Modernising the plant health regime of the EU in view of globalisation and climate change

Contributors

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Threats to forests and forest products

Insects and diseases

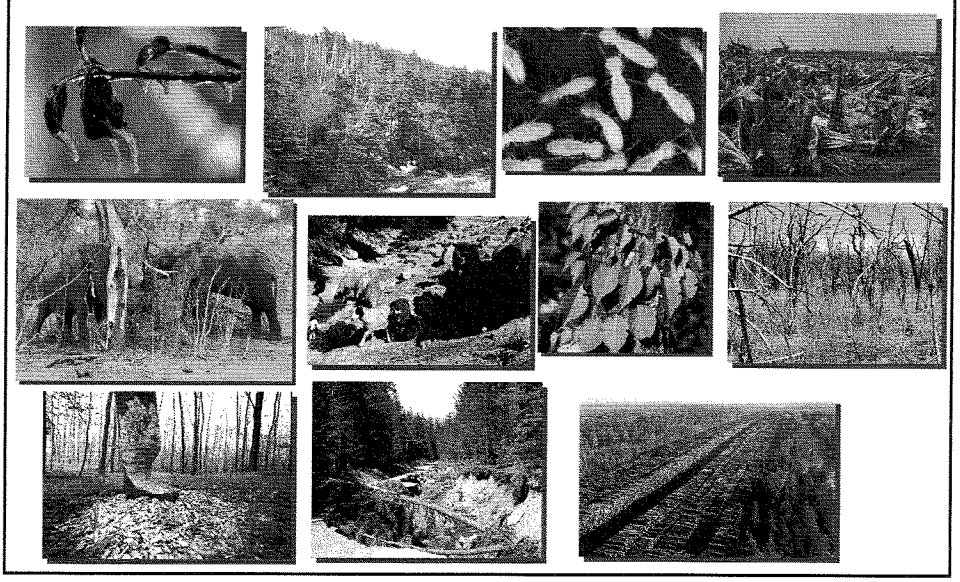
Other biotic agents, e.g. wildlife browsing, grazing, physical damage, nematodes

Abiotic disturbances, e.g. air pollution, wind, snow, ice, frosts, floods, storms, drought, windthrow, earthquakes, floods, landslides, tsunami

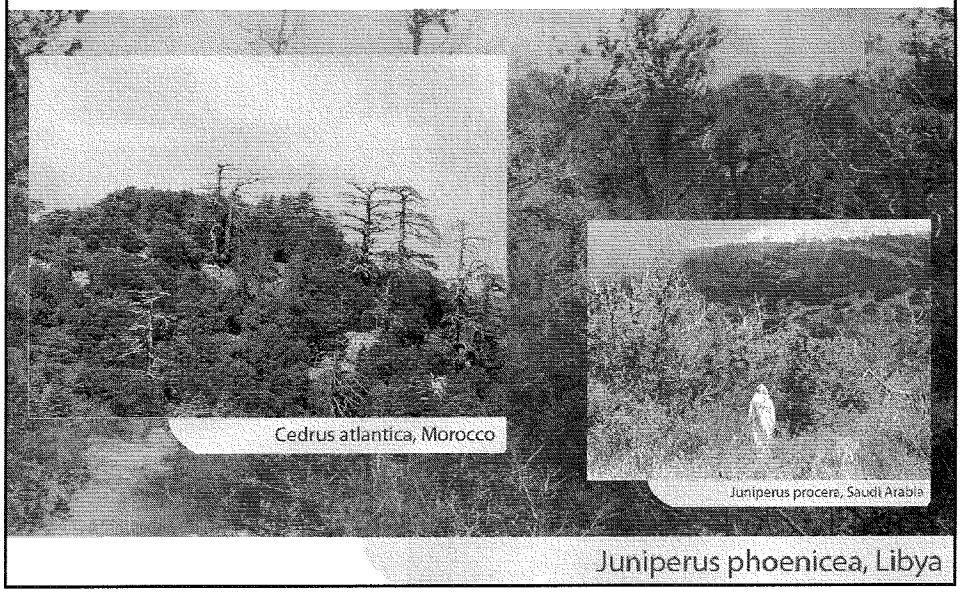
Plants (woody invasive species)

