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## A new species of the enigmatic genus *Osphyoplesius* from Sicily (Coleoptera: Tenebrionoidea: Pythidae)

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### Abstract

*Osphyoplesius* is an obscure Palearctic genus tentatively placed in Pythidae, comprising one species from Crimea and one from Greece, each of them collected only once. A third species is here described from Sicily, based on recently collected specimens. Despite the poor sample, statistic analysis of morphometrical data allowed to confirm the differentiation between the new species and its closest relative, and revealed the existence of sexual dimorphism in the genus.

**Key words:** *Osphyoplesius*, new finding, taxonomy, morphometrics, sexual dimorphism

### Introduction

The obscure Palearctic genus *Osphyoplesius* is composed of small-sized and anophthalmic endogean beetles. Its systematic placement has been a matter of debate since its description: *Osphyoplesius* was first assigned to Tenebrionidae and considered related to the genus *Boros* (Winkler 1915); later it was placed in a tribe of its own (*Osphyoplesiini*) of the subfamily Borinae (Reitter 1917), subsequently considered as a family. Lawrence and Pollock (1994), discussing the systematics of Boridae excluded the genus from this family, and tentatively assigned it to Pythidae, where it is still placed today, although considered *incertae sedis* (Pollock and Lawrence 1995; Pollock 2008).

To date, *Osphyoplesius* comprised two species living in southern and Eastern Europe, far apart from each other: *O. anophthalmus* Winkler 1915 from the southern area of Crimean Mountains (Crimea, Ukraine) and *O. loebli* Español 1975 from Epirus (continental Greece).

Collection of *Osphyoplesius* specimens seems to be an extremely rare event. As far as we could ascertain, both known species were never recorded after the original description, each taxon being therefore represented by two specimens only.

In the present paper we describe a new *Osphyoplesius* species based on five specimens recently collected in Sicily. Morphometrical analysis of these specimens confirmed differences between the newly discovered population and the closest one and demonstrated the existence of sexual dimorphism in this genus.

### Material and methods

Specimens of *Osphyoplesius* were extracted indoor from a soil sample, killed with ethyl acetate and dry preserved. Dissected parts and genitalia (including those of the *O. loebli* holotype, which were re-prepared) were mounted in Euparal on a vinyl acetate substrate. Mentioned specimens are preserved in the following collections: coll. P. Magrini, Firenze (CM); coll. M. Uliana, Codevigo (CU); coll. A. Petrioli, Asciano (CP); coll. L. Colacurcio, Zola Predosa (CC); Museo civico di Storia naturale di Milano (MSNM); Muséum d'histoire naturelle, Genève (MHNG).

The Sicilian *Osphyoplesius* were compared with the male holotype of *O. loebli* and with a photo of the female allotype. Direct comparison with the Crimean *O. anophthalmus* was deemed unnecessary, given the obvious differences in external morphology from the drawing published by Español (1975).

Comparative morphometrical analysis between *O. colacurcioi* and *O. loebli* was done after exploration of the sexual dimorphism, therefore treating sexually dimorphic traits separately from those non-dimorphic.

Anatomical measurements of the specimens were taken with a micrometric eyepiece and abbreviated as follows:

TL: total length, from the anterior margin of the clypeus to the apex of the elytra;

LA: antennal length;

HW: head maximum width;

PL: pronotum length, along the median line;

PW: pronotum maximum width;

PB: pronotum basal width;

EL: elytral length, from the base of the scutellum to the sutural angle;

EW: elytral maximum width;

LE: length of the aedeagus;

Images were obtained from multiple photographic images taken with a Nikon D2X camera mounted on a Nikon Labophot II microscope by means of a Nikon PFX adapter, using diaphragmed lenses. The original photos were mounted with CombineZM software and the resulting image was retouched with Photoshop CS software.

Toponyms related the two already known species of *Osphyoplesius* were investigated on various web maps and gazetteer, in particular on [www.fallingrain.com](http://www.fallingrain.com).

