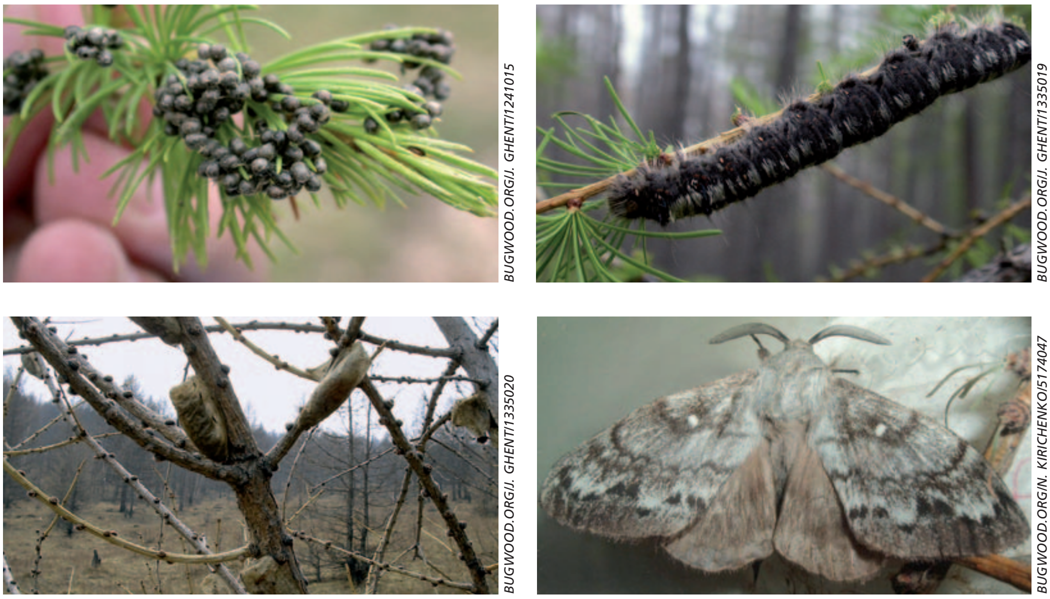
Dendrolimus sibiricus

Other scientific names: *Dendrolimus laricus* Tschetverikov; *Dendrolimus superans sibiricus* Tschetverikov
Order and Family: Lepidoptera: Lasiocampidae
Common names: Siberian caterpillar; Siberian silk moth; Siberian moth; Siberian conifer silk moth; Siberian coniferous silk moth; Siberian lasiocampid; larch caterpillar

Widespread on the Asian continent, *Dendrolimus sibiricus* Tschetverikov is a destructive pest of conifers causing significant defoliation of trees in both naturally regenerated and planted forests. It is able to attack and kill healthy trees and it has been known to kill forests across very wide areas.



Dendrolimus sibiricus *life cycle stages: eggs, larva, pupae, adult*

DISTRIBUTION

Native: Asia and the Pacific: Democratic People's Republic of Korea, Kazakhstan, Mongolia, People's Republic of China, Republic of Korea,
Europe: Russian Federation
This pest is believed to have originated in Siberia.
Introduced: No record to date but this pest poses a real threat

IDENTIFICATION

Adult Siberian moths are yellowish-brown or light grey to dark brown or almost black. The forewings are marked by two characteristic dark stripes and a white spot in the centre. Hind wings are the same colour as the forewings but lack markings. Females are approximately 40 mm long with a wing span of 60 to 80 mm while males are approximately 30 mm long with a 40 to 60 mm wing span (Kimoto and Duthie-Holt, 2006; EPPO, 2005).

Larvae are mainly black or dark brown with numerous spots and long hairs. They are 55 to 70 mm long and the second and third segments are marked with blue-black stripes (Kimoto and Duthie-Holt, 2006). Reddish setae are found on the sides of larvae, usually as red jagged bands or spots.

Eggs are oval, 2.2 mm long and 1.9 mm wide. Initially light-green in colour, they turn creamy-white and darken and become spotted over time (Kimoto and Duthie-Holt, 2006; EPPO, 2005).

HOSTS

Larix spp., including *L. gmelinii* and *L. sibirica*; *Pinus* spp., including *P. sibirica* and *P. koraiensis*; *Abies* spp., including *A. sibirica* and *A. nephrolepis*; *Picea* spp., including *P. ajanensis* and *P. obovata*; and *Tsuga* spp.

BIOLOGY

Spring flight usually occurs in mid-July. Immediately after mating, females lay eggs on the needles primarily in the lower part of the crown although during outbreak years, eggs are laid throughout the tree and on the surrounding ground. One egg mass may contain 1 to 200 eggs (Kimoto and Duthie-Holt, 2006; EPPO, 2005). Each female lays an average of 200 to 300 eggs, with a maximum of 800 (EPPO, 2005). Egg development typically takes 13 to 15 days with an occasional maximum of 20 to 22 days (EPPO, 2005).

