



EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION
ORGANISATION EUROPEENNE ET MEDITERRANEE
POUR LA PROTECTION DES PLANTES

Pest Risk Analysis for
Pseudips mexicanus
(Coleoptera: Curculionidae: Scolytinae)



Pseudips mexicanus adult. EPPO Global Database. Courtesy: Robyn Earl (IE).

EPPO Technical Document No. DT1100
September 2026

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The risk assessment follows EPPO standard PM 5/5(1) *Decision-Support Scheme for an Express Pest Risk Analysis* (EPPO, 2012) as recommended by the EPPO Panel on Phytosanitary Measures. Pest risk management was conducted according to the EPPO Decision-support scheme for quarantine pests PM 5/3(5) (EPPO, 2011; Annex 1). The risk assessment uses the terminology defined in ISPM 5 Glossary of Phytosanitary Terms (FAO, 2024).

Cite this document as:

EPPO (2026) EPPO Technical Document No. DT1100. Pest risk analysis for *Pseudips mexicanus* (Coleoptera: Curculionidae: Scolytinae). EPPO, Paris. Available at <https://gd.eppo.int/taxon/IPSXRA/documents>

Following this PRA, *P. mexicanus* was not added to the EPPO A1/A2 Lists of pests recommended for regulation as quarantine pests, and therefore no risk management measures were recommended. It is unlikely that *P. mexicanus* will cause important economic loss in the potential area of establishment; thus, no endangered area for *P. mexicanus* in the EPPO region was defined.

**Pest Risk Analysis for
Pseudips mexicanus (Coleoptera: Curculionidae: Scolytinae)**

PRA area: EPPO region (as per May 2025)

Prepared by: Expert Working Group on *Pseudips mexicanus*

Dates: 13–16 May 2025. Further reviewed and amended by EPPO Core members (2025-06/07), Panel on Phytosanitary Measures (2025-10) and Panel on Quarantine Pests for Forestry (2025-11).

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The first draft of the PRA was prepared by A. Bourke and C. McGee (Plant Sciences Division, DAFM, Ireland) and D. Musolin (EPPO) and reviewed by EPPO Secretariat (M. Suffert and R. Tanner).

Ratings of likelihoods and levels of uncertainties were made during the meeting. These ratings are based on evidence provided in the PRA and on discussions in the group. Each EWG member provided a rating and a level of uncertainty anonymously and proposals were then discussed together in order to reach a final decision. Such a procedure is known as the Delphi technique (Schrader et al., 2010).

Following the EWG, the PRA was reviewed by the following EPPO PRA Core members: J. Boberg (SLU, SE), C. Gent (Defra, UK), J.M. Guitian Castrillon (TRAGSATEC, ES), A. MacLeod (Defra, UK), and D.J.

van der Gaag (Netherlands Food and Consumer Product Safety Authority, NL) and EPPO Secretariat (M. Suffert and R. Tanner).

The PRA was reviewed and amended by the EPPO Panel on Phytosanitary Measures (2025-10) and the Panel on Quarantine Pests for Forestry (2025-11). EPPO Working Party on Phytosanitary Regulation and Council agreed that *P. mexicanus* is not added to the A1/A2 Lists of pests recommended for regulation as quarantine pests.

*Note: In this PRA, all elements considered relevant are presented in the text. However, readers wishing a rapid reading can focus on the **bold highlighted text**.*

**Summary of the Pest Risk Analysis for
Pseudips mexicanus (Coleoptera: Curculionidae: Scolytinae)**

PRA area:

EPPO region (Albania, Algeria, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Guernsey, Hungary, Ireland, Israel, Italy, Jersey, Jordan, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Malta, Moldova, Montenegro, Morocco, Netherlands, Norway, North Macedonia, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tunisia, Türkiye, Ukraine, United Kingdom, Uzbekistan).

Describe the endangered area:

The Expert Working Group (EWG) considered that the potential area of establishment of *P. mexicanus* could include Northern Africa; most of continental Europe (particularly Spain); some parts of the United Kingdom and Ireland; isolated regions in Azerbaijan; the southern parts of the Russian Federation; and Central Asia. There is an uncertainty on the northern limit and whether the pest could survive in areas with a drier climate in the EPPO region. However, the EWG believed that it is unlikely that *P. mexicanus* will cause important economic losses in the potential area of establishment. **Thus, no endangered area (in terms of ISPM 5) for *P. mexicanus* in the EPPO region was defined.**

Main conclusions:

Pseudips mexicanus is a secondary bark beetle native to Mexico and Guatemala with confirmed hosts in the genus *Pinus*. The pest recently entered the EPPO region (recorded in 2023 in Ireland, where it is currently under official control and eradication). Because several *Pinus* species are known as hosts of *P. mexicanus* in its native range and one *Pinus sylvestris* tree was found with galleries of *P. mexicanus* in Ireland in 2025, the EWG considered that all *Pinus* spp. are potential hosts.

Entry: Round wood and sawn wood with bark and wood packaging material (WPM) from Mexico and Guatemala were identified as the most likely pathways. The introduction of the pest to Ireland is suspected to be linked to WPM. Overall, the likelihood of entry was rated as **moderate** with **moderate** uncertainty. The limited amount of trade of round wood and sawn wood with bark from Mexico and Guatemala to the EPPO member countries and the known records of interception of *P. mexicanus* in WPM are taken into account.

Transfer from infested round wood and sawn wood with bark or WPM to suitable hosts in the PRA area may be problematic for *P. mexicanus*, as it depends on the alignment of a range of favourable circumstances (Section 8). To establish a new breeding population, a sufficient number of males and females have to escape from the infested material and find suitable plant material and conditions to breed (dying, recently dead or stressed *Pinus* host trees). As with many other bark beetle species, males colonise host material and initiate gallery construction, which then attract other males (to infest the tree) and females (to mate) (Section 2). This implies that mating does not take place at the site of introduction but only after finding suitable breeding material.

Likelihood of establishment outdoors in the PRA area was rated as **very high** with **low** uncertainty. The pest is known to have been present in Ireland since 2023. At least one host *Pinus* species (*Pinus sylvestris*) is widely present in the PRA area. Even though *Pinus contorta* and *Pinus radiata* were cited as hosts of *P. mexicanus*, the EWG considered their host status uncertain because of their limited distribution in the native range of the pest. More species from the genus *Pinus* might become hosts. *Pseudips mexicanus* is present in different climatic types in its native range and can tolerate a wide range of climates. Thus, it is unlikely that climate will be a limiting factor for *P. mexicanus* to potentially establish within the EPPO region. The overwintering strategy of *P. mexicanus* in colder climates is unknown and it is still possible that it may struggle to survive in the northern part of the EPPO region (with annual GDD < 900 above the estimated lower developmental threshold of 8.5°C). The EWG considered that the potential area of establishment could include Northern Africa; most of continental Europe (particularly Spain); some parts of the United Kingdom and Ireland; isolated regions in Azerbaijan; the southern parts of the Russian Federation; and Central Asia. Under conditions of climate change, the potential area of establishment of *P. mexicanus* can increase.

Likelihood of establishment in protected conditions was rated as **very low** with **low** uncertainty.

The magnitude of spread was rated as **moderate**, because most bark beetles flights are local and short and natural spread was estimated to be within 1–10 km per year; however, uncertainty was rated as **high**, because no information is available about the dispersal behaviour of *P. mexicanus*.

The magnitude of impact in the current area of distribution was rated as **very low** with **low** uncertainty, because there is no evidence of economic, environmental nor social impact of *P. mexicanus* in Mexico, Guatemala, and Ireland.

The magnitude of impact in the EPPO region could be higher than that in the current area of distribution; it was rated as **low**. The uncertainty is **moderate**, because there is the possibility that *P. mexicanus* becomes more aggressive in the EPPO region than in its native range.

It is noted that under conditions of climate change the potential area of establishment might increase if compared to the current climate (e.g. to extend in Southern Sweden, Poland and Kazakhstan).

Phytosanitary risk for the <u>endangered area</u> was assessed to be low . The EWG believed that it is unlikely that <i>P. mexicanus</i> will cause important economic loss in the potential area of establishment; thus, no endangered area for <i>P. mexicanus</i> in the EPPO region was defined.	High ☐	Moderate ☐	Low ☒
Level of uncertainty of assessment was assessed to be moderate , because there is the possibility that <i>P. mexicanus</i> becomes more aggressive in the EPPO region than in its native range.	High ☐	Moderate ☒	Low ☐

The EWG and EPPO Panel on Phytosanitary Measures (2025-10) decided to not recommend the addition of *P. mexicanus* to the EPPO A1 and A2 Lists of pests recommended for regulation as quarantine pests for the time being, and therefore to not propose risk management options.

The EWG advised to closely follow the situation in Ireland and if new information becomes available, this could warrant a revision of this PRA.

Other recommendations:

Recommendations for future research are provided in Section 18.

The EWG also noted that DAFM (NPPO of Ireland) used pheromone lures earlier developed for *Ips cembrae* and *I. sexdentatus* and these lures demonstrated their attractiveness for *P. mexicanus* (see Section 18).

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Stage 1. Initiation

Reason for performing the PRA. *Pseudips mexicanus* (Coleoptera: Curculionidae: Scolytinae) is a bark beetle known for infesting a range of pine (*Pinus* spp.) species. The species was only known to occur in Mexico and Guatemala until 2023, when it was reported in the EPPO region in Ireland. In 2023, 93 specimens of *P. mexicanus* were reported in *Ips* spp. traps located in conifer plantations in the Cratloe area (municipality of Shannon) in Clare County on the west coast of Ireland (DAFM, 2023)¹. A further 260 beetles were found in 2024 and 269 in 2025 including findings in Co. Limerick, outside the original demarcated area. In Ireland, the pest has not been observed causing damage to living trees and has only been recovered from traps and dead trees. In 2024 and 2025, two adult beetles were found in the same location of different dead *Pinus*² *contorta* trees. The beetle found in 2024 was on the bark of a *Pi. contorta* tree; no other life stages or galleries were found. The beetle found in 2025 was in an under bark gallery on *Pi. contorta*; no other life stages were found. In 2025 breeding galleries under the bark of a single dead *Pi. sylvestris* tree were found along with two adults of *P. mexicanus*. Pupae were also found but have not yet been identified. In its native range in Mexico and Guatemala, *P. mexicanus* is considered to be a secondary pest attacking recently dead and dying trees. There are two reports of attack on stressed saplings (Cibrián Tovar et al., 1995; FIPRODEFO, 2025). As *P. mexicanus* was recently detected in the EPPO region, and as the pest is reported to potentially be a threat to *Pinus*, an ecologically and economically important tree genus in the EPPO region, the EPPO Secretariat added this pest to the EPPO Alert List in February 2024. As ISPM 11 requires, a PRA process was initiated when a pest presenting a potential pest hazard for entry into the EPPO region was identified. The EPPO Panel on Phytosanitary Measures (PPM) selected *P. mexicanus* as a possible priority for PRA in March 2024, and the EPPO Working Party for Phytosanitary Regulations (WPPR) selected it for PRA in June 2024.

PRA area. The EPPO region as of 2025 (map at https://www.eppo.int/ABOUT_EPPO/eppo_members).

Stage 2. Pest risk assessment

1. Taxonomy

Taxonomic classification. Kingdom: Animalia; Phylum: Arthropoda; Subphylum: Hexapoda; Class: Insecta; Order: Coleoptera; Family: Curculionidae; Subfamily: Scolytinae; Genus: *Pseudips*; Species: *Pseudips mexicanus* (Hopkins, 1905).

Synonyms. *Ips mexicanus*; *Tomicus mexicanus*; *Tomicus wieslanderi* (Atkinson, 2025), *Orthotomicus mexicanus* (Cognato & Smith, 2024).

EPPO code. IPSXRA.

Notes on taxonomy. *Pseudips mexicanus* was previously classified under the genus *Ips*. However, phylogenetic analysis that incorporated molecular, morphological, and behavioural characters found *Ips mexicanus* to be monophyletic and distinct from *Ips* (Cognato, 2000). This resulted in the formation and recognition of a new genus called *Pseudips* (Annex 2; Cognato, 2000; Cognato, 2013; Atkinson, 2025). The genus *Pseudips* originally was comprised of three species: *Pseudips concinnus* (Mannerheim, 1852), *Pseudips mexicanus* (Hopkins, 1905), and *Pseudips orientalis* (Wood & Yin, 1986), all of which were transferred from *Ips*. The genus is recognized by ISPM 27 (DP 27).

¹ In 2023, the Irish NPPO identified the bark beetles as belonging to the *Pseudips* genus through morphological analysis. This identification was confirmed by the European National Reference Laboratory (EURL). Specimens were subsequently sent to Prof. A. Cognato (Michigan State University, USA), who confirmed identification as *P. mexicanus* using both morphological and molecular analysis. A scientific publication on identification of these specimens is under preparation (A. Cognato, pers. comm., 2025).

² hereafter abbreviated as '*Pi.*' in order to avoid confusion with the genus *Pseudips*.

Ips radiatae (Hopkins, 1915) was initially described as a distinct species based on morphological differences from specimens collected from California, USA, but the species was later synonymized with *P. mexicanus* due to a lack of consistent differences (Hopkins, 1915; Hopping, 1963; Cognato & Smith, 2024). Potential biological and morphological distinctions were also noted by Wood (1982) without taxonomic action.

Following analysis by Cognato and Smith (2024) (Annex 3), *P. radiatae* (Hopkins, 1915) has been resurrected from synonymy with *P. mexicanus* due to sufficient COI DNA sequence differences and subtle yet distinct diagnostic morphological characteristics traditionally used for recognition of species belonging to the bark beetle tribe Ipini. There are therefore now three *Pseudips* species recognised as present in western North America and Central America: *P. concinnus*, *P. mexicanus*, and *P. radiatae*. Cognato and Smith (2024) published an identification key to distinguish these species. Keys are also available to distinguish *Ips* and *Pseudips* species present in Mexico (Cibrián Tovar et al., 1995; Camacho-Pantoja, 2012) and other regions (Pan et al., 2022). A key to all North American Ipini genera and *Pseudips* will soon be published; this key can be used to identify Ipini in Europe (A. Cognato, pers. comm., 2025).

Common name. The English name for the pest used to be Monterey pine engraver (CABI, 2023; EPPO, 2023a), however, this common English name was originally applied to *Pseudips radiatae* and should be restricted to this species because the native range of the Monterey pine (*Pinus radiata*) overlaps with the range of *P. radiatae* rather than that of *P. mexicanus*. In May 2025, the EWG initiated a process of changing the common name of *P. mexicanus* to ‘ocotl pine engraver’ and this name was officially recognized by the Entomological Society of America in April 2026³.

2. Pest overview

Very little information is available about the native Mexican and Guatemalan populations of *P. mexicanus*. Most information in the literature referring to *P. mexicanus* relates, in fact, to the USA and Canadian populations of *Pseudips* which have recently been reclassified as *P. radiatae* (Cognato & Smith, 2024; Section 1). The extent to which the life cycles of *P. mexicanus* and *P. radiatae* are similar is not fully known. When they were considered to be one species, it was noted in the literature that the geographically separate populations (i.e. American/Canadian and Mexican/Guatemalan) displayed behavioural and ecological differences in the field. Thus, the Canadian population (now considered *P. radiatae*) was noted to be univoltine, while the southern ones (i.e. *P. mexicanus*) were multivoltine. Beetles from the Canadian population preferred to feed and overwinter in the lower portion of the suppressed stems (no attacks were noted above 1.0 m height, on felling debris or in branches; it might be linked to protective role of snow cover during winter), whereas beetles from the southern populations tended to make use of the whole standing tree, branches, and felled material previously infected by fungi. The Californian population was characterised as monogynous, whereas the Mexican/Guatemalan ones were considered polygynous. The mean number of individual galleries per nuptial chamber was different between populations; the galleries of the Canadian population were shorter than those of Mexican/Guatemalan origin (5.4 cm vs 6.5 and 9.0 cm); the mean number of egg niches per gallery (7.2 vs 16–20) and potential fecundity (25 vs 64–90 eggs/female) also differed (Trimble, 1924; Schwerdtfeger, 1956; Wood, 1982; Fox et al., 1990; Steed & White, 2007; differences are reviewed by Smith et al., 2009). Thus, readers of the literature concerning populations from Canada or USA or data published before 2024 should be aware of the change in *Pseudips* taxonomy (Section 1).

In Mexico/Guatemala, *P. mexicanus* completes its life cycle on pine material (dying or recently dead trees, fallen trees, slash, etc). In Mexico, it is reported to often infest pine felling debris (after wildfire, lightning, storm or pest damage) or logging residues (‘slash’) and complete its life cycle in this material (Fonseca-González et al., 2014, 2024; T. Atkinson, pers. comm., 2025). In living material, it is generally considered a secondary pest which attacks trees weakened by storms, droughts, fires or more aggressive primary pests like *Dendroctonus* spp. (Cibrián Tovar et al., 1995). There are two mentions in literature of *P. mexicanus* attacking pine saplings (Cibrián Tovar et al., 1995; Cibrián & Cibrián, 1998; Tello-Salgado et al., 2021; FIPRODEFO, 2025) and in both cases the context is trees affected by drought,

³ <https://www.entsoc.org/publications/common-names>

disease, injury and weakened or suppressed by competition from other trees. Reports of the pest are more frequent in Mexico than in Guatemala.

2.1. Morphology

Cibrián Tovar et al. (1995) provided the following description: Adults: the cylindrical elongate adults are 2.5 times as long as broad. The body is between 3.6 and 5.0 mm long (Schwerdtfeger [1956] reports 4.0 to 5.6 mm), bright brown, almost black. Elytral declivity with three spines on each side. On the males, the third spine is narrow and prominent. On the antennae, the club has strongly arched sutures. Eggs are oval, pearly, a little more than 1 mm long. Larvae are curculioniform, legless, whitish. Pupae are exarate (i.e. with free appendages).

For diagnosis, Cognato and Smith (2024) added the following details of morphology of adults: Characters including coarse punctures, separated by the diameter of a puncture, on the basal portion of the pronotum; biserial punctures on the second elytral interstria beginning after the middle of the elytral disc and continuing to the base of the elytral declivity; and the elytral subapical margin thickness greater than the length of the first denticle differentiates this species from the remaining *Pseudips* species.

Macrophotographs of *P. mexicanus* are available in the EPPO Global Database (<https://gd.eppo.int/taxon/IPSXRA/photos>) and in the online database ‘[Bark and ambrosia beetles of the Americas](#)’ (Atkinson, 2025).

2.2. Biology and life cycle

The biology of *P. mexicanus* has not been extensively studied. Cibrián Tovar et al. (1995) provided a short overview of the species in Mexico. In studies on pine bark beetles in Guatemala, Schwerdtfeger (1956) and Schedl (1956) examined *P. mexicanus* (referred to by both authors as *Ips concinnus*). According to Atkinson (2025), reports of *P. concinnus* from Mexico were almost certainly misidentifications of *P. mexicanus* as *P. concinnus* is only known to be found in the USA and Canada (Cognato & Smith, 2024). Therefore, both papers from the 1950s likely refer to *P. mexicanus*.

***Pseudips mexicanus* produces usually two or three generations per year in Mexico (Hernández-Livera, 2010; A. Equihua-Martínez, pers. comm., 2025). However, other literature has reported that it can produce up to seven generations per year, depending on local climate (Cibrián Tovar et al., 1995; Norma Oficial Mexicana, 2018). In Guatemala, it is thought that *P. mexicanus* has one generation per year in the high-altitude areas around 3 000 m a.s.l., while in lower, warmer regions, the species may complete two or more generations annually (Schwerdtfeger, 1956).**

Pseudips mexicanus spends most of its life cycle either feeding under the bark of hosts or overwintering just beneath the bark (in phloem; Cibrián Tovar et al., 1995), but exact overwintering stage is not known. The sister species *P. radiatae* is known to be able to overwinter primarily as adults or larvae, although other life stages have been observed in winter (Struble, 1961).

***Pseudips mexicanus* mainly infests dying or recently dead trees at the lower part of the trunk, it often cohabits with more aggressive primary bark beetle species such as *Dendroctonus adjunctus*, *D. mexicanus*, or *D. frontalis* (Cibrián Tovar et al., 1995). These aggressive bark beetles infest trees first and kill them (A. Equihua-Martínez, pers. comm, 2025). *Pseudips mexicanus* can also infest large, fallen trees. *Pseudips mexicanus* can also be found on small, suppressed or weakened trees in a subordinate canopy position, sometimes leading to their death (Cibrián Tovar et al., 1995; FIPRODEFO, 2025). Schwerdtfeger (1956) noted that the pest primarily infests trunks with diameters 5–20 cm but also twigs and branches with diameters greater than 2.0 cm depending on host species. Wood (1982) noted that the pest attacks the trunks of standing trees well above the ground level (2 m or higher) and may occur in felled material. Atkinson stressed that *P. mexicanus* inhabits dying lower branches of trees (T. Atkinson, pers. comm., 2025). In general, the species might be encountered in a variety of host material of different diameter and at varying height (but usually dying, recently dead, stressed or suppressed).**

Pseudips mexicanus is a polygynous species. Males construct a nuptial chamber with a diameter of about 6 mm in the cambium and phloem and then can mate with up to five females, but usually three (Schwerdtfeger, 1956; Cibrián Tovar et al., 1995). In some cases, chambers are in the bark and not visible when the bark is lifted (Schwerdtfeger, 1956). Females construct curved galleries (up to 8.0–10.0 cm long and up to 3.0 mm wide; Annex 4), creating semicircular niches on one side where they deposit three or four eggs each (Cibrián Tovar et al., 1995; Schwerdtfeger, 1956). In total, a female can lay up to 100 or more eggs (Trimble, 1924; Schwerdtfeger, 1956; FIPRODEFO, 2025). The egg galleries are straight (longitudinal) for at least two-thirds of their length, with the terminal third curved (Wood, 1982). Egg-laying process can take 16–20 days (Schwerdtfeger, 1956). Upon emerging, the larvae create individual tunnels that expand as they lengthen. Since multiple larvae emerge from each egg niche, their galleries are closely spaced and diverge as the larvae grow larger, spreading in a fan-like pattern (Schwerdtfeger, 1956). These tunnels ultimately lead to oval-shaped pupation chambers in the phloem where the larvae moult into adults (Cibrián Tovar et al., 1995). The type of gallery and egg-laying habits of *Pseudips* spp. are distinctive particularly for *P. mexicanus* where galleries are curved and shepherds-hook shaped (Cognato & Smith, 2024). Schwerdtfeger (1956) noted that the pattern of galleries is quite different in appearance between *Pinus ayacahuite* and *P. rudis* (syn. *P. hartwegii*). After emerging as adults, the young beetles stay at their breeding sites for a relatively long time (likely a few weeks) and carry out maturation feeding. Their irregular tunnels penetrate the bark and wood and are filled with brown-white-mixed drilling dust (Schwerdtfeger, 1956).

***Pseudips mexicanus* exhibits strong attraction to pheromones in insect traps.** In particular, *P. mexicanus* demonstrates attraction for traps baited with ipsdienol alone or in combination with ipsenol (Steed & Willhite, 2007; Hernández-Livera, 2010). **This suggests that both ipsenol and ipsdienol may be part of the pheromone blend for *P. mexicanus*.**

Steed and Willhite (2007) reported that *P. mexicanus* was present in traps in Mexico (Coloradas, Corralitos, and Pinabetes/Sauces) from February to July, but the data were presented for a complex of six bark beetle species treated together. Using pheromone traps, Hernández-Livera (2010) found two seasonal flight peaks of *P. mexicanus* in Jalisco, Mexico: the first one from March to June, and the second one in November.

Preliminary data on captures of beetles of *P. mexicanus* in Theysohn traps in Ireland indicated that the flight occurs in May and August–October (DAFM, pers. comm., 2025).

2.3. Dispersal capacity

No studies are currently available that directly investigate the dispersal capacity of *P. mexicanus* under laboratory or field conditions. In general, dispersal flights of bark beetles are short, consisting of a few hundred meters; however, some species have the potential to fly more than 30 km (Gomez et al., 2023; see also Section 11.1).

Specimens of *P. mexicanus* trapped in Ireland had fully developed wings and tried to fly when captured (R. Earl, pers. comm., 2025).

2.4. Temperature requirements

Schwerdtfeger (1956) observed that *P. mexicanus* completed its life cycle in about 12–14 weeks at 17 °C when infesting *Pinus ayacahuite* (including 10 days for embryonic development, 9–11 weeks for larval development, and 12 or 13 days for pupal development). At an average temperature of 19 °C, the larval development until pupation took approximately 8 weeks (Schwerdtfeger, 1956).

The lower developmental threshold of *P. mexicanus* is not known, but that of a closely related species, *P. radiatae* (which has a much more northerly distribution; see Section 6), was estimated to be 8.5 °C (Smith et al., 2009).

2.5. Other environmental factors

Pseudips mexicanus was found at altitudes from approximately 500 to 4 000 m a.s.l. in Mexico and Guatemala (Schwerdtfeger, 1956; Atkinson & Equihua Martínez, 1985; Hernández-Ruiz, 2015; González et al., 2023) and at sea level in Ireland (DAFM, pers. comm., 2025); in mid- to high-altitude pine forests within temperate and cold habitats. This suggests that the species can tolerate high elevation and cold conditions well.

Atkinson (1986) stated that *P. mexicanus* prefers more humid conditions than *Ips* species, however, Suárez-Hernández et al. (2023) studied *P. mexicanus* in an area of relatively high humidity (the northeastern region of the State of Puebla, Mexico) and concluded that it was among the species showing a negative correlation between their trap catches and relative humidity.

Trees damaged or recently killed by fire, storms, drought, lightning or other pests are attractive to *P. mexicanus* (Schwerdtfeger, 1956; Fonseca-González et al., 2014; Atkinson, pers. comm., 2025). Schwerdtfeger (1956) also noted that trees attacked by *P. mexicanus* were those that had been severely weakened and were dying due to bark peeling (in *Pinus ayacahuite*). A single *Pinus sylvestris* tree was found with galleries of *P. mexicanus* in Ireland (in 2025). That tree had been damaged by deer before the infestation, which led to the death of the tree (DAFM, pers. comm., 2025).

After a forest fire, *P. mexicanus* was the second most abundant bark beetle which colonized trunks of fire-damaged *Pinus patula* but it was not found in the live trees sampled (Fonseca-González et al., 2014).

2.6. Nature of the damage, plant parts attacked and location of life stages on the plants

Nature of the damage

Like all other bark beetles, *P. mexicanus* lives, feeds and reproduces in the cambium and phloem under the bark of trees. This activity (mostly during the development of larvae) damages vascular tissues of the infested tree, impeding the tree's ability to transport water and nutrients. Internal damage like this contributes to the death of the tree since *P. mexicanus* is regarded as a secondary pest, which infests trees that are already suppressed and/or experiencing stress from environmental factors or more aggressive primary pests (Cibrián Tovar et al., 1995). Some species of bark beetles are also known to carry harmful fungi that further accelerate the decline of an infested tree (Lieutier et al., 2004). There are reports of association of *P. mexicanus* with wood-staining fungi (Section 3).

High population density of the pest under conditions of limited food resources can stimulate its attacks on healthier trees (Steed & Willhite, 2007).

2.7. Signs and symptoms of infestation and detection

The following signs can indicate presence of *P. mexicanus* in pine trees:

- fine red (or reddish-brown) frass and sawdust on the bark (Cibrián Tovar et al., 1995; Norma Oficial Mexicana, 2018),
 - resin bleeding (exudate) (Cibrián Tovar et al., 1995),
 - yellow to brown needles in the crowns (Norma Oficial Mexicana, 2018; A. Cognato, pers. comm., 2024),
- although these signs are not species-specific. Often, signs of infestation of primary bark beetles can indicate the presence of cohabiting *P. mexicanus* (O. Burgos-Dueñas, pers. comm., 2024).

