

EPPO – FAO-REUFIS – BFW Conference

Safeguarding Forests in Europe:
Emerging Risks of *Agrilus* Wood Borers
(Buprestidae)



**EPPO activities and resources on
Agrilus species and its Network of experts
working on surveillance, monitoring,
and control of the emerald ash borer,
*Agrilus planipennis***



Vienna, 21–23 April 2026

Dmitrii Musolin (dm@eppo.int)

Work of EPPO in plant quarantine

EPPO – FAO-REUFIS – BFW Conference

Safeguarding Forests in Europe:
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(Buprestidae)



Manage an early warning system (EPPO Alert List)



Evaluate the risks presented by emerging pests
(Pest Risk Analysis)



Make recommendations on pests which
should be regulated in the EPPO region



Prepare associated Standards
(e.g., diagnostics, phytosanitary measures)



Agrilus: in work of EPPO

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Agrilus planipennis (AGRLPL) - <https://gd.eppo.int>

Infestation of *A. planipennis* in Ottawa (Canada). Photo: E. Jendek



Agrilus mali (AGRLMA) - <https://gd.eppo.int>

Infestation of *A. mali* in China. Photo: Wang Zhi-Yong

Species	GD page & Map	Host plants	Host commodities	Categorization (EPPO)	Categorization	Reports	EPPO PRA	Non-EPPO PRA	PRA platform docs	Datasheet	EPPO Q-Bank	EPPO Standards	Photos	Communication		
<i>A. planipennis</i>	41	8	8	4	6	8	8	5	5	16	6	3	2	PM7/154 (Diag) (rev.), PM3/014, PM3/087, PM 8/011	Y	Y
<i>A. anxius</i>	Y	Y	Y	Y	A1	YYY	Y	2021	EU, PL, SE, NO	Y	2020		PM7/New, PM3/087, PM 8/006	Y	Y	
<i>A. s.</i>	Y	Y	Y	Y	A2	Y	Y	2019		Y	2020			Y	Y	
<i>A. angelicus</i>	Y									Y						
<i>A. angustulus</i>	Y									Y						
<i>A. angustatus</i>	Y															
<i>A. a. fulgens</i>	Y															
<i>A. ater</i>	Y													Y		
<i>A.</i>	Y															
<i>A. auricollis</i>	Y															
<i>A. auriventris</i>	Y	Y	Y							Y						
<i>A.</i>	Y				AL 2013-	Y	Y			Y	2017					
<i>A. biguttatus</i>	Y								GB	Y						
<i>A. caspini</i>	Y															
<i>A. cephalicus</i>	Y															
<i>A.</i>	Y								GB	Y						
<i>A. coxalis</i>	Y	Y	Y													
<i>A. derasolanzatus</i>	Y									Y						
<i>A. dimidiatus</i>	Y									Y						
<i>A. dunnii</i>	Y									Y						
<i>A. fleischeri</i>	Y	Y	Y	Y	A2	Y	Y	2019		Y	2020		Y	Y		
<i>A. horni</i>	Y	Y	Y							Y						
<i>A. hyperici</i>	Y									Y						
<i>A. integerrimus</i>	Y															
<i>A. kalshoveni</i>	Y															
<i>A. liragus</i>	Y															
<i>A. mali</i>	Y	Y	Y		A2	YYY	Y	2024		Y	2026		Y			
<i>A. occipitalis</i>	Y															
<i>A.</i>	Y															
<i>A. politus</i>	Y															
<i>A. prionurus</i>	Y															
<i>A.</i>	Y															
<i>A. quercicola</i>	Y															
<i>A. ruficollis</i>	Y															
<i>A. setipes</i>	Y															
<i>A. sinuatus</i>	Y															
<i>A. solieri</i>	Y					Y										
<i>A. sulcicollis</i>	Y											Y				
<i>A. tschichevini</i>	Y															
<i>A. vestitus</i>	Y											Y				
<i>A. vividus</i>	Y															

Agrilus: EPPO GD and Codes

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EPPO Global Database

Search by name or EPPO Code... Go! advanced search...

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Agrilus (1AGRLG) [Print] [Facebook] [Twitter]

Code created in: 1998-08-17

Overview

Basic information

- EPPO Code: 1AGRLG
- Preferred name: *Agrilus*
- Authority: Curtis

Taxonomy

- Kingdom: Animalia (1ANIMK)
- Phylum: Arthropoda (1ARTHYP)
- Subphylum: Hexapoda (1HEXAQ)
- Class: Insecta (1INSEC)
- Order: Coleoptera (1COLEO)
- Family: Buprestidae (1BUPRF)
- Genus: *Agrilus* (1AGRLG)

Children

- > *Agrilus angelicus* (AGRLAG)
- > *Agrilus angustulus* (AGRLAN)
- > *Agrilus anxius* (AGRLAX)
- > *Agrilus arcuatus* (AGRLAR)
- > *Agrilus arcuatus fulgens* (AGRLAF)
- > *Agrilus ater* (AGRLAT)
- > *Agrilus aurichalceus* (AGRLRC)
- > *Agrilus auricollis* (AGRLAU)

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EPPO Codes ensure:

- clarity,
- consistency,
- efficiency,
- global coordination in plant protection.

Pages in EPPO GD and EPPO Codes
are created for **41** species of *Agrilus*.

Agrilus: EPPO GD and Codes

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Agrilus planipennis (AGRLPL)

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TOOLS


Propose photos

Photos


All photos included on this page can only be used for educational purposes. For publication in journals, books or magazines, permission should be obtained from the original photographers with a copy to EPPO.

Filter photos by tag:


All Damage Symptoms Adult Larva Egg



An European ash (*Fraxinus excelsior*) with galleries of *A. planipennis*, Borisoglebsk, Voronezh Region of Russia, 2025.
Courtesy: A.V. Petrov (Institute of Forest Science Russian Academy of Science)



A larvae of *A. planipennis* under the bark of an European ash (*Fraxinus excelsior*), Borisoglebsk, Voronezh Region of Russia, 2025.
Courtesy: A.V. Petrov (Institute of Forest Science Russian Academy of Science)



Agrilus planipennis
Fairmaire, 1888
Courtesy: Alexander Petrov

Agrilus quercicola (AGRLQU)

