Ministerial Council for Forestry, Fisheries and Aquaculture

STANDING COMMITTEE ON FORESTRY

RESEARCH PRIORITIES AND COORDINATION COMMITTEE

Meeting Number	**4**
Location	**BRISBANE**
Date	**3-4 September 1997**
Agenda Number	**3.7**

ANNUAL DISEASE STATUS AND QUARANTINE REPORT FOR AUSTRALIA AND NEW ZEALAND

1996/97

INTRODUCTION

1. This report presents the year's annual statement of forest disease conditions throughout Australia and New Zealand, and this year also incorporates the quarantine statement for the two countries. It follows from Outcome 5 of the 1996 Operating Plan of Research Working Group 7 Forest Pathology, and is summarised from the individual state and country reports submitted (Annex A).

PURPOSE

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

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

3. Dothistroma needle blight (*Dothistroma septosporum* or *D. pini*) was successfully controlled through intensive management in plantations of *P. radiata* on the northern tablelands of New South Wales, but is still causing significant defoliation in plantations on the southern tablelands. A limited spray program was undertaken in north eastern Victoria in October, 1996, as a result of a substantial disease increase and a forecast of a wet spring. Spraying, combined with subsequent dry conditions has led to tree recovery. *D. septosporum* has spread further in plantations in central Victoria, but a report of the disease in the far south west requires confirmation. The

disease continued to afflict stands of *P. radiata* in Gambubal forest in Queensland during 1997.

4. Cyclaneusma needle cast (*Cyclaneusma*) is ubiquitous in *P. radiata* plantations in New South Wales. Control is being undertaken through selection against diseased trees in the breeding program.

5. Diplodia or Sphaeropsis dieback and canker of *P. radiata* caused by *Sphaeropsis sapinea* are widespread in New South Wales, especially on infertile or drought prone sites. Diplodia dieback was also present in young unthinned *P. radiata* plantations up to 10 years old at Passchendaele forest in Queensland following severe drought stress.

6. Establishment losses in 2-year-old *P. radiata* were caused by *Phytophthora cinnamomi* at Passchendaele forest in Queensland. *P. cactorum* and three *Cylindrocarpon* species (including *C. tenue*) were associated with diseased root collars of young *P. radiata* in a plantation sustaining significant mortality losses in the Derwent Valley in Tasmania. Mortality also occurred in a rural *P. radiata* shelterbelt in south eastern Tasmania adjacent to a cypress shelterbelt in which *P. citricola* was isolated from the roots of dying trees.

7. No major problems were reported from pine plantations in South Australia, or from plantations of *P. radiata* and *P. pinaster* in Western Australia over the past twelve months.

Sub-tropical *Pinus* species:

8. Few problems were reported in plantations of *Pinus elliottii* and *P. elliottii* x *P. caribaea* hybrid plantations in Queensland this year. The Beerburrum fire salvage log storage facility in south east Queensland was terminated in July, 1997, following continued decay by *Rigidoporus lineatus* and *Armillaria* spp.

Araucaria cunninghamii:

9. Further mortality was noted in hoop pine stands at Jimna in south east Queensland caused mainly by *Junghuhnia* (*Poria*) *vincta*, and occasionally by *Rosellinia arcuata*. Vigorous growth of Kikuyu grass following early cessation of weed control has led to widespread nitrogen deficiency and associated yellowing symptoms in the same forest.

***Eucalyptus* species:**

10. Ramularia shoot blight caused by *Ramularia pitereka* was widely distributed in *Corymbia* species planted in south east Queensland and throughout New South Wales. In Queensland the disease occurred at low levels mainly in young stands of *C. maculata*, *C. citriodora*, and *C. henryi*, up to two years old, but was also observed on suppressed trees up to 17 years old.

11. A diverse range of pathogens, including *Mycosphaerella* species, was recorded from eucalypt plantations in New South Wales, creating difficulties for disease management. In Queensland leaf spots caused by *Cryptosporiopsis eucalypti* and

Aulographina eucalypti were commonly encountered at insignificant levels. In East Gippsland in Victoria defoliation in stands of *E. globulus* was caused by *Mycosphaerella* spp., and in stands of *E. obliqua* and *E. sieberi*, by *A. eucalypti*. There have been few significant disease problems in eucalypt plantations in north east and central Victoria over the past 12 months.

12. Mortality occurred in two 1-year-old plantations of *Eucalyptus nitens* in far north western Tasmania, in one plantation the cause being root rot associated with infection by *Phytophthora cinnamomi* and *P. cactorum*. Planting of *Phytophthora*-resistant *E. globulus* instead of *E. nitens* would reduce the status of this problem.

13. No disease problems were reported from eucalypt plantations in South Australia or Western Australia (*Eucalyptus globulus*).

***Cupressus* species:**

14. Substantial mortality in a rural shelterbelt of *C. benthami* in south eastern Tasmania was associated with root infection by *Phytophthora citricola*.

Managed natural forests:

***Eucalyptus* species:**

15. In the Central Highlands of Victoria, *Aulographina eucalypti* continued to cause damage to *Eucalyptus regnans* regrowth stands in association with attack by the psyllid *Cardiospina bilobata*. The cause of similar defoliation in the north east of the state has yet to be identified.

16. Disease attributed to *Phytophthora cinnamomi* has been less common in eucalypt forests in Victoria as a result of dry conditions during the past year, though previous root damage may have exacerbated recent drought mortality. A large *Armillaria luteobubalina* root disease centre was identified in a 60-year-old regrowth stand of *Eucalyptus regnans* due for thinning in north eastern Tasmania, associated with stem cankering and heart rot. Armillaria root rot continues to operate in Western Australia, as does jarrah dieback (*Phytophthora cinnamomi* on *Eucalyptus marginata*). Branch and stem cankering due to *Cryphonectria cubensis* were identified on mature *E. marginata* near Boddington in Western Australia. Dieback has occurred in stringybarks (*Eucalyptus baxteri*) in south eastern South Australia, but the cause has yet to be determined.

***Santalum* species:**

17. In tropical Western Australia attack by *Ganoderma* spp. of important sandalwood hosts such as species of *Albizia*, *Dalbergia*, *Cassia*, and *Peltophorum*, is causing concern.

Nurseries:

Conifer species:

18. No significant diseases have yet been detected at a new nursery at Tumut where production of New South Wales *Pinus radiata* stock is now concentrated. In Victoria, monitoring *P. radiata* for infection by *Phytophthora cinnamomi* has remained a high priority in order to reduce the spread of disease through nursery hygiene and quarantine. Attempts to control the disease by means of soil sterilants and fungicides have been unsuccessful due to rapid reinvasion.

Hardwood species

19. Disease loss in eucalypt nurseries in New South Wales has been substantially reduced following the establishment of disease monitoring and management systems. *Botrytis* remains the most common problem.

Native plant communities:

20. In Victoria *Phytophthora cinnamomi* has continued to cause damage to understorey species, notably in areas set aside as flora reserves. Equipment used in road and track construction is being tested before entry into sensitive areas. *P. cinnamomi* has also continued to cause concern for conservation management in Tasmania. A GIS-based management plan to minimise risk to susceptible rare or threatened plant species has been implemented in state forests in consultation with a forest pathologist.

21. *Armillaria luteobubalina* is believed to be associated with a tree mortality centre in native bushland in the Cataract Gorge Reserve area of Launceston in Tasmania.

22. In Victoria a disease has appeared causing leaf browning and dieback of *Elaeocarpus reticulatus* and *E. holopetalus* in rainforest north of Orbost on the Bonang Highway. Although confined to a gully, the disease may be spreading. The cause has not yet been determined, but an unidentified fungus has been isolated from diseased trees.

Urban:

23. New *Armillaria luteobubalina* infection centres have been identified in the Royal Tasmanian Botanical Gardens in Hobart, and as a result of publicity it has been demonstrated that this fungus is causing losses in urban gardens throughout Hobart and other population centres in Tasmania. A management program established for the Botanical Gardens has included the appointment of a pathologist, removal of infested soil and root material from infection centres, and biological stump treatment with a competitive, non-pathogenic wood decay fungus (*Phanerochaete filamentosa*).

24. A suspected outbreak of Dutch elm disease (*Ophistoma ulmi*) in Melbourne was not confirmed, and it appears that the problem was physiological.

NEW ZEALAND

Plantations:

Pinus radiata:

25. Cyclaneusma needle-cast (*Cyclaneusma minus*) was substantial during 1996-97, being most noticeable in Autumn and Spring. The disease was recorded most frequently from the central North Island and to a lesser extent from the southern South Island.

26. Slightly more than half the records of Dothistroma needle blight (*Dothistroma septosporum* or *D. pini*) during 1996-97 were made between August and November. Most disease occurred in the central North Island region, with low levels of infection in the drier eastern North Island and warmer northern North Island. In the South Island the disease was most prevalent in the moister northern and western regions. Areas aerially sprayed to control the disease were 118, 370 ha in the North Island (compared with 115, 400 ha in the previous year), and 8,000 ha in the South Island (5,000 ha in 1995-96).

27. Most records of Armillaria root disease (*A. novae-zelandiae, A. limonea*) this year came from the central North Island, with no reports from the far north and few from the eastern North Island. There was no major seasonal trend. There were fewer reports of the disease from the South Island most being from the north and west.

28. Damage from the introduced brush tailed possum (*Trichosurus vulpecula*) was most common in the central and eastern North Island, with very few records from the South Island. Most reports were made in Summer and Autumn.

29. Most records of nutrient deficiencies (nitrogen, phosphorus, magnesium, boron) were made during the late spring and summer growth period from the central North Island and northern South Island. Upper mid-crown yellowing symptoms, attributed to a magnesium and potassium nutrient imbalance, were most common during Summer and Autumn in the central North Island, and northern and southern South Island.

Eucalyptus species:

30. A variety of fungi were reported on eucalypt foliage, including *Aulographina eucalypti, Fairmaniella leprosa, Microthyrium eucalypti, Mycosphaerella cryptica, Mycosphaerella nubilosa, Pseudocercospora eucalypti, Kirramyces eucalypti* (*Septoria pulcherrima*), and *Vermisporium obtusum.* Records occurred slightly more frequently in Summer and Autumn, and most were from the central North Island where the majority of eucalypt plantations occur, and also from the central and southern South Island.

31. Due to the proximity of New Zealand to Australia the number of fungi found on eucalypts is growing, and there were two new records during the past year.

Catenophoropsis eucalypticola was detected on shoots of *E. nitens* but appeared to be causing little harm. *Coleophoma oleae* was found associated with spots on leaves of *E. saligna*, and is being further investigated.

QUARANTINE

Organisational:

33.Following the Australian quarantine review held during 1996, and a Forest Incursion Management workshop sponsored by the Forest and Wood Products Research and Development Corporation in April, 1997, a steering committee (the Forest Quarantine Consultative Committee) is to set in place a Forest Health Committee which will develop a comprehensive strategy to improve the effectiveness of forest quarantine in Australia. Among other responsibilities this committee will produce a Generic Incursion Management Plan (GIMP) for the forestry sector, which will include contingency planning and clarification of responsibilities for dealing with new pest and disease outbreaks, establish linkages to other relevant organisations, review the current timber importing policy and inspection methodology, and clarify funding arrangements. It is also intended that the committee should coordinate and complement existing forest health surveillance and disease reporting within Australia.

34. In sharp contrast, New Zealand is to combine the functioning of agricultural and forestry quarantine. A new Ministry of Agriculture and Forestry is to be operational by March, 1998, formed by merging the existing Ministry of Agriculture and Ministry of Forestry. Assurance of continued government commitment to forestry contrasts with previous experience in Australia that led to the expression of RWG 7 concern over forest quarantine effectiveness (RWG 7 1997-98 Operating Plan, Annex A 1996-97 Immediate Priority Outcome 1). National border quarantine and inspection will remain a 'core' government operation, but some commercial services may be transferred to a Crown company or State-Owned Enterprise under an arrangement that will maintain quality standards.

Imports:

35. Information on the imports of certain forestry material into Australia is not readily available. An AQIS review of the importation of *Eucalyptus*, *Pinus*, and *Acacia* germplasm is planned, based on pest risk analyses.

36. Imports of *Rhizopogon* spore suspensions into New Zealand for mycorrhizal infection of *Pinus radiata* and *Pseudotsuga menziesii* seedlings have ceased due to doubts about purity, identity, and effectiveness, and because of disease entry risk.

37. During the past year 459 quarantine interception samples were subjected to laboratory examination in New Zealand. Sources were mainly from used cars, containers, wood packaging, and used machinery from Japan, Australia, elsewhere in Asia, North America and Europe.

38. The pathogenicity of the symbiotic fungus associated with the Eurasian woodwasp *Tremex fuscicornis*, newly introduced into Australia, is being tested against a range of tree species. The wasp was recently detected on poplars and willows in the Tamworth area of New South Wales and distribution surveys have been undertaken in New South Wales and Victoria. The wasp has not yet been detected in Victoria.

Pine pitch canker disease:

39. An analysis of the risk of *Fusarium subglutinans* f. sp. *pini* to Australasian *Pinus* plantations undertaken in new Zealand with Australian support has identified potential entry to New Zealand on seed, plant material on used logging machinery, wood packaging, and bark and twig insects. Following a workshop in Rotorua a New Zealand strategy is to be developed through the Forest Health Collaborative. AQIS will review the policy for the importation of *Pinus* seed into Australia pending findings from New Zealand and advice from the Australian Pine Pitch Canker Advisory Committee. Further interactive Australasian evaluation is underway, and research is planned for consideration by SCF and the New Zealand Forest Health Collaborative (RWG 7 1997-98 Operating Plan Medium Term Priority Outcome 1). All *Pinus* and some *Pseudotsuga menziesii* seed imported into New Zealand from areas where the disease occurs is currently tested for the presence of the disease agent before release. The effectiveness of heat treatment is under investigation.

Other policy and methodology:

40. Under the Northern Australian Quarantine Strategy host plants of economic, amenity or conservation value potentially threatened by pests and diseases entering through northern Australia include conifers, and species of *Eucalyptus* and *Acacia*. Following pest risk analyses, and after consultation, revised pest and disease target lists will be produced for each of these plants.

41. Because of considerable uncertainty and ambiguity, AQIS currently considers eucalypts in South Africa to be free of rust (*Puccinia psidii*) for quarantine purposes.

42. An objective methodology developed for the routine inspection of parks and reserves within a 5 km radius of ports in new Zealand will be tested in Auckland later in 1997.

43. A comprehensive survey of pest and disease agents entering New Zealand in debris in imported used cars is planned when funds become available.

44. Following earlier studies of the effectiveness of container door-only inspections in intercepting potential pests and disease agents, a cost-benefit model is being developed in new Zealand to determine the most efficient container sampling intensity. External examination of containers is also planned as part of routine cargo inspection, and a study to determine the normal proportion of contaminated containers is currently underway in order to decide the sampling intensity required.

FOREST HEALTH SURVEILLANCE

45. Forest Health Surveillance has been functioning for slightly over one year in Queensland. Surveys have been conducted in many plantation areas throughout the state and the forest health data base has been reorganised and computerised. A number of reports have been produced for forest management.

46. In New South Wales all pine and eucalypt plantations younger than five years in state forests were surveyed aerially and from the ground, in order to provide forest managers with information on the extent and incidence of health problems. The information supplied was comprehensive and included data on diseases, pests, environmental stress problems, weeds, and wallaby and possum damage. A eucalypt plantation forest health workshop held at Grafton in March, 1997, was attended by participants from a number of states and New Zealand, and included discussions on survey methodologies and interactive data bases.

47. A comprehensive health survey of all state forest plantations of *Pinus radiata*, eucalypt, and *Acacia melanoxylon* in Tasmania is planned during the next 12 months. It is hoped that this will lead to the establishment of formal forest health surveillance in this state. Surveys are also planned to evaluate the incidence and severity of damage caused by *Armillaria luteobubalina* in a 200 ha area of 60-year-old *Eucalyptus regnans* in north eastern Tasmania.

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51. A ministerial review of dieback in Western Australia is now completed and copies are available.

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48. Forest health surveillance is not established in Western Australia, but information on forest health does accumulate through the diagnostic Vegetation Health Service run by the Department of Conservation and Land Management. During the past year nearly 2,000 samples were processed for *Phytophthora* identification. Diagnosis now includes isozyme analysis as part of the identification procedure.

49. Forest health surveillance, long established in New Zealand, is supported by a substantial data base and a full complement of surveillance protection officers of the Ministry of Forestry who liaise closely with FRI Forest Health diagnostic services. A total of 9,575 tree disorders were reported during the year to June, 1997. Comprehensive recording provides sufficient data for the evaluation of regional and seasonal trends which were examined and reported on this year.

PHYTOPHTHORA IN NATURAL VEGETATION

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RESEARCH AND DEVELOPMENT

52. The following catalogue summarises research studies or other activities itemised in the respective state and organisation reports (Annex A). Because not all submissions have included such projects the list cannot be taken as representative of current forest pathology research in Australasia. However, it does provide a useful summary of activities being undertaken in some parts of the region. Presentation is by state and organisation.

53. **Queensland (Queensland Forestry Research Institute, Queensland Department of Primary Industries Forestry):**

- Plots established in hoop pine (*Araucaria cunninghamii*) stands to monitor mortality caused by *Junghuhnia* (*Poria*) *vincta*.

