RESEARCH WORKING GROUP NO. 7 - FOREST PATHOLOGY

REPORT OF SEVENTH MEETING

COFFS HARBOUR 25-27 NOVEMBER 1986

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HELD AT
THE R.S.L. CONFERENCE CENTRE
COFFS HARBOUR

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ITEM 1. PARTICIPANTS

Representing the Coordinator

Mr J. Brian Schaumberg	Queensland Department of Forestry

Members

Dr Bruce N. Brown	Queensland Department of Forestry
Dr Glen A. Kile	CSIRO Division of Forest Research (Tasmania)
Mr Sam Navaratnam	Department of Primary Industry (Plant Health and Quarantine)
Dr Ken M. Old	CSIRO Division of Forest Research (Canberra)
Dr Doug G. Parbery	University of Melbourne (School of Agriculture and Forestry)
Dr Frank D. Podger	CSIRO Division of Forest Research (Tasmania)
Mr Jack Simpson(1)	Forestry Commission of N.S.W.
Mr John Tierney (*vice* Dr Lyn Bolland)	Queensland Department of Forestry
Dr John D. Thornton(2)	CSIRO Division of Chemical and Wood Technology
Mr Tim Wardlaw	Forestry Commission of Tasmania

1 Chairman
2 Secretary

Observer (Part-time)

Mr Charles M. Mackowski	Regional Research Forester

ITEM 2. Secretary's Introductory Remarks

At the previous meeting, 1984, a total of 13 members were present with five members being absent. Of those five one was retired, two were overseas, one had alternative work arrangements, with only one (from Western Australia) failing to obtain travel funds. However, two other WA members were present and other states (particularly Victoria and South Australia) were represented.

In contrast, at this meeting (1986) a total of 10 members were present with eight members absent. Of those eight (a further) one was retired, one had other work commitments and one was overseas. However, the remaining five were all absent due to a lack of travel funding. Furthermore the absence of the five meant that the State Forest Services of Victoria and Western Australia were not represented. Also the two CSIRO members resident in WA were not funded, leaving no representation at all for WA at this meeting.

The lists of participants for the 1984 and 1986 meetings shows that only seven members attended both of these meetings.

Bearing in mind what is stated in the three previous paragraphs, I have had to give a lot of thought as to the format for the minutes of the 1986 meeting. DORC require a short report with the Recommendations, and the "Brief Report for DORC" is clearly all that they need. For members of RWG 7 it is different. I have taken the view that those members not present at the 1986 meeting are entitled to a full version of what was discussed. I believe this is necessary also if one thinks ahead to the next meeting, where the participants may not be exactly the same as those at this meeting, and where covering the same ground twice will hopefully be avoided by the availability of a full report of this meeting.

Despite the reduced numbers of participants, the one and a half days discussion was fully occupied with thorough attention being paid to all matters raised (with the possible exception of *Phytophthora*, owing to absence of WA and Victorian State Forestry representatives). The Field Day was also fully occupied, with local forestry officers David Ryan and

Charles Mackowski showing participants the forestry practices and problems typical of NSW north coast hardwood forests and *Pinus* plantations.

ITEM 3. Brief Report for DORC

In accordance with the desire of DORC to have a brief report of RWG meetings, this ITEM is written with the intention of satisfying this need. A "Full Report for Members" has also been compiled largely for the information of members who did not attend this 7th meeting of RWG 7. (NOTE: The Full Report will not be sent to DORC, unless they should request to see it after they have read this Brief Report).

Only a total of ten members attended this meeting, a lack of travel funds denying us the presence of the Victorian State representative, both the State WA members, and those CSIRO DFR members based in WA. Despite this we had a full agenda to fill the one and a half days discussions, plus a field day. The field days are invaluably informative, this one concentrating on "superculture trials" of *Eucalyptus grandis*, ambrosia beetle attack, cavity development in blackbutt, bluestain associated with *Ips*, and local nursery stock problems.

The Acting Coordinator, Brian Schaumberg welcomed the participants and, following a previous request from the Chairman, outlined how DORC viewed the RWG's and what DORC expected from them. This led to some lively discussion of DORC's view that policy matters should not be discussed, with members pointing out that some of the topics of RWG 7, particularly quarantine, are essentially policy matters but are directly relevant to our activities.

Mr John Walker, though unable to attend, had provided an incomplete list of tree rusts. The real concern is that many have alternate hosts of possible horticultural interest and may be introduced on these alternate hosts. The meeting encouraged John to continue work on these lists.

Having been put on somewhat low priority by individual members concerned, no progress had been made with the writing of Pest and Disease Leaflets.

These are expected to commence soon.

Correspondence received since the 1984 meeting included the following:

(a) a letter from member Sam Navaratnam expressing concern at some of the matters discussed in his absence in 1984. This meeting pointed out that some of the misunderstandings had arisen owing to the 1984 meeting having taken place without Quarantine representation.

(b) several letters concerning mvoement of pine planting stock and the possible spread of *Dothistroma septospora*. A one-day meeting of interested parties in Melbourne has proposed that before plants went from an area where *Dothistroma* was known to be present (even if the plants did not have obvious symptoms, but the area was known to be infected) the plants would have to go thorugh a quarantine procedure. This topic is further complicated by Victoria being willing to accept risk of *Dothistroma* while South Australia wishes to exclude it.

(c) The *Ips grandicollis* in NSW proclamation (*Ips* causes blue stain affecting colour brightness for paper quality). Systems for spraying, fumigating, and minimising log storage now established.

(d) Parks and Wildlife export of plant material. Restrictions unfortunately include fungi, but since the latter are so readily propagated their cultures should be excluded from this policy.

(e) Committee for common names for plant diseases. It was reported that this committee had not yet got going.

(f) Australian Forestry Terminology. It was believed that no progress had been made on RWG4's Recommendation for a working party to produce a standard terminology.

Chairman's Report

Mentioned the severe financial cuts organisations had received since last meeting and their possible impact on functioning of RWG's. (This led to

lengthy discussion later (see RECOMMENDTION NO. 1)). Noted two enquiries were in progress that were looking at ways that Quarantine Service, Museums and Collections could all be "made to pay for themselves". Any changes in these areas would be expected to have an impact for forest pathology.

Since the last meeting a change of interests within the profession was noted, with *Phytophthora* less obsessive, less interest in *Pinus* foliage diseases and much greater interest in diseases of native forests.

State Reports and Ancillary Reports

(a) Tasmania. Outbreaks of *Dothistroma*, at present restricted to the north of the state, are being monitored, but no formal arrangements have been made regarding long-term operational control (though there is interest in using progeny showing some resistance). A review of all research results pertaining to eucalypt regrowth dieback is being prepared. Management of dieback affected forests is by salvage logging or salvage thinning. No further work done on *Phytophthora cinnamomi* which is not causing a long term problem in production forests. Wood rots of branches and stubs are being investigated for their influence on the utilization of mature trees. Fungi associated with spring needle of *Pinus radiata* cast have been surveyed and identified, with the disease being largely amenable to control by keeping the stand well aerated. Seasonally recurrent nursery disease problems were listed. Myrtle wilt is widespread and severe, and the current understanding of its etiology was given.

(b) New South Wales. Establishment of *Marssonina castagnei* on white poplars was noted, with some disussion on how splash-dispersed fungi such as this can be rapidly dispersed over large distances. No dramatic change in the disease situation with *Pinus* spp., with research into two species causing premature needle senescence, two *Fusarium* species possibly capable of causing pitch cankers of southern pines, and a detailed study of microflora and microfauna associated with introduced bark beetles. Also looking at relationship between causal decay organisms and termite attack of *Eucalyptus* spp.

(c) Queensland. An extensive report covered *Phytophthora* in tropical rainforests, and species other than *Phytophthora cinnamomi*, with maps of distribution and tables of isolates grouped under elevation, locality, forest health, management history and pig activity. Environmental data and relationship between rainfall and resultant soil moisture levels were also given. A statistical evaluation of fitting a generalized linear model to survey data was given for forested areas. Health status of trees in observed plots in patch-death affected rainforest is included. *P. cinnamomi* is causing deaths on ridgetops, a complete antithesis of what would be expected for the fungus. Other diseases discussed were a root rot of Hoop pine and a shoot dieback of tallowwood.

Research has continued into an examination of the potential for biological control of the root-rotting fungi *Phellinus noxius* and *Poria vincta* in plantations of hoop pine. Of the four potential control fungi selected, *Trametes versicolor* grows best when inoculated into stumps. However, all four are being tested for any pathogenicity on both live trees in thinned sites and in greenhouse inoculations of seedlings. For clearfelled sites, one of the most common fungi found in stumps is *Tyromyces* sp., and when inoculated into stump it decays them completely whilst excluding *P. vincta*. The advantages of *Tyromyces* sp. as a biocontrol fungus were presented.

(d) CSIRO Division of Forest Research (Canberra). Genetic variability and pathogenicity of *P. cinnamomi* were discussed. No new recombinants were found, so getting no genetic variation. This topic brought out a lot of discussion, including the problems of registration of pesticides and herbicides and the difficulty of early access to other peoples test data for Australian conditions. Later in the meeting a decision was made for the incoming chairman to look at the possibilities for making data quickly available.

(e) Western Australia. In the absence of WA representatives, the meeting received two written submissions. One from Brian Shearer dealt with *P. cinnamomi* under headings prediction of impact, processes within sites,

assessment of damage. The situation with *Armillaria* and the susceptibility of four *Eucalyptus* species to *Botryosphaeria ribis* were presented. The other written report, from Joanna Tippett, dealt with rate of extension of lesions of Jarrah caused by *P. cinnamomi* and with root loss relationships with water relations of the tree. The aim is to define relationships between site wetness, disease development and symptom expression in order to be able to better predict impact of *P. cinnamomi* on particular sites or in response to unusual climatic events. A project on decline in Wandoo is in its early stages, with the aims being outlined.

Contingency Planning Workshop

The Acting Coordinator told us that DORC:

- fully commended those three RWG 7 members on the workshop
- fully supported all seven recommendations
- has referred it all back to FFPPDC meeting for other comments from States.

Standing Committee set up a committee (chaired by Marcia Lambert) to look very closely at Recommendations 1 to 6.

This meeting considered endorsing the recommendations of the Workshop, accordingly this was formally proposed and seconded, with no-one dissenting from that view.

Plant Quarantine

The chairman pointed out that one of the real problems with the quarantine service is that quarantine is a national function but once disease is established it becomes a state responsibility, and the problem then is the availability to the state of sufficient money for quick action to be taken.

The chairman expressed concern at current plant quarantine policy and described three specific cases where procedures were unsatisfactory and

increased the risk of introducing forest tree diseases. These related to *Cupressus* seed, bonsai plants and eucalypt foliage.

The quarantine representative in reply provided an explanation for the three examples cited and he also outlined the revised policy for nursery stock.

The meeting concluded that there was still some disquiet about quarantine matters and a small group was nominated to formulate a Recommendation (SEE RECOMMENDATION NO. 3).

Armillaria

Though there must still be some undiscovered *Armillaria* species in Australia as tropical areas have not been adequately investigated, the four species described are believed to be the major species in terms of distribution, with *A. luteobubalina* being the important one in terms of pathogenicity. Chances of survival and spread of any *Armillaria* species introduced in the future was expected to be remote.

A document on the ecology of *A. luteobubalina* in karri in W.A. forests gives extensive detail of experiments in progress. With death of hosts directly related to presence of nearly infected stumps, the possibility of biological control is considered worthy of further investigation.

Assessment of resistance of superior clones to common pathogens

If claims for superior growth rate are reliable then we are likely to get substantial plantings of a few clones. It was stated that it would be desirable to test these against the common pathogens for which resistance tests are available.

It was pointed out that such tests are not available for all the pathogens. However, depending on the State where the material is to be

grown, some pathogens would be potentially dangerous with others not worth considering. With only a few clones being considered for planting, members did not believe that it be too big a job of testing (with the possible difficulty of many different races of the same species of potential pathogen in some cases). Since growers would probably be looking at harvesting small dimension material, it was considered that those pathogens capable of destroying shape (e.g. stem invaders, leader damagers) ought to be included. Also worth considering if material should be sent overseas for testing against, for example, Western Gall rust.

Members resolved to consider a recommendation on this (SEE RECOMMENDATION NO. 2).

Eucalypt canker fungi

Work on fungi associated with eucalypt cankers in WA had now been terminated and a report presented. Results showed that *Botryosphaeria ribis* and a species of *Endothia* are wound pathogens with ability to cause similar symptoms and cankers on jarrah, wandoo and karri in WA. However, they are infrequently isolated from the cankers, hence it seems likely that other unidentified pathogens may also be involved and that eucalypt cankers have a multiple cause.

The Canberra research showed that five eucalypt species outplanted in the nursery had an ability to limit canker development following inoculation with a range of isolates of *Endothia gyrosa* and *Endothiella* spp. Indications were that, for some combinations, defoliation delayed wound healing, but drought stress had no effect on canker severity.

Dr Old reported that he had recently found *Endothia parasitica* on *Eucalyptus* spp. in Japan causing large cankers. *E. parasitica* is the cause of chestnut blight in North America and Europe.

Defects in Regrowth Stands

The "Young Eucalypt Program" was discussed. An interesting program in terms of its organisation, its orientation, in securing industry

involvement in research from the start, and the mechanisms for transfer of resarch results into practice. This program has only just begun, pathology research will involve a comparative analysis of the development of decay and discolouration in thinned and unthinned stands and establish whether new thinning technologies can reduce the incidence and severity of damage. The canker work could form a significant part.

NSW are looking at the kinds and incidences of fungi associated with defect in a sample of trees from a potential intensive silviculture trial of flooded gum (currently growing at 30 m^3 with some plots at more than 50 m^3 per hectare per annum). This trial was seen and discussed at the field day.

Rust Diseases of Forest Trees

At the Burnie meeting, it was agreed that preparation of lists of exotic rust diseases which could attack trees growing in Australia be prepared. Absent from this 7th meeting, John Walker had submitted details of his progress as follows: a list of all the rusts of *Pinus* species and their alternate hosts is 90% completed. No work has been done yet on rusts of conifers other than *Pinus*. A list of rusts of broad-leaved trees is in preparation, though is a much more extensive area than that covered by the other two lists.

Members appreciated the work done so far and asked that the Secretary write to Mr Walker and ask him to continue with this most valuable work.

Studies on the genetic variability in susceptibility of *Pinus radiata* to Western Gall Rust have shown the New Zealand and Australian select families to be intermediate in susceptibility between the Ano Nuevo and Monterey populations, from which the New Zealand and Australian land-races are derived. Results suggest that breeding for resistance to the disease is likely to yield worthwhile changes in average susceptibility.

Bibliography of Australian Forest Pathology

Two members of RWG 8 have almost completed a bibliography of Australian

Entomology. The then Coordinator (Ian Bevege) had indicated it might be desirable for RWG 7 to produce similar for Australian Forest Pathology. Members concluded it would be a large undertaking for a small audience; that there would be problems deciding which of the many *Phytophthora* references related more to Agriculture rather than Forest Pthology; that there is a list of Plant Pathologists enabling anyone new to make suitable contacts for references; that the disease leaflets RWG 7 will produce will have adequate key references. The group concluded not to attempt to produce a bibliography of Australian forest pathology.

General Business

Dothistroma and its toxin Dothistromin were discussed at length. A document "Dothistromin in Forests' of New Zealand origin has based a "safe dose" on extrapolations from the body mass of laboratory test animals to the body mass of humans. However, it appears to be in error in that the lethal value for the animals has been used in order to arrive at the safe level for humans. Members considered it not to be the Groups role to be making recommendations as to whether or not forests with the disease should require certain precautions, treatments or exclusion of people. Members concluded this was a health problem to be considered by qualified medical persons and recommended accordingly (SEE RECOMMENDATION NO. 4).

Election of Office Bearers

Both the Chairman (Jack Simpson) and the Secretary (John Thornton) of the 7th meeting proposed to stand down. The new Chairman is Doug Parberry, and the new Secretary is Tim Wardlaw.

The new Chairman thanked the outgoing officers. He thought probably May 89 would be a suitable time for the 8th meeting. Since Melbourne University has facilities in both Gippsland and Central Victoria, the possibility of a split meeting was to be considered. He would wait until discussions with his Victorian colleagues before proposing any particular themes, highlights or special topics for the 8th meeting.

RECOMMENDATIONS

Recommendation 1 (Attendance at RWG's)

Background. Members were disappointed at the lack of attendance at this meeting. In particular members from WA, SA and Victoria were missing. It was felt that some priority should be given for travel funds for members to attend RWG meetings.

"THE MEETING EXPRESSED CONCERN THAT VARIOUS STATE FOREST SERVICES WITH ACTIVE FOREST PATHOLOGY RESEARCH PROGRAMMES WERE NOT REPRESENTED AT THE 7TH MEETING OF RWG 7. THE DELEGATES FEEL THAT THESE MEETINGS ARE OF IMMENSE VALUE IN REVIEWING FOREST DISEASE SITUATIONS, AND IN FRANK EXCHANGE OF VIEWS AND OPINIONS.

IN VIEW OF THE DECLINE IN GOVERNMENT SUPPORT FOR OFFICERS TO ATTEND WORKING GROUP MEETINGS IT IS RECOMMENDED THAT THE STANDING COMMITTEE REITERATE AND RECIRCULATE ITS OBJECTIVES IN SETTING UP THE WORKING GROUPS AND THAT SUCH A STATEMENT SHOULD INCLUDE AN EXPRESSION OF THE IMPORTANCE OF THIS AND OTHER WORKING GROUP MEETINGS TO THE WELFARE OF FORESTRY IN AUSTRALIA."

Recommendation 2 (Clonal planting material)

Members were concerned at the possible disease risk increase associated with the use of clonal material. It was wondered whether DORC might like to consider the desirability of having a joint sub-committee look at this over the next few years.

Recommendation No. 2

"THE MEETING EXPRESSED CONCERN THAT WITH INCREASING USE OF CLONAL PLANTING STOCK OF SPECIES OF *PINUS* AND *EUCALYPTUS* THERE WOULD BE A POSSIBLE INCREASED RISK OF SERIOUS OUTBREAKS OF DISEASE.

THE MEETING URGES DORC TO BRING TO THE ATTENTION OF RWG 1 THE DESIRABILITY OF EVALUATING THE SUSCEPTIBILITY OF CLONES THAT ARE TO BE USED EXTENSIVELY

TO THE MORE SIGNIFICANT LOCAL AND EXOTIC PATHOGENS.

THE MEETING CONSIDERED IT DESIRABLE THAT A JOINT WORKING PARTY BETWEEN RWG 1 AND RWG 7 BE ESTABLISHED TO REVIEW THE EXTENT TO WHICH RESISTANCE TO PATHOGENS NEEDS TO BE CONSIDERED IN AUSTRALIAN FOREST TREE IMPROVEMENT PROGRAMMES, AND TO REPORT TO THE NEXT MEETINGS OF RWG 1 AND RWG 7."

Recommendation 3 (Plant Quarantine)

Members continue to be concerned with the danger of introduction of dangerous pests and diseases and believe there is a real risk of the level of this danger increasing following changes within-house in the philosophy of approach of the plant quarantine service. The meeting emphasised the need for early implementation of the recommendations of the task force that dealt with the handling of dangerous introductions and recommended urgent review of the implications of this new approach within plant quarantine for the health of Australian forests. The RWG members do not have sufficient information on quarantine policy at this stage, and it was felt that someone of higher authority should look into the policy. It was pointed out that at the Burnie meeting (6th meeting) of RWG 7 there was a suggestion that Plant Quarantine wasn't looking at areas it should have been looking at where we believed there were real problems. What was different at this meeting was that here we are believing that there must have been a whole change of philosophy in the Plant Quarantine Service and we are even more concerned to voice this disquiet than we were at Burnie. We get the impression that the change in philosophy is to facilitate trade since clearly a change in volume, i.e. increase, of material has occurred. It is to be noted that the Plant Quarantine representative, Mr Sam Navaratnam, was diplomatic in his approach and pointed out the subjective nature of some of the quarantine work and the problems with some importers deliberately falsifying the description of goods. The examples of specific concern, such as *Eucalyptus* leaf imports for Koalas, the import of *Pinus thunbergii* and the import and export of seeds for Bonsai, were all brought up by members other than the Plant Quarantine representative. When this third recommendation was worded and put to the meeting (in the form given below) it was noted that all members indicated that they were in favour of the recommendation, with one and only one

exception; Mr Sam Navaratnam was not in favour.

Recommendation No. 3

"RESEARCH WORKING GROUP 7 IS CONCERNED THAT RECENT CHANGES IN THE AUSTRALIAN PLANT QUARANTINE SERVICE HAVE SIGNIFICANTLY INCREASED THE LIKELIHOOD OF NEW INTRODUCTIONS OF FOREST PESTS AND DISEASES FROM OVERSEAS. THE GROUP RECOMMENDS: (I) EARLY IMPLEMENTATION OF THE RECOMMENDATIONS FOR THE WORKING PARTY ON PEST AND DISEASE CONTINGENCY PLANNING; (II) AN URGENT AND DETAILED REVIEW OF THE CHANGED PLANT QUARANTINE PRACTICES AND THEIR POSSIBLE CONSEQUENCES FOR FORESTRY."

Recommendation 4 (Dothistromin)

The members considered a document of New Zealand origin which concerned the toxin Dosthistromin from the needle blight fungus *Dothistroma septospora*. Calculations in this document extrapolated certain doses from tests on rats to what would be expected for a human of average weight. The level arrived at was of concern to members, because it was believed that what they were calling a "safe" level really the toxic level. Discussion on this toxin was extensive, but the Group agreed that we should refer to DORC through the coordinator that we are not competent to judge something which is essentially human medicine.

Recommendation No. 4

THAT THE QUESTION OF A POSSIBLE HEALTH RISK ASSOCIATED WITH EXPOSURE TO DOTHISTROMIN BE REFERRED TO NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL FOR EVALUATION.

Full Report for the RWG 7 Members

The following is a complete report of this meeting and it is made up of ntoes taken at the time by the Secretary, tape recordings of the discussion sessions and the various State and Ancillary Reports. The latter reports have, where necessary been divided and placed into the appropriate discussion Item, rather than presenting them as separate and complete State Reports.

The following initials will be seen in the margin and serve to identify members as follows:

BS Brian Schaumberg
BB, Bruce Brown
GK, Glen Kile
SN, Sam Navaratnam
KO, Ken Old
DP, Doug Parbery
FP, Frank Podger
JS, Jack Simpson
JT, John Tierney
JDT, John Thornton
TW, Tim Wardlaw

GM, Geoff Marks (who although absent had conveyed material in separate conversations with GK and JDT)

ITEM 4. Apologies

Apologies were received by the Secretary from the following:

Mr John Walker, who has a very heavy workload and currently attempting to finalise other projects.

Dr Jack Warcup, who has retired from Waite Agricultural Research Institute and has sent a letter of "resignation" from the Group (incoming Secretary to contact Waite re. replacement member)

Prof. John Brown, who was overseas.

Dr Brian Shearer, Dr Joanna Tippett, Dr David Murray, Dr Nick Malajczuk and Dr Geoffrey Marks, all of whom would have been available, but were unable to secure travel funding.

ITEM 5. Introduction of new members and visitors

Mr Tim Wardlaw of the Tasmanian Forestry Commission was introduced; replacing Dr Chris Palzer who now has commitments outside pathology research. Similarly, Dr Lynton Bolland of the Forestry Department of Queensland now has a managerial role and accordingly Mr John Tierney of the same Department was introduced as replacement.

The Chairman introduced also Mr Charles Mackowski, a Regional Research Forester based at Coffs Harbour, who was an observer during the first day of the meeting.

ITEM 6. Opening

Mr Brian Schaumberg (Queensland Department of Forestry) welcomed the participants to the meeting on behalf of DORC, as Acting Coordinator.

Prior to this meeting the RWG7 Chairman had asked Mr Schaumberg to prepare

and deliver an outline of how DORC viewed the RWG's and what DORC expected from the RWG's. He mentioned the RWG's should facilitate and establish research contacts, and identify the gaps. Communication is the problem, use of newsletters mentioned. No good doing good research work unless put knowledge into practice by publication. It is largely recognised that the recent contingency Workshop was held largely as a result of the stimulation from this RWG together with RWG8.

The meeting should concentrate on research matters, DORC don't like to see policy maters discussed (i.e. policy made by government and standing committee). DORC main function is to manage the RWG sysem and to bring forward to Standing Committee tailored recommendations from RWG's. DORC would like to see more attention paid to preparation of meetings, to see big agenda and a theme, like to see agenda in advance, if meeting big enough like to see leaders appointed to lead discussion on certain sections. The Report should be concise, include summary, recommendations with priorities. Like to see this as a separate letter to report but submitted at same time as the formal report. If there are specific recommendations which are best put by a member rather than by the coordinator, then by special arrangement the member can attend DORC meeting to put recommendation. Like to see statement of objectives for next meeting, time, place and any specific theme for meeting.

DORC discusses recommendations and report. Filters those recommendations from standing committee which are outside terms of reference. Once a recommendation is not being put forward it is responsibility of the coordinator to go back to RWG and explain reasons why. Job of coordinator to facilitate communication between DORC and RWG's, perhaps haven't been working as well as was originally intended, due to isolation and travel expense. DORC has looked at itself recently and hasn't been satisfied with what it is doing, has looked at terms of reference with view to DORC assuming a more dominating role in application of research results.

Q. How are the coordinators chosen?

A. Coordinators chosen by round table discussion.

FP. Questioned need for a theme. we are not here to hold a conference on some topical subject. but to review the whole area of Forest Pathology.

BS. Unless you have a theme the group may then attempt too much in time available.

FP. We are basically in house. reports needn't go beyond DORC, so I am therefore puzzled about sensitivity of talking about policy matters. Can't discuss quarantine, without discussing policy. For example, last time we discussed quarantine, and policy, and what came of it was, as far as we have heard from DORC, the desirable result of a Contingency Plan. FP pointed out that another would come up this week. Dothistromin, that none of us have a direct research interest in but where this policy decision will be of prime interest and concern to members. Effectiveness of this group would be reduced if policy matters as well as quarantine could not be considered.

FP. Simply a matter of standing committee getting understanding that RWG's have no right to set policy, but we have right to criticise and pass these criticisms "in private" to DORC for their consideration.

DP. All members are dependent on the goodwill of the organisation we work for. Pointed out recommendation may be needed for priority for attendance at RWG's.

BS. There have been criticisms of cost of running working groups.

DP. What may be needed is a statement of objectives and importance of standing committee. DORC and RWG's so individual members have something on paper to put up in a submission for funding. A "reinforcing" document is in effect what is needed.

BS. Would be a reasonable recommendation for you to make.

Chair asked DP and FP to help coordinate a recommendation.

ITEM 7. Minutes of 6th Meeting

These were accepted by GK and seconded by DP.

ITEM 8. Business arising from the Minutes of the Sixth Meeting

(a) List of tree rusts by John Walker. ongoing.

JS. The list has concentrated so far on rusts of *Pinus*. Real concern is that many have alternate hosts of possible horticultural interest and that these rusts will be introduced on alternate hosts. Obviously he has not got very far with rusts of other trees. One of the real concerns is that at the Contingency Workshop people did not have much confidence that, if rusts were introduced, they would be effectively contained or eradicated. That is also JW's view. DP thought that this conclusion is reasonable based on the few we had seen spreading in recent years. Members voted to commend JW for this time-consuming exercise and may it please continue.

(b) Pest and disease leaflets. Not much has happened. JS has put it on lower priority than it deserved. Authors would be approached in next few weeks and get going again. Financing for it is still secure, according to KO. JS made firm undertaking to get this motivated very quickly, within next month.

ITEM 9. Correspondence

1. 11 June 1984. SN complained about members having complained about quarantine. However, Quarantine section welcomed areas of risk being pointed out by people at this and other meetings. However, there are political policy areas which are obviously out of bounds.

FP. Pointed out that some of the difficulties and apparent misunderstandings that followed can be largely considered to be due to the 6th meeting having taken place without Quarantine representation.

2. Southern tree breeding people and the movement of pines. Letter from the chairman of the tree breeding association. Various letters including Joe Lansberg to Wal Gentle, telex Alan Brown and Joe Landsberg to Jack Simpson.

In response to question of where all this correspondence led to (DP), KO replied that it stopped plants moving from Francis Clarke's nursery to Otways at same time as *Dothistroma* discovered in the particular material that was being moved. BB understood that a recommendation had gone forward to Standing Committee that they consider setting up a *Dothistroma* sub-committee, with Victoria and SA representation to look at movement into what could be defined as *Dothistroma*-free areas.

JS. Gave the background that South Australia private pine growers heard of this movement in of cuttings, so a one-day meeting in Melbourne was held with 1 representative from SA, several Victorians and JS, and tree breeders. Colin Matheson put forward view that tree breeders had got to stage where gains in volume from use of select clones was so great that to not use these clones would result in substantial loss to pine growers. What was wanted was definitive view of hazard posed by introduction of *Dothistroma* into SA. Victorian Geoff Marks was willing to accept *Dothistroma* in Otways, that was a risk Victorians would countenance, whereas the South Australians had view that they did not want *Dothistroma* if they could possibly avoid it, it was an unknown risk and they didn't want to take the risk of finding out whether summer drought would negate an infection or control an outbreak. JS himself strongly opposed to movement. As a compromise it was proposed that before plants went from an area where *Dothistroma* was known to be present (even if the plants did not have obvious symptoms, but the area was known to be infected) was that the plants would have to go through a quarantine procedure. End result of all that was that Francis Clarke lobbied heavily at the following Standing Committee meeting, and then a week later admitted that he had *Dothistroma* in his cutting orchard, so he didn't proceed with establishment of further cutting orchard in Otways. JS understood that a cutting orchard had now been established at Colac with material

being moved into there.

FP. Expressed amazement that there wasn't a significant role for DORC in this and similar matters. Pointed out that DORC has the job of coordinating the various RWG's and here we clearly have a good example of tendency of the geneticist to believe that all gains that are to be made will be made through genes, and to forget that in establishing these select new plots they may be putting at risk the less productive areas of some 100 000s of hectares. JS pointed out that further confusion arose because of the NSW Forest Commission view that *Dothistroma* was only a problem where one gets associated sulphur and boron deficiencies, so that disease incidence is correlated with tree nutrition.

DP. Basic precaution must be taken when circulating material between states.

JS. The problem is one of <u>private</u> clonal propagators, would be no problem if it was a state government matter.

3. *Ips*. JS. The problem is one of paper colour brightness for pulp and paper. So we then put a quarantine on *Ips* for NSW. Took nearly a year to get proclamation proclaimed. After that it was discovered that the Forestry Commission NSW had no idea of pine bark movements to Canberra. A fumigation procedure (phosgene) for bark and chips, costing 30¢/m^3, now done at Grafton. Once the Act was enforced there has been no spread. Victoria made no attempt at quarantine so *Ips* had gone to within 40 km of NSW border. *Ips* coordinating committee established at Albury and a system for minimising storage of susceptible logs has been put in hand. There is a need to spray stockpiles.

JS. In mixes used there is partial (intentional or otherwise) composting. There is a lot of bark material still going into Canberra from Victoria as potting mixes, but *Ips* hasn't established in Canberra, and we haven't found live *Ips* in this material. It has been a very interesting exercise trying to implement a state quarantine.

BB. Based on experience and comments from Queensland entomologists, the problem is this magnitude of bark movement. Queensland has increased progressively quarantine area which currently extends to Bundaberg. Area has now increased three times by proclamation. Hasn't heard suggestion of fumigant use for Queensland. BB pointed out that movement by train also came to light and is currently being investigated.

