EPPO Datasheet: *Ips cembrae*

Last updated: 2020-12-18

IDENTITY

Preferred name: *Ips cembrae*
Authority: (Heer)
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Coleoptera: Curculionidae: Scolytinae
Other scientific names: *Bostrichus cembrae* Heer, *Ips cembrae engadinensis* Fuchs, *Ips shinanoensis* Yano, *Tomicus subelongatus* Motschulsky
Common names: large larch bark beetle
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EU Categorization: PZ Quarantine pest ((EU) 2019/2072 Annex III)
EPPO Code: IPSXCE

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Notes on taxonomy and nomenclature

The taxonomy of *Ips* species attacking larch in Europe and Asia has been studied using mitochondrial gene sequences (Stauffer *et al.*, 2001; Cognato & Sun, 2007). These studies confirm that the European species *Ips cembrae* and the Asian species *Ips subelongatus* were closely related, but had distinct haplotypes which probably diverged due to geographical separation, and therefore that they may be considered as separate species. Additional support for this is provided by the distinct assemblages of blue-stain fungi associated with the European and Asian beetles (Stauffer *et al.*, 2001), albeit characterised from beetles living on different host tree species. Morphologically very similar, *I. cembrae* differs from *I. subelongatus* by a less setose elytral declivity (Cognato, 2015), but uncertain specimens are best diagnosed using DNA sequencing. Other putative taxa *I. fallax*, *I. shinanoensis* and *I. cembrae* var. *engadinensis* were not found to differ from *I. cembrae*, and can be considered as synonyms. With respect to the Eurasian region covered by EPPO, *I. cembrae* and *I. subelongatus* are regarded as presenting distinct phytosanitary risks and documented separately.

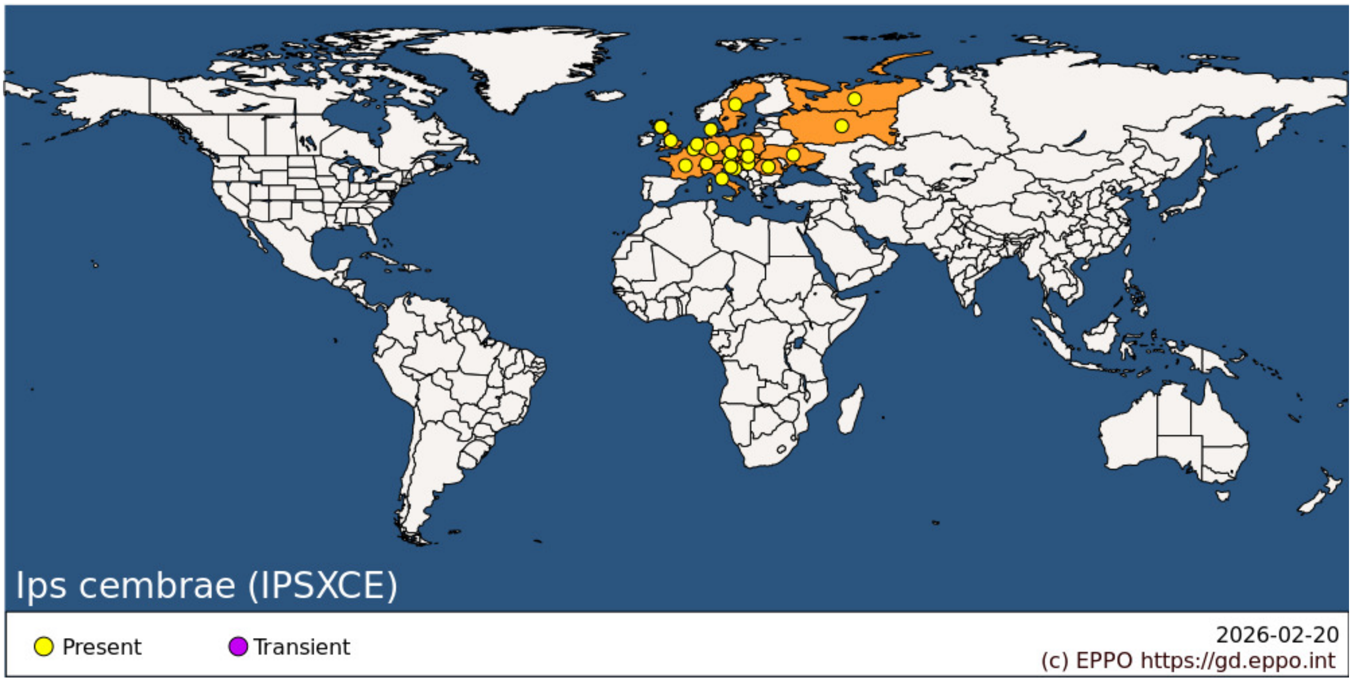
HOSTS

Larix decidua European larch, is the main host of *I. cembrae*, but exotic *Larix* species planted in Europe, such as *Larix kaempferi* Japanese larch and *Larix x eurolepis* hybrid larch are also attacked. The beetle typically breeds in freshly-cut logs, windthrown stems or storm-damaged or dying trees, but it sometimes attacks standing live trees subject to localized stress, such as drought. *Ips cembrae* may occasionally breed in species of the genera *Pinus* and *Picea*, but only when larch hosts are limited in availability, and never as primary pests. Some alternative host reports may reflect misidentifications of other species such as *Ips amitinus* and *Ips typographus* (Balogun, 1963), for example reports of *I. cembrae* development in *Pinus cembra* seem to be erroneous (Grodzki *et al*., 2019).