54. **New South Wales (State Forests of New South Wales):**

- Field trials in *Eucalyptus* plantations to determine the effect of various pruning regimes on incidence and extent of decay.
- Study of the infection process, nature of resistance, and epidemiology of *Ramularia pitereka* caused dieback of *Corymbia* species.
- Papers submitted for publication on the results of research on the impacts on tree growth of foliar pathogens and invertebrate pests.

55. **Victoria (Centre for Forest Tree Technology, Department of Natural Resources and Environment):**

- Trial to evaluate the effectiveness of aerial spraying against Dothistroma needle blight of *Pinus radiata* under Victorian conditions: effective monitoring awaits another serious outbreak of disease.
- Trials to ascertain the contribution of *Aulographina eucalypti* to defoliation of *Eucalyptus regnans* infested with the psyllid *Cardiospina bilobata*: it appears this pathogen may be more important in the disease complex than was previously thought.
- Studies to evaluate the use of soil sterilants and fungicides against *Phytophthora cinnamomi* in nurseries: treatments have proved ineffectual due to rapid reinvasion.

56. **Tasmania (Forestry Tasmania):**

- Glasshouse trials to evaluate the pathogenicities of *Phytophthora cactorum* and three *Cylindrocarpon* species to *Pinus radiata*.

57. **Western Australia (Conservation and Land Management, Western Australia; also CSIRO, MERIWA, Murdoch University, ALCOA of Australia; refer Annex A):**

- Selection of *Pinus radiata* resistant to *P. cinnamomi*: screening of the Southern Tree Breeding Association's second generation breeding population.
- The interaction of copper deficiency and fungal disease in *Eucalyptus globulus*.

- Selection of *Eucalyptus marginata* resistant to *P. cinnamomi*: further field plots of resistant clonal material; monitoring of resistant clones on bauxite mine rehabilitation sites; establishment of seed orchard at Manjimup; identification and mapping of genetic markers linked to resistance genes.
- Biology, ecology and pathology of *P. cinnamomi* in *E marginata* forests and native plant communities: the association between temporary flooding and low oxygen levels in host responses; the effects of phosphonate treatments on the disease - various aspects; the effects of ectomycorrhizas in inducing resistance; impact of the fungus on native plant communities; early infection on rehabilitated sites; and the genetics of pathogenicity.
- *Armillaria luteobubalina* in *Eucalyptus diversicolor* forests: biocontrol; monitoring precision; establishment of long term monitoring plots.
- *Phytophthora megasperma* in native plant communities: contrary to earlier reports, oospore production was suppressed by in vitro treatment with phosphite, which has the potential for containing the spread of this pathogen.

58. **CSIRO Forestry and Forest Products, Forest Pathology collaborative research:**

Canberra

- Diseases in tropical acacias: collaborative surveys undertaken in north Queensland, India, Thailand, Indonesia and Malaysia, the proceedings of a workshop held in Indonesia published, and a manual planned (in Australia, with QFRI, Inst. of Hort. Development, Victoria; CIFOR funded).
- Minimisation of eucalypt diseases in South East Asia: regional knowledge network development; surveillance training; resistance screening against *Cylindrocladium quinqueseptatum*, *Cryptosporiopsis eucalypti*, *Coniella* sp. etc. (with QFRI, Forest Science Inst. of Vietnam, Royal Forest Dept., Thailand; ACIAR funded).
- Incursions of forest pests and diseases into Australia, 1971-1996: joint consultancy undertaken with CFTT, Victoria, for Bureau of Resource Sciences.
- Defect and decay from harvester wounds in *Eucalyptus sieberi*: with DNRE in East Gippsland.
- Genetic markers as an aid to selection against Dothistroma needle blight in *Pinus radiata*: with TIGR Molecular Biology Group, Canberra.
- Genetic markers as an aid to selection against *Phytophthora cinnamomi* in *Eucalyptus marginata*: in association with plant screening by CALM, WA.

Hobart

- Projects on the pathology of pruning plantation-grown *Eucalyptus nitens*: with University of Tasmania, Forestry Tasmania (funding: FFIC, Tasmanian Forest Research Council).
- Aetiology of canker diseases, particularly *Endothia gyrosa* in *Eucalyptus nitens*: PhD study.
- Dieback in alpine heath and conifer communities at Pine Lake, Central Plateau, Tasmania: possible role of undescribed *Phytophthora* sp. (PhD study).

Perth

- Genetics and pathogenicity of *Phytophthora cinnamomi*: with Murdoch and Monash Universities (funding: LWRRDC).

CONCLUSION

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

RECOMMENDATIONS

60. The Annual Disease and Quarantine Statement be accepted and noted by the Standing Committee.

FOR INFORMATION

Research Working Group 7
(Secretary)
15 August 1997

ANNEX A: Forest disease situation and quarantine reports 1996/97 by states and country.

ANNEX A

FOREST DISEASE AND QUARANTINE SITUATION REPORTS 1996/97 BY STATES AND COUNTRY

1. QUEENSLAND

Mike Ivory
Queensland Forestry Research Institute
PO Box 631
Indooroopilly QLD 4068

1.1 Introduction

Rainfall has continued to be in short supply with the effects of the protracted drought still noticeable in some stands. The Forest Health Surveillance team operated throughout the year, conducting surveys in many plantation areas in addition to reorganizing and computerizing the forest health database.
A new pathologist, Mike Ivory, was appointed in May 1997 to replace Ian Hood who left about 12 months earlier.

1.2 *Pinus* plantations.

Few problems were reported in plantations of *P.elliottii* or *P.caribaea/elliottii* hybrid, whereas Dothistroma needle blight (*Mycosphaerella pini*) continued on *P.radiata* at Gambubal forest. Diplodia Die-back (*Sphaeropsis sapinea*) was encountered on 10-year-old *P.radiata* in unthinned plantations at Passchendaele following severe drought stress. This disease was also noted on 2-year-old trees to a lesser extent, together with establishment losses caused by *Phytophthora cinnamomi*. Fire salvaged logs at Beerburrum continued to be decayed by *Rigidoporus lineatus* and *Armillaria* spp. up to the termination of the logpile facility in July 1997.

1.3 Hoop Pine plantations.

Further mortality caused by *Junghuhnia vincta* mainly, and occasionally *Rosellinia arcuata*, was noted at Jimna. Plots are being established in the area to monitor the level of mortality caused. Hoop Pine Yellows was widespread at Jimna in June following the early cessation of grass control. Excessive growth of Kikuyu grass subsequently induced severe Nitrogen deficiency in the young trees.

1.4 Native Hardwoods.

Ramularia Shoot Blight (*Ramularia pitereka*) was reported from many sites in S.E.Queensland affecting *Corymbia maculata*, *C.citriodora* & *C.henryi*. Immature foliage of trees up to 2-years-old is affected (< 90% trees significantly affected), but suppressed trees of 17-years-old have also been noted with the disease. Spore germination is very rapid at 20 C, and does not appear to be affected by the age or identity of the host leaves used.Leaf-spots (*Cryptosporiopsis eucalypti* and *Aulographina eucalypti*) are also commonly encountered at insignificant levels.

2. NEW SOUTH WALES

Jack Simpson
Research Division
State Forests of New South Wales
PO Box 100
Beecroft NSW 2119

2.1 Forest Health Surveys.

Aerial and ground surveys were carried out by the Forest Health Survey Unit of all State Forests of New South Wales pine plantations and all eucalypt plantations (including joint venture plantations) younger than five years. Privately owned plantations were not surveyed. The emphasis of the surveys is on providing forest managers with information on the extent and incidence of forest health problems especially those amenable to remedial or preventative treatment. The surveys are holistic and include reporting on diseases, invertebrate pests, vertebrate pests, nutrient deficiency symptoms, weeds, and frost, hail and drought injuries. While the depradations of wallabies have been recognised for many years the Health Surveys have shown for the first time the widespread damage caused by Mountain Brush Tail Possums - some 7000 ha were affected.

A eucalypt plantation forest health workshop was conducted at Grafton in March 1997. Representatives from New South Wales, Queensland, Tasmania and New Zealand attended. A wide range of forest health issues were discussed including the need for more reliable survey methodologies and interactive databases.

2.2 *Pinus* diseases

A. *Dothistroma* needle blight of *Pinus radiata*
Intensive management has this disease under control on the northern tablelands. However, it is still causing significant defoliation in plantations on the southern tablelands.

B. *Sphaeropsis* canker and dieback of *Pinus radiata*
These conditions are widespread especially on infertile or drought prone sites.

C. *Cyclaneusma* needle cast of *Pinus radiata.*
Cyclaneusma is ubiquitous in pine plantations in N.S.W. The tree breeding program is selecting against families and clones that do not retain healthy canopies.

D. Nursery diseases.
Production of *Pinus radiata* stock has been concentrated at one new nursery at Tumut. No significant diseases have been detected there as yet.

2.3 Eucalypt diseases

A. Foliage pathogens.
A diverse range of pathogens have been recorded from plantation grown eucalypts. Species of *Mycosphaerella* continue to be of interest. However, the diversity of pathogens makes disease management difficult. Papers on results of research on

impacts on tree growth of disease and inertebrate pests have been submitted for publication.

B. *Ramularia* dieback of species of *Corymbia*.
This disease is very widespread in spotted gum plantations throughout New South Wales. A research program into the infection process, nature of resistance and epidemiology has commenced.

C. Stem decays.
Field trials have been established to determine the effect of various pruning regimes on incidence and extent of decay in plantation grown eucalypts.

D. Nursery diseases.
Disease monitoring and management systems now in place in the production nurseries have dramatically reduced losses from disease. *Botrytis* remains the most common problem.

2.4 Quarantine

a. Pitch Canker.
A workshop on pitch canker was held in Rotorua in November 1997. Subsequently a Pine Pitch Canker Advisory Committee was formed. Deficiencies in knowledge of the disease as it might affect pines if introduced to Australasia have been identified. Proposals for research to address some of these matters have been prepared and submitted to the New Zealand Forest Health Collaborative and Standing Committee on Forestry for consideration and joint funding.

b. Forest Health Consultative Committee.
Following on from the Nairn Report an AQIS Forestry Quarantine Consultative Committee was formed. At a meeting of that group on 17 June 1997 it was proposed to form a Forest Health Committee comprising representatives of forestry, concervation, industry and local government. A proposed membership and terms of reference were prepared for consideration and endorsement by ANZECC, ARMCANZ and MCFFA. One of the first tasks for the Plant Health Committee will be preparation of a Generic Incursion Management Plan for Forestry.

c. *Tremex*
An outbreak of the eurasian woodwasp *Tremex fuscicornis* was detected in poplars and willows in the Tamworth area of New South Wales. Surveys of the distribution of the wasp are continuing. The symbiotic fungus has been isolated and its pathogenicity to a range of tree species is being tested. The wasp was probably introduced in imported packing timbers.

2.5 National *Phytophthora* Threat Abatement Plan

A meeting was held in Sydney on 12 June 1997 to review the *Phytophthora* threat to native plant communities in New South Wales. It is planned to complete the Threat Abatement Plan process by the end of this year.

3. VICTORIA

Ian W. Smith
Centre for Forest Tree Technology
Department of Natural Resources and Environment
P.O. Box 137
Heidelberg,Victoria 3084

3.1 *Pinus radiata*

3.1.1 *Dothistroma septospora*

Disease levels rose from autumn 1996 through to early spring with up to 49% needle infection in some areas by August 1996. Coupled with the Bureau of Meteorology forecast of a wetter than usual spring, a limited spray program was conducted in October 1996 in north-east regions of the State. Disease levels dropped significantly following the spray program and with the dry conditions throughout the north-east from spring 1996 through summer and autumn 1997. Substantial recovery of the tree crowns was observed. The disease has spread in areas of Central Victoria to include Christmas tree plantations around Ballarat, Melbourne and near Drouin and in plantations in the Loch Valley. A report of disease in the far south-west of the State has yet to be confirmed and will be the subject of an inspection in Spring 1997.
An aerial spray trial established to evaluate the effectiveness of spraying under Victorian conditions is being monitored, although results cannot be fully evaluated until another serious outbreak of disease occurs.

3.1.2 Nursery diseases

Monitoring of nurseries for *Phytophthora cinnamomi* remains a high priority so as to reduce the further spread of disease. Trials established to evaluate the use of soil sterilants and fungicides provided little control of the disease due to rapid reinvasion from surrounding infested areas. Maintenance of a disease free status for *P. cinnamomi* through hygiene and quarantine, should remain a primary focus for nursery management.

3.2*Eucalyptus*

3.2.1 Foliage and branch pathogens

In plantations in East Gippsland, *Mycosphaerella* spp. were recorded causing defoliation of *Eucalyptus globulus* and *Aulographina eucalypti* on *E. obliqua* and *E. sieberi* . In north-east and central Victoria, very few diseases have been reported as causing significant problems in plantation grown eucalypts throughout 1996/97.
In native forest, *Aulographina eucalypti* is still causing damage to *Eucalyptus regnans* regrowth in the Central Highlands in an association with psyllid damage caused by *Cardiospina bilobata*. Trials established to ascertain the input to the defoliation due to disease has shown that *Aulographina* may of greater importance in the insect/disease complex than first observations had suggested. Similar defoliation was also recorded in *E. delegatensis* in north-east Victoria, although the cause of defoliation has yet to be identified.

3.2.2 *Phytophthora cinnamomi*

Dry conditions over summer have resulted in less disease attributed to the pathogen although reported drought deaths may have been exacerbated by previous root disease. The pathogen is still causing damage to understorey species particularly in areas set aside as flora reserves. More attention is being paid by road and track construction authorities to preventing the spread of the fungus through the testing of road and track material before use in sensitive areas.

3.3 Other

3.3.1 *Tremex*

A survey throughout Victoria, of Poplars and Willows adjacent to main roads, revealed no evidence of damage caused by *Tremex* wood wasp which was recently identified from N.S.W.

3.3.2 Disease of *Elaeocarpus reticulatus* and *E. holopetalus*

A disease has been observed in *Elaeocarpus reticulatus* and *E. holopetalus* (Blue and Black Oliveberries) in rainforest along Martins Creek 45 km north of Orbost on the Bonang Highway. The disease is causing a browning of the leaves and dieback of small branches of the trees starting from the base of the tree and progressing up the crown. Some of the trees have lost up to 80% of their foliage, although none have yet died from the disease. The disease is presently confined to the gully area although it appears to be spreading as symptoms are becoming more noticeable. The cause of the disease is yet to be determined although samples have yielded a fungus of currently unknown status.

4. TASMANIA

Tim Wardlaw
Forestry Research and Development
Forestry Tasmania
G.P.O. Box 207B
Hobart Tasmania 7001

4.1 *Armillaria* diseases

Armillaria luteobubalina continues to show considerable activity in the State over the past year. New infection centres have been found at the Royal Tasmanian Botanical Gardens. A comprehensive management program focussed around soil and root removal from major infection centres continues and is supplemented by stump treatment by *Phanerochaete filamentosa* (a competitive, non-pathogenic wood decay fungi) is firmly in place in the Gardens. Recently a Pathologist was appointed by the Botanical Gardens to oversee the management of the *Armillaria* problem as well as support a general plant health program in the Gardens.

Following the wide publicity given by local media to the *Armillaria* problem in the Botanical Gardens a large response from the general public showed that *A. luteobubalina* was associated with mortality in gardens throughout Hobart and other population centres of the State. *A. luteobubalina* is also thought to be associated a

rapidly developing centre of tree mortality in native bushland in the Cataract Gorge Reserve area of Launceston.

In the forestry situation *A. luteobubalina* damage was recently found throughout a 200 ha patch of 60 year-old *Eucalyptus regnans* regrowth forest in northeastern Tasmania in an area identified for a possible thinning operation. Affected trees had basal stem cankers, some of which had extended several metres up the stem. Cankered trees generally had extensive columns of wood decay associated with the cankers. Surveys are planned for the coming year to more accurately measure the incidence and severity of the *Armillaria* damage.

4.2 *Phytophthora* diseases

The mortality of plants, associated with *P. cinnamomi* and *P. cactorum* root infection, in a 1-year-old *E. nitens* plantation in far northwestern Tasmania has stabilised as the trees grow into their second year. A smaller outbreak was reported in a nearby 1-year-old *E. nitens* plantation but isolation attempts from the roots of affected plants failed to detect either *P. cinnamomi* or *P. cactorum*. The future status of this *Phytophthora* root rot problem in eucalypt plantations in far northwestern Tasmania will depend on decisions to use *E. globulus* (*Phytophthora* resistant) instead of *E. nitens* in new plantations.

P. citricola was isolated from the roots of dying *Cupressus benthami* in 15-years-old farm a shelterbelt on a flat site at Copping in southeastern Tasmania. More than half of the trees in several hundred metres of shelterbelt had died. Mortality was also occurring in a nearby *Pinus radiata* agroforestry plantation growing on a flat site. However no attempts have been made to date to verify *P. citricola* as the cause of the mortality in the *P. radiata*.

Significant mortality in 2 and 3-years-old *P. radiata* (ca. 10 %) due to a collar rot disease was occurring over an area of several hectares of quite undulating topography in in a plantation at Mt Lloyd in the Derwent Valley. *P. cactorum* and three *Cylindrocarpon* species including *C. tenue* and two as yet unidentified species have been isolated from the root collars of affected plants. Glasshouse pathogenicity trials are currently in progress to evaluate the pathogenic status of these fungi.

