

## ***Opilo orocastaneus* n. sp.: a new checkered beetle from Sardinia (Coleoptera Cleridae)**

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### **Abstract**

*Opilo orocastaneus* n. sp., from the Gennargentu Massif (East-Central Sardinia; Italy), is described and figured. The new taxon is easily distinguishable from *Opilo mollis* (L.) by the uniform colour of its legs, the small clear circular spot isolated from the apical margin of the elytra and differences of the aedeagus.

**Key words:** Coleoptera, Cleridae, Clerinae, *Opilo*, new species, Sardinia, Italy.

### **Introduction**

Cleridae (also known as checkered beetles) are a small family of Coleoptera occurring worldwide but primarily in tropical and sub tropical areas. Following Gerstmeier (2000) there are approximately 3600 species assigned to just over 300 genera, of which there are about 350 species in the Palaearctic Region and, according to Löbl and Smetana (2007), 34 in Italy.

Checkered beetles are a family of economic importance. Most species (e.g. in *Denops*, *Tillus*, *Thanasimus*, *Opilo*, etc.) are predacious, both as larvae and as adults, on other arthropods (mainly insects) associated with woody plants. Some species (e.g. in *Trichodes*) have larvae which develop in the cells of wild and honey bees, while others (e.g. in *Necrobia*), also remaining predacious, attack stored food products. Two species of *Opilo* Latreille 1802 [*O. domesticus* (Sturm 1837) and *O. mollis* (Linnaeus 1758)] have become synanthropic, attacking wood-damaging insect pests, and having a wide distribution, via human-induced spread (Gerstmeier, 1998).

The genus *Opilo*, although believed to occur worldwide (Corporaal, 1950) (excluding the Neotropics, see Solervicens, 1973), is probably restricted to the Palaearctic region and partly to the Oriental one. In the Palearctic there are 27 species of *Opilo* (Löbl and Smetana, 2007), of which 9 occur in the West Palaearctic zone (Gerstmeier, 1998), and 4 in Italy (Audisio *et al.*, 1995).

A single peculiar specimen of *Opilo* from the Gennargentu Massif area in Sardinia was collected in 1995 by Lucio Saltini. As this was the only record known to us for more than a decade, taxonomic inference about this specimen could not be made. Only thanks to recent samplings by Francesca Fiori during her PhD research, and discovery of about ten new specimens has it been possible to define their taxonomic status. We have assessed these, and a small series found in the Dodero collection of the Museum of Natural History "G. Doria" in Genoa, as constituting a new species. This species is described herein.



**Figure 1.** *Opilo orocastaneus* n. sp., habitus of male holotype [Sardinia: Aritzo], length = 8.3 mm. Scale bar = 1.0 mm.

## Materials and methods

Morphological observations were performed using Leica MZ16 and Meiji EMZ 13 stereo microscopes and a Leitz Diaplan FSA/20 microscope. An ocular micrometer was used for measurements.

The micro-photographs were taken with the SMC Pentax - M 1:1.7 50 mm lens on a Nikon P5100 (12.1 MP) digital camera (habitus of adults), with a Reflex Pentax K20D (14.6 MP) digital camera on a Nikon Labophot 1 microscope (cleared aedeagus) and with a Nikon Coolpix 4300 (4.1 MP) digital camera (non-cleared aedeagus). The all-in-focus software CombineZM was used to create all the images.

Male and female genitalia were macerated in a cold solution of 10% potassium hydroxide for some hours and examined in glycerol.

The labels of each specimen have been faithfully transcribed separating the lines by a “\” and the labels by a “\\”.

The following abbreviations are used in the text:

ISE-SS = collection of the Istituto per lo Studio degli Ecosistemi (Institute for the Study of Ecosystems),

CNR, Sassari, Italy.

Dodero-MSNG = collection of Agostino Dodero in the Museo Civico di Storia Naturale (Civic Museum of Natural History) “G. Doria”, Genoa, Italy.