Fire

Forest threats



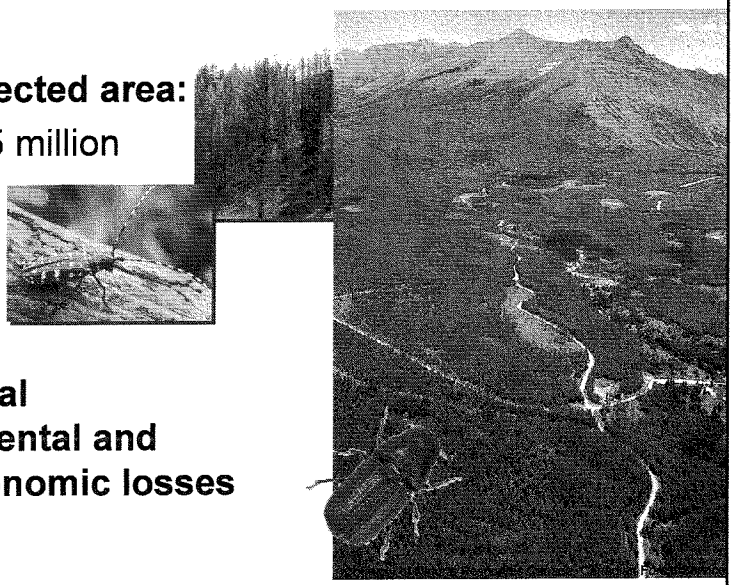
Diebacks



Threats to forests

Insect affected area:

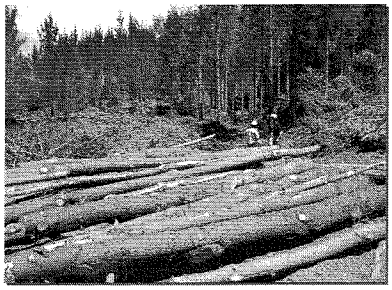
At least 35 million hectares per year



Substantial environmental and socio-economic losses

Impact

Tree survival



Yield and quality of forest products

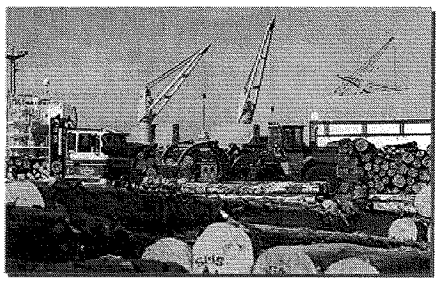
- Cultural values of forests
- Wildlife habitat
- Species biodiversity

Impact

Disrupt natural fire cycles

Deplete water

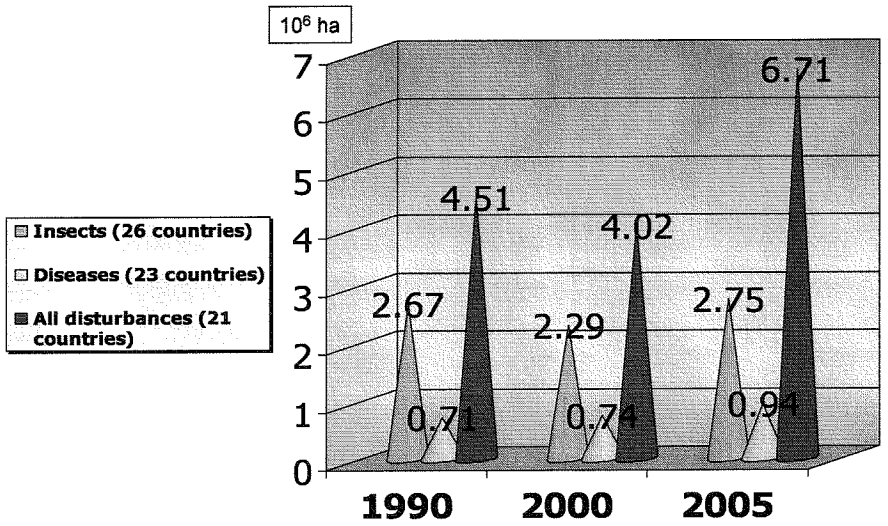
Affect international trade in forest products



Impact livelihoods

Europe

Trends in area of forest annually affected by insects, diseases and all disturbances (excl. fire)



Invasive species

An organism that is non-native to the ecosystem under consideration and ..

whose introduction will cause or is likely to cause economic or environmental harm or harm to human health

General traits of successful invasive species

Rapid growth rate

Efficient dispersal capabilities

Large reproductive output

Broad environmental tolerance

Invasive species in forests
Three levels

- **Populations**
  Can reduce or eliminate populations of particular native species
- **Ecosystems**
  Can affect the composition and processes of entire forest ecosystems
- **Global processes**
  Can change patterns of forest cover – alter nutrient cycling, and potentially climate

