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FABRIZIO PENNACCHIO (*) - ROBERTO DANTI (**) - DANIELE BENASSAI (*) - MICHELE SQUARCINI (*)
LORENZO MARZIALI (*) - VINCENZO DI LONARDO (**) - PIO FEDERICO ROVERSI (*)

A NEW ADDITIONAL RECORD OF *PHLOEOSINUS ARMATUS* REITTER FROM ITALY (COLEOPTERA CURCULIONIDAE SCOLYTINAE)

(*) *Consiglio per la ricerca e la sperimentazione in agricoltura - Research Centre for Agrobiology and Pedology, Via Lanciola 12/A, 50125 Firenze, Italy.* e-mail: fabrizio.pennacchio@entecra.it.
(**) *CNR, Institute for Plant Protection, via Madonna del Piano 10, 50019 Sesto Fiorentino, Firenze, Italy.*

Pennacchio F., Danti R., Benassai D., Squarcini M., Di Lonardo V., Roversi P.F. – A new additional record of *Phloeosinus armatus* Reitter from Italy (Coleoptera Curculionidae Scolytinae)

In the early 1990s, outbreaks of the Cypress bark beetle *Phloeosinus armatus* Reitter were reported on *Cupressus sempervirens* L. and *C. arizonica* Sarg. in north-western Italy (Liguria). About 10 years later, this bark beetle, whose distribution range is originally the eastern Mediterranean, was found again in the same region on rows and isolated plants of Mediterranean cypress. In this paper *P. armatus* is reported for the first time on *C. sempervirens* in central Italy (Tuscany), where this insect species is widespread both on ornamental trees and on woodland formations. A taxonomic key is presented for the identification of both the male and female adults of *P. armatus* among species of the genus *Phloeosinus* Chapuis living on Cupressaceae in south-western Europe. Due to its greater size, compared with the indigenous species *P. aubei,* and the behavioural similarities in the adult maturation phase among the two species, *P. armatus* could convey large quantities of inoculum of the fungus *Seiridium cardinale* (Wagener) Sutton et Gibson, causal agent of cypress canker. The need for extensive monitoring and specific research for the development of attractants and traps to capture the adult bark beetles is emphasized.

KEY WORDS: Alien forest insects, xylophagous, *Cupressus sempervirens*, *Phloeosinus armatus*. Mediterranean Cypress, bark beetle Scolytids, alien species

INTRODUCTION

Italy occupies a central position in the Mediterranean and its harbours and airports host an intense traffic of plants, wood and wood products. This involves a heightened risk of introduction of phytophagous species from other geographical areas. In recent years, there has been a succession of reports of alien species of xylophagous beetles in imported wood and in the wild, and various researchers have published papers on their biology, monitoring strategies and control (PENNACCHIO *et al.*, 2003; PENNACCHIO *et al.*, 2004; FACCOLI, 2008; FACCOLI *et al.*, 2009; FRANCARDI *et al.*, 2009; RABAGLIA *et al.*, 2009; VAN DER GAAG *et al.*, 2010; SABBATINI PEVERIERI and ROVERSI, 2010; RABAGLIA *et al.*, 2010; SABBATINI PEVERIERI *et al.*, 2012; STRANGI *et al.*, 2013). In this regard the interception of bark beetles coming from other distribution ranges is particularly important. Indeed, their accidental introduction and subsequent naturalization can cause weakening and deaths in forest stands not only by means of direct damage but also due to the establishment of new associations between beetle vectors and phytopathogenic fungi (ROVERSI *et al.*, 2000).