JS. Surprise was magnitude of bark movements including bark on logs. *Ips* got taken in logs to Queensland from SA, Armidale was buying pine logs from Queensland; if get cheap logs then people are prepared to freight large distances. *Ips* has been in Adelaide Hills since 1943, but because of dry surrounds it never spread to SE until late 70's. Has also been in WA for long time. Think initially a lot of forest entomologists looked at *Ips* as potential pest to cause death of living tree, now appears of only minor significance in this role. F. Neumann in Victoria believes it to be less than 1%, and willing to accept this. What JS is worried about is the blue stain problem, with *Ips* being the vector for blue stain fungi. GK: are these blue stain fungi dependent entirely on *Ips* for spread? JS: there are three introduced bark beetles in Australia, *Ips grandicollis* which has *Ophiostoma ips* and two species of *Ceratocystiopsis*. *Hylastes ater* has *Ophistoma huntii* as constant associate and *Hylurgus ligniperda* has two species of *Ophiostoma* associated with it, *picea* and *piceapoliticola*, JS has paper submitted to Mycotaxon describing these fungi. The fungi seem to be associated with appropriate bark beetles. JS has an entomologist looking at *Ips* who has now found 15 mites, 5 nematodes, 4 mutualistic fungi; plus a number of yeasts all on *Ips grandicollis*, all very complex. Some of these mites are also vectors, but they travel with the *Ips*. In answer to question by TW of how much bluestain is due to *Ips* and how much due to airborne spores, we put in trials up here and removal of *Ips* by sprays halved bluestain in 700 mm billets, so still have large end effect. Paper submitted to Australian Forestry.

BB. One of the other factors which has bigger influence is those tree harvesting methods which strip the bark. Our local paper mill a number

of years ago worried about this, got rapid invasion by blue stain before the *Ips* problem.

DP. Pointed out available field of research for blue stain and insects, for example *Scolytis* in elms in Melbourne associated with a basidiomycete. When trees pruned in Melbourne, 90% of limbs gave this fungus.

4. Parks and Wildlifes exports of materials plants, and the fungus problem. Fungi are included in the policy which is quite an upheaval for those sending fungi routinely overseas (JDT). Those making policy evidently had not realised that can propagate fungi so easily in comparison to plants and that we are not "giving irreplaceable material away" when we send cultures overseas. JDT undersand there is a move to have fungi excluded from this policy.

5. Letter from GK to JS about committee for common names for plant diseases about which GK, DP and SN were to be members of that committee. GK reported that this committee had not yet got going.

6. Australian Forestry Termnology - June 85, L.T. Carron to JS. Research Working Group 4 resolved to recommend to DORC that Australian Forestry Council commissions and supports preparation and publication of a standard Australian Forestry Terminology and promotes its adoption. This project should be allocated to a working party drawn from Universities and state forestry services and be given a clear completion date. RWG7 members knew of no known progress on this.

Chairman asked if anyone moved to accept correspondence. BB accepted, seconded by KO.

ITEM 10. Chairman's Report

JS. Major change since last meeting has been severe financial cuts that a lot of organisations have had and the drastic reorganisatins that have taken place in some of the forest services and in the quarantine services about which we cannot do anything, but as they impact on the functioning of these research working groups JS would like to see a recommendation come out, as we discussed previously, recommending a continuation of support for the RWG concept. When we were preparing this meeting I was devastated at the apparent lack of attendance, but then found it to be comparable with the numbers attending entomology and some of other RWG's. Basically it is Victorians and WA members who couldn't be here today. It was noted that Bill Heather had retired and that there was no suitable replacement, Jack Warcup was retiring and a suitable replacement was expected in due course. A letter had been received from Nick Malaczuk in which he feels he may have to withdraw because his interests now are within nutrition and mycorrhizae rather than pathology. Ken Old pointed out that David Murray was in a similar situation to Nick in terms of changed research interests.

JS. Apart from Contingency Planning Workshop there were two other enquiries of interest to this group, the Federal Parliamentary Public Accounts Committee have been holding enquiries, the general thrust of which is how to make organisations pay for themselves. They have one enquiry which has issued its report, into the Quarantine services, to which both NSW Forestry Commission and NSW Department of Agriculture made submissions. This is something we should be aware of and concerned about. We have to consider that if Quarantine is to be made to pay for itself then the standards will plummet because of the pressures from industry saying extra impost of costs will be too much.

JS. Other Committee just ceased taking submissions is into museums, it was concerned with the Commonwealth's role in national collections, state collections, and the problem of how to make collections pay for themselves. Again NSW put in submissions pointing out the problems. JS believes collections should be regarded as (a) research tool, (b) the equivalent of public libraries having vast amount of material that

should be available to qualified public as data bases. A problem exists because national fungus culture collection is at three geographically separated locations (Queensland, NSW, Victoria) all of which are Department of Agriculture collections.

This raises a lot of problems about our contributions to the Commonwealth Agricultural Bureau, CMI, C. Inst. Entomology and things of that nature, whether Australia should be diverting these funds or giving them to our own National Institutions.

F. Podger asked how long the first enquiry had to run? It ceased takings submissions at beginning of November 86, expected to report within six months.

JS This continuing concern of making organisations pay for themselves is going to continue and is expected to be a real worry especially with regard to collections. Also important because there is a renewed interest worldwide in taxonomy of Australian plants and fungi, e.g. Ryvarden on Australasian polypores, a revision in Adelaide of Clelands collection of agarics and gasteromycetes, Sutton publishing lot of material on Australian coelomycetes, John Walker checklist of pathogens of NSW. With plants also lot of changes, Laurie Johnson has divided *Allocasuarina* into 10 sections for the Australian flora, changed name of white cypress pine to *Callistris glaucophylla*, doing massive revision of *Eucalyptus* to split into 10 genera and describing about 250 new species. In terms of usefulness it was pointed out that *Acacia* review has segregated out those species susceptible to certain rusts from those that aren't. It is hoped that review of *Eucalyptus* will have associations with disease susceptibility.

Quarantine is a continuing problem in Australia, import of seeds in particular. Seems strange that Quarantine policy is being published in Journal of Australian Nurserymans Association.

There are now changing interests with pathologists. *Phytophthora* is now less obsessive, less interest in *Pinus* foliage diseases and much greater interest with native forest eucalypt diseases.

ITEM 11. State Reports and Ancillary Reports

TASMANIA

1. *Phytophtora cinnamomi*

A paper entitled "Regeneration of *Eucalyptus* species in an Eastern Tasmanian coastal forest in the presence of *Phytophthora cinnamomi* has been submitted to Australian Journal of Botany for consideration. The abstract from the paper is attached.

No further research on *Phytophthora cinnamomi* by the Forestry Commission is currently planned other than the ongoing periodic measurement of long term plots at Chain of Lagoons.

2. *Dothistroma septospora*

Outbreaks of *D. septospora* have been recorded from two regions of the state:

(i) Several small localised outbreaks in APPM and Commission plantations south of Burnie on the North West Coast.

(ii) Two small localised outbreaks in the Commission's Star of Peace plantation in the North East.

The clearwood regime routinely used in many of the Commission's plantations is at present protecting retained trees from infections. In a ten-year old plantation at Oonah infected with *D. septospora*, retained trees have been pruned to approximately 3 metres while the cull trees have not yet been thinned from the stand. The pruned trees remain free of infection while the unpruned cull trees have been heavily infected particularly in areas with dense under-story.

No formal arrangements have been made regarding the long-term

operational control of the disease. It seems likely that APPM will spray infected plantations they manage under a pulpwood regime when necessary. The effectiveness of a clearwood regime in protecting plantations throughout the length of the rotation or until adult resistance appears has yet to be determined. AFH, the forest production subsidiary of APPM, have expressed interest in using progeny showing some level of resistance to *Dothistroma*.

3. Regrowth dieback

3.1 Examination of possible casual agents.

The description of the crown symptoms of dieback affected trees by Dr C. Palzer indicated that the disease had symptoms similar to those of the "yellow diseases" caused by MLOs. Investigations to determine the possible presence of MLO's in dieback shoots using;

(i) graft transmission onto *Vinca rosea* plants,
(ii) electron microscopy of leaf petioles from dieback shoots and *V. rosea* graft recipients
(iii) fluorescent microscopy of the leaf petioles from dieback shoots following incubation in the DNA fluorochrome DAPI.

All tests failed to indicate the presence of MLO's in shoots from dieback affected trees.

A review of all research results pertaining to regrowth dieback is being prepared.

3.2 Management of dieback affected forests

(i) Forests in the Scottsdale District of N.E. Tasmania

Many of the regrowth forests in this district are poorly stocked as a result of previous selective logging operations. The superimposition of regrowth dieback in such forests particularly those dominated by *E. regnans* has resulted in the recommendations of salvage logging in the most severely affected stands. Regeneration by aerial sowing following

logging using a seed mix containing a higher proportion of *E. obliqua* - a species which seems less severely affected by regrowth dieback than *E. regnans* - has been recommended.

(ii) Forests in Sprent area of N.W. Tasmania

These forests although containing patches of severe regrowth dieback have generally reasonable stocking levels. This situation has resulted in the recommendation of salvage thinning operation on a trial basis to remove the more severely dieback affected trees leaving approximatley 100 trees/ha final stocking of mostly healthy trees. Monitoring of thinned stands to determine growth response and crown health will be done on a regular basis.

(iii) Current status of regrowth dieback in Southern Tasmania

Analysis has been done of regrowth data obtained from plots in the Southern forests established and measured by CSIRO. Basal area increments rates of trees which were dominant (in terms of diameter) prior to the onset of regrowth dieback have increased in years subsequent to the nadir reached in the early 1970's. Basal area increment rates in the pre-dieback dominants are currently at levels equal to or greater than those attained in the 1950's prior to the appearance of regrowth dieback.

An examination of the correlation between basal area increment rates of dominant trees and the pattern of rainfall events preceding the end of the growth increment period - determined as a ratio of $R(y)-R(y-1)-R(_y-2)/(R(_y-1)-R(_y-3)$, where $R(_y)$ is the annual rainfall at the end of the increment period - is being done. Preliminary indications show a trend of decreasing growth rates following years with rainfall ratios less than unity (dry year following a period of wet years). Growth rates tend not to be depressed in years of low rainfall which are preceded by years of low rainfall.

4. Spring Needle Cast of *Pinus radiata*

A survey of the fungal associates of needles sample from plantations both affected and unaffected by Spring Needle Cast has been carried out as a co-operative project with Dr F. Podger. *Cyclaneusma minor*. *Lophodermium pinastri*, (and its anamorph *Leptostroma pinastri*), and *Strasseria geniculata* were found to be ubiquitous in *P. radiata* plantations irrespective of the presence or otherwise of Spring Needle Cast.

5. Wood rots in eucalypts

This project has recently been initiated. The scope of the study is concentrated on the examination of pathological problems associated with branch stubs, imperfectly shed branches and pruned branches. The species being studied include *E. regnans*, *E. obliqua*, *E. delegatensis*. *E. globulus* and *E. nitens* in plantations and intensively managed native forests. Some sample trees have been logged in association with a utilization study being done by Mr G. Waugh (CSIRO, DCWT) under the auspices of the Young Eucalypt Program. The sample trees taken will be sawn and the levels of decay quantified in early November.

A study to investigate and quantify reportedly high levels of internal decay in understocked *E. obliqua* forests south of Wynyard and *E. delegatensis* forests in the Deloraine district is scheduled to commence at the beginning of 1987. Both of these forests are approaching the end of their rotation so that the studies are primarily one of utilization.

6. Nursery diseases

Seasonally recurrent disease problems at the commission's nursery at Perth are usually:

(i) Upper stem rots of a variety of seedlings species caused by *Fusarium* spp and Pythiaceae present in untreated irrigation water.

(ii) Grey mould on a variety of seedling species caused by *Botrytis cinerea*.

(iii) Root rot of various species caused by *Phytophthora* spp.

(iv) Powdery mildew on *Eucalyptus* spp and *Crataegus monogyna* (Hawthorn).

Upper stem rot in *Eucalyptus* spp caused by Pythiaceae is effectively controlled by regular application of Ridomil. Treatment with fungicides has not been effective, however, in controlling upper steam rots in *Chamaecytisus proliferus* (tree lucerne) caused by Pythiaceae, and varous Proteaceae seedlings caused by *Fusarium* spp. The removal of fungal inoculum from the irrigation water by filtration has been effective in controlling upperstem rot in the latter two cases. The recent installation of a water chlorination plant should provide good control of upper stem rot diseases. Outbreaks of *Botrytis cinerea* were particularly severe in *Eucalyptus* spp seedling during the summer of 1984/1985. This was due largely to cultural practices in operation in the nursery at that time - luxury fertilizer levels in the potting mix resulting in the production of very lush foliage and close interplant spacing. The amendment of these cultural practices as well as a fortnightly alternating application of Benlate and Rovral to the most susceptible species from January until April. *Phytophthora cinnamomi* and *P. cryptogea* outbreaks occur infrequently. The *P. cinnamomi* outbreaks have been controlled by removing infected soils from the raised beds whenever detected. Granular Ridomil has been suggested as a possible fungicide for the treatment of open beds infested with *Phytophthora* spp.

Powdery mildew outbreaks have been common over the last two seasons. A particularly severe outbreak in *Eucalyptus nitens* seedlings growing in paper pots under shade was effectively controlled when the plants were placed under less shaded conditions offering better ventilation.

7. Miscellaneous Diseases

7.1 Stem cankers in *Eucalyptus globulus*

Occasional deaths of *E. globulus* growing in plantations have been reported over the past 12 months. Abundant fructifications of

Endothiella spp within the stem bark have been consistently associated with the dead trees.

7.2 *P. radiata* Needle Cast following Velpar Spraying.

Two reports of needle casts have been recently made in plantations previously sprayed with Velpar. In both cases the usually weakly pathogenic or saprophytic fungi *Lophodermiun pinastri* and *Strasseria geniculata* were fruiting abundantly on the majority of needles present on affected trees. Trees growing on a southern and eastern aspect are more severely affected.

Abstract

The composition of *Eucalyptus* regeneration following *Phytophthora cinnamomi* infestation in an open *E. sieberi* shrubby forest is examined.

On well-drained sites, regenerated by aerial sowing following logging, the proportions of each regenerating *Eucalyptus* species reflects the proportions used in the seed mix for aerial sowing.

Natural regeneration in a poorly drained, unlogged area which is infected with *P. cinnamomi* has an increased component of the field resistant *E. globulus* and *E. ovata* at the expense of the susceptible and previously dominant *E. sieberi*.

Even in the presence of *P. cinnamomi*, *E. sieberi* and *E. obliqua* seedling regeneration have significantly higher relative height growth rates than the field resistant species *E. globulus*, *E. ovata* and *E. viminalis* on all sites examined.

Frank Podger Spring needle cast we will define as the casting of the needles of the previous season at the beginning of the growth season in October/November. There are all sorts of other yellowings that don't fit that definition, hence now using spring needle cast term. In summary, the disease appears to be largely amenable to control by keeping the stand well aerated, i.e. thinning and pruning - so becomes a real problem for

pulpwood managed stands where they use outrow thinning at a late stage. The growth inpact of it hasn't been assessed except that it is very substantial on an individual tree basis and will require some calculations, along the lines of the NZ work, by APPM management people to work out if it is a really serious loser for them or not. So from a management viewpoint you can get out of it by growing for clearwood purposes. If that does suit you then there is a long term genetic prospect (and the NZ have already done some selections). The only remaining areas are those of etiology which we haven't looked at. Still not happy to believe that there is a primary pathogen, but still thinks there may be a role for a fungus. Tried a lot of experiments with a wide range of fertilizers and have had no responses at all including fairly heavy doses of gypsum, but it still remains that in foliar analysis the only chemical that is not there in levels deemed adequate is sulphur, so that is still worth looking at. Future research, look more closely at the ecology and phenology of fungal infection and to doing climatic analysis.

FP. *Phytophthora cinnamomi*

Primarily a problem for conservation, virtually no problem at all for production forestry, where forest services or government instrumentalities have the responsibility of management of lands such as poor quality heathlands and rainforests in SW Tasmania. Is a serious problem particularly for heathlands, but also for disturbed rainforest and close-by regeneration for some floristic elements. Of interest within this is the presence of *Phytophthora cinnamomi* doing severe damage in a very humid cool environment like SW Tasmania. I think we need a major reassessment on this question of the need for post-infection stress in *Phytophthora*, something which a number of people have been hanging onto for many years as an explanation of *Phytophthora* damage. TW; on all hosts, or just the most susceptible hosts? FP; Well at least in Tasmania if a species has any resistance of any kind at all, that is it can prevent stem invasion of the plant by any resistance mechanism at all, then there is no problem. Really only a problem for those species having no resistance at all. That's a fairly short list, may be only 20-30 species, mostly *Epacridaceae* and the *Liliaceae*. A lot of things that are repeatedly listed as hosts of *Phytophthora cinnamomi* which suffer quite severe impact in the initial

invasions still manage to stay in the communities and even increase after the inoculum drops so I think that we also need to think of susceptibility to *Phytophthora cinnamoni* much more in population terms than we had in the past, where we tended not to look at it in terms of how much of the population it took out. For things like *Epacris* and *Leucopogon* even though you lose a very high percentage of the plants in the first wave, they are still there in quantity after infection has passed and some of the things listed on host lists for which there are small percentage losses of population turn out in the long run to be increases after *Phytophthora cinnamomi* infection when there is more room opened up by the loss of the highly susceptibles.

Myrtle wilt

G.A. Kile, CSIRO Divison of Forest Research

Nothofagus cunninghamii (myrtle) the predominant tree species of cool temperate rainforest in Tasmania and the southern highlands of Victoria is currently affected by widespread and locally severe disease.

The disease syndrome was first described by Howard (1973) and was associated particularly with logging or roading operations which could lead to almost mass death of residual *N. cunninghamii*. Reconnaisance and recent surveys have indicated that the disease occurs in *N. cunninghamii* in the most remote and inaccessible localities and that even in these forests undisturbed by human activities, disease levels may be very high. Howard postulated that death was caused by a pathogenic fungus transmitted by the native ambrosia beetle *Platypus subgranosus*.

Research over the last 3½ years has significantly advanced our understanding of the etiology of the disease. Salient findings include:-

(a) A survey of 20 rainforest stands by H.J. Elliott on the TFC and G.A. Kile showed that the percentage of dead and dying trees ranged from 9-54% with an average incidence of 25%. Diseased trees occurred in patches with damaged and larger diameter trees having the highest incidence.

Disease incidence decreased with altitude, was related to myrtle stand density in some situations and was most severe in high quality rainforest stands on fertile soils.

(b) The disease is caused by the newly described species *Chalara australis* Walker & Kile. This fungus appears to be endemic to Australia although closely related to a species occurring in new Caledonia where *Nothofagus* species also occur.

(c) While the disease appears to involve a complex interrelationship between the host tree, an insect and the fungus, a vector role has not been established for *Platypus subgranosus*. Recent studies have shown that the fungus is air/water disseminated, is a wound pathogen and spreads underground by root grafts or root contacts between adjacent trees. *P. subgranosus* is most probably a secondary factor attacking trees already infected by the fungus. *C. australis* produces a range of volatile compounds and infected hosts are now known to emit ethanol to which beetles are strongly attracted. The hypothesis that beetles attack stressed trees and that the beetle tunnels serve as entry points for the fungus is also being evaluated.

(d) *N. cunninghamii* appears to be the only species infected by *C. australis* under field conditions but both *N. gunni* and *Trochocarpa gunni* have been infected or killed by artificial inoculation. The fungus also grows and sporulates on wound surfaces on a range of other rainforest species. This suggests that it may post a hazard to *Nothofagus* species elsewhere and that other tree species may contribute to inoculum build up within the forest.

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Kile, G.A. and Walker, J. (1987) *Chalara australis* sp. nov. (Hyphomycetes), a vascular pathogen of *Nothofagus cunninghamii* (Fagaceae) in Australia and its relationship to other *Chalara* species. Aust. J. Bot. 35 (In press)

F.D. Podger, CSIRO Division of Forest Research

Spring Needle-cast of *Pinus radiata*

This disease of *Pinus radiata* in closed stands in humid environments in Tasmania has been shown experimentally to be (i) insensitive to applications of a range of nutrient amendments, (ii) amenable to control by heavy thinning and (iii) responsive to fungicidal spray with a chlorothalinol-dithane formulation.

Its impact on the growth of susceptible individuals is severe, but how this translates to impact on a stand basis has not been assessed.

The disease appears to be constantly associated with *Cyclaneusma minus*, but the converse is not the case. Bioclimatic analysis suggests that the disease ought to occur in several localities which have the fungus, closed stands, and apparently suitable climate, yet no evidence of the disease. This and certain other epidemiological characteristics suggest that the disease syndrome is not one of primary pathogenicity by *Cyclaneusma*. An hypothesis of primary physiological dysfunction exacerbated by fungal infection is preferred. Among the many candidates for predisposition, nutrient imbalance is the only one which has been extensively tested. The only element which appears to be in suboptimal supply is sulphur which has not attained adequate levels even with heavy on-soil application of gypsum.

A reduced programme of research is envisaged with emphasis on the ecology and phenology of fungal colonisation and attempts to address the sulphur

status by stem injection will be made.

Phytophthora cinnamomi, fire and vegetation.

This work is in the process of write-up. Field pathogenicity tests and bioclimatic analysis provide a basis for the following conclusions.

1. *P. cinnamomi* has a capacity to cause severe losses in heathlands, throughout Tasmania and the potential to reduce the floristic diversity of temperate rainforest on disturbed rainforest sites durng the post-disturbance phase of recovery.

2. It presents no significant problem for production forestry.

3. There is no evidence of significant variation in pathogenicity during field inoculation trials on heathland in a range of c.30 isolates from a variety of host taxa, and geographic origins.

4. Ecological studies indicate that repeated firing in forests in the perhumid oligotrophic environments of Tasmania lead to both displacement of forest by sedgeland-heath and increased vulnerability to damage by *Phytophthora cinnamomi*.

GK in conversation previous day with Geoff Marks:

Victoria

Armillaria work still going on at Mount Cole.
Geoff Marks doing some funded work with *Phytophthora cinnamomi* from *Protea* growers, some work in Grampians.
Concerned about Dothistromin.
It was noted that Geoff Marks and Gretna Weste were writing a review on *Phytophthora cinnamomi* for Annual Review of Phytopathology.

New South Wales

JS. *Populus* spp.

Marssonina castagnei found in Neutral Bay on one large tree in a suburban backyard in November 1984. A month later was found in mature stand of white poplars in Mangrove Mountain (foothills of blue mountains) about 50 k away. No suggestion that small white poplar material had been introduced to either site, but fungus spread rapidly, understands now in Canberra. Its been found in New Zealand in 1986 and has spread rapidly there, but we haven't got *M. brunea*. Interesting thing about these species is that they have splash-dispersed spores, which are not supposed to spread rapidly. Compare with *Dothistroma*, so we have to forget about slow disposal of splash dispersed spores.

FP. Some of these spores, particularly hyaline ones, are not going to stand up to much UV. If turbulent wet storms can carry some of these fungi, why did *Dothistroma* take so long to reach Tasmania when the results ripped right through? Discussion on spore disposal was joined by BB reminding us of document by FP saying *Dothistroma* was an excellent local disperser and a good occasional long distance disperser. DP thought that in some cases for successful dispersal we do need a combination of events to move large distances which may only happen every 15 to 50 years.

JS. *Pinus* diseases

There has been no dramatic change in the disease situation since the previous meeting.

A post graduate student from South Korea has been working at W.T. & F.R.D. on aspects of the biology and pathology of *Cyclaneusma minus* and *Lophodermium* spp on *Pinus radiata*. The field work is being done at Sunny Corner S.F. in Bathurst Region. Needles of all age classes are infected, but the incidence of infection increases steadily with increasing needle age. Disease is expressed only when the trees are under physiological stress. The most common symptom is premature senescence of needles.

Fusarium subglutinans and *F. proliferatum* have been frequently isolated from seed of southern pines, and from green cones from Coffs Harbour Region. Isolates are pathogenic to seedlings under glasshouse conditions. Haven't

yet started any work on larger trees to see if they will cause pitch cankers, but this work is proposed for next year.

A study has commenced of the microflora and microfauna associated with the introduced bark beetles *Ips grandicollis*, *Hylastes ater*, and *Hylurgus ligniperda*. *I. grandicollis* is the most important of these beetles, but is for the present confined to the north eastern corner of N.S.W. The other two beetles are confined to the tablelands. Three species of *Ophiostoma*, including *O. ips* are associated with *I. grandicollis*, one species, *O. huntii* with *H. ater*, and two species with *H. ligniperda*. In field trials at Coffs Harbour it was found that lindane sprays halved the incidence of bluestain in the first twelve weeks after felling. The principal stain fungi in the absence of *I. grandicollis* were *Sphaeropsis* spp and *Coniochaeta* spp.

Cercoseptoria pini-densiflora, and its teleomorph *Mycosphaerella gibsoni*, have been found on *Pinus* in Papua New Guinea, and this fungus is now a possible quarantine problem in northern Australia, probably on seed from S. America or Asia.

Populus spp.

Marssonina castagnei is established on white poplars in the Sydney area, and has recently been found in New Zealand. *M. brunea* has as yet not established in Australia.

Eucalyptus spp.

Studies have been commenced on relationship between decay, and the causal organisms present, and termite attack. Studies are at present restricted to *Glyptotermes* and some *Kalotermes* spp. The termites are apparently constantly associated with soft rots in wood.

QUEENSLAND

CONTENTS

BASIDIOMYCETE ROOT ROTS

BIOLOGICAL CONTROL

Research continued into an examination of the potential for biological control of the root-rotting fungi *Phellinus noxius* and *Poria vincta* in plantations of hoop pine (reported in Research Report 1983). The method under investigation involves inoculation of fresh stump surfaces with innocuous, wood-decaying basidiomycetes, thereby excluding the pathogens from stumps in thinned plantations and on clearfelled sites.

Work which commenced early in 1983 to develop an inoculation procedure for use in field trials has been completed. In this study, 24 fresh thinnings stumps in each of two compartments at Imbil were inoculated with aqueous suspensions of macerated mycelia of either *Pycnoporus coccineus* or *Trametes versicolor*, or were left uninoculated (eight stumps in each treatment). Four stumps from each treatment in the two compartments were harvested and dissected, and laboratory isolations were performed eight months after inoculation. The remainder were harvested three months later. Of the 16 stumps inoculated with each fungus, *T. versicolor* had extensively colonised 12 after eight to eleven months , and *P. coccineus*, five (Table 1). Also, inoculations with either fungus appeared to significantly reduce spore-initiated infections of stumps by *P. vincta* (Table 1). This work demonstrated the suitability of the technique for use in subsequent trials and also indicates that the method has promise for the control of *P. vincta*.

Table 1. Number of stumps (of 16) from which *Pycnoporus coccineus* or *Trametes versicolor* was recovered, and *Poria vincta* was isolated, from two compartments at Imbil, 8 to 11 months after inoculation.

Inoculant	Inoculant recovered	*P. vincta* isolated
Nil	n.a.	10
P. coccineus	5	4
T. versicolor	12	2

Also completed this biennium were laboratory studies performed to assist in the selection of four or five of the basidiomycetes, isolated from decaying hoop pine stumps in earlier surveys, for further testing as potential biocontrol agents. Criteria used for this selection are given in Research Report 1983. The four most promising fungi: *Fuscoporia contigua*, *Pycnoporus coccineus*, *Trametes versicolor* and *Tyromyces* sp., were inoculated on to fresh stumps of 22-year-old trees at Imbil in autumn and winter 1985. Laboratory isolations to assess the success of these inoculations were completed only recently. Results are not yet final, but it appears that *T. versicolor* had extensively colonised all stumps to which it had been applied, to at least 20 cm below the stump surface. *Tyromyces* sp. had colonised approximately 40 to 50 per cent of the wood, but in only about half of the stumps. Inoculations with the other two fungi appear to have been unsuccessful. Trees on the site of these stump trials have been inoculated with the four fungi to check they are not capable of inciting disease in live hoop pine. Glasshouse inoculations of seedlings are planned as a further check on their pathogenic capabilities.

Inoculations of stumps of clearfelled hoop pine, before replanting, have also been carried out. At Benarkin early in 1984, 27 fresh stumps of 52-year-old trees were treated with either *Lentinus strigosus* or *Tyromyces* sp., or were left uninoculated (nine stumps per treatment). These two fungi were chosen for the trial because they

are common on clearfall stumps in north and south-eastern Queensland. In 1985, cores were removed on a 10 cm × 10 cm grid from five stumps in each treatment for assessment of the stage of decay reached and for isolation studies in the laboratory. Both fungi were found to have extensively colonised all the stumps to which they had been applied (an average of 50 per cent for *L. strigosus*, and 76 per cent for *Tyromyces*, at about 20 cm below the stump surface), but *Tyromyces* had caused much more rapid decay (Tables 2 and 3). Both fungi also appeared to have excluded infection by *P. vincta*, which was isolated only from the uninoculated stumps (Table 3). The remaining stumps were sampled this year. Results of the laboratory studies, although not yet finalised, confirmed the effectiveness of *Tyromyces* sp. Stumps inoculated with this fungus were completely decayed, and no *P. vincta* was isolated. Although decay was extensive in the *L. strigosus* inoculations, *P. vincta* was isolated from at least one, and probably more, of the stumps.

Table 2. Average per cent of sound and decayed wood at approximately 20 cm below the surface of five clearfall stumps at Benarkin 12 months after inoculation with *Lentinus strigosus* or *Tyromyces* sp. Results are also given for uninoculated control stumps.

Inoculant	Per cent of cross section at various stages of decay			
	Sound	Apparently sound†	Incipient decay	Advanced decay
Nil	43	29	9	19
L. strigosus	29	45	24	2
Tyromyces sp.	9	15	12	64

† Wood not noticeably softened, but a wood-decaying basidiomycete was isolated.

Table 3. Average per cent of the wood at approximately 20 cm below the surface of five clearfall stumps at Benarkin, occupied by various basidiomycetes, 12 months after inoculation with *Lentinus strigosus* or *Tyromyces* sp. Results are also given for uninoculated control stumps.

Inoculant	Per cent of wood occupied by various basidiomycetes				
	Nil fungi	*L. strigosus*	*Tyromyces* sp.	*Poria vincta*†	Other basidiomycetes
Nil	43		3	15	39
L. strigosus	29	50			21
Tyromyces	9		76		15

† This pathogen was found in two of the five "control" stumps.

Tyromyces sp., a brown cubical rot fungus, seems to have a number of the attributes desired of a biocontrol fungus:

- It colonises stumps rapidly and extensively, quickly reducing the wood to an advanced stage of rot;
- it apparently inhibits infections by *P. vincta*;
- laboratory inoculations of hoop pine root segments have shown that it not only halts the invasion of both *P. noxius* and *P. vincta*, but also neither pathogen can invade wood already colonised by it.

Tyromyces possesses another attribute useful in the preparation of inocula. It will sporulate prolifically from the entire under-surface of a disc removed from an

inoculated stump. The spores are readily harvested from polythene sheeting placed under the disc, and they remain viable for almost three weeks when stored refrigerated in aqueous suspension.

SUSCEPTIBILITY OF HOOP AND HONDURAS CARIBBEAN PINES

Early results are available from an experiment established in 1983 to compare the susceptibility of hoop and Honduras Caribbean pines to *P. noxius*. In north Queensland, an area of first rotation hoop pine with serious disease was clearfelled and replanted with the two pines. Rows of the pines were planted one metre apart, on either side of rows of clearfall stumps. Losses to root rot have been minor to date (1.9 per cent of Honduras Caribbean pine, and 0.2 per cent of hoop pine), and both *P. noxius* and *P. vincta* have been associated with this mortality. The Honduras Caribbean pine appears to be emerging as the more susceptible tree species to both pathogens; mortality has been recorded in 13 species pairs, and on 12 occasions it was the Honduras Caribbean pine partner which succumbed.