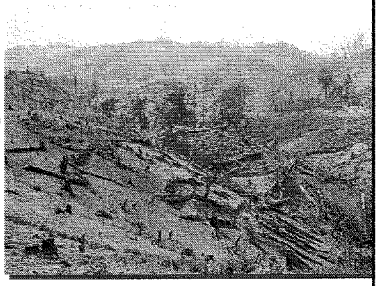
How global change affects pests

Increasing international trade

Changing climate

Changing land-use patterns

- Deforestation
- Habitat fragmentation
- Desertification



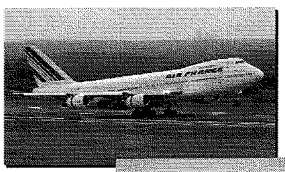
Causes of international pest movement

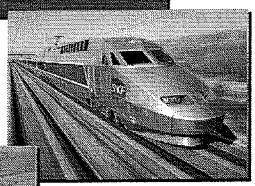
"The 3 T's"

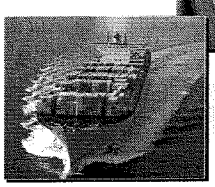
Travel (faster)

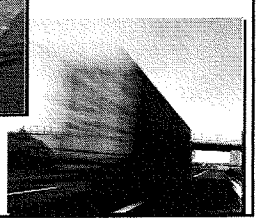
Transport (further)

Trade (increased)