For several decades, the Mediterranean cypress (*Cupressus sempervirens* L.) has been suffering severe and widespread damage as a result of attacks by a virulent mitosporic fungus named *Seiridium cardinale* (Wagener) Sutton et Gibson, responsible of a pandemic disease of *Cupressaceae* commonly referred to as "cypress canker". The active role of bark beetles of the genus *Phloeosinus* Chapuis in the spread of this fungus is well known (WAGENER, 1939; COVASSI *et al.*, 1975; MENDEL, 1984; GIMÉNEZ VERDÚ, 1991). In the reproductive phase, the adults of these xylophagous beetles dig egg galleries in the subcortical tissues of cypresses weakened by canker or by other stress factors. In the maturation stage, after emergence they move onto healthy trees in which they dig burrows in young branches (ZOCCHI, 1956). Adult attacks on the crowns of healthy cypresses occur not only after their emergence from the developmental substrates but also after long dispersal flights or overwintering periods. The movement of new adults onto healthy trees is the phase of the cycle with the greatest risk of transmission of *S. cardinale* propagules (conidia and mycelium), also due to the contemporaneous opening of the fruitbodies of the fungus (acervuli) (MORIONDO, 1972).

Concern about the fate of *C. sempervirens* has increased since the early 1990s following the finding of *Phloeosinus armatus* Reitter in north-western Italy, outside its native range (BALACHOWSKY and CHARARAS, 1961; COVASSI, 1991; COVASSI *et al.*, 1998). In 2013, *P. armatus* outbreaks were detected for the first time in Tuscany, central Italy, on *C. sempervirens* trees weakened by prolonged water stagnation of clayey soils. In view of the wide distribution of the Mediterranean Cypress in this region (the Forestry Inventory indicates 4960 ha of cypress groves), we report here on new finds and we provide a key for the identification of the *Phloeosinus* species living on Cupressaceae in the south-western Europe.

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***Phloeosinus armatus* Reitter**

DISTRIBUTION AND OUTBREAKS AS RECORDED FROM NORTH-WESTERN AND CENTRAL ITALY

The genus *Phloeosinus* includes over 70 species distributed in all the continents, most of them associated to Cupressaceae (WOOD and BRIGHT, 1992). *Phloeosinus armatus* Reitter was described in 1887 based on specimens collected in Syria (REITTER, 1887) and its range mirrors the native range of *C. sempervirens*, i.e. the Middle East (Iran, Azerbaijan, Syria, Jordan, Lebanon and Israel), Turkey, Greece and Cyprus (REITTER, 1887; EGGERS, 1927; SCHIMITSCHEK, 1944; ZOCCHI, 1956; BALACHOWSKY and CHARARAS, 1961; MENDEL, 1984; SAMIN *et al.*, 2011). In 1991, this bark beetle was recorded for the first time in Italy (COVASSI, 1991), while WOOD (1992) gave the first report that *P. armatus* was causing damage to *Cupressus* spp. in California (USA).

The first records of *P. armatus* in Italy were referred to specimens collected in Liguria (provinces of Imperia and Savona) in the period May to October 1991 at four sites situated between 300 and 600 m above sea level in an area with a high density of nurseries. The *P. armatus* attacks in that region were detected on isolated trees and rows of both *Cupressus sempervirens* and *C. arizonica* Sarg., in most cases in association with the indigenous species *P. aubei* Perris in an area of ca. 100 Km^2 within the olive cultivation zone. The infestation on *C. arizonica*, a cypress species until then not reported as a host of this bark beetle, involved a mature tree with a DBH (diameter at breast height) of 50 cm (COVASSI, 1991). Further investigations carried out in early 1998 to evaluate the acclimation of this xylophagous in western Liguria confirmed the persistence of isolated outbreaks of *P. armatus* in the same areas involved in the first records; however, there was no advance of the infestation outside the territories affected in previous years (COVASSI *et al.,* 1998).

Over a decade after this second finding, new outbreaks of *P. armatus* on common cypress trees were detected for the first time in central Italy in summer 2013 in the course of phytosanitary monitoring activities carried out yearly in woodland areas of Tuscany.

Table 1 reports the localities with the presence of *P. armatus* in inland districts of Tuscany, not far from the urban area of Florence. In August, September and October, both systems of galleries dug in previous years and adult bark beetles in the reproductive phase were found.

