DOI: 10.1111/epp.12840

ORIGINAL ARTICLE

# First report of the alien ambrosia beetle *Cnestus mutilatus* and further finding of *Anisandrus maiche* in the European part of the EPPO region (Coleoptera: Curculionidae: Scolytinae: Xyleborini)

**Fernanda Colombari** | **Isabel Martinez-Sañudo** | **Andrea Battisti**

Department of Agronomy, Food, Natural Resources, Animals and Environment (DAFNAE), University of Padova, Agripolis, Legnaro, Italy

**Correspondence**
Fernanda Colombari, Department of Agronomy, Food, Natural Resources, Animals and Environment (DAFNAE), University of Padova, Agripolis, 35020, Legnaro, Italy.
Email: fernanda.colombari@unipd.it

**Funding information**
European Union's Horizon 2020 research and innovation, Grant/Award Number: 771271; Horizon 2020, Grant/Award Number: 10.13039/501100007601

**Abstract**

Based on specimens collected in traps in North-Eastern Italy, *Cnestus mutilatus* (Blandford, 1894), an ambrosia beetle native to Asia, is reported for the first time in Italy and in the European part of the EPPO region. A second species, *Anisandrus maiche* Kurentsov, 1941, is recorded for the first time in Italy and the third time in the European part of the EPPO region 14 and 12 years after the first detection in Ukraine and in European Russia, respectively. Both species are EU quarantine pests associated with the pathway of plants for planting and with wood material. Furthermore, they are polyphagous, able to reproduce on several genera of deciduous plants typical of temperate regions, and able to attack small diameter material and to colonize stressed and/or weakened plants. Surveillance based on traps and rearing from symptomatic material may help to assess the size and distribution of the beetle populations, the spread capability and to identify the most susceptible hosts.

**KEYWORDS**
biological invasion, broadleaved trees, introduction, non-European Scolytidae, quarantine

**Premier signalement du scolyte exotique *Cnestus mutilatus* et nouvelle découverte d'*Anisandrus maiche* dans la partie européenne de la région OEPP (Coleoptera : Curculionidae : Scolytinae : Xyleborini)**

*Cnestus mutilatus* (Blandford, 1894), un scolyte originaire d'Asie, est signalé pour la première fois en Italie et dans la partie européenne de la région OEPP, sur la base de spécimens collectés dans des pièges dans le nord-est de l'Italie. Une deuxième espèce, *Anisandrus maiche* Kurentsov, 1941, est signalée pour la première fois en Italie ; il s'agit du troisième signalement dans la partie européenne de la région OEPP, respectivement 14 et 12 ans après la première détection de celle ci, en Ukraine et en Russie occidentale. Ces deux espèces sont des organismes de quarantaine pour l'UE, associés à la filière des végétaux destinés à la plantation et à celle du bois. Elles sont par ailleurs polyphages, capables de se reproduire sur plusieurs genres de plantes à feuilles caduques typiques des régions tempérées ; elles sont également capables d'attaquer des plantes de petit diamètre et de coloniser des plantes stressées et/ou affaiblies. Un

suivi, au moyen de pièges et d'élevage à partir matériel symptomatique, peut aider à évaluer la taille et la répartition géographique des populations de coléoptères, ainsi que leur capacité de dissémination et les plantes-hôtes les plus sensibles.

**Первое сообщение о чужеродном амброзиевом жуке *Cnestus mutilatus* и дополнительное обнаружение *Anisandrus maiche* в европейской части региона ЕОКЗР (Coleoptera: Curculionidae: Scolytinae: Xyleborini)**

На основании образцов, собранных в ловушки в Северо-Восточной Италии, впервые сообщается о *Cnestus mutilatus* (Blandford, 1894) (амброзиевом жуке родом из Азии) в Италии и в европейской части региона ЕОКЗР. Второй вид, *Anisandrus maiche* Kurentsov, 1941, впервые регистрируется в Италии и в третий раз в европейской части региона ЕОКЗР через 14 и 12 лет после предыдущих обнаружений в Украине и в европейской части России, соответственно. Оба вида являются карантинными вредными организмами для ЕС, связанными с такими путями проникновения как посадочный материал и древесина. Кроме того, они многоядны, способны размножаться на нескольких родах лиственных растений, типичных для регионов с умеренным климатом, и нападать на материал малого диаметра, а также колонизировать ослабленные растения и/или растения, находящиеся в стрессе. Надзор, основанный на использовании ловушек и выращивании из симптоматического материала, может помочь оценить размер и распространение популяций жуков, их способность к распространению, а также определитьнаиболее уязвимых хозяев.

