



Updated distribution of the species of the genus *Platycerus* Geoffroy, 1762 in Piacenza province and surroundings (northern Italy), with new records of host trees (Coleoptera: Lucanidae)

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Abstract. The updated distribution of the two Italian *Platycerus* species (Coleoptera: Lucanidae) in Piacenza province and surroundings (northern Italy) is reported, adding data mainly from field research, but also from one collection and from websites. Furthermore, host trees are listed from field data, showing the relationship between *Platycerus caraboides* (Linnaeus, 1758) and plants not reported yet (*Acer* spp., *Corylus avellana* L., and *Ostrya carpinifolia* Scop.), and confirming bibliographic data for both species.

Riassunto. Distribuzione aggiornata delle specie del genere *Platycerus* Geoffroy, 1762 nella provincia di Piacenza e dintorni (Italia settentrionale), con nuovi dati sulle piante ospiti (Coleoptera: Lucanidae). È illustrata la distribuzione aggiornata delle due specie italiane di *Platycerus* (Coleoptera: Lucanidae) nella provincia di Piacenza e dintorni (nord Italia), aggiungendo dati derivanti principalmente da raccolte di campagna, ma anche dallo studio di una collezione e da siti web. Sono inoltre riportate le piante ospiti ricavate dai dati di campagna, mostrando il legame tra *Platycerus caraboides* (Linnaeus, 1758) e piante non ancora segnalate (*Acer* spp., *Corylus avellana* L. e *Ostrya carpinifolia* Scop.) e confermando i dati bibliografici per entrambe le specie.

Key words. *Platycerus caprea*, *Platycerus caraboides*, distribution, new records, host plants, Piacenza province, northern Apennines, Italy.

Introduction

Saproxyllic insects such as stag beetles (Coleoptera: Lucanidae) are beneficial organisms in forest ecosystems for their activity in wood decomposition and nutrient recycling (STOKLAND *et al.*, 2012; AUDISIO *et al.*, 2014; CARPANETO *et al.*, 2015). The family Lucanidae includes forest indicator species, and it is considered a priority group in monitoring (LACHAT *et al.*, 2012). The Italian stag beetle species of *Platycerus* Geoffroy, 1762, *P. caprea* (De Geer, 1774) and *P. caraboides* (Linnaeus, 1758), are quoted as Least Concern (LC) in the International Union for Conservation of Nature (IUCN) Red List (AUDISIO *et al.*, 2014; CARPANETO *et al.*, 2015), and are protected by the Tuscany Regional Law 56/2000 (BARTOLOZZI & SFORZI, 2001; BALLERIO, 2003).

The flight period of Italian *Platycerus* species is from April to July (shorter for *P. caprea*; see FRANCISCOLO, 1997), when the females lay eggs gnawing oviposition scars on the wood surface (SCACCINI, 2016). The development after hatching lasts three years, and larvae grow in different species of host trees (MORETTO, 1984; KLAUSNITZER & KRELL, 1996; FRANCISCOLO, 1997). Pupation usually occurs in the late summer, inside the deadwood, and the period spent as pupa lasts about two-three weeks (SCACCINI, 2017a). Adults overwinter in the pupal chamber up to the following spring (MORETTO, 1984; FRANCISCOLO, 1997).

Despite the distribution of *Platycerus* spp. was recently updated across the Italian peninsula (BARTOLOZZI & MAGGINI, 2005, 2007), some areas are still poorly studied. This paper improves the knowledge on the geographic distribution of *P. caprea* and *P. caraboides* in Piacenza province and

surroundings (northern Italy), an area for which data were scarce and often old, providing information also on their host trees.

