

# A new species of *Laemostenus* Bonelli, 1810 (Coleoptera, Carabidae) from Els Ports Natural Park (Catalonia, northeastern Iberian peninsula)

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## Abstract

A new species of *Laemostenus* Bonelli, 1810 (Coleoptera, Carabidae) from Els Ports Natural Park (Catalonia, northeastern Iberian peninsula).— *Laemostenus* (*Antisphodrus*) *portsensis* n. sp. is described from five caves at Els Ports Natural Park. The new taxon can be distinguished from its geographical neighbours, *L. (A.) levantinus* (Bolívar, 1919) and *L. (A.) lassallei* Mateu, 1989, by the shape of its head and pronotum, and particularly by the morphology of the male genitalia. The study includes some remarks about the habitat and ecology of the new species.

Key words: Coleoptera, Carabidae, *Laemostenus* (*Antisphodrus*), New species, Iberian peninsula, Catalonia, Cave habitat

## Resumen

Un nuevo *Laemostenus* Bonelli, 1810 (Coleoptera, Carabidae) del Parc Natural dels Ports (Cataluña, nordeste de la península ibérica).— Se describe *Laemostenus* (*Antisphodrus*) *portsensis* sp. n., localizada en cinco cavidades del Parc Natural dels Ports. Se compara con sus vecinos geográficos, *L. (A.) levantinus* (Bolívar, 1919) y *L. (A.) lassallei* Mateu, 1989, de los que se distingue por la forma de la cabeza y el pronoto, y especialmente por la morfología de la genitalia masculina. Se completa el estudio aportando datos sobre el hábitat y la ecología de la nueva especie.

Palabras clave: Coleoptera, Carabidae, *Laemostenus* (*Antisphodrus*), Especie nueva, Península ibérica, Cataluña, Hábitat cavernícola

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## Introduction

The genus *Laemostenus* Bonelli, 1810 is represented by 19 species in the Iberian peninsula (Casale & Comas, 2012; Serrano, 2013), most of them belonging to the subgenus *Antisphodrus* Schaufuss, 1865, with several species showing morphological adaptations to the subterranean environment (Casale, 1988). The Iberian species of *Antisphodrus* belong to the group of *L. (A.) navaricus* (Vuillefroy, 1893), and are divided into three subgroups. The subgroup of *L. (A.) navaricus* is distributed in the northern part of the Peninsula, mainly in the northwestern third, while the subgroups of *L. (A.) villardi* (Antoine, 1948) and *L. (A.) kabylicus* (De Miré, 1958) are confined to the southeastern quadrant. The most recently described species (Fernández-Cortés, 1995; Mateu, 1996; Carabajal-Márquez et al., 2002) belong to the *kabylicus* and *villardi* subgroups, and are found widely in the Betic–Riffian area (Casale, 1988).

Although the subterranean fauna of the Iberian peninsula is considered one of the richest and best known in Europe (Sendra et al., 2011), new data about species as conspicuous as those of the genus *Laemostenus* have recently been published, the latest provided by Casale & Comas (2012) (including the description of a new species) and Ramos–Abuin (2013).

In 2012, with the collaboration of the Associació Catalana de Bioespeleologia (Catalan Association of Biospeleology, BIOSP), the Department of Arthropods of the Museu de Ciències Naturals de Barcelona (MCNB) performed a first biospeleological survey of the arthropod fauna from Els Ports Natural Park (Caballero–López & Masó–Ros, 2013) and identified a new species of *Laemostenus* (*Antisphodrus*) which we describe herein.

## Material and methods

### Study area

The caves where the new species was found are located in the mountain massif of Els Ports, in Els Ports Natural Park and surrounding areas, southwest of the Tarragona province (fig. 1). This massif faces NE–SW and is situated at the confluence of the Catalan Pre-Coastal Range with the Iberian System. The substrate consists of limestone and dolomites of the Mesozoic, mainly Triassic and Jurassic, except at the SW end of the massif, dominated by Cretaceous outcrops.

