Quick scan for *Xyleborus affinis*

National Plant Protection Organization, the Netherlands

Quick scan number: QS2022ENT002

Quick scan date: 27 January 2022

No.	Question	Quick scan answer for *Xyleborus affinis*
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*.	 Adult ambrosia beetle (*Xyleborus affinis*). Photo: Pest and Diseases Image Library , Bugwood.org **Scientific name:** *Xyleborus affinis Eichhoff 1868* **Common name:** Sugarcane shot-hole borer **Synonyms:** *Xyleborus affinis parvus* Eichhoff 1878, *Xyleborus affinis mascarensis* Eichhoff 1878, *Xyleborus affinis fuscobrunneus* Eichhoff 1878, *Xyleborus sacchari* Hopkins 1915, *Xyleborus subaffinis* Eggers 1933, *Xyleborus societatis* Beeson 1935, *Xyleborus proximus* Eggers 1943
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.*	Approximately 75 individuals of *Xyleborus affinis* were intercepted during a routine inspection on a consignment of *Yucca* sp. from Costa Rica. Specimens were found in the stem.

No.	Question	Quick scan answer for *Xyleborus affinis*
3.	What is the current area of distribution?	*X. affinis* occurs in many countries worldwide mostly in subtropical and tropical areas. The origin of *X. affinis* is in tropical America (Wood 1977, 1982 Gohli et al. 2006, Barnouin et al. 2020). However, some authors consider also North America to be in its native range since population distributions appear to be contiguous from Central America along the South Eastern United States (Atkinson and Peck 1994). The species has established in regions with a colder temperate climate (Dfa, Dfb classification on the Köppen Climate Classification) such as Toronto and Montreal (Douglas et al. 2013). *X. affinis* has a much wider Asian distribution than *X. ferrugineus*, which has only been reported from India (Lin et al. 2021). The distribution data listed below is based on Douglas et al. (2013), Rabaglia et al. (2006), Lin et al. (2021), Beaver and Liu (2010), Beaver et al. (2014), Atkinson (2021) and Lin et al. (2021): South America: Argentina, Bolivia, Brazil, Chile, Ecuador, Fr. Guiana, Guyana, Paraguay, Perú, Trinidad and Tobago, Uruguay, Venezuela. Central America: Belize, Honduras, Nicaragua, El Salvador, Costa Rica, Guatemala, Honduras, Nicaragua, Panamá throughout Caribbean (Antilles). Northern America: México, United States: Alabama, Arkansas, California, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Virginia, West Virginia, Canada (Quebec - near Montreal and in Ontario). Africa: Angola, Burundi, Cameroon, Congo, Cote d'Ivoire, Equatorial Guinea, Ethiopia, Bioko, Gabon, Guinea, Kenya, Liberia, Malawi, Mauritania, Mauritius, Nigeria, Republic of South Africa, Ruanda, Senegal, Sierra Leone, Tanzania, Togo, Uganda, Zambia, Azores, Seychelles, Reunion. Asia: China (Taiwan , Yunnan, Hainan, Fujian, Guangxi, Guangdong), India, Indonesia, Israel Malaysia, Sri Lanka, Thailand, Cambodia, Myanmar, Nepal. Oceania: Australia, Fiji, French Polynesia, Mariana Islands, New Caledonia, Palau Samoa, Hawaii.
4.	What are the hostplants?	The following list of host plants is based on Atkinson (2021), Lin et al. (2021), Weber & McPherson (1991) and Roy et al. (2020).

Family	***Species***
Aceraceae	*Acer saccharinum*
Agavaceae	*Dracaena fragrans, D. massangeana, Dracaena* sp.
Annonaceae	*Annona reticulata, A. squamosa*
Anacardiaceae	*Mangifera indica, Metopium brownei, Spondias dulcis, Spondias mombin, Spondias purpurea, Toxicodendron radicans,*
Apocynaceae	*Couma macrocarpa*
Aracaceae	*Arecastrum romanzoffianum, Cocos nucifera, Wodyetia bifurcata*
Araliacae	*Dendropanax arboretum, Schefflera octophylla*