Host list: *Larix decidua*, *Larix kaempferi*, *Larix sibirica*, *Larix x marschlinsii*, *Larix*, *Picea abies*

GEOGRAPHICAL DISTRIBUTION

Ips cembrae is native to Europe and occurs there throughout the natural range of *Larix decidua* and most of the planted range of *L. decidua* and *L. kaempferi*. It is present only in Europe (including non-EU regions of Central and Northern Russia, Ukraine, Switzerland and mainland United Kingdom); reports of its presence in Asia are considered to relate to the closely related species *I. subelongatus*. *Ips cembrae* is absent in some areas such as Greece, Ireland and parts of the United Kingdom (Northern Ireland, Isle of Man), which have protected zone status.



EPPO Region: Austria, Belgium, Croatia, Czechia, Denmark, France (mainland), Germany, Hungary, Italy (mainland), Netherlands, Poland, Romania, Russian Federation (Central Russia, Northern Russia), Slovakia, Slovenia, Sweden, Switzerland, Ukraine, United Kingdom (England, Scotland)

BIOLOGY

Ips cembrae can overwinter as larvae, pupae or young adults under the bark of host trees, and commonly as mature adults in the forest litter. Adults disperse by flight on warm days from late-April until late summer, depending upon local climate, temperature, and altitude, which influence generation time and adult emergence. There may be one or two generations each year depending on the length of the summer season in a location. Peaks in flight activity are often observed around May and again around August (Balogun 1963; Grucmanová *et al*., 2014; Holuša *et al*., 2014). Males tunnel into the bark of suitable host material, and excavate a nuptial chamber in the phloem; thicker bark of larger stems is preferred, but this can be in branches as small as 3 cm in diameter (Holuša *et al.*, 2014). They then release an aggregation pheromone which attracts females (and other males to the host material) (Stoakley *et al*., 1978). Up to five females (typically three) join each male, and establish individual maternal galleries radiating away from the nuptial chamber, along which they lay up to 50 eggs spaced at regular intervals. Adults may then emerge to start a new sister-brood. Newly hatched larvae begin to excavate galleries as they feed, perpendicular to the maternal gallery. Development is temperature-dependent requiring around 120 days at a constant 15°C, but only around half that time at 20°C (Schebeck & Schopf, 2016). New adults must undergo maturation feeding before becoming reproductively mature, either within the same material where they developed, or else within young twigs on suitable host trees.

DETECTION AND IDENTIFICATION

Symptoms

Breeding occurs under thick bark of *Larix*. Signs of attack include the presence of frass ejected by tunnelling adults, which may collect on bark scales or the ground below. Maturation feeding by adults within the twigs of healthy trees can result in significant foliage loss where populations are large, and twigs broken by tunnelling may be found at the base of the trees. Trees severely damaged by *I. cembrae* will exhibit dieback and eventually discoloured and dead canopies. Woodpecker activity (pecked holes) may be extensive where galleries are abundant beneath the bark. Removal of the bark from infested trees will reveal distinctive gallery systems with 1 to 5 maternal galleries radiating from a central nuptial chamber, with smaller perpendicular larval galleries at regular intervals along the maternal galleries. Three female galleries commonly diverge longitudinally from the nuptial chamber, two in one direction and one in the opposite direction. Female galleries are typically 13-17 cm in length, but may be up to 25 cm. In active gallery systems larvae, pupae and adults may be found; the adults are the most easily identified.

Morphology

Egg. The eggs are initially translucent, becoming creamy-white, and are oval in shape and approximately 1 mm long. They are laid individually in niches along both sides of the maternal gallery.

Larva. Creamy-white, legless, cylindrical grub with a curved body and yellow-brown head capsule. When fully grown, they are approximately 5 mm long.

Pupa. Uniformly white, gradually darkening to pale brown, 4.5 - 5 mm in length. Adult structures are apparent, including antennae, legs, and wings, folded against the body.

Adult. Typical cylindrical bark beetle body form, light brown when newly emerged, becoming dark brown to black; approximately 5 mm long and 2 mm wide. The head is concealed from above by the pronotum, which bears wrinkles and minute teeth apically and laterally, whilst the elytra bears rows of deep punctures (striae). The body has a shiny surface and is covered in long yellowish hairs. There are four spines on each side of the elytral declivity (8 in total); the third from the top is the largest, with a broad 'head' (Balachowsky, 1949; Grüne, 1979).

