ForHeal Forestry Higher Education Advancement in Laos

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The potentially most important forest pests at plantations

UNIVERSITY OF HELSINKI · VITRI · UNI FREIBURG · CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE · National University of Laos · Souphanouvong University · Savannakhet University

Forest protection management

- many pests and diseases, particularly native ones, exhibit cyclical patterns of impact on native forests, and are generally of minor overall concern
- active management of agents affecting forest health is directed mainly at the protection of commercial values in multiple-use public and private native forests and plantations
- in most states and territories, forest health surveillance is carried out regularly, to detect and identify the extent and severity of problems
- forest health surveillance is mainly undertaken in plantations
- Australia has effectively incorporated the principles and operational guidelines of the ecosystem approach into its National Forest Policy Statement, regional forest agreements, certification standards and other institutional arrangements for sustainable forest management

Introduction

- since eucalypts are the dominant tree species in Australia, there is a large variety of insects associated with them in that country
- in contrast, the eucalypt insect fauna is less diverse in the exotic plantations

- obviously, out of the many species of insects associated with a tree species in the natural forest, only some have the greater potential to adapt to the particular host species and the plantation environment and become serious plantation pests
- this is shown by the spectrum of pests attacking *Eucalyptus* spp. in natural forests and plantations - only some of the pests that occur in natural forests are found in plantations
- the most notable difference is the near absence of phasmatids and the dominance of leaf-feeding beetles chrysomelids and scarabaeids) in plantations

Main pests

- include defoliating leaf beetle and moth larvae, psyllids, aphids, sawflies, weevils, bark beetles, wood wasps and wood borers
- exotic root-rotting pathogen *Phytophthora cinnamomi* and related species, which occur in all states and territories, kill a wide range of plant species, and a range of fungal leaf pathogens can have significant impacts on hardwood and softwood plantations
- weeds compete with native forest flora and can become locally dominant, reducing biodiversity and other valuesand can also affect tree establishment, growth and product yield in commercial forest plantations

Insect pests

- native insect pests and pathogens caused only low-severity damage to forest ecosystems
- most of the observed damage to forests was caused by exotic pests and pathogens that should become established in Laos
- occasional outbreaks caused damage that adversely affected commercial values, particularly in plantations
- native and plantation forests affected by drought, fire and cyclones were colonised by pests such as bark beetles and ambrosia beetles
- the pine-killing *Sirex* wood wasp remained a significant issue, although it had only localised adverse impacts

Control Methods

- chemical pest and disease control methods used in plantations are regulated????

Control Methods

- plantation forestry uses pesticides for forest protection and to improve production
- The must be an Authority controls pesticide registration in a consistent manner across forestry and agriculture
- forestry relies mainly on pesticides developed for agricultural crops because the plantation forestry industry is too small to warrant the cost of specialised pesticide development and registration

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Insect pests affecting hardwood plantations

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Leaf beetles Order Coleoptera: Family Chrysomelidae

- ✓ the larvae tend to feed in a group on new leaves; pupate in the soil
- ✓ the upper, outer parts of a small tree may be completely stripped of leaves
- ✓ the adults feed on older foliage as well as young growth, and the leaves may have scalloped edges
- ✓ those that feed on eucalypts often lay their eggs on small stems or leafstalks, in a circular arrangement which produces a structure like a cob of corn or a rosette
- ✓ adults vary in size and colour according to species but are about 10 mm long

Leaf beetles Order Coleoptera: Family Chrysomelidae

- ✓ species of the chrysomelid leaf beetles *Paropsis* and *Paropsisterna* (formerly *Chrysophtharta)* continued to cause damage in eucalypt forests and plantations in subtropical areas, *Paropsis atomaria* remained a major insect pest risk
- ✓ the most destructive chrysomelid species is *Paropsisterna cloelia* on *E. dunnii* plantations

Paropsis atomaria

Leaf beetles
Order Coleoptera: Family Chrysomelidae

- ✓ while in Tasmania *Paropsisterna* spp. continued to cause significant damage to eucalypt plantations and required an ongoing, extensive integrated pest management program

P. m-fuscum

ForHeal Control

- at present, research on pesticide efficacy against Eucalyptus leaf beetle is lacking
- in field nurseries and eucalyptus stands, long–term control may be achieved by a soil drench application of the systemic neonicotinoid insecticides imidacloprid or clothianidin
- foliar sprays of broad-spectrum insecticides such as the carbamate carbaryl or pyrethroids, including cyfluthrin and permethrin may also be effective against adults and larvae