## 1 | INTRODUCTION

Global trade networks are generally recognized as both the direct and indirect driver of alien species introductions into new regions, to the extent that biological invasions are currently deemed to be synonymous with international trade (Hulme, 2021). In particular, non-native ambrosia beetles (Coleoptera: Scolytinae) have often become more abundant than native ambrosia beetles in many world regions (Brockerhoff & Liebhold, 2017). This is explained by specific life-history traits (e.g. cryptic lifestyle, fungus farming, inbreeding and wide host range) that mean these beetles are associated with woody commodities in several pathways (EPPO, 2020). Considering Europe and the Mediterranean region, recent introductions of new non-indigenous ambrosia beetle species belonging to the tribe Xyleborini have caused great concern, focusing attention on the international trade of specific commodities such as non-coniferous wood (i.e. woody angiosperms) that have a great economic, environmental and social importance in many types of habitats in the EPPO region (EPPO, 2020). The adoption of appropriate control measures has been suggested to reduce the risk of entry, establishment and spread of these species (Chapman et al., 2017; EPPO, 2020).

In this paper, the records of two ambrosia beetles are presented: *Cnestus mutilatus* (Blandford, 1894), new for the European part of the EPPO region, and *Anisandrus maiche* Kurentsov, 1941, previously found only in Eastern European EPPO member countries. These species might represent a threat when introduced into new areas, given the ability to successfully establish and spread rapidly


**FIGURE 1** Map of alien ambrosia beetle records in the Veneto Region. The black dot represents the city of Treviso (coordinates 45.6813 N, 12.2219 E) where both the alien species were found. The insert in the top-left corner shows the position of the Veneto Region in Italy

through human-mediated transport of goods, and the broad host range (Rabaglia et al., 2009; Terekhova & Skrylnik, 2012; EPPO, 2020; EPPO, 2022). Both species are considered quarantine pests for the European Union as non-European Scolytidae (Commission Implementing Regulation (EU) EPPO, 2022), and since 2002 *C. mutilatus* has been included in the NAPPO alert list.

## 2 | MATERIALS AND METHODS

In the context of a citizen science project involving high schools, a monitoring programme for ambrosia beetles was carried out in spring 2021 throughout the Veneto Region (Figure 1). All the schools were located in urban areas, but their school yards/grounds and their immediate surroundings differed greatly in the number and type of plants. In each school yard, three traps were hung at about 1.5 m height on three different trees or shrubs, depending on the plants available, and, starting from the end of March, they were filled with an ethanol-based gel (Septaman Gel, Nuova Farmec® S.r.l., Settimo di Pescantina, Italy) and emptied 24 h later. During the analysis of the collected samples, three specimens from the same site (Treviso, coordinates: 45.6813 N, 12.2219 E) (Figure 1) were noticed for their distinctive traits, which were different from both native and non-native species known to be established in the region. Specimens were identified both morphologically, using diagnostic features (Rabaglia et al., 2009; Gomez et al., 2018; Smith et al., 2020), and by DNA barcoding, using primers LCO-1490/HCO-2198 as in Folmer et al. (1994). Specimens and/or DNA are deposited in the author's collections.

## 3 | RESULTS AND DISCUSSION

Morphological and molecular analyses showed that the three specimens were females belonging to two different species of the tribe Xyleborini: *C. mutilatus* and *A. maiche*. They were caught on 9 June 2021. So far, *C. mutilatus* has never been found in the European part of the EPPO region, whereas *A. maiche* has been recorded twice, in Ukraine and European Russia in 2007 and 2009, respectively (Terekhova & Skrylnik, 2012; Nikulina et al., 2015; Orlova-Bienkowskaja, 2017).