It has been difficult to find *P. mexicanus* in trees, even when the species is caught in high numbers in traps in Mexico (Steed & Willhite, 2007) and in Ireland (C. O'Flynn, pers. comm., 2024). Exit holes may be spotted more easily than entrance holes as adults of *P. mexicanus* enter the tree through bark fissures and emerge through the bark plates (Cibrián Tovar et al., 1995). The likely areas of infestation by *P. mexicanus* are the bases of standing recently dead or dying trees or stressed young trees, lower branches as well as fallen trees. (Cibrián Tovar et al., 1995).

2.8. Morphological identification

Morphological identification of American *Pseudips* species is challenging. However, Cognato (2000) published a description of genus *Pseudips* (with three species: *P. concinnus*, *P. mexicanus*, and *P. orientalis*) and later Cognato and Smith (2024) provided taxonomic features and a key for distinguishing *P. mexicanus* from other *Pseudips* species (namely, *P. concinnus*, *P. orientalis*, *P. radiatae*, and *P. yak*) (Section 2.1).

2.9. Molecular identification

PCR primers are available for amplifying and sequencing the mitochondrial cytochrome oxidase 1 (COI) and partial carbamoylphosphate synthetase 2, aspartate transcarbamylase and dihydroorotase (CAD) DNA from *Pseudips* species which can be used for reliable identification at the species level (Cognato & Smith, 2024).

Sequences of COI and CAD genes of *P. mexicanus* are present in NCBI (National Center for Biotechnology Information) (Cognato & Smith, 2024).

2.10. Natural enemies

The following natural enemies are reported for *P. mexicanus* in Mexico:

- *Temnoscheila virescens* (Coleoptera: Trogossitidae) (introduced into Australia for the biological control of *Ips grandicollis* in the 1980s; Lawson & Morgan, 1992; Kolibáč, 2013);
- *Enoclerus arachnodes* (Coleoptera: Cleridae);
- *Lasconotus* spp. (Coleoptera: Colidiidae) (Hernández-Livera, 2010; FIPRODEFO, 2025; <https://www.gbif.org/species/9432840>; <https://www.gbif.org/species/8603791>; <https://www.gbif.org/species/1045292>);
- the fungus *Beauveria bassiana* (Ascomycota: Cordycipitaceae) was found to naturally parasitise *P. mexicanus* in Mexico and demonstrated pathogenicity in infection tests (Tello-Salgado et al., 2021); it is present in the EPPO region as well (<https://www.gbif.org/species/2560612>).

A number of natural enemies of a closely related species *P. radiatae* (see Section 1) are present in North America (Struble, 1961):

- *T. virescens* (Lawson & Morgan, 1992; Kolibáč, 2013);
- *Cucujus clavipes* (Coleoptera: Cucujidae) known as the flat bark beetle appears to be widely distributed but only across North America (<https://www.gbif.org/species/1043759>);
- *Enoclerus lecontei* (Coleoptera: Cleridae) present in Central and North America (<https://www.gbif.org/species/1161905>);
- *E. sphegeus* (Coleoptera: Cleridae) present in Central and North America (<https://www.gbif.org/species/6947730>).

None of these species are currently known to occur in Europe.

Predatory polyphagous *Thanasimus formicarius* (Coleoptera: Cleridae) and/or *Temnoscheila caerulea* (Coleoptera: Trogossitidae) are indigenous and widely spread in Europe (<https://www.gbif.org/species/4448819> and <https://www.gbif.org/species/7514499>; Pérez & Sierra, 2006); they might become natural enemies of *P. mexicanus* in a substantial part of the EPPO region.

Coeloides sp. (Hymenoptera: Braconidae) are believed to be important parasitoids for controlling *P. radiatae* (Struble, 1961) in Central and North America. There are several *Coeloides* species present in the EPPO area (<https://www.gbif.org/species/1253991>).

3. Is the pest a vector?

Yes ☐ No ☐

In Mexico, as with other bark beetles, *P. mexicanus* is sometimes considered as a vector of wood-staining fungi (*Ceratocystis* spp.; Ascomycota: Microascales; <https://gd.eppo.int/taxon/1CERAG>) of several pine species (Cibrián Tovar et al., 1995; Rendón et al., 2021). The closely related species *P. radiatae* has been identified as a vector for the fungus *Fusarium subglutinans* (Ascomycota: Hypocreales; <https://gd.eppo.int/taxon/GIBBFS>) which causes pitch canker in Californian forests (USA; Fox et al., 1990, 1991). Note that *Fusarium subglutinans* f. sp. *pini* is synonymized to *Fusarium circinatum* (Ascomycota: Hypocreales; <https://gd.eppo.int/taxon/GIBBCI>). **However, *P. mexicanus* has never been associated with *F. subglutinans* / *F. circinatum*.**

4. Is a vector needed for pest entry or spread?

Yes ☐ No ☒

5. Regulatory status of the pest

Pseudips mexicanus was added to the EPPO Alert List in 2024 (EPPO, 2024).

The EU regulates *P. mexicanus* as a quarantine non-EU Scolytinae pest under EU Regulation 2019/2072.

It is listed (No. 119) as one of the 139 non-EU Scolytinae of coniferous hosts by EFSA (2020) in the EFSA Pest categorisation of non-EU Scolytinae of coniferous hosts that meet the criteria to be considered Union quarantine pests. However, this listing is based on the information in the literature which was available before the taxonomic revision of the genus *Pseudips* and, thus, most likely relates to *P. radiatae*.

According to the United Kingdom plant health legislation, non-European Scolytinae species are considered quarantine pests, thus *P. mexicanus* is also regulated in the United Kingdom (Defra, 2023).

The Eurasian Economic Union (EAEU: Armenia, Belarus, Kazakhstan, Kyrgyzstan, and the Russian Federation; EAEU, 2016b; EPPO, 2023b, 2024) lists *P. mexicanus* as an A1 quarantine pest.

The Official New Zealand Pest Register (ONZPR) lists *I. mexicanus* (synonym to *P. mexicanus*) as regulated in New Zealand (MPI, 2023).

However, it should be kept in mind that all listed regulatory documents were published before the taxonomic study of Cognato and Smith (2024), which separated the species within the genus *Pseudips* and limited the range of *P. mexicanus* to Mexico and Guatemala.

6. Distribution

When Cognato and Smith (2024) reviewed *Pseudips*, they outlined the range of *P. mexicanus* (Fig. 6.1). **The current range for *P. mexicanus* appears to be Mexico and Guatemala (Figs 6.2 and 6.3; Table 6.1), which is most likely the native range of the species.** There are records of the pest throughout Mexico and a limited number of records of it inside Guatemala (Annex 5). Numerous records in the literature published before 2024 and referring to the USA and Canada most likely in fact refer to *P. radiatae* (see Notes on taxonomy in Section 1). *Pseudips radiatae* may occur on the island of Baja California (Mexico), but it is believed that native ranges of *P. mexicanus*, *P. concinnus*, and *P. radiatae* do not overlap in western North America (Fig. 6.1; see comments in Table 6.1; Cognato & Smith, 2024).

***Pseudips mexicanus* was found in Ireland during 2023–2025, mostly in traps (DAFM, 2023; <https://gd.eppo.int/taxon/IPSXRA/reporting>; DAFM, pers. comm., 2025; Earl & Cognato, 2026), thus it can be considered that there is a local breeding population already established outdoors in the EPPO region. It is transient, under eradication (DAFM, 2023; the status currently under review in Ireland; DAFM, pers. comm., 2025).**

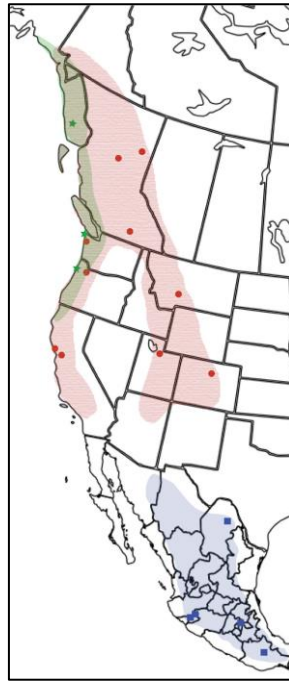


Figure 6.1. Approximate distribution (shading) based on known field and collection localities (symbols) of *Pseudips concinnus* (green shading and stars), *P. mexicanus* (blue shading and squares), and *P. radiatae* (red shading and circles) in western North America. The distribution of *P. mexicanus* continues southwards into Chiapas and Guatemala (from Cognato & Smith, 2024).

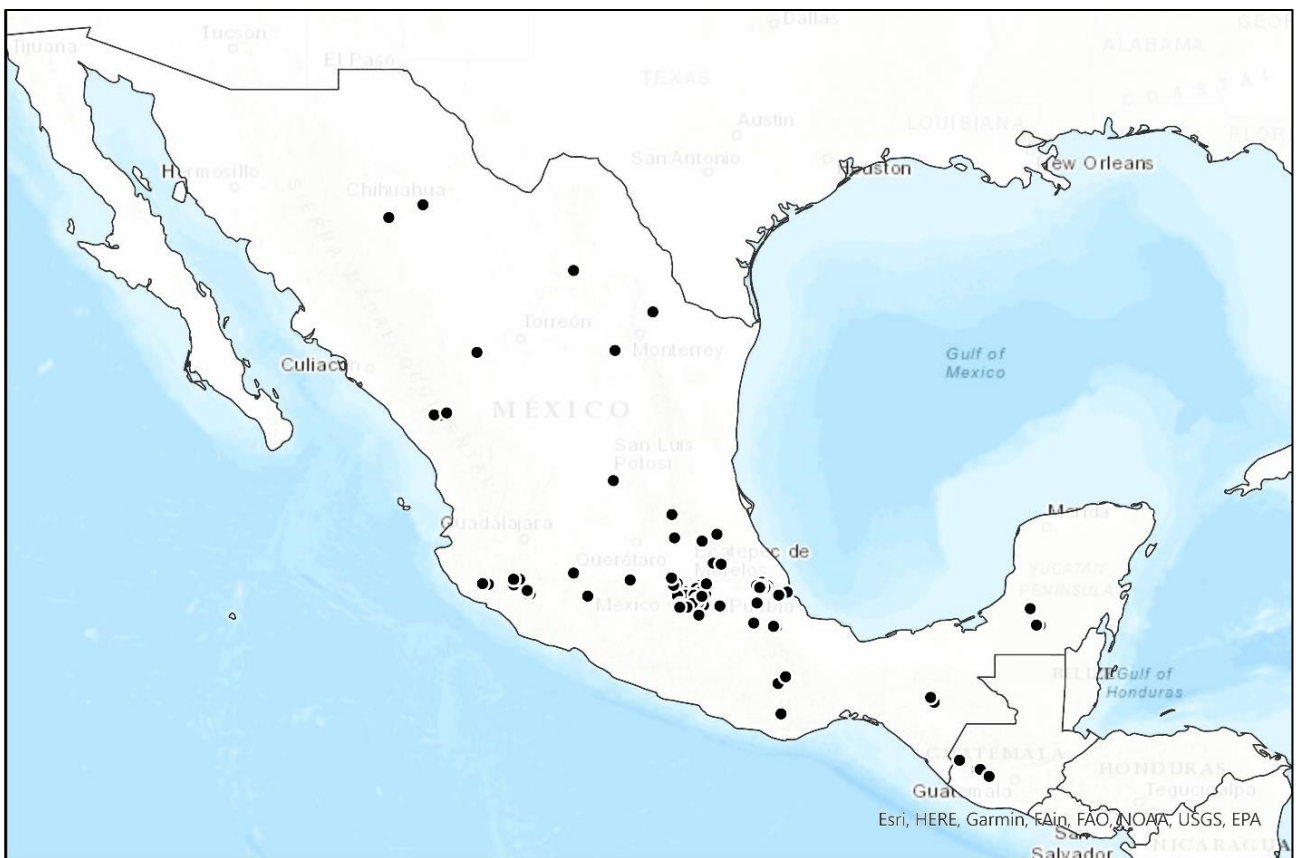


Figure 6.2. Occurrence records of *P. mexicanus* (black dots) available in literature and online databases and collected by EWG which can be with high confidence attributed to this species (122 records; Annex 5). The country borders in the map were sourced from GADM (2020). The map was prepared by J. Tuomola (EWG; Ruokavirasto, Finland).

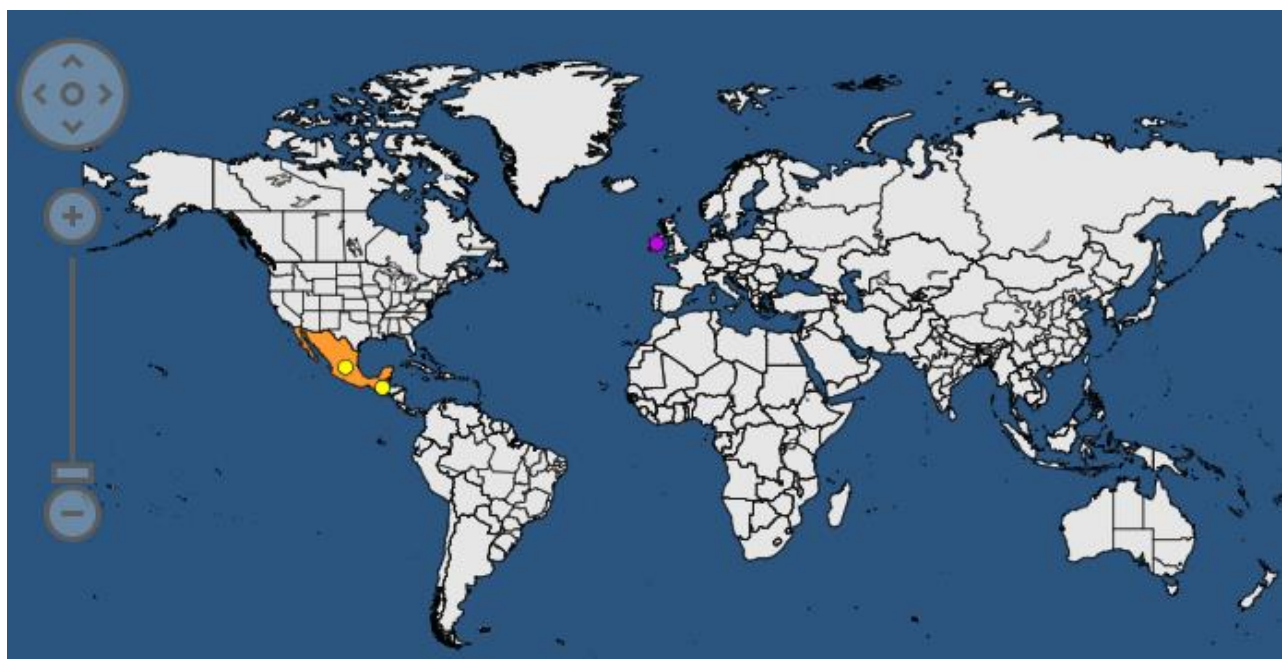


Figure 6.3. Distribution of *Pseudips mexicanus* from the EPPO Global Database (EPPO, 2025). Yellow – present (Mexico and Guatemala), purple – transient (Ireland).

Table 6.1. Distribution of *Pseudips mexicanus*

Continent	Distribution	Comments	References
EPPO region	Ireland	Trapped in 2023 and 2024, collected in 2025 under bark of one tree, all in Counties Clare and Limerick. Transient, under eradication.	DAFM (2023), DAFM, pers. comm. (2025)
America	<u>Central America:</u> Guatemala	Recorded in Chimaltenango, Huehuetenango, Quezaltenango, Quiché, Sololá, Totonicapán, San Marcos.	Schedl (1956), Schwerdtfeger (1956), Barstad (2005), Albanes-Barahona et al. (2020), Macías Sámano et al. (2021), Cognato & Smith (2024), Atkinson (2025).

Continent	Distribution	Comments	References
	<u>North America:</u> Mexico	Recorded in Chiapas, Chihuahua, Coahuila, Chilpancingo, Distrito Federal, Durango, Guadalajara, Estado de México, Hidalgo, Jalisco, Michoacán, Morelos, Nuevo León, Oaxaca, Pue, Puebla, Querétaro, San Luís Potosí, Tlaxcala, Veracruz. The Mexican state Baja California is no longer listed for <i>P. mexicanus</i> by Cognato and Smith (2024) and Atkinson (2025). A specimen from Guadalupe Island (Baja California) was not available for the recent taxonomy study, however it is likely <i>P. radiatae</i> given the shared geological history of California and Baja California (Cognato & Smith, 2024). Therefore <i>P. radiatae</i> may also occur in northern Mexico. The known northern extent of <i>P. mexicanus</i> in Mexico appears to be the states of Chihuahua and Coahuila.	Atkinson & Equihua (1985a,b), Camacho-Pantoja (2012), Hernández-Ruiz (2015), Cervantes Mayagoitia & Huacuja Zamudio (2017), Atkinson (2024), Cognato & Smith (2024).

7. Host plants and their distribution in the PRA area

Pseudips mexicanus has been reported feeding and breeding only in *Pinus* species in the native and introduced ranges (Table 7.1). Of the 46 species of pines in Mexico⁴, Camacho-Pantoja (2012) identifies 10 species of pines as hosts of *P. mexicanus*. **Table 7.1 lists 17 species of *Pinus* reported in the literature as hosts of *P. mexicanus* in Mexico and Guatemala and additionally, one species (*P. sylvestris*) recorded as a host species in Ireland.** Also, there is a general record referring to non-specified species of *Pinus* spp. Thus, *P. mexicanus* can be considered an oligophagous bark beetle. Nothing is known on whether any of the host plants are more susceptible to the pest than others.

Table 7.1. Hosts of *Pseudips mexicanus*.

Hosts	Presence in PRA area (Yes/No/Not known)	References for host status
<i>Pinus</i>*		
<i>Pi. arizonica</i>	Yes; not native; very rarely present in botanical collections	Camacho-Pantoja (2012), Rendón et al. (2021)
<i>Pi. ayacahuite</i>	Yes; not native; rarely present in botanical collections; rarely cultivated or used in provenance trials	Schedl (1956), Cibrián Tovar et al. (1995), Camacho-Pantoja (2012), Rendón et al. (2021), Atkinson (2025)
<i>Pi. cembroides</i>	Yes; not native; very rarely present in botanical collections	Secretaría de Medio Ambiente (2023), Atkinson (2025)
<i>Pi. cooperi</i>	Yes; not native; very rarely present in botanical collections	Wood (1982), Cibrián Tovar et al. (1995), Atkinson (2025)

⁴ Rendón et al. (2021) provide a list of 49 species of *Pinus* in Mexico.

Hosts	Presence in PRA area (Yes/No/Not known)	References for host status
<i>Pi. devoniana</i> (syn.: <i>Pi. michoacana</i>)	Yes; not native; very rarely present in botanical collections	Cibrián Tovar et al. (1995) (as <i>Pi. michoacana</i>), Rendón et al. (2021)
<i>Pi. douglasiana</i> (syn.: <i>Pi. gordoniana</i>)	Not known; not native	Cervantes Mayagoitia, Huacuja Zamudio (2017)
<i>Pi. duranguensis</i>	Not known; not native	Wood (1982), Cibrián Tovar et al. (1995), Camacho-Pantoja (2012), Rendón et al. (2021), Atkinson (2025)
<i>Pi. engelmannii</i>	Yes; not native; rarely present in botanical collections	Camacho-Pantoja (2012), Rendón et al. (2021)
<i>Pi. greggii</i>	Yes; not native; used in experimental forestry in Spain and Portugal	Cervantes Mayagoitia and Huacuja Zamudio (2017), Secretaría de Medio Ambiente (2023)
<i>Pi. hartwegii</i> (syn.: <i>Pi. rudis</i>)	Not known; not native	Schedl (1956), Wood (1982), Camacho-Pantoja (2012), Cibrián Tovar et al. (1995), Rendón et al. (2021), Atkinson (2025)
<i>Pi. herrerae</i> (syn.: <i>Pi. teocote</i>)	Not known; not native	Cervantes Mayagoitia and Huacuja Zamudio (2017), Atkinson (2025)
<i>Pi. leiophylla</i> (syn.: <i>Pi. chihuahuana</i>)	Yes; not native; occasionally trailed in Mediterranean forestry	Wood (1982), Camacho-Pantoja (2012), Cibrián Tovar et al. (1995), Rendón et al. (2021), Atkinson (2025), Yes; not native, but
<i>Pi. maximinoi</i> (syn.: <i>Pi. tenuifolia</i>)	Yes; not native; very rarely present in botanical collections	Schedl (1956) as (<i>P. tenuifolia</i>)
<i>Pi. montezumae</i>	Yes; not native; cultivated in countries in the Mediterranean region	Wood (1982), Cibrián Tovar et al. (1995), Camacho-Pantoja (2012), Rendón et al. (2021), Atkinson (2025)
<i>Pi. oocarpa</i>	Yes; not native; cultivated in limited scale in some countries, rarely present in botanical collections	Camacho-Pantoja (2012), Atkinson (2025)
<i>Pi. patula</i>	Yes; not native; widely planted in parts of southern Europe for timber and reforestation, present in botanical collections	Schedl (1956), Cibrián Tovar et al. (1995), Camacho-Pantoja (2012), Fonseca-González et al. (2014), Rendón et al. (2021), Atkinson (2025)
<i>Pi. pseudostrobus</i>	Yes; not native; grown in southern Europe for forestry trials	Wood (1982), Cibrián Tovar et al. (1995), Barstad (2005), Camacho-Pantoja (2012), Rendón et al. (2021), Atkinson (2025)
<i>Pi. sylvestris</i>	Yes; native; very widely distributed	DAFM, pers. comm. (2025): One dead <i>Pi. sylvestris</i> tree was found in Ireland with breeding galleries under the bark and pupae and two adults; the adults have been identified as <i>P. mexicanus</i> . That tree had been damaged by deer before the infestation, which led to the death of the tree. It is not thought that the presence of the beetles contributed to the death of the tree. <i>Pinus sylvestris</i> is not present in Mexico and Guatemala: https://mexico.inaturalist.org/taxa/58722-Pinus-sylvestris

Hosts	Presence in PRA area (Yes/No/Not known)	References for host status
<i>Pinus</i> spp.	Yes / Not known ; several native and introduced species of <i>Pinus</i> are widely present in forests and amenity areas	Atkinson (2025)

* abbreviated as ‘*Pi.*’ in order to avoid confusion with the genus *Pseudips*.

Uncertainties

Pinus radiata and *Pi. contorta* are often listed as hosts of *P. mexicanus* (e.g. Wood, 1982; Cibrián Tovar et al., 1995; Camacho-Pantoja, 2012; Rendón et al., 2021; Atkinson, 2025), but the EWG considered these two species as uncertain hosts (and they are not listed in the Table 7.1) because these *Pinus* species have very limited distributions in the state Baja California (Mexico). There are no confirmed records of *P. mexicanus* on *Pi. radiata* in Mexico (A. Equihua-Martínez, pers. comm, 2025). Any record of *P. mexicanus* from this region is likely to be of the sister species *P. radiatae* because the latter species occurs in southern California (USA). However, given that *P. mexicanus* uses a wide variety of *Pinus* hosts (Table 7.1) and its sister species *P. radiatae* feeds on both *Pi. radiata* and *Pi. contorta*, it is likely that *P. mexicanus* can use both these *Pinus* species as hosts.

A single adult of *P. mexicanus* with no evidence of breeding was found on one dead tree of *Pi. contorta* in Ireland in 2024; another adult was found in 2025 in a gallery under the bark of *Pi. contorta* (Fig. A4.4); no other life stages were found (DAFM, pers. comm., 2025). The EWG considered the current evidence insufficient to classify *Pi. contorta* as a host of *P. mexicanus*.

Therefore, the classification of ‘uncertain host’ for *Pi. radiata* and *Pi. contorta* should continue until further evidence becomes available (e.g. with feeding experiments).

Doubtful host

In 2022, China reported an interception by Lianyungang customs of *P. mexicanus* during a quarantine inspection of Douglas fir (*Pseudotsuga menziesii*) from the USA. That was the first interception of *P. mexicanus* in China (Pan et al., 2022) and the only record of this pest on a host other than *Pinus* spp. The EWG believed that since the commodity originated from the USA on a tree species commonly grown in the USA, the intercepted species is unlikely to be *P. mexicanus*. **That is why Douglas fir was not included into Table 7.1.**

8. Pathways for entry

Bark beetles are regularly intercepted in trade of plants and wood products (Brockerhoff et al., 2006; Haack, 2006). The highest number of species has been intercepted in round wood with bark followed by wood packaging material (WPM) and sawn wood with bark (EFSA, 2020). *Pseudips mexicanus* has been intercepted with confidence only in WPM (see data on interception below in this section).

The following pathways for entry of *P. mexicanus* are discussed in detail in this PRA in Section 8.1:

- Round wood and sawn wood with bark (Table 8.1),
- WPM,
- Plants for planting (except seeds, tissue cultures, pollen) (Table 8.2),
- Wood chips, processing wood residues, hogwood (except sawdust and shavings) (Table 8.3),
- Bark (Table 8.4).

The following pathways are discussed in Section 8.2 but not considered in detail:

- Above-ground fresh plant parts (including cut branches and Christmas trees).

The following pathways are considered very unlikely and are discussed in Section 8.3:

- Round wood and sawn wood without bark,
- Sawdust and shavings, processed wood material, post-consumer scrap wood,
- Furniture and articles entirely or partly made of raw wood or bark,
- Fruits (cones),
- Underground fresh plant parts (roots),
- Stored products/dried plant parts,
- Natural spread,
- Travellers,
- Conveyances, vehicles and equipment,
- International mail items,
- Hitchhiking.

8.1. Pathways investigated in detail

Information on import prohibitions and phytosanitary measures is not provided for all countries in the PRA area (see individual pathways in Tables 8.1 to 8.4).

In Ireland, the current pest situation of *P. mexicanus* evaluated by EPPO on the basis of information dated October 2024 is ‘Transient’ (<https://gd.eppo.int/taxon/IPSXRA/distribution/IE>). The NPPO of Ireland confirmed that harvesting and movement of pine (*Pinus* spp.) plants and plant products in the demarcated area is stopped (there are no sawmills in the demarcated area, and wood from the demarcated area is not used to produce or repair WPM) (DAFM, 2023; see details in Section 16.2). Trade of plants for planting from Ireland is not prohibited and plants for planting produced in Ireland will normally need a plant passport (within EU) or phytosanitary certificate (see below in Trade). *Pseudips mexicanus* is regulated as one of non-EU Scolytinae species (Regulation (EU) 2019/2072; Annex II A; # 72; EU, 2019). **Therefore it is considered that there are currently no pathways for the entry of *P. mexicanus* from Ireland into other EPPO countries. Consequently, in Sections 8.1 to 8.3, the pathways only address entry from Mexico and Guatemala.**

Table 8.1. Pathway: Round wood and sawn wood with bark

Pathway	Round wood and sawn wood with bark
Coverage	This pathway concerns the round wood and sawn wood of hosts from countries where the pest occurs, and covers: • round wood with bark; • sawn wood with bark. Sawn wood is wood sawn longitudinally, with or without its natural rounded surface with or without bark (ISPM 5). Round wood includes logs, but also other types of material. Whole trees including branches, twigs, possibly stumps, may be harvested (e.g. as fuel wood / firewood). In addition, part of the commodity described in the EPPO Study on wood commodities other than round wood, sawn wood and manufactured items (EPPO, 2015) as ‘<i>harvesting residues</i>’ is a type of round wood (when in the form of tops of trees, branches, twigs etc.) (Annex 1, Table A1.1). <i>Composition:</i> Consignments of round wood (as logs for processing) and sawn wood are generally comprised of one species. Harvesting residues (in the form of round wood) arise from the harvest of logs and may initially be from one tree species, but it is not known if they would be mixed with other tree species from other origins when traded (e.g. as fuel wood). Round wood intended for other purposes (e.g. fuel wood, production of chips) may contain a mixture of species. <i>Presence of bark:</i> Round wood (as logs) and sawn wood may be traded with or without bark, but the pathway under consideration here concerns roundwood and sawn wood with bark. Other types of round wood may also have bark attached. <i>Size:</i> Logs normally have large size (longer than 1 m). Harvesting residues (in the form of round wood) have variable size. Sawn wood of less than 6 mm of thickness is considered to pose a minimal risk because larvae and pupae of insects will be removed or damaged during the processing. <i>Intended use:</i> Roundwood can be processed into sawn wood for use in construction, for stake wood and pallet wood production. Other end uses include wood for furniture, manufacture, for energy purposes or processed (such as for production of wood chips, pulp, fibreboard, etc.).
Plants concerned	<i>Pinus</i> species (see Section 7 for details)
Pathway prohibited in the PRA area?	Yes, partly in some EPPO countries. For EU countries: wood of conifers from Mexico must undergo appropriate treatment and have an official statement to ensure they are free from <i>Bursaphelenchus xylophilus</i> (Regulation (EU) 2019/2072; Annex VII, section 76; EU, 2019); wood of conifers from Guatemala must undergo appropriate treatment (Regulation (EU) 2019/2072; Annex VII, section 80; EU, 2019); wood of <i>Pinus</i> spp. from Mexico must be from a pest free area for <i>Fusarium circinatum</i> or undergo heat treatment (Commission Implementing Decision (EU) 2019/2032; Article 10). Such treatments will reduce the likelihood of <i>P. mexicanus</i> surviving. A phytosanitary certificate is required in all cases.

