EPPO Datasheet: *Pissodes fasciatus*

Last updated: 2022-03-09

IDENTITY

Preferred name: *Pissodes fasciatus*
Authority: LeConte
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Coleoptera: Curculionidae: Molytinae
Common names: Douglas-fir weevil
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EU Categorization: A1 Quarantine pest (Annex II A)
EPPO Code: PISOFA

Notes on taxonomy and nomenclature

This species was described in 1876 by LeConte and there have been no taxonomic or nomenclatural changes since.

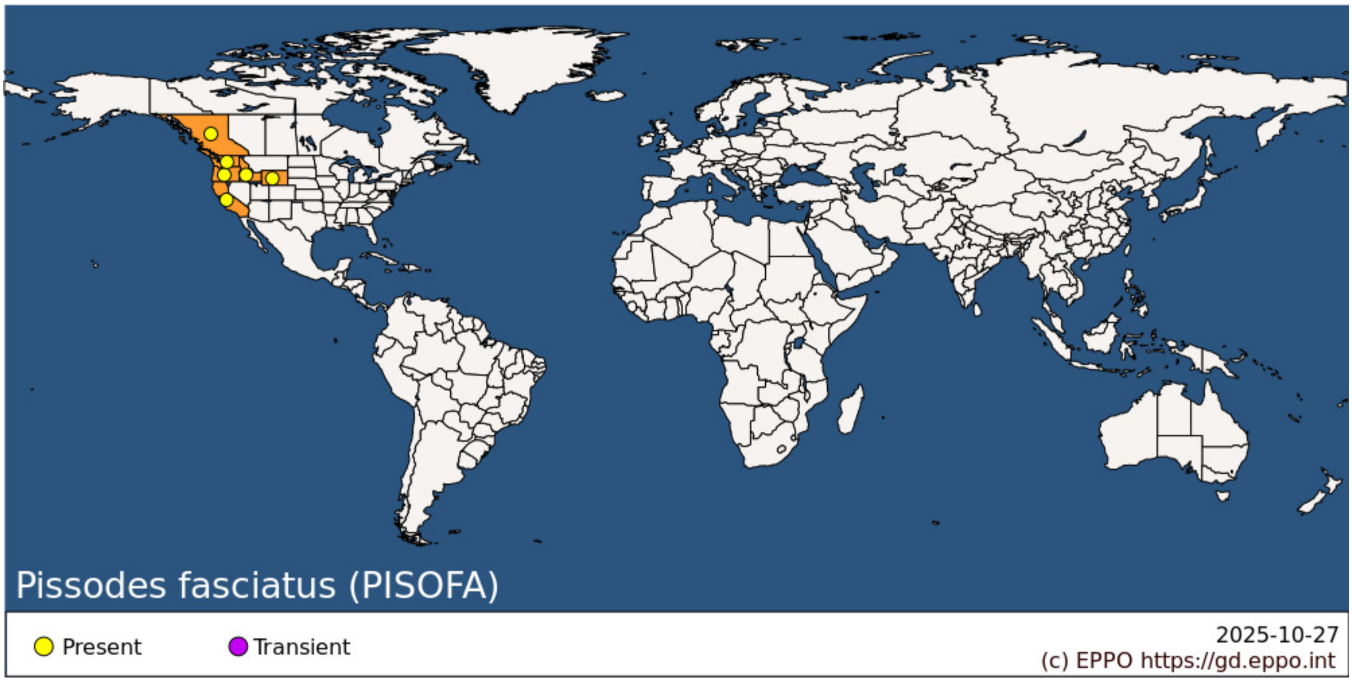
HOSTS

Pseudotsuga menziesii (Douglas-fir) is the only known host of *Pissodes fasciatus* (Hopkins, 1911). Both *P. menziesii* var. *menziesii* (the coastal variant) and *P. menziesii* var. *glauca* (the inland variant) are attacked by *P. fasciatus*. Two other members of this genus of conifers occurs in North America. The closely related species, *Pseudotsuga lindleyana*, occurs throughout Mexico, and many taxonomists consider it to be a variant of Douglas-fir (Gugger *et al* ., 2011). Another species in this genus, *Pseudotsuga macrocarpa* is distributed in Southern California. It may be that *P. fasciatus* can also colonize these taxa, but there are no known records.