CIZ = collection of Iuri Zappi, Casalecchio di Reno (BO), Italy.

CLS = collection of Lucio Saltini, Modena, Italy.

## *Opilo orocastaneus* n. sp.

### Diagnosis

A species of *Opilo* Latreille 1802, of moderate length, mainly castaneous with some pale yellow elytral markings. Pronotum densely punctate, in large part dull. Elytra with punctuation irregular, not deep.

The new species differs from other *Opilo* species in having a small pale spot near the apex of the elytra clearly separated from the margin, the legs uniformly pale castaneous and by its peculiar aedeagus with the droplet-shaped sinus.

## Type series

### H o l o t y p e

- ♂ on board – “ARITZO \ Sard. \ VI-1910 \ A. Dodero \ MUSEO GENOVA \ coll. A. Dodero \ (Acquisto 2000) \ ♂” [Dodero-MSNG] {Pre-printed label with only the date of capture added. The other labels are pre-printed}

### P a r a t y p e s

- 2 ♂♂ in alcohol – “ SARDEGNA (OG) [ex NU] \ Villagrande Strisaili \ 11-X-2006, leg. F. Fiori \ ♂” [ISE-SS]  
– “ SARDEGNA (Nuoro) \ Desulo, 17-X-2006 \ leg. F. Fiori \ ♂” [ISE-SS]
- 2 ♀♀ in alcohol – “ SARDEGNA (OG) [ex NU] \ Villagrande Strisaili \ 11-X-2006, leg. F. Fiori \ ♀” [ISE-SS]  
– “ SARDEGNA (OG) [ex NU] \ Villagrande Strisaili \ 2-VII-2007, leg. F. Fiori \ ♀” [ISE-SS]
- 1 ♀ pinned – “ARITZO \ (Sardinia) \ 30-V-1902 \ A. Dodero \ MUSEO GENOVA \ coll. A. Dodero \ (Acquisto 2000) \ *O. mollis* \ var. \ *Guerini* \ *Pic* \ ♂” [Dodero-MSNG]
- 7 ♂♂ on boards – “Desulo \ IV-1896 \ commiss.[um] {means that was not collected by Dodero: from Latin committo = to confide, to deliver} \ MUSEO GENOVA \ coll. A. Dodero \ (Acquisto 2000) \ ♂” [Dodero-MSNG]  
– “Gennarg. \ VI-1900 \ MUSEO GENOVA \ coll. A. Dodero \ (Acquisto 2000) \ ♂” [Dodero-MSNG]  
– “ ITALIA, SARDEGNA \ [upstream of] LANUSEI, Ex. l. da \ *Ficus carica* \ leg. L. Saltini \ I-1995 \ ♂” [CIZ]  
– “ I – SARDEGNA (NU) [today OG] \ Talana, ex larva \ VII-2002, leg. P. Leo \ ♂” [CIZ]  
– “ SARDEGNA (OG) [ex NU] \ Villagrande Strisaili \ 3-XI-2006, leg. F. Fiori \ ♂” [CIZ]  
– “ SARDEGNA (OG) [ex NU] \ Villagrande Strisaili \ 9-V-2007, leg. F. Fiori \ ♂” [CIZ]  
– “ SARDEGNA (Nuoro) \ Desulo, 19-VI-2007 \ leg. F. Fiori \ ♂” [CIZ]
- 9 ♀♀ on boards – “M.<sup>te</sup> GENNARGENTU \ (Sardinia) \ VII-1911 \ A. Dodero \ MUSEO GENOVA \ coll. A. Dodero \ (Acquisto 2000) \ ♀” [2 specimens in brochette], [Dodero-MSNG]  
– “ I – SARDEGNA (NU) [today OG] \ Talana, ex larva \ VII-2002, leg. P. Leo \ ♀” [CIZ]  
– “ SARDEGNA (NU) [today OG] \ Villagrande Strisaili \ IX-2002, leg. P. Leo \ ♀” [CIZ]  
– “ SARDEGNA (OG) [ex NU] \ Villagrande Strisaili \ 4-X-2006, leg. F. Fiori \ ♀” [CLS]  
– “ SARDEGNA (OG) [ex NU] \ Villagrande Strisaili \ 18-X-2006, leg. F. Fiori \ ♀” [CIZ]  
– “ SARDEGNA (OG) [ex NU] \ Villagrande Strisaili \ 9-I-2007, leg. F. Fiori \ ♀” [CIZ]  
– “ SARDEGNA (OG) [ex NU] \ Villagrande Strisaili \ 9-V-2007, leg. F. Fiori \ ♀” [CIZ]  
– “ SARDEGNA (Nuoro) \ Desulo, 9-V-2007 \ leg. F. Fiori \ ♀” [CIZ]

