J. Entomol. Res. Soc., 20(2): 61-70, 2018 *ISSN:1302-0250*

First Record of Four Scolytid Species (Coleoptera: Curculionidae) in the Balearic Islands (Western Mediterranean; Spain)

Claudia COMPARINI[1a] Diego GALLEGO[3,4] Luis NÚÑEZ[2]
Alejandra Maria CLOSA[2] Mar LEZA[1a*]

[1]Laboratory of Zoology. Dept. of Biology, University of the Balearic Islands, Ed. Guillem Colom, Cra. Valldemossa km 7,5. CP:07122 (Palma, Balearic Islands. SPAIN), [a] equal contribution, * mar.leza@uib.es
[2]Servicio de Sanidad Forestal, Conselleria de Medio Ambiente, Govern de les Illes Balears, C/ del Gremi de Corredors, 10, 1r., Poligono de Son Rossinyol, CP: 07009 (Palma, Balearic Islands. SPAIN)
[3]Sanidad agrícola ECONEX, S.L., C/ Mayor, Nº 15B-Edificio ECONEX, CP: 30149 (Siscar, Murcia. SPAIN)
[4]Department of Ecology, University of Alicante, San Vicente del Raspeig, 03690 (Alicante, SPAIN)

ABSTRACT

Bark beetles are a group of phytophagous insects which are considered important pests of conifer and broadleaf forests. In order to carry out the characterization and monitoring of bark beetles communities present in Majorca, flight interception traps (cross-vane type trap) have been placed in three plots of pine forest (*Pinus halepensis*) and three plots of evergreen oak forest (*Quercus ilex*). The content of the traps were collected monthly and were taken to the laboratory and analyzed for their entomological determination.

The main objective of this study is to present four scolytid species reported in Majorca (Balearic Islands, Spain) for the first time: *Chaetoptelius vestitus, Coccotrypes dactyliperda, Xylocleptes bispinus* and *Xyleborus eurygraphus*, as well as increase the knowledge of this coleopteran group with specific importance on forestry management in Mediterranean conditions.

Key words: Chaetoptelius vestitus, *Coccotrypes dactyliperda*, *Xylocleptes bispinus, Xyleborus eurygraphus*, Scolytinae, new records, bark beetles, Majorca.

INTRODUCTION

Scolytinae (Curculionidae), popularly known as bark and ambrosia beetles, are insects with a length range from 1 mm to ≥10 mm and present a semi-spherical or cylindrical form (Soto *et al.*, 2002; Gallego, 2006; López *et al.*, 2007). Scolytids are

an important insect group of forest ecosystems playing an important role in early successional forest. They are the cause of the beginning part of the decomposition process of bark and wood tissue by feeding on them directly (Wood, 1982; Gallego, 2006; Samin *et al.*, 2011; Olenici *et al.*, 2014). However, under conditions of weakened trees by disease, drought or burnt, some bark beetles can develop pest and can cause significant ecological and economic damage to trees in forests (Wood, 1982; Gil and Pajares, 1986; Olenici *et al.*, 2014). Moreover, other bark beetles attack healthy trees and can kill them (Wood, 1982; Lightle *et al.*, 2007; Samin *et al.*, 2011; Olenici *et al.*, 2014). In addition, scolytids facilitate the penetration of other xylophages organisms like insects, fungi and bacteria that can damage the wood tissues and causes the tree death (Gil and Pajares, 1986; Gallego, 2006, Olenici *et al.*, 2014).

This subfamily is represented by at least 282 genera and 6000 species of which 128 species are present in the Ibero-Balearic area (Vega and Hofstetter, 2015; Goldazarena *et al*., 2012; Alonso-Zarazaga, 2002). The objective of this paper is to present four scolytid species reported in Majorca (Balearic Islands, Spain) for the first time and increase the knowledge of this coleopteran group with specific importance on forestry management in Mediterranean conditions.

MATERIALS AND METHODS

Site locations

The study was conducted during four years (April 2011 to March 2015) in Majorca, the largest island (3640.11 km²) of the Balearic archipelago (Western Mediterranean region). Majorca (39º30'N, 03º0'E) has a temperate climate, characterized by mild winters and hot dry summers.