ADULT MORPHOLOGY

The adults of *P. armatus* have a shiny brownish-black colour and are larger than the Palaearctic *Phloeosinus* species. The specimens collected in central Italy showed a length of 3.83 mm ± 0.83 SD in males and of 3.87 mm ± 0.30 SD in females. These values are similar to those reportead by REITTER (1887) for the male in the original description but lower than those reported by MENDEL (1984) for individuals collected in Israel.

The *P. armatus* male presents distinctive characters that allow identification: the posterior elytral declivity bears two pairs of large curved teeth, the first above, near the suture, and the second below, near the elytral apex, to which are added other smaller teeth (fig. I, 1 and 3). The females differ from the male mainly in the characters of the elytral declivity, which is more rounded and provided along the third interstria of each elytron with a rather marked crest of adjacent teeth, curved downward (fig. I, 2 and 4). In view of the size variability, we provide a dichotomous key to distinguish the *P. armatus* adults of both sexes from the other *Phloeosinus* species found on the Mediterranean cypress in south-western Europe.

IDENTIFICATION KEY FOR THE SPECIES OF *PHLOEOSINUS* ASSOCIATED WITH CUPRESSACEAE IN SOUTH-WESTERN EUROPE

1 Elytral declivity armed by isolated large teeth, or with rows of adjacent dentiform tubercles or with rows of isolated tubercles 2
– Elytral declivity unarmed. Some interstriae with isolated or roughly aligned very small granules 6

2 Elytral declivity armed by a large hooked, transversely widened tooth at the beginning of the declivity, near suture; beside is another hooked tooth and before the elytral apex other simple hooked teeth. Near the apex is a small granule. Pronotum with a short median carina. Frons weakly concave. Length: 3.0-4.7 mm ..... *armatus* (Reitter) ♂
– Elytral declivity with rows of isolated dentiform tubercles or with rows of adjacent tubercles 3

3 Elytral declivity with two series of dentiform tubercles on the first and third interstria, in addition to smaller granules on the fifth interstria 4
– Elytral declivity with a single series of dentiform tubercles on the third interstria, in addition to smaller granules on the fifth interstria 5

4 -First declivital interstria enlarged on the proximal sector and bears a rows of 8-10 adjacent tubercles arranged obliquely than elytral suture. The third interstria is slightly raised and provided with a row of 7 tubercles. Frons with a slight, median, longitudinal carina. Length: 2.0-2.8 mm ..... *aubei* (Perris) ♂
– First declivital interstria not enlarged and with a row of robust, separated tubercles, spaced by about 1-2 time than their basal diameter, arranged parallel to the elytral suture. Interstriae corrugated and finely punctate. Third tarsal segment largely cordiform. Length: 3.0-3.2 mm ..... *udis* Blandford ♂

5 Pronotum with markedly shortened median carina. Elytral declivity with a row of pointed granules on the third interstria and with some small granules on the fifth interstria. Frons convex, densely punctate, with short pubescence and a faint median longitudinal carina. Length: 3.0-4.5 mm ..... *armatus* (Reitter) ♀
– Pronotum without median carina. Frons with strong transverse impression and with a thin median carina reaching the centre of the impression. Length: 1.5-2.2 mm ..... *thujae* (Perris) ♂

6 Interstrial setae more squamate toward the apex of the elytra. First and second interstria of elytral declivity slightly impressed with respect to the others. Frons lacking carina. Eyes strongly emarginate, the emargination exceeding half the entire width of the eye, with only the thickness of 1-3 ommatidia at the narrowest point. Length: 1.5-2.2 mm ..... *thujae* (Perris) ♀
– Interstrial setae with the same structure over the entire length of the elytra, denser only on the elytral declivity. First and second interstriae of elytral declivity on the same level as the others. Eyes less strongly emarginate, the emargination not exceeding the mid-point of the entire eye width, with thickness of at least 4-5 ommatidia at the narrowest point 7

7 Third tarsal segment of the same width or slightly wider than second. Frons flat, with a median carina to epistomal margin. Length: 2.0-2.8 mm ..... *aubei* (PERRIS) ♀
– Third tarsal segment wider than second. Frons convex and without carina. Length: 3.0-3.2 ..... *rudis* Blandford ♀

Table 1 – Localities with *P. armatus* outbreaks identified in Tuscany in August, September and October 2013.