## Description of the holotype

*Size* – The length from the clypeus to the apex of the elytra is 8.3 mm.

*Head* – Dark castaneous, densely but irregularly punctate, with yellow-golden setae; clypeus amber-colored, glossy, smooth; labrum transverse, anteriorly bilobed, amber-colored, glossy with setae from long, near the base, to short, near the margin; mandibles robust, from light castaneous, near the base, to dark, close to black teeth; labial and maxillary palpi with apical segment large, securiform; head, including eyes, a little broader than apex of pronotum; eyes large, protruding, coarsely faceted, feebly emarginate anteriorly at antennal base and with long erect setae among ocelli.

*Antennae* – 11-segmented, slender, pale castaneous, reaching the base of the pronotum when laid alongside; scape large and curved, pedicel small (as long as the 2/5 of the scape); antennomeres 3, 4 and 5 long and slender (twice as long as the pedicel); antennomere 6, 7 and 8 as the previous but with decreasing length; antennomere 9 slightly longer than 10; 11 longer than 10 (one and a half times as long as 10); antennomeres 9, 10 and 11 are slightly thicker; 9 and 10 are truncate whereas antennomere 11 is acuminate; macrosetae long and acuminate, decreasing in number and length from scape to antennomere 11; microsetae only distributed on the last three antennomeres (particularly on the apex of 9 and 10 and on the whole antennomere 11).

*Pronotum* – Slightly longer than wide (length : width ratio 1.18:1), anteriorly attenuate and narrowed posteriorly; dark castaneous, with long, sparse yellow-golden setae; disc with a longitudinal impression medially, surface strongly punctate and opaque, only a peculiar, vaguely lyre-shaped, raised formation is glossy and impunctate to very sparsely punctate; procoxal cavities open posteriorly.

*Scutellum* – Oval, broader than long, entirely punctate with long sparse setae; switching from pale castaneous at the center to dark castaneous near the borders.

*Elytra* – Elongate, broader than head or pronotum, initially subparallel, but droplet-shaped at the apex, widest at the apical third, apices rounded, length : width ratio 2.35:1; ground colour castaneous with three areas of pale yellow pattern: a humeral spot, a second central small spot in the middle, a third subcircular small spot isolated and well separated from the elytral margin; punctuation formed by seven shallow striae, the first five gradually vanishing before the middle, the sixth longer, the seventh formed by an isolated, scarce dot; seventh interval between striae only weakly convex; discal vestiture consisting of two types of golden-yellow pubescence (sparse, long, straight setae above dense, short setae, strongly curved and tilted backwards).

*Legs* – Long, slender, uniformly light castaneous, color identical to the entire lower surface of the body, with white or pale yellowish setae of variable length; mesotrochanters covered with setae clearly much denser than those covering pro- and meta-trochanters; femora almost straight, tibia slightly curved with two carinae, running respectively on bottom and top side; protibiae with one spur, meso- and metatibiae with two short spurs which are almost straight; tarsi with basitarsus

scarcely visible from above (shorter than other tarsomeres), covered by tarsomere 2, tarsomere 3 shorter than 2, 4 shorter than 3, tarsomere 5 as long as 2; pulvilli of basitarsus absent, pulvilli of tarsomeres 2, 3 and 4 normally developed; claws dilated at the base, without denticle; empodium very small, bisetose.