No.	Question	Quick scan answer for *Xyleborus affinis*	
		Betulaceae	*Betula nigra*
		Bignoniaceae	*Spathodea campanulata, Tabebuia heterophylla, Tabebuia rosea*
		Burseraceae	*Bursera instabilis, Bursera simaruba, Dacryodes excelsa, Tetragastris altissima*
		Cannabaceae	*Celtis laevigata, C. occidentalis*
		Chrysobalanaceae	*Licania sp.*
		Clethraceae	*Clethra hondurensis*
		Clusiaceae	*Calophyllum calaba; Rheedia sp.*
		Combretaceae	*Buchenavia tetraphylla; Terminalia amazonica, T. catappa*
		Cupressaceae	*Chamaecyparis thyoides*
		Cyrillaceae	*Cyrilla racemiflora*
		Eleaocarpaceae	*Sloanea berteriana, S. multiflora*
		Euphorbiaceae*	*Croton nitens; Sapium laurocerasus, Hevea brasiliensis*
		Fagaceae	*Quercus alba, Q. rubra, Q. borealis, Q. coccinea, Q. falcata, Q. velutina, Q. virginiana, Castanea dentata*
		Hamamelidaceae	*Liquidambar styraciflua*
		Humiriaceae	*Sacoglottis procera*
		Juglandaceae	*Carya illinoinensis, Juglans nigra*
		Lauraceae	*Nectandra coriacea, Persea americana, Persea sp*
		Lecythidaceae	*Barringtonia asiatica, Eschweilera biflava, Eschweilera corrugata, E. grata, Lecythis sp.*
		Leguminosae	*Acacia guameri, Acrocarpus fraxinifolius, Andira inermis, Cajanus cajan, Dialium guianense, Erythrina costaricensis, Erythrina sp., Hymenea corbaril, Inga vera, Inga , Leucaena pulverulenta, Lonchocarpus macrophyllus, Pentaclethra macroloba, Schizolobium sp., Sindora glabra*
		Malvaceae	*Pachira quinata, Theobroma cacao*
		Melastomataceae	*Miconia prasine, M. globulifera*
		Meliaceae	*Cedrela odorata, Swietenia macrophylla, Trichillia propingua*
		Moraceae	*Brosimum alicastrum*
		Myrtaceae	*Metrosideros polymorpha*
		Nyctaginacae	*Eucalyptus robusta, Eucalyptus sp, Syzygium jambos, S. malaccense*
		Ochnaceae	*Cespedesia macrophylla*

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

Oleaceae	*Fraxinus sp*
Pinaceae	*Pinus caribaea, P. elliottii, P. sylvestris*
Poaceae	*Sacharinum officinale*
Rosaceae	*Prunus serotina*
Rubiaceae	*Anthocephalus chinensis*
Rutaceae	*Citrus sp.*
Salicaceae	*Populus deltoides*
Sapindaceae	*Meliococcus bijugatus, Toulicia pulvinata*
Sapotaceae	*Manilkara bidentata, M. zapota, Micropholis garcinifolia, Pouteria anibaefolia, P. egregia*
Taxodiaceae	*Taxodium distichum*
Urticaceae	*Cecropia peltata, C. schreberiana*
Verbenaceae	*Avicennia germinans, Gmelina arborea*

No.	Question	Quick scan answer for ***Xyleborus affinis***
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.).*	Hulcr & Stelinski (2017) have defined three distinct modes of ambrosia beetle damage: (i) "*association with a virulent tree pathogen*", (ii) "*mass accumulation on stressed trees*", and (iii) "*structural damage*" (including staining) of freshly sawn timber. Below, these different modes of damage are discussed for *X. affinis*. <u>Mode (i): Association with a virulent pathogen</u> *X. affinis* appears to be a potential vector of several economically important plant pathogens. Saucedo et al (2016) and Saucedo-Carabez et al. (2018) isolated *Raffaelea* species from *X. affinis* individuals collected from avocado plants with symptoms of laurel wilt disease, such as *Raffaelea lauricola*, *R. subfusca* and *R. arxii* with the last being the most abundant species associated with *X. affinis*. The frequency of vectoring the disease likely varies between related host species. Under experimental conditions, Carrillo et al. (2014) observed the transmission of the pathogen to redbay (*Persea borbonia*) by *X. affinis*, but not on avocado plants. Since the number of trees tested for incidence of transmission were low (N=5), it remains to be investigated whether the observed differences in transmission between *Persea* species by *X. affinis* are quantitative or qualitative. It is also uncertain how effective *X. affinis* is as a vector of *R. lauricola* (Carillo et al. 2014). Another group of pathogens that have been found associated with *X. affinis* are *Ceratocystis* species, the causal agent of diseases such as mango wilt, macadamia quick decline and ʻŌhiʻa Death of *Metrosideros polymorpha.* Souza et al. (2013) recovered *C. fimbriata* from both *X. affinis* individuals and their frass acquired from mango plants exhibiting wilt symptoms and demonstrated the pathogenicity of these fungal isolates to healthy seedlings. Chang (1993) showed that one of the three *Xyleborus* species vectoring the causal pathogen of macadamia quick decline may be *X. affinis*, the second most frequent species reared from