	Municipality	Province	UTM WGS84 Coordinates	Notes
1	Montespertoli	(Florence)	E 671057 N 4838641	Rows of adult trees of *Cupressus sempervirens* L. with the contemporaneous presence of *P. aubei* and *P. armatus* galleries on dead trees
2	Montespertoli	(Florence)	E 669987 N 4837829	Row of *C. sempervirens* with one tree with a dead upper part of the crown due to *Seiridium cardinale* attacks and the lower part turned brown with subcortical galleries of *P. armatus* on the trunk
3	Castelfiorentino	(Florence)	E 661010 N 4832696	Stand of *C. sempervirens* of different ages with two adult trees turned brown on whose trunk were found pairs of breeding *P. armatus* adults (21 August 2013)
4	Fiesole	(Florence)	E 684552 N 4853227	Row of adult trees of *C. sempervirens* with the contemporaneous presence of *P. aubei* and *P. armatus* galleries on dead trees
5	Impruneta	(Florence)	E 676997 N 4843015	Row of adult trees of *C. sempervirens* with one tree with turned brown on whose trunk were found pairs of breeding *P. armatus* adults (10 October 2013)
6	San Casciano V.P.	(Florence)	E 679451 N 4833935	Young trees of *C. sempervirens* with subcortical galleries of *P. armatus* on the trunk
7	San Casciano V.P.	(Florence)	E 679546 N 4834218	Row of adult trees of *C. sempervirens* with *P. armatus* galleries
8	San Casciano V.P.	(Florence)	E 678862 N 4834524	Row of adult trees of *C. sempervirens* with one tree with galleries of *P. armatus* on the trunk
9	San Casciano V.P.	(Florence)	E 676856 N 4835905	Small group of *C. sempervirens* about 150 years old with *P. armatus* galleries in the lower part of the trunk
10	Scandicci	(Florence)	E 674917 N 4842297	Row of *C. sempervirens* with one tree with *P. armatus* galleries along the trunk
11	Scandicci	(Florence)	E 674283 N 4842510	Stand of *C. sempervirens* of different ages with one adult tree turned brown on whose trunk were found *P. armatus* galleries
12	Scandicci	(Florence)	E 674718 N 4841414	Mixed wood with oaks and conifer with one *C. sempervirens* with galleries of *P. armatus*
13	Empoli	(Florence)	E 660284 N 4840725	Small group of *C. sempervirens* with three adult tree with *P. armatus* galleries along the trunk
14	Empoli	(Florence)	E 658109 N 4840284	Row of *C. sempervirens* with one adult tree with *P. armatus* galleries along the trunk
15	Lastra a Signa	(Florence)	E 666989 N 4842954	Small group of *C. sempervirens* with one adult tree with *P. armatus* galleries in the upper part of the trunk
16	Lastra a Signa	(Florence)	E 667088 N 4843088	Small group of *C. sempervirens* with one adult tree with *P. armatus* galleries along the trunk

BIOLOGICAL NOTE

P. armatus is moderately oligophagous, with a clear preference for *C. sempervirens* (SCHIMITSCHEK, 1944; BALACHOWSKY and CHARARAS, 1961). The association with the Mediterranean cypress is also confirmed by its native range, which closely reflects that of the main host plant. In Israel, *P. armatus* was detected also on *Cupressus macrocarpa* Hartw., *C. glabra* Sudw. and *Juniperus* sp. (MENDEL, 1984). Observations conducted in Liguria since the early 1990s have confirmed the association with the Mediterranean cypress. Despite the widespread presence of trees of other cypress species, only one case of an attack on *C. arizonica* has been observed (COVASSI, 1991) in this region. Tests carried out in a controlled environment demonstrated oviposition and subsequent development up to adult emergence on branches of x*Cupressocyparis leylandii*, a hybrid widely used for ornamental purposes in the Italian peninsula (COVASSI, 1991).

