

EPPO perspective on *Agrilus planipennis* (Emerald Ash Borer) and *Agrilus anxius* (Bronze Birch Borer)

F Petter*, A Orlinski, M Suffert, AS Roy and M Ward

European and Mediterranean Plant Protection Organization, 21 Boulevard Richard Lenoir 75016, Paris, France

*Corresponding author. E-mail: petter@epo.int

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One of the main aims of EPPO is to help its member countries to prevent entry or spread of dangerous pests (plant quarantine). The Organization has therefore been given the task of identifying pests which may present a risk (early warning/horizon scanning), evaluating their risk for the region and making proposals on the phytosanitary measures which can be taken against them (Pest Risk Analysis). Standards are also developed, including standards on how to eradicate and control pests. In addition to the development of Standards, activities on communication and citizen science (development of guidelines on raising public awareness and the production of toolkits to use in raising awareness campaigns) have also recently been started. The EPPO Secretariat was alerted by the National Plant Protection Organization (NPPO) of Sweden in 2003, and Norway in 2010, to two potential new pests, Emerald ash borer (EAB), *Agrilus planipennis* (Fairmaire) and Bronze birch borer, *Agrilus anxius* (Gory) respectively. Because of the importance of these two pests for forest species in the EPPO region, member countries agreed that EPPO recommendations should be prepared. The different EPPO activities relevant to *A. planipennis* and *A. anxius* are presented, highlighting the challenges they currently pose to the region.

Background

The European and Mediterranean Plant Protection Organization (EPPO) is one of the 10 Regional Plant Protection Organizations (RPPOs) recognized under the International Plant Protection Convention (IPPC). Its member countries are European as well as some Mediterranean and central Asian countries. RPPOs function as coordinating bodies at a regional level for activities to achieve the objectives of the Convention. Since 1951, 10 RPPOs have been created among which EPPO is the oldest. RPPOs are intergovernmental organizations (i.e. their official members are countries not individuals); most of them have been founded on the initiative of governments, while others are administered by Food and Agriculture Organisation (FAO) regional offices.

Since its creation in 1951, EPPO has been helping its member countries to strengthen plant protection activities and promote international cooperation.

The objectives of the Organization can be summarized as follows:

- To protect plant health in agriculture, forestry and the uncultivated environment.
- To develop an international strategy against the introduction and spread of pests (including invasive alien plants) that damage cultivated and wild plants, in agricultural and natural ecosystems.

- To encourage harmonization of phytosanitary regulations and all other areas of official plant protection action.
- To promote the use of modern, safe, and effective pest control methods.
- To provide a documentation and information service on plant protection.

In order to achieve these objectives, the Organization has been given the task of identifying pests that may present a risk, and hence provide an early warning to its member countries. If needed a Pest Risk Analysis is carried out to evaluate in detail the risk for the region and to identify phytosanitary measures which can be taken against these pests. Once a pest has been identified as presenting a risk for the EPPO region, recommendations on how to eradicate and control this pest as well as recommendations on how to detect and identify the pest may be developed (e.g. phytosanitary procedures for inspection). In recent years, the Organization has also included in its work program activities on communication and citizen science (development of guidelines on raising public awareness and the production of toolkits to use in raising awareness campaigns).

The technical work of the Organization is carried out by Panels and Expert Working Groups under the supervision of two Working Parties (one on phytosanitary regulations and another on plant protection products). The EPPO Secretariat has developed and maintains different databases including the EPPO Global Database as well as the EPPO Reporting Service, and a

Table 1 Main conclusions of the PRAs on *Agrilus planipennis* (EPPO, 2013a) and *Agrilus anxius* (EPPO, 2011).