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Overview

Basic information

- EPPO Code: AGRLQU
- Preferred name: *Agrilus quercicola*
- Authority: Fisher

Code created in: 2011-08-05

Propose photo

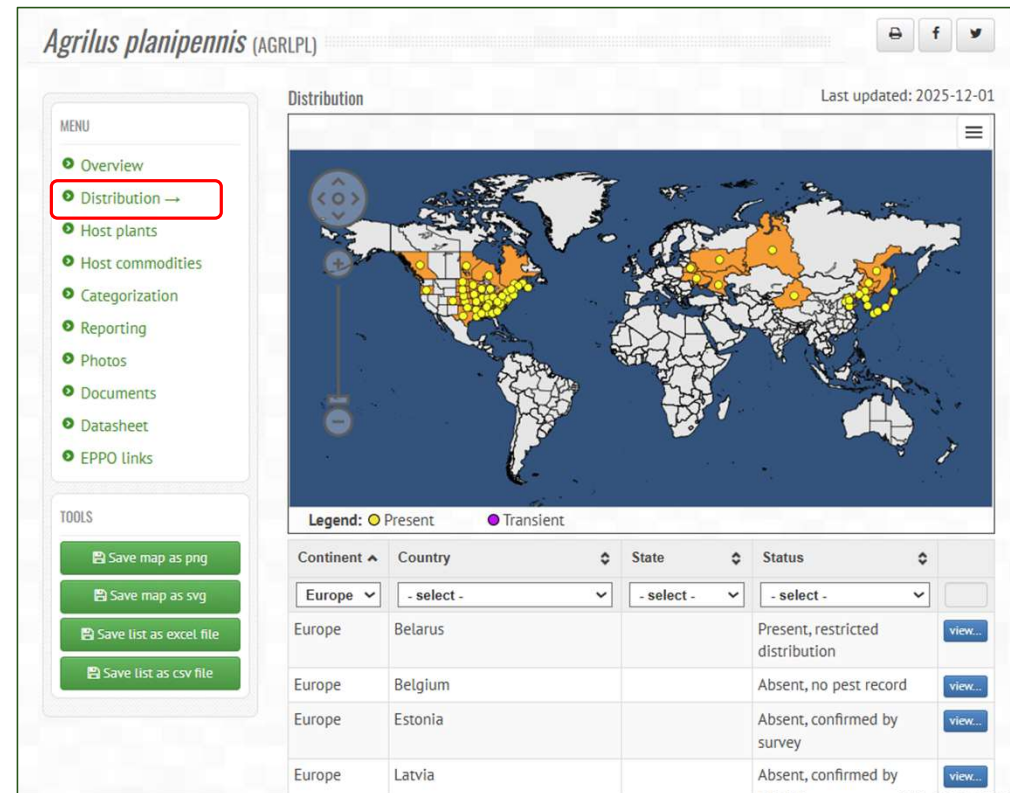
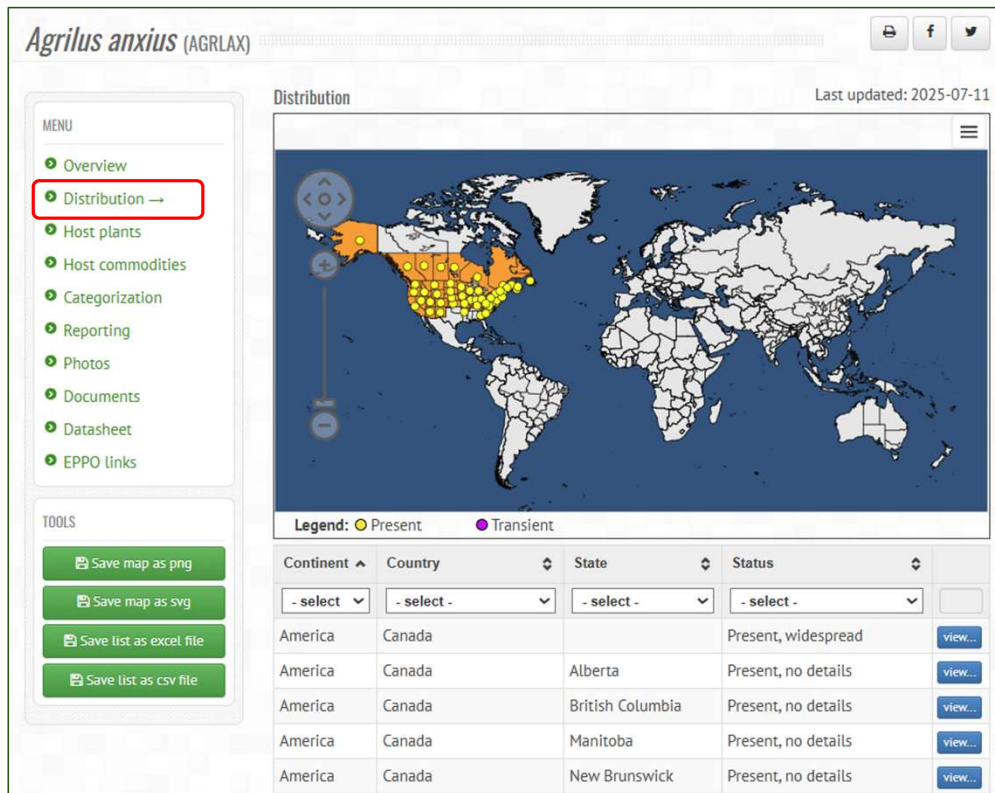
Taxonomy

- Kingdom: Animalia (1ANIMK)
- Phylum: Arthropoda (1ARTHYP)
- Subphylum: Hexapoda (1HEXAQ)
- Class: Insecta (1INSEC)
- Order: Coleoptera (1COLEO)
- Family: Buprestidae (1BUPRF)
- Genus: *Agrilus* (1AGRLG)
- Species: *Agrilus quercicola* (AGRLQU)

Agrilus: EPPO GD – maps

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Maps are available for 8 species of *Agrilus*:
- countries or sub-country units.

Agrilus: EPPO GD – hosts

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Agrilus anxius (AGRLAX) 📄 🌐 🐦

Distribution Last updated: 2025-07-11

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TOOLS

- 📄 Save map as png
- 📄 Save map as svg
- 📄 Save list as excel file
- 📄 Save list as csv file

Legend: ● Present ● Transient

Continent	Country	State	Status	
- select	- select	- select	- select	
America	Canada		Present, widespread	view...
America	Canada	Alberta	Present, no details	view...
America	Canada	British Columbia	Present, no details	view...
America	Canada	Manitoba	Present, no details	view...
America	Canada	New Brunswick	Present, no details	view...

Search... - select -

Chionanthus virginicus (CIOVI)	Host
Fraxinus americana (FRXAM)	Major host
Fraxinus angustifolia subsp. oxycarpa (FRXAX)	Major host
Fraxinus chinensis (FRXCH)	Host
Fraxinus chinensis subsp. rhynchophylla (FRXRH)	Major host
Fraxinus excelsior (FRXEX)	Major host
Fraxinus lanuginosa (FRXLN)	Doubtful host

Fraxinus excelsior (FRXEX) Major host

- Baranchikov Y, Seraya L & Grinash M (2014) [All European ash species are susceptible to emerald ash borer *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae) – a Far Eastern invader]. *Siberian Journal of Forest Science* 6, 80–85 (in Russian).
- Hems DA (2015) Host range and host resistance. In: Van Driesche R, Duan J, Abell K, Bauer L & Gould J (eds), *Biology and control of emerald ash borer*. FHTET-2014-09. USDA Forest Service, Forest Health Technology Enterprise Team, Morgantown, WV, pp. 65–73.
- Orlova-Bienkowskaja MJ, Bienkowski AO (2020) Minimum winter temperature as a limiting factor of the potential spread of *Agrilus planipennis*, an alien pest of ash trees, in Europe. *Insects* 11(4), 258.
- Volkovitch MG, Biełkowski AO, Orlova-Bienkowskaja MJ (2021). Emerald ash borer approaches the borders of the European Union and Kazakhstan and is confirmed to infest European ash. *Forests*, 12(6), 691. <https://doi.org/10.3390/f12060691> ----- reported to kill trees in forest in Russia.

Categories:
- hosts,
- major hosts,
- experimental,
- doubtful.

Data on hosts are available for 8 species of *Agrilus*.

Agrilus: EPPO GD and Codes

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Agrilus planipennis (AGRLPL)

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Host Commodities

Type	Host
- select -	Search...
bark	Fraxinus (1FRXG)
bark	Juglans ailanthifolia (IUGAI)
bark	Juglans mandshurica (IUGMN)
bark	Pterocarya rhoifolia (PTFRH)
bark	Ulmus davidiana (ULMDA)
non-squared wood	Fraxinus (1FRXG)
non-squared wood	Juglans ailanthifolia (IUGAI)
non-squared wood	Juglans mandshurica (IUGMN)
non-squared wood	Pterocarya rhoifolia (PTFRH)
non-squared wood	Ulmus davidiana (ULMDA)
packaging material	Fraxinus (1FRXG)
packaging material	Juglans ailanthifolia (IUGAI)
packaging material	Juglans mandshurica (IUGMN)
packaging material	Pterocarya rhoifolia (PTFRH)
packaging material	Ulmus davidiana (ULMDA)

Categories:

- bark,
- manufactures articles,
- non-squared wood,
- packaging material,
- plants for planting,
- squared wood.

Available only for 4 species:

- *A. anxius*,
- *A. bilineatus*,
- *A. fleischeri*,
- *A. planipennis*.

Agrilus: EPPO A1 and A2 Lists

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EPPO A1 List of pests recommended for regulation as quarantine pests

- version 2025-09 -

EPPO recommends its member countries to regulate the pests listed below as quarantine pests (A1 pests are absent from the EPPO region). The EPPO A1 List is reviewed every year by the Working Party on Phytosanitary Regulations and approved by Council.

A1 List (absent from the EPPO region): *A. anxius*

A2 List (locally present in the EPPO region): *A. bilineatus*, *A. fleischeri*,
A. mali, *A. planipennis*

In the tables below, click on the links to access pest-specific information stored in EPPO Global Database (geographical distributions, host plants, pictures, data sheets, PRAs, diagnostic protocols and other EPPO Standards).


[Click here to view A2 List >](#)

Agrilus: EPPO Alert List

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Pest reporting

EPPO Alert List

Purpose of the EPPO Alert List

The main purpose of the Alert List is to draw the attention of EPPO member countries to certain pests possibly presenting a risk to them and achieve early warning. It can also be used by EPPO to select candidates which may be submitted to a Pest Risk Analysis (PRA). Pests are marked with an asterisk * in the table below when a PRA is planned or under development within EPPO. The entry date corresponds to the date when the pest was added to the Alert List. [Read a short introduction to the EPPO Alert List](#).