In recently detected outbreaks in central Italy, we confirmed both the ability of the adults to colonize shoots bearing cones during maturation feeding and the suitability of small branches, up to ca. 2 cm in diameter, for oviposition.

The egg gallery systems of *P. armatus* on infested cypresses in central Italy had a mean length of 16.08 ± 1.32 cm and were almost always formed by two asymmetric longitudinal egg tunnels, with a total of 96.17 ± 15.35 (SD).

As previously observed in Liguria, recent *P. armatus* outbreaks in Tuscany have showed that this bark beetle can be associated with *P. aubei*, found? in adjacent maternal galleries with a high colonization density.

Studies on the voltinism of *P. armatus* showed the

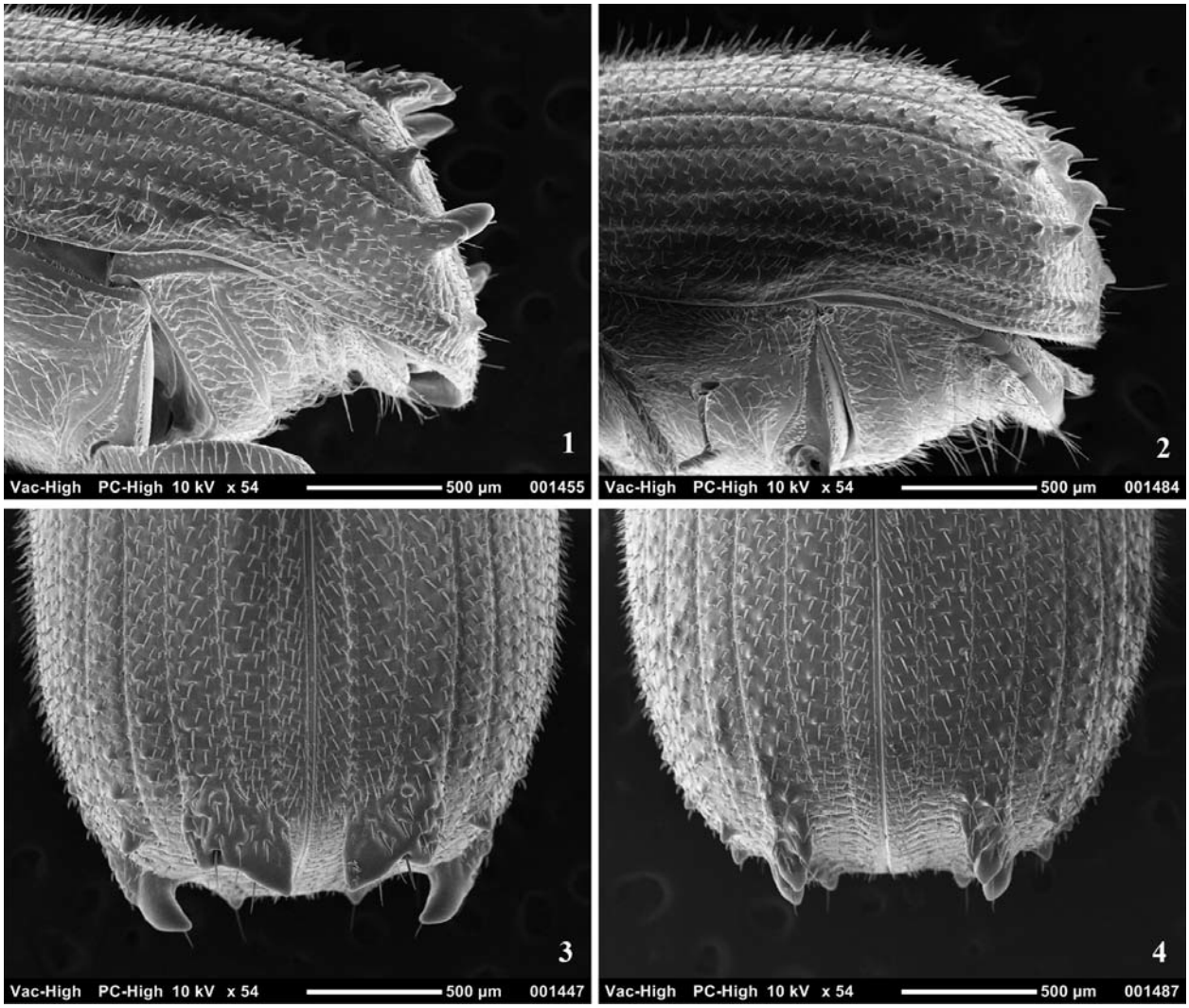

Fig. I – *Phloeosinus armatus* Reitter, elytral declivity. 1. Male, lateral view. 2. Female, lateral view. 3. Male, dorsal view. 4. Female, dorsal view.

completion of two generations in Greece and Turkey (SCHIMITSCHEK, 1944; BALACHOWSKY and CHARARAS, 1961), while MENDEL (1984) observed 3-4 partially overlapping generations in Israel, with adults active throughout the year at least in the coastal areas. The data obtained thus far in Liguria and Tuscany indicate the completion of two generations, with overwintering mainly as adults.

CONCLUSIONS

The Mediterranean cypress, a characteristic landscape tree in large areas of central Italy, was introduced into Italy long ago, probably in Roman times or earlier by the Phoenicians and Etruscans (VIRGILIO, 29 b.C.; GIANNELLI and BEZZINA, 2002). This tree has also become an integral and characteristic element of the landscape in large areas of northern Italy, where it benefits from locally favourable climatic conditions such as in surrounds of the large pre-Alpine lakes (DELLA ROCCA *et al.*, 2007).

The image of the Mediterranean cypress (*Cupressus sempervirens* L.) immediately brings to mind countries facing the Mediterranean Sea and in particular Italian landscapes. The common names by which *C. sempervirens* is known in Anglo-Saxon countries, i.e. Mediterranean cypress and Italian cypress, are proof of this.