OTHER DISEASES

ROSELLINIA ARCUATA ROOT ROT IN QUEENSLAND HOOP PINE PLANTATIONS

INTRODUCTION

Rosellinia arcuata Petch. was first recorded on *Hodgkinsonia frutescens*, a common understory shrub in tropical hoop pine plantations, at Wongabel, north Queensland in 1976. Perithecia were present on this collection. An isolate was cultured from necrotic tissues at the root collar.

In 1977, glasshouse studies were conducted to test that isolate's pathogenicity against hoop pine and two alternative plantation species (eg. *Pinus caribaea* var. *hondurensis* and *Eucalyptus microcorys*). Three month old seedlings were inoculated with a culture in rye seed/sand mixture placed around the root collar. The root systems of the test plants were not wounded or disturbed. All inoculated plants died within two weeks.

PLANTATION DEATHS

The first record of *Rosellinia* root rot on plantation hoop pine was in September 1983, at Benarkin in south east Queensland.

A survey of an 11 month old second rotation compartment confirmed that at least 1.2 per cent of trees were lost due to *Rosellinia* root rot.

Since then, significant losses have been recorded in several first and second rotation plantations in south east Queensland. Deaths have been confirmed in four-year-old plantations and are expected to continue.

Rosellinia root rot is easily identified in the field. The fungus produces white mycelial fans between the outer bark and cortex, as well as a grey felty mycelium on the bark of infected roots and stems.

Synemmata of the *Dematophora* conidial state are sometimes found on the bark at the root collar of dead plants.

Perithecia have not been found on any of the south east Queensland collections, therefore identification has been based on cultural characters. Both the northern and southern isolates consistently produce pyriform swellings at their septa, a characteristic feature of *R. arcuata*.

DICHOMERA EUCALYPTI ASSOCIATED WITH SHOOT DIEBACK OF *EUCALYPTUS MICROCORYS*

Dichomera eucalypti (Wint.) Sutton was recorded from *Eucalyptus microcorys* (tallowwood) windbreak plantings around Atherton in north Queensland in December 1985.

Diseased plants were recognised by their bushy, stunted appearance. This growth pattern had resulted from the repeated dieback of young shoots. When a shoot died back, a new shoot was produced from the axis, but this shoot would soon be infected and itself die back. Often up to five dead shoots were found originating from the one enlarged node, a 'witches-broom' like effect.

D. eucalypti was isolated from the live dead margin of the diseased shoots. Pycnidia were abundant on the dead tissues and were produced in cultures exposed to U.V. radiation.

Reports from overseas confirm that at least two *Dichomera* species are plant pathogens. *D. saubinetii* (Mont.) Cke has been associated with a stem canker of sycamore in the United Kingdom (Bevercombe and Rayner, 1978). *D. gemmicola* Funk and Sutton has been associated with a repeated bud dieback of conifers in Canada (Funk and Sutton 1972).

In Australia, *D. eucalypti* has been recorded on leaves of *E. viminalis, E. rubida* and another *Eucalyptus* sp. (Sutton 1980)

References

Bevercombe, G.P. and Rayner, A.D.M. (1978). *Dichomera saubinetii* and bark diamond canker formation in Sycamore.
Transactions of the British Mycological Society 71(3), 505-507.

Funk, A. and Sutton, B.C. (1972). A disease of conifer buds in western Canada associated with *Dichomera gemmicola* n.sp.
Canadian Journal of Botany 50(7), 1513-1518.

Sutton, B.C. (1980). *The Coelomycetes*. Commonwealth Mycological Institute.

PHYTOPHTHORA IN TROPICAL RAINFORESTS

We have finally completed the processing of data from the *Phytophthora* survey and our field observation studies. This work will be reported as a series of internal reports prepared so that they can be submitted for formal publication. The reports completed to date cover;

- A survey of tropical rainforests for *Phytophthora* species
  An evaluation of isolation techniques
  P. cinnamomi in tropical rainforests
  Species other than *P. cinnamomi* in tropical rainforests.
- The rainforest environment and *P. cinnamomi*.
- *P. cinnamomi* in part of the Eungella National Park.

Some of the highlights of this work were;

BAITING TECHNIQUES

- The second baiting of a double-baiting (New Zealand blue lupins) technique resulted in additional detection of 8.6 per cent.
- A number of *Phytophthora* taxa (see Table 1) were detected by N.Z. blue lupin baiting.

Table 4. Summary of *Phytophthora* taxa isolated from rainforest soils of tropical Queensland.

Taxa	Samples†	Sites†	Isolates			
			Total	A_1	A_2	Homothallic
P. cinnamomi	991	645	11 519	16	4 492	-
P. boehmeriae	26	21	52	-	-	52
P. citricola	86	76	184+	-	-	184+
P. cryptogea	4	4	22	22	-	-
P. drechsleri‡	7	7	14+	-	-	-
P. heveae	392	322	1 220	-	-	1 220
P. katsurae	67	61	168	-	-	168
P. meadii‡	22	22	32	5	-	4
P. n. v n.§	3	3	5	-	3	-
P. n. v p.§	6	6	27	3	2	1
P. palmivora	34	31	178	46	56	-

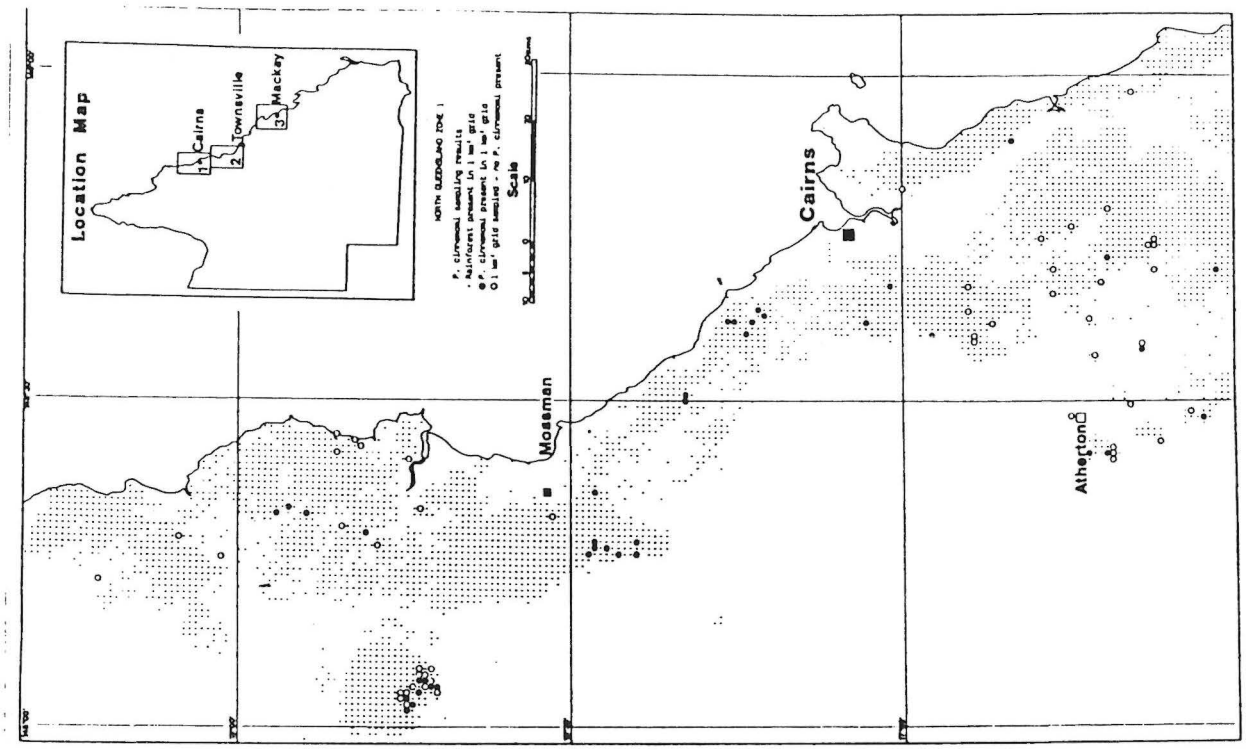
† Total samples were 3019 and total sites were 1817
\+ in some cases the presence of fungus was recorded without counts
‡ identified only as 'near'
§ *P.* n. *n.* = *P. nicotianae* var. *nicotianae*
'*P.* n. *p.* = *P. nicotianae* var. *parasitica*

PHYTOPHTHORA CINNAMOMI IN RAINFORESTS

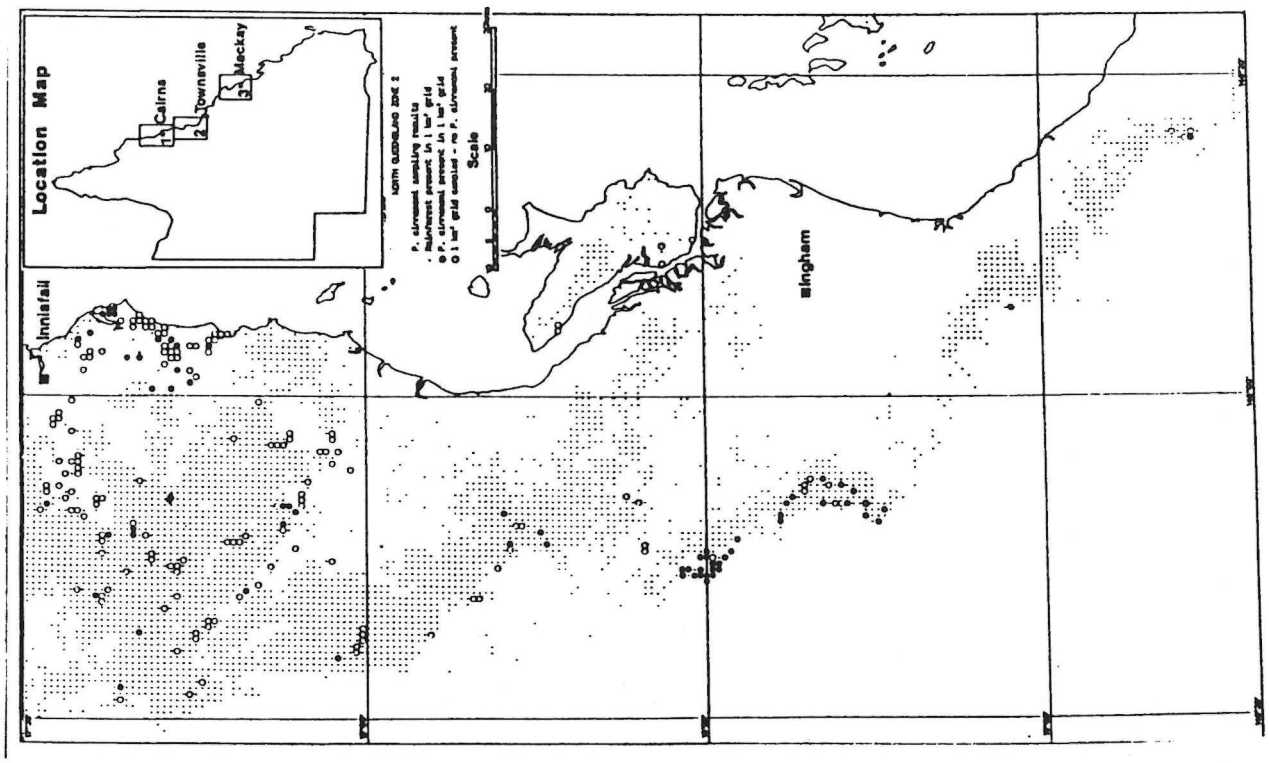
- Detection of *P. cinnamomi* was dependent on the following site factors (Tables 2 and 3);
  - pig activity
  - management history
  - forest health
  - locality
  - locality × health
  - management × health
  - locality × pig activity
  - management × pig activity
- Crediton and Dalrymple Heights together form the Eungella Tableland and apart from the differences in *P. cinnamomi* detection shown in Table 2, there were big differences between the two in pig activity (Table 5).
- Possibly because of the virtual absence of pigs at Crediton, the area was the only major locality to show significance for management history (Table 5) with heavier detection from logged compared with virgin forest and a further increase where roading had an influence.
- The apparent anomaly of highest detection from virgin forest at Dalrymple Heights is probably due to the fact that feral pig activity is highest in such forest (Table 5), a situation which differs from other forest management categories and areas.
- *P. cinnamomi* was widespread through the tropical rainforests of Queensland (Maps 1, 2, and 5) with heaviest intensity of detection at Garrawalt and Dalrymple Heights.
- The ratio of A_1:A_2 mating types of *P. cinnamomi* was 16:4492. The 16 A_1 isolates came from four discrete localities.
  - Six were the only isolates from one dead patch.
  - A_1:A_2 of 5:43 from an area of healthy forest with a nearby patch yielding
    - 63 A_2 isolates.
  - A_1:A_2 of 3:4 from a diffuse patch area.
  - A_1:A_2 of 2:63 from a dead patch.

SPECIES OTHER THAN *PHYTOPHTHORA CINNAMOMI*

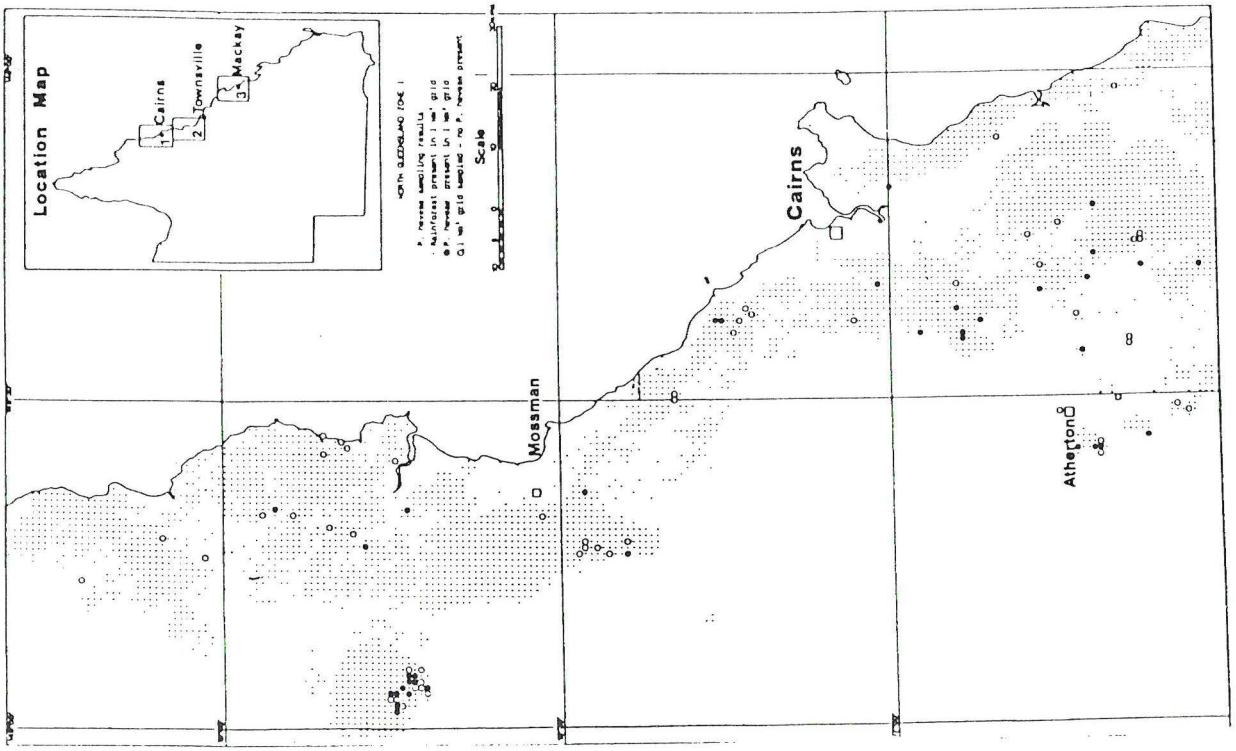
- Most of the *Phytophthora* species other than *P. cinnamomi* were too few to permit any statistical treatment (Table 1).
- Detection of *P. heveae* was dependent on
  - management history
  - forest health
  - locality
  - locality × health
  - management × health.
  - but not pig activity
- The isolations of *P. katsurae* and *P. meadii* represent the first records for Australia
- Isolations of *P. citricola*, *P. cryptogea* and *P. heveae* are the first for Queensland.
- P.heveae was widespread through tropical rainforests (Maps 3, 4, and 6).
- *P. boehmeriae*, *P. katsurae* and *P. citricola* were common in the Central Queensland area (Maps 7 and 8) but were less common in the two northern zones.



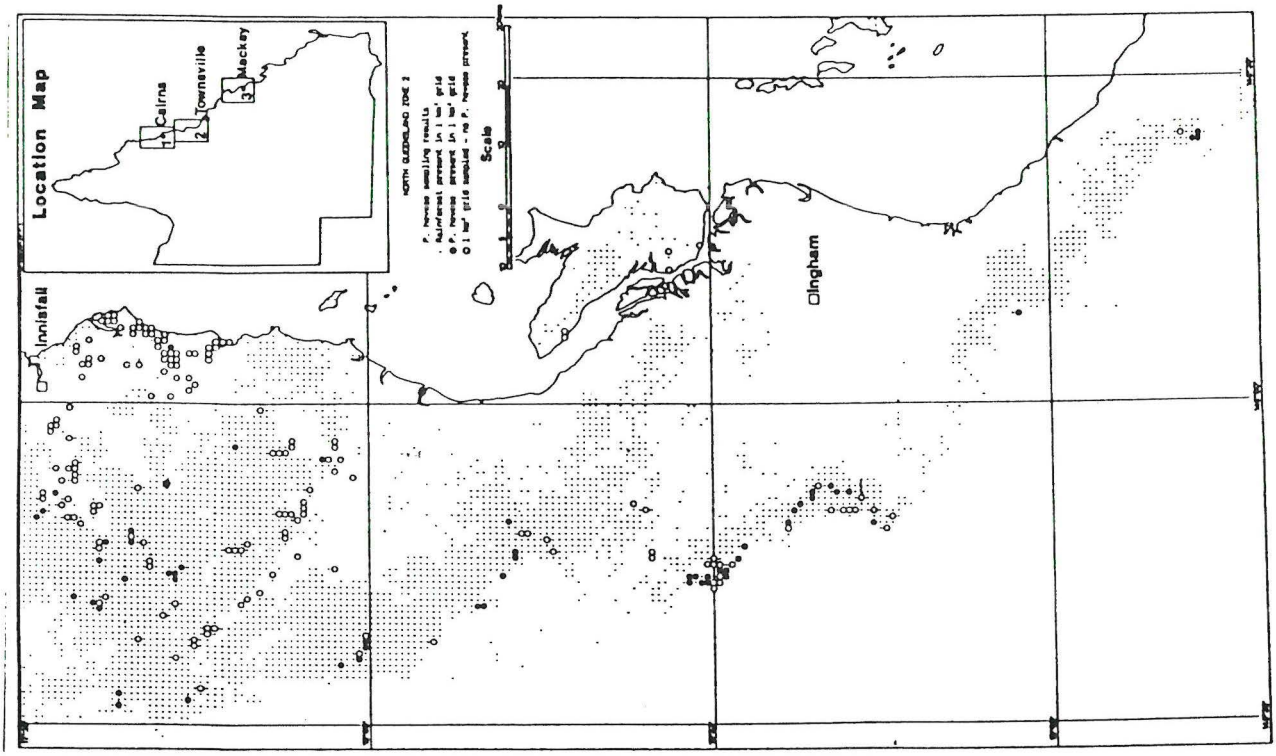
Map 1. *P. cinnamomi* detections in Zone 1 of North Queensland.



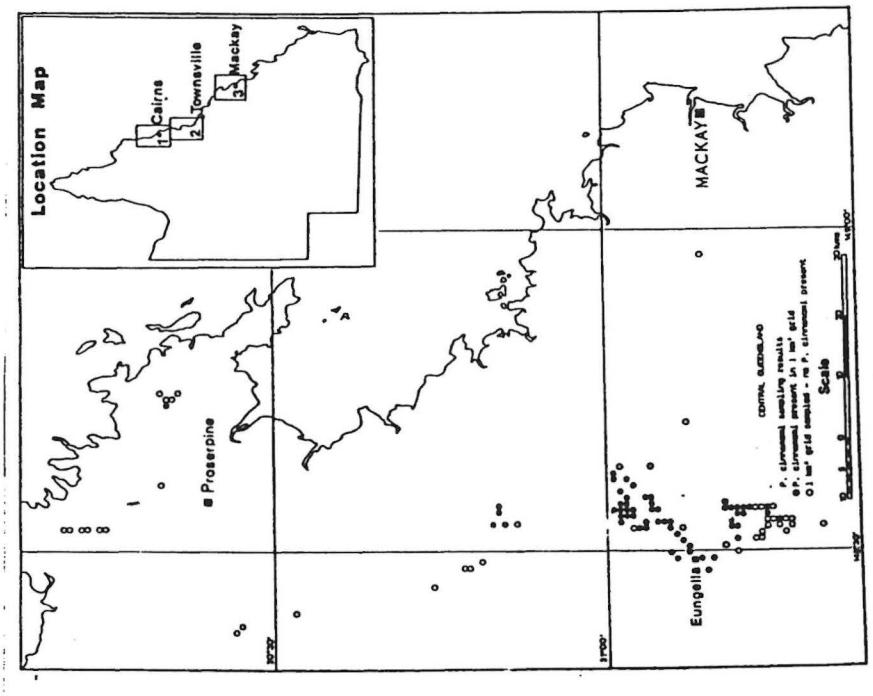
Map 2. *P. cinnamomi* detections in Zone 2 of North Queensland.



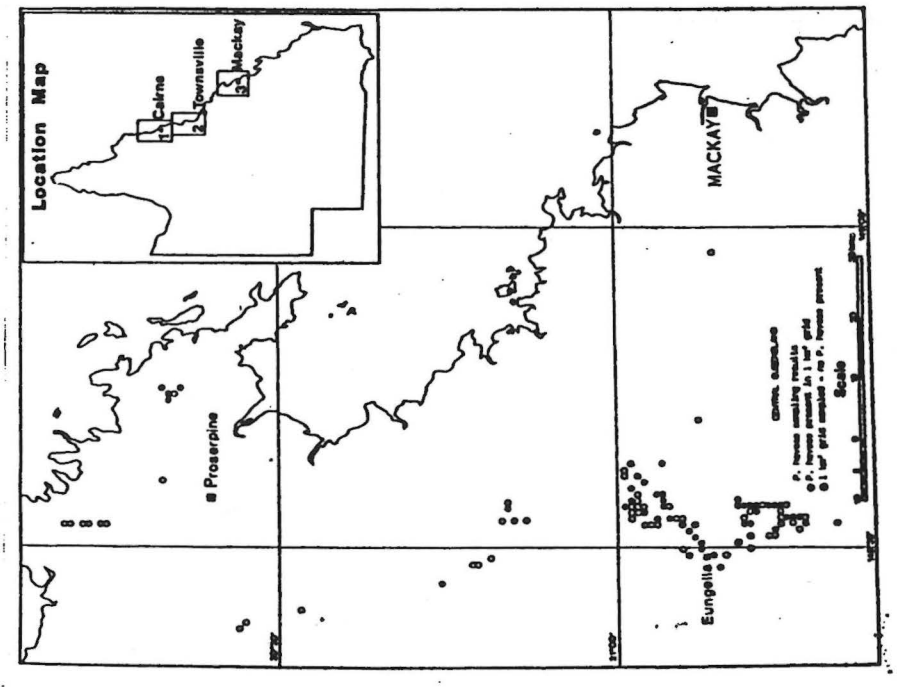
Map 3. *P. heveae* detections in Zone 1 of North Queensland.



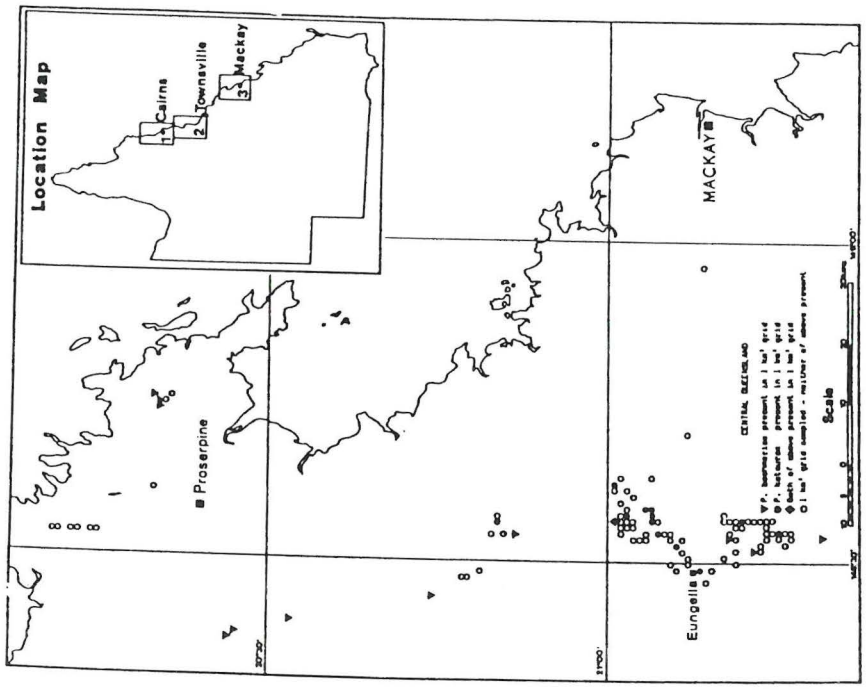
Map 4. *P. heveae* detections in Zone 2 of North Queensland.



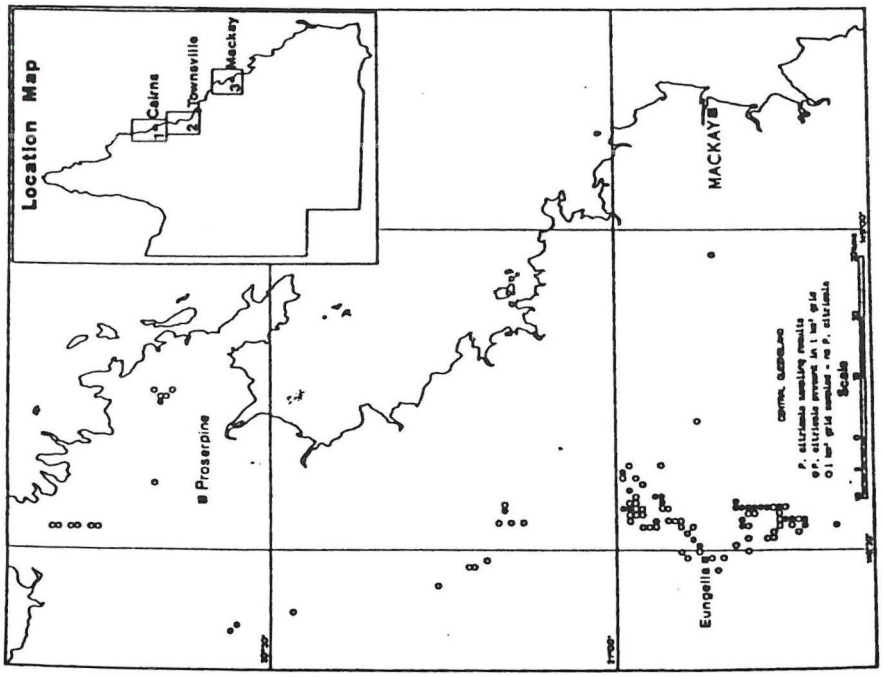
Map 5. ***P. cinnamomi*** **detections in Central Queensland.**



Map 6. ***P. heveae*** **detections in Central Queensland.**



Map 7. *P. boehmeriae* and *P. katsurae* detections in Central Queensland.



Map 8. *P. citricola* detections in Central Queensland.

SOIL ENVIRONMENT

- A ridge-top site was chosen for study of soil environmental conditions at Dalrymple Heights.
- The study area is believed to have rainfall in excess of 2 500 mm p.a. with pronounced wet seasons during January, February and March (Table 6) and Figure 1.
- Soil temperatures are above 15° C for all but the three months June to August (Figure 1).
- Soil moisture was high (0 to -0.12 bar) for long periods during the wet season and at other times of the year (Figure 1).
- Weekly rainfall of 15 to 20 mm is sufficient to hold or produce soil moisture in the 0 to -0.12 bar range (Figure 2).

Table 5. Detection of *P. cinnamomi* during survey of rainforest soils of tropical Queensland (results by major forest categories).

	Samples		Sites		Isolates		
	Total	%	Total	%	Total	A1	A2
Total survey	3019	32.8	1817	35.5	11519	16	4492
Elevation (m)							
0 - 399	466	10.5	336	14.3	343	6	263
400 - 799	735	38.6	509	34.8	2742	5	1081
800 +	1818	36.2	972	43.2	8434	5	3148
Locality							
Crediton	751	23.2	438	31.5	2104	0	953
Dalrymple Heights	701	60.6	403	65.3	5973	0	1963
Garrawalt	292	62.3	130	70.8	1674	0	463
Balances							
C. Queensland	220	8.2	216	6.9	179	0	69
N. Queensland	1055	17.8	630	21.7	1589	16	1044
Total of balances	1275	16.2	846	18.0	1768	16	1113
Forest health							
definite patch	531	48.0	135	63.0	3378	8	1181
diffuse patch	258	41.9	112	57.1	1234	3	452
scattered deaths	467	36.4	347	43.2	2155	0	823
single death	92	29.3	64	37.5	441	0	162
healthy	1671	25.8	1159	27.8	4311	5	1874
Management history							
virgin	1318	40.5	777	41.6	6774	16	2308
virgin/road	415	21.9	227	30.0	927	0	497
logged	395	25.6	300	29.3	893	0	464
logged/road	617	28.5	404	32.2	2264	0	799
planted	195	40.0	54	46.3	611	0	378
not recorded	79	13.9	55	20.0	50	0	46
Pig activity							
old signs	456	42.1	347	41.5	2513	7	944
fresh signs	523	44.6	308	43.8	3216	6	968
no evidence	1457	22.5	845	30.8	3604	3	1813
not recorded	583	40.8	317	33.4	2186	0	767

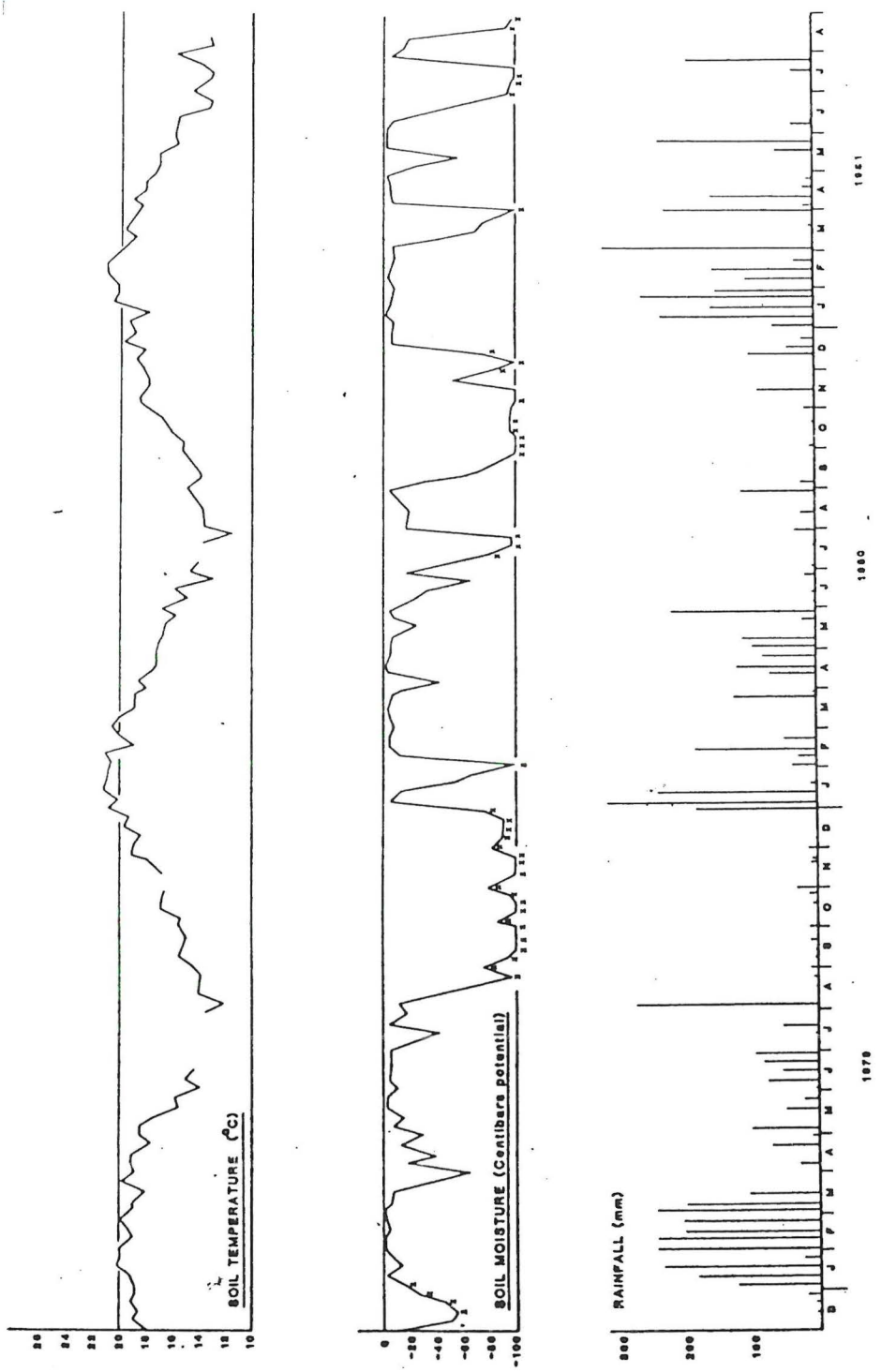


Figure 1. Summary of environmental data recorded under healthy virgin rainforest in the study area in the Eungella National Park (Soil data are means of 50 mm and 150 mm depth at four positions along transect).