<i>Agrilus planipennis</i>	<i>Agrilus anxius</i>
<p>Endangered area</p> <p>The whole EPPO region is endangered: although ash (<i>Fraxinus</i>) is more widespread in the north, central and eastern parts of the region (and with a larger number of species), <i>Fraxinus</i> spp. are present throughout the EPPO region.</p> <p>Main conclusions</p> <p><i>planipennis</i> occurs in a small part of the EPPO region and the likelihood of establishment in the rest of the region is high. The pest is considered as likely to cause major losses and environmental impact, and some social effects. Impact is likely to occur throughout the natural and planted range of ash in the EPPO region. Eradication or containment would be difficult due to the hidden life stages of the pest and the fact that it might not be detected before it has already established and caused damage. Long-distance spread will be via human-assisted pathways. Natural spread from areas where it is present in the EPPO region will happen although at a slow pace. Where <i>A. planipennis</i> is introduced, it will have massive impact, and eradication or containment will be difficult and costly, and very unlikely to be successful.</p> <p>The pest was recommended for immediate action in the PRA area. Measures to prevent further introduction and spread within the EPPO region were recommended for the following pathways: wood, wood waste, wood chips, plants for planting, bark, furniture and cut branches of host plants.</p>	<p>Endangered area</p> <p>All areas where birch (<i>Betula</i>) is naturally present in the EPPO region, i.e. northern Europe, from western Europe to Siberia to the East, and from Nordic countries to central France to the South. In North America, the pest occupies a wide range of ecological and climatic conditions, suggesting that it can establish in the EPPO region wherever birch occurs.</p> <p>Main conclusions</p> <p>If <i>A. anxius</i> enters the EPPO region, the pest would have a very high probability of establishment wherever birch is present. It is adapted to a wide range of climatic conditions and would find susceptible hosts. Eradication or containment would be difficult due to the hidden life stages of the pest and the fact that it might not be detected before it has already established and caused damage. Due to the higher susceptibility of European and Asian birch species, it is expected that the pest would have major economic consequences where birch is present in the PRA area.</p> <p>Measures to prevent its introduction from Canada and USA were recommended for the following pathways: wood (with or without bark), wood chips, plants for planting, furniture and other objects made of untreated wood of <i>Betula</i> spp.</p>

monthly newsletter on events of phytosanitary concern. In the rest of this paper the different EPPO activities relevant to *Agrilus planipennis* and *Agrilus anxius* are presented, highlighting the challenges they currently pose to the region.

From early warning (EPPO Alert List) to recommendations for regulation (EPPO A1 and A2 Lists)

Emerging plant pests (newly identified pests presenting a phytosanitary risk, known pests presenting an increased phytosanitary risk, or a change of phytosanitary risk of a known pest)¹ can be serious threats to agriculture, forestry and the environment (Pautasso et al., 2015). It is thus essential to identify them as early as possible to assess their potential risks and ascertain potential management measures. In 2003, a communication from the National Plant Protection Organization (NPPO) of Sweden attracted the EPPO Secretariat's attention to a potential new pest, *Agrilus planipennis* (EAB). It had been first reported from North America in 2002. The pest was added to the EPPO Alert List in 2003 (EPPO, 2003). The Alert list is freely available on the EPPO website (https://www.eppo.int/ACTIVITIES/plant_quarantine/alert_list). Its main purpose 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) see Appendix.

A. planipennis was added to EPPO A1 List of pests recommended for regulation as quarantine pests in 2004, based on a PRA performed during the EPPO Panel on Quarantine Pests for Forestry in 2003. A datasheet was published in 2005 (EPPO, 2005). *A. planipennis* was then transferred to the A2 list in 2009, after confirmation of its introduction and establishment in European Russia. The EPPO A1 List contains pests that are absent in the EPPO region, the EPPO A2 List contains pests that are not widely distributed in the EPPO region (for more information visit https://www.eppo.int/ACTIVITIES/quarantine_activities). When considering the measures recommended (see Table 1), it was noted that some measures to prevent introduction with traded commodities were not consistent with those required against *A. planipennis*. A more complete PRA was consequently prepared for *A. planipennis*, to reconsider pest risk management options in view of recent advances in research, and to obtain more information on spread, host plants, and the situation in Russia. An Expert Working Group was organized in 2013 and included experts from the USA and Canada, as well as from Russia and other EPPO member countries. The main conclusions of the PRA (EPPO, 2013a) are presented in Table 1.

In addition to performing PRAs, information on *A. planipennis* is collected and articles are regularly published in the monthly EPPO Reporting Service (https://www.eppo.int/RESOURCES/eppo_publications/eppo_reporting_service). Since 2003, 38 articles have been published on *A. planipennis* mostly about its spread in North America, but a few also about the situation in European Russia.