The prospected caves were:

1. *Avenc dels Ermetes de Passamonte* (31T–278852, 4535748; 990 m): located in the municipality of Prat de Comte, in the Barranc d'Engrilló. The opening is on the right side of the track leading to Tossal d'Engrilló (northern end of the Natural Park).

2. *Cova del Conill* (31T–276201, 4535632; 425 m): in the municipality of Horta de Sant Joan, located near the Barranc del Closet, between Reguers and Bosc d'Horta, at the northern end of the Natural Park.

3. *Avenc de la Barcina* (31T–277230, 4521575; 1,300 m): cave located at the peak of Barcina, about 2 km NE of the peak of Caro (municipality of Roquetes).

4. *Avenc dels Mamelons* (31T–270981, 4520902;

1,225 m): municipality of Tortosa, located in the Mola de Catí.

5. *Forat the Rastre* (31T–270829, 4520086; 1,240 m): also located in the Mola of Catí, but within the municipality of Roquetes.

UTM coordinates (ETRS89 *Datum*) and official toponymy from the Institut Català de Cartografia (ICC) are used.

### Collection and study of specimens

A total of 32 specimens were obtained by direct capture and with pitfall traps installed according to the survey design (Caballero–López & Masó–Ros, 2013). Several sectors of the caves, from the penumbra zones to the innermost chambers, were prospected using two sets of traps. In the first set, bait consisted of a mixture of cheese and dried meat, and propyleneglycol was used as preservative. In the second set, beer and salt were used as attractant and preservative.

Fifteen specimens were preserved in 70° ethanol and one in 100° ethanol. The remaining specimens were dry-preserved and mounted on cards. Male genitalia were fixed in dimethyl–hydantoin–formaldehyde (DMHF) and mounted on a transparent card attached to the pin bearing the respective specimens.

The criteria used for the species description were basically those established by Casale (1988) and the morphometric parameters were those as defined by Casale & Comas (2012): TL. Body total length, taken from the anterior margin of the epistome to the apex of the elytra, measured along the suture; PW/PL. Ratio between the width of the pronotum (PW) and length of the pronotum (PL), taking respectively the greatest transverse distance and the distance from the basal to the anterior margin along the midline; EL/EW. Ratio between the elytra length (EL), taken from the basal margin to the apex along the suture, and the elytra width (EW), taken as the greatest transverse distance.

All types are housed in the entomological collection of the MCNB, identified by their corresponding register numbers (MZB acronym). The information associated with each one has been documented and recorded in the database of the collection.

The comparison of the new species with *L. (A.) lassallei* is based on the original description by Mateu (1989) and nine specimens from the private collections of Eduard Vives and Achille Casale (6♂♂ and 3♀♀, F. Baget leg.), collected at several localities (including the type locality) in Els Ports and Beceite (Tarragona and Teruel provinces). Examined material of *L. (A.) levantinus* is from the type locality (Bolívar, 1919) and is housed in the MCNB collection (register numbers MZB 76–9239, 76–9240 and 76–9267).