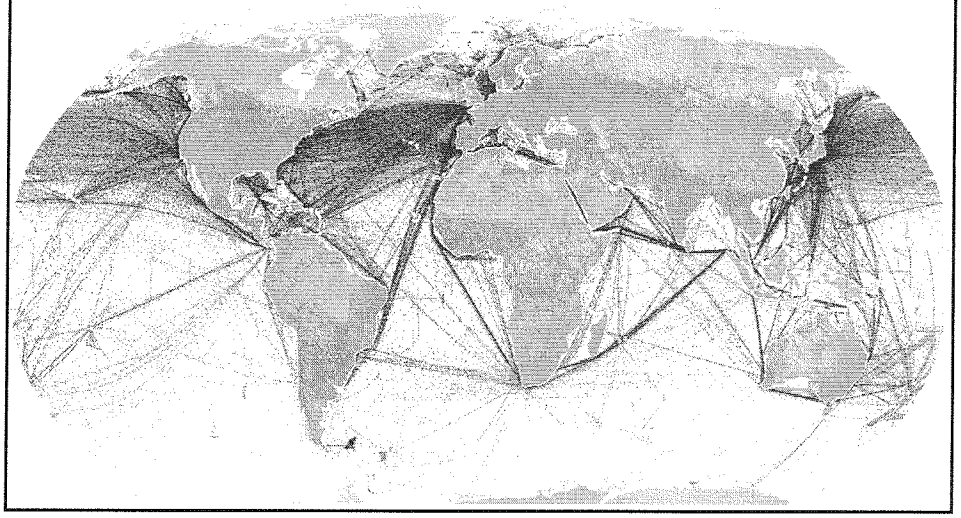




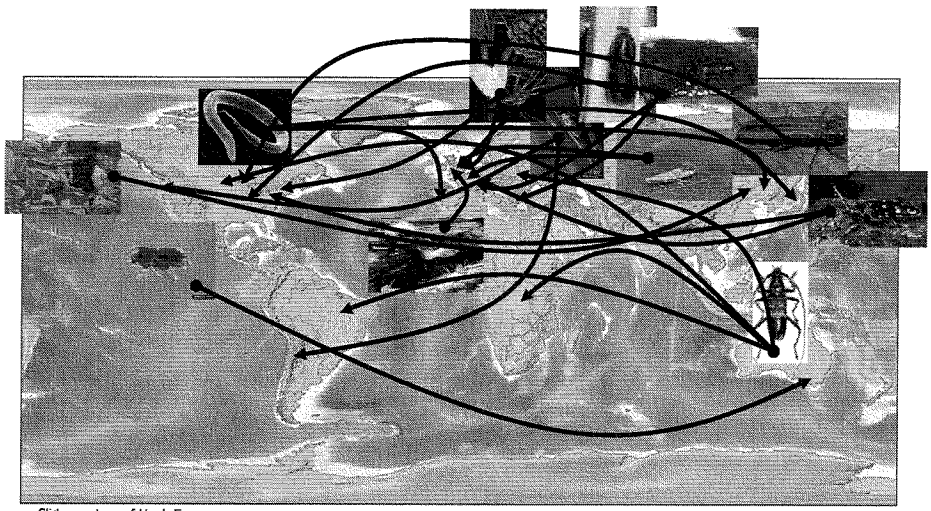


GA1

Increasing global trade



Increased trade moves pests globally

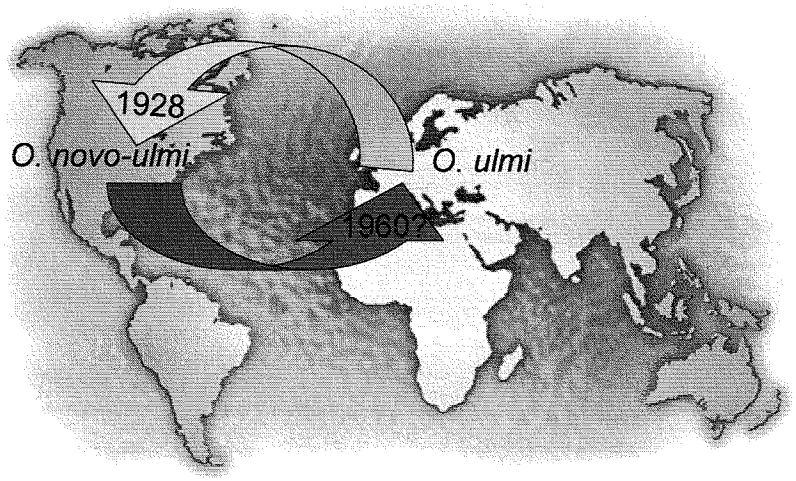


Slide courtesy of Hugh Evans,
Forest Research Agency (Wales)

Slide 15

GA1 Allard, Gillian (FOMR); 8/02/2010

Reinvasion - Dutch elm disease



Slide courtesy of Jacques Régnière, Natural Resources Canada, Canadian Forest Service

Important pathways

Pathways	
Wood as a commodity	Rour Sawr Proc Fuelv
Packaging wood	Palle **dunr**
Plants for planting	Live balls.
Cut plants	Orna Chris
Germplasm	Cone very
Hitchhikers	Any such

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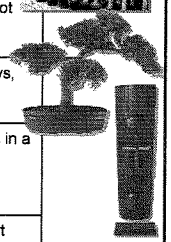


Forestry ISPMs

Created because regulatory systems were overwhelmed with the increasing volume of international trade

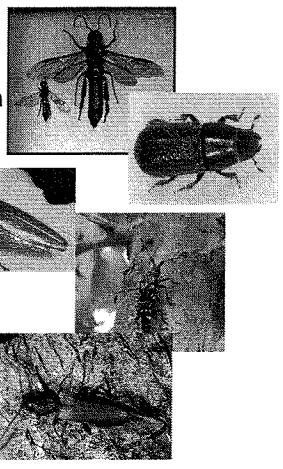
Pest introductions that resulted in ISPM No 15

Sirex woodwasp
Europe or North Africa ➡ Argentina, Oceania, South Africa

Red turpentine beetle (*Dendroctonus valens*)
North America ➡ China

Emerald ash borer (*Agrilus planipennis*)
Asian longhorned beetle (*Anoplophora glabripennis*)
Brown spruce longhorn beetle (*Tetropium fuscum*)
Asia ➡ North America

Pine wood nematode
North America ➡ Asia



Potential, emerging or establishing pest problems in Europe

Pathogens

Chalara fraxinea – Ash dieback

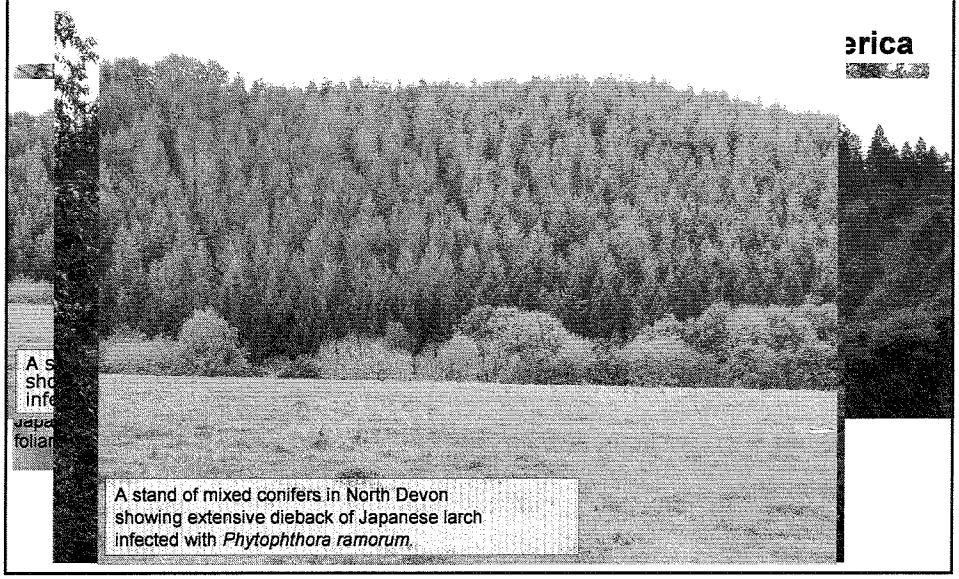
Cryophonectria parasitica – Chestnut blight