Material and methods

From 2014 to 2016, in different periods of the year, field surveys in Piacenza province and surroundings (as reported below) were carried out to improve the knowledge on the distribution of *P. caprea* and *P. caraboides*. Surveys were performed in different places in Apennine's hills and mountains. Collections were made directly by opening the deadwood, searching for specimens (larvae, adults). Suitable logs were also detected by the individuation of the oviposition scars left by females, which can be useful to identify the presence of this genus in a forest (IMURA, 2010; SCACCINI, 2016, 2017b). Adults and larvae were identified up to specific level according to HÜRKA (1975), FRANCISCOLO (1997), BALLERIO *et al.* (2014), and observations made by SCACCINI (2015a). Due to the methodology, all the adults found were overwintering or dead. Findings for each species are reported in maps, covering the survey area (Piacenza province and surroundings: parts of the Emilia-Romagna, Lombardy and Liguria regions; Figs 1, 2). Several alive specimens were reared for further studies, while the others are preserved in the author's collection, Zelo Buon Persico (Lodi, Italy). Other data included in the present work also come from the Di.Pro.Ve.S. (Dipartimento di Produzioni Vegetali Sostenibili) collection, Entomological Area, Università Cattolica del Sacro Cuore, Piacenza. In addition, in the distribution map, data from the "Forum Entomologi Italiani" and the "Forum Natura Mediterraneo" (see below) are also considered. Concerning field data, the host plant is also reported; the question mark indicates doubts in tree identification, due to the wood decay. When available, the coordinates of records are reported in degrees, minutes, and seconds (datum WGS84). Data are listed in chronological order; the double slash ("/") divides different labels for the material of the Di.Pro.Ve.S. collection, and labels are quoted *verbatim*. In squared brackets, the transliteration of Italian labels is reported, preceded by the symbol "=". FRANCISCOLO (1997), BARTOLOZZI & MAGGINI (2005, 2007) and POGGI (2006) give information on the place where collections are located.

Abbreviations

Acronyms of collections and web Forums:

CA = Collection V. Aliquò, Catania;

CB = Collection B. Bari, in CMD (see below);

CDPVS = Collection Di.Pro.Ve.S., Entomological Area, Università Cattolica del Sacro Cuore, Piacenza;

CF = Collection M. E. Franciscolo, in CMD (see below);

CMD = Collections Museo Civico di Storia Naturale "G. Doria", Genoa;

CS = Collection N. Sanfilippo, in CMD;

FEI = Forum Entomologi Italiani, www.entomologiitaliani.net, accessed 01 October 2017;

FNM = Forum Natura Mediterraneo, www.naturamediterraneo.com/Forum, accessed 01 October 2017.

Collection data: ♀/♀♀ = adult female/s; ♂/♂♂ = adult male/s; abt. = about; fac. = facing (exposition); la. = larva/ae; leg. = legit; m = metres above sea level (a.s.l.); o.s. = oviposition scars.

Results

Distribution and host plants

In the studied area, in two sites the presence of *P. caraboides* was assessed by the only presence of oviposition scars, hypothesising the species by the habitat characteristics (i.e. plant species, altitude) and the area of finding. *P. caprea* seems to be limited to some areas, while *P. caraboides* appears to be widely spread in Piacenza province, related to hills and mountains.

Overall, *P. caprea* was found to feed exclusively on *Fagus sylvatica* L., while *P. caraboides* on the following trees: *Acer* spp., *Castanea sativa* Mill., *Corylus avellana* L., *Quercus* spp., *Fagus sylvatica*, *Fraxinus ornus* L., *Ostrya carpinifolia* Scop., and *Prunus avium* L.

Platycerus caprea (De Geer, 1774) (Fig. 1)

Bibliographic data (of the area covered by the map; 1). **Lombardy** (1) - Pavia: Oltrepò Pavese, Monte Lesima, 1300 m, 01.VI.1947, CB (FRANCISCOLO, 1997; BARTOLOZZI & MAGGINI, 2005, 2007).