No.	Question	Quick scan answer for ***Xyleborus affinis***
		symptomatic trees. *X. affinis* was one of the Xyleborine species frequently recovered from *Metrosideros polymorpha* (a Hawaiian native tree) with symptoms of ʻŌhiʻa Death caused by *Ceratocystis* sp. (Roy et al. 2020). Frass of *X. affinis* frequently contained propagules of the pathogen (Roy et al. 2020). Other reported plant pathogenic fungal species associated with *X. affinis* include *Fusarium* sp., and *Phaeoacremonium* sp (Kostovcik et al. 2015 and refs. therein, Biedermann 2020, Saucedo-Carabez et al. 2018*).* Thus, several plant pathogenic fungi have been isolated from *X. affinis* but it remains uncertain to which extent the beetle contributes to the spread of the diseases caused by these fungi (i.e. how effectively they act as a vector). In conclusion, *X. affinis* is a potential vector of plant pathogenic fungi. It has been found associated with several plant pathogenic fungi. Its ability to transmit at least one of these fungi has been shown experimentally but its role in the spread of these fungi remains uncertain (i.e. how effectively *X. affinis* transmits these species). <u>Mode (ii): Mass accumulation on stressed trees</u> *X. affinis* is known to attack mainly weakened and stressed trees. Sobel et al. (2018): "*The presence of Xyleborus affinis can hasten the decline of weak and injured trees, but normally does not cause it".* Sobel et al. (2018) also points out that as a result of the species attacking "freshly dead wood", the cause of death is also frequently, and unjustly attributed to this species, while the number of confirmed records of *X. affinis* killing healthy trees is likely more limited. In conclusion, *X. affinis* may contribute to the decline of already weakened and stressed trees. <u>Mode (iii): Structural damage</u> Similar to *X. ferrugineus*, the risk of which for the EU has been recently assessed in another Quick scan, *X. affinis* also causes structural damage to freshly harvested timber (Wood 1977, Sobel et al. 2018; NPPO-NL, 2021). Wood (1977) mentions that *X. affinis* typically attacks trees that are stressed or damaged, dying and that it frequently attacks logs. However, *X. affinis* is thought to be uncommon in sawn timber (Wood 1977). Rabaglia et al. (2006) mentions that similar to *X. ferrugineus*, *X. affinis* causes damage in moist, lowland areas of the Neotropics. In conclusion, *X. affinis* can cause structural damage to wood logs especially under warm and moist conditions. Evidence for structural damage in areas with a more temperate climate has not been found.
6.	Assess the probability of establishment in the Netherlands (NL) (i.e. the suitability of the environment for establishment). a. In greenhouses b. Outdoors	See Question 7 (no detailed assessment made for the Netherlands).

