Forestry Commission

Contingency plan for the Siberian Coniferous Silk Moth (*Dendrolimus sibiricus*)

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INTRODUCTION

1. Serious or significant pests require strategic-level plans to be developed at a national level to describe the overall aim and high-level objectives to be achieved, and the response strategy for eradicating or containing outbreaks.
2. The Plant Health Risk Group (PHRG) has commissioned, following identification by the Risk Register, pest-specific contingency plans for those pests that pose the greatest risk and require stakeholder consultation.
3. The purpose of these pest-specific contingency plans is to ensure rapid and effective responses to outbreaks of the pests or diseases described.
4. Contingency planning starts with the anticipation and assessment of potential threats, includes preparation and response, and finishes with recovery.

Anticipation

5. Researching sources of information and intelligence about the pest, including horizon scanning.

Assessment

6. Identifying concerns and preparing plans.
7. Setting outbreak objectives.

Preparation

8. Ensuring staff and stakeholders are familiar with the pest.

Response

9. Determining the requirements for either containing or eradicating the pest, including work to determine success.

Recovery

10. Identifying when the response strategy has been effective, or when the response is not considered feasible, cost-effective or beneficial.

11. The Defra Contingency Plan for Plant Health in England (in draft) gives details of the teams and organisations involved in pest response in England, and their responsibilities and governance. It also describes how these teams and organisations work together in the event of an outbreak of a plant health pest.

The purpose of pest-specific contingency plans is to ensure rapid and effective responses to outbreaks of the pests or diseases described.

Scope

This contingency plan was prepared by the Forestry Commission's cross-border Plant Health Service to be used at country and national levels. It should be used in England in conjunction with the Defra Plant Health Contingency Plan, which was developed by Defra/APHA and which provides details as to the level of response required and by whom, depending on the scenario. Forestry Commission England's Forest Services will use OGB17b, *Managing Incidents in the Forestry Commission,* for relevant incidents. A generic plant health contingency plan is in place in Scotland, and Forestry Commission Scotland and the Welsh Government will develop similar documents detailing their management of tree health outbreaks. When an outbreak becomes of UK or Great Britain-wide concern, the UK Chief Plant Health Officer will form an outbreak management team to co-ordinate the activities in the different countries.

This contingency plan falls into three main parts:

- official action following a presumptive diagnosis;
- official action following the confirmation of an outbreak; and
- pest background information.

It is designed to help government agencies anticipate, assess, prepare for, prevent, respond to, and recover from pest outbreaks.

This plan will be updated following new information or changes in policy or contact details. (Last updated June 2016).

Objectives of this plan

- To raise awareness, in the event of an outbreak, of the potential threat posed by *Dendrolimus sibiricus,* thereby ensuring that stakeholders are aware of the symptoms caused by infestation by this pest.
- To provide guidance on steps to be taken when symptoms of attack by *D. sibiricus* are observed.
- To ensure that infestations of *D. sibiricus* are managed promptly with the aim of eradicating pioneer populations of the moth.
- To ensure that all relevant Forestry Commission staff, other government agencies and local authorities are conversant with the contents of this contingency plan, so that effective and immediate action is implemented.
- To ensure that good communications are put in place so that all stakeholders (including the media) are kept fully informed of the scale of infestation, both at regional and national levels.

Anticipation and Assessment

1.1 *Dendrolimus sibiricus* (Chetverikov) is a serious pest in regions it inhabits due to its ability to defoliate conifer trees. It acts as a primary pest, whilst also weakening the tree and making it susceptible to secondary pest attack.

1.2 It is native to Russia and China, and has spread to other parts of Asia (Mongolia and Kazakhstan) and Europe, although there is doubt about the validity of the European Russian findings (Baranchikov *et al.* 2007, Mikkola & Stahls 2008).

1.3. The damage that *D. sibiricus* causes in its native range, such as extensive defoliation, results in cascading ecological, economic and social impacts, including potential loss of whole forests.

