Adopted: 26 October 2023

DOI: 10.2903/j.efsa.2023.8401

SCIENTIFIC OPINION

efsa JOURNAL

Pest categorisation of *Mimela testaceipes*

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Abstract

The EFSA Panel on Plant Health performed a pest categorisation of *Mimela testaceipes* (Coleoptera: Scarabaeidae), the striated chafer, for the EU, following a commodity risk assessment of dwarfed *Pinus parviflora* grafted onto *P. thunbergii* from China in which *M. testaceipes* was identified as a pest of possible concern to the EU. *M. testaceipes* occurs in Japan, northeast China, Far East Russia, South Korea and very likely North Korea. Adults are recognised pests feeding on and damaging the needles of Japanese cedar (*Cryptomeria japonica*), Japanese cypress (*Chamaecyparis obtusa*) and Japanese larch (*Larix leptolepis*) which are important forestry trees where the pest currently occurs. It has adapted to feed on the needles of *Pinus* species introduced into its native area, such as *P. taeda,* which is native to southeastern USA although *M. testaceipes* is not regarded as a significant pest of pines. Larvae are reported to cause root damage to grasses, as well as conifers. Eggs are usually laid in grassy soils by females that develop on conifer species. Larvae develop in the soil feeding on the roots of grasses or conifer hosts. Larvae overwinter in the soil and take 2 or 3 years to develop. In principle soil, host plants for planting and cut branches with foliage could provide pathways into the EU. However, prohibitions on the import of soil and hosts such as *Chamaecyparis*, *Larix* and *Pinus* regulate such pathways into the EU. Nevertheless, certain dwarfed *Pinus* spp. from Japan are provided with a derogation for entry into the EU. In addition, the host *C. japonica* is unregulated and could also provide a pathway. Hosts occur in the EU in climate zones that match those where *M. testaceipes* occurs in Asia. If *M. testaceipes* were to enter the EU, conditions in central and northern EU are conducive to establishment. Following establishment, impacts on Japanese cedar, Japanese cypress and Japanese larch would be expected; it is possible that *M. testaceipes* could adapt to feed on *Pinus* and *Larix* species growing in Europe. *M. testaceipes* satisfies the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest.

KEYWORDS

forestry, pest risk, plant health, plant pest, quarantine, root feeding, striated chafer

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1 | INTRODUCTION

1.1 | BACKGROUND AND TERMS OF REFERENCE AS PROVIDED BY THE REQUESTOR

1.1.1 | Background

The new Plant Health Regulation (EU) 2016/2031, on the protective measures against pests of plants, is applying from 14 December 2019. Conditions are laid down in this legislation in order for pests to qualify for listing as Union quarantine pests, protected zone quarantine pests or Union regulated non-quarantine pests. The lists of the EU regulated pests together with the associated import or internal movement requirements of commodities are included in Commission Implementing Regulation (EU) 2019/2072. Additionally, as stipulated in the Commission Implementing Regulation 2018/2019, certain commodities are provisionally prohibited to enter in the EU (high risk plants, HRP). EFSA is performing the risk assessment of the dossiers submitted by exporting to the EU countries of the HRP commodities, as stipulated in Commission Implementing Regulation 2018/2018. Furthermore, EFSA has evaluated a number of requests from exporting to the EU countries for derogations from specific EU import requirements.

In line with the principles of the new plant health law, the European Commission with the Member States are discussing monthly the reports of the interceptions and the outbreaks of pests notified by the Member States. Notifications of an imminent danger from pests that may fulfil the conditions for inclusion in the list of the Union quarantine pest are included. Furthermore, EFSA has been performing horizon scanning of media and literature.

As a follow-up of the above-mentioned activities (reporting of interceptions and outbreaks, HRP, derogation requests and horizon scanning), a number of pests of concern have been identified. EFSA is requested to provide scientific opinions for these pests, in view of their potential inclusion by the risk manager in the lists of Commission Implementing Regulation (EU) 2019/2072 and the inclusion of specific import requirements for relevant host commodities, when deemed necessary by the risk manager.

1.1.2 | Terms of Reference

EFSA is requested, pursuant to Article 29(1) of Regulation (EC) No 178/2002, to provide scientific opinions in the field of plant health.

EFSA is requested to deliver 53 pest categorisations for the pests listed in Annex 1A, 1B, 1D and 1E (for more details see mandate M-2021-00027 on the Open.EFSA portal). Additionally, EFSA is requested to perform pest categorisations for the pests so far not regulated in the EU, identified as pests potentially associated with a commodity in the commodity risk assessments of the HRP dossiers (Annex 1C; for more details see mandate M-2021-00027 on the Open.EFSA portal). Such pest categorisations are needed in the case where there are not available risk assessments for the EU.

When the pests of Annex 1A are qualifying as potential Union quarantine pests, EFSA should proceed to phase 2 risk assessment. The opinions should address entry pathways, spread, establishment, impact and include a risk reduction options analysis.

Additionally, EFSA is requested to develop further the quantitative methodology currently followed for risk assessment, in order to have the possibility to deliver an express risk assessment methodology. Such methodological development should take into account the EFSA Plant Health Panel Guidance on quantitative pest risk assessment and the experience obtained during its implementation for the Union candidate priority pests and for the likelihood of pest freedom at entry for the commodity risk assessment of High Risk Plants.

1.2 | Interpretation of the Terms of Reference

Mimela testaceipes is one of a number of pests relevant to Annex 1C of the Terms of Reference (ToR) to be subject to pest categorisation to determine whether it fulfils the criteria of a potential Union quarantine pest for the area of the EU excluding Ceuta, Melilla and the outermost regions of Member States referred to in Article 355(1) of the Treaty on the Functioning of the European Union (TFEU), other than Madeira and the Azores, and so inform EU decision making as to its appropriateness for potential inclusion in the lists of pests of Commission Implementing Regulation (EU) 2019/ 2072. If a pest fulfils the criteria to be potentially listed as a Union quarantine pest, risk reduction options will be identified.