## Sexual dimorphism

In the members of the genus *Osphyoplesius* the two sexes are alike; however the series of specimens at hand offered the so far unique opportunity to explore the existence of non-obvious secondary sexual characters (i.e. based on morphometrical traits). Apart from the intrinsic interest, these observations were prompted by the necessity to perform an appropriate morphometrical comparison between the Sicilian specimens and the two known specimens of *O. loebli* (a male and a female).

A Student T test (two tailed, for groups with unequal variance) was applied on the measurements and summarized in Table 1. Among the tested traits, the following ones resulted sexually dimorphic (between brackets are references to the columns of Table 1).

- body size on average larger in males for all tested measures (A–H), and strongly supported ( $p < 0.05$ ) by total length (A), pronotum width (E) and elytral length and width (G, H).
- pronotum, when compared with total length, shorter in males (J)
- pronotum shape broader in males (N)
- elytra comparatively much longer than pronotum in males (L)
- pronotum comparatively much broader than head in males (Q).

The analysis provided no evidence for the differences in the elongation of the antenna (I). It is noteworthy that, although statistically insignificant, antennal length was on average greater in females.

## *Osphyoplesius colacurcioi* n. sp.

(Figs. 1–7, 9–14)

**Diagnosis.** An *Osphyoplesius* species about 2.1–2.7 mm long. Pronotum evidently sinuated at sides, with no sign of dorsal grooves or keels; elytra with humeral tooth. Can be diagnosed from the other two species of the genus also by the shape of the aedeagus and by morphometric analysis (Table 2).

**Type locality.** Italia, Sicilia, Foresta di Ficuzza (Palermo), 37°52'N, 13°23'E, m 900.

**Type series.** Holotype ♂: Italia, Sicilia, Foresta di Ficuzza (Palermo), 37°52'N, 13°23'E, m 900, 5.IV.2013, leg. L. Colacurcio (CM). Paratypes: same data of the holotype 4 ♀♀, (CU, CP, CC, MSNM).

**Description.** A small-sized *Osphyoplesius*, measuring 2.15–2.73 mm from the apex of the mandibles to the apex of the elytra (2.09–2.63 mm excluding the mandibles). Uniformly yellowish-brown, with testaceous appendages. Integument shiny, without evident microsculpture but with strong and dense punctures quite evenly distributed on the dorsal surface. Each puncture bearing a seta, the dorsal surface appearing therefore covered with a quite long yellowish pubescence (Fig. 1). Ventral side covered by confluent punctures, giving the integument a granulose to wrinkled appearance (Fig. 2).

**TABLE 1.** Morphometrics of *Osphyoplesius colacurcioi* n. sp. and analysis of sexual dimorphism, with T-test evaluation (two tailed, for groups with unequal variance) of the differences between the two sexes.

For  $p < 0.05$  (figures marked in grey) the difference between the two sexes is assumed to be statistically significant and therefore the traits assumed to be dimorphic. For acronyms of the measures, see Material and methods.

		A	B	C	D	E	F	G	H
		Measurements							
		TL	LA	HW	PL	PW	PB	EL	EW
♀	min	2.09	0.86	0.38	0.58	0.56	0.38	1.08	0.59
	max	2.31	1.05	0.45	0.69	0.66	0.49	1.26	0.75
	average	2.27	0.99	0.44	0.68	0.65	0.47	1.23	0.72
♂		2.63	1.06	0.48	0.7	0.74	0.5	1.35	0.8
<b>T test: p=</b>		0.0043	0.0682	0.0502	0.1124	0.0191	0.0991	0.0245	0.0393