Mnesampela privata
Autumn gum moth

- ✓ host tree: *Eucalyptus* spp.
- ✓ present in most states and territories and causes widespread damage to juvenile or young adult eucalypt foliage: young larvae skeletonise the leaf, and older larvae eat the whole leaf, rapidly defoliating trees
- ✓ they attack the juvenile leaves and web several together into a bag in which they shelter

ForHeal Control

- to prevent serious damage check trees regularly during autumm for eggs, early stages of damage and young caterpillars
- removing caterpillars by hand may be an option for control of outbreaks in small areas of younger plantations
- chemical control is often necessary when small trees are attacked and are in danger of being defoliated.
- no insecticides are registered specifically for use on Autumn Gum Moth but most broad spectrum chemicals will kill larvae (including biopesticedes with Bt).
- control is not difficult to achieve but large larvae are in shelters during the day and therefore are protected from sprays until they emerge to feed at night

Perthida spp. Shothole miner

- ✓ host tree: *Eucalyptus* spp.
- ✓ causes increasing damage in blue-gum plantations
- ✓ each larva constructs an elliptical case by cutting out an oval section from the upper and lower leaf surfaces of the mine and joining them together with silk, they then drop to the ground and burrow into the soil and leaf litter to a depth of two to three cm
- ✓ no control

Creiis lituratus

- this psyllid is a threat to young *E. dunnii* plantations in northern New South Wales, causing significant damage in both young (1 to 2-year-old) and older (5 to 8-year-old) stands
- kills leaf tissue and severe infestations can result in extensive damage to foliage
- control: insecticide sprays have limited efficacy

Kahaono spp.
Tent leafhopper

- this hemipteran species is an emerging problem for *Corymbia* hybrids, although it is not expected to have a significant effect on tree growth rates

female vs. male

Kahaono spp. Tent leafhopper

- feeds under globules of blackened screment suspended on the tent
- tent on gumleaf with continuous covering of excremental material

Gonipterus scutellatus
eucalypt weevil

- ✓ host tree: *Eucalyptus* spp.
- ✓ family Curculionidae, endemic in Australia
- ✓ recently is a major threat worldwide as it continues to spread, both within continents where it currently occurs and to previously uninfested continents
- ✓ is a leaf-feeding beetle that is a major defoliator in some young eucalypt plantations

ForHeal Damage

- adults and larvae feed on the leaves of host trees but it is the larval stage that does the most damage
- they cause damage by eating only one surface of the leaves, leaving characteristic tracks while adults chew the edges of the leaves giving them a ragged, scalloped appearance
- both adults and larvae prefer the newly expanded adult leaves and shoots - such feeding can result in dieback of shoot tips and development of tufts of epicormic shoots

Control

- biological control of this species by means of the importation of *Anaphes nitens* (Hymenoptera: Mymaridae), an egg parasitoid, has been highly successful in many areas.
- the alternative is to use tolerant host plant species
- chemical treatment is not recommended because of the potential danger to beneficial honey bees attracted to the flowers of eucalypt species
- is an A2 quarantine pest for EPPO – it is regulated by most EPPO countries

Perga spp.
Steelblue sawfly

- host tree: *Eucalyptus* spp.
- the eggs of this sawfly are deposited in slits in the leaves
- after hatching, the larvae remain together in the same group during the day, spread out over the tree to feed at night, re-assemble for the next day, they pupate in the soil
- if the cluster of larvae are disturbed, they wave their bodies up and down and exude a thick yellowish fluid

ForHealDamage

- sawflies are very conspicuous on the trees, they do little damage if they occur on large trees and there are few larvae
- eucalypts have a great ability to regenerate quickly after the initial attack unless such factors as drought or other insects further weaken the trees
- occasionally major outbreaks do occur and may cause considerable damage to trees particularly if the trees are young
- in large numbers, sawflies are capable of rapidly defoliating whole trees and may cause dieback, stunting or even death of small trees

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ForHeal Control

If only a few trees are affected and clumps of larvae can be reached:

- knock clumps from the tree and destroy them
- hose off with strong water jet
- cut off affected branches

Biological options include:

- parasitic wasps
- large cockatoos may eat larvae (other predators may be put off by the liquid exuded)

Apply **chemicals**:

- combine spray with wetting agent for eucalypts
- inject tree when tree is actively growing and larvae are feeding

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Insect pests affecting softwood plantations