1.3 | Additional information

This pest categorisation was initiated following the commodity risk assessment of bonsai plants from China consisting of *Pinus parviflora* grafted onto *P. thunbergii* (EFSA PLH Panel, Bragard et al., 2022), in which *M. testaceipes*[1] was identified as a relevant non-regulated EU pest which could potentially enter the EU on *P. parviflora* and *P. thunbergii*.

[1]In the commodity assessment the name *Anomala testaceipes* was used.

2 | DATA AND METHODOLOGIES

2.1 | Data

2.1.1 | Literature search

A literature search on *M. testaceipes* was conducted at the beginning of the categorisation in the ISI Web of Science bibliographic database, using the scientific name and synonyms of the pest as search terms. Papers relevant for the pest categorisation were reviewed, and further references and information were obtained from experts, as well as from citations within the references and grey literature.

2.1.2 | Database search

The Europhyt and TRACES databases were consulted for pest-specific notifications on interceptions and outbreaks. Europhyt is a web-based network run by the Directorate General for Health and Food Safety (DG SANTÉ) of the European Commission as a subproject of PHYSAN (Phyto-Sanitary Controls) specifically concerned with plant health information. TRACES is the European Commission's multilingual online platform for sanitary and phytosanitary certification required for the importation of animals, animal products, food and feed of non-animal origin and plants into the European Union and the intra-EU trade and EU exports of animals and certain animal products. Up until May 2020, the Europhyt database managed notifications of interceptions of plants or plant products that do not comply with EU legislation, as well as notifications of plant pests detected in the territory of the Member States and the phytosanitary measures taken to eradicate or avoid their spread. The recording of interceptions switched from Europhyt to TRACES in May 2020.

GenBank was searched to determine whether it contained any nucleotide sequences for *M. testaceipes* which could be used as reference material for molecular diagnosis. GenBank® (www.ncbi.nlm.nih.gov/genbank/) is a comprehensive publicly available database that as of August 2019 (release version 227) contained over 6.25 trillion base pairs from over 1.6 billion nucleotide sequences for 450,000 formally described species (Sayers et al., 2020).

2.2 | Methodologies

The Panel performed the pest categorisation for *M. testaceipes*, following guiding principles and steps presented in the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, Jeger, et al., 2018), the EFSA guidance on the use of the weight of evidence approach in scientific assessments (EFSA Scientific Committee et al., 2017) and the International Standards for Phytosanitary Measures No. 11 (FAO, 2013).

The criteria to be considered when categorising a pest as a potential Union quarantine pest (QP) is given in Regulation (EU) 2016/2031 Article 3 and Annex I, Section 1 of the Regulation. Table 1 presents the Regulation (EU) 2016/2031 pest categorisation criteria on which the Panel bases its conclusions. In judging whether a criterion is met the Panel uses its best professional judgement (EFSA Scientific Committee et al., 2017) by integrating a range of evidence from a variety of sources (as presented above in section 2.1) to reach an informed conclusion as to whether or not a criterion is satisfied.

The Panel's conclusions are formulated respecting its remit and particularly with regard to the principle of separation between risk assessment and risk management (EFSA founding regulation (EU) No 178/2002); therefore, instead of determining whether the pest is likely to have an unacceptable impact, deemed to be a risk management decision, the Panel will present a summary of the observed impacts in the areas where the pest occurs and make a judgement about potential likely impacts in the EU. Whilst the Panel may quote impacts reported from areas where the pest occurs in monetary terms, the Panel will seek to express potential EU impacts in terms of yield and quality losses and not in monetary terms, in agreement with the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, Jeger, et al., 2018). Article 3 (d) of Regulation (EU) 2016/2031 refers to unacceptable social impact as a criterion for quarantine pest status. Assessing social impact is outside the remit of the Panel.

TABLE 1 Pest categorisation criteria under evaluation, as derived from Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column).

Criterion of pest categorisation	Criterion in regulation (EU) 2016/2031 regarding union quarantine pest (article 3)
Identity of the pest (Section 3.1)	Is the identity of the pest clearly defined, or has it been shown to produce consistent symptoms and to be transmissible?
Absence/presence of the pest in the EU territory (Section 3.2)	Is the pest present in the EU territory? If present, is the pest in a limited part of the EU or is it scarce, irregular, isolated or present infrequently? If so, the pest is considered to be not widely distributed.
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Is the pest able to enter into, become established in and spread within, the EU territory? If yes, briefly list the pathways for entry and spread.
Potential for consequences in the EU territory (Section 3.5)	Would the pests' introduction have an economic or environmental impact on the EU territory?
Available measures (Section 3.6)	Are there measures available to prevent pest entry, establishment, spread or impacts?
Conclusion of pest categorisation (Section 4)	A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential quarantine pest were met and (2) if not, which one(s) were not met.

3 | PEST CATEGORISATION

3.1 | Identity and biology of the pest

3.1.1 | Identity and taxonomy

Is the identity of the pest clearly defined, or has it been shown to produce consistent symptoms and/or to be transmissible?

Yes. The identity of the species is established and M. testaceipes (Motschulsky) is the accepted name and authority.

M. testaceipes (Motschulsky) is an insect within the order Coleoptera and family Scarabaeidae. It was originally described by Victor de Motschulsky in 1860 and named *Rhombonyx testaceipes* from a collection of insects sent to him from Japan (Motschulsky, 1860). However, *Rhombonyx* is now regarded as a junior synonym of the genus *Mimela*, so all species that were described within the genus *Rhombonyx* are now *Mimela* species. The current valid name is *M. testaceipes* (Motschulsky, 1860) (Schoolmeesters, 2023). CABI (2019), the NCBI database[2] and GBIF database[3] also use *M. testaceipes* (Motschulsky, 1860) as the preferred name.

