

The genus *Lichenophanes* Lesne, 1899 in Italy (Coleoptera Bostrichidae) and short considerations on the saproxylophagous beetle-fauna of Nebrodi Mountains (Sicily)

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ABSTRACT

The Italian distribution and ecology of *Lichenophanes numida* Lesne, 1899 and *L. varius* (Illiger, 1801) are summarized; both species are recorded for the first time from Sicily, and *L. varius* also from Veneto and Molise Regions. *L. varius* is a protected species, at different levels, in most of European countries in which it occurs, so its main threatening factors are discussed. Finally, the importance of the dead wood for the conservation of saproxylic beetle-fauna of Sicilian forests, is underlined.

KEY WORDS

distribution; saproxylic fauna; global warming.

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INTRODUCTION

The genus *Lichenophanes* Lesne, 1899 (Coleoptera Bostrichidae Bostrichinae) occurs with 41 species in Europe, Asia, Africa and Americas, especially in more mesic areas (Ivie, 2002; Borowski & Węgrzynowicz, 2007).

As stated by Lesne (1899) in the original description of this genus, its etymology refers to the mimetic lichen-like appearance of the colouration of many of its species. *Lichenophanes* is distinguished from other genera of Bostrichinae (cf. Lesne, 1899, 1901; Ivie, 2002; Bahillo de la Puebla et al., 2007) by the shape of the apophysis of the first sternite dilated ventrally, and by the presence, on each side of the articles of the antennal club, of a pairs of sensory rounded dimples (Lesne, 1899,

figs. 57-59; De Marzo & Porcelli 1989, fig. 5b) with well-defined margins and covered by a dense golden pubescence (Fig. 1).

From a biological point of view, this genus includes secondary saproxylophagous beetles that, so, during the larval stages feed on wood yet partially degraded by other organisms.

In the Palaearctic Regions are present only three species (Borowski & Węgrzynowicz, 2007), two of them occur in Europe: *L. numida* Lesne, 1899 and *L. varius* (Illiger, 1801), both live also in Italy (Audisio et al., 1995; Nardi, 2004; Borowski, 2007; Borowski & Węgrzynowicz, 2007). New records of these species give an opportunity to revise their distribution in Italy and to summarize (Table 1; Figs. 2-7) the morphological features for their identification.

<i>Lichenophanes varius</i>	<i>Lichenophanes numida</i>
Colour brown	Colour dark brown
Length 5.5-13 mm	Length 9-14 mm
Clypeus without reddish, dense and long hairs	Clypeus with reddish, dense and long hairs
Pronotum slightly longer than wide (Figs. 2, 3) (Lesne, 1899: figs. 66-67)	Pronotum slightly wider than long (Fig. 4) (Lesne, 1899: fig. 68)
Apex of elytra (visible ventrally) not enlarged (Fig. 6) with crenulate margin	Apex of elytra (visible ventrally) enlarged (Fig. 7) with smooth margin
Intercoxae process of the abdomen rounded or truncate at the apex (Fig. 5)	Intercoxae process of the abdomen pointed at the apex
Ventral surface of the abdomen with dense and regular punctures	Ventral surface of the abdomen with sparse punctures on the midline, denser on the sides
Apical declivity of the elytra generally with numerous pubescent areas (Fig. 10)	Apical declivity of the elytra generally with only two pubescent areas in the upper part
Lobes of the parameres of the aedeagus wider than long with parallel sides to the basal half and the apical half abruptly truncated and occupied by a sensory and pubescent area (Bahillo de La Puebla et al., 2007: fig. 9c)	Lobes of the parameres of the aedeagus as long as wide, regularly decreasing in width from the base to the apex, with outer margin regularly rounded (Bahillo de La Puebla, 2007: figs. 9a-b)

Table 1. Morphological characters that differentiate the two species: *Lichenophanes varius* and *L. numida* (cf. Lesne, 1899, 1901; Porta, 1929; Bahillo de la Puebla et al., 2007).

MATERIALS AND METHODS

In this paper, all the available Italian data are critically revised and listed together with new records. For each record, the following information, when available, is provided: region, province, commune, locality, biotope, metres a.s.l., geographic coordinates, date, collector, additional information on the finding, number of specimen/s (es.), collection, possible published data source (bibliographic reference or website, in parenthesis); the symbol “(!)” refers to examined records. The labels of the examined specimens are generally written in Italian; hereunder, the regions and the collecting methods were translated in English; the same is valid for literature records. The mainland Italian regions are listed from north to south, and from west to east, all toponyms are listed alphabetically. When deemed useful for the discussion of both species, material examined from other countries (“Other material examined”) is also provided. The material was iden-

tified according to Lesne (1899, 1901) and Bahillo de la Puebla (2007). Comments and interpretations are given in square brackets.

ACRONYMS. Specimen depositories: CFA = F. Angelini, Francavilla Fontana (Brindisi), Italy (F. Angelini, pers. com., 2013); CDS = D. Sechi, Cagliari, Italy; CLE = P. Leo, Cagliari, Italy; CLI = A. Liberto, Rome, Italy; CMO = L. Mola, Castel Mella (Brescia), Italy; CMU = C. Muscarella, Palermo, Italy; CNA = G. Nardi, Cisterna di Latina (Latina), Italy; CNBFVR = Centro Nazionale per lo Studio e la Conservazione della Biodiversità Forestale “Bosco Fontana” di Verona, Sede di Bosco Fontana, Marmirolo (Mantua), Italy; CPA = G. Pace, Rome, Italy (G. Pace, pers. com., 2013); CSP = I. Sparacio, Palermo, Italy; CVO = V. Vomero, Rome, Italy (V. Vomero, pers. com., 1995); MCGB = G. Binaghi c/o Museo Civico di Storia Naturale “Giacomo Doria”, Genoa, Italy; MCGD = A. Dodero c/o Museo Civico di Storia Naturale “Giacomo Doria”, Genoa, Italy (R. Poggi, in litteris, 1996);