There are 6 to 8 larval instars. First instar larvae eat the edges of needles and moult in 9 to 12 days while second instar larvae cause further damage to the needles and develop for 3 to 4 weeks before moulting (EPPO, 2005). The third instar larvae descend to the soil in September and overwinter in the top layers of soil. In the spring of the following year, the larvae return to the crowns to feed, eating complete needles and sometimes the bark of young shoots and cones. They moult after one month and again at the end of July or in August. In autumn, the larvae return to the soil and overwinter for a second time.

In the following spring, when the temperature of the forest floor rises to 3.5 to 5.0 °C, the larvae break diapause and ascend to the tree crowns to resume feeding. During this period, they eat about 95 percent of the food they need for development and it is then that the major damage occurs (Orlinski, 2000). Larvae finish maturation feeding by late June or early July and pupate in the crowns of trees where they form silken cocoons intertwined with foliage and branches. The pupal stage last from 18 to 22 days after which the adults emerge and the cycle begins again.

The full life cycle usually takes two years. However in southern parts of its native range one generation can develop in a single year while in northern regions it may take up to three years (Orlinski, 2000). Drought, increasing population density and other factors cause some larvae to have a shorter, two calendar-year life cycle. As a result, the adults of two generations emerge simultaneously and the population increases sharply. Competition for food may extend larval development and increase the number of instars.

Outbreaks of this moth are cyclic, occurring every 8 to 11 years following a few years of water shortage and last for 2 to 3 years. The period between outbreaks is becoming shorter partly due to changing climate.

SYMPTOMS AND DAMAGE

The Siberian caterpillar causes significant defoliation of both naturally regenerated and planted forests. It is able to attack and kill healthy plants and it has been known to kill trees and forests across very wide areas. Death of forests can be caused directly by defoliation or indirectly by increasing the susceptibility of the forest to subsequent attack by other forest pests such as bark beetles or forest fires (Orlinski, 2000). Other effects of *D. sibiricus* attack include the loss of vigour, reduction in growth, and reduced seed crops.

The duration and effect of outbreaks depends on the forest type (Ghent and Onken, 2004). Outbreaks in fir and five-needled pines result in defined focal areas with very high densities of larvae that defoliate trees for two or three successive years before the outbreak collapses. Tree mortality is virtually 100 percent in many stands. Outbreaks in larch forests are more prolonged but cause less tree mortality. Moths migrate from defoliated larch hosts to new areas to lay eggs. As a result, successive years of severe defoliation rarely occur and the outbreak population becomes dispersed.

As well as the impact on trees and forests, Siberian caterpillars have stinging hairs that can cause significant allergic reactions in people living near and visiting forests as well as forest workers. Exposure to the larval hairs or secretions of the Siberian caterpillar produces severe dermatitis as well as systemic reactions affecting the joints and other parts of the body.

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*Siberian larch (*Larix sibirica*) defoliated by the Siberian caterpillar, Mongolia*

DISPERSAL AND INTRODUCTION PATHWAYS

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.

CONTROL MEASURES

Ground and aerial application of chemical and bacterial insecticides, such as *Bacillus thuringiensis* var *kurstaki* (Btk), has been used to control *Dendrolimus sibiricus* in countries within the native range of the pest.

Natural enemies of the Siberian caterpillar, including several parasitoids and pathogens, play an important role in the regulation of population density. Examples include the egg parasitoids *Telenomus gracilis*, *T. tetratomus*, and *Trichogramma dendrolimi*; the larval and pupal parasitoids *Ooencyrtus pinicolus* and *Rhogas dendrolimi*; the bacteria *Bacillus dendrolimus* and *B. thuringiensis*; the fungus *Beauveria bassiana*; and some viruses (Orlinski, 2000; EPPO, 2005).

In 2002, *D. sibiricus* was added to the EPPO A2 action list and it has been recommended that EPPO member countries regulate it as a quarantine pest. Since *D. sibiricus* is apparently slowly spreading westwards through Europe, carrying out surveys using pheromone traps and applying appropriate control measures in areas at the border of the pest's present range would help avoid the possible introduction of this pest into new areas (EPPO, 2005).

To prevent the introduction of *D. sibiricus*, it is recommended that: commodities, plants for planting and cut branches of host plants from infested areas should be free of soil; commodities should originate in a pest-free area, be produced in protected houses, fumigated, or be imported during winter; and wood should be debarked, heat-treated, originate in a pest-free area, or be imported during winter, and isolated bark should be treated to destroy any insects (EPPO, 2005).