The English common name for the beetle is striated chafer. Some literature and online sources refer to the striated chafer as *Anomala testaceipes*. Possible confusion may have been caused by the species *A. testaceipennis* Blanchard, 1851 which is native to Central and South America and has remained in the genus *Anomala* since it was described from specimens collected in Bolivia. Unfortunately, it seems that the invalid name *A. testaceipes* has been coined mistakenly for *M. testaceipes*. The names *A. testaceipes* (invalid) and *A. testaceipennis* (valid) are both in the public domain and may explain why errors have been perpetuated within literature. The EPPO global database (EPPO, online) now uses the name *M. testaceipes*.

The EPPO code[4] (EPPO, 2019; Griessinger & Roy, 2015) for this species is: ANMLTE (EPPO, online).

3.1.2 | Biology of the pest

A detailed description of the biology of *M. testaceipes* is lacking. In general, environmental factors such as temperature, soil type and especially soil moisture influence oviposition, egg and larval survival, adult emergence, flight activity and expression of damage by scarabs (Potter & Braman, 1991). Information from literature provides an outline of the lifecycle of the pest. There are four stages of development: egg, larva (there is no information on the number of instars), pupa and adult. On Honshu, the central and largest island of Japan, adults emerge during the summer (July and August). They

[2] https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=1618302&mode=info

[3] https://www.gbif.org/species/8655645

[4] An EPPO code, formerly known as a Bayer code, is a unique identifier linked to the name of a plant or plant pest important in agriculture and plant protection. Codes are based on genus and species names. However, if a scientific name is changed the EPPO code remains the same. This provides a harmonised system to facilitate the management of plant and pest names in computerised databases, as well as data exchange between IT systems (EPPO, 2019; Griessinger & Roy, 2015).

feed on conifer needles and mate, then fly from conifer hosts in forests to grasses to feed and oviposit (Torikura, 1991). Females lay between 25 and 60 eggs in grassy soils. Furuno and Uenaka (1976) reported estimated densities in stands of *P. taeda* of between approximately 2000 adults ha^{-1} in 1972 up to approximately 13,000 ha^{-1} in 1975. On Hokkaido, the northern island of Japan, adult females oviposit during August (Torikura, 1992b). Larvae hatch from eggs during September and overwinter, remaining in the soil feeding on plant roots (Toepfer et al., 2014; Yoshida & Umemura, 1973). Kureha et al., (1966) reported most larvae were found within 30 cm of the soil surface with the number at greater depth increasing from late summer and by November some were found at depths of 60 cm. Thus, larvae penetrate deeper into the soil to avoid the colder winter temperatures. Larvae are sensitive to freezing, with a supercooling point at approximately −6.8°C (Hoshikawa et al., 1988). Vertical movement of larvae in the soil is governed by soil moisture as well as temperature (Potter & Braman, 1991). After 2 or 3 years of development (Toepfer et al., 2014) larvae pupate in the soil in mid to late June before adults emerge later in the summer. In Hokkaido, larvae take 3 years to develop (Hoshikawa et al., 1988); further south in Honshu (Nagano Prefecture, central Japan), Kureha et al., (1966) reported larvae taking 2 years to develop before adult emergence.

3.1.3 | Host range/species affected

Adult *M. testaceipes* feed on conifer leaves (needles) and tender stems (Kureha et al., 1966; Matsiakh et al., 2017). When literature refers to species of conifer that are damaged, it is usually *Cryptomeria japonica* (Japanese cedar), *Chamaecyparis obtusa* (Japanese cypress) and *Larix leptolepis* (Japanese larch) that are mentioned. Larvae feed on the roots of grasses, conifers, young seedlings and citrus (Inouye, 1950; Toepfer et al., 2014). A Japanese website providing sampling devices to monitor scarab beetles report larvae of *M. testaceipes* also feed on legumes, wheat and buckwheat (Fuji Flavor Co. Ltd., 2023). Appendix A provides a list of plant species on which adults or larvae are reported to feed on.

Lee et al. (2002) reported small numbers of adult *M. testaceipes* in persimmon (*Diospyros virginiana*) orchards, captured in light traps. It is likely that the adults were attracted to the light traps from neighbouring conifer trees. No literature was found that reports persimmon as a host on which *M. testaceipes* feeds.

3.1.4 | Intraspecific diversity

There are three subspecies. *Mimela testaceipes testaceipes* (Motschulsky, 1860) and *M. testaceipes yuasai* Nomura, 1969 both occur in Japan, whilst *M. testaceipes ussuriensis* (Medvedev, 1949) is recorded from China, Korea and the Russian Far East. Other than slight colour variations and differences in geographic distribution, no evidence was found to suggest that the subspecies present different plant health risks to the EU. This pest categorisation therefore focuses on the organism at a species level.

3.1.5 | Detection and identification of the pest

Are detection and identification methods available for the pest?

Yes, adults can be caught in light traps and detected by visual inspection of host foliage. Larvae can be recovered from soil sampling.

<u>Detection</u>

Symptoms of infestation are damaged conifer needles. The edges of needles are nibbled and can be cut short (Matsiakh et al., 2017). Hosts showing symptoms can be visually inspected for adults in the foliage. A beating tray can be placed under branches to catch fallen adults (Matsiakh et al., 2017). Adults are attracted to black light (365–370 nm) (Torikura, 1992a) and blue fluorescent lights (430–450 nm) when they fly at dusk (Komatsu et al., 2020).

Larvae can be detected by soil sampling e.g. in infested grass swards (Kureha et al., 1966).

<u>Identification</u>

Machatschke (1952) provides a detailed morphological description of features distinguishing the adult from other *Mimela* species although no dimensions are provided. He comments how similar the genus is to the closely related genus *Anomala*. Kim (2011) also provides a detailed description of adults and a key to species of *Mimela*.