Pathway	Round wood and sawn wood with bark
	For Great Britain: similar special requirements to the EU exist (https://www.legislation.gov.uk/eur/2019/2072/annexes; https://check-plant-health-information.service.gov.uk/; Annex 7, part A); also for <i>Heterobasidion irregulare</i> (for Mexico). Northern Ireland is aligned to the EU regulations. For Switzerland: special requirements for wood of conifers exist according to Ordinance 916.201, Annex 7, section 76 (similar to the EU requirements; https://www.fedlex.admin.ch/eli/cc/2019/787/fr). For the Eurasian Economic Union (EAEU): all imported products of <i>Pinus</i> sp., including round and sawn wood with bark, should be free from quarantine pests (EAEU, 2016a). Imported round wood and sawn wood of the host with bark should originate from areas and places of production free from <i>P. mexicanus</i> (EAEU, 2016a). Within the EU, trade of round wood and sawn wood with bark is not prohibited. However, <i>P. mexicanus</i> is regulated as one of non-EU Scolytinae species (Regulation (EU) 2019/2072; Annex II A; # 72; EU, 2019).
Pathway subject to a plant health inspection at import?	Yes. Plant health import requirements specify that wood of certain listed species and product types are regulated from specified origins and are subject to import inspection and control; a phytosanitary certificate is required (e.g. in the EU and EAEU).
Pest already intercepted?	No. There is no evidence that <i>P. mexicanus</i> has been intercepted on round wood or sawn wood with bark from countries where the pest is known to occur. Haack and Rabaglia (2013) reported interceptions of <i>P. mexicanus</i> associated with wood either in the form of wood packaging material, lumber, or logs, but later Mr R. Haack (pers. comm., 2024) clarified that all those interceptions of <i>P. mexicanus</i> were on pallets from Mexico listed as consumables, indicating they were likely for food items. No interceptions of <i>P. mexicanus</i> are recorded in the Russian Federation (O. Kulinich, pers. comm., 2025).
Most likely stages that may be associated	Pre-adult stages and young adults of <i>P. mexicanus</i> can be found under bark of trunks of diameter 5–20 cm. This means that <i>P. mexicanus</i> can be associated with round wood or sawn wood of <i>Pinus</i> spp. with bark.
Important factors for association with the pathway	<i>Pseudips mexicanus</i> can be attracted to and use harvested and locally stored wood logs as breeding material. This species is normally a secondary pest that mostly infests dying, recently dead or suppressed trees. It may be present under bark with no signs of infestation, making close inspection necessary to detect the pest. The presence of exit holes may be the result of attack by other insects, and they may not be conspicuous at low levels of infestation in a consignment.
Survival during transport and storage	If not killed by treatment, larvae of later instars, pupae or adult <i>P. mexicanus</i> may survive during transport and during subsequent storage if they have enough plant material at their disposal, and if the wood remains suitable for feeding/boring galleries. Sea freight shipping from Mexico to Europe takes normally approximately 18–25 days (https://www.fluentcargo.com/routes/mexico/france?utm_source, https://www.fluentcargo.com/routes/mexico/germany?utm_source). There is uncertainty as to the ability of early instar larvae to complete development depending on transport conditions. If adults emerge during transport, their survival would be more limited.

Pathway	Round wood and sawn wood with bark
Trade	FAOSTAT (2025) provides data on the total export of ‘industrial roundwood of conifers’ and this trade is very variable in amount: in 2014–2023, the annual export from Mexico varied from almost 0 to more than 9 000 m³ (peaked in 2021; Annex 7, Fig. A6.1) and that from Guatemala varied from 2 400 to almost 18 000 m³ (peaked in 2019; Annex 7, Fig. A6.2). The share of <i>Pinus</i> spp. and export to the EPPO region in the total export is not known. Data on import of round wood and sawn wood to the EU from Mexico and Guatemala are given in Annex 7 (Tables A7.1 and A7.2), although the share of <i>Pinus</i> spp. in the total export is not known. In 2014–2023, the total import of commodities under the custom code CN Code 4401 (Fuel wood, in logs, billets, etc.) from Mexico to the EU countries varied from 0.6 to 437 tons/year, being highest in 2021 and 2023. Almost all import was to Spain in 2015 or Poland (all years since 2016). The share of <i>Pinus</i> spp. in the total exports is not known. There was apparently no import of round and sawn wood with bark to the EU from Guatemala 2014–2023 (Annex 7, Table A7.1; Eurostat, 2025). During the same period (2014–2023), the total import of commodities under the custom code CN Code 440320 (Coniferous wood in the rough, whether or not stripped of bark or sapwood, or roughly squared, etc.) from Mexico to the EU was in fact only 305 tons in 2014 and 116 tons in 2015 (both years to France). There was no import of this commodity in other years or to other countries from Mexico; there was also no import from Guatemala during this period (Annex 7, Table A7.2; Eurostat, 2025). The share of <i>Pinus</i> spp. in the total exports is not known. In 2014–2024, the total import of commodities under the custom code CN Code 44011100 (Fuel wood, in logs, billets, twigs, faggots or similar forms, coniferous) to the United Kingdom from Mexico was 19 tons (reported only in 2021) (https://www.uktradeinfo.com/trade-data/). For Switzerland: In 2024, there was no import from Mexico and Guatemala (A. Knoblauch, pers. comm., 2025). Detailed data on import of <i>Pinus</i> spp. round wood and sawn wood to the Russian Federation or the Eurasian Economic Union (EAEU) are not available. Analysis of broad categories of import (Wood and wood products; charcoal) is presented in Annex 7, Table A7.3. In 2016–2020, the import of this commodity from Mexico varied from 1.39 to 9.23 tons/year and from 0 (most years) to 1.35 ton/year from Guatemala. The share of <i>Pinus</i> spp. in the total import is not known. Under conditions of the current geopolitical restrictions (since 2022) for the Russian Federation and Belarus, it is often difficult to understand the country of origin of imported consignment (an expert from VNIKR, pers. comm., 2025).
Transfer to a host	Round wood and sawn wood are often stored outdoors. If larvae or pupae are present under the bark, adults could emerge later. Beetles that emerge from the wood are likely to seek out new hosts in the immediate vicinity where the consignment is stored.
Likelihood of entry and uncertainty	From Mexico or Guatemala: <i>Likelihood: moderate</i>, because round wood with bark is very attractive to bark beetles, however regulations for various treatments are in place in many countries, thus the commodity should be treated; the current trade volume is very low.

Pathway	Round wood and sawn wood with bark
	<i>Uncertainty: moderate</i> , because it is not guaranteed that treatment is always applied correctly, and information on trade and requirements are limited from non-EU and non-EAEU countries.

• Pathway: Wood Packaging Material (WPM)

WPM is wood or wood products (excluding paper products) used in supporting, protecting or carrying a commodity (includes dunnage) (ISPM 15). It is frequently made of raw wood that may not have undergone sufficient processing or treatment to remove or kill pests and therefore remains a pathway for the introduction and spread of quarantine pests. Dunnage in particular has been shown to present a high risk of introduction and spread of quarantine pests. Furthermore, WPM is very often reused, repaired or remanufactured. The true origin of any piece of WPM may be difficult to determine, and thus its phytosanitary status cannot easily be ascertained. Therefore, the normal process of undertaking pest risk analysis to determine if measures are necessary, and the strength of such measures, is frequently not possible for wood packaging material (ISPM 15; Section 1). For this reason, ISPM 15 describes internationally accepted measures that may be applied to wood packaging material by all countries to reduce significantly the risk of introduction and spread of most quarantine pests that may be associated with that material.

***Pseudips mexicanus* may be present in WPM in use, which then could be a pathway for pest introduction, especially if the WPM has not been correctly treated and/or has bark attached.** Dunnage has been shown as a major source of introduction of Scolytinae worldwide (e.g. in New Zealand, 34.7% of interceptions of Scolytinae are made on dunnage, 10.4% on pallets; Brockerhoff et al., 2003). However, some of these interception records predate the implementation of ISPM 15 in 2002. This standard requires that all WPM moved in international trade should be debarked (any number of visually separate and clearly distinct small pieces of bark may remain if they are less than 3 cm in width [regardless of the length] or greater than 3 cm in width, with the total surface area of an individual piece of bark less than 50 square cm; ISPM 15) and heat treated or fumigated with methyl bromide or sulphuryl fluoride, and stamped or branded with a mark of compliance. These treatments are internationally considered to be adequate to destroy insects (including Scolytinae) and nematodes that are present in WPM at the time of treatment.

There are two categories of reported interceptions of *P. mexicanus* on WPM originating from Mexico:

- 1) An analysis of Scolytinae interceptions at USA ports of entry during 1984–2008 revealed five interceptions of *P. mexicanus*, all originating from Mexico (Haack & Rabaglia, 2013). The specific commodity associated with each finding was not named in the paper. Instead, it was stated that all these interceptions occurred on trade associated with wood either in the form of WPM, lumber, or logs (Haack & Rabaglia, 2013). Later, Mr R. Haack (pers. comm., 2024) clarified that all these interceptions were found on WPM, specifically on pallets carrying food products from Mexico imported between 2001 and 2008. The data interceptions in the USA after 2008 is not currently available;**
- 2) According to Europhyt/TRACES-NT data covering all reported interceptions in Europe since 1995, the United Kingdom reported one interception of *P. mexicanus* in 1999 on dunnage with bark (N. Lévêque, pers. comm., 2025). The interception was before the introduction of ISPM 15 in 2002. The trade origin is given as Mexico with the interception discovered in Aberdeen Docks. Upon examination, beetles and galleries were found, requiring the material to be incinerated. This interception is also documented in an EPPO report (EPPO, 1999).**

The EFSA Pest categorisation of non-EU Scolytinae of coniferous hosts (EFSA, 2020) reported six interceptions for *P. mexicanus*, which are the same as those described above – five from Haack and Rabaglia (2013) and one from Europhyt/TRACES-NT (1999) (N. Lévêque, pers. comm., 2025).

The international interception dataset compiled by Turner et al. (2021) includes two interceptions for *P. mexicanus* from two different regions. No further details are provided in the paper or associated datasets, but the authors clarified that these records refer to one interception in Japan (commodity originating from the USA [Alaska] with ‘wood’ in 2002; thus most likely not *P. mexicanus*, but another *Pseudips* species) and one interception of *P. mexicanus* on mixed dunnage with bark in 1998 which was reported by the United Kingdom (EPPO, 1999) and just mentioned above (R. Turner, E. Brockerhoff, pers. comm., 2025).

Even though *P. mexicanus* is listed as A1 pest in the EAEU, there is no evidence that it has been ever intercepted in the countries of the EAEU. *Pseudips mexicanus* has never been intercepted in the Russian Federation (O. Kulinich, pers. comm., 2025).

The interceptions data outlined above (in total, five interceptions in the USA on pallets from Mexico in 2001–2008 and one interception in the United Kingdom on dunnage from Mexico in 1998) provide evidence that *P. mexicanus* can be transported with WPM via international trade. The introduction of the pest to Ireland is also suspected to be linked to WPM, since there had been no direct trade in pine wood commodities between Mexico or Guatemala and Ireland (DAFM, 2023; C. McGee, DAFM, pers. comm., 2025).

It is possible that WPM could provide the entry for the pest into the EPPO region. For WPM import, the ISPM 15 Standard is required to be applied for commodities from all third countries. However, despite the effectiveness of ISPM 15, recurring interceptions of WPM infested with bark beetles still occur (Haack et al., 2014; COSAVE, 2025), thus in practice WPM remains a viable route of entry for *P. mexicanus*, e.g. when WPM is not properly treated. WPM moved within and between EU countries is not necessarily treated in accordance with ISPM 15.

WPM from Mexico or Guatemala:

Likelihood of entry: **moderate**, because WPM should comply with ISPM 15 (debarked and treated), but incorrect implementation of treatment may occur, e.g. with dunnage; there have been interceptions reported, but partly before the implementation of ISPM 15 in 2002, WPM should not be attractive as a breeding substrate to infestation for *P. mexicanus*.

Uncertainty: **moderate**, because the level of correct implementation of ISPM15 is not known, there is uncertainty in reporting of interceptions, inspection rate and efficiency.

Table 8.2. Pathway: Plants for planting (except seeds, tissue cultures, pollen)

Pathway	Plants for planting (except seeds, tissue cultures, pollen)
Coverage	This pathway concerns host plants from countries where the pest occurs, and covers: • plants for planting in pots or similar (including bonsais) with or without growing media, plants with bare roots, and cuttings (including scions and rooted cuttings); • associated packaging material; • plants for planting carried by travellers and in the internet trade. Hosts can be imported in the EPPO region or a country within the EPPO region for planting for commercial production of pine (reforestation) or as ornamental tree. Seeds, tissue cultures and pollen are excluded because the pest is not associated with these pathways.
Plants concerned	<i>Pinus</i> species (see Section 7 for details)
Pathway prohibited in the PRA area?	Yes, partly in some EPPO countries. For EU countries: It is prohibited to introduce plants for planting, other than seeds, of <i>Pinus</i> L. from certain third countries (but including Mexico and Guatemala) (Regulation (EU) 2019/2072; Annex VI, section 1; EU, 2019) https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:02019R2072-20250126#anx_VI). For Switzerland: Import from all third countries is prohibited according to Ordinance 916.201, Annex 5, Section 1 (https://www.fedlex.admin.ch/eli/cc/2019/787/fr). For Great Britain: <i>Pinus</i> L. is prohibited from Mexico and Guatemala (https://www.legislation.gov.uk/eur/2019/2072/annexes; https://check-plant-health-information.service.gov.uk/; Annex 6. Part A. Point 1). Northern Ireland is aligned to the EU regulations. For the Eurasian Economic Union (EAEU): all imported plants for planting should be free from quarantine pests (<i>P. mexicanus</i> is a A1 pest for EAEU; EAEU, 2016a,b), but there is no additional official specific requirements for plants for planting of <i>Pinus</i> spp. in relation to <i>P. mexicanus</i> (the current practice is to inspect all consignment with plants for planting with special care; O. Kulinich, pers. comm., 2025). Special requirements for bonsai plants, as set out in Regulation (EU) 2019/2072 (EU, 2019), may act to mitigate the risk, if derogations were to be put in place.

Pathway	Plants for planting (except seeds, tissue cultures, pollen)
	The above measures do not cover the entry of <i>Pinus</i> spp. to all countries in the EPPO region. Additionally, there are no measures (except a plant passport) preventing the internal movement of <i>Pinus</i> spp. between countries of the EU. A plant passport does not specify requirements which may play a role to prevent the entry of <i>P. mexicanus</i> with <i>Pinus</i> spp.
Pathway subject to a plant health inspection at import?	Yes. Plant health regulations usually specify that plants for planting (with often exceptions for seeds) are regulated and should be imported with a phytosanitary certificate and are consequently subjected to import inspection, e.g. for the EU and EAEU.
Pest already intercepted?	No. There is no evidence that <i>P. mexicanus</i> has been intercepted on plants for planting from countries where the pest is known to occur. China reported an interception of <i>P. mexicanus</i> during a quarantine inspection of Douglas fir (<i>Pseudotsuga menziesii</i>) from the United States (Pan et al., 2022; not clearly stated in the paper, but possibly associated with plants for plantings). The EWG believed that this interception is more likely to be another <i>Pseudips</i> species rather than <i>P. mexicanus</i> (see Section 7).
Most likely stages that may be associated	Pre-adult stages and young adults of <i>P. mexicanus</i> can be found under the bark of trunks of diameter 5–20 cm and twigs and branches with diameter 2.0 cm or more (Schwerdtfeger, 1956). This means that the pest can be associated with plants for planting (including bonsais) in pots with growing media or bare rooted plants for planting. Both dormant and non-dormant plants may be infested with the bark beetle.
Important factors for association with the pathway	<i>Pseudips mexicanus</i> is a secondary pest which will unlikely attack healthy plants for planting in tree nurseries. Young <i>Pinus</i> plants might have bark too thin to be infested. The pest may be present under the bark, but it might be difficult to find them if their population density is low.
Survival during transport and storage	<i>Pseudips mexicanus</i> is expected to survive transport and storage. Sea freight shipping from Mexico to Europe takes approximately 18–25 days (https://www.fluentcargo.com/routes/mexico/france?utm_source,https://www.fluentcargo.com/routes/mexico/germany?utm_source).
Trade	Trade volume is very low because most EPPO countries prohibit the import of <i>Pinus</i> plants for planting. It is very difficult to obtain reliable data on the trade (including postal trade) of plants for planting of <i>Pinus</i> spp. from Mexico and Guatemala to the EPPO region. Even though import to Switzerland is prohibited, in 2024, a total of 21 live plants were imported from Guatemala. The species were not specified, but they are assumed to be tropical ornamental plants (A. Knoblauch, pers. comm., 2025). Detailed data on import of <i>Pinus</i> spp. plants for planting to the Eurasian Economic Union (EAEU) are not available. Analysis of broad categories of import to the Russian Federation (from Mexico: https://ru-stat.su/date-Y2016-2020/RU/import/MX or Guatemala: https://ru-stat.su/date-Y2016-2020/RU/import/GT) does not suggest that import of <i>Pinus</i> spp. is large or it exists at all.

Pathway	Plants for planting (except seeds, tissue cultures, pollen)
	Internet sales of pines grown in Mexico exists (e.g. https://elreydelasplantas.com/shop/en/home/53-1-pink-guava-live-plant-psidium-guava-tree-tropicals.html) and may avoid phytosanitary inspections, although it is unlikely that it is performed on a large scale. Pines might be grown and sold as bonsai (dwarf) trees (but such items were not found in online markets as originating in Mexico or Guatemala).
Transfer to a host	As the commodity is intended for planting, there is a potential of pest transfer if infested plants are planted in areas close to stressed local host plants. Transfer to another host plant will depend on where the plants will be used. Transfer would be less likely for plants that are used indoors (e.g. bonsais/draft trees).
Likelihood of entry and uncertainty	From Mexico or Guatemala: <i>Likelihood: very low</i>, because <i>P. mexicanus</i> does not usually attack healthy trees, for most of EPPO countries there is prohibition for import; mostly only small plants are traded. <i>Uncertainty: low</i> (no main uncertainties were identified).

Table 8.3. Pathway: Wood chips, processing wood residues, hogwood (except sawdust and shavings)

Pathway	Wood chips, processing wood residues, hogwood (except sawdust and shavings)
Coverage	This pathway concerns the wood chips, processing wood residues, and hogwood of host plants. The hosts of <i>P. mexicanus</i> are major forest and timber tree species. Low quality or damaged trees might be used for production of wood chips, etc., most likely in a mixture with trees of other species (e.g. after clear cuttings). Sawdust and shavings are excluded because the pest is not associated with these pathways. Note ‘(except sawdust and shavings)’ is not repeated below to simplify the text but is intended throughout this pathway. Where harvesting residues are in another form than round wood (e.g. residues from squaring), the EPPO Study on wood commodities other than round wood, sawn wood and manufactured items (EPPO, 2015) considered that they would either be left on-site or be transformed on-site, in which case they become another commodity (e.g. wood chips, hogwood). All these commodities can be used for different purposes, such as pulp, fibreboard, mulch production or for energy purposes. <i>Composition:</i> Depending on the intended use, wood chips are produced from one or a mixture of tree species. This is not known in respect to the other commodities but would presumably be the same. <i>Presence of bark:</i> Wood chips or hogwood may be produced from different types of initial material (e.g. wood with or without bark, post-consumer scrap wood, etc.). Processing wood residues are residues from round and sawn wood, e.g. made from off-cuts, and may have bark attached. As a consequence, at least part of these commodities may include some bark. <i>Size:</i> Wood chips are produced through a chipper using sharp tools and a round-hole sieve that defines the width and thickness of wood chips (e.g. <2.5 cm) on two directions (not the third one). The European Standard on solid biofuel ISO-17225-1 (2021) identifies several classes of wood chips according to their size. It specifies that the typical particle size of wood chips is 5–100 mm and proportion of the coarse fraction (i.e. the largest wood chips: 63–200 mm in maximum length) should be less than 10%. Hogwood or processing wood residues have no size requirement. As a consequence, both wood chips and hogwood could be large enough to allow survival and development of small bark beetles, including <i>P. mexicanus</i>. <i>Intended use:</i> Use of wood commodities as mulch presents the highest risk (as it facilitates transfer of pests to nearby trees), but this is a minor use of such commodities.
Plants concerned	<i>Pinus</i> species (see Section 7 for details)
Pathway prohibited in the PRA area?	Yes, partly in some EPPO countries.

Pathway	Wood chips, processing wood residues, hogwood (except sawdust and shavings)
	For EU countries: wood of conifers (Pinales) in the form of chips, particles, sawdust, shavings, wood waste and scrap obtained in whole or part from these conifers from Mexico must undergo appropriate treatment and have an official statement to ensure they are free from <i>Bursaphelenchus xylophilus</i> (Regulation (EU) 2019/2072; Annex VII, section 77; EU, 2019); wood chip of conifers from Guatemala must undergo appropriate treatment (Regulation (EU) 2019/2072; Annex VII, section 81; EU, 2019); wood of <i>Pinus</i> spp. in the form of chips, particles, wood waste and scrap, for Mexico must be from a pest free area for <i>Fusarium circinatum</i> or undergo heat treatment (Commission Implementing Decision (EU) 2019/2032, Article 10). These treatments will likely reduce the likelihood of <i>P. mexicanus</i> surviving. A phytosanitary certificate is required in all cases. For Great Britain: Similar special requirements to the EU exist (https://www.legislation.gov.uk/eur/2019/2072/annexes; https://check-plant-health-information.service.gov.uk/; Annex 7, part A). Northern Ireland is aligned to the EU regulations. For Switzerland: Special requirements exist according to Ordinance 916.201, Annex 7, section 77 (similar to the EU requirements; https://www.fedlex.admin.ch/eli/cc/2019/787/fr). For the Eurasian Economic Union (EAEU): all imported wood products should be free from quarantine pests (EAEU, 2016a,b), but there is no specific requirements for wood chips, processing wood residues and hogwood of <i>Pinus</i> spp. in relation to <i>P. mexicanus</i>. Within the EU, trade of wood chips, processing wood residues and hogwood is not prohibited. <i>Pseudips mexicanus</i> is regulated as one of non-EU Scolytinae species (Regulation (EU) 2019/2072; Annex II A; # 72; EU, 2019).
Pathway subject to a plant health inspection at import?	Yes. Plant health regulations usually specify that wood products are regulated and should be imported with a Phytosanitary Certificate and are consequently subjected to import inspection e.g. for the EU and EAEU.
Pest already intercepted?	No. There is no evidence that <i>P. mexicanus</i> has been intercepted on host wood chips, processing wood residues or hogwood from countries where the pest is known to occur.
Most likely stages that may be associated	Any life stages of <i>P. mexicanus</i> can be found under the bark of trunks of diameter 5–20 cm and bark of twigs and branches with diameter 2.0 cm or more (Schwerdtfeger, 1956). This means that <i>P. mexicanus</i> can be associated with wood chips (if they still contain bark) or processing wood residues, and hogwood.
Important factors for association with the pathway	<i>Pseudips mexicanus</i> may be present without noticeable signs of infestation; inspection is necessary, but might be difficult. Consignments of wood chips may be a mix of tree species. Heavily infested trees that cannot be used for other purposes may be processed into e.g. wood chips. The fragmentation process for chips or hogwood production would cause high larval mortality (Flø et al., 2014). This was demonstrated for <i>A. planipennis</i> prepupae using a horizontal grinder with a 2.5 cm x 2.5 cm screen: no evidence of survival was observed (McCullough et al.,

Pathway	Wood chips, processing wood residues, hogwood (except sawdust and shavings)
	2007). Chipping 2.5 cm x 2.5 cm or smaller was considered effective against <i>A. planipennis</i> (McCullough et al., 2007). However, Økland et al. (2012) considered that surviving prepupae could have been found if a larger volume of wood chips would have been used in the experiment. <i>Pseudips mexicanus</i> is smaller (3.6–5.0 mm vs 8.5–14.0 mm of <i>A. planipennis</i>; https://inspection.canada.ca/en/plant-health/invasive-species/insects/emerald-ash-borer/fact-sheet), and this may influence survival during the production of wood chips of 2.5 cm. For wood chips, existing requirements (e.g. in the EU) based on size, i.e. chips should be below 2.5 cm in two dimensions, would make it very unlikely that final instar larvae, pupae and adults in pupal chambers would survive the process. However, the third dimension can be of any size. The higher risk of introduction would arise from the presence of final instar larvae, pupae or adults in pupal chambers.
Survival during transport and storage	<i>Pseudips mexicanus</i> is expected to survive transport and storage in wood chips, especially of larger size; however, survival is considered to be less likely than in round wood with bark. Furthermore, a high mortality is expected since in some cases wood chips are dried and other treatments might be applied (Dunbar & Stephens, 1974). Sea freight shipping from Mexico to Europe takes approximately 18–25 days (https://www.fluentcargo.com/routes/mexico/france?utm_source, https://www.fluentcargo.com/routes/mexico/germany?utm_source). Although there were no available experimental data, the EWG believed that it is unlikely that young larvae of <i>P. mexicanus</i> can survive and complete their development in this commodity since the amount of cambium and phloem would not be sufficient and of suitable quality. The survived final instar larvae, pupae and callow (pharate) adults might have higher chances to complete their development and survive during transport and storage in pieces of wood. Such commodities may be stored in big piles. The temperature in the core of the bulk for wood chips may become high (e.g. 60 °C) due to composting effect, which will likely be detrimental to the pest. Temperatures in the periphery of the pile are expected to be much lower and seldom lethal. Thus, part of the consignment/pile is likely to present conditions that would allow survival of larvae, pupae, and young adults, however with high uncertainty.
Trade	Eurostat (2025) was checked for the data on import of this commodity from Mexico and Guatemala for 2014–2023 using the custom CN Code CN 44012100 (Coniferous wood in chips or particles [excl. those of a kind used principally for dyeing or tanning purposes]); however, no data were available, likely suggesting that this commodity is not currently imported from these countries. In Switzerland, in 2024, there were two cases of imports of wood chips of <i>Pinus</i> sp. with Guatemala as country of origin (1.2 kg in total, probably decorative materials), and one case of import of wood chips of <i>Pinus</i> sp. with Mexico as the country of origin (11.3 kg in total, probably also decorative material) (A. Knoblauch, pers. comm., 2025). Detailed data on import of <i>Pinus</i> spp. wood commodities to the Russian Federation or the Eurasian Economic Union (EAEU) are not available. Analysis of broad categories of import (wood and wood products; charcoal) suggests that wood chips, processing wood residues, hogwood

Pathway	Wood chips, processing wood residues, hogwood (except sawdust and shavings)
	was not imported from Mexico and Guatemala in 2016–2020 (https://ru-stat.su/date-Y2016-2020/RU/import/MX/0944; https://ru-stat.su/date-Y2016-2020/RU/import/GT/0944; Ru-Stat, 2025). Currently, Internet trade of wood chips produced in Mexico and Guatemala exists but should be limited and the proportion of <i>Pinus</i> spp. might be small (two examples: https://www.go4worldbusiness.com/member/view/3011628/campirano-charcoal.html and https://www.go4worldbusiness.com/suppliers/guatemala/pine-wood.html)
Transfer to a host	Beetles that emerge from the wood material are likely to seek out new hosts in the immediate area where the consignment is stored. Transfer would be similar to that for wood. Transfer is facilitated when the commodity is stored outdoors for enough time prior to processing, allowing emergence. However, emergence of beetles is likely to be possible only from the upper layer of the pile and very difficult from deep inside of the pile. In addition, transfer may be limited by the intended use of the commodity (e.g. wood chips for paper or energy production) or facilitated if the commodities are used outdoors (e.g. ground cover, mulch). However, products for ground cover (mulch) likely constitute a small part of imports. Adults would need to find a suitable host tree species. The possibility for escape from wood chips varies depending on the type of packaging.
Likelihood of entry and uncertainty	From Mexico or Guatemala: <i>Likelihood: low</i>, because most EPPO countries only import treated wood chips, processing wood residues, hogwood; moreover, the current trade volume is low. <i>Uncertainty: low</i>; however, there are no experimental data on survival of small bark beetles in wood chips.

