Quick scan for *Xyleborus ferrugineus*

National Plant Protection Organization, the Netherlands

Quick scan number: QS2021ENT006

Quick scan date: 15 October 2021

No.	Question	Quick scan answer for ***Xyleborus ferrugineus***
1.	What is the scientific name (if possible up to species level + author, also include (sub)family and order) and English/common name of the organism? *Add picture of organism/damage if available and publication allowed*.	*Xyleborus ferrugineus* (Fabricius, 1801) **Note** *X. bispinatus* and *X. impressus* were removed from synonymy with *X. ferrugineus* by Rabaglia (2005) and Kirkendall and Jordahl (2006). Consequently, some records of *X. ferrugineus* prior to 2006 may actually refer to *X. bispinatus* or *X. impressus*. In the present Quick scan, information is also used from papers that have been published prior to 2006. However, there is some uncertainty if these all concern *X. ferrugineus* especially because the geographical distribution areas of *X. ferrugineus* and *X. bispinatus* in the Americas (the presumed origin of both species) largely overlap (see also Question 3).
2.	What prompted this quick scan? *Organism detected in produce for import, export, in cultivation, nature, mentioned in publications, e.g. EPPO alert list, etc.*	*X. ferrugineus* cf species was intercepted during an import inspection of a consignment of *Dracaena* sp. from Costa Rica. The specimen was found in a sample taken from a stem.
3.	What is the current area of distribution?	*X. ferrugineus* is most likely native to tropical and subtropical regions in the Americas where it is a common species (Gohli et al. 2006, Barnouin et al. 2020). Nowadays, it appears to be established on most continents. It has spread to north-eastern states in the USA and also to Canada (Ontario) and (sub)tropical regions in Africa, Asia and Oceania (Douglas et al. 2013, Barnouin et al. 2020, Atkinson 2021, EPPO 2021). The species has not established in Europe (Atkinson, 2021).
4.	What are the host plants?	Atkinson (2021) provides a list of host species of *X. ferrugineus* and this list has been supplemented by records from (mostly) recent literature, resulting in the host species list below. This includes some 116 plant species in 44 families indicating that the real host range is likely broader that we know based on literature.

No.	Question	Quick scan answer for ***Xyleborus ferrugineus***

§Family	Species
Aceraceae	*Acer rubrum*
Agavaceae	*Dracaena fragrans, Dracaena sp.*
Altingiaceae	*Liquidambar styraciflua*[1]
Anacardiaceae	*Mangifera indica, Spondias dulcis, Spondias mombin, Spondias purpurea*
Apocynaceae	*Aspidosperma megalocarpon, Couma macrocarpa*
Aracaceae*	*Cocos nucifera*[1,12], *Wodyetia bifurcata*[2]
Araliacae	*Dendropanax arboreus, Sciadodendro excelsum*[14]
Araliaceae	*Sciadodendron excelsum*
Araucariaceae	*Araucaria angustifolia*[1]
Betulaceae	*Corylus* spp[3]
Bignoniaceae	*Spathodea campanulata, Tabebuia heterophylla, Tabebuia rosea*
Burseraceae	*Bursera simaruba, Bursera sp. Dacryodes excelsa, Protium sp.*
Chrysobalanaceae	*Licania sp.*
Clusiaceae	*Rheedia sp., Vismia sp.*
Combretaceae	*Terminalia amazonica*
Cupressaceae	*Taxodium distichum*[1]
Dioscoreaceae	*Dioscorea sp*[11]
Eleaocarpaceae	*Sloanea berteriana*
Euphorbiaceae*	*Hevea brasiliensis**
Fagaceae	*Quercus alba, Quercus rubra, Quercus sp., Quercus stellata*, Fagus* sp[1]
Humiriaceae	*Sacoglottis procera*
Juglandaceae	*Carya illinoinensis*[1], *Carya* spp[1], *Juglans* sp[1], Juglans nigra[9?]
Lauraceae	*Persea americana, Persea palustris, Persea borbonea*[2]
Lamiaceae	*Vitex guameri*[14]
Lecythidaceae	*Barringtonia asiatica, Eschweilera biflava*, Eschweilera corrugata, Gustavia brachycarp Lecythis sp.*
Leguminosae	*Acacia guameri, Acrocarpus fraxinifolius, Andira inermis, Bauhinia variegata*[5], *Cajanus cajan, Delonix regia, Dialium guianense, Diphysa robinoides*[14], *Erythrina americana*[14], *Erythrina brevifolia, Erythrina sp., Erythrina orientalis*[5], *Fissicalyx fendleri, Glyricidia*