The bark beetles were collected in six plots of the *Balearic Network of Assessment and Monitoring of Forest Damages* from the *Government of the Balearic Islands*. Three of these plots are pine forest (*Pinus halepensis*): (1) *La Victòria*, (2) *Mondragó*, (3) *Albufera*, and the other three plots are of evergreen oak forest (*Quercus ilex*): (4) *Planícia*, (5) *Tiraset* y (6) *Coll Pelat*. Details about the six areas are provided in Fig. 1 and Table 1.

Sampling methods

In both type of forest, bark beetles were collected using a cross-vane type trap, Crosstrap® (Econex, Murcia), performed by a cross vane of black plastic with a lower funnel where catches are in a collect jar, filled with 100 cm^3 of propylene glycol 20%, to prevent evaporation (Gallego and Campo, 2010; González-Rosa *et al*., 2012, Olenici *et al.* 2014). Traps have been baited with α-pinene, ethanol and a mixture of ipsdienol, ipsenol and z-verbenol (1:1:1) (Econex, Murcia). During April 2011 to March 2015 the content of the traps were collected monthly and arthropods were stored in 70% ethanol.

Species identification

The identification of scolytid species was done using the keys published by Gil and Pajares (1986), Pfeffer (1995) and López *et al.* (2007). Some identification was confirmed by M. Faccoly (University of Padova). Examinations and pictures were carried out using a Zeiss stereomicroscope (SteReo Discovery V8) and Nikon D5000 camera. The nomenclature for this group of insects is that used in the Iberian Fauna Databank (IBERFAUNA, 2008).

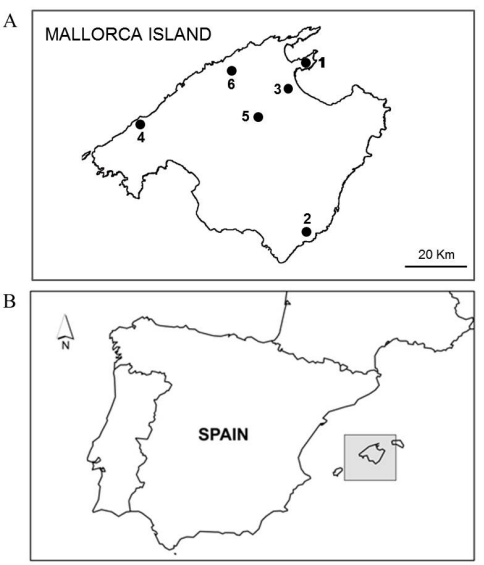

Fig. 1. (A) Locations of site studies on Majorca Island (black filled circles). (B) Location of Majorca Island off the east coast of Spain. Note: 1 - La Victòria; 2 - Mondragó; 3 - Albufera; 4 - Planícia; 5 - Tiraset; 6 - Coll Pelat.

Table 1. Details of the study areas. Note: C.h. - *Chamaerops humilis*, C.m. - *Cistus monspeliensis*, E.sp. - *Erica sp*., J.sp. - *Juniperus sp*., O.e. - *Olea europaea var. sylvestris*, P.la. - *Phillyrea latifolia*, P.h. - *Pinus halepensis*, P.le. - *Pistacia lentiscus*, Q.i. - *Quercus ilex*, R.o. - *Rosmarinus officinalis*.

ID site	Location	Coordinates	Altitude	Arboreal layer (predominant sp.)	Shrub layer	Tree density
1	***La Victòria***	31S, 515684.00mE, 4411200.00mN	120m	*Pinus halepensis*	P.le., C.m., P.h., O.e., C.h., R.o., Q.i.	496 stems/ha
2	***Mondragó***	31S, 516249.00mE, 4355109.00mN	23m	*Pinus halepensis*	P.le., J.sp., O.e.	357 stems/ha
3	***Albufera***	31S, 510784.00mE, 4402510.00mN	19m	*Pinus halepensis*	P.le., E.sp., O.e.	714 stems/ha
4	***Planícia***	31S, 457221.00mE, 4390581.00mN	416m	*Quercus ilex*	P.le.	460 stems/ha
5	***Tiraset***	31S, 497016.00mE, 4393588.00mN	65m	*Quercus ilex*	P.le.	125 stems/ha
6	***Coll Pelat***	31S, 491440.00mE, 4407489.00mN	680m	*Quercus ilex*	C.m., P.la., P.h., Q.i., P.le.	1146.34 stems/ha