New data (4). **Lombardy** (4) - Pavia: Oltrepò Pavese, close to Monte Lesima, Brallo di Pregola, surroundings, 44°45'16.50" N 9°17'00.87" E, 1072 m, fac. S/W, 23.X.2014, 3 la. (*Fagus sylvatica*), D. Scaccini leg.; *ibidem*, 44°45'20.70" N 9°17'00.51" E, 1083 m, fac. S/W, 23.X.2014, 3 la. (*Fagus sylvatica*), D. Scaccini leg.; *ibidem*, 44°45'17.53" N 9°17'01.61" E, 1080 m, fac. S/W, 30.VII.2015, 1 la., o.s. (*Fagus sylvatica*), D. Scaccini leg.; *ibidem*, near the border Lombardy-Emilia-Romagna, 44°45'25.88" N 9°17'13.55" E, 1146 m, fac. S/W, 30.VII.2015, 1 la., o.s. (*Fagus sylvatica*), D. Scaccini leg.

Distribution. Europe and Asia (BARTOLOZZI *et al.*, 2016).

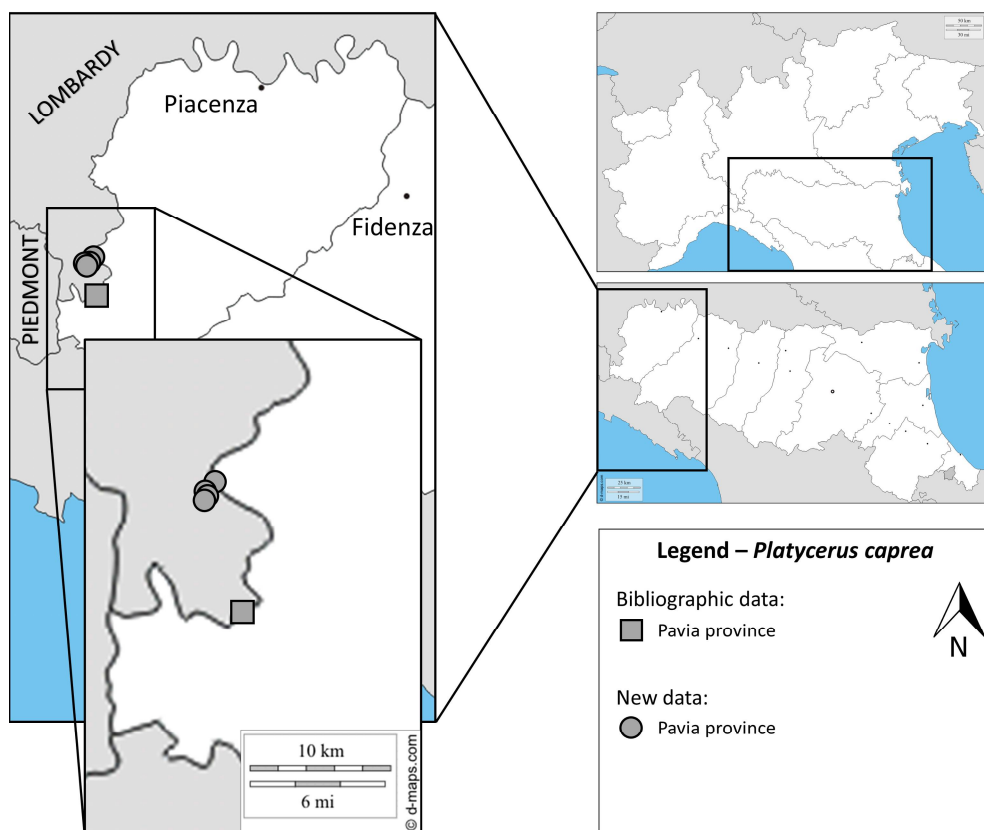


Fig. 1. Distribution of *Platycerus caprea* in Pavia province, close to Piacenza province.

Platycerus caraboides (Linnaeus, 1758) (Fig. 2)

Bibliographic data (of the area covered by the map; 4). **Emilia-Romagna** (2) - Piacenza: Zerba, frazione Pey, 1500 m, 1962, CA (BARTOLOZZI & MAGGINI, 2005, 2007); Parma: Monte Gottero, 800 m, VII.1976, CS (BARTOLOZZI & MAGGINI, 2005, 2007; quoted as Liguria, La Spezia by FRANCISCOLO, 1997). **Liguria** (2) - La Spezia: Rezzoaglio D'Aveto, 900 m, VII.1947, CF (FRANCISCOLO, 1997; BARTOLOZZI & MAGGINI, 2005, 2007); Varese Ligure, 500 m, VIII.1948, CF (FRANCISCOLO, 1997; BARTOLOZZI & MAGGINI, 2005, 2007).

