing this special issue. RWG7 members could also ensure that interested persons contact Blackwells to ensure they can obtain a copy of the issue.

2. Pheromones for monitoring autumn gum moth populations

The initial phase of this project is now nearing completion. The 3 compounds that comprise the sex pheromone of Autumn gum moth have been identified and confirmatory studies are all that are still required.

In early 2001, Martin Steinbauer and Geoff Allen (University of Tasmania and the CRC for Sustainable Production Forestry) with industry support, prepared a funding application to the Australian Research Council to continue the pheromone research. If successful, this funding will enable Dr Fredrik Ostrand from Lund University, Sweden, to work in Australia on the project and advance it to the stage of field implementation. Martin is presently in British Columbia, Canada, talking to representatives of companies expert in the synthesis of insect sex pheromones with a view to establishing partnerships to produce the pheromone for use in the field. Sometime prior to this stage of the process, issues concerning patenting will need resolution.

3. Parasitoids of autumn gum moth

Mark Short, Martin Steinbauer and Stefan Schmidt concluded their first season's field work using experimental trials established the preceeding year. Malaise and UV light traps were used to monitor populations of Autumn gum moth adults and populations of hymenopteran natural enemies of the moth in plantings of different levels of vegetational complexity/nectar availability. Data compilation is complete and initial analysis will be complete before the start of the 2001/2002 season.

4. Establishing new linkages with international experts

In December 2000 Martin Steinbauer was granted funding from the Australian Academy of Science to undertake 6 weeks research with Dr Allan Carroll at the Pacific Forestry Centre (PFC) in Victoria, British Columbia, during July and August 2002. The PFC is the research centre of the Canadian Forest Service on the west coast of Canada. Martin and Allan are studying oviposition preference for hosts of different nutritional qualities by the Phantom hemlock looper and Hemlock looper (Geometridae) – two very serious lepidopteran defoliators of conifers in north America which exhibit some life history similarities to Autumn gum moth. In addition, Martin has had the opportunity to see management practices for Mountain pine beetle as well as pheromone-based management practices for beetles and lepidopteran defoliators, both in the interior and coastal mountains of BC, respectively.

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, established by Andrew Loch with support from the Western Australian Blue Gum Industry Pest Management Group (IPMG), will aid in the determination of economic thresholds for these various pests. Trials are proceeding well with early results indicating significant growth losses as a result of feeding by the eucalyptus weevil, *C. excrementarius* and autumn gum moth.

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. Results so far show that the eucalyptus weevil has only one annual generation in southwestern Australia, and species of *Chrysophtharta* go through one to two generations per year. Critical surveillance, monitoring and control times for these pest species have been identified and are being incorporated into industry management systems.

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. Results indicate that aerial insecticide applications cause virtually 100% mortality of both pests and natural enemies. Numbers of pests and natural enemies gradually increased post spraying as they re-entered the plantation from surrounding areas.

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. Results show that parasitism rates by *A. nitens* are extremely low (<5%) during early spring but increase to nearly 100% by summer.

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

Investigations into the biology and ecology of *Essigella californica*, with particular reference to the basic development and reproductive biology as well as aphid-plant interactions are under way. Permanent aphid cultures have been established and maintained. To determine the rate of nymphal development, developmental studies at varying temperatures, 10°C, 15°C, 20°C and 25°C have been undertaken, as well as morphological studies into the number of larval instars of *E.californica*. . Three field monitoring sites have been set up in the ACT since February 2000, with population monitoring and sampling continuing. Suction traps have been placed in an old growth forest over autumn and winter of 2001 in the ACT, to monitor for sexual stages of *E.californica* in the field.