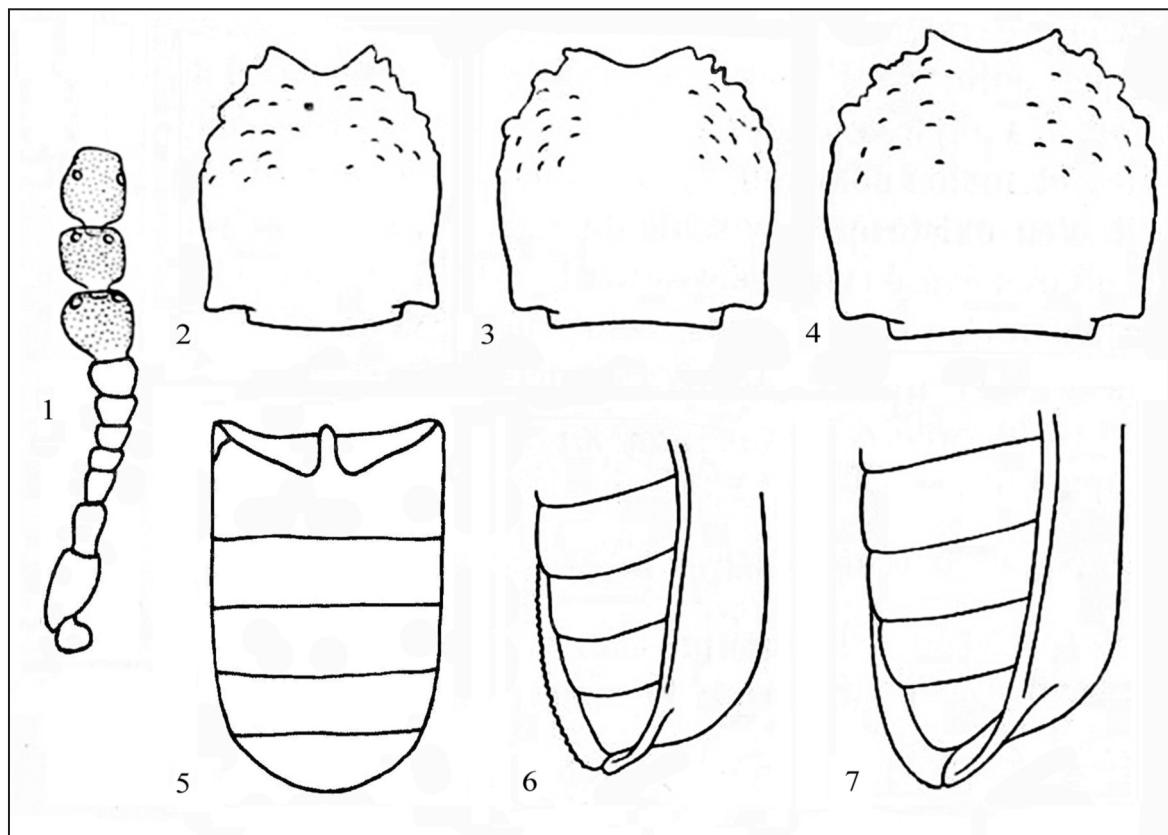


Figure 1. Antenna of the genus *Lichenophanes*. Figures 2-7. Morphological characters of *Lichenophanes varius* and *L. numida*, see Table 1 (cf. Lesne, 1899, 1901; Bahillo de la Puebla et al., 2007).

MCGM = C. Mancini c/o Museo Civico di Storia Naturale "Giacomo Doria", Genoa, Italy; MCSV = Museo Civico di Storia Naturale, Verona, Italy; MCSVB = M. Burlini c/o Museo Civico di Storia Naturale, Verona, Italy; MCSVS = A. Sette c/o Museo Civico di Storia Naturale, Verona, Italy; MCZRE = C. Emery c/o Museo Civico di Zoologia, Rome, Italy; MCZRG = G. Ganev c/o Museo Civico di Zoologia, Rome, Italy; MCZRL = P. Luigioni c/o Museo Civico di Zoologia, Rome, Italy; MNHN = Muséum National d'Histoire Naturelle, Paris, France; MSNF = Museo di Storia Naturale dell' Università degli Studi di Firenze, Sezione di Zoolo gia "La Specola", Florence, Italy (F. Cianferoni, pers. com., 2013).

Main collectors: AL = A. Liberto; AM = A. Molinu; AS = A. Sette; AV = A. Verdugo; CE = C. Esposito; CM = C. Muscarella; DB = D. Birtele; DS = D. Sechi; DW = D. Whitmore; EC = E. Colonnelli; FA = F. Angelini; FI = F. Izzillo; GA = G. Altadonna; GM = G. Magnani; GN = G. Nardi; GP = G. Pace;

GS = G. Sama; IG = I. Ganev; IS = I. Sparacio; LM = L. Mola; MBr = M. Bracalini; MBu = [M.] Burlini; MG = M. Gigli; ML = M. Lopresti; PC = P. Cerretti; PL = P. Leo; RD = R. De Togni.

Other abbreviations and recurrent terms used in Records: Bosco = Wood; ca = circa = about; coll. = collection; dint. di = dintorni di = environs of; env. = environs; es. = specimen/s; ex = emerged from wood of; FEI = "Forum Entomologi Italiani" (<http://www.entomologiitaliani.net>) (accessed 13 August 2013); Lago = Lake; loc. = locality; M. = Monte = Mount; prov. = province; presso = near; sdb = same data but; Via = Road; wdc = without date of collection; wfd = without further data; ! = material examined.

RESULTS

Revised quotations and new records of the species in Italy with details are listed below.