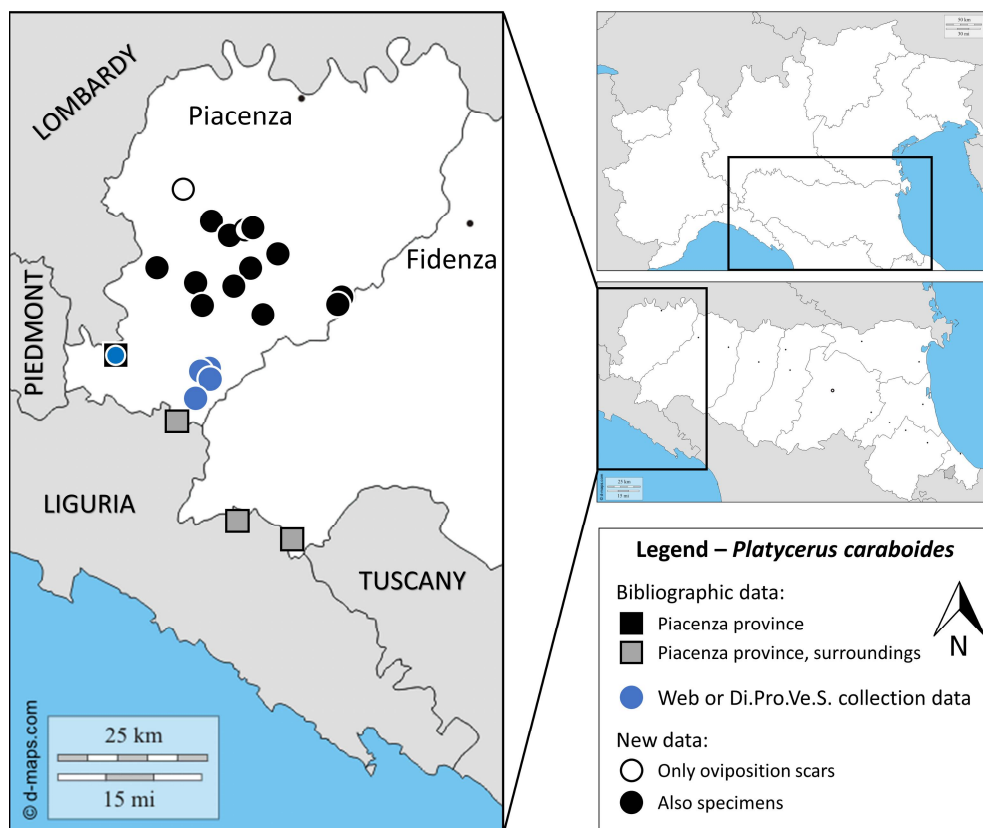


Fig. 2. Distribution of *Platycerus caraboides* in Piacenza province and surroundings.