RESULTS

A total of four new species were recorded in the Balearic Islands: *Chaetoptelius vestitus*, *Coccotrypes dactyliperda*, *Xylocleptes bispinus* and *Xyleborus eurygraphus.*

Family Curculionidae Latreille, 1802 (Coleoptera, Polyphaga, Curculionoidea)

Subfamily Scolytinae

Tribe Dryocoetini

Coccotrypes Eichhoff, 1878

Coccotrypes dactyliperda (Fabricius, 1801)

Xylocleptes Ferrari, 1867

Xylocleptes bispinus (Duftschmid, 1825)

Tribe Hylesinini

Chaetoptelius Fuchs, 1913

Chaetoptelius vestitus (Mulsant & Rey, 1861)

Tribe Xyleborini

Xyleborus Eichhoff, 1864

Xyleborus eurygraphus (Ratzeburg, 1837)

Chaetoptelius vestitus (Mulsant & Rey, 1861)

A total of 86 specimens of *Chaetoptelius vestitus* (Fig. 2A) were caught during this study. The major part of captures was in pine forests (plots 1, 2 and 3), where it was collected a total of 84 specimens along the four years of the present study, with the exception of July and August. Moreover, 2 specimens were captured in the evergreen oak forest (plots 5 and 6), in October 2011 and December 2012.

General distribution: The area of distribution of *C. vestitus* includes Asia (Iran, Iraq, Israel, Saudi Arabia, Syria, Tajikistan, Turkey and India: Uttarackhand), Europe (Bulgaria, Croatia, France, Greece, Italy, Macedonia, Iberian Peninsula (Spain), Rusia: South European Territory and Ukraine), North Africa (Algeria, Canary Islands, Morocco and Tunisia), Neotropical and Oriental Regions. (Alonso-Zarazaga *et al*., 2017; Wood and Bright, 1992).

Host plant: *Pistacia atlantica*, *P. integerrima*, *P. lentiscus*, *P. terebinthus* and *P. vera* (Wood and Bright, 1992; Meziou-Chebouti *et al*., 2013). Moreover, this species is apparently rare in *Cotinus coggygria*, *Olea europaea* and *Smilax aspera* (Wood and Bright, 1992).

Coccotrypes dactyliperda (Fabricius, 1801)

Six specimens of *C. dactyliperda* (Fig. 2B) were captured in the pine forests (plots 1, 2 and 3) only in 2012 (June, August and October). No captures of *C. dactyliperda* were recorded in *Quercus* forest.

General distribution: Asia (China, Israel, Japan, Jordan, Saudi Arabia and India Uttarackhand), Europe (France, Greece, Iceland, Italy, Malta, Montenegro, Portugal, Iberian Peninsula (Spain) and Switzerland), North Africa (Canary Islands, Egypt, Libya, Morocco and Madeira Archipelago), Afrotropical, Australian, Nearctic, Neotropical and Oriental Regions (Alonso-Zarazaga *et al*., 2017; Wood and Bright, 1992).

Host plant: Seeds of *Areca catechu*, *Cargotus urenus*, *Chamaedorea* spp., *Chamaerops* spp., *Cinnamomum zeylanicum*, *Coccos* spp., *Coccothrinax* sp., *Dictyosperma album*, *Elaeis guineensis*, *Elaeocarpus oblongus*, *Freycinetia arborea*, *Hyphaena* spp., *Hyophorbe* sp., *Livingstonia* spp., *Olea europaea*, *Oreodoxa* spp., *Persea gratissima*, *Phoenix* spp., *Phytelephas macrocarpa*, *Pritchardia pacifica*, *Ptychosperma* sp., *Sabal bermudana*, *Seaforthia* sp., and *Washingtonia filifera* (Wood and Bright, 1992). In addition, in a study conducted in Tenerife (Siverio and Montesdeoca, 1990) has also been found *C. dactyliperda*, attacking seeds of *Howea fosteriana*.