No.	Question	Quick scan answer for ***Xyleborus ferrugineus***
		sepium, Hymenea corbaril, Inga sp., Leucaena sp[5]*, Lonchocarpus macrophyllus, Lonchocarpus margaritensis, Lysiloma bahamensis* **Malvaceae** *Heliocarpus appendiculatus, Heliocarpus pallidus, Heliocarpus sp., Pachira quinata, Theobroma cacao***+** **Melastomataceae** *Miconia prasina* **Meliaceae** *Cedrela odorata, Cedrela fissilis,*[1] *Guarea sp., Swietenia macrophylla*[14] **Moraceae** *Artocarpus altilis, Brosimum alicastrum, Castilloa elastica*[5]*, Ficus retusa nítida, Ficus elastica*[1] **Musaceae** *Heliconia sp.* **Myrtaceae** *Metrosideros polymorpha*[15] **Nyctaginacae** *Eucalyptus robusta, Eucalyptus dunni*[1]*, Eucalyptus grandis*[8, 13?] **Nyssaceae** *Nyssa sp.* **Oleaceae** *Fraxinus* sp[1] **Pinaceae** *Pinus caribea, Pinus palustris, Pinus sp., Pinus oocarpa*[7]*, Pinus car. bahamensis*[7]*, Pinus taeda* **Proteaceae** *Grevillea robusta*[5]*, Macadamia integrifolia*[4], *Macadamia ternifolia*[5] **Rubiaceae** *pulavao*[5] **Rutaceae** *Citrus sp., Zanthoxylum sp.* **Rhamnaceae** *Colubrina arborescens*[14]*,* **Salicaceae** *Populus deltoides*[**,6?] **Sapindaceae** *Litchi chinensis*[10]*, Meliococcus bijugatus, Thouinidium decandrum* **Sapotaceae** *Manilkara chicle, Manilkara zapota, Micropholis garcinifolia, Planchonella samoensis*[5]*, Pouteria anibaefolia* **Urticaceae** *Cecropia obtusifolia*[14], *Urera sp*[14] § - List compiled from Bark Beetle Database unless indicated otherwise. Entries indicate *X. ferrugineus* record unless indicated otherwise; * - species mentioned as host for *X. bispinatus* only; ** - species mentioned as host for *X. impressus* only; 1 - Aguilar-Perez et al. (2007), 2 - Atkinson et al. 2013, 3 - Barnouin et al. 2020; 4 - Chang 1993; 5 – Beaver (1976); 6 – Coyle et al. 2005.; 7 – Flechtmann et al. 1999; 8 - Flechtmann et al. 2001; 9 – Klingemann et al. 2017; 10 – Lin et al. 2021; 11 – Williams 1988; 12 – Maramorosch et al. 1972; 13 – Morales et al. 2000; 14 – Rangel et al. 2012; 15 – Roy et al. 2020; ? – feeding relationship is not directly measured, but rather using baited traps placed in a stand of a given tree species.