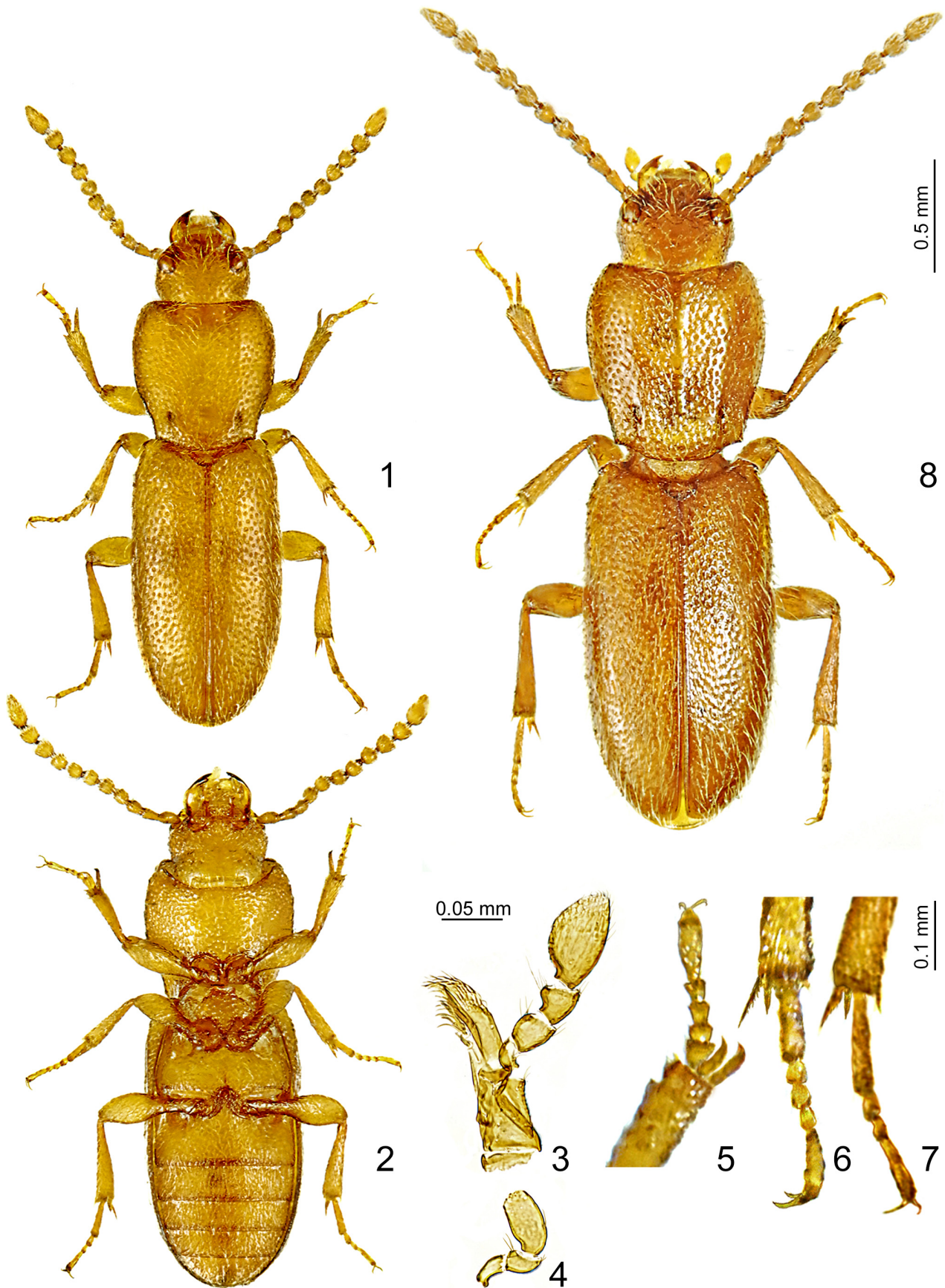
		I	J	K	L	M	N	O	P	Q
		Ratios								
		TL/LA	TL/PL	TL/EL	EL/PL	PW/PB	PW/PL	EL/EW	EW/PW	PW/HW
♀	min	2.19	3.33	1.83	1.80	1.35	0.96	1.68	1.05	1.47
	max	2.43	3.60	1.94	1.86	1.47	1.00	1.83	1.14	1.49
	average	2.29	3.36	1.85	1.81	1.38	0.96	1.70	1.11	1.48
♂		2.48	3.76	1.95	1.93	1.48	1.06	1.69	1.08	1.54
<b>T test: p=</b>		0.1173	0.0149	0.0599	0.0056	0.0874	0.0023	0.1965	0.9091	0.0010