***Lichenophanes numida* Lesne, 1899**

- Lichenophanes numida* Lesne, 1899: Lesne, 1901: 92; Audisio et al., 1995: 7; Urbano Granero, 2002: 30; Nardi 2004; Bahillo de la Puebla et al., 2007: 163; Borowski & Węgrzynowicz, 2007: 97; López-Colón & Bahillo, 2011: 3; Baena & Zuzarte, 2013: 33.
- Lichenophanes numida* Lesne, [18]99: Winkler, 1927: 796.
- Lichenophanes numida* Lesne: Luigioni, 1929: 640; Porta, 1929: 415.
- Lichenophanes numida* Lesne, 1898 [sic!]: Vrydagħ, 1960: 10.
- Lichenophanes numidica* [sic!] Lesne, 1899: Angelini, 1998: 20.
- Lichenophanes numida* (Lesne, 1899) [sic!]: Fernández-Carillo et al., 2001: 42; Murria Beltrán, 2002: 198.

ITALIAN RECORDS (Fig. 8). Basilicata: Matera prov.: Lago di San Giuliano, loc. Ponte Cagnolino, VIII.1992, FA, light trap (Angelini, 1998); sdb, 27–31.VII.1993, 1 ex (CFA). Sardinia: no exact locality and date (Winkler, 1927; Luigioni, 1929; Porta, 1929; Vrydagħ, 1960; Audisio et al., 1995; Fernández-Carillo et al., 2001; López-Colón et al., 2001; Murria Beltrán, 2002; Urbano Granero, 2002; Nardi, 2004; Bahillo de la Puebla et al., 2007; Borowski & Węgrzynowicz, 2007; López-Colón & Bahillo, 2011; Baena & Zuzarte, 2013); Cagliari prov.: “Gonnos, en juin (Baudi [leg.] in Coll. Oberthür)” (Lesne, 1901); “Gonnos, VI.[18]91, *A. varia*”, 1 es. (MCGD); Gesturi, Giara VIII.2004, ex *Quercus suber*, DS, 3 es. (CDS); idem, VIII.2005, 1 es. (CDS); Sinnai, M. Sette Fratelli, VIII.2005, ex *Quercus suber*, DS, 3 es. (CDS); Villaputzu, Rio Ollastu, m. 80, 17.VI.2007, collecting at light, DS, 1 es. (CDS); San Nicolò Gerrei 19.VI.2013, collecting at light, DS, 1 es. (CDS); Nuoro prov.: Orune, wfd, 1 es. (MCGD); ibidem, wfd, 2 es. (MCGM) (!); ibidem, wdc, coll. Demarchi, 2 es. (MCGB) (!); Oristano prov.: Magomadas, Nicolosu, VII.1994, PL, 1 es. (CLE) (!); Sassari prov.: Buddusò, loc. Sos Canales, 14.VI.1997, AM, 2 es. (CLI) (!); Sassari, Rio Bunnari, 8.VI.1997, DS, collecting at light, 1 es. (CDS) (!). Sicily: Palermo prov.: Bosco della Ficuzza, Torretta Torre, 940 m, Plot Conecofor SIC1, UTM 33 S 357671 4194110, 5.V.2004, under the bark of a *Quercus* sp. tree, GN, 3 es. remains (CNBFVR)

(!); [Bosco della] Ficuzza, Torretta Torre, 986 m, UTM 33 S 359993 4196856, 28.VI.2005, DB, PC, ML & DW, collecting at light, 1 es. (CNA) (!); [Monreale], Lago Scanzano, 8.VII.2008, IS, direct collection, 1 es. (CSP) (!).

OTHER MATERIAL EXAMINED. Algeria: Tizi Ouzou, Parc Nat. [= National] d'Akfadou, 800-1000 m, 17–18.VI.1982, GS, 4 es. (MCSV); Ft. [= Fôret] d'Akfadou, 1000 m, 4–7.VI.1980, GS & GM, 2 es. (MCSV). Spagna: Cádiz, Los Barrios, Arroyo Valdeinfierro, P.N. [= National Park] Los Alcornocales, 155 m, 10.VI.2008, AV, 4 es. (CMU).

CHOROTYPE. W-Mediterranean: Morocco, Algeria, Tunisia, Portugal, Spain and Italy (Borowski, 2007; Borowski & Węgrzynowicz, 2007). Borowski (2007) recorded this species also from “AFR” [= Afrotropical Region], very probably on the basis of unpublished data, since no other literature record from this Region (see also Borowski & Węgrzynowicz, 2007) is known.

ECOLOGY. The adults of this species, as those of *L. varius*, are nocturnal (Español, 1956), and are often collected at light (Lesne, 1905; Español, 1956, 1974, as *L. numida* Lesne, 1898 [sic!]; Angelini, 1998; Murria Beltrán, 2002; Urbano Granero, 2002; Llinares & Navarro, 2003; !); they remain hidden in their tunnels, under bark or in the cracks of trunks during the day (Español, 1956). The adults are collected chiefly from May to August (Bahillo de la Puebla et al., 2007). The main host plant is *Quercus suber* L. (cf. Bahillo de la Puebla et al., 2007), but this beetle develops also on *Q. canariensis* Willd. (FEI, 2012), *Q. pyrenaica* Willd. (Baena & Zuzarte, 2013), *Eucalyptus* spp. (Lesne, 1901, 1905; Pic, 1905) and *Populus nigra* L. (López-Colón & Bahillo de la Puebla, 2011). On High Atlas (Morocco), this species reaches an altitude of 2000 m a.s.l. (Kocher, 1956).

REMARKS. *L. numida* is quite spread in the southern and central parts of the Iberian Peninsula (Bahillo de la Puebla et al., 2007), but according to Llinares & Navarro (2003) its presence in this area, as for other saproxylic beetles, is due to passive introductions with woods from Maghreb.