EPPO Alert List – last updated in 2026-03

Insects and mites	
Name	Main host plants
<i>Amrasca biguttula</i> (Hemiptera: Cicadellidae) – NEW	Polyphagous
<i>Anoplophora horsfieldii</i> (Coleoptera: Cerambycidae)	Broadleaf trees
<i>Atherigona orientalis</i> (Diptera: Muscidae)	Capsicum, tomato

Agrilus auroguttatus (AGRLGT)

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Categorization				
Country/NPPO	List	Year addition	Year transfer	Year deletion
Europe				
Türkiye	A1 list	2016		
RPPO/EU				
EPPO	Alert list (formerly)	2013		2017

https://commons.wikimedia.org/wiki/File:Agrilus_auroguttatus.jpg



Agrilus: Categorization in countries

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Agrilus anxius (AGRLAX)

Categorization		Year addition	Year transfer	Year deletion
Country/NPPO	List			
Africa				
Morocco	Quarantine pest	2018		
Asia				
Kazakhstan	A1 list	2017		
Europe				
Norway	Quarantine pest	2018		
Serbia	A1 list	2015		
Switzerland	A1 list	2019		
Türkiye	A1 list	2016		
Ukraine	A1 list	2019		
United Kingdom	A1 list	2020		
RPPO/EU				
EAEU	A1 list	2016		
EPPO	A1 list	2011		
EU	Quarantine pest ((EU) 2019/2072 Annex II A)	2019		

Agrilus mali (AGRLMA)

Categorization		Year addition	Year transfer	Year deletion
Country/NPPO	List			
Asia				
Kazakhstan	A1 list	2017		
Uzbekistan	A1 list	2008		
Europe				
Azerbaijan	A1 list	2024		
Belarus	Quarantine pest	1994		
Moldova, Republic of	Quarantine pest	2017		
United Kingdom	Quarantine pest	2024		
RPPO/EU				
EAEU	A2 list	2016		
EPPO	A2 list	2024		
EPPO	Alert list (formerly)	2020		2024

Available for 8 species

Agrilus: EPPO Reporting Service

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Agrilus planipennis (AGRLPL)



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Reporting Service articles

Num.	Title	year-month
2025/261	Update on the situation of <i>Agrilus planipennis</i> in Belarus	2025-11
2025/255	Update on the situation of quarantine pests in the Russian Federation	2025-11
2025/208	First report of <i>Agrilus planipennis</i> in Belarus	2025-09
2025/021	Pre-emptive biological control of <i>Agrilus planipennis</i> in Europe	2025-01
2025/001	New data on quarantine pests and pests of the EPPO Alert List	2025-01
2024/166	Changes made to the EU list of regulated pests	2024-08
2024/097	New data on quarantine pests and pests of the EPPO Alert List	2024-05
2024/028	New EU Regulations	2024-02
2024/007	<i>Agrilus planipennis</i> found in Kyiv, Ukraine	2024-01
2023/175	New data on quarantine pests and pests of the EPPO Alert List	2023-08
2023/081	EPPO network of experts working on surveillance, monitoring, and control of <i>Agrilus planipennis</i>	2023-04
2022/187	Update of the situation of <i>Agrilus planipennis</i> in Ukraine	2022-09
2022/143	New data on quarantine pests and pests of the EPPO Alert List	2022-07
2021/216	Update on the situation of <i>Agrilus planipennis</i> in Ukraine	2021-10
2021/154	<i>Agrilus planipennis</i> in Russia approaching the borders of the European Union and Kazakhstan	2021-07

Agrilus fleischeri (AGRLFL)



Reporting Service articles

Num.	Title	year-month
2020/065	New and revised dynamic EPPO datasheets are available in the EPPO Global Database	2020-04
2020/028	New data on quarantine pests and pests of the EPPO Alert List	2020-02
2019/176	New additions to the EPPO A1 and A2 Lists	2019-09
2018/051	<i>Agrilus fleischeri</i> : addition to the EPPO Alert List	2018-03

Available for 8 species

Agrilus: EPPO PRA Platform

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EPPO Platform on PRAs

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EPPO PRA for *Agrilus planipennis*

EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION 2674

Description

Overall assessment of risk: The likelihood of entry is considered as moderate, and the likelihood of establishment as high. Where it is introduced, the pest is likely to cause major losses and environmental impact, and some social effects. Long-distance spread will be via human-assisted pathways, although natural spread will happen but at a slower pace. Where *A. planipennis* is introduced, it will have massive impact, and eradication or containment will be difficult and costly, and very unlikely to be successful.

Organisms

- Agrilus planipennis*

Hosts

- Fraxinus*

Files

Type	File	Size
Pest Risk Analysis	Download	1,44MB

ADDITIONAL INFORMATIONS

- Country: EPPO
- Lang: English
- Date PRA: 2013-09-30
- Visible for: Public
- Publication: 2018-08-0
- Last update: 2018-09-1
- Published by: Muriel Su

TOOLS

[Download XML](#)

PRA Area

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

EPPO PRAs – for 5 species:

- *A. anxius* (2021),
- *A. bilineatus* (2019),
- *A. fleischeri* (2019),
- *A. mali* (2024),
- *A. planipennis* (2013).

Non-EPPO PRAs – 5 species:

- *A. anxius* (EU, PL, SE, NO),
- *A. biguttatus* (GB),
- *A. convexicollis* (GB),
- *A. horni* (GB),
- *A. planipennis* (EU, GB, PT).

Documents on PRA Platform

– 16 species

Agrilus: EPPO Datasheets

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EPPO, 2017

Mini data sheet on *Agrilus auroguttatus*

Added in 2013 - Deleted in 2017

Reasons for deletion:

Agrilus auroguttatus is perceived as a risk for the EPPO region and surveys have been conducted by several EPPO countries. However, trade from areas where this insect occurs is limited and European species of oak are not considered susceptible. In 2017, the Working Party on Phytosanitary Regulations agreed that it could be deleted, considering that sufficient alert has been given.

Agrilus auroguttatus (Coleoptera: Buprestidae - goldspotted oak borer)

Why: *Agrilus auroguttatus* (Coleoptera: Buprestidae - goldspotted oak borer) has recently been introduced into California (US) where it attacks oak trees. Although *A. auroguttatus* is a North American species probably originating from Arizona (US), its introduction into California is considered to be a serious threat to native oak species. Because extensive tree mortality has been observed in California, the Panel on Phytosanitary Measures decided that *A. auroguttatus* should be added to the EPPO Alert List.

Where: *A. auroguttatus* is morphologically very similar to *Agrilus coxalis* which ranges from central Mexico to Guatemala. Over the years, several authors have considered that they represented either the same species or subspecies of *A. coxalis* (*A. coxalis coxalis* and *A. coxalis auroguttatus*). At present, it seems accepted that they are distinct species; that the pest introduced into California is *A. auroguttatus*; and that *A. auroguttatus* originates from Southern Arizona (most probably from the Dragon Mountains area). In California, the first outbreaks were observed in 2004 in the San Diego county (Descanso, Guatay, Pine Valley), although it is suspected that the pest has probably been present since the early 2000s. In 2009, a satellite infestation was observed near La Jolla (Marion Bear Memorial Park - San Diego county). In 2012, the pest was detected in Riverside county (community of Idyllwild), approximately 60 km south of the main outbreak site in San Diego county.

EPPO region: absent.

North America: USA (Arizona, California), Mexico (Baja California Sur).

On which plants: *Quercus* spp. with a preference for species belonging to the red oak group. In California, *A. auroguttatus* mainly attacks *Q. agrifolia* (coast live oak), *Q. kelloggii* (California white oak), *Q. chrysolepis* (canyon live oak). In its natural range, *A. auroguttatus* is not considered as a pest, although recent surveys conducted in Southeastern Arizona revealed some injuries on *Q. emoryi* (Emory oak) and *Q. hypoleucoides* (silverleaf oak), but with low levels of infestation and tree mortality. During surveys conducted in 2008/2009, no damage was observed on 'white' oaks in Arizona, or only rarely on *Q. engelmannii* (belonging to the white oak group), in California. No mortality was observed on the latter species.

Damage: Symptoms of infestations are wet, dark-coloured stains on the bark surface, D-shaped adult exit holes (3 mm wide), and a reduction of foliage in the tree crown. Larvae feed in the phloem, primarily at the interface of the xylem and phloem, and bore galleries which form dark and sinuous patterns on the wood surface. After several years of continuous infestation, oak trees may die.

In California, it is estimated that since 2002, *A. auroguttatus* has contributed to the mortality of more than 80 000 oak trees over approximately 5 000 km². The infested area continues to increase as the insect population grows and spreads.