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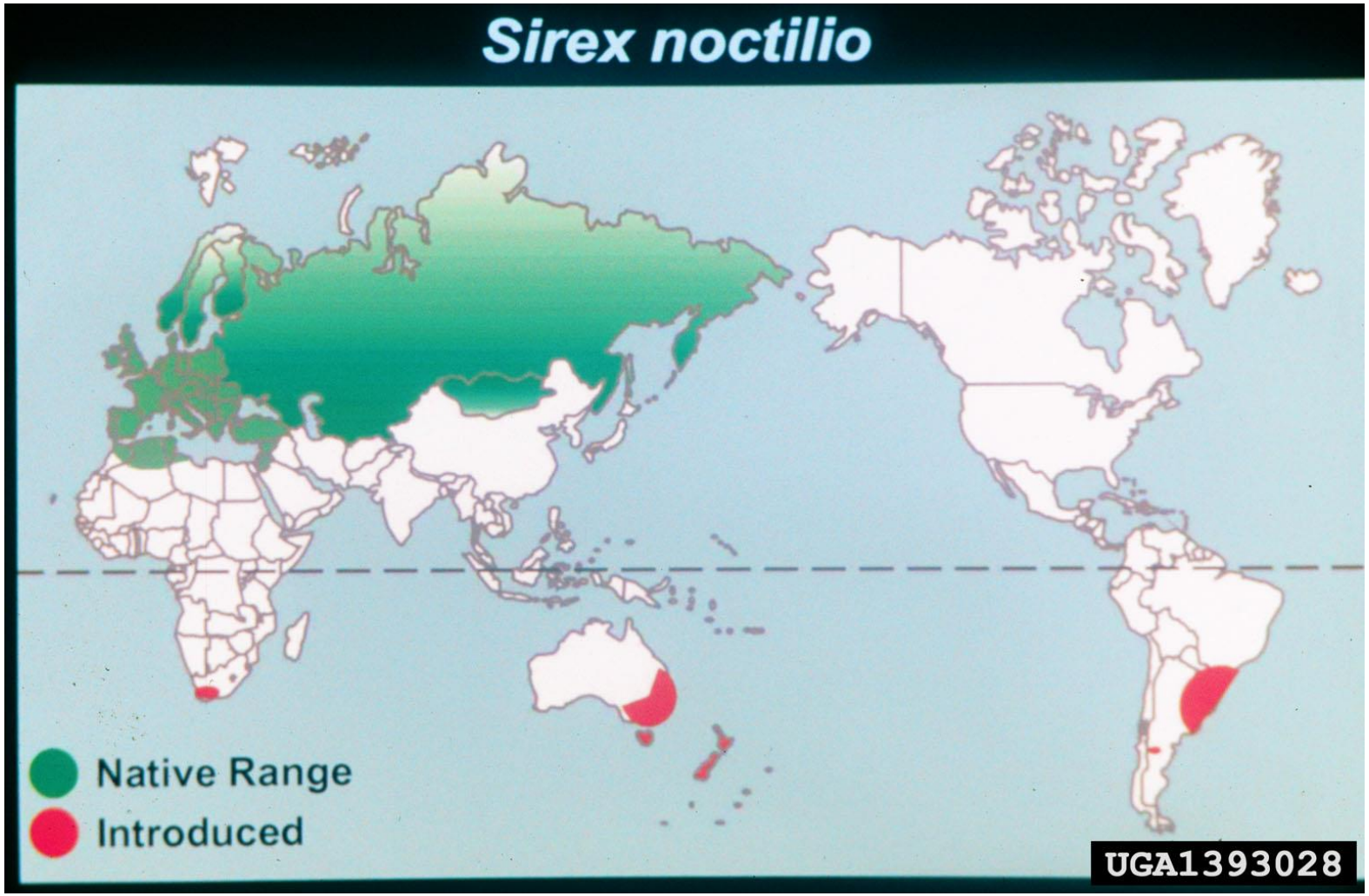
Sirex noctilio
Sirex wood wasp

- remain a significant issue in *Pinus radiata* plantations
- although Sirex was widespread in distribution across most planted areas, it had only localised adverse impacts, with its impact being minimised through biological control agents
- in the past, however, serious Sirex outbreaks have killed several million trees in *P. radiata* plantations in several states

Distribution



Control

- The National Sirex Control Strategy encourages an integrated pest management approach that aims to keep *Sirex* populations low by the release of virulent strains of the nematode *Beddingia siricidicola,* as well as a range of parasitoid wasps, as biological controls, and by encouraging optimal plantation thinning practices and site selection to minimise the occurrence of stressed trees in areas at risk