Table 8.4. Pathway: Bark

Pathway	Bark
Coverage	This pathway concerns the isolated bark of host plants. Bark of the host can enter the EPPO region or a country within the EPPO region as a traded commodity.
Plants concerned	<i>Pinus</i> species (see Section 7 for details)
Pathway prohibited in the PRA area?	Yes, partly in some EPPO countries. For EU countries: isolated bark of conifers (Pinales) must undergo appropriate treatment and have an official statement to ensure they are free from <i>Bursaphelenchus xylophilus</i> (Regulation (EU) 2019/2072; Annex VII, section 82; EU, 2019); isolated bark from Mexico, of <i>Pinus</i> spp. must be from a pest free area for <i>Fusarium circinatum</i> or undergo heat treatment (Commission Implementing Decision (EU): EU/2019/2032, Article 10). This treatment will likely reduce the likelihood of <i>P. mexicanus</i> surviving. A phytosanitary certificate is required in all cases. For Great Britain: Similar special requirements to the EU exist (https://www.legislation.gov.uk/eur/2019/2072/annexes; https://check-plant-health-information.service.gov.uk/; Annex 7 (part A)). Northern Ireland is aligned to the EU regulations. For Switzerland: Special requirements for bark from all third countries exist according to Ordinance 916.201, Annex 7, section 5 (obligation of plant health certificate; https://www.fedlex.admin.ch/eli/cc/2019/787/fr). For the Eurasian Economic Union (EAEU): all imported products of <i>Pinus</i> spp., including bark, should be free from quarantine pest (EAEU, 2016a). Imported isolated bark of <i>Pinus</i> spp. should originate from areas and places of production free from <i>P. mexicanus</i> (EAEU, 2016a). Within the EU, trade of bark is not prohibited. <i>Pseudips mexicanus</i> is regulated as one of non-EU Scolytinae species (Regulation (EU) 2019/2072; Annex II A; # 72; EU, 2019).
Pathway subject to a plant health inspection at import?	Yes. Plant health regulations usually specify that wood products are regulated and should be imported with a phytosanitary certificate and are consequently subjected to import inspection, e.g. for the EU and EAEU.
Pest already intercepted?	No. There is no evidence that <i>P. mexicanus</i> has been intercepted in bark.
Most likely stages that may be associated	Pre-adult stages and young adults of <i>P. mexicanus</i> can be found under the bark of trunks and branches. This means that <i>P. mexicanus</i> can be associated with isolated bark of <i>Pinus</i> spp.
Important factors for association with the pathway	Bark plays an important part in the life cycle of the pest and therefore <i>P. mexicanus</i> may be present in pupation chambers within bark and there might be no visible signs of infestation; inspection is necessary.

Pathway	Bark
Survival during transport and storage	Although there were no available experimental data, the EWG believed that <i>P. mexicanus</i> is able to survive transport and storage in bark. Sea freight shipping from Mexico to Europe takes approximately 18–25 days (https://www.fluentcargo.com/routes/mexico/france?utm_source=, https://www.fluentcargo.com/routes/mexico/germany?utm_source=).
Trade	Eurostat (2025) was checked for the data on import of this commodity from Mexico and Guatemala for 2014–2023 using different custom CN Codes; however, no data were available, suggesting that this commodity is not currently imported from these countries. For Switzerland: No import in 2024 (A. Knoblauch, pers. comm., 2025). Detailed data on import of <i>Pinus</i> spp. wood commodities to the Russian Federation or the Eurasian Economic Union (EAEU) are not available. Analysis of broad categories of import (Wood and wood products; charcoal) suggests that bark was not imported from Mexico and Guatemala in 2016–2020 (https://ru-stat.su/date-Y2016-2020/RU/import/MX/0944; https://ru-stat.su/date-Y2016-2020/RU/import/GT/0944; Ru-Stat, 2025). A search was conducted in February 2025 with a purpose to find sellers in the Internet who would trade pine bark from Mexico and Guatemala with no success. This suggests that such trade does not exist or is very limited.
Transfer to a host	Adults of <i>P. mexicanus</i> that emerge from the pupal chambers are likely to seek out new hosts in the immediate area where the consignment is stored. Transfer would be similar to that for round wood. Transfer is facilitated when the commodity is stored outdoors for enough time prior to utilization, allowing emergence. In addition, transfer may be limited by the intended use of the commodity or facilitated if the commodities are used outdoors (e.g. ground cover, mulch). However, products for ground cover (mulch) likely constitute only a part of imports. Adults would need to find a suitable host tree species. The possibility for escape from bark vary depending on the type of packaging.
Likelihood of entry and uncertainty	From Mexico or Guatemala: <i>Likelihood: low</i>, because bark should be treated for most of the EPPO countries, volume of trade is small. <i>Uncertainty: moderate</i>, because the size of pieces of bark is not specified in legislation, the way of processing is not known, and no experimental data on survival of small bark beetles in bark were found.

8.2. Pathways considered but not investigated in detail

- **Above-ground fresh plant parts (including cut branches and Christmas trees)**

This pathway covers cut branches of hosts used for decoration or other ornamental purposes and young trees of host plants used as Christmas trees (although *Pinus* spp. are seldom used as Christmas trees).

For EU countries, it is prohibited to introduce plants of *Pinus* spp. (including parts) from Mexico and Guatemala (Regulation (EU) 2019/2072; Annex VI, section 1; EU, 2019; https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:02019R2072-20250126#anx_VI).

For the Eurasian Economic Union (EAEU), all imported products of *Pinus* spp., including cut branches, must be free from quarantine pest (EAEU, 2016a). Imported cut branches of *Pinus* spp. must originate from areas and places of production free from *P. mexicanus* (EAEU, 2016a).

The export of these commodities from Mexico to other countries is limited (less than 3 500 shipments during September 2023 – August 2024) and mostly destined to the USA, Dominican Republic and Costa Rica (<https://www.volza.com/p/christmas-or-tree/export/export-from-mexico/>).

Sea freight shipping from Mexico/Guatemala to Europe takes approximately 18–25 days (https://www.fluentcargo.com/routes/mexico/france?utm_source=https://www.fluentcargo.com/routes/mexico/germany?utm_source).

Both cut branches for ornamental purposes and Christmas trees are expected to be of high value and consequently of good quality, and therefore infested material is unlikely to be traded. For import into the EU, cut branches and Christmas trees of hosts require a phytosanitary certificate (Regulation (EU) 2019/2072; EU, 2019).

Pseudips mexicanus can be associated with twigs and branches with diameter 2.0 cm or more (Section 2); however the likelihood of the pest completing its lifecycle in cut branches of such diameter seems to be low.

It is noteworthy that *P. mexicanus* has never been found in host species in nurseries or Christmas tree farms (Equihua-Martínez, pers. comm, 2025).

From Mexico and Guatemala:

Likelihood: very low, because volume of trade into the EPPO area is thought to be very low; there are no reports of *P. mexicanus* from Christmas tree farms in Mexico; quality of the commodity should also be high.

Uncertainty: low (no major uncertainty found).

8.3. Unlikely pathways: very low likelihood of entry

The unlikely pathways are listed in no particular order.

- **Round wood and sawn wood without bark**

Bark-free round and sawn wood are not considered likely pathways for *P. mexicanus*, because bark is essential for the development of bark beetles.

Uncertainty: low.

- **Sawdust and shavings, processed wood material, post-consumer scrap wood**

The EPPO Study on wood commodities (EPPO, 2015) considered the risk of this pathway as being low for insect pests (p. 23). Such wood material is processed to a level that would not allow survival of the pest. Any eggs, larvae or pupae present in the initial material would die or not be able to continue development.

Uncertainty: low.

- **Furniture and articles entirely or partly made of raw wood or bark**

Wood of host can be used for furniture or handicraft objects. The wood used in the manufacture of furniture must be appropriately treated and is normally significantly processed material and thus should not be a pathway to entry.

The size of some wooden objects may not be sufficient to allow the presence or the complete development of the insect. As the wood and bark dry, they will also become unsuitable for larval development. If pupae or callow (pharate) adults are present, it is not known if adults would be able to emerge from very dry substrate, even though some traded wooden objects are known to allow the movement of insects: the longhorn beetles *Monochamus alternatus* (a potential vector of *B. xylophilus*) and *Trichoferus holosericeus* have been found in dining chairs, *Trichoferus campestris* in a wooden cutlery tray, *Leptura quadrifasciata* in a railway sleeper, and the buprestid *Coomaniella purpurascens* was found in souvenir pencils (size: 25 x 5 cm) made from unknown host (Ostojá-Starzewski, 2014; Bílý & Volkovitsh, 2015; Hodgetts et al., 2016). Note that longhorn beetles and buprestids live in wood, not under the bark. In online trade, pine bark for articles and crafting is available (https://www.etsy.com/market/pine_bark_for_crafts), but as for January 2025, no producers from Mexico or Guatemala are listed.

Uncertainty: low.

- **Fruits (cones)**

No life stages are associated with pine cones.

Uncertainty: low.

- **Underground fresh plant parts (roots)**

No life stages are associated with roots.

Uncertainty: low.

- **Stored products/dried plant parts**

No life stages are associated with these commodities.

Uncertainty: low.

- **Natural spread**

This pathway covers the natural movement of *P. mexicanus*. The bark beetle is present in Mexico and Guatemala and is under official control in Ireland. Natural spread refers to flight either wind assisted or not. This pathway is relevant for spread within the EPPO region (Section 11).

No information has been found on the rate or distance of natural spread of *P. mexicanus*; however natural spread from Mexico and Guatemala to the EPPO region is not considered possible, and from Ireland to other countries of the EPPO region – very unlikely.

Uncertainty: low.

- **Travellers**

This pathway concerns the movement of potential host material through personal consignments associated with overseas travel. It is not thought to be a pathway of concern.

Uncertainty: low.

- **Conveyance, vehicles and equipment**

This pathway concerns machinery, vehicles, and other equipment that have been operated in a pine production area. Vehicles and equipment used are unlikely to be specialized machinery. If there is any movement of used machinery from the countries where the pest occurs into an EPPO country, phytosanitary requirements may be applied, such as that the machinery should be free from plant (and soil) debris and decontaminated. Recommendations of phytosanitary measures are given in the ISPM 41. This pathway is, in general, relevant for spread within the EPPO region (Section 11).

Uncertainty: low.

- **International mail items**

This pathway concerns the movement of potential host material through e-commerce. It is not thought to be a pathway of concern.

Uncertainty: low.

- **Hitchhiking**

This pathway concerns the movement of the pest through opportunistic hitchhiking on commodities other than host material. It is not thought to be a pathway of concern.

Uncertainty: low.

8.4. Overall rating of the likelihood of entry

Table 8.6. Summary of ratings of the likelihood of entry

Commodity	Section/Table	Likelihood	Uncertainty
Round wood and sawn wood with bark (from Mexico and Guatemala)	Section 8.1, Table 8.1	Moderate	Moderate
Wood packaging material (WPM) (from Mexico and Guatemala)	Section 8.1	Moderate	Moderate
Plants for planting (except seeds, tissue cultures, pollen) (from Mexico and Guatemala)	Section 8.1, Table 8.2	Very low	Low
Wood chips, processing wood residues, hogwood (except sawdust and shavings) (from Mexico and Guatemala)	Section 8.1, Table 8.3	Low	Low
Bark (from Mexico and Guatemala)	Section 8.1, Table 8.4	Low	Moderate

The overall rating of the likelihood of entry is based on the rating of two pathways with the highest rating: Round wood and sawn wood with bark and Wood packaging material (from Mexico and Guatemala).

Rating of the overall likelihood of entry	Very low ☐	Low ☐	Moderate ☒	High ☐	Very high ☐
Rating of uncertainty			Low ☐	Moderate ☒	High ☐

Transfer from infested round wood and sawn wood with bark or WPM to suitable hosts in the PRA area may be problematic for *P. mexicanus*, as it depends on the alignment of a range of favourable circumstances. For the successful establishment of a new breeding population, a sufficient number of males and females have to escape from the location of infested material and find a suitable place (recently dead, dying or stressed *Pinus* spp. host plants). As with many other bark beetle species, males of *P. mexicanus* colonise host material and initiate gallery construction, then they attract other males (to infest the tree) and females (to mate) (Section 2). **This implies that mating does not take place at the point of entry but only after finding suitable breeding material.**

9. Likelihood of establishment outdoors in the PRA area

9.1. Climatic suitability

The knowledge is very limited on the climatic requirements of *P. mexicanus* (see Sections 2.4 and 2.5), in particular, nothing is known about the accumulated temperatures required for the development of each life stage, lower developmental threshold, and the lethal low and high temperature-duration combinations. Consequently, the suitability of climate was estimated only by comparing the climate in the known range of the pest in Mexico and Guatemala to the climate in the EPPO region using Köppen-Geiger climate classification, the ‘match regional climate’ algorithm of the CLIMEX software (Kriticos et al., 2015), and data on annual degree days above 8.5 °C. Because *P. mexicanus* spends most of its life cycle inside the host tree, relative humidity is not expected to have a strong influence on the likelihood of establishment of the pest (nevertheless its effect is taken into account in the matching of regional climates; Section 9.1.3).

9.1.1. Köppen-Geiger climate match

To understand environmental requirements of *P. mexicanus*, the EWG collected records of the pest from all available sources (GBIF database: <https://doi.org/10.15468/dl.kxha27> for *Ips mexicanus* and <https://doi.org/10.15468/dl.3pz2sa> for *P. mexicanus*; iNaturalist: <https://uk.inaturalist.org/taxa/222272-Ips-mexicanus>; Steed & Willhite, 2007; Tello-Salgado et al., 2021; Atkinson, 2025; Cognato & Smith 2024; A. Petrov, pers. comm., 2025; etc.). In total, there were 164 occurrence records in the initial dataset. Using the ‘CoordinateCleaner’ package (Zizka et al., 2019) in R, the data was screened to identify and delete duplicate occurrence records, and records in the vicinity of biodiversity institutions, country and province centroids and non-terrestrial areas. The remaining (revised) dataset included 122 records. These records were cross-referenced with Köppen-Geiger climate types in 1991–2020 at a spatial resolution of 0.01° (approximately 1 km at the equator; Beck et al., 2023; Fig. 9.1; Table 9.1; Annex 8). The 122 records were categorized within 11 Köppen-Geiger climate types (Table 9.1).

Five occurrence records that are located within the ET climate type (polar tundra) looked suspicious. Temperature should be very low there and hosts hardly available. A closer look at those regions revealed that the areas with ET climate types are very small and local (probably the high peaks of mountains). It is likely that there were small inaccuracies in the coordinates or in assignment to particular Köppen-Geiger climate types close to their borders, and that these records are not located within the ET areas but close to them. When these five records are cross-referenced with Köppen-Geiger data at a spatial resolution of 0.1 ° (approximately 10 km at the equator) they fall into the categories Cwb and Cfb. These are more likely Köppen-Geiger

categories for these records. Consequently, these ET climate types were not included in further analysis in this section.

Table 9.1. Datasets of distribution records used for the climate suitability analysis (a revised dataset, 122 records)*.

Köppen-Geiger climate types**	Number of records	Proportion (%)
Am (tropical monsoon)	2	1.6
Aw (tropical, savanna with wet seasons)	14	11.5
BWh (dry, hot desert)	1	0.8
BSh (dry, hot semi-arid steppe)	2	1.6
BSk (dry, cold semi-arid steppe)	6	5.0
CWa (temperate, dry winter humid sub-tropical)	4	3.3
CWb (temperate, dry winter, sub-tropical highland)	78	64.0
CWc (temperate, dry winter, cold sub-tropical highland)	1	0.8
Cfa (temperate, uniform precipitation through the year, humid sub-tropical)	2	1.6
Cfb (temperate, uniform precipitation through the year, oceanic)	7	5.7
ET (polar tundra)	5	4.1
Total	122	100.0

* Climate types that have more than 5.0% of the records each in the revised dataset are shown in bold.

** Descriptors (characteristics) of the climate types are given as in MacLeod and Korycinska (2019).

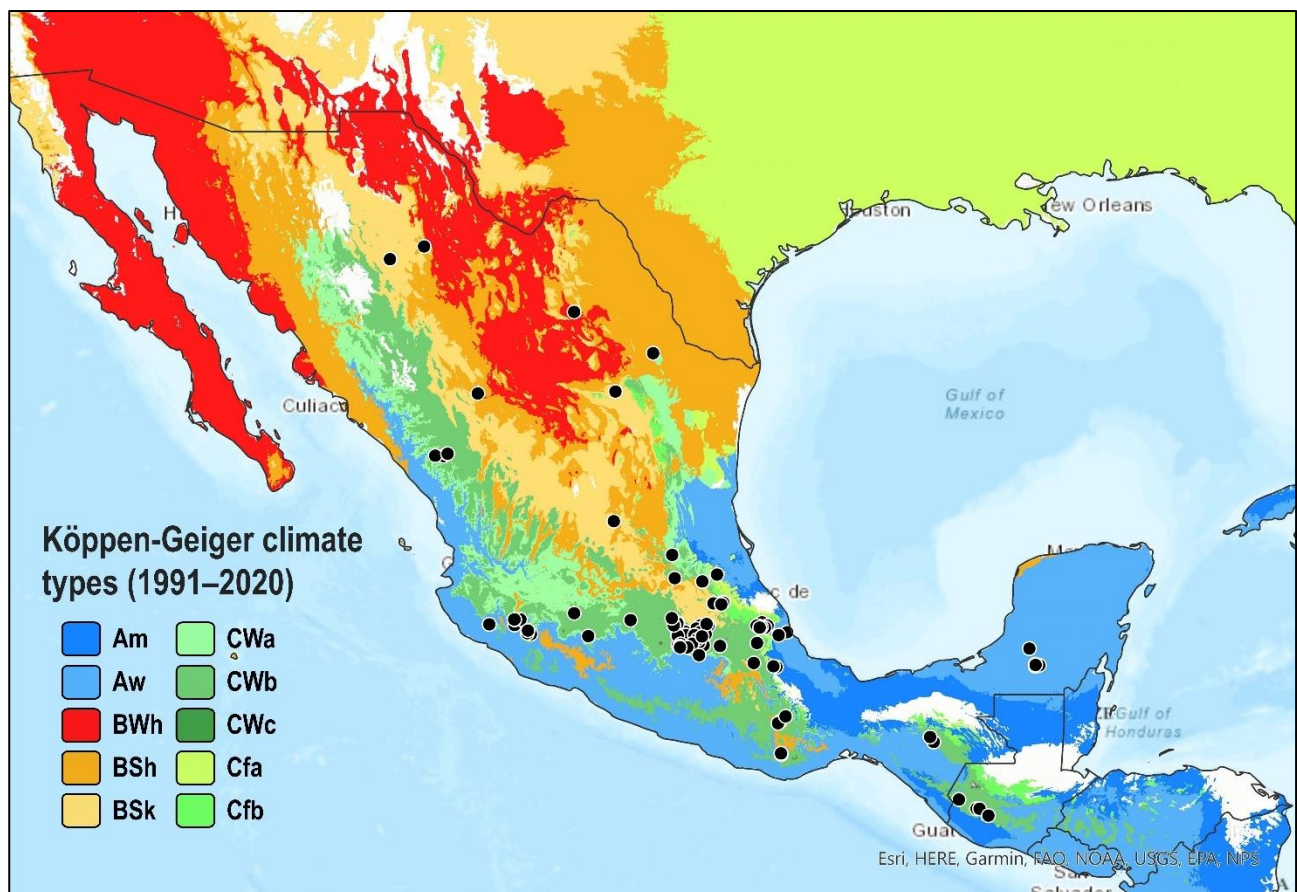


Figure 9.1. Occurrence records of *P. mexicanus* (black dots) collected by EWG from literature and online databases, which can be with high confidence attributed to this species (117 records), plotted against the distribution of the Köppen-Geiger climate type (the current climate: 1991–2020) according to Beck et al. (2023). The country borders in the map were sourced from GADM (2020). The map was prepared by J. Tuomola (EWG; Ruokavirasto, Finland).

As presented in Table 9.1 and Fig. 9.1, four Köppen-Geiger climate types have 5.0% or more records each in the revised dataset and these four climate types were considered typical for *P. mexicanus* in its native range: CWb (temperate, dry winter, sub-tropical highlands), Aw (tropical, savanna with wet season), BSk (dry, cold semi-arid steppe), and Cfb (temperate, uniform precipitation through the year, oceanic) (descriptors of climate types are given after MacLeod & Korycinska, 2019).

Figure 9.2 depicts the distribution in the EPPO region of the ten Köppen-Geiger climate types that are associated with the observation points of *P. mexicanus* in its native range (without ET climate type) and Fig. 9.3 depicts separately two climate types (Cfb and BSk) which are present in both native range of *P. mexicanus* and in the EPPO region and both having more than 5.0% of records. Together Cfb and BSk correspond to 10.7% of the records of *P. mexicanus* in its native range. The other nine climate types which correspond to 89.3% of the records in the native range either are not present in the EPPO region or correspond to a very small proportion of records (each to less than 5.0%). Distribution of Cfb and BSk climate types are demonstrated under the current climate conditions (1991–2020) and one of future pessimistic climate change scenario SP370 (Shared Socioeconomic Pathways 370 for 2041–2070; SSP3-7.0; ‘regional rivalry, low cooperation, slow mitigation’; Fig. 9.3).

The climate type Cfb (temperate, uniform precipitation through the year, oceanic; 5.7% of records) is currently typical for major parts of the United Kingdom and Ireland, France, Belgium, Germany, the Netherlands and numerous but isolated locations in the north-west of Mediterranean region. The climate type BSk (dry, cold semi-arid steppe; 5.0% of records) is typical mostly for central and southern Spain, northern Africa, countries situated around Black and Caspian Seas (Moldova, Romania, Türkiye), Kazakhstan and south-west of the Russian Federation (Fig. 9.3).

In Ireland, the pest is recorded in the Cratloe area (municipality of Shannon) in Clare County (close to 52.7°N, -8.8°W), a region with climate type Cfb (one of the climate types considered typical for *P. mexicanus* pest in its native range).

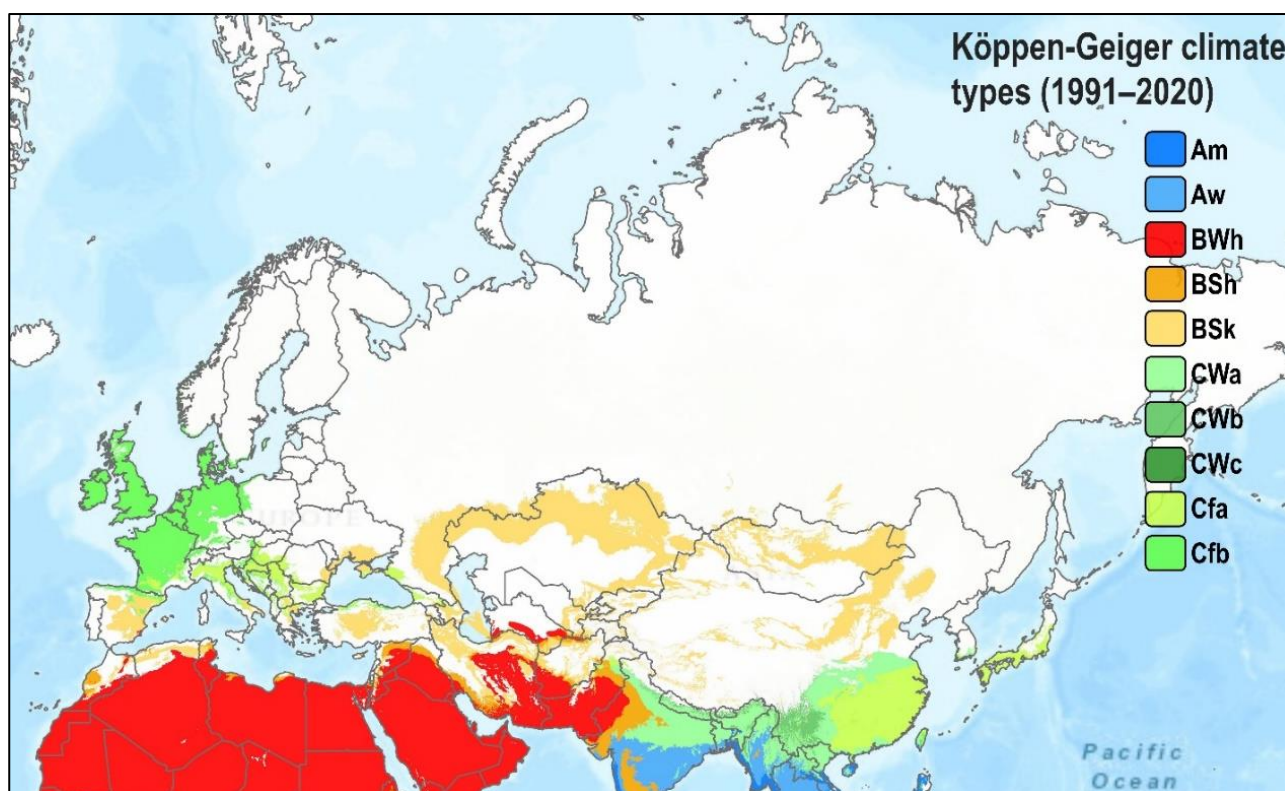


Figure 9.2. Distribution in the EPPO region of the recent Köppen-Geiger climate types that are associated with the observation points of *P. mexicanus* in its native range. The country borders in the map were sourced from GADM (2020). The map was prepared by J. Tuomola (EWG; Ruokavirasto, Finland).