Available
for 6 species

Agrilus fleischeri (AGRFL)



EPPO Datasheet: *Agrilus fleischeri*

IDENTITY

Preferred name: *Agrilus fleischeri*

Authority: Obenberger

Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Coleoptera: Buprestidae

Other scientific names: *Agrilus fleischeri kurosawai* Obenberger, *Agrilus fleischeri nipponicola* Kurosawa,

Agrilus fleischeri var. *coreicus* Kurosawa, *Agrilus kochi* Théry, *Agrilus tscherepanovi* Stepanov

[view more common names online...](#)

EPPO Categorization: A2 list, Alert list (formerly)

[view more categorizations online...](#)

EPPO Code: AGRFL

+ HOSTS

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+ BIOLOGY

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+ DETECTION AND IDENTIFICATION

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+ PATHWAYS FOR MOVEMENT

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+ PEST SIGNIFICANCE

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+ PHYTOSANITARY MEASURES

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TOOLS

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Agrilus: EPPO-Q-Bank

EPPO – FAO-REUFIS – BFW Conference

Safeguarding Forests in Europe:
Emerging Risks of *Agrilus* Wood Borers
(Buprestidae)





EPPO-Q-bank
A database to support plant
pest diagnostic activities

Home | [Arthropods](#) | [Bacteria](#) | [Fungi](#) | [Nematodes](#) | [Phytoplasmas](#) | [Plants](#) | [Viruses and Viroids](#)

EPPO Code	Preferred Name	EPPO Categorization	Nb Specimens	Nb Sequences
Filter...	<input type="text" value="Agrilus"/>	- select -	Filter...	Filter...
AGRLPL	Agrilus planipennis	A2 list	8	8
AGRLSO	Agrilus solieri		1	1
AGRLVE	Agrilus vestitus		1	1

EPPO Q-BANK

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- [Phytoplasmas](#)
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Welcome to EPPO-Q-bank!

A curated database to support plant pest diagnostic activities

Our objective

The aim of the EPPO-Q-bank is to support diagnostic activities of phytosanitary organizations: national plant protection organizations, general inspection bodies, and private laboratories. The analysis of DNA sequences (e.g. barcodes) is increasingly used for diagnostics in phytosanitary laboratories. Barcoding uses short DNA sequences specific to a well-defined taxon for species identification. A database with reliable sequences generated from vouchered biological material is an indispensable tool to detect and identify harmful quarantine organisms.

EPPO-Q-bank comprises data of properly documented species and strains present in collections. Depending on the collection, these may be obtained for further studies or used as controls in identification and detection tests.

The entries in EPPO-Q-bank are updated by a team of curators with taxonomic, phytosanitary and diagnostic expertise from national plant protection organizations world-wide and institutes with connections to relevant phytosanitary collections. The curators are functioning under the supervision of the EPPO Panel on Diagnostics and Quality Assurance and specialized diagnostic EPPO Panels.

Specimen

General information

Name: BCOU00055_0101

Metadata available

General information - specimen description

Stage of the specimen	adult
Sex of the specimen	unknown

Sampling - Origin

Country of sampling	Russia
---------------------	--------


Sampling - When

Sampling/isolation date	2008-06-26
-------------------------	------------

Identification - Remarks

Remarks on molecular methods	leg
------------------------------	-----

**Available
for 3 species**



EPPO Q-BANK

- [Arthropods](#)
- [Bacteria](#)
- [Fungi](#)
- [Nematodes](#)
- [Phytoplasmas](#)
- [Invasive Plants](#)
- [Viruses & Viroids](#)

STATISTICS

Species: 2336
Specimens: 10280
Sequences: 26892

Welcome to EPPO-Q-bank!

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Sampling/isolation date	2008-06-26
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Remarks on molecular methods	leg
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**Available
for 3 species**



Agrilus: EPPO Standards (D)

EPPO – FAO-REUFIS – BFW Conference

Safeguarding Forests in Europe:
Emerging Risks of *Agrilus* Wood Borers
(Buprestidae)



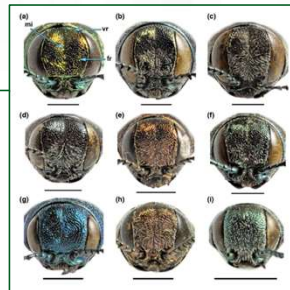
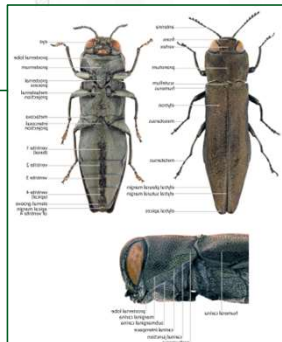
Agrilus planipennis (AGRLPL)

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Associated EPPO Standards

Number	Title	Download
PM1/002(34)	EPPO A1 and A2 Lists of pests recommended for regulation as quarantine pests (2025)	Download ▾
PM3/087(1)	Monitoring and consignment inspection of wood chips, hogwood and bark for quarantine pests	Download ▾
PM7/154(1)	<i>Agrilus planipennis</i> →	Download ▾
PM8/011(1) ?	<i>Fraxinus</i>	Download ▾
PM9/014(1)	<i>Agrilus planipennis</i> : procedures for official control	Download ▾



Primer name	Sequence	Primer description
EABI_F3	5'-CTCCCTCCCTCTTT AACATTAC-3'	External primer set
EABI_B3	5'-GATCAGACTAGTAG AGGTGT-3'	
EABI-FIP ^a	5'-ATATTAGCCGC TAATGGTGG GAATAGTCGAAA GAGGAGCAG-3'	Internal primer set
EABI-BIP ^b	5'-GGCTCTGTGTA CTTAGCAA GGTTATTC TATTGCTCGC-3'	

Available
for 2 species

DOI: 10.1111/epp.12926

EPPO STANDARD ON DIAGNOSTICS

PM 7/154 (1) *Agrilus planipennis*

Specific scope: This Standard describes a diagnostic protocol for *Agrilus planipennis*. This Standard should be used in conjunction with PM 7/76 Use of EPPO diagnostic protocols¹

Specific approval and amendment: First approved in 2023–04.

Authors and contributors are given in the Acknowledgements section.

1 | INTRODUCTION

The emerald ash borer, *Agrilus planipennis* Fairmaire, 1888 has recently established in the EPPO region and represents a threat to ash forest stands in many European countries. The native distribution range of *A. planipennis* includes East Asia, more specifically China, the Russian Far East, the Korean peninsula and under the assumption that *A. marcopoli ulmi* is synonymous to *A. planipennis*, also parts of Japan (EFSA, 2020; Orlova-Bienkowskaja & Volkovitsh, 2018). Following its recent introduction and detection in 2002 in the United States, *A. planipennis* has quickly established and rapidly spread across the eastern states of the USA and in some of the Canadian provinces. The emerald ash borer was first detected within the EPPO region in the European part of Russia in 2003, initially in Moscow (Orlova-Bienkowskaja et al., 2020; Volkovitsh & Mozolevskaia, 2014). This was then followed by detections in Eastern Ukraine in 2019 (Drogvalenko et al., 2019) and also in St Petersburg (Russia) in 2020 (Volkovitsh & Suslov, 2020). Depending on latitude and local temperatures, adult emergence usually begins in May or June, peaks in late May to early July, and adult activity can persist into September. Females lay eggs individually onto or in the crevices of tree bark. Eggs hatch within 2 weeks and larvae chew their way through the outer bark and develop in the nutritious layer between the phloem and the cambium.

able to fly over long distances especially in the spring and summer months when searching for mates and host plants. Especially when local hosts and mates are abundant, *A. planipennis* tend to attack trees in the vicinity of their original host and may colonize host trees in groups (EFSA, 2020). Passive dispersal takes place by the transportation of infested timber and firewood.

While primary host plants of the emerald ash borer are *Fraxinus* species, such as *F. mandshurica* in its native range in Asia, other *Fraxinus* species have been attacked in the US, European congeners such as *F. excelsior*, *F. angustifolia*, and *F. ornus* are all suitable hosts with a distribution across the entire European region (Baranchikov et al., 2014). Moreover, native *Fraxinus* stands are often interspersed with North American *Fraxinus* species across North – Eastern European cities, which may facilitate spread and transfer to novel hosts (see also EFSA, 2020; EPPO, 2013). In addition to the preferred *Fraxinus* species, the white fringe tree (*Chionanthus virginicus*), native to the US and an exotic ornamental in the EU, is also noted as a suitable albeit suboptimal host plant. *Olea europaea* has been found to be susceptible but in laboratory trials only (Cipollini et al., 2017). Although *Juglans mandshurica* var. *sieboldiana* as well as *Ulmus davidiana* var. *japonica*, and *Pterocarya rhoifolia* are indicated as hosts for *A. marcopoli ulmi* (Akiyama & Ohmomo, 1997 – see Chamorro et al., 2015; Jendek & Grebennikov, 2011), there is no evidence of successful larval development on these plants so far. Further details on the biology of *A. planipennis* are available in the EPPO Datasheet (EPPO, 2022).