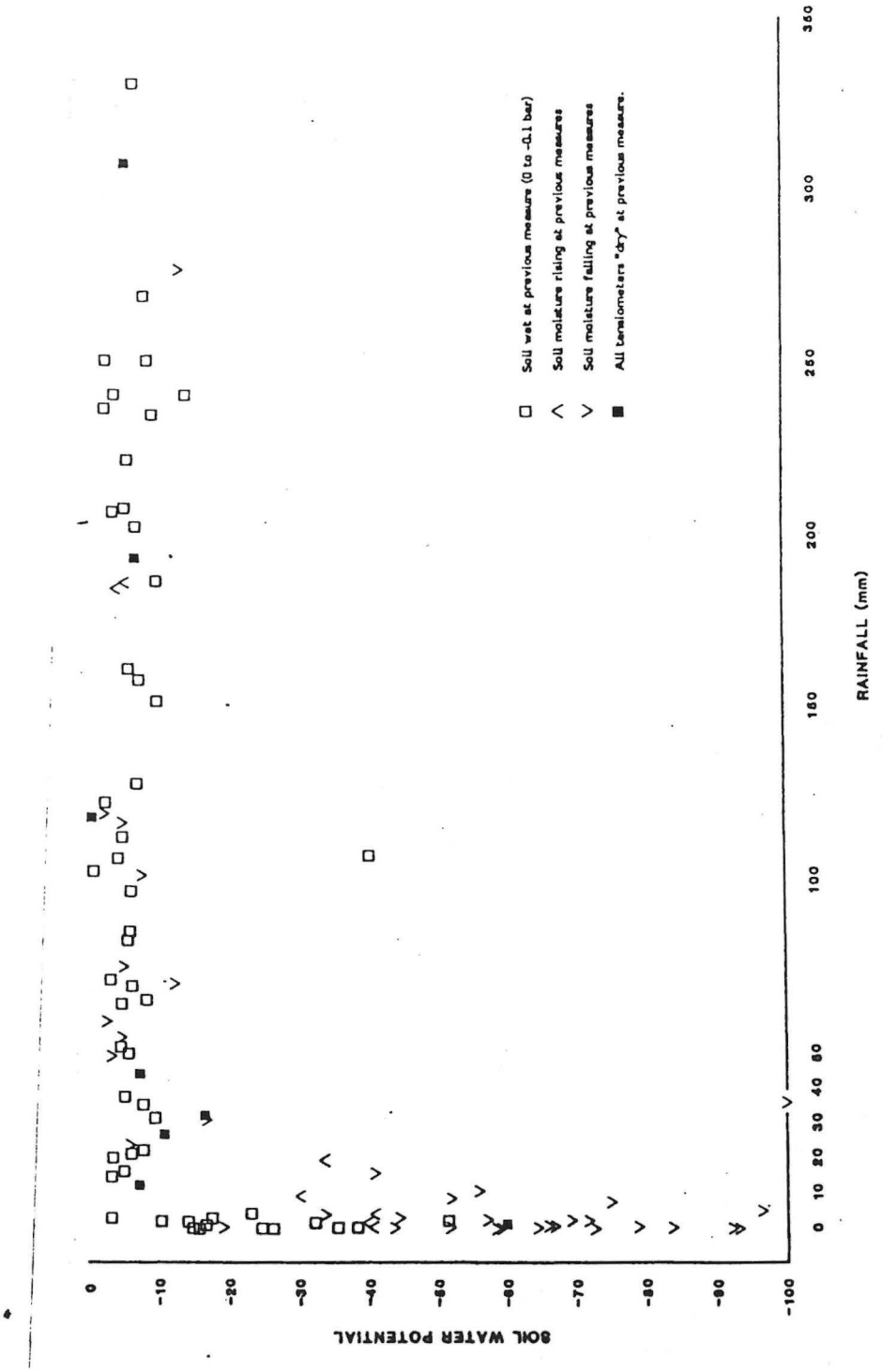


Figure 2. Relationship between rainfall for periods up to 10 days and resultant soil moisture levels under healthy rainforest (averages of tensiometers at 50 mm and 150 mm at four locations).

EUNGELLA NATIONAL PARK

- An area of about 780 ha was chosen for the first locality report because;
  - It is essentially virgin rainforest
  - It is the site of the most serious disease
- The small area provided almost 20 per cent of all *P. cinnamomi* isolates and 58 per cent of all *P. katsurae* isolates from only 7.2 per cent of all samples
- Tree mortality in three plots in the area averaged 25.7 per cent (Table 7).
- These three plots contained 39 identified species from 18 families but only 9 species were represented by over 10 individuals (Table 8).
- Heaviest losses were recorded for
  - *Cinnamomum oliveri*
  - *Cryptocarya corrugata*
  - *Syzygium wesa*
  - *Sphenostemon lobosporus*
- Part of the area (641 ha) was included in a sequence of colour aerial photography and API of this area gave the following results;
  - December 1976 4.6 per cent dead
  - August 1978 11.9 per cent dead
  - July 1980 19.3 per cent dead.

Table 6. Results of fitting generalised linear model with binomial error distribution and logit link function to *Phytophthora* survey data for forested areas††.

Factor	Full dataset			Partial dataset†		
	df	Δ Deviance	Significance	df	Δ Deviance	Significance
Pig activity	§	§	§	2	17.9	***
Management history	3	19.3	***	3	11.7	**
Forest health	4	90.9	***	4	72.9	***
Survey localities	3	316.1	***	3	258.5	***
Interactions						
locality.management	8	14.0	ns	8	10.7	ns
locality.health	12	22.1	*	12	17.4	ns
management.health	12	30.9	**	12	33.9	***
locality.pig activity	§	§	§	4	27.7	***
management.pig	§	§	§	6	22.1	**
health.pig	§	§	§	8	12.8	ns

†† virgin or logged forest categories ± roading
† 'not recorded' data for pig activity excluded
§ not tested because includes 'not recorded' for pig activity

Table 7. Locality totals from survey of tropical Queensland rainforest soils for *P. cinnamomi* (data by main sites and forest categories).

	Dalrymple Heights		Crediton		Garrawalt		Balance of survey	
	Total	%	Total	%	Total	%	Total	%
Elevation (m)								
0 - 399	-	-	-	-	-	-	336	14.3
400 - 799	20	30.5	24	33.3	130	70.8	335	21.2
800 +	383	67.1	414	31.4	-	-	175	18.9
Forest health								
definite patch	53	94.3	8	37.5	20	85.0	54	27.8
diffuse patch	38	89.5	12	50.0	14	92.9	48	22.9
scattered deaths	85	74.1	85	37.6	36	66.7	141	22.0
single death	10	90.0	8	25.0	11	90.9	35	8.6
healthy	217	49.3	325	29.2	49	57.1	568	16.2
Management history								
virgin	227	69.7	175	24.6	81	76.5	244	10.2
virgin/road	37	45.9	133	28.6	-	-	57	22.8
logged	24	54.2	45	44.4	42	61.9	189	15.3
logged/road	57	66.7	60	50.0	7	57.1	280	20.7
planted	8	25.0	25	28.0	-	-	21	76.2
Pig activity								
old signs	138	58.7	-	-	37	56.8	172	24.4
fresh signs	112	83.9	-	-	8	75.0	188	18.1
no evidence	139	56.1	397	32.0	22	68.2	287	13.9
not recorded	14	71.4	41	24.4	63	79.4	199	18.1

Summary of linear modelling†

	Dalrymple Heights	Crediton	Garrawalt	Balance of survey
Forest health	***	ns	*	***
Management history†	ns	**	ns	ns
Management.health	ns	ns	ns	ns
Pig activity§	***	-	ns	***
Health.pig	ns	-	ns	***
Management.pig	ns	-	ns	***

† - planted areas excluded
§ - "not recorded" data deleted

TOTAL VEGETATION RESPONSE

- A total of 57 field plots were established, mostly in the Dalrymple Heights and Garrawalt areas.
- Total mortality was 12.4 per cent with heaviest losses in the two laurels listed for the Eungella National Park study area.
- Although *Syzygium wesa* showed high mortality in the Eungella National Park area, there were few deaths of this species elsewhere with the result that for the total study, deaths in this species were lower than average.
- The results suggest that the most numerous laurel (*C. mackinnoniana*) may be tolerant or resistant.

Table 8. Relative levels of pig activity as recorded for soil samples from *P. cinnamomi* survey (includes old plus recent evidence of pigs).

	Dalrymple Heights		Crediton		Garrawalt		Balance of survey	
	pig	nil	pig	nil	pig	nil	pig	nil
Virgin	311	97	3	209	27	10	173	244
Virgin/road	19	42	25	225	-	-	28	58
Logged	7	19	0	47	34	13	87	97
Logged/road	46	47	0	125	0	8	177	155
Total	383	205	28	606	61	31	465	554

Table 9. Mean rainfall and number of raindays for Dalrymple Heights Post Office (45 year average 1939 to 1984)‡.

	Rainfall (mm)	Raindays
January	417	16
February	504	17
March	411	16
April	192	13
May	128	11
June	96	8
July	73	7
August	60	6
September	32	5
October	59	6
November	87	8
December	186	11
Total	2 245	124

‡ Bureau of Meteorology records

Table 10. Mortality by size class in the three observation plots of Expt. 64PTH. Annual death rates (ADR) recorded for more than 40 years in eight Departmental plots in virgin rainforest of North Queensland are included for comparison.

Size class †	Experiment 64PTH								
	Plot A		Plot B		Plot C		All plots		
	Dead	Total	Dead	Total	Dead	Total	Dead	Total	%
5 - 10			20	87	11	39	31	126	24.6
10 - 20	22	91	13	87	7	28	42	197	21.3
20 - 30	11	28	5	21	2	10	18	59	30.5
30 - 40	9	19	7	14	2	4	18	37	48.6
40 - 50	5	12	2	4	0	3	7	19	36.8
50 - 60	0	6	0	3	1	1	1	10	10.0
60 +	4	16	0	7	1	3	5	26	19.2
Total	51	172	47	214	24	88	122	474	25.7

Size class	ADR	
	64PTH‡	8 plots§
0 - 10	4.0	1.2
10 - 20	2.8	0.6
20 - 30	4.3	0.4
30 - 40	5.2	0.6
40 - 50	7.1	0.7
50 - 60	0	0.7
60 +	2.7	0.6
Total	3.5	0.9

† DBH in cm
‡ ADR for plots A and B as % of living in 1976
§ ADR in virgin rainforest plots of North Queensland as % of stand

Table 11. Deaths recorded in the three observation plots of 64PTH listed by species, genus, and family (only taxa with > 10 stems).

	Total trees	% Dead	Total BA‡
LAURACEAE			
Cinnamomum oliveri	19	36.8	1.03
Cryptocarya corrugata	45	31.1	2.83
C. glaucescens	17	5.9	1.17
Total *Cryptocarya*	67	23.9	4.04
Total Lauraceae	103	22.3	5.33
MYRTACEAE			
Acmena resa	27	7.4	11.44
Syzygium wilsonii†	64	1.6	0.86
S. wesa	24	29.2	6.53
Total *Syzygium*	97	9.3	8.25
Total Myrtaceae	124	8.9	19.68
EUPHORBIACEAE			
Rockinghamia angustifolia	37	0	0.39
Total Euphorbiaceae	39	0	0.43
ELAEOCARPACEAE			
Total Elaeocarpaceae	18	0	0.31
PROTEACEAE			
Total Proteaceae	10	10.0	0.19
SAPOTACEAE			
Total Sapotaceae	16	6.3	0.50
SYMPLOCACAEA			
Symplocos stawellii§	17	11.8	0.26
SPHENOSTEMONACEAE			
Sphenostemon lobosporus	29	27.6	0.85
Total stems§§	483	25.3	31.98

‡ sq m/ha
† *S. wilsonii* ssp. *cryptophlebium*
§ or *S. cochinchinensis* ssp. *thwaitesii* var. *pilosiuscula*
§§ Nine stems just outside plot C are included in this total
c.f. 474 total in Table 3

Un-identified stems 98/483 = 20.3% of total stems
Un-identified deaths 73/122 = 59.8% of total deaths

Table 12. Final health status of trees in observation plots in patch-death affected rainforest.

	Total		Health class§				
	Trees	B.A.†	0	1	2	3	4
Lauraceae							
Cinnamomum oliveri	101	4.42	22	0	0	51	28
Cryptocarya cinnamomifolia	129	1.70	26	2	1	51	49
C. corrugata	144	10.79	23	2	4	51	64
C. mackinnoniana	157	11.53	8	0	5	26	118
Total *Cryptocarya*	578	29.69	73	7	22	183	293
Total Lauraceae	891	48.70	104	9	25	301	452
Myrtaceae							
Acmena resa	131	53.38	2	0	12	83	34
Syzygium endophloium	98	17.21	2	1	5	39	51
S. wilsonii‡	213	2.86	7	0	2	28	176
S. wesa	92	21.98	9	1	8	47	27
Total *Syzygium*	508	53.08	18	2	14	138	336
Total Myrtaceae	722	108.80	32	2	28	237	423
Elaeocarpaceae							
Elaeocarpus foveolatus	98	3.99	8	2	2	40	46
Total *Elaeocarpus*	193	15.53	14	2	3	66	108
Total *Sloanea*	99	8.59	2	2	3	20	73
Total Elaeocarpaceae	314	26.49	20	3	7	91	193
Proteaceae							
Cardwellia sublimis	55	10.12	2	0	0	8	45
Total Proteaceae	140	15.68	13	1	2	23	101
Rutaceae							
Flindersia bourjotiana	131	21.56	7	1	0	17	106
Total Rutaceae	343	31.62	36	3	2	43	259
Meliaceae							
Synoum muelleri	98	1.36	10	0	1	18	69
Total Meliaceae	125	2.16	11	0	1	21	92
Sapotaceae							
Planchonella laurifolia	102	13.60	1	0	3	32	66
Total Sapotaceae	142	16.78	4	0	4	39	95
Araliaceae							
Polyscias australiana	114	0.98	13	2	1	1	97
Symplocaceae							
Symplocos cochinchinensis	136	1.69	9	0	2	16	109
Sphenomenstemonaceae							
Sphenostemon lobosporus	70	1.67	12	1	1	12	44
Total Euphorbiaceae	96	2.48	3	0	2	20	71
Unidentified	457	34.47	190	0	18	93	156
Total	4 265	341.49	527	32	114	1 037	2 555

§ 0 = dead
1 = fully defoliated — stem cambium still alive
2 = > 50% defoliated
3 = up to 50% defoliated
4 = healthy

† total basal area in m^2
‡ *S. wilsonii* ssp. *cryptophlebium*

CONTROL OF *PHYTOPHTHORA CINNAMOMI*

GENERAL

For many years it has been the policy of the Queensland Department of Forestry to produce planting stock free of *Phytophthora cinnamomi*. This arose from the recognition that *Phytophthora* root rot caused both nursery losses and problems, including early losses, in plantings.

It was established some years ago that *P. cinnamomi* could be controlled by soil fumigation and the fumigated nursery areas kept free of the pathogen providing post-fumigation hygiene was adopted. However, in the sub-tropics it was found that it was impossible to prevent the production of large and succulent planting stock in fumigated areas.

To maintain the desired *Phytophthora*-free planting stock, the Department adopted a nursery hygiene system using new *Phytophthora*-free sites and based on the post-fumigation hygiene measures that have been used for many years. This system has been successfully used for 18 years at one of three such nurseries now operating in Queensland.

The experimental and routine use of soil fumigation in Queensland forest nurseries and the 'hygiene' nursery system were described in a paper that I presented to the International Symposium on Nursery Management Practices for the Southern Pines at Montgomery, Alabama last year. (Brown 1985. *Phytophthora cinnamomi*. Root Rot in *Pinus* Nurseries. Soil Fumigation and Disease Prevention by Hygiene. pp. 507 - 514 in the proceedings of the Symposium).

SYSTEMIC FUNGICIDES

Based on the evidence from Queensland horticulture and elsewhere, the use of metalaxyl (Ridomil) (100 g m^{-2} in beds and 1 kg m^{-3} in container soil) is used when required in non-hygiene nurseries. However, there is evidence to suggest that metalaxyl may have been phytotoxic to *Pinus oocarpa* in one nursery.

There is reason to believe that phosphorus acid will be a useful systemic fungicide for the control of *P. cinnamomi* in forest nurseries. Early trials have demonstrated that neither the acid at 4 g $litre^{-1}$ nor the acid neutralised with 4 g $litre^{-1}$ potassium hydroxide have any detrimental effects on *Pinus caribaea* var. *hondurensis*.

NURSERY HERBICIDES

Farook Kassaby (*Australasian Plant Pathology* 14 (2); 21-22 1985) reported that the herbicide chlorthal dimethyl was a potent fungicide against *P. cinnamomi* but that propazine was only mildly phytotoxic to growth and actually stimulated sporangial production and increased inoculum potential indices.

One problem in translating Farook's results into the Queensland nursery scene is the fact that standard weed control schedules use a mixture of both chlorthal dimethyl and propazine. The important question is therefore what effect does the mixture have, does chlorthal dimethyl (30 kg per 500 l) override the stimulation of propazine (2.2 kg per 500 l).

As a preliminary to studying the effect of a mixture we investigated the effect of the two herbicides singly against isolates of *P. cinnamomi*. Both chemicals when used at the normal concentration used in Queensland nurseries and at lower concentrations gave almost no sporangial production (Table 13). It is not known if the effect was due to inhibition of *P. cinnamomi* itself or to an effect on the soil microflora that usually stimulates the fungus.

Table 13. The effect of two nursery herbicides on production of sporangia by two isolates of *Phytophthora cinnamomi*. (Data are average number of sporangia in four fields each of 0.625 mm^2).

Treatment	Rate (ppm)	Isolate	
		2664/L1	4482/L4
Control	...	45.75	27.25
Propazine†	550	0.25	0
	1100	0	0
	2200	0	0.25
Chlorthal§ dimethyl	7500	0	0
	15000	0	0
	45000	0	0

† Kassaby used 2200 ppm the same as used in Queensland nurseries
§ Kassaby used 18750 ppm; the Queensland rate is 45000 ppm

The reason for the difference between these results and those of Kassaby's are unknown. Some possibilities are;

- inherent differences in the isolates
- changes in the *P. cinnamomi* due to continuing exposure to nursery herbicides (assuming that the isolate used by Kassaby was from a nursery)
- changes to the soil microflora in the Benalla nursery due to continuing exposure to the herbicides (it is important to remember that production of sporangia by *P. cinnamomi* is stimulated by microorganisms in the non-sterile soil extract. However non-stimulation, i.e., no or few sporangia can result from inhibition or merely the lack of stimulation)

Another question that could be asked is were all the Benalla Nursery losses due to *P. cinnamomi* or was there also an effect of herbicides?

Discussion on *Phytophthora cinnamomi* and *P. cryptogea* taxonomy between BB, KO, FP and JS included:

JS. "What did you think of that paper by Curran in Mycologia recently describing unusual variants of *Phytophthora cinnamomi* from China, based on proteins, and he was including in *cinnamomi* those which didn't produce swellings or chlamydospores. Seems to completely change concept of what *cinnamomi* is?" BB; then this highly distorted *cryptogea* would be there included as *cinnamomi*.

FP Took 22 isolates from a range of host sources to cover broad floristic range and inoculated them into field in heathland and all 22 isolates killed plants on 1 rep, all but 1 killed on 2nd rep (3rd very burnt out unfortunately). Also did pot trials using peat cores with Tasmania and also Canberra isolates to cover the range of isosymes and in those got similar effects. Didn't seem to be very big differences between the forms in practical terms.

JS. One of problems we have been getting is with registration of pesticides and herbicides. In nurseries in the past it has been common practice to use benlate, captan or captafol at regular intervals; the last two have now been deregistered. Repeated continued use of benlate must be a matter of concern. In the field there is various reports of carryover effects of herbicides, one being associated with increase in needle cast in Tasmania and reports in NSW of another with same effect. Victorians have done a lot of work suggesting some herbicides affect the incidence of *Phytophthora* in nursery. Nett result is that I think we need to look seriously at the herbicides that have been recommended and their effect on tree health.

Genetic variability and pathogenicity in *Phytophthora cinnamomi*

K.M. Old and M.J. Dudzinski, CSIRO Division of Forest Research

Further sampling of field populations of *P. cinnamomi* in eastern Australia has yielded no new isozyme genotypes in several individual soil samples from Ourimbah S.F. (NSW) both the common A_1 and rarer type 2 A2 genotypes

co-existed. No recombinants were discerned in this location thus providing further evidence for the lack of an effective sexual phase in the field in south-eastern Australia. Similarly inoculations using combinations of A_1 and A2 isolates in controlled environments has failed to yield recombinants.

Pathogenicity studies in controlled environments using individual isolates selected on the basis of isozyme genotypes and using cloned *E. marginata* as a test host are continuing. It is intended that mass root inoculations, individual root inoculations and stem inoculations will be applied. Although not yet fully analysed, data from mass inoculations show significant differences between isolates but no relation to isozyme genotype.

Isozyme examination of isolates from NT and PNG show that a *Phytophthora* isolate from Nhulunbuy (NT) has the same genotype as a group of wide-ranging isolates from PNG. The NT isolate is pathogenic to *E. marginata* and has been identified (CMI), together with some of the PNG isolates, as *P. cinnamomi*. Some doubt remains as to the identification of this group as it is outside the normal morphological range for *P. cinnamomi*. This work may have quarantine implications.

Phytophthora research may be terminated towards the end of 1987.

BB CONTROL OF *PHYTOPHTHORA CINNAMOMI*

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Another question that could be asked is were all the Benalla Nursery losses due to *P. cinnamomi* or was there also an effect of herbicides?

TW. Interested in using granular Ridomil but granular form not registered in Tasmania. Powdery mildew problem, difficulty getting any product registered, e.g. trifluorine.

TW. Need to consider broader problem.

JS. One of things I would like to get out of this meeting is a formalised exchange of information - so that we do not have everyone repeating similar experiments - so that we can get efficacy data together to get these things registered (overseas data not acceptable because host, pathogen or climate is different).

DP Wondered about mechanism. Should there be a section in APPS.

JS A lot of this efficacy testing seems to be being done, but results are not getting into acessible media.

DP So little information available to Melbourne nurseryman to enable him to find suitable fungicide.

JS Problem of coping with possible phytotoxicity and variations in susceptibility of various pathogens when treated with huge range of pesticides.

BB Should we maintain this exchange on a working group basis?

DP Send information, every bit, to some central point?

BB New quarterly journal of Plant Protection, intended to cover all aspects of plant protection in Australia, would be a possibility.

WESTERN AUSTRALIA

B.L. SHEARER
DEPT. CONSERVATION AND LAND MANAGEMENT
DWELLINGUP, WESTERN AUSTRALIA

PHYTOPHTHORA CINNAMOMI

As part of the general aim to identify key site indicators that can be used to predict impact of *Phytophthora cinnamomi* in the northern jarrah forest, the research programme at Dwellingup is divided into three main areas.

1. Prediction of impact.

Significant progress has been made towards developing methods to predict impact of *P. cinnamomi* in upland areas of the northern jarrah forest. Over 300 upland sites infected with *P. cinnamomi* have been described according to disease expression, topography, geology, soils and vegetation. Uninfected upland sites were also described. Data from sites in the high rainfall zone has been analyzed and indicators identified. Five impact types are now recognized for the high rainfall zone. Work is now in progress to analyze data from the intermediate and low rainfall zones and develop a system for use by operations.

2. Processes within sites.

The amount of subsurface flow of water within a site has an important influence on survival, sporulation, dispersal and impact of *P. cinnamomi*. To help predict changes in disease development with time the objectives of processes within sites were to relate variation of subsurface flow, within and between sites, to rainfall event and site characteristics.

An upland moderate and high impact site were instrumented with throughflow trenches, piezometers and tensiometers and monitored over the last year. Perched water tables developed on the sandy clays beneath the laterite more rapidly, were more sustained and more extensive in the high than the moderate impact area. These differences in hydrological response between impact areas were related to a reduced infiltration capacity due to fewer cracks and vertical channels passing through the lateritic duricrust and to finer clay textures in the high impact area. In the high impact area, *P. cinnamomi* was consistently recovered from throughflow above the laterite high in the landscape. Inoculum was also recovered from up to 2.8m below the soil surface, mostly in the lower slope positions. Dispersal of inoculum occurred throughout winter, but very little subsurface flow and dispersal occurred in an above average rain event in summer.

3. Assessment of damage.

Little is known of the amount of damage that occurs to the roots of live jarrah trees growing in infected moderate impact sites; the objective was to quantify this damage.

Twenty six and eight live trees have been excavated from infected and uninfected moderate impact sites, respectively. Excavation and assessment of a tree takes 2 wk. *Phytophthora cinnamomi* was recovered from the large roots of 16 of the trees in infected sites and from none of the roots of trees in the uninfected control sites. In one tree the fungus was recovered from 11 roots. Analysis of the results is in progress.

ARMILLARIA

Armillaria luteobubalina was widespread and caused damage in the jarrah forest of southwestern Australia. Over 200 infection centres were identified during the last five years. Deaths of five *Eucalyptus* species associated with *A. luteobubalina* have been observed: *E. calophylla, E. gomphocephala, E. marginata, E. wandoo* (all endemic to the region) and the introduced species, *E. saligna*. Death of understorey and overstorey hosts was greater in infection centres in the intermediate or low rainfall zones of the eastern jarrah forest than in centres in the high rainfall zone at the western edge of the Darling Scarp. Although *A. luteobubalina* basidiomes were found originating from roots of 34 plant species, incidence of basidiomes was greatest on *E. marginata* roots.

Root systems were excavated and patterns of *A. luteobubalina* invasion recorded. The host species varied in their susceptibility to the fungus. *Eucalyptus wandoo* invariably died once *A. luteobubalina* reached the base of the stems. This species lack of resistance to tangential spread often meant death by the time the fungus had advanced columns of decay into the lower stem or butt. The ability of *E. marginata* individuals to restrict tangential spread and prevent girdling of stems was indicated by the presence of old scars or 'inverted-V-shaped-lesions'. Lesions in *E. calophylla* stems were different to those described for *E. marginata*; they did not have a definite V shape and decay penetrated deep into the sapwood.

SUSCEPTIBILITY OF EUCALYPTUS SPECIES TO *BOTRYOSPHAERIA RIBIS*

As part of studies into the cause of death of *E. radiata* in arboreta, *E. calophylla, E. cladocalyx, E. marginata* and *E. radiata* were inoculated with *B. ribis*. In a glasshouse, *E. calophylla* contained longitudinal and tangential extension by the fungus (Fig.) and containment of lesions was associated with rapid callus formation. Lesions in *E. cladocalyx* stems were long and narrow. Necrophylactic periderms formed the boundaries of the lesions which ceased to extend tangentially. Lesion development in *E. marginata* was the reverse to that in *E. cladocalyx*; while longitudinal extension was limited, tangential extension was not. Only in *E. radiata* did *B. ribis*

lesions extend both longitudinally and tangentially. Field inoculations confirmed observations in the glasshouse. The long, but narrow lesions in *E. cladocalyx* stems illustrates the need to determine tangential as well as longitudinal spread when assessing resistance to *B. ribis*.

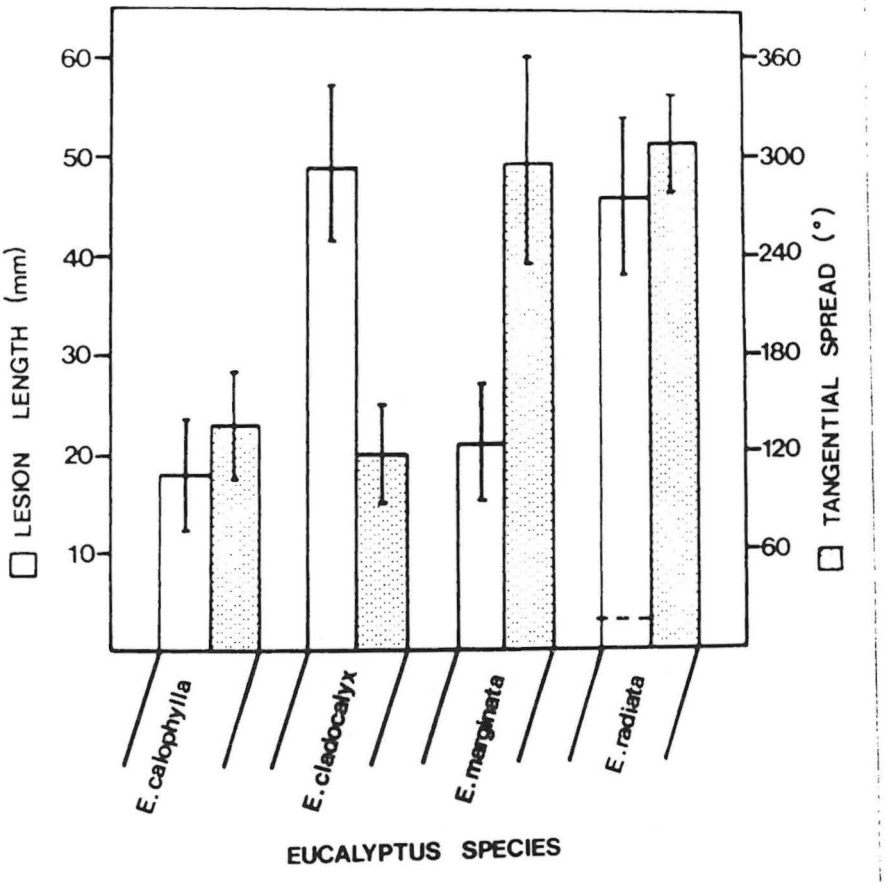


Fig. Lesion lengths and tangential spread (± standard error of the mean) of *Botryosphaeria ribis* in stems of four *Eucalyptus* species in a glasshouse 33 days after inoculation. --- indicates size of control inoculations.