P. cinnamomi continues to be the major pathogen of concern for conservation management in Tasmania. During the year Forestry Tasmania completed implementation of a management system to minimise the risk of populations of susceptible rare or threatened plant species on State Forest being accidentally infected with the fungus. This management system is GIS-based and relies on indicating to field staff at the planning stage of proposed operations that consultation with a forest pathologist is necessary when developing appropriate management prescriptions.

4.3 Miscellaneous

Provisional approval has been given to fund a comprehensive health survey of *all P. radiata*, eucalypt and blackwood plantations on State Forest during the next 12 months. It is hope that this initial survey will be the precursor to the establishment of formal forest health surveillance in Tasmania.

5. SOUTH AUSTRALIA

Charlma Phillips
Primary Industries of South Australia Forestry
P.O. Box 162
Mount Gambier SA 5290

No disease problems have been reported in either pine or eucalypt plantations this year. There have been some instances of dieback in stringybarks (*Eucalyptus baxteri*) in the South East of the state and samples have been collected for further investigation - no results as yet.

6. WESTERN AUSTRALIA

Mike Stukely
Science and Information Division
Department of Conservation and Land Mnagement
Locked Bag 104
Bentley Delivery Centre WA 6983

6.1 WA Dieback Review

The Review of Dieback in Western Australia, conducted for the Minister of the Environment by Drs Podger, James and Mulcahy, was completed. Copies can be obtained by writing to Dr F.D. Podger, CALM, Locked Bag 104, Bentley Delivery Centre, WA 6983.

6.2 National Threat Abatement Plan for *Phytophthora* in Australia's Native Vegetation (ANCA)

The contract team has visited all states except Queensland and will meet in WA in September. It is anticipated that a draft Plan will be made public early in 1998 (F.Podger).

6.3 Softwood and Hardwood Plantations

No major pathological problems have been reported in the softwood (*Pinus radiata* and *P.pinaster*) or hardwood (*Eucalyptus globulus*) plantations in the last year.

Selection of *Pinus radiata* resistant to *Phytophthora cinnamomi*: The Southern Tree Breeding Association's second-generation breeding population of *P.radiata* is

currently being screened for resistance to *P.cinnamomi* (T.Butcher & M. Stukely, CALM).

E globulus: The following student projects are in progress at Murdoch University.
Honours:
The interaction of copper deficiency and fungal pathogens on disease development in *Eucalyptus globulus*. (F Tovar; Supervisors G.Hardy & B. Dell).

Masters:
The interaction of copper deficiency and disease in *Eucalyptus globulus* plantations. (L Ishaq; Supervisors B. Dell & G.Hardy)

6.4 Tropical Forestry
Ganoderma spp. and Sandalwood hosts: *Ganoderma* spp. commonly attack fast-growing legumes (*Albizzia*, *Dalbergia*, *Cassia*, *Peltophorum* spp.). This is a major concern since many important Sandalwood host species are fast-growing legumes (A.Rado, CALM).

Mastotermes darwiniensis: The giant termite causes immense damage to palatable trees. They are generally restricted to light-textured soils, but CALM is looking at establishing a range of timber species including teak and *Pterocarpus* spp. on these soils (A.Rado, CALM).

6.5 Native Forests
No major new pathological problems have been reported. Root rot diseases due to *Phytophthora* and *Armillaria*, together with stem-decaying organisms, continue to command attention.

6.6 Jarrah Forest Region
Dieback-resistant jarrah (*Eucalyptus marginata*): Further trial plots of clonal jarrah resistant to *Phytophthora cinnamomi* were established in operational, forest rehabilitation sites in the Northern and Central Forest Regions in 1996 (M.Stukely, CALM). Monitoring of field validation trials of resistant clones on bauxite mine rehabilitation sites has continued (I.Colquhoun, Alcoa of Australia and M.Stukely, CALM). Planting of a seed orchard of dieback-resistant jarrah has commenced at CALM's Plant Propagation Centre at Manjimup.

A genetic linkage map has been constructed for a full-sib family of *E marginata* using nuclear RFLP markers. The progeny of this family were screened for resistance to *P.cinnamomi* using stem inoculation in the glasshouse. Markers associated with the resistant reaction have been identified, and their map position suggests two regions of the genome that are associated with resistance to *P.cinnamomi* in this family (M.Byrne, CALM, G.Moran, CSIRO & M.Stukely, CALM).

Biology, ecology, pathology and control of *Phytophthora*:
i). Work under the following grants is in progress at Murdoch University.

Collaborative ARC 1995-1997: The Role of Temporary Flooding and Low Oxygen Levels in the Biochemical and Histological Responses of *Eucalyptus marginata* to

Phytophthora cinnamomi. (Investigators: A/Prof. J.McComb, Dr. G.Hardy, MU, and Dr I.Colquhoun, Alcoa of Australia).

Collaborative ARC 1997-1999: The potential role of the fungicide phosphonate to control *Phytophthora cinnamomi* in native plant communities adjacent to mining. (Investigators: Dr. G.Hardy, MU, Dr. I.Colquhoun, Alcoa of Australia, A/Prof B.Dell and Dr. G.Roos, MU).

Minerals and Energy Research Institute of Western Australia (MERIWA) 1997-8: The potential role of the fungicide phosphonate to control *Phytophthora cinnamomi* in native plant communities adjacent to mining. (Investigators: Dr. G.Hardy, MU, Dr. I.Colquhoun, Alcoa of Australia, A/Prof B.Dell and Dr. G.Roos, MU).

Small ARC 1996: Does inoculation with ectomycorrhizal fungi systemically induce the resistance of *Eucalyptus marginata* to *Phytophthora cinnamomi*? A study of plant defence enzymes. (Investigators: A/Prof. B.Dell and Dr. G.Hardy, MU).

Small ARC 1997: Does inoculation with ectomycorrhizal fungi systemically induced resistance in *Eucalyptus marginata* to *Phytophthora cinnamomi*? (Investigators: A/Prof. B.Dell, Dr. G.Hardy and A/Prof. J.McComb, MU).

ii). The following student projects are in progress at Murdoch University.
Honours
Role of host defences in controlling the growth of *Phytophthora cinnamomi* in phosphonate treated clonal *Eucalyptus marginata* plants resistant and susceptible to *P.cinnamomi*. (T. Jackson; Supervisors G.Hardy & T. Burgess).

The ability of *Phytophthora cinnamomi* to sporulate from colonised host plant tissue treated with phosphite. (C. Wilkinson; Supervisors G.Hardy, MU, & B. Shearer, CALM).

Ph.D. Theses
The long term impact of *Phytophthora cinnamomi* on native plant communities.. (K. McDougall; Supervisors G.Hardy & R. Hobbs; awarded1997).

The early infection process of *Phytophthora cinnamomi* in *Eucalyptus marginata* growing in
rehabilitated bauxite mines. (E. O'Gara; Supervisors G.Hardy & J.McComb).

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

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

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

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

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

6.7 Karri Forest Region

Armillaria Root Disease (ARD): Monitoring of the biocontrol trial (established by E. Davison and M. Pearce in 1992) in 1979 regrowth has been completed and stumps will be excavated and examined later in the year (R. Robinson and M. Pearce). Monitoring of the biocontrol trial in 1972 regrowth (established by M. Stukely in 1995) has continued (R. Robinson, CALM).

A tree pulling trial in 1979 regrowth, to compare the incidence of ARD as assessed by above ground tree symptoms with the actual below ground incidence, has been initiated. Analyses of the results of the first trial is underway (R. Robinson, CALM).

Long term monitoring plots have been established in 1985 planted regrowth to monitor the presence of disease and the effects of future thinning (R. Robinson, CALM).

6.8 Native Plant Communities

In vitro containment of growth, and suppression of oospore production in *Phytophthora megasperma* with phosphite: Contrary to earlier studies which reported that Western Australian isolates of *P. megasperma* were insensitive to phosphite, it has been determined that while it was not as sensitive as Western Australian isolates of *Phytophthora cinnamomi* (ED_{50}= 4.99 $\mu g\ mL^{-1}$ phosphite), *P. megasperma* was sensitive to low levels of phosphite (ED_{50}= 14.74 (n=8) and 24.69 (n=4) $\mu g\ mL^{-1}$ phosphite). Oospore production was suppressed in all isolates of *P. megasperma* (n=9) at phosphite concentrations of 16.7 $\mu g\ mL^{-1}$ and greater. The evidence suggests that phosphite would contain the spread of *P. megasperma* in ecosystems, and that production of infective oospores would be suppressed. In some cases the pathogen would probably not survive in phosphite-treated plants and sensitive biotypes of the fungus may be eradicated (S.Carstairs & L. Carstairs, CALM Contractors).

6.9 Diagnostic Work

Between July 1996 and June 1997, a total of 1,932 samples was processed for *Phytophthora* identification by CALM's Vegetation Health Service (VHS). *P.cinnamomi* was detected in 651 samples, *P.citricola* (89), *P.cryptogea* (9), *P.megasperma* (9), and *P.*spp. (11). There were 14 pine, eucalypt and other samples received for general diagnosis in this period (F.Tay, CALM).

Isoenzyme analysis (using cellulose acetate gel electrophoresis, or CAGE) has been incorporated into the VHS's identification procedure for *Phytophthora* species other than *P.cinnamomi,* following the completion of the assessment of the efficiency and utility of this method by S.Carstairs (CALM Contractor) and M.Stukely (CALM) (F.Tay, CALM).

P.citricola has been isolated from soil in the locality of Moorine Rock, over 300km east of Perth (E.Davison, Curtin University).

Cryphonectria cubensis was isolated from branch and trunk canker on mature *E.marginata* in the locality of Boddington (E.Davison, Curtin University).

7. CSIRO FORESTRY AND FOREST PRODUCTS

Mark Dudzinski
CSIRO Forestry and Forest Products
P.O. Box E4008
Kingston ACT 2604

7.1 Introduction

Summarised are forest pathology projects or consultancies across the Division's sites at Canberra, Hobart, and Perth. These all represent collaborative activities with either local or overseas organisations where CSIRO has a significant role.

7.2 Canberra

- Surveys of diseases in tropical tree acacias, funded by CIFOR, were undertaken in north Queensland, India, Thailand, Indonesia and Malaysia. Proceedings of a synthesising Workshop held in Indonesia in May 1996 were published. A manual on these diseases is proposed within the next 12 months. Australian participants included QFRI and Institute of Horticultural Development, Victoria.

- ACIAR funded study on minimising disease impacts on eucalypts in SE Asia aimed at developing a network of knowledge in the region, through survey and training, and screening for resistance to blight pathogens such as *Cylindrocladium quinqueseptatum*, *Cryptosporiopsis eucalypti* and *Coniella* sp. (other participants are QFRI, Forest Science Institute of Vietnam and Royal Forest Department, Thailand).

- Joint-consultancy with CFTT, Victoria, on incursions of forest pests and diseases into Australia from 1971 to 1996, was undertaken for Bureau of Resource Sciences.

- Defect and decay from minor mechanised harvester wounds in *Eucalyptus sieberi* in East Gippsland in association with DNRE.

- Investigation of genetic marker-aided selection for resistance to *Dothistroma* needle blight in radiata pine (Molecular Biology group of the Tree Improvement and Genetic Resources (TIGR) program based in Canberra).

- Potential genetic markers for use in selection for resistance to *Phytophthora cinnamomi* in *Eucalyptus marginata* (jarrah) with molecular studies undertaken in Canberra and plant selection and screening by CALM researchers in WA.

7.3 Hobart

Projects with CSIRO involvement in collaboration with University of Tasmania, Forestry Tasmania, and other agency and Industry participants include:

- Three investigations related to pruning in plantation eucalypts, primarily *E. nitens*: 1. Effective pruning in *E. nitens* plantations, funded by FFIC; 2. Pathological effects of pruning in *E. nitens* plantations; 3. Defence mechanisms of *E. nitens* against infection by decay fungi. The latter is a PhD project funded by by a Tasmanian Forest Research Council Postgraduate Award.

- A PhD study on etiology of canker diseases in Tasmania, primarily in *E. nitens* plantations, which, although describing several new fungal taxa associated with cankers in eucalypts, places some emphasis on the pathogen *Endothia gyrosa*.

- Investigation of causal factors of dieback in alpine heath and conifer communities at Pine Lake, on the Central Plateau with emphasis on the possible role of an undescribed *Phytophthora* sp. This is a PhD study.

7.4 Perth

Genetics and pathogenicity of *Phytophthora cinnamomi,* a Perth-based study in association with Murdoch and Monash Universities, funded by LWRRDC.

8. AUSTRALIAN QUARANTINE REPORT

Sharan Singh
Plant Quarantine and Inspection Branch
Australian Quarantine and Inspection Service
Department of Primary Industries and Energy
GPO Box 858
Canberra ACT 2601

8.1 Imports of Key Forestry Species

Statistics on imports of certain forestry material are not readily available. Some figures are quoted below as examples of various imports. NSW has recorded imports of 19 kg of *Eucalyptus* seed, 65 kg of *Pinus* seed, 100 *Eucalyptus* tissue cultures, 20 *Acacia* tissue cultures and 30 *Pinus* scions. An importer in Western Australia has brought in about 200 kg *Pinus* seed.

AQIS is considering a review of the importation policy for *Eucalyptus, Pinus* and *Acacia* germplasm. These reviews would be based on pest risk analyses.

8.2 Eucalyptus Rust Concerns

AQIS received an application for the importation of *Eucalyptus* pollen from the USA for the purpose of field cross pollination work. However, the prospective importer withdrew the application after considering the possible threats of introduction of *Eucalyptus* rust pathogen with the proposed imports.

There are several question marks over the distribution and identification of *Eucalyptus* rust. For example, South Africa has been listed as a *Eucalyptus* rust country in the FAO/IPIGRI technical guidelines for the safe movement of germplasm (Ciesla *et al* 1996). According to personal correspondence with Dr Francisco Alves Ferreira, Brazil, this information is incorrect. However, an Australian importer has taken precautionary measures to treat seed which had been imported from South Africa and already cleared by AQIS. The uncertainty over the records of *Eucalyptus* rust in certain areas presents problems in deciding phytosanitary measures for addressing risks with imports of *Eucalyptus* material. AQIS has been adopting a conservative approach in instances where technical information is unclear, however, in this particular situation AQIS finds it difficult to accept that *Eucalyptus* rust is present in South Africa.

8.3 Pitch Canker

AQIS is considering a review of the importation policy for *Pinus* seed, pending clarification of the potential pitch canker risks associated with seed imports. AQIS has written to the Chairman of the RWG7 on this matter, is awaiting a response, and will progress this matter in consultation with RWG7.

AQIS is aware that New Zealand is conducting a pest risk analysis on picth canker. AQIS will take into account the findings of this work while revising the importation policy for *Pinus* seeds.

8.4 Incursion Management

There were no incursions of quarantine diseases on forestry species. Dutch Elm disease was suspected on two elm trees in the Fitzroy Gardens in Melbourne but tests proved negative. The exact cause of the dieback of the trees was not completely identified, however, it was suspected that it may be of a physiological nature rather than due to a pathogenic infection. No further disease testing was conducted.

A workshop on Forest Incursion Management was held in Canberra on 23 April 1997. The workshop was sponsored by the Forest & Wood Products Research & Development Corporation. A summary of the of the workshop proceedings has been produced and is available from AQIS. The following conclusions and strategies were drawn from the workshop.

- Seek endorsement by the Standing Committee on Forestry (SCF), the Standing Committee on Conservation (SCC) and the Australian and New Zealand Environmental and Conservation Council (ANZECC) and industry peak bodies of the strategic outcomes of the Forest Incursion Management Workshop.

- Forest Quarantine Consultative Committee (FQCC) to function as a steering committee for the establishment of the Forest Health Committee (FHC)

    - and to seek endorsement by SCF of FHC membership, terms of reference, functions and role in forest health.

- FHC to expedite forest health matters, including the following short term actions:

    - establish a mechanism to implement Generic Incursion Management Plan (GIMP) for the forest sector (conservation and commercial forestry);

    - develop strategies to further raise awareness of threats from incursions to forest health amongst all stakeholders;

    - examine the need for species specific or more general contingency planning for high risk pests;

    - determine the role of different stakeholders in quarantine and incursion management in the forest sector.

- Decide on and make recommendations to SCF about the forest sector health role in Australian plant protection, namely its relationship with the Australian Plant Health Council and the office of the Chief Commonwealth Plant Protection Officer.

- Establish linkages and, where appropriate, consultative mechanisms on forest health policy between SCF, SCC and Standing Committee on Agriculture and Resource Management (SCARM) and their respective Ministerial Councils, Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) and ANZECC.

- FHC to commence consultations with AQIS policy and operations on the role of timber importers in quarantine inspection policy development, inspection procedures and resourcing quarantine inspections.

- Settle funding arrangements for Incursion Management, focussing on funding the four stages of GIMP with consideration, for example, being given to:

    - extending the current SCF 50:50 cost sharing arrangements for responses to AGM and Tussock Moth to all future incursions on a case by case basis;

    - mechanisms for funding incursion management R&D, especially increased contingency planning if warranted;

    - levies at point of sale or delivery to fund pest incursion management; extending the 'user-pays' principle to all stakeholders, especially beneficiaries of Australia's low pest status;

- Cost-benefit analysis and community service obligations as a base for apportionment of costs between Governments and industry.

