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Forest Health & Biosecurity Working Papers

OVERVIEW OF FOREST PESTS

MONGOLIA

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Forest Resources Development Service
Forest Management Division
Forestry Department

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DISCLAIMER

The aim of this document is to give an overview of the forest pest[1] situation in Mongolia. It is not intended to be a comprehensive review.

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

[1] Pest: Any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products (FAO, 2004).

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Background

This paper is one of a series of FAO documents on forest-related health and biosecurity issues. The purpose of these papers is to provide early information on on-going activities and programmes, and to stimulate discussion.

In an attempt to quantify the impacts of the many factors that affect the health and vitality of a forest, the Global Forest Resources Assessment 2005 (FRA 2005) asked countries to report on the area of forest affected by disturbances, including forest fires, insects, diseases and other disturbances such as weather-related damage. However, most countries were not able to provide reliable information because they do not systematically monitor these variables.

In order to obtain a more complete picture of forest health, FAO continues to work on several follow-up studies. A review of forest pests in both naturally regenerating forests and planted forests was carried out in 25 countries representing all regions of the world. This *Overview of forest pests* represents one paper resulting from this review. Countries in this present series include Argentina, Belize, Brazil, Chile, China, Cyprus, Colombia, Ghana, Honduras, India, Indonesia, Kenya, Kyrgyz Republic, Malawi, Mauritius, Mexico, Moldova, Mongolia, Morocco, South Africa, Sudan, Thailand, Romania, Russian Federation, Uruguay; this list will be continuously updated.

Comments and feedback are welcome. For further information or if you are interested in participating in this process and providing information on insect pests, diseases and mammals affecting forests and the forest sector in your country, please contact:

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Information for Mongolia was compiled by W. Ciesla and B. Moore.

MONGOLIA

Introduction

Mongolia has a total land area of 157 million hectares (FAO, 2006). It spans the major transition zone between the deserts of Central Asia and the boreal taiga of Siberia, which comprises six broad bio-geoclimatic zones. The climatic zones are desert, desert steppe, steppe, forest steppe, boreal forest and montane. The forest steppe, boreal forest and montane zones all exhibit varying depths and distributions of permafrost.

Forests cover in Mongolia is approximately 10 million hectares (FAO, 2006). The forested areas of Mongolia can be divided into two broad types: the northern coniferous forests of the forest steppe, boreal forest and montane zones, and Saxaul forests of the southern desert and desert steppe. Mongolia's principal tree species are *Larix sibirica, Pinus sylvestris, Pinus cembra*, *Picea obovata* and *Betula* spp.

In 2000, the average annual area affected by insects in Mongolia was estimated at almost 2.9 million hectares (FAO, 2005).

Forest pests

By law, areas harvested for timber are required to be regenerated by the logging companies that do the harvesting. Planted forests are established with indigenous species, primarily pine and larch. Therefore the same complex of insects and diseases that affect naturally regenerating forests also affect planted forests.

Naturally regenerating forests

Insects

Indigenous insects

***Dendrolimus sibiricus* Tschetwerikov, 1908**

Other scientific names: *Dendrolimus laricus* Tschetverikov; *Dendrolimus superans sibiricus* Tschetverikov
Lepidoptera: Lasiocampidae
Common names: Siberian caterpillar; Siberian silk moth; larch caterpillar
Host type: conifer
Hosts: *Larix* spp.; *Pinus* spp.

The Siberian silk moth feeds on the foliage of *Larix* and *Pinus* spp. and is considered a major pest of Mongolia's forests. During 2003/2004, 159 000 ha of forests were infested by this insect.

Dendrolimus sibiricus caterpillars cause significant defoliation of both natural and planted forests. As well as the impact on trees, the caterpillars of this moth have stinging hairs that can cause significant health problems in humans. This moth, unlike a number of other tree pests, is able to attack and kill healthy plants. Other effects are the loss of vigour, reduction in growth, reduced seed crops and tree mortality by secondary species.

The life cycle of this species lasts for more than two years. Outbreaks of this moth are cyclic, occurring about every 10-11 years following a few years of drought. The period between outbreaks is becoming shorter partly due to changing climate. The adults are strong fliers and can spread fairly rapidly. Pathways of introduction include natural movement of adults and the movement of eggs on nursery stock or forest products.
http://www.fao.org/forestry/site/20528/en/mng
http://www.eppo.org/QUARANTINE/action_list.htm
http://spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=45&langdisplay=english

***Erannis jacobsoni* Djakonov, 1926**

Other scientific names: *Hybernia jacobsoni*
Lepidoptera: Geometridae
Common names: Jacobson's spanworm; Jacobson's inchworm
Host type: conifer
Hosts: *Larix* spp.; *L. gmelinii*; *L. sibirica*

Erannis jacobsoni or the Jacobson's spanworm only feeds on species of *Larix*. Feeding by larvae can lead to tree mortality resulting in the death of large areas of larch forests. This mortality is caused either directly by the feeding or by causing stress in the trees which makes them susceptible to secondary invasives such as bark beetles and woodborers.