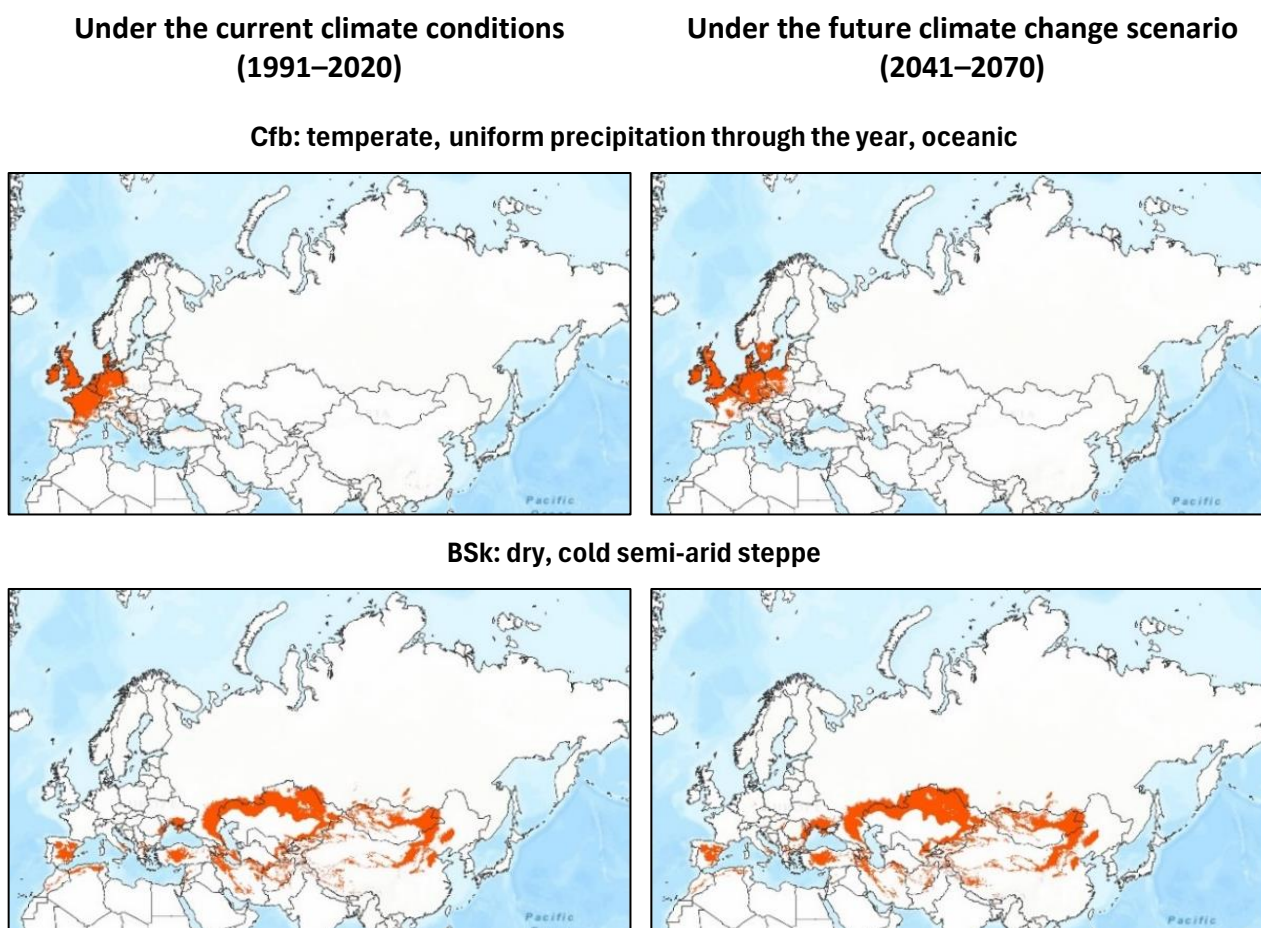


Figure 9.3. Distribution in the EPPO region of two climate types typical for *P. mexicanus* (Cfb and BSk) under current climate conditions (1991–2020, left panel) and the future pessimistic climate change scenario SP370 (2041–2070, right panel). The country borders in the maps were sourced from GADM (2020). The maps are prepared by J. Tuomola (EWG; Ruokavirasto, Finland).

9.1.2. Annual growing degree days above 8.5 °C

Annual growing degree days (GDD) data were used to further analyze climate suitability. The 90-arc second spatial resolution daily air temperature data for 1997–2016 (Karger et al., 2017, 2022) were used to calculate a 20-year average annual GDD globally. **As the lower thermal threshold is not known for *P. mexicanus*, the EWG decided to use the lower thermal threshold (8.5 °C) of the sister species *P. radiatae* estimated in British Columbia (Canada)** (Smith et al., 2009). The annual GDDs were calculated using Method 1 by McMaster and Wilhelm (1997). Then the annual GDD values were cross-referenced with the occurrence records for *P. mexicanus*. Based on these data, maps of the annual GDDs in the native range of *P. mexicanus* (Fig. 9.4) and in the EPPO region (Fig. 9.5) were prepared (an enlarged map of the western part of the EPPO region is presented in Annex 9).

For *P. mexicanus*, the annual GDD values corresponding to the occurrence records vary from 884 to 6658 (Table 9.1; Annex 5). Such a large variation reflects the ability of the species to produce different numbers of annual generations in regions with different climates (see Section 2.2). **It is likely that most of occurrence records correspond to the conditions where *P. mexicanus* produces 2 or 3 generations per year.**

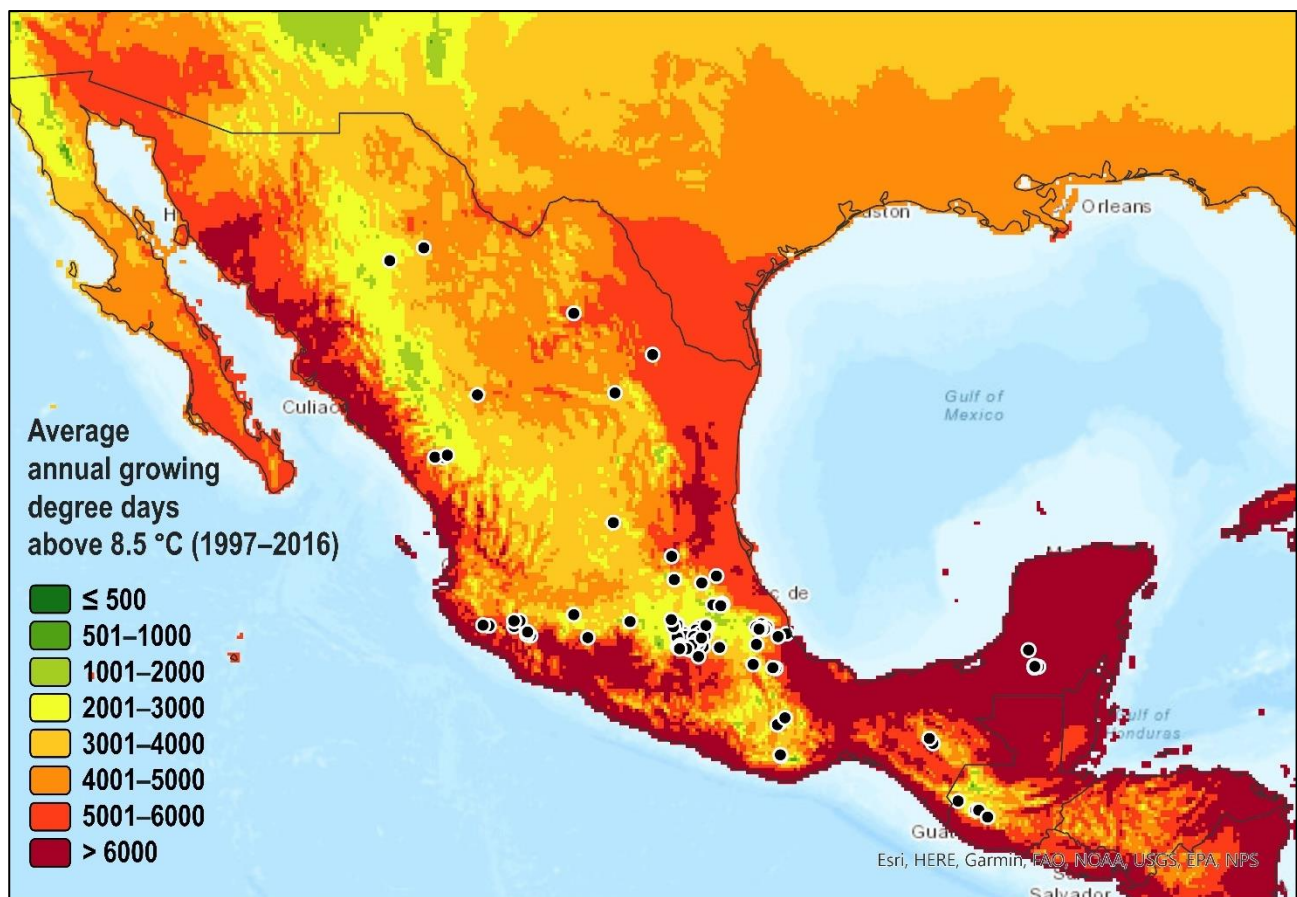


Figure 9.4. A 20-year average of annual growing degree days above 8.5 °C for 1997–2016 (Karger et al., 2017, 2022) in the native range of *P. mexicanus*. The country borders on the map were sourced from GADM (2020). The map was prepared by J. Tuomola (EWG; Ruokavirasto, Finland).

It was shown that for *P. radiatae* in British Columbia (Canada), 889 GDD were needed to complete pre-adult development (without a period for maturation of adults; with the estimated lower developmental threshold of 8.5°C; Smith et al., 2009). The data from Table 9.1 and Annex 5 suggest that **approximately 900–1000 GDD are needed for *P. mexicanus* to complete a full generation** (and this limit covers more than 95% of records in the revised dataset; only five records were below 900 GDD [874...895]; Table 9.1). **If it is hypothesized that only temperature limits the distribution of *P. mexicanus* (and not other factors), then a large part of the EPPO region can be considered suitable for *P. mexicanus* (the zones indicated in Fig. 9.5 as bright green [GDD 1001–2000] – isolated locations in Ireland, central United Kingdom, almost all continental western and central Europe, southern Sweden, western and southern parts of the Russian Federation, Kazakhstan and Central Asia and further southward to the southern limits of the EPPO region).**

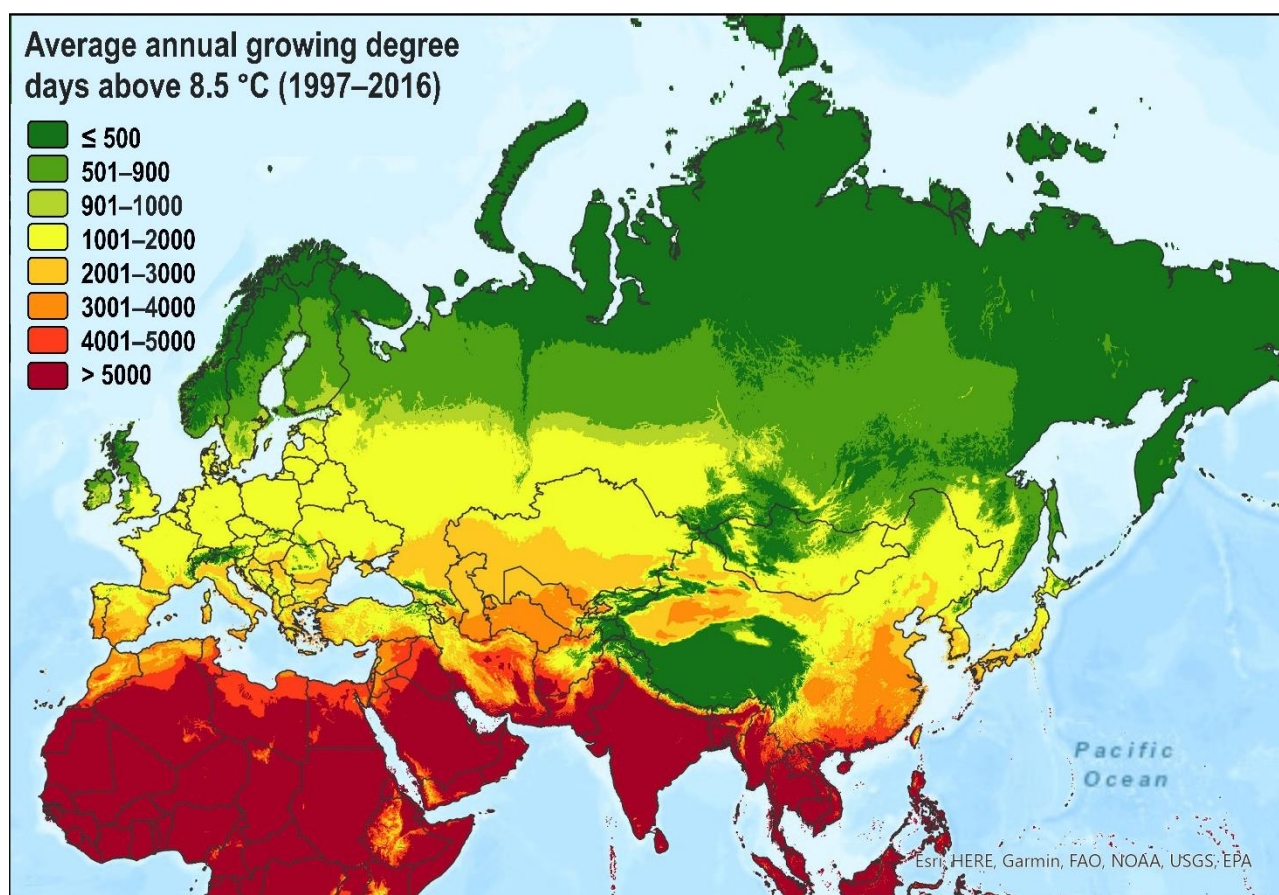


Figure 9.5. A 20-year average of annual growing degree days above 8.5 °C for 1997–2016 (Karger et al., 2017, 2022) in the EPPO region. The country borders on the map were sourced from GADM (2020). The map was prepared by J. Tuomola (EWG; Ruokavirasto, Finland). An enlarged map of the western part of the EPPO region is presented in Annex 9.

Table 9.1. Distribution of occurrence records of *P. mexicanus* in relation to classes of the annual growing degree days above 8.5 °C (a revised dataset, 122 records).

Annual growing degree days (GDD) above 8.5 °C (for 1997–2016)	Number of corresponding occurrence records for <i>P. mexicanus</i>	Number of corresponding occurrence records for <i>P. mexicanus</i> (proportion, %)
≤ 500	0	0
501–900	5	4.0
901–1000	2	1.7
1001–2000	23	18.9
2001–3000	51	41.8
3001–4000	14	11.5
4001–5000	8	6.6
5000–6000	6	4.9
> 6000	13	10.7
Total	122	100.0

9.1.3. Matching climate

The CLIMEX software and the ‘match regional climate’ algorithm was used to assess climatic similarity between the known occurrence locations of *P. mexicanus* (‘home’ locations – corresponding to the 122 minus 5 ET climate type occurrence records of the pest) and the rest of the world (‘away’ locations). The analyses

were run using the default selected settings of the parameter values (i.e. equal weighting of (1) minimum and (2) maximum weekly temperatures, (3) weekly rainfall pattern and (4) total annual rainfall) in a 30-arc minute spatial resolution (about 50 km). The climatological data on the recent climate as 30-year average centred on 1995 was acquired from the CliMond climatic database (for 1981–2010; www.climond.org; Kriticos et al., 2012). The ‘match regional climate’ algorithm compares climatic variables between all the ‘away’ locations to each of the ‘home’ locations as a separate run and retains the best match from all the runs as a final result for each ‘away’ location (Kriticos et al., 2015). The Composite Match Index (CMI), which ranges from 0 (very low similarity) to 1.0 (very high similarity), was used to describe the climatic similarity. The general rule of thumb is that $CMI \geq 0.7$ indicates high enough similarity to allow establishment (Roigé & Phillips, 2021). The CMI data for the native range are presented on Fig. 9.6.

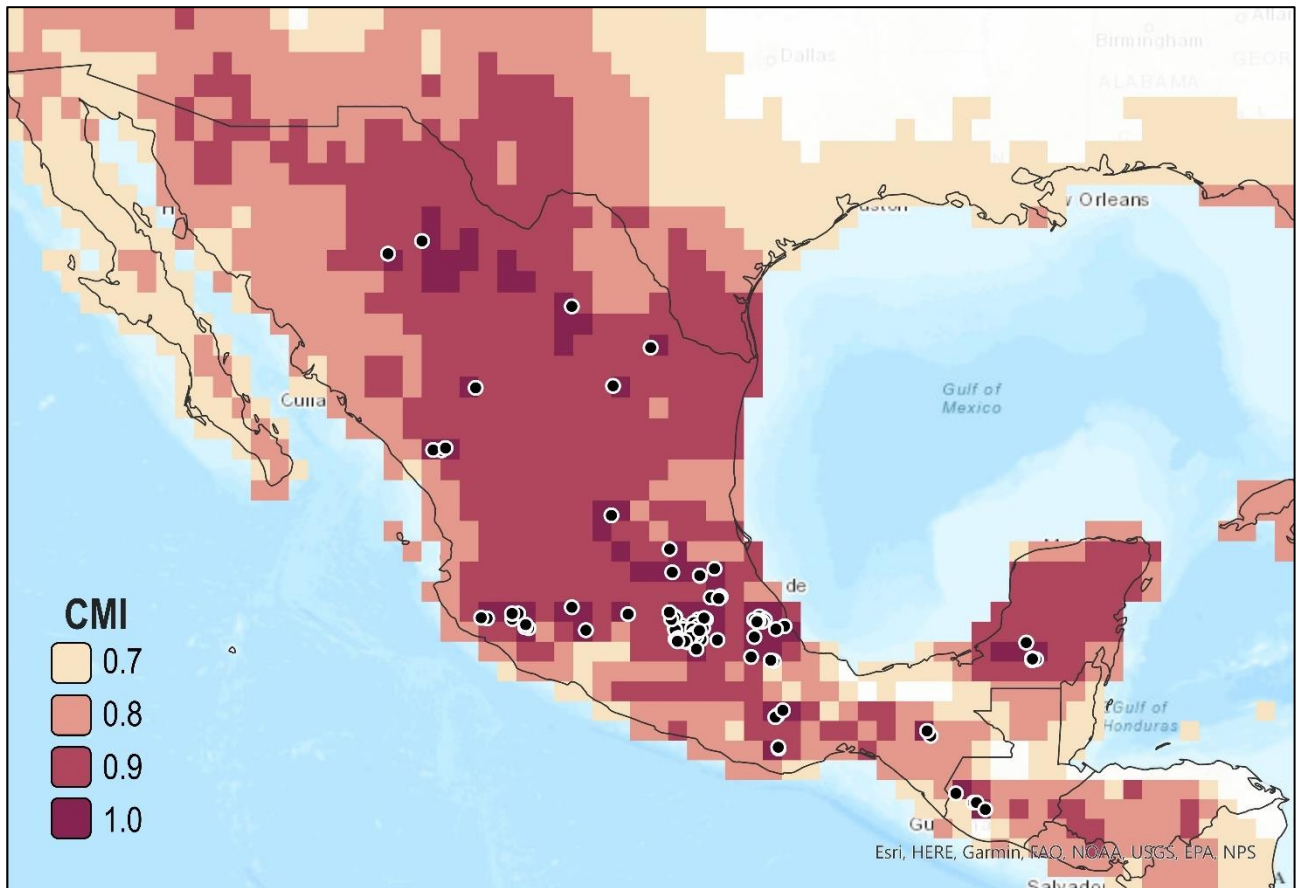


Figure 9.6. Occurrence records of *P. mexicanus* (black dots) in the native range and calculated Composite Match Index (CMI), which ranges from 0 (very low similarity to ‘home’ locations) to 1.0 (very high similarity to ‘home’ locations). Climate data for 1981–2010 are used. The country borders in the map were sourced from GADM (2020). The map was prepared by J. Tuomola (EWG; Ruokavirasto, Finland).

Figure 9.7 shows areas in the EPPO region where the $CMI \geq 0.7$ according to the analyses (an enlarged map of the western part of the EPPO region is present in Annex 10). Areas where the $CMI \geq 0.9$ are not present in the EPPO region. $CMI = 0.8$ is present locally in Spain, northern Africa, along northern and eastern coast of the Mediterranean Sea. The area where the $CMI \geq 0.7$ is wider and covers (although fragmentary) part of England, most of Europe, northern Africa, isolated regions in Azerbaijan, southern part of the Russian Federation, and central Asia. Only a small central part of Ireland is characterized by $CMI = 0.7$.

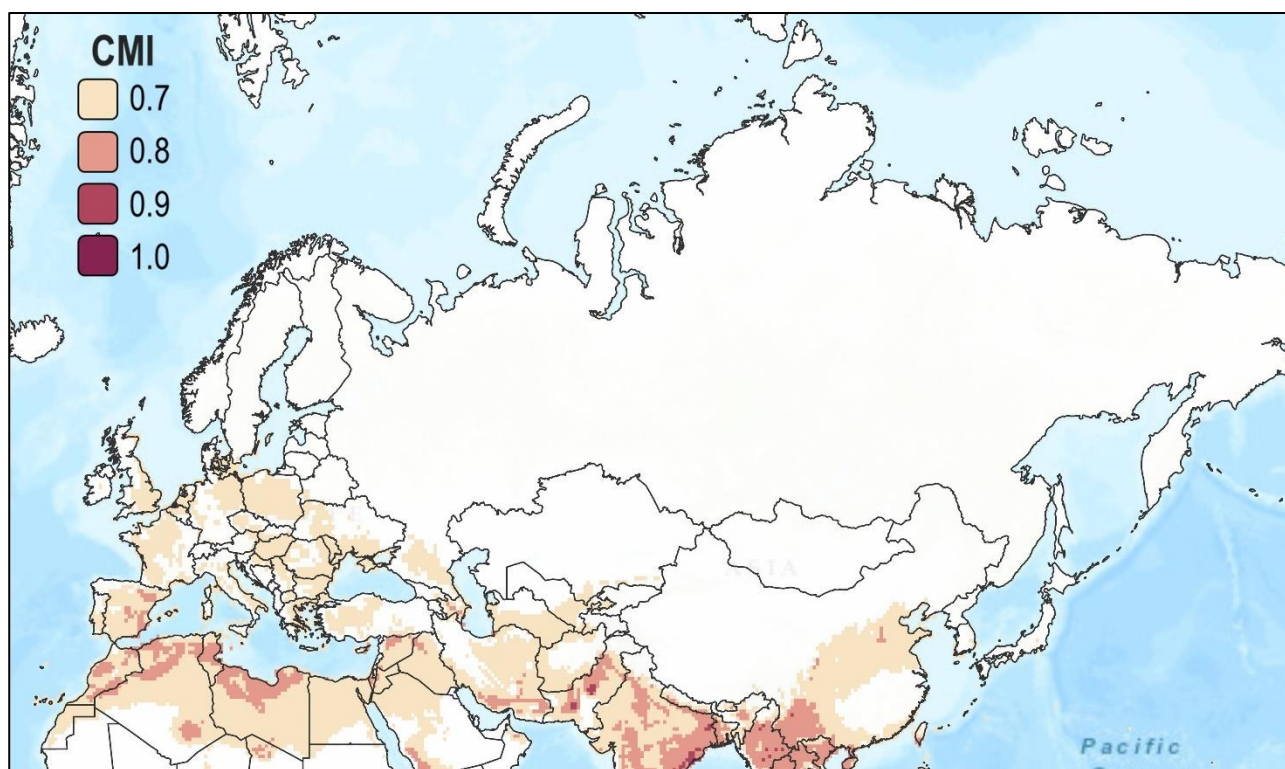


Figure 9.7. Similarity of climate between the EPPO region to the climate in the record points of *P. mexicanus* in its native range. The climate similarity was estimated using the ‘match regional climate’ algorithm of the CLIMEX software. Only results where the CMI ≥ 0.7 are presented. The country borders on the map were sourced from GADM (2020). Climate similarity based on the default parameter values of the algorithm (i.e. equal weighting of minimum and maximum weekly temperatures, weekly rainfall pattern and total annual rainfall). An enlarged map of the western part of the EPPO region is present in Annex 10. The map was prepared by J. Tuomola (EWG; Ruokavirasto, Finland).

Thus, overall, when all used elements of climatic analysis are combined (i.e. not only temperature, but also precipitation) and climate matching are considered together, it seems possible that *P. mexicanus* can establish in Northern Africa; most of continental Europe (particularly Spain); some parts of the United Kingdom and Ireland; isolated regions in Azerbaijan; the southern parts of the Russian Federation; and Central Asia.

There is an uncertainty on whether *P. mexicanus* can establish under Köppen-Geiger climate types that are not present in its area of distribution (according to the available records of the species), such as the Mediterranean climate types Csa and Csb, and in drier areas, and in the northern part of the EPPO region with lower winter temperature. There is no information on how this species overwinters (e.g. in Ireland).

9.1.4. Future climate

The future climate similarity was evaluated only using Köppen-Geiger climate types, because datasets of daily future temperatures based on ensembles of Global Circulations Models (GCMs) are not readily available. Distribution of all relevant climate types is presented in Fig. 9.8 and that of the two main climate types, both having more than 5.0% of the records (Cfb and BSk) under the future climate scenario SP370 (2041–2070) (Shared Socioeconomic Pathways 370) is shown separately in Fig. 9.3 (the right column).

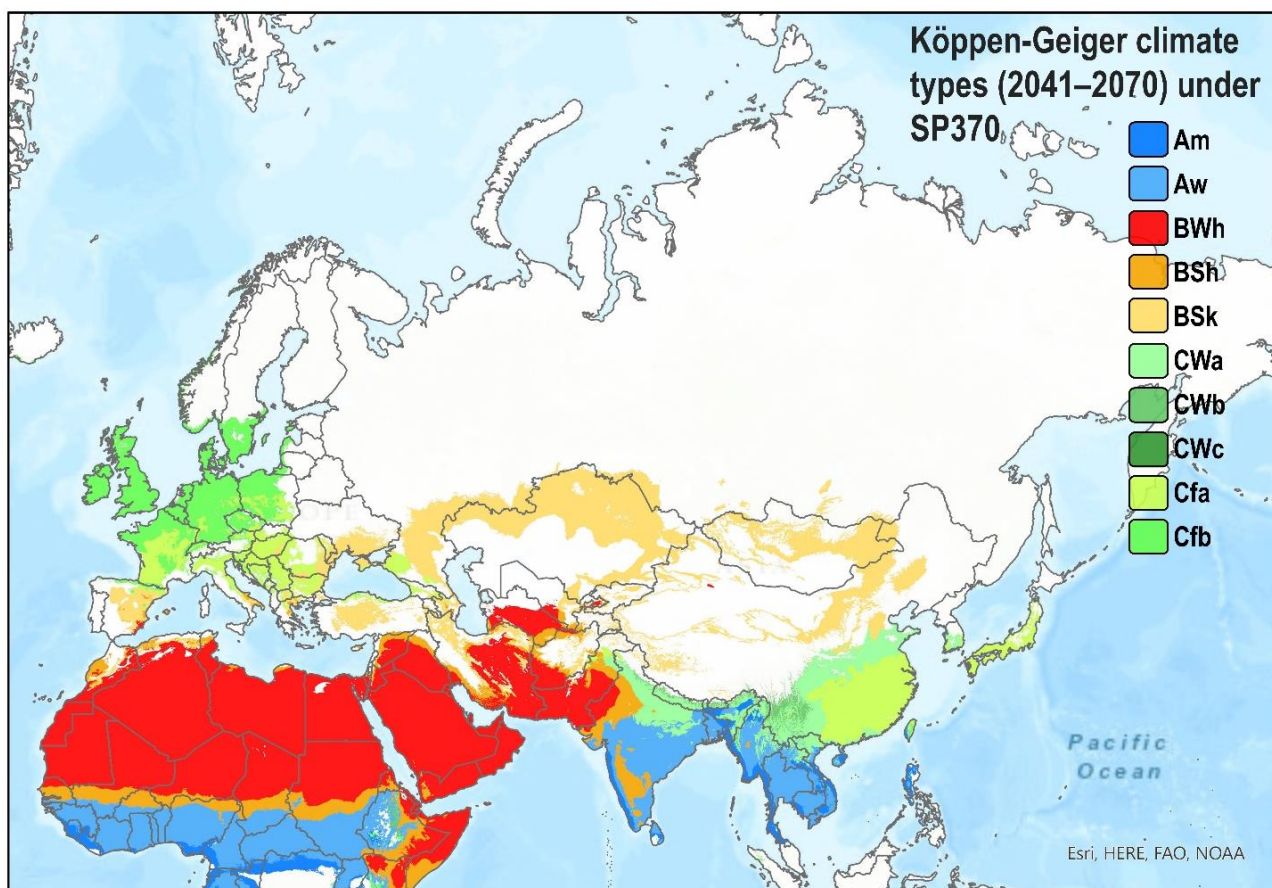


Figure 9.8. Distribution in the EPPO region of the Köppen-Geiger climate types that are associated with the observation points of *P. mexicanus* in its native range. The situation is shown for the future climate scenario SP370 (2041–2070). The country borders in the map were sourced from GADM (2020). The map was prepared by J. Tuomola (EWG; Ruokavirasto, Finland).