1.4. The risk of the pest being introduced to regions with host species, either by natural or human-related dispersal, is high. Data suggests that the larvae can develop on most European conifers, putting European forests at risk of infestation.

1.5. It is officially absent from the UK, and has never been recorded in the wider environment, for example, by amateur moth trappers.

Preparation

2.1. *D. sibiricus* has been added to the EPPO A2 list and the EC 1A1 list. Given the threat it poses to the native and non-native conifers in the UK despite mitigations, it has a relatively high mitigated risk rating in the UK risk register of 50/125 (unmitigated 100/125).

2.2. There is no Pest Risk Analysis available at present to support this risk rating.

2.3. EPPO has prepared a datasheet on the species. There is also a CABI datasheet available.

Legislation

2.4. A list of all the relevant legislation which might be pertinent to a D. sibiricus outbreak is given in Appendix 3.

Response

Trigger

3.1. The key indicators which would trigger a response are findings of or reports of:

- characteristic egg clusters or cocoons in trees;
- larvae found on trees; or
- live adult moth(s) found on nursery stock or in the wider environment (*e.g.* discovered by amateur moth trappers).

Official Action Following a Presumptive Diagnosis

Communication

3.2. In England, a duty officer from Forestry Commission England or the Animal & Plant Health Agency (APHA) will act as a point of contact for incidents, and it is their job to assign a response officer to incidents when they occur. Similar arrangements are expected to be in place in Scotland and Wales. The response officer investigates, and organises for samples to be taken and sent to Forest Research or Fera Science labs, and reports back to the Defra Contingency Core Group. For outbreaks in Scotland and Wales, respective country teams will fully manage the outbreak in accordance with their own generic contingency plans, but will provide updates to the Defra Contingency Core Group for information purposes and for Defra to report to ministers and the European Commission (EC).

3.3. The response officer will gather information, including the location, likely origin, host or commodity, level of damage, extent of outbreak and chance of spread. Based on the information fed back to the Contingency Core Group, in England they will decide upon the alert status given (black, amber or red), which will determine the level of response. (See Appendix 2 for alert status table.) In Scotland and Wales, the Core Contingency Group can advise on alert status and the appropriate response. If required, the Core Contingency Group will request the relevant organisation/s to set up an incident management team to resolve the incident.

Holding consignments and movement / planting restrictions

3.4. Until further investigation no material shall leave the site, and local operations will be halted until which time as the suspected case is categorised as a false alarm.

Preliminary trace forward / trace backward

3.5. Depending upon the pathway of entry, tracing forwards and backwards to identify suspect material will be conducted to identify other potentially contaminated stock or sites. This will include suppliers, propagators and

wholesalers, including any potentially contaminated stocks, where appropriate. Suppliers of potentially contaminated stock from outside the UK will be informed so they can carry out trace forward/back investigations.

How to survey to determine whether there is an outbreak

3.6. An outbreak of *D. sibiricus* will be most likely detected by general surveillance as well as investigation of any defoliation episodes on host tree species. It could also be detected during a nursery inspection or following a report from forestry or arboriculture practitioners, or a member of the public, describing pine, larch, fir or spruce trees with needle loss. The UK also has an extensive network of amateur moth trappers who might also detect the pest. Detection may also be from import inspection of host material.

3.7. Confirmation of an outbreak of *D. sibiricus* will require samples or specimens to be sent to a laboratory for diagnosis, and follow-up inspections where identification is confirmed. It is important to note that detection of adults does not confirm that a breeding population is present, because they can migrate large distances, especially the males. However, if presence is confirmed by location of immature life stages, findings of adults could mean that entry might have occurred a number of years earlier, because of the length of the life cycle.