Agrilus is regarded to be the most speciose genera in the animal kingdom with more than 3000 recorded species (Kelnarova et al., 2019). According to Jendek (2016), 87 species are reported in Europe: identification of *Agrilus* species thus is difficult and confirmation by a specialist is highly recommended in case of first identification (see Section 8). A flow diagram describing the diagnostic procedure for *Agrilus planipennis* is presented in Figure 1.

Agrilus: EPPO Standards (PM)

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Emerging Risks of *Agrilus* Wood Borers
(Buprestidae)



Agrilus planipennis (AGRLPL)

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Associated EPPO Standards

Number	Title	Download
PM1/002(34)	EPPO A1 and A2 Lists of pests recommended for regulation as quarantine pests (2025)	Download
PM3/087(1)	Monitoring and consignment inspection of wood chips, hogwood and bark for quarantine pests	Download
PM7/154(1)	<i>Agrilus planipennis</i>	Download
PM8/011(1)	<i>Fraxinus</i>	Download
PM9/014(1)	<i>Agrilus planipennis</i> : procedures for official control	Download

Fig 5 All infested trees should be destroyed and all ash trees within a radius of at least 100 m should be felled. Each felled tree should be checked meticulously (taking off the bark) for the presence of *A. planipennis*.

Fig 7 All clear-cut areas should be merged into the 'infested area'. All ash trees in this area should be felled and checked meticulously (taking off the bark) for the presence of *A. planipennis*.

[pm9-014-1-en.pdf](#)
[pm9-014-1-ru.pdf](#)

Available for 2 species

Bulletin OEPP/EPPO Bulletin (2013) 43 (1), 489-509 ISSN 0290-8062, DOI: 10.1111/epp.12063

European and Mediterranean Plant Protection Organization
Organisation Européenne et Méditerranéenne pour la Protection des Plantes PM 9/14 (1)

National regulatory control systems
Systèmes de lutte nationaux réglementaires

PM 9/14 (1) *Agrilus planipennis*: procedures for official control

Specific scope
This standard describes the procedures for official control with the aim of containing and eradicating *Agrilus planipennis*.

Specific approval and amendment
First approved in 2013-09.

Introduction

Agrilus planipennis (EPPO Code: AGRLPL), the emerald ash borer, is on the EPPO A2 List of pests recommended for regulation. Details about its biology, distribution and economic impact can be found in the EPPO datasheet (EPPO, 2005) and in the Pest Risk Analysis (PRA) for this pest (EPPO, 2013). Hosts of *A. planipennis* include *Fraxinus americana*, *F. chinensis*, *F. excelsior*, *F. japonica*, *F. mandshurica*, *F. nigra*, *F. pennsylvanica*, *F. profumata*, *F. quadrangulata* and *F. rhynchophylla*. *A. planipennis* has also been reported on *Juglans mandshurica*, *Pterocarya rhoifolia*, *Ulmus davidiana* and *U. propinqua* in Japan only (Haack *et al.*, 2002; Baranchikov *et al.*, 2008). In China, Russia and North America only *Fraxinus* spp. are reported as hosts for *A. planipennis* hence the present Standard focus on *Fraxinus* spp. Recent studies (Rebek *et al.*, 2008) have shown that *Fraxinus americana*, *F. excelsior*, *F. nigra*, *F. pennsylvanica* and *F. quadrangulata* are the most susceptible hosts. *F. mandshurica* and *F. chinensis* are the least susceptible. Its area of origin includes North-Eastern China, the Democratic People's Republic of Korea, Japan, the Republic of Korea, the Russian Far East and Taiwan (Jendek, 1994; Haack *et al.*, 2002). As a non-indigenous species, *A. planipennis* was first detected in the USA in 2002 in Michigan. It subsequently spread to Ontario and Quebec (Canada), and to a number of US states (widely in Michigan, Illinois, Indiana and Ohio; limited in Kentucky, Maryland, Minnesota, Missouri, New York, Pennsylvania, Virginia, West Virginia and Wisconsin). Most infestations are believed to have been established for at least 5 years prior to their discovery. Tree death usually occurs within 3-4 years following initial attack although higher level of infestation can kill trees within 1-2 years (Haack *et al.*, 2002). More than 20 million ash trees have already been killed in North America. It is suspected that *A. planipennis* entered the USA in Detroit, in wood packaging material on cargo ships from China (Bray *et al.*, 2008).

In the EPPO region, *A. planipennis* occurs naturally in the Russian Far East, where it lives on *Fraxinus mandshurica* and *F. chinensis* without causing serious damage (Baranchikov *et al.*, 2008; Baranchikov & Kurtyev, 2012). In Europe, it was first detected in Moscow in 2005 during investigations conducted to determine the cause of ash (*Fraxinus excelsior* and *F. pennsylvanica*) dieback. By 2012, the pest had spread to a radius of about 250 km around Moscow (Baranchikov & Kurtyev, 2012). European ash (*Fraxinus excelsior*) has shown high susceptibility to the pest (Baranchikov *et al.*, 2008).

Signs and symptoms of *A. planipennis* attack include, externally, yellowing and thinning of foliage, dying of branches, dieback and mortality of ash trees and, internally, frass-filled larval galleries in the cambium, D-shaped exit holes and the presence of *A. planipennis* life stages inside the tree (Cappaert *et al.*, 2005; Poland & McCullough, 2006). Usually, ash trees have been infested with *A. planipennis* for 3 to 4 years before trees show strong external symptoms and begin to die (Siegert *et al.*, 2009). As very few species of *Agrilus*, originating from North America or Europe, are known to attack trunks of ash trees, the occurrence of galleries typical for the genus *Agrilus* in ash trees should be considered suspect.

In China, *A. planipennis* typically attacks ash trees that grow in open areas or at the edges of dense forests with closed canopies. However, entire stands can be killed during outbreaks (Yu, 1992). In North America, on the other

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Agrilus: GD photos

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(Buprestidae)



Agrilus planipennis (AGRLPL)

Photos

All photos included on this page can only be used for educational purposes. For publication in journals, books or magazines, permission should be obtained from the original photographers with a copy to EPPO.

Filter photos by tag:

All Damage Symptoms Adult Larva Egg

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Propose photos

An European ash (*Fraxinus excelsior*) with galleries of *A. planipennis*, Borisoglebsk, Voronezh Region of Russia, 2025.
 Courtesy: A.V. Petrov (Institute of Forest Science Russian Academy of Science)

A larvae of *A. planipennis* under the bark of an European ash (*Fraxinus excelsior*), Borisoglebsk, Voronezh Region of Russia, 2025.
 Courtesy: A.V. Petrov (Institute of Forest Science Russian Academy of Science)

Agrilus planipennis Fairmaire, 1888
 Courtesy: Alexander Petrov

Old galleries of *Agrilus planipennis* on a dead tree

Exit hole (Ottawa, June 2010)

Adult (Ottawa, June 2010)
 Courtesy: Jean-François Germain



Agrilus fleischeri and *Agrilus ater*
(Photo: E. Endek)



A. bilineatus
(Photo: S. A. Katovich)

Available for 6 species:

- *A. anxius*,
- *A. bilineatus*,
- *A. ater*,
- *A. fleischeri*,
- *A. mali*,
- *A. planipennis*.

Agrilus: Communication materials

EPPO – FAO-REUFIS – BFW Conference

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Display: campaigns
 documents

Search criteria:

-- search by keyword --

Agrilus planipennis

-- search by country --


-- search by language --

Campaigns matching search results: *Agrilus planipennis*



Czechia

2025 Leaflet "The Most Dangerous Priority Pests on Wood Species"
The leaflet "The Most Dangerous Priority Pests of Wood Species"...



Estonia

2025 Agrilus planipennis
Agrilus planipennis pocket guide...

See full campaign



Estonia

2025 Agrilus planipennis
Agrilus planipennis small pocket guide...

See full campaign

CAN YOU HELP US?

Agrilus fleischeri
A threat to poplars and willows



What is it?
Agrilus fleischeri (Coleoptera: Buprestidae) is an Asian pest of poplars and willows, which has caused some tree mortality on Lombardy poplar (Populus nigra var. italica) plantations in parts of China. It is not yet present in the European and Mediterranean regions but could pose a threat to forestry where the host plants are grown. As this species is morphologically and biologically very similar to Agrilus ater, a common native pest on poplars and willows in Europe, distinguishing A. fleischeri from A. ater should be done by experts.