Phytophthora kernovieae

Phytophthora pinifolia

Phytophthora ramorum – sudden oak death

New invasive pathogen



A stand of mixed conifers in North Devon showing extensive dieback of Japanese larch infected with *Phytophthora ramorum*.

Potential, emerging or establishing pest problems in Europe

Insects

Agrilus planipennis – Emerald Ash Borer (EAB)

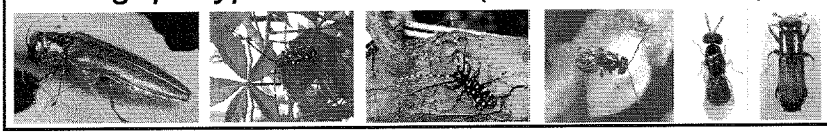
Anoplophora chinensis – Citrus longhorned beetle

Anoplophora glabripennis – Asian longhorned beetle (ALB)

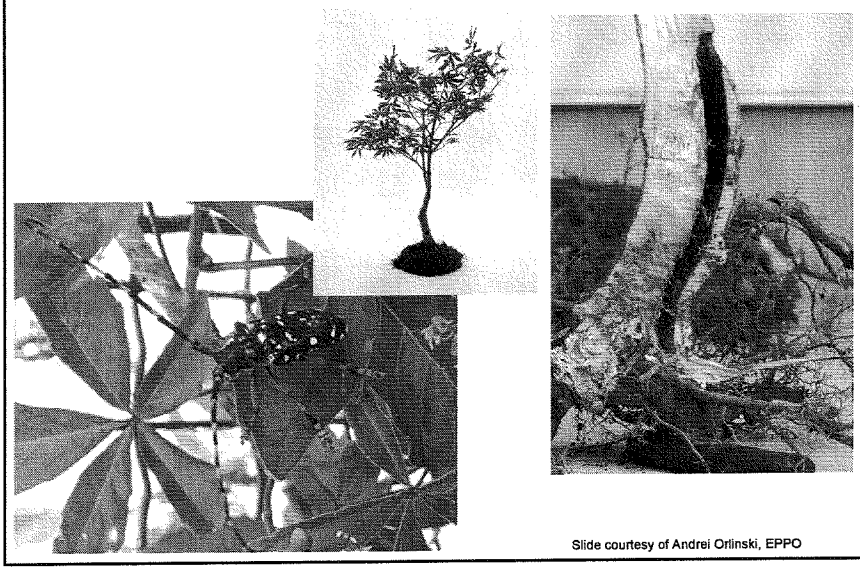
Drycocosmus kuriphilus – Oriental chestnut gall wasp

Leptocybe invasa – Blue gum chalcid

Megaplatypus mutatus – (Ambrosia beetle)



Anoplophora chinensis imported on bonsai Acer palmatum

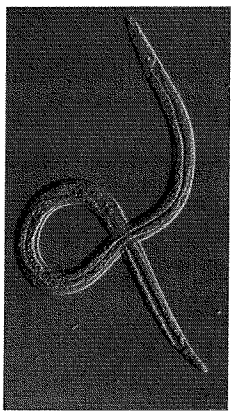


Slide courtesy of Andrei Orlinski, EPPO

Emerging and establishing pest problems in Europe

Nematodes

Bursaphelenchus xylophilus- pine wilt nematode



GA2

Potential costs of current trade restrictions

Trade in logs from Chile to Korea banned due to recent *Phytophthora pinifolia* sp.nov. on *Pinus radiata* pines

Impact of Asian log trade bans, triggered by a biosecurity threat, would lead to the loss of NZ$11 billion in the present value of NZ growers' revenues (FOA, 2010).