3.8. If there is evidence of the presence of *D. sibiricus,* follow-up inspections in line with ISPM 6 (guidelines for surveillance) should gather information about:

- the likely origin of the pest and, if a consignment of plant and plant products is suspected as the origin of the outbreak, details of the premises or destinations where the plants have been grown or sent should be obtained;
- the geographical location and ownership of the affected site, including any factors that might influence the outbreak (*e.g.* public access, presence of conifer stands nearby *etc*.), including maps if possible;
- the hosts infested at the site (species, variety, development stage, *etc*.);
- when and how the pest was detected and identified (including photographs of symptoms);

- the level of pest incidence and, where appropriate, life stages present;
- the extent and impact of damage (including part of host affected);
- the recent importation or movement of host plants or host plant products into and out of the affected site;
- the movement of people, products, equipment and vehicles, where appropriate;
- relevant treatments applied to host plants that might affect development of symptoms, or detection and diagnosis of the pest;
- the history of the pest on the site, place of production or surrounding area; and
- the likely biodiversity impacts of any control, including any duty of care obligations under Natural Environment and Rural Communities (NERC) (2006) Act.

Sampling

3.9. Samples and specimens from infested plants should be either:

(a) triple-wrapped in robust plastic bags; or

(b) double-wrapped in robust plastic bags and the bags placed inside a secure box or vial and sent immediately to the Tree Health Diagnostic & Advisory Service at Forest Research for diagnosis. Suspect insects should be preserved in alcohol and sent in a similar manner. The samples should be accompanied by information about the date when the samples were collected, the location (address, postcode, GPS) and contact details of the person collecting the samples. The address is: Tree Health Diagnostic & Advisory Service, Forest Research, Alice Holt Lodge, Gravel Hill Road, Wrecclesham, Farnham, Surrey, GU10 4LH.

Samples collected from nurseries by APHA's PHSI staff should be sent to Fera Science Limited at Sand Hutton for analysis.

Confirming a new outbreak

Diagnostic procedures

3.10. Positive identification of *D. sibiricus* can only be made in the laboratory and it will be based on morphological characteristics (see factsheet in Appendix 1) and/or DNA sequencing of adults, larvae or pupae. However on-site inspection by a Forest Research or Fera entomologist or an experienced tree health officer from the Forestry Commission, Natural Resources Wales or APHA is part of the confirmation process.

OFFICIAL ACTION FOLLOWING THE CONFIRMATION OF AN OUTBREAK

Strategic Actions on confirmation

3.11. On positive confirmation, the following should be initiated:

- notification of ministers and senior officials, including those in the Devolved Administrations;
- establishment of regular (frequency determined by scale of outbreak) Lead Government Department (LGD) meetings to keep partners aware of current status, actions and possible future requirements, and to agree a communications strategy;
- notification of EU and other countries; and
- discussion with stakeholders.

Communication

3.12. The incident controller will set up a management structure to implement the functions of incident management. The outbreak will determine the size and nature of the management structure. Identification of, and liaison with, key stakeholders are crucial parts of this process.

Surveillance

3.13. To determine the extent of the outbreak, a delimiting survey should be set up as soon as possible after the first finding of *D. sibiricus* to determine the geographical limits of the infested area, and to demarcate a regulated area.

The delimiting survey should include the following elements

- an intensive ground-based survey of all suitable host trees within at least a 1km radius of the first tree(s) found to be infested;
- line transects outwards to at least 10km, along which visual inspection of host trees is carried out at regular intervals (*e.g.* every 50-100m) to estimate the full extent of the spread; and
- glue banding to trap larvae in autumn, when they leave the tree to overwinter in soil and leaf litter, and in spring as they climb the trees to resume feeding. As the life cycle might last up to three years, such surveillance should take place over three years.
- aerial surveillance might also be employed for extensive outbreaks. This will help to locate any satellite infestations in particular.

3.14. *D. sibiricus* distribution can also be determined by using pheromone traps or light traps during the flight period from late May to early June. However, this is the flight period for *D. sibiricus* in its native range, and its might differ in the UK because of the different climate. Because of the uncertainties around potential distribution in a UK outbreak, these traps should initially be distributed out to 10km, but this might need to be extended if moths are seen out with this range. In their native range adults can fly up to 100km/year, with males often flying further than females.