Damage
Be aware of unusual tree mortality and dieback associated with tortuous larval galleries in the wood and D-shaped exit holes on poplar and willows.



Contact us!
Your contact details, logos, links, QR codes ...



Available only for 4 species:

- *A. anxius*,
- *A. bilineatus*,
- *A. fleischeri*,
- *A. planipennis*.



Agrilus: Support from experts

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Emerging Risks of *Agrilus* Wood Borers
(Buprestidae)



Information resources of EPPO are widely used by NPPOs, practitioners and researchers in EPPO member countries and beyond.

EPPO always welcomes contribution and support from experts:

- new **country** and **host** records,
- good and verified **photos** of pests: larvae, adults, signs and symptoms of damage, commodities with symptoms, etc.,
- national **PRAs**,
- **sequences** for EPPO-Q-Bank,
- proposals and data for **new Standards** (diagnostic or others) or for **revisions of Standards**,
- **communication material**, etc.



Symptoms on intercepted wood dunnage (2015, Ontario): galleries and D-shaped exit holes

Courtesy: S. Cecchini, Canadian Food Inspection Agency



Adult on Populus, Jilin province (China, 2017)

Courtesy: E. Jendek

EPPO Global Database

Practical guide for photos

How to propose photos to be displayed in the EPPO Global Database?

- A practical guide -

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To share your communication material: **contact the EPPO Secretariat!**

Check EPPO Standards for general guidance on when and how to raise awareness of the **general public** ; **professional operators** about the risks of regulated and emerging pests.

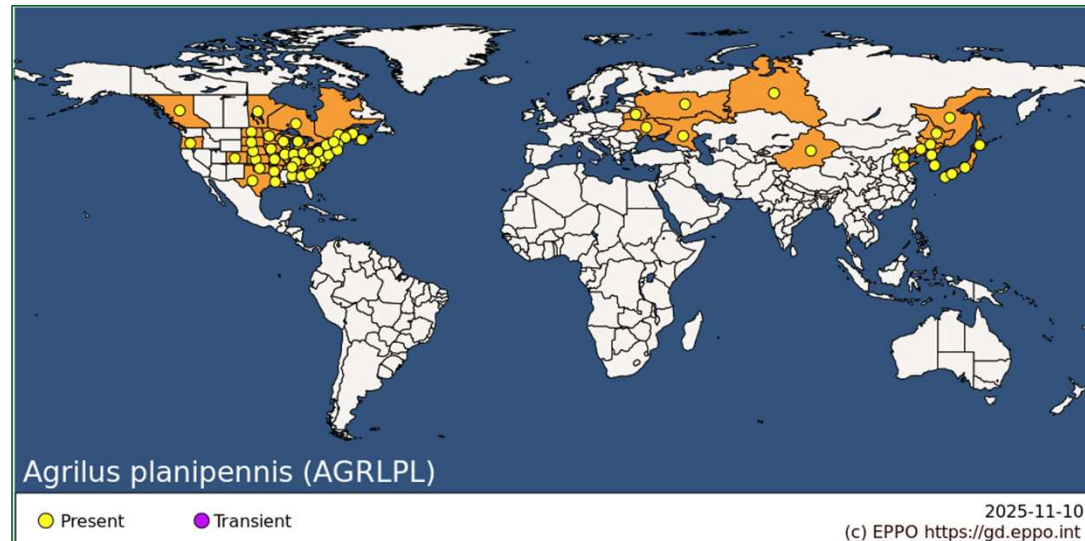
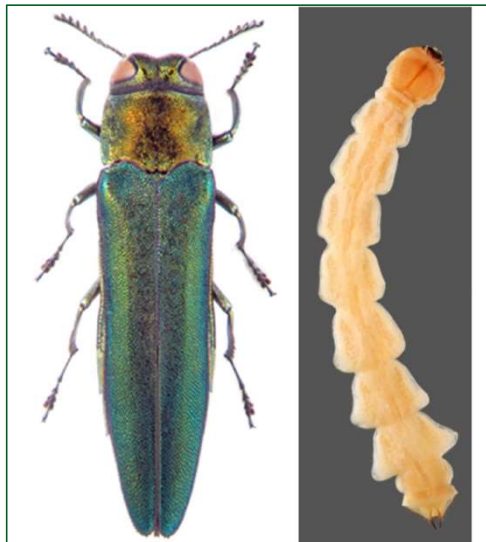
Agrilus: EPPO Agrilus Network

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Safeguarding Forests in Europe:
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(Buprestidae)



In 2022, the EPPO Panel on Quarantine Pests for Forestry proposed to organize a Network of experts working on surveillance, monitoring, and control of *Agrilus planipennis* in Europe



Agrilus: EPPO Agrilus Network

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Safeguarding Forests in Europe:
Emerging Risks of *Agrilus* Wood Borers
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Network of experts working on surveillance, monitoring, and control
of the Emerald ash borer, *Agrilus planipennis*

REGISTER NOW for the the EPPO-REUFIS-BFW Conference on 'Safeguarding Forests in Europe: Emerging Risks of *Agrilus* Wood Borers (Buprestidae)' (Vienna, 2026-04-21/23).

In October 2022, the EPPO Panel on Quarantine Pests for Forestry decided to establish a network of experts working on surveillance, monitoring, and control of *Agrilus planipennis* (Coleoptera: Buprestidae – Emerald ash borer).

This network was established in association with an EPPO-EU project (Grant agreement SANTE/2020/G1/EPPO/SI2.823766).

On the 5th of December 2024, EPPO held a webinar '**Emerald ash borer (*Agrilus planipennis*) in the EPPO region: preparedness of countries for its further spread**'.

View presentations: /MEETINGS/2024_meetings/wk_agrilus_planipennis



Adult - Courtesy: Eduard Jendek



Larva - Courtesy: Eduard Jendek



Exit hole - Courtesy: Eduard Jendek



Trap - Courtesy: Dominic Eyre



FORS AID

The Network is supported by the EU Horizon Europe Research and Innovation programme (grant # 101134200 "**FORS AID: Forest surveillance with artificial intelligence and digital technologies**").

New technological horizons in the domain of forest pest control

The FORSAID project aims to harness innovative technologies to ensure plant health in Europe's forests.

[Learn more](#)



Agrilus: EPPO Agrilus Network

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- [Newsletter # 6 \(September 2024\)](#)
- [Newsletter # 7 \(December 2024\)](#)

2025

- [Newsletter # 8 \(April 2025\)](#)

Useful links

EPPO Standards and documents on *Agrilus planipennis*

- [EPPO Standards. Phytosanitary procedures. PM 3/87 \(1\) Monitoring and consignment inspection of wood chips, hogwood and bark for quarantine pests](#) [2019]
- [EPPO Standards. Diagnostics. PM 7/154\(1\) *Agrilus planipennis*](#) [2023]
- [EPPO Standards. Commodity-specific phytosanitary measures. PM 8/11 \(1\) *Fraxinus*](#) [2020]
- [EPPO Standards. National regulatory control systems. PM 9/14 \(1\) *Agrilus planipennis*: procedures for official control](#) [2013]
- [EPPO Pest Risk Analysis for *Agrilus planipennis*](#) [2013]
- [EPPO Datasheet on *Agrilus planipennis*](#) [revised in 2021]
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FORSAID



Agrilus: EPPO Agrilus Network

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Safeguarding Forests in Europe:
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In 2023–2025, 9 issues of the Newsletter were published



ORGANISATION EUROPEENNE ET MEDITERRANEEENNE POUR LA PROTECTION DES PLANTES

EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION

Newsletter

of the EPPO Network of experts working on surveillance, monitoring, and control of the Emerald ash borer, *Agrilus planipennis*

No. 1 PARIS, 2023-07

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A photo of *Agrilus planipennis*: Courtesy of Dr. Edward Jendak.

21, Rue Richard Lenoir 75011 Paris, France Tel: +33 1 84 79 07 07 E-mail: dm@ippa.int Web: www.ippa.int GD: gd.ippa.int

ORGANISATION EUROPEENNE ET MEDITERRANEEENNE POUR LA PROTECTION DES PLANTES

EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION

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of the EPPO Network of experts working on surveillance, monitoring, and control of the Emerald ash borer, *Agrilus planipennis*

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The webpage of the Network:
https://www.ippa.int/REOURCES/special_projects/agrilus_planipennis_network

Photos of *Agrilus planipennis* above: Courtesy of Dr. Edward Jendak.

