EPPO Datasheet: *Ips sexdentatus*

Last updated: 2021-03-02

IDENTITY

Preferred name: *Ips sexdentatus*
Authority: (Börner)
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Coleoptera: Curculionidae: Scolytinae
Other scientific names: *Bostrichus pinastri* Bechstein, *Bostrichus sexdentatus* (Börner), *Dermestes sexdentatus* Börner, *Ips stenographus* (Duftschmidt), *Tomicus sexdentatus* (Börner), *Tomicus stenographus* Duftschmidt
Common names: six-toothed bark beetle
view more common names online...
EU Categorization: PZ Quarantine pest ((EU) 2019/2072 Annex III)
EPPO Code: IPSXSE



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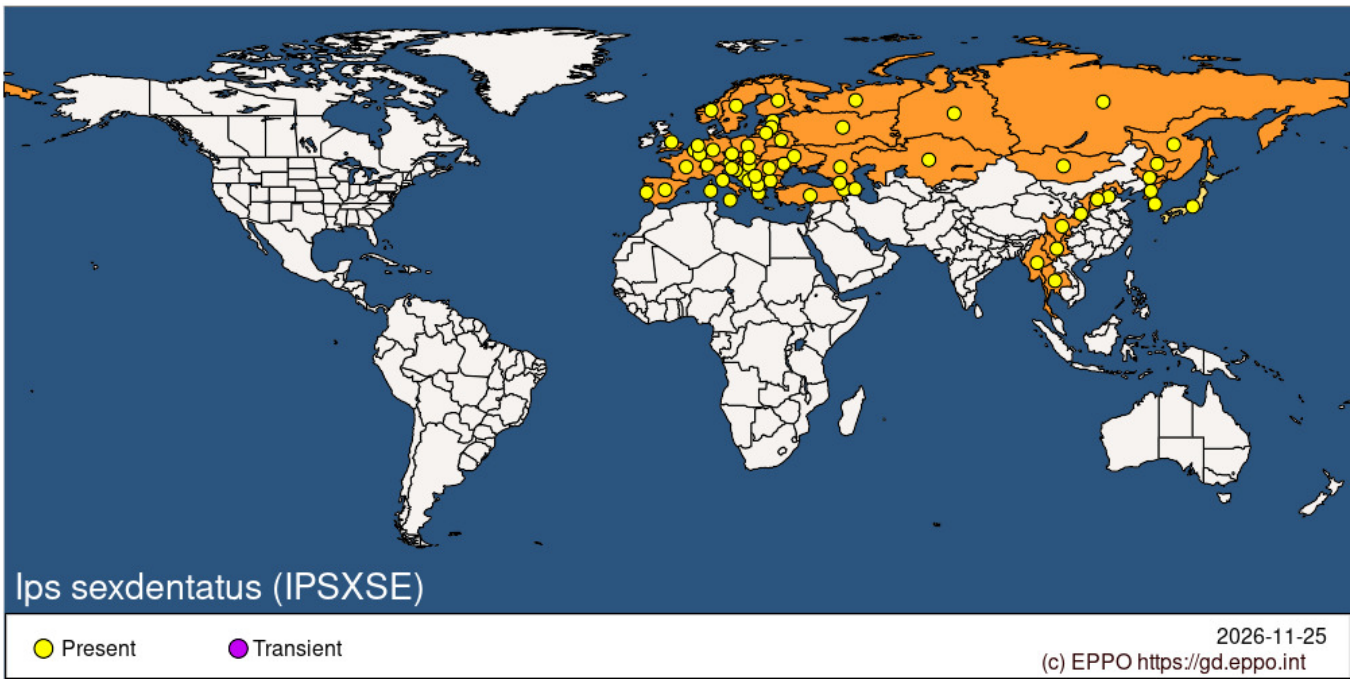
HOSTS

Ips sexdentatus attacks mainly pines. In Northern Europe, *I. sexdentatus* is found on *Pinus sylvestris*, and in Central and Southern Europe it is also found on *P. pinaster*, *P. heldreichii* and *P. nigra*. In Turkey, Georgia and Southern Russia, it occurs on *Picea orientalis*. It is occasionally recorded on species of *Picea*, *Abies* and *Larix*. In Asia, *I. sexdentatus* occurs on *Pinus armandii* and other species of *Pinus* (Izhevsky *et al*., 2005; EFSA, 2017; Douglas *et al*., 2019).