***Xylocleptes bispinus* (Duftschmid, 1825)**

Five specimens of *X. bispinus* (Fig. 2C) have been captured in pine forests in 2012 and 2014, (four specimens in plot 3 and one in plot 1) and other one specimen in *Quercus* forest in 2014 (plot 5). All specimens have been collected during summer (from July to September).

General distribution: According to Wood and Bright (1992) and Alonso-Zarazaga *et al*. (2017) the area of distribution of *X. bispinus* includes Asia (Turkey), Europe (Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, France, Great Britain, Germany, Greece, Hungary, Italy, Macedonia, Montenegro, The Netherlands, Poland, Romania, Serbia, Slovakia, Slovenia, Iberian Peninsula (Spain), Russia: South European Territory, Switzerland and Uckaine) and North Africa (Algeria, Egypt, Libya, Morocco and Tunisia). Host plant: *Clematis* species and *Vitis sylvestris* (Wood and Bright, 1992; Gourlay *et al.,* 2000).

***Xyleborus eurygraphus* (Ratzeburg, 1837)**

Two specimens of *X. eurygraphus* (Fig. 2D) has been collected, one in pine forest (plot 3) and other one in oak forest (plot 6), during May and August of 2012.

General distribution: This species distributes across Asia (Iran and Turkey), Europe (Austria, Bosnia-Herzegovina, Bulgaria, Croatia, Russia: Central European Territory, Czech Republic, France, Germany, Greece, Hungary, Italy, Luxembourg, Macedonia, Moldavia, The Netherlands, Poland, Portugal, Slovakia, Iberian Peninsula (Spain), Russia: South European Territory, Switzerland, Ukraine and Serbia and Montenegro) and North Africa (Algeria, Egypt, Libya, Morocco and Tunisia) (Alonso-Zarazaga *et al*., 2017; Wood and Bright, 1992).

Host plant: *Pinus* species like *P. sylvestris, P. nigra, P. maritima, P. halepensis, P. pinaster* and *P. radiata, Quercus* spp. (*Q. suber* in Galicia) and *Ulmus* spp. (Wood and Bright, 1992; Lombardero, 1994).

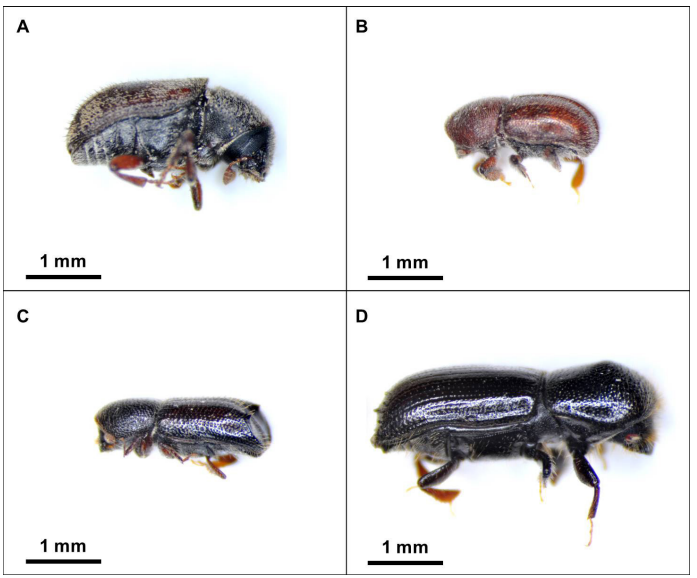

Fig. 2. Lateral view of (A) *Chaetoptelius vestitus*; (B) *Coccotrypes dactyliperda*; (C) *Xylocleptes bispinus* and (D) *Xyleborus eurygraphus*.