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ORGANISATION EUROPEENNE ET MEDITERRANEEENNE POUR LA PROTECTION DES PLANTES

EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION

Newsletter

of the EPPO Network of experts working on surveillance, monitoring, and control of the Emerald ash borer, *Agrilus planipennis*

No. 5 PARIS, 2024-06

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The webpage of the Network:
https://www.ippa.int/REOURCES/special_projects/agrilus_planipennis_network

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EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION

Newsletter

of the EPPO Network of experts working on surveillance, monitoring, and control of the Emerald ash borer, *Agrilus planipennis*

No. 7 PARIS, 2024-12

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EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION

Newsletter

of the EPPO Network of experts working on surveillance, monitoring, and control of the Emerald ash borer, *Agrilus planipennis*

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The webpage of the Network:
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Agrilus: EPPO Agrilus Network

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Safeguarding Forests in Europe:
Emerging Risks of *Agrilus* Wood Borers
(Buprestidae)



6. A new EU Commission Implementing Regulation on measures to prevent the establishment and spread of *Agrilus planipennis* within the Union territory



The European Commission prepared a draft of the Commission Implementing Regulation (EU) on measures to prevent the establishment and spread of *Agrilus planipennis* Fairmaire within the Union territory (<https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14026-Plant-health-measures-to-eradicate-prevent-the-spread-of-the-emerald-ash-borer-Agrilus-planipennis-en>). This document, after adoption, will regulate how to carry out risk-based surveys to detect *A. planipennis*, establish demarcated areas, perform annual surveys in demarcated areas, prepare and apply eradication measures, prepare contingency plans and annual reporting. The draft considers *Chionanthus*

6. EABRACE: A new project focused on *Agrilus planipennis*

Iryna Matsiakh (Swedish University of Agricultural Sciences) obtained financial support from the Svenska Institute (<https://si.se/>) to study the invasion of *A. planipennis*. The project 'EABRACE: Emerald ash borer invasion: exploring spread patterns and xylobiont beetle biodiversity dynamics for strategic conservation measures' will run for two years - from November 2024 to November 2026.

The aim of the project is to monitor the spread of *A. planipennis* towards the EU border and to assess the dynamics of the xylobiont beetles' biodiversity during the invasion of *A. planipennis*.



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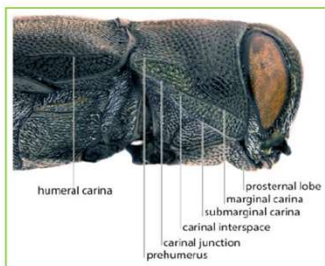
12. New publications on *Agrilus planipennis* and related species

After the release of the previous Newsletter, information on 29 new publications on *A. planipennis* and on other relevant species (taxonomically related *Agrilus* species and key pests of *Fraxinus* spp.) have been received (24 journal papers, 3 conference abstracts, 1 guideline, and 1 book chapter; in addition to the data on new theses - see Section 11).

13. New PhD dissertation and MSc thesis using pests of ash as models

Recently, a PhD dissertation and a MSc thesis, in which *A. planipennis* and ash dieback caused by another important pest of ash trees - *Hymenoscyphus fraxineus* respectively were used as models, were presented in the USA and the United Kingdom:

4. New EPPO Diagnostic Standard PM 7/154 (1) for *Agrilus planipennis*



In August 2023, EPPO published a new **Diagnostic Standard PM 7/154 (1) for *Agrilus planipennis***. This Standard covers identity, symptoms, detection methods (both morphological and molecular), remarks on possible confusion with adults of other native Buprestidae species, keys and diagnostic tables for larvae and adults. The protocol contains 40 figures and figure plates. This new Standard was originally drafted by: Dr. M. de Groot (Department of Forest

Protection, Slovenian Forestry Institute), Dr. E.O. Campbell (Canadian Food Inspection Agency, Government of Canada), Dr. T. Bukovinszky (Netherlands Food and Consumer

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Safeguarding Forests in Europe:
Emerging Risks of *Agrilus* Wood Borers
(Buprestidae)



A call to share reference specimens

- Ukraine to Sweden
- United Kingdom to Sweden
- United Kingdom to Estonia
- United Kingdom to Romania
- Russia to EPPO
- Canada to EPPO
- EPPO to Malta
- EPPO to Latvia
- EPPO to EURL
- EPPO to Poland



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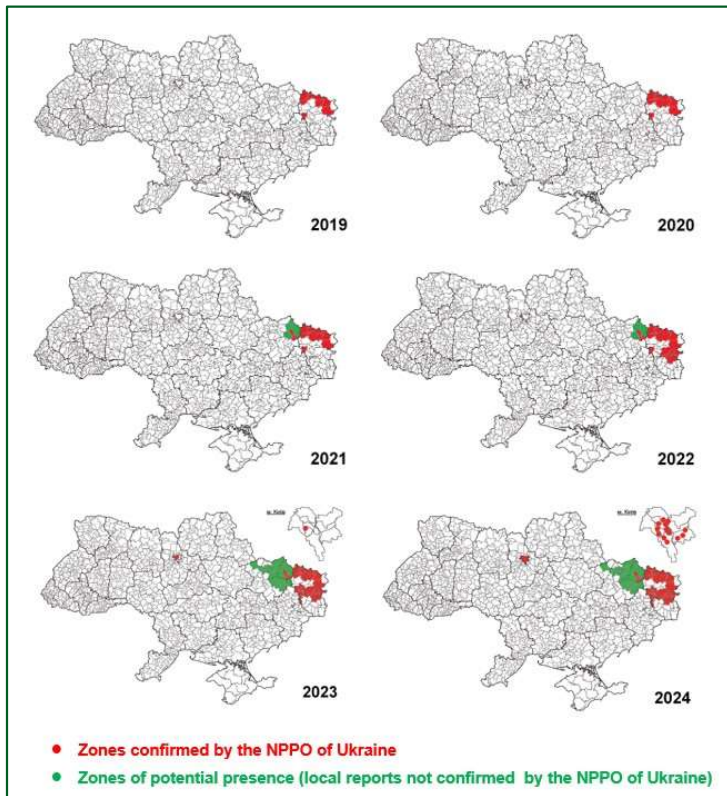
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A call to create a dynamic map of spreading in Europe



The Ukrainian State Specialized Forest Protection Enterprise DSLP "Kharkivlisozakhyst" publishes on its webpage a dynamic map showing the change of the range of *A. planipennis* in Ukraine in 2019-2025 (<https://lisozahyst.at.ua/index/agrilus-planipennis/0-17>).



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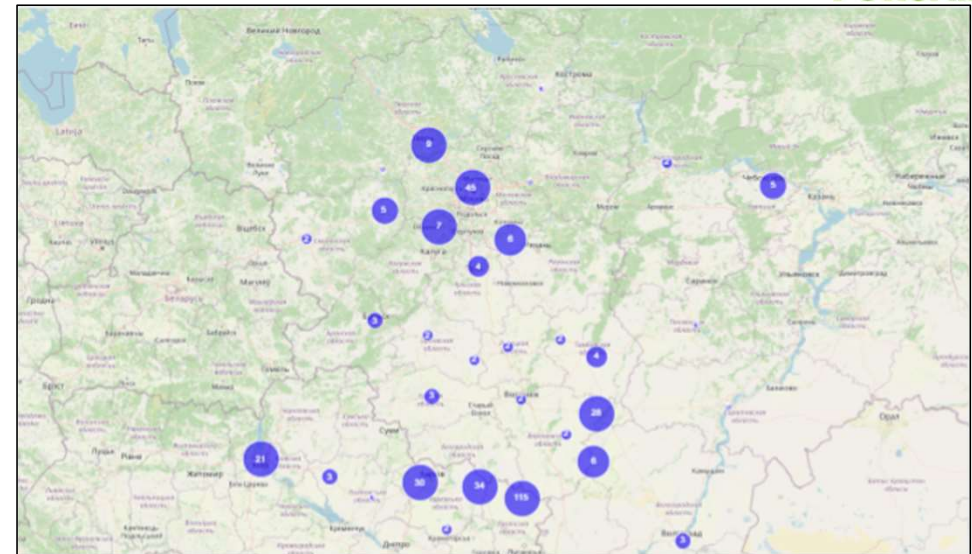
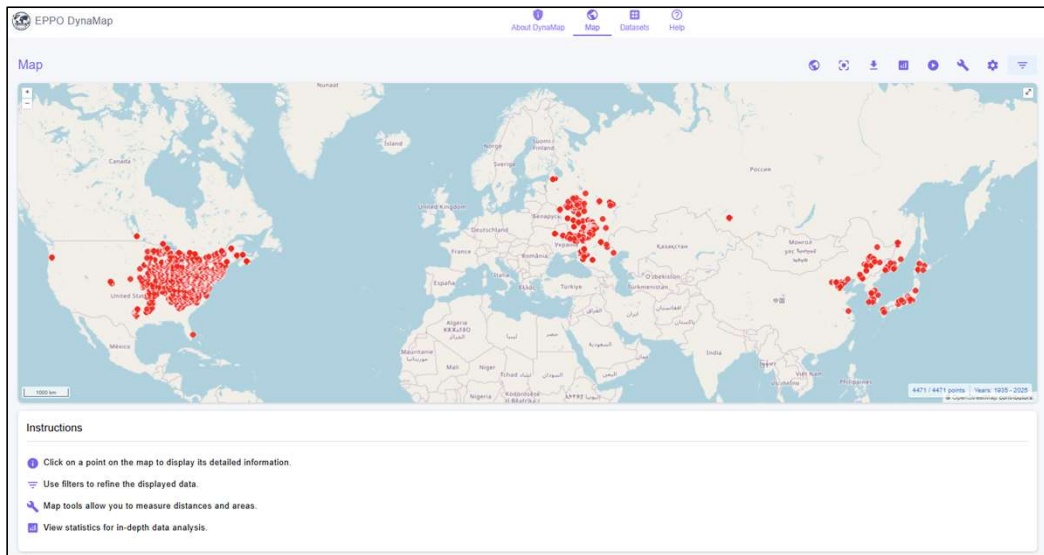
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EPPO dynamic map of spread of the emerald ash borer