No.	Question	Quick scan answer for *Xyleborus affinis*
	c. Otherwise (e.g. storage facilities, human environment)	
7.	Assess the probability of establishment in the EU (i.e. the suitability of the environment for establishment).	It is likely that *X. affinis* is able to establish in large parts of the EU. The species has a contiguous distribution up to north-eastern regions of USA (states around Michigan and Maine area) bordering areas in Canada (Ontario and Montreal area), where cold winters are not uncommon. *X. affinis* has a wide host range, including genera that are widespread across the EU, such as *Acer, Quercus, Castanea, Betula, Pinus, Juglans, Fraxinus,* and *Prunus*. *X. affinis* is likely able to establish in greenhouses where host plants are present.
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)?	The most likely pathway for spread of *X. affinis* is trading of timber and woody plants. There are no studies that quantify the dispersal capacity of *X. affinis*, but such information may be inferred from a well-studied congeneric *X. glabratus*, a species with a similar biology and overlapping distribution and habitat use. *X. glabratus* may on average disperse ~ 2m meters a day, and up to ~250m in a period of 2 weeks (Seo et al. 2017). The estimated annual spread of the pathogen vectored predominantly by *X. glabratus* was 54.8 km (Koch and Smith 2008), which likely reflects the combination of active and human assisted speed of dispersal of the species.
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?	Economic damage in the EU may be similar or less than in its current area of distribution (see 5). The species may: - contribute to the decline of weakened and stressed trees, and - cause structural damage to wood. However, structural damage is expected to be less severe because of less favourable conditions (lower temperatures and/or humidity) for *X. affinis* in the major part of the EU. Structural damage can occur especially under tropical (warm and moist) conditions (see 5). Several plant pathogenic fungi have been found associated with *X. affinis* but its role as a vector in the epidemiology of the diseases caused by these fungi is uncertain. No detailed assessment was made for the Netherlands. It is assessed that the species is mainly a risk for the warmer parts of the EU (i.e. southern EU).
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.*	n.a.

No.	Question	Quick scan answer for *Xyleborus affinis*
12.	Additional remarks	• *X. bispinatus*, a species that is probably also native to the Neotropics is established in the EU (Barnouin et al., 2020) • Earlier findings of *X. affinis* in Europe include those from Hungary (Merkl and Tusnadi 1992), Austria (Holzer 2007) and Italy (Carrai 1992). The Hungarian report is based on the finding of *X. affinis* in a greenhouse after importing an apparently infested consignment of *Dracaena fragrans* 'Massangeana'. Holzer (2007) found *X. affinis* in 2006 in Austria (Graz area). Kirkendall and Faccoli (2010) subsequently designated *X. affinis* as "established" and "rare" in Austria. However, this designation is likely premature as the report is based on a single specimen encountered in a Malaise trap (albeit not along a trading port of entry). *X. affinis* appears to be regularly imported with infested *Dracaena* (Carrai 1992, Kirkendall and Faccoli 2010).
13.	References	Atkinson T, 2021. *Xyleborus affinis* Eichhoff 1868. Bark and ambrosia beetles of the Americas [Web page]. Available online: http://www.barkbeetles.info/amer_chklist_target_species.php?lookUp=2046 [Accessed: 14-1-2021]. Atkinson, T. H., and S. B. Peck. 1994. Annotated checklist of the bark and ambrosia beetles (Coleoptera: Scolytidae) of tropical southern Florida. *Fla. Entomol*. 77, 313-329. 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 RA, Liu LY 2010. An annotated synopsis of Taiwanese bark and ambrosia beetles, with new synonymy, new combinations and new records (Coleoptera: Curculionidae: Scolytinae). *Zootaxa*. 2602, 1-47. Beaver RA, Sittichaya W, Liu LY 2014. A Synopsis Of The Scolytine Ambrosia Beetles Of Thailand (Coleoptera: Curculionidae: Scolytinae). *Zootaxa*. 3875, 1-82. Biedermann PHW 2020. Cooperative breeding in the ambrosia beetle *Xyleborus affinis* and management of its fungal symbionts. *Frontiers in Ecology and Evolution*. 8, -. Carrai C (1992) *Xyleborus affinis* Eichh. su tronchetti di *Dracaena* di importazione. Informatore. *Fitopatologico* 10: 27–30. Carrillo D, Duncan RE, Ploetz JN, Campbell AF, Ploetz RC and Peña JE 2014. Lateral transfer of a phytopathogenic symbiont among native and exotic ambrosia beetles. *Plant Pathology*. 63, 54–62. Chang VCS 1993. Macadamia quick decline and *Xyleborus* beetles (Coleoptera, Scolytidae). *Int. J. Pest Manage*. 39, 144-148. 10.1080/09670879309371779 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

No.	Question	Quick scan answer for *Xyleborus affinis*
		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 Holzer (2007) Erstnachweise und Wiederfunde für die Käferfauna der Steiermark (X) (Coleoptera). *Joannea Zoologie* 9, 51–68. Kirkendall LR and Faccoli M 2010. Bark beetles and pinhole borers (Curculionidae, Scolytinae, Platypodinae) alien to Europe. In: Cognato AI, Knížek M (Eds) Sixty years of discovering scolytine and platypodine diversity: A tribute to Stephen L. Wood. *ZooKeys* 56, 227– 251. doi: 10.3897/zookeys.56.529 Koch FH and Smith WD 2008. Spatio-Temporal Analysis of Xyleborus glabratus (Coleoptera: Curculionidae: Scolytinae) Invasion in Eastern U.S. Forests. *Environ. Entomol.* 37, 442-452. Kostovcik M, Bateman CC, Kolarik M, Stelinski LL, Jordal BH, Hulcr J 2015. The ambrosia symbiosis is specific in some species and promiscuous in others: evidence from community pyrosequencing. *ISME Journal*. 9, 126-138. 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 Merkl O, Tusnádi CK (1992) First introduction of *Xyleborus affinis* (Coleoptera: Scolytidae). *Folia Entomologica Hungarica* 52, 67–72. NPPO-NL 2021 Quick scan for *Xyleborus ferrugineus*. National Plant Protection Organization of the Netherlands. Netherlands Food and Consumer Product Safety Authority. Available at https://english.nvwa.nl/topics/pest-risk-analysis/documents/plant/plant-health/pest-risk-analysis/documents/quickscan-xyleborus-ferrugineus. Rabaglia RJ, Dole SA, Cognato AI (2006) Review of American Xyleborina (Coleoptera: Curculionidae: Scolytinae) occurring North of Mexico, with an illustrated key. Annals of the Entomological Society of America 99: 1034–1056. doi: 10.1603/0013-8746(2006)99[1034:ROAXCC]2.0.CO;2 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 Saucedo J, Ploetz R, Carrillo D, Konkol J, Smith J, Rollins J, Ochoa S 2016. *Raffaelea arxii* may be the primary symbiont of *Xyleborus affinis*. *Phytopathology*. 106, 124-124. Saucedo-Carabez JR, Ploetz RC, Konkol JL, Carrillo D, Gazis R 2018. Partnerships between ambrosia beetles and fungi: lineage-specific promiscuity among vectors of the laurel wilt pathogen, *Raffaelea lauricola*. *Microbial Ecology*. 76, 925-940. 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. Sobel, L., Lucky, A. & Hulcr, J. (2018) *Xyleborus affinis* Eichhoff, 1868 (Insecta: Coleoptera: Curculionidae: Scolytinae). EENY 627, University of Florida. Available from: http://entnemdept.ufl.edu/creatures/trees/beetles/Xyleborus_affinis.htm/

No.	Question	Quick scan answer for ***Xyleborus affinis***
		Souza AGC, Maffia LA, Murta HM, Alves YH, Pereira RM, Picanco MC 2013. first report on the association between *Ceratocystis fimbriata*, an agent of mango wilt, *Xyleborus affinis*, and the sawdust produced during beetle colonization in Brazil. *Plant Disease*. 97, 1116-1116. Weber BC, Mcpherson JE 1991. Seasonal flight patterns of Scolytidae (Coleoptera) in black-walnut plantations in North-Carolina and Illinois. *Coleopterists Bulletin*. 45, 45-56. Wood, S. L. 1982. The Bark and Ambrosia Beetles of North and Central America (Coleoptera: Scolytidae), a taxonomic monograph. Great Basin Nat. Mem. No. 6. 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
14.	**Conclusions**	This quick scan was prompted by the finding of *Xyleborus affinis* in a consignment of Yucca from Costa Rica. *X. affinis* is not known to be present in the EU. Large parts of the EU are likely suitable for establishment of the species. The species is not known as a primary pest of healthy plants. *X. affinis* may cause economic damage on wood logs if it were to become established in the EU. However, the climatic conditions in the EU may generally be unfavourable for infestation of wood logs. Several plant pathogenic fungi have been found associated with *X. affinis* but its role as a vector in the epidemiology of the diseases caused by these fungi is uncertain.
15.	**Follow-up measures**	Infested plants must be destroyed (all non-European Scolytinae are regulated in the EU)