*Metasternum* – Castaneous, with fine, sparsely distributed punctation; setae fine, more or less long; the discriminial line prominent, absolutely smooth and hairless.

*Abdomen* – Castaneous; moderately convex, with 6 visible sternites punctate, covered with fine, scattered, posteriorly oriented, setae; a lattice of micro-sculpture is present at the base of the terminal sternite; pygidium subtruncated, with a central, almost smooth area at the base, the pubescence thickening towards the margins where the short setae are accompanied by long curved gold-yellowish setae.

*Aedeagus* – Phallus with rounded apex; parameres well developed, slender and curved at the apex (figures 4A-4B); tegmen with broad dorsal sinus, droplet-shaped (figures 4C-4D).

## Variability in the paratypes

*Size* – The length from the clypeus to the apex of the elytra is 8.7-11.4 mm in ♂♂ and 7.9-11.9 mm in ♀♀.

*Elytral pattern* – The humeral spot sometimes stretching obliquely towards the first third of the elytral suture (see figure 2B). The second central small spot sometimes larger than in holotype (see figure 2C). The third subcircular small spot sometimes very evanescent (see figure 2A).

*Elytra* – The seventh interval between striae sometimes flat.

*Sternites* – The lattice of micro-sculpture in the terminal sternite of females not limited at the base as in the males.

## Etymology

The species epithet is a neologism composed from the latin adjective *castan(e)-us, a, um* (colour of chestnut, from greek *κάστανον* chestnut) and by the greek prefix *oro-* (from *ὄρος, ov, ó* mount, mountain) and treated as an adjective. The name is intended to recall both the general colour of the new species and its orophily.

## Comparative notes

*Opilo orocastaneus* n. sp. is easily distinguishable from other species of the genus *Opilo* living in the Western Palearctic region.

*Opilo taeniatus* (Klug 1842), *Opilo cilicicus* Hinz 1902 and *Opilo tilloides* Chevrolat 1876 – E-Mediterranean group of species; only *O. taeniatus* is certainly present in Italy, Basilicata (Wittmer, 1935) – have a black or red pronotum and legs, elytra with anterior half red, posterior half black and a transverse yellowish white fascia behind the middle (on black).

*Opilo longipilis* Fairmaire 1892 – N-African species present also in Israel, Saudi Arabia, and Horn of Africa – has extremely narrow frons, eyes very close and protruding, pronotum scarcely punctate, legs pale with femoral tip partly darkened, elytra brown without pale apical spot, the light median spots stretch along the su-

ture towards the scutellum.

