EPPO Datasheet: *Pissodes punctatus*

Last updated: 2021-11-04

IDENTITY

Preferred name: *Pissodes punctatus*
Authority: Langor & Zhang
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Coleoptera: Curculionidae: Molytinae
Common names: Armand pine bark weevil
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EU Categorization: A1 Quarantine pest (Annex II A)
EPPO Code: PISOPU

Notes on taxonomy and nomenclature

This species was described in 1999 (Langor *et al.*, 1999) and there have been no subsequent taxonomic or nomenclatural changes.

HOSTS

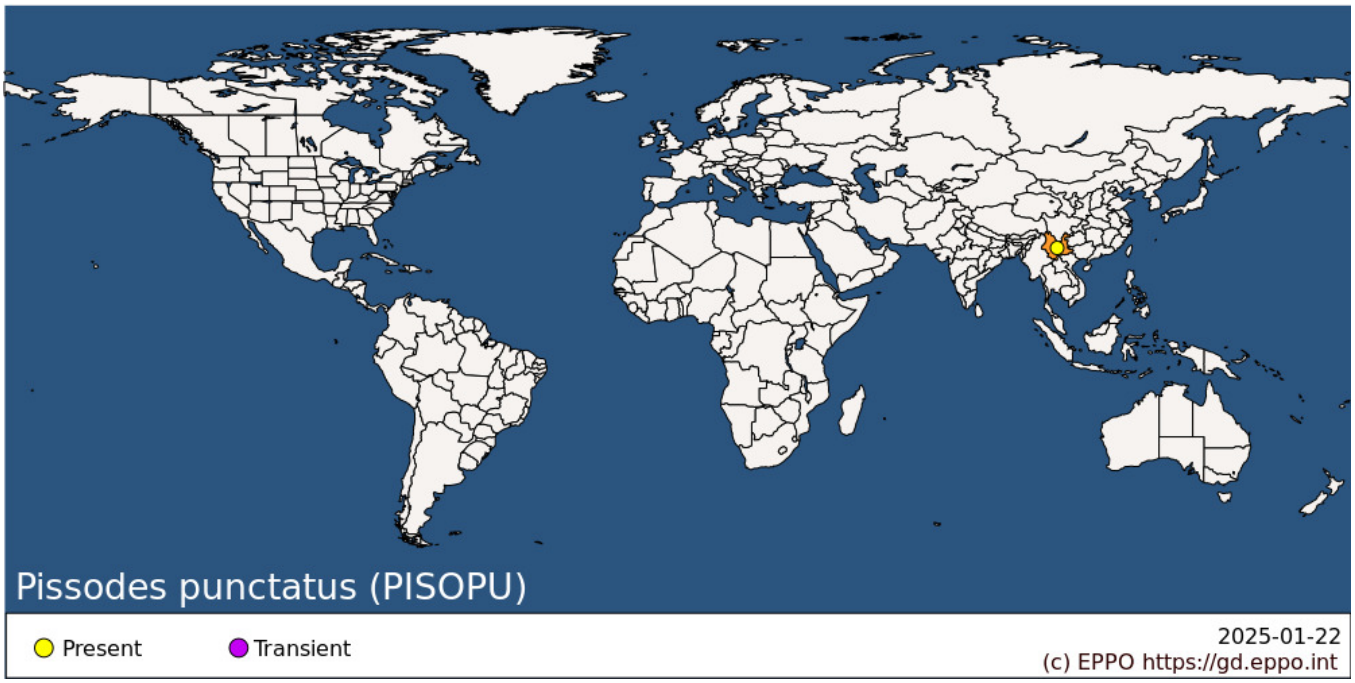
Pinus armandii (Armand's pine) is the most common tree species attacked by *Pissodes punctatus* in the forests of South-west China, although *Pinus yunnanensis* is also sometimes successfully attacked (Duan *et al.*, 1998; Langor *et al.*, 1999). Chai and Liang (1990) report that adults will feed on *P. yunnanensis* when they cannot find Armand's pine, but that they did not mate and lay eggs on *P. yunnanensis*. In laboratory studies in which adult Armand pine bark weevils were caged on cut twigs of 21 species of Pinaceae, including species native to China and introduced alien species, 18 species in three genera were fed upon by the weevils, including *P. armandii* and *P. yunnanensis*. Of those, weevils laid eggs on 12 (Duan *et al.*, 1998).