Host list: *Pseudotsuga menziesii*

GEOGRAPHICAL DISTRIBUTION

Pissodes fasciatus is known from the states of California, Idaho, Oregon, Washington, and Wyoming, in the United States of America, and the province of British Columbia in Canada. The distribution of its only known host, *P. menziesii*, ranges up to western Alberta in Canada and from Washington and Montana south to Arizona and New Mexico in the USA, and even into Mexico if *P. lindleyana* is indeed a variant of *P. menziesii.* Thus, it is possible that the range of *P. fasciatus* is wider than currently reported.



North America: Canada (British Columbia), United States of America (California, Idaho, Oregon, Washington, Wyoming)

BIOLOGY

The biology of *P. fasciatus* is not well known. Most of the following details are from a study conducted in secondary growth stands of coastal Douglas-fir in Washington state (Deyrup, 1978), unless otherwise stated. The species has a strong affinity for breeding material that is dead or dying and shaded rather than sun-exposed. Thus, the root collar and lower trunk of dead or declining standing trees as well as stumps are selected by adults in forest stands. This species can also breed in stumps of trees (e.g., Christmas trees) in open plantations, but only when stumps are shaded by shrubs. Fallen trees can also be colonized but only on the undersides of trunks that are close to the ground and shaded. Moist subcortical environments created by shading of breeding material and its close proximity or contact with the ground creates ideal breeding sites for *P. fasciatus*. Furthermore, as larvae occur in bark that is about 0.5 – 2.0 cm thick, small-to-medium size saplings are the most suitable trees as mature trees have much thicker bark at the trunk base.

Pissodes fasciatus adults overwinter, although the site of overwintering has not been reported. Adults have not been observed feeding, and they have not been reported to cause damage. As adults of most other *Pissodes* species feed on fresh phloem, it is presumed that *P. fasciatus* also does so, meaning that the approximately 2.5 mm length of the snout limits adults to feeding on twigs or small saplings of Douglas-fir. Adults may be found mating on freshly fallen or cut trees in early spring when air temperatures reach 18-20 °C. Flying adults were attracted to baited funnel traps between mid-April and mid-August in coastal British Columbia (Miller & Hepner, 1999) and Western Oregon (Witkosky *et al*., 1986b). Peak emergence occurred in May in western Oregon (Witkosky *et al.*, 1986a). Oviposition occurs from April to August. Females use their mouthparts to create punctures in the outer bark and deposit 1-6 eggs per puncture, which are then plugged with either frass or macerated bark. As eggs hatch in the outer bark but larvae feed in the phloem, newly hatched larvae are presumed to chew their way from the outer bark to the phloem layer. It is unknown whether young larvae receive nutrients from the outer bark. The larval galleries in the phloem are parallel to the grain of the wood and usually do not score the surface of the sapwood. The number of instars is unknown but there are likely to be four as for many other species of *Pissodes*. Many larvae do not complete development before winter and thus overwinter in the phloem. The fact that both adults and larvae overwinter means that the developmental stages are not synchronized even in the same population, which makes for a complex phenology. The mature larva chews a pupal chamber in the bark or outer sapwood and lines it with bits of wood and bark to create a so-called ‘chip cocoon’ which is characteristic of most species of *Pissodes*.

DETECTION AND IDENTIFICATION

Symptoms

As the Douglas-fir weevil attacks the lower trunk and root collar area of dead or declining standing saplings, the lower side of trunks of recently fallen trees, and stumps, it is such material that should be examined for the presence of this weevil species. Presumably upon close inspection oviposition punctures could be found, although there is no report of how conspicuous these are. As oviposition punctures are seemingly largely or wholly confined to the outer bark, they would not be marked by resin flow. In addition to visual inspection for oviposition punctures, bark should be removed from the lower trunk and root collar of seemingly susceptible trees, and from stumps, to search for larvae in the phloem. As larvae of *Pissodes* are superficially similar to those of bark beetles, which are also common in the same areas of the tree trunk, it is important to trace the larval galleries to their origin to allow identification. If they do not originate from a much wider 'adult gallery', often with live or dead adult beetles present, but rather lead to the outer bark, this signals that the larva is that of a bark weevil. Although *P. fasciatus* is the only *Pissodes* species infesting Douglas-fir, another weevil, *Steremnius carinatus*, commonly feeds in this tree species in the lower bole and root collar area (Witkosky *et al.*, 1986a). Means of distinguishing between the immature stages and shape of larval galleries has not been reported for these two species. The presence of chip cocoons under the bark is evidence that *Pissodes* are present (as *Steremnius carinatus* does not construct these), although chip cocoons may persist for many years after they are vacated.