New data (19). Emilia-Romagna (19) - Piacenza: Zerba, Frazione Pey, 1500 m, 29.IV.1962, 2 ♂♂, 2 ♀♀, CDPVS, A. Ravizza leg., ♂ with the following labels: 34 [printed] // (Piacenza), Capannette di Pej, Zerba m 1500, 29.IV.1962 // leg. A. Ravizza, accentrati in un certo numero in un ceppo di faggio [= centralized in a big number inside a stump of beech] // *S. caraboides* L., A. Ravizza det. [handwritten]; ♂ with the following labels: 35 [printed] // [same further labels of the previous one, handwritten]; ♀ with the following labels: 36 [printed] // [same further labels of the previous one, handwritten]; ♀ with the following labels: 37 [printed] // [same further labels of the previous one, handwritten]; Ferriere, Lago Moo, 1000 m, 02.VI.1967, 1 ♂, CDPVS, F. Tagliaferri leg., with the following labels: 44 [printed] // (Piacenza), Lago Moo - Ferriere, m 1000, 2.VI.1967 // F. Tagliaferri leg., al volo con sole, brezza, discretamente caldo [= flying, with sun, breeze, fairly warm] // *S. caraboides* L., F. Tagliaferri det. [handwritten]; Ferriere, Selva, surroundings, 1100 m, 23.V.1968, 1 ♂, CDPVS, F. Tagliaferri leg., with the following labels: 2 [printed] // (Piacenza), Selva - Ferriere, m 1100, 23.V.1968, F. Tagliaferri leg. // Aggrappato a un filo d'erba lungo la strada per Pertuso [= Clinging to a blade of grass along the road to Pertuso] // *S. caraboides* L., F. Tagliaferri det. [handwritten]; Ferriere, frazione Canadello, abt. 800 m, 11.V.2011, 1 ♂, FEI, C. Acquistapace leg.; Ferriere, 1200 m, 21.V.2011, 1 ♂, FNM, photo by P. Marenzi; Bettola, Castellana, going to Buzzetti, 44°46'50.53" N 9°34'00.18" E, 725 m, fac. N/E, 03.IV.2015, 6 la., o.s. (*Castanea sativa*), D. Scaccini leg.; Bettola, Bigotti, surroundings, 44°44'44.12" N 9°37'54.65" E, 793 m, fac. S/W, 21.IV.2015, 1 ♂, 38 la., o.s. (?*Corylus avellana*), D. Scaccini leg.; Ponte dell'Olio, Cassano, surroundings, 44°50'19.96" N 9°38'20.45" E, 586 m, fac. N/W, 27.V.2015, 1 ♂, 5 la. (*Quercus* sp.), D. Scaccini leg.; Bobbio, Centomerli, surroundings, 44°48'19.85" N 9°24'37.15" E, 455 m, fac. S/E, 12.XI.2015, 10 la.,

o.s. (*Acer* sp., ?*Castanea sativa*), D. Scaccini leg.; Vernasca, Luneto di Bore, surroundings, 44°44'09.77" N 9°48'14.77" E, 829 m, fac. N/W, 24.III.2016, 2 la., o.s. (*Fagus sylvatica*), D. Scaccini leg.; *ibidem*, 44°44'24.10" N 9°48'27.40" E, 787 m, fac. N/W, 24.III.2016, 1 ♂, 1 ♀ (remains), 4 la., o.s. (*Fagus sylvatica*), D. Scaccini leg.; Farini, Pradovera, surroundings, 44°44'27.52" N 9°29'47.11" E, 855 m, fac. N/E, 31.III.2016, 3 la., o.s. (*Fagus sylvatica*), D. Scaccini leg.; Coli, Filippazzi, 44°47'03.94" N 9°29'01.05" E, 775 m, fac. N, 05.V.2016, 1 ♀, 8 la., o.s. (?*Corylus avellana*, *Acer* sp.), D. Scaccini leg.; Rivergaro, Mandrola, 44°51'50.38" N 9°35'16.63" E, 572 m, fac. N, 25.VIII.2016, 2 la., o.s. (*Quercus* sp., *Corylus avellana*), D. Scaccini leg.; *ibidem*, surroundings of Monte Dinavolo, 44°51'43.24" N 9°34'58.73" E, 637 m, fac. N, 25.VIII.2016, o.s. (*Quercus* sp., *Fagus sylvatica*), D. Scaccini leg.; Rivergaro, Rallio, surroundings, 44°51'35.48" N 9°33'52.51" E, 461 m, fac. N/W, 26.IX.2016, 5 la., o.s. (*Ostrya carpinifolia*), D. Scaccini leg.; Travo, surroundings, 44°52'12.86" N 9°31'22.99" E, 578 m, fac. N/E, 26.IX.2016, 1 la., o.s. (*Prunus avium*), D. Scaccini leg.; Piozzano, Vidiano, surroundings, 44°55'32.78" N 9°27'15.49" E, 448 m, fac. S/E, 27.IX.2016, o.s. (*Acer* sp.), D. Scaccini leg.; Bettola, Recesio, surroundings, 44°42'14.25" N 9°35'25.86" E, 723 m, fac. N/E, 28.IX.2016, 2 ♂♂, 10 la., o.s. (*Ostrya carpinifolia*, *Quercus* sp., *Fraxinus ornus*), D. Scaccini leg.

