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First report: *Xylosandrus compactus* (Eichhoff, 1876), new invasive ambrosia beetle in Montenegro

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Key message

The ambrosia beetle *Xylosandrus compactus* (Eichhoff, 1876), originally from Southeast Asia, was first found in Europe in 2010, specifically in Italy. Since then, *X. compactus* has rapidly spread across southern Europe, including France, Spain, Greece, Turkey, Malta, Slovenia, Russia, Croatia, and Switzerland, gradually moving northward through lower-elevation areas. In 2023, a single female was found near the village of Kameno in Montenegro. This female was sifted through leaf litter in rocky terrain within a deciduous forest mainly populated by oak and hornbeam trees, located 2.5 km from the international port of Herceg Novi.

Keywords Ambrosia beetle, Montenegro, *Xylosandrus compactus*

1 Context

Invasive species impose a considerable economic burden on individual economies and pose a significant threat to biodiversity (InvaCost 2024). Europe is currently home to 42 species of invasive bark and ambrosia beetles (Alonso-Zarazaga et al. 2023; Mas and Johnson 2023; EPPO 2024; Gebhardt et al. 2024; Knížek and Smith 2024; Toccafondi et al. 2025). Among them, *Xylosandrus compactus* (Eichhoff, 1876) causes damage to shrubs and trees in forests, ornamental gardens, and parks (Garonna et al. 2012; Vannini et al. 2017; Leza et al. 2020). This species harms thin twigs, causing them to wither and die (Pennacchio et al. 2012; Vannini et al. 2017; Gugliuzzo et al. 2019a) while also serving as a vector for various fungal pathogens (Bateman et al. 2016; Vannini et al. 2017; Morales-Rodríguez et al. 2021). In exceptional cases, it can even infest tree trunks with a diameter of up to 80 cm (Gugliuzzo et al. 2019b). With a host range exceeding 220 plant species (Gugliuzzo et al. 2023), monitoring its spread is essential.

X. compactus is originally from Southeast Asia (Wood 1982) and was first observed in Europe in Italy in 2010 (Pennacchio et al. 2012), followed by detections in France in 2015 (Chapin et al. 2016), Spain in 2019 (Leza et al. 2020), Greece in 2019 (Spanou et al. 2019), Turkey in 2021 (Hizal et al. 2023), Malta in 2021 (EPPO 2021), Slovenia in 2023 (Hauptman et al. 2024), the European part of Russia in 2023 (Karpun et al. 2024), Switzerland in 2023 (Blaser et al. 2024), and Croatia in 2023 (Pernek et al. 2025).

X. compactus has been rapidly spreading across southern Europe since 2010 and is gradually extending northward (see Blaser et al. 2024). Although this expansion is currently confined to lower elevations, the prediction model made by Urvois et al. (2021), suggesting that *X.*

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compactus would not reach the Baltic Sea coast until approximately 2050, may no longer be valid.

This article reports a new occurrence of the *X. compactus* in Montenegro.

2 Material and methods

In 2023, sifting studies were conducted at various locations in Montenegro. The study took place from October 28 to November 4, 2023, at sites in National Park Durmitor, National Park Biogradska Gora, and surroundings of Boka Kotorska bay. A circular sieve with a diameter of 28 cm and a mesh size of 0.4 × 0.4 cm was used for sifting. Approximately 5–15 L of material was examined during each sifting event. The material was placed in Berlese-type extractors, and collected beetles were preserved in ethyl acetate.

For the generic and species-level identification of the specimen, morphological characters described by Gomez et al. (2018) and Smith et al. (2020) were used. The total length of the specimen is 1.77 mm, measured from the anterior margin of the pronotum to the apex of the elytra.

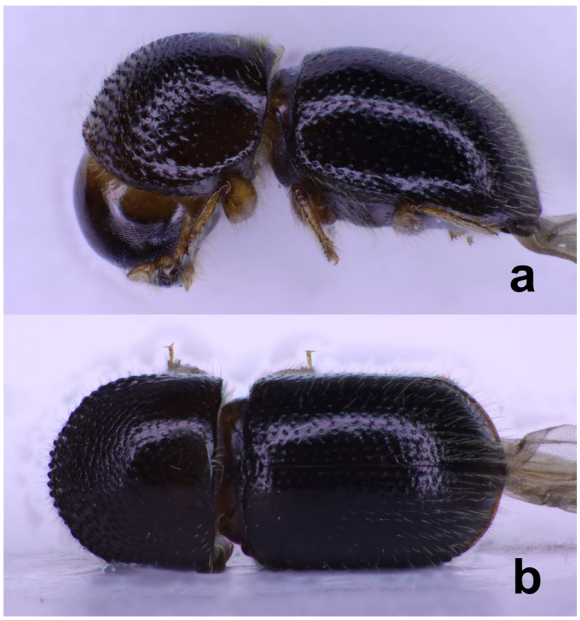

Fig. 1 *Xylosandrus compactus* female found near the village of Kameno in Montenegro in 2023. Lateral view (**a**), dorsal view (**b**). Length 1.77 mm