Additional note on host plants
Species colonized in nature (in Yunnan Province): *Pinus armandii, Pinus yunnanensis*
Species fed upon when presented with cut twigs (*denotes species on which eggs were laid):
Native to Southwest China: *Pinus massoniana**, *Pinus wallichiana** (=*Pinus griffithii*), *Pinus densata, Pinus kesiya* var. *langbianensis*
Asian species, including other regions of China: *Pinus sylvestris* var. *mongolica, Pinus tabuliformis, Pseudolarix amabilis**
European or Mediterranean species: *Pinus pinaster**, *Pinus halepensis**
Nearctic and Central American species: *Pinus strobus**, *Pinus ayacahuite**, *Pinus edulis**, *Pinus pseudostrobus, Pinus patula, Pinus taeda**, *Cedrus deodara**

Host list: *Pinus armandii, Pinus yunnanensis*

GEOGRAPHICAL DISTRIBUTION

Pissodes punctatus is currently known only from Yunnan province in the People's Republic of China where it occurs between 2000-2900 m in elevation (Langor *et al.*, 1999; Zhang *et al.*, 2007). It is possible that its distribution is broader, including other provinces where its natural hosts are found, especially Sichuan.



Asia: China (Yunnan)

BIOLOGY

Duan *et al.* (1998), Langor *et al.* (1999), and Chai and Liang (2009) provide information on the biology of *P. punctatus*. A 1-year life cycle is most common but this may vary with altitude, and generations may overlap in the same stand. In a typical one-year life cycle, adults begin emerging from their pupal chambers (chip cocoons) under the bark in late winter to early spring, and the emergence period of the species can span 6-9 months depending on the locality and its climate. Emerged adults are diurnal and positively phototactic (Chen *et al.*, 2013) and capable of flight. They can also disperse by walking. Adults prefer to feed and lay eggs on parts of the trunk that have smooth bark and on leaf sheaths. The species only attacks living and healthy trees. Adults actively avoid areas with rough bark and dead trees. Trees which are 15-30 years old are strongly preferred for feeding and egg laying as these trees are sufficiently large to permit development and the trunks have mostly smooth bark. Older trees have mainly rough bark with interspersed small patches of smooth bark that are difficult for adults to locate. As adults feed, mainly on the upper trunk, they become sexually mature and produce a pheromone that attracts both sexes (Li *et al.*, 2007; Ze *et al.*, 2010), and mating occurs on the trunk. Adults mate multiple times over their lifespan. Eggs are typically deposited from June to November in punctures chewed by female adults in the phloem of areas of the trunk with smooth bark, but mainly in the middle and lower portions of the tree trunk (1-3 m above ground level; Li *et al.*, 2000). The oviposition period can last up to nine months. Larvae start appearing by July and feed in the cambium and phloem of trunks, moving in a downward direction and creating meandering feeding tunnels that increase in diameter as the larvae grow. Sometimes larvae even reach the roots. Larvae overwinter in the trunk when it is too cold for development to continue (typically from November). Development continues the next year when temperatures are sufficiently warm (typically from mid-February to March). There are four larval instars (Situ Ying Xian, unpublished data). Pupation occurs from mid-April to early June. The mature larva excavates a chamber at the end of the feeding gallery in the outer xylem and lines it with elongated wood chips stripped from the sapwood, and this is where pupation occurs. These so-called chip cocoons are typical of most species of *Pissodes*. Adults emerge by chewing a circular hole 4-5 mm in diameter through the bark. Adults can live for up to two years and overwinter in the decaying vegetation on the forest floor (Langor *et al.*, 1999). The species does not have a diapause period.