Host list: *Abies alba*, *Abies holophylla*, *Abies nephrolepis*, *Abies nordmanniana*, *Abies sachalinensis*, *Abies sibirica*, *Larix gmelinii*, *Larix sibirica*, *Picea abies*, *Picea jezoensis subsp. jezoensis*, *Picea jezoensis*, *Picea koraiensis*, *Picea obovata*, *Picea orientalis*, *Picea schrenkiana*, *Pinus armandii*, *Pinus brutia subsp. pityusa*, *Pinus brutia*, *Pinus cembra*, *Pinus densiflora*, *Pinus halepensis*, *Pinus heldreichii*, *Pinus koraiensis*, *Pinus nigra subsp. pallasiana* , *Pinus nigra subsp. salzmannii*, *Pinus nigra*, *Pinus peuce*, *Pinus pinaster*, *Pinus radiata*, *Pinus sibirica*, *Pinus strobus*, *Pinus sylvestris*, *Pinus tabuliformis*

GEOGRAPHICAL DISTRIBUTION

I. sexdentatus is widely distributed in European countries, but the pest is absent in Ireland, Cyprus and parts of the United Kingdom (Northern Ireland and the Isle of Man) (Protected Zones). The pest is widely spread in Asia: Russia (Siberia, Far East), China, Japan, Mongolia, Myanmar, Thailand (Izhevsky *et al*., 2005; EFSA, 2017; Douglas *et al*., 2019).



EPPO Region: Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, Estonia, Finland, France (mainland), Georgia, Germany, Greece (mainland), Hungary, Italy (mainland, Sardegna, Sicilia), Kazakhstan, Latvia, Lithuania, Luxembourg, Moldova, Republic of, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal (mainland), Romania, Russian Federation (Central Russia, Eastern Siberia, Far East, Northern Russia, Southern Russia, Western Siberia), Serbia, Slovakia, Slovenia, Spain (mainland), Sweden, Switzerland, Türkiye, Ukraine, United Kingdom (England)
Asia: China (Hebei, Heilongjiang, Jilin, Shaanxi, Shanxi, Sichuan, Yunnan), Japan, Kazakhstan, Korea, Democratic People's Republic of, Korea, Republic of, Mongolia, Myanmar, Thailand

BIOLOGY

The species has only one annual generation north of the Arctic Circle, two generations in central areas of Eurasia and up to five generations in the Mediterranean area and in other areas with a long, warm summer season. The spring flight starts when the temperature exceeds about 20°C; in the north this is in May/June, and in more southern areas in March/April. The male beetle initiates the boring and releases an aggregation pheromone consisting mainly of ipsdienol (Vité *et al*., 1974). After having excavated a nuptial chamber in the phloem, each male is joined by one to five females, which each bore a maternal gallery in the phloem, parallel to the fibres. Single eggs are laid at regular intervals along these galleries. After oviposition, the parent adults re-emerge and often establish sister broods either on the same tree or on a new host-tree. Each larva excavates an individual gallery perpendicular to the maternal gallery. Pupation occurs in a small niche in the phloem, at the end of the larval gallery. Productivity varies between Pineau *et al*., 2017). Brood development from the start of gallery construction until 1 and 60 offspring per female and is inversely correlated to attack density (the emergence of the new generation adults may take 2-3 weeks at a constant laboratory temperature of 27°C and 3-4 weeks at 22°C. No gallery construction and brood production is observed a constant temperature of 12°C. Overwintering takes place as adults under the bark, in stump cracks or in forest litter. The supercooling point in hibernating adults is about -19°C, whereas in larvae it is only -9°C (Bakke, 1968). Pathogenic ophiostomatoid fungi may be carried by *I. sexdentatus* beetles, some of them in pit mycangia on the body (Levieux *et al*., 1991) and are inoculated to the host tree (Kirisits, 2004; Romon *et al*., 2008; Bueno *et al*., 2010; Jankowiak, 2012). They cause blue staining of the wood and some of them can contribute to tree death. A general description of the biology and ecology of *I. sexdentatus* is provided by Chararas (1962), Bakke (1968) and Levieux *et al*. (1985) as cited in EFSA (2017).