3 Results and discussion

On November 4, 2023, a single live, dormant female specimen of *X. compactus* (leg. Adam Šíma, Czech Republic) (Fig. 1) was found in a soil sample from a deciduous forest dominated by oak (*Quercus* spp.) and hornbeam (*Carpinus* spp.) near the village of Kameno (42.4727 N, 18.5288E), at an altitude of 415 m (Fig. 2). This discovery was made while sifting leaf litter on rocky terrain approximately 2.5 km from the international port of Herceg Novi.

The nearest known population of *X. compactus* is on Lokrum Island, Croatia, approximately 40 km from the study site (Pernek et al. 2025). The flight capacity of *X. compactus* extends up to approximately 8 km per season but may be constrained by altitudes around 400 m above sea level (Gugliuzzo et al. 2019a). It is possible that the observed female specimen was introduced via the international port of Herceg Novi and subsequently dispersed to the recorded location (Fig. 2). At the study site, the beetle may have burrowed into the leaf litter to overwinter. However, it is more likely that this specimen represents an overwintering offspring of a locally developed generation, suggesting a potential establishment of the species in the area. Although no specific searches for galleries were conducted, their presence at the site remains a possibility.

Some ambrosia beetles do not overwinter within their galleries; instead, part of the new generation may leave them and overwinter elsewhere (Hadorn 1933; Swaine 1933; Kinghorn and Chapman 1959). However, this behavior is not consistent across all species (Ranger et al. 2016; Gugliuzzo et al. 2020). For example, in *Xylosandrus germanus* (Blandford, 1894) and *Xylosandrus crassiusculus* (Motschulsky, 1866), not all females overwinter within their burrows (Hoffmann 1941; Oliver and Mannion 2001), with some individuals documented overwintering outside galleries. Similarly, the discovery of a single dormant *X. compactus* female in leaf litter strongly suggests that this species is also capable of overwintering outside its galleries under certain conditions. Given that galleries were not specifically searched for at the site, their potential presence raises the possibility of an already established population in the region.

The detection of a single individual, even without confirmed galleries in host trees, suggests the establishment of a permanent population in the region (see Knížek 2009; Fiala et al. 2021). Nonetheless, to confirm the establishment of *X. compactus* further surveys are necessary. Montenegro hosts Mediterranean biotopes similar to those along the Italian coast, where the species is already established. Consequently, there is a high likelihood that Montenegro could experience similar damage, particularly to shrubs, as observed in Italy (Pennacchio et al. 2012; Vannini et al. 2017; Gugliuzzo et al. 2019a).

In 2023, the species was also recorded in multiple other European countries, including Slovenia, Russia, Switzerland, and Croatia (Blaser et al. 2024; Hauptman et al. 2024; Karpun et al. 2024; Pernek et al. 2025). This trend indicates a broader and potentially synchronized

Fig. 2 The location near the village of Kameno with a view of the international port of Herceg Novi (**a**), interior (**b**), and a rocky area in an oak-hornbeam forest (**c**), where one female *Xylosandrus compactus* was found in November 2023

expansion of this invasive beetle across southern and central Europe.

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Authors' contributions
TF and MK formally analyzed data. TF, MK, and JH wrote manuscript. TF, MK, and JH wrote manuscript after reviews. JH had supervision. The authors read and approved the final manuscript.

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Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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References

Alonso-Zarazaga MA, Barrios H, Borovec R, Bouchard P, Caldara R, Colonnelli E, Gültekin L, Hlaváč P, Korotyaev B, Lyal CHC, Machado A, Meregalli M, Pierotti H, Ren L, Sánchez-Ruiz M, Sforzi A, Silfverberg H, Skuhrovec J, Trýzna M, Velázquez de Castro AJ, Yunakov NN (2023) Cooperative Catalogue of Palaearctic Coleoptera Curculionoidea. Mon Electr Soc Entomol Aragon 14:1–729

Bateman C, Šigut M, Skelton J, Smith KE, Hulcr J (2016) Fungal associates of the *Xylosandrus compactus* (Coleoptera: Curculionidae, Scolytinae) are spatially segregated on the insect body. Environ Entomol 45:883–890. https://doi.org/10.1093/ee/nvw070

Blaser S, Hoelling D, Ruffner B, Brockerhoff EG, Marazzi C, Mattei G, Meier M, Beenken L (2024) First record of the invasive ambrosia beetle *Xylosandrus compactus* (Eichhoff, 1875) (Coleoptera: Scolytinae) and its fungal associates in Switzerland. BioInv Rec 13:621–636. https://doi.org/10.3391/bir.2024.13.3.05

Chapin É, Mouttet R, Chauvel G (2016) *Xylosandrus compactus* trouvé en France métropolitane. Phytoma 697:10–12

EPPO (2021) Current pest situation evaluated by EPPO on the basis of information dated 2021. https://gd.eppo.int/taxon/XYLSCO/distribution/MT. Accessed Sept 23 2024.