Slide 26

GA2 Allard, Gillian (FOMR); 16/02/2010

Forest-related standards currently being developed

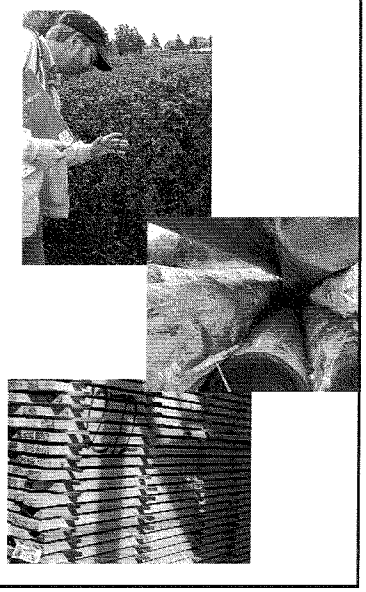
International movement of wood

International movement of forest tree seeds

Forestry Surveillance

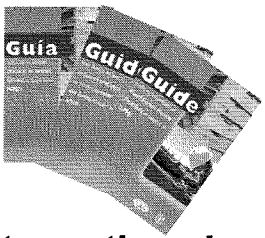
Criteria for treatments for wood packaging materials

Guidelines for treatment of wood packaging materials (as part of ISPM 15)



Guide to forestry and international phytosanitary standards

To make ISPMs more accessible to the forestry sector

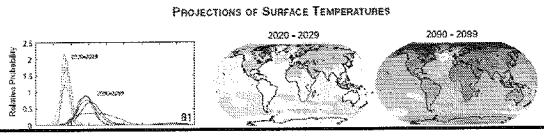


Plain-language guide

In development by FAO with international scientists, phytosanitary authorities and forest sector representatives, supported by IPPC Secretariat

Global impacts of climate change

Increase in temperatures	→	Increased stress in tropical /subtropical forests
	→	Increased growing season in temperate / boreal forests
Sea level rise	→	Impact on coastal forests
Changes in rainfall patterns	→	Drought / flooding
Increase in concentration of CO_2 in atmosphere	→	Increased tree growth
Number and severity of extreme events	→	Disturbance dynamics



Response of insects and pathogens to climate change

High mobility

Short generation times

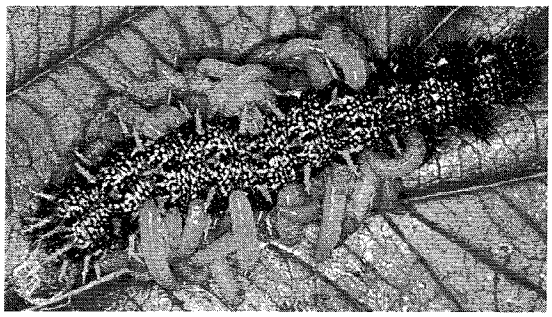
High reproductive rates

→ Pests respond to climate change more rapidly than tree populations

May be first predictors of climate change in forests

Changed relationship between pest, environment and other species

Changes in abundance of natural enemies, competitors and mutualists

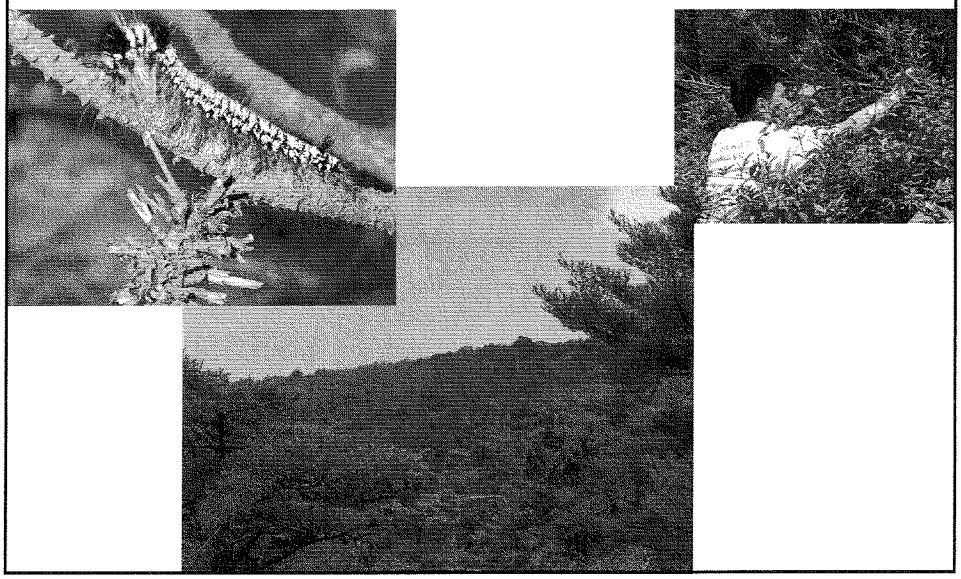


Altered host physiology and defences

Increased temperatures – the main driver of change

Phenology
Accelerated insect development rate
Early spring emergence
Community dynamics and composition
Increased or decreased winter mortality
Distribution
Range expansion of pests
Extension of range of insect vectors of pathogens