## Results

### *Laemostenus (Antisphodrus) portsensis* n. sp. (figs. 2, 3A, 4A, 5A)

#### Type material

Holotype: ♂, Avenc dels Ermetes de Passamonte, Prat

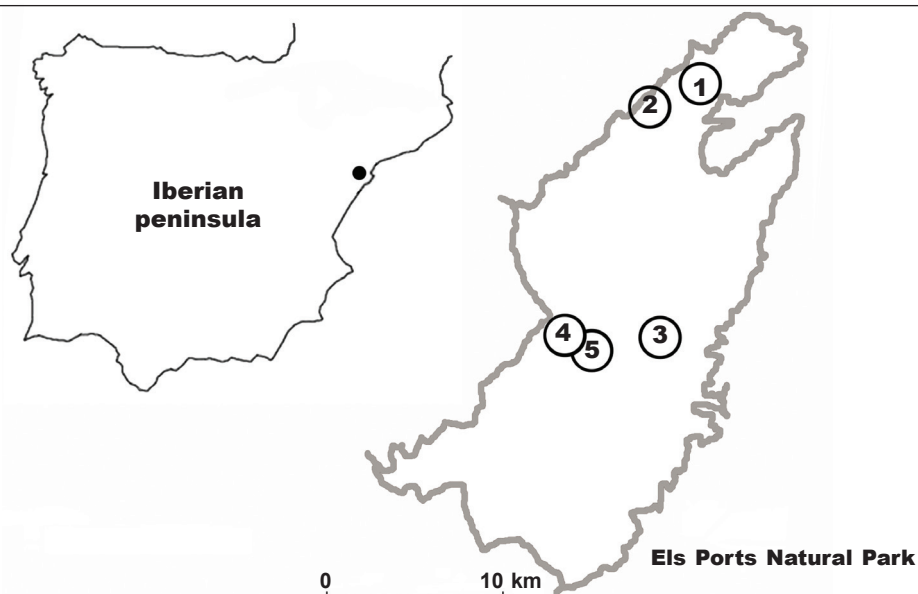


Fig. 1. Location of Els Ports Natural Park (Tarragona province) in the Iberian peninsula, showing location of the caves (see text).

*Fig. 1. Localización del Parc Natural dels Ports (provincia de Tarragona) en la península ibérica, mostrando la ubicación de las cavidades (véase el texto).*

del Comte, P. N. Els Ports, Tarragona, Catalunya. 18 IV–29 VIII 2012 (pitfall trap), MZB 2012–0520.

Paratypes: Avenc dels Ermetes de Passamonte, Prat del Comte (pitfall trap): 18 IV–29 VIII 2012, 3♀♀ (MZB 2012–0521 to 2012–0523); 21 X–28 XI 2012, 4♂♂ and 8♀♀ (MZB 2012–1076 to 2012–1081); 28 XI 2012–7 II 2013, 2♀♀ (MZB 2013–1244); 7 I–13 III 2013, 1♂ (MZB 2013–1245). Cova del Conill, Horta de Sant Joan (pitfall trap): 18 IV–31 VIII 2012, 2♀♀ (MZB 2012–0746); 31 VIII–28 XI 2012, 1♂ (MZB 2012–1082); 28 XI 2012–7 II 2013, 2♂♂ and 3♀♀ (MZB 2013–1239 to 2013–1243). Avenc de la Barcina, Roquetes: 24 V 2012 (direct capture), 1♂ and 1♀ (MZB 2012–0329, 2012–0398); 24 V–8 X 2012 (pitfall trap), 1♀ (MZB 2012–0836). Avenc dels Mamelons, Tortosa: 7 IX 2012 (direct capture), 1♂ (MZB 2012–0726). Forat del Rastre, Roquetes: 22 XI 2012 (direct capture), 1♀ (MZB 2012–1075).

#### Diagnosis

Total length: 11.70–16.30 mm (holotype 12.60). Body slender and depressed, with dark reddish brown integuments; large and ovoid head, with small eyes; transverse–cordiform pronotum, with prominent anterior angles; elongate–ovate elytra, with well–defined striae and elytral intervals flat or moderately convex; median lobe of the edeagus, in lateral view, elongated and widened towards the middle with prominent apical lamina; dorsal surface of head and pronotum shiny and almost smooth, and elytra intervals with a microsculpture conferring a dull appearance.

#### Description

Body slender and depressed, with dark, reddish brown integuments (morphometry, table 1).

Head: big, ovoid, longer than wide, and somewhat narrower than the base of the pronotum. Eyes reduced and slightly convex, not protruding from the contour of the head, as long as 1/2 the temple, the latter slightly arched, with two suborbital setigerous pores. Neck constriction well impressed. Front smooth and slightly convex, with frontal impressions short and shallow. Antennae long, surpassing first third of the elytra.

Pronotum: transverse–cordiform (PW/PL: 1.12 to 1.22), maximum width at the anterior fourth, lateral sides slightly sinuated at posterior third and constricted posteriad, basolateral angles right. Anterior margin concave, with anterolateral angles rounded and prominent; base slightly concave at middle. Disc depressed, with shallow transversal wrinkles; lateral edges slightly raised, especially at base. Basal impressions elongated and extended beyond basal third. Median groove deep. Anterolateral and basolateral setigerous pores present.