Demarcated zones

3.15. A statutory regulated area should be established as soon as possible after the discovery of an outbreak of *D. sibiricus*. This is to help minimise the spread of the pest within the infested area, and to prevent human-assisted transport to areas outside the infested area. An initial regulated area of at least 10km around the infested trees will need to be established, within which measures to prevent the movement of all potentially infected host material should be implemented. These measures should include a prohibition on the movement of untreated host material, particularly branch wood and arboricultural arisings. Larvae also overwinter in soil, and

because this is a potential pathway, there should be restrictions on the movement of soil both within and out with the regulated area. Subsequently, the size of the regulated area might need to be increased, depending on the spread of *D. sibiricus.*

Tracing forwards/backwards

3.16. If the infested trees have been recently planted, *i.e*. within the previous three years, the source of the plants must be traced back to the supplying nursery, and the nursery must be visited and inspected for the presence of *D. sibiricus*. In addition, any supplies of conifer planting material from the nursery over the previous three years should be traced to the final planting sites and inspected for the presence of *D. sibiricus.*

Pest management procedures

3.17. The management programme should focus on monitoring and the phased removal of the worst-affected host species from the outbreak site.

3.18. Material which has been confirmed as infested shall be dealt with as follows:

a) Infested material for planting, as well as all other material in the consignment, will either be burned or chipped/mulched or exceptionally re-exported to the exporting country. (Burning must comply with the appropriate waste management regulations applied by the Environment Agency in England, Scottish Environment Protection Agency (SEPA) and Natural Resources Wales.) If burning is used for disposal, no more than 10 tonnes can be burnt in a 24-hour period, in accordance with Environment Agency and SEPA guidelines and Natural Resources Wales.

b) Where heavily infested mature trees are involved, it might be necessary to either undertake high pruning or crown reduction, or even to fell the tree. In these cases, all branches with buds shall be removed and destroyed, preferably by burning on site. The larvae and cocoons can be associated with the bark of the tree, so movement of barked timber should be restricted. If removed from site, potentially infested bark should be disposed of by licensed processors. Likewise, larvae overwinter in the soil, so there should be restrictions on the movements of soil, and

machinery should be thoroughly cleaned of soil before leaving the site. If disposal is by landfill, transport of the material should be in a closed container.

c) Use of *Bacillus thuringiensis,* sometimes with the addition of dimilin, has been tried in parts of Russia. This could be tried as a control option, although significantly more evidence of its effectiveness, and of any impact on native insect fauna, would need to be gathered before it could be approved for use in the UK.

Public outreach

3.19. It is crucial to have public support for the management programme and to help with surveillance. Engaging the public will require the provision of timely, balanced and accurate information about monitoring and control. Engaging the public, in particular amateur moth recorders, will also provide opportunities for them to participate in monitoring and reporting suspect trees using the TreeAlert on-line reporting tool. The Observatree voluntary tree health surveillance network could also be deployed. Information, subject to available budget, can be made available through newspapers, radio, TV, publicity materials, the internet and social media, and should be targeted locally, especially within the infested and regulated areas and, where appropriate, regionally and nationally.

3.20. It is important to provide information about:

- the location and size of the infested and regulated areas;
- statutory and voluntary responsibilities;
- possible rates of spread;
- management options;
- pathways and the how the pest might have arrived and could be transported; and
- the prospects for British forestry and what people can do to help, especially in terms of monitoring.

Managing this level of public engagement will require a central administration office capable of handling a large numbers of enquiries and able to provide general and specific information. Liaison with

communications and press offices from other countries and organisations will be required for cross-border outbreaks.