DETECTION AND IDENTIFICATION

Symptoms

Adults of *Pissodes punctatus* attack healthy trees, mainly those that are 15-30 years old (Duan *et al.*, 1998). Larvae

feed in the phloem and sapwood of trunks, moving down the trunk and creating meandering and widening feeding galleries that sometimes reach the roots (Duan *et al.*, 1998). Feeding by adult weevils, usually starting in May, results in resin droplets that exude from puncture wounds on the trunk. The resin droplets can be seen from several metres away, and trees exhibiting resin flow should be closely inspected. Upon inspection of trees undergoing attack, punctures (0.5 mm wide and 1.0-2.5 mm deep) made by adults will be visible on portions of trunks that have smooth bark and on leaf sheaths. Puncture wounds and associated cambium discolouration are indicators of *P. punctatus* infestation. Infested trees begin dying in September and the foliage turns yellow in the fall, and orange or red by the next spring. The presence of chip cocoons under the bark is also evidence that *Pissodes* species are or have been present, however chip cocoons may persist for many years after they are vacated. It would not be possible to distinguish old, abandoned chip cocoons of *P. punctatus* from those of other species of *Pissodes* that colonize pine trunks.

Morphology

Eggs

Eggs are yellowish-white, oval, translucent and approximately 1.0-1.1 mm long and 0.7-0.8 mm wide (Chai and Liang, 1990).

Larva

Fourth-instar larvae are 6.1-10.7 mm long and 2.0-2.9 mm wide, milky-white, slightly curved, wrinkled and have light brown heads (Chai and Liang, 1990). A detailed description of mature larvae of this species is provided by Williams and Langor (2011).

Pupa

Pupae are 4.2-6.8 mm long and 1.4-2.8 mm wide (Chai and Liang, 1990). They are at first ivory-white, changing to dark brown as they mature.

Adult

Adult morphology is described in detail by Langor *et al*. (1999). The robust adult has a long, curved snout. The cuticle is mostly black and sparsely clothed with recumbent, whitish, scale-like setae. The whitish scales on the elytra form a diffuse, antedeclivital, transverse fascia (patch), but the elytra lack posthumeral fascia. Elytra have large, deep and elongate punctures. Females are 5.1-7.1 mm long and 2.0-2.7 mm wide at the elytra, and males are 5.0-7.0 mm long and 2.2-2.9 mm wide.

Detection and inspection methods

This species attacks only live pines and are found mainly on trees which are 15-30 years old, although they occasionally attack younger and older trees. Trees with copious resin droplets on the trunk should be investigated for signs of weevil attack, particularly feeding and oviposition punctures on leaf sheaths and portions of the trunk with smooth bark and presence of adults on the bark. Removal of bark on the trunks of trees suspected of infestation will reveal larval galleries in the phloem and sapwood, chip cocoons, pupae, callow adults and/or round adult emergence holes in the bark. Pines with yellow to orange foliage should especially be inspected for signs of attack. There are several species of *Pissodes* in the EPPO Region that infest the trunks of pines so care must be taken to collect larvae and adults. Specimens of *Pissodes punctatus* can be identified using Langor *et al.* (1999) for adult diagnosis or Williams and Langor (2011) for identification of mature larvae. Adults are very distinct; the black cuticle and the large and deep punctures on the elytra will distinguish this species from all nine species of native European *Pissodes*. Larvae have not been described for all European species, so if live larvae are found in trees suspected to be infested by *P. punctatus*, the most rapid and accurate diagnosis is via the use of DNA barcodes which are available for *P. punctatus* (Zhang *et al.*, 2007; **GenBank**) and for most European species of *Pissodes* (Haran *et al.*, 2016).

PATHWAYS FOR MOVEMENT

Adults are capable of flying and can move at least 95 m in a single flight (Duan *et al.*, 1998). The species spreads

quickly among Armand pine plantations in southern Yunnan (Duan *et al.*, 1998). It is also possible that human transplant of infested Yunnan pine and Armand pine trees as well as transport of logs and foliage could help dispersal of this species within the region. As this species are known to attack pines which are up to 9 m tall and 20 cm diameter at breast height (Li *et al.*, 2000), long distance transport via lumber or dunnage is possible.