No.	Question	Quick scan answer for *Xyleborus ferrugineus*
5.	Does the organism cause any kind of plant damage in the current area of distribution and/or does the consignment demonstrate damage suspected to have been caused by this organism? *Yes/no + plant species on which damage has been reported + short description of symptoms.* *Please indicate also when the organism is otherwise harmful (e.g. predator, human/veterinary pathogen vector, etc.).*	*X. ferrugineus* causes cosmetic damage to harvested timber; the sapwood may be completely discoloured. Felled, broken, damaged, and unthrifty stems ranging in diameter from about 3 cm to more than 3 m are selected for attack. In broken or felled stems the attack may be massive and encompass most or all of the sapwood within a few days (GBIF_2021). *X. ferrugineus* aggressively attacks newly felled logs in the forest or in wood processing and storage areas where the sapwood may be destroyed entirely. The habits of *X. ferrugineus* are similar to those of other *Xyleborus* spp. such as *X. affinis*, except that it is more aggressive and more abundant and, consequently, is of greater economic concern (Wood 1977). The species has some economic importance as a pest of cacao (*Theobroma cacao*) (Sterculiaceae) (Saunders and Knoke 1967, Saunders et al. 1967ab, Entwhistle 1972). In addition to their activities of perforating sapwood, *Xyleborus ferrugineus* is the principal vector of cacao wilt (*Ceratocystis fimbriata*) (Entwhistle 1972, GBIF 2021). Williams (1988) also mentions *X. ferrugineus* as a pest of stored yam tubers (*Dioscorea* spp.) in Nigeria. Roy et al. (2020) showed a correlation between the attack by several Xyleborine, including *X. ferrugineus*, and the associated pathogen *Ceratocystis* sp. that is likely responsible for rapid ʻŌhiʻa Death, a disease of *Metrosideros polymorpha*, a Hawaiian native keystone tree species. It is also a reported as a pest of avocado. However, unlike *X. glabratus*, which is the primary pest causing laurel wilt in avocado, *X. ferrugineus* rather appears to be a secondary colonizer of stressed and dying trees (Miller and Rabaglia 2009). *Xyleborus ferrugineus* was also found to be abundant in commercial pecan plantations in Mexico, but from the study it was not clear if the species caused economic damage (Aguilar – Perez et al 2007).
6.	Assess the probability of establishment in the Netherlands (NL) (i.e. the suitability of the environment for establishment). a. In greenhouses b. Outdoors c. Otherwise (e.g. storage facilities, human environment)	See Question 7 (no detailed assessment made for the Netherlands).
7.	Assess the probability of establishment in the EU (i.e. the suitability of the environment for establishment).	*X. ferrugineus* can likely establish in large parts of the EU. It is not only present in tropical and subtropical areas but also in north-eastern USA and in Canada (Ontario) where winters can be cold. It is polyphagous and host plants are widespread in the EU. It may also establish in greenhouses.

No.	Question	Quick scan answer for *Xyleborus ferrugineus*
8.	What are the possible pathways that can contribute to spread of the organism after introduction? How rapid is the organism expected to spread (by natural dispersal and human activity)?	*X. ferrugineus* may especially spread with trade of wood and woody plants. Estimates of natural spread for this species is lacking. The dispersal of the closely related congeneric species *X. glabratus* has been previously quantified and may provide some insight here. Using flight-mill tests, Seo et al. (2017) found that *X. glabratus* exhibited ~ 20 m during a 24 hours bouts and estimated a spread of up to ca. 250 m within forests during a period of 2 weeks. Based on the spatio-temporal distribution of laurel wilt mortality caused by *X. glabratus*, Koch and Smith (2008) calculated an annual spread of the species to be 54.8 km per year. This distance may be the result of a combination of natural and human assisted spread.
9.	Provide an assessment of the type and amount of direct and indirect damage (e.g. lower quality, lower production, export restrictions, threat to biodiversity, etc.) likely to occur if the organism would become established in NL and the EU, respectively?	Most damage would likely be related to logging: reduction in quality of wood material due to structural and cosmetic damage (i.e. staining). Other economic damage may occur in avocado plantations in southern EU member states although its current status as a pest of avocado is uncertain (see Question 5).
10.	Has the organism been detected on/in a product other than plants for planting (e.g. cut flowers, fruit, vegetables)? *If "no", go to question 12*	no
11.	If the organism has been found on/in a product other than plants for planting (e.g. cut flowers, fruit, vegetables), what is the probability of introduction (entry + establishment)? *Only to be answered in case of an interception or a find.*	-
12.	Additional remarks	• According to EFSA-Panel-on-Plant-Health et al. (2020), *X. ferrugineus* qualifies as an EU quarantine pest. • The related species *X. bispinatus* is established in the EU (Barnouin et al., 2020)
13.	References	Aguilar-Perez H, Rodriguez-del-Bosque LA, Aguilar-Perez CH, de la Pena ND 2007. Seasonal abundance *of Xyleborus ferrugineus* (Coleoptera : Curculionidae) on pecan trees in northern Coahuila, Mexico. *Southw. Entomol*. 32, 105-109. 10.3958/0147-1724-32.2.105 Atkinson T, 2021. Bark and ambrosia beetles of the Americas [Web page]. Available online: http://www.barkbeetles.info [Accessed: 11-10-2021].