The introduction of an alien species often has negative consequences, sometimes leading to a true biological invasion. Normally three phases are recognized: a) arrival of the phytophage in the new territory, b) acclimation, c) spread. The first record of *P. armatus* in Italy was over 20 years ago. Further investigations carried out during late winter - early spring 1998 confirmed the presence of outbreaks of this bark beetle in Italy, with adult individuals active in western Liguria (provinces of Savona and Imperia), and the acclimation of this beetle in the country (COVASSI *et al.*, 1998).

P. armatus has the ability to colonize trees even in conditions of temporary physiological imbalance. Of particular concern is the potential of *P. armatus* to be a vector of the fungal pathogen causing cypress canker. Given the beetle's large size, the depth of the feeding and breeding galleries dug in the host tissues, and the points of contact between its cycle and that of the pathogen, it seems plausible that this beetle might dangerously complement the indigenous beetle *P. aubei* in spreading

cypress canker propagules, showing a similar if not higher efficacy. Therefore, there is a need for research to evaluate the effectiveness of *P. armatus* as a vector of *Seiridium cardinale*.

Regarding the possibility of control of this bark beetle, in addition to preventive cultivation practices aimed at ensuring good growth conditions to cypresses, it is essential to establish an extensive monitoring program to determine the actual distribution of the species in Italy. Moreover, it is necessary to promptly fell and destroy trees with ongoing *P. armatus* infestations, as well as the material resulting from thinning and pruning, as recommended to prevent the spread of other harmful corticolous species. It also seems desirable to conduct research on the semiochemical mechanisms of the different species present in Italy in order to develop biotechnical monitoring and effective control strategies. Studies are in progress to define the biology of *P. armatus* in areas of new introduction, to assess the efficacy of potential indigenous antagonists able to adapt to the new host. Based on the work of CHARARAS *et al.* (1980) on the bioconversion of sabinene into 4-terpineol and alpha-terpineol in the hind gut of *P. armatus*, studies are also in course to test the possibility of using traps baited with semiochemicals for monitoring programs and mass trapping.