Adult: between 14.5 and 20.0 mm long, oval, yellowish-brown or green-brown. Antennae are light yellow (Ohaus, 1915). Four longitudinal stripes on each elytra, often coppery in colour (Machatschke, 1952).

No descriptions of eggs, larvae or pupae were found.

Voucher specimens of *M. testaceipes* mitochondrial 16S rRNA and nuclear 28S rRNA genes have been deposited in Genbank (Jia et al., online).

3.2 | Pest distribution

3.2.1 | Pest distribution outside the EU

M. testaceipes occurs in eastern Asia, specifically in Japan, northeast China, the Russian Far East, South Korea and very likely North Korea. Figure 1 shows the global distribution of *M. testaceipes*. Details of the known distribution are shown in Appendix B.

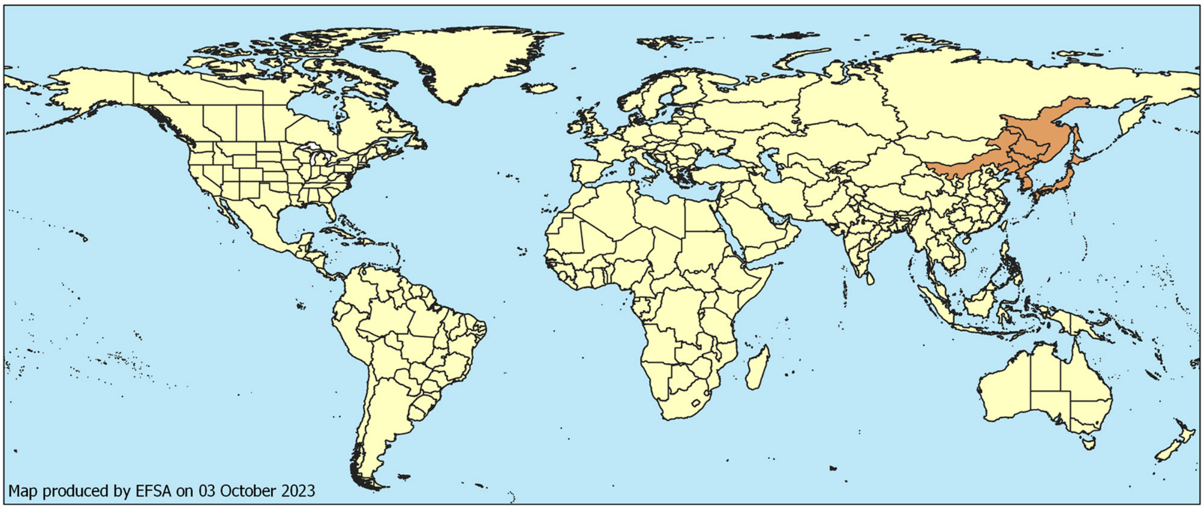

FIGURE 1 Global distribution of *Mimela testaceipes* (Source: literature cited in the document; for details see Appendix B).

3.2.2 | Pest distribution in the EU

Is the pest present in the EU territory? If present, is the pest in a limited part of the EU or is it scarce, irregular, isolated or present infrequently? If so, the pest is considered to be not widely distributed.

No, *M. testaceipes* is not known to be present in the EU.

3.3 | Regulatory status

3.3.1 | Commission implementing Regulation 2019/2072

M. testaceipes is not listed in Annex II of Commission Implementing Regulation (EU) 2019/2072, an implementing act of Regulation (EU) 2016/2031, or in any emergency plant health legislation.

M. testaceipes is not included in a list of pests of concern in relation to naturally or artificially dwarfed *P. parviflora* and *P. thunbergii* plants for planting from Japan in Commission Implementing Regulation (EU) 2020/1217. The regulation provides for a derogation from Article 7, point 1 of Annex VI of Implementing Regulation (EU) 2019/2072 if the plants comply with the conditions set out in Implementing Regulation EU 2020/1217.

3.3.2 | Hosts or species affected that are prohibited from entering the union from third countries

TABLE 2 List of plants, plant products and other objects that are *Mimela testaceipes* hosts whose introduction into the Union from certain third countries is prohibited (Source: Commission Implementing Regulation (EU) 2019/2072, Annex VI).

List of plants, plant products and other objects whose introduction into the union from certain third countries is prohibited			
	Description	**CN code**	**Third country, group of third countries or specific area of third country**
1.	Plants of …*Chamaecyparis* Spach., … *Larix* Mill., …, *Pinus* L. …, other than fruit and seeds	ex 0602 20 20 ex 0602 20 80 ex 0602 90 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 47 ex 0602 90 50 ex 0602 90 70 ex 0602 90 99 ex 0604 20 20 ex 0604 20 40	Third countries other than: […]
11.	Plants of *Citrus* L., […] and their hybrids, other than fruits and seeds	ex 0602 10 90 ex 0602 20 20 0602 20 30 ex 0602 20 80 ex 0602 90 45 ex 0602 90 46 ex 0602 90 47 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91 ex 0602 90 99 ex 0604 20 90 ex 1404 90 00	All third countries
14.	Plants for planting of the family *Poaceae*, other than plants of ornamental perennial grasses of the subfamilies *Bambusoideae* and *Panicoideae* and of the genera *Buchloe*, *Bouteloua* Lag., *Calamagrostis*, *Cortaderia* Stapf., *Glyceria* R. Br., *Hakonechloa* Mak. ex Honda, *Hystrix*, *Molinia*, *Phalaris* L., *Shibataea*, *Spartina* Schreb., *Stipa* L. and *Uniola* L., other than seeds	ex 0602 90 50 ex 0602 90 91 ex 0602 90 99	Third countries other than […]
19.	Soil as such consisting in part of solid organic substances	ex 2530 90 00 ex 3824 99 93	Third countries other than Switzerland

In relation to points 1 and 14, in Table 2, *M. testaceipes* does not occur in any of the third countries for which prohibitions are exempt.