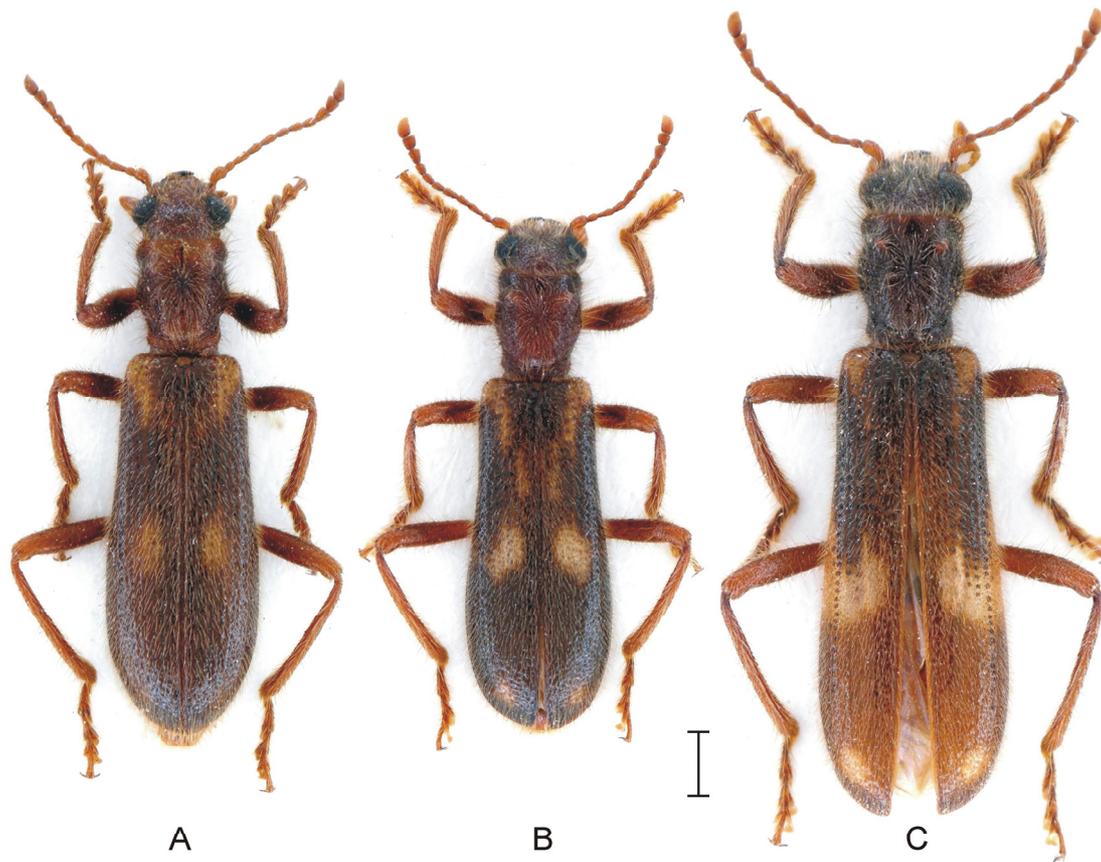
*Opilo domesticus* (Sturm 1837) – Euro-Mediterranean species, today wide-spread – and *Opilo abeillei* Korge 1860 – W-Mediterranean species – have punctation of elytra regular and deep reaching the apex and legs with pale/dark zonation.

*Opilo barbarus* (Abeille 1893) – N-African species – is very pale with a large, deep longitudinal pit on the pronotum.

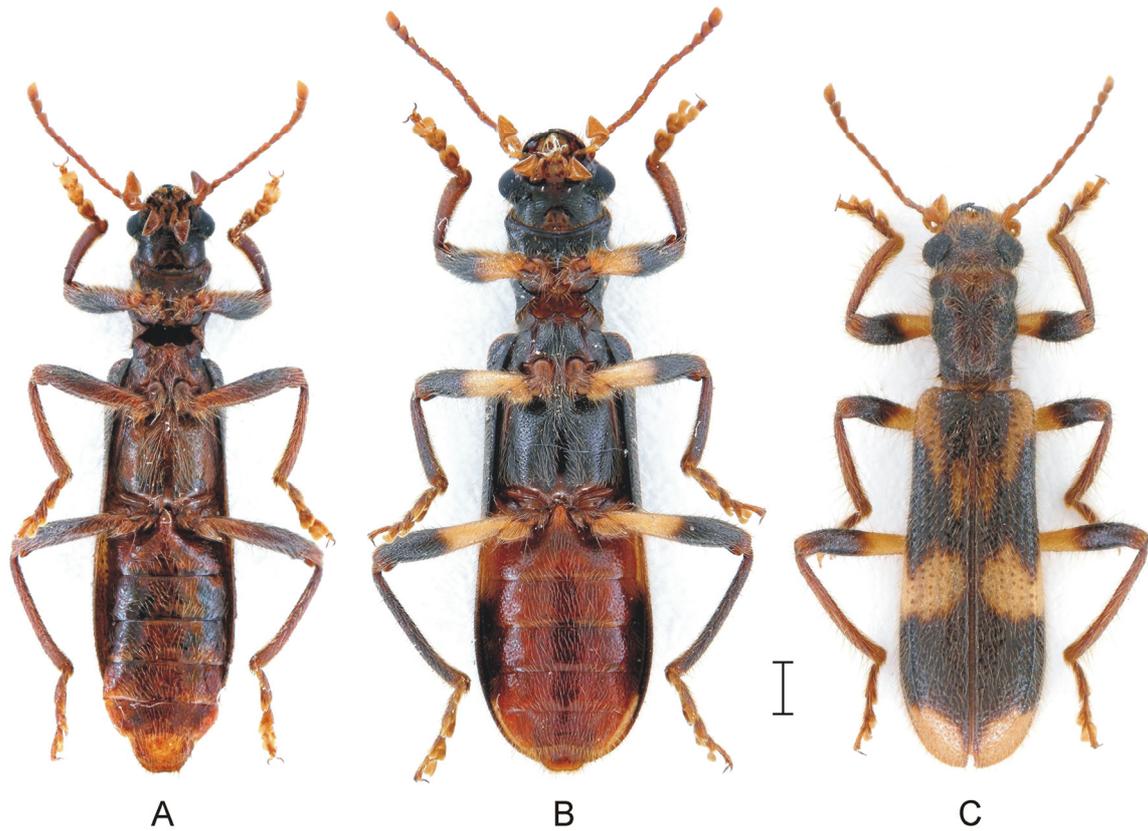
*Opilo pallidus* (Olivier 1795) – Euro-Mediterranean species – is almost uniformly yellow with unicolorous femora, the pronotum is glossy and scarcely punctate.