Distribution. Europe, North Africa and Asia (BARTOLOZZI *et al.*, 2016).

Discussion and Conclusions

Collecting specimens directly from the deadwood allowed in most cases the prompt identification of the tree in which the larvae developed or were developing. Although *P. caprea* specimens were found developing inside a known host tree, *Fagus sylvatica*, those of *P. caraboides* were also collected from trees not previously reported in literature. KLAUSNITZER & SPRECHER-UEBERSAX (2008), in their overviewed list of host plants for *P. caraboides*, quoted the following plant genera: *Fagus*, *Tilia*, *Quercus*, *Betula*, *Carpinus*, *Fraxinus*, *Pinus*, *Buxus*, *Prunus* (with *P. spinosa* L.), and *Crataegus*. Additionally, *P. caraboides* can develop also on *Castanea sativa* (see e.g. NICOLAS & BARAUD, 1964; BARAUD, 1993; PESARINI, 2004; SCACCINI 2015b, 2016), and probably on *Acer* sp. (SCACCINI & ULIANA, 2017). Species of the genus *Acer* are reported as host plants for *P. caprea* (cfr. KLAUSNITZER & SPRECHER-UEBERSAX, 2008). Primarily, the original data here reported confirmed the relationship between *P. caraboides* and some known trees, reporting its occurrence in some well-known taxa (i.e. *F. ornus* for *Fraxinus*, and *P. avium* for *Prunus*). Moreover, other plants are confirmed host species: *Acer* spp., *Corylus avellana*, and *Ostrya carpinifolia*, which, together with bibliographic data, confirm the polyphagous lifestyle of *P. caraboides*. The species seems also to prefer parts of decaying wood rich in moisture (MONNERAT *et al.*, 2016; SCACCINI, 2016), and to have relations with some fungi and microorganisms. LACHAT *et al.* (2012) report a relationship between some European stag beetles and wood amount and temperature in beech forests. In their paper, *P. caraboides* is considered independent of available deadwood amount, and an indicator of warmer sites than *P. caprea*, which prefers places with a greater amount of wood. This could explain the observed distribution of *P. caprea* and *P. caraboides* in the surveyed area, where *P. caprea* resulted to be rarer than *P. caraboides* (Figs 1, 2), a species widely distributed in hills and mountains. In addition, differences between the vertical distribution of *P. caprea* and *P. caraboides* are recorded in some studies, placing the second species in relation to lower altitudes (see e.g. NICOLAS & BARAUD, 1964; DELLACASA, 1966; SCHERF, 1985; FRANCISCOLO, 1997; MELLONI & LANDI, 1997). In Italy, both the species were previously recorded also at low altitudes, in particular *P. caraboides* (e.g. DELLACASA, 1966; FRANCISCOLO, 1997; MELLONI & LANDI, 1997; BARTOLOZZI & MAGGINI, 2005, 2007; SCACCINI & ULIANA, 2017). Regarding the data here reported, the mean altitude for *P. caprea* (calculated in four different sites) is 1095 m, ranging from 1072 to 1146 m a.s.l., while for *P. caraboides* (in 19 sites) is 780 m, from 448 to 1500 m a.s.l. The vertical distribution of *P. caprea* seems to be related to the distribution of *F. sylvatica*, the main host plant recorded for the species. Examples of biotopes in a panoramic view are reported in Figs 3, 4.