Head distinctly narrower than pronotum, eyes absent. Frons concave, strongly punctured; clypeus broad, wider than long, flat, with anterior margin almost straight; labrum narrow, elongated, anterior border straight and bearing some setae. Mandibles short, strong, apex sharp and strongly pigmented. Temples laterally protruding, with slightly inflated appearance. Antennal insertion and base of the first antennal article covered by a lobe and not visible from above. The integument covering the base of the antenna bearing a well-defined semi-transparent area, approximately circular and suggestive of an eye.

Maxillary palps (Fig. 3) attached near the base of the maxilla, composed of 4 articles, the last one securiform in both sexes; labial palps (Fig. 4) much smaller, last article subcylindrical.

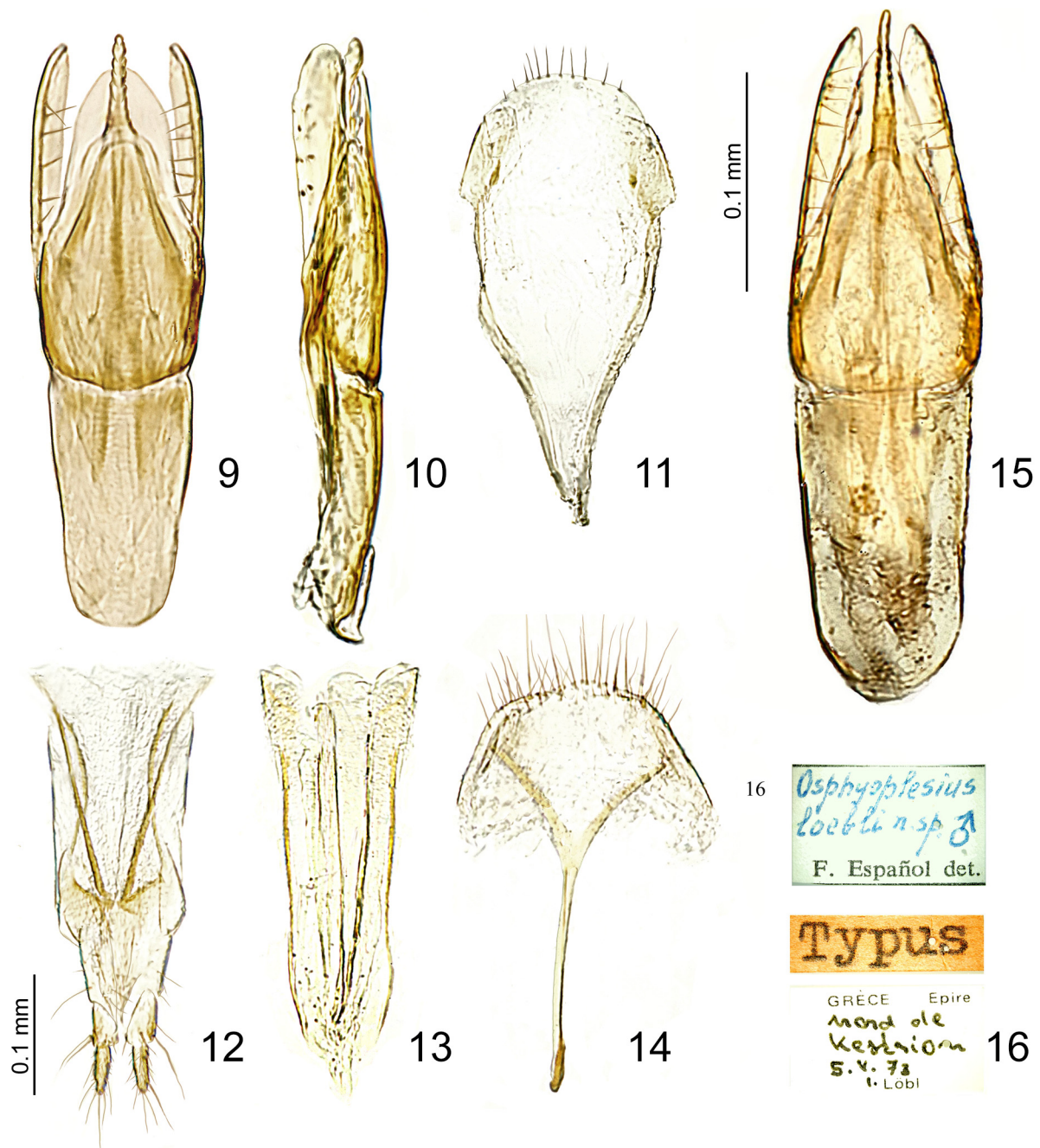
Antenna moniliform, composed of 11 articles, about 0.4 times as long as the body. Shape of the articles from subcylindrical near the base, to subquadrate or irregularly isodiametric towards the apex, last article more elongated, piriform. Article 1 about 0.08 mm long, article 2: 0.06–0.08, article 3: 0.07–0.09, article 4: 0.06–0.08, article 11: 0.10–0.17.