3.4 | Entry, establishment and spread in the EU

3.4.1 | Entry

Is the pest able to enter into the EU territory? If yes, identify and list the pathways.

Yes, in principle *M. testaceipes* could enter the EU on host plants, such as rooted plants for planting in soil or growing media, or on cut branches with foliage. However, Annex VI of EU 2019/2072 prohibits the introduction of soil and some *M. testaceipes* hosts. The host *C. japonica* though is not named in this Annex and certain dwarfed *Pinus* spp. from Japan are provided a derogation by EU 2020/1217.

Comment on plants for planting as a pathway.

Plants for planting (rooted) are expected to provide the pathway most likely to facilitate entry of *M. testaceipes* into the EU.

Annex VI of Implementing Regulation EU 2019/2072 prohibits the introduction of soil and *Chamaecyparis*, *Larix, Pinus* and *Citrus* from countries and areas where *M. testaceipes* is known to occur (Table 2). The derogation for Japan relates to dwarfed *P. parvifolora* and *P. thunbergii*.

It is unknown if *C. japonica* plants for planting have been imported into the EU from countries where *M. testaceipes* is known to occur. The amount of trade in host bonsai from Japan via the recent derogation is also unknown.

Table 3 lists potential pathways into the EU. Whilst adults can fly, there is no evidence that *M. testaceipes* is naturally spreading westwards towards the EU, so natural spread as a means of entry is not considered possible.

TABLE 3 Potential pathways for *Mimela testaceipes* into the EU.

Pathways (e.g. host/intended use/source)	Life stage	Relevant mitigations (e.g. prohibitions [Annex VI], special requirements [Annex VIII] or phytosanitary certificates [Annex XI] within Implementing Regulation 2019/2072)
Rooted host plants for planting	Adults on foliage, eggs, larvae, pupae in soil/growing media	Annex VI prohibition (although a derogation exists for bonsai from Japan)
Cut branches with foliage	Adults on foliage	Annex VI prohibition
Rooted grasses in soil/growing media	Eggs, larvae, pupae in soil/growing media	Annex VI prohibition although ornamental perennial grasses in specified subfamilies and genera are exempt and Annex VII (6.) requirements apply
Soil	Pupae	Annex VI prohibition

Regarding soil as a possible pathway, larvae in soil need to feed on roots to survive. Bare soil is unlikely to sustain any larvae it may contain. Whilst eggs could possibly survive, once larvae hatch, they would likely starve without host roots to feed on. Therefore, only pupae are relevant for the soil pathway.

Notifications of interceptions of harmful organisms began to be compiled in Europhyt in May 1994 and in TRACES in May 2020. As at 24 August 2023, there were no records of interception of *M. testaceipes* in the Europhyt and TRACES databases.

3.4.2 | Establishment

Is the pest able to become established in the EU territory?

Yes, there are climate zones in the EU that match those where *M. testaceipes* occurs and hosts occur as forestry and ornamental trees in these zones.

The climate in central and northern Europe where *M. testaceipes* hosts grow within conifer stands would provide areas most conducive to establishment.

Climatic mapping is the principal method for identifying areas that could provide suitable conditions for the establishment of a pest taking key abiotic factors into account (Baker, 2002). Availability of hosts is considered in Section 3.4.2.1. Climatic factors are considered in Section 3.4.2.2.

3.4.2.1 | *EU distribution of main host plants*

The main hosts on which damage by *M. testaceipes* is reported are grown in Europe. For example, *C. japonica* is used in forestry in the Azores where there are over 12,000 ha of pure and mixed *C. japonica* plantations (Government of Azores, online). It is also cultivated as an ornamental and amenity tree elsewhere in temperate European areas. Japanese larch (*Larix kaempferi*) is an important tree in forestry plantations and is grown widely in northern Europe (Pâques, 2004; Tyler et al., 1996). *C. obtusa* is an important ornamental tree and is widely cultivated in temperate areas of Europe. The European larch, *L. decidua*, occurs naturally in the central and eastern mountains of Europe and is widely planted in other areas. This species could probably be attacked by the pest, as well as *Larix* x *eurolepis*, the hybrid between the European and the Japanese larch.

In Japan, *M. testaceipes* feeds on native pine, *P. densiflora* (Matsiakh et al., 2017), and has adapted to feed on introduced *Pinus* species, such as *P. taeda* which is native to southeastern USA (Furuno and Uenaka (1976). If *M. testaceipes* were to enter the EU, it is possible that it could adapt to feed on *Pinus* species growing in Europe. *Pinus* spp. are grown widely for forestry across Europe.

3.4.2.2 | *Climatic conditions affecting establishment*

The global Köppen–Geiger climate zones (Kottek et al., 2006) describe terrestrial climate in terms of average minimum winter temperatures and summer maxima, amount of precipitation and seasonality (rainfall pattern). *M. testaceipes* occurs in a range of climate zones in eastern Asia. Some climatic zones in which *M. testaceipes* occurs are also found in the EU (Figure 2). Collectively, climate types Bsk, Cfa, Cfb, Dfb and Dfc occupy approximately 84% of all EU 27 five arcmin grid cells (MacLeod and Korycinska, 2018).