- Commission the staged development of a comprehensive forestry pest surveillance, incident reporting and response network that complements and utilises common elements of the plant industries' incursion management resource, communication, public relations network and database, including:

  - an assembly of forest incursion management resources and operational systems at local (rural and urban), national, regional and global levels;

  - global linkages with forestry expertise in regional plant protection organisations, for example North American Plant Protection Organisation (NAPPO), European Plant Protection Organisation (EPPO), Pacific Plant Protection Organisation (PPPO).

8.5 Northern Australia Quarantine Strategy

The Northern Australia Quarantine Strategy (NAQS) has developed and reviews target lists of weeds, pests and diseases, not present in Australia, which present a high risk of entering through northern Australia, becoming established and imposing a cost to the economy. In a recent review of NAQS the reviewers recommended that target lists be reviewed and that weeds, pests and diseases of environmental concern also be considered.

NAQS has completed a review of its weed target list and is in the process of reviewing its target lists of plant pests and diseases. The approach taken was to engage a consultant, Muirhead Consulting, to identify the host plant or plant groups at risk from incursions of new pests and diseases through northern Australia. These plants and plant groups were prioritised on the basis of their economic, amenity or conservation value in Australia.

In the consultants report, *Eucalyptus*, conifers, *Acacia* and sawn timber were identified, in addition to 10 horticultural and field crops, as major host plants at risk from pest and disease incursions. *Eucalyptus* was identified both for its timber value and conservation value. A Pest Risk Analysis (PRA) will be conducted on each of these plants to identify and prioritise the quarantinable pests and diseases. Following consultation with stakeholders, pests and diseases identified in the PRA process will be incorporated into revised NAQS target lists.

CSIRO Entomology, in association with CSIRO Forestry and the Queensland Forestry Research Institute, have been engaged to conduct a PRA on *Eucalyptus*.

8.6 Reference

Ciesla, W.M., Diekmann, M. and Putter, C.A.J. 1996. 1996. FAO/IPGRI Technical Guidelines for the Safe Movement of Germplasm. No. 17. *Eucalyptus* spp. Food and Agriculture Organization of the United Nations, Rome/International Plant Genetic Resources Institute, Rome.

9. NEW ZEALAND

Ian Hood
New Zealand Forest Research Institute
Private Bag 3020
Rotorua
New Zealand

9.1 Forest plantation health status

Report by Peter Gadgil and Lindsay Bulman, New Zealand Forest Research Institute

9.1.1 Introduction

In the year from 1 July 1996 to 30 June 1997, reports of disorders of forest trees totalled 9575. More than 90% of these reports originated from forest health surveys carried out by the Forest Health Officers of the Ministry of Forestry. The remainder of the reports were by forest industry staff specialising in forest health. Table 1 lists all disorders or groups of disorders which accounted for one or more percent of the total number of reports.

New Zealand is divided into 29 biological regions (Fig 1.1) and the disorder reports are classified according to these regions. There were no reports of disorders for three of the biological regions in the South Island (KA: Kaikoura; MK: MacKenzie; SI: Stewart Island) and these are not considered further. The seasonal incidence and geographical distribution of the major disorders (those accounting individually for 4.5% or more of the total number of reports) are considered separately below and data for these are tabulated by biological region and month in Tables 2.1-2.7. In order to show the seasonal incidence of these disorders in different regions of the country, the data are also shown as histograms (Figs. 2.1-2.7), with the biological regions grouped into geographical regions as shown in Table 1.2.

9.1.2 Major disorders

9.1.2.1 Armillaria root disease (Table 2.1, Figure 2.1)

Armillaria novae-zelandiae, A. limonea

There was no major seasonal trend in the records although the winter months (June to August) generally have fewer records, possibly because the symptoms of the disease are less noticeable when tree growth is slow.

In the North Island, most of the records (85% of the total North Island records and 76% of the total records) were from the Central region; there were no records from the Northern region and very few from the Eastern (4% of the North Island total) and Southern (11% of the North Island total) regions. The root disease was not common in the South Island (11% of the total records) with the Northern and Western regions providing nearly all the reports.

Records, grouped by major host species, are given in Table 1.3.

TABLE 1.1 - Disorders reported in 1996-97

Disorder	Host(s)	No. of reports	% of total
I. Major disorders			
Armillaria root-disease	mainly *Pinus radiata*	497	5.0
Cyclaneusma needle-cast	*P. radiata*	877	9.0
Dothistroma needle-blight	*P. radiata*	433	4.5
Eucalyptus pest and diseases	*Eucalyptus* spp.	720	7.5
Possum damage	mainly *Pinus radiata*	828	9.0
Nutrient deficiencies	mainly *Pinus radiata*	555	6.0
Upper mid-crown yellowing	*P. radiata*	1093	11.0
	Total	**5003**	**52.0**
II. Minor disorders			
Diplodia dieback	*P. radiata*	118	1.5
Swiss needle-cast	*Pseudotsuga menziesii*	98	1.0
Pine woolly aphid	*P. radiata*	106	1.0
Nursery diseases	*P. radiata, Ps. menziesii*	89	1.0
Abiotic (wind damage, frost, waterlogging, snow damage, lightning, drought)	All plantation species	963	10.0
Resin bleeding	*P. radiata*	204	2.0
	Total	**1578**	**16.5**
III. Other disorders			
Damage by animals other than possums, pests and diseases of species other than those of *Pinus*, *Pseudotsuga* and *Eucalyptus*, minor pests and diseases of *Pinus* and *Pseudotsuga*, disorders of unknown aetiology.		2994	31.5
	TOTAL	**9575**	**100.0**

9.1.2.2 Cyclaneusma needle-cast (Table 2.2, Figure 2.2)
Cyclaneusma minus

The 1996-97 season was a good one for Cyclaneusma needle-cast with the symptoms most noticeable in the autumn and spring months (32% and 42% of the total records, respectively).

In the North Island, the needle-cast was recorded mainly from the Central region (72% of the North Island records), the other regions showing only a minor incidence of the disease.

TABLE 1.2 - Groupings of biological regions into geographical regions

Geographical regions	Biological regions
N1: Northern North Island	ND: Northland; AK: Auckland
N2: Central North Island	CL: Coromandel; BP: Bay of Plenty; TO: Taupo; WO: Waikato
N3: Eastern North Island	GB: Gisborne; HB: Hawkes Bay
N4: Southern North Island	TK: Taranaki; RI: Rangitikei; WI: Wanganui; WA: Wairarapa; WN: Wellington
S1: Northern South Island	SD: Marlborough Sounds; NN: Nelson; MB: Marlborough; NC: North Canterbury
S2: Central South Island	MC: Mid-Canterbury; SC: South Canterbury
S3: Western South Island	BR: Buller; WD: Westland; FD: Fiordland
S4: Southern South Island	CO: Central Otago; OL: Otago Lakes; DN: Dunedin; SL: Southland

TABLE 1.3 - Disorder records grouped by host species

Host	No. of records	% of total
Acacia spp.	84	1.0
Cupressus, Chamaecyparis, Cryptomeria spp.	99	1.0
Eucalyptus spp.	720	7.5
Pinus spp.	7978	83.5
Pseudotsuga menziesii	300	3.0
Others (more than 1 record each): *Abies, Acer, Alnus, Arbutus, Brachyglottis, Betula, Coprosma, Fagus, Fuchsia, Griselinia, Hebe, Larix, Meterosideros, Myoporum, Nothofagus, Picea, Pittosporum, Podocarpus, Populus, Prunus, Quercus, Salix, Sequoia, Thuja, Ulmus* spp.	394	4.0
TOTAL	**9575**	**100**

The needle-cast was generally less prevalent in the South Island which contributed only 20% of the total number of records. The incidence was greatest in the Southern region (38% of the South Island records). The incidence was negligible in the other regions.

9.1.2.3 Dothistroma needle-blight (Table 2.3, Figure 2.3)
Dothistroma pini

Records of the incidence of Dothistroma needle-blight refer to stands with more than 15% crown infection which is regarded as the minimum sprayable level. A little over half (54%) of the total records were made from August to November.

In the North Island, the Central regional contributed most of the records (86% of the North Island total and 65% of the total records). Climatically, this is the region with the most favourable conditions for infection by *D. pini;* the warmer Northern and the drier Eastern regions had low levels of infection. The area sprayed to control the disease in 1996-97 was 118,370 ha, about the same as in the 1995-96 season (115,400 ha).

The South Island accounted for 25% of the records and most of these (92% of the South Island total) were from the moist Northern and Western regions. The area sprayed to control the needle-blight in the 1996-97 season was 8000 ha (5000 ha in 1995-96).

9.1.2.4 *Eucalyptus* disorders (Table 2.4, Figure 2.4)
All biotic agencies combined.

A large number of leaf-infecting fungi (e.g. *Aulographina eucalypti, Fairmaniella leprosa, Microthyrium eucalypti, Mycosphaerella cryptica, M. nubilosa, Pseudocercospora eucalyptorum, Septoria pulcherrima, Vermisporium obtusum)* and pests (e.g. *Cardiospina fiscella, Ctenarytaina eucalypti, Ophelimus* spp., *Paropsis charbydis, Phylacteophaga froggatti*) affect the eucalypts grown in New Zealand. As the incidences of all pests and pathogens are grouped together in this report, little seasonal variation attributable to biological causes is discernible. There are rather more records of disorders in the summer and autumn months, probably because the damage tends to be more visible later in the growing season.

In the North Island, most of the reports were from the Central region (70% of the North Island and 61% of the total records) mainly because the bulk of the North Island eucalypt plantations are in this region. In the South Island, most of the records were from the Central and Southern regions. The abundance of eucalypt pests and diseases in New Zealand reflects the proximity of the country to Australia, a munificent source of these organisms. This number is growing and unfortunately, seems likely to keep on growing (see Section 3).

9.1.2.5 Possum damage (Table 2.5, Figure 2.5)
Trichosurus vulpecula

Possum damage occurs throughout the year but there are more records of the damage during the summer and autumn months, probably because the damage tends to be more visible when the trees are growing vigorously (and also probably because the Forest Health Officers tend to be more active in the warmer seasons).

Possum damage is mainly a North Island problem and 75% of the total number of reports came from the Central (60%) and Eastern (15%) regions of the North Island. The South Island regions reported a mere 7% of the total; either the South Island possum is more fastidious or the South Island Forest Health Officers are less avid followers of the latest fashions.

9.1.2.6 Nutrient deficiencies

The majority of the records refer to deficiency of nitrogen, phosphorus, magnesium or boron. Most of the records were made in late spring and summer when the trees were growing vigorously and when the deficiency symptoms were most apparent.

The Central region of the North Island and the Northern region of the South Island were responsible for 48% and 19% of the total number of records respectively. Other regions reported relatively few incidences of nutrient deficiencies.

9.1.2.7 Upper mid-crown yellowing (UMCY)

Upper mid-crown yellowing is a condition of *Pinus radiata* in which needles in the sub-apical zone of the upper crown turn yellow and are prematurely cast. Nutritional imbalance involving magnesium and potassium is suggested as the most likely cause. As with nutrient deficiencies, symptoms of upper mid-crown yellowing are most readily seen in the summer and autumn months and the majority of the records (74%) were made in these months.

TABLE 3.1 - Pests and pathogens established in New Zealand (1 July 1996 - 30 June 1997)

Organism	Host(s)	Date first recorded
Nematus oligospilus (Hymenoptera:Tenthredinidae)	*Salix* spp.	February 1997
Catenophoropsis eucalypticola	*Eucalyptus nitens*	March 1997
Uraba lugens (Lepidoptera:Nolidae)	*Eucalyptus* spp.	June 1997
Coleophoma oleae	*Eucalyptus saligna*	June 1997

In the North Island, the Central region is the one most affected by upper mid-crown yellowing (81% of the North Island and 58% of the total records). In the South Island, the Northern and the Southern regions accounted for 46% and 40% respectively of the South Island records.

9.1.3 New establishments

A list of pests and pathogens of tree established in New Zealand since 1 July 1996 is given in Table 3.1

FIGURE 1.1 - NEW ZEALAND BIOGEOGRAPHIC REGIONS

New Zealand Biogeographic Regions (after Crosby et al. 1976)

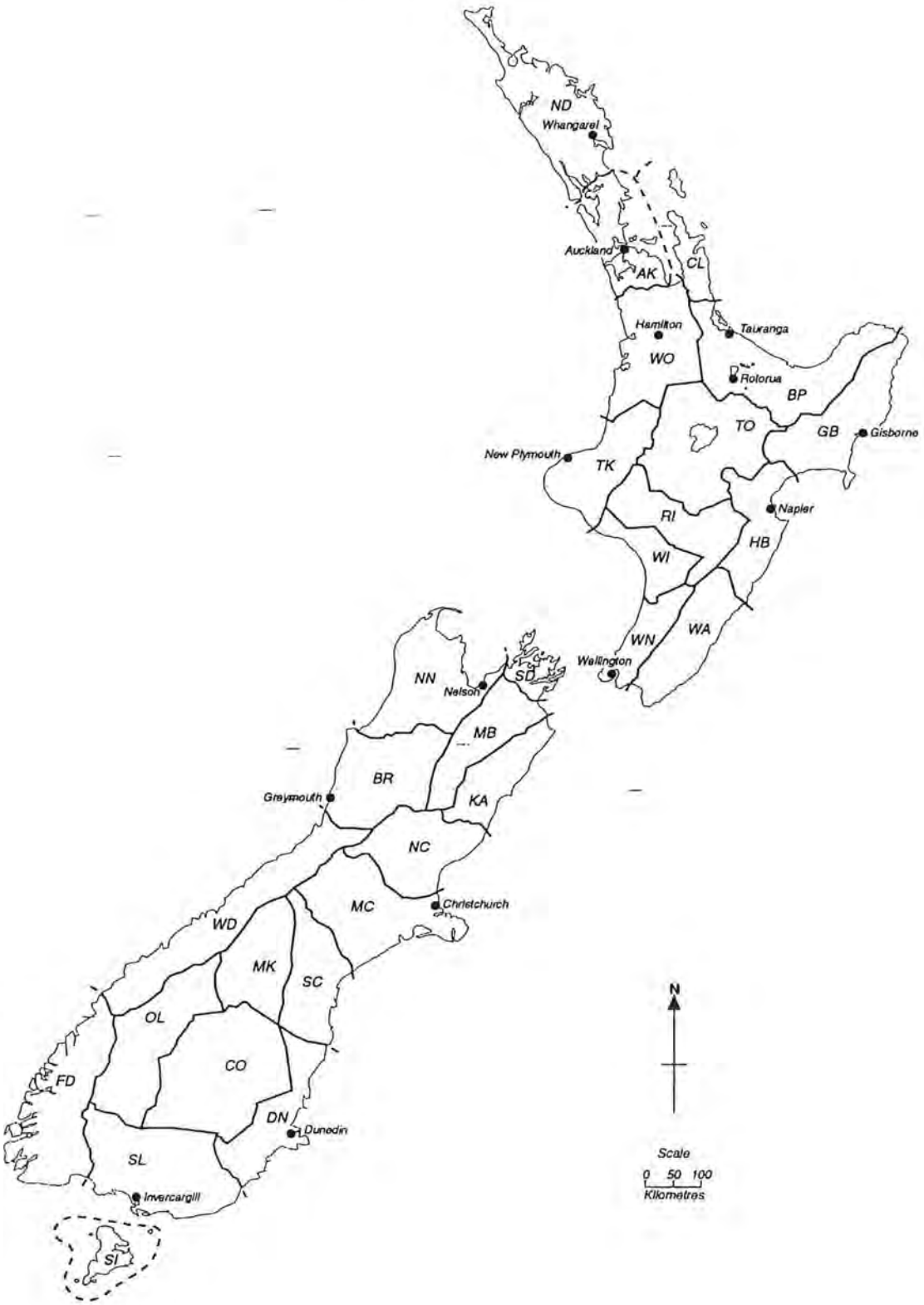
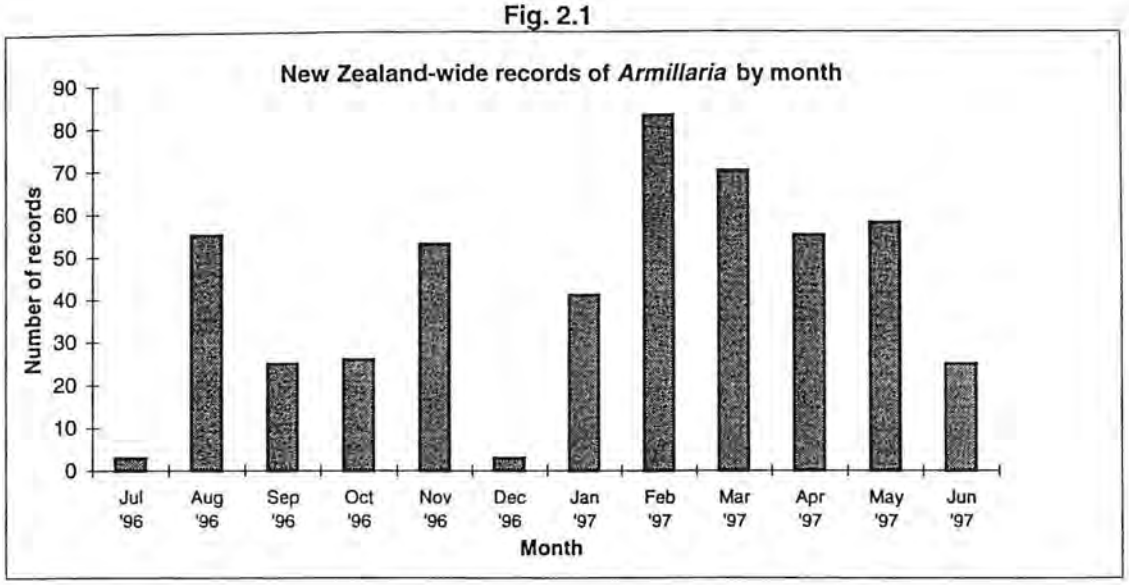
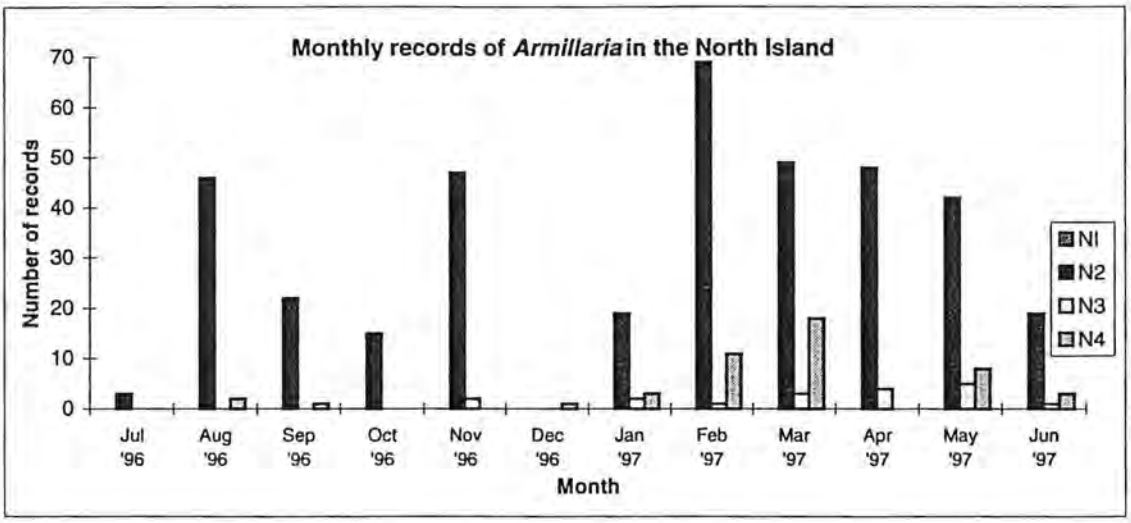