¹ The Technical Panel on the Glossary of the International Plant Protection Convention is currently developing a definition.

Agrilus anxius was added to the EPPO Alert List in 2010 following a suggestion of the NPPO of Norway (EPPO, 2010). A Pest Risk Analysis was performed by an Expert Working Group in the same year. The Expert Working Group included experts from the USA in addition to experts from EPPO countries. The main conclusions of the PRA (EPPO, 2011) are presented in Table 1. Since 2010, 3 articles have been published in the EPPO Reporting Service on *A. anxius*.

The PRAs, EPPO Standards and information (e.g. geographical distribution, host plants, photos) related to these pests are freely available on the EPPO Website (<https://www.eppo.int>), through the EPPO Global Database (<https://gd.eppo.int>) and the EPPO Platform on PRA (<https://pra.eppo.int>).

Official control

EPPO countries decided to develop a harmonized response to *A. planipennis* because of the potential high impact of *A. planipennis* in the EPPO region, and the fact that it is likely to spread from the initial outbreak in European Russia. The Panel on Quarantine Pests for Forestry drafted guidance on procedures for official control with the aim of containing and/or eradicating *A. planipennis* in the EPPO region. The Standard was developed taking into account the experience of control in Canada and

USA, and adopted in 2013 (EPPO, 2013b). It provides guidance on how to conduct surveys for *A. planipennis* (identification of high risk places where ash trees should be surveyed such as places where ash trees or wood originating from areas where the pest is present have been imported, how the pest can be detected visually or based on trapping, and the setting of the delimiting surveys in case of an outbreak). It also provides guidance on the measures to be implemented in an outbreak situation to eradicate the pest and prevent its spread (delimitation of a regulated area and prevention of movement of infested material, felling of infested ash trees and all ash trees in a radius of 100 m around infested trees, or in an area as determined by the NPPO depending on the distribution of ash trees). Containment and suppression measures are also described.

Raising awareness

As part of the EPPO work program on communication and citizen science, guidelines on raising public awareness are developed and toolkits to be used by EPPO member countries during their national awareness raising campaigns have been developed. This includes the ‘Don’t risk it!’ poster directed to travelers and which is increasingly used at airports in the EPPO region (Figure 1).



Figure 1 Posters prepared by EPPO member countries and displayed in different airports and seaports.



Figure 2 Poster on Emerald ash borer (*A. planipennis*).

A poster has also been specifically prepared on *A. planipennis*. It is a template that countries can adapt, translate and use to invite members of the public to report possible sightings of the pest (Figure 2).

Coordination of phytosanitary research: Euphresco, a network hosted by EPPO

Euphresco is a network of organizations funding research projects, hosted within the European and Mediterranean Plant Protection Organization. The objective of the network is to increase active collaboration among the organizations involved in plant protection research activities at the national and regional levels. The Euphresco network coordination activities are carried out by the EPPO Secretariat and activities are funded by all EPPO member countries through their regular contribution to the Organization as well as by funders from individual research institutes. For the projects themselves, however, each funder typically pays for the work carried out by its own national researchers. The benefits of this coordination are multiple and have been described in [Giovani et al. \(2015\)](#).

In 2017, Euphresco members published their 2017–2022 Strategic Research Agenda to identify plant health research priorities to be addressed over the medium term through national and transnational efforts. The activities of Euphresco members will always try to synchronize with other research agendas so that:

- topics are complementary to and not overlapping with European Union research framework themes
- topics are in line with the Chief Officers of Plant Health research priorities and/or EPPO priorities
- topics support the European Commission policy need for a given pest (e.g. General Directorate Santé).

PREPSYS (Risk-based strategies to prepare for and manage invasive tree borers) is one of the projects that was funded through the international Euphresco network (see [Evans et al.](#) this issue).