Morphology

Eggs

Eggs are yellowish, oval, and on average about 1.2 mm long (Deyrup 1978), and look like the eggs of many other species of *Pissodes.*

Larva

Mature larvae are typically 7-9 mm in length (but sometimes slightly smaller), legless, and the abdomen is cylindrical and slightly curved downwards. The milky-white body contrasts with the light brown head. Superficially, larvae of this species look like larvae of other species of *Pissodes*, and there is no detailed description of the larval stage of *P. fasciatus* to help distinguish it from larvae of native species in the EPPO region. A larva is illustrated in Anderson (1947), but not in sufficient detail to show diagnostic characters.

Pupa

Pupae are about 7-8 mm in length, have a beak, and are milk-white for a few days before gradually obtaining brown tones as they mature. Pupae of different *Pissodes* species cannot currently be distinguished.

Adult

Adults have been described (LeConte, 1876; Hopkins, 1911), albeit in insufficient detail to allow an unambiguous diagnosis. Adult *P. fasciatus* are 5-8 mm long (Hopkins, 1911), which overlaps with the size range of most native European *Pissodes* species, except *P. piniphilus* and *P. scabricollis* which are smaller. The base colour of both the dorsal and ventral integument is piceous to black as for all native European species. The easiest way to discriminate *P. fasciatus* from the nine native European species is by the patterns and colours of scales on the elytra. The Douglas-fir weevil has a distinct anterior ochre patch on each elytron that extends slightly obliquely from interstriae 4 to 6 (sometimes 7). This patch has no, or rarely very few, white scales. There is no distinct posterior band or patch but rather a large diffuse field of dispersed white scales that extends obliquely from the elytral suture to the lateral edge. A few ochre scales are scattered on the posterior and anterior edges near the outer edge of the field. No European species of *Pissodes* has this elytral scale pattern.

Detection and inspection methods

Funnel traps baited with (±)-pityol and (-)-alpha-pinene were attractive to *P. fasciatus* in a coastal Douglas-fir stand in British Columbia although only a mean of 2.3 beetles per trap were caught over an approximately four-month period (Miller & Hepner, 1999). This trapping approach may be used to detect the presence of adults in susceptible

Douglas-fir stands in the EPPO region; however, the trapping effort would have to be relatively high as the semiochemicals are at best moderately attractive. Susceptible stands are those experiencing tree mortality or decline due to natural thinning, precommercial thinning, soil compaction, tree diseases, and altered drainage (Witkosky *et al.*, 1986a; Witkosky, 1989) and thus should be the priority target of surveys. Removal of bark on the lower 1 m of the trunk and root collar area of dead and dying saplings suspected of being infested may reveal larval galleries in the phloem, chip cocoons, pupae, callow adults and/or round adult emergence holes in the bark. DNA barcodes are not yet available for *P. fasciatus*.

PATHWAYS FOR MOVEMENT

Adults disperse by flight and by walking (Deyrup, 1978), but it is not known how far they can naturally disperse in a season. It is possible that dispersal could be aided by human transport of infested saplings and foliage of Douglas-fir. Long-distance transport via lumber, fresh foliage, and dunnage is possible, although evidence is lacking.

PEST SIGNIFICANCE

Economic impact

Douglas-fir is an economically important species in much of Europe, having been planted covering about 800 000 ha in 2008, especially throughout Central and Western Europe (Brus *et al.*, 2011). It grows quickly and has denser wood than commercially harvested native conifers, so it is highly suitable for lumber and manufactured products. Douglas-fir is actively managed in Europe and there are plentiful plantations of regenerating saplings that are potentially suitable for *P. fasciatus.* However, *P. fasciatus* is only reported to attack saplings that are dead or weakened, recently fallen trees, and stumps. Thus, it functions as a secondary pest rather than as a primary pest. By itself it likely does not pose much risk of significant economic impact if it establishes in Europe. However, it is a known vector of black stain root disease in North American Douglas-fir forests, a disease which can spread through root systems and soil from infested trees or stumps to healthy trees, where it results first in productivity loss and then tree death within 2-4 years (Witkosky and Hansen, 1985; Witkosky *et al.*, 1986b; Jacobi, 1992). In particular, precommercial thinning of Douglas-fir stands creates many stumps that are readily colonized by *P. fasciatus* and other bark-inhabiting beetles that serve as inoculation points for fungi and disease foci for spread to healthy trees (Witkosky *et al.*, 1986a). The causal agent of this disease is the pathogenic fungus, *Grosmannia wageneri* (also sometimes reported as *Leptographium wageneri* and *Ophiostoma wageneri*). This fungus is an EPPO A1 quarantine pest and could cause much economic and ecological damage to Douglas-fir and other conifers in Europe if introduced.