J.T. Tippett & D.S. Crombie
Research Branch, Department of Conservation & Land Management,
Como 6152, W.A.

Jarrah Dieback

We are concerned primarily with the post-infection interaction of the fungal pathogen *Phytophthora cinnamomi* and the susceptible host, jarrah (*Eucalyptus marginata*). The outcome of the host-pathogen interaction is determined in part by the water status of the host which in turn reflects the hydrologic nature of the site on which it grows. By defining the relationships between site "wetness", disease development and symptom expression the ability to predict impact of *P. cinnamomi* on particular sites, and in response to events such as unseasonal rainfall, may be improved.

Results to date:

i) Phloem water relations and the rate of lesion extension.
The rate at which *P. cinnamomi* invades host tissue has been found to decrease as the host becomes water stressed. These effects have been demonstrated in the laboratory and in the field. Further, sites with the potential for severe dieback have been shown to maintain higher water potentials during summer than sites where disease expression is typically less severe.

ii) Root loss and jarrah water relations
The relationship between symptom expression and destruction of roots by *P. cinnamomi* was simulated by cutting roots from jarrah poles and monitoring the effects on tree water relations. Root loss had little effect on leaf water potentials until very severe levels of pruning (over 80% of roots cut). Stomatal conductances were reduced by much less severe root pruning (about 50% roots cut).

The results will be used to interpret changes in water relations of dieback affected jarrah in the field.

iii)Use of plants as soil tensiometers.

A number of species associated with jarrah, and having shallow (about 1m), moderate (penetrating to the impervious layer in the soil but not beyond), or deep (penetrating the impervious layer) root systems, as determined by root excavations, were selected for testing as in situ tensiometers. Measurement of predawn water potentials of these species over a dry summer confirmed that the water status of these plants behaved in a manner consistent with their root depth and soil drying patterns.

The 'plant tensiometer' approach appears therefore to be a suitable technique for the investigation of the relation between site 'wetness' and the potential for dieback impact on a particular site.

Causes of Wandoo Decline (Project supervised at Narrogin by Paul Brown).

Objectives of the study are:

To determine the causes of Eucalyptus wandoo decline in part of the wheatbelt of W.A. and to seek correlations between damage caused by insects and fungi with various environmental conditions.

There had been no detailed information available on any of the agents associated with crown decline of Eucalyptus wandoo in Western Australia. Therefore, the first phase of this project was to describe and record photographically the various types of external and internal damage to wandoo and to identify the causal agents associated with each damage type. During the first six months of the project we concentrated on recording the amount and types of damage to wandoo in the Narrogin region.

For many of the bole symptoms described there have been no casual agents yet identified. However, encouraging progress in identifying insects (mostly borers) and fungal organisms associated with various types of damage has been achieved. Some 5 insects have been identified to genera and a further 5 insects have been classified down to family level. All of the insects identified cause varying amounts of internal damage. However, only two - Tryphocaria punctipennis and the Xyloryctidid 'bark-cutter' moth larvae - appear to cause branch death in living E. wandoo by girdling ('ringbarking') branches.

ITEM 12. Contingency planning workshop

Contingency planning workshop meeting held in July - see Appendix.

Recommendations have all been circulated to RWG7 members. The Keynote papers have been sent to Austalian Forestry for their consideration for publication [Published August, 1987].

JS What was DORC response?

BS DORC happy with representation, commends those three RWG7 officers who were allowed to attend. DORC fully supports all ten recommendations. Specific attention was drawn by IB to 3, 4b, 6a and 6b. Important issue is need for coordinating national approach. Standing Committee have agreed to set up a committee (chaired by Marcia Lambert) to look very closely at recommendations 1 to 6. In the meantime DORC has referred the whole issue back to FFPPDC meeting, because other States comments are needed particularly on recommendation no. 7.

JS Should this working group endorse the recommendations of the contingency planning workshop on a formal basis?

BS Yes, because hasn't been through this group as a whole, even though DORC already endorsed it.

JS Will someone propose that we endorse the recommendation of the pest and diseases contingency planning workshop?

Yes, BB, seconded DP.

JS Does anyone dissent from that point of view? Nobody dissented.

Sam Navaratnam Current Quarantine Practices

JS. One of the real problems with the quarantine services is that quarantine is a national function, but once disease is established in the state it becomes a state responsibility and not a federal matter. It's not

the delegation that is the problem, but the money. Once disease established it is the funding, e.g. Queensland has paid for eradication of *Cryptotermes brevis*. NSW forestry also has paid for some actions.

JS. John Walker is still concerned that seed is still coming in. A firm in Collingwood, Victoria is manufacturing Bonsai kits and exporting them to America. The US quarantine services intercepted these kits and found they were contaminated with *Botryodiplodia* and ordered the kits to be destroyed. A sample was sent back to the Export Inspection Service in the Department of Primary Industry and subsequently given to JW to look at. He didn't find *Botryodiplodia*, but did find *Sieridium cardinale* on it and four other fungi which are possible significant pathogens of *Cupressus* (seeds turned out to be *Cupressus sumpervirens* seeds). Seeds traced back to being imported from Italy; two species of rusts which are carried by Cupressus can be a problem on other plants.

SN drew attention to what changes have occurred recently in quarantine policy.

Quarantine policy for plants and seeds in this country would be considered the strictest in the world. All imported plants must be grown in quarantine, that is the rules which do not apply in USA or Europe or NZ. Then looked at by nursery staff, who are unqualified, who will report anything unusual and Quarantine staff will follow it up. Number of disease findings are very few. Decided to review those seed species frequently coming in with a view to not worrying about those which hadn't given problems. The quota systems have now been thrown out as arbitrary, not based on health risks. Originally the small quota system meant that what came in could be used only as nuclear material not for resale. This has now been thrown out. Number of prohibited species which could be brought in only as seeds, but not plants, now thrown out. Same happened with Bonsai. Another reason prohibition was removed because if prohibited then someone will bring in deliberately.

Now have flexible policy, negotiable, based on the belief that the policy should be on disease risk, not flat refusal. Now accept results if it is checked out in another country, provided given assurance that the checking

will be done.

Then we have quarantinable diseases, quarantine pests defined as one that is exotic or one that is serious and subject to control. Elite material, therefore, from certain places is allowed in without any quarantine procedures.

DP. Do you feel you are in control of the situation compared to, say, what you were five years ago, do you feel as effective?

SN. A lot of breaches of quarantine are due to three million passengers by-passing system.

SN. Only certain seeds restricted, then allow 100 grams which is treated and released.

JS. Suggested there is still some disquiet about quarantine matters and we should form small committee to formulate a recommendation. FP to coordinate, with KO, etc.

KO. It is a pity these changes in administrative procedure have not been set out in written form for us to appreciate before this meeting.

GK. Consider recommending publication of the procedure.

JS. We have quite a few examples, e.g. (1) koala bear eucalypts, (2) the cupressus seed, (3) *Pinus thunbergii* from Japan, of quarantine problems.

ITEM 13. *Armillaria*

GK believes there are still some undiscovered *Armillaria* species in Australia. Tropical areas of Queensland haven't been looked at in any detail, but four species described already are the major species in terms of their distribution and *A. luteobubalina* being the important one in terms of pathogenicity.

SN. Does *A. mellea* occur in Australia?

GK. Not as far as we are aware, *A. mellea* is a species of temperate northern hemisphere (North America and Europe) and of hardwood species.

SN. What are chances of introducion of new *Armillaria* spp?

GK. Introduction always possible, but chances of survival and spread believed to be remote. Don't know of any examples of introduced *Armillaria* species anywhere in the world.

The ecology of *Armillaria luteobubalina* in the karri forests of Western Australia.

M.H. Pearce, c/- CSIRO Division of Forest Research, Perth.

The occurrence and effects of *A. luteobubalina* were examined in the karri (*Eucalyptus diversicolor* F. Muell.) forests of south-west Western Australia. The fungus occurs in all soil types, has a widespread but discontinuous distribution and spreads below ground by root contact. Each infection centre is usually occupied by a different genotype. Basidiomes develop from May-August with peak production between mid-May and early June. The fungus is a primary pathogen of karri and understorey species, but the effects of the fungus differ with the age of the forest. In the youngest regrowth stands it is able to kill vigorous karri saplings, but in older stands it appears to kill mainly the subdominant and suppressed trees. Infection and death of hosts was directly related to the presence of nearby infected stumps.

To understand the relative paucity of *A. luteobabalina* rhizomorphs in field soils, some factors affecting rhizomorph growth in soil were studied. Comparisons between (a) a laboratory study on the interaction between soil moisture content and temperature, (b) a field seasonal variation experiment, and (c) field monitoring of soil temperature and moisture content over a 15 month period, indicated that optimal conditions for rhizomorph growth either do not occur, or only occur for a short

period (approx. 1 month) in the field, thus at least partially explaining the paucity of rhizomorphs in field soils. Other factors which affected rhizomorph growth were foodbase, soil type, depth from soil surface, site, and soil sterility. The presence of organic matter also appears to stimulate rhizomorph growth. Differences in rhizomorph production between the four described *Armillaria* species (*A. luteobubalina*, *A. hinnulea*, *A. fumosa* and *A. novae-zelandiae*) were also studied.

A three-part study into the possible biological control of *A. luteobubalina* (by the use of other wood-decay fungi) was also undertaken. A floristic survey of stump colonisation by the larger fungi indicated (a) some fungi prefer different eucalypt species as a foodbase, (b) some fungal species show differences between parts of stumps colonised (top v. base), (c) a successional trend of fungal species was evident in an age series of stumps (1-15 years old after clearfelling), (d) there was little relationship between the presence of other wood decay fungi v. absence or presence of *A. luteobubalina*, but a significant correlation was evident between % basal stump infection by *A. luteobubalina* v. other fungi. The screening of fungal isolates for antagonism against *A. luteobubalina* on malt extract agar and karri stemwood indicated that some fungi can prevent or significantly reduce the growth of *A. luteobubalina*. The field inoculation of stumps indicated that some fungi may be effective in preventing, or at least reducing, *A. luteobubalina* colonisation of stumps. Further studies in this area appear to be warranted.

Armillaria root rot

G.A. Kile

CSIRO Division of Forest Research studies in this topic have continued at a low level since the last RWG 7 meeting.

(a) Information on Queensland and New South Wales *Armillaria* species is being compiled in a paper which will be completed in late 1986.

(b) A reference collection of *Armillaria* species tester strains (single basidiospore and diploid isolates of *A. luteobubalina*, *A.*

hinnulea, *A. novae-zelandiae* and *A. fumosa*) has been lodged at DAR. With these strains it is possible for researchers to identify unknown isolates of these species either from single basidiospore or di-mon crosses.

(c) It is hoped Dr Earl Nelson, USDA Forest Service will be awarded a Fullbright Scholarship to work on the biological control of *Armillaria* root rot in Western Australia in 1987. This research is of obvious relevance to WA and Victoria where *Armillaria* root rot is recognised as a problem in eucalypt forests. Results of the Fullbright selection should be known about the time of this meeting. Glen Kile believes this application to have been successful.

(d) The *Armillaria* root rot control trials at Mt Cole, Victoria, will be the subject of a major evaluation in 1988 (i.e. 10 years after establishement) and is exclusively *luteobubalina*.

ITEM 14. Assessment of Resistance of Superior Clones to Common Pathogens

JS. This came up out of the *Dothistroma*-movement proposal, the increasing use of clones in forestry. What is of some concern is if the claims for superior growth rate are reliable then we are likely to get substantial plantings of a few clones, it be desirable that these be tested against the common pathogens for which resistance tests are available. Tests are not available for all fungi, but Butcher has started this for *Phytophthora* in WA. It would also be possible to do this with *Dothistroma*. It might be possible to do it with *Sphaeropsis*, even *Cyclaneusma*. This wouldn't imply that they shouldn't plant a clone because it is highly susceptible to something, but that management should be aware of its susceptibility. Whilst the examples given above apply to *Pinus*, something similar is possible for Eucalypts, e.g. Brazil, where cutting material is known to be resisant to *Cryphonectria cubense*.

This morning we were mentioning branch shedding in eucalypts, where branch shedding characteristics appears to be so important against entry of pathogens.

JS. What does this group think about suggesting to RWG 1 (Tree breeding) that they should be wherever possible arranging to have the more promising clones tested for resistance to the more common pathogens where the tests are available?

BB. I would support that, particularly as Queensland is involved in cloning *Pinus carribea*.

JS. In answer to question by FP about would it be too big a job, JS replied that he understood that the number of clones being considered in this country is rather small.

DP. We have the problem here with such a long lead time to forestry production, compared to agriculture where the wipe out of one particular crop for one particular year would not be disastrous. Hence the "genetic vulnerability situation" is potentially more damaging to forestry than to agriculture. Any practice which narrows the genetic make up of forestry should be considered unacceptable until some answers on the resistance of that reduced genetic make up are known.

JS. Unfortunately it has all sorts of problems, because if look at poplars what happened was they found all sorts of races of poplar rust. Suspect if looked at *Dothistroma* one would also find many races.

GK. Believes geneticists so involved with the selection of fast growing trees that they do not want to know about anything else - so there is a great education job to be done on the geneticists.

JS. Does this group think that there are enough pathogens for which there are reliable assessments for resistance? Certainly is so for two *Phytophthoras*, *cryptogea* and *cinamomi* for which the approach that Butcher has taken is entirely reasonable.

FP. Butcher has very good reasons, in WA, for looking at *Phytophthora*, wouldn't be too interested in *Dothistroma* or *Cyclaneusma* for climatic reasons. So would need to look at this problem on a regional basis. If go to New England, probably too high and too cool to worry about

Phytophthora, probably more worried about *Dothistroma*. If go to Tasmania, more worried about *Cyclaneusma* than *Dothistroma*, and not at all about *Phytophthora*.

BB. Even though it would become then a State problem, the test results from one State would be of immense value to other states.

DP. Could this be considered under plant protection policy as a sort of register system?

SN. What happens elsewhere, e.g. USA?

JS. Last year we had a visit from a group of Brazilians who came out here to see how we grow eucalypts and could scarcely believe their ears when told that growth rate in NSW was 0.5 m^3 when they are looking at 30-90! therefore there is intense pressure to go to clonal material in Australia.

FP. What we need to make sure we haven't got clonal susceptibility to is some of the more dangerous overseas pests, particularly the stem invading, leader damagers, those that corrupt shape. Shape is top priority with the breeders, and if we tell them that there are diseases with the potential to completely mess up the shape of their clones, e.g. *Diplodia*, *Scleropsis*, and *Cercospora*, they are going to listen more than if we tell them that they might lose 30 per cent of their foliage every third year.

GK. Yes, shape is most important since the growers will be looking at small dimension material.

Then discussion between KO and FP as to whether material should be sent overseas for testing against for example Western Gall rust, and it was considered that there was a possibility that tests carried out in another climate may yield results different to what would happen in Australian climate.

JS. Resolved to consider a recommendation on this problem on Thursday morning.

ITEM 15. Eucalypt Canker Fungi

KO. Work by Dave Murray terminated, now working full time with Nick M. on mycorrhizae.

KO. Japanese eucalypts shoots with leaves are sent to Taronga Park Zoo for koalas to acclimatise before the koalas are sent over to Japanese zoo.

JS. No known significant pathogens of *Eucalyptus* in Japan, so the objections of JS and JW to this practice were discounted.

SN. Explained that when application came in we did a "pest risk assessment", we go through literature, we considered that this was material not to be propagated, and we thought that each batch should be inspected by pathologists, though the latter was never carried out and the shipments were given the go ahead.

Fungi Associated with Eucalypt Cankers in Western Australia

D.I.L. Murray, Division of Forest Research, CSIRO, Wembley, WA

Between July 1984 and June 1986 cankers associated with branch dieback of 32 *Eucalyptus* spp. were examined in the jarrah, wandoo and karri forests and in the wheatbelt and goldfields of Western Australia. Numerous fungi were isolated from cankers and tested for pathogenicity towards *E. wandoo*, *E. calophylla* (marri) and *E. diversicolor* (karri) in the glasshouse. Isolates of three fungal species (*Cytospora eucalypticola*, *Botryosphaeria ribis* and *Endothiella* sp.) were also tested against wandoo and marri in the field.

Cytospora was isolated from over 85% of cankers while the corresponding figures for *Endothiella* and *B. ribis* were 19% and 15% respectively. *Cytospora* was recovered from cankers on all 32 *Eucalyptus* spp. studied. *Endothiella* was isolated from cankers on wandoo, marri, *E. gomphocephala*, *E. maculata* and *E. saligna*, whereas *B. ribis* was recovered only from the

first two of these species and karri. *Endothiella* and *B. ribis* were not isolated from any cankers in the goldfields and were seldom detected on trees in the wheatbelt. Another fungus, *Sporothrix canescens*, was isolated from over 25% of cankers and was particularly common in the goldfields.

In pathogenicity tests *Endothiella* and *B. ribis* caused typical cankers on marri, wandoo and karri but there was no good evidence that *Cytospora*, *Sporothriax* or any of the other isolated fungi were pathogenic. Based on canker dimensions, marri was found to be more susceptible to *B. ribis* than *Endothiella* while the converse was true of wandoo. Karri was least susceptible to attack by either pathogen.

In field trials *B. ribis* and *Endothiella* caused extensive lesions in the phloem of wandoo and marri, and both pathogens induced kino vein formation in marri but not usually in wandoo. Lesions on inoculated trees continued to expand for up to 9 months. After 1 year, most lesions had been walled off by the host and many had started to dry out and shrink. Nevertheless, *B. ribis* and *Endothiella* were regularly reisolated from lesion edges even where the host tissue was dry and shrunken after a year.

In glasshouse trials with seedlings, *B. ribis* and *Endothiella* caused severe necrosis of the phloem and xylem of marri and wandoo. In some treatments with *B. ribis*, one year old marri seedlings were killed. The two pathogens also induced kino vein formation in marri, wandoo and karri, though the latter host was least affected.

Using different inoculation techniques it was shown unequivocally that *B. ribis* and *Endothiella* can only establish an infection if the stem surface has been physically damaged.

The results of this work clearly indicate that *B. ribis* and *Endothiella* are wound pathogens with the ability to cause similar symptoms and cankers on *Eucalyptus* in WA. However, the low frequencies of isolation of the two pathogens from cankers in the field contrasts with the relative ease of reisolation from artificially induced (and dried out) cankers in the field trial. Thus, it seems likely that other unidentified pathogens may also be involved and that eucalypt cankers have a multiple cause.

Eucalyptus canker fungi

K.M. Old, CSIRO Division of Forest Research, Canberra

a) *Endothia gyrosii*

Research at Canberra has studied the pathogenicity of a range of isolates of *Endothia gyrosa* and *Endothiella* to 5 species of eucalypts of significance to forestry in eastern Australia. All isolates produced cankers on seedling trees but significant variation in pathogenicity was detected. Trees outplanted in the nursery showed an ability to limit canker development and with few exceptions the lesions healed within one year.

Studies of the effect of defoliation and drought stress on the severity of cankers caused by *E. gyrosa* and *Botryosphaeria ribis* showed that defoliation predisposed *E. delegatensis* and *E. regnans* to shoot girdling and death caused by *E. ribis*. There were indications that defoliation delayed callus growth and wound healing of *E. grandis*, *E. maculata* and *E. salignis* infected by *E. gyrosa*. Drought stress of *E. maculata* and *E. delegatensis* had no significant effect on the severity of cankers caused by the two pathogens.

b) *Cryphonectria parasitica*

Research in Japan has shown that all 5 *Eucalyptus* species so far tested, namely *E. robusta*, *E. microcorys*, *E. camaldulensis*, *E. punctata* and *E. haemophila* are susceptible to canker disease caused by *Endothia (Cryphonectria) parasitica*. A *Cryphonectria* species tentatively identified as *C. parasitica* and *Endothiella anamorphs* have been found associated with shoot dieback and stem defect of seven eucalypt species at 3 locations in central Honshu.

c) *Cytospora eucalypticola*

A comparison of two collections of a *Valsa* sp. (DAR 51629) on *E. saligna*

in NSW with fresh and herbarium material of *Valsa* spp. at Tsukuba strongly suggest that *C. eucalypticola* is an anamorph of *Valsa ceratosperma* (Tode ex fries) Maire. This conclusion is supported by pathogenicity studies with eucalypts and the finding of *Valsa* teleomorphs identical to V. *ceratosperma* on *E. globulus* in central Honshu.

V. ceratosperma is widely distributed in the Northern Hemisphere and has a very wide host range.

ITEM 16. Defects in Regrowth Stands (the Young Eualypt Program)

GK. Not a great deal to report yet as no work yet begun. Is an interesting program in terms of its organisation, and its orientation and the mechanisms for transfer of this knoweldge into practice and in getting industry involvement in research from the start.

GK. KO's canker work could become a significant component of this study so there will be close liaison.

There has been one public seminar in Launceston and will be repeated on 11 December 1986 in Melbourne.

FP. How large is the resource in Victoria and Tasmania?

GK. One of the projects is to find this out, but they talk about a quarter million hectares of regrowth, that obviously varies a lot in quality and accessibility.

JS. We are looking at the kinds and incidences of fungi associated with defect in the sample of trees from a potential intensive silviculture trial, but we will discuss that in the field tomorrow (thats growing at 50 m^3 per annum - Charlie Mackowski).

Discolouration and Decay in Young Eucalypts

G.A. Kile, CSIRO Division of Forest Research

The Young Eucalypt Programme (YEP) is a joint programme of the CSIRO Divisions of Chemical and Wood Technology and Forest Research, the Forest Services and the Forest Industries of Tasmania and Victoria which aims to increase the productivty and utilisation of material from faster growing eucalypt forests.

The seven major projects in the programme are (1) Growth modelling, (2) Discolouration and decay, (3) Thinning and harvesting, (4) Debarking, (5) Sawmilling, (6) Pulping studies and (7) Resources and Marketing. the programme has a Management Board representing the contributors and is responsible for approving projects and recruiting the required resources.

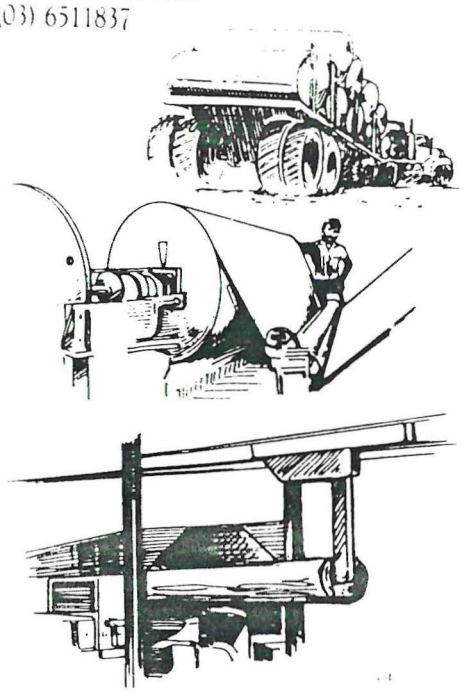
The discolouration and decay project aims to assess the incidence and types of discolouration and decay in young regrowth eucalypts, the amount of damage caused to residual trees by various thinning technologies and its consequences for wood quality. The work will be linked with studies to be undertaken by Tim Wardlaw of the TFC on branch stubs as sources of defect and the consequences of pruning eucalypts in terms of discolouration and decay. It is proposed to appoint a pathologist for a 3 year term to undertake the YEP project.

FOR FURTHER INFORMATION CONTACT

Program Director:
Bill Kerruish
CSIRO Forest Research
PO Box 4008
CANBERRA 2600
(062) 815235

Tasmanian Co-ordinator:
Chris Palzer
Forestry Commission
199 Macquarie St
HOBART 7000
(002) 303133

Victorian Co-ordinator:
Peter Fagg
Department of Conservation, Forests and Lands
240 Victoria Parade
MELBOURNE 3000
(03) 6511837



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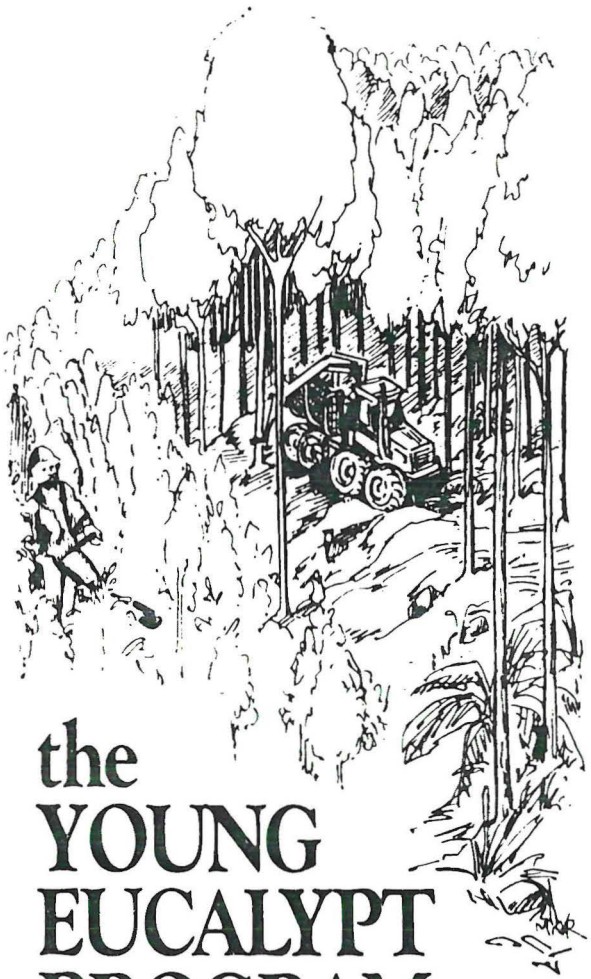


the YOUNG EUCALYPT PROGRAM

. . . co-operative research into the growth, harvesting and use of intensively managed eucalypts.

The program brings together managers and researchers with the objective of increasing the contribution regrowth forests make to the Australian Community.

It is funded and managed by its participants: CSIRO's Divisions of Chemical and Wood Technology and of Forest Research, the Tasmanian Forestry Commission, the Victorian Department of Conservation, Forests and Lands and the Forest Industries of Tasmania and Victoria.

BACKGROUND

Australia's native forests have been contracting since European settlement and today much of the 'old growth' has been replaced by younger regrowth forest. Research into methods of managing eucalypt forests has been stimulated by:

- the need to secure wood supplies as a basis for developing rural economies,
- the need to set aside forested land for conservation and recreation purposes and
- some ideas as to how science and technology could be used to improve the growth, harvesting and utilisation of the faster growing regrowth forests.

WHY A CO-OPERATIVE PROGRAM?

Australia's eucalypt forests are mostly managed by State Governments and are harvested and converted to forest products by private industries. CSIRO is a federally funded organisation researching many aspects of the forests and forest products industries.

An objective of the Program is to integrate knowledge across the organisations and disciplines involved. Emphasis will be placed on the rapid transfer of research results to the Programs participants.

PROGRAM MANAGEMENT

The Program is directed by a Management Board which represents the contributing participants. The Board ensures that the resources of the participants are effectively used, it assists in recruiting resources from industry and research funding bodies, and sees that the required research integration occurs.

Research projects in the Young Eucalypt Program include:

THINNING AND HARVESTING

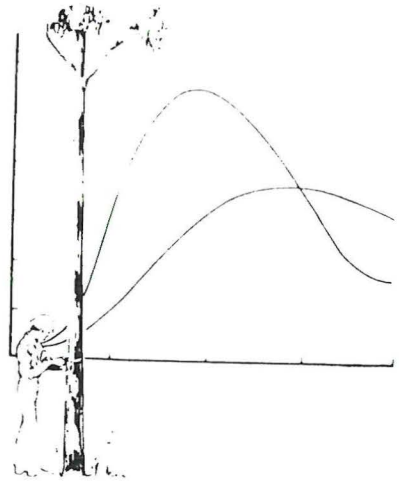
The initial phase of this project involves the introduction and study of new technologies for thinning young stands. Both non-commercial and commercial thinning systems will be explored to establish the effect of stand variables on productivity. Future work will also examine the cleartelling of young stands. A forest classification system based on stand and terrain factors will be developed alongside these studies so that the results can be generalised to other sites.

Project Leader: Bob McCormack, CSIRO Forest Research, Canberra.

STAND DAMAGE

Thinning can be expected to cause some damage to the roots and stems of a proportion of the remaining trees. Changed patterns of branch shed may also influence the occurrence of defect. The research will involve a comparative analysis of the development of decay and discolouration in thinned and unthinned stands and establish whether new thinning technologies can reduce the incidence and severity of damage. The project will include an economic analysis of timber losses.

Project Leader: Glen Kile, CSIRO Forest Research, Hobart.



GROWTH RESPONSE

This project is designed to predict the growth of young stands of *Eucalyptus regnans* at different spacings, and how they will respond to different thinning treatments. The prediction will require new relationships to be established between crown characteristics, competition between trees, and tree growth. The results will be used to extend STANDSIM, an existing growth forecasting model, so that it can be used in younger stands.

Project Leader: Phil West, CSIRO Forest Research, Hobart.

DEBARKING

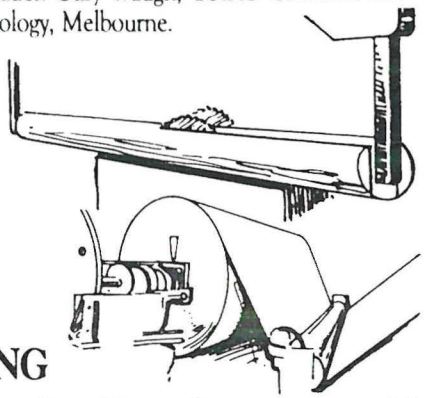
This project investigates alternative technologies for removing the bark from small diameter, fibrous barked eucalypts. The absence of a suitable process remains a major constraint to the use of early thinnings. Several harvesting/debarking/transport systems are being compared to identify those debarking processes worthy of research and development. Initial studies will involve short experiments on readily available equipment, including debarking by drum, modified softwood harvesting equipment and possibly vibration.

Project Leader: Robin Wingate-Hill, CSIRO Forest Research, Canberra.

SAWN TIMBER PRODUCTION

Available market research information will be used to predict the sawn products likely to have high total sales and high prices per cubic metre. The problems likely to prevent young, fast grown eucalypts supplying these markets will then be examined. Existing drying, sawing and finishing facilities will be assessed and at the same time a computer model of drying, sawing and finishing processes will be built to relate log specification to log value.

Project Leader: Gary Waugh, CSIRO Chemical and Wood Technology, Melbourne.



PULPING

Kraft pulping studies will be conducted on samples of *E. regnans* and *E. obliqua* between 7-10 and 70 years of age, as well as samples of the old growth forest from southern Tasmania. Trees from the younger age group will also be pulped with bark included, to simulate the situation where bark removal from small wood is prohibitively expensive. The technical results will be used to calculate dollar values of pulpwood relative to woodchip export prices where these values are known.

Project Leader: Frank Phillips, CSIRO Chemical and Wood Technology, Melbourne.