PEST SIGNIFICANCE

Economic impact

Pinus armandii is an important timber and reforestation species in Southern China (Li *et al.*, 2007). In *P. armandii* stands located in Huize County, Yunnan, about 90% of trees were badly damaged by *P. punctatus* (Liu *et al.*, 2005). At Damashan Forest Farm, Yunnan, mortality of *P. armandii* caused by *P. punctatus* was 7.2% in 1995, increasing to 9.8% in 1996 and 17.3% in 1997 (Duan *et al.*, 1998). Surveys in the Huashan pine forest showed that the annual mortality rate was 7% in 1997, 10% in 1998, 15% in 1999, and 30% in 2000 (Lei *et al.*, 2003). In trees that are attacked by these weevils but not killed, there is subsequent volume loss (Li *et al.*, 2001).

Control

There are currently no efficient and economical control measures that can be deployed over a large geographic scale. Chai and Liang (2009) report on 11 pesticides that kill *P. punctatus*, three applied as powders and nine as liquids. All were effective but the best were Xiweiyin and Piyawu powders which killed >88% of individuals. Two environmentally benign pesticide powders, No. 2 and No. 3 Hulinshen powders, were applied to young Armand pine on which adult *P. punctatus* were placed, resulting in 95.6% and 91.6% mortality, respectively, by five days post-application (Liu *et al.*, 2005). These pesticides can be effective at controlling adults during the feeding period when they are present on the bark surface.

High mortality of *P. punctatus* using the fungus *Isaria farinosa* can be achieved in laboratory settings with mortality of larvae, pupae and adults reaching as high as 91%, 89% and 89%, respectively, suggesting that this agent has potential as a commercial biocontrol agent against bark weevils (Yang *et al.*, 2007, 2009).

Cutting infested pines followed by removal of the bark and spraying the wood and bark with pesticide causes >96% mortality of larvae (Chai and Liang 1990), but this tactic is labour intensive and therefore not cost effective over large areas.

Male *P. punctatus* produce a sex pheromone containing grandisol, which is attractive to both sexes (Ze *et al.*, 2010). In field tests, the combination of grandisol and two tree monoterpenes, (+)-limonene and 3-(+)-carene, was highly attractive to both sexes (Ze *et al.*, 2010). Deployment of lures containing these three semiochemicals and attached to funnel traps may be an effective means of monitoring *P. punctatus* and possibly other *Pissodes* species, but is too costly to be an economically feasible control strategy.

To prevent introduction of this weevil to other regions, importation of trees and foliage of *P. yunnanensis* and *P. armandii* should continue to be closely regulated.

Phytosanitary risk

Although recorded as infesting mainly *Pinus armandii* and sometimes *Pinus yunnanensis* in nature, *P. punctatus* can feed on and oviposit in cut twigs of many other pine species, including the European species, *Pinus pinaster* and *Pinus halepensis* (Duan *et al.*, 1998). Thus, it is possible that this weevil species could breed in and cause significant damage to pine species in the EPPO region should it be introduced there. The risk of inadvertent introduction of *P. punctatus* to the EPPO region currently seems somewhat low. Logs with retained bark and untreated lumber of this pine species are not known to be exported to Europe, so it would require the transportation of untreated dunnage and infested trees 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. punctatus*.

PHYTOSANITARY MEASURES

Adherence to International Standards for Phytosanitary Measures No. 15 for solid wood packing material (FAO, 2019) will greatly decrease the risk of introduction of bark- and wood-boring insects, including *P. punctatus*. Any trees or tree parts of *Pinus armandii* and *Pinus yunnanensis* introduced into the EPPO region should be quarantined until thoroughly checked for signs and symptoms of non-native species, including *P. punctatus*.

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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 October 2021]

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Datasheet history

This datasheet was first published online in 2021. 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.

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