Erannis jacobsoni only completes one generation per year. Adults usually appear in autumn for about 6 weeks with the maximum adult activity a few weeks after emergence. They lay eggs which overwinter and first instar larvae appear at the end of May and the beginning of June. The larvae feed on needles with highest defoliation occuring in mid-July. Populations can reach a density of 6 000 larvae per tree. They leave the trees to pupate in the soil. The adult females are wingless hence there is limited capacity for dispersal at the adult phase, however dispersal can occur either in the egg phase by passive transport on young plants or by the ballooning of young larvae on air currents. Frequently sequential attacks occur on the same plant which can lead to mortality particularly in young trees. Outbreaks of this pest often correspond with times of drought or stressed trees.
http://www.spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=139&langdisplay=english

***Ips sexdentatus* (Boerner, 1767)**

Other scientific names: *Dermestes sexdentatus*; *Bostrichus pinastri*; *Tomicus stenographus*
Coleoptera: Scolytidae
Common names: six-spined engraver beetle; six-toothed bark beetle
Host type: conifer
Hosts: *Picea* spp.; *Pinus* spp.; *Larix* spp.

Ips sexdentatus is a secondary pest that usually attacks trees that have been otherwise stressed or weakened. It also occasionally attacks freshly felled trees or windthrown trees. It rarely attacks healthy, vigorously growing trees. It can significantly affect the amount

of timber that is able to be recovered from fire damaged areas because of damage caused either by the larvae itself or the blue stain fungus associated with this beetle.
http://www.eppo.org/QUARANTINE/insects/Ips_sexdentatus/IPSXSE_ds.pdf
http://spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=79&langdisplay=english
http://www.barkbeetles.org/exotic/ipsxdnts.html
http://www.invasive.org/browse/subimages.cfm?sub=887
http://www.padil.gov.au/viewPestDiagnosticImages.aspx?id=162

***Ips subelongatus* (Motschulsky, 1860)**

Other scientific names: *Ips fallax* Eggers
Coleoptera: Scolytidae
Common names: larch bark beetle; larch engraver beetle; oblong bark beetle
Host type: broadleaf and conifer
Hosts: *Larix* spp.; *Abies* spp.; *Picea* spp.; *Pinus* spp.

Ips subelongatus is typically a secondary pest of larch and other conifers, including *Abies* spp., *Picea* spp. and *Pinus* spp. However, it can attack both apparently healthy trees and stressed trees. Repeated attacks by this species can affect the growth and rate of timber production, occasionally leading to dieback or death of a tree. The feeding activities of adult females inoculate a blue-stain fungus into host trees; the larvae feed on the fungus. Trees attacked by this insect are usually killed either by the activity of the beetle feeding which at times girdles the trees or by the affect of the blue-stain fungus. It prefers to attack mature trees. Attacks frequently occur on trees that have been stressed by other factors such as those damaged by wildfire or defoliators. The larch bark beetle is often found in association with infestations of other bark beetles and woodborers.
http://www.eppo.org/QUARANTINE/insects/Ips_cembrae/DSIPSXCE.pdf
http://spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=132&langdisplay=english

***Leucoma salicis* (Linneaus, 1758)**

Other scientific names: *Bombyx salicis*; *Laelia salicis*; *Liparis salicis*; *Phalaena salicis*; *Stilpnotia salicis*
Lepidoptera: Lymantriidae
Common names: satin moth; white satin moth; willow moth
Host type: broadleaf
Hosts: *Salix* spp.; *Populus* spp.

The larvae of *Leucoma salicis* feed on *Populus* and *Salix* species. There is usually only one generation per year in cooler areas and two generations per year in warmer areas. They overwinter as mid-size larvae and pupate in the foliage of the host trees. The adult females rarely fly so dispersal occurs by the ballooning of young larvae and movement of infested plant material. The females have high fertility and there often repeated attacks on the same host tree over several generations. Repeated defoliation can significantly affect the growth rate of trees and eventually lead to the dieback or death of trees. However, tree death tends to be limited to relatively small areas with natural enemies apparently restricting the extent of outbreaks.

In 2004 it was reported tohave defoliated 45 500 ha of forests in Mongolia (Dorj, 2004). Natural enemies appear to limit the duration of population outbreaks.
http://www.forestpests.org/subject.html?SUB=162
http://www.forestry.ubc.ca/fetch21/FRST308/lab5/leucoma_salicis/satin.html
http://spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=112&langdisplay=english

Lymantria dispar Linnaeus, 1758

Other scientific names: *Bombyx dispar*; *Hypogymna dispar*; *Liparis dispar*; *Ocneria dispar*; *Phalaena dispar*; *Porthesia dispar*; *Porthetria dispar*; *Porthetria hadina* Butler, 1881; *Porthetria umbrosa* Butler, 1881
Lepidoptera: Lymantriidae
Common names: Asian gypsy moth; gypsy moth
Host type: broadleaf and conifer
Hosts: *Betula* spp.; *Larix* spp.; *Pinus* spp.