Under the future climate scenario SP370 (Shared Socioeconomic Pathways 370; 2041–2070; Figs 9.3 and 9.8), climate type Cfb (temperate, uniform precipitation through the year, oceanic) will be less spread in France than now, but will be typical for major parts of the United Kingdom and Ireland, Belgium, Germany, the Netherlands, Denmark, Southern Sweden and numerous but isolated regions in the north-west of Mediterranean region. It will cover most of Poland. In many of these countries several host species are and will be present. The distribution of the climate type BSk (dry, cold semi-arid steppe) will not change significantly if compared to the current situation, except expanding in the northern Kazakhstan (Fig. 9.3). Thus, the potential area of establishment of *P. mexicanus* can increase in the future (e.g. in Southern Sweden, Poland and Kazakhstan).

9.2. Host plants

Within its native range *P. mexicanus* is associated with at least 17 species of *Pinus* (Section 7). None of these pine species grow naturally in the EPPO region. Some of them are cultivated to some extent (e.g. *Pi. montezumae* or *Pi. oocarpa*), used in forestry trials (e.g. *Pi. pseudostrobus*) or in present in botanical collections (e.g., *Pi. ayacahuite* or *Pi. cembroides*) (Section 7).

Pinus radiata and *Pi. contorta* are often mentioned as hosts of *P. mexicanus*, but the EWG considered these two species uncertain hosts (Section 7).

As in Ireland, *P. mexicanus* was found in galleries under the bark of a single tree of Scots pine (*Pi. sylvestris*), this pine species is also considered by the EWG as a host (Section 7).

***Pinus sylvestris* is a very common species of pine found across a large area in Europe and Asia (Fig. 9.9).** It can grow in many different environments and from low to high altitudes. *Pinus sylvestris* is an important tree in forestry in the EPPO region. Its wood is used for pulp and sawn timber products. Commercial plantation rotations vary between 50 and 120 years, with longer rotations in northeastern areas where growth is slower.

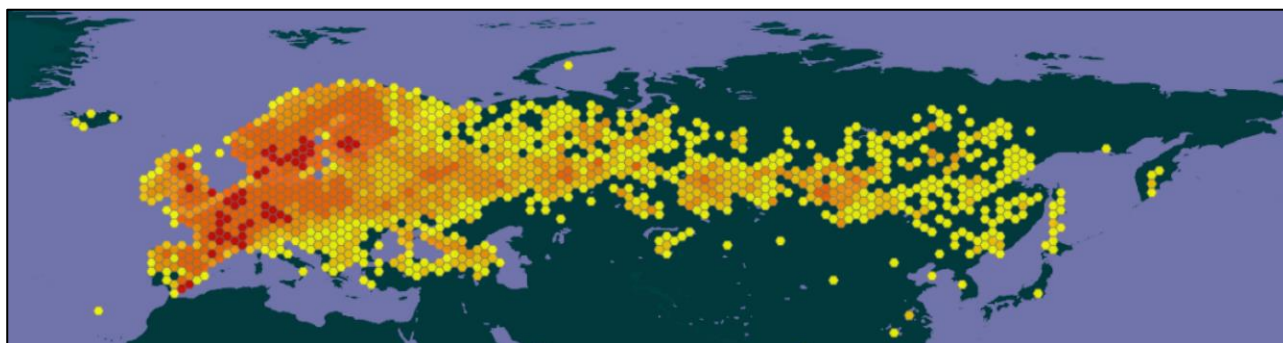


Figure 9.9. Distribution of *Pinus sylvestris* in the EPPO region (from the GBIF Database; <https://www.gbif.org/ru/species/5285637>).

If *P. mexicanus* spreads from Ireland or re-enters into the EPPO region, there is a risk that it can shift to new hosts, likely from the same genus (*Pinus*). Host shifts are known to sometimes facilitate the establishment of bark beetles (Grégoire et al., 2024). In Europe, at least eight out of 86 species of Scolytinae associated with *Pinus* spp. are not native to Europe (Šenfěldová et al., 2024; see also Annex 6). In the Caucasus, *Ips sexdentatus* started to aggressively attack a new host – oriental spruce, *Picea orientalis* Carr (EFSA, 2017). In west Siberia, *Ips amitinus* also infested new hosts: *Pinus sibirica*, *Picea obovata* and possibly the introduced *Pinus koraiensis* (Kerchev et al., 2019; Kerchev & Krivets, 2021). Within a short period of time, *I. amitinus* infested a few thousand hectares of *Pi. sibirica* in West Siberia and its spread continues (Kerchev et al., 2022).

In the PRA area, *Pinus* spp. are widely present and utilised in commercial forestry, amenity areas and present in the wider environment (Fig. 9.10). Their susceptibility to *P. mexicanus* is not yet known.

Shift to other coniferous (non-*Pinus* spp.) is unlikely, because *P. mexicanus* has been recorded developing only on pines (see Section 7), but with uncertainty because some examples of host plant shifts are known for invasive Scolytinae species (Lantschner et al., 2017; Faccoli et al., 2020).

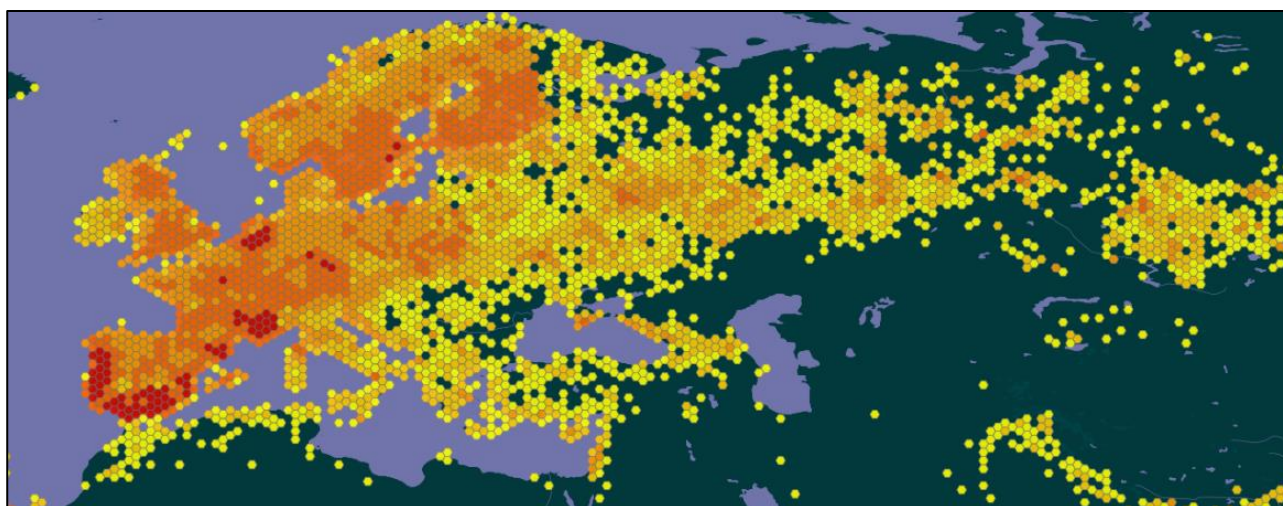


Figure 9.10. Distribution of the genus *Pinus* L. in the EPPO region (from the GBIF Database; <https://www.gbif.org/species/2684241>).

9.3 Other factors

- It is not known how *P. mexicanus* (as a secondary pest) will interact with local aggressive and secondary bark beetle species and native natural enemies in the EPPO region.
- It is also not known how early in the season *P. mexicanus* will start flying and colonizing hosts (it might have a relatively low flying temperature threshold) in the PRA area. If it is a late flier, however, most of the possible hosts (niches) may already be colonized by other bark beetles.
- Forest management practices differ in different countries of the EPPO region.
- Outbreaks of more aggressive bark beetles and other pests, drought stress, fires, storms, and other disturbances create habitat and suitable conditions for secondary bark beetles like *P. mexicanus*.
- Removal of all recently dead *Pinus* spp. trees might be very costly for small forest owners, and it is not always done in a timely manner.
- Where *P. mexicanus* is a regulated pest (as in EU and EAEU), official control and eradication are mandatory.

9.4. Conclusions

Pseudips mexicanus is present in different climatic types in its native range and can tolerate a wide range of climates. Thus, it is unlikely that climate will be a limiting factor for it to potentially establish within at least some parts of the EPPO region. The overwintering strategy of *P. mexicanus* in colder climates is unknown and it is still possible that it may struggle to survive in the more northern part of the EPPO region (with GDD < 900 above the estimated lower developmental threshold of 8.5°C; see Fig. 9.5).

There is uncertainty on whether *P. mexicanus* can establish under climate types that are not present in its area of current distribution (according to the available records of the species), such as the Mediterranean climate types Csa and Csb, and in drier areas, but establishment in these areas is not excluded.

Pinus sylvestris and several other *Pinus* species are widely present in the PRA area and can become hosts for *P. mexicanus*.

The EWG considered that the potential area of establishment of *P. mexicanus* could include Northern Africa; most of continental Europe (particularly Spain); some parts of the United Kingdom and Ireland; isolated regions in Azerbaijan; the southern parts of the Russian Federation; and Central Asia. However, there is an uncertainty on the northern limit and whether *P. mexicanus* could survive in the dry areas in the EPPO region. Under conditions of climate change, the potential area of establishment of *P. mexicanus* can increase.

The likelihood of establishment of *P. mexicanus* was rated as **very high** with **low** uncertainty because hosts (*Pinus* spp., including potential hosts) are readily available and climatic conditions are suitable in a considerable part of the EPPO region.

The following uncertainties were noted: no information on the thermal requirements of *P. mexicanus*, and therefore there is uncertainty on the extent of the area at risk is in the EPPO region.

Rating of the likelihood of establishment outdoors	Very low	Low	Moderate	High	Very high
	☐	☐	☐	☐	☒
Rating of uncertainty			Low ☒	Moderate ☐	High ☐

10. Likelihood of establishment in protected conditions in the PRA area

Pinus spp. are cultivated under protected conditions (at least in some EPPO countries) but only for a short time and when they are very young (seedlings) and would be too small to be suitable as hosts.

Rating of the likelihood of establishment in protected conditions	Very low ☒	Low ☐	Moderate ☐	High ☐	Very high ☐
Rating of uncertainty			Low ☒	Moderate ☐	High ☐

11. Spread in the PRA area

11.1. Natural spread

No information has been found on the rate or distance of spread of *P. mexicanus* in the current area of distribution in Mexico, Guatemala and in Ireland.

In general, for bark beetles, for majority of adults in a population, dispersal flights are local and short, (up to a few hundred meters or a few kilometres), especially if host plants are available (Kautz et al., 2016; Jones et al., 2018). However, direct flight distances of 50 km for *Ips sexdentatus* (Jactel and Gaillard, 1991) and 18 km or more for *I. typographus* (Forsse & Solbreck, 1985) have been reported. Some *Ips* species are known to fly over even longer distances (greater than 50 km), in particular when they are wind-assisted (Evans, 2021; see Section 2.3). In Sweden, the non-native *Ips amitinus* was estimated to expand its range by about 14 km per year (Cocos et al., 2023).

Recent findings demonstrate that *I. typographus* can disperse semi-passively over hundreds of kilometres with assistance of wind (Inward et al., 2024), which may also apply to species from other Ipini genera, such as *Pseudips*.

Nothing is known about the dispersal mechanism and range of dispersal of *P. mexicanus*.

Propagule pressure (population density) will be very important and play a key role as it does for most non-native/invasive species (Vilardo et al., 2022; Cocos et al., 2024).

Therefore, without specific data for *P. mexicanus* and based on information on bark beetles with similar biology (e.g. *I. amitinus*), the EWG assumed that the spread rate of the pest could be less than 10 km per year. Ireland used 10 km for demarcated area.

11.2. Human-assisted spread

Movement of infested wood (e.g. round wood with bark, firewood, etc.) and infested plants for planting of the host can facilitate dispersal of *P. mexicanus*.

There have been several reports of *P. mexicanus* spread with WPM used to export goods from Mexico (Section 8.1), but mostly before the introduction of ISPM 15 in 2002. WPM associated with international trade is considered a likely pathway of introduction of the pest into Ireland, since there was no direct trade in pine wood commodities from the suspected countries of origin (Mexico/Guatemala) to Ireland (DAFM, 2023; C. McGee, DAFM, pers. comm., 2025). However, the pest may have been introduced over a decade ago and hence before the introduction of ISPM 15.

Conclusion of the magnitude of spread

No information is available about dispersal behaviour of *P. mexicanus*; therefore, it is very difficult to estimate the rate of spread of the pest in the PRA area.

Since most flights for bark beetles are local and short if host plants are available, the magnitude of natural spread was assessed as **moderate** (1–10 km per year), with a **high** uncertainty due to the lack of recorded flight information for *P. mexicanus*.

Official control measures (e.g. in EU countries) should help slow the spread rate of *P. mexicanus*, although the implementation of containment strategies in different EPPO member countries varies, and this will likely increase uncertainty (Sun et al., 2023).

Rating of the magnitude of spread	Very low ☐	Low ☐	Moderate ☒	High ☐	Very high ☐
Rating of uncertainty			Low ☐	Moderate ☐	High ☒

12. Impact in the current area of distribution

Pseudips mexicanus is widely present in Mexico and Guatemala and regarded as a pest of secondary importance (Cibrián Tovar et al., 1995; Rendón et al., 2021; Tello-Salgado et al., 2021; O. Burgos-Dueñas, pers. comm., 2024), which usually infests recently dead, dying or fallen trees and follow infestations of more aggressive bark beetle species (Section 2). However, there are a few reports of attack of *P. mexicanus* on stressed saplings, what can lead to the death of the latter (Cibrián Tovar et al., 1995; FIPRODEFO, 2025). Cibrián Tovar et al. (1995) indicated that, like other bark beetle species, *P. mexicanus* can vector blue stain of wood, but the damage has never been evaluated (Equihua-Martínez, pers. comm., 2025). *Pseudips mexicanus* has never been associated with *Fusarium* spp. (Equihua-Martínez, pers. comm., 2025).

Steed and Willhite (2007) studied an outbreak of bark beetles in young pine plantations in the State of Jalisco (Mexico) and concluded that *I. lecontei*, *I. cribricollis* and potentially *I. calligraphus* were the species of major concern for plantation management, as they were the only species associated with the affected trees. *Pseudips mexicanus* was only detected in pheromone traps, not in standing trees.

Cervantes-Martínez et al. (2019) analysed the history of bark beetle outbreaks in Mexico, Guatemala and Honduras during 1895–2015 and their relationship with environmental parameters. The most frequent outbreaks concerned *Dendroctonus mexicanus*, *D. frontalis*, and *D. adjunctus*, whereas *P. mexicanus* was not listed as a species of concern. Billing (2002) did a similar analysis and listed the same species. **There have been no reports of outbreaks of, or containment programs for, *P. mexicanus* in Mexico or Guatemala (Equihua-Martínez, pers. comm., 2025).**

Some Scolytinae species (Coleoptera: Curculionidae) that were previously considered secondary pests are becoming primary pests in Mexico (A. Burgos-Solorio, pers. comm., 2024). For example, *I. lecontei* has recently started to behave as a primary pest in the Durango state of Mexico (CONAFOR, 2024). It cannot be excluded (as for many other Scolytinae species) that *P. mexicanus* will change its behaviour in the same way.

A closely related species with a behaviour similar to *P. mexicanus*, *P. radiatae*, is not managed in the USA (A. Cognato, pers. comm., 2025) because it has low impact.

Most evidence from Mexico and Guatemala, though limited, suggests that *P. mexicanus* is usually a secondary pest. Its importance is much lower than that of more damaging and aggressive pine bark beetles such as *I. pini* and *Dendroctonus* spp.

To date in Ireland, no evidence of damage caused by *P. mexicanus* has been reported (DAFM, pers. comm., 2025).

In conclusion, *P. mexicanus* is a pest of secondary importance; there is no evidence of economic, environmental and social impact of *P. mexicanus* in Mexico, Guatemala, and Ireland.

Control methods

Cibrián Tovar et al. (1995) reported that no control measures were developed for *P. mexicanus* in Mexico, and measures known for *Dendroctonus adjunctus* and *D. mexicanus* were useful against *P. mexicanus*. These measures include:

- forest management aimed at maintaining the health of forest stands (e.g. through the removal of damaged, suppressed/stressed trees, and slash/harvesting residues);
- timely removal of individual trees with signs of infestation (during periods when larvae develop and before the flight of adults);
- elimination of susceptible trees (those recently infested, i.e. those having 20 or more reddish-brown pitch tubes, but not those trees which have very few attacks and where the resin tubes are white – to these trees insecticides can be applied);
- application of insecticides to the trunks of felled trees (if not debarked), possible with oil;
- cutting the infested trees (in winter, when *P. mexicanus* is dormant); cut trees should be directed towards open areas where they are exposed to direct sun rays;
- debarking of cut trees (to accelerate death of the pest developing under the bark; usually no insects survive after 24 h); debarking should be complete; no residues of bark or phloem should remain on the trunk; removed bark can be burned if there is a risk that adults can emerge from the removed bark and fly, or can be covered with soil, or treated with insecticides dissolved in water or diesel oil immediately after debarking; no treatment is needed for the debarked trunks;
- combination of cutting, debarking and application of insecticides;
- for high value trees, insecticides can be applied for prevention (possibly with pump sprays).

Trap trees are traditionally considered control measures against bark beetles, and their effectiveness can be increased by optimising choice of specific sites selection, tree characteristics, or felling dates (Holuša et al., 2017). Pheromones can also be used in this context.

Chemical control

There are no data of use of specific insecticides for controlling *P. mexicanus* in the literature.

Biological control

Tello-Salgado et al. (2021) isolated and identified fungi naturally infecting *P. mexicanus* in Mexico to test as possible biocontrol agents. An isolate of *Beauveria bassiana* demonstrated pathogenicity showing promise as a potential biological control agent for managing bark beetles in Mexican forests, although further research is needed to assess its viability.

No biological control programmes focused on *P. mexicanus* have been developed in its native range (Equihua-Martínez, pers. comm., 2025).

Magnitude of impact in the current area of distribution is rated as **very low** with **low** uncertainty, because there is no evidence of economic, environmental and social impact of *P. mexicanus* in Mexico, Guatemala, and Ireland. The information available for this species is limited, and this also reflects its low economic importance in the countries where it is present.

Rating of the magnitude of impact in the current area of distribution	Very low ☒	Low ☐	Moderate ☐	High ☐	Very high ☐
Rating of uncertainty	Low ☒			Moderate ☐	High ☐

13. Potential impact in the EPPO region

Will impacts be largely the same as in the current area of distribution? – **No**, because behaviour of this pest can be different in a new area.

There is no information that *P. mexicanus* ever established and caused noticeable impact in new areas. The pest has been detected in Ireland, but it is under official control and no impact has been recorded (DAFM, pers. comm., 2025).

The climate conditions in the PRA area appear to be suitable for *P. mexicanus* in Northern Africa; most of continental Europe (particularly Spain); some parts of the United Kingdom and Ireland; isolated regions in Azerbaijan; the southern parts of the Russian Federation; and Central Asia (Section 9).

Pinus sylvestris and other *Pinus* species grow under outdoor conditions in the EPPO region (Section 9.2) and are known to be or might become hosts in the PRA region (although this is based so far only on a single tree of *Pi. sylvestris* found with adults and breeding galleries). If the current eradication program fails in Ireland and *P. mexicanus* establishes in Ireland or spreads from Ireland to other countries or re-enter into the EPPO region, there is a risk that it can shift to new host plants, most likely from the same genus (*Pinus*; Section 9.2). In the EPPO region there are many non-American *Pinus* species that have never been exposed to *P. mexicanus*, and they may be susceptible to a new pest.

Under the current and future climate conditions, drought stress, forest fires, and storms are likely to occur and provide suitable habitat conditions for *P. mexicanus* population build-up.

Specific natural enemies present in its area of origin are lacking in the EPPO region, creating an enemy-free space for *P. mexicanus* and enabling possible impact. However, the potential impact might be reduced by competition with native bark beetle species exploring the same ecological niche and by local natural enemies (e.g. clerid beetle *Thanasimus formicarius* or braconids *Coeloides* spp.; Section 2.10).

There is currently no registered active substance for the management of *P. mexicanus* in the EPPO region. In the EU, the generic insecticide Cypermethrin can be used against *P. mexicanus* (<https://ec.europa.eu/food/plant/pesticides/eu-pesticides-database/start/screen/active-substances/details/834>).

13.1. Economic impact (sensu stricto)

The main economic impact caused by *P. mexicanus* in the PRA area might be expected in the following host communities/production sectors.

13.1.1. Forests for wood production

Several *Pinus* species are widely grown as forest species for wood production in the PRA area (e.g. *Pi. halepensis*, *Pi. mugo*, *Pi. nigra*, *Pi. pinaster*, *Pi. sylvestris*; Euforgen, 2021), but available literature indicates that in the native range, the damage on standing *Pinus* trees is at least very rare and the pest is considered a secondary bark beetle (Section 12). When it has caused damage, it normally follows more aggressive bark beetles (e.g. *Dendroctonus* spp.). In the EPPO region, *Pi. sylvestris* and other *Pinus* species may be susceptible. Damage can also be potentially associated with the wood-staining fungi ecologically linked with *P. mexicanus* (Section 3).

The fact that non-American *Pinus* species (including *Pi. sylvestris* and *Pi. pinaster*) are evolutionarily naïve to *P. mexicanus* (i.e. have never been exposed to *P. mexicanus*) may also have a major influence on the potential impact. However, at this stage there is no basis to expect that *P. mexicanus* can become a primary and aggressive pest of *Pinus* spp. in the PRA area. At least such behaviour has so far not been observed in Ireland, where *Pi. sylvestris* and other pine species are present (DAFM, pers. comm., 2025).

13.1.2. Ornamental trees, shelterbelts and nurseries

***Pseudips mexicanus* has never been reported as a noticeable pest on ornamental, shelterbelt, landscape trees and young trees in nurseries.** Potentially, all non-American pine species used as ornamentals are more likely to be evolutionary naïve to *P. mexicanus* (i.e. they have never been exposed to this beetle) than the pine species naturally growing in the pest's native range and co-evolving with it. This may lead to a higher impact in the PRA area than has been reported in the native range of *P. mexicanus*.

13.1.3. Christmas tree plantations

The cultivation area of Christmas trees in the EPPO region is considerable (SDW, 2025). Pine species are among those cultivated for this purpose, although their share is unlikely to be more than 10%, as they are less common in this industry than fir or spruce.

***Pseudips mexicanus* has never been reported as a noticeable pest of Christmas tree plantations.** Trees in the plantations are normally fertilized to be healthy and in a marketable form. Thus, the EWG believed that it is very unlikely that *P. mexicanus* would affect Christmas tree plantations in the PRA area, but if the pest establishes, its presence might result in unmarketable trees (because, e.g. quality issues or export restrictions).

13.2. Environmental impact

Several species of *Pinus*, including *Pi. sylvestris*, are native and widespread in the PRA area (Section 9) and in some areas they constitute key components for vulnerable habitats, e.g. the ancient pine forest in Highland Scotland, in Nordic countries and in the Russian Federation. Pinar de Valsaín and Tierra de Pinares are of great economical and cultural value in Spain. **There are no reports that *P. mexicanus* cause environmental impact.**

Impact on local biodiversity cannot be excluded, but it is unlikely that ecosystem services will be affected.

None of the known host plant species of *P. mexicanus* that are present in the PRA area are listed in the IUCN Red List (<https://www.iucnredlist.org/>) as threatened. However, several species of the genus *Pinus* are described as 'endangered' or 'critically endangered' in the IUCN Red List (<https://www.iucnredlist.org/search/list?query=Pinus&searchType=species>).

13.3. Social impact

Many potential hosts of *P. mexicanus* are used as ornamentals in the PRA area. Their aesthetic value in parks, public and private gardens, in historical sites and in urban areas might be affected if *P. mexicanus* establishes and spreads in the PRA area. Trees of cultural significance and monumental trees are unlikely to become infested as *P. mexicanus* is not an aggressive bark beetle, and the state of such trees are normally monitored.

13.4. Overall rating of the magnitude of impact and uncertainty

In conclusion, the EWG expected that **the impact in the EPPO region might be higher than in the native range of the pest, because (1) non-American *Pinus* species (including *Pi. sylvestris* and *Pi. pinaster*) are evolutionarily naïve to *P. mexicanus* (i.e. have never been exposed to *P. mexicanus*) and thus might be susceptible; (2) natural enemies of *P. mexicanus* present in its area of origin are lacking in the EPPO region.**

Rating of the magnitude of potential impact in the PRA area	Very low ☐	Low ☒	Moderate ☐	High ☐	Very high ☐
Rating of uncertainty			Low ☐	Moderate ☒	High ☐

Uncertainty: moderate (the main uncertainty is that the level of aggressiveness of *P. mexicanus* is not known when the pest interacts with non-American *Pinus* species).

14. Identification of the endangered area

According to ISPM 5, the **endangered area** is an area where ecological factors favour the establishment of a pest whose presence in the area will result in **economically important loss**.

The EWG considered that the potential area of establishment could include Northern Africa; most of continental Europe (particularly Spain); some parts of the United Kingdom and Ireland; isolated regions in Azerbaijan; the southern parts of the Russian Federation; and Central Asia. There is an uncertainty on the northern limit and whether the pest could survive in areas with a drier climate in the EPPO region. However, the EWG believed that it is unlikely that *P. mexicanus* will cause important economic loss in the potential area of establishment. Thus, no endangered area (in terms of ISPM 5) for *P. mexicanus* in the EPPO region was defined.

15. Overall assessment of risk

Summary of ratings:

	Likelihood	Uncertainty
Entry (overall)	Moderate	Moderate
Round wood and sawn wood with bark (from Mexico and Guatemala)	Moderate	Moderate
Wood packaging material (WPM) (from Mexico and Guatemala)	Moderate	Moderate
Plants for planting (except seeds, tissue cultures, pollen) (from Mexico and Guatemala)	Very low	Low
Wood chips, processing wood residues, hogwood (except sawdust and shavings) (from Mexico and Guatemala)	Low	Low
Bark (from Mexico and Guatemala)	Low	Moderate
Establishment outdoors	Very high	Low
Establishment in protected conditions	Very low	Low
Spread	Moderate	High
Magnitude of impact in the current area of distribution	Very low	Low
Magnitude of potential impact in the PRA area	Low	Moderate

Pseudips mexicanus is a secondary bark beetle native to Mexico and Guatemala with confirmed hosts in the genus *Pinus*. The pest recently entered the EPPO region (Ireland, 2023, where it is currently under official control and eradication). Because several *Pinus* species are known as host of *P. mexicanus* in its native range, the EWG considered that all *Pinus* spp. are potential hosts.

Entry: Round wood and sawn wood with bark and Wood packaging material (WPM) from Mexico and Guatemala were identified as the most likely pathways, and overall, the likelihood of entry was rated as **moderate** with **moderate** uncertainty. The limited amount of trade of round wood and sawn wood with bark from Mexico and Guatemala to the EPPO member countries and the known records of interception of *P. mexicanus* in WPM are taken into account.

Transfer from infested round wood and sawn wood with bark or WPM to suitable hosts in the PRA area may be problematic for *P. mexicanus*, as it depends on the alignment of a range of favouring circumstances

(Section 8). To establish a new breeding population, a sufficient number of males and females have to escape from the infested material and find suitable plant material and conditions to breed (dying, recently dead or stressed *Pinus* host trees). As with many other bark beetle species, males colonise host material and initiate gallery construction, which then attract other males (to infest the tree) and females (to mate) (Section 2). This implies that mating does not take place at the site of introduction but only after finding suitable breeding material.