*Opilo mollis* (Linnaeus 1758) is a European species but today having a wide distribution because of human-induced spread. It is very similar to *Opilo orocastaneus* n. sp. but there are some constant and well-plotted differences in coloration and in external morphology. These are compared in the following table.

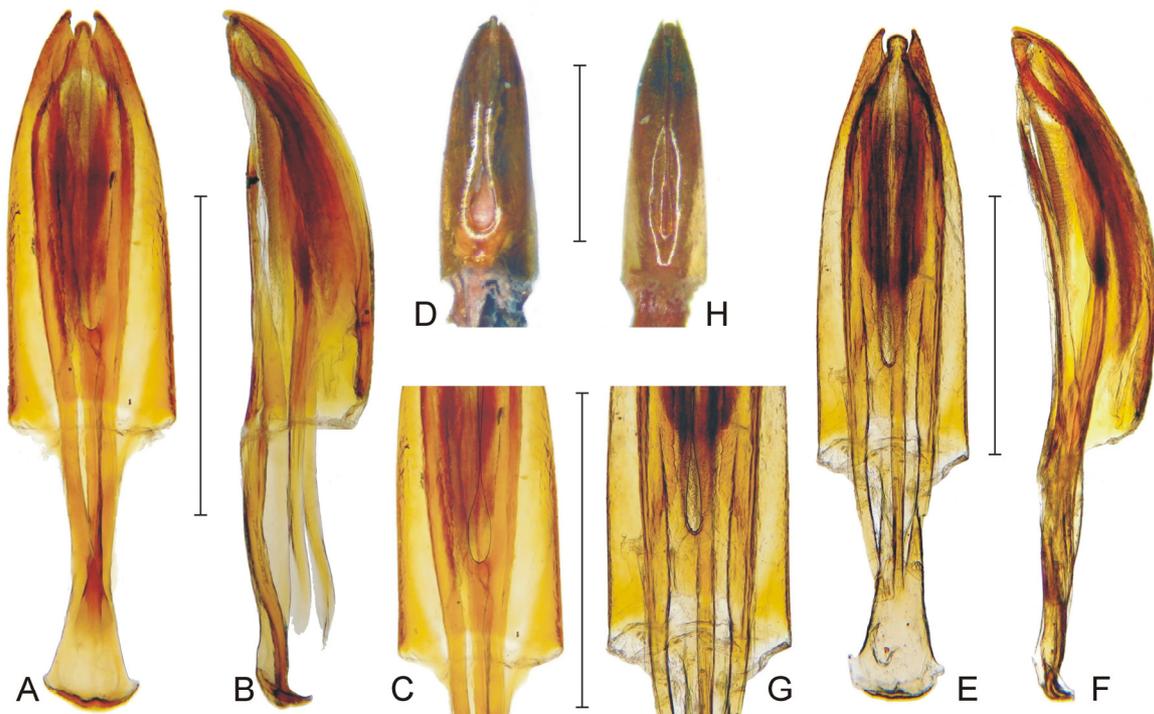
<i>Opilo orocastaneus</i> n. sp.	<i>Opilo mollis</i> (L.)
Femora uniformly pale castaneous (figures 1-2-3A)	Femora bicoloured; in the proximal half pale-yellow, in the distal half dark brown (with a very short transition zone) (figures 3B-3C)
Elytra with a small, roundish, pale apical spot, always clearly separated from the margin, only sometime evanescent and seldom totally absent (figures 1-2)	Elytra with a large pale apical spot adjoining the margin and never reduced or absent (figure 3C)
Second and third elytral striae of dots do not pass through the median pale spot	Second and third elytral striae of dots that reach and cross, in whole or in part, the median pale spot
Seventh interval between elytral striae never prominent	Seventh elytral interval in finely shaped hull relief, very rarely flat; on this last characteristic Reitter (1894) described the ab. <i>aequalis</i> from Bosnia
Pubescence dense on the apical third of the elytra, the legs and the ventral side	Pubescence less dense on the apical third of the elytra, the legs and the ventral side
Tegmen with dorsal sinus always droplet-shaped (figures 4C-4D)	Tegmen with dorsal sinus generally narrow, only sometimes barely droplet-shaped (figures 4G-4H)