Mesosternum: unarmed in front of mesocoxae.

Elytra: elongate–ovate, maximum width at apical third, with lateral margins less curved and convergent in basal third (EL/EW: 1.62 to 1.77). Shoulders almost effaced, humeral tooth barely visible. Disc depressed. Striae well impressed and shallowly punctuate. Elitral intervals flat in the anterior half of the disc, moderately convex towards the apex, with distinct isodiametric microsculpture.

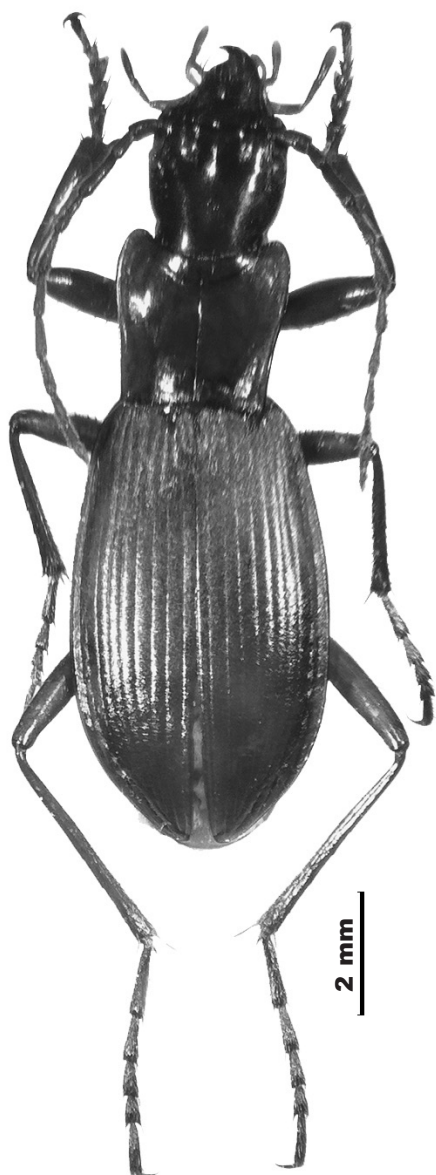


Fig. 2. Habitus of *Laemostenus (Antisphodrus) portsensis* n. sp. (male holotype).

Fig. 2. Habitus de *Laemostenus (Antisphodrus) portsensis* sp. n. (holotipo macho).

Legs: elongate and slender. Profemora with ventral side flat. Protibiae with pubescence on the apical third, reaching backwards to the cleaning organ. Mesotibiae and metatibiae straight in both sexes. Tarsomeres with dorsal pubescence. Tarsal claws smooth on the inner margin.

Male genitalia: median lobe of aedeagus in lateral view elongate and slightly constricted basally, with basal bulb well-developed and apex attenuated (fig. 3A); apical lamina in dorsal view broadly curved, nonscooped-out at middle (fig. 4A).