Lymantria dispar caterpillars are at times a major defoliator in Mongolian forests where they are a major pest of *Betula, Larix* and *Pinus* forests. During 2003-2004, 369 300 ha of forests were defoliated by this insect. This species of moth occurs at low levels in forests for many years without causing significant damage. However, at times there are significant outbreaks that cause severe defoliation of trees, which can cause tree mortality. Frequently, outbreaks coincide with periods when the trees are under stress. Outbreaks typically last for about three years and collapse when host trees are weakened to the point that they produce little or no foliage the following spring for the next generation of larvae. High levels of parasitism can also cause outbreaks to collapse.

Adults of Asian strains are capable of flight, hence dispersal over large areas is possible and the risk of introduction to new areas is increased. Females of European strains cannot fly. Young larvae can move some distance by ballooning from tops of trees. Human activities can also facilitate the movement of this pest. Some of the pathways include vehicles, camping equipment, nursery stock, ships, vehicles, and equipment that have been exposed for a period to the outdoors.
http://www.padil.gov.au/viewPest.aspx?id=342
http://www.padil.gov.au/viewPestDiagnosticImages.aspx?id=342
http://www.forestpests.org/subject.html?SUB=165
http://www.issg.org/database/species/ecology.asp?si=96&fr=1&sts=sss
http://www.inspection.gc.ca/english/sci/surv/data/lymdise.shtml
http://www.forestry.ubc.ca/fetch21/FRST308/lab5/lymantria_dispar/gypsy.html

Melanophila cyanea (Fabricius, 1775)

Other scientific names: *Phaenops cyanea*
Coleoptera: Buprestidae
Common names: steelblue jewel beetle; blue pine wood borer
Host type: conifer
Hosts: *Pinus* spp.; *Larix* spp.; *Abies* spp.

Melanophila cyanea attacks trees stressed by abiotic factors or other pests. It has a preference for trees in high light areas such as forest margins. Infested trees usually die. It

attacks various genera of conifers, in particular *Pinus sylvestris*. There is usually one generation per year however at times it can take up to two years for one generation. Adults feed in the crown of trees for maturation and the larvae feed in the bark. The sap flow of healthy trees is known to kill young larvae. They overwinter as mature larvae with the adults emerging in spring and summer.
http://www.forestryimages.org/browse/subimages.cfm?SUB=4107
http://www.forestpests.org/poland/phaenopscya.html
http://www.user.gwdg.de/~uffz/forsch/pracht/pracht_e.html

***Orgyia antiqua* (Linneaus, 1758)**

Other scientific names: *Phalaena antiqua* Linnaeus, 1758; *Phalaena paradoxa* Retzius, 1783; *Orgyia gonostigma* (Scopoli, 1763); *Orgyia recens*
Lepidoptera: Lymantriidae
Common names: rusty tussock moth; tussock moth; vapourer moth; antique tussock moth
Host type: broadleaf and conifer
Hosts: *Larix* spp.; *Pinus* spp.; *Populus* spp.; *Tsuga* spp.; *Picea* spp.

Rusty tussock moth is a defoliator that has damaged 2 950 ha of broadleaf trees in Mongolia. The eggs of this species are usually laid in late summer and it overwinters as eggs. The larvae emerge in late spring and tend to feed from the top of trees down to lower areas hence causing defoliation and die back in the crown of the trees first. They pupate on the tree, in the foliage or on the trunk of the tree. This species is a generalist feeder; it attacks numerous coniferous and broadleaf speciesincluding pines, larches, hemlock, poplars and spruces.
http://www.forestpests.org/subject.html?SUB=196
http://www.pfc.forestry.ca/entomology/defoliators/tussock_moths/rusty_tussock_e.html

***Orthotomicus suturalis* (Gyllenhal, 1827)**

Other scientific names: *Orthotomicus nigritus* Gyllenhal, 1827
Coleoptera: Scolytidae
Common names:
Host type: conifer
Hosts: *Picea* spp.; *Pinus* spp.

Orthotomicus suturalis infests the inner bark and outer sapwood of branches of standing trees, trees damaged by fire, and dying and dead trees particularly on sides exposed to sunlight. It also attacks stored timber with thin bark. It occurs in more mature trees, that is those older than 10 years. There are one to two generations per year.
http://www.forestryimages.org/browse/subimages.cfm?SUB=10286
http://www.forestpests.org/poland/orthotomicus.html

***Scolytus morawitzi* (Semenow)**

Other scientific names: *Eccoptogaster morawitzi* Semenow
Coleoptera: Scolytidae
Common names: Morawitz's bark beetle; larch sapwood beetle
Host type: conifer

Hosts: *Larix* spp.