DETECTION AND IDENTIFICATION

Symptoms

Reproduction occurs under thick bark on plant hosts. The gallery system has two to four female galleries up to about 1 m in length, half running in one direction half running in the opposite direction. Larval galleries are 8-10 cm long. The wood under the gallery is stained blue from fungi transferred by the beetles (Chararas, 1962). As in the case of other conifer bark beetles, *I. sexdentatus* acts as a vector for a bluestain fungus (*Ophiostoma brunneo-ciliatum*) which also damages the tree (Lieutier *et al*., 1989).

Morphology

I. sexdentatus is the largest beetle of the genus *Ips*, at 6-8 mm in length. The adults are dark brown or black and cylindrical. Both sexes have six spines at each side of the elytral declivity. The fourth spine is the largest and is capitate. Only the female has a longitudinal stridulatory organ on the upper hind part of the head. The larvae are legless, with a dark amber cephalic capsule (Balachowsky, 1949; Chararas, 1962; Grüne, 1979; Izhevsky *et al*., 2005; Douglas *et al*., 2019).

Detection and inspection methods

I. sexdentatus can be detected by visual examination, often after damage symptoms are seen, and by pheromone trapping. The species can be identified by examining morphological features, for which taxonomic keys exist, e.g. Grune (1979); Schedl (1981); Wood (1982); Douglas *et al*. (2019). The standing trees attacked by *I. sexdentatus* die during the colonisation process, with an obvious discolouration of their crown, which becomes brown and then grey after the needles have shed. During the attacks, brown sawdust is expelled from the entry holes and, when the broods have metamorphosed and the young adults start feeding on the phloem around the galleries, the bark can flake off. This phenomenon can be amplified by the action of woodpeckers. Within and under the phloem, maternal galleries, parallel to the fibres and up to 50 cm long, and transversal larval galleries can be seen. Pheromone lures and traps are commercially available for *I. sexdentatus* but, because of the large dispersal capacity of the pest, trap catches do not necessarily reflect correctly local establishment. The sapwood of trees shows blue staining due to the fungi introduced by the beetles (Izhevsky *et al*., 2005; EFSA, 2017).

PATHWAYS FOR MOVEMENT

Laboratory experiments have shown that adult *Ips* spp. can fly continuously for several hours. Jactel & Gaillard (1991) found, for example, that in a sample of 38 beetles, 98% could fly >5 km, 50% >20 km and 10% >45 km. The speed of flight was constant and equalled 1.3 m/s. In the field, however, flight has only been observed to take place over limited distances and then usually downwind. Beetles have been found in the stomach of trout in lakes 35 km from the nearest spruce forest, probably carried by the wind (Nilssen, 1978). Dispersal over longer distances occurs via transportation of the pest under the bark of wood commodities.

PEST SIGNIFICANCE

Economic impact

This species is of low significance as a pest in Northern and Central Europe. In Europe, *I. sexdentatus* preferentially colonise weakened pines, cut logs or wind-felled trees, trees affected by forest fires or drought-stressed trees (EFSA, 2017). The infestation by *I. sexdentatus* of *Pinus sylvestris* and *P. radiata*, suffering from drought stress in Central and Southern France, Northern Spain and Portugal, has resulted in pine death (Goix, 1977; Perrot, 1977; Lieutier *et al*., 1984; Ferreira & Ferreira, 1986; Lieutier *et al.*, 1988; Paiva *et al.*, 1988; Cobos-Suarez & Ruiz-Urrestarazu, 1990). *I. sexdentatus* often attacks trees together with other pests (*Ips acuminatus, Tomicus piniperda*). The pest carries pathogenic ophiostomatoid fungi. These cause blue staining of the wood and some of them can contribute to tree death. However, *I. sexdentatus* can also attack living trees when population levels are high (Rossi *et al*., 2009; Pineau *et al*., 2017). In Turkey and Georgia, *I. sexdentatus* is a major primary pest of *Picea orientalis*, attacking living trees (Schimitschek, 1939; Lozovoj, 1966; Ozcan *et al*., 2011). In European Russia, *I. sexdentatus* is often associated with pine plantations of 50-100 years old (Izhevsky *et al*., 2005).