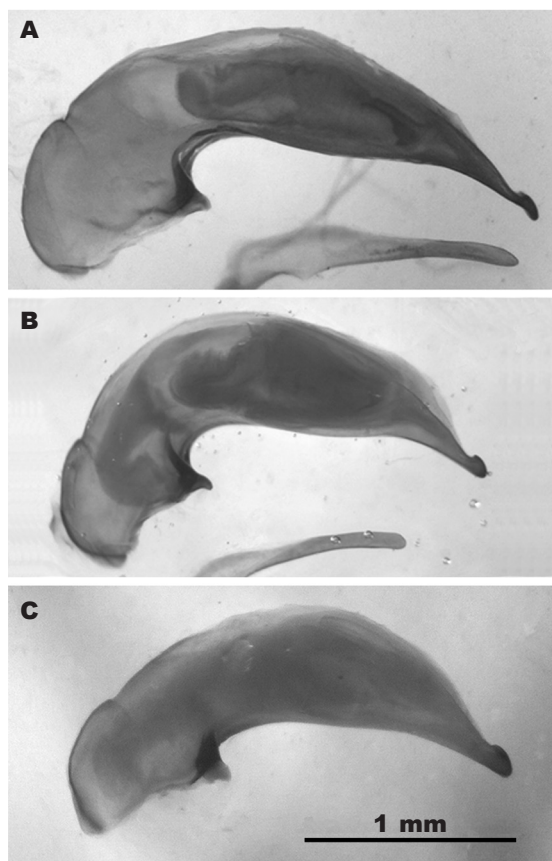


Fig. 3. Aedeagus in lateral view: A. *Laemostenus (Antisphodrus) portsensis* n. sp., holotype; B. *L. (A.) lassallei*, from Beceite (Teruel); C. *L. (A.) levantinus*, specimen MZB 76–9240 from the Cueva de las Maravillas (Castellón).

Fig. 3. Edeago en visión lateral: A. *Laemostenus (Antisphodrus) portsensis* sp. n., holotipo; B. *L. (A.) lassallei*, de Beceite (Teruel); C. *L. (A.) levantinus*, ejemplar MZB 76–9240 de la Cueva de las Maravillas (Castellón).

#### Etymology

The specific epithet derives from name of the masiff Els Ports, where the species is located.

#### Discussion

##### Comparative notes

According to Casale (1988), the group of *Laemostenus (Antisphodrus) navaricus* (Vuillefroy, 1893) is divided into four subgroups. The closely related subgroups of *L. kabilicus* (De Miré, 1958), *L. prolixus* (Fairmaire, 1875) and *L. villardi* (Antoine, 1948) comprise Betic–Riffian species confined in the Iberian peninsula to the southeastern quadrant, with northern limit at

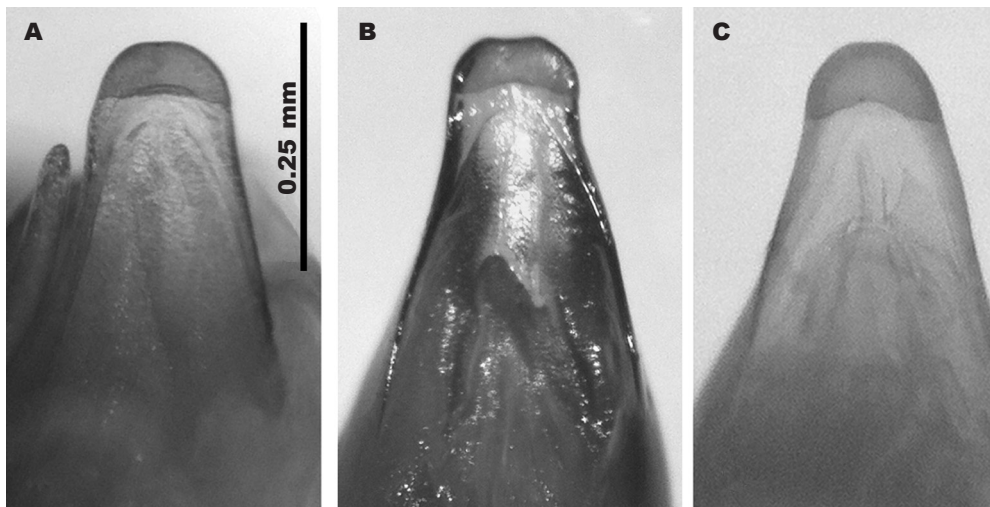


Fig. 4. Apex of aedeagus in dorsal view: A. *Laemostenus (Antisphodrus) portsensis* n. sp., holotype; B. *L. (A.) lassallei*, from Beceite (Teruel); C. *L. (A.) levantinus*, specimen MZB 76–9240 from the Cueva de las Maravillas (Castellón).

Fig. 4. Ápice del edeago en visión dorsal: A. *Laemostenus (Antisphodrus) portsensis* sp. n., holotipo; B. *L. (A.) lassallei*, de Beceite (Teruel); C. *L. (A.) levantinus*, ejemplar MZB 76–9240 de la Cueva de las Maravillas (Castellón).