Scolytus morawitzi only attacks species of larch (*Larix*). In some areas it is considered the major pest of larches. It usually only attacks stressed or dying trees, but at high population levels it will also attack healthy trees. Repeated attacks on the same tree over several generations may lead to the death of the host tree. There is one generation per year. This beetle tends to attack trees in more open forests where there are high light levels.
http://www.spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=133&langdisplay=english
http://www.eppo.org/QUARANTINE/insects/Scolytus_morawitzi/DSSCOLMO.pdf

***Tetropium gracilicorne* Reitter, 1889**

Other scientific names:
Coleoptera: Cerambycidae
Common names: thin-antenna spruce borer; larch borer
Host type: conifer
Hosts: *Abies* spp., *Abies nephrolepis*; *Larix* spp.; *Larix gmelinii*; *Larix sibirica*; *Picea* spp.; *Picea ajanensis*; *Pinus* spp.; *Pinus sibirica*; *Pinus koraiensis*; *Pinus sylvestris*

Tetropium gracilicorne feeds on several genera of conifers including larches and pines. It attacks all parts of the trunk of trees from roots through to the crown. This beetle attacks both apparently healthy as well as stressed trees causing damage that includes loss of vigour and health of trees, lower productivity or death of trees as well as significant damage to the timber produced because of the bore holes. The loss of vigour makes the host trees more susceptible to other invasive species. Infestation of a particular tree can continue over several generations, hence significant tunneling (damage) occurs.

The adults and larvae of this species are readily dispersed by movement of cut timber as the feeding is cryptic and difficult to detect, particularly in early stages of infestation. Dispersal can also occur by long distant flights of the adults. Adults fly enmass at the beginning of summer and are capable of flying several kilometers.
http://www.eppo.org/QUARANTINE/insects/Tetropium_gracilicorne/DSTETOGR.pdf
http://www.spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=138&langdisplay=english

***Tomicus minor* (Hartig, 1834)**

Other scientific names: *Blastophagus minor*; *Myelophilus minor corsicus* Eggers; *Myelophilus minor*
Coleoptera: Scolytidae
Common names: lesser pine shoot beetle
Host type: conifer
Hosts: *Pinus pinaster*; *Picea abies*

Tomicus minor attacks stressed trees, mainly the upper part with thin bark and branches however it is also capable of attacking apparently healthy trees. These beetles feed towards the top of trees. The adult feeding during the reproduction phase causes significant damage to the trees because the egg galleries go across the fibers deeply in the

sapwood, thus leading to the death of crown of the tree. The female inoculates the tree with blue-stain fungus while feeding. The larvae then feed on the blue-stain fungus. These beetles have a high reproductive capacity and act as a vector of blue-stain fungus. Infestations predispose trees to later attack by other pest species. Effects of infestation by this beetle include loss of vigour and reduction in timber production.
http://www.forestryimages.org/browse/subimages.cfm?sub=4160
http://www.forestpests.org/poland/lesserpineshoot.html
http://spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=115&langdisplay=english

***Tomicus piniperda* (Linnaeus, 1758)**

Other scientific names: *Blastophagus piniperda*; *Blastophagus major* Eggers; *Blastophagus testaceus*
Coleoptera: Scolytidae
Common names: common pine shoot beetle
Host type: conifer
Hosts: *Pinus* spp.; *Picea* spp.; *Pseudotsuga menziesii*; *Larix* spp.

Tomicus piniperda tends to attack the crowns of stressed or weakened trees as well as recently cut or fallen trees. The most damage is done by the adults when they are feeding for maturation. The feeding can cause stunting, malformation of trees hence reducing commercial values. When shoot feeding is severe, tree height and diameter growth is reduced. This beetle has one generation per year in cooler areas and two in warmer climates. It overwinters in dead twigs and branches.
http://www.spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=86&langdisplay=english
http://www.forestryimages.org/browse/subimages.cfm?SUB=980
http://www.na.fs.fed.us/spfo/pubs/pest_al/shootbeetle/shootbeetle.htm

***Xyleborus dispar* Fabricius, 1792**

Other scientific names:*Anisandrus pyri* Hopkins, 1915; *Anisandrus pyri* Peck, *Anisandrus rugulosus* Eggers, 1922; *Anisandrus swainei* Drake, 1921; *Apate dispar* Fabricius, 1792; *Bostrichus brevis* Panzer, 1793; *Bostrichus dispar* Herbst, 1793; *Bostrichus ratzeburgi* Kolenati, 1846; *Bostrichus tachygraphus* Sahlberg, 1834
Coleoptera: Scolytidae
Common names: European shot-hole borer; ambrosia beetle
Host type: broadleaf
Hosts: *Populus* spp.; *Acer* spp.; *Betula* spp.; *Fagus* spp.; *Quercus* spp.; *Salix* spp.; *Castanea sativa*; *Malus domestica*; *Pirus communis*; *Prunus armeniaca*; *Prunus cerasus*; *Prunus domestica*; *Prunus persicae*

Xyloborus dispar larvae feed on the fungus that was inoculated into the sapwood by adult females when laying eggs. This species exhibits a high degree of polyphagy feeding on many species of broadleaved trees ranging from forest trees (beeches, oaks, poplars) to various fruit trees including apple, pear, apricot, peach, cherry, sweet chestnut, and plum. This species attacks healthy trees, stressed trees or recently dead trees. The drilling of galleries often leads to the death of young trees and a rapid decline of older trees. In some healthy trees, sap flow caused by the feeding damage hinders larval development. There

is usually on generation per year with the adults undergoing diapause in excavated tunnels during winter.
http://www.forestryimages.org/browse/subimages.cfm?sub=4163
http://www.inra.fr/Internet/Produits/HYPPZ/RAVAGEUR/6xyldis.htm
http://wcga.net/shb.htm

Introduced insects

No information was available on introduced insects affecting Mongolia's naturally regenerating forests.