Control

No tactics have been developed specifically to manage *P. fasciatus*. More care with harvesting operations to minimize damage to unharvested saplings may keep them from being attacked by *P. fasciatus*. Quick removal of dead and dying tree trunks and stumps will reduce the amount of susceptible breeding material in stands. There are some insect natural enemies (mainly parasitic wasps) that kill larvae of *P. fasciatus*, but the extent to which these control weevil populations is unknown. Most of these parasitoids also prey on other bark inhabiting weevils in Douglas-fir and other conifers. In Western Oregon, the timing of precommercial thinning influences the extent to which stumps are colonized by *P. fasciatus*; thinning during or after the peak flight period in May resulted in less stump colonization than thinning performed in January or September prior to the peak flight period (Witkosky *et al.*, 1986a; Witkosky, 1989).

Phytosanitary risk

This species is only known to infest *Pseudotsuga menziesii* which is not native to the EPPO region. However, Douglas-fir is the most abundant and widely planted non-native tree species in Europe (covering 800 000 ha in 2008), having been planted throughout Central and Western Europe, and >80% of which occurs in France and Germany (Brus *et al.*, 2011). If introduced to Europe, this species has a high possibility of establishing in Douglas-fir as amenable climates and microhabitats occur there. As these beetles strongly prefer to breed in dead and weakened saplings, they are not expected to pose a significant direct risk to healthy trees; however, if they carry *G. wageneri*, this pathogen could establish in beetle-colonized trees and spread via the roots and soil to healthy trees. In addition, native European bark beetles species that infest the lower trunks, root collar and roots of Douglas-fir, e.g., species of *Hylastes*, could vector this pathogen and increase its rate of spread, possibly including spread to other genera of Pinaceae.

The risk of inadvertent introduction of *P. fasciatus* from its native range in western North America to the EPPO region via transportation on Douglas-fir logs is likely to be very low as these materials are typically not exported from North America to Europe. It would require the transportation of infested untreated dunnage and possibly infested saplings, seedlings or foliage samples to allow spread of this species, and movement of these materials is subject to high levels of regulation. Although any insect may be transported as a 'hitch-hiker', it seems unlikely this could occur for *P. fasciatus*.

PHYTOSANITARY MEASURES

Adherence to International Standards for Phytosanitary Measures No. 15 for solid wood packing material (**ISPM 15**) will greatly decrease the risk of introduction of bark- and wood-boring insects, including *P. fasciatus*. Any seedlings, saplings, logs or foliage of *Pinus* introduced into the EPPO region should be quarantined until it is thoroughly checked for signs and symptoms of non-native species, including *P. fasciatus*. Fumigation of tree material suspected of being infested with *P. fasciatus* is expected to be highly effective as has been demonstrated for the related Asian species, *Pissodes nitidus.* Fumigation using methyl isothiocyanate (applied at 20 g/m^3 for 24 h at 15 °C), sulfuryl fluoride (30 g/m^3, 24h, 15°C), methyl bromide (10 g/m^3, 24h, 15°C), and methyl iodide (30 g/m^3, 24h, 15°C) cause complete mortality of *P. nitidus* eggs, larvae, and pupae under the bark (Naito *et al.*, 1999, 2003; Soma *et al.*, 1999). In the EU, methyl bromide can only be used in emergency quarantine situations upon receiving special permission from the European Commission.

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EFSA resources used when preparing this datasheet

EFSA Pest survey card *on Pissodes cibriani, P. fasciatus, P. nemorensis, P. nitidus, P. punctatus, P. strobi, P. terminalis, P. yunnanensis* and *P. zitacuarense*. Available at: https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/sp.efsa.2020.EN-1910 [Accessed 15 December 2021]

ACKNOWLEDGEMENTS

This datasheet was prepared in 2022 by Stephen D. Langor (University of Alberta) and David W. Langor (Natural Resources Canada, Canadian Forest Service). Their valuable contributions are gratefully acknowledged.

How to cite this datasheet?

EPPO (2025) *Pissodes fasciatus*. EPPO datasheets on pests recommended for regulation. Available online. https://gd.eppo.int

Datasheet history

This datasheet was first published online in 2022. It is 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.

Co-funded by the European Union