DISCUSSION

This is the first report of *C. vestitus, C. dactyliperda, X. bispinus* and *X. eurygraphus* in the Balearic Islands (Western Mediterranean). This discovery improved the knowledge of the composition of bark beetles fauna of the Balearic forests in Western Mediterranean. In addition, it is important to note that two of these new species, *Chaetoptelius vestitus* and *Coccotrypes dactyliperda*, appear as species of interest in some Mediterranean areas. Concretely, *C. vestitus* was the most abundant species captured in forests during the four years of study, with a total of 86 specimens. On the other hand, *C. dactyliperda* had shown lower population density in pine forests (with a total of 6 specimens), during the years 2011 to 2015. But, a proliferation of these insects could imply a major ecological damage to habitat (Mehrnejad, 2001; Braham and Jardak, 2012; Blumberg and Kehat, 1982), so it is important maintain a consistent population studies in order to detect a possible peak of these species, especially under conditions of drought and post-fire.

The most abundant specie was *C. vestitus*, which is a very harmful species to the cultures of pistachio orchards, and it is considered as a key pest of pistachio in Tunisian, Algerian, Iranian, Iraqi and Turkish regions, where *C. vestitus* are infesting twigs and are inducing important damages (Mehrnejad, 2001; Chebouti-Meziou *et al*. 2011; Samin *et al*. 2011; Braham and Jardak, 2012; Meziou-Chebouti *et al*. 2013). The host species of *C. vestitus* in the Balearic Islands are: *Pistacia terebinthus*, *Pistacia lentiscus*, *Olea europaea* var. *sylvestris* and *Smilax aspera* (Herbari Virtual

del Mediterrani Occidental, 2007). Even though the genus *Pistacia* includes a large number of species, *Pistacia vera* is the only one that produces edible fruits and *C. vestitus* has an economic importance due to the fall of the fruit and the decrease in yield of this type of pistachio orchards. It is important to note that in the Balearic Islands are wild pistachios, in particular *Pistacia terebinthus* and *Pistacia lentiscus* (Chebouti-Meziou *et al*., 2011; Meziou-Chebouti *et al*., 2013; Herbari Virtual del Mediterrani Occidental, 2007). On one hand *Pistacia lentiscus* is very abundant in forestry superficies because it is the main species of the shrub layer in pine forests (98.63% probability of presence) and evergreen oak forests (71.05% probability of presence) in Majorca (CAIB, 2012). On the other hand, *Pistacia terebinthus* is not an abundant species in Majorca that is listed as endangered by the IUCN which lives in the rocky walls of the Serra de Tramuntana, World Heritage by UNESCO (Herbari Virtual del Mediterrani Occidental, 2007). This species of scolytid can also cause damage to *Olea europaea* var. *sylvestris* and *Smilax aspera,* other abundant plant species in Majorca.

The abundance of the other three species described for first time in this study was very low. According to Bright and Peck (1998) *C. dactyliperda* attack most frequently in seeds of various palms, but the seeds and nuts of a large number of tropical trees are also attacked. Furthermore, according to Wood and Bright (1992) *C. dactyliperda* is polyphagous species. In Majorca and the Balearic Islands we can find the following species of palms: *Chamaerops humilis, Phoenix canariensis*, *Phoenix dactylifera*, *Washingtonia filifera* and *Olea europaea* var. *sylvestris* (Herbari Virtual del Mediterrani Occidental, 2007). *C. dactyliperda* is considered a primary pests of green unripe dates (Blumberg and Kehat, 1982) causing the fruit drop that resulted in economic losses for those countries with date production (Kehat *et al*., 1976). In a study in the palm fields of Elche (Spain) fruit drop due to *Coccotrypes dactyliperda* activity was result in a 52.71% yield loss (Gómez, 2004), while the yield losses in Israel resulted in a 30-40% (Kheat *et al.*, 1976) and in Egypt the yield losses resulted in a 12.5-33.8% (Monir *et al*., 1998). In Majorca there are no palm trees cultured with commercial purposes, but we can find species of *Phoenix canariensis*, *Phoenix dactylifera* and *Washingtonia filifera* cultivated as ornamentals (Herbari Virtual del Mediterrani Occidental, 2007). The only species of native palm in this region is *Chamaerops humilis*. *C. humilis* is a species with special protection by the Balearic Catalogue of Endangered Species and Special Protection (BOIB, 2005). The presence of *C. dactyliperda* is important because it is associated with *C. humilis* (Ponel and Lemaire, 2012) and it could extend this bark beetle by selling nursery material affected, causing significant damage to *Chamaerops humilis*. *C. dactyliperda* is an invasive seed predator for *C. humilis* (Kirkendall and Faccoli, 2010, Sauvard *et al*., 2010). The impact of this seed predation on native populations of *C. humilis* is not very clear and varies across geographic location, habitat degradation and fleshy pulp amount (Rodríguez *et al.*, 2014). Thus, a negative correlation between seed predated rate and persisting fruit pulp has been shown, explained by the secondary compounds present in the pulp are capable of deter the *C. dactyliperda* attacks. Therefore, activity of species that feeding seed