Moreover, according to the updated distribution for the survey area (BARTOLOZZI & MAGGINI, 2005, 2007), *P. caprea* seems to be formally absent from Piacenza province, so far (cfr. Fig. 1). Indeed, *P. caprea* specimens (2 ♂♂, 4 ♀♀) stated by DELLACASA (1966: 45) for Piacenza province (Zerba, 773 m, 29.IV.1962, A. Ravizza leg.) were not considered in the distribution list of aforementioned papers

(i.e. FRANCISCOLO, 1997; BARTOLOZZI & MAGGINI, 2005, 2007). Furthermore, in the same date and area, the same collector found some specimens of *P. caraboides* (not *P. caprea*), a species already reported by BARTOLOZZI & MAGGINI (2005, 2007) and present with four specimens in CDPVS (see above).

In conclusion, confirming the observation made by SCACCINI (2016), the presence of suitable fallen logs (Fig. 5) was positively related to the occurrence of *Platycerus* spp. inside, and oviposition scars on the surface (Figs 6, 7).



Fig. 3. Panoramic view of biotopes of *Platycerus caprea* (surroundings of Pregola, Pavia, 1000 m a.s.l., 23 October 2014).



Fig. 4. Panoramic view of biotopes of *Platycerus caraboides* (surroundings of Filippazzi, Piacenza, 775 m a.s.l., 5 May 2016).

The two *Platycerus* species are threatened by the incorrect managing of deadwood and, generally, by the habitat destruction (see e.g. BARTOLOZZI & SFORZI, 2001; SCACCINI, 2017b). Further studies should be performed to better understand the occurrence of these beetles in less investigated areas, and their biology in the field, together with their altitudinal distribution and their host trees.



Fig. 5. Habitat of *Platycerus caraboides* in closer view (surroundings of Pradovera, Piacenza, 855 m a.s.l., 31 March 2016).



Fig. 6. Overwintering *Platycerus caraboides* male (surroundings of Recesio, Piacenza, 723 m a.s.l., 28 September 2016).

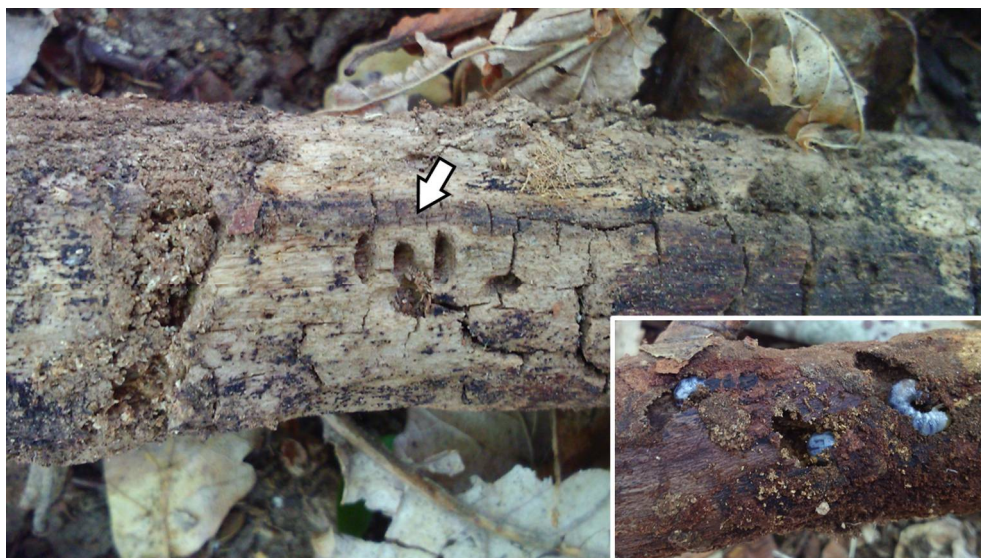


Fig. 7. Oviposition scars (arrow) on a fallen branch, and larvae of *Platycerus caraboides* found therein (surroundings of Bigotti, Piacenza, 793 m a.s.l., 21 April 2015).

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