*C. mutilatus*, commonly known as camphor shot beetle (or sweetgum ambrosia beetle), can be distinguished from other members of the tribe by its relatively large size (mean = 3.7 mm) and by the truncate elytra, which are shorter than the pronotum (Schiefer & Bright, 2004; Gomez et al., 2018) (Figure 2). It is native to eastern and Southern Asia, extending northwards to Japan, the Korean Peninsula and the Russian Far East, and it is currently well-established in several south-eastern states of the United States, where it was first accidentally introduced in 1999 in Mississippi (Schiefer & Bright, 2004; EPPO, 2020; Smith et al., 2020). The sequence obtained from one of the specimens collected in our survey was compared with other sequences available in GenBank, showing 100% similarity with a *C. mutilatus* specimen caught in Shanghai (MN619877; Cognato et al., 2020). It is therefore possible that the specimens collected at the Treviso site came directly from Asia, although the possibility that this haplotype is present but undiscovered in the USA cannot be excluded. The issue of the phytosanitary risk that could be posed by this species to the EPPO member countries has been recently raised, and it was included as one of the 26 representative species selected by an Expert Working Group on non-coniferous wood (EPPO, 2020).

*A. maiche* is similar to the native congeneric *A. dispar* but is smaller (<2.5 mm) and distinguished by the declivity appearing bisulcate (Gomez et al., 2018; Smith et al., 2020) (Figure 3). Its native distribution corresponds to North-Eastern Asia (China, Japan, South and North Korea, and the Russian Far East) but it has increasingly colonized the midwestern and north-eastern states of the United States starting from 2005, when it was reported for the first time from Pennsylvania (Rabaglia et al., 2009; Gomez et al., 2018; Smith et al., 2020). Two years later it was first found in Ukraine (Terekhova & Skrylnik, 2012) and soon after in the European part of Russia. It was considered likely that the pest arrived directly from East Asia to both countries (Nikulina et al., 2015; Orlova-Bienkowskaja, 2017). No other reports of introduction have been published since then, although it was predicted to expand westward and to appear rapidly in Central Europe (Nikulina et al., 2015). The sequence

**FIGURE 2** Dorsal and lateral views of the distinctive stout body shape of *Cnestus mutilatus*, with truncated elytra, wider than long, and shorter than pronotum (Gomez et al., 2018). Scale bar: 1.0 mm. (Photo by F. Colombari)


**FIGURE 3** Dorsal and lateral views of *Anisandrus maiche* (b) in comparison with those of the native *A. dispar* (a). Scale bar: 1.0 mm. In insert ($b_1$), a distinctive trait of *A. maiche* is shown: the declivity that appears bisulcate as it is impressed from striae 1 to interstriae 2, whereas interstriae 3 is distinctly raised (Smith et al., 2020). (Photo by F. Colombari)

obtained showed a similarity of 99.51% with specimens of *A. maiche* collected in Michigan, United States (MN619845) and Ontario, Canada (MG060371). A lower similarity (98%) was observed when comparing our sequence with that of the Russian sample (SCOL295-12). This led us to hypothesize that the beetle arrived in Italy from North America rather than across Europe, but unfortunately no sequence data for the Ukrainian finding are available to support this argument.

DNA sequences of *C. mutilatus* and *A. maiche* were submitted to the GenBank® database, where they are available with the accession numbers OL441045 and OL451219, respectively.

## 4 | CONCLUSIONS

Monitoring of ambrosia beetles is being regularly carried out in the Veneto Region (Marchioro et al., 2020) and none of the two new alien species was found prior to the current report. Thus, it can be hypothesized that the introductions are all quite recent. During the surveys, no symptoms or evident damage were observed on the potential host plants located around the traps where the few specimens were captured. However, traps cannot indicate ambrosia beetle abundance as trapping rates are affected by many factors, such as the variation in regional scolytid faunas, the tree phenological state, the method of trapping used, the environment and the presence of attractive host material in the vicinity of traps that modified the response (Oliver & Mannion, 2001). Currently, there are no data on the economic impact (except for *C. mutilatus* in native China) and the two species are not known to build up large populations in their range of origin and introduction (EPPO, 2020). Being quarantine species in the EU, their potential spread has to be taken into consideration, especially in areas at higher risk of damage, such as nurseries and ornamental plantations.