EPPO (2024) First report of *Euwallacea fornicatus* sensu lato in Spain. https://gd.eppo.int/reporting/article-7939. Accessed Oct 12 2024.

Fiala T, Knížek M, Holuša J (2021) Continued eastward spread of the invasive ambrosia beetle *Cyclorhipidion bodoanum* (Reitter, 1913) in Europe and its distribution in the world. BioInv Rec 10:65–73. https://doi.org/10.3391/bir.2021.10.1.08

Garonna AP, Dole SA, Saracino A, Mazzoleni S, Cristinzio G (2012) First record of the black twig borer *Xylosandrus compactus* (Eichhoff) (Coleoptera: Curculionidae: Scolytinae) from Europe. Zootaxa 3251:64–68. https://doi.org/10.11646/zootaxa.3251.1.5

Gebhardt H, Mertens D, Schacht W (2024) Erster Nachweis von *Phloeosinus sequoiae* (Hopkins, 1903) für Europa aus dem nordwestlichen Deutschland (Coleoptera, Curculionidae, Scolytinae). Entomol Nach Ber 68:43–46

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. https://doi.org/10.3897/zookeys.768.24697

Gugliuzzo A, Criscione G, Siscaro G, Russo A, Garzia GT (2019a) First data on the flight activity and distribution of the ambrosia beetle *Xylosandrus compactus* (Eichhoff) on carob tree in Sicily. Bull OEPP/EPPO Bull 49:340–351. https://doi.org/10.1111/epp.12564

Gugliuzzo A, Criscione G, Garzia GT (2019b) Unusual behavior of *Xylosandrus compactus* (Coleoptera: Scolytinae) on carob trees in a Mediterranean environment. Insects 10:82. https://doi.org/10.3390/insects10030082

Gugliuzzo A, Criscione G, Biondi A, Aiello D, Vitale A, Polizzi G, Garzia GT (2020) Seasonal changes in population structure of the ambrosia beetle *Xylosandrus compactus* and its associated fungi in a southern Mediterranean environment. PLoS ONE 15:e0239011. https://doi.org/10.1371/journal.pone.0239011

Gugliuzzo A, Francardi V, Simoni S, Roversi PF, Ferrati M, Spinozzi E, Perinelli DR, Bonacucina G, Maggi F, Tortorici S, Garzia GT, Biondi A, Rizzo R (2023) Role of plant essential oil nanoemulsions on host colonization by the invasive ambrosia beetle *Xylosandrus compactus*. Ind Crops Prod 195:116437. https://doi.org/10.1016/j.indcrop.2023.116437

Hadorn C (1933) Recherches sur la morphologie, les stades évolutifs et l´hivernage du bostryche liseré (*Xyloterus lineatus* Oliv.). Bei Zeit Schweiz Forst 11:113–117

Hauptman T, Devetak Z, De Groot M, Faccoli M, Piškur B (2024) First record of non-native *Xylosandrus compactus* and *Anisandrus maiche* (Coleoptera: Curculionidae, Scolytinae) in Slovenia. Zootaxa 5415:339–345. https://doi.org/10.11646/zootaxa.5415.2.8

Hizal E, Acer S, Altunişik S (2023) First record of the invasive alien species *Xylosandrus compactus* (Eichhoff) (Coleoptera: Curculionidae: Scolytinae) in Turkey. BioInv Rec 12:93–102. htpps://doi.org/https://doi.org/10.3391/bir.2023.12.1.08

Hoffmann CH (1941) Biological observations on *Xylosandrus germanus* (Bldfd.). J Econ Entomol 34:38–42. https://doi.org/10.1093/jee/34.1.38

InvaCost (2024) Invacost database. https://invacost.fr/en/accueil/. Accessed Dec 04 2024.