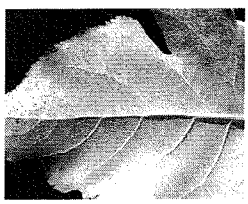
Example of early spring emergence DPR Korea



Consequences for pathogen distribution in Europe

Phytophthora cinnamomi
Root rot pathogen
Predicted to spread into colder regions of Europe

Melampsora allii-populina
European rust pathogen
Likely to spread northwards with increased summer temperatures



Consequences for insect distribution in Europe

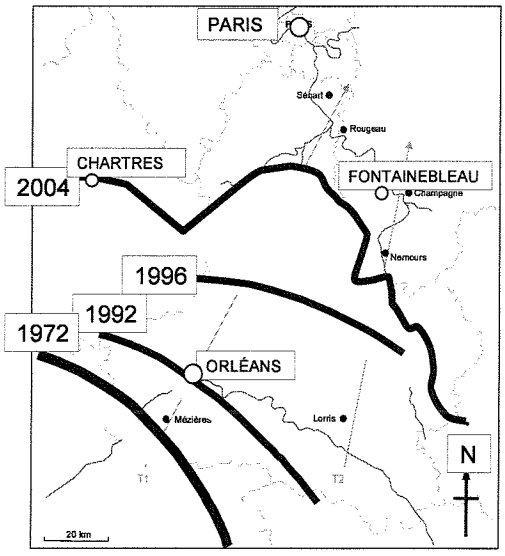
Insects can rapidly follow climatic changes to new environments

Some could overcome geo-climatic barriers

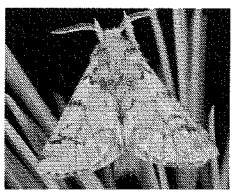
Many indigenous species could become invasive

Changing distribution

Pine processionary moth, *Thaumetopoea pityocampa*

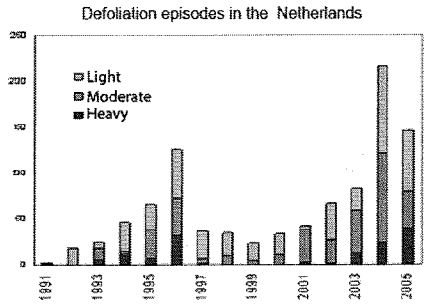


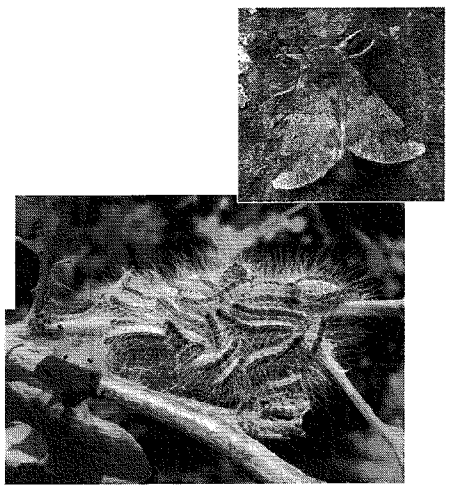
After Roques et al. 2007



Slide courtesy of Hugh Evans, Forest Research Agency (Wales)

Changing distribution
Oak processionary moth, *Thaumetopoea processionea*





Slide courtesy of Hugh Evans, Forest Research Agency (Wales)