Diseases

Indigenous diseases

No information was available on indigenous pathogens affecting Mongolia's natura forests.

Introduced diseases

No information was available on introduced pathogens affecting Mongolia's naturally regenerating forests.

Other pests

Indigenous other pests

No information was available on indigenous other pests (i.e. mites, nematodes, mammals, etc.) affecting Mongolia's naturally regenerating forests.

Introduced other pests

No information was available on introduced other pests (i.e. mites, nematodes, mammals, etc.) affecting Mongolia's naturally regenerating forests.

Diebacks and other conditions

No information was available on diebacks and other conditions in Mongolia's naturally regenerating forests.

Planted forests

Insects

Indigenous insects

***Dendrolimus sibiricus* Tschetwerikov, 1908**

Other scientific names: *Dendrolimus laricus* Tschetverikov; *Dendrolimus superans sibiricus* Tschetverikov

Lepidoptera: Lasiocampidae
Common names: Siberian caterpillar; Siberian silk moth; larch caterpillar
Host type: conifer
Hosts: *Larix* spp.; *Pinus* spp.

The Siberian silk moth feeds on the foliage of *Larix* and *Pinus* spp. and is considered a major pest of Mongolia's forests. During 2003/2004, 159 000 ha of forests were infested by this insect.

Dendrolimus sibiricus caterpillars cause significant defoliation of both natural and planted forests. As well as the impact on trees, the caterpillars of this moth have stinging hairs that can cause significant health problems in humans. This moth, unlike a number of other tree pests, is able to attack and kill healthy plants. Other effects are the loss of vigour, reduction in growth, reduced seed crops and tree mortality by secondary species. The life cycle of this species lasts for more than two years. Outbreaks of this moth are cyclic, occurring about every 10-11 years following a few years of drought. The period between outbreaks is becoming shorter partly due to changing climate. The adults are strong fliers and can spread fairly rapidly. Pathways of introduction include natural movement of adults and the movement of eggs on nursery stock or forest products.
http://www.fao.org/forestry/site/20528/en/mng
http://www.eppo.org/QUARANTINE/action_list.htm
http://spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=45&langdisplay=english

***Erannis jacobsoni* Djakonov, 1926**

Other scientific names: *Hybernia jacobsoni*
Lepidoptera: Geometridae
Common names: Jacobson's spanworm; Jacobson's inchworm
Host type: conifer
Hosts: *Larix* spp.; *L. gmelinii*; *L. sibirica*

Erannis jacobsoni only feeds on species of *Larix*. Feeding by larvae of *Erannis jacobsoni* can lead to tree mortality which can cause the death of large areas of larch forests. This mortality is caused either directly by the feeding or by causing stress in the trees which makes them susceptible to secondary invasives such as bark beetles and woodborers.

Erannis jacobsoni only completes one generation per year. Adults usually appear in autumn for about six weeks with the maximum adult activity a few weeks after emergence. They lay eggs which overwinter and first instar larvae appear at the end of May and the beginning of June. The larvae feed on needles with highest defoliation occuring in mid-July. Populations can reach a density of 6 000 larvae per tree. They leave the trees to pupate in the soil. The adult females are wingless hence there is limited capacity for dispersal at the adult phase, however dispersal can occur either in the egg phase by passive transport on young plants or by the ballooning of young larvae on air currents. Frequently sequential attacks occur on the same plant which can lead to the mortality particularly in young trees. Outbreaks of this pest often correspond with times of drought or stressed trees.
http://www.spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=139&langdisplay=english

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Coleoptera: Scolytidae
Common names: six-spined engraver beetle; six-toothed bark beetle
Host type: conifer
Hosts: *Picea* spp.; *Pinus* spp.; *Larix* spp.

Ips sexdentatus is a secondary pest that typically attacks trees that have been otherwise stressed or weakened. It also occasionally attacks freshly felled trees or windthrown trees. It rarely attacks healthy, vigorously growing trees. It can significantly affect the amount of timber that is able to be recovered from fire damaged areas because of damage caused either by the larvae itself or the blue-stain fungus associated with this beetle.
http://www.eppo.org/QUARANTINE/insects/Ips_sexdentatus/IPSXSE_ds.pdf
http://spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=79&langdisplay=english
http://www.barkbeetles.org/exotic/ipsxdnts.html
http://www.invasive.org/browse/subimages.cfm?sub=887
http://www.padil.gov.au/viewPestDiagnosticImages.aspx?id=162

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http://www.eppo.org/QUARANTINE/insects/Ips_cembrae/DSIPSXCE.pdf
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***Leucoma salicis* (Linneaus, 1758)**

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Common names: satin moth; white satin moth; willow moth
Host type: broadleaf
Hosts: *Salix* spp.; *Populus* spp.