Likelihood of establishment outdoors in the PRA area was rated as **high** with **low** uncertainty. The pest is known to be present in Ireland since 2023. At least one host *Pinus* species (*P. sylvestris*) is widely present in the PRA area. For *Pi. contorta* and *Pi. radiata*, the host status is uncertain. More species from the same genus might become hosts. *Pseudips mexicanus* is present in different climatic types in its native range and can tolerate a wide range of climates. Thus, it is unlikely that climate will be a limiting factor for *P. mexicanus* to potentially establish within the EPPO region. The overwintering strategy of *P. mexicanus* in colder climates is unknown and it is still possible that it may struggle to survive in the northern part of the EPPO region (with GDD < 900). The EWG considered that the potential area of establishment could include Northern Africa; most of continental Europe (particularly Spain); some parts of the United Kingdom and Ireland; isolated regions in Azerbaijan; the southern parts of the Russian Federation; and Central Asia.

Likelihood of establishment in protected conditions was rated as **very low** with **low** uncertainty.

The magnitude of spread was rated as **moderate**, because most flights for bark beetles are local and short and natural spread was estimated not to exceed 10 km per year; however, uncertainty was rated as **high**, because no information is available about the dispersal behaviour of *P. mexicanus*.

The magnitude of impact in the current area of distribution was rated as **very low** with **low** uncertainty, because there is no evidence of economic, environmental nor social impact of *P. mexicanus* in Mexico, Guatemala, and Ireland.

The magnitude of impact in the EPPO region could be higher than that in the current area of distribution; it was rated as **low**. The uncertainty is **moderate**, because the level of aggressiveness of *P. mexicanus* is not known when the pest interacts with non-American *Pinus* species.

It is noted that under conditions of climate change the potential area of establishment might increase if compared to the current climate (e.g. to extend in Southern Sweden, Poland and Kazakhstan).

The phytosanitary risk for the endangered area (based on a three-level scale) was assessed to be **low** with **moderate** uncertainty, because there is the possibility that *P. mexicanus* becomes more aggressive in the EPPO region than in its native range. The EWG believed that it is unlikely that *P. mexicanus* will cause important economic loss in the potential area of establishment; thus, no endangered area for *P. mexicanus* in the EPPO region was defined.

Based on all the information in this PRA, the EWG concluded that the impact of *P. mexicanus* in the potential area of establishment is considered to be **low** and therefore **the EWG did not proceed to the stage of pest risk management.**

The EWG and EPPO Panel on Phytosanitary Measures (2025-10) proposed to not recommend the addition of *P. mexicanus* to the EPPO A1 and A2 Lists of pests recommended for regulation as quarantine pests for the time being, and therefore to not propose risk management options.

The EWG advised to closely follow the situation in Ireland and if new information becomes available, this could warrant a revision of this PRA.

Stage 3. Pest risk management

16. Phytosanitary measures

16.1. Measures on individual pathways to prevent entry

No measures were recommended.

16.2. Eradication and containment

No measures were recommended.

Remark: early detection would be essential for the eradication of *P. mexicanus* but is complicated by:

- difficulty in the identification of breeding sites as it is a secondary pest usually impacting recently dead and dying trees;
- possible confusion (especially for larvae and pupae) with other Scolytinae species requiring rearing to adult and identification;
- early larval stages are small and do not produce clear signs of infestation;
- low levels of infestation may be difficult to detect.

16.2.1. The current measures in Ireland

In December 2023, DAFM (NPPO) of Ireland confirmed the finding in County Clare of *P. mexicanus* in the course of 2023 DAFM Forest Health Protected Zone surveys and started the following actions (DAFM, pers. comm., 2025):

- A Contingency plan was activated (a generic Contingency plan: pest specific measures were developed; available on DAFM web-page <https://www.gov.ie/en/department-of-agriculture-food-and-the-marine/publications/plant-health-contingency-plans/>) and a site-specific Action Plan was implemented;
- The Action Plan sets out the outbreak specific actions to be taken to ensure the coherent, rapid and uniform implementation of the required measures, taking into account the biology of the pest and the local factors specific to the outbreak;
- A demarcated area was established based on a 10 km radius around the traps where the beetles were found;
- Contacts were made with all impacted forest owners of *Pinus* spp. stands identified from NPPO records;
- Restrictions on harvesting and movement of pine (*Pinus* spp.) in the demarcated area were introduced;
- A prohibition on the movement of wood and wood products out of the Demarcated Area was introduced.
- A protocol is in development [2025-04] to potentially allow controlled felling, harvesting, and movement of *Pinus* sp. plant commodities produced in demarcated area (no live trees have been found with the pest);
- Communications: following the identification of *P. mexicanus*, the NPPO notified European Commission and EU Member States, the United Kingdom, and forest owners in the demarcated area (using phone calls, letters, and training). A bark beetle stakeholder group was established through which forestry sector was kept informed; stakeholder group was established);
- A webpage was created with communications updates, technical notice, FAQs, maps (DAFM, 2023; <https://www.gov.ie/en/department-of-agriculture-food-and-the-marine/publications/monterey-pine-engraver-pseudips-mexicanus-discovered-in-co-clare/>);
- Plant Pest Factsheet was published (DAFM, 2024; https://assets.gov.ie/static/documents/Pseudips_mexicanus_Factsheet_290425.pdf);
- Follow-up intensive ground survey were conducted in early 2024 and a single adult beetle was detected on a dead pine tree (*Pinus contorta*) very close (50 m) to one of the seven traps where beetles had been caught in 2023;

- In 2024 a delimiting survey was conducted in and around the demarcated area focused on potential host species (*Pinus* spp.). Eight rounds of trap checks between May and October were conducted, using lures developed for *Ips cembrae* and *I. sexdentatus* which proved to be attractive for the beetle⁵.
- In total, 260 beetles were trapped in 2024 and 269 in 2025; new findings of the beetles were made in 2024 within and outside the demarcated area, approximately 7 km to the south-west in Co. Limerick;
- These local trap findings necessitated an increase of the demarcated area (see map: <https://assets.gov.ie/static/documents/monterey-pine-engraver-revised-demarcated-area.pdf>);
- In addition to the delimiting survey, a new national trap network for *P. mexicanus* was established, in addition to existing Protected Zone bark beetle survey network; two rounds of trap checks nationally resulted in no findings;
- Surveillance for 2025 is underway: Risk-based surveys were conducted in quarter 1 of 2025 following which adult bark beetles and pupae were found in a dead *P. sylvestris* tree. A number of the adult bark beetles have been identified as *P. mexicanus*. Further laboratory analysis is on-going. Surveillance and trapping will continue in the demarcated area and nationally in 2025.

17. Uncertainty

The EWG used the categories of main sources of uncertainties (under development) (EPPO, 2024):

- *Key uncertainties*: likely to significantly affect the overall conclusions (including overall risk and overall uncertainty) of the PRA (i.e. the determination of whether the pest has the characteristics of a quarantine pest, and the pathways that should be managed);
- *Other main uncertainties*: not likely to affect the overall conclusions of the PRA but likely to impact conclusions of individual part(s) of the risk assessment or risk management.

Key uncertainties	Other main uncertainties
	Ability to become more aggressive and to cause economic impact in the EPPO region (Sections 12, 13)
	Thermal requirements (low and high developmental thresholds, flight threshold, sum of temperature required for a complete generation) (Sections 2.4 and 9.4)
	Dispersal capacity of adults of <i>P. mexicanus</i> (Section 11)
	The overwintering stage and strategy in colder climates (e.g. in Ireland) is unknown (Sections 2.2 and 9.1.3)
	Host range of <i>P. mexicanus</i> in the EPPO region
	Reporting of interceptions (correctness, completeness, etc.) (Section 8.1)
	Survival during transport and storage of round and sawn wood with bark; wood chips, processing wood residues, hogwood; bark (Section 8.1)
	Trade of bark: size of pieces of bark, way of production (Section 8.1, Table 8.4)
	Structure of trade of relevant wood commodities and plants for planting, share of <i>Pinus</i> in the trade (Section 8.1)
	Likelihood of establishment in climate types that are not present in its area of distribution, e. g. Mediterranean climate types Csa and Csb, in areas with drier climates and in the northern part of the EPPO region with lower winter temperature (Section 9.1.3)
	Possible interaction with local aggressive and secondary bark beetle species and natural enemies in the EPPO region (Section 9.3)

⁵ *P. mexicanus* is not attracted to lures developed for *Ips typographus*.

18. Remarks

The EWG noted possible topics for future research:

- Biology of *P. mexicanus* (thermal requirements, overwintering, host plants),
- Dispersal capacity of adults of *P. mexicanus*,
- Morphological key to distinguish *P. mexicanus* from European genera/species of bark beetles,
- Management strategies for *P. mexicanus*, including development of biological control.

DAFM used in Ireland pheromone lures earlier developed for *Ips cembrae* (Cembräwit®) and *I. sexdentatus* (Sexowit®) and noted that these lures demonstrated their attractiveness for *P. mexicanus*.

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Annex 1. Evaluation of possible phytosanitary measures for the main identified pathways, using EPPO Standard PM 5/3.

Table A1.1. Definitions used in the EPPO Study on wood commodities, including existing definitions from ISPM 5 for wood commodities and definitions developed as part of the Study (EPPO, 2015c).

Commodity	Definition	Origin of definition
Bark (as a commodity)	Bark separated from wood	ISPM 5
Firewood except sawn wood, processing wood residues, wood chips, hogwood, processed wood material and post-consumer scrap wood	See ‘round wood’ definition	
Harvesting residues	Wood material consisting of any parts of trees left on the site after round wood harvesting	EPPO (2015)
Hogwood	Wood with or without bark in the form of pieces of varying particle size and shape, produced by crushing with blunt tools such as rollers, hammers, or flails	EPPO (2015, 2019)
Manufactured wood items	To be added when defined under the ISPM on international movement of wood products and handicrafts made of wood	EPPO (2015)
Post-consumer scrap wood	Wide variety of wood material from ex-commercial, industrial and domestic use made available for recycling	EPPO (2015)
Processed wood material	Products that are a composite of wood constructed using glue, heat and pressure, or any combination thereof	ISPM 5
Processing wood residues	Parts of wood and bark that are left after the process of transforming round wood into sawn wood and further transformation of sawn wood	EPPO (2015)
Round wood	Wood not sawn longitudinally, carrying its natural rounded surface, with or without bark	ISPM 5
Sawn wood	Wood sawn longitudinally, with or without its natural rounded surface with or without bark	ISPM 5
Wood chips	Wood with or without bark in the form of pieces with a definable particle size produced by mechanical treatment with sharp tools	EPPO (2015)

Annex 2. A diagnosis of genus *Pseudips* (from: Cognato, 2000).

Pseudips Cognato, new genus

Type species *Bostrichus concinnus* Mannerheim, 1852.

Description (Synapomorphies that distinguish *Pseudips* from the other Ipxini genera are in bold; for illustrations, refer to *I. concinnus* in Hopping 1963a,b) – Frons broadly convex; epistoma medially emarginate, margin lined with denticles including a larger median tubercle; central shining fovea sometimes present as with some *Ips*. Eyes more finely granulate and shallowly emarginate as compared with *Acanthotomicus*. Antennae as in *Ips* except antennal club with sutures strongly procurved, suture 1 reaching the middle of club as in many *Acanthotomicus*.

Pronotum as long as wide; widest at base, sides slightly arcuate, broadly round in front, hind margin moderately arcuate; pronotal disk anteriorly aspirate, posteriorly punctate.

Elytra 1.3–1.5 times as long as wide; lateral margins near parallel, apex broadly truncate, striae not impressed, striae and interstriae punctures similar in size and appearance, confused near the declivity and sides. Declivity steeper than *Ips*, apical margin weakly explanate; lateral margins armed with 3 pairs of spines; 1st spine small, in line with striae 2; 2nd spine larger than 1st, in line with striae 3; 3rd spine largest, cylindrical, subcapitate, placement to nearest striae is obscured.

Male genitalia with divided internal sac; seminal trough as an apparent single rod; median struts broad, compressed, truncate.

Included Species. Previous publications on *I. concinnus*, *I. mexicanus*, and *I. orientalis* (Hopping, 1963b, Wood, 1982, Wood and Yin, 1986) adequately diagnose the species and are not detailed here.

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Wood SL and Yin HF (1986) Relict occurrence of three ‘American’ Scolytidae (Coleoptera) in Asia. *Great Basin Nat. Mem.* 46: 461–464.

Annex 3. Description of *Pseudips mexicanus* (Hopkins, 1905) (from: Cognato and Smith, 2024)⁶.

***Pseudips mexicanus* (Hopkins, 1905)** (Figs. 11–18 – numbered as in the original publication)

Tomicus mexicanus Hopkins 1905: 75.

Ips mexicanus (Hopkins): Hopkins 1915: 54.

Pseudips mexicanus (Hopkins): Cognato 2000: 365.

Orthotomicus mexicanus (Hopkins): Wood 2007: 340.

Pseudips mexicanus (Hopkins): Alonso-Zarazaga and Lyal 2009: 81.

Type Material. Lectotype, female, NMNH, examined.

Other Specimens Examined. See Cognato and Smith (2024).

New Records. None.

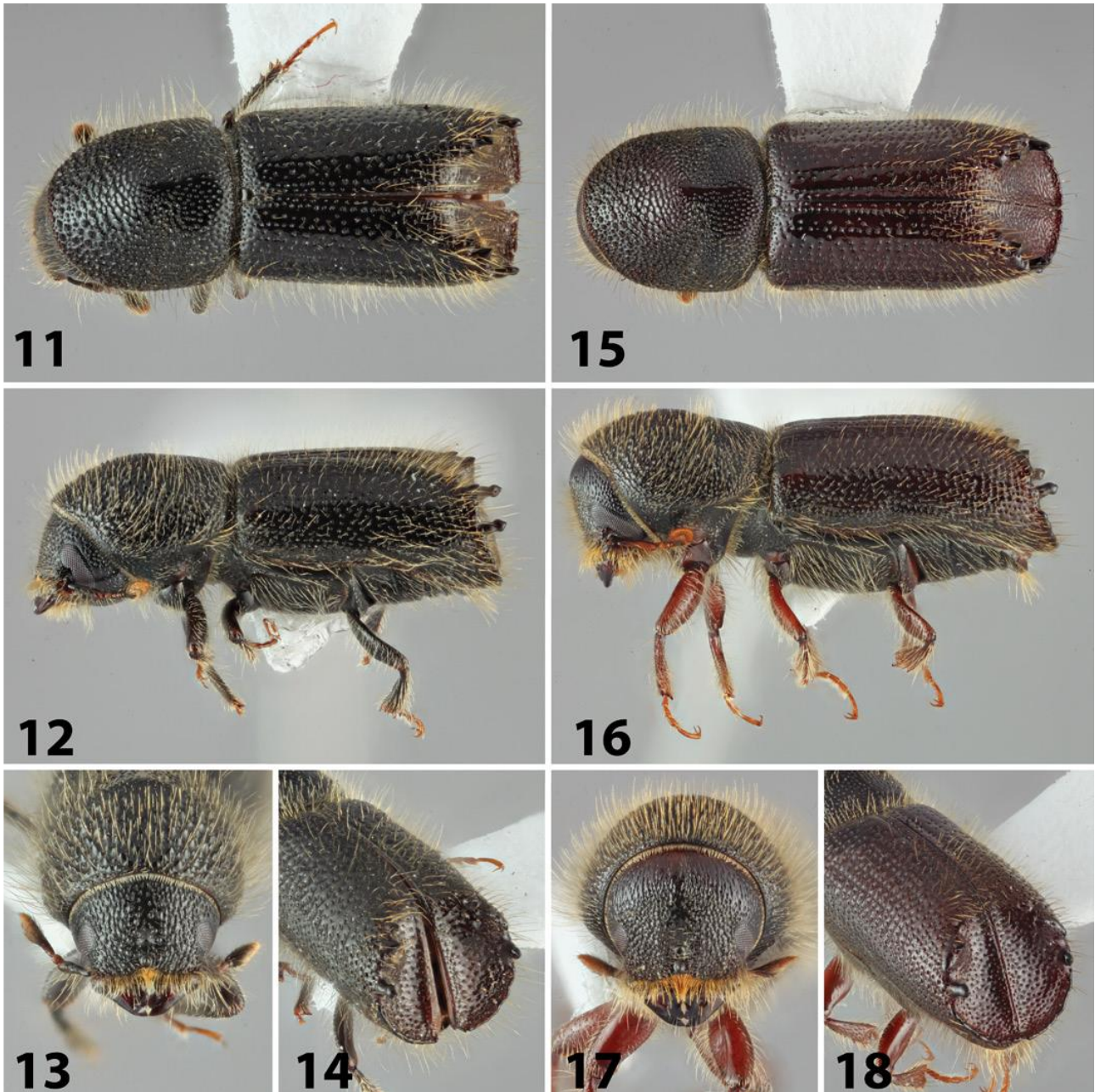
Diagnosis. Characters including coarse punctures, separated by the diameter of a puncture, on the basal portion of the pronotum; biserial punctures on the second elytral interstria beginning after the middle of the elytral disc and continuing to the base of the elytral declivity; and the elytral subapical margin thickness greater than the length of the first denticle differentiate this species from the remaining *Pseudips* species. In addition, the shared derived characters of COI and CAD nucleotides that support clade A (Fig. 2) found in a parsimonious phylogenetic analysis identify this species.

Hosts. Various *Pinus* spp.

Distribution. MEXICO: Chiapas, Chihuahua, Coahuila, Distrito Federal, Durango, Hidalgo, Jalisco, Mexico, Michoacán, Morelos, Nuevo León, Oaxaca, Puebla, San Luis Potosí, Tlaxcala, Veracruz; GUATEMALA: Totonicapán.

Comments. Although we did not examine Guatemalan specimens, we assume they are *P. mexicanus* given the continuous coniferous habitat between Oaxaca and Totonicapán and previous determination by other scolytine taxonomists.

⁶ All references to literature and figures as in the original publication. Figs 11–18, see the next page



Figs 11–18. *Pseudips mexicanus*. Male: **11)** Habitus, dorsal view; **12)** Habitus, lateral view; **13)** Frontal view; **14)** Declivital view. Female: **15)** Habitus, dorsal view; **16)** Habitus, lateral view; **17)** Frontal view; **18)** Declivital view.

Annex 4. Galleries of *Pseudips mexicanus*.



Figures A4.1–A.4.3. Galleries of *P. mexicanus*. The photographs are from EPPO GD by Alexander V. Petrov, VNNIIKR and Institute of Forest Science RAS, Russia, taken 60 km south-west–west of Ciudad Victoria, Mexico, 23°37'28'' N, 99°42'39' W, H = 2520 m a.s.l.; 17.07.2025 on *Pinus* sp.).



Figure A4.4. Adult *P. mexicanus* under bark of dead *Pinus contorta* in Ireland in 2025. The photograph is from EPPO GD by DAFM, Ireland.

Annex 5. The complete datasets of distribution records of *Pseudips mexicanus* used for the climate suitability analysis.

Table A5. The complete datasets of distribution records of *Pseudips mexicanus* used for the climate suitability analysis (122 records)

N	Decimal latitude, °N	Decimal longitude, °W	Köppen-Geiger type	Growing degree days above 8.5 °C
1	23.72684	-105.472	CWb	2402
2	19.35	-98.6667	CWb	1679
3	19.41859	-99.189	CWb	2456
4	19.12778	-98.7628	CWb	2870
5	19.72722	-99.4631	CWb	2463
6	19.69111	-100.553	CWb	2953
7	18.55722	-89.7983	Aw	6415
8	18.97528	-90.0608	Aw	6593
9	18.56444	-89.895	Aw	6477
10	18.53472	-89.9008	Aw	6477
11	18.57722	-89.8981	Aw	6477
12	18.57722	-89.8992	Aw	6477
13	18.57833	-89.8989	Aw	6477
14	18.57083	-89.8961	Aw	6477
15	18.57806	-89.8972	Aw	6477
16	18.56556	-89.8953	Aw	6477
17	18.51583	-96.7194	Am	5659
18	19.58694	-97.0092	Cfb	2249
19	18.98345	-98.9869	CWa	4673
20	19.35428	-98.7182	CWb	895
21	19.72783	-99.4632	CWb	2463
22	19.02833	-99.2672	CWb	2124
23	19.03167	-99.2042	CWb	2295
24	19.49708	-97.1577	ET	1371
25	19.02897	-99.2673	CWb	2124
26	19.55892	-98.7033	CWb	1698
27	19.625	-99.3142	CWb	2648
28	19.09453	-99.2371	CWb	1393
29	19.55905	-98.7068	CWb	1698
30	19.08664	-99.2245	CWb	1393
31	19.30015	-99.2991	CWb	1450
32	19.04847	-99.2382	CWb	2295
33	18.52944	-96.7908	Am	6182
34	19.05788	-98.6349	ET	901
35	19.55778	-99.4128	CWb	2040
36	19.03231	-99.2043	CWb	2295
37	20.64428	-98.6531	CWb	2916
38	19.31896	-99.3234	CWb	1450
39	19.01258	-99.0607	CWb	2181
40	19.47756	-98.8229	CWb	1753
41	20.64485	-98.6532	CWb	2916
42	19.12842	-98.7629	CWb	2870
43	19.20444	-98.8025	CWb	2587
44	19.55616	-98.4984	CWb	1973
45	20.13616	-98.1285	Cfb	2618

N	Decimal latitude, °N	Decimal longitude, °W	Köppen-Geiger type	Growing degree days above 8.5 °C
46	19.35214	-98.6425	CWb	1679
47	19.28657	-101.664	CWb	3268
48	20.12017	-98.1146	Cfb	2618
49	19.635	-97.0986	Cfb	1700
50	19.4028	-99.1347	CWb	2428
51	16.29633	-96.5835	CWb	3444
52	19.06493	-99.3072	CWb	2124
53	28.40766	-106.887	BSk	2692
54	19.56827	-103.609	ET	905
55	19.70534	-103.451	CWa	4319
56	19.28176	-98.6722	CWb	1311
57	17.26889	-96.4743	CWb	3432
58	25.23728	-104.574	BWh	4896
59	17.14686	-96.6091	CWb	3381
60	14.91721	-91.4452	CWb	2373
61	14.91476	-91.3704	CWb	2070
62	16.62064	-92.5789	CWb	2861
63	16.74996	-92.6708	CWb	2501
64	28.70107	-105.991	BSh	4069
65	27.17246	-102.035	BSk	3305
66	25.28215	-100.952	BSk	2925
67	19.30923	-99.1	CWb	2586
68	19.29639	-99.316	CWb	1450
69	23.78075	-105.377	CWb	2647
70	23.73126	-105.694	CWb	2204
71	20.10415	-98.3706	BSk	2690
72	20.82144	-98.2742	Cfa	5205
73	20.64659	-98.6655	CWb	2916
74	20.72842	-99.3882	BSh	3332
75	19.58603	-104.275	CWb	3699
76	19.13144	-98.7498	CWb	2101
77	19.33455	-98.5806	CWb	2232
78	19.39497	-98.7078	CWc	895
79	19.6068	-99.3236	CWb	2648
80	19.31324	-98.8732	CWb	2609
81	19.20323	-98.7972	CWb	2587
82	19.55437	-99.4202	CWb	1322
83	19.73571	-99.4675	CWb	2463
84	19.85784	-102.041	CWb	3043
85	19.10331	-98.9333	CWb	1682
86	19.08684	-99.2247	CWb	1393
87	19.09462	-99.2372	CWb	1393
88	19.03681	-99.2617	CWb	2124
89	19.01107	-99.0602	CWb	2181
90	18.8096	-98.7556	CWa	5206
91	26.19335	-99.9561	Cfa	4632
92	17.09685	-96.6762	CWb	3748
93	16.32665	-96.5976	Aw	3444
94	17.26625	-96.4762	CWb	3432
95	19.33415	-98.5814	CWb	2232
96	18.61867	-97.3074	CWb	2267

N	Decimal latitude, °N	Decimal longitude, °W	Köppen-Geiger type	Growing degree days above 8.5 °C
97	22.13252	-100.996	BSk	3628
98	19.58701	-98.557	BSk	2223
99	19.11279	-97.2231	CWb	1783
100	19.49316	-97.1525	ET	1371
101	19.53181	-97.1551	CWb	874
102	19.3881	-96.4315	Aw	6068
103	19.31015	-96.658	Aw	5650
104	19.54918	-97.2376	CWb	1594
105	19.55288	-96.9451	Cfb	4101
106	19.5025	-97.0175	Cfb	2367
107	19.5194	-97.1175	CWb	874
108	19.01306	-99.2501	CWb	2295
109	19.039	-98.204	CWb	3579
110	19.33806	-103.173	CWb	4451
111	19.3625	-103.273	CWb	4265
112	19.42833	-103.258	CWb	5045
113	19.69556	-103.609	CWb	2886
114	19.7075	-103.62	CWb	2886
115	20.08	-98.169	Cfb	2039
116	14.738	-91.137	CWb	3779
117	19.6	-104.43	Aw	6658
118	21.307	-99.458	CWa	5879
119	15.151	-91.916	CWb	1798
120	19.5	-97.155	ET	874
121	19.282	-98.672	CWb	1311
122	23.782	-105.371	CWb	2647

Annex 6. European bark beetles (Curculionidae: Scolytinae) trophically associated with *Pinus* spp.

Table A6. European bark beetles (Curculionidae: Scolytinae) trophically associated with *Pinus* spp. (86 species; data are from the dataset associated with the article Šenfeldová et al., 2024; <https://zenodo.org/records/10927845>).