## ACKNOWLEDGEMENTS

The monitoring programme was conducted in the context of the European project HOMED (Holistic management of emerging forest pests and diseases), which receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 771271.

## REFERENCES

Brockerhoff EG & Liebhold AM (2017) Ecology of forest insect invasions. *Biological Invasions* 19, 3141–3159.

Chapman D, Purse BV, Roy HE & Bullock JM (2017) Global trade networks determine the distribution of invasive non-native species. *Global Ecology and Biogeography* 26, 907–917.

Cognato A, Sari G, Smith S, Beaver R, Li Y, Hulcr J, Jordal B, Kajimura H, Lin C, Pham T, Singh S & Sittichaya W (2020) The essential role of taxonomic expertise in the creation of DNA databases for the identification and delimitation of Southeast Asian ambrosia beetle species (Curculionidae: Scolytinae: Xyleborini). *Frontiers in Ecology and Evolution* 8, 27.

EPPO (2020) EPPO Technical Document No. 1081, EPPO Study on the risk of bark and ambrosia beetles associated with imported non-coniferous wood. EPPO Paris.

EPPO (2022) EPPO Global Database (available online). https://gd.eppo.int

Folmer O, Black M, Hoeh W, Lutz R & Vrijenhoek R (1994) DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. *Molecular Marine Biology and Biotechnology* 3, 294–299.

Gomez DF, Rabaglia RJ, Fairbanks KEO & Hulcr J (2018) North American Xyleborini north of Mexico: a review and key to genera and species (Coleoptera, Curculionidae, Scolytinae). *ZooKeys* 768, 19–68.

Hulme PE (2021) Unwelcome exchange: International trade as a direct and indirect driver of biological invasions worldwide. *One Earth* 4, 666–679.

Marchioro M, Rassati D, Faccoli M, Van Rooyen K, Kostanowicz C, Webster V, Mayo P & Sweeney J (2020) Maximizing bark and ambrosia beetle (Coleoptera: Curculionidae) catches in trapping surveys for longhorn and jewel beetles. *Journal of Economic Entomology* 113, 2745–2757.

Nikulina T, Mandelshtam M, Petrov A, Nazarenko V & Yunakov N (2015) A survey of the weevils of Ukraine. Bark and

ambrosia beetles (Coleoptera: Curculionidae: Platypodinae and Scolytinae). *Zootaxa* 3912, 1–61.
Oliver C & Mannion M (2001) Ambrosia beetle (Coleoptera: Scolytidae) species attacking chestnut and captured in ethanol-baited traps in middle Tennessee. *Environmental Entomology* 30, 909–918.
Orlova-Bienkowskaja MJ (2017) Main trends of invasion processes in beetles (Coleoptera) of European Russia. *Russian Journal of Biological Invasions* 8, 143–157.
Rabaglia RJ, Vandenberg NJ & Acciavatti RE (2009) First records of *Anisandrus maiche* Stark (Coleoptera: Curculionidae: Scolytinae) from North America. *Zootaxa* 2137, 23–28.
Schiefer TL & Bright DE (2004) *Xylosandrus mutilatus* (Blandford), an exotic ambrosia (Coleoptera:Curculionidae: Scolytinae: Xyleborini) new to North America. *The Coleopterists Bulletin* 58, 431–438.
Smith SM, Beaver RA & Cognato AI (2020) A monograph of the xyleborini (Coleoptera, Curculionidae, Scolytinae) of the Indochinese Peninsula (except Malaysia) and China. *ZooKeys* 983, 1.
Terekhova VV & Skrylnik YY (2012) Biological peculiarities of the alien for Europe *Anisandrus maiche* Stark (Coleoptera: Curculionidae: Scolytinae) bark beetle in Ukraine. *Russian Journal of Biological Invasions* 3, 139–144.

**How to cite this article:** Colombari, F., Martinez-Sañudo, I. & Battisti, A. (2022) First report of the alien ambrosia beetle *Cnestus mutilatus* and further finding of *Anisandrus maiche* in the European part of the EPPO region (Coleoptera: Curculionidae: Scolytinae: Xyleborini). *EPPO Bulletin*, 00, 1–5. Available from: https://doi.org/10.1111/epp.12840