About the occurrence of this species in Sardinia, it must be underlined that the old above records from “Gonnos” refer probably to one of the following toponyms of the Cagliari province: Gonnoscodina, Gonnosfanadiga, Gonnosnò, Gonnastramatza. The species after the record of Lesne (1901), was cited

generically from Sardinia by several authors (Winkler, 1927; Luigioni, 1929; Porta, 1929; Vrydagh, 1960; Audisio et al., 1995; López-Colón, 2000; Fernández-Carillo et al., 2001; López-Colón et al., 2001; Murria Beltrán, 2002; Urbano Granero, 2002; Nardi, 2004; Bahillo de la Puebla et al., 2007; Borowski & Węgrzynowicz, 2007; López-Colón & Bahillo, 2011; Baena & Zuzarte, 2013) but the same Lesne (1938) has omitted (or has overlooked?) this record. The new records confirm definitively the occurrence of this species in Sardinia. While, the generic record for “S” (= Peninsular Italy) of Audisio et al. (1995) is an error (Liberto & Nardi, unpublished data), but the occurrence of the species in this area was later reported by Angelini (1998). The species is here firstly recorded from Sicily. The above first Sicilian specimens come from an old mixed oak-forest belonging to the *Quercetum gussonnei* vegetational association (cf. Mason et al., 2006), while the latest specimen comes from a dense planting of *Eucalyptus* trees situated among stands of the same above-mentioned oak-forest; so at least two of the host plants of this beetle occur in these

Sicilian sites (cf. Gianguzzi & La Mantia, 2004). Various kinds of traps (window flight, Malaise, pitfall) were used in this forest (cf. Mason et al., 2006), but the species was not intercepted by these methods. The same situation was observed in various Sardinian sites (cf. Cerretti et al., 2009; Nardi et al., 2011). In Italy this species is rare and localized; before this paper, the sole recent record was from Basilicata Region (Angelini, 1998).

Lichenophanes varius (Illiger, 1801)

Apate varia Illiger: Comolli, 1837: 37.

Apate varia Ill.: Villa & Villa, 1844: 62; Bertolini, 1875: 143.

Apate varia Illig.: Bargagli, 1873: 40.

Apate varians [sic!] Ill. (*Dufouri* Latr. [= *dufourii*] (Latreille, 1805))]: Costa, 1884: 28.

Lichenophanes varius Illiger, 1801: Lesne, 1898: 470; Lesne, 1901: 470.

Lichenophanes varius Illig.: Bertolini, 1904: 76; Luigioni, 1920: 207; Porta, 1929: 415; Grandi, 1956: 417; Tassi, 1963: 26; De Marzo & Porcelli, 1989: 88; Gobbi, 2002: 46.

Lichenophanes varius Ill.: Luigioni, 1929: 640; Faggioli, 1955: 174; Frediani, 1961: 3.

Lichenophanes varius: Borchert, 1938: 78; Gobbi, 1984: 54, 58.

Lichenophanes varius (Illiger, 1801): Audisio et al., 1995: 7; Nardi, 1997: 177–178; Gobbi, 2000: 195, 221; Nardi, 2004; Nardi & Zahradník, 2004: 127; FEI, 2011, 2012; Pezzi, 2013: 110.

ITALIAN RECORDS (Fig. 9). Lombardy: no exact locality and date (Bertolini, 1875, 1904; Luigioni, 1929; Porta, 1929; Borchert, 1938); “p” [= plain] (Villa & Villa, 1844); Brescia prov.: Capriano del Colle, Bosco delle Colombere, 20.VI.2012, LM, 1 es. (CMO) (FEI, 2012); Como prov.: “campagne di Rovello Porro” (Comolli, 1837); Mantua prov.: Marmirolo, Bosco della Fontana, Stand 12, [31.V–]14.VI.2000, FM, Qr1B3 [= trunk window trap on an untreated standing *Quercus robur* tree], 1 es. (CNBFVR) (!) (Nardi & Zahradník, 2004). Veneto: Verona prov.: Illasi, Parco Perez-Pompeii, 18.V–12.VII.2010, AS, trappola [= trap = wine trap (cf. Allemand & Aberlenc, 1991)], 1 es. and 1 es. remains (MCSVs) (!); ibidem, 20.V.2011, RD & AS, ex *Carpinus betulus*, 1 es. (MCSVs) (!); ibidem, 12.VI.2011, RD & AS, 1

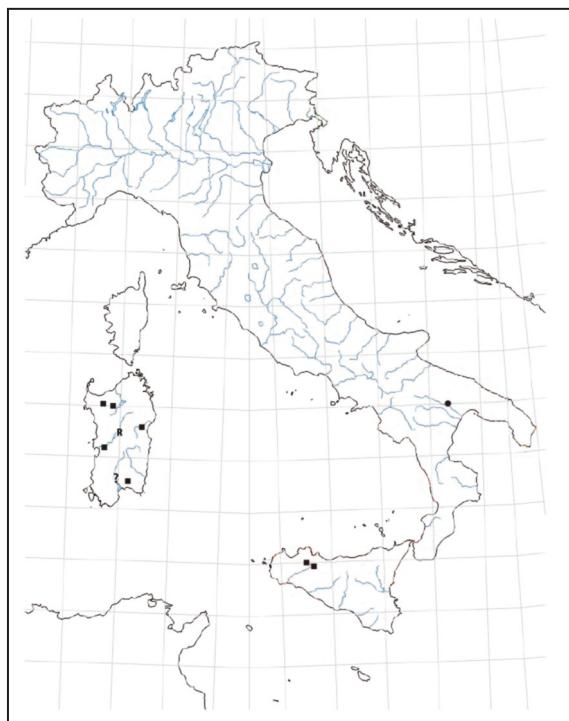


Figure 8. Distribution in Italy of *Lichenophanes numida*. Dot = references; square = new places; R = regional reports; ? = dubious locations.