Tribe	Genus	Species	Feeding guild	Host status	Nativeness in Europe
Corthylini	<i>Pityophthorus</i>	<i>balcanicus</i>	bark beetle	primary	native
Corthylini	<i>Pityophthorus</i>	<i>buyssoni</i>	twig beetle	primary	native
Corthylini	<i>Pityophthorus</i>	<i>carniolicus</i>	twig beetle	primary	native
Corthylini	<i>Pityophthorus</i>	<i>exsculptus</i>	twig beetle	rare	native
Corthylini	<i>Pityophthorus</i>	<i>glabratus</i>	twig beetle	primary	native
Corthylini	<i>Pityophthorus</i>	<i>henscheli</i>	twig beetle	primary	native
Corthylini	<i>Pityophthorus</i>	<i>knoteki</i>	twig beetle	primary	native
Corthylini	<i>Pityophthorus</i>	<i>lapponicus</i>	twig beetle	secondary	native
Corthylini	<i>Pityophthorus</i>	<i>lichtensteinii</i>	twig beetle	primary	native
Corthylini	<i>Pityophthorus</i>	<i>mauretanicus</i>	twig beetle	primary	native
Corthylini	<i>Pityophthorus</i>	<i>pityographus</i>	twig beetle	primary	native
Corthylini	<i>Pityophthorus</i>	<i>pubescens</i>	twig beetle	primary	native
Corthylini	<i>Pityophthorus</i>	<i>solus</i>	twig beetle	primary	non native
Cryphalini	<i>Cryphalus</i>	<i>piceae</i>	bark beetle	secondary	native
Cryphalini	<i>Hypothenemus</i>	<i>crudiae</i>	twig beetle	primary	non native
Cryphalini	<i>Hypothenemus</i>	<i>eruditus</i>	twig beetle	primary	non native
Crypturgini	<i>Crypturgus</i>	<i>cinereus</i>	bark beetle	primary	native
Crypturgini	<i>Crypturgus</i>	<i>concolor</i>	bark beetle	primary	native
Crypturgini	<i>Crypturgus</i>	<i>cribrellus</i>	bark beetle	primary	native
Crypturgini	<i>Crypturgus</i>	<i>cylindricollis</i>	bark beetle	primary	native
Crypturgini	<i>Crypturgus</i>	<i>dubius</i>	bark beetle	primary	native
Crypturgini	<i>Crypturgus</i>	<i>hispidulus</i>	bark beetle	primary	native
Crypturgini	<i>Crypturgus</i>	<i>mediterraneus</i>	bark beetle	primary	native
Crypturgini	<i>Crypturgus</i>	<i>numidicus</i>	bark beetle	primary	native
Crypturgini	<i>Crypturgus</i>	<i>pusillus</i>	bark beetle	rare	native
Dryocoetini	<i>Cyrtogenius</i>	<i>luteus</i>	bark beetle	primary	non native
Dryocoetini	<i>Dryocoetes</i>	<i>affaber</i>	bark beetle	secondary	non native
Dryocoetini	<i>Dryocoetes</i>	<i>autographus</i>	bark beetle	secondary	native
Dryocoetini	<i>Dryocoetes</i>	<i>baicalicus</i>	bark beetle	secondary	native
Dryocoetini	<i>Dryocoetes</i>	<i>hectographus</i>	bark beetle	secondary	native
Hylastini	<i>Hylastes</i>	<i>angustatus</i>	bark beetle	primary	native
Hylastini	<i>Hylastes</i>	<i>ater</i>	bark beetle	primary	native
Hylastini	<i>Hylastes</i>	<i>attenuatus</i>	bark beetle	primary	native
Hylastini	<i>Hylastes</i>	<i>brunneus</i>	bark beetle	primary	native
Hylastini	<i>Hylastes</i>	<i>cunicularius</i>	bark beetle	rare	native
Hylastini	<i>Hylastes</i>	<i>linearis</i>	bark beetle	primary	native
Hylastini	<i>Hylastes</i>	<i>lowei</i>	bark beetle	primary	native
Hylastini	<i>Hylastes</i>	<i>opacus</i>	bark beetle	primary	native
Hylastini	<i>Hylurgops</i>	<i>glabratus</i>	bark beetle	rare	native

Tribe	Genus	Species	Feeding guild	Host status	Nativeness in Europe
Hylastini	<i>Hylurgops</i>	<i>palliatius</i>	bark beetle	secondary	native
Hypoborini	<i>Liparthrum</i>	<i>corsicum</i>	twig beetle	primary	native
Ipini	<i>Ips</i>	<i>acuminatus</i>	bark beetle	primary	native
Ipini	<i>Ips</i>	<i>amitinus</i>	bark beetle	secondary	native
Ipini	<i>Ips</i>	<i>cembrae</i>	bark beetle	secondary	native
Ipini	<i>Ips</i>	<i>duplicatus</i>	bark beetle	rare	native
Ipini	<i>Ips</i>	<i>mannsfeldi</i>	bark beetle	primary	native
Ipini	<i>Ips</i>	<i>sexdentatus</i>	bark beetle	primary	native
Ipini	<i>Ips</i>	<i>typographus</i>	bark beetle	rare	native
Ipini	<i>Orthotomicus</i>	<i>erosus</i>	bark beetle	primary	native
Ipini	<i>Orthotomicus</i>	<i>laricis</i>	bark beetle	primary	native
Ipini	<i>Orthotomicus</i>	<i>longicollis</i>	bark beetle	primary	native
Ipini	<i>Orthotomicus</i>	<i>nobilis</i>	bark beetle	primary	native
Ipini	<i>Orthotomicus</i>	<i>proximus</i>	bark beetle	primary	native
Ipini	<i>Orthotomicus</i>	<i>robustus</i>	bark beetle	primary	native
Ipini	<i>Orthotomicus</i>	<i>starki</i>	bark beetle	rare	native
Ipini	<i>Orthotomicus</i>	<i>suturalis</i>	bark beetle	primary	native
Ipini	<i>Pityogenes</i>	<i>bidentatus</i>	twig beetle	primary	native
Ipini	<i>Pityogenes</i>	<i>bistridentatus</i>	twig beetle	primary	native
Ipini	<i>Pityogenes</i>	<i>calcaratus</i>	twig beetle	primary	non native
Ipini	<i>Pityogenes</i>	<i>chalcographus</i>	twig beetle	secondary	native
Ipini	<i>Pityogenes</i>	<i>conjunctus</i>	twig beetle	primary	native
Ipini	<i>Pityogenes</i>	<i>irkutensis</i>	twig beetle	primary	non native
Ipini	<i>Pityogenes</i>	<i>pennidens</i>	twig beetle	primary	native
Ipini	<i>Pityogenes</i>	<i>porifrons</i>	twig beetle	primary	native
Ipini	<i>Pityogenes</i>	<i>quadridens</i>	twig beetle	primary	native
Ipini	<i>Pityogenes</i>	<i>trepanatus</i>	twig beetle	primary	native
Ipini	<i>Pityokteines</i>	<i>curvidens</i>	bark beetle	secondary	native
Ipini	<i>Pityokteines</i>	<i>vorontzowi</i>	bark beetle	secondary	native
Phloeosinini	<i>Phloeosinus</i>	<i>laricionis</i>	bark beetle	primary	native
Polygraphini	<i>Carphoborus</i>	<i>bonnairei</i>	twig beetle	primary	native
Polygraphini	<i>Carphoborus</i>	<i>cholodkovskyi</i>	twig beetle	primary	native
Polygraphini	<i>Carphoborus</i>	<i>henscheli</i>	twig beetle	primary	native
Polygraphini	<i>Carphoborus</i>	<i>marani</i>	twig beetle	primary	native
Polygraphini	<i>Carphoborus</i>	<i>minimus</i>	twig beetle	primary	native
Polygraphini	<i>Carphoborus</i>	<i>pini</i>	twig beetle	primary	native
Polygraphini	<i>Polygraphus</i>	<i>grandiclava</i>	bark beetle	secondary	native
Polygraphini	<i>Polygraphus</i>	<i>poligraphus</i>	bark beetle	secondary	native
Polygraphini	<i>Polygraphus</i>	<i>proximus</i>	bark beetle	secondary	non native
Polygraphini	<i>Polygraphus</i>	<i>subopacus</i>	bark beetle	secondary	native
Scolytini	<i>Scolytus</i>	<i>morawitzi</i>	bark beetle	rare	native
Tomicini	<i>Dendroctonus</i>	<i>micans</i>	bark beetle	secondary	native
Tomicini	<i>Hylurgus</i>	<i>ligniperda</i>	bark beetle	primary	native
Tomicini	<i>Hylurgus</i>	<i>miklitzi</i>	bark beetle	primary	native

Tribe	Genus	Species	Feeding guild	Host status	Nativeness in Europe
Tomicini	<i>Tomicus</i>	<i>destruens</i>	bark beetle	primary	native
Tomicini	<i>Tomicus</i>	<i>minor</i>	bark beetle	primary	native
Tomicini	<i>Tomicus</i>	<i>piniperda</i>	bark beetle	primary	native

Annex 7. Trade in the pathway ‘Round wood and sawn wood of hosts with bark of *Pinus* spp.’

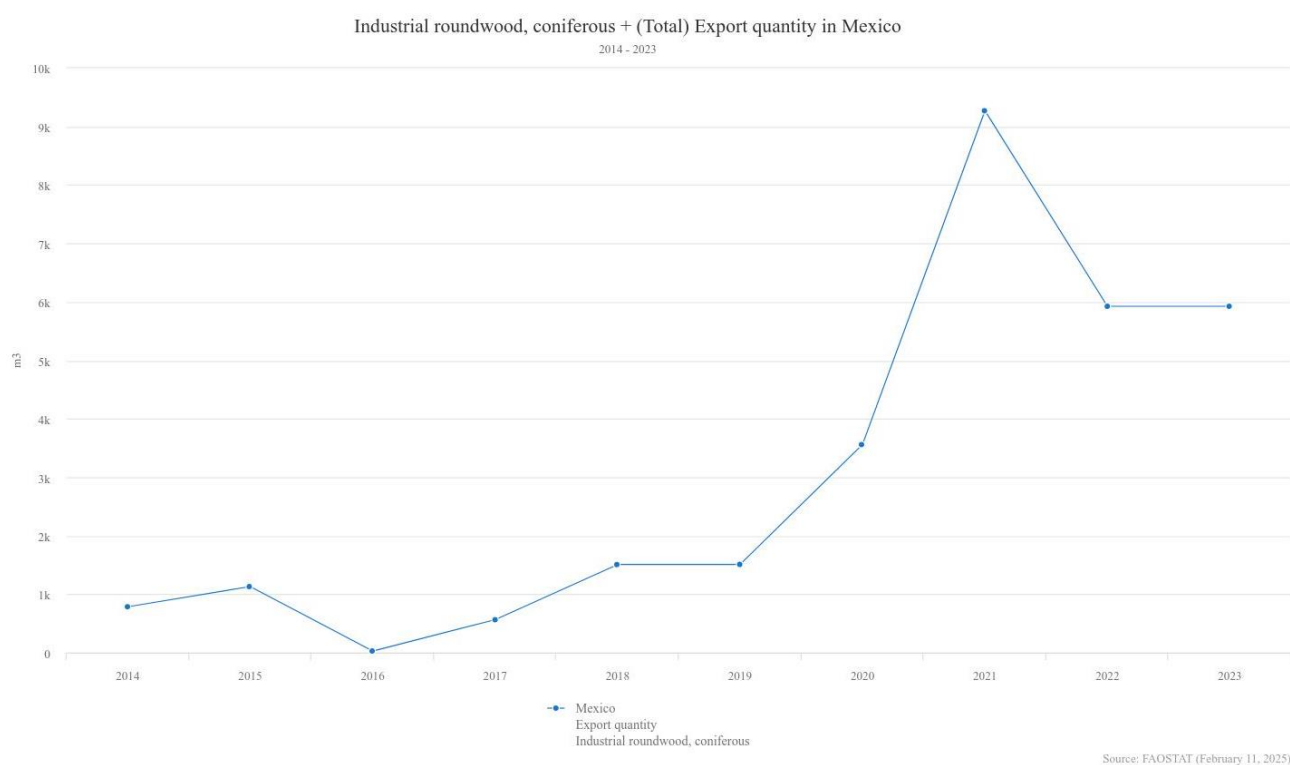


Figure A7.1. Industrial roundwood, conifers + (Total): Export quantity from Mexico worldwide in 2014–2023, in m³ (FAOSTAT, 2025).

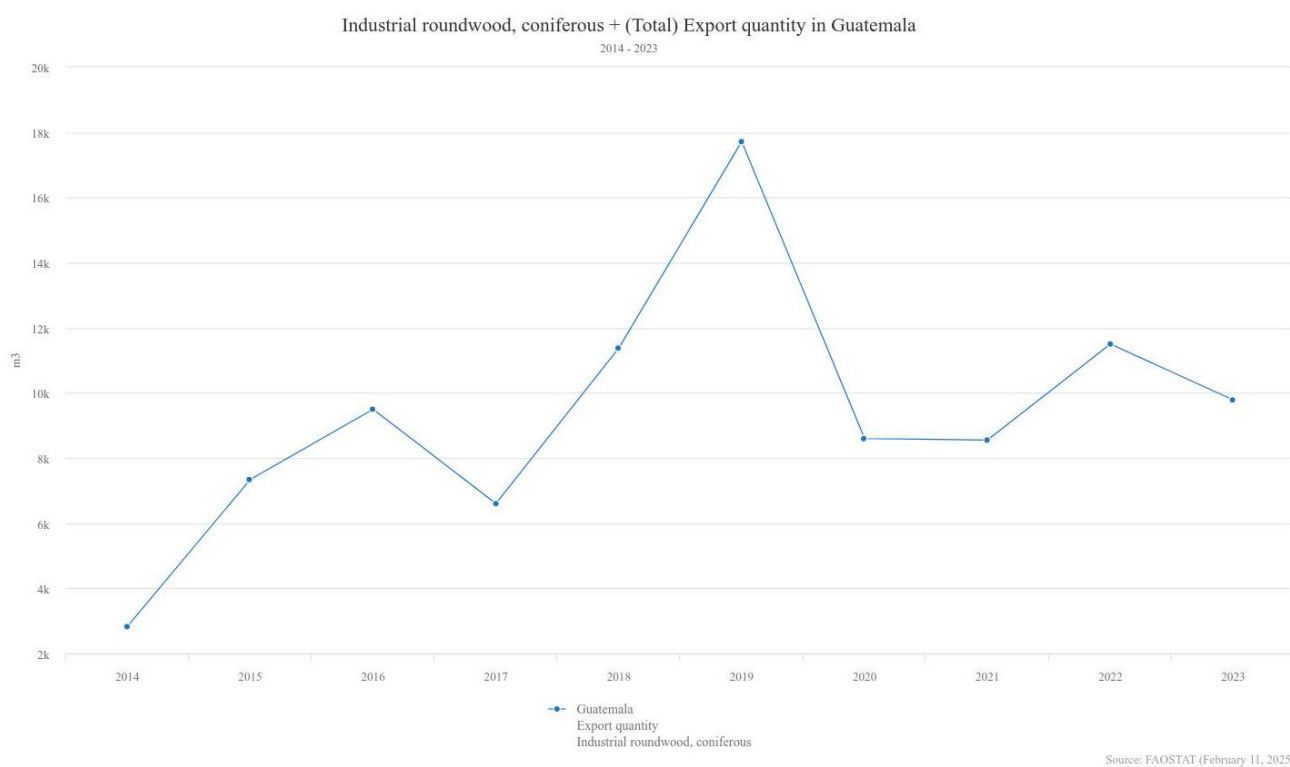


Figure A7.2. Industrial roundwood, conifers + (Total): Export quantity from Guatemala worldwide in 2014–2023, in m³ (FAOSTAT, 2025).

Table A7.1. Import to EU from Mexico*: CN Code 4401 – Fuel wood, in logs, billets, twigs, faggots or similar forms; wood in chips or particles; sawdust and wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms in 2014–2023, in 100 kg (Eurostat, 2025)**.

Country	Year									
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Austria			1.5							
Germany	6.1	93.6								
Spain		3 730.1					0.15	0.13		
France								180.0	0.18	0.02
Italy	0.12									
Netherlands			85.50	107.00	155.28		15.50			0.11
Poland		230.0	2986.0	2070.0	2760.0	1610.0	3104.0	4140.00	2730.0	4370.6
Romania	0.03									
Sweden		0.03							8.32	
EU (in total)	6.25	4053.73	3073.00	2177.00	2915.28	1610.00	3119.85	4320.13	2738.50	4370.76

* Import to the EU from Guatemala: only 1 kg (to Spain) in 2022.

** https://ec.europa.eu/eurostat/databrowser/view/ds-045409_custom_15063163/default/table?lang=en

Table A7.2. Import to EU from Mexico*: CN Code 440320 – Coniferous wood in the rough, whether or not stripped of bark or sapwood, or roughly squared (excl. rough-cut wood for walking sticks, umbrellas, tool shafts and the like; wood in the form of railway sleepers; wood cut into boards or beams, etc.; wood treated with paint, stains, creosote or other preservatives) in 2014–2023, in 100 kg (Eurostat, 2025)**.

Country	Year									
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
France	3049.69	1160.00								
EU (in total)	3049.69	1160.00								

* No import to the EU from Guatemala in 2014–2023.

** https://ec.europa.eu/eurostat/databrowser/view/ds-045409_custom_15331958/default/table?lang=en

Table A7.3. Wood and wood products; charcoal: Import quantities from Mexico and Guatemala to the Russian Federation (2016–2020) (Ru-Stat, 2025)*.

Years	Exports quantities, in kg	
	From Mexico*	From Guatemala**
2016	8 820	1 180
2017	1 390	-
2018	3 060	1 350
2019	2 310	-
2020	9 230	-
Total	24 800	2 520

* more detailed data are not available, but round wood does not exceed 20% (<https://ru-stat.su/date-Y2016-2020/RU/import/MX/0944>).

** more detailed data are not available, but 100% refer to processed timber (<https://ru-stat.su/date-Y2016-2020/RU/import/GT/0944>).

Annex 8. Köppen-Geiger climate classification (1999–2020).

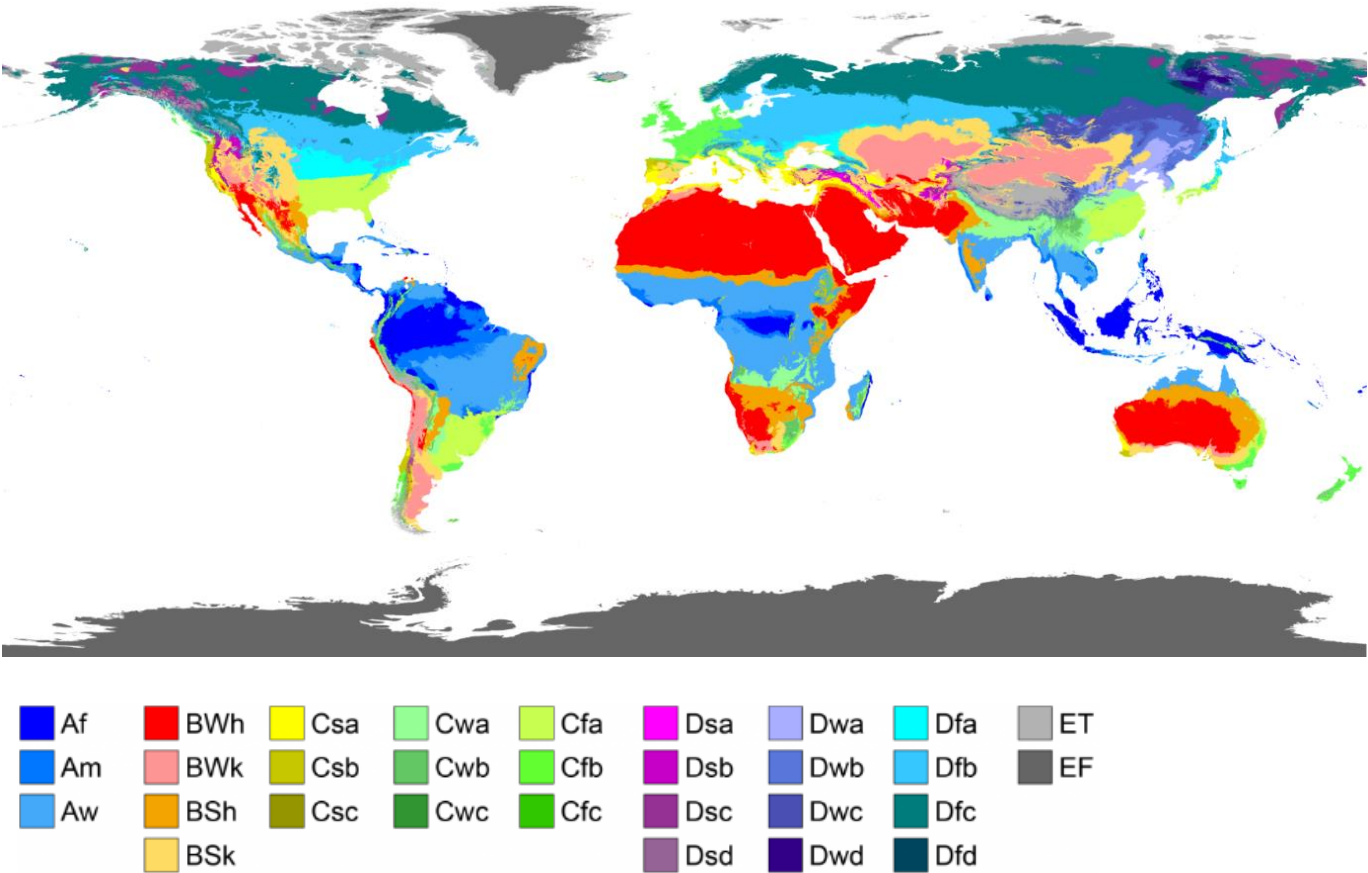


Figure A8. Köppen-Geiger climate classification (1999–2020) (Beck et al., 2023).

Annex 9. An enlarged map of the western part of the EPPO region with the 20-year average annual growing degree days data.

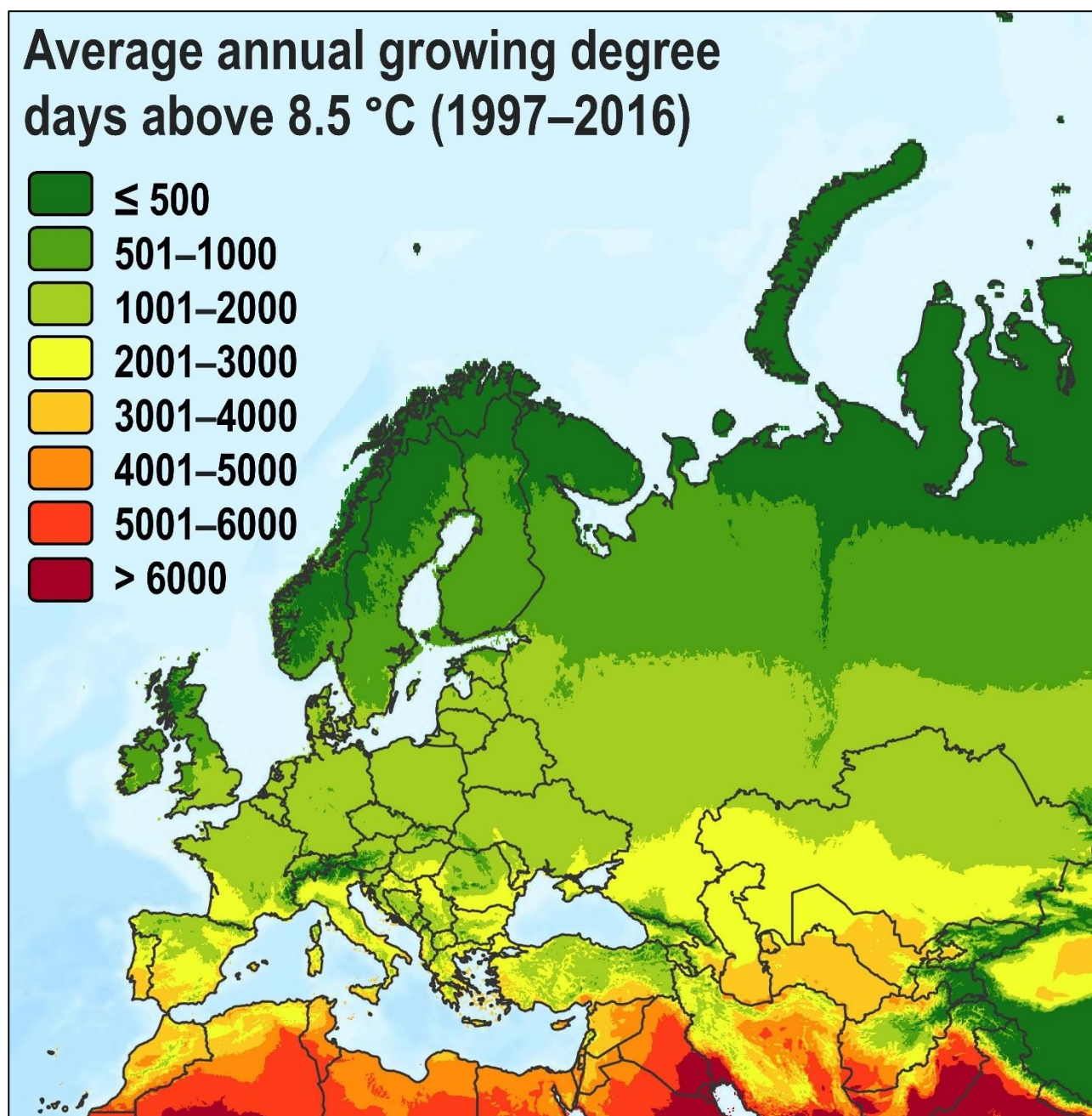


Figure A9. An enlarged map of the western part of the EPPO region with the 20-year average annual growing degree days above 8.5 °C for 1997–2016 (Karger et al., 2017, 2022). The country borders on the map were sourced from GADM (2020). The map was prepared by J. Tuomola (EWG; Ruokavirasto, Finland).

Annex 10. An enlarged map of the western part of the EPPO region with data on similarity of climates.

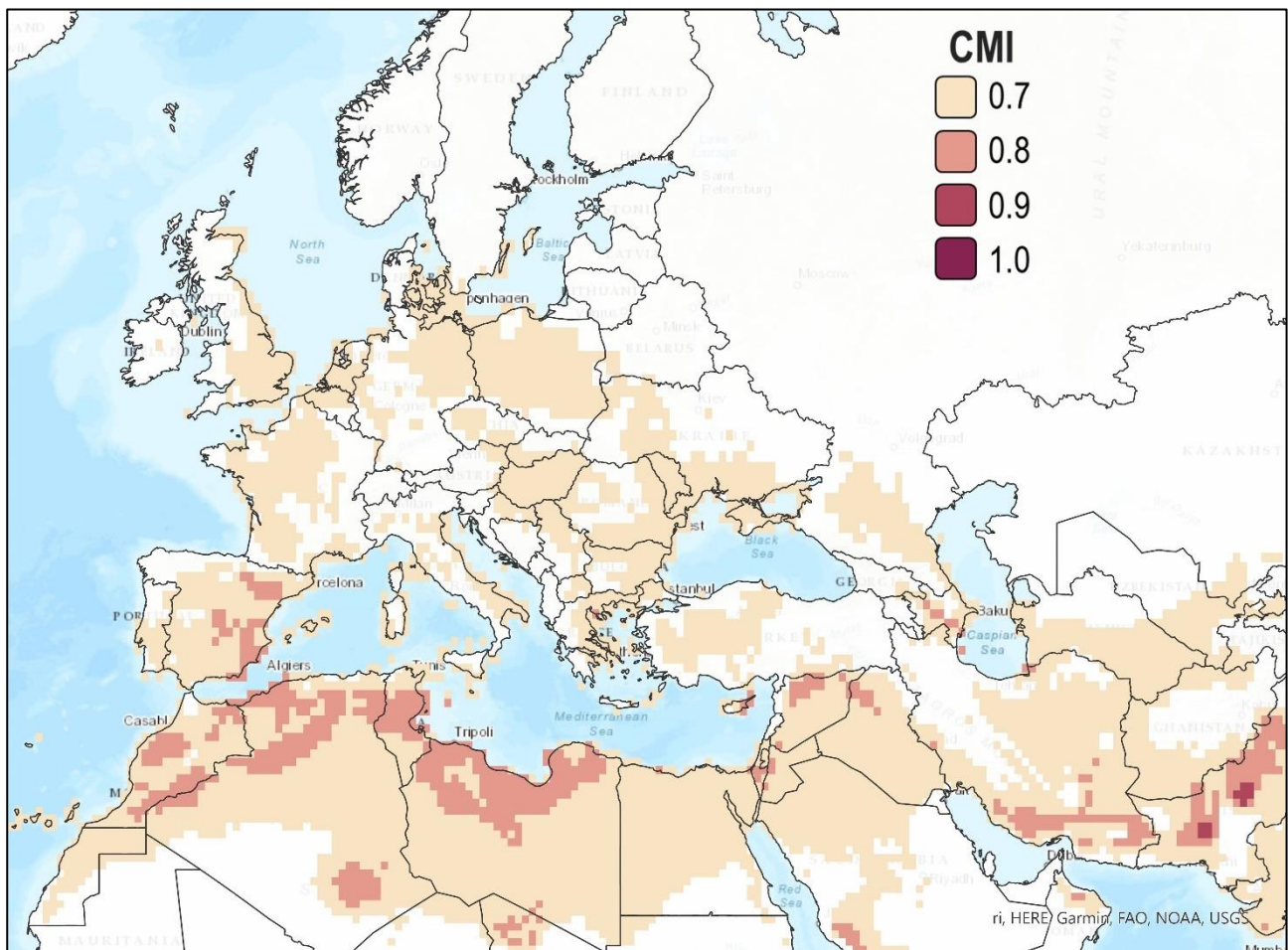


Figure A10. An enlarged map of the western part of the EPPO region with data on similarity of climates. Similarity of climate between the EPPO region to the climate in the record points of *P. mexicanus* in its native range. The climate similarity was estimated using the ‘match regional climate’ algorithm of the CLIMEX software. Only results where the CMI ≥ 0.7 are presented. The country borders on the map were sourced from GADM (2020). Climate similarity based on the default parameter values of the algorithm (i.e. equal weighting of minimum and maximum weekly temperatures, weekly rainfall pattern and total annual rainfall). The map was prepared by J. Tuomola (EWG; Ruokavirasto, Finland).