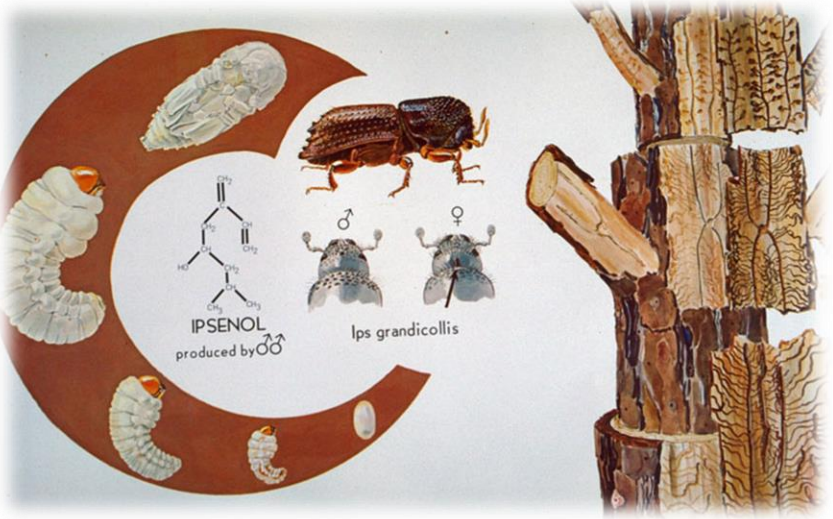
Essigella californica
Monterey pine aphid

- is widespread and caused significant damage in most *Pinus radiata* plantation areas
- mid-rotation to preharvest plantations were the most severely affected,
- biological control program to manage Monterey pine aphid, with the parasitoid wasp *Diaeretus essigellae* - released into plantations over the past couple of years

Ips grandicollis

The five-spined bark beetle

- is able to infest all plantation pine species grown in subtropics!!!
- population levels build primarily on fresh logging debris or in standing trees that are damaged (e.g. after fire) or severely stressed (e.g. after drought)



ForHeal Damage

- adults and larvae are phloeophagous or bark-feeding
- They frequently carry the spores of bluestain fungi (e.g. *Ceratocystis ips*)
- high beetle numbers, particularly in trees in overstocked stands during periods of drought, can result in tree death

Fivespined bark beetle (Ips grandicollis)

Galleries aka artwork by the beetle reduces pine quality.

This is how BLUE STAIN FUNGUS looks. It can look blue or greyish. Also, see the very tiny borer holes that can be observed when pine logs are checked for export.

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Control

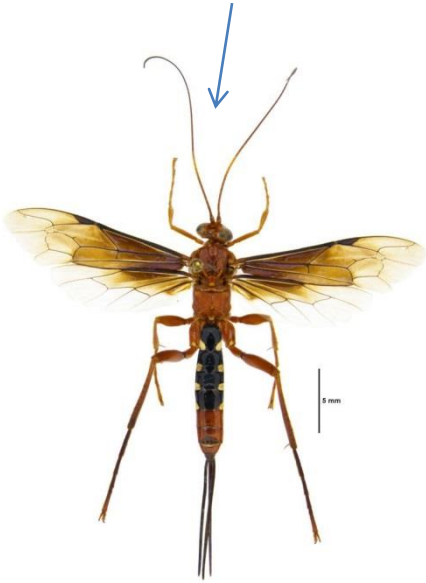
- the parasitoids *Roptrocerus xylophagorum* and *Dendrosoter sulcatus*
- *m*anagement included developing drought-risk maps (using historical forest health data and environmental and silvicultural data to develop drought-risk models) and site-specific silviculture (e.g. thinning regimes)

Truncaudum agnatum
The pin-hole borer

- in north Queensland, populations of this species expanded following damage to Caribbean pine *(Pinus caribaea* var. *hondurensis)* plantations by tropical cyclone Yasi in February 2011
- visual pin-hole damage and associated fungal staining caused by these and other beetles reduced recovered log values

Tiracola plagiata
Cacao armyworm

- caterpillar defoliated large areas of young plantation *Araucaria*
- control was possible with aerial application of insecticide, as well as natural control through the parasitoid wasp *Lissopimpla excelsa*



Hylotrupes bajulus
The European house borer

- native: in Europe
- is a destructive pest of seasoned coniferous timber, including pine and oregon, and can cause major structural damage to buildings

control

- measures being taken to contain European house borer included regulations to control movement of seasoned pine, surveys to detect new infestations, better detection methods, removal and destruction of infested materials program for the publi stry