**Figure 2.** *Opilo orocastaneus* n. sp., habitus of 3 paratypes: A, paratype ♀ [Sardinia: M.<sup>te</sup> Gennargentu], length = 8.5 mm; B, paratype ♀ [Sardinia: Villagrande Strisaili (OG), 9-I-2007], length = 7.8 mm; C, paratype ♂ [Sardinia: up stream of Lanusei (OG)], length = 10.1 mm. Scale bar = 1.0 mm.



**Figure 3.** *Opilo orocastaneus* n. sp.: A, ventral side, paratype ♂ [Sardinia: Villagrande Strisaili (OG), 3-XI-2006], length = 10.0 mm. *Opilo mollis* (L.): B, ventral side, ♀ [Italy, Basilicata (PZ), Lagonegro, Monte Sirino, 1346 m], length = 11.9 mm; C, habitus, ♂ [Italy, Toscana (FI), Passo Paretaiio, Monte Faggiola, 1000 m], length = 10.2 mm. Scale bar = 1.0 mm.



**Figure 4.** *Opilo orocastaneus* n. sp. (A-D) - Cleared aedeagus of holotype: dorsal view (A), lateral view (B), particular of the dorsal sinus (C); aedeagus not cleared (D) [paratype, Sardinia: upstream of Lanusei (OG)]. *Opilo mollis* (L.) (E-H) - Cleared aedeagus: dorsal view (E), lateral view (F), particular of the dorsal sinus (G) [Italy, Toscana (FI), Passo Paretaiio, Monte Faggiola, 1000 m]; aedeagus not cleared (H) [*idem*, another specimen]. Scale bar = 1.0 mm.

## Geographic distribution and ecological notes

All the known records of *Opilo orocastaneus* n. sp. are from the Gennargentu Massif (East-Central Sardinia). The species is probably endemic to this area.