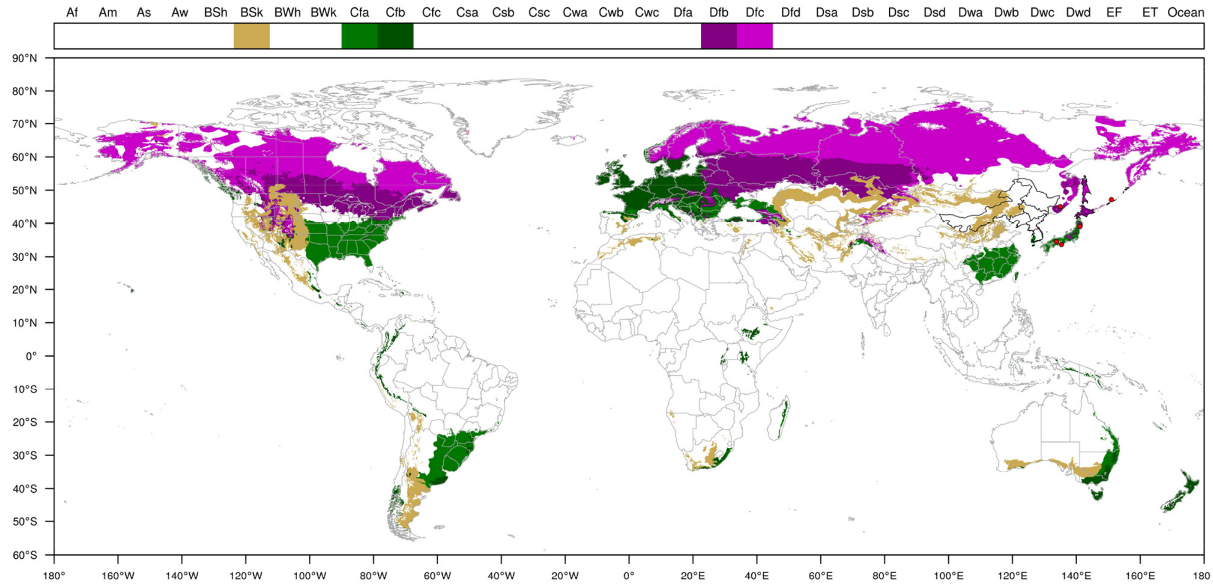

FIGURE 2 Distribution of Köppen–Geiger climate types that occur in the EU and in areas where *Mimela testaceipes* has been reported (red dots).

Of note, *Popilia japonica* Newman (Coleoptera: Scarabaeidae), a closely related species from East Asia, that has been present in the Azores since the 1970s (Jackson, 1992), in Italy since at least 2014 and is currently present in Switzerland, has a super cooling point of −7.0°C whilst *M. testaceipes* has a similar super cooling point of −6.8°C (Hoshikawa et al., 1988). Overwintering survival of *M. testaceipes* can be expected to be about the same as *P. japonica*.

3.4.3 | Spread

Describe how the pest would be able to spread within the EU territory following establishment?

Larvae develop in the soil. Adults are the life stage responsible for natural population spread. Adults can fly hundreds of metres so could spread locally.

Comment on plants for planting as a mechanism of spread.

Movement of rooted plants for planting would provide the primary means for rapid and long distance spread within the EU. Eggs, larvae and pupae could be transported in soil with host plants for planting; adults could be transported amongst the foliage (needles) with plants for planting.

Based on field observations, adults can fly for 8 to 12 minutes at a time (Torikura, 1992b) although 30% fly for less than 1 minute. Using a flight mill, Torikura (1992b) reported that the average distance travelled at night was 1.5 km, and the maximum distance was approximately 3.0 km. However, flight mill experiments represent artificial flight performance and usually overestimate dispersal capacity (Robinet et al., 2019), although they do not take into account the passive dispersal by wind of flying insects.

3.5 | Impacts

Would the pests' introduction have an economic or environmental impact on the EU territory?

Yes, within its current range M. testaceipes is a recognised forestry pest feeding on the needles of Japanese cedar, Japanese cypress and Japanese larch, all of which are important forestry or amenity trees in the EU. Impacts would be expected on these hosts in the EU.

The literature on *M. testaceipes* does not generally provide detailed reports of impacts. Nevertheless, adults are well-known as pests damaging the needles of Japanese cedar (*C. japonica*), Japanese cypress (*C. obtusa*) and Japanese larch (*L. leptolepis*). *M. testaceipes* is not primarily regarded as a pest of pine species although adults do feed on pine needles (Furuno & Uenaka, 1976). Furuno and Uenaka (1976) conducted a detailed study of adult *M. testaceipes* feeding on non-native Japanese pine species. They calculated that the annual loss of needles caused by adult grazing in Loblolly pine (*P. taeda*) reached a maximum of 133 kg ha^{-1}; the authors did not consider this to be an economically significant level of damage. Given the lack of detailed information regarding impacts by *M. testaceipes* on its hosts in eastern Asia, there is some uncertainty regarding the magnitude of possible impacts, especially to Japanese cedar, Japanese cypress and Japanese larch growing in the EU, nevertheless damage would be expected. Equally, there is uncertainty on the magnitude of possible impact on *Pinus* in the EU, assuming *M. testaceipes* could adapt to feed on European *Pinus* species.

Attributing damage to life stages of specific species that dwell largely in the soil is challenging. Literature on *M. testaceipes* often includes text in the introduction noting that larvae of *M. testaceipes* are reported to cause root damage on pasture and grassy crops as well as on conifers and citrus, however there is no further elaboration or details provided (e.g. Toepfer et al., 2014). Nevertheless, many species of scarab beetle are recognised as destructive pests of grasslands due to their root-feeding (Potter & Braman, 1991). Nursery seedlings can also be damaged by larval feeding of *Popillia japonica* (EFSA PLH Panel, Bragard, et al., 2018), and this is probably also the case with *M. testaceipes* larvae.

3.6 | Available measures and their limitations

Are there measures available to prevent pest entry, establishment, spread or impacts such that the risk becomes mitigated?

Yes, Annex VI of Implementing Regulation 2019/2072 prohibits the introduction of plants and plant products of hosts such as *Chamaecyparis*, *Larix*, *Pinus* and Citrus from many third countries, including from countries and areas where *M. testaceipes* occurs.