es. (MCSVS) (!); ibidem, 21.VI.2011, RD & AS, ex *Carpinus betulus*, 1 es. (MCSVS) (!); sdb 2.VII.2011, 3 es. (MCSVS) (!); sdb 7.VIII.2011, 1 es. (MCSVS) (!); Musella, 5.VIII.1981, AS, ex *Quercus* sp., 5 es. (MCSVS) (!); sdb 5.IX.1982, ex Carpino [(*Carpinus betulus*)], 1 es. (MCSVS) (!); Negrar, [Fraz.] Montecchio, 500 m, 11.VII.2011, RD & AS, ex *Carpinus betulus*, 1 es. (MCSVS) (!); [Sommaccampagna] (Verona), [Fraz.] Custoza, Val dei Mulini, 25.II.2010, AS, 2 es. remains (MCSVS) (!). Emilia-Romagna: Ravenna prov.: Mezzano, Zona di Protezione Speciale (ZPS) "Bacini ex zuccherificio di Mezzano", 2006–2013 (Pezzi, 2013). Tuscany: Grosseto prov.: Grosseto, 20.VII.2011, MBr, ex *Quercus pubescens*, 4 es. (FEI, 2011). Lazio: no exact locality and date (Luigioni, 1929; Porta, 1929; Borchert, 1938); Frosinone prov.: [Monti Lepini,] Supino, loc. Pian della Croce, 1100 m, 9.VII.2006, GP, under the bark of an unidentified tree (maybe a Beech (*Fagus sylvatica*)), 27 es. (CPA); Latina prov.: Monti Lepini, Norma, Monte Arrestino vers. SW, 750 m ca, 25.VII.2002, GN & CE, about 16 hours, a death specimen carried by a *Camponotus (Camponotus) vagus* (Scopoli, 1763) (Hymenoptera, Formicidae) (M. Mei det., 2013) on a trunk of a fallen *Quercus pubescens* tree, under an old tree of the same species covered with Polyporaceae, 1 es. (CGN) (!); Parco Nazionale del Circeo [= Circeo National Park], Sabaudia, 1.VI.1996, GP, under the bark of a *Quercus* sp. tree, 2 es. (CLI) (!); Rome prov.: [Manziana,] Bosco di Manziana, 12.III.2012, under the bark of a death standing *Quercus* sp. tree, MG, 1 es. remains (FEI, 2012); Roma [= Rome], VI.1922, Delbue leg., on walls, 1 es. (MCZRL) (!) (Tassi, 1963; Nardi, 1997); dint. di Roma [= Rome], presso Via Appia Antica, 2.VII.1963, F. Tassi leg., about 20 hours while fluttering around the canopy of a large oak tree, 1 es. (Tassi, 1963); Roma, Nuovo Salario, 1995, introduced with woods (CVO) (Nardi, 1997); Sasso Furbara, 250 m, 2.VI.1996, FI, ex *Quercus suber*, 1 es. (CLI) (!); sdb 22.V.1996, 1 es. (CLI) (!); Viterbo prov.: Bassano [di Sutri = Bassano Romano], VII, under the bark of a dead Beech [(*Fagus sylvatica*)], 1 es. (Luigioni, 1920); Bassano [di] Sutri, 18.VII.1909, Luigioni leg., 1 es. (MCZRL) (!); Tuscania, 13–24.IV.1972, ex *Quercus suber* (Gobbi, 1984: 54); dint. Tuscania, 5.V.1972, ex dry branks of *Quercus suber* (Gobbi, 1984: 58). Molise: Campobasso prov.: Campomarino, Fraz. Campomarino Lido, 17.VI.1992, AL, on *Populus* sp., 1 es. (CLI) (!). Campania: no exact locality and date (Luigioni, 1929; Porta, 1929); Naples prov.: no exact locality and date (Luigioni, 1929; Porta, 1929); Naples prov.: "Naples" (MNHN) (Lesne, 1898, 1901); "Nap" [= Neapel = Naples] (Borchert, 1938); Napoli [= Naples], wfd [very probably collected during the XIX century], 1 es. (MSNF); "Nap." [= Napoletano = Naples area] (Bertolini, 1875); "n" [= ditto] (Bertolini 1904); [Naples,] Capodimonte, 27.VI.1867, 2 es. (MCZRE) (!); sdb 29.VI.1867, 1 es. (MCZRE) (!); dint. di Napoli [= Naples], Capodimonte, VI.1911, *Anguis*. [= *Anguissola*] leg., 1 es. (MCZRL) (!). Apulia: Foggia prov.: Gargano, Foresta Umbra (Faggioli, 1956); ibidem, [4.VII–4.VIII.1955], direct collection on dry woods (Grandi, 1956); Villaggio Amendola, 21.V.1999, P. Crovato leg., on *Ulmus* sp., 1 es. (CLI). Basilicata: Matera prov.: Policoro, 25.V.1986, 1 female (De Marzo & Porcelli, 1989); Potenza prov.: Foresta [demaniale] Gallipoli–Cognato, 500 m, 14.VI.1994, G. Gobbi leg., taken from a little cell in a death brank of an *Acer monspessulanum* tree, 2 es. (Gobbi, 2002); Foresta demaniale Gallipoli-Cognato, 500 m, 15.VI.1996, AL, under the bark of a fallen *Quercus cerris* tree, 1 es. (CLI) (!). Sicily: Messina prov.: [Monti Nebrodi,] Biviere di M. Sori, VII.1938, MBu, 1 es. (MCSVB) (!); [Monti Nebrodi,] Monte Soro, Piano Vescovo, 1400 m, 1.VII.1989, IS, 1 es. (CSP) (!); [Monti Nebrodi,] Messina, Monte Trefinate, 20.VII.2013, GA & CM, [on a stump of a *Quercus cerris* tree], 1 es. (CMU) (!); Monti Nebrodi, tra [= between] Caronia e [= and] Capizzi, 1300 m, 37°56'01"N/14°30'67"E, 6.VII.2005, AL, on a *Quercus cerris* tree, 1 es. (CLI) (!). Sardinia: no exact locality and date (Bertolini, 1875, 1904; Porta, 1929; Audisio et al., 1995; Nardi, 2004); no exact locality and date, "Baudi, Ghiliani [leg.]" (Bargagli, 1873); Nuoro prov.: "un individuo sotto le corteccie delle Elci sul Monte Chiesa di Aritzo: luglio" [= a specimen under the barks of Holms [(*Quercus ilex*)] on Mount Chiesa of Aritzo: July] (Costa, 1884).