pulp, as rabbits or rodents could increases the seed predation rate by *C. dactiliperda* (Rodríguez *et al.*, 2014). On the other hand, this species of bark beetle can attack other vegetal specie present in Majorca and the Balearic Islands: *Olea europaea* var. *sylvestris* (Herbari Virtual del Mediterrani Occidental, 2007).

According to Gourlay *et al.* (2000), *Xylocleptes bispinus* is the most damaging agent for old man's beard (*Clematis* spp.) which attacks young woody stems and is capable to kill a significant part of the plant, but it is not considered a primary pest. The hosts species of *X. bispinu*s which are presents in the Balearic Islands are: *Clematis vitalba*, *C. cirrhosa* and *C. flammula*.

Xyleborus eurygrapgus is the new reported specie for the Balearic archipelago in this study that was captured in less number (two specimens), and only attack trees that are already weakened. The host species of *X. eurygraphus* which are presents in the Balearic Islands are: *Pinus halepensis*, *P. canariensis*, *P. nigra*, *P. pinaster*, *P. pinea*, *Quercus ilex*, *Q. cerrioides*, *Q. coccifera*, *Q. suber*, *Q. humilis*, *Ulmus minor*, *U. glabra* and *U. pumila* (Herbari Virtual del Mediterrani Occidental, 2007).

This work has allowed to know new species had not detected in the Balearic archipelago as yet, so new ways to tracing and manage are opened. Two of this four new species reported are primary pests and in some cases they attack emblematic species of the Mediterranean area, so it is important to monitor and control their population levels to prevent explosions and pests.

ACKNOWLEDGEMENTS

Special thanks to Massimo Faccoli, from University of Padova (Italy), for confirm the identification of some specimens. We thank *Agentes de Medio Ambiente* and *Operarios de sanidad forestal del IBANAT* for their assistance with the field sampling, and the participating farmers for access to the study sites and their assistance.

REFERENCES

Alonso-Zarazaga, M. A., 2002. Lista preliminar de los Coleoptera Curculionoidea del área ibero-balear, con descripción de *Melicius* gen. nov. y nuevas citas. *Boletín de la SEA*, 31: 9-33.

Alonso-Zarazaga, M. A., Barrios, H., Borovec, R., Bouchard, P., Caldara, R., Colonnelli, E., Gültekin, L., Hlaváč, P., Korotyaev, B., Lyal, C. H. C., Machado, A., Meregalli, M., Pierotti, H., Ren, L., Sánchez-Ruiz, M., Sforzi, A., Silfverberg, H., Skuhrovec, J., Trýzna, M., Velázquez de Castro, A. J., Yunakov, N. N., 2017. *Cooperative Catalogue of Palaearctic Coleoptera Curculionoidea.* Monografías electrónicas SEA 8. Sociedad Entomológica Aragonesa S.E.A., Spain, 729.

Blumberg, D., Kehat, M., 1982. Biological studies of the date stone beetle, *Coccotrypes dactyliperda*. *Phytoparasitica*, 10(2): 73-78.