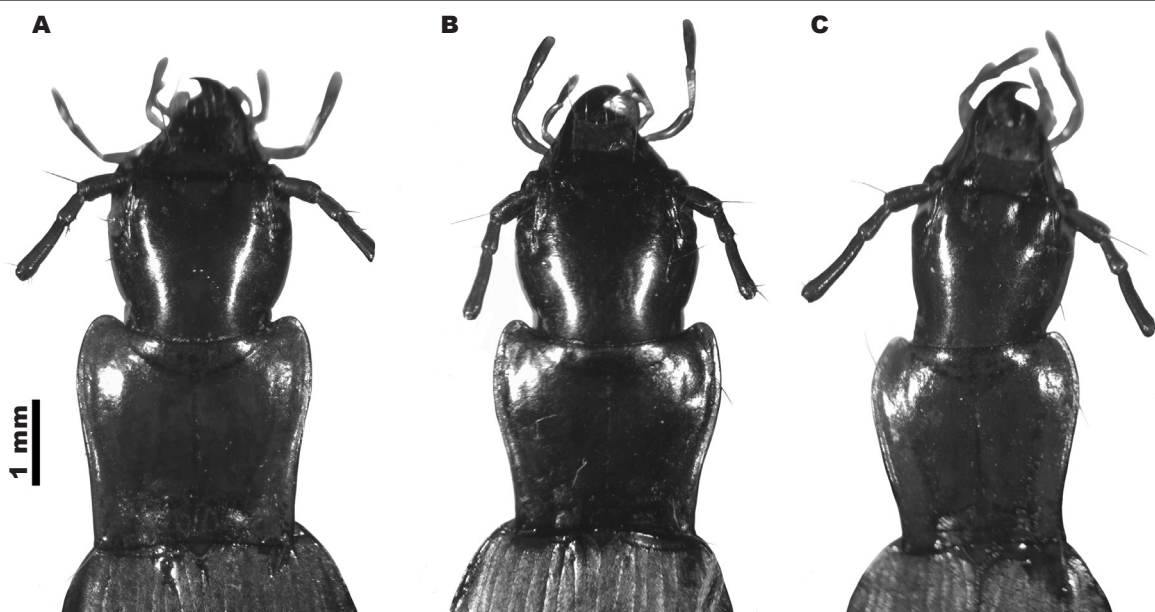


Fig. 5. Head and pronotum in dorsal view: A. *Laemostenus (Antisphodrus) portsensis* n. sp., holotype; B. *L. (A.) lassallei*, from Beceite (Teruel); C. *L. (A.) levantinus*, specimen MZB 76–9240 from the Cueva de las Maravillas (Castellón).

Fig. 5. Cabeza y pronoto en visión dorsal: A. *Laemostenus (Antisphodrus) portsensis* sp. n., holotipo; B. *L. (A.) lassallei*, de Beceite (Teruel); C. *L. (A.) levantinus*, ejemplar MZB 76–9240 de la Cueva de las Maravillas (Castellón).

Table 1. Morphometry of *Laemostenus (Antisphodrus) portsensis* n. sp. Mean values and ranges of variation are indicated.

Tabla 1. Morfometría de *Laemostenus (Antisphodrus) portsensis* sp. n. Se indican los valores promedio y los intervalos de variación.

Dimensions	Holotype ♂	♂♂	♀♀	Total sample
TL (mm)	12.60	13.22 (11.70–14.40)	14.10 (12.90–16.30)	13.82 (11.70–16.30)
PL (mm)	2.45	2.59 (2.30–2.85)	2.70 (2.40–3.00)	2.66 (2.30–3.00)
PW (mm)	2.90	3.08 (2.75–3.45)	3.23 (2.85–3.65)	3.18 (2.75–3.65)
PW/PL	1.18	1.19 (1.13–1.22)	1.19 (1.12–1.22)	1.19 (1.12–1.22)
EL (mm)	7.20	7.65 (6.70–8.40)	7.96 (7.20–9.10)	7.86 (6.70–9.10)
EW (mm)	4.30	4.53 (4.10–4.80)	4.68 (4.10–5.20)	4.63 (4.10–5.20)
EL/EW	1.67	1.69 (1.62–1.75)	1.70 (1.62–1.77)	1.70 (1.62–1.77)