OTHER MATERIAL EXAMINED. [Bulgaria:] Svile-uprad, 10.VII.1981, IG, 1 es. (MCZRG) (!). Czech Republic: Moravia, Břeclav, 2.VI.2007, M. Brabech leg., ex [unspecified tree], 1 es. (CNA) (!); sdb 2.VII.2008, 1 es. (CNA) (!). France: Corse du sud, env. Porto Vecchio, Rau Scopa Piana, 100 m, 7.VI.1999, EC, 2 es. (CLI) (!). Greece: Thessaly

(Trikala), Oros Antihassià, Vlahava env., 600 m, 29.VI.1999, AL, on *Quercus* sp., 1 es. (CLI) (!). [Romania:] Banat, Mehadia, wfd, coll. Burlini, 2 es. (MCSV) (!).

CHOROTYPE. Turano-Europeo-Mediterranean (cf. Nardi & Zaharadník, 2004; Borowski, 2007; Borowski & Węgrzynowicz, 2007).

ECOLOGY. The larvae are saproxylophagous and develop in the wood (branks and rotting trunks) of many broadleaved tree genera (e.g. *Alnus*, *Carpinus*, *Castanea*, *Fagus*, *Populus*, *Quercus* and *Tilia*) (cf. Lesne, 1901; Sahlberg, 1913; Iablokoff, 1945; Español, 1955; Horion, 1961; Damoiseau, 1966; Koch, 1989, as *Lichenophanus* [sic!] *varius*; Zaharadník, 1996; Nardi & Zaharadník, 2004; Ricarte et al., 2009) and roots of *Glycyrrhiza glabra* L. (Frediani, 1961); in Italy this species was found in *Acer monspessulanum* L., *Carpinus betulus* L., *Quercus* sp., *Q. pubescens* Willd., and *Q. suber* (Gobbi, 1984; FEI, 2011; Gobbi, 2002; !); moreover, adults were collected on the following trees: *Quercus* sp., *Q. cerris* L., *Q. ilex* L., *Q. robur* L., *Fagus sylvatica* L., and *Populus* sp. (Costa, 1884; Tassi, 1963; Nardi & Zaharadník, 2004; !).

The females seem to prefer for oviposition the trunk and smaller branches of large decaying logs, but with wood still compact, positioned on the sunny clearings of forests exposed to the East (Klingelhöffer, 1843; Perris, 1850 as *Apate dufourii*).

L. varius, similarly to other Bostrichidae, is able also at the adult stage of digging tunnels in the wood. These galleries have a circular entrance that penetrates into the wood horizontally for about 1–2 cm and then fold down with a straight stretch of about 2–3 cm. After the oviposition, the female reaches the entrance of the cavity where shortly after dies occluding the entry; the small larvae, after hatching, go towards the bottom, filling the gallery of sawdust, to build a small niche where to end the development (Klingelhöffer, 1843; Reitter, 1911). The larval stage lasts for more than five years (Recalde Irizun & San Martín Moreno, 2012) and during this long period, the larvae may be preyed upon by birds such as woodpeckers and owls, other beetles such as Cleridae and, occasionally, even mammals such as dormice (*Glis glis* Linnaeus, 1766) (Floßmann, 2010). The pupal stage begins in late April and lasts about two weeks. The flickering occurs in early summer and the specimens remain active until August (Klingelhöffer, 1843; Lesne, 1901; Español, 1955).

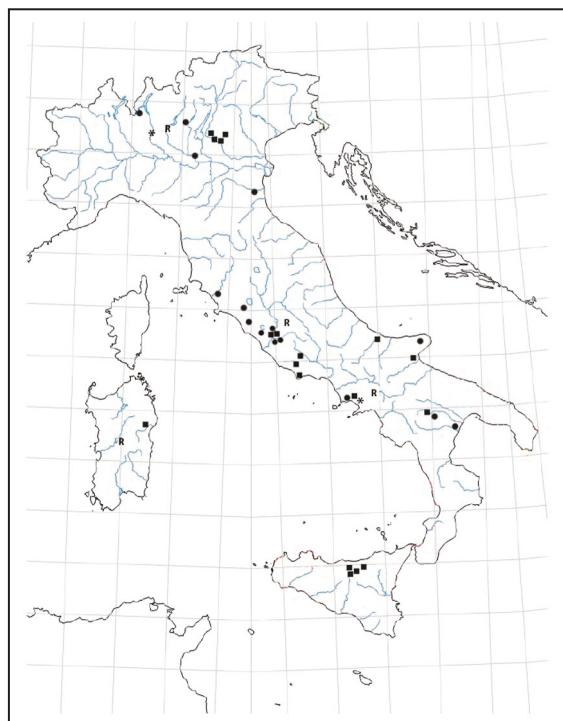


Figure 9. Distribution in Italy of *Lichenophanes varius*. Dot = references; square = new places; asterisk = general reports; R = regional reports; ? = dubious locations.

The adult is typically crepuscular and nocturn and is often attracted by artificial lights (Dajoz, 1961; Flechtner, 2000; Bahillo de la Puebla et al., 2007); according to Iablokoff (1945) it is particularly active in humid and rainy nights. *L. varius* during the day remains hidden under the bark, in the cracks of trunks or in its tunnels (Lesne, 1901; Iablokoff, 1943; Español, 1955; Horion, 1961), from where it is easy to get it out by blowing out the entrance with tobacco smoke (Perris, 1850).

According to some authors (cf. Iablokoff, 1943, 1945; Español, 1955), *L. varius* might attack only wood invaded by the mycelia of *Biscogniauxia nummularia* (Bull.) Kuntze (1891) (Pyrenomycetes, Xylariaceae). This peculiar ecology, is probably, as observed for other saproxylophagous beetles (cf. Rejzek & Vlásak, 2000), one of the causes of the rarity of this species. The above Sicilian records seem to confirm this requirement since a large decay of the beechs caused by *Biscogniauxia nummularia* is known from one (Monte Soro) of the above mentioned collection sites (Torta et al., 2009), while the beetle from Monte Trefinaita was collected on a

stump of an oak (*Quercus* sp.) (Fig. 10) tree infested by the black ascocarpi of another species of the same genus: *B. mediterranea* (De Not.) Kuntze (1891) (A. La Rosa, pers. com., 2013). This fungus lives on oaks (*Quercus* spp.) while *B. nummularia* lives on beech (cf. Franceschini et al., 2009; Torta et al., 2009). *B. mediterranea* is recorded also from Bosco della Ficuzza (cf. Torta et al., 2009), where *L. numida* was collected (!). In recent years there has been a resurgence of attacks from these phytopathogenic fungi in Mediterranean forest stands. This is in response to climate change that essentially led to an increase in average temperatures and an altered pattern of annual rainfalls, which caused water stress to trees, limiting their tolerance to adverse factors (Franceschini et al., 2009). This resurgence probably can favour the populations of *Lichenophanes* spp.