Pronotum as long as wide (Table 1, N), evenly convex, without carinations, narrowing towards base. Punctuation strong and regular, evenly distributed except for a smooth, narrow longitudinal area occupying the anterior third of the midline. Anterior angles obtuse, broadly rounded; posterior angles obtuse, sharp. Sides broadly



**FIGURES 1–8.** *Osphyoplesius colacurcioi* n. sp., female, paratype: (1–2) habitus in dorsal and ventral view; (3) maxilla and maxillary palp; (4) labial palp; (5) right protarsus; (6) mesotarsus and (7) metatarsus. (8) *Osphyoplesius loebli*, holotype, habitus. Photos P. Magrini.





**FIGURES 9–16.** *Osphyoplesius colacurcioi* n. sp.: male, holotype: (9–10) aedeagus in ventral and lateral view; (11) internal sclerite. (12) female, paratype: ovipositor; (13) sclerites associated with the stylomeres; (14) spiculum. *Osphyoplesius loebli*, holotype: (15) aedeagus in ventral view; (16) labels. Photos P. Magrini.

rounded in the distal 2/3, sinuated before the basal third, where they are slightly concave. Margins regular and simple, lacking any bead or denticulation. A small fovea, shallow, narrow, strongly pigmented present on each side, in front of the base. Marginal groove narrow, pigmented. Pubescence directed along the midline and backwards, but for the anterior angles, where it is transversally directed towards the midline. Scutellum triangular, well visible, wider than long.

Elytra elongate, slightly convex, roughly as wide as the pronotum, with subparallel sides and rounded apex, slightly narrowing towards the base. The base is beaded and concave, housing the base of the pronotum. Humeral angles obtuse, rounded, although marked by a well-evident protruding tooth. Surface strongly and evenly punctured, missing any sign of striation. Pubescence longer than that of pronotum, inclined, directed backwards. Epipleura broad at the base, steeply reducing towards the apex; at the posterior border of the metasternum reduced

to a narrow stripe, completely disappearing in the apical region. Elytra either partially fused or strongly locked in the proximal half, but easily separated from each other during specimen dissection. Wings present, strongly reduced.

**TABLE 2.** Morphometrical comparison between *O. colacurcioi* n. sp. and *O. loebli*: average values and results of T-test (two tailed, for groups with unequal variance). Average values for ♂+♀ given only for non-dimorphic traits (cfr. Table 1). T-test was performed taking into account only females for sexually dimorphic traits, all specimens for non-dimorphic ones. For  $p < 0.05$  (figures marked in grey) the difference between the two taxa are assumed to be statistically significant. For acronyms of the measures, see Material and Methods.