Main challenges posed by *A. planipennis* and *A. anxius* and future actions needed

From its early and continuing history in Canada, Russia and USA, *A. planipennis* is difficult to detect and to control. EPPO experts expect that a similar situation would occur for *A. anxius* if it were to be introduced into the region. Eradication of either pest will be a challenge. For *A. planipennis* natural spread from the eastern part of the EPPO region is likely to continue and it is important that countries where the pest is not yet present are prepared in the event of an outbreak. Several uncertainties were highlighted in 2011 and 2013 when the PRAs on both these species and the official control Standard were developed. More information is now available thanks to the experience in North America and Russia on detection and biological and chemical control. The research carried out and the knowledge gathered can directly benefit the EPPO region. Contingency plans, including the revision of the EPPO Standard on official control for *A. planipennis* and the possible preparation of recommendations for *A. anxius* will be proposed to EPPO Member Countries to incorporate outcomes of research.

Preparedness should include:

- For *A. planipennis* and *A. anxius*, reducing the risk of introduction of the species and developing and using early detection methodologies: the use of detection tools such as girdled trees as traps, as well as other forms of traps with lures should be considered (as presented during the Euphresco PREPSYS Conference in Vienna 1–4 October 2018; <https://bfw.ac.at/rz/bfwcms.web?dok=10361>).
- For *A. planipennis*, enhanced regional collaboration for control and to limit the spread of *A. planipennis*. This would include establishing a regional group with experts from EPPO member countries that are at the edge of the infestation of *A. planipennis* (involvement of experts from Ukraine and Belarus is being sought by the EPPO Secretariat). This could also include programmes to raise public awareness in the region (using tools developed by EPPO)
- Evaluation of natural enemies for release. Based on the experience reported from areas where *A. planipennis* is

present, biological control is a very promising control strategy. However, it should be noted that the regulatory processes on release of biological control generally lack harmonization within the EPPO region (Ward, 2016), so the earlier this type of work is started the better. Recommendations may be prepared by the EPPO Panel on Biological Control Agents.

- Consideration of chemical control options. The use of systemic insecticides, applied by tree injection technology is now commonly used in Canada and the USA in the control and management of the EAB outbreak (see McCullough, 2015). The use of chemicals and application methods, as well as the regulations and licensing in using these products will likely need to be assessed in Europe.
- For *A. planipennis* and *A. anxius*, prevention of introduction and spread of the species with traded commodities is important. Therefore, efficacy of heat treatments for different wood commodities and of chipping, in eliminating/killing the pests in consignments should be further evaluated (see McCullough et al., 2007).
- Firewood with round surfaces falls within the internationally agreed definition of 'round wood' and should therefore be regulated as such. The low value and high risk of this commodity (for *Agrilus* spp. and other pests) raises the question whether there should be restrictions on moving it over long distances, even within national borders and before these specific pests are known to be present.

The Secretariat carries on monitoring the literature and other relevant information to identify other emerging pests of concern for the EPPO region. Recently two other *Agrilus* species (*A. bilineatus* and *A. fleisherei*) have been identified. The work previously done on *A. planipennis* and *A. anxius* will be useful to address issues raised by these new threats for the EPPO region.

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Conflict of interest statement

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Appendix

Pest Risk Analysis (PRA) activities in EPPO

In addition to the preparation of Standards on the methodology to conduct PRAs (https://www.eppo.int/ACTIVITIES/plant_quarantine/practivities), a system was established in 2006 to organize internationally conducted PRA in the region. Indeed, it was recognized that many countries did not have the resources to perform PRAs and consequently member countries expressed the wish that EPPO should play an active role in PRA, in order to share costs and workload, as well as to provide technical justifications for the regulation of certain pests.

Dedicated EPPO Expert Working Groups regularly conduct PRAs on specific pests or groups of pests. The conclusions resulting from these PRAs are addressed to EPPO member countries only, as the area potentially at risk that is considered during these PRAs is the EPPO region (not the other parts of the world). PRAs are carried out on pests either proposed by an EPPO member government or by the EPPO Panels (in particular while reviewing the EPPO Alert List). PRAs are then reviewed by relevant EPPO Panels. During these Panel meetings, national PRAs or Pest Risk Assessments performed by European Food Safety Authority (EFSA) are also reviewed and whenever appropriate, they will also serve as a basis to make recommendations for all EPPO members as to which pests should be regulated and which measures should be taken.