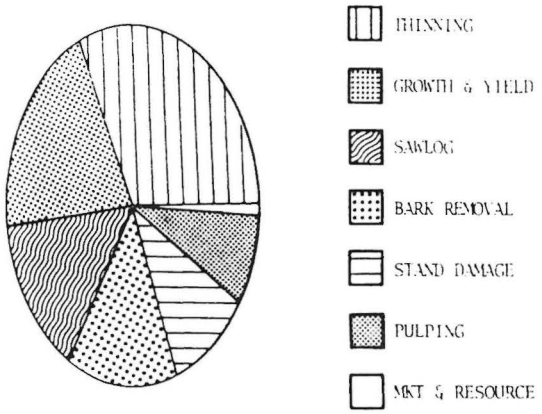
RESOURCES AND MARKETS

This is a project to assess the extent and potential of the regrowth forest. It involves the collation of existing information on forest areas and likely markets for wood products.

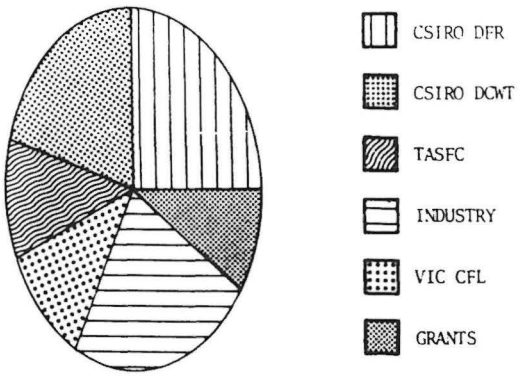
Project Leader: Geoff Gartside, CSIRO Chemical and Wood Technology, Melbourne.

PLANNED SOURCE AND USE OF FUNDS

USE OF PROGRAM FUNDS



SOURCES OF PROGRAM FUNDS*



* Total expenditure over the four year period is expected to be in the vicinity of $2.9 million dollars.

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ITEM 17. Rust Diseases of Forest Trees

JW Seeks advice as to whether he should continue with his work on preparing list of rust disease of angiosperms (broad-leaved trees).

Secretary to write and thank him and ask him to continue (since done, JDT).

The work John has done so far can be seen in the following pages, 88-93. Page 90 is a specimen page from list of *Pinus* rusts with the list in rust order, whereas page 91 is a specimen page in host order. Note that in the revision, the references which are now quoted by number in brackets will be given as author and date. Pages 92 and 93 are specimen pages of rust lists of broad-leaved trees.

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Item 17 - Rust diseases of Forest Trees

At the Burnie meeting, it was agreed that preparation of lists of exotic rust diseases which could attack trees growing in Australia be prepared. This report gives details of progress made on preparation of these lists. The rusts will be considered under three separate headings.

1. Rusts of *Pinus* spp.

A list of all the rusts of *Pinus* species and their alternate hosts is 90% completed. This list is based on a list of *Pinus* rusts sent to me in the late 1970's by the late Dr. G. F. Laundon, Levin, New Zealand. Dr. Laundon had prepared this list for internal use by New Zealand quarantine authorities. This year I obtained permission from New Zealand to use Dr. Laundon's 1977 list as a basis for the list of *Pinus* rusts to be prepared for RWG7. I made it clear to the New Zealand authorities that, should the list be published, the senior author will be G.F. Laundon. I have added some more recent records to Laundon's list and all that remains to be done is

(i) checking of some recent literature

(ii) alteration of the format of the list to make the information more readable and informative. I will be altering the method of citing the literature and the cross referencing in the lists. Some entries will also be expanded

(iii) checking of some of Laundon's earlier entries and updating of rust names in accordance with the recent changes to the International Code of Botanical Nomenclature.

I have attached as Appendix No. 1 copies of pages from the rust list and the host list. At present, the list is 29 A4 pages long (including bibliography) and by the time it is finished it will probably be 35-40 pages.

2. Rusts of conifers other than *Pinus*

No work has been done on this list.

3. Rusts of broad-leaved trees

Preparation of this list has begun, and records have been abstracted from literature from Japan and North and South America. A specimen page is attached as Appendix No. 2. This is a much more extensive exercise than the list of *Pinus* or conifer rusts and, whilst quite a lot of information has been abstracted from the literature, most of it has not been assembled into list form. The literature to be examined, in the form of check lists and rust monographs, for many countries is on hand, but this work will of necessity need to be fitted in with other pressing commitments that I have, in particular the writing of the Check List of Plant Diseases for New South Wales. If RWG7 is willing for me to proceed with the list of broad-leaf tree rusts in this way, I will continue to prepare it.

..2/-

In summary

(a) a world list of Pinus rusts and potential Pinus rusts with alternate hosts, geographic distribution and literature sources is 90% prepared.

(b) no work has been done so far by me on a list of rusts of other conifers.

(c) a list of rusts of broad-leaved trees is in preparation.

J. Walker

13.xi.1986

Co. sp. On Nicotiana. Europe, USSR (18).

Co. sp. On Perezia. Mexico (22).

Co. sp. On Siegesbeckia. China (25).

(Cronartium andinum Lagerh. is Cionothrix andina (Lagerh.) Jackson & Holway.

(Cr. antidesmae-dioicae Sydow is Crossopsora antidesmae-dioicae (Kuc.) Arthur & Cummins.

Cr. appalachianum Hept. (syn.: Peridermium appalachianum Hept. & Cumm.) On Pinus/Buckleya. USA (5).

Cr. asclepiadeum (Willd.) Fr. is C. flaccidum (Alb. & Schw.) Winter.

Cr. balsaminae Niessl is Cr. flaccidum

Cr. bresadoleanum P. Henn. is Cionothrix gilgiana (P. Henn.) Sydow).

Cr. byrsonimatis P. Henn is Crossopsora byrsonimatis (P. Henn.) Peterson).

Cr. cerebrum (Peck) Hedgc. & Long is C. quercuum.

Cr. coleosporioides Arthur (syn.: C. stalactiforme Arthur & Kern, Peridermium stalactiforme Arthur & Kern). On Pinus/Castilleja, Cordylanthus (= Adenostegia), Elephantella, Orthocarpus, Pedicularis (5), Melampyrum (12), N., C. & S. America (5).

Cr. comandrae Peck (syn.: C. pyriforme Meinecke, Peridermium betheli Hedgc. & Long, P. pyriforme Peck). On Pinus/Comandra, Geocaulon (33). Canada, USA (5).

Cr. comptoniae Arthur (syn: Peridermium comptoniae Ort. & Adams, P. pyriforme auct. non Peck). On Pinus/Comptonia, Myrica. Canada, USA (5).

Cr. conigenum Hedgc. & Hunt (syn.: P. conigenum (Pat.) Peterson, P. mexicanum Arthur & Kern). On Pinus/Quercus. USA, Mexico, C. America (33).

Cr. delawayi Pat. is C. flaccidum

(Cr. egenulum Sydow is Cionothrix egenula (Sydow) Sydow).

Cr. eupatorium Speg. is Cionothrix praelonga (Winter) Arthur).

Cr. euphrasiae Ran. is C. flaccidum.

Host list (*Pinus* rusts)

Argyroxiphium (Co. madiae). Canada, USA

Arnica (Co. madiae). Canada, USA

Arundina (Co. arundinae). China, Formosa, Indonesia

Asclepias (Cr. flaccidum). Asia, Europe, Japan, USSR (E)

Aster (Co. argentinum, Co. asterum, on cult. spp. America (N), Argentina, China, Japan, USSR (E)

Astericus (Co. asterici-aquatici, Co. tussilaginis. As Adenophora

Asteromoea (Co. asterum). As Aster

Asyneuma (Co. tussilaginis). As Adenophora

Barleria (Uredo mitteri). India

Bartsia (Co. tussilaginis). As Adenophora

Begonia (Co. begoniae). Plants: Mexico; dormant tubers: no restrictions

Bletia (Co. bletiae). China, Japan, India

Bletilla (Co. bletiae). China, Japan, India

Bocconia (Co. bocconiae). Colombia

Boltonia (Co. asterum). As Aster

Brachyglottis (Co. asterum). As Aster

Brickellia (Co. eupatorii). China, Japan, USA, Mexico.

Bubonium (Co. tussilaginis). As Adenophora

Buckleya (Cr. appalachianum). USA

Buphthalmum (Co. telekiae, on cult. B. speciosum). Europe.

Cacalia (Co. neocacaliae, Co. tussilaginis). As Adenophora

Calanthe (Co. bletiae). China, Japan

Calendula (Co. calendulae, on cult, C. officinalis etc., Co. tussilaginis, on C. officinalis, etc). As Adenophora

Callistephus (Co. asterum, on cult. C. chinensis, etc). As Aster

R. acaciae-micranthae Dietel is R. versatilis Dietel

R. aurea Cumm. & J.W. Baxter
On Acacia pringlei Rose
Mexico (Cummins, 1978)

R. australis Dietel & Neger
Syn. Uredo hieronymii Speg.
On Acacia cavenia Hook. & Arn.
A. pennatula (Schlecht. & Cham.) Benth.
A. smallii Isley
Southern U.S.A., Mexico, South America (Cummins, 1978; Lindquist, 1954).

R. farlowiana Dietel is R. versatilis Dietel

R. gooddingii Long is R. texensis Dietel

R. morongiae Long is R. texensis Dietel var. morongiae (Long) Cumm.

R. pringlei Cumm.
Syn. R. versatilis auth. non Dietel
On Acacia greggii Gray
Southern U.S.A., Mexico (Cummins, 1978)

R. reticulata Long is R. texensis Dietel

R. scopulata Cumm. & J.W. Baxter
On Acacia greggii A. Gray
A. occidentalis Rose
Mexico (Cummins, 1978)

R. siliquae Long (based on uredinia) is R. spegazziniana Lindquist

R. spegazziniana Lindquist
Syns. R. siliquae Long (based only on uredinia).
On Acacia aroma Gill.
A. farnesiana Willd.
A. smallii Isley
Southern U.S.A., Central America, Caribbean, South America, (Cummins, 1978; Lindquist, 1954; Long, 1903).

R. texanus Ell. & Gall. in Jennings nom. nud. is R. texensis Dietel

R. texensis Dietel var. morongiae (Long) Cumm.
Syns. R. morongiae Long
On Schrankia diffusa Rose
S. uncinata
Southern U.S.A., Mexico (Cummins, 1978)

R. texensis Dietel var. texensis

Syns. R. texanus Ell. & Gall. in Jennings nom. nud.

R. reticulata Long

R. gooddingii Long

On Acacia angustissima (Mill.) Kuntze

Calliandra humilis Benth.

C. reticulata Gray

Desmanthus cooleyi (Eat.) Trel.

Southern U.S.A., Mexico (Cummins, 1978)

R. thornberiana Long

On Acacia constricta Benth.

Southern U.S.A., Mexico (Cummins, 1978)

R. versatilis Dietel

Syns. R. farlowiana Dietel

R. acaciae-micranthae Dietel

On Acacia anisophylla Wats.

Acacia spp.

Mexico (Cummins, 1978)

R. versatilis auth. non Dietel is R. pringlei Cumm.

Uredo hieronymii Speg. is based on the pycnial and aecial stages of Ravenelia australis Dietel & Neger (Lindquist, 1954).

Genetic variability in susceptibility of *Pinus radiata* to Western Gall Rust.

K.M. Old, CSIRO Division of Forest Research.

At a single experimental site, large differences in susceptibility to WGR were found between the five native populations of *P. radiata*. The two island populations, from Guadalupe and Cedros Islands, were least susceptible. Of the three mainland populations, Ano Nuevo trees were substantially less susceptible than were trees from the Monterey and Cambria populations. New Zealand and Australian select families were intermediate in susceptibility between the Ano Nuevo and the Monterey populations, from which the New Zealand and Australian land-races are derived. Components of variation between families within populations were significant in the native Monterey population, among the select families from New Zealand and Australia, and among inter-population hybrids. Heritability estimates and comparisons of full-sib families to half-sib or open-pollinated families indicate substantial levels of additive (narrow-sense) heritability with regard to susceptibility to WGR, and provide no evidence for non-additive genetic variance in this trait. The results suggest that breeding for resistance to the disease is likely to yield worthwhile changes in average susceptibility.

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ITEM 18. Bibliography of Australian Forest Pathology

JS. This topic arose because two members of RWG8 (Entomology) John French and Ross Wylie (in their own time I understand) have almost completed a bibliography of Australian entomology. Ian Bevege indicated it might be desirable for RWG7 to consider the possibility of doing the same sort of thing for Forest Pathology. What would people think?

DP. What would it involve, how broad?

JS. Understand that the entomology one is an annotated bibliography of papers concerning Forest Pests.

KO. Would be a huge undertaking.

BB. My initial reaction is which of the thousands of *Phytophthora* references would be regarded as Agriculture orientated and which would be regarded as Forestry. That would be a major undertaking in itself.

GK. Who would benefit from this, how large would be the "audience"?

FP. As one with personal experience of preparing literature for a *Phytophthora* conference, I don't believe my bibliography was read by many.

FP. Sort of thing that ends up on the shelf with no reward for the effort.

DP. There is a list of plant pathologists, most people here would be listed with their interests, that is a good start for anyone wantng to get into these fields anyway.

FP. Even if you did a bibliography, to annotate it would not be a very good move because there is a great deal of the literature you would have to remark as "not worth your attention".

GK. The disease leaflets RWG7 will produce will give adequate key references.

JS. Concluded that we won't do anything more.

ITEM 19. General Business

JS. BS gave me a copy of a facsimile he received yesterday concerning re-drafted terms of reference for DORC and some of it is of interest to this group. "At the 33rd meeting of Standing Committee it was agreed that responsibility of RWG's be delegated to research directors of the organisations represented on Standing Committee. It was further agreed that CSIRO DFR would convene the meetings of the research directors and of the two Chiefs of the two CSIRO Divisions concerned with forestry. The

DORC meets once per year and reports to Standing Committee."

The 50th Standing Committee meeting gave further consideration to DORC terms of reference and revised objectves are given below.

The preamble includes the sentence "As governments must be convinced that the directions and effectiveness of research programs are appropriate it is important that research into forestry and forestry related issues be successfully coordinated.
Aims: 1. To optimise national benefit from investment into forest research.

2. To maintain an overview of Forest Research in Australia, with particular reference to the efficiency of RWG activities and the effectiveness with which their findings are implemented. Then lists objectives of DORC: (1) to identify gaps in current research which warrant attention; (2) to help coordinate research between the organisations; (3) to identify subjects where further expertise needed; (4) to achieve objectives of DORC which will be to define scope of each RWG, make recommendations to Standing Committee about formation, dissolution, or amalgamation of RWG's to ensure cost effectiveness of the operation of RWGs and, after taking advice from the RWG's and considering other relevant factors, to formulate a statement of priorities for forest research for consideration by Standing Committee; (5) to report annually to Standing Committee."

JS. The above clarifies some of what we talked about on Tuesday.

BS. Has effect of giving DORC a more positive role.

DP. When the various information is put to a Standing Committee and they in the end analysis set the priorities for the research that they see as being needed in forestry, how is this got back to the various RWG's that might pick up these research proposals? (Especially if nobody is already doing it).

BS. In the past it has been the responsibility of the various state members to refer those to their research chiefs, for yea or nay. Now there

is a charter given to the research chiefs to act as receivers of those recommendations and to take responsibility of it being done. It was interesting to see just how the heads of services would react to that, but they have endorsed it subject to confirmation.

JS. Wished members to note that the above paper read out (and one to follow on *Dothistroma*) is headed "Redrafted terms of reference for DORC and paper on Dothistroma are attached for your information. These papers are the subject of final clearance by Standing Committee on Forestry."

Dothistroma

JS. Two aspects to this report. 1. Standing Committee on Forestry report.

STANDING COMMITTEE ON FORESTRY

Meeting Number 50
Location Gympie, Qld
Date 10-14 Nov. 1986
Agenda Number B.12

DOTHISTROMA

INTRODUCTION

1. Dothistroma has been established for some years in Queensland, NSW and Victoria, and was found in Tasmania in 1984.

2. In 1985 the Chairman of RWGs 1, 5 and 7 (Genetics, Silviculture of Plantations, and Pathology) collaborated to prepare a paper on the disease and its dispersal for consideration by the Pests and Diseases Committee (Meeting 8, Agenda item 5.2.2, May 1985). Of particular concern was the possible role of infected planting stock in extending the infection to new localities.

3. The Chairman of that Committee subsequently reported the discussion to SCF (Meeting 47, Agenda item B.8, 15-16 May 1985). SCF asked that the authors reconsider the recommendations and report further to SCF.

4. The Chairmen of the RWGs involved in the original discussions were asked for comment on 27 September 1985.

PURPOSE

5. To afford SCF an opportunity to consider possible action to lessen the rate of spread of dothistroma particularly via transfers of potentially-infected planting stock of radiata pine.

CONSIDERATION

6. Dothistroma has not yet (as far as the writer is aware) been found in Western Australia, South Australia, western Victoria, the Otways nor Gippsland.

7. Dispersal of spores by wind is thought to have been the major method by which the disease has been spread over long distances in Australia.

8. As major pine-growing areas free from the disease are up-wind (in terms of the prevailing winds) from infected areas, there is a prospect that infection of these through air-borne spores may not occur for years.

9. Climatic and nutritional factors influence the severity of the disease.

10. Since infection <u>may</u> reduce the growth of affected stands by 40%, or alternatively require spraying at intervals of 1-5 years at costs of $15-30/ha, it is desirable to postpone infection as long as possible.

11. It has become standard practice within State agencies to avoid the transfer of pines from infected to non-infected regions, since there is evidence of some movement of the disease in infected plants, in which it may remain

latent, without observable symptoms, for at least 60 days. It must be recognised that plants cannot be certified disease free on the basis of inspection.

12. The ad-hoc working party recommended that a procedure be recognised whereby plants might be deemed disease-free if they were treated with nominated fungicides, subsequently isolated under conditions conducive to the expression of the disease and failed to exhibit symptoms on inspection by a pathologist familiar with the disease, were transported in sealed containers, and re-examined at the point of receipt. The efficacy of this procedure has apparently not been tested. Both testing and application to large numbers of plants would be expensive.

13. The key question, consequently, is how best to minimiso any transfers by the private sector.

14. Members of the Pests and Diseases Committee expressed concern at the difficulty of satisfactorily defining the boundaries of zones of infection, and in determining areas still free of infection, in any plan to minimise transfers.

15. The Chairman of RWG 5 did not consider the question of boundaries of infected areas to be insuperable (Squire to Brown, 22 October 1985). While not precise, and possibly including some un-infected regions, the boundaries briefly described in Para. 6 above were believed to adequately reflect existing knowledge.

16. Opinions differ on the practicality and value of any legislative approach to the problem of limiting stock movement. If the Committee wishes to pursue this avenue, expert advice will be necessary.

17. Whether or not legislation is employed, education and publicity to win the understanding and support of suppliers and users of nursery stock is essential. It is important that the presentation be balanced so as not to unnecessarily prejudice public confidence in radiata pine.

18. The key information would seem to be -

- Gippsland, the Otways, western Victoria, South Australia and Western Australia are free of the disease
- the establishment of the disease will reduce growth and raise costs (by varying amounts in each case)
- plants from nurseries in regions where infection is established may carry the disease
- the disease may not be evident on inspection
- disease-free nursery stock is available from nurseries in regions where the disease is not yet established.

19. The boundaries of S.A. and W.A. in the above context are clear. The current relevant boundaries within Victoria could presumably be established by consultation among officers from that State. Changes in the recognised distribution may occur in future.

CONCLUSIONS

20. An educational and publicity campaign to convey the points in para 18, with the formal support of SCF, is essential if any specific effort is to be made by SCF lessen the rate of spread of dothistroma.

21. Target groups include private forest growers, nurserymen and landowners who purchase trees for amenity purposes.

22. Target areas are Victoria and South Australia.

23. The campaign could be efficiently conducted through articles or paid advertisements in the 'Australian Forest Grower', 'Trees and Victoria's Resources', regional newspapers, any nursery trade journals, extension literature (forestry and agriculture) and personal contact between forest service staff and target groups.

24. Periodic review of the disease situation, the effectiveness and content of publicity material and activity would be required.

25. Any legislative approach would be in addition to the above.

26. Since the matter primarily concerns two States coordinated action might be planned by an ad-hoc sub-committee of SCF, consisting of one nominee from Victoria and South Australia. It is likely that most of the necessary action could be taken by the two States in question without further reference to SCF. Matters which do involve other States could be brought forward to SCF.

RECOMMENDATIONS

27. SCF establish a 'Dothistroma Sub-committee'.

28. Membership to consist of one nominee from Victoria and one from South Australia.

29. The Sub-committee to provide close liaison on and to be a vehicle for any appropriate joint action to limit the spread of dothistroma.

30. Where practicable any resulting activities be undertaken directly by the two States in question.

31. Any proposals requiring action or endorsement by SCF as a whole be referred back to SCF.

- this might include a brief statement through which SCF might express formal support for action to limit the spread of dothistroma.

32. The initial term of the Sub-committee to be 3 years.

31. The Sub-committee report administratively to SCF and for information to PDC.

FOR CONSIDERATION

Division of Forest Research
Canberra
30 October 1986

FP. Item 3 tells us virtually nothing, does anyone know why, didn't they like it?

GK. Believes they asked them to reconsider because it was too complicated, the consequences of the recommendations, were asked to reconsider, but RWG Chairman of Committee reconfirmed original recommendation.

JS. Thinks what is proposed is perfectly reasonable, its basically saying that WA and SA if they want to they can introduce legal quarantine, problem to liaise with Victoria to try and persuade Victoria to minimise risk of spreading disease to areas where it doesn't occur already. One thing that might be of possible concern is if they start conducting a series of public advertising about the horrors of *Dothistroma* then may be some enterprising "greenie" will carry it down there and let it go, but don't think that is a likely scenario, even if it is a possibility.

FP. With a membership of two, with the two states apparently having two different attitudes it would be like a truck with no wheels!

JS. This is the obvious problem that the Victorian Commission is in such a demoralised position that I don't see that we can do much about it.

JS. The document is fairly final and we have to accept it as it is.

DOTHISTROMIN IN FORESTS

WHAT IS DOTHISTROMIN?

Dothistromin is the poisonous chemical produced in very small quantities by the fungus known as Dothistroma pini, which causes a needle blight of many pine species. Part of the needle is killed by the toxin and the fungus then grows on this dead tissue. It is here that small amounts of dothistromin are contained. Tests using bacteria have suggested that dothistromin may have properties causing cancers in animals.

HOW IS DOTHISTROMIN MEASURED?

The very small amounts of dothistromin involved can only be measured by very sensitive chemical analysis. Such small amounts are expressed in nanograms (ng). A nanogram is one thousand millionth of a gram (a cigarette paper weighs 40,000,000 ng).

WHAT IS THE 'SAFE' LEVEL OF DOTHISTROMIN?

This question is difficult to answer because not enough is known about the cancer-causing properties of dothistromin; indeed, it is by no means certain that it can cause cancer in animals nor is there any knowledge of its effects on humans. A comparison can be made with aflatoxin, a known cancer-causing agent which chemically has some similarities to dothistromin. Rats fed with 50 ng per kg body weight per day of aflatoxin developed cancer. For a person weighing 12 stone (76 kg) this translates into 3800 ng per day being a possible maximum level for safety. This comparison has been used as a "worst case" example for dothistromin.

WHAT ARE THE DOTHISTROMIN LEVELS IN THE FOREST?

(a) In the air

On dry days, very little dothistromin (less than 5 ng/1000 litres of air) is present in the air. On wet days, an average level of 44 ng/1000 litres has been detected. Someone doing physically demanding work would breathe in about 6000 litres of air in an eight hour day, giving a total of 264 ng of dothistromin. This amount is only 7% of the "safe" level of 3800 ng.

(b) On clothing and skin

Practically no dothistromin (less than 10 ng) was found on samples of clothing and skin of workers engaged in clear-felling. Workers pruning and thinning infected stands had up to 15 ng dothistromin on skin samples and 30 ng on patches of their clothing. While these amounts are less than 1% of the "safe" level, regular washing of skin and clothing should be carried out.

(c) In streams and ponds

Very large samples had to be collected before dothistromin could be detected in stream and pond water. The highest level found was 7 ng/litre. One would have to drink over 500 litres (1000 pints) in a day to exceed the "safe" level (an amount unthinkable even if beer was the liquid involved).

SO?

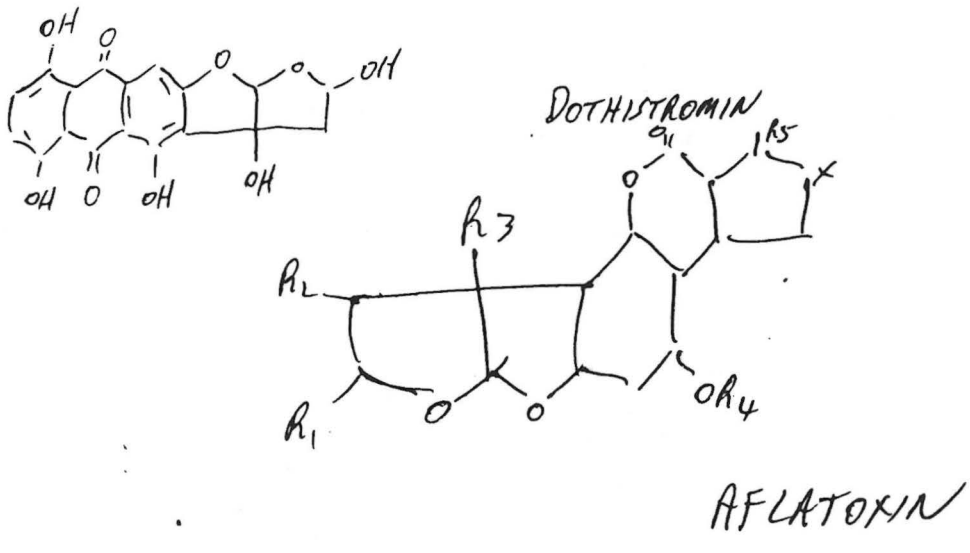
Workers in stands infected by Dothistroma are exposed to low amounts of dothistromin. These amounts are less than 10% of the possible safe limit for an average person.

WHAT PRECAUTIONS SHOULD WORKERS TAKE?

Dothistromin is readily destroyed by soap and water, so regular washing of face, hands and clothing should give sufficient protection.

THE FUTURE

Research is continuing into the effects of the toxin on animals which in turn will allow further evaluation of safe levels for humans.



~ DOTH.STROMIN ~

Theoretical SAFE Level:

50 nanograms / kg bodyweight / day
(3000 ng/day for a person weighing 60 kg

Amounts in infected stands:

AIR: Dry day: max 20 ng, ave < 5 ng / 1000
Wet day: max 100 ng, ave 45 ng / 1000
(Max. inhaled in 8 hr 600 ng)

CANOPY RUN-OFF:
Max 50 ng, ave 20 ng / mm rain
(60 mm rain ≡ 3000 ng)

PONDS: Max 7 ng, ave < 5 ng / ℓ
(430 ℓ ≡ 3000 ng)

ON WORKERS:
CLOTHES max 500 ng, ave 100 ng / c
SKIN max 200 ng, ave 25 ng /

1 ng = 0.000000001 g)

Dothistromin prepared by Peter Gadgil

BB. Spoke to Geoff Marks on another matter, indicated that he (GM) proposed to take action within the Commission to place controls/restrictions/prohibitions (not quite sure at what level intended at) on activity of personnel at least in heavily *Dothistroma*-infected stands, on the basis that GM has looked at figures provided to him (in the document we are now considering). He believes that there has been a miscalculation of what should and should not be regarded as a safe level, and having looked at this document I have to agree with GM, because allowing for the fact that I know that we have got no way of transferring from tissue culture tests or rat tests across to humans, Geoff's comment was that rats fed with 50 nanograms per kg body weight per day of aflatoxin developed cancer. For a person weighing 12 stone, this translates into 3800 nanogams per day being a possible maximum level for safety. But in fact as Geoff says, if you are going to do this sort of comparison using simple mathematics, then 3800 is not the safe level, it is the cancer-inducing level of aflatoxin. There is certainly doubt in my mind as to whether this so-called safe level is in fact a calculated safe level.

JS. In NZ the radiata pine association have proposed that infected stands be sprayed with sufficient frequency to ensure that the level of infection does not exceed 15%, which in case of NSW means we would be spraying several times per year.

FP. There is a big problem in that for anyone wanting to take action, that is to establish that someone out there in those stands is going to inhale, or have delivered into their system, all that level that is supposed to be in the air. That is an interesting human disease problem, what level is inhaled, is it coming out of needles as pigment in wet condition. This would have to be running off during rainfall, when people have wet weather gear, and do not inhale water.

JS. But, it is absorbed through skin.

JDT. On 'phone GM told JDT to report to the meeting his action on this

- Dothistromin is same as aflatoxin for phytotoxicity, 50-30 millions of a gram. Is absorbed through the skin. There is enough in the air blown vapour in the forest to go into lungs. The quantities in NZ gives us the suspicions that the same would happen to Queensland and he questions whether or not people should go into these areas with *Dothistroma*. And GM wants us to look into the question with considerable urgency. He has sent this information from NZ to the medial faculty of Melbourne University for response and he thinks they should be recommending precautions to people working in the forests in these areas. He would like us to give some sort of policy directive from this working group relating to Victoria, NSW, possibly Queensland and Tasmania.

FP. We can't do that, that is not our role.

KO. I think we are just completely out of our field here.

BB. Agree, but think we have responsibility to take some action.

FP. Refer to DORC and say that we are not competent to judge something which is essentially human medicine.

JS. We are going to get questioned about this later and probably the best way is to say that we as a group feel that this appears to be a problem outside the competence of forest pathologists and should be referred to national medical and health commission or some such organisation for consideration. And stop there.

KO. Anyone can speculate further, but we shouldn't.

GK. This is a potential industrial problem for the forest.

BB. NZ believed to have taken some action already, so will soon filter through.

JS. Someone said that union action already taken in Tasmania.

FP. Pretty sure that Les Baker had some difficulty with it at

Ridgeley. He had some union comment, but had been able to settle them down for the time being.

JS. On the basis of this document the unions there (NZ) are evidently satisfied (but the miscalculation of data is a problem in this document - see earlier). New Zealand has highly publicised that they believe that there is no problem with this Dothistromin.

DP. It does relate to forest pathologists. If guidelines came down from the Department of Health they could go along two ways. One is on what was safe levels for people to work in.

FP. But needs an aerosol chemist to go out and investigate, none of us here qualified to do that.

DP. If we were required to keep the disease down to a set amount for harvest periods then this would fall into pathologists camp, but all other risks would have to be considered first and our involvement would be a long way down the track.

FP. I don't see a research involvement in the field monitoring stage for a forest pathologist.

BB. If they started to set disease levels as being criteria then the forest pathology will be involved.

JS. Will make resolution later, essentially saying that we don't want anything to do with it, but something must be done about it, by someone else.

JS. As I understand all the tests on mutagenicity were done by Baker at School of Medical Research at Sydney University in 1984, and that there has been no further work on animal testing. There is a lot of work on aflatoxin, nothing on dothistromin.

FP. Because of the industrial attention isn't it a matter for urgent reference to Pest and Diseases Committee, they are bigger than us and have

higher level participation and greater access to Standing Committee and responsibility to advise all forest owners. Don't want a piecemeal function by separate states or organisations, want coordinated considerations so ought to go to DORC or Pest and Diseases.

ITEM 20. Report of field Day (26 May 1986)

Introduction

Together with local forestry officers Mr David Ryan and Mr Charles Mackowski, members were taken on an extensive tour of the local forests. Major topics were: cavity development in live eucalypts; *Eucalyptus grandis* "superculture" trials; bluestain associated with *Ips grandicollis* infestations in *Pinus* logs; ambrosia beetle attack; nursery practices.