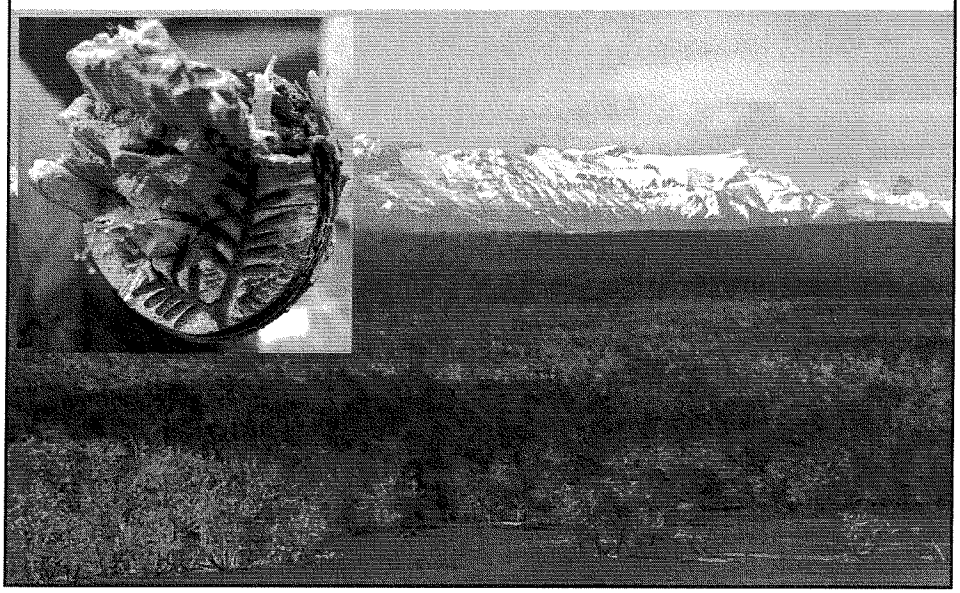
Effects of changes in rainfall pattern

Increased mortality

Dispersal of moisture-dependent pathogens,
e.g. *Mycosphaerella pini*

Drought-stressed trees may become more suitable to support pest development

Example of flooding effects



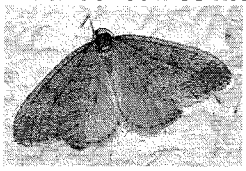
Effects of increased atmospheric CO_2

Host plant changes

Changed plant structure

Change in palatability

Winter moth *Operophtera brumata* consumes more oak



Increase in defensive chemicals

***Lymantria dispar* longer development time due to increased tannins**

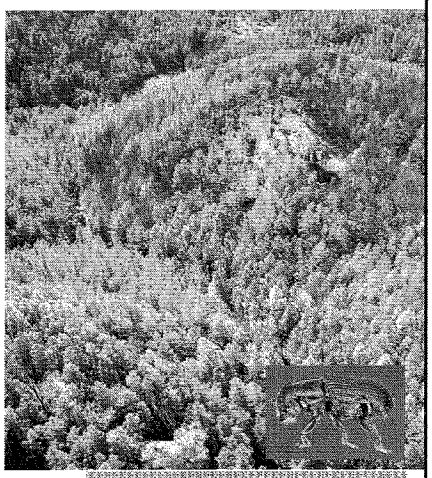
Effects of extreme weather events

Influence tree composition, structure and functions of forests

Create an environment ripe for invasion and spread of introduced species

Facilitate expansion of the range of indigenous pests

Increase trees' susceptibility to secondary pests

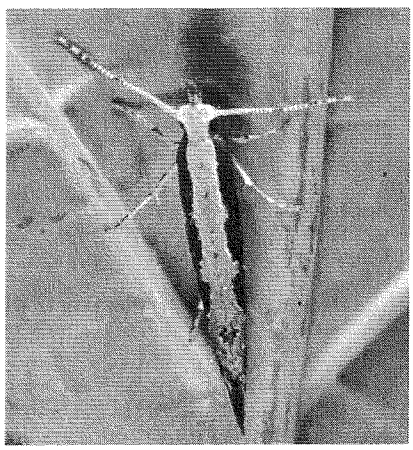


Dendroctonus frontalis after Hurricane Mitch in Central America (1998)

Effects of increased warm air mass movements

Increased frequency and extent of long-distance windborne dispersal

Diamondback moth found 800 km north of the population source

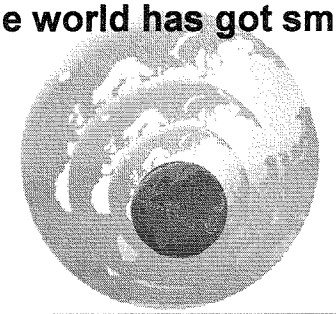


What next?

Complexity of interactions between forest pests and trees will make predictions about the impacts of climate change difficult

Global trade is continuing to increase

the world has got smaller



What needs to be done

Be proactive not reactive - stop it from happening!

Increase monitoring for new pest threats before they arrive

Identify new trade trends especially of plants

Adapt policies/legislation to rapidly respond to new challenges

THANK
YOU