Review of measures in the case of prolonged official action

3.21. If continuing action is required within the delimited area over a prolonged period, a review of the management programme should be undertaken regularly (*e.g.* at least annually) to determine the success and cost effectiveness of the measures in the longer term. This review will involve consultation with stakeholders and should include:

- evaluation of the effectiveness of current measures;
- evaluation of the economic impact and cost effectiveness of continuing existing measures;
- consideration of further measures to strengthen containment and eradication actions;
- consideration of statutory obligations and impact on import and export procedures;
- consideration of alternative approaches or the cessation of statutory action; and
- consideration of biodiversity impacts following control.

3.22. In situations where official action is no longer considered appropriate, stakeholders should be consulted and a timetable and mechanism agreed for the removal of official measures and for the dissemination of pest management information as appropriate.

Criteria for declaring / change of policy

3.23. Policy changes to be considered in light of the following:

- changes in the geographic distribution of *D. sibiricus;*
- new or updated research information on the pest species range and lifecycle; and
- identification of new pathways.

Evaluation and review of the contingency plan.

3.24. This and other contingency plans will be reviewed on an annual basis to accommodate any significant changes in pest/pathogen distribution, dispersal, refinement of surveillance techniques, legislation changes or changes in policy. When and if policy makers in the country/countries affected deem that eradication is no longer a viable option then there will be a move towards containment. The criteria for such a determining such a break point could be based on a % of host species lost, a set number of hectares lost, number of individual outbreaks, resources needed or a combination of these but this will be determined by the policy makers in the country/countries affected. Further details can be found in the Defra Generic plan.

3.25. The plan should only be re-consulted upon if significant new information is presented which affects the approach to the management of an outbreak.

Recovery

4.1. *D. sibiricus* can be declared eradicated if it has not been found after six years of monitoring. This would cover two full life cycles in its native range, although what the length of the life cycle in the UK would be is unclear at this stage.

Appendix 1: Pest Background Information. Source: EPPO datasheet

Identity of organism and quarantine status

Species name: *Dendrolimus sibiricus* (Chetverikov) (Lepidoptera: Lasiocampidae)

Synonyms: *Dendrolimus superans sibiricus* (Chetverikov), *Dendrolimus laricis* (Chetverikov)

Common names: Siberian Coniferous Silk Moth, Siberian Silk Moth

UK risk rating: Unmitigated 100/125, Mitigated 50/125

EU status: EC 1A1 list, EPPO A2 list. Officially absent.

UK status: Absent

Hosts

The preferred hosts of *D. sibiricus* in its native range are *Abies sibirica*, *Abies nephrolepis*, *Pinus sibirica*, *Pinus koraiensis*, *Larix gmelinii*, *Larix sibirica*, *Picea ajanensis* and *Picea obovata.*

Life cycle

The host/pest relationship of *D. sibiricus* is characterised by cycles of slow build-up of population numbers over several years, reaching a peak (outbreak), followed by a population collapse. Outbreaks of *D. sibiricus* occur with a periodicity of 10–11 years (Rozhkov, 1963; Epova & Pleshanov, 1995; Vorontsov, 1995), usually last 2–3 years, and are often preceded by two to three years of water deficit. It has been noticed that the cycle of these outbreaks in some parts of the geographical range of the pest coincides with solar cycles, with the maximum development of the outbreaks occurring in years of increased number of sunspots (Galkin, 1975,1992).

The first flight of *D. sibiricus* in the middle latitudes of its natural range usually occurs in the middle of July. Immediately after mating, females lay eggs on the needles, mainly in the lower part of the crowns. During outbreak years, eggs are laid throughout the tree and on the surrounding ground. One egg mass might contain a few eggs or as many as 200. Each female lays an average of 200–300 eggs, with a maximum of 800 (Rozhkov, 1963; Vorontsov, 1995). Egg development usually takes 13 to 15 days (with an occasional maximum of 20 to22). First-instar larvae eat the edges of needles and moult in nine to 12 days. Second-instar larvae cause even more damage to the needles, and develop for three to four weeks before moulting. Third-instar larvae descend to the soil in September, and overwinter under moss. At the end of April the following year, the larvae return to the crowns, eat complete needles, and sometimes also the bark of young shoots and cones. They moult after one month, and again at the end of July or in August. The larvae return to the soil in autumn, and overwinter for a second time. In May and June of the following year, the larvae feed very intensively. During this period, they eat about 95% of the food that they need for