Detection and inspection methods

Bark beetle traps (e.g. slot, multi-funnel, or cross-vane types) baited with commercially available pheromone may be employed to monitor population levels of *Ips cembrae* during the period of adult flight activity. Girdled trap trees or freshly felled stems will attract adults, and may be assessed by peeling away the bark to reveal the gallery systems. Attacked trees become apparent once they exhibit canopy dieback and needle discoloration. Groups of attacked trees may be identified by aerial surveillance combined with a follow-up ground survey to confirm the presence of *I. cembrae* infestation, and this may help to identify sites at risk of further damage.

PATHWAYS FOR MOVEMENT

Laboratory experiments have shown that adult *Ips* spp. can fly continuously for several hours, potentially travelling tens of km. In the field however, flight has only been observed to take place over limited distances (usually to nearby suitable host material), and usually downwind. Movement over longer distances can occur via human-assisted spread, in infested wood, bark, and wood packaging material. For example, *I. cembrae* is believed to have been introduced into Great Britain in timber shipments from Germany in the late 1940s, and it has been intercepted on wood imported into Sweden from Central Europe, where it appears also to have recently established (EFSA, 2017).

PEST SIGNIFICANCE

Economic impact

Ips cembrae is generally considered a secondary pest in *Larix* plantations, breeding in recently felled logs, windthrown stems, and dying trees. However, an abundant breeding resource such as fresh thinning residues can promote major population growth and facilitate subsequent attack on live standing trees, whilst drought conditions on drier sites are recognized to weaken trees and leave them susceptible to attack (Redfern *et al.,* 1987; Grodzki ,2008). Adults carry out maturation feeding on young twigs, so large populations can cause additional damage to live trees when this results in shoot pruning and defoliation. Initial attacks upon live host trees may be concentrated within a relatively limited area on the stem (mediated by pheromone aggregation) and potentially resulting in crown dieback, but tend to be more diffuse along the stem on windthrown or dying trees (Redfern *et al*., 1987).

As in the case for other conifer bark beetles, *I. cembrae* is associated with a considerable diversity of fungi, most notably ophiostomatoid species, including 'blue stain' fungi (Jankowiak *et al*., 2007). The most important of these is *Ceratocystis laricicola* which kills bark and cambium in the host tree, stains the sapwood and likely contributes to the dieback of and killing of larch during *I. cembrae* outbreaks (Redfern *et al*., 1987). An area requiring further investigation is the relationship between *I. cembrae* and *Phytophthora ramorum*, an invasive oomycete pathogen which has caused large-scale dieback and death of larch plantations across Great Britain, but which has also been detected across Western and Central Europe (Brasier & Webber, 2010, Schenck *et al*., 2018). It remains unclear whether the pathogen may influence population growth or damage by *I. cembrae* in affected larch.

Control

Control measures against *Ips cembrae* tend to be limited because of its status as a secondary pest. However, population build-up may be generated by an abundance of suitable breeding material, including thinning residues and harvested logs from forest operations, and on occasion, standing live trees which have been severely weakened by environmental stresses such as drought. To prevent this, felling and thinning residues should be disposed of promptly, for example by chipping and burning, and cut logs removed from site before the adult flight season to prevent colonization. Highly stressed larch stands identified as being at risk from attack, for example on poor drought-prone sites, may be pre-emptively felled or thinned.

Phytosanitary risk

Ips cembrae is listed in Annex IIB of Council Directive 2000/29/EC, and is considered a protected zone quarantine pest in Greece, Ireland and parts of the United Kingdom (Northern Ireland, Isle of Man), where the species is not present and quarantine measures are implemented to prevent entry (EFSA, 2017). Elsewhere, *I. cembrae* is widespread and not considered to be a quarantine pest. It is not a primary pest and only attacks trees already weakened by contributory stress factors, typically environmental or from other pests and diseases. It is therefore a much less damaging pest than *I. typographus* and presents a much lower risk to the protected zones. *Ips cembrae* has been introduced into areas where *Larix* spp. are planted (mainland UK, Netherlands, Sweden), and to date has behaved there in the same way as in its natural range.

PHYTOSANITARY MEASURES

In the protected zones of Greece, Ireland, Northern Ireland, and the Isle of Man where *I. cembrae* is considered to be a quarantine pest, phytosanitary measures are available to prevent introduction of the pest with wood and bark. These include debarking of wood, and heat treatment of wood, bark and chips, considered to be effective where isolated areas cannot be reached by natural spread, as specified in Annex IVB of Council Directive 2000/29/EC.

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CABI and EFSA resources used when preparing this datasheet

CABI Datasheet on *Ips cembrae* (large larch bark beetle) https://www.cabi.org/isc/datasheet/28820

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Datasheet history

This datasheet was first published in the EPPO Bulletin in 2005 and revised in 2020. It is now maintained in an electronic format in the EPPO Global Database. The sections on 'Identity', 'Hosts', and 'Geographical distribution' are automatically updated from the database. For other sections, the date of last revision is indicated on the right.

EPPO (2005) *Ips cembrae* and *Ips subelongatus*. Datasheets on pests recommended for regulation. *EPPO Bulletin* **35** (3), 445-449. https://doi.org/10.1111/j.1365-2338.2005.00880.x

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