EPPO (2018) suggests commodity specific phytosanitary measures for Coniferae.

3.6.1 | Identification of potential additional measures

Phytosanitary measures (prohibitions) are applied to some of the pest's host genera (see Section 3.3.2). The Panel does not foresee such prohibitions being removed in the foreseeable future. A derogation for dwarfed *P. parviflora* and *P. thunbergii* from Japan details the necessary requirements for the introduction of such plants into the EU (EU 2020/1217) and the Panel has not identified further measures for these plants.

3.6.1.1 | *Additional potential risk reduction options*

Possible measures for permitted ornamental grasses and *C. japonica* are shown in Table 4 below.

TABLE 4 Selected potential control measures targeting elements of risk in relation to currently unregulated hosts and pathways (a full list of measures is available in EFSA PLH Panel, Jeger, et al., 2018).

Control measure/risk reduction option (Blue underline = Zenodo doc, Blue = WIP)	RRO summary	Risk element targeted (entry/establishment/spread/impact)
Require pest freedom	The plant or plant product comes from a pest free area (e.g. pest free country, a pest free place of production or a pest free production site)	Entry/Spread
Growing plants in isolation	Dwarfed plants, seedlings and ornamental grasses should be grown in protected (insect proof) sites of cultivation providing a physical barrier to prevent plant infestation	Entry (reduce contamination/ infestation)/Spread
Biological control and behavioural manipulation	Torikura (1986) reports *Istochaeta rhombonicus* (Dipt: Tachinidae) as a parasite of *M. testaceipes* but it is not known to be commercially available. Entomopathogens have potential for control of scarab pests in soil (Deans & Krischik, 2023); nematodes have been used against many soil-dwelling insect pests but have been limited in their usage due to unpredictable performance (Helmberger et al., 2017). Nevertheless, the entomopathogenic nematodes *Steinerenema glaseri* and *Heterorhabditis bacteriophora* can be effective in controlling scarab larvae in turf and potted nursery stock but are expensive and have limited shelf life (Potter & Held, 2002)	Entry/Impact

(Continues)

TABLE 4 (Continued)

Control measure/risk reduction option (Blue underline = Zenodo doc, Blue = WIP)	RRO summary	Risk element targeted (entry/establishment/spread/impact)
Chemical treatments on crops including reproductive material	Insecticides could be applied to hosts grown in nurseries	Entry/ Establishment/ Impact
Cleaning and disinfection of facilities, tools and machinery	Prior to their export, machinery and vehicles which have been operated for forestry purposes should be cleaned and free from soil and plant debris	Entry/Spread
Limits on soil	To reduce the likelihood of immature stages entering the EU with soil, imported plants, plant products and machinery should be free from soil or growing media	Entry/Spread
Post-entry quarantine and other restrictions of movement in the importing country	Post-entry quarantine could be imposed on host plants for planting	Establishment/Spread

3.6.1.2 | *Additional supporting measures*

Potential additional supporting measures are listed in Table 5.

TABLE 5 Selected supporting measures (a full list is available in EFSA PLH Panel, Jeger, et al., 2018) in relation to currently unregulated hosts and pathways. Supporting measures are organisational measures or procedures supporting the choice of appropriate risk reduction options that do not directly affect pest abundance.

Supporting measure	Summary	Risk element targeted (entry, establishment, spread impact)
Inspection and trapping	Inspections of material prior to import, on arrival in the EU and when moving plants for planting within the EU could reduce likelihood of entry or spread	Entry, Spread
Sampling	Necessary as part of other RROs	Entry
Phytosanitary certificate and plant passport	According to ISPM 5 (FAO, 2023), a phytosanitary certificate and a plant passport are official paper documents or their official electronic equivalents, consistent with the model certificates of the IPPC, attesting that a consignment meets phytosanitary import requirements: a) export certificate (import) b) plant passport (EU internal trade)	Entry (phytosanitary certificate) Spread (plant passport)
Certified and approved premises	If the material is sourced from approved premises, e.g. in a PFA (Table 4), likelihood of commodity being infested is assumed to be reduced (no specific literature in relation to *M. testaceipes*)	Entry, Spread
Surveillance	Surveillance to guarantee that plants and produce originate from a Pest Free Area could be an option	Entry, Spread

3.6.1.3 | *Biological or technical factors limiting the effectiveness of measures*

Life stages occurring in the soil would be difficult to detect.

3.7 | Uncertainty

No key uncertainties were identified.

4 | CONCLUSIONS

M. testaceipes satisfies the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest. Some uncertainty exists over the magnitude of potential impacts.

Table 6 provides a summary of the PLH Panel conclusions.

TABLE 6 The Panel's conclusions on the pest categorisation criteria defined in Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column).

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the species is established and *Mimela testaceipes* (Motschulsky) is the accepted name and authority	None
Absence/presence of the pest in the EU (Section 3.2)	*M. testaceipes* is not known to be present in the EU	None
Pest potential for entry, establishment and spread in the EU (Section 3.4)	In principle, *M. testaceipes* could enter the EU on host plants such as rooted plants for planting in soil or growing media or on cut branches with foliage. However, Annex VI of EU 2019/2072 prohibits the introduction of soil and some *M. testaceipes* hosts from countries and areas where *M. testaceipes* occurs, although certain dwarfed *Pinus* spp from Japan are provided a derogation by EU 2020/1217. The host *Cryptomeria japonica* appears unregulated and could provide a pathway. There are climate zones in the EU that match those found where *M. testaceipes* occurs and forestry and ornamental tree hosts occur in these zones	None
Potential for consequences in the EU (Section 3.5)	Impacts at least on Japanese cedar, Japanese cypress and Japanese larch would be expected in the EU	None
Available measures (Section 3.6)	Annex VI of 2019/2072 prohibits the introduction of plants and plant products of *M. testaceipes* host genera from many third countries, including countries and areas where *M. testaceipes* occurs	None
Conclusion (Section 4)	*M. testaceipes* satisfies the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	Studies on species of *Pinus* used in EU forestry would help to clarify their host status	