	A	B	C	D	E	F	G	H
	measurements							
	TL	LA	HW	PL	PW	PB	EL	EW
<i>O. colacurcioi</i> ♂ (n=1)	2.63	1.06	0.48	0.7	0.74	0.5	1.35	0.8
<i>O. colacurcioi</i> ♀ (n=4)	2.27	0.99	0.44	0.68	0.65	0.47	1.23	0.72
<i>O. colacurcioi</i> ♂+♀ (n=5)	–	1.00	–	0.68	–	0.48	–	–
<i>O. loebli</i> ♂ (n=1)	2.86	1.22	0.5	0.82	0.77	0.54	1.46	0.82
<i>O. loebli</i> ♀ (n=1)	2.87	1.26	0.56	0.84	0.85	0.64	1.61	0.86
<i>O. loebli</i> ♂+♀ (n=2)	–	1.24	–	0.83	–	0.59	–	–
T-test (dimorphic traits): p=	0.0011	–	0.0041	–	0.0027	–	0.0016	0.0131
T-test (non-dim. traits): p=	–	0.0015	–	0.0007	–	0.1863	–	–

	I	J	K	L	M	N	O	P	Q
	ratios								
	TL/LA	TL/PL	TL/EL	EL/PL	PW/PB	PW/PL	EL/EW	EW/PW	PW/HW
<i>O. colacurcioi</i> ♂ (n=1)	2.48	3.76	1.95	1.93	1.48	1.06	1.69	1.08	1.54
<i>O. colacurcioi</i> ♀ (n=4)	2.29	3.36	1.85	1.81	1.38	0.96	1.70	1.11	1.48
<i>O. colacurcioi</i> ♂+♀ (n=5)	2.44	–	1.91	–	1.45	–	1.71	1.08	–
<i>O. loebli</i> ♂ (n=1)	2.34	3.49	1.96	1.78	1.43	0.94	1.78	1.06	1.54
<i>O. loebli</i> ♀ (n=1)	2.27	3.42	1.79	1.91	1.33	1.01	1.86	1.02	1.52
<i>O. loebli</i> ♂+♀ (n=2)	2.31	–	1.87	–	1.38	–	1.82	1.04	–
T-test (dimorphic traits): p=	–	0.6297	–	0.0109	–	0.0273	–	–	0.0029
T-test (non-dim. traits): p=	0.2679	–	0.8468	–	0.4889	–	0.2093	0.2200	–

Metasternum and first abdominal sternite (Fig. 2) bearing a broad and shallow impression on each side, near the anterior border. Metasternum much wider than the median coxa, first abdominal sternite much longer than the following ones, with intercoxal area similar to a semiellipse open downwards. Sternites 2–5 similar in length.

Legs strong. Anterior and median coxae, globous, projecting, and adjoining; the medial ones also adjoining, the posterior ones more parted. Femora claviform, tibia straight, progressively enlarging towards the apex. Apex of the protibia bearing, on the internal side, two large, strong and sharp spurs, of similar size. Apex of meso- and metatibiae bearing two thin, small-sized spurs, the one on the above longer than the other. All tibiae bearing, aside spurs, tiny apical spines, more evident on the meso- and metatibiae. Protarsi and mesotarsi with 5 articles, metatarsi with 4 articles (figs 5–7); all of them pubescent. Claws smooth.

Aedeagus small (0.27 mm), with trifold apex (Fig. 9), subrectangular in lateral view (Fig. 10). Medial piece composed of a broad base and of long and thin apical prominence, with serrate margins. Parameres thin, concave towards the medial piece, each of them bearing six long marginal setae. Basal piece of the aedeagus subcylindrical, connected to the apical pieces by a ring-shaped articulation. Aedeagus connected to a suboval internal sclerite, ciliated along the distal margin (Fig. 11).

Female genitalia as in Figs. 12–14, with densely ciliated spiculum.