The larvae of *Leucoma salicis* feed on *Populus* and *Salix* spp. There is usually only one generation per year in cooler areas and two generations per year in warmer areas. They overwinter as mid-size larvae and pupate in the foliage of the host trees. Adult females rarely fly so dispersal occurs by the ballooning of young larvae and movement of infested plant material. The females have high fertility and there are often repeated attacks on the same host tree over several generations. The repeated defoliation can significantly affect the growth rate of trees and eventually lead to the dieback or death of trees. However, tree death tends to be limited to relatively small areas with natural enemies apparently restricting the extent of outbreaks.

In 2004, *L. salicis* was reported to have defoliated 45 500 ha of forests in Mongolia (Dorj, 2004). Natural enemies appear to limit the duration of population outbreaks.
http://www.forestpests.org/subject.html?SUB=162
http://www.forestry.ubc.ca/fetch21/FRST308/lab5/leucoma_salicis/satin.html
http://spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=112&langdisplay=english

Lymantria dispar Linnaeus, 1758

Other scientific names: *Bombyx dispar*; *Hypogymna dispar*; *Liparis dispar*; *Ocneria dispar*; *Phalaena dispar*; *Porthesia dispar*; *Porthetria dispar*; *Porthetria hadina* Butler, 1881; *Porthetria umbrosa* Butler, 1881
Lepidoptera: Lymantriidae
Common names: Asian gypsy moth; gypsy moth
Host type: broadleaf and conifer
Hosts: *Betula* spp.; *Larix* spp.; *Pinus* spp.

Lymantria dispar caterpillars are at times a major defoliator in Mongolian forests and are particularly a major pest of *Betula, Larix* and *Pinus* forests. During 2003-2004, 369 300 ha of forests were defoliated by this insect. This species of moth occurs at low levels in forests for many years without causing significant damage. However, at times there are significant outbreaks that cause severe defoliation of trees, which can cause tree mortality. Frequently, outbreaks coincide with periods when the trees are under stress. Outbreaks typically last for about three years and collapse when host trees are weakened to the point that they produce little or no foliage the following spring for the next generation of larvae. High levels of parasitism can also cause outbreaks to collapse.

Adults of Asian strains are capable of flight, hence dispersal over large areas is possible and the risk of introduction to new areas is increased. Females of European strains cannot fly. Young larvae can move some distance by ballooning from tops of trees. Human activities can also facilitate the movement of this pest. Some of the pathways include vehicles, camping equipment, nursery stock, ships, vehicles, and equipment that have been exposed for a period to the outdoors.
http://www.padil.gov.au/viewPest.aspx?id=342
http://www.padil.gov.au/viewPestDiagnosticImages.aspx?id=342
http://www.forestpests.org/subject.html?SUB=165
http://www.issg.org/database/species/ecology.asp?si=96&fr=1&sts=sss
http://www.inspection.gc.ca/english/sci/surv/data/lymdise.shtml
http://www.forestry.ubc.ca/fetch21/FRST308/lab5/lymantria_dispar/gypsy.html

***Melanophila cyanea* (Fabricius, 1775)**

Other scientific names: *Phaenops cyanea*
Coleoptera: Buprestidae
Common names: steelblue jewel beetle; blue pine wood borer
Host type: conifer
Hosts: *Pinus* spp.; *Larix* spp.; *Abies* spp.

Melanophila cyanea attacks trees stressed by abiotic factors or other pests. It has a preference for trees in high light areas such as forest margins. Infested trees usually die. It attacks various genera of conifers, in particular *Pinus sylvestris*. There is usually one generation per year however at times it can take up to two years for one generation. Adults feed in the crown of trees for maturation and the larvae feed in the bark. The sap flow of healthy trees is known to kill young larvae. They overwinter as mature larvae with the adults emerging in spring and summer.
http://www.forestryimages.org/browse/subimages.cfm?SUB=4107
http://www.forestpests.org/poland/phaenopscya.html
http://www.user.gwdg.de/~uffz/forsch/pracht/pracht_e.html

***Orgyia antiqua* (Linneaus, 1758)**

Other scientific names: *Phalaena antiqua* Linnaeus, 1758; *Phalaena paradoxa* Retzius, 1783; *Orgyia gonostigma* (Scopoli, 1763); *Orgyia recens*
Lepidoptera: Lymantriidae
Common names: rusty tussock moth; tussock moth; vapourer moth; antique tussock moth
Host type: broadleaf and conifer
Hosts: *Larix* spp.; *Pinus* spp.; *Populus* spp.; *Tsuga* spp.; *Picea* spp.