the Sierra de Alcaraz (province of Albacete). The subgroup of *L. navaricus* (Vuillefroy, 1893) includes four species in the Iberian peninsula, distributed in its northern half. Two of them, *L. navaricus* (Vuillefroy, 1893) and *L. peleus* (Schaufuss, 1861), are spread in the Pyrenees and the Cantabrian Cornice, whereas the other two, *L. levantinus* and *L. lassallei*, are located in the north of the Valencian region (provinces of Castellón and Valencia) and the mountain massif of Els Ports–Beceite (southern of the provinces of Tarragona and Teruel), respectively. The records of Els Ports–Beceite attributed to *L. levantinus* by Vives & Vives (1983) and Ortuño (1989) must refer to *L. lassallei*, according to Ortuño (2006).

*Laemostenus lassallei*, very similar in morphology to the new species, was included by Mateu (1989) in the subgroup of *L. kabylicus*, in particular, for its transverse pronotum. In a later review of Spanish Sphodrina (Mateu, 1996), the same author transferred *L. lassallei* to the subgroup of *L. navaricus*. By sharing the main features of the subgroup of *L. navaricus* stated by Casale (1988), as well as for geographical considerations, *L. portsensis* n. sp. should be placed in that subgroup, with *L. levantinus* and *L. lassallei*, its geographical neighbours.

Despite the known variability within the *Laemostenus* species, the shape of the head and the pronotum are within a range that distinguishes the new species from *L. lassallei*, even considering population variations from different localities. The pronotum is slightly less transverse and clearly less constricted basally in *L. portsensis* n. sp. (fig. 5), and both species show significant differences in the male genitalia (fig. 3). The median lobe in *L. lassallei* is markedly curved in its basal third, with geniculated bulb and shorter apex than *L. portsensis* n. sp.; there are also differences in the contour of the apex, in the dorsal view (fig. 4).

The new species differs from *L. levantinus* by its less elongate and slender body, shorter appendages (antennae not reaching half of elytra), more bulky head and pronotum (fig. 5) with anterolateral angles mar-

kedly more prominent, and basolateral angles being right instead of acute. For differences in aedeagus, see figures 3 and 4.

A key that allows to distinguish the three northeastern Iberian species of the *Laemostenus navaricus* subgroup is given.

#### Distribution and ecology

Most specimens of *L. portsensis* n. sp. were captured with pitfall traps in the caves of the Avenc dels Ermetes Passamonte and the Cova del Conill. The traps were placed at the entrance to these caves, along a path of 30 m, inclined about 45° and 30°, respectively. No specimens were located beyond a distance of 40 m from the entrance. However, a few specimens were captured in relatively deep zones of vertical caves (second chamber of Avenc dels Mamelons and Avenc de la Barcina), walking on damp stalagmites. Some related species are considered troglitic, with *L. levantinus* and *L. navaricus* being the most modified species within the subgenus (Casale, 1988; Ortuño, 2006), the last species termed as 'quasi aphaenopsian' by Casale (1988). Most Iberian species of *Antisphodrus* have been located in deep subterranean habitat, although the presence of certain species in the superficial subterranean habitat (MSS) or even in epigeal environments (Novoa et al., 1989; Ortuño, 1989; Fernández–Cortés, 1995; Peláez & Salgado, 2006; Ramos–Abuin, 2013) indicates a wide ecological range for the group.