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

Field trials of Meliaceae tree species have been established in Australia (with QFRI) and South East Asia to assess genetic and silvicultural methods of control of the shoot borer, *Hypsipyla robusta*. Tree growth and insect damage has been assessed regularly for the last two years. This data is providing clues to the management of *Hypsipyla robusta* and the improvement of forestry. In parallel with this field activity we have conducted laboratory trials on mechanisms of resistance of *Toona ciliata* to *Hypsipyla robusta*. Experiments currently underway examine the role of plant chemistry in oviposition and feeding responses of *Hypsipyla*. We have recently discovered that leaves from trees that attract more *Hypsipyla* damage have a different chemical profile to leaves from less damaged trees. We are currently working to determine exactly what part of the chemical mix seems to influence insect attack. We have also determined that plants grown at lower light (such as in the understorey) are less attractive to ovipositing adult *Hypsipyla* than

leaves of open-grown trees, even when offered in the same environment. This probably explains the apparent advantage to growing *Toona* under a canopy.

Marianne Horak's work on clarifying taxonomy of *Hypsipyla robusta* is continuing.

11. Insect diversity in farm forestry

We have completed 4 two-week invertebrate diversity surveys in farm forestry plantations and nearby natural vegetation in south west Australia. The material collected in the survey is currently being sorted and identified. This data will be used to quantify the role of vegetational diversity upon populations of herbivorous invertebrates as a potential component of sustainable farm forestry.

PEST REPORTS FROM WESTERN AUSTRALIA

Eucalyptus weevil, *Gonipterus scutellatus*

Gonipterus scutellatus was again the most significant insect pest of all *Eucalyptus globulus* plantations two years and older resulting in aerial spraying of large areas. Larvae and adults caused significant defoliation in the range of 50-100% to growing tips over spring and summer. Again, the parasitoid *Anaphes nitens* parasitised egg masses at very low rates (<5%) in early spring, with parasitism rates rising to almost 100% by summer.

Chrysomelid beetles, *Chrysophtharta* spp., *Paropsis* spp. and *Cadmus excrementarius*

Several species of *Chrysophtharta* caused some damage to plantations two years and older throughout the plantation estate. Species of *Paropsis* were extremely rare in all ages of plantations. The cryptocephaline *Cadmus excrementarius* caused extensive defoliation between January and March 2001 to several young plantations established during 2000. Older plantations were also damaged by this species but not as severely. *Cadmus excrementarius* is concentrated mainly in the Rocky Gully and Mt Barker areas, and is only a minor problem in other areas.

Autumn gum moth, *Mnesampela privata*

Autumn gum moth has not been a significant pest during 2001. Several plantations established east of Albany (especially near Cheyne Beach) in 2000 had high infestations and were controlled with an insecticide application of alpha-cypermethrin.

Leafblister sawfly, *Phylacteophaga froggatti*

Several 1-2 year old plantations in the Albany area have up to 50% damage to juvenile foliage as a result of leafblister sawfly. Exclusion trials are in place to assess the economic impact of this species.

Leaf-tier moths

Leaf-tiers have caused some defoliation and shoot mortality, especially in plantations grown in the Albany region. Trees in their first year of growth are most vulnerable to damage.

Blue gum psyllid, *Ctenarytaina eucalypti*

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

African black beetle, *Heteronychus arator*

African black beetle continues to be a major establishment pest in wetter areas of south-western Australia. Trials in 2000 showed broad-spray insecticide applications to be inconsistent. Degradable plastic mesh barriers placed around the roots and lower stem of seedlings were the most effective seedling protection in trials and this method has gone into commercial use in 2001 plantings.

Heteronyx elongatus

Larval damage to the roots of seedlings by *H. elongatus*, one of the 'spring' beetles, has been widespread in the south coastal region. Damage is characterised by often complete removal of the potting medium and much of the seedling's roots. Prediction of at-risk sites is difficult and there are no satisfactory control methods.

Spring beetles, *Liparetrus spp.*

These small, abundant insects swarm onto seedlings from adjacent forest and can defoliate them very quickly. The unpredictability of swarming and rapid damage makes this pest difficult to manage.