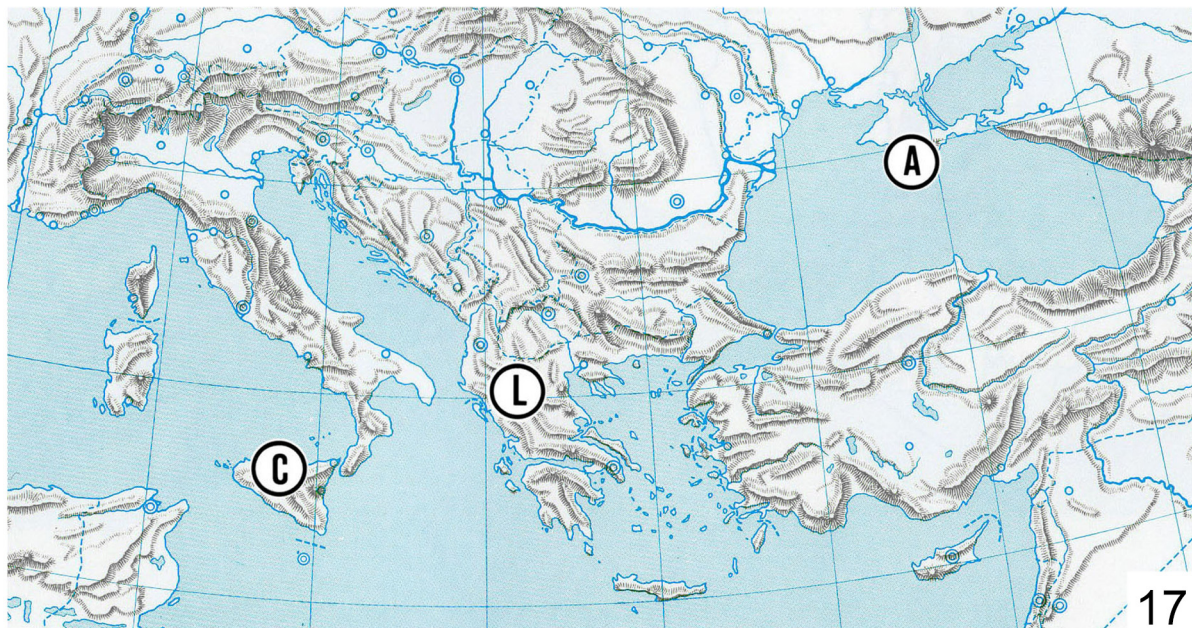
**Derivatio nominis.** We are glad to dedicate this species to our friend Loris Colacurcio (Zola Predosa, Italy), keen collector of soil-dwelling beetles and enthusiast student of Pselaphinae, who collected all known specimens of the type series.

## Discussion

The three species of *Osphyoplesius* exhibit a strongly conservative morphology, being very similar to each other. *Osphyoplesius colacurcioi* is similar in body size to the Crimean *O. anophthalmus* (which is long 2-2.5 mm according to Winkler 1915), but it is distinct from the latter by the presence of the humeral teeth (also present in *O. loebli*), by the much more evident sinuation of the pronotum, by the elytra more elongate and narrower compared to the pronotal width.

The new species appears therefore morphologically closer to *O. loebli*. Main differences between the species are found in the smaller size of *O. colacurcioi*, and in the structure of the pronotum: its surface is regular in *O. colacurcioi*, while it has three weak longitudinal keels (the medial one unpunctured and more evident) in the holotype of *O. loebli* (Fig. 8), a character which was not mentioned in the original description. In addition, in *O. colacurcioi* the base of the pronotum is less protruding posteriorly, the sides are more abruptly rounded near the anterior angles and more evidently sinuated near the posterior ones. In spite of the small sample, we performed a morphometrical comparison, in order to explore morphometrical differences between the two taxa. Statistical analysis indicated four independent traits for which the difference between the two species is statistically significant (Table 2). *Osphyoplesius colacurcioi* was confirmed to be significantly smaller than *O. loebli* (Table 2, columns A–H). Also, females of *O. colacurcioi* have less elongate elytra in comparison to the pronotum (Table 2, column L), pronotum less transverse (Table 2, column N) and less widened in comparison to head width (Table 2, column Q). Aedeagal differences between *O. colacurcioi* and *O. loebli* (figs 9, 15), albeit modest, are evident in the shape of the medial piece (basal part distally broader and apical prominence less developed in *O. colacurcioi*) and in the structure of the lateral ones, bearing a different number of marginal setae (6 vs. 9). It is however to remark that we lack any information on intraspecific aedeagal variability in the genus.