TABLE 2.1 - Records of *Armillaria* root-disease by biological region

Geographical Region	Biological Region	Jul '96	Aug '96	Sep '96	Oct '96	Nov '96	Dec '96	Jan '97	Feb '97	Mar '97	Apr '97	May '97	Jun '97	TOTAL
N1	AK	0	0	0	0	0	0	0	0	0	0	0	0	0
	ND	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0
N2	BP	0	5	18	11	8	0	2	66	26	34	18	2	190
	CL	0	0	0	0	0	0	0	0	6	0	0	0	6
	TO	3	41	4	4	39	0	15	3	17	14	14	17	171
	WO	0	0	0	0	0	0	2	0	0	0	10	0	12
	TOTAL	3	46	22	15	47	0	19	69	49	48	42	19	379
N3	GB	0	0	0	0	1	0	0	1	1	3	0	0	6
	HB	0	0	0	0	1	0	2	0	2	1	5	1	12
	TOTAL	0	0	0	0	2	0	2	1	3	4	5	1	18
N4	RI	0	0	0	0	0	0	0	0	18	0	0	0	18
	TK	0	0	0	0	0	0	2	0	0	0	0	0	2
	WA	0	0	0	0	0	1	0	0	0	0	5	0	6
	WI	0	2	1	0	0	0	1	0	0	0	0	3	7
	WN	0	0	0	0	0	0	0	11	0	0	3	0	14
	TOTAL	0	2	1	0	0	1	3	11	18	0	8	3	47
S1	MB	0	0	0	0	0	0	0	0	0	1	0	0	1
	NC	0	0	0	0	0	0	0	0	0	0	0	0	0
	NN	0	2	1	2	1	2	5	1	0	2	3	2	21
	SD	0	1	0	0	0	0	0	0	0	0	0	0	1
	TOTAL	0	3	1	2	1	2	5	1	0	3	3	2	23
S2	MC	0	0	0	0	0	0	0	0	0	0	0	0	0
	SC	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0
S3	BR	0	2	1	0	0	0	9	0	0	0	0	0	12
	FD	0	0	0	7	0	0	0	0	0	0	0	0	7
	WD	0	2	0	0	0	0	1	0	0	0	0	0	3
	TOTAL	0	4	1	7	0	0	10	0	0	0	0	0	22
S4	CO	0	0	0	0	0	0	0	0	0	0	0	0	0
	DN	0	0	0	0	0	0	0	0	0	0	0	0	0
	OL	0	0	0	0	0	0	0	0	0	0	0	0	0
	SL	0	0	0	2	3	0	2	1	0	0	0	0	8
	TOTAL	0	0	0	2	3	0	2	1	0	0	0	0	8
GRAND TOTAL		3	55	25	26	53	3	41	83	70	55	58	25	497

Fig. 2.1


New Zealand-wide records of *Armillaria* by month
Number of records
0
10
20
30
40
50
60
70
80
90
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month


Monthly records of *Armillaria* in the North Island
Number of records
0
10
20
30
40
50
60
70
N1
N2
N3
N4
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month

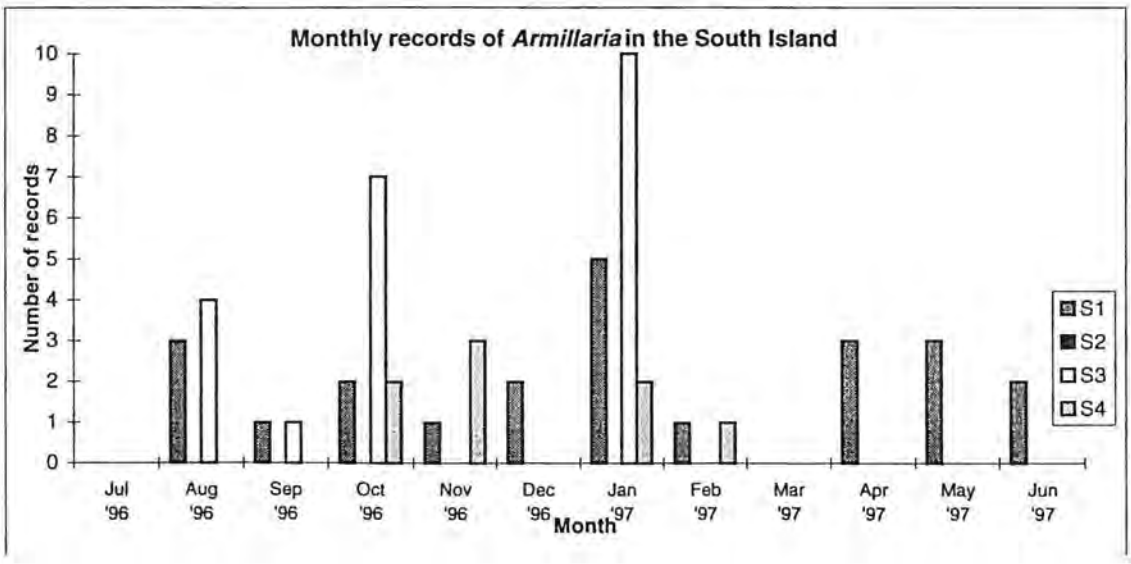
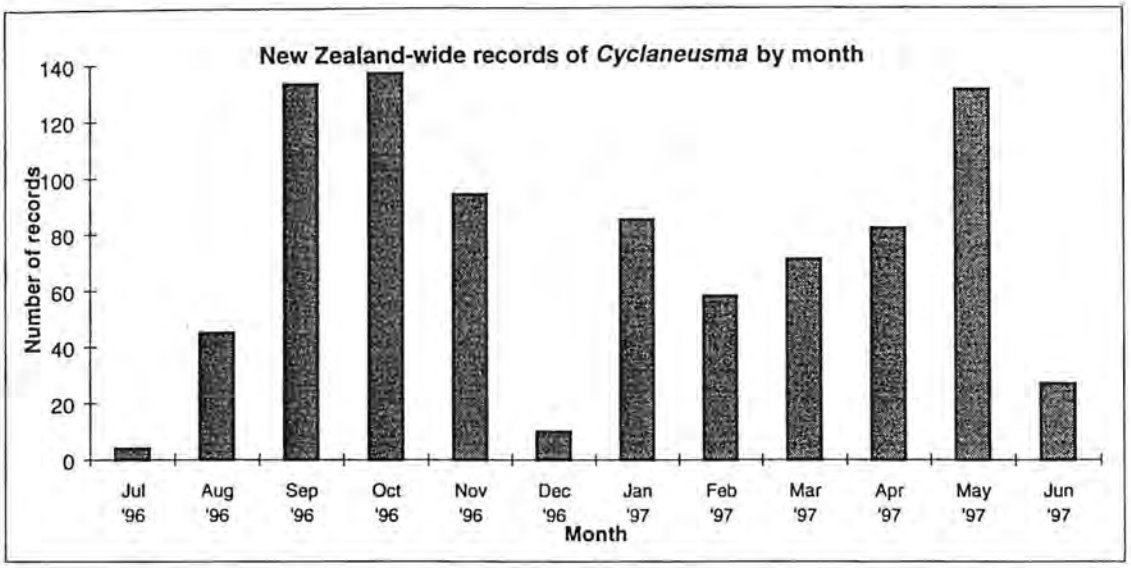
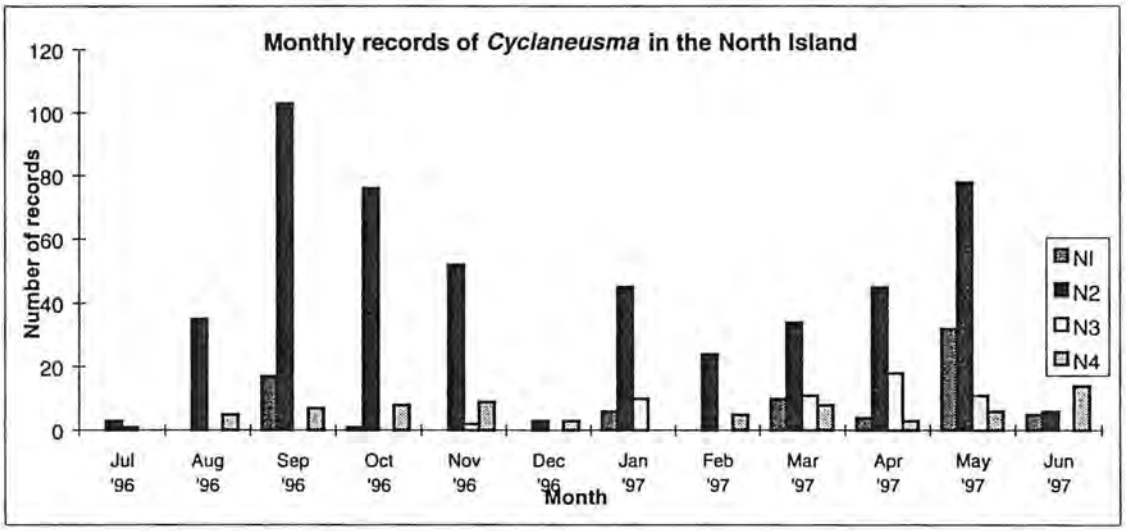

Monthly records of *Armillaria* in the South Island
Number of records
0
1
2
3
4
5
6
7
8
9
10
S1
S2
S3
S4
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month

TABLE 2.2 - Records of *Cyclaneusma* needle-cast by biological region

Geographical Region	Biological Region	Jul '96	Aug '96	Sep '96	Oct '96	Nov '96	Dec '96	Jan '97	Feb '97	Mar '97	Apr '97	May '97	Jun '97	TOTAL
N1	AK	0	0	17	0	0	0	0	0	10	4	10	0	41
	ND	0	0	0	1	0	0	6	0	0	0	22	5	34
	TOTAL	0	0	17	1	0	0	6	0	10	4	32	5	75
N2	BP	0	12	38	49	3	0	4	15	10	26	41	4	202
	CL	0	0	1	0	0	0	0	0	17	7	0	0	25
	WO	0	0	9	0	0	3	2	0	0	0	7	0	21
	TO	3	23	55	27	49	0	39	9	7	12	30	2	256
	TOTAL	3	35	103	76	52	3	45	24	34	45	78	6	504
N3	GB	0	0	0	0	2	0	0	0	5	3	1	0	11
	HB	1	0	0	0	0	0	10	0	6	15	10	0	42
	TOTAL	1	0	0	0	2	0	10	0	11	18	11	0	53
N4	TK	0	0	0	8	3	0	0	1	0	2	0	0	14
	RI	0	0	0	0	0	0	0	0	8	0	0	0	8
	WA	0	4	0	0	0	3	0	1	0	0	6	5	19
	WI	0	0	4	0	3	0	0	0	0	1	0	7	15
	WN	0	1	3	0	3	0	0	3	0	0	0	2	12
	TOTAL	0	5	7	8	9	3	0	5	8	3	6	14	68
S1	MB	0	0	0	1	0	0	0	0	0	0	0	0	1
	NN	0	1	6	12	13	1	9	13	5	4	0	2	66
	SD	0	0	0	0	0	0	0	0	0	0	0	0	0
	NC	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	1	6	13	13	1	9	13	5	4	0	2	67
S2	SC	0	0	0	0	0	0	1	0	0	3	0	0	4
	MC	0	0	0	0	0	0	0	0	0	0	2	0	2
	TOTAL	0	0	0	0	0	0	1	0	0	3	2	0	6
S3	WD	0	0	0	0	0	0	2	0	0	0	0	0	2
	BR	0	4	0	1	0	0	7	0	0	0	0	0	12
	FD	0	0	0	6	0	0	0	0	0	0	0	0	6
	TOTAL	0	4	0	7	0	0	9	0	0	0	0	0	20
S4	SL	0	0	0	3	6	1	4	14	0	0	1	0	29
	CO	0	0	0	1	0	0	1	2	0	0	1	0	5
	DN	0	0	0	28	12	2	0	0	3	5	0	0	50
	OL	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	0	0	32	18	3	5	16	3	5	2	0	84
GRAND TOTAL		4	45	133	137	94	10	85	58	71	82	131	27	877

Fig. 2.2


New Zealand-wide records of *Cyclaneusma* by month
Number of records
0
20
40
60
80
100
120
140
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month


Monthly records of *Cyclaneusma* in the North Island
Number of records
0
20
40
60
80
100
120
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month
N1
N2
N3
N4