their development, and it is then that the major damage occurs. In total, larvae moult five to seven times and have, correspondingly, six to eight instars. The larvae make cocoons in June, and the development of pupae within them takes about one month. The full life cycle usually takes two years. In southern parts of the natural range, however, one generation can develop in a single year, whereas in northern regions the completion of a generation can sometimes take three years (Rozhkov, 1963; Galkin, 1993; Vorontsov, 1995).

Eggs

The eggs are brown-yellow-green. They are oval, about 0.5-0.6mm in length, and slightly flattened dorso-ventrally to about 1.5-2mm. They are laid in masses on branches, twigs and needles (Figure 1).

Figure 1. *D. sibiricus* eggs. Source: J. Grant, USDA Forest Service.

Larva

The larva is 5-7mm long just after emergence, but just before pupation it is 50-80mm long.

Figure 2. *D. sibiricus* larva. Source: J. Grant, USDA Forest Service.

Pupa

When the larvae reach the final instar and feeding has stopped, they each spin a brown silken cocoon, 25-45mm long, in which to pupate. The cocoon is attached to the branches or trunk of the host. The pupation period is very long, lasting from May to July.

Figure 3. Cocoons of *D. sibiricus* . Source: Y. Baranchikov, Institute of Forest SB, RASC

Adult

The male wingspan is 40-60mm, the female's 60-80mm, and sometimes up to 100mm. The front wings are brown-violet, with one characteristic white spot.

Figure 4. Adult female *D. sibiricus*. Source: V. Petko, V.N. Sukachev Institute of Forests SB, RASC

Identification

Defoliation of *Pinus*, *Larix*, *Abies* or *Picea* spp. is usually spectacular.

Figure 5. Extensive defoliation of larch caused by *D. sibiricus*. Source: J. Grant, USDA Forest Service.

The presence of larvae is easily detected, and these and the adults can be readily distinguished from the most closely related European species, *Dendrolimus pini* (pine tree lappet moth). Adult males can be monitored using species-specific pheromone traps (Pletniev *et al*., 1999).

Distribution of the organism

EPPO region
Russia (eastern part of European Russia, although not fully confirmed) and practically all Asian Russia except the extreme north, Sakhalin and the Kurile Islands.

Asia
Russia (practically all of Asian Russia except the extreme north, Sakhalin and the Kurile Islands, as documented under 'EPPO region' above), Kazakhstan, China (Heilongjiang, Jilin, Liaoning and Neimenggu), Korean Democratic People's Republic, Republic of Korea and northern Mongolia.

EU

Absent.

D. sibiricus is presumed to have originated in Siberia, but has apparently been spreading westwards at a rate that has been variously estimated at between 12and 40 to 50km per year. In 1955, Okunev (1955) considered that it had reached longitude 37° or 38° in European Russia (including the White Sea coast), but a later opinion (Rozhkov, 1963) places the most western point much further to the east, at longitude 52°. The furthest west at which outbreaks of *D. sibiricus* have occurred were in the regions of Perm and Udmurtia (Koltunov *et al*., 1997; Gninenko, 1999). However, males of the species were captured in pheromone traps in 2001 close to Moscow, more than 1000km to the west, although according to the EPPO database, males were not known to be established in this area.