REMARKS. The alleged rarity of *L. varius* in much of its range, including Italy (Tassi, 1963; Horion, 1969; Flechtner, 1999; Gobbi, 2000; Zahradník & Nardi, 2004; Moulin, 2007; Lakatos & Molnár, 2009; Recalde Irurzun & San Martín Moreno, 2012), and its fragmented distribution is due not only to lack of research, but above all to the peculiar ecological requirements.

In fact, several authors (Cymorek, 1969; Geiser, 1994, 1998; Flechtner, 1999, 2000; Schillhammer, 2003) consider *L. varius* as "primary forest species", a species associated with primary forests that since the last European glaciation have not undergone environmental disturbances. Horion (1969) considers *L. varius* as a pre-glacial forest relict ("präglaziales urwaldrelikt"), that as a result of climate change remained confined to relict forest islands ("urwaldinseln") thus forming disjunct populations spread over a fragmented distribution area. To confirm this distribution model Horion (1969) claims to have identified the area of discontinuity, located along the valley of the Rhine River, between the French and North-German populations of *L. varius* and other beetles; the existence of this area confirms the existence of two glacial forest islands that have worked to refuge areas.

However, as noted by Nagel (1971), in central Europe this species is mainly distributed in areas that during the ice ages were devoid of forest islands, or in countries (e.g. Romania, Hungary and former Yugoslavia), which, although forested, were still covered by permafrost for most of the year, a condition that would inhibit the survival of *L. varius*.

Ponel (2007), however, argues that the fragmented distribution of *L. varius* is attributable to the human impact that from the Neolithic has gradually reduced the extent of primary forest grind into portions, relegating in these forestry islands the relict saproxylophagous species with high ecological requirements and determining elsewhere the extinction.

For all these reasons, *L. varius* is included in the Red Lists, both regional and national, in several European countries (Mason et al., 2013), in addition, it is considered rare in environmental conditions not compromised (Bulgarini et al., 2004) and its habitat of choice is considered in strong regression throughout Europe (Franc, 2004; Fischer et al., 2012).

L. varius is referred to as CR (Critically Endangered) in Poland (Głowaciński, 1992; Pawłowski et al., 2002) and in Germany (Geiser, 1998); "stark gefährdet" (highly endangered) in the lander of Baden-Württemberg and Brandenburg, "vom aussterben bedroht" (endangered) in the land of Bavaria (see Bussler, 2013; Büche & Möller, 2005), "Rare" in the Upper Silesia (Kubisz et al., 1998), "stark gefährdet" in Austria (Geiser, 1994), "VU" (Vulnerable) in Slovakia (Holecová & Franc, 2001). It is not among the species mentioned by a proposal for an Italian Red List of invertebrates (Cerfolli et al., 2002), probably due to lack of available data. It is also classified as "NT" (Near Threatened) in the European Red List of Saproxylic Beetles developed by Nieto & Alexander (2010) on behalf of the IUCN (International Union for Conservation of Nature, 2013). Finally, *L. varius* was included by Brustel (2001) in a list of saproxylophagous beetles that are bioindicators of high-quality mature French woodlands. It is not surprising, therefore, that this species in Sicily has been found just on Nebrodi Mountains, that are the Sicilian mountain range that includes forest environments of greater naturalness (cf. Sabella & Sparacio, 2004).

The old Italian regional records were listed also by most of subsequent authors (see above), nevertheless Luigioni (1929) has not listed the species from Sardinia; the sole detailed records from this island (Bargagli, 1873; Costa, 1884) are prior to the description of *L. numida*. In this framework, it is possible that the two species have been confused, nevertheless *L. varius* occurs also in the nearby Corsica Island (Lesne, 1901; Bertolini, 1904; Luigioni, 1929; Porta, 1929; Sainte-Claire Deville, 1937; Borchert, 1938; Vrydaghs, 1960; Horion,



Figure 10. *Lichenophanes varius* from Monte Trefinaite (Nebrodi Mountains, Sicily). Photo by C. Muscarella.

1961; !), which has also a similar biogeographical history (cf. De Jong, 1998), so only the study of the old Sardinian specimens (Bargagli, 1873; Costa, 1884) can confirm their identifications, but unfortunately their re-examination has so far been impossible. The above-listed new records from Veneto, Molise and Sicily, suggest that *L. varius* probably occurs in most of Italian regions. The new records show an unexpected diffusion of the species in the Verona province (Veneto), but in this province it was not intercepted by various kinds of traps (window flight, Malaise, pitfall) in the relatively undisturbed broadleaved woods of Mount Baldo (Spada, 2008; Nardi & Spada, 2008). In this province the species develops also on *Carpinus betulus* (!) that in Italy is a new host plant, while it was already listed by Damoiseau (1966) and Ricarte et al. (2009). At Bosco della Fontana (Lombardy, Mantua prov.), *L. varius* is very rare; this nature reserve (236.11 ha) includes one of the last remaining oak-hornbeam forest (*Querco-Carpinetum boreotalicum*) in the Po plain. This reserve is a forest-habitat island, completely surrounded by cultivated fields (cfr. Mason et al., 2002; Mason, 2004). In this locality a sole specimen was trapped during 2000 (Nardi & Zaharadník, 2004), although this forest, since 1988, was object of monitoring of the entomofauna (Mason et al., 2002; Cerretti et al., 2004a; D'Amen et al., 2013a; Cornacchia & Nardi, unpublished data), also at canopy-level (Cerretti et al., 2004b; Stireman et al., 2011; Birtele & Hardersen, 2012). In Lombardy, this species was not trapped (Nardi, unpublished data) also in forest sites situated along the Ticino Valley Regional Park (cf.