Karpun NN, Petrov AV, Zhuravleva EN, Shoshina EI, Kirichenko NI, Mandelshtam MY, Musolin DL (2024) Two invasive bark beetles *Phloeosinus armatus* Reitter and *Xylosandrus compactus* (Eichhoff) (Coleoptera, Curculionidae: Scolytinae) newly recorded in Russia. EPPO Bull 54:166–181. https://doi.org/10.1111/epp.13019

Kinghorn JM, Chapman JA (1959) The overwintering of the ambrosia beetle *Trypodendron lineatum* (Oliv.). For Sci 5:81–92. https://doi.org/10.1093/forestscience/5.1.81

Knížek M (2009) Faunistic records from the Czech Republic – 272, Coleoptera: Curculionidae: Scolytinae. Klapalekiana 45:22

Knížek M, Smith SM (2024) A new widely distributed invasive alien species of *Amasa* ambrosia beetles (Coleoptera: Curculionidae: Scolytinae: Xyleborini). Zootaxa 5403:385–390. https://doi.org/10.11646/zootaxa.5403.3.8

Leza M, Nuñez L, Riba JM, Comparini C, Roca Á, Gallego D (2020) First record of the black twig borer, *Xylosandrus compactus* (Coleoptera: Curculionidae, Scolytinae) in Spain. Zootaxa 4767:345–350. https://doi.org/10.11646/zootaxa.4767.2.9

Mas H, Johnson AJ (2023) First reported detection of *Ips calligraphus* (Germar) and *Ips grandicollis* (Eichhoff) (Coleoptera: Curculionidae) on a port of entry and its surrounding forest in Spain. Col Bull 77:501–506. https://doi.org/10.1649/0010-065X-77.4.501

Morales-Rodríguez C, Sferrazza I, Aleandri MP, Valle MD, Speranza S, Contarini M, Vannini A (2021) The fungal community associated with the ambrosia beetle *Xylosandrus compactus* invading the Mediterranean maquis in central Italy reveals high biodiversity and suggests environmental acquisitions. Fung Biol 125:12–24. https://doi.org/10.1016/j.funbio.2020.09.008

Oliver JB, Mannion CM (2001) Ambrosia beetle (Coleoptera: Scolytidae) species attacking chestnut and captured in ethanol-baited traps in middle Tennessee. Environ Entomol 30:909–918. https://doi.org/1603/0046-225X-30.5.909

Pennacchio F, Santini L, Francardi V (2012) Bioecological notes *Xylosandrus compactus* (Eichhoff) (Coleoptera Curculionidae Scolytinae), a species recently recorded into Italy. Redia 95:67–77

Pernek M, Hrašovec B, Lacković N, Domijan O, Avtzis D (2025) First record of the ambrosia beetle *Xylosandrus compactus* (Coleoptera, Curculionidae) in Croatia. Forests 16:157.https://doi.org/10.3390/f16010157

Ranger CM, Reding ME, Schultz PB, Oliver JB, Frank SD, Addesso KM, Chong JH, Sampson B, Werle C, Gill S, Krause C (2016) Biology, ecology, and management of nonnative ambrosia beetles (Coleoptera: Curculionidae: Scolytinae) in ornamental plant nurseries. J Integr Pest Manag 7:9. https://doi.org/10.1093/jipm/pmw005

Smith SM, Beaver RA, Cognato AI (2020) A monograph of the Xyleborini (Coleoptera, Curculionidae, Scolytinae) of the Indochinese Peninsula (except Malaysia) and China. ZooKeys 983:1–442. https://doi.org/10.3897/zookeys.983.52630

Spanou K, Marathianou M, Gouma M, Dimou D, Nikoletos L, Milonas PG, Papachristos DP (2019) First record of black twig borer *Xylosandrus compactus* (Coleoptera: Curculionidae) in Greece. In: Andreadis SS, Dolaptsogu CS, Koutsogeorgiou E (Eds) Proceedings of 18th Panhellenic Entomological Congress. Komotini: Hellenic Entomological Society:77.

Swaine JM (1933) The relation of insect activities to forest development as exemplified in the forests of Eastern North America. For Chron 9:5–32. https://doi.org/10.5558/tfc9005-4

Toccafondi P, Vitale S, Rizzo D, Luongo L, Binazzi F, Garaguso I, Benvenuti C, Mercuri I, Resta E, Pennacchio F (2025) First report in Europe of *Euwallacea similis* (Ferrari) (Coleoptera Curculionidae Scolytinae Xyleborini). Redia 108:83–89. https://doi.org/10.19263/REDIA-108.25.09

Urvois T, Auger-Rozenberg MA, Roques A, Rossi JP, Kerdelhue C (2021) Climate change impact on the potential geographical distribution of two invading *Xylosandrus* ambrosia beetles. Sc Rep 11:1339. https://doi.org/10.1038/s41598-020-80157-9

Vannini A, Contarini M, Faccoli M, Della Valle M, Rodriguez CM, Mazzetto T, Guarneri D, Vettraino AM, Speranza S (2017) First report of the ambrosia beetle *Xylosandrus compactus* and associated fungi in the Mediterranean maquis in Italy, and new host-pest associations. Bull OEPP/EPP Bull 47:100–103. https://doi.org/10.1111/epp.12358

Wood SL (1982) The bark and ambrosia beetles of North and Central America (Coleoptera: Scolytidae), a taxonomic monograph. Gr Bas Natural Mem 6:1–1359

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