Stop 1

Charles Mackowski gave a description of his work on hollows in eucalypts for vertebrate fauna:

The ontogeny of hollows in eucalypts was explained in terms of allometric and demographic characteristics of *Eualyptus pilularis*. Height growth dominates early life. Crown growth dominates middle life. Maturity is reached when the tree reaches its limits of dimensional stability in the crown. During maturity the crown is maintained at a constant size where growth is balanced by branch breakage and other forms of branch shedding.

The formation of, and maintenance of hollows suitable for vertebrate fauna in Blackbutt is dependent on (1) excavation of hollow limbs by termites, (2) branch breakage to allow access to hollows, (3) drainage patterns within tree hollows, (4) occlusion of wildlife hollows by continued branch growth, until eventual total collapse of the large tree.

Larger wildlife hollows do not form in Blackbutt trees less than about two hundred years old. Longevity is estimated at three hundred years.

The relevance of ontogeny of hollows to the management of commercial eucalypt forests for possums and gliders was discussed. Three hollow trees per hectare is identified as the level below which lack of hollows becomes limiting to possum and glider populations in Blackbutt forest. When managing for retention of tree hollows, large sized trees should be left in the initial logging as recruits to the hollow tree class. In forests where hollows are not limiting, greater benefit is obtained by management for combined fauna and timber values than by management for the complete exclusion of one or other of these values.

For complete information see pages 553-67 in POSSUMS and GLIDERS, ed. by A.P. Smith and I.D. Hume, Australian Mammal Society, Sydney, 1984.

Timber species seen in this forest included Blackbutt, flooded gum (rose gum), Sydney blue gum, spotted gum, bloodwood, white mahogany, red mahogany, tallowwood, brush box.

Stop 2

Evidence of *Austraplatypus* attack was seen on stumps of eucalypts. This beetle can complete its life cycle in the living tree with no visible sign of defect from an external examination of that tree. The beetle bores horizontally into the heartwood. The life cycle takes several years, resulting in "pencil streak". The beetles always start by attacking the rough bark over the tree, never going for the smooth bark areas. Along with the beetle comes a group of dematiaceous hyphomyctes which induce preciptitation of phenols and cause soft rot of timber, while inhibiting the formation of kino.

Here also was brush box growing at 0.1 cm per annum to lifetimes of between 1200 and 2000 years with a rainfall of 1200 to 2000 mm per annum. However, in 1986 had had only 800 mm rainfall to date, 200 of which was in January, with virtually no rainfall since May.

Stop 3

Stands of *E. grandis* and *E. saligna* planted 1952. Pointed out that flooded

gum would make good veneer logs, although used previously for banana cases. Will be used for mouldings to replace currently used rainforest species.

Stop 4

1974 plantation of flooded gum grown to 6 years under *Acaria* competition. Test growing here between blackbutt stands to keep away from outside flooded gum pollen. 20 seedlings out of 104 flooded gum mothers were planted and ranked according to families, weaker ones being weeded out to leave 27 families. 6 trees out of each family will be kept finally, selecting best 6 phenotypes.

Stop 5 Flooded gums superculture growth maximisation experiment

This experiment was designed to quantify the volume gains associated with several intensive cultural treatments. These treatments were: pre-planting ploughing, (F) fertilizer, (W) weeding, (I) insecticide, and thinning.

Layout: The experiment layout was: ten replicates, split blocks, randomised treatments. Twenty-five trees per plot.

Ploughing: each replicate block was split down the centre with one half ploughed using a D9 tractor with a 80 cm diameter disc harrow. Treatments were applied as ploughed and unploughed pairs.

Planting: routine stock flooded gum seedlings were planted January 1977.

Fertilizer (F): the elemental mix of fertilzer was 12:10:8:11, N:P:K:S. Application rates were: 100 grams per tree at planting then again at one month, thence 250 grams per tree at three and six months, thence 500 grams per tree at eight months, and twelve months. After the twelve month application the experiment was further divided with all odd numbered replicates receiving no further treatment. Subsequent fertilizer application for treated replicates was 1 kg per tree three times a year (or per tree site in thinned plots, see later) until six years of age, nil fertilizer after six years of age.

Weeding (W): two weeks after ploughing weeded plots were sprayed with propazine (4 kg a.i/ha), seedlings were planted two to four weeks after this spraying. After planting weeding was by hand chipping at four monthly intervals until twelve months when treatments stopped in odd numbered replicates. Hand chipping continued at four monthly intervals in treated replicates until three years of age. Subsequent weeding was by misting with a knapsack blower using "Roundup" (Glyphosate) once per mid summer until six years of age, nil weeding after six years of age.

Insecticide (I): a mix of organophosphate contact and systemic insecticides (Malathion and Rogor) was applied in water solution (1:1000) as a drench at three month intervals to twelve months. Even numbered replicates were drenched to 18 months. At 23 months insecticide was applied to all even numbered replicates as a concentrate sapwood injection of systemic organophosphate (usually "Nuvacron" but when unavailable then "Metasystox") at the rate of 1 ml per centimetre diameter of stem at injection position. This treatment was also applied at 35 months. Subsequent injections were applied in November of each year only to WI and FWI plots in even numbered replicates until six years of age (insecticide injections were discontinued in unweeded plots for safety reasons). Nil insecticide after six years of age.

Thinning: all ploughed plots were thinned at 2.75 years of age - from 1089 stems per hectare to 479 stems/ha. Thinning was strictly "from below" with trees of largest diameter kept - little account taken of actual tree to tree spacing. Felled trees were kept within plots and damage to other vegetation kept to a minimum.

Second thinning: at age 9.75 years replicate blocks 1, 4, 5, 7, 8 and 10 were thinned to 130 stems per hectare (3 retained trees per plot regardless of previous treatment). Replicate blocks 2, 3, 6 and 9 were not thinned at 9.75 years of age.

Establishment Success - Age One Year

Treatment	C	I	W	F	WI	FI	FW	FWI
Top Height (m)	1.69	1.88	2.01	2.92	2.14	3.57	3.51	3.69
Survival (%)	100	98.9	98.3	98.3	96.1	97.8	97.8	86.7

Effect of Treatment and Thinning at 2.75 y.o.

Treatment		Thinned (nominal 479 s.p.ha)					Not thinned (nominal 1089 s.p.ha)				
		C	W	F	FW	FWI	C	W	F	FW	FWI
Treated for 1 year only											
Age 3	Average DBHOB (cm)	6.32	6.80	7.16	10.22	10.64	4.80	6.36	6.42	8.78	9.52
	Average Tree Ht (m)	7.88	8.02	8.84	10.90	10.96	6.82	7.60	8.16	10.02	10.46
	Av. Stand B.A (sq m/ha)	0.56	0.70	0.88	1.68	1.61	0.85	1.28	1.29	2.35	2.46
Age 6	Average DBHOB (cm)	11.96	13.38	14.26	16.66	16.90	10.00	11.42	10.56	13.72	14.60
	Average Tree Ht (m)	15.46	15.24	15.32	18.12	17.82	13.66	14.16	13.76	16.54	16.90
	Av. Stand B.A (sq m/ha)	5.72	7.19	8.31	10.58	10.70	9.16	11.07	10.18	16.11	15.76
Age 9	Average DBHOB (cm)	16.06	18.22	19.24	21.20	21.16	13.30	15.10	14.02	16.92	18.36
	Average Tree Ht (m)	20.88	21.78	21.84	24.82	24.58	18.68	19.82	18.52	21.44	22.50
	Av. Stand B.A (sq m/ha)	10.46	12.86	14.65	17.30	16.62	15.61	18.52	17.09	24.69	24.38
	Stocking (s.p.ha)	479	479	479	479	462	984	932	941	984	854
Treated for 6 years											
Age 3	Average DBHOB (cm)	6.50	8.82	10.68	12.74	14.26	5.56	6.60	8.10	11.32	12.32
	Average Tree Ht (m)	7.66	8.68	11.74	12.18	13.16	7.76	7.12	10.63	11.64	12.38
	Av. Stand B.A (sq m/ha)	0.69	1.02	2.08	2.81	3.64	1.90	1.55	2.11	3.76	4.28
Age 6	Average DBHOB (cm)	13.64	16.56	17.72	20.40	21.64	11.00	12.76	13.38	16.64	17.82
	Average Tree Ht (m)	15.28	16.56	18.68	19.78	20.16	14.44	14.64	16.04	18.02	18.82
	Av. Stand B.A (sq m/ha)	7.22	10.60	12.06	15.39	17.93	11.26	14.34	13.37	22.52	24.71
Age 9	Average DBHOB (cm)	18.54	21.54	22.08	24.88	26.04	14.94	16.14	17.00	20.16	21.38
	Average Tree Ht (m)	21.64	23.74	24.70	26.64	26.34	19.84	19.92	21.24	23.68	24.58
	Av. Stand B.A (sq m/ha)	13.40	18.08	18.87	23.09	26.33	19.33	22.72	20.20	31.71	34.72
	Stocking (s.p.ha)	462	479	479	462	479	984	967	767	906	889

Stop 6

Nursery visit. Nursery not well situated, next to creek and in a depression with a floodwater problem. Have Mg and Boron deficiencies at nursery. *Pinus elliotii* and *Pinus taeda* being grown there. Water has been pumped out of creek to irrigate the stock, even though creek has *Phytophthora*, *Fusarium* and weevils.

Stop 7

Ips pheromone trap examined. Essentially an agricultural pipe containing a synthetic pheromone from Sweden ($20 per g), uses 0.2 g per trap per month. This attracts males, jar with *Ips* sent back to the Division of Wood Technology and Forest Research each month.

Trials are being installed to look at *Ips* control using insecticide, fungicide, nematicide, miticide treatments. Fungus produces three stages and finally ascocarps of *Ophiostoma ips* (≡ *Ceratocystis ips*).

Pointed out that if burn thinnings quickly get no *Ips* on *P. elliotii*.

How blue stain develops depends on how quickly log is dried.

Members were told also of needles affected by *Lophodermium australis* which was not a severe problem, and was not seen.

Field days are an important part of RWG 7 meetings. A significant contribution to the success of this day came from the two local forestry officers, Mr David Ryan and Mr Charles Mackowski who gave a most interesting and informative description of the local forestry scene.

ITEM 21. Election of Office Bearers

JS. Both John (JDT) and I propose to resign so we call for nominations for office bearers.

FP. I would like to nominate Doug Parberry.

KO. Seconds that.

JS. Any other nominations.
If not, all those in favour of Doug Parberry as next Chairman acknowledge with an "aye".
Acknowledged and congratulated by all.

JS. Nominations for position of Secretary.

FP. I would like to nominate Tim Wardlaw.

J. Tierney seconds that.

JS. Any other nominations?
If not, all those in favour of Tim Wardlaw as next Secretary acknowledge with an "aye".
Acknowledged and congratulated by all.

ITEM 22. Preparation of Recommendations Arising from this, the 7th Meeting

NOTE: The words underlined in the text are those being the formal Recommendations (see Short Report to DORC for list of actual Recommendations).

Some priorities be given for travel funds for members to attend RWG meetings.

DP and BB in preparing this recommendation were pleased to note that the new (draft) DORC directives apparently moved some way towards making this easier.

"In view of the decline in government support for officers to attend Working Group meetings it is recommended that the Standing Committee

restate and recirculate its objectives insetting up the working group and that such a satement should include an expression of the importance of the working group meetings to the welfare of conservation and forestry in Australia." And that would go as a head to a request to government department heads to support attendance of people at meetings.

JDT. We (JDT and JS) have gone a step further back and made some statement of dismay by the group of the lack of completeness of this group and of the lack of representation by particular states.

GK. That really is the critical thing, the lack of representation by particular states.

JS. What JDT and I composed this morning was:
"The meeting expressed concern that various State Forest Services with active forest pathology research programmes were not represented at the 7th meeting of RWG 7. The delegates felt that these meetings are of immense value in reviewing forest disease situations, and in frank exchange of views and opinions.

"Therefore the meeting requests DORC to make a formal endorsement of its support, interest and recognition of the value of RWG meetings."

Delegates thought these last paragraphs were a good preamble to the recommendation statement put together by DP and BB.

FP. Wondered whether we ought to be instructing DORC?

JS. We are REQUESTING of DORC.

FP. The first two paragraphs say it, without needing a specific reference to DORC, because it is several members of DORC who have failed to win the funds for their representatives. Thinks that last paragraph best left off.

BB. At last DORC meeting some DORC members couldn't get funds themselves.

FP. In essence they (DORC) have made a decision not to fund the attendance, and we are now in effect castigating them, so best leave out last paragraph.

DP. I was hoping that Standing Committee themselves might make this statement.

GK. I think the coodinator can convey the feelings to DORC anyway.

BS. Yes I can. I am happy with what is said, the RWG's were set up by Standing Committee to do a job and can't do the job unless people can attend the meetings.

FP. The way we are now structured I believe our resolutions should be pretty much kept to those matters which we want to see go right through to Standing Committee, and messages to DORC. We have been asked not to give too many recommendations, because over the years not too many have been considered by Standing Committee anyway, so I think we should restrict formal resolutions to those matters of very considerable importance.

JDT. So put parts one and two together.

Potential Recommendation

Formalising exchange of data on efficacy data

JS. JDT and I talked about this this morning and we can't see any immediate way of doing it, but it might be something that the incoming Chairman would look at to see what could be done to facilitate this, and that could be discussed at the next meeting.

TW. Can we adopt a resolution to urge members or concerned individuals undertaking such tests to have their results published in some way so as to be available?

JS. That's something we can include in the account of this meeting rather than making a formal recommendation.

RECOMMENDATION NO. 2

Concerning possible pest and disease risk increase associated with use of clonal material.

JS. "The meeting expressed concern that with increasing use of clonal planting stock of species of *Pinus* and *Eucalyptus* there would be a possible increased risk of serious outbreaks of disease.

The meeting urges DORC to bring to the attention of RWG 1 the need to consider the desirability of evaluating the susceptibility of clones that are to be used extensively to the more significant local and exotic pathogens.

FP. Wonder here whether DORC might like to consider the desirability of having a joint sub-committee look at that over next few years, two persons from RWG 1 and 7, to talk to people, review literature and to prepare a report on. DORC says it wants more interaction between RWG's.

BS. Include that then in recommendation.

JS. The meeting considered it desirable that a joint working party between RWG 1 and RWG 7 be established to review the proposal and report in two years.

FP. Review is wrong.

The meeting considered it desirable that a joint working party between RWG 1 and RWG 7 be established to review the extent to which resistance to pathogens needs to be considered in Australian Forest Tree Improvement programmes, and to report to the next meetings of RWG 1 and RWG 7.

However, DORC should also consider, through the coordinator that the end of the first para "of disease" should perhaps be brought to the attention of RWG 8 and in effect be changed to say "of pest or disease".

Recommendation No. 4. Dothistromin

FP. Really is message to DORC via coordinator.

BB. It needs action.

FP. To answer GM's problem, they wouldn't pick one person from this group.

JDT. Need para for coordinator to bring DORC's attention.

FP. When we are writing the minutes, because GM is not here, and will not have heard all this discussion, it must be said that we discussed the matter and considered it was a human health problem finally, and that we were not competent to comment on it, but we passed to DORC through coordinator a suggestion that it ought to go to a wider authority.

BS. To get a submission prepared for pest and diseases.

JS. That the question of a possible health risk associated with exposure to dothistormin be referred to National Health and Medical Research Council for evaluation.

Recommendation No. 3. Quarantine

Float measures first:

FP. Proposed we make a resolution briefly reading something along these lines:

"The working group continues to be concerned with the danger of introduction of dangerous pests and believe there is a real risk of the

level of this danger increasing following changes within-house in the philosophy of approach of the plant quarantine service, and we emphasise the need for early implementation of the recommendation of the task force that dealt with the handling of dangerous introductions and recommended urgent review of the implications of this new approach within plant quarantine for the health of Australian forests.

That would then be supported with examples of recent problems, e.g. the koala story, the *thunbergii* story, and the third example, Bonsai.

Mention those three cases and ask that BS take these as matter of urgency and perhaps get poll of DORC members to see if they ought to make urgent recommendation to Standing Committee, about getting an enquiry into the consequences of the quarantine changes for forest health.

GK. But as I understand this, the review has been conducted within plant quarantine, the states have been invited to comment already, this is going back two years to 1984.

FP. It hasn't been referred to RWG has it?

JS. I don't think it has ever been referred to any of the forest services either!

SN. It has been referred to agriculture services.

FP. What this recommendation is doing is asking DORC to consider whether it believes that there is a need to have an inquiry into these consequences, whether the changes are really important and dangerous changes, and if they have been informed before by that review committee they will just write back and tell us that we knew all about it and accepted it and we don't share your concern. All we are doing is saying that we believe, from what we know, that there is an increased danger to Australian forests through a changed quarantine system, and that what we need is some people at a higher level who can look at the wider implications of it, both for diseases and pests, and say whether or not there is an increased danger, and whether or not the forest service and

the industry ought not to be lobbying the government to bring about changes in that area at least as far as forestry is concerned.

SN. It is a very controversial area, an area which is subjective, arbitrary, and there exists no book on how to do it. Can get a consensus by asking various states, and some people could go overboard with extremist measures. I agree it is a serious problem, and a long-term one, the impact is not tomorrow or next year but 20 years time, and what do we do now? I believe that within this group you should look in depth at our policy, and if you identify real gaps, then go ahead and take it up with DORC. You are in a better position because it is a biology matter and you are the biologists.

KO. Problem here is that we don't have sufficient information on quarantine policy at this stage, we only meet every two years, and at best then we need DORC direction to set up a committee to further investigate.

BB. I thought we had enough information from our discussions on this on Tuesday to head towards US forming a sub-committee to investigate the matter further, get the information on policy, investigate and we can report out of session ourselves within the group and refer the matter to DORC through the chairman then.

FP. I don't agree with that. I accept Sam's very difficult job, and to say that it's a complex matter is true. But what we are proposing here is not as serious for Plant Quarantine group as SN seems to think, I think you overestimate the influence and power of this group. We are here as a bunch of people to draw the attention to DORC of matters which members, by and large and not necessarily unanimously, agree is a matter of concern on which we don't have enough information, and which would require further investigation and for DORC to consider that. Now all we are doing is making some in-house suggestions to a body which is superior to us, and it will then have to look at some of the areas, e.g. in insect pests about which we know nothing, and in the end they may decide to do nothing, they may already know about it, but as we sit here we don't know and from what SN told us the other day about the changed attitude about trade and about volumes, a number of us at least, if not all of us, have a legitimate

concern that there is a greater risk to the health of Australian forests as a result of this change in approach. Now, not all the examples that we had discussed necessarily fall within changes, as SN said some are practices which have been going on for a very long time, but nevertheless they are practices that some members of our working group have a deep concern about. Nothing from here, as I understand it, has any authority, it doesn't go out to plant quarantine, it doesn't go out directly to forest services. Our reports go to our members, and to DORC. And DORC decides whether it will use any of that material, and DORC itself has no say, it has to go to Standing Committee before anything gets any status. So we are going through an in-house exercise, expressing a concern. We don't have all the facts, we may have got the story the wrong way round, but those who have heard you (SN) believe that there must have been a major change in philosophy, to facilitate trade, and to increase the volume of movement of plants into this country. That we are concerned, and I think that if we have a majority view, and from the views of those involved in drafting this recommendation I suspect it is a majority, I will have further words with Ken and Doug and then put it in a formal manner after tea.

BS. Include in your write-up there the actual change.

FP. No, because we don't have a clear enough understanding of all the changes in quarantine and since they are in-house, and only partly out in the Journals, we don't really know. And I think it requires that some people be appointed who can get that information, and have a realistic view of it, and I think it is a responsibility of DORC to urgently set up a committee to get hold of it.

JS. This is complementary to the recommendations of that Contingency Plan, the workshop recommended asking people to coordinate the State/Commonwealth legislation and clarify it.

FP. Members of RWG 7 endorse the recommendations of the working party on Pests and Diseases, the early implementation of these recommendations are particularly appropriate following the recent relaxation of quarantine controls by the Department of Primary Industry. Members considered that

these changes in quarantine policies have significantly increased the likelihood of new introductions of forest pests and diseases from overseas.

FP (New wording after tea break)

Research Working Group 7 is concerned that recent changes in the Australian Plant Quarantine Service aimed at freeing up international trade have significantly increased the likelihood of new introduction of forest pests and diseases from overseas. The group recommends:

(i) early implementation of the recommendations of the working party on Pests and Diseases; and

(ii) a detailed review of the consequences of the revised Plant Quarantine practices.

SN. Objected to use of terms "freeing up trade".

FP. Well that is evidently the basis for the changes.

KO. We don't need to tell them why they did it.

FP. OK, in that case Brian (BS) can tell directly those that he talks to on this recommendation. So we will remove "freeing up trade".

FP. Reading it again:-

Recommendation 3

"Research Working Group 7 is concerned that recent changes in the Australian Plant Quarantine Service have significantly increased the likelihood of new introductions of forest pests and diseases from overseas.

The Group recommends:

i) early implementation of the recommendations of the working party on plant disease; and

ii) an urgent and detailed review of the changes and their possible consequences, attributable to these revised Plant Quarantine practices."

There was general worry that we may be repeating what we said in Burnie.

FP. At Burnie there was a suggestion that Plant Quarantine wasn't looking at areas it should have been looking at, Vietnamese boats, etc., and there were real problems, we believed. What is different here from Burnie is that we are now aware that there is a whole change in philosophy in the Plant Quarantine Service, and I think we are even more concerned to voice this disquiet than we were at Burnie.

JS. Frank to read recommendation once more and we will put it to a vote.

FP. Read as underlined.

JS. Put to meeting, raise right hand in favour.

- There was one dissenting vote, that of the Plant Quarantine representative Sam Navaratnam.

ITEM 23. Closing Remarks

JS. Secretary to write to Jack Warcup thanking him for his involvement in the RWG 7 over the years. (Since done, JDT).

JS. Thank you all for coming. I know some of you thought that coming to Coffs Harbour was a substantial additional cost, but I think it is important that people come to areas where there are real forest problems and I hope the field day yesterday justified the extra expenditure. I thank you all for your co-operation and attendance.

BB. I would like to move a vote of thanks to the outgoing Chairman and Secretary. It has been in some ways a fairly dramatic period for the working group, not so much for the group but some of the peripheral issues that arose out of it, particularly the contingency plan. (Applause)

BS. I would like to second that and thank Jack and John for the work they put in.

DP. Supported what was said by BB and BS, and just to say that just looking quickly at my movements and the requirements of the working group it seems that probably May 1989 for the next meeting and because Melbourne University has facilities in both Gippsland and central Victoria I will be looking at possibility of having a split meeting held partly at these two places. With our own mini buses we can see as much as possible of Victorian forestry and its problems.

JDT. Any proposed themes, highlights or special topics?

DP. Wait until I've had discussions with my Victorian colleagues.

PEST AND DISEASES CONTINGENCY PLANNING WORKSHOP

Wood Technology and Forest Research Division

Forestry Commission of N.S.W.

West Pennant Hills

29-30 July, 1986

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1. Introduction

1.1 A workshop on contingency planning for forest pests and diseases was originally proposed by Research Working Group 8 - Forest Entomology in November 1982.

The proposal was endorsed by the Directors of Research Committee in October 1984, and approved by Standing Committee on Forestry.

1.2 The workshop was organized by RWG-7 (Forest Pathology) and RWG-8 (Entomology) and hosted by the Wood Technology and Forest Research Division of the Forestry Commission of N.S.W. at Pennant Hills on 29-30 July, 1986.

1.3 The original purpose was to establish operational and organizational guidelines for adoption when an exotic pest or disease escapes quarantine. However, in the planning phase for the workshop it was apparent that a more appropriate objective would be to provide the Forest and Forest Products Pests and Diseases Committee with a series of considered statements and recommendations which would form the basis of a much wider planning action necessarily involving the Commonwealth and the States. In drawing up this action plan, it was considered that the experience of New Zealand would be valuable, as that country had drawn up a Forest Disease Contingency Plan in 1982, and had practical experience in its application.

1.4 Furthermore, it was considered that at the current stage of development, the formulation of a general action plan would be a more appropriate strategy than to concentrate on the preparation of specific action plans for individual pests and diseases. Such specific plans could be prepared, as deemed necessary, within the wider framework of the more general plan.

2. Meeting Format

2.1 The meeting was attended by a representative cross section drawn from RWG-7, RWG-8 with invitees from the New Zealand Forest Service and the Australian Counter Disaster College. Delegates from the Australian Agricultural Health and Quarantine Service were also members of RWG-7 and RWG-8, so providing an esential link between Federal and State authorities.

Mr. J. Stewart, Assistant Commissioner N.S.W. Forestry Commission represented senior forest management and Dr. I. Bevege chaired the meeting as DORC representative and co-ordinator of RWG-7 and RWG-8. Attendees are listed in Annex 1.

2.2 Programme details are provided in Annex 2. Day one was given over to position papers identifying problem areas and organizational needs.

The authors of the position papers have undertaken to forward their manuscripts to the organizers by the end of September 1986. These will be submitted to Australian Forestry for publication.

On Day two, specific exotic pests and diseases of potential significance to Australian forestry were debated and the meeting concluded with a session at which statements and recommendations were formulated.

3. Statements and Recommendations

Position statements and recommendations are presented as items 1 to 7 in Annex 3.

The areas of concern, and requiring consideration by Pests and Diseases Committee as part of their wider deliberation on forest pest and disease control through contingency planning, devolve upon the following issues. These issues are inextricably linked and an effective organization to deal with outbreaks of exotic pests and diseases will require action on all these fronts.

1. Effective Quarantine (Items 1 and 2)
2. Compatibility of Pest and Disease Legislation (Item 3)
3. Co-ordination of Data Bases (Item 4)
4. Identification Services (Item 5)
5. Organization and Action Planning for Addressing Exotic Introductions (Items 6 and 7)

4. Comment

4.1 A feature of the meeting was the high degree of compatibility of viewpoint among delegates of differing backgrounds and specialities. The level of unanimity on desirable courses of action was high, although delegates did not underestimate the difficulties inherent in implementing the recommendations. The meeting felt that it was important that Pest and Diseases Committee be made as fully aware as possible as to the issues involved and the commitments needed if a viable and effective system is to be developed for protecting Australian forests against exotic pests and diseases.

4.2 A comment from Mr. Cameron of the Australian Counter Disaster College is relevant to this point. Namely that the technical solutions and requirements for a preferred course of action are frequently quite clearly perceived by the "specialists", but there can be a gap between this perception and the social and political will to implement the optimum solution; from his observation at the meeting, he felt that forestry protection was no different to many other fields of community endeavour in suffering from this credibility gap and this may hinder the timely development of desirable procedures. The Counter Disaster College has provision in its course structure to address these kinds of issues at the technology/management interface and would be in a position to contribute if called upon.

4.3 The New Zealand Contingency Plan is a most useful model and is recommended as a starting point for development of contingency plans in this country. The New Zealanders of course, did not have a Federal system to contend with, with the attendant problems of multijurisdictions. The New Zealand plan (less appendices) is attached as Annex 4; to re-iterate its objectives which are highly relevant to Australia:

> The objective of this contingency plan is to guide the practical steps which will be taken against suspected forest insect and disease outbreaks. Specifically it
>
> - details the responsibilities of management and research in responding to a pest or disease emergency.
>
> - provides a reference to the legal responsibilities inherent in invoking the Forest Disease Control Regulations, and summarises

other legislation which may be relevant to action taken against an outbreak.

- gives details of the procedures the Forest Service will adopt to inform private forest growers and governmental agencies in the event of a disease outbreak.

- sets procedures to provide the public, through the news media, with accurate factual information from a controlled and authoritative source.

4.4 Members of RWG-7 and RWG-8 are willing to contribute further to the development of effective forest protection systems through the contingency plan concept under the auspices of Pest and Diseases Committee.

D. I. BEVEGE,
Chairman.

8.9.86

ANNEX 1 - Attendees

Dr. D.I. Bevege	Wood Technology & Forest Research Division, Forestry Commission of N.S.W., Beecroft, 2119. (DORC Co-ordinator, RWG-7, RWG-8).
Mr. A. Cameron	Australian Counter Disaster College, Mt. Macedon, 3441.
Mr. R. Eldridge	Wood Technology & Forest Research Division, Forestry Commission of N.S.W., Beecroft, 2119. (RWG-8).
Dr. P. Gadgil	Forest Research Institute, Rotorua, New Zealand. (FRI Plant Quarantine Co-ordinator and Leader of Forest Pathology).
Dr. G. Hosking	Forest Research Institute, Rotorua, New Zealand. (FRI Leader of Entomology and Forest Health Group).
Dr. G. Kile	CSIRO Division of Forest Research, Hobart, 7000. (RWG-7).
Mr. S. Navaratnam	Australian Agricultural Health and Quarantine Service, Department of Primary Industry, Queen Victoria Terrace, 2600.
Dr. C. Ohmart	CSIRO Division of Forest Research, Queen Victoria Terrace, 2600. (RWG-8).
Mr. R. Paton	Australian Agricultural Health and Quarantine Service, Department of Primary Industry, Queen Victoria Terrace, 2600.
Mr. J. Simpson	Wood Technology & Forest Research Division, Forestry Commission of N.S.W., Beecroft, 2119. (RWG-7).
Mr. J. Stewart	Forestry Commission of N.S.W., Sydney, 2000. (Assistant Commissioner, representing Senior Australian Forest Management).

Mr. J. Walker	Biological and Chemical Research Institute, Department of Agriculture, N.S.W., Rydalmere, 2116. (RWG-7).
Mr. R. Wylie	Biology Section, Department of Forestry, Indooroopilly, 4068. (RWG-8).

Observers

Mr. K. Fairey	Wood Technology & Forest Research Division, Forestry Commission of N.S.W., Beecroft, 2119. (Entomologist).
Ms. R. Keirle	Wood Technology & Forest Research Division, Forestry Commission of N.S.W., Beecroft, 2119. (Forest Pathologist).
Mr. E. Nicholson	Forest Operations Division, Forestry Commission of N.S.W., Sydney, 2000.
Mr. P. O'Neill	Marketing Division, Forestry Commission of N.S.W., Sydney, 2000.
Mr. B. Reid	Export and Import Branch, Department of Agriculture, N.S.W., Sydney, 2000.
Ms. C. Stone	Wood Technology & Forest Research Division, Forestry Commission of N.S.W., Beecroft, 2119. (Entomologist).
Mr. G. Webb	Wood Technology & Forest Research Division, Forestry Commission of N.S.W., Beecroft, 2119. (Technical Officer - Entomology).
Mr. E. Taylor	Wood Technology & Forest Research Division, Forestry Commission of N.S.W., Beecroft, 2119. (Technical Officer - Entomology).

ANNEX 2 - Programme

CONTINGENCY PLANNING - PEST AND DISEASE OUTBREAKS

Tuesday, 29 July	09.30	Welcome to delegates - J. Stewart, Assistant Commissioner, Forestry Commission N.S.W.
	09.45	Problems with detection, identification and verification of exotic plant pathogens - J. Walker, Biological and Chemical Research Institute, Rydalmere.
	10.45	Morning tea.
	11.00	Problems with detection, identification of exotic invertebrate pests - R. Wylie, Biology Laboratory, Queensland Department of Forestry.
	12.00	The New Zealand Contingency Plan for use against exotic forest insects and diseases - G. Hosking, New Zealand Forest Service.
	13.00	Lunch.
	14.00	Organisation of response when an exotic forest pest or disease is identified - R. Paton, Australian Agricultural Health and Quarantine Service, Department of Primary Industry, Canberra.
	15.30	Afternoon tea.
	15.45	Assessment of control measures and nature of secondary action - R. Eldridge and J. Simpson, Wood Technology & Forest Research Division, Forestry Commission of N.S.W.
	16.30	Conclusion for day.
Wednesday, 30 July	09.30	Simulation exercises.
	09.30	*Dendroctonus* spp. - C. Ohmart, CSIRO, Division of Forest Research, Canberra.