Rusty tussock moth is a defoliator that has damaged 2 950 ha of broadleaf trees in Mongolia. The eggs of this species are usually laid in late summer and it overwinters as eggs. Larvae emerge in late spring and tend to feed from the top of trees down to lower areas hence causing defoliation and dieback in the crown of the trees first. They pupate on the tree, in the foliage or on the trunk of the tree. This species is a generalist feeder attacking numerous coniferous and broadleaf species including pines, larches, hemlock, poplars and spruces.
http://www.forestpests.org/subject.html?SUB=196
http://www.pfc.forestry.ca/entomology/defoliators/tussock_moths/rusty_tussock_e.html

***Orthotomicus suturalis* (Gyllenhal, 1827)**

Other scientific names: *Orthotomicus nigritus* Gyllenhal, 1827
Coleoptera: Scolytidae
Common names:
Host type: conifer
Hosts: *Picea* spp.; *Pinus* spp.

Orthotomicus suturalis infests the inner bark and outer sapwood of branches of standing trees, trees damaged by fire, and dying and dead trees particularly on sides exposed to sunlight. It also attacks stored timber with thin bark. It occurs in more mature trees, that is those older than 10 years. There are one to two generations per year.

http://www.forestryimages.org/browse/subimages.cfm?SUB=10286
http://www.forestpests.org/poland/orthotomicus.html

***Scolytus morawitzi* Semenow**

Other scientific names: *Eccoptogaster morawitzi* Semenov
Coleoptera: Scolytidae
Common names: Morawitz's bark beetle; larch sapwood beetle
Host type: conifer
Hosts: *Larix* spp.

Scolytus morawitzi only attacks species of larch (*Larix*). In some areas it is considered the major pest of larches. It usually attacks only stressed or dying trees, but at high population levels it will attack healthy trees. Repeated attacks on the same tree over several generations may lead to the death of the host tree. There is one generation per year. This beetle tends to attack trees in more open forests where there are high light levels.
http://www.spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=133&langdisplay=english
http://www.eppo.org/QUARANTINE/insects/Scolytus_morawitzi/DSSCOLMO.pdf

***Tetropium gracilicorne* Reitter, 1889**

Other scientific names:
Coleoptera: Cerambycidae
Common names: thin-antenna spruce borer; larch borer
Host type: conifer
Hosts: *Abies* spp.; *Larix* spp.; *Picea* spp.; *Pinus* spp.; *Larix gmelinii*; *Larix sibirica*; *Pinus sibirica*; *Pinus koraiensis*; *Pinus sylvestris*; *Abies nephrolepis*; *Picea ajanensis*

Tetropium gracilicorne feeds on several genera of conifers including larches and pines. It attacks all parts of the trunk of trees from roots through to the crown. This beetle attacks both apparently healthy as well as stressed trees causing damage that includes loss of vigour and health of trees, lower productivity or death of trees as well as significant damage to the timber produced because of the bore holes. The loss of vigour makes the host trees more susceptible to other invasive species.

Often infestation of a particular tree continues over several generations, hence significant tunneling (damage) occurs. The adults and larvae of this species are readily dispersed by transportation in cut timber as the feeding is cryptic and difficult to detect, particularly in early stages of infestation. As well, dispersal can occur by long distant flights of the adults. Adults fly enmass at the beginning of summer and are capable of flying several kilometers.
http://www.eppo.org/QUARANTINE/insects/Tetropium_gracilicorne/DSTETOGR.pdf
http://www.spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=138&langdisplay=english

***Tomicus minor* (Hartig, 1834)**

Other scientific names: *Blastophagus minor*; *Myelophilus minor corsicus* Eggers; *Myelophilus minor*
Coleoptera: Scolytidae
Common names: lesser pine shoot beetle
Host type: conifer
Hosts: *Pinus pinaster*; *Picea abies*

Tomicus minor attacks stressed trees, mainly the upper part with thin bark and branches however it is capable of attacking apparently healthy trees. These beetles feed towards the top of trees. The adult feeding during the reproduction phase causes significant damage to the trees because the egg galleries go across the fibers deeply in the sapwood, thus leading to the death of crown of the tree. The female inoculates the tree with blue-stain fungus while feeding which the larvae then feed on. These beetles have a high reproductive capacity and act as a vector of blue-stain fungus. Infestations predispose trees to later attack by other pest species. Effects of infestation by this beetle include loss of vigour and reduction in timber production.
http://www.forestryimages.org/browse/subimages.cfm?sub=4160
http://www.forestpests.org/poland/lesserpineshoot.html
http://spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=115&langdisplay=english

***Tomicus piniperda* (Linnaeus, 1758)**

Other scientific names: *Blastophagus piniperda*; *Blastophagus major* Eggers; *Blastophagus testaceus*
Coleoptera: Scolytidae
Common names: common pine shoot beetle
Host type: conifer
Hosts: *Pinus* spp.; *Picea* spp.; *Pseudotsuga menziesii*; *Larix* spp.