The majority of specimens, collected by Francesca Fiori, derive from collections carried out about 1500 m a.s.l. in riparian forests dominated by Black Alder, *Alnus glutinosa* (L.) Gaertner, attributable to the association *Glechomo-Alnetum glutinosae* Arrig., with *Epilobium lanceolatum* Seb. et Mauri, *Glechoma sardoa* (Beg.) Beg., *Polystichum setiferum* (Forsskal) Woynar, *Carex microcarpa* Bertol. ex Moris, *Hypericum hircinum* L. (Arrigoni, 1986; Puxeddu and Citterio, 2009).

Similar research, but much more intense and prolonged, carried out on Barbagia of Belvi (South-West slopes of Gennargentu) at altitudes between 550 and 700 m a.s.l., have never provided any specimens of the new species. It therefore appears likely that the specimens, for which we do not know the altitude of capture, have been collected in the upper part of the massif. There is a mountain flora of Tertiary origin which was common in the ice age and today is represented by *Quercus pubescens* Willd., *Taxus baccata* L., *Ilex aquifolium* L., *Populus tremula* L., and other non-xerothermic taxa such as *Ribes sandalioticum* Arrig., *Helleborus argutifolius* Viv., *Paeonia mascula* (L.) Miller ssp. *russii* (Biv.) Cullen et Heywood, *Rhamnus alpina* L., *Digitalis purpurea* L., *Gentiana lutea* L., *Daphne oleoides* Schreber, *Scrophularia umbrosa* Dumort., *Ranunculus platanifolius* L. (Arrigoni, 1988).

This district, with a cold Mediterranean climate (Arrigoni, 1968), is home to a large number of endemic animal and plant species. It could be considered a true biodiversity hot spot (e. g. Prota, 1993).

*O. orocastaneus* does not seem to be sympatric with other species of *Opilo*. *O. domesticus* is common and widespread throughout the Island, but limited to lower altitudes. On the contrary, *O. mollis* is not present in Sardinia; only Luigioni (1929), and Porta (1934) (as *Opilo mollis* ab. *Guerini* Pic, 1911) have reported *O. mollis* from Sardinia. These records were surely founded on the six specimens identified in the collection of Agostino Dodero in the MSNG (now all paratypes of *O. orocastaneus*). Surely Dodero, observing the strong differences between other *O. mollis* and the Gennargentu population, thought that these examples belonged to the var. *Guerini* described by Pic (1911) from Flacé-les-Mâcon in France. The value of this name must still be defined formally, but until today it has always been regarded as a simple aberration of *O. mollis* (Corporaal, 1950; Winkler, 1961). Nonetheless, the specimens in Dodero's collection do not correspond to Pic's description and their identification was mistaken by Dodero or, less probably, Luigioni.

Like all other members of the genus *Opilo*, both larvae and adults of *O. orocastaneus* are likely to be predators of xylophagous beetles and corticolous insects (Richter, 1961; Kolibáč et al., 2005).

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This work could not have been carried out without the help of a great deal of friends and colleagues who made it possible for us to study this new species. We would like to thank Francesca Fiori (now at the Corpo Forestale e di Vigilanza Ambientale della Sardegna [Sardinian Forestry and Environmental Protection Agency]) and all the technical staff of the ISE-CNR in Sassari who collected and examined a good number of specimens. At the Civic Natural History Museum of Genoa, we were given the full support of Roberto Poggi and Fabio Penati, respectively Director and Curator, who allowed us to recuperate specimens of the new species collected over a century ago. Contributions from Lucio Saltini, Piero Leo, Gario Zappi and Daniele Sechi were essential as they generously gave us access to their own material, gave precious advice or translated some works cited in the bibliography. We give special thanks to our friends Augusto De Giovanni for the photographs and Justin S. Bartlett (Brisbane) for his careful revision of the manuscript. We also thank our three anonymous reviewers for helpful comments. Finally, we would like to remember Marcello Romano who, due to his unflagging work as administrator of the Forum Entomologi Italiani [www.entomologiitaliani.net], created a place where entomological knowledge can be shared, and which we made use of, allowing us to begin this collaboration.

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