No.	Question	Quick scan answer for *Xyleborus ferrugineus*
		Atkinson TH, Carrillo D, Duncan RE, Pena JE 2013. Occurrence of *Xyleborus bispinatus* (Coleoptera: Curculionidae: Scolytinae) Eichhoff in southern Florida. *Zootaxa*. 3669, 96-100. 10.11646/zootaxa.3669.1.10 Baker, J. M. & Norris, D. M. 1968 A complex of fungi mutualistically involved in the nutrition of the ambrosia beetle *Xyleborus ferrugineus*. *J. Invert. Pathol*. 11, 246–260. (doi:10.1016/0022-2011(68)90157-2) Barnouin T, Soldati F, Roques A, Faccoli M, Kirkendall LR, Mouttet R, Daubree JB, Noblecourt T 2020. Bark beetles and pinhole borers recently or newly introduced to France (Coleoptera: Curculionidae, Scolytinae and Platypodinae). *Zootaxa*. 4877, 51-74. 10.11646/zootaxa.4877.1.2 Beaver R 1976. The biology of Samoan bark and ambrosia beetles (Coleoptera, Scolytidae and Platypodidae). *Bulletin of Entomological Research*. 65, 531 – 548. Chang VCS 1993. Macadamia quick decline and *Xyleborus* beetles (Coleoptera, Scolytidae). *Int. J. Pest Manage*. 39, 144-148. 10.1080/09670879309371779 Coyle DR, Booth DC, Wallace MS 2005. Ambrosia beetle (Coleoptera : Scolytidae) species, flight, and attack on living eastern cottonwood trees. *J. Econ. Entomol*. 98, 2049-2057. Douglas H, Bouchard P, Anderson RS, de Tonnancour P, Vigneault R, Webster RP 2013. New Curculionoidea (Coleoptera) records for Canada. ZooKeys 309, 13–48. doi: 10.3897/zookeys.309.4667 EFSA-Panel-on-Plant-Health, Bragard C, Dehnen-Schmutz K, Di Serio F, Gonthier P, Jacques M-A, Jaques Miret JA, Justesen AF, MacLeod A, Magnusson CS, Navas-Cortes JA, Parnell S, Potting R, Reignault PL, Thulke H-H, Van der Werf W, Civera AV, Yuen J, Zappalà L, Grégoire J-C, Kertész V, Streissl F & Milonas P, 2020. Pest categorisation of non-EU Scolytinae of coniferous hosts. EFSA Journal, 18 (1), e05934. Available online: https://doi.org/10.2903/j.efsa.2020.5934 EPPO, 2021. Xyleborus ferrugineus. EPPO Global Database (available online). https://gd.eppo.int Entwhistle, PF, 1972. Pests of Cocoa. Longman, London Flechtmann CAH, Ottati ALT and Berisford CW 2001. Ambrosia and bark beetles (Scolytidae: Coleoptera) in pine and eucalypt stands in southern Brazil. *Forest Ecology and Management*. 142, 183 – 191. Flechtmann CAH, Ottati ALT, Berisford CW 1999. Attraction of ambrosia beetles (Coleoptera : Scolytidae) to different tropical pine species in Brazil. *Environ. Entomol*. 28, 649-658. 10.1093/ee/28.4.649 GBIF_2021_Xyleborus ferrugineus (J.C.Fabricius, 1802). GBIF Backbone Taxonomy. https://doi.org/10.15468/39omei Accessed via https://www.gbif.org/species/5020459 (accessed 10 October 2021) Gohli J, Selvarajah T, Kirkendall LR, Jordal BH 2016. Globally distributed Xyleborus species reveal recurrent intercontinental dispersal in a landscape of ancient worldwide distributions. BMC Evol. Biol. 16, -. 10.1186/s12862-016-0610-7 Kirkendall LR and Jordal BH 2006. The bark and ambrosia beetles (Curculionidae, Scolytinae) of Cocos Island, Costa Rica and the role of mating systems in island zoogeography. *Biological Journal of the Linnean Society*. 89, 729–743. Koch FH and Smith WD 2008. Spatio-Temporal Analysis of Xyleborus glabratus (Coleoptera: Circulionidae: Scolytinae) Invasion in Eastern U.S. Forests. Environ. Entomol. 37, 442-452.