Tomicus piniperda tends to attack the crowns of stressed or weakened trees as well as recently cut or fallen trees. The most damage is done by the adult beetles when they are feeding for maturation. The feeding can cause stunting, malformation of trees hence reducing commercial values. When shoot feeding is severe, tree height and diameter growth is reduced. This beetle has one generation per year in cooler areas and two in warmer climates. It overwinters in dead twigs and branches.
http://www.spfnic.fs.fed.us/exfor/data/pestreports.cfm?pestidval=86&langdisplay=english
http://www.forestryimages.org/browse/subimages.cfm?SUB=980
http://www.na.fs.fed.us/spfo/pubs/pest_al/shootbeetle/shootbeetle.htm

***Xyleborus dispar* Fabricius, 1792**

Other scientific names:*Anisandrus pyri* Hopkins, 1915; *Anisandrus pyri* Peck; *Anisandrus rugulosus* Eggers, 1922; *Anisandrus swainei* Drake, 1921; *Apate dispar* Fabricius, 1792; *Bostrichus brevis* Panzer, 1793; *Bostrichus dispar* Herbst, 1793; *Bostrichus ratzeburgi* Kolenati, 1846; *Bostrichus tachygraphus* Sahlberg, 1834
Coleoptera: Scolytidae
Common names: European shot-hole borer; ambrosia beetle
Host type: broadleaf

Hosts: *Populus* spp.; *Acer* spp.; *Betula* spp.; *Fagus* spp.; *Quercus* spp.; *Salix* spp.; *Castanea sativa*; *Malus domestica*; *Pirus communis*; *Prunus armeniaca*; *Prunus cerasus*; *Prunus domestica*; *Prunus persicae*

Xyloborus dispar larvae feed on the fungus that was inoculated into the sapwood by adult females when laying eggs. The European shot-hole borer exhibits a high degree of polyphagy feeding on many species of broadleaved trees ranging from forest trees (beeches, oaks, poplars) to various fruit trees including apple, pear, apricot, peach, cherry, sweet chestnut and plum. This species attacks healthy trees, stressed trees or recently dead trees. The drilling of galleries often leads to the death of young trees and a rapid decline of older trees. In some healthy trees, sap flow caused by the feeding damage hinders larval development. There is usually on generation per year with the adults undergoing diapause in excavated tunnels during winter.
http://www.forestryimages.org/browse/subimages.cfm?sub=4163
http://www.inra.fr/Internet/Produits/HYPPZ/RAVAGEUR/6xyldis.htm
http://wcga.net/shb.htm

Introduced insects

No information was available on introduced insects affecting Mongolia's planted forests.

Diseases

Indigenous diseases

No information was available on indigenous pathogens affecting Mongolia's planted forests.

Introduced diseases

No information was available on introduced pathogens affecting Mongolia's planted forests.

Other pests

Indigenous other pests

No information was available on indigenous other pests (i.e. mites, nematodes, mammals, etc.) affecting Mongolia's planted forests.

Introduced other pests

No information was available on introduced other pests (i.e. mites, nematodes, mammals, etc.) affecting Mongolia's planted forests.

Diebacks and other conditions

No information was available on diebacks and other conditions in Mongolia's planted forests.

Capacity for forest health protection

Government level

Forest management is within the Ministry of Nature and Environment (MNE) and timber harvesting and forest industry development are under the Ministry of Trade and Industry. The Institute of Geo-ecology under the MNE is responsible for scientific and technological development in forestry. All forest lands are in public ownership.

Monitoring and detection

Local rangers, environmental inspectors and local people observe areas known to have previously harboured insect infestations. If they detect the presence of abnormally high levels of insect activity, they report its occurrence to the MNE. More detailed surveys of insect occurrence are conducted by several scientific institutes using systematic counts of insect numbers on sample trees (Dorj, 2004).

Data management

No pest management plans were maintained prior to 2002. In 2002 at the commencement of an FAO project on emergency management of Sibirian caterpillar surveys were undertaken to determine the extent of pests within Mongolian forests and management plans were developed for continued integrated pest management which included monitoring and survelliance (Dorj, 2004).

Pest management

Emergency control operations were carried out in Mongolia against the Siberian silk moth (*Dendrolimus sibiricus*) and several other defoliators using a commercial formulation of the microbial insecticide *Bacillus thuringiensis* var. *kurstaki*. Application was by aircraft and backpack sprayers. Antonov AN-2 spray aircraft were equipped with Micronair AU5000 and AU8000 rotary atomizers. An AU8000 backpack sprayer was used for the ground applications (Byambajav, 2004).

Effectiveness of aerial and ground applications of microbial insecticides was accomplished by making counts of live and dead insects from sample trees established in treatment areas (Dorj, 2004).

Private landowners

All forest lands are in public ownership (FAO, 2006).

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OSN = Other Scientific Name (other names, synonyms, other combinations, etc. that have been used for this species)