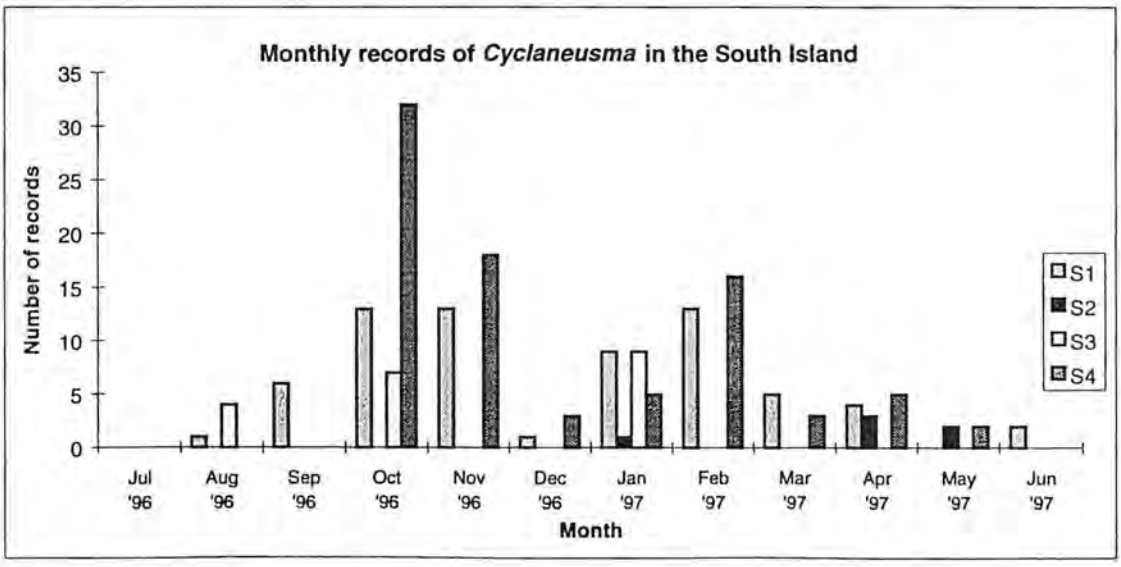
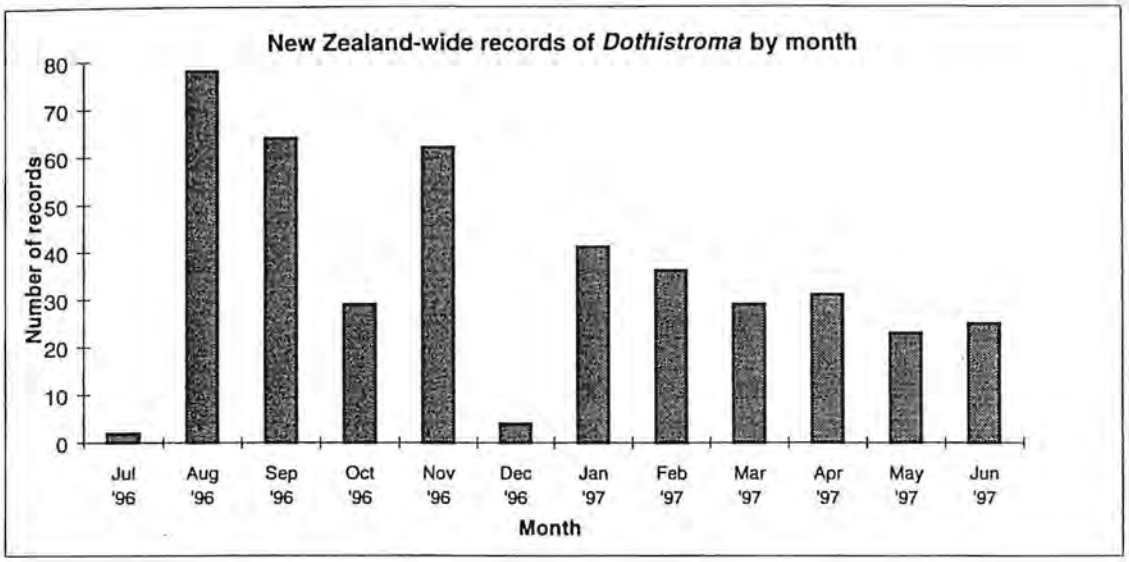
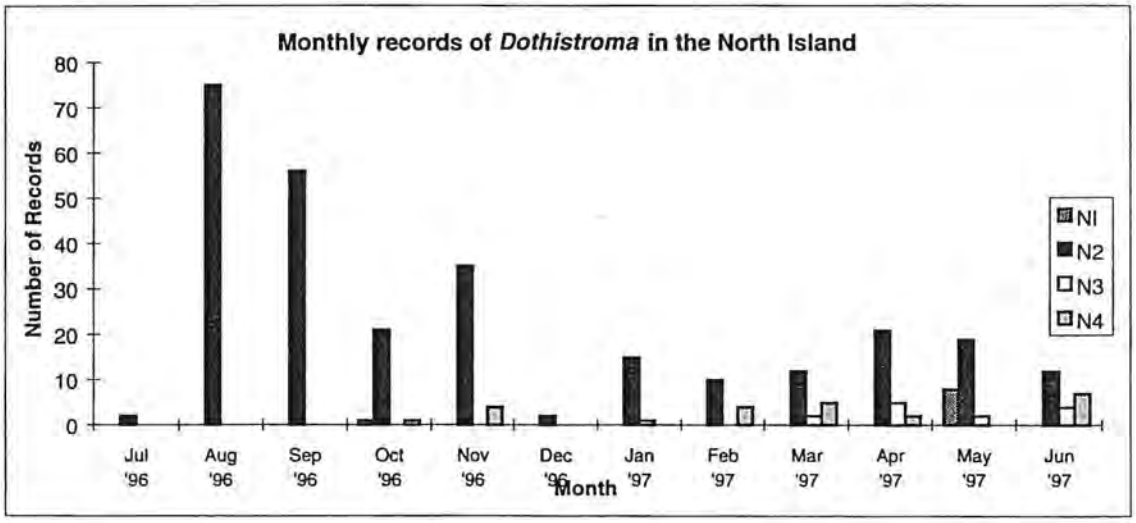

Monthly records of *Cyclaneusma* in the South Island
Number of records
0
5
10
15
20
25
30
35
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month
S1
S2
S3
S4

TABLE 2.3 - Records of *Dothistroma* needle-blight by biological region

Geographical Region	Biological Region	Jul '96	Aug '96	Sep '96	Oct '96	Nov '96	Dec '96	Jan '97	Feb '97	Mar '97	Apr '97	May '97	Jun '97	TOTAL
N1	AK	0	0	0	0	0	0	0	0	0	0	0	0	0
	ND	0	0	0	1	0	0	0	0	0	0	8	0	9
	TOTAL	0	0	0	1	0	0	0	0	0	0	8	0	9
N2	BP	1	15	24	18	3	0	0	6	11	16	13	2	109
	CL	0	0	0	0	0	0	0	0	0	3	0	0	3
	TO	1	60	32	3	32	1	14	4	1	2	4	9	163
	WO	0	0	0	0	0	1	1	0	0	0	2	1	5
	TOTAL	2	75	56	21	35	2	15	10	12	21	19	12	280
N3	GB	0	0	0	0	0	0	0	0	2	1	0	0	3
	HB	0	0	0	0	0	0	1	0	0	4	2	4	11
	TOTAL	0	0	0	0	0	0	1	0	2	5	2	4	14
N4	RI	0	0	0	0	0	0	0	0	5	0	0	0	5
	TK	0	0	0	1	0	0	0	0	0	2	0	0	3
	WA	0	0	0	0	0	0	0	0	0	0	0	0	0
	WI	0	0	0	0	1	0	0	0	0	0	0	0	1
	WN	0	0	0	0	3	0	0	4	0	0	0	7	14
	TOTAL	0	0	0	1	4	0	0	4	5	2	0	7	23
S1	MB	0	0	0	0	0	0	0	0	0	0	0	0	0
	NC	0	0	0	0	0	0	0	0	0	0	0	0	0
	NN	0	2	8	7	22	2	12	21	7	3	2	2	88
	SD	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	2	8	7	22	2	12	21	7	3	2	2	88
S2	MC	0	0	0	0	0	0	0	0	0	0	0	0	0
	SC	0	0	0	0	0	0	1	0	0	0	0	0	1
	TOTAL	0	0	0	0	0	0	1	0	0	0	0	0	1
S3	BR	0	1	0	0	0	0	7	0	0	0	0	0	8
	FD	0	0	0	0	0	0	0	0	0	0	0	0	0
	WD	0	0	0	0	0	0	3	0	0	0	0	0	3
	TOTAL	0	1	0	0	0	0	10	0	0	0	0	0	11
S4	CO	0	0	0	0	0	0	0	0	0	0	0	0	0
	DN	0	0	0	0	1	0	0	0	3	0	0	0	4
	OL	0	0	0	0	0	0	0	0	0	0	0	0	0
	SL	0	0	0	0	0	0	2	1	0	0	0	0	3
	TOTAL	0	0	0	0	1	0	2	1	3	0	0	0	7
GRAND TOTAL		2	78	64	30	62	4	41	36	29	31	31	25	433

Fig. 2.3


New Zealand-wide records of *Dothistroma* by month
Number of records
0
10
20
30
40
50
60
70
80
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month


Monthly records of *Dothistroma* in the North Island
Number of Records
0
10
20
30
40
50
60
70
80
N1
N2
N3
N4
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month

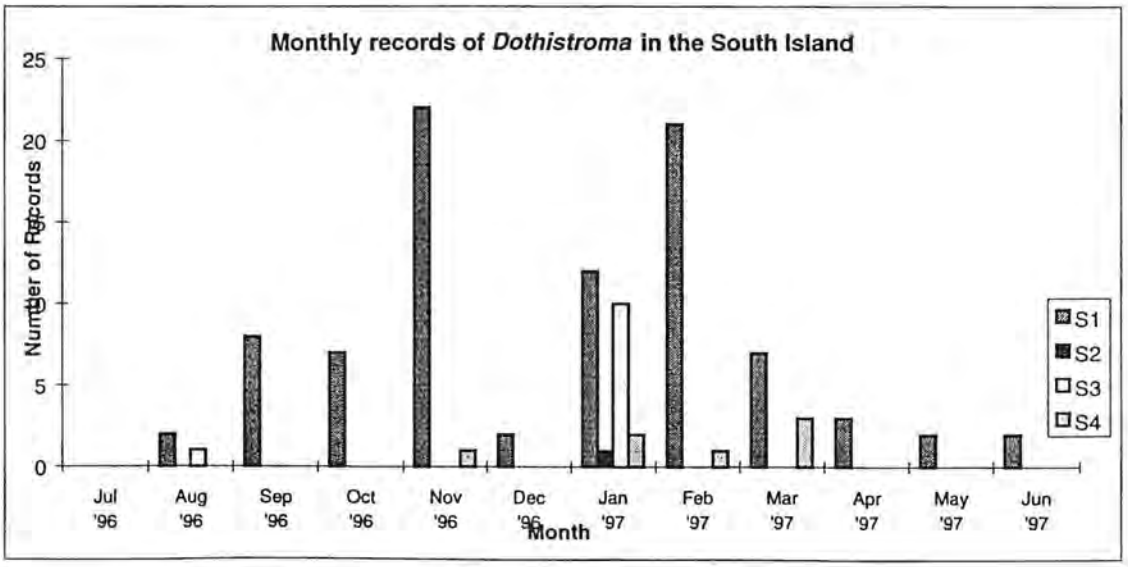
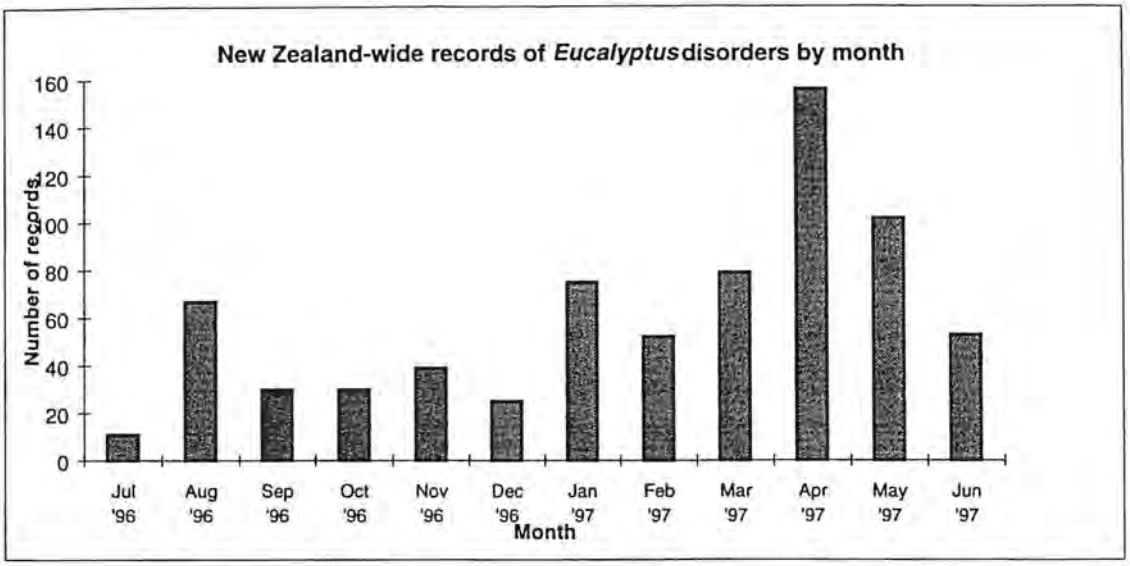
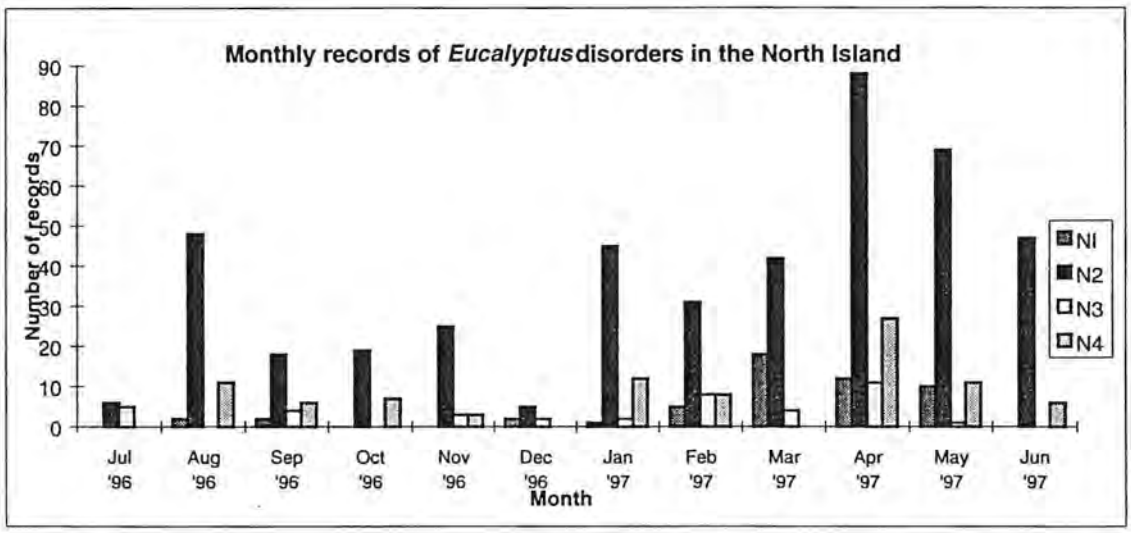

Monthly records of *Dothistroma* in the South Island
Number of Records
0
5
10
15
20
25
S1
S2
S3
S4
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month

TABLE 2.4 - Records of *Eucalyptus* disorders by biological region

Geographical Region	Biological Region	Jul '96	Aug '96	Sep '96	Oct '96	Nov '96	Dec '96	Jan '97	Feb '97	Mar '97	Apr '97	May '97	Jun '97	TOTAL
N1	AK	0	2	2	0	0	1	1	5	18	12	10	0	51
	ND	0	0	0	0	0	1	0	0	0	0	0	0	1
	TOTAL	0	2	2	0	0	2	1	5	18	12	10	0	52
N2	BP	4	6	12	9	0	1	5	28	11	82	54	33	245
	CL	0	0	1	1	0	0	0	0	9	2	0	0	13
	TO	2	42	5	9	23	3	5	3	21	4	11	14	142
	WO	0	0	0	0	2	1	35	0	1	0	4	0	43
	TOTAL	6	48	18	19	25	5	45	31	42	88	69	47	443
N3	GB	0	0	0	0	0	0	0	2	3	8	0	0	13
	HB	5	0	4	0	3	2	2	6	1	3	1	0	27
	TOTAL	5	0	4	0	3	2	2	8	4	11	1	0	40
N4	RI	0	0	0	0	0	0	0	0	0	4	0	0	4
	TK	0	0	0	0	1	0	5	0	0	6	0	0	12
	WA	0	0	0	0	0	0	0	0	0	0	0	2	2
	WI	0	0	3	1	2	0	6	0	0	5	4	3	24
	WN	0	11	3	6	0	0	1	8	0	12	7	1	49
	TOTAL	0	11	6	7	3	0	12	8	0	27	11	6	91
S1	MB	0	0	0	0	0	0	0	0	0	1	0	0	1
	NC	0	0	0	0	0	0	0	0	1	0	0	0	1
	NN	0	2	0	0	4	2	0	0	0	1	1	0	10
	SD	0	4	0	0	0	2	0	0	0	0	0	0	6
	TOTAL	0	6	0	0	4	4	0	0	1	2	1	0	18
S2	MC	0	0	0	0	0	0	0	0	6	12	7	0	25
	SC	0	0	0	0	0	0	0	0	2	5	0	0	7
	TOTAL	0	0	0	0	0	0	0	0	8	17	7	0	32
S3	BR	0	0	0	0	0	0	7	0	0	0	0	0	7
	FD	0	0	0	4	0	0	0	0	0	0	0	0	4
	WD	0	0	0	0	0	0	4	0	0	0	0	0	4
	TOTAL	0	0	0	4	0	0	11	0	0	0	0	0	15
S4	CO	0	0	0	0	0	0	2	0	0	0	0	0	2
	DN	0	0	0	0	2	9	0	0	2	0	0	0	13
	OL	0	0	0	0	0	3	0	0	4	0	0	0	7
	SL	0	0	0	0	2	0	2	0	0	0	3	0	7
	TOTAL	0	0	0	0	4	12	4	0	6	0	3	0	29
GRAND TOTAL		11	67	30	30	39	25	75	52	79	157	102	53	720

Fig. 2.4


New Zealand-wide records of *Eucalyptus* disorders by month
Number of records
0
20
40
60
80
100
120
140
160
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month


Monthly records of *Eucalyptus* disorders in the North Island
Number of records
0
10
20
30
40
50
60
70
80
90
N1
N2
N3
N4
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month