The known distribution of *O. colacurcioi* shifts considerably towards the south and west the geographical range of the genus, summarized in Fig. 17.



**FIGURE 17.** Map of the Mediterranean showing the known localities for the genus *Osphyoplesius*. A=*O. anophthalmus* Winkler 1915; L=*O. loebli* Español, 1975; C=*O. colacurcioi* n. sp.

**Ecological notes.** All specimens of *O. colacurcioi* were extracted by mean of a Berlese funnel from a single soil sample, collected under a large stone deeply buried in the ground. The collecting area is a Mediterranean evergreen woodland with prevalence of holm oak (*Quercus ilex*), growing on clayish soil. The sampling occurred with conditions particularly favorable to the collecting of endogean beetles, i.e. after abundant rain and fresh season.



Among other endogean coleopteran species collected at the same locality are *Duvalius marii* Vanni, Magrini & Pennisi and *Typhloreicheia baudii* Ragusa (Carabidae), *Bathysciola destefanii* (Ragusa) (Cholevidae), *Amaurops sulcatula confusa* Binaghi (Staphylinidae: Pselaphinae), and *Alaocyba* sp., *Raymondiellus siculus* (Rottemberg), *Torneuma ficuzzense* Stüben, and *T. deplanatum deplanatum* (Hampe) (Curculionidae).

Bosco della Ficuzza is comprised in the natural reserve “Riserva naturale orientata Bosco della Ficuzza, Rocca Busambra, Bosco del Cappelliere e Gorgo del Drago” and is an area of remarkable naturalistic interest, intensively explored by entomologists for the last 150 years. The discovery of this noteworthy species only in the present time seems to confirm the rarity of the *Osphyoplesius* species or, at least, the difficulty in collecting them with ordinary sampling methods, which is obviously stressed by the lack of ecological information.

An attempt was done to investigate the gut content of the specimens. Dry specimens were relaxed and dissected in order to extract the gut, which appeared partly filled with a black-brownish content. Undissected guts were attached with water soluble glue on cardboard and delivered to a specialized laboratory in order to perform a DNA barcode search for putative fungal content. Unfortunately it was not possible to amplify any fungal sequence from the content, possibly for the treatment of the material having been inappropriate for the DNA preservation.

Little is known about ecology of the other species and even precise collecting localities are not well defined. Specimens of *O. anophthalmus* were sifted from moist clay soil collected under dead wood, near “Baidar” a toponym probably to be referred to the present-day Orlinoe, also called Baydary and Baidari, or to the surrounding Baydar Valley. *Osphyoplesius loebli* was collected sifting litter collected under a vegetation with Rosaceae and oaks, in a locality of the Epirus “north of Kestrión” (original labels in Fig. 16), a toponym which is apparently impossible to find and that may be referred either to Kastrion (Evrymenes), in Ioannina regional unit, or to Kastrion in Thesprotia regional unit.

## Acknowledgements

Our gratitude goes to our friend Loris Colacurcio, who kindly entrusted us the study of the specimens he collected, and to Augusto Degiovanni, Andrea Petrioli and Alessandro Paladini who shared with him and with one of the authors (PM) the entomological expedition to Sicily which led to the discovery of this new taxon. The loan of *O. loebli* holotype is due to the kind assistance of Dr. G. Cuccodoro (Muséum d'histoire naturelle, Genève), while photographic documentation of the allotype is due to the courtesy of Glòria Masó Ros and Amador Viñolas (Museu de Ciències Naturals de Barcelona).

Matteo Garbelotto (Forest Pathology and Mycology Laboratory, University of California, Berkeley) kindly tried fungal DNA amplification on the gut contents.

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