ABBREVIATIONS

EPPO	European and Mediterranean Plant Protection Organization
FAO	Food and Agriculture Organization
IPPC	International Plant Protection Convention
ISPM	International Standards for Phytosanitary Measures
MS	Member State
PLH	EFSA Panel on Plant Health
PZ	Protected Zone
TFEU	Treaty on the Functioning of the European Union
ToR	Terms of Reference

GLOSSARY

Containment (of a pest)	Application of phytosanitary measures in and around an infested area to prevent spread of a pest (FAO, 2023).
Control (of a pest)	Suppression, containment or eradication of a pest population (FAO, 2023).
Entry (of a pest)	Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled (FAO, 2023).
Eradication (of a pest)	Application of phytosanitary measures to eliminate a pest from an area (FAO, 2023).
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2023.
Greenhouse	A walk-in, static, closed place of crop production with a usually translucent outer shell, which allows controlled exchange of material and energy with the surroundings and prevents release of plant protection products (PPPs) into the environment.
Hitchhiker	An organism sheltering or transported accidentally via inanimate pathways including with machinery, shipping containers and vehicles; such organisms are also known as contaminating pests or stowaways (Toy & Newfield, 2010).
Impact (of a pest)	The impact of the pest on the crop output and quality and on the environment in the occupied spatial units.
Introduction (of a pest)	The entry of a pest resulting in its establishment (FAO, 2023).
Pathway	Any means that allows the entry or spread of a pest (FAO, 2023).
Phytosanitary measures	Any legislation, regulation or official procedure having the purpose to prevent the introduction or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests (FAO, 2023).
Quarantine pest	A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO, 2023).

Risk reduction option (RRO)	A measure acting on pest introduction and/or pest spread and/or the magnitude of the biological impact of the pest should the pest be present. A RRO may become a phytosanitary measure, action or procedure according to the decision of the risk manager.
Spread (of a pest)	Expansion of the geographical distribution of a pest within an area (FAO, 2023).

ACKNOWLEDGEMENTS

EFSA wishes to acknowledge Alex Gobbi for generating the distribution map and coordinating the climate suitability exercise performed by Malayka Picchi.

CONFLICT OF INTEREST

If you wish to access the declaration of interests of any expert contributing to an EFSA scientific assessment, please contact interestmanagement@efsa.europa.eu.

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How to cite this article: EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Gonthier, P., Jaques Miret, J. A., Justesen, A. F., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Potting, R., Reignault, P. L., Stefani, E., Thulke, H.-H., Van der Werf, W., Civera, A. V., Yuen, J., … MacLeod, A. (2023). Pest categorisation of *Mimela testaceipes*. *EFSA Journal*, *21*(11), e8401. https://doi.org/10.2903/j.efsa.2023.8401

APPENDIX A

Mimela testaceipes host plants/species affected

Source: literature references as indicated.

Plant family	Genus and species	Common name	Reference
Adult feeding hosts			
Cupressaceae	*Chamaecyparis obtusa*	Japanese cypress	Furuno and Uenaka (1976)
	Cryptomeria japonica	Japanese cedar	Furuno and Uenaka (1976)
Pinaceae	*Larix kaempferi* (=*leptolepis*)	Japanese larch	Furuno and Uenaka (1976)
	Pinus banksiana	Jack pine	Furuno and Uenaka (1976)
	Pinus echinate	Shortleaf pine	Furuno and Uenaka (1976)
	Pinus elliottii	Slash pine	Furuno and Uenaka (1976)
	Pinus densiflora (=funebris)	Japanese red pine	Matsiakh et al. (2017)
	Pinus muricata	Bishop pine	Furuno and Uenaka (1976)
	Pinus pungens	Table mountain pine	Furuno and Uenaka (1976)
	Pinus rigida	Pitch pine	Furuno and Uenaka (1976)
	Pinus taeda	Loblolly pine	Furuno and Uenaka (1976)
	Pinus virginiana	Virginia pine	Furuno and Uenaka (1976)
Larval feeding hosts (conifers as above)			Furuno and Uenaka (1976)
Fabaceae	–	Legumes	Fuji Flavour Co. Ltd. (2023)
Poaceae	–	Grasses	Toepfer et al. (2014)
	Triticum aestivum	Wheat	Fuji Flavour Co. Ltd. (2023)
Polygonaceae	*Fagopyrum esculentum*	Buckwheat	Fuji Flavour Co. Ltd. (2023)
Rutaceae	*Citrus*	Citrus	Toepfer et al., 2014

APPENDIX B

Distribution of *Mimela testaceipes*

Distribution records are based on the indicated sources.

Region	Country	Sub-national (e.g. state)	Status	Reference
North America			No records, presumed absent	
Central America			No records, presumed absent	
Caribbean			No records, presumed absent	
South America			No records, presumed absent	
EU (27)			No records, presumed absent	
Other Europe			No records, presumed absent	
Africa			No records, presumed absent	
Asia	China	Heilongjiang Inner Mongolia Jilin Liaoning	Present	Bezborodov (2018)
	Japan	Hokkaido	Present	Torikura (1992a, b)
		Honshu	Present	Kureha et al. (1966)
	North Korea		*Likely present*	Toepfer et al. (2014)
	South Korea		Present	Cho et al. (2008), Han et al. (2013), Kim et al. (2006), Lim et al. (2012), Oh et al. (2011)
	Russia	Far East (Jewish Autonomous Region; Khabarovsk)	Present	Bezborodov and Koshkin (2020)
		Primorsky Krai (Putyatin Island, Askold Island, Furugelm Island, Lisy Island)		Bezborodov and Lesik (2023)
Oceania			No records, presumed absent	