BOIB., 2005. Num. 106. 16-07-2005. *Decret 75/2005, de 8 de juliol, pel qual es crea el Catàleg Balear d.Espècies Amenaçades i d.Especial Protecció, les Àrees Biològiques Crítiques i el Consell Assessor de Fauna i Flora de les Illes Balears.*

Braham, M., Jardak, T., 2012. Contribution a l'etude de la bio-ecologie du scolyte du pistachier *Chaetoptelius vestitus* Muls & Rey (Coleoptera, Scolytidae) dans les regions du centre et du sud tunisiens. *Revue Ezzaitouna,* 13(1 et 2): 1-17.

Bright, D. E., Peck, S. B., 1998. Scolytidae from the Galápagos Islands, Ecuador, with descriptions of four new species, new distribution records, and a key to species (Coleoptera: Scolytidae). *Koleopterologische Rundschau*, 68: 233-252.

CAIB., 2012. Cuarto Inventario Nacional Forestal, http://www.caib.es/sacmicrofront/archivopub.doctrl=MCRST472ZI139398&id=139398. 10.06.2017.

Chebouti-Meziou, N., Chebouti, Y., Doumandji, S., 2011. Les Attaques de Chaetoptelius vestitus (Mulsant & Rey)(Coleoptera: Scolytidae) sur Pistacia vera L. dans les Hautes Plaines Occidentales d'Algérie (Tlemcen). *Silva Lusitana*, 11-17.

Gallego Cambronero, D., Campo García, M. T., 2010. El bosque ante el cambio climático. *Murcia en clave ambiental*, 25, 16-27.

Gallego, D., 2006. *Tomicus destruens (Wollaston, 1856) (Coleoptera, Scolytidae): un estudio a* múltiple escala. PhD These. University of Murcia.

Gil Sánchez, L. A., Pajares Alonso, J. A., 1986. Los escolítidos de las coníferas en la Península Ibérica. Ministerio de Agricultura, Pesca y Alimentación, Instituto Nacional de Investigaciones Agrarias, Madrid, Spain, 194.

Goldazarena, A., Romón, P., López, S., 2012. *Bark beetles control in forests of Northern Spain. In:* Larramendy, M. L., Soloneski, S. (Eds.). Integrated Pest Management and Pest Control - current and future tactics. INTECH Open Access Publisher. Spain, 323-352.

Gómez, S. 2004. Evolución e importancia del ataque y biología de *Coccotrypes dactyliperda* (Curculionidae: Scolytinae) perforador del fruto de la palmera datilera. *Boletín de sanidad vegetal. Plagas*, 30(3): 497-506.

González-Rosa, E., Sabah-Mazzetta, S., Gallego, D., 2012. Experiencias de atracción de Tomicus piniperda (Linneo, 1758) usando atrayentes cairomonales. *Boletín de sanidad vegetal. Plagas*, 38(2): 361-369.

Gourlay, A. H., Wittenberg, R., Hill, R. L., Spiers, A. G., Fowler, S. V., 2000. *The biological control programme against Clematis vitalba in New Zealand*. In: Proceedings of the X international symposium on biological control of weeds. New Zealand, 799-806.

Herbari Virtual del Mediterrani Occidental., 2007. In: http://herbarivirtual.uib.es/cat-med/index.html. 20.09.2016.

Iberfauna., 2008. Subfamilia Scolytinae. En: IBERFAUNA. El Banco de Datos de la Fauna Ibérica. Museo Nacional de Ciencias Naturales (CSIC). (http://iberfauna.mncn.csic.es/showficha.aspx?rank=T&idtax=42068)

Kehat, M., Blumberg, D., Greenberg, S., 1976. Fruit drop and damage in dates: the role of *Coccotrypes dactyliperda* F. and nitidulid beetles, and prevention by mechanical measures. *Phytoparasitica*, 4(2): 93-99.

Kirkendall, L., Faccoli, M., 2010. Bark beetles and pinhole borers (Curculionidae, Scolytinae, Platypodinae) alien to Europe. *Zookeys,* 56: 227-251.

Lightle, D. M., Gandhi, K. J., Cognato, A. I., Mosley, B. J., Nielsen, D. G., Herms, D. A., 2007. New reports of exotic and native ambrosia and bark beetle species (Coleoptera: Curculionidae: Scolytinae) from Ohio. *Great Lakes Entomol*, 40: 194-200.