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Currently there are approximately **4500 records** of *A. planipennis* from native (Asia) and invasive ranges (North America, the Russian Federation, Ukraine, and Belarus).

29

Verification of data is needed



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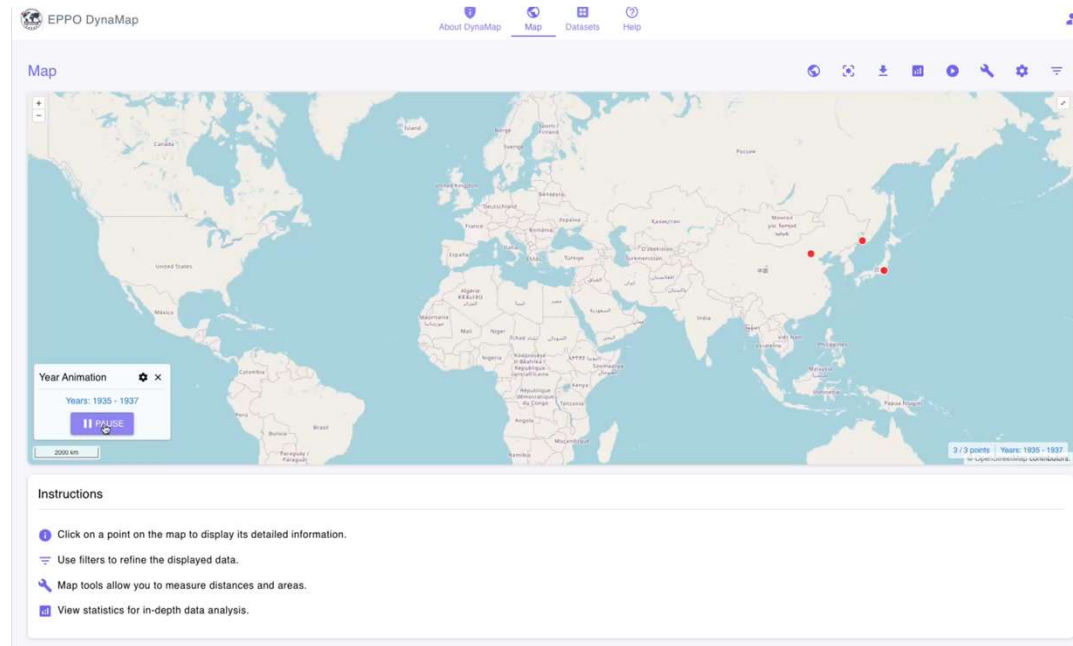
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EPPO dynamic map of spread of the emerald ash borer



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animation



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Safeguarding Forests in Europe:
Emerging Risks of *Agrilus* Wood Borers
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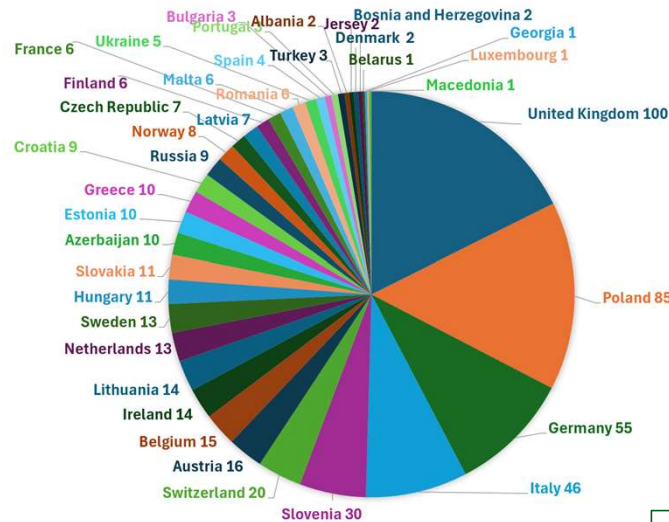
A webinar (12-2024): ‘Emerald ash borer (*Agrilus planipennis*) in the EPPO region: preparedness of countries for its further spread’:



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Presentations from **Belarus, Estonia, Finland, Latvia, Russian Federation, 600+** attendees from **55** countries registered.

Continent	Countries	Attendees
Europe	39	574
Asia	8	9
Africa	4	5
Americas	3	9
Australia	1	3
TOTAL	55	600
EPPO MC	42	578



epppo.int/MEETINGS/2024_meetings/wk_agrilus_planipennis

Download the program and summaries of presentations



Agrilus: New resources

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(Buprestidae)



What can we do together?

We can create new resources:

- (1) presentations and posters from this conference in a pdf format (*if approved by the authors*) and a video record can be stored online at the Network' web page,
- (2) a virtual issue of the *EPPO Bulletin* on *Agrilus* wood borers could be organized if we have at least 5 full size original research or review papers; it is also possible to link all past papers and Standards relevant to *Agrilus* spp. to this virtual issue.

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Invasion potential of *Agrius planipennis* and other *Agrius* beetles in Europe: import pathways of deciduous wood chips and MaxEnt analyses of potential distribution areas

D. Flø, P. Krokene, B. Økland

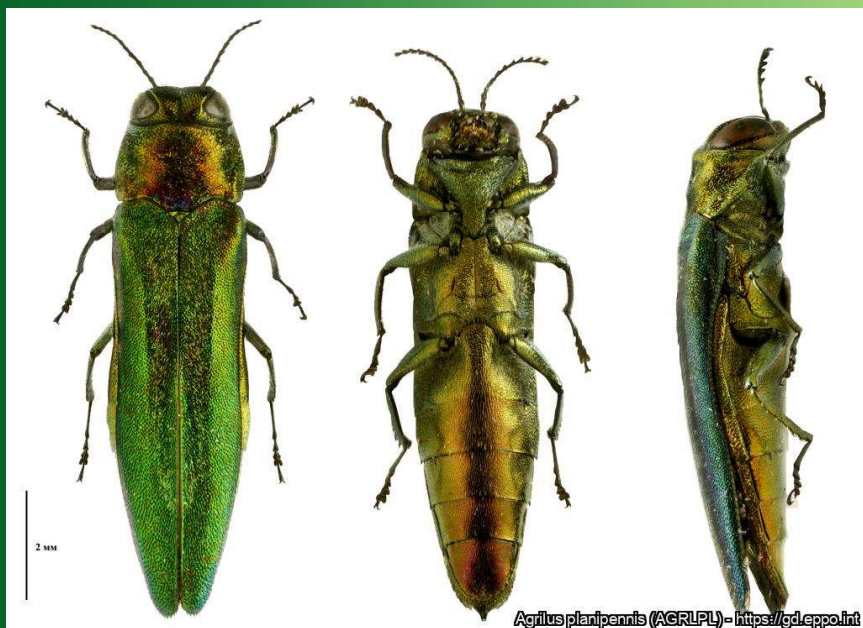
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Abstract

Original Article  Open Access

Thank you for attention,
participation and
contribution (*past and future*)!



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