Della Rocca et al., 2013), in spite of being recorded from the bordering Swiss Ticino Region (Luigioni, 1929; Borchert, 1938; Fontana, 1947). The above site from Molise Region is in an area that in the past was covered by large woodland formations, and it is near two remaining forests. The former forest is Bosco Fantine (Campomarino, Campobasso prov.) and is 2–3 km in a beeline; it is an hygrophil wood survived to a reclamation (“Bonifica Ramitelli”) made during the first half of the twentieth century (Taffetani, 2011), the second forest is a few km south of Bosco Fantine, a little beyond the regional border Molise-Apulia, in the commune of Marina di Chieuti (Foggia prov.), and is a well preserved but unprotected small hygrophilic wood. The record from Villaggio Amendola (Apulia, Foggia prov.) comes from a row of elms and is very surprising, since the environment in this locality is very degraded: it is constituted by cultivated fields or by fallow fields with *Ferula* sp. (Apiaceae) along the State Road Garganica near a military airport, moreover in the neighbouring area no forest is present. At the time, there was a row of elms not very old, all cut during the previous year. On these elms, before their cutting, were present also some Buprestidae (Coleoptera) typical of this tree: e.g. *Anthaxia* (*Anthaxia*) *senicula* (Schrank, 1789), = *A. (A.) deaurata* (Gmelin, 1790, and *A. (A.) manca* (Linnaeus, 1767) (Liberto, unpublished data). This locality is in the historic Appenine region of Capitanata (southern Molise and northern Apulia); in all this historic region there is a grid of these rows of elms with function of windbreak, nowadays gradually replaced with *Eucalyptus* sp. The dispersal flight capacity of this species is probably low (Liberto & Nardi, unpublished data), so probably the occurrence in this site, may reflect a past habitat situation when the forest density was probably higher than that measured actually (cf. Pratesi & Tassi, 1979; Ranius, 2006; Taffetani, 2011).

Finally, it must be underlined that the type specimen of this species is probably lost (Vrydaghs, 1962).

SHORT CONSIDERATIONS ON THE SAPROXYLOPHAGOUS BEETLE-FAUNA OF SICILY

The discovery of *L. varius* in various Italian regions and its ecological value, as documented above,

further underline the importance of conservation of forest environments which often act as refuge-area for many saproxylophagous species; they, represent a fauna consortium highly specialized in the processes of degradation of wood and creation of ecological niches of vital importance for the development of numerous other organisms which, according to some estimates, are up to about 30% of the overall biodiversity of a forest (Pignatti et al., 2009).

Moreover, in recent years, the "dead wood" has become a key indicator to assess the well-being of forest environments and the implementation of their management (Mason et al., 2003; MCPFE, 2003; European Environment Agency, 2007); the role of the "dead wood" in the global ecology of a forest, in terms of biodiversity, has been highlighted and shown in numerous works (Wermelinger & Duels, 2002; Mason et al., 2003; Schlaghamersky, 2003; Tagliapietra, 2003; Speight & Good, 2003; Hahn & Christensen, 2004; Humphrey et al., 2004; Ranius & Fahrig, 2006; Travaglini et al., 2007; Bishop et al., 2009; Pignatti et al., 2009; La Mantia et al., 2010; D' Amen et al., 2013b, 2013c).

In particular, on Nebrodi Mountains (Sicily), where *L. varius* was recently collected, different saproxylophagous beetles that are included in the Habitat Directive (cf. Trizzino et al., 2013) can be found as well: *Rosalia alpina* Linnaeus, 1758, *Cerambyx cerdo* Linnaeus, 1758 (Cerambycidae) and *Osmoderma cristinae* Sparacio, 1994 (Cetoniidae). Moreover, in this area are present many taxa endemic of Sicily, in rarefaction and with an extremely limited range: *Ropalopus siculus* (Stierlin, 1864), *Clytus clavicornis* Reiche, 1860, *Grammoptera viridipennis* Pic, 1893 (Cerambycidae), *Gnorimus decempunctatus* Helfer, 1833 (Cetoniidae), and *Lucanus tetraodon sicilianus* Thunberg, 1806 (Lucanidae) (Sparacio, unpublished data). The Nebrodi Mountains host at least 70 species (Sabella & Sparacio, 2004; Sparacio, unpublished data) included in the "European Red List of Saproxylic Beetles" (Nieto & Alexander, 2010).

The paper of Nieto & Alexander (2010), although worthy of further updates, shows that in Sicily there are at least 112 of the 436 mentioned species (Muscarella & Sparacio, unpublished data). Then it occurs that Sicily (0.24 % of European territory) hosts approximately 25% of the saproxylophagous beetles considered threatened or endangered in Europe.

This faunal community according to the "2nd National Report on the implementation of the Habitats Directive and the conservation status of habitats and species in Italy" is particularly threatened (La Posta et al., 2008). For this reason the EU directives on the protection of the saproxylic fauna have been implemented by the Italian State which has enacted specific laws, both regional and national, and proposed guidelines for the management of dead wood and fauna associated with it (Campanaro et al., 2011; Trizzino et al., 2013).

The main factor of disturbance of such an important wildlife is the short-sighted management of forests carried out by some administrations that do not consider the dead wood as fundamental to the ecological balance of the forest but rather as a threat to health, a vector of pests and insects "harmful" or, at best, as a simple source of firewood. As a result, the indiscriminate falling of dead stumps not yet fallen, and removing decayed and senescent trees have a negative impact on the populations of saproxylophagous beetles with inevitable repercussions on the entire food chain in forest ecosystems causing biodiversity loss (see Biscaccianti & Lorenzetti, 2012).

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