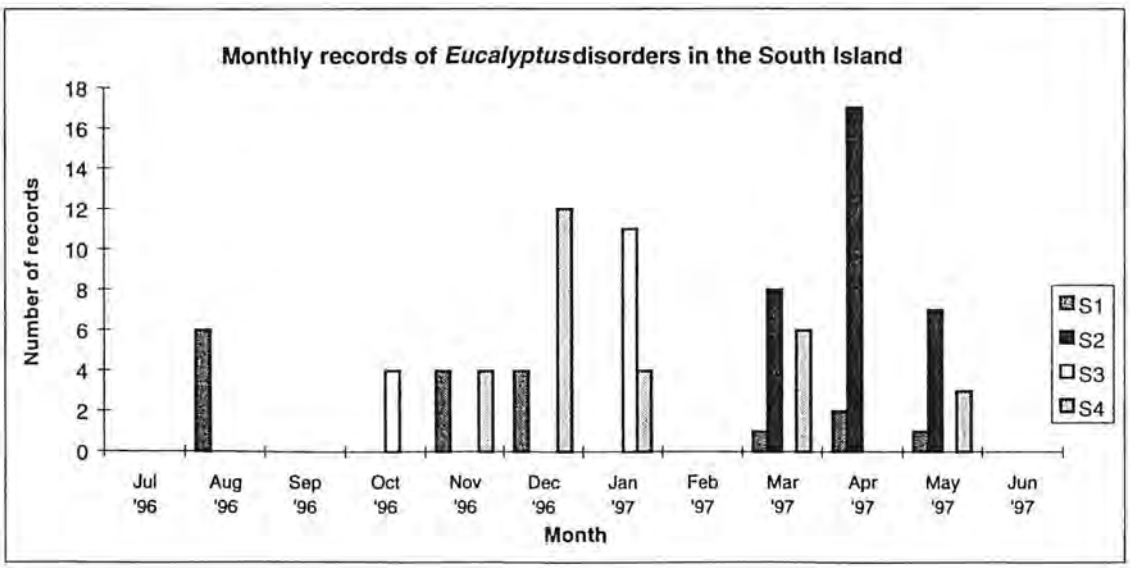
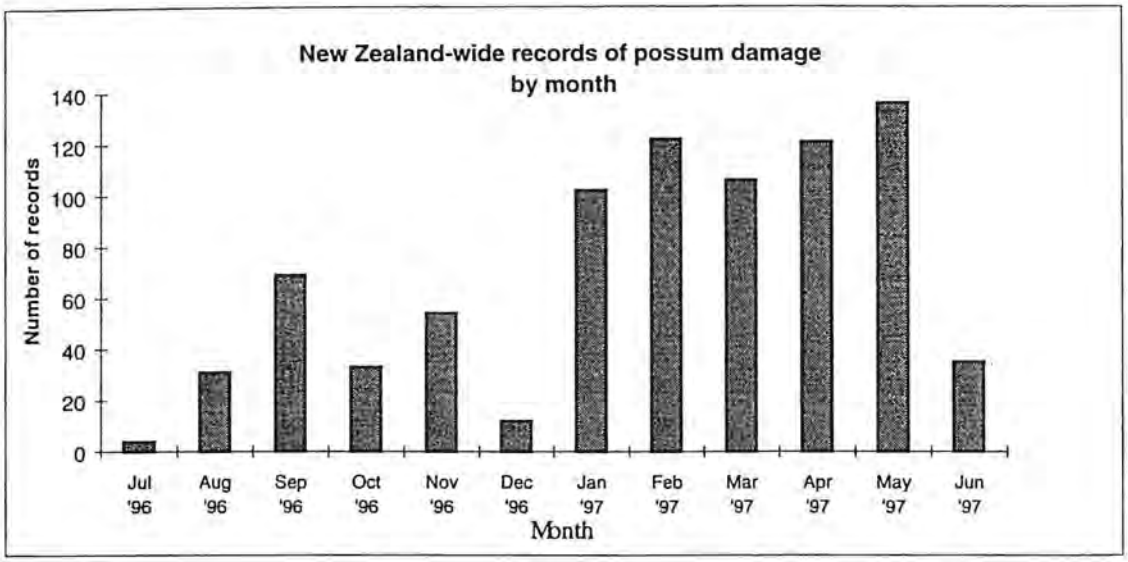
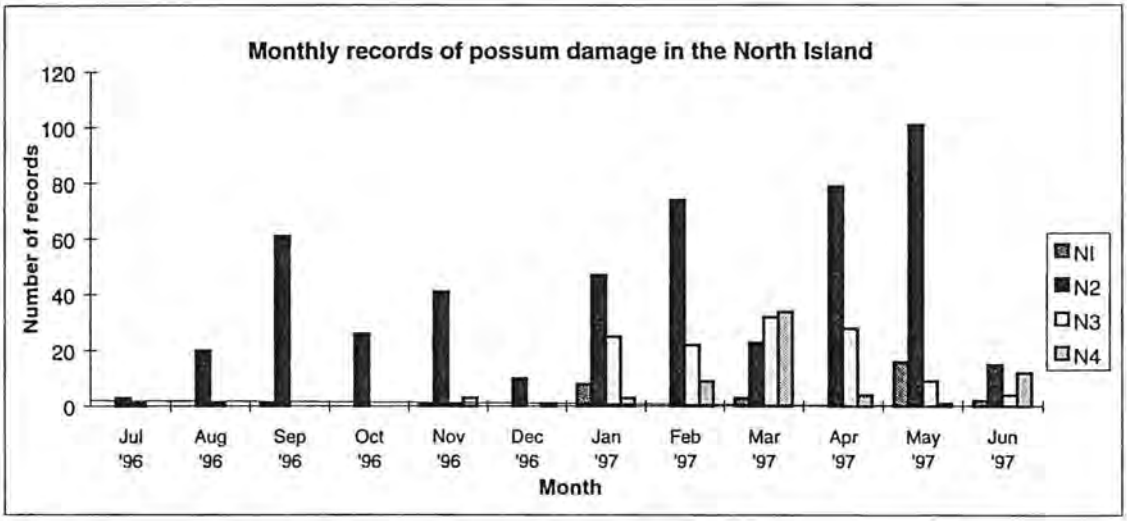

Monthly records of *Eucalyptus* disorders in the South Island
Number of records
0
2
4
6
8
10
12
14
16
18
S1
S2
S3
S4
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month

TABLE 2.5 - Records of Possum damage by biological region

Geographical Region	Biological Region	Jul '96	Aug '96	Sep '96	Oct '96	Nov '96	Dec '96	Jan '97	Feb '97	Mar '97	Apr '97	May '97	Jun '97	TOTAL
N1	AK	0	0	1	0	1	0	0	0	3	0	0	0	5
	ND	0	0	0	0	0	0	8	0	0	0	16	2	26
	TOTAL	0	0	1	0	1	0	8	0	3	0	16	2	31
N2	BP	0	9	22	20	6	0	4	68	11	37	23	9	209
	CL	0	0	0	0	0	0	0	0	10	2	0	0	12
	TO	3	11	37	6	35	0	43	6	2	40	78	6	267
	WO	0	0	2	0	0	10	0	0	0	0	0	0	12
	TOTAL	3	20	61	26	41	10	47	74	23	79	101	15	500
N3	GB	0	0	0	0	1	0	0	18	23	15	0	0	57
	HB	1	1	0	0	0	0	25	4	9	13	9	4	66
	TOTAL	1	1	0	0	1	0	25	22	32	28	9	4	123
N4	RI	0	0	0	0	0	0	0	0	34	0	0	0	34
	TK	0	0	0	0	0	0	1	0	0	4	0	0	5
	WA	0	0	0	0	0	1	0	0	0	0	0	0	1
	WI	0	0	0	0	0	0	2	2	0	0	0	9	13
	WN	0	0	0	0	3	0	0	7	0	0	1	3	14
	TOTAL	0	0	0	0	3	1	3	9	34	4	1	12	67
S1	MB	0	0	0	0	0	0	0	0	0	1	0	0	1
	NC	0	0	0	0	0	0	0	0	0	0	8	0	8
	NN	0	1	5	3	0	0	14	11	2	6	1	0	43
	SD	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	1	5	3	0	0	14	11	2	7	9	0	52
S2	MC	0	0	0	0	0	0	0	0	0	0	1	2	3
	SC	0	0	0	0	0	0	3	0	0	0	0	0	3
	TOTAL	0	0	0	0	0	0	3	0	0	0	1	2	6
S3	BR	0	5	0	0	0	0	1	0	0	0	0	0	6
	FD	0	0	0	1	0	0	0	0	0	0	0	0	1
	WD	0	4	0	0	0	0	0	0	0	0	0	0	4
	TOTAL	0	9	0	1	0	0	1	0	0	0	0	0	11
S4	CO	0	0	0	0	0	0	1	1	0	0	0	0	2
	DN	0	0	2	1	3	1	0	0	12	0	0	0	19
	OL	0	0	0	0	0	0	0	0	0	3	0	0	3
	SL	0	0	0	2	5	0	1	6	0	0	0	0	14
	TOTAL	0	0	2	3	8	1	2	7	12	3	0	0	38
GRAND TOTAL		4	31	69	33	54	12	103	123	106	121	137	35	828

Fig. 2.5


New Zealand-wide records of possum damage by month
Number of records
140
120
100
80
60
40
20
0
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month


Monthly records of possum damage in the North Island
Number of records
120
100
80
60
40
20
0
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month
NI
N2
N3
N4

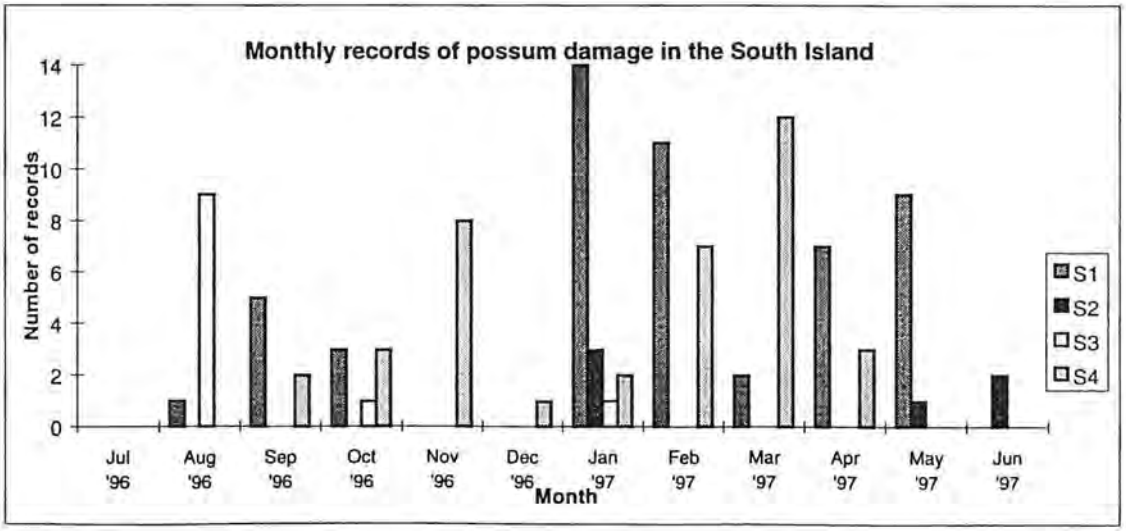
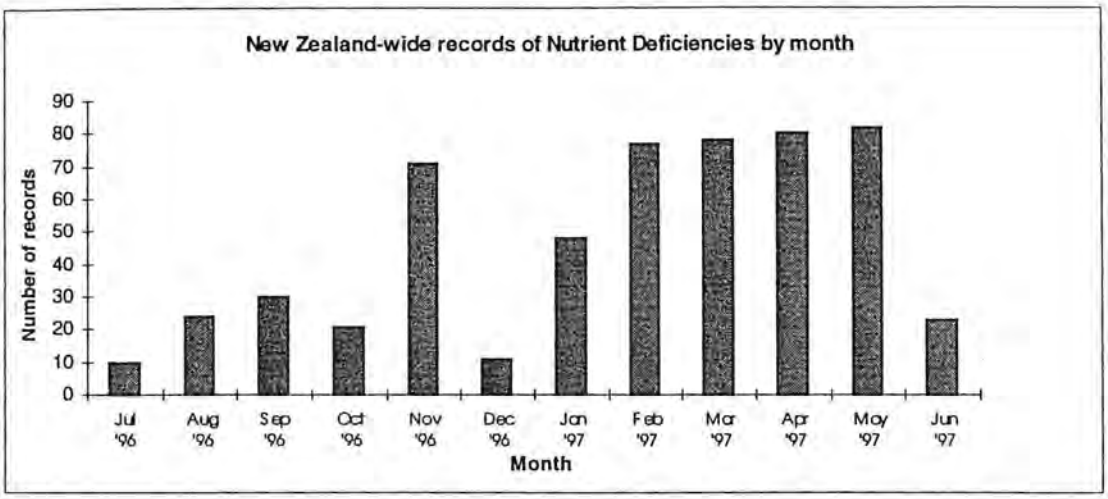
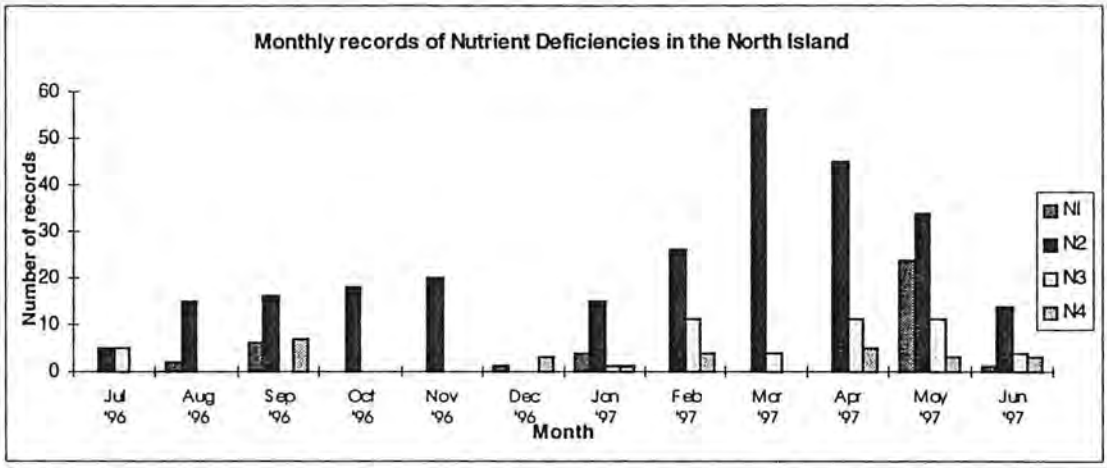

Monthly records of possum damage in the South Island
Number of records
14
12
10
8
6
4
2
0
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month
S1
S2
S3
S4

TABLE 2.6 - Records of Nutrient deficiencies by biological region

	Biological Region	Jul '96	Aug '96	Sep '96	Oct '96	Nov '96	Dec '96	Jan '97	Feb '97	Mar '97	Apr '97	May '97	Jun '97	TOTAL
N1	AK	0	1	5	0	0	1	0	0	0	0	4	0	11
	ND	0	1	1	0	0	0	4	0	0	0	20	1	27
	TOTAL	0	2	6	0	0	1	4	0	0	0	24	1	38
N2	BP	0	4	9	14	4	0	0	14	30	19	14	8	116
	CL	0	0	0	0	0	0	0	0	6	1	0	0	7
	TO	5	11	7	4	16	0	14	12	20	25	16	6	136
	WO	0	0	0	0	0	0	1	0	0	0	4	0	5
	TOTAL	5	15	16	18	20	0	15	26	56	45	34	14	264
N3	GB	0	0	0	0	0	0	0	8	2	5	1	0	16
	HB	5	0	0	0	0	0	1	3	2	6	10	4	31
	TOTAL	5	0	0	0	0	0	1	11	4	11	11	4	47
N4	RI	0	0	0	0	0	0	0	0	0	0	0	0	0
	TK	0	0	0	0	0	0	0	0	0	0	0	0	0
	WA	0	0	0	0	0	3	0	0	0	0	1	3	7
	WI	0	0	7	0	0	0	1	3	0	5	0	0	16
	WN	0	0	0	0	0	0	0	1	0	0	2	0	3
	TOTAL	0	0	7	0	0	3	1	4	0	5	3	3	26
S1	MB	0	0	0	0	0	0	0	0	0	1	0	0	1
	NC	0	0	0	0	0	0	2	0	0	0	2	0	4
	NN	0	0	0	2	36	4	10	28	12	6	1	0	99
	SD	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	0	0	2	36	4	12	28	12	7	3	0	104
S2	MC	0	0	0	0	0	0	0	0	0	5	6	1	12
	SC	0	0	0	0	0	0	1	0	0	0	0	0	1
	TOTAL	0	0	0	0	0	0	1	0	0	5	6	1	13
S3	BR	0	3	0	1	0	0	9	0	0	0	0	0	13
	FD	0	0	0	0	0	0	0	0	0	0	0	0	0
	WD	0	4	0	0	0	0	3	0	0	0	0	0	7
	TOTAL	0	7	0	1	0	0	12	0	0	0	0	0	20
S4	CO	0	0	0	0	0	0	0	1	0	0	0	0	1
	DN	0	0	1	0	10	3	0	0	6	2	0	0	22
	OL	0	0	0	0	0	0	0	0	0	5	0	0	5
	SL	0	0	0	0	5	0	2	7	0	0	1	0	15
	TOTAL	0	0	1	0	15	3	2	8	6	7	1	0	43
GRAND TOTAL		10	24	30	21	71	11	48	77	78	80	82	23	555