Control

The main control measures for *I. sexdentatus* are similar to those used for the control of other bark beetle species. The most effective measure is to remove infested trees from the forest before the new generation of adult beetles emerges. Sanitation felling of infested trees involves the harvesting of windthrown trees (to remove breeding substrates), as well as the felling of infested standing trees. In order to prevent the further development of bark beetles (pupae or young adults inside the bark) the immediate debarking of logs is recommended, followed by the destruction, processing or composting of the bark. Pheromone mass-trapping can also be implemented locally. Quarantine measures should be implemented to prevent entry into the zones, where *I. sexdentatus* is absent. The main pathways of entry are: wood commodities of plant hosts, bark and wood packaging material (including dunnage) from countries where the pest occurs.

Phytosanitary risk

I. sexdentatus is not recommended for regulation as a quarantine pest by EPPO. It is not generally a primary pest and is only capable of attacking trees already suffering stress, either environmental or from other pests. It is already very widespread in Europe. It is a protected zone quarantine pest in Ireland and Cyprus under the EU regulations (EPPO GD, online, accessed in 2021; EFSA, 2017) and it had the same status in the United Kingdom (for Northern Ireland and Isle of Man) until the end of 2020. These are the principal areas facing a certain risk from this pest. *I. sexdentatus* is unlikely to spread to these areas naturally, therefore phytosanitary measures could be justified. However, it should be stressed that *I. sexdentatus* is a much less important pest than *I. typographus* (EPPO/CABI, 1996), and presents a much lower risk than that species.

Wood commodities, bark and wood packaging material are considered as pathways for this pest, which is also able to disperse by flight over tens of kilometres. *Ips* species are regularly intercepted on wood, wood packaging material and dunnage. During the period from 1985–2000, among the 2 740 Scolytinae intercepted at the US ports of entry and identified to species, 157 *I. sexdentatus* were found (Haack, 2001). In the Europhyt database, there are in total 66 interceptions of *Ips* species in the EU countries (in 1994–2017), all on coniferous wood or wood packaging material. For *I. sexdentatus*, there were two records of interceptions, one from Bulgaria on coniferous wood and one from Ukraine on *P. sylvestris* wood (EFSA, 2017).

PHYTOSANITARY MEASURES

If it is judged necessary to take phytosanitary measures against *I. sexdentatus*, measures equivalent to those taken against *I. typographus* would be effective. The following phytosanitary measures recommended by the EPPO Standard PM 8/2 (3) ‘Coniferae’ (EPPO, 2018) are considered to be effective against bark beetles including *I. sexdentatus*. Plants for planting, cut branches (including cut Christmas trees), round wood or other parts of the host plants of *I. sexdentatus* from countries in which this pest is present should originate from a pest-free area. If not, the following phytosanitary measures are required to import round wood from the area where the pest is present: wood should be bark-free or heat-treated (EPPO, 2009a), or fumigated with an appropriate fumigant, or treated with ionizing radiation (EPPO, 2009b). Harvesting wood residues, processing wood residues, hogwood and wood chips of the host should be produced from debarked wood or heat-treated. The heat treatment is also required for import of isolated bark. Wood packaging materials should meet requirements of ISPM no. 15 (I???, 2018). When wood with bark is moved in international trade, it should be stored and transported through the pest-free areas, or outside of the pest flight period, or to be in closed containers to prevent infestation.

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CABI and EFSA resources used when preparing this datasheet

CABI Datasheet on Pest. CABI Invasive Species Compendium, online. *Ips sexdentatus* (six-toothed bark beetle).

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EFSA Pest survey card on Pest *Ips sexdentatus* (2017) EFSA Journal 15. https://doi.org/10.2903/j.efsa.2017.4999 [Accessed: 24 February 2021]

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Datasheet history

This datasheet was first published in 1997 in the second edition of 'Quarantine Pests for Europe' and revised in 2021. 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.

CABI/EPPO (1997) *Quarantine Pests for Europe (2nd edition).* CABI, Wallingford (GB).

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