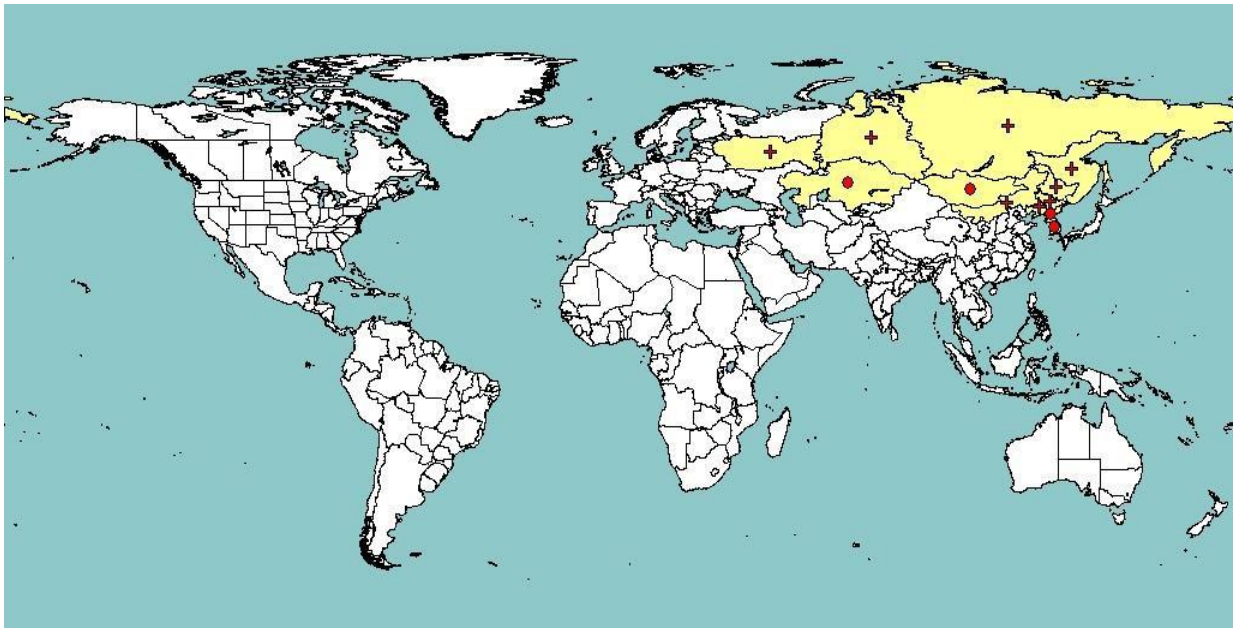

Figure 6: Distribution map of *D. sibiricus*, as of February 2016. Circles represent national records and crosses represent sub-national records. (EPPO PQR database)

Damage, impact and controls

D. sibiricus is the most important defoliator of coniferous trees (*Pinus sibirica*, *Larix sibirica*, *Abies sibirica*, *Picea obovata*) in Russia and Kazakhstan (Rozhkov, 1963; Epova & Pleshanov, 1995; Vorontsov, 1995), and one of the most important defoliators of *Larix gmelinii* in China (Yang & Gu, 1995). Outbreaks occur over enormous areas (many thousands of hectares), and often lead to the death of entire forests. The evaluation made by Florov (1948) showed that, over the 90 years from 1855 to 1945, *D. sibiricus* killed at least 4 million hectares of Russian forests. According to Kolomets (1958), during the 25 years 1932 to 1957, *D. sibiricus* damaged 7 million ha of forests in Western Siberia and Chita Oblast alone, causing the death of forests in half of this area. Similar data have been published by many other scientists (*e.g.* Rozhkov, 1963).

Trees can be defoliated over two or– three successive years during outbreaks, and many trees are unable to withstand such a long period of defoliation. Furthermore, the outbreaks of *D. sibiricus* are also often followed by outbreaks of wood-boring insects (scolytinae, cerambycidae species and others), particularly *Ips typographus, Ips subelongatus* (OEPP/EPPO, 2005a), *Scolytus morawitzi*

(OEPP/EPPO, 2005b), *Monochamus galloprovincialis*, *Xylotrechus altaicus* (OEPP/EPPO, 2005c) and *Melanophila guttulata* (Pavlovskii & Shtakelberg, 1955; Rozhkov, 1963; Mamaev, 1990; Epova & Pleshanov, 1995; Vorontsov, 1995). These pests are able to kill trees which are heavily stressed by *D. sibiricus*. Forests might also be predisposed to forest fires. Reforestation of affected areas is often complicated and takes much time, resulting in serious changes in the environment over large areas.