Lombardero, M. J., 1995. Plantas huésped y escolítidos (Col: Scolytidae) en Galicia (Noroeste de la Península Ibérica). *Boletín de sanidad vegetal. Plagas*, 21(3): 357-370.

López, S., Romón, P., Iturrondobeitia, J. C., Goldarazena, A., 2007. Los escolítidos de las coníferas del País Vasco: guía práctica para su identificación y control. Spain, 198.

Mehrnejad, M. R., 2001. The current status of pistachio pests in Iran. *Cahiers Options Méditerranéennes*, 56: 315-322.

Meziou-Chebouti, N., Merabet, A., Chebouti, Y., Bissaad, F.Z. and Behidj, N., 2013. Cycle of *Chaetoptelius vestitus* on pistachio fruit (*Pistacia will vera* L.) and counting galleries at four cardinal exposure in Algeria. 2013 International Conference on Sustainable Enviormental Agriculture IPCBEE, 57(23): 119-123.

Monir, M., Metwally, A., Hussein, A. E., 1998. Date losses and control programme of the date stone beetle *Coccotrypes dactyliperda* in date palm fields at Bahria oasis, Egypt. *The First International Conference on Date Palms*. UAE University, Fac, of Agr, Sci. 8-10 March 1998. Al Ain, UAE :46.

Olenici, N., Knízek, M., Olenici, V., Duduman, M. L., Biriş, I.-A., 2014. First report of three scolytid species (Coleoptera: Curculionidae, Scolytinae) in Romania. *Annals of Forest Research*, 57(1): 87-95.

Pfeffer, A., 1995. Zentral- und westpaläarktische Borken- und Kernkäfer (Coleoptera: Scolytidae, Platypodidae), *Pro Entomologia*, Basel, 310.

Ponel, P., Lemaire, J. M., 2012. Coléoptères méditerranéens inféodés à *Chamaerops humilis* L. *Les Fous de Palmiers*. H.S. N°1. 32-37.

Rodríguez, M., Delibes, M., Fedriani, J. M., 2014. Hierarchical Levels of Seed Predation Variation by Introduced Beetles on an Endemic Mediterranean Palm. *PLoS ONE*. 9(10):e109867. doi:10.1371/journal.pone.0109867.

Samin, N., Sakenin, H., Rastegar, J., 2011. A study of the species composition of Scolytidae (Coleoptera) of north and northwestern Iran. *Amurian zoological journal III,* 3(3): 265-267.

Sauvard, D., Branco, M., Lakatos, F., Faccoli, M., Kirkendall, L. 2010. Weevils and Bark Beetles (Coleoptera, Curculionoidea). *BioRisk,* 4: 219-266.

Siverio, A., Montesdeoca, M., 1990. *Coccotrypes dactyliperda* F., coleóptero, escolytido parásito de semilleros de *Howea (Kentia) fosteriana* Becc. *Boletín de sanidad vegetal. Plagas,* 16(1): 16-18.

Soto, A., Orengo, L., Estrela, A., 2002. Estudio de poblaciones de insectos escolítidos (Coleoptera: Scolytidae) en las masas de *Pinus halepensis* Miller del Parque Natural de Montgo (Alicante). *Boletín de sanidad vegetal. Plagas*, 28(3): 445-456.

Vega, F. E., Hofstetter, R. W. (Eds.). 2015. Bark beetles: biology and ecology of native and invasive species. Academic Press. 619

Wood, S. L., 1982. The Bark and Ambrosia Beetles of North and Central America, a taxonomic monograph. *Great basin naturalist memoirs 6,* Brigham Young Univ., Provo, Utah. 1359.

Wood, S. L., Bright, D. E., 1992. A catalog of Scolytidae and Platypodidae (Coleoptera). Part 2. Taxonomic index. Vols. A and B. Brigham Young University. Great Basin Naturalist Memoir, 6, 1553.

Received: March 17, 2017 *Accepted: June 26, 2018*