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REFERENCES

BALACHOWSKY A.S., CHARARAS C., 1961 – *Contribution a l'étude de* Phloeosinus armatus *Reitter (Coleoptera Scolytidae) nuisible au cypres dans le bassin oriental de la Méditeranée*. - Rev. Path. vég. et Ent. agr. Fr., 39 (4): 245-257.

CHARARAS C., RIVIERE J., DUCAUZE C., RUTTLEDGE D., DELPUI G., CAZELLES M.T., 1980 – *Bioconversion of a terpene compound under the action of a bacterium of the digestive tract of* Phloeosinus armatus *(Coleoptera, Scolytidae).* – Comptes Rendus Hebdomadaires des Seances de l'Academie des Sciences, 291(2): 299-302.

COVASSI M., INTINI M., PANCONESI A., 1975 – *Osservazioni preliminari sui rapporti fra* Coryneum cardinale *Wag. e* Phloeosinus aubei *Perr. in Toscana*. - Redia, 56: 159-166.

COVASSI M., 1991 – *Il* Phloeosinus armatus *Reitter, Coleottero Scolitide del Cipresso, nuovo per l'Italia.* – Atti del Convegno "Il Cipresso. Proposte di valorizzazione ambientale e produttiva nei paesi mediterranei della Comunita Economica Europea", Firenze (Italy) 12–13 dicembre 1991, 190-196.

COVASSI M.V., ROVERSI P.F., BINAZZI A., 1998 – *Diffusione e risposte adattative di insetti xilofagi nel mutato quadro fitosanitario di* Cupressus sempervirens. – Atti Convegno "Il nostro amico cipresso". Giornata di studio e aggiornamento sulle avversità del *Cupressus sempervirens* L., a cura di P.F. Roversi e M.V. Covassi, Firenze, Accademia Italiana di Scienze Forestali 14 maggio 1998: 77-91.

DELLA ROCCA G., DANTI R., INTINI M., 2007 – *Il Cipresso*. In: Il Cipresso dalla leggenda al futuro. A Panconesi Ed. CNR: 119-132.

EGGERS M., 1927 – *Seltene und neue palaearktische Borkenkäfer.* - Ent. Blätter, 28 (3): 120-121.

FACCOLI M., 2008 – *First record of* Xyleborus atratus *Eichoff from Europe, with an illustrated key to the European Xyleborini (Coleoptera: Curculionidae: Scolytinae).* – Zootaxa, 1772: 55-62.

FACCOLI M., FRIGIMELICA G., MORI N., PETRUCCO T., VETTORAZZO M., SIMONATO M., 2009 – *First record of* Ambrosiodmus *(Hopkins, 1915) (Coleoptera: Curculionidae, Scolytinae) in Europe.* - Zootaxa 2303: 57-60.

FRANCARDI V., DE SILVA J., PENNACCHIO F., ROVERSI P.F., 2009 – *Pine volatiles and terpenoid compounds attractive to European xylophagous species, vectors of* Bursaphelenchus *spp. nematodes.* - Phytoparasitica 37 (4): 295-302.

GIANNELLI L., BEZZINI L. 2002 – *Il cipresso: storie e miti di terre toscane.* Firenze, Ed. Scramasax. pp. 151.

MENDEL Z., 1984 – *Life history of* Phloeosinus armatus *Reitter and* P. aubei *Perris (Coleoptera: Scolytidae) in Israel.* Phytoparasitica 12 (2): 89-97.