Significant control efforts against *D. sibiricus (*mainly aerial treatment with chemical and bacterial products) are undertaken during outbreak years in Russia (Ivliev, 1960; Ageenko, 1969; Baranovskii, Remorov & Lamikhov, 1988; Maslov, 1988; Bushmelev & Yurchenko, 1989; Epova & Pleshanov, 1995; Vorontsov, 1995) and other affected countries..

The natural enemies of *D. sibiricus* play an important role in the regulation of its population density under non-outbreak conditions, (Nikiforov, 1970; Gorshkov, 1973; Baranovskii, Remorov & Lamikhov, 1988; Yang & Gu, 1995; Vorontsov, 1995). (According to these scientists they include the egg parasitoids *Telenomus gracilis*, *Telenomus tetratomus*, *Trichogramma dendrolimi*, *Ooencyrtus pinicolus*; the larval and pupal parasitoid *Rhogas dendrolimi*; the micro-organisms *Bacillus dendrolimus*, *Bacillus thuringiensis* (Bt), *Beauveria bassiana*, polyhedrosis viruses, and some other viruses) Bt in particular has been used in Russia as part of its control strategy.

Main pathways

D. sibiricus can spread by flight of the adult moths (up to 100km per year) (Rozhkov, 1963). All stages of the life cycle can be transported on plants moving in trade, particularly plants for planting and cut branches (including Christmas trees). During outbreaks especially, eggs, larvae and cocoons might be associated with wood carrying bark, or isolated bark, and might be present as contaminating pests on other products. Indeed, cocoons are often transported on branches collected for firewood.

Import controls

According to OEPP/EPPO (1994), plants for planting and cut branches of host plants from the infested areas should be free from soil to prevent introduction of D*. sibiricus* by international movement of commodities, The importation of plants into the EU of potential hosts species of *D. sibiricus* is prohibited under Annex 3 of the EC Plant Health Directive 2000/29/EC.

Details about the regulations applying to importation of conifer wood from Russia, Kazakhstan, China and other non-EU countries is available on the Forestry Commission's website pages about conifer wood imports.

Appendix 2 – Alert status levels for an outbreak – (based on alert status levels for draft Defra generic contingency plan).

ALERT	STATUS	COMMAND LEVEL
White	Plant pest/disease with potential for limited geographical spread	Instigation of incident management plan involving operational command at appropriate level, and following Standard Operating Procedures or scientific advice where applicable
Black	Significant plant pest/disease with potential for limited geographical spread	Instigation of incident management plan, usually involving joint tactical and operational command at appropriate level, and following plant pest/disease-specific response plans where applicable
Amber	Serious plant pest/disease with potential for relatively slow but extensive spread leading to host death and/or major economic, food security or environmental impacts	Instigation of incident management plan, usually involving joint strategic and tactical command, and following plant pest/disease-specific response plans

		where applicable
Red	Serious or catastrophic plant pest/disease with potential for rapid and extensive geographical spread leading to host death and/or major economic, food security or environmental impacts	Instigation of incident management plan involving strategic, tactical and operational command, and following plant pest/disease-specific response plans where applicable

Appendix 3: Relevant legislation

Domestic:

The Waste Management Licensing (Scotland) Regulations 2011
The Environmental Permitting (England and Wales) Regulations 2010
Natural Environment and Rural Communities Act 2006
Plant Health (Forestry) Order 2005
Plant Health Act 1967
Forestry Act 1967

European:

EC Council Directive 2000/29/EC

References

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