Fig. 2.6


New Zealand-wide records of Nutrient Deficiencies by month
Number of records
0
10
20
30
40
50
60
70
80
90
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month


Monthly records of Nutrient Deficiencies in the North Island
Number of records
0
10
20
30
40
50
60
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month
N1
N2
N3
N4

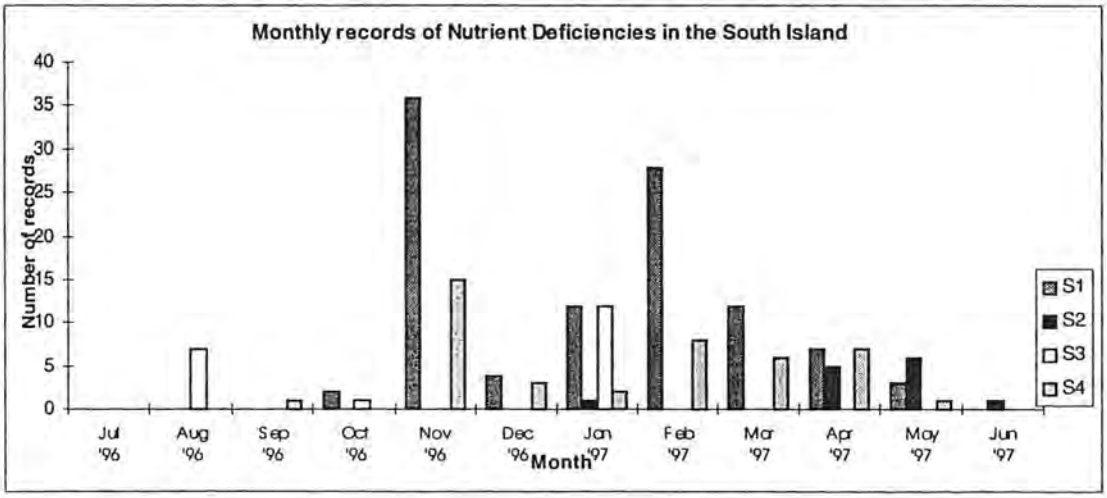
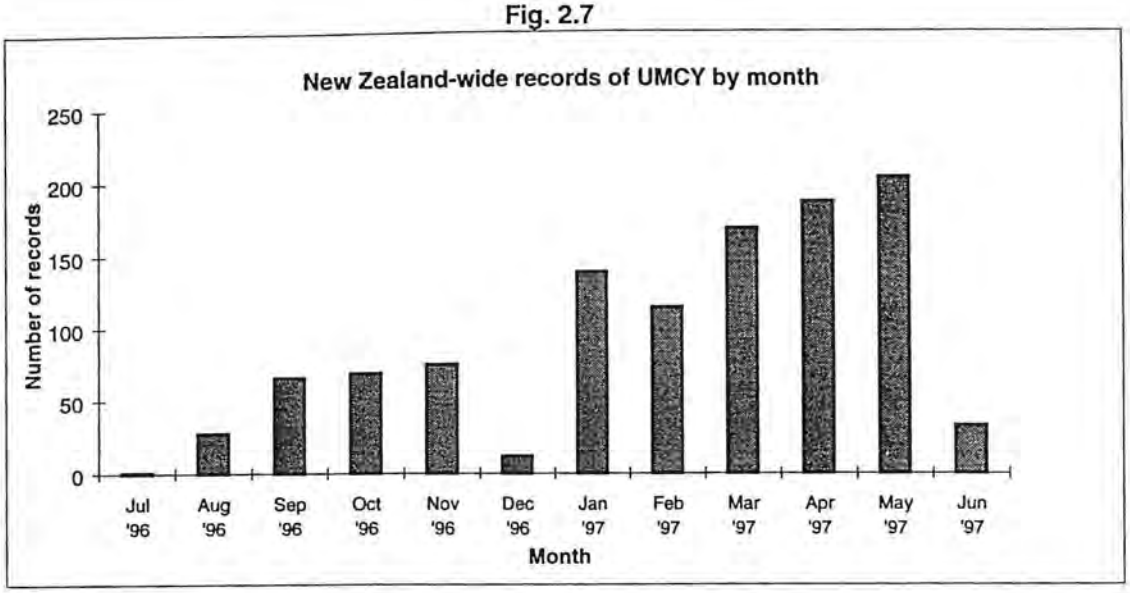
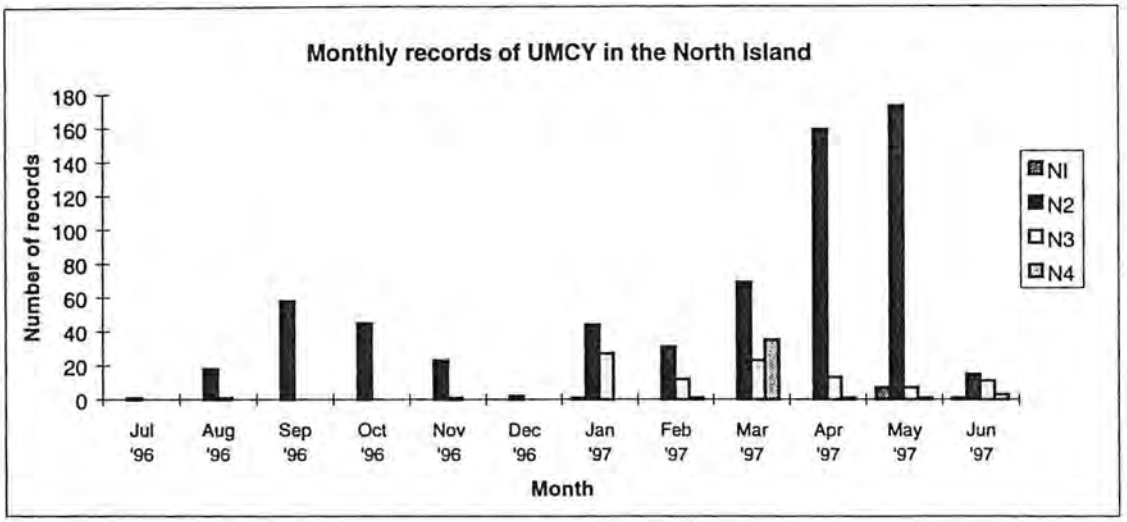

Monthly records of Nutrient Deficiencies in the South Island
Number of records
0
5
10
15
20
25
30
35
40
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month
S1
S2
S3
S4

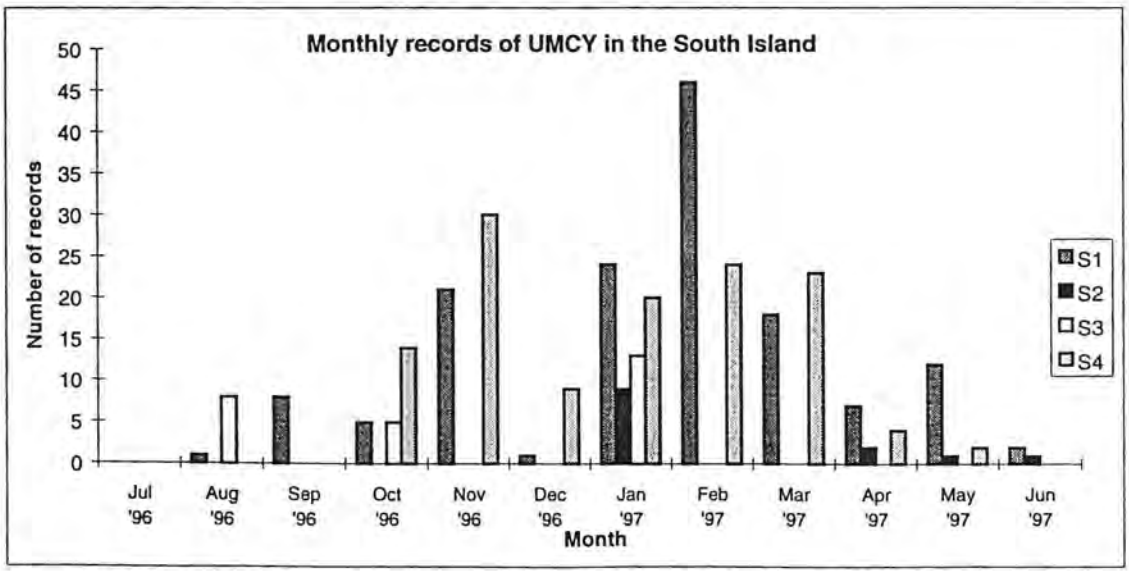
TABLE 2.7 - Records of Upper mid-crown yellowing by biological region

Geographical Region	Biological Region	Jul '96	Aug '96	Sep '96	Oct '96	Nov '96	Dec '96	Jan '97	Feb '97	Mar '97	Apr '97	May '97	Jun '97	TOTAL
N1	AK	0	0	0	0	0	0	0	0	0	0	0	0	0
	ND	0	0	0	0	0	0	1	0	0	0	7	1	9
	TOTAL	0	0	0	0	0	0	1	0	0	0	7	1	9
N2	BP	0	8	9	19	4	0	4	25	53	24	10	5	161
	CL	0	0	0	0	0	0	0	0	4	4	0	0	8
	TO	1	10	49	26	19	1	38	6	12	131	155	10	458
	WO	0	0	0	0	0	1	2	0	0	0	8	0	11
	TOTAL	1	18	58	45	23	2	44	31	69	159	173	15	638
N3	GB	0	0	0	0	1	0	0	11	20	7	0	1	40
	HB	0	1	0	0	0	0	27	1	3	6	7	10	55
	TOTAL	0	1	0	0	1	0	27	12	23	13	7	11	95
N4	RI	0	0	0	0	0	0	0	0	35	0	0	0	35
	TK	0	0	0	0	0	0	0	0	0	1	0	0	1
	WA	0	0	0	0	0	0	0	1	0	0	1	0	2
	WI	0	0	0	0	0	0	0	0	0	0	0	3	3
	WN	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	0	0	0	0	0	0	1	35	1	1	3	41
S1	MB	0	0	0	0	0	0	0	0	0	2	0	0	2
	NC	0	0	0	0	0	0	0	0	0	0	10	0	10
	NN	0	1	8	5	21	1	24	46	18	5	2	2	133
	SD	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	1	8	5	21	1	24	46	18	7	12	2	145
S2	MC	0	0	0	0	0	0	0	0	0	0	1	1	2
	SC	0	0	0	0	0	0	9	0	0	2	0	0	11
	TOTAL	0	0	0	0	0	0	9	0	0	2	1	1	13
S3	BR	0	3	0	0	0	0	9	0	0	0	0	0	12
	FD	0	0	0	5	0	0	0	0	0	0	0	0	5
	WD	0	5	0	0	0	0	4	0	0	0	0	0	9
	TOTAL	0	8	0	5	0	0	13	0	0	0	0	0	26
S4	CO	0	0	0	0	0	0	10	1	0	0	0	0	11
	DN	0	0	0	10	16	6	0	0	23	0	0	0	55
	OL	0	0	0	0	0	0	0	0	0	4	0	0	4
	SL	0	0	0	4	14	3	10	23	0	0	2	0	56
	TOTAL	0	0	0	14	30	9	20	24	23	4	2	0	126
GRAND TOTAL		1	28	66	69	75	12	138	114	168	186	203	33	1093

Fig. 2.7


New Zealand-wide records of UMCY by month
Number of records
250
200
150
100
50
0
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month


Monthly records of UMCY in the North Island
Number of records
180
160
140
120
100
80
60
40
20
0
NI
N2
N3
N4
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month


Monthly records of UMCY in the South Island
Number of records
50
45
40
35
30
25
20
15
10
5
0
S1
S2
S3
S4
Jul '96
Aug '96
Sep '96
Oct '96
Nov '96
Dec '96
Jan '97
Feb '97
Mar '97
Apr '97
May '97
Jun '97
Month

9.2 New Zealand Quarantine Report

Report by Geoff Ridley, New Zealand Forest Research Institute

9.2.1 Interceptions: For the year ending 30 June 1997 some 459 quarantine samples were received from Ministry of Forestry and Ministry of Agriculture quarantine inspectors. The source of these samples was - 290 (63%) from used cars, debris in or on containers 58 (12%), wood packaging 40 (9%), used machinery 32 (7%), timber 15 (3%), debris 11 (2%), dunnage (1%), and miscellaneous 9 (2%). The geographic area of origin of the samples was - Japan 285 (62%), rest of Asia 36 (8%), Australia and PNG 47 (10%), North America 28 (6%), Europe 26 (5.5%), southern Africa 9 (2%), northern Africa/ Middle East 2 (0.5%), Pacific 6 (1.5%), unknown 20 (4.5%).

9.2.2 Port Environs Inspections: A system that ensures full systematic coverage of parks and reserves within a 5 km radius of each port has been developed. Inspection sites, chiefly parks and reserves, are to be chosen on an objective rather than subjective basis. Parks to be inspected are selected by segmenting the area within a 5 km radius of the port into 1 km wide concentric bands and each band is quartered a specific number are chosen within each segment. The area and number of parks to be inspected are given in the following table

Distance from port (km)	Total area (km^2)	Segment area (km^2)	Number of parks for each quarter
1	3	3	1
2	12	9	3
3	28	16	5
4	50	22	7
5	78	28	9

For instance, a maximum of 9 parks should be inspected in the North East quarter between 4 and 5 km from the port. If a segment does not have the specified number of parks available then as many parks as are available are inspected. If a segment has more than the specified number of parks then a ranking system is used to select the parks to be inspected. Ranking is based on points allocated for the diversity of tree genera found in the parks, the number of commercial forestry trees present in the park, and for the importance of the trees present (notable scheduled trees, rare or unique species, and aesthetic value). Points are added and the parks are ranked by total point score. A trial of the procedure will be run in one segment of Auckland later this year to assess its practicality and coverage. It is intended to incorporate inspection of private property in to the procedure in the future.

9.2.3 Container Survey: In 1990, the FHAC formed a sub-committee to examine the quarantine risk associated with various cargo types. The goal was to develop a cost-benefit model so the optimum level of quarantine inspection could be determined. Inspections of over 2,500 containers carrying mixed goods (LCL) were analysed, 9.1% of consignments examined had contaminants. Another 9,000 full containers (FCL) were examined and the contamination rate was 4.2%. The next step involved following 500 containers that had been door-inspected to their final destination and examining the contents for contaminants as the cargo was unpacked. The follow up study determined that many contaminants are missed during door inspections, but

most of those missed are of little significance. 20% of significant contaminations were missed during door inspections. A model is being developed to compare cost of inspection to the benefit gained from intercepting quarantine targets, which will determine the optimum level of inspection.

Earlier this year, external surfaces of containers from the Russian Far East were found to be contaminated by egg masses of the Asian gypsy moth *(Lymantria dispar).* Generally, containers are not examined for contaminants borne externally, except when suspected of carrying the giant African snail and now, if they originate from the Russian Far East. The current finding shows that it is not safe to assume that containers do not carry contaminants externally and that it is necessary to examine them to ensure that they are clean. The sampling intensity of such an examination would depend upon the proportion of contaminated containers in the total container population. This proportion is not known, either from local or overseas studies and is the subject of a current study. Contaminating biological material will be examined for forestry and agricultural diseases and pests.

9.2.4 Car Survey: The deregulation of the car industry has seen a dramatic increase in numbers of used cars imported into New Zealand. These cars often contain large amounts of plant debris. It is the intention of MAF to institute, when funding becomes available, a survey of pest and disease organisms accompanying this debris. The survey will cover a sample of 4500 cars from Japan and all cars from other countries (note: Japan is the source of 95% of used car imports). The samples will be analysed by FRI.

9.2.5 Pitch Canker: As part of a risk analysis to plantation forestry in Australasia by *Fusarium subglutinans* f. sp. *pini* a number of potential pathways for the entry of the pitch canker fungus into New Zealand were recognised. These are *Pinus* seed, plant material associated with used logging machinery, timber used as wood packing and bark and twig insects which have been shown to transmit the disease in North America. Used logging equipment and seed are considered to have the highest probability of establishment whereas packaging timber had the lowest.

New Zealand's response to the threat was discussed at the workshop held on 4 November at FRI. No final decisions were made by the workshop and the development of a strategy for dealing with the threat was deferred to the Committee of the Forest Health Collaborative.

9.2.6 Seed Testing Protocols: The importation of *Pinus* seed into New Zealand requires the seed to be either accompanied by an International Phytosanitary Certificate stating that the seed was collected from an area free of pitch canker and to be dressed with fungicide; or for the seed to be tested by FRI for the presence of *Fusarium subglutinans* f. sp. *pini* before release. No such restrictions apply to Douglas fir seed but there was a general agreement by forestry companies at the Pitch Canker Workshop that Douglas fir seed should be submitted to FRI for testing. Protocols are being established to define the disease areas from which seed should be tested. Future research to determine if heat treating seed will effectively destroy *Fusarium* contamination is in the planning stage.

9.2.7 Imports of Forestry Related Material: A number of risk analyses were produced for MAF. The most significant concerned the importation of *Rhizopogon* spore suspensions for inoculating commercial nursery beds of *Pinus radiata* and *Pseudotsuga menziesii*. We were able to convince MAF that there was a lack of research data to suggest that these inocula would improve tree survival or growth and that they posed a risk of introducing disease as they were not axenic cultures of the desired fungi. MAF has stopped issuing permits for the importation of these products.