No.	Question	Quick scan answer for *Xyleborus ferrugineus*
		Klingeman WE, Bray AM, Oliver JB, Ranger CM, Palmquist DE 2017. Trap Style, Bait, and Height Deployments in Black Walnut Tree Canopies Help Inform Monitoring Strategies for Bark and Ambrosia Beetles (Coleoptera: Curculionidae: Scolytinae). *Environ. Entomol*. 46, 1120-1129. 10.1093/ee/nvx133 Lin W, Xu MF, Gao L, Ruan YY, Lai SC, Xu Y, Li Y 2021. New records of two invasive ambrosia beetles (Curculionidae: Scolytinae: Xyleborini) to mainland China. *BioInvasions Rec*. 10, 74-80. 10.3391/bir.2021.10.1.09 Maramorosch K, Martorell LF, Bird J, Melendez PL 1972. *Platypus rugulosus* (Platypodidae) and *Xyleborus ferrugineus* (Scolytidae) and certain diseases of coconut palms in Puerto-Rico. *J. N.Y. Entomol. Soc*. 80, 238-240. Miller DR, Rabaglia RJ 2009. Ethanol and (-)-alpha-Pinene: Attractant Kairomones for Bark and Ambrosia Beetles in the Southeastern US. *J. Chem. Ecol*. 35, 435-448. 10.1007/s10886-009-9613-9 Morales NE, Zanuncio JC, Pratissoli D, Fabres AS 2000. Population fluctuation of Scolytidae (Coleoptera) in areas planted with *Eucalyptus grandis* (Myrtaceae) in Minas Gerais, Brazil. *Rev. Biol. Trop*. 48, 101-107. Rabaglia RJ 2005. The validity of *Xyleborus impressus* Eichhoff (Coleoptera : Curculionidae : Scolytinae) as distinct from *Xyleborus ferrugineus* (Fabricius). *Coleopt. Bull*. 59, 261-266. 10.1649/768 Rangel R, Perez M, Sanchez S, Capello S 2012. Population fluctuation of *Xyleborus ferrugineus* and *X. affinis* (Coleoptera: Curculionidae) in ecosystems of Tabasco, Mexico. Rev. *Biol. Trop*. 60, 1577-1588. Roy K, Jaenecke KA, Peck RW 2020. Ambrosia Beetle (Coleoptera: Curculionidae) Communities and Frass Production in 'Ohi'a (Myrtales: Myrtaceae) Infected With *Ceratocystis* (Microascales: Ceratocystidaceae) Fungi Responsible for Rapid 'Ohi'a Death. *Environ. Entomol*. 49, 1345-1354. 10.1093/ee/nvaa108 Saunders JL, Knoke JK 1967. Diurnal emergence of *Xyleborus ferrugineus* (Coleoptera Scolytidae) from cacao trunks in Ecuador and Costa Rica. *Ann. Entomol. Soc. Am*. 60, 1094-&. 10.1093/aesa/60.5.1094 Saunders JL, Knoke JK, Norris DM 1967a. Endosulfan and lindane residues on trunk bark of *Theobroma cacao* for control of *Xyleborus ferrugineus*. *J. Econ. Entomol*. 60, 79-&. 10.1093/jee/60.1.79 Saunders JL, Norris DM, Knoke JK 1967b. Insect-host tissue interrelations between *Xyleborus ferrugineus* (Coleoptera Scolytidae) and *Theobroma cacao* in Costa Rica. *Ann. Entomol. Soc. Am*. 60, 419-+. 10.1093/aesa/60.2.419 Seo M, Martini X, Rivera MJ and Stelinski LL 2017. Flight Capacities and Diurnal Flight Patterns of the Ambrosia Beetles, Xyleborus glabratus and Monarthrum mali (Coleoptera: Curculionidae). Environmental Entomology, 46, 729–734. Williams JO 1988. Occurrence of *Xyleborus ferrugineus* (fabr) (Coleoptera, Scolytidae) on yam tubers in Nigeria. *Insect Sci. Appl*. 9, 41-42. 10.1017/S1742758400010006 Wood, Stephen L. 1977. Introduced and exported American Scolytidae (Coleoptera). *Great Basin Naturalist*: Vol. 37 : No. 1 , Article 5. Available at: https://scholarsarchive.byu.edu/gbn/vol37/iss1/5

No.	Question	Quick scan answer for ***Xyleborus ferrugineus***
14.	**Conclusions**	This Quickscan was prompted by the interception of *Xyleborus ferrugineus* cf in plants for planting of Dracaena from Costa Rica. *X. ferrugineus* is not known to be present in the EU. Large parts of the EU are likely suitable for establishment of the species. The species may cause economic damage especially on wood logs if it were to become established in the EU.
15.	**Follow-up measures**	The consignment was rejected.