09.55 Guava rust, *Puccinia psidii* - S. Navaratnam, Australian Agricultural Health and Quarantine Service, Department of Primary Industry, Canberra.

10.20 Pine wilt nematode - J. Simpson, Wood Technology & Forest Research Division, Forestry Commission of N.S.W.

10.45 Morning tea.

11.00 *Coptotermes formosanus* - R. Eldridge, Wood Technology & Forest Research Division, Forestry Commission of N.S.W.

11.25 Western Gall Rust *Endocronartium harknessii* - G. Kile, CSIRO, Division of Forest Research, Canberra.

12.00 Lunch.

13.30 Meeting to formalise recommendations.

14.30 Conclusion.

ANNEX 3 - Statements and Recommendations

ITEM 1. MAINTENANCE OF EFFECTIVE QUARANTINE

The Working Party recognised that because of the very large number of pests and pathogens of forests and forest products which could enter Australia, the insidious nature of many exotic pests and diseases, the difficulties of early detection, and the ineffectiveness of eradication measures in many cases, there would be few circumstances in which an introduced pest or pathogen could be eradicated once established.

Recommendation 1.

That the Australian Agricultural Health and Quarantine Service maintain and apply a strict quarantine policy against the introduction of exotic pests and diseases of forests and forest products and against the importation of potential vectors of such pests and diseases.

ITEM 2. QUARANTINE FOR HOST TARGET GROUPS

The Australian flora has evolved in relative isolation and has a high proportion of endemic species. Two genera, *Eucalyptus* and *Acacia* dominate almost all plant associations of the continent. One exotic genus, *Pinus*, is extensively planted for wood production. The pests and pathogens of much of the forest flora of the world is far from adequately known with many species poorly documented, undescribed or possibly unknown. Some pathogens complete their life-cycle on alternate hosts unrelated to the genus or species being protected. Many pests and pathogens of minor significance in one area have become ones of major importance when introduced elsewhere. It is therefore very difficult to forecast reliably which foreign organisms are likely to pose a significant threat.

Recommendation 2.

Quarantine policy should not be directed only against specific exotic pests and pathogens but should also emphasise stringent restrictions on the importation of any material that would imperil the health of ecologically or economically significant groups of our native and exotic flora.

ITEM 3. COMPATIBILITY OF PEST AND DISEASE LEGISLATION

The Workshop recognised that eradication or control of introduced pathogens or pests necessitated involvement of Commonwealth and State governments. The limits of responsibility in plant quarantine matters by the Commonwealth and the States are not clear. It was noted that each State has its own plant pest and disease legislation and that trade between States is protected by provisions of the Constitution.

In most States, the Chief Quarantine Officer (Plants) is located within State Departments of Agriculture or Primary Industry; administration of quarantine from within the agricultural sphere has created difficulties for forestry quarantine in the past.

The Commonwealth Quarantine Act (1908) is presently being redrafted so it is essential that Commonwealth and State plant pest and disease legislation be reviewed to ensure it is adequate and compatible.

Recommendation 3.

That a liaison committee be formed under the auspices of Standing Committee on Forestry and Standing Committee on Agriculture to ensure that Commonwealth and all State plant pest and disease legislation is adequate and compatible to permit rapid and effective action for containment eradication and control programmes.

ITEM 4. DEVELOPMENT AND CO-O RDINATION OF PEST AND DISEASE DATA BASES

Promptness of detection of any newly introduced pest or pathogen is crucial to successful containment and eradication. To facilitate detection, it is essential that there be effective exchange of information between the Quarantine Services and the Forestry and Agriculture Services concerning (a) known established pests and pathogens, their distribution and hosts; (b) species of tree and timber pests and pathogens being intercepted at Australian ports. At present, this information is either not available or not readily accessible for much of Australia, hampering targeting of likely introductions and high risk areas.

Recommendation 4A.

The Australian Agricultural Health and Quarantine Service collate on a continuing basis information on the species of tree and timber pathogens and pests being intercepted at Australian ports, the frequency of their interception, mode of entry, and country of origin. These data should be readily available to the Forestry Services, to enable regular review of quarantine programmes.

Recommendation 4B.

The Forestry Services establish, under the auspices of the Directors of Research Committee of Standing Committee on Forestry, compatible data bases for recording of (a) known established pathogens and pests of forest trees and forest products, their distribution, and hosts; (b) post-quarantine detection of recognised pathogens and pests of forest trees and forest products. New data should be made available to the Quarantine Services on a continuing basis, for incorporation into their data base and to provide a monitoring mechanism for quarantine effectiveness.

ITEM 5. CAPABILITY AND CAPACITY IN IDENTIFICATION SERVICES

The Workshop recognised that to facilitate rapid identification of exotic pests and pathogens there needs to be a higher level of taxonomic capability and research within Australia. None of the forest services employs a full-time taxonomist working on pests or pathogens of forests or forest products. However, several employ professional entomologists and pathologists and maintain important working collections of insects and fungi.

CSIRO Division of Entomology manages the Australian National Insect Collection but there is no strict analogue for fungi. The various plant pathogen collections in Departments of Agriculture in N.S.W., Queensland and Victoria are recognised by the Standing Committee on Agriculture as the National Collections of Plant Pathogens. Many forest pathogens are curated in the collections which provide points of reference for forest pathologists. The Australian Biological Resources Study Programme does not include taxonomic revision of any economically important group of forest or forest product pests or pathogens among its preferred objectives.

Recommendation 5A.

Existing forest service pest and disease collections should be maintained and where desirable, strengthened as essential tools toward the early detection and identification of forest and forest product pests and pathogens. The development of taxonomic expertise within the forest services should be encouraged by ensuring that existing Research and Development and investigate programmes include a taxonomic component where relevant.

Recommendation 5B.

The Workshop identified need for a full-time fungal taxonomist and an insect taxonomist specialising in pathogens and pests respectively of native and exotic trees. The fungal taxonomist would be best located at Biological and Chemical Research Institute, Rydalmere; the insect taxonomist at the Australian National Insect Collection, Canberra. Forestry and Forest Products Pest and Diseases Committee to examine the most appropriate means by which these essential positions be established and funded within the next twelve months.

ITEM 6. ORGANISATION, STRUCTURE AND FUNDING OF QUARANTINE ACTION COMMITTEE.

The Workshop recognised the need to establish an organizational structure under the auspices of Standing Committee on Forestry to investigate and initiate rapid action should an exotic pest or pathogen affecting forestry be introduced. It was also recognised that a crucial factor in determining the success of any eradication or containment programme is the marshalling of resources and funds for rapid action.

The Workshop considers an organisational structure similar to that used for eradication of exotic animal diseases would be appropriate, as it contains the essential elements of rapid communication among authorities, decision making at the highest level, the existance of action plans, and the immediate availability of funds for implementation of early control measures.

Recommendation 6A.

That Standing Committee on Forestry establish a Quarantine Action Committee (QAC) comprising the heads of forests services in each State and Territory and the Director of Quarantine, to convene on notification of an introduction or outbreak of an exotic pest or pathogen affecting forestry.

The function of this Committee would be to review information and circumstances of the outbreak, decide on a course of action and, where appropriate, allocate funds.

Investigation, planning and action to be the responsibility of a Working Party of the QAC convened within the State or Territory where the outbreak occurred. The Working Party would have the following basic composition:-

* Technical, management and administrative representatives drawn from the State or Territory Forest Service.
* Representatives from Quarantine (State and/or Commonwealth).
* Other representation as considered appropriate (e.g. legal, or technical experts with experience in the target pest or pathogen).

Recommendation 6B.

It is recommended that the States and the Commonwealth establish a Contingency Fund, under the control of the Quarantine Action Committee, for eradication/containment/control programmes for exotic pests and pathogens of forestry significance.

ITEM 7. CONTINGENCY PLANS.

The immediacy of action required to eradicate or contain new pest or pathogen introductions presupposes the existence of an action plan which would be followed with minimum delay.

Pre-prepared action plans for specific pathogens or pests are valuable but they require continual updating as the biology of a pathogen or pest becomes better known. The Workshop recognised the need for each Forest Service to develop an appropriate general management plan which would (a) ensure timely and adequate technical and management advice for decision making; (b) identify manpower and other resources for use in case of an emergency. The New Zealand Pests and Diseases Contingency Plan has been successfully tested in the field and provides a suitable starting point for State plans.

Recommendation 7.

Each Forest Service should develop a Pest and Disease Contingency Plan that takes into account State forestry organisational and administrative arrangements and their legal framework. Each plan would provide for immediate liaison between State Forestry and Quarantine Services.

These plans should be prepared and tested with a simulation exercise within 12 months of Standing Committee on Forestry approval of this recommendation. The results of simulation exercises should be reviewed by Standing Committee on Forestry after that time, plans modified accordingly, and published in a single document for circulation to all those who need to be aware of them.

Compatibility among State plans is a highly desirable objective, with provision for inter-State co-operative action as appropriate.

ANNEX 4.

New Zealand Forest Service
Forest Disease
Contingency Plan

August 1982

TABLE OF CONTENTS

SECTION 1 : INTRODUCTION

1.1 Contingency plan objectives

The objective of this contingency plan is to guide the practical steps which will be taken against suspected forest insect and disease outbreaks. Specifically it

- details the responsibilities of management and research in responding to a pest or disease emergency.

- provides a reference to the legal responsibilities inherent in invoking the Forest Disease Control Regulations, and summarises other legislation which may be relevant to action taken against an outbreak.

- gives details of the procedures the Forest Service will adopt to inform private forest growers and governmental agencies in the event of a disease outbreak.

- sets procedures to provide the public, through the news media, with accurate factual information from a controlled and authoritative source.

This plan is not intended to relate to the procedures of inspection and treatment of forest produce arising from the Forest Produce Import and Export Regulations 1966, for which a Timber Inspector's Manual has been prepared.

1.2 NZ Forest Service responsibilities

The Forest Service administers the Forests Act 1949 and the Forest Disease Control Regulations 1967. The former makes general provision for the control and eradication of diseases affecting trees, tree seed, timber, forests and forest products, and for the payment of compensation for the destruction of diseased trees. The latter statute specifies certain insects and diseases as forest diseases, and prescribes for the declaration of infected areas, the destruction or treatment of infected materal, the restriction on moving forest produce, and the establishment of a committee to advise the Minister.

1.3 Forest Service policy

The department's policy on forest diseases is:

- to practise sound forest management as a first defence against insect and disease outbreaks.

- to take all reasonable measures to prevent the entry and establishment of foreign diseases.

- to provide for early detection of forest diseases through the activities of the Forest Health Group.

- to control or eradicate diseases causing actual or potential disruption, or economic loss, to any forest area in the country.

- to provide assistance and advice to other Government departments, local bodies, and private forest owners in the event of a pest or disease outbreak.

The prime responsibility for action specified in this plan rests with the Conservator of Forests who has territorial responsibility at the outbreak site. Throughout this plan reference to the Conservator can be interpreted as applying equally to any forest officer acting as assistant or deputy to the Conservator.

SECTION 2 : PROCEDURES IN HANDLING AN OUTBREAK

2.1 Detection

The outbreak may be detected by FRI staff, forest staff, timber inspection officers, DSIR, MAF, or the general public.

Notification: All unusual or suspect insect or disease problems will be referred in the first instance to the Conservator who will decide whether to:

- take no action, or
- invoke precautionary measures immediately (section 2.2), or,
- seek (further) specialist information (section 2.3)

2.2 Immediate precautionary measures

Action: If a serious situation is suspected the Conservator will immediately implement measures to minimise the movement of people and vehicles in and out of the suspected affected area:

- in State forests, by ceasing all forest work in and about the affected area, and withdrawing staff and vehicles from the area to an assembly point where disinfection procedures can be undertaken if appropriate (see Appendix III). Public access to or through the suspected outbreak site is to be discouraged and restricted completely if at all possible.
- in private forests, by encouraging the private forest owner to similarly withdraw staff and vehicles, and to assist in restricting public access to the suspected outbreak site.

If forest produce has been removed from a suspected infected area immediately before a suspected emergency, this material will be checked by qualified staff and appropriate control/quarantine measures implemented.

Immediately after the implementation of the above precautionary measures the Conservator will formally refer the suspected outbreak problem to the FRI for identification and advice on control measures (section 2.3). In extreme circumstances he will invoke the provisions of the Forest Disease Control Regulations immediately (section 2.4). The Conservator shall also notify Head Office (Director of Production Forest Management) that a suspected outbreak has been referred to FRI for analysis.

2.3 Referral of problem to FRI for analysis

Samples: Material from a suspected outbreak site must not be moved except for identification purposes, and then only in such a way as to prevent accidental spread to unaffected forest areas. In the event of a suspected new introduction all samples, live specimens, etc. removed from an affected area must be packaged as if under quarantine, i.e., in unbreakable, escape-proof containers (see Appendix I). They will be opened under quarantine when received at FRI.

Identification: FRI will identify, or obtain identification of all samples.

FRI action: In the event that the FRI identifies the disease as not serious, the Conservator will be advised to discontinue any precautionary quarantine measures implemented. If this preliminary analysis indicates a potentially serious situation, the FRI will proceed with action as in section 3, and notify the Conservator (for action as in section 2.4) and Head Office immediately. The Director of Production Forestry Research will appoint one of his staff as the FRI co-ordinator to liaise with the Conservator on all matters of concern to the FRI. This person will move immediately to the appropriate conservancy office.

Head Office: The Director of Production Forest Management Division or his deputy will maintain a watching brief and will when necessary liaise with legal section, other government departments, and act as Head Office spokesperson. In particular he will liaise with the Deputy Director (Plant Health) of the Ministry of Agriculture and Fisheries and keep him informed of all developments. He will keep all Conservators of Forests informed of developments in the problem area, and attend to any special financial requirements associated with procedures set out in this plan.

2.4 Outbreak control measures

Statutory responsibility: In the event of a potentially serious outbreak, the Conservator of Forests as an authorised forest officer under the Forest Disease Control Regulations may (see Appendix II):

(i) declare the problem area to be an infected area

(ii) implement precautionary or remedial measures of control or eradication by the destruction or treatment of forest produce in an infected area

(iii) restrict the movement of forest produce from, into or within an infected area

(iv) restrict the destruction of forest produce within an infected area

Declaration: The Conservator has the delegated authority to declare infected areas (see Appendix II) but unless there are exceptional circumstances he is expected to first consult with the FRI co-ordinator, major private forest owners in the area, and the Director-General. When the advice from FRI indicates that prompt action under the regulations is required, the area declared as infected should include a generous buffer around the outbreak site, with consideration being given to the economic implications of including forest nurseries, logging operations etc. when infection is not confirmed at these localities. Desirably an infestation limits survey (section 2.5) should precede declaration of an infected area, but not if the time delay prejudices early action to contain the outbreak.

Contingency plan implementation: The Conservator of Forests has prime responsibility to implement the above regulations and to invoke the provisions of this contingency plan until such time as the outbreak has been controlled, eradicated or accepted as a routine element of forest management. In doing so he will act as project co-ordinator and will

- make or obtain decisions relating to the project in liaison with the Director, Production Forest Management Division and the FRI co-ordinator

- obtain the goods, services and manpower necessary to effect the required survey and control measures

- appoint as necessary a survey co-ordinator (section 2.5), a control operation co-ordinator (section 2.7), public spokespersons and press officers (section 5), and a recorder (section 2.8) for the project.

Alternative to Forest Disease Control Regulations: Should the Conservator's powers prove not wide enough, or there is an unforeseen loophole, he will refer the matter to the Director, Production Forest Management Division, who may request the Minister of Agriculture to have the Governor-General (through Cabinet) declare a plant disease emergency under the Plants Act 1970. The Minister of Agriculture may then "direct such measures as he considers necessary" to prevent the establishment of, or to eradicate the disease. Under the Plants Act, forest officers could be appointed inspectors; there are greater powers of search and entry (i.e., all land can be searched and not only land with forest produce), and wider powers for recovering expenses when a person fails to comply with directives.

2.5 Infestation limits survey

Infested area: The extent of the infestation must be determined before any action decision can be made. A survey to obtain this information is of highest priority.

Survey co-ordinator: The project co-ordinator shall appoint a survey co-ordinator to direct, co-ordinate, provide services and equipment for the field survey, record survey results and to report findings back to the project co-ordinator.

Survey design: The FRI co-ordinator will, after consultation with FRI staff, recommend to the survey co-ordinator the most appropriate survey design on the basis of the organism involved, expected rate of spread and the life stage at detection.

Survey team training: The FRI co-ordinator will provide instructions for survey team training. Samples, photographs, and where possible the observation of the insect or disease in the field should form part of this training.

Resources: All staff involved on field surveys will report to the survey co-ordinator (and through him to the project co-ordinator) in the first instance. The FRI will assist with manpower by providing experienced staff, including scientists and technicians from Entomology and Forest Health Research fields. The Senior Forest Health Officer, in consultation with Conservators, may make available

FHO staff from other conservancies, to assist with the survey. Additional staff requirements will be provided by the conservancy affected.

The survey co-ordinator will call on the necessary equipment and vehicles from forest, district, conservancy and FRI sources as required. Where appropriate helicopter and fixed wing aircraft will be hired for aerial inspections. Conservancy fire plans will be consulted to identify available resources.

Should staff, plant, vehicles or other resources be required from adjoining conservancies, the survey co-ordinator will contact the Director, Production Forest Management Division, for him to action the requirement.

Decontamination: Facilities are to be provided to ensure survey crews and equipment are clean of the organism involved when leaving the outbreak site (see Appendix III).

Communication: A communication centre will be set up by the survey co-ordinator to monitor and direct the operation.

Survey assessment: At regular intervals, probably daily, the project co-ordinator will require the survey co-ordinator, FRI advisers, and other staff to assess the extent, direction and general methods of the survey.

National co-ordination: If the disease is found to occur within more than one conservancy, the Director of Production Forest Management will co-ordinate the survey and control measures over the whole infected area, with each Conservator retaining responsibility for operational activity in his conservancy, as project co-ordinator.

Records: The survey co-ordinator will be responsible for ensuring accurate mapping and recording of all survey results.

2.6 Monitoring survey

Objective: To collect and consolidate all scientific information on the nature and progress of the outbreak from the earliest possible time until work is concluded. This survey is a second priority to the infestation limits survey.

Responsibility: The monitoring survey will be carried out by FRI and may involve trapping and sampling separate from the infestation limits survey. Its organisation will be the responsibility of the Branch Head, Entomology and Forest Health, who will liaise with the FRI co-ordinator.

2.7 Control or Eradication Action:

Nature of decision: To decide line of action based on the seriousness of the pest or pathogen, known or expected extent of infestation, options available for control or eradication.

Responsibilities: The responsibility for action rests with the Conservator (project co-ordinator) who should make decisions on control measures under the best possible advice, using a local forum or the Forest Disease Control Advisory Committee (see section (4)) as appropriate. A local forum under the chairmanship of the project co-ordinator, comprising scientists, forest owners, survey and FRI co-ordinators and administrators, can provide immediate advice on the outbreak, and is to be convened by the project co-ordinator at the earliest convenient time. In most instances it will be appropriate for the project co-ordinator to appoint a control operation co-ordinator to oversee the implementation of the desired control measures at an operational level.

Options available:

(a) No action is a valid option when all possible alternatives and their implications have been thoroughly explored.

(b) Attempts to eradicate an insect or disease require early detection and immediate action, and are unlikely to be successful once the disease is well established. The benefits of a successful eradication campaign are high, and even if it should fail, it would not adversely affect any future alternative control programme. The two basic eradication methods are chemicals and fire - each has strengths and weaknesses which must be fully evaluated.

Chemicals - practicality of mounting an immediate operation
- likelihood of 100% mortality of target species
- available stocks of suitable chemicals

Fire - climatic conditions
- nature of fuel for hot burn for eradication

The decision to use fire as an eradicant requires adherance to the provisions of the Conservancy Fire Plan and the Forest and Rural Fires Act 1977.

(c) Attempted containment and control must initially be broad in its approach until the relative values of the different control options are established. Immediate control to reduce the population level might be necessary if rapid spread appears likely. Thereafter longer term plans for dealing with the insect or disease introduction must be formulated.

Biological factors to be considered: The economic importance of the tree species affected, both present and future. The probability that other species may become affected.

Probable biological impact of pest or pathogen on the affected tree species and its projected economic and social costs.

Known area of infestation, probability of this being true area, topography of area, geographic position, climate, accessibility, hydrology, etc.

Expected rate of spread of pest or pathogen and present stage in life cycle.

General biology of organism.

Eradication methods applicable, and assessment of the likely success of each.

Long term control and containment options and their projected costs.

Operational factors to be considered

Spraying: Examine possible application to problem; aircraft availability; chemical availability; monitoring.

Salvage: Consideration should be given to the utilisation of material being felled within the infested area. However, salvage can only be carried out if no biological hazards exist.

Burning: Possible application to problem; fuel levels; modification of stand; local weather conditions; fire control equipment; accelerators; monitoring methods.

Access: Roading; security of equipment; on-site accommodation.

Machinery and operators available: Consult Conservancy Fire Plan.

2.8 Records

Recorder: The project co-ordinator will appoint a member of his staff to collate, write up and take charge of all survey records delivered by the survey co-ordinator, minutes, notes, etc., pertaining to the operation.

Meetings: Minutes must be kept of all meetings with details of decisions made and reasoning behind them.

Operations: Full details of all operations will be kept along with any relevant climatic data.

2.9 Final report

At a certain stage the project co-ordinator will decide that the problem is over because the disease is controlled, eradicated or accepted as being present, and will then prepare a comprehensive final report for Head Office, FRI and the Forest Disease Control Advisory Committee. The report will include all relevant data, decisions made, results for the whole operation and any recommendation for continuing control measures.

SECTION 3 : FRI PROCEDURES

3.1 Forest Health Group (Entomology and Forest Health Research Field)

Detection: Where the Forest Health Officer, either by himself or after consultations with other FRI staff, judges that there is an unusual or suspect disease problem, he immediately notifies the Conservator. Samples plus detailed information are forwarded by the fastest possible means to FRI where they are opened in quarantine.

Manpower: If the pest or disease is positively identified as potentially serious, all FRI-based FHOs are recalled and regional FHOs placed on standby.

Survey: Senior FHO immediately organises the Forest Health Research staff to assist with survey as directed by the survey co-ordinator and consults with appropriate scientists so that he can place his team at the disposal of the project co-ordinator to assist with the initial survey.

3.2 Entomologists (Forest Health Group)

Identification: If a new introduction is suspected the identifying entomologist gathers all available information and calls a meeting of FRI entomologists, Branch Head, and Senior FHO.

Classification: The meeting classifies the problem as

(a) transfer of responsibility, e.g., to MAF;

(b) potentially not serious, or

(c) potentially serious.

Action: Where the problem is seen as potentially serious or requires a transfer of responsibility, the Directors of Production Forest Research and Production Forest Management, and the Conservator are informed. For potentially serious pests the Director, Production Forest Research, appoints an FRI co-ordinator who proceeds to conservancy office with as much information as is available.

Background information: Remaining entomologists gather as much background information as possible on biology, control, survey techniques, etc., and consult with any appropriate researchers in New Zealand.

3.3 Pathologists (Forest Health Group)

Identification: Common and well-known pathogens are diagnosed after microscopic and macroscopic examination. However, many pathogens, particularly in the absence of fruiting bodies, are very difficult to identify. Management action may have to proceed before the definitive identification stage.

Post identification: Procedures similar to those under 3.2 Entomologists.

3.4 Chemical control

Recommended chemicals: Chemical Control Officer resident at FRI determines appropriate chemicals and will assist the project co-ordinator to ensure adequate supplies are available.

Application: The Chemical Control Officer will advise the project co-ordinator, through the FRI co-ordinator, of the appropriate chemicals, methods, rates of application, operational techniques and monitoring procedures.

SECTION 4 : FOREST DISEASE CONTROL ADVISORY COMMITTEE

Statutory basis: The Forest Disease Control Regulations state that "the Minister may from time to time set up an advisory committee....." to advise him on ".....the eradication or control of a forest disease specified in any declaration of an infected area."

Composition of committee: In general terms the committee is comprised of a chairman nominated by the Director-General; an FRI scientist; three members from any association formed by owners of any forest produce affected by the forest disease; one member of the NZ Institute of Foresters; and one member from any association formed by persons engaged in producing, promoting, or utilising forest produce likely to be affected by the disease; a total of seven members.

Formation of the committee: An advisory committee will be set up at any time the Minister so directs. He will be recommended to constitute the advisory committee when

- any disease outbreak is seen as a serious threat to State and/or private forest resources

- quarantine and/or control measures are required which may result in loss of private resources or expense to private forest owners or traders in forest produce

- the co-operation of private sector owners and producers is required

Committee meetings: Advisory committee meetings will be held at such time and place as the Chairman thinks fit. In advising on any disease outbreak the most appropriate time for the initial meeting will probably be after the declaration of an infected area and following the completion of the infestation limit survey.

SECTION 5 : PUBLICITY

A press officer(s) will be appointed by the Conservator when the contingency plan procedures are implemented (section 2.4) and will move immediately to the conservancy office. The press officer should be a Forest Service journalist, or outside journalists as recommended by Head Office Information Section.

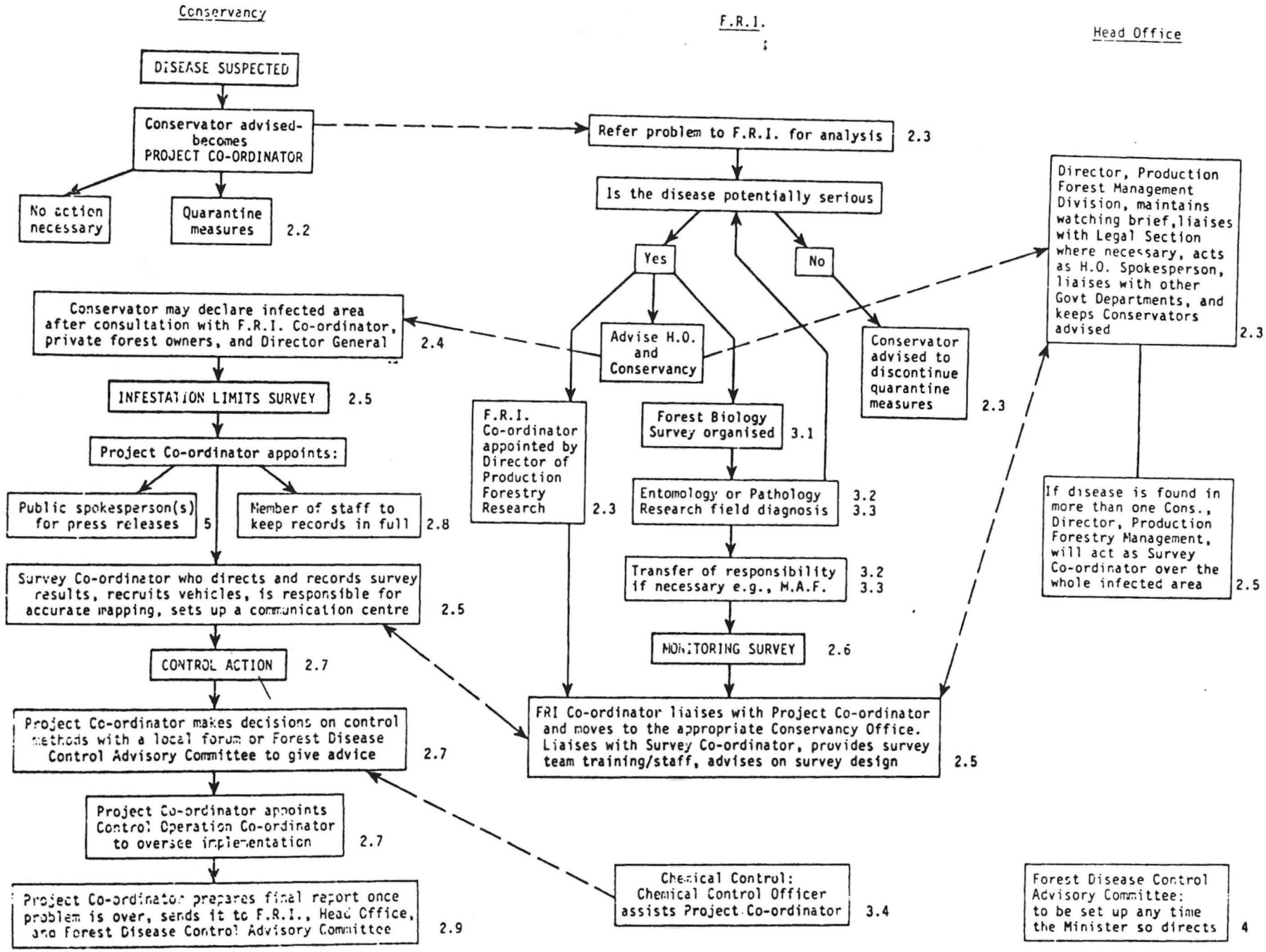
The press officer will be

- directly responsible to the Conservator
- kept informed of all developments
- an observer at any meetings of involved personnel

The Conservator will appoint other spokespersons, such as the FRI co-ordinator or a district officer, as he sees fit. The Head Office spokesperson is the Director of Production Forest Management Division (section 2.3).

The Conservator will publicly release news of the outbreak AS SOON AS POSSIBLE. The press officer will prepare and release an initial press statement and arrange a press conference. After the initial statement, regular bulletins on action being taken, and up-dating the situation will be issued. All bulletins will be statements from the Conservator, or other authorised spokespersons.

The press officer will liaise between the press, the Conservator and other spokespersons, directing inquiries, arranging conferences and meetings with the press and preparing news statements.


Conservancy
F.R.I.
Head Office
DISEASE SUSPECTED
Conservator advised- becomes PROJECT CO-ORDINATOR
No action necessary
Quarantine measures
2.2
Refer problem to F.R.I. for analysis
2.3
Is the disease potentially serious
Yes
No
Director, Production Forest Management Division, maintains watching brief, liaises with Legal Section where necessary, acts as H.O. Spokesperson, liaises with other Govt Departments, and keeps Conservators advised
2.3
Conservator may declare infected area after consultation with F.R.I. Co-ordinator, private forest owners, and Director General
2.4
Advise H.O. and Conservancy
Conservator advised to discontinue quarantine measures
2.3
INFESTATION LIMITS SURVEY
2.5
F.R.I. Co-ordinator appointed by Director of Production Forestry Research
2.3
Forest Biology Survey organised
3.1
Project Co-ordinator appoints:
Public spokesperson(s) for press releases
5
Member of staff to keep records in full
2.8
Entomology or Pathology Research field diagnosis
3.2
3.3
If disease is found in more than one Cons., Director, Production Forestry Management, will act as Survey Co-ordinator over the whole infected area
2.5
Survey Co-ordinator who directs and records survey results, recruits vehicles, is responsible for accurate mapping, sets up a communication centre
2.5
Transfer of responsibility if necessary e.g., M.A.F.
3.2
3.3
CONTROL ACTION
2.7
MONITORING SURVEY
2.6
Project Co-ordinator makes decisions on control methods with a local forum or Forest Disease Control Advisory Committee to give advice
2.7
FRI Co-ordinator liaises with Project Co-ordinator and moves to the appropriate Conservancy Office. Liaises with Survey Co-ordinator, provides survey team training/staff, advises on survey design
2.5
Project Co-ordinator appoints Control Operation Co-ordinator to oversee implementation
2.7
Chemical Control: Chemical Control Officer assists Project Co-ordinator
3.4
Forest Disease Control Advisory Committee: to be set up any time the Minister so directs
4
Project Co-ordinator prepares final report once problem is over, sends it to F.R.I., Head Office, and Forest Disease Control Advisory Committee
2.9