At the time of placement and removal of traps, temperature ranged from 9.1 to 16.3°C (lower temperatures corresponded to deeper sectors of the vertical caves). The relative humidity reached values close to saturation in most prospected caves. Invertebrates cohabiting with *L. portsensis* n. sp. were chilopods (*Lithobius* sp.), arachnids (e.g. *Tegenaria* and *Metellina*), crickets (*Petaloptila* sp.)—very abundant—, and several species of dipterans (Mycetophilidae, Phoridae, Heleomyzidae and Limo-

Identification key for the three northeastern Iberian species of the *Laemostenus navaricus* subgroup

*Clave de identificación para las tres especies del subgrupo de Laemostenus navaricus del nordeste ibérico.*

1	Head elongate and narrow, with temples barely convex and neck constriction feebly marked. Pronotum elongate, with anterolateral angles less prominent (fig. 5C)	<i>L. levantinus</i> (Bolívar, 1919)
	Head wider, with temples more convex. Neck constriction well marked. Pronotum transverse, with prominent anterolateral angles	2
2	Pronotum more transverse (PW/PL: 1.23 to 1.28), with lateral sides markedly sinuated (fig. 5B)	<i>L. lassallei</i> Mateu, 1989
	Pronotum less transverse (PW/PL: 1.12 to 1.22), with lateral sides less sinuated (fig. 5A)	<i>L. portsensis</i> n. sp.

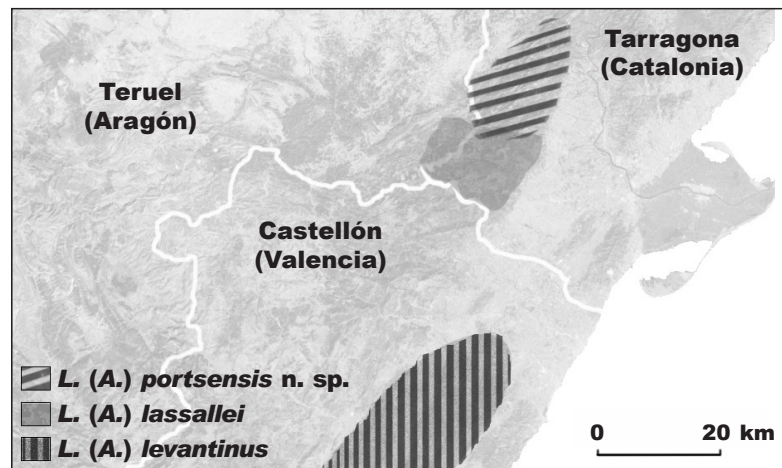


Fig. 6. Distribution area of *Laemostenus (Antisphodrus) portsensis* n. sp., *L. (A.) lassallei*, and *L. (A.) levantinus* (showing only the northern part of the province of Castellón).

*Fig. 6. Área de distribución de Laemostenus (Antisphodrus) portsensis sp. n., L. (A.) lassallei, y L. (A.) levantinus (se muestra solo el norte de la provincia de Castellón).*

nidae) (Caballero-López & Masó-Ros, 2013). The presence of the beetle *Paraphaenops breuilianus* Jeannel, 1916 (family Carabidae), a remarkable troglitic endemism of Els Ports massif (Español, 1979; Bellés, 1987), was detected in the Forat del Rastre and Avenc dels Mamelons.

The known distribution of *L. lassallei* is limited to the locality of Beceite and Els Ports massif, showing a slight overlap with the distribution area of *L. portsensis* n. sp. in el Mascar, adjacent to Mola del Catí (fig. 6). Unlike the new species, *L. lassallei* has been located so far under stones, in deeply fissured limestone areas (Ortuño, 1989; Eduard Vives, pers. com.), and it is considered an inhabitant of the MSS (Ortuño, 2006). The survey that led to the discovery of

the new species was limited to the exploration of the deep subterranean domain. Therefore, the possibility of *L. portsensis* n. sp. also inhabiting the MSS cannot be disregarded.

The separation of the two species could be due to ecological rather than geographical barriers. More interesting is the fact that the occurrence of both taxa in the same area is a strong argument for supporting their genetic distinctness and their status of isolated species. Within *Laemostenus*, there are other documented cases of sympatric species of *Antisphodrus* which are morphologically closely related, as occurs with *L. (A.) elongatus* (Dejean, 1828) and *L. (A.) cavicola* (Schaum, 1858), