Zootaxa 4877 (1): 051–074
https://www.mapress.com/j/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)
https://doi.org/10.11646/zootaxa.4877.1.2
http://zoobank.org/urn:lsid:zoobank.org:pub:3CABEE0D-D1D2-4150-983C-8F8FE2438953

Bark beetles and pinhole borers recently or newly introduced to France (Coleoptera: Curculionidae, Scolytinae and Platypodinae)

THOMAS BARNOUIN[1*], FABIEN SOLDATI[1,7], ALAIN ROQUES[2], MASSIMO FACCOLI[3], LAWRENCE R. KIRKENDALL[4], RAPHAËLLE MOUTTET[5], JEAN-BAPTISTE DAUBREE[6] & THIERRY NOBLECOURT[1,8]
[1]*Office national des forêts, Laboratoire national d'entomologie forestière, 2 rue Charles Péguy, 11500 Quillan, France.*
[7] *https://orcid.org/0000-0001-9697-3787*
[8] *https://orcid.org/0000-0002-9248-9012*
[2]*URZF- Zoologie Forestière, INRAE, 2163 Avenue de la Pomme de Pin, 45075, Orléans, France.*
alain.roques@inra.fr; https://orcid.org/0000-0002-3734-3918
[3]*Department of Agronomy, Food, Natural Resources, Animals and Environment (DAFNAE), University of Padua, Viale dell'Università, 16, 35020 Legnaro, Italy.*
massimo.faccoli@unipd.it; https://orcid.org/0000-0002-9355-0516
[4]*Department of Biology, University of Bergen, P.O. Box 7803, N-5006 Bergen, Norway.*
lawrence.kirkendall@bio.uib.no; https://orcid.org/0000-0002-7335-6441
[5]*ANSES, Laboratoire de la Santé des Végétaux, 755 avenue du Campus Agropolis, CS 30016, 34988 Montferrier-sur-Lez cedex, France.*
raphaelle.mouttet@anses.fr; https://orcid.org/0000-0003-4676-3364
[6]*Pôle Sud-Est de la Santé des Forêts, DRAAF SRAL PACA, BP 95, 84141 Montfavet cedex, France.*
jean-baptiste.daubree@agriculture.gouv.fr; https://orcid.org/0000-0002-5383-3984
**Corresponding author: labo.entomo@onf.fr; https://orcid.org/0000-0002-1194-3667*

Abstract

We present an annotated list of 11 Scolytinae and Platypodinae species newly or recently introduced to France. Four species are recorded for the first time as interceptions: *Euplatypus hintzi* (Schaufuss), *Euplatypus parallelus* (Fabricius), *Xyleborus affinis* Eichhoff and *Xyleborus ferrugineus* (Fabricius). Two are possibly naturalised: *Xyleborus bispinatus* Eichhoff and *Cryphalus dilutus* Eichhoff, while *Cyclorhipidion distinguendum* (Eggers) and *Xyloterinus politus* (Say) are confirmed as species newly established in Europe. Moreover, an unidentified species of *Amasa* Lea, collected previously in Spain, is recorded for the first time in France: *Amasa* sp. near *truncata* (Erichson). We point out that literature references to *Amasa truncata* as an invasive species in New Zealand and South America are incorrect, as the photographs of these non-native populations do not match the holotype of *A. truncata*. For each species we have updated its global distribution, detailed all French records, and summarized biology, ecology, host trees and potential risks as pests.

Keywords: Europe, ambrosia beetles, alien species, exotic species, new records

Introduction

Biological invasions are considered among the main threats to biodiversity and causing many negative impacts on forest and agro-ecosystems (Pimentel *et al.* 2005; Kenis & Branco 2010). In many countries, introduced wood boring insects pose serious risks because they are likely to cause significant damage to natural forest areas, wood plantations and arboriculture (Beaver 2013; Cutajar & Mifsud 2017; Vannini *et al.* 2017). With the increase of international trade, the rate of introduction of these insects has steadily increased throughout the twentieth century, accelerating in the last 20 years (Haack 2006; Kirkendall & Faccoli 2010; Rassati *et al.* 2016; Inward 2020). In Europe and North America, alien wood boring species are mainly from Asia (Haack 2006; Kirkendall & Faccoli 2010; Rassati *et al.* 2016; Roques *et al.* 2020) and comprise mainly bark beetles and pinhole borers (Coleoptera: Curculionidae, Scolytinae and Platypodinae: Haack 2006; Sauvard *et al.* 2010; Rassati *et al.* 2016). These beetles are difficult to intercept and detect due to their small size and ability to survive for long periods when under bark or in wood, and they are easily transported via international trade in woody products, especially wood packaging ma-

Accepted by S. Smith: 22 Sept. 2020; published: 9 Nov. 2020

terials and logs (Kirkendall & Faccoli 2010; Marini *et al.* 2011). In addition, their reproductive strategy and trophic plasticity allow them to colonize and adapt quickly to new environments (Kirkendall & Faccoli 2010). For example, *Xylosandrus germanus* (Blandford) colonized the whole of France in just 30 years (Nageleisen *et al.* 2015) becoming the most common species in many French forests (Bouget & Noblecourt 2005; LNEF-ONF unpublished data).

Kirkendall & Faccoli (2010) identified 19 invasive species of Scolytinae and Platypodinae in Europe, and Rassati *et al.* (2016) tallied 18 species in the Mediterranean Basin, the main area of introduction to Europe. After Italy, France is the second European country most affected by this invasion (Kirkendall & Faccoli 2010; Rassati *et al.* 2016). Recently, several new exotic scolytines have been found in France (Nageleisen *et al.* 2015; Chapin *et al.* 2016; Noblecourt & Lessieur 2016; Lagarde & Noblecourt 2018). The proliferation of alien species in France over the past ten years has led to the strengthening of surveillance of international port and airport areas, the main points-of-entry, as well as to the deployment of a specific monitoring program for the survey of these new invaders (Daubrée 2016; Fan *et al.* 2019). The programs of surveillance of the French territory, associated with many inventories and studies carried out in France on the saproxylic entomofauna, has resulted in detection of exotic beetles of the families Cerambycidae (Fan *et al.* 2019), Scarabaeidae (Soldati *et al.* 2016), Nitidulidae (Jelínek *et al.* 2016; Soldati *et al.* 2019) and Zopheridae (Soldati *et al.* 2018). We present here an annotated list of exotic species of Scolytinae and Platypodinae recently introduced to France.

Material and Methods

Acronyms used

ANSES	Agence Nationale de Sécurité Sanitaire de l'alimentation, de l'environnement et du travail (French Agency for Food, Environmental and Occupational Health & Safety)
CNRS	Centre National de la Recherche Scientifique (French National Center of Scientific Research)
DSF	Département de la Santé des Forêts (French Department of Forest Health)
FD	Forêt domaniale (national forests)
INRAE	Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement (French National Institute of Research for Agriculture, Food and Environment)
LNEF-ONF	Laboratoire National d'Entomologie Forestière de l'ONF (National Laboratory of Forest Entomology of the ONF)
ONF	Office National des Forêts (French National Forest Office)
OPIE	Office pour les Insectes et leur Environnement (Office for Insects and their Habitats)
PNR	Parc Naturel Régional (Regional Natural Park)
RBI	Réserve Biologique Intégrale (Biological Reserve)
URZF	Unité de Recherche en Zoologie Forestière, INRAE centre Val de Loire (Forest Zoology Research Unit, INRAE Val de Loire Center)

Terminology

The terminology concerning biological invasions is still much discussed; in this paper we will use the semantics proposed by Kirkendall & Faccoli (2010). The terms "exotic", "non-native" and "alien" we use interchangeably and are used to designate species whose native distribution is external to France according to our references. The term "invasive" is used for non-native species with established populations in both natural and anthropic habitats. All species unintentionally imported into France by human activities are called "introduced". Finally, the terms "naturalized" and "established" are used interchangeably for alien species able to breed in the natural environment, producing self-sustainable populations.

Origins of the captures

The alien species found in France and reported in this paper are the result of several projects of different nature and purpose in which the LNEF-ONF is involved. A part of these captures come from two programs devoted specifically to the French territorial surveillance. The first, run by the French Department of Forest Health since 2015, is a program aimed to determine the extension of an outbreak of an exotic scolytine recently introduced to France, *Xylosandrus crassiusculus* (Motschulsky) (Daubrée 2016). In this respect, a trapping protocol was deployed on the Côte d'Azur, around the introduction site, in an area extending from Menton (Alpes-Maritimes) to Toulon (Var). The second project, followed since 2014 by one of the authors (AR), is intended to test traps baited with generic lures for the early detection of new introductions of exotic xylophagous insects within the French port and airport areas (Fan *et al.* 2019). In addition, a European LIFE project entitled SAMFIX (*SAving Mediterranean Forests from Invasions of Xylosandrus beetles and associated pathogenic fungi*), deployed traps baited with attractants specifically targeting invasive ambrosia beetles in a number of sites of southeastern France since 2018 (Roques *et al.* 2019).

Some captures were incidental interceptions made by Polytrap™ traps in the framework of inventories and scientific studies conducted on French saproxylic Coleoptera. Indeed, LNEF-ONF associated with the entomology network of ONF and OPIE deploys each year in France a large network of traps. In 2018, at least 35 sites throughout the country were involved in these inventories. In addition, the LNEF-ONF regularly collaborates with research laboratories (INRAE, CNRS, etc.) acting as supporting infrastructure for beetle identification in studies concerning biodiversity and forest management.

Protocols of detection, identification and report

The detection of exotic Scolytinae and Platypodinae was carried out during the routine work by LNEF-ONF members with long experience concerning the fauna of France, about 150 species (Noblecourt 2014).

Initial identifications were then carried out by one of the authors (TN) based on taxonomic literature (Balachowsky 1949) and on the important collection of LNEF-ONF that includes more than 95% of the French species. For the most problematic species, confirmation or correction of the identifications was requested from international experts. For *Cryphalus dilutus* Eichhoff, *Xyleborus affinis* Eichhoff, *Xyleborus bispinatus* Eichhoff and *Xyleborus ferrugineus* (Fabricius), the verifications were performed by one of the authors (MF) while the identification of *Euplatypus hintzi* (Schaufuss) and *Euplatypus parallelus* (Fabricius) were made by another author (LRK) who also verified the identifications of *X. bispinatus* and *X. ferrugineus*. *Euplatypus hintzi* was determined by comparison with African specimens identified by Roger A. Beaver or Karl E. Schedl. Concerning *Cyclorhipidion distinguendum* (Eggers) [= *C. fukiense* (Eggers), Smith *et al.* 2020b], the collected specimens remained indeterminate for a long time and the identification was then conducted jointly with Benoit Dodelin. Sequencing of the mitochondrial COI gene for two specimens captured in the Chartreuse Massif was carried out as part of the CLIMTREE barcoding project (specimen ID: BC-PNEF-PSFOR1198 & BC-PNEF-PSFOR1199; available on BOLD database: http://boldsystems.org) (Sire *et al.* 2019). The two sequences obtained were passed on to Sarah M. Smith (Michigan State University), who confirmed the species identity in comparison with sequences from Asian specimens (China and Taiwan). The molecular identification was then validated morphologically by Heiko Gebhardt (University of Tübingen) who compared a specimen from La-Motte-Servolex to a type of the Schedl collection (Museum of Natural History of Vienna). The identification of *Amasa* sp. near *truncata* (Erichson) was a laborious process and primarily involved comparisons of specimens and photographs from France with photographs of species of *Amasa* available from the internet and in the literature combined with email exchanges with Roger A. Beaver, Miloš Knižek, Andrew J. Johnson, Sarah M. Smith, and Miguel Alonso-Zarazaga.

Following identification and validation, all the new alien species detected were reported by the LNEF-ONF to the plant protection service of the ANSES Montpellier (Hérault) so that any necessary control measures could be initiated. In order to facilitate further identifications, at least one specimen of each species is kept in the voucher collections of the LNEF-ONF in Quillan (Aude - France).

Biology and distribution in France

The information presented in this paper for each species builds upon that of Kirkendall & Faccoli (2010). Thus, the information relating the region of origin, the date of first introduction to France, the trophic guild, and the diet were completed for all species. In addition, the colonization stage was evaluated according to five phases (Table 1) defined according to Kirkendall & Faccoli (2010). For species considered as naturalized in France, the colonized climatic zone was also indicated.

TABLE 1. Definition of colonization phase applied of alien species in France (Kirkendall & Faccoli 2010)

	Population level in France	Examples of evidence (not exhaustive)
Phase 1	Interception, recently arrived (no evidence of establishment)	Collected from imported plant material; trapped at port or near imported logs; unique, old literature records
Phase 2	Local colony persisting	One area: many specimens; repeated collections; collections in natural forests far from ports of entry
Phase 3	>1 colony, not spreading	Disjoined populations, but no sign of expanding
Phase 4	More than one large colony, spreading	Disjoined populations: well established in several areas and still spreading
Phase 5	Established throughout suitable habitats	Distributed throughout region with currently suitable climate and host plants

Results and discussion

Species introduced to France

Twenty-two identified species of exotic bark and ambrosia beetles have been introduced into France to which we add an indeterminate species belonging to the genus *Amasa* Lea (Table 2). Seven species are considered to date as simple interceptions (phase 1). For *Xylosandrus morigerus* (Blandford) and *Phloeosinus rudis* Blandford, contrary to what is envisaged at European and Mediterranean scale (Kirkendall & Faccoli 2010; Rassati *et al.* 2016), the absence of new reports for more than 80 years argues against naturalization of these species in France. However, a breeding population of *P. rudis* was recently reported in Belgium in a standing dead trunk of *Cupressus sempervirens* L. in a botanical garden near Brussels (Moucheron *et al.* 2019). Four other species are considered just to be interceptions and are reported for France for the first time: *Xyleborus affinis*, *X. ferrugineus*, *Euplatypus hintzi* and *E. parallelus*. They have all only been caught in port areas, though sometimes in relatively large numbers (especially the two *Euplatypus* species). However, traps baited with similar attractants within a radius of 1 km from the port area did not catch any specimens of these species, suggesting they have not spread out of the port. A single individual of a fifth species, *Phloeotribus liminaris* (Harris), was intercepted at the border of a large port area. Thus, neither evidence of *in natura* reproduction nor the presence of a viable population support the hypothesis that these five species are established in France.

Excluding *Xylosandrus morigerus* and *Phloeosinus rudis*, 11 species of scolytines and platypodines are considered to be naturalized in France (phase 2 and above) (Kirkendall & Faccoli 2010; Sauvard *et al.* 2010; Chapin *et al.* 2016; Rassati *et al.* 2016; Lagarde & Noblecourt 2018). Our results add five new species to this list, bringing to 16 the total number of exotic bark and ambrosia beetles naturalized in France (Table 2). *Cyclorhipidion distinguendum* and *Xyloterinus politus* (Say) have been incidentally captured in the wild in large numbers and in several localities although they have not previously been reported from Europe. *Cryphalus dilutus* and *Xyleborus bispinatus* had been expected to reach the French coast since they occur in bordering countries (southern Italy and Malta) and have been rapidly expanding toward western Mediterranean regions (Faccoli *et al.* 2016a; Gaaliche *et al.* 2018; INPV 2018).

The increase in naturalized exotic species occurring in France of about 45% in less than 10 years is largely due to new recent introductions, as recorded in last decades in the whole of Europe and in the Mediterranean Basin (Kirkendall & Faccoli 2010; Rassati *et al.* 2016). The recent intensification of sampling and monitoring programs is probably also an important factor in this significant increase (Kirkendall & Faccoli 2010). The increase in trapping and discovery of alien species has occurred both in natural environments as part of saproxylic wildlife inventory programs (Bouget & Noblecourt 2005; Noblecourt & Lessieur 2016; Lagarde & Noblecourt 2018) and through the implementation of monitoring and surveillance programs specifically targeted for the detection of exotic wood-boring insects (Daubrée 2016; Fan *et al.* 2019).

Distribution and biology of recently and newly introduced Scolytinae species

- *Amasa* sp. near *truncata* (Erichson)

(Figs. 1A, 1B)

Distribution and identification. The genus *Amasa* is native to Asia and Australasia (Wood & Bright 1992) and comprises at least 53 species (Wood & Bright 1992; Smith *et al.* 2020a, 2020b). Little is known of the biology of most species, but in Australia and Malaysia most recorded hosts are in the Myrtaceae (Browne 1961; Wood & Bright 1992).

Based on photographs, *Amasa* specimens from France appear to belong to the same species that was collected in Spain in 2009. Furthermore, the both European populations appear to be the same as the *Amasa* now established in *Eucalyptus* plantations in New Zealand, Brazil, Uruguay and Chile (Milligan 1969; Zondag 1977; Flechtmann & Cognato 2011; Gómez *et al.* 2017; Kirkendall 2018). The single Spanish specimen from Cádiz was identified as the southeast Asian species *A. resecta* (Eggers) (Viñolas & Verdugo 2011), possibly based on photographs of said species (https://www.insectimages.org/browse/detail.cfm?imgnum=5593028). Details of the declivity differ, however. A mtDNA sequence from the COI gene of a French specimen was 100% identical to an unidentified bark beetle sequence in the BOLD database from New South Wales, Australia (M.A. Auger-Rozenberg, pers. comm.: http://v3.boldsystems.org/index.php/Public_RecordView?processid=SBGB053-03), meaning that the French specimen is an Australian species (and morphologically it is clearly an *Amasa*). The New Zealand *Amasa* and South American populations were all identified as *Amasa truncata* (Erichson). This appears now to be incorrect. Bark beetle taxonomists Roger A. Beaver and Milos Knižek (both, pers. comm., April 2020) have examined the holotype, which has noticeably longer setae on the declivity and more pronounced swellings on the odd-numbered declivital interstriae. These differences can be seen in the PaDIL photographs of *Amasa truncata* (http://www.padil.gov.au/pests-and-diseases/pest/main/141313). *Amasa* sp. near *truncata* does not match photos or descriptions of the any of other four species of *Amasa* recorded from Australia, nor does the *Amasa* now in South America (Flechtmann & Cognato 2011), but there are at least four more undescribed species in the genus present in that country that are similar to and have been confused with *A. truncata* (R. A. Beaver, pers. comm., April 2020). The invasive species, then, could well be one of those undescribed cryptic species.

Many adults of an *Amasa* species were trapped throughout the summer 2018 in the arboretum of Villa Thuret in Antibes, then again in 2019; none were trapped in the nearby Garoupe forest although a number of similarly baited traps were deployed there. In 2019, specimens were caught on the island of Sainte Marguerite, ca. 8 km away. These data show that this species has become established in that region.

New records. **ALPES-MARITIMES –** Antibes, Villa Thuret, interception traps baited with ethanol 100%, (-) α-pinene and a blend of longhorn beetle pheromones: 3 ind. from 27.VI. to 18.VII.2018, 24 ind. from 19.VII. to 08.VIII.2018, 17 ind. from 29.VIII. to 19.IX.2018, and 10 ind. from 20.IX to 11.X. 2018, URZF *leg.*; *ibidem*, from 21.V. to 22.X.2019, 22 ind., URZF *leg.;* Cannes, Sainte- Marguerite island, interception traps baited with ethanol 100%, (-) α-pinene, and a pheromone blend for longhorn beetles, from 24.V. to 14.VI.2019, 3 ind., URZF *leg.*

Damage and infestation risk. *Amasa* species have mandibular mycangia which transport symbiotic fungi belonging to *Raffaelea* (previously reported as *Dryadomyces*), a genus that includes a number of pathogenic species (Gebhardt *et al.* 2005; Hulcr & Stelinski 2017). However, there are no reports yet of significant damage being caused by either *A. truncata* or *A*. sp. near *truncata* (reviewed in Kirkendall 2018).

- *Cryphalus dilutus* Eichhoff

(Figs. 3A, 3B)

Nomenclatural note. Our specimens are the same species as that reported in previous literature for southern Europe (Italy and Malta) as *Hypocryphalus scabricollis*. In a recent treatment of *Hypocryphalus*, Johnson *et al.* (2017) state that the *Hypocryphalus* from southern Europe, North Africa, Middle East and southern Asia is *H. dilutus*. Verifications carried out by authors on male specimens from France, Italy, Tunisia and Malta confirmed species identification. Indeed the males have a sharp, true (non-socketed) spine on the proximal face of the mesofemur, which is a unique character not described or observed in any other *Hypocryphalus* species, or even any other scolytine (Johnson *et al.* 2017). This species is now placed in *Cryphalus* Erichson, the genus in which it was originally described (Johnson *et al.* 2020).

Distribution. Described from and probably native to north of the Indian subcontinent (Eichhoff 1878), *C. dilutus* is a highly successful invasive species newly intercepted in France. After Malta in 1991 (Mifsud & Knižek 2009) and Sicily in 2014 (Faccoli *et al.* 2016a), France is the third European country colonized by this species. On the Mediterranean rim, this species has recently been found in Tunisia (Gaaliche *et al.* 2018) and Algeria (INPV 2018). In Malta, the species has become common throughout the country (Mifsud *et al.* 2012), while in Sicily it has been detected in eight localities in just two years (Faccoli *et al.* 2016a). A thermophilic species, *C. dilutus* is preadapted to the Mediterranean climate. In France, it was captured in good numbers (30 individuals) in two municipalities of the peninsula of Saint-Tropez. Thus, available data suggest that this species is already established in France, though details of its distribution remain to be ascertained.

New records: **VAR –** Ramatuelle, bottle trap: 2 ind. from 02.VIII. to 22.VIII.2017 and 2 ind. from 27.IX. to 19.X.2017, DSF *leg.*; Ramatuelle, Pascasti, bottle trap, 05.VII. to 19.VII.2017, 1 ind., DSF *leg.*; Saint-Tropez, Salins, interception traps baited with ethanol 20%: 1 ind. from 24.III. to 12.IV.2017, 3 ind. from 05.VII. to 19.VII.2017, 4 ind. from 02.VIII. to 22.VIII.2017, 10 ind. from 13.IX. to 27.IX.2017 and 7 ind. from 27.IX. to 19.X.2017, DSF *leg.*

Biology and ecology. *Cryphalus dilutus* is a small bark beetle species that breeds in twigs, branches and trunks of the host trees and shrubs (Cutajar & Mifsud 2017). It attacks stressed or dying trees as well as healthy individuals (Cutajar & Mifsud 2017; Gaaliche *et al.* 2018). Johnson *et al.* (2017) found there to be two slightly divergent clades of *C. dilutus*, one developing in mango (*Mangifera indica* L.) and the other in several species of fig trees. In Malta, the fig clade of this species was probably introduced via international trade of *Ficus retusa* L., a species imported from Asia frequently used as an ornamental tree along roads and in the Maltese gardens (Mifsud & Knižek 2009). *C. dilutus* was found infesting several fig species on the Maltese island (*Ficus macrocarpa* L., *F. retusa* and *F. carica* L.) (Mifsud & Knižek 2009; Mifsud *et al.* 2012). In Sicily, it develops on both wild and cultivated common fig (*F. carica*) (Faccoli *et al.* 2016a). Data from Tunisia confirm the common fig as a *C. dilutus* host in the Mediterranean Basin (Gaaliche *et al.* 2018). Thus, these data support the hypothesis that the *C. dilutus* in France belong to the *Ficus*-breeding lineage.

Damage and infestation risk. Massive infestations of *C. dilutus* cause a host dieback resulting in the partial drying of the main branches and leave yellowing. Rapidly, the whole tree is affected with sap flow and bark cracks visible at the base of the trunk (Cutajar & Mifsud 2017; Gaaliche *et al.* 2018). The dieback leads to tree death, which mainly affects old trees regardless of their vigor (Gaaliche *et al.* 2018). In Malta, more than 50% of the fig trees infested by this insect died between 2011 and 2017, which led the authorities to implement a monitoring and a control program against this species (Cutajar & Mifsud 2017). As France is the fourth largest producer of figs in Europe, this pest represents a major threat to this fruit tree.

- *Cyclorhipidion distinguendum* (Eggers)
(Fig. 1C)

Distribution. *C. distinguendum,* native to Southeast Asia, was recently detected in two eastern states of the United States, South Carolina and Georgia (Hoebeke *et al.* 2018). France is the first European country where this species is reported. Detected for the first time in 2013 in the Dauphiné Pre-Alps (Dodelin 2018), the species is currently known from five municipalities in two French departments. It was captured in moist alder mixed forest at low altitude and in beech-fir forests growing at low altitude. Thus, *C. distinguendum* is established in France but the point-of-entry remains unknown. It occupies a small geographical area stretching from the Chartreuse massif to south and from the Épine and the Chambotte mountains to the north. Its overall distributional range in France is unclear, however.

Literature records: **SAVOIE –** Brison-Saint-Innocent, interception trap, from 02.V. to 12.VII.2018, 4 ind. (Dodelin 2018); La-Motte-Servolex, interception trap, 28.VI.2013, 2 ind. (Dodelin 2018); Saint-Jean-de-Chevelu, interception trap, from 01.VIII. to 06.IX.2017, 4 ind. (Dodelin 2018).

TABLE 2. List of Scolytinae and Platypodinae introduced to France. Phase: see Table 1; Bioclimat: M, Mediterranean region; T, Temperate region. Feeding guild: Spm, spermatophagous, breeding in seeds; Phl, phloeophagous, breeding in inner bark; Xm, xylomycetophagous (ambrosia beetles).

	Native to	Phase	First record	Bioclimat / Feeding guild	Additional informations	References
SCOLYTINAE						
Amasa sp. near *truncata* (Erichson)	Australia	2	2018	M / Xm	French Riviera: Antibes and Cannes. Host presumably *Eucalyptus*.	This work
Coccotrypes dactyliperda (Fabricius)	Unknown (cosmopolitan)	5	< 1949	M / Spm	Common. Entire Mediterranean region. In seeds of palm trees.	Balachowsky 1949; Kirkendall & Faccoli 2010
Cyclorhipidion bodoanum (Reitter)	North Asia	5	1960	T / Xm	Common. Widespread in the French mainland, especially in plains. On broadleaved trees (mainly oaks).	Kirkendall & Faccoli 2010
Cyclorhipidion distinguendum (Eggers)	Southeast Asia	3	2013	T / Xm	Rare. Alps: Dauphiné. On broadleaved trees (Fagaceae).	Dodelin 2018; this work
Cryphalus dilutus Eichhoff	Indian subcontinent	2	2017	M/ Phl	French Riviera: Saint-Tropez area. On broadleaved trees (fig trees).	This work
Dactylotrypes longicollis (Wollaston)	Canary Islands	5	1940	M / Spm	Locally common invasive throughout Mediterranean. In the seeds of palm trees.	Balachowsky 1949; Kirkendall & Faccoli 2010
Dryocoetes himalayensis Strohmeyer	South Asia (India)	4	1975	T / Phl	Rare. Sporadic in France. On broadleaved trees (walnut and probably oaks).	Knížek, 2011a; Schott 2017; this work
Gnathotrichus materiarius (Fitch)	Northeastern USA	5	1933	T / Xm	Common. Widespread in the French mainland, especially plains. On Conifers (mainly pines).	Balachowsky, 1949; Kirkendall & Faccoli 2010
Hypothenemus eruditus Westwood	Unknown (cosmopolitan)	5	< 1949	M / Phl	Southern France. On broadleaved trees (mainly fig trees).	Balachowsky 1949; Kirkendall & Faccoli 2010
Liparthrum mandibulare (Wollaston)	Canary Islands	2	2015	T / Phl	Locally abundant. French Britany (Côte d'Armor). On various broadleaved trees and shrubs.	Lagarde & Noblecourt 2018
Phloeosinus rudis Blandford	East Asia	1	1940	Phl	Rare. Southeast France: Var. Not recorded since 1945. On Conifers (Cupressaceae).	Balachowsky 1949; Kirkendall & Faccoli 2010

...Continued on the next page

TABLE 2. (Continued)

	Native to	Phase	First record	Bioclimat / Feeding guild	Additional informations	References
Phloeotribus liminaris (Harris)	East USA	1	2007	Phl	Southwest France: Gironde. On *Prunus serotina*.	Noblecourt & Lessieur 2016
Xyleborus affinis Eichhoff	Unknown (cosmotropical)	1	2016	Xm	Charente-Maritime: port of La Rochelle.	This work
Xyleborus bispinatus Eichhoff	American tropics?	2	2017	M / Xm	French Riviera: Nice. Broadleaved trees.	This work
Xyleborus ferrugineus (Fabricius)	American tropics?	1	2016	Xm	Charente-Maritime: port of La Rochelle. Broadleaved trees.	This work
Xyleborus pfeilii (Ratzeburg)	East Asia	5	19th century	T / Xm	Very rare. Here and there in France. On broadleaved trees.	Balachowsky 1949; Kirkendall & Faccoli 2010
Xylosandrus compactus (Eichhoff)	Southeast Asia	4	2015	M / Xm	Locally abundant. Southeast France: Alpes-Maritimes and Var. On broadleaved trees.	Chapin *et al.* 2016; this work
Xylosandrus crassiusculus (Motschulsky)	Asian tropics	4	2013	M / Xm	Locally abundant. South of France. On broadleaved trees.	This work
Xylosandrus germanus (Blandford)	East Asia	5	1984	T (M) / Xm	Very common. Widespread in nearly all France. On broadleaved trees.	Schott 1994; Nageleisen *et al.* 2015; Kirkendall & Faccoli 2010
Xylosandrus morigerus (Blandford)	Asian tropics?	1	1897	Xm	Found in greenhouses in Marseille. Not recorded since 19th century. On orchids (*Dendrobium phalaenopsis*).	Balachowsky 1949; Kirkendall & Faccoli 2010
Xyloterinus politus (Say)	North America	2	2017	T / Xm	Rare. Northwestern France: between Le Havre and Rouen (Seine-Maritime). On broadleaved trees (field maple).	Dodelin & Saurat 2017; this work
PLATYPODINAE						
Euplatypus hintzi (Schaufuss)	African tropics	1	2012	Xm	Charente-Maritime: port of La Rochelle, Herault: port of Sète. Polyphagous.	This work
Euplatypus parallelus (Fabricius)	American tropics	1	2012	Xm	Charente-Maritime : port of La Rochelle. Polyphagous.	This work

New records: **ISERE –** Pommier-la-Placette, unbaited interception trap, from 20.V. to 20.VI.2014, 1 ind., Janssen / Irstéa *leg.*; St-Pierre-de-Chartreuse, unbaited interception trap, 23.VI.2014, 1 ind. Janssen / INRAE *leg.*

Biology and ecology. Little information is available on the biology and ecology of this ambrosia beetle. Like many species belonging to this genus, *C. distinguendum* seem to be an oligophagous species with feeding preference for woody species of Fagaceae (Hoebeke *et al.* 2018).

Damage and infestation risk. To date, no phytosanitary problem related to this species has been observed in France or in the United States (Hoebeke *et al.* 2018). However, like all Xyleborini, this insect carries symbiotic fungi some of which could be plant pathogens.

- *Dryocoetes himalayensis* Strohmeyer
(Figs. 1D, 1E)

Distribution. Native to the Himalayan regions of northern India, this species was introduced to Europe in the mid-1970s. It was detected for the first time in France in 1975 (Knižek 2011a; Schott 2017) then in Switzerland in 1980, in the Czechia in 2009 (Knižek 2011a) and recently in Germany (Gebhardt & Bense 2016). *D. himalayensis* is considered to be established in Europe and is regularly found in Switzerland and the Czechia (Foit *et al.* 2017). In France, *D. himalayensis* is already established and clearly expanding. Despite its rarity, this species is now well distributed in the eastern half of France, and has been collected in various habitats (forests, gardens and orchards), far from urban areas and potential sites of introduction. Although *D. himalayensis* responds weakly to the walnut twig beetle (*Pityophthorus juglandis* Blackman) pheromone, it has not been captured in Italy where a large monitoring program is set up annually in the main walnut plantations to survey the walnut twig beetle populations present in north Italy since 2013 (Faccoli *et al.* 2016b).

Literature records: **HAUT-RHIN** – Heiwiller, 1.II.1975 (Knižek 2011a; Schott 2017); **SAVOIE** – Challes-les-Eaux, interception trap, from 20.V. to 04.VIII.2016, 7 ind. (Dodelin 2016).

New records: **ALLIER** – Lalizolle, FD des Colettes, interception trap baited with ethanol 20%, 12.IV.2015, 1 ind., L. Velle *leg.*; **DORDOGNE** – Cazoulès, caught on English walnut, 08.X.2019, 2 ind., Fredon Aquitaine *leg.*; Coteaux Périgourdins, walnut orchard, interception trap baited with a pheromonal blend for the walnut twig beetle, 08.X.2019, 1 ind., J. Aubardier & M. Hoareau *leg.*; Montignac, caught on English walnut, 24.VII.2019, 2 ind., Fredon Aquitaine *leg.*; **DROME** – Laval-d'Aix, walnut orchard, interception trap with a pheromonal blend for the walnut twig beetle, 17.VI.2019, 1 ind., J.-L. Oddon *leg.*; Saint-Agnan-en-Vercors, RBI du Vercors, interception trap baited with ethanol 20%, from 22.V. to 05.VI.2012, 1 ind., ONF *leg.*; **YVELINES** – Andrésy, 16.VI.2005, 1 ind., E. Jiroux *leg.*; Vernouillet, interception traps baited with ethanol 100%, (-) α-pinene, and a pheromone blend for longhorn beetles, from 26.VII to 19.VIII.2016, 1 ind., URZF *leg.*

Biology and ecology. *D. himalayensis* is an oligophagous species reported in its native range only from English walnut (*Juglans regia* L.) and pear (*Pyrus lanata* D. Don) (Wood & Bright 1992). In Europe, reproduction of this species has been observed in the Czechia on black walnut (*Juglans nigra* L.) (Foit *et al.* 2017) and in France on English walnut (*Juglans regia* L.), but it is suspected to also occur on oak (*Quercus*) (Knižek 2011a). On black walnut, the species has never been observed on healthy plants, preferring dying or stressed trees (Foit *et al.* 2017). A phloeophagous species, colonization is generally on the lower part of trunks (below 4 meters) of variable diameter. A black necrosis develops from the galleries and around the entrance holes (Foit *et al.* 2017).

Damage and infestation risk. *D. himalayensis* seems to mainly be a secondary pest on black walnut (Foit *et al.* 2017). Its role in the mortality of the attacked trees remains unclear and would require further investigations focused on the role of the associated fungi carried by this species and how it interacts with tree condition (Foit *et al.* 2017).

- *Xyleborus affinis* Eichhoff
(Figs. 2A, 2B)

Distribution. The pantropical distribution of *X. affinis* reflects a combination of ancient and recent inter- and intracontinental dispersal events (Gohli *et al.* 2016). It is one of the most common and widespread species of Scolytinae. Reported for the first time in Europe in 1950 in Belgium, it was later detected in Switzerland and Germany in 1955 and in Italy in 1966 (Cola 1971, 1973; Merkl & Tusnádi 1992). It was then detected in imported ornamental plants in Hungary in 1990 (Merkl & Tusnadi 1992) and Italy in 1992 (Carrai 1992). Finally, in 2006, it was found in natural environments in Austria (Holzer 2007). Although individuals of this species were caught in 2016 in the French port area of La Rochelle, no data suggests that this species may be established in France since no insects were trapped near the port by similarly-baited traps.

New records: **CHARENTE-MARITIME –** La Rochelle, port area, interception trap baited with ethanol 100%, (-) α-pinene, and a pheromone blend for longhorn beetle, from 04.VII. to 25.VII. 2016, 9 ind., URZF *leg.*

Biology and ecology. *X. affinis* is an extremely polyphagous ambrosia beetle species, reported from about 248 host plants, both broadleaf trees and conifers, without any specific preference (Schedl 1963; Wood & Bright 1992). In Europe, the species has been found in ornamental plants of the genus *Dracaena* imported from Central America (Carrai 1992; Merkl & Tusnadi 1992). In its native range, this ambrosia beetle bores galleries in the xylem of weakened, injured or recently cut trees, but occasionally may infest also healthy trees (Sobel *et al.* 2018). *Xyleborus affinis* is a highly selective species according to wood moisture and decay, preferring large and very moist wood of recently dead trees (Sobel *et al.* 2018). For this reason, *X. affinis* can be particularly abundant in undebarked trunks partially immersed or left on wet soils.

Damage and infestation risk. *X. affinis* carry the pathogenic fungus *Raffaelea lauricola* TC Harr., Fraedrich & Aghayeva, which causes a disease lethal for many Lauraceae tree species, but it is not an effective vector (Carrillo *et al.* 2013). Moreover, *X. affinis* is well-known for causing structural damage to fresh timber, particularly on moist soil, decreasing its quality and the economic value (Sobel *et al.* 2018).

- *Xyleborus bispinatus* Eichhoff
(Figs. 2C, 2D)

Distribution. This recently reinstated species was previously confused with *X. ferrugineus*; it is presumably native to the Neotropics where it occurs widely (Kirkendall & Jordal 2006), *X. bispinatus* has spread to much of the Americas with tropical timber trade (Faccoli *et al.* 2016a). After the first finding in Sicily (Italy) in 2014 (Faccoli *et al.* 2016a), France is the second European country colonized by this insect. Detected on trees in eight localities in two years, this ambrosia beetle is already considered established in Sicily (Faccoli *et al.* 2016a). In France, its occurrence for the moment is still limited to the municipality of Nice, where five individuals were trapped in two localities. Although this needs to be confirmed, it is possible that this species is established in France.

New records: **ALPES-MARITIMES –** Nice, Mont Boron, interception traps baited with ethanol 20%: 1 ind. from 23.V. to 07.VI.2017, 1 ind. from 04.VII. to 18.VII.2017 and 1 ind. from 12.IX. to 26.IX.2017, DSF *leg.*; Nice, castle, bottle trap: 1 ind. from 20.VI. to 05.VII.2017 and 1 ind. from 01.VIII. to 22.VIII.2017, DSF *leg.*

Biology and ecology: *X. bispinatus* is a polyphagous species, but following the long period of synonymy with *X. ferrugineus* its host plants remain uncertain (Kirkendall & Jordal 2006; Faccoli *et al.* 2016a). *X. bispinatus* is an ambrosia beetle infesting only dying or recently dead trees (Faccoli *et al.* 2016a). In Florida, *X. bispinatus* breeds in avocado (*Persea americana* Mill.), *Persea palustris* (Raf.) Sarg and Australian Palm (*Wodyetia bifurcata* Irvine) (Atkinson *et al.* 2013); it has also been recorded from oak (*Quercus*) and big-leaf mahogany (*Swietenia macrophylla* King) (Faccoli *et al.* 2016a). In Sicily, *X. bispinatus* has been observed only in wild and cultivated common figs (*Ficus carica*) (Faccoli *et al.* 2016a), while in France the host plants are currently unknown. In Sicily, it was always found in figs that were massively infested by *C. dilutus*, another invasive scolytine recently detected in France.

Damage and infestation risk: *X. bispinatus*, like most Xyleborini, should be considered a secondary pest attacking only dead, dying or very stressed trees (Faccoli *et al.* 2016a). However, like all Xyleborini, this insect carries symbiotic fungi, some of which could be pathogenic for certain host trees (Carrillo *et al.* 2013; Beaver 2013; Vannini *et al.* 2017).

- *Xyleborus ferrugineus* (Fabricius)
(Fig. 2E)

Distribution. Most likely native to tropical and subtropical regions of the Americas (Gohli *et al.* 2006), *X. ferrugineus* has spread to the temperate parts of the eastern United States as well as to the tropical regions of Africa, Oceania and Asia (India, Taiwan, and Yemen) (Rabaglia *et al.* 2006; Knížek 2011b; Smith *et al.* 2020b). There is no evidence of its establishment neither in the French territory nor in Europe. The first interception in Europe dates to 1956 in the port of Hamburg (Germany) on elm logs coming from Canada (Cola 1971). It was subsequently intercepted in 1966 and 1968 in the port of Ancona (Italy) in logs coming from western Africa (Cola 1973. In France, only one individual has been intercepted, in the port area of La Rochelle.

New records: **CHARENTE-MARITIME –** La Rochelle, port area, interception trap baited with ethanol 100%, (-) α-pinene, and a pheromone blend for longhorn beetles, 26.IX.2016, 1 ind., URZF *leg.*

Biology and ecology. *X. ferrugineus* is a highly polyphagous species reported from more than 200 host plants, including both angiosperms and gymnosperms (Schedl 1963; Wood & Bright 1992; Wood 2007). In the temperate United States, it is recorded mainly on oaks (*Quercus*), beech (*Fagus*), ash (*Fraxinus*), hazel (*Corylus*), pines (*Pinus*) and many cypresses (Cupressaceae). As with *X. affinis* and *X. bispinatus*, this ambrosia beetle is extremely common wherever it is found. It usually breeds in small stems as well as in large logs of dead, dying or cut trees but can be found in recently killed standing trees as well (Wood 2007; Kirkendall pers. obs.).

Damage and infestation risk. *X. ferrugineus* (probably mixed with *X. bispinatus*) is causes cosmetic damage to newly harvested timber in forests, on wood piles and in sawmills (Wood 2007). The sapwood can be completely discolored. It is probably the most destructive species of wood harvested in the forested areas of South America. Like all ambrosia beetles, *X. ferrugineus* carries symbiotic fungi, some of which are pathogens, particularly to cocoa (*Theobroma cacao*) (Wood 2007).

- *Xylosandrus compactus* (Eichhoff)
(Figs. 3C, 3D)

Distribution. Native to Asia, *X. compactus* is today a sub-cosmopolitan species distributed in Southeast Asia, Africa, Oceania, the Americas and Europe (Wood & Bright 1992). In Europe it was detected for the first time in 2011 in Italy (Garonna *et al.* 2012) where it quickly spread in almost all Tyrrhenian regions and Sicily; in 2015 reached southern France where established in parks and gardens (Chapin *et al.* 2016). To date, its distribution in France extends on a fringe of the Mediterranean coast from Nice to Bormes-les-Mimosas, and an expansion toward West is highly probable in the next future.

Literature records: **ALPES-MARITIMES –** Antibes, Cap d'Antibes, 2015 (Chapin *et al.* 2016); Saint-Jean-Cap-Ferrat, 2015 (Chapin *et al.* 2016); **VAR –** Saint-Tropez, 2015 (Chapin *et al.* 2016).

New records: **ALPES-MARITIMES –** Antibes, Garoupe Forest, traps baited with ethanol 100%, (-) α-pinene, and a pheromonal blend for longhorn beetles, from 25.VI. to 19.IX.2018, 37 ind., URZF *leg.*; Antibes, Villa Thuret, traps baited with ethanol 100%, (-) α-pinene, and a pheromonal blend for longhorn beetles, 10 ind. from 06.VIII. to 30.X.2017 & 27 ind. from 25.VI. to 19.IX.2018, URZF *leg.*; Cannes, Sainte- Marguerite island, interception traps baited with ethanol 100%, (-) α-pinene, and a pheromone blend for longhorn beetles, from 24.V. to 27.IX.2019, 13 ind., URZF *leg.*; Cap d'Ail, traps baited with ethanol 100%, (-) α-pinene, and a pheromonal blend for longhorn beetles, from 06.VIII. to 27.VIII.2018, 1 ind., URZF *leg.*; Nice, Mont Boron, bottle traps, from 06.VIII. to 30.X.2018, 12 ind., DSF *leg.*; *ibidem*, interception traps baited with ethanol 100%, (-) α-pinene, and a pheromone blend for longhorn beetles, from 06.VIII. to 17.IX.2018, 32 ind., URZF *leg.*; Théoule-sur-Mer, caught on Carob tree, 02.XII.2016, 120 ind., S. Pionnat *leg.*; Villeneuve-Loubet, traps baited with ethanol 100%, (-) α-pinene, and a pheromone blend for longhorn beetles, from 16.VII. to 27.VIII.2018, 3 ind., URZF *leg.*; *ibidem*, caught on Laurel, 24.IV.2018, 6 ind., DSF *leg.*; **VAR –** Bormes-les-Mimosas, caught on Laurel, 21.XI.2018, 3 ind., DSF *leg.*; Bormes-les-Mimosas, Chateau-Léoube, interception traps baited with ethanol 100%, (-) α-pinene, and a pheromone blend for longhorn beetles, from 24.V. to 27.IX.2019, 14 ind., URZF *leg.*; Saint-Raphaël, interception traps baited with ethanol 100%, (-) α-pinene, and a pheromone blend for longhorn beetles, from 30.VII. to 30.VIII.2019, 1 ind., URZF *leg.*; Saint-Tropez, the Salins, traps baited with ethanol 20%, from 27.IX. to 19.X.2017, 1 ind., DSF *leg.*

Biology and ecology. *X. compactus* is a highly polyphagous species recorded from more than 220 host plants (Chapin *et al.* 2016). In France, it is already reported to breed on more than a dozen species, mainly ornamental shrubs, with a clear preference, as in Italy, for laurel (*Laurus nobilis* L.). *X. compactus* is an ambrosia beetle infesting twigs and small-diameter branches (<2 cm) where females bore into the pith, although infestations of large trees may also occur. It is one of the few ambrosia beetles that infests healthy plants.

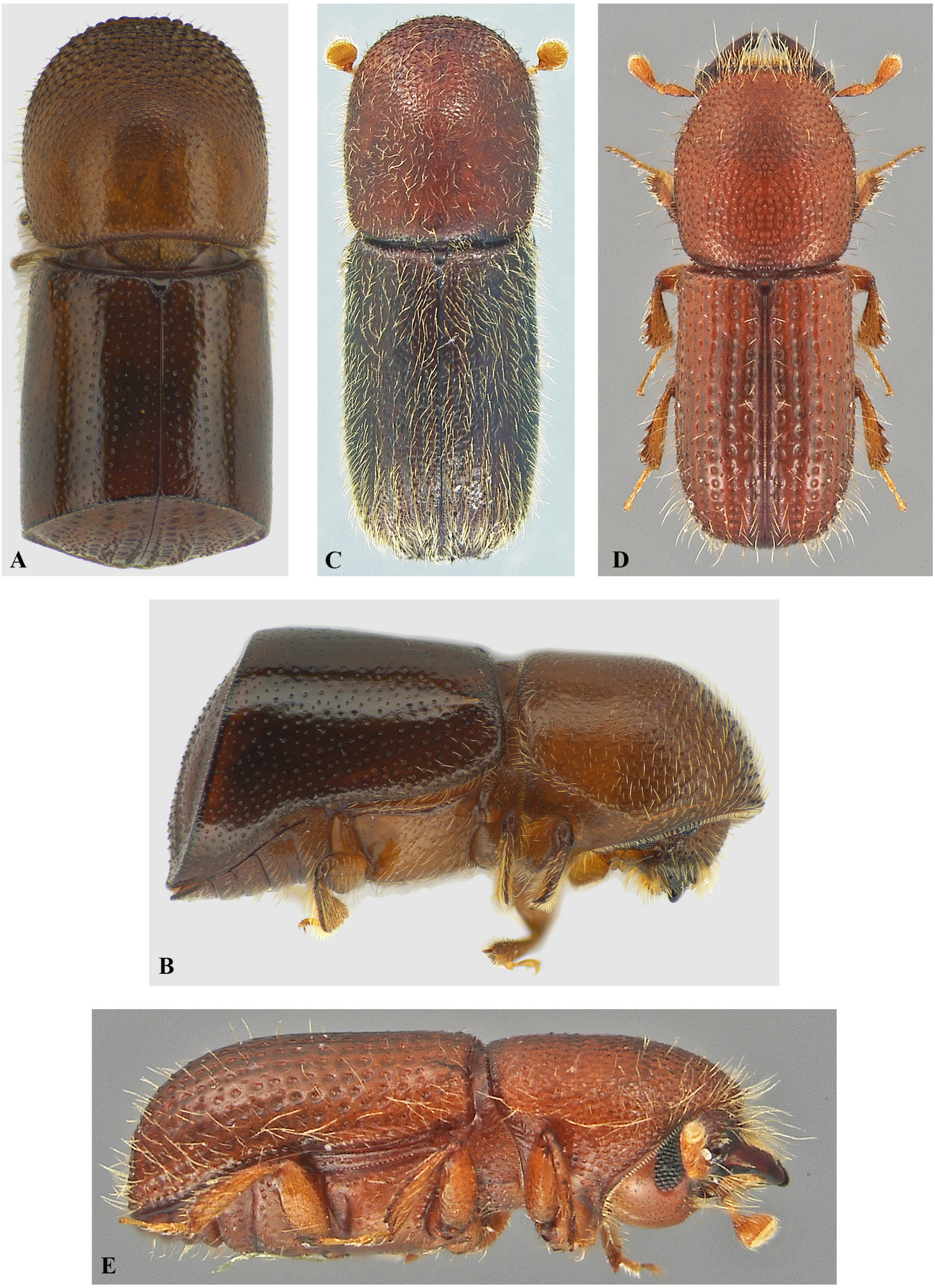

FIGURE 1. *Amasa* sp. near *truncata* (Erichson) (2.5 mm). A. dorsal view; B. lateral view. *Cyclorhipidion distinguendum* (Eggers) (2.9 mm). C. dorsal view. *Dryocoetes himalayensis* Strohmeyer (2.7 mm). D. dorsal view; E. lateral view. Length of specimens in brackets. (Photos: Olivier Denux, Fabien Soldati & Thomas Barnouin).

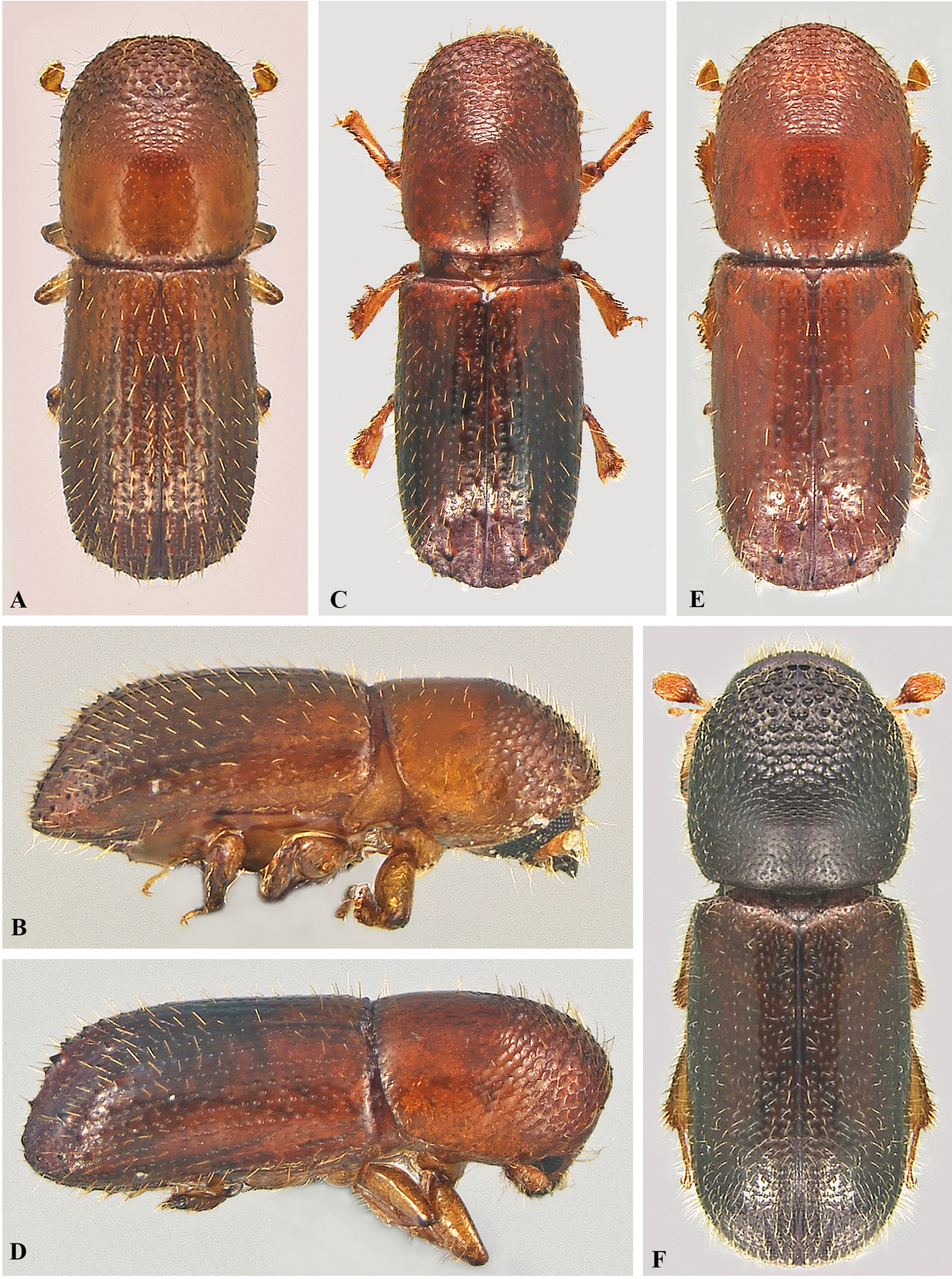

FIGURE 2. *Xyleborus affinis* Eichhoff (2.2 mm). A. dorsal view; B. lateral view. *Xyleborus bispinatus* Eichhoff (2.8 mm). C. dorsal view; D. lateral view. *Xyleborus ferrugineus* (Fabricius) (2.4 mm). E. dorsal view. *Xyloterinus politus* (Say) (3.4 mm). F. dorsal view. Length of specimens in brackets. (Photos: Fabien Soldati).

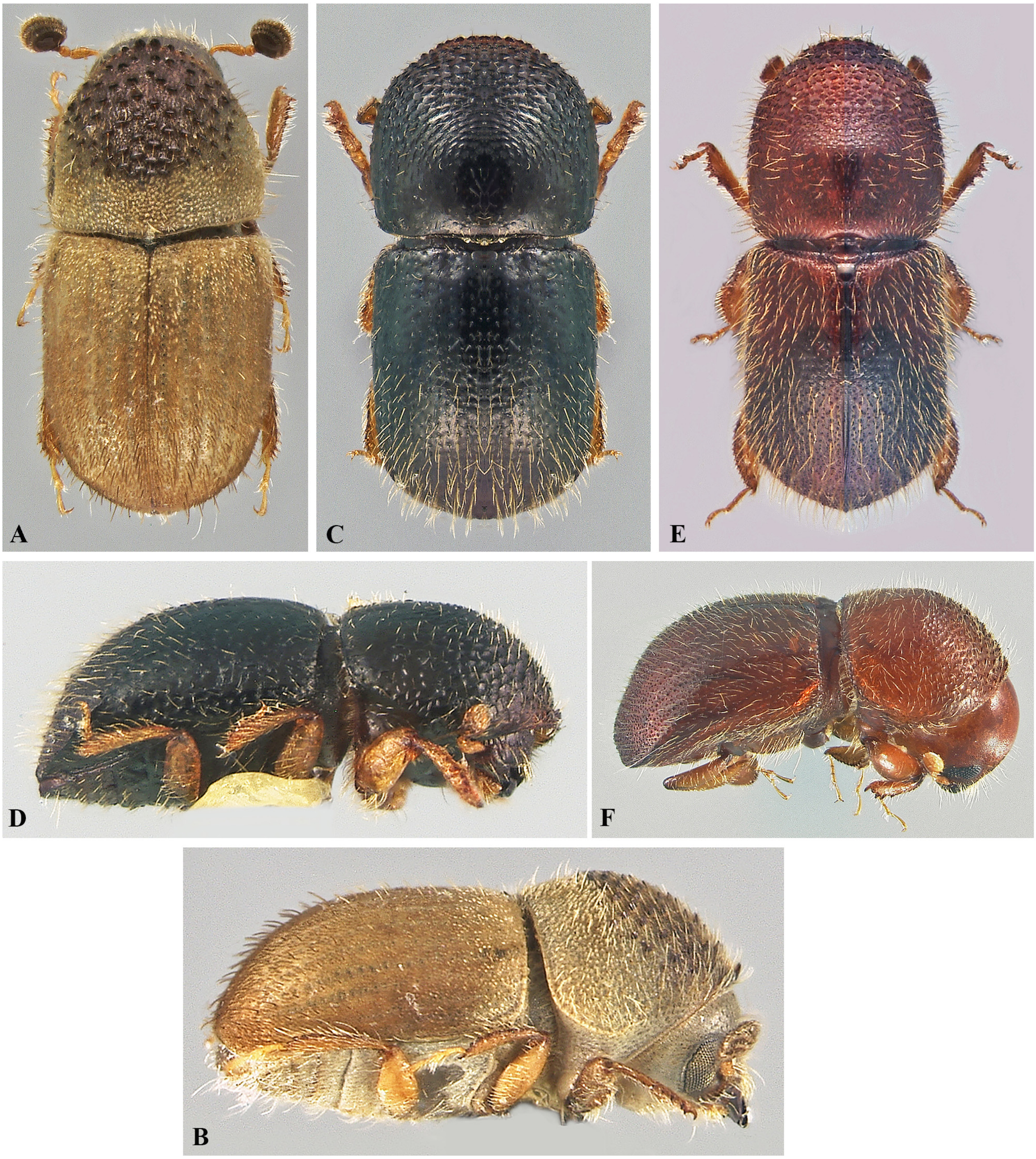

FIGURE 3. *Cryphalus dilutus* Eichhoff (1.8 mm). A. dorsal view; B. lateral view. *Xylosandrus compactus* (Eichhoff) (1.7 mm). C. dorsal view; D. lateral view. *Xylosandrus crassiusculus* (Motschulsky) (2.6 mm). E. dorsal view; F. lateral view. Length of specimens in brackets. (Photos: Fabien Soldati & Thomas Barnouin).

Damage and infestation risk. In tropical regions and in areas of recent introduction this species causes damage to host plants of major economic interest such as avocado (*Persea americana* Mill.) or coffee (*Coffea*) (Garonna *et al.* 2012). Many other species of economic, ecological and ornamental importance can also be infested. Damage caused by this ambrosia beetle is mainly due to the female activity when boring egg tunnels inside the wood (Garonna *et al.* 2012; Chapin *et al.* 2016). However, *X. compactus* is also associated with phytopathogenic fungi that could play a major role in tree dieback (Vannini *et al.* 2017). In France, this species causes a quick leaf desiccation associated to a progressive drying of the affected stems of the infested laurel (Chapin *et al.* 2016). Repeated attacks reduce the crown volume leading to physiologically weakened plants. In France, *X. compactus* mainly affects ornamental trees, but it could eventually become problematic in scrubland areas, as already recorded in Italy (Vanini *et al.* 2017).

- *Xylosandrus crassiusculus* (Motschulsky)
(Figs. 3E, 3F)

Distribution. Native to Asia, *X. crassiusculus* is a cosmopolitan species, present on all continents. In Europe, it was detected for the first time in Italy in 2003 in Tuscany (Pennacchio *et al.* 2003) and then spread across the country in the regions of Liguria, Veneto, Friuli Venezia Giulia, Lazio, Campania and Piedmont (Gallego *et al.* 2017). In France the species was repeatedly intercepted in the port of Le Havre, Seine-Maritime, on wooden packaging materials from China, and then recorded in southeastern France in 2014 (Nageleisen *et al.* 2015), in Switzerland in 2015 (Daubrée 2016), in Spain in 2016 in the Valencia region (Gallego *et al.* 2017), and finally in Slovenia in 2017 (Kavčič 2018). The distribution of *X. crassiusculus* in France was relatively restricted until 2017, confined to east of the Alpes-Maritimes, mainly in the town of Nice in the Mont-Boron forest. At the margins of this infestation, the species was trapped in four municipalities of the same district. Despite the eradication attempts set up in 2014 for the Nice infestation, the species is now established and clearly expanding in France (Daubrée 2016). Since 2018, two new breeding populations have been discovered in south-west of France, far from the first introduction sites (Roques *et al.* 2019). As with *Xylosandrus germanus* (Nageleisen *et al.* 2015), *X. crassiusculus* seems able to quickly colonize new areas and could spread over a large part of France in only few decades.

New records: **ALPES-MARITIMES –** Biot, Vaugrenier Park, interception trap, 2016, 1 ind., Y. Braud *leg.*; Cannes, Sainte Marguerite Island, intercepting trap baited with ethanol 20%: 36 ind. from 01.IV. to 08.VII.2014, 23 ind. from 14.IV. to 21 VII.2015 and 37 ind. from 12.IV. to 05.VII.2016; *ibidem*, interception traps baited with ethanol 100%, (-) α-pinene, and a pheromone blend for longhorn beetles, from 24.V. to 27.IX.2019, 13 ind., URZF *leg.*; Menton, interception traps baited with ethanol 100%, (-) α-pinene, and a pheromonal blend for longhorn beetles, from 24.V. to 27.IX.2019, 163 ind., URZF *leg.*; Nice, bottle trap and interception trap baited with ethanol 20%: 1,760 ind. in 2015, 5,254 ind. in 2016, 23,360 ind. in 2017 and 89 ind. in 2018; *ibidem*, interception traps baited with ethanol 100%, (-) α-pinene, and a pheromonal blend for longhorn beetles, 2018, 735 ind., URZF *leg.*; Saint-Jean-Cap-Ferrat, bottle trap and intercept trap initiated 20%: 1 ind. in 2016 and 15 ind. in 2017, DSF *leg.*; La Turbie, trap bottle and trap intercept baited with ethanol 20%, 2018, 5 ind., DSF *leg.*; *ibidem*, interception traps primed ethanol 100%, (-) α-pinene, and a pheromonal blend for longhorn beetles, from 06.VII. to 27.VIII.2018, 33 ind., URZF *leg.*; Villefranche-sur-Mer, sight on Judas tree, 17.X.2016, 28 ind., E. Chapin *leg.*; Villeneuve-Loubet, interception traps baited with ethanol 100%, (-) α-pinene, and a pheromonal blend for longhorn beetles, from 16.VII. to 27.VIII.2018, 10 ind., URZF *leg.*; **HERAULT** – Gignac, interception traps baited with ethanol 100%, (-) α-pinene, and a pheromone blend for longhorn beetles, from 24.V. to 27.IX.2019, 13 ind., URZF *leg.*; **LANDES –** Saint-Maurice-sur-Adour, VIII.2019, massive attack on a Crape myrtle, C. Le Bihan *leg.*; **PYRENEES-ATLANTIQUES –** Guiche, deciduous forest, intercepting trap, from 24.VII to 18.IX.2018, 151 ind., N. Komeza *leg.*; **SEINE-MARITIME –** Le Havre, port area, caught on wooden packaging material, 25.VII.2013, 35 ind., CEP Le Havre *leg.*; *ibidem*, 29.VII.2014, 2 ind., CEP Le Havre *leg.*; *ibidem*, 28.VII.2016, 1 ind., CEP Le Havre *leg.*

Biology and ecology. *X. crassiusculus* is a very polyphagous species infesting both hardwoods and conifers. It is known from 124 plant species (mainly tropical) belonging to 46 families (Schedl 1963). It has been observed also on fruit (*Prunus, Malus, Ficus*, etc.), forest (*Alnus*, *Populus*, *Salix*, *Quercus*, etc.) and ornamental (*Acacia, Hibiscus, Magnolia*, etc.) tree species. In France, this insect has been detected on carob tree (*Ceratonia siliqua* L.), Judas tree (*Cercis siliquastrum* L.), olive trees (*Olea europea* L.) and crape myrtle (*Lagerstroemia indica* L.). In the Mediterranean region, *X. crassiusculus* seems to show a clear preference for the carob tree in France, Italy and Spain (Pennacchio *et al.* 2003; Gallego *et al.* 2017). However, in the southwest of France (Guiche), many specimens were trapped in a deciduous forest dominated by oaks, showing the species able to reproduce in native tree species other than carob. *X. crassiusculus* is an ambrosia beetle infesting both stressed and recently dead trees, although colonization of apparently healthy host plant is not unusual (Atkinson *et al.* 2011). Females can colonize twigs, branches and small trunks (2 to 30 cm in diameter) with preference for small branches and stems (Atkinson *et al.* 2011).

Damage and infestation risk. Damage caused by *X. crassiusculus* is mainly related to the activity of females boring deep galleries into the sapwood. However, like all ambrosia beetles, *X. crassiusculus* can be a vector of phytopathogenic fungi that could play a role in the host dieback. Aside from the leaf drying on the infected twigs, the most noticeable infestation symptom in carob trees and some other host species is the presence of white sawdust cylinders expelled by females from the entrance holes (Atkinson *et al.* 2011; Daubrée 2016). However, this symptom is observable only during the first days of the stem colonization, making later detection of this species more difficult (Daubrée 2016). Massive colonization leads to dieback and death of the infected trees (Atkinson *et al.* 2011; Daubrée 2016). Massive attacks lead to the death of trees. Smith & Hulcr (2015) describe instances of the species attacking living trees in water-stressed conditions (flooding root system). The damage related to *X. crassiusculus* in France has for the moment a mainly environmental relevance, as carob tree is a plant species protected at national level and carob forests constitute a habitat of community interest under the Fauna Flora Habitats Directive (European Directive 92/43/CEE of 21 May 1992).

- *Xyloterinus politus* (Say)
(Fig. 2F)

Distribution. Native to North America, distributed throughout the northern portions of eastern United States and southeastern Canada (Wood & Bright 1992). France is the first European country colonized by this species. Reported in Seine-Maritime for the first time in 2017 in a blog (Dodelin & Saurat 2017), its presence was then confirmed in a forest of the same department. Given the current distribution, *X. politus* likely entered the French territory via the port of Le Havre. Although so far only few individuals have been captured, the presence in a natural forest suggests it is established in France. However, for the moment *X. politus* seems to be a non-aggressive and rare species.

Literature records: **SEINE-MARITIME –** Near Le Havre, PNR of the Boucles de la Seine Normande, interception trap, 2017, 2 ind. (Dodelin & Saurat 2017); Near Le Havre, PNR of the Boucles de la Seine Normande, caught on a young and died field maple, 08.VIII.2017, 1 ♀ (Dodelin & Saurat 2017).
New records: **SEINE-MARITIME –** Vatteville-la-Rue, FD Brotonne, RBI des Landes, interception traps baited with ethanol 20%, from 15.V. to 29.V.2018, 1 ind., S. Etienne *leg.*

Biology and Ecology. In its native range, *X. politus* is highly polyphagous and has been recorded from a wide variety of angiosperm families, and has even been collected from conifers; in the eastern U.S. it is said to attack mainly Fagaceae (*Quercus* and *Fagus*) (MacLean & Giese 1967). Although in France this species has been observed only on field maple (*Acer campestre* L.) (Dodelin & Saurat 2017), its host range should ultimately be much broader. In the United States, this ambrosia beetle colonizes very weak or recently dead trees, with a preference for fallen trunks (MacLean & Giese 1967).

Damage and infestation risk. In North America this species is considered a secondary pest, so it is unlikely that it will become a phytosanitary threat in France, even though behavioral changes of invasive alien species arriving in new environments and experiencing changes in climate cannot be excluded (Kühnholz *et al.* 2001; Knižek 2007; Hulcr & Dunn 2011).

Distribution and biology of recently and newly introduced Platypodinae species

- *Euplatypus hintzi* (Schaufuss)
(Figs. 4A, 4B)

Distribution. *E. hintzi* is native to sub-Saharan Africa, and it seems to be one of the most frequently collected Platypodinae species in that region (Schedl 1962; Beaver & Löyttyniemi 1985; Wagner *et al.* 1991). There are no records of established populations outside of its native range. However, this species has been reported as interceptions in Australia (timber from Africa: Schedl 1964), Italy (*Mansonia*, *Triplochiton*, *Guibuortia* and *Dumori* logs, West Africa: Cola 1971, 1973), Israel (timber from W. Africa: Halperin & Menier 1981), Poland (*Aucoumea* logs from Congo: Karnkowski 1992) and the Seychelles (a port, at light, single female: Beaver 1988). France is thus the third country in Europe where this species has been collected. That *E. hintzi* has not succeeded in dispersing beyond Africa is not unusual: only one African platypodine, *Diapus quinquespinatus* Chapuis, has successfully spread to other continents.

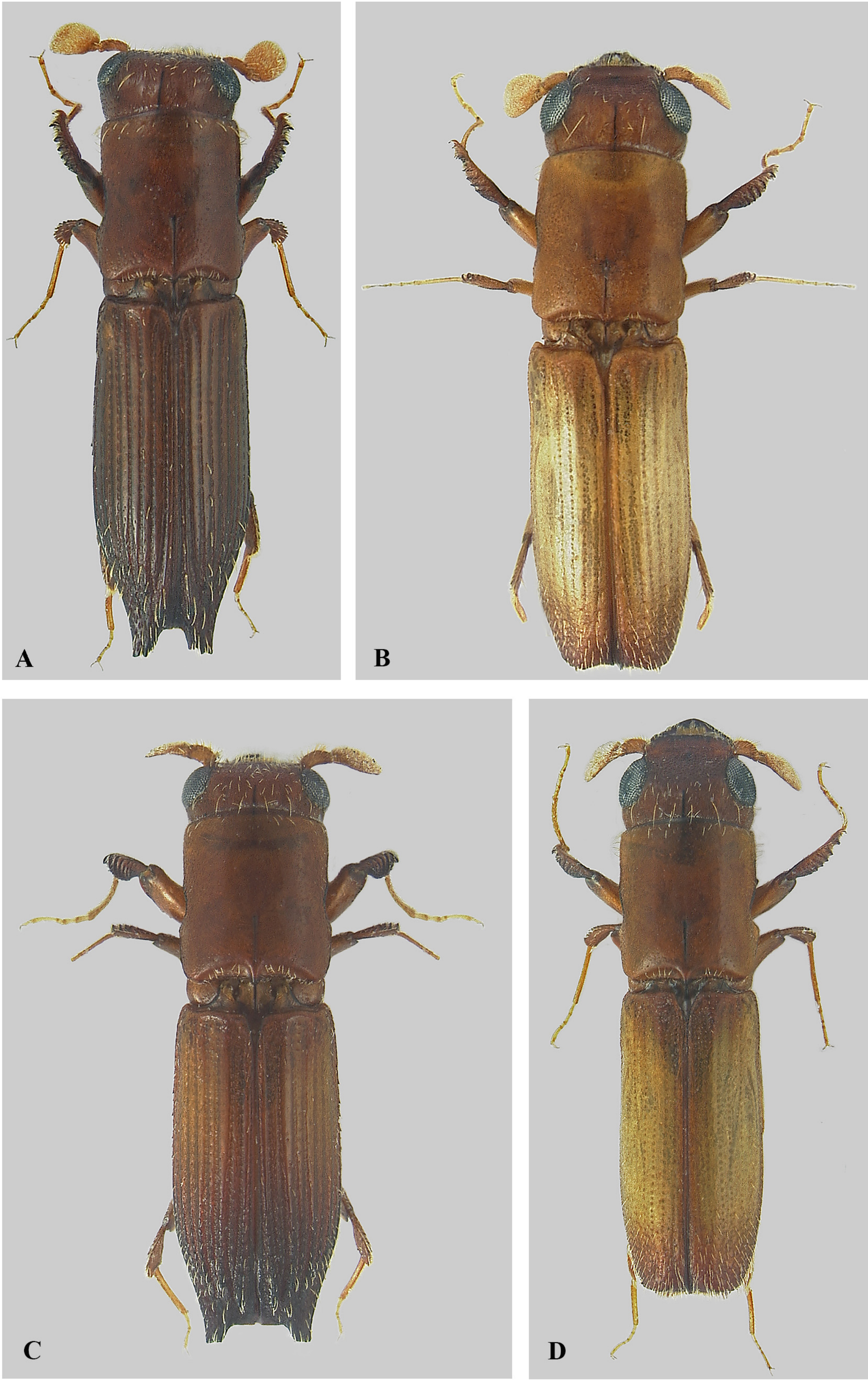

FIGURE 4. *Euplatypus hintzi* (Schaufuss). A. male in dorsal view (4 mm); B. female in dorsal view (3.9 mm). *E. parallelus* (Fabricius). C. male in dorsal view (4.6 mm); D. female in dorsal view (4.6 mm). Length of specimens in brackets. (Photos: Thomas Barnouin).

New records: **CHARENTE-MARITIME –** La Rochelle, port area, interception trap baited with ethanol 100%, (-) α-pinene, and a pheromone blend for longhorn beetles, 26.VII.2012, 2 ind., URZF *leg*.; *ibidem*, 17.IX.2012, 3 ind., URZF *leg*., *ibidem,* 27.VII.2013, 1 ind., URZF *leg*.; *ibidem*, 09.X.2015, 1 ind., URZF *leg*.; *ibidem*, 26.IX.2016, 4 ind., URZF *leg*. **HERAULT –** Sète, port area, funnel traps baited with a blend of cerambycid pheromones, 25.VI.2019, 3 ind., URZF *leg*.

Biology and ecology. There have been no detailed studies of this species. Older observations on the biology and ecology of *E. hintzi* are summarized in Beaver & Löyttniemi (1985, see also Beaver 1988). *E. hintzi* are monogamous ambrosia beetles, breeding in a wide variety of host conditions and host diameters. Although most platypodines are polyphagous, *E. hintzi* is unusually so, having been recorded from nearly 200 host species in 43 plant families (Schedl 1962; Wagner *et al.* 1991).

Damage and infestation risk. *E. hintzi* is a secondary pest. Attacks by this species on living trees are rare and seldom successful (Beaver 1988). This species seems to be frequently present in imported timbers yet has not established breeding populations outside of tropical Africa. It seems unlikely, then, that it will present significant phytosanitary problems in France.

- *Euplatypus parallelus* (Fabricius)
(Figs. 4C, 4D)

Distribution. *E. parallelus* is native to tropical and subtropical regions of the Americas, with a distribution ranging from northern Argentina to Texas (Beaver 2013). This species was probably introduced at the end of the 19th century to tropical Africa, where it is now widespread (Wood & Bright 1992). Since the second half of the 20th century, it has also spread to the tropical regions of Asia and Oceania. It is established in most of the eastern regions of Asia, southeastern China, Taiwan, Papua New Guinea, Hawaii and Australia (Walker 2006; Beaver 2013; Gillett & Rubinoff 2017; Li *et al.* 2018). In Japan, this species has been intercepted many times in imported wood but it has never established lasting populations, probably for climatic reasons (Beaver 2013). In the Middle East, it was recently intercepted in Turkey (Gümus & Ergün 2015) and Arabia (El-Hawagry *et al.* 2016). The first record in Europe dates to the 19th century in England, where it has been recaptured several times during the last fifty years in London although the species has probably not become established there (Allen 1976, 1985; Whitehead 2001). During the same period, it was also reported from the harbors of Hamburg (Germany) and Ancona (Italy) in tropical wood originating from Western Africa (Cola 1971, 1973). This is the first record of this exotic species in France, with specimens intercepted regularly in the port area of La Rochelle from 2012 to 2018. A risk of spreading *E. parallelus* in France is therefore possible, but it is unlikely following climatic limitations, except perhaps in the Mediterranean region.

New records: **CHARENTE-MARITIME –** La Rochelle, port area, interception trap baited with ethanol 100%, (-) α-pinene, and a pheromone blend for longhorn beetles, 26.VII.2012, 2 ind., URZF *leg*.; *ibidem*, 17.IX.2012, 2 ind., URZF *leg*.; *ibidem*, 27.VII.2013, 1 ind., URZF *leg*.; *ibidem*, 04.VII.2016, 6 ind., URZF *leg*.; *ibidem*, 25.VII.2016, 1 ind., URZF *leg*.; *ibidem*, 26.IX.2016, 10 ind., URZF *leg*.; *ibidem*, 19.X.2018, 2 ind., URZF *leg*.

Biology and ecology. This polyphagous insect has been recorded on 82 tree species belonging to 25 families with no notable preferences (Gümus & Ergün 2015). We note, in particular, that it is known to develop also on tree species occurring in France, such as pines (*Pinus*), figs (*Ficus*) and *Eucalyptus*. This ambrosia beetle species usually infests weakened trees (water, heat, biological stress, etc.) or recently cut trees (Beaver 2013).

Damage and infestation risk. *E. parallelus* is well-known as a secondary pest. In rare cases, massive attacks can lead to mortality of stressed trees (Beaver 2013). Nevertheless, its role as a vector of pathogenic fungi and its involvement in tree mortality remains unclear and varying with different situations (Beaver 2013). In addition, *E. parallelus* is known for the economic damage it may produce to some recently cut tropical woods, reducing quality and commercial value (Beaver 2013).

Conclusions

France is a territory particularly favorable for the arrival and establishment of new invasive bark and ambrosia beetles due to its large surface area, the presence of vast forests and wild areas, the variety of climatic conditions, and the many international ports and airports (Kirkendall & Faccoli 2010; Rassati *et al.* 2016). In accordance with the large number of species of bark and ambrosia beetles already intercepted or established in France, the risk of future colonizations is high. Exotic species can arrive directly via international or intercontinental trade, as well as through border countries where invasive species are already established, i.e. *Xyleborinus attenuatus* (Blandford) from Germany (Lohse 1991), *Pityophthorus juglandis* Blackman and *Cyrtogenius luteus* (Blandford) from Italy (Faccoli *et al.* 2012; Faccoli *et al.* 2016b), or *Pityophthorus solus* (Blackman) from Spain (Goldarazena *et al.* 2014).

New introductions of bark and ambrosia beetles can have serious consequences from an economic, ecological and environmental point of view. The implementation of early detection programs deserves to be continued and should be strengthened. The deployment of trapping devices should be prioritized to specific strategic entry points, such as international ports and surrounding forests, as well as to wood waste landfills (Rassati *et al.* 2015a; Rassati *et al.* 2015b). Moreover, in order to adapt to technical and financial constraints related to the monitoring, the survey methods and tools must evolve by improving trap and lure efficiency (Rassati *et al.* 2014; Fan *et al.* 2019).

The intensification and modernization of trapping methods and protocols is not enough to make the detection of new invasions effective. Often underestimated and underappreciated, taxonomic competence remains fundamental, being part of the territorial surveillance strategy (Kirkendall & Faccoli 2010). For bark beetles in particular, the detection of a new taxon among hundreds or even thousands of specimens is a delicate and complicated task that only expert entomologists, having a very good knowledge of the local fauna, are able to perform effectively. The identification of these taxa must then be entrusted to taxonomists networked internationally. This approach would ensure a quick identification and its reliability, avoiding mistakes that could be detrimental to the control efforts (Kirkendall & Faccoli 2010). The case of *Cyclorhipidion distinguendum* is a good example of taxonomists using modern molecular identification methods (DNA barcoding). These methods can be used to validate determinations in some difficult groups but are particularly beneficial in the absence of recent identification keys, as the case of many Asian, African and Oceanic taxa (Kirkendall & Faccoli 2010). Fortunately, several efficient tools have now been developed to identify southeast Asian Xyleborini for use with both morphology and DNA sequences (Smith *et al.* 2019; Cognato *et al.* 2020; Smith *et al.* 2020b).

Rapid interception of new exotic taxa is an essential step in the strategy for keeping invasive alien species at bay. In France, due to the absence of chemicals authorized for use against forest pests and pathogens, the most effective control measure is prompt sanitation, *i.e.* rapid identification and elimination of infested plants or parts of plants (Daubrée 2016). It is therefore essential for an effective surveillance of the national territory that new detections are reported quickly to the national phytosanitary services so that specific eradication or containment measures can be implemented as soon as possible.

Acknowledgements

We would like to thank very much Marie-Anne Auger-Rozenberg (INRAE, Orléans, France), Christophe Bouget (INRAE, Nogent-sur-Vernisson, France), Frédéric Delport (DSF, Paris, France), Benoit Dodelin (Lyon, France), Sébastien Etienne (ONF, Agneaux, France), Heiko Gebhardt (Tübingen University, Tübingen, Germany), Nicolas Komeza (Albine, France), Cyrille Le Bihan (ONF, Saint-Maurice-sur-Adour, France), Louis-Michel Nageleisen (DSF, INRAE, Champenoux, France), and Laurent Velle (ONF, Begaar, France).

Ascertaining the correct identify of the *Amasa* species newly found in France was a difficult challenge and would not have been possible without the generous input of colleagues with taxonomic expertise in this group of bark beetles. Our effusive thanks to Roger A. Beaver (Chiangmai, Thailand), Sarah M. Smith, (Michigan State University, East Lansing, USA), Miloš Knížek (Forestry and Game Management Research Institute, Prague, Czechia), Andrew J. Johnson (School of Forest Resources and Conservation, University of Florida, Gainesville, USA), and Miguel Alonso-Zarazaga (Museo Nacional de Ciencias Naturales, Madrid, Spain).

We greatly acknowledge funding by successive grants from the French Ministry of Agriculture (Projects PORTRAP I-2015/045, PORTRAP II-2016/098, and PORTRAP III-2017/276 "Test de l'efficacité de pièges génériques multicomposés pour la détection précoce d'insectes exotiques xylophages dans les sites potentiels d'entrée sur le territoire national") and by the LIFE project SAMFIX (SAving Mediterranean Forests from Invasions of *Xylosandrus* beetles and associated pathogenic fungi- Life17 NAT/IT/000609).

References

Allen, A.A. (1976) *Platypus parallelus* F. (= *linearis* Steph.) (Col.: Scolytidae) recaptured in Britain after 150 years. *The Entomologist's Record and Journal of Variation*, 88, 57–58.

Allen, A.A. (1985) *Platypus parallelus* (F.) (Col., Scolytidae) again captured at light in S. E. London. *Entomologists Monthly Magazine*, 121, 141.

Atkinson, T.H., Carrillo, D., Duncan, R.E. & Peña, J.E. (2013) Occurrence of *Xyleborus bispinatus* (Coleoptera: Curculionidae: Scolytinae) Eichhoff in southern Florida. *Zootaxa*, 3669 (1), 96–100. https://doi.org/10.11646/zootaxa.3669.1.10

Atkinson, T.H., Foltz, J.L., Wilkinson, R.C. & Mizell, R.F. (2011) Granulate Ambrosia Beetle, *Xylosandrus crassiusculus* (Motschulsky) (Insecta: Coleoptera: Curculionidae: Scolytinae). EENY-131. University of Florida, Gainesville, Florida, 5 pp. Available from: https://entomology.ifas.ufl.edu/creatures/ (accessed 1 March 2019)

Balachowsky, A. (1949) *Faune de France n°50. Coléoptères Scolytides*. Centre National de la Recherche Scientifique, Paris, 320 pp.

Beaver, R.A. (1988) Biological studies on ambrosia beetles of the Seychelles (Col, Scolytidae and Platypodidae). *Journal of Applied Entomology*, 105 (1–5), 62–73. https://doi.org/10.1111/j.1439-0418.1988.tb00162.x

Beaver, R.A. (2013) The invasive Neotropical ambrosia beetle *Euplatypus parallellus* (Fabricius, 1801) in the Oriental region and its pest status (Coleoptera: Curculionidae, Platypodinae). *Entomologist's Monthly Magazine*, 149, 150–154. https://doi.org/10.1649/0010-065X-72.4.713

Beaver, R.A. & Löyttyniemi, K. (1985) The platypodid ambrosia beetles of Zambia (Coleoptera: Platypodidae). *Revue de Zoologie Africaine*, 99, 113–134.

Bouget, C. & Noblecourt, T. (2005) Short-term development of ambrosia and bark beetles assemblages following a wing-storm in French broadleaved temperate forests. *Journal of Applied Entomology*, 129, 300–310. https://doi.org/10.1111/j.1439-0418.2005.00970.x

Browne, F.G. (1961) The biology of Malayan Scolytidae and Platypodidae. *Malayan Forest Records*, 22, 1–255.

Carrai, C. (1992) *Xyleborus affinis* Eich. (Coleoptera, Scolytidae) su tronchetti di *Dracaena* di importazione. *Informatore Fitopatologico*, 10, 27–30.

Carrillo, D., Duncan, R.E., Ploetz, J.N., Campbell, A.F., Ploetz, R.C. & Peña, J.E. (2013) Lateral transfer of a phytopathogenic symbiont among native and exotic ambrosia beetles. *Plant Pathology*, 63, 54–62. https://doi.org/10.1111/ppa.12073

Chapin, E., Mouttet, R. & Chauvel, G. (2016) *Xylosandrus compactus* trouvé en France métropolitaine. *Phytoma*, 697, 10–12.

Cognato, A.I., Sari, G., Smith, S.M., Beaver, R.A., Li Y., Hulcr, J., Jordal, B.H., Kajimura, H., Lin, C.-S., Pham, T.H., 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. https//doi.org/10.3389/fevo.2020.00027

Cola, L. (1971) Mit fremden Hölzern eingesebleppte Insekten insbesondere Scolytidae and Platypodidae. *Anzeiger für Schädlingskunde and Pflanzenschutz*, 49 (5), 65–68. https://doi.org/10.1007/BF02027387

Cola, L. (1973) Mit fremden Hölzern eingesebleppte Insekten, insbesondere Scolytidae and Platypodidae (2. Beitrag). *Anzeiger für Schädlingskunde, Pflanzen- und Umweltschutz*, 46 (7), 7–11. https://doi.org/10.1007/BF01992961

Cutajar, S. & Mifsud, D. (2017) *Good Agricultural Practice (GAP) for Fig tree cultivation*. Plant Protection Directorate, Lija, Malta, 30 pp.

Daubrée, J.-B. (2016) Le scolyte *Xylosandrus crassiusculus* (Coleoptera: Curculionidae) en France: de la détection à la lutte. *Annales de l'AFPP, 4e Conférence sur l'entretien des Jardins, Espaces Végétalisés et Infrastructures, 19 et 20 octobre 2016*, ENSAT Toulouse, pp. 35–44. Available from: www.arbestense.it/images/Annales_JEVI_2016.compressed.pdf/ (accessed 1 March 2019)

Dodelin, B. (2016) *Dryocoetes himalayensis,* expansion confirmée dans les Alpes. EntomoData. Available from: https://entomodata.wordpress.com/2016/11/25/dryocoetes-himalayensis-expansion-confirmee-dans-les-alpes/ (accessed 1 March 2019)

Dodelin, B. (2018) *Cyclorhipidion fukiense* installé en Europe. EntomoData. Available from: https://entomodata.wordpress.com/2018/04/24/cyclorhipidion-fukiense-installe-en-europe/ (accessed 1 March 2019)

Dodelin, B. & Saurat, R. (2017) *Xyloterinus politus* a traversé l'Atlantique. EntomoData. Available from: https://entomodata.wordpress.com/2017/07/08/xyloterinus-politus-a-traverse-latlantique/ (accessed 1 March 2019)

Eichhoff, W.J. (1878) Neue oder noch unbeschriebene Tominicen. *Entomologische Zeitung*, 39, 383–392.

El-Hawagry, M.S., Sharaf, M.R., Al Dhafer, H.M., Fadl, H.H. & Aldawood, A.S. (2016) Addenda to the insect fauna of Al-Baha Province, Kingdom of Saudi Arabia with zoogeographical notes. *Journal of Natural History*, 50 (19–20), 1209–1236. https://doi.org/10.1080/00222933.2015.1103913

Faccoli, M., Campo, G., Perrota, G. & Rassati, D. (2016a) Two newly introduced tropical bark and ambrosia beetles (Coleoptera: Curculionidae, Scolytinae) damaging figs (*Ficus carica*) in southern Italy. *Zootaxa*, 4138 (1), 189–194.

https://doi.org/10.11646/zootaxa.4138.1.10
Faccoli, M., Simonato, M. & Rassati, D. (2016b) Life history and geographical distribution of walnut twig beetle, *Pityophthorus juglandis* (Coleoptera: Scolytinae), in southern Europe. *Journal of Applied Entomology*, 140 (9), 697–705. https://doi.org/10.1111/jen.12299
Faccoli, M., Simonato, M. & Toffolo, E.P. (2012) First record of *Cyrtogenius* Strohmeyer in Europe, with a key to the European genera of the tribe Dryocoetini (Coleoptera: Curculionidae, Scolytinae). *Zootaxa*, 3423 (1), 27–35. https://doi.org/10.11646/zootaxa.3423.1.2
Fan, J.-T., Denux, O., Courtin, C., Bernard, A. Javal, M., Jocelyn, G., Millar, J.G., Hanks, L.M. & Roques, A. (2019) Multi-component blends for trapping native and exotic longhorn beetles at potential points-of-entry and in forests. *Journal of Pest Science*, 92 (1), 281–297. https://doi.org/10.1007/s10340-018-0997-6
Flechtmann, C. & Cognato, A. (2011) First report of *Amasa truncata* (Erichson) (Coleoptera: Curculionidae: Scolytinae) in Brazil. *The Coleopterists Bulletin*, 65 (4), 417–421. https://doi.org/10.1649/072.065.0419
Foit, J., Kasak, J., Majek, T., Knižek, M., Hoch, G. & Steyrer, G. (2017) First observations on the breeding ecology of invasive *Dryocoetes himalayensis* Strohmeyer, 1908 (Coleoptera: Curculionidae: Scolytinae) in its introduced range in Europe. *Journal of Forest Science*, 63 (6), 290–292. https://doi.org/10.17221/3/2017-JFS
Gaaliche, B., Ben Abdelaali, N., Mouttet, R., Ben Halima-Kamel, M. & Hajlaoui, M.R. (2018) Nouveau signalement de *Hypocryphalus scabricollis* (Eichhoff, 1878) en Tunisie, un ravageur émergent sur figuier (*Ficus carica* L.). *Bulletin of European and Mediterranean Plant Protection Organization*, 48 (1), 164–166. https://doi.org/10.1111/epp.12459
Gallego, D., Lencina, J.L., Mas, H., Ceveró, J. & Faccoli, M. (2017) First record of the Granulate Ambrosia Beetle, *Xylosandrus crassiusculus* (Coleoptera: Curculionidae, Scolytinae), in the Iberian Peninsula. *Zootaxa*, 4273 (3), 431–434. https://doi.org/10.11646/zootaxa.4273.3.7
Garonna, A.P., Dole, S.A., Saracino, A., Mazzoleni, S. & Cristinzio, G. (2012) First record of the black twig borer *Xylosandrus compactus* (Eichhoff) (Coleoptera: Curculionidae, Scolytinae) from Europe. *Zootaxa*, 3251 (1), 64–68. https://doi.org/10.11646/zootaxa.3251.1.5
Gebhardt, H. & Bense, U. (2016) Erstfund von *Dryocoetes himalayensis* Strohmeyer (Coleoptera, Curculionidae, Scolytinae) in Deutschland. *Mitteilungen des Entomologischen Vereins Stuttgart*, 51, 69–73.
Gebhardt, H., Weiss, M. & Oberwinkler, F. (2005) *Dryadomyces amasae*: a nutritional fungus associated with ambrosia beetles of the genus *Amasa* (Coleoptera: Curculionidae, Scolytinae). *Mycological Research*, 109, 687–696. https://doi.org/10.1017/S0953756205002777
Gillett, C.P.D.T. & Rubinoff, D. (2017) A second adventive species of Pinhole-borer on the islands of Oahu and Hawaii (Coleoptera: Curculionidae: Platypodinae). *Proceedings of the Hawaiian Entomological Society*, 49, 51–57.
Gohli, J., Selvarajah, T., Kirkendall, L.R. & Jordal, B.H. (2016) Globally distributed *Xyleborus* species reveal recurrent intercontinental dispersal in a landscape of ancient worldwide distributions. *BMC Evolutionary Biology*, 16, 37–48. https://doi.org/10.1186/s12862-016-0610-7
Goldarazena, A., Bright, D. E., Hishinuma, S.M., López, S. & Seybold, S.J. (2014) First record of *Pityophthorus solus* (Blackman, 1928) in Europe. *Bulletin of European and Mediterranean Plant Protection Organization*, 44 (1), 65–69. https://doi.org/10.1111/epp.12093
Gómez, D., Suarez, M. & Martinez, G. (2017) *Amasa truncata* (Erichson) (Coleoptera: Curculionidae: Scolytinae): a new exotic ambrosia beetle in Uruguay. *The Coleopterists Bulletin*, 71 (4), 825–826. https//doi.org/10.1649/0010-065X-71.4.825
Gümus, E.M. & Ergün, A. (2015) Report of pest risk analysis for *Platypus parallelus* (Fabricius, 1801) for Turkey. *Bulletin of European and Mediterranean Plant Protection Organization*, 45 (1), 112–118. https://doi.org/10.1111/epp.12190
Haack, R.A. (2006) Exotic bark- and wood-boring Coleoptera in the United-States: recent establishments and interceptions. *Canadian Journal of Forest Research*, 36, 269–286. https://doi.org/10.1139/x05-249
Halperin, J. & Menier, J.J. (1981) On interceptions of tropical Platypodidae (Coleoptera) from wood imported in Israel. *Israel Journal of Entomology*, 15, 105–106.
Hoebeke, E.R., Rabaglia, R.J., Knížek, M. & Weaver, J.S. (2018) First records of *Cyclorhipidion fukiense* (Eggers) (Coleoptera: Curculionidae: Scolytinae: Xyleborini), an ambrosia beetle native to Asia, in North America. *Zootaxa*, 4994 (2), 243–250. https://doi.org/10.11646/zootaxa.4394.2.7
Holzer, E. (2007) Erstnachweise und Wiederfunde für die Käferfauna der Steiermark (X) (Coleoptera). *Joannea Zoologie*, 9, 51–68.
Hulcr, J. & Dunn, R. (2011) The sudden emergence of pathogenicity in insect-fungus symbioses threatens native forest ecosystems. *Proceeding of the Royal Society of London*, 2078, 2866–2873. https://doi.org/10.1098/rspb.2011.1130
Hulcr, J. & Stelinski, L.L. (2017) The ambrosia symbiosis: from evolutionary ecology to practical management. *Annual Review*

of Entomology, 62, 285–303.
https://doi.org/10.1146/annurev-ento-031616-035105
INPV (Institut National de la Protection des Végétaux) (2018) Zoom sur: Emergence de deux ravageurs xylophages sur figuier. *Bulletin d'information phytosanitaire*, 52, 4. Available from: http://www.inpv.edu.dz/institut/wp-content/uploads/2018/11/Info-phyto-n%C2%B052-2018.pdf/ (accessed 1 March 2019)
Inward, D.J.G. (2020) Three new species of ambrosia beetles established in Great Britain illustrate unresolved risks from imported wood. *Journal of Pest Science*, 93 (1), 117–126.
https://doi.org/10.1007/s10340-019-01137-1
Jelínek, J., Audisio, P., Hájek, J., Baviera, C., Moncoutier, B., Barnouin, T., Brustel, H., Genç, H. & Leschen, R.A.B. (2016) *Epuraea imperialis* (Reitter, 1877), new invasive species of Nitidulidae (Coleoptera) in Europe, with a checklist of sap beetles introduced to Europe and Mediterranean areas. *Atti della Accademia Peloritana dei Pericolanti, classe di Scienze Fisiche, Matematiche e Naturali*, 94 (2), 1–24.
https://doi.org/10.1478/AAPP.942A4
Johnson, A.J., Knížek, M., Atkinson, T.H., Jordal, B.H., Ploetz, R.C. & Hulcr, J. (2017) Resolution of global mango and fig pest identity crisis. *Insect Systematics and Diversity*, 1 (2), 1–10.
https://doi.org/10.1093/isd/ixx010
Johnson, A.J., Hulcr, J., Knížek, M., Atkinson, T.H., Mandelshtam, M.Y., Smith, S.M., Cognato, A.I., Park, S., Li, Y. & Jordal, B.H. (2020) Revision of the bark beetle genera within the former Cryphalini (Curculionidae: Scolytinae). *Insect Systematics and Diversity*, 4 (3), 1–81.
https://doi.org/10.1093/isd/ixaa002
Karnkowski, W. (1992) The appearance of *Platypus hintzi* (Coleoptera, Platypodidae) in imported timber. *Sylwan*, 136 (6), 33–36. [in polish]
Kavčič, A. (2018) First record of the Asian ambrosia beetle, *Xylosandrus crassiusculus* (Motschulsky) (Coleoptera: Curculionidae, Scolytinae), in Slovenia. *Zootaxa*, 4483 (1), 191–193.
https://doi.org/10.11646/zootaxa.4483.1.9
Kenis, M. & Branco, M. (2010) Impact of alien terrestrial arthropods in Europe. *BioRisk*, 4, 51–71.
https://doi.org/10.3897/biorisk.4.42
Kirkendall, L.R. (2018) Invasive bark beetles (Coleoptera, Curculionidae, Scolytinae) in Chile and Argentina, including two species new for South America, and the correct identity of the *Orthotomicus* species in Chile and Argentina. *Diversity*, 10 (2), 1–20.
https://doi.org/10.3390/d10020040
Kirkendall, L.R. & Faccoli, M. (2010) Bark beetles and pinhole borers (Curculionidae, Scolytinae, Platypodinae) alien to Europe. *ZooKeys*, 56, 227–251.
https://doi.org/10.3897/zookeys.56.529
Kirkendall, L. & Jordal, B. (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 (4), 729–743.
https://doi.org/10.1111/j.1095-8312.2006.00698.x
Knížek, M. (2007) Bark and ambrosia beetle species in worldwide trade. *In*: Evans, H. & Oszako, T. (Eds.), *Alien Invasive Species and International Trade*. Forest Research Institute, Warsaw, pp. 101–104.
https://doi.org/10.1371/journal.pone.0158519
Knížek, M. (2011a) Faunistic records from the Czech Republic – 307. Coleoptera: Curculionidae: Scolytinae. *Klapalekiana*, 47, 12.
Knížek, M. (2011b) Subfamily Scolytinae Latreille, 1804. *In*: Löbl, I. & Smetana, A. (Eds.), *Catalogue of Palaearctic Coleoptera. Vol. 7. Curculionoidea I.* Apollo Books, Stenstrup, pp. 204–251.
Kühnholz, S., Borden, J.H. & Uzunovic, A. (2001) Secondary ambrosia beetles in apparently healthy trees: adaptations, potential causes and suggested research. *Integrated Pest Management Reviews*, 6, 209–219.
https://doi.org/10.1023/A:1025702930580
Lagarde, M. & Noblecourt, T. (2018) Une nouvelle espèce de Scolyte pour la France: *Liparthrum mandibulare* (Wollaston, 1854) (Coleoptera Curculionidae Scolytinae). *L'Entomologiste*, 74 (3), 191–192.
Li, Y., Zhou, X., Lai, S., Yin, T., Ji, Y., Wang, S., Wang, J. & Hulcr, J. (2018) First record of *Euplatypus parallelus* (Coleoptera: Curculionidae) in China. *Florida Entomologist*, 101 (1), 141–143.
https://doi.org/10.1653/024.101.0127
Lohse, G.A. (1991) 17. Nachtrag zum Verzeichnis mitteleuropäischer Käfer. *Entomologische Blätter für Biologie und Systematik der Käfer*, 87, 92–99.
MacLean, D.B. & Giese, R.L. (1967) The life history of ambrosia beetle *Xyloterinus politus* (Coleoptera Scolytidae). *The Canadian Entomologist*, 99 (3), 285–299.
https://doi.org/10.4039/Ent99285-3
Marini, L., Haack, R.A., Rabaglia, R.J., Toffolo, E.P., Battisti, A. & Faccoli, M. (2011) Exploring associations between international trade and environmental factors with establishment patterns of exotic Scolytinae. *Biological Invasions*, 13, 2275–2288.
https://doi.org/10.1007/s10530-011-0039-2

Merkl, O. & Tusnádi, C.K. (1992) First introduction of *Xyleborus affinis* (Coleoptera Scolytidae), a pest of *Dracaena fragans* 'Massangeana' to Hungary. *Folia Entomologica Hungarica*, 52, 67–72.

Mifsud, D., Falzon, A., Malumphy, C., de Lillo, E., Vovlas, N. & Porcelli, F. (2012) On some arthropods associated with *Ficus* species (Moraceae) in Maltese Islands. *Bulletin of the Entomological Society of Malta*, 5, 5–34.

Mifsud, D. & Knižek, M. (2009) The Bark beetles (Coleoptera: Scolytidae) of the Maltese Islands (Central Mediterranean). *Bulletin of Entomological Society of Malta*, 2, 25–52.

Milligan, R.H. (1969) *Insect damage to eucalypts. Report of the Forest Research Institute for 1 January—31 December 1968*. New Zealand Forest Service, Wellington, 60 pp.

Moucheron, B., Dahan, L., Delbol, M., Ignace, D., Limbourg, P., Raemdonck, H. & Drumont, A. (2019) *Phloeosinus rudis* Blandford, 1894, scolyte invasif et nouveau pour la faune belge (Coleoptera, Curculionidae, Scolytinae). *Lambillionea*, 119 (1), 25–33.

Nageleisen, L., Bouget, C. & Noblecourt, T. (2015) Les scolytes du genre *Xylosandrus* en France (Coleoptera Curculionidae Scolytinae). *L'Entomologiste*, 71 (4), 267–271.

Noblecourt, T. (2014) Curculionidae, Platypodinae & Scolytinae. *In*: Tronquet M. (Eds.), *Catalogue des Coléoptères de France.* Association Roussillonnaise d'Entomologie, Perpignan, pp. 650–658.

Noblecourt, T. & Lessieur, D. (2016) Premier signalement de *Phloeotribus liminaris* (Harris, 1852) en France (Coleoptera Curculionidae Scolytinae). *L'Entomologiste*, 76 (6), 405.

Pennacchio, F., Roversi, P., Francardi, V. & Gatti, E. (2003) *Xylosandrus crassiusculus* (Motschulsky), a bark beetle new to Europe. *Redia*, 86, 77–80.

Pimentel, D., Zuniga, R. & Morrison, D. (2005) Update on the environmental and economic costs associated with alien-invasive species in the United States. *Ecological Economics*, 52 (3), 273–288. https://doi.org/10.1016/j.ecolecon.2004.10.002

Rabaglia, R.J., Dole, S.A. & Cognato, A.L. (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. https://doi.org/10.1603/0013-8746(2006)99[1034:ROAXCC]2.0.CO;2

Rassati, D., Faccoli, M., Marini, L., Haack, R.A., Battisti, A. & Toffolo, E.P. (2015a) Exploring the role of wood waste landfills in early detection of alien wood-boring beetles. *Journal of Pest Science*, 88, 563–572. https://doi.org/10.1007/s10340-014-0639-6

Rassati, D., Faccoli, M., Toffolo, E.P., Battisti, A. & Marini, L. (2015b) Improving the early detection of alien wood-boring beetles in ports and surrounding forests. *Journal of Applied Ecology*, 52, 50–58. https://doi.org/10.1111/1365-2664.12347

Rassati, D., Lieutier, F. & Faccoli, M. (2016) Alien wood-boring beetles in Mediterranean regions. *In*: Paine T.D. & Lieutier, F. (Eds.), *Insects and diseases of Mediterranean forest systems*. Springer International Publishing, Cham, pp. 293–327. https://doi.org/10.1007/978-3-319-24744-1_11

Rassati, D., Toffolo, E.P., Roques, A., Battisti, A. & Faccoli, M. (2014) Trapping wood boring beetles in Italian ports: a pilot study. *Journal of Pest Science*, 87, 61–69. https://doi.org/10.1007/s10340-013-0499-5

Roques, A., Bellanger, R., Daubrée, J.-B., Ducatillion, C., Urvois, T. & Auger-Rozenberg, M.A. (2019) Les scolytes exotiques: une menace pour le maquis. L'expansion rapide de *Xylosandrus crassiusculus* et *X. compactus* associée à leur polyphagie nécessitent de mieux connaître ces ravageurs de ligneux. *Phytoma*, 727, 16–20.

Roques, A., Shi, J., Auger-Rozenberg, M.A., Ren, L., Augustin, S. & Luo, Y.Q. (2020) Are invasive patterns of non-native insects related to woody plants differing between Europe and China? *Frontiers in Forest and Global Change*, 2, 91. https://doi.org/10.3389/ffgc.2019.00091

Sauvard, D., Branco, M., Lakatos, F., Faccoli, M. & Kirkendall, L.R. (2010) Weevils and bark beetles (Coleoptera, Curculionoidea). *BioRisk*, 4, 219–266. https://doi.org/10.3897/biorisk.4.64

Schott, C. (1994) *Catalogue et atlas des Coléoptères d'Alsace. Tome 6. Scolytidae.* Société alsacienne d'entomologie, Musée zoologique de l'université et de la ville de Strasbourg, Strasbourg, 85 pp.

Schott, C. (2017) *Catalogue et atlas des Coléoptères d'Alsace. Supplément au Tome 6 Scolytidae*. Available from: http://claude.schott.free.fr/MAJscolytes.html/ (accessed 1 March 2019)

Schedl, K.E. (1962) Scolytidae und Platypodidae Afrikas. Band 3. Familie Platypodidae. *Revista de Entomologia de Moçambique*, 5, 595–1352.

Schedl, K.E. (1963) Scolytidae und Platypodidae Afrikas. Band 2. Familie Scolytidae. *Revista de Entomologia de Moçambique*, 5, 1–594.

Schedl, K.E. (1964) Neue und interessante Scolytoidea von den Sunda-Inseln, Neu Guinea und Australien. *Tijdschrift voor Entomologie*, 107, 297–306.

Sire, L., Gey, D., Debruyne, R., Noblecourt, T., Soldati, F., Barnouin, T., Parmain, G., Bouget, C., Lopez-Vaamonde, C. & Rougerie, R. (2019) The challenge of DNA barcoding saproxylic beetles in natural history collections—exploring the potential of parallel multiplex sequencing with Illumina MiSeq. *Frontiers in Ecology and Evolution, section Phylogenetics, Phylogenomics, and Systematics*, 7 (article 495), 1–12. https://doi.org/10.3389/fevo.2019.00495

Smith, S.M., Beaver, R.A. & Cognato, A.I. (2020a) Taxonomic changes for Indo-Malayan ambrosia beetles (Coleoptera: Curculionidae: Scolytinae: Xyleborini). *The Coleopterists Bulletin*, 74, 37–40.
https://doi.org/10.1649/0010-065X-74.1.37

Smith, S.M., Beaver, R.A. & Cognato, A.I. (2020b) A monograph of the Xyleborini (Coleoptera, Curculionidae, Scolytinae) of the Indochinese Peninsula (except Malaysia) and China. *ZooKeys*. [in press]

Smith, S.M., Beaver, R.A., Cognato, A.I., Hulcr, J. & Redford, A.J. (2019) *Southeast Asian Ambrosia Beetle ID*. USDA APHIS Identification Technology Program (ITP) and Michigan State University. Fort Collins, Colorado. Available from: https://idtools.org/id/wbb/sea-ambrosia/ (accessed 1 August 2020)

Smith, S.M. & Hulcr, J. (2015) Chapter 12. Scolytus and other economically important bark and Ambrosia Beetles. *In*: Vega, F.E. & Hofstetter, R.W. (Eds.), *Bark beetles: biology and ecology of native and invasive species*. Academic Press, London, pp. 495–531.
https://doi.org/10.1016/B978-0-12-417156-5.00012-5

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/ (accessed 1 March 2019)

Soldati, F., Barnouin, T., Noblecourt, T. & Audisio, P. (2019) Première mention en France de *Phenolia (Lasiodites) tibialis* (Boheman, 1851) (Coleoptera, Nitidulidae). *L'Entomologiste*, 75 (2), 103–106.

Soldati, F., Noblecourt, T. & Barnouin, T. (2016) Présence d'*Aplidia transversa* (F., 1801) dans les Alpes-Maritimes (Coleoptera Scarabaeidae Melolonthinae). *L'Entomologiste*, 72 (6), 371–372.

Soldati, F., Noblecourt, T. & Barnouin, T. (2018) Première mention en France de *Bitoma siccana* (Pascoe, 1863) (Coleoptera Zopheridae). *L'Entomologiste*, 74 (1), 31–32.

Vannini, A., Contarini, M., Faccoli, M., Della Valle, M., Rodriguez, C.M., Mazzetto, T., Guarneri, D., Vettraino, A.M. & 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. *Bulletin of European and Mediterranean Plant Protection Organization*, 47 (1), 100–103.
https://doi.org/10.1111/epp.12358

Viñolas, A. & Verdugo, A. (2011) Nuevas especies de coleópteros para la Península Ibérica. Familias Zopheridae, Corylophidae y Curculionidae. *Orsis*, 25, 131–139.

Wagner, M.R., Atuahene, S.K.N. & Cobbinah, J.R. (1991) *Forest Entomology in West Tropical Africa: Forest Insects of Ghana.* Kluwer Academic Publishers, Dordrecht, xii + 210 pp.
https://doi.org/10.1007/978-94-015-7936-0

Walker, K. (2006) Common ambrosia beetle (*Platypus parallelus*). PaDIL. Updated 7 November 2006, 3:41:39 PM. Available from: http://www.padil.gov.au/ (accessed 1 March 2019)

Whitehead, P.F. (2001) *Euplatypus parallelus* (Fabricius) (Coleoptera: Platypodidae) confirmed as British. *Entomologist's Gazette*, 52 (4), 262.

Wood, S.L. (2007) *Bark and Ambrosia Beetles of South America (Coleoptera, Scolytidae)*. Monte L. Bean, Life Science Museum, Provo, 900 pp.

Wood, S.L. & Bright, D.E. Jr. (1992) A catalog of Scolytidae and Platypodidae (Coleoptera), part 2: Taxonomic index. *Great Basin Naturalist Memoirs*, 13, 1–1553.

Zondag, R. (1977) *Xyleborus truncatus* Erichson (Coleoptera: Scolytidae). *Forest and Timber Insects in New Zealand*, 21, 1–3.