MORIONDO F., 1972 – *Il cancro del cipresso da* Coryneum cardinale *Wag. I° Contributo: la progressione del processo infettivo nei tessuti caulinari.* – Annali Accademia Italiana di Scienze Forestali, 21: 399-426.

PENNACCHIO F., ROVERSI P.F., FRANCARDI V., GATTI E., 2003 – Xylosandrus crassiusculus *(Motschulsky) a bark beetle new to Europe.* – Redia, 86: 77-80.

PENNACCHIO F., FAGGI M., GATTI E., CARONNI F., COLOMBO M., ROVERSI P.F., 2004 – *First record of* Phloeotribus liminaris *(Harris) in Europe (Coleoptera Scolytidae).* – Redia, 87: 85-89.

RABAGLIA R.J., VANDERBERG N.J., ACCIAVATTI R.E., 2009 – *First records of* Anisandrus maiche *Stark (Coleoptera: Curculionidae: Scolytinae) from North America.* – Zootaxa, 2137: 23-28.

RABAGLIA R.J., KNIZEK M., JOHNSON W., 2010 – *First records of* Xyleborinus octiesdentatus *(Murayama) (Coleoptera, Curculionidae, Scolytinae) from North America.* – ZooKeys, 56: 219-226.

REITTER E., 1887 – *Neue Borkenkäfer aus Europa und den angrenzenden Ländern.* – Wiener Ent. Zeit., 6 (6): 192-198.

ROVERSI P.F., TIBERI R., BATTISTI A., 2000 – *Insetti vettori di agenti patogeni delle piante ornamentali in Toscana.* In: L'albero e le aree urbane: convivenza possibile? eds P.F. Roversi e R. Tiberi. Litografia I.P. Firenze: 45-62.

SABBATINI PEVERIERI G., ROVERSI P.F., 2010 – *Feeding and oviposition of* Anoplophora chinensis *on ornamental and forest trees.* – Phytoparasitica, 38 (5): 421-428.

SABBATINI PEVERIERI G., FURLAN P., SIMONI S., STRONG W.B., ROVERSI P.F., 2012 – *Laboratory evaluation of* Gryon pennsylvanicum *(Ashmead) (Hymenoptera, Platygastridae) as a biological control agent of* Leptoglossus occidentalis *Heidemann (Heteroptera, Coreidae).* – Biological Control, 61(1): 104-111.

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): 265-267.

SCHIMITSCHEK E., 1944 – *Forstinsekten der Türkei und ihre Umwelt*. Grundlagen der türkischen Forstentomologie. Volk und Reich Verlag, Prag, Amsterdam - Berlin – Wien: 156-162.

STRANGI A., SABBATINI PEVERIERI G., ROVERSI P.F., 2013 – *Managing outbreaks of the citrus long-horned beetle* Anoplophora chinensis *(Forster) in Europe: Molecular diagnosis of plant infestation*. – Pest Management Science, 69 (5): 627-634.

VAN DER GAAG D.J., SINATRA G., ROVERSI P.F., LOOMANS A., HÉRARD F., VUKADIN A., 2010 – *Evaluation of eradication measures against* Anoplophora chinensis *in early stage infestations in Europe*. – EPPO Bulletin, 40 (2): 176-187.

VIRGILIO PUBLIO MARONE, 29 b.C. – Georgiche 1: 1-42.

WAGENER W.W., 1939 – *The canker of* Cupressus *induced by* Coryneum cardinale *n. sp.* – J. Agric Res., 58 (1): 1-46.

WOOD, S.L. 1992 – *Nomenclatural changes and new species in Platypodidae and Scolytidae (Coleoptera), Part II.* – Great Basin Nat., 52: 78-88.

WOOD S.L, BRIGHT D.E., 1992 – *A catalog of Scolytidae and Platypodidae (Coleoptera), Part 2: taxonomic index.* – Great Basin Nat. Mem., 13: 1-1553.

ZOCCHI R., 1956 – *Insetti del cipresso. Il Gen.* Phloeosinus *Chap. in Italia.* – Redia, 41: 129-225.