Chlenias sp. 'pine looper'

- an outbreak of this native geometrid moth in 2009-10 completely defoliated more than 100 hectares of mature pine plantations in Tasmania at Pittwater, north-east of Hobart

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Insect pests affecting native forests

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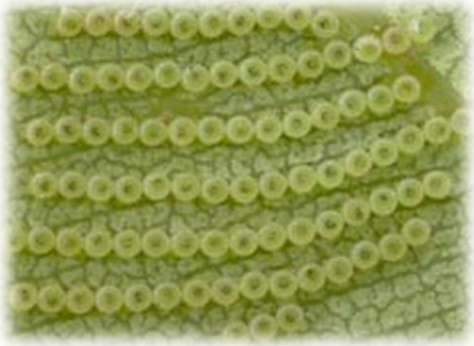
Uraba lugens
Gumleaf skeletoniser

- host tree: *Eucalyptus* spp.
- causes widespread and severe defoliation of natural eucalypt stands across a range of climatic and vegetation types, but generally few trees die
- regional outbreaks tend to occur on a 5—10-year cycle
- an outbreak of gumleaf skeletoniser occurred in southern Western Australia in 2009-11, causing moderate to severe temporary defoliation on extensive areas of forest



Damage and Control

- young caterpillars feed in groups on the leaf surfa ce, skeletonizing it and causing wilting and browning.
- older caterpillars consume all the leaf tissue, leaving only the midrib
- **chemical control**: spray with maldison mixed with a wetting agent to help penetrate the hairs on the caterpillars

Doratifera spp. Cup moths

- host tree: *Eucalyptus* spp.
- the larvae of most of these moths are basically rectangular in shape with a saw-tooth edge
- thespines they carry can inflict a painful sting and cause some local inflammation
- the fully-fed larvae construct cup-shaped cocoons stuck to twigs or under loose bark
- the moths emerge after pushing up a small lid at the top of the cocoon
- eggs are laid in groups on the leaves and covered with hairs from the female moth´s body

ForHeal Damage

- small larvae feed in a group and remove the leaf surface
- later they feed individually and chew the edges from the leaves
- in Tasmania, several hundred hectares of peppermint forest *(Eucalyptus amygdalina, E. tenuiramis* and *E. pulchella)* near Hobart suffered near-complete defoliation by the cup moth *(Doratifera oxleyi)* in autumn 2010

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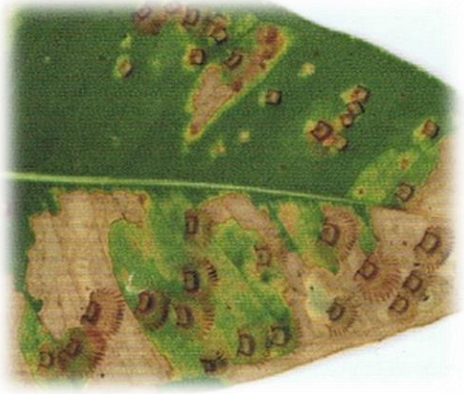
Control

- wasps and tachinid flies often parasitise the caterpillars and they are also eaten by predatory bugs and birds
- viral diseases are common in cup moths and can be brought on by wet weather, shortage of food and overcrowding
- caterpillars infected by a viral disease stop feeding, turn brown and swell up, with spines raised. After death, the skin ruptures and brownish fluid oozes out
- egg batches can be removed by hand from small trees

Cardiaspina fiscella
Brown lace lerp

- host tree: *Eucalyptus* spp.
- probably the most damaging example of the group called psyllids
- the insects feed under the leaves and produce small open-weave coverings for themselves as shown in the photograph
- they suck sap, and gradually the upper leaf surface becomes marked with reddish of yellowish blotches
- eventually the leaves turn brown, and from a distance the tree looks as if it has been damaged in a bushfire
- a tree that is attacked season after season may die



Other important insect pests of native eucalypts

- included shothole miner *(Pertha* spp.)
- spurlegged phasmatid or stick insect *(Didymuria violescens)*
- European wasp *(Vespula germanica)* was widespread and sometimes locally abundant in the forests of Namadgi National Park and Tidbinbilla Nature Reserve

Didymuria violescens

Vespula germanica

ForHeal Termites

- the most common pest problem of exotic eucalypts is mortality of saplings caused by root-feeding termites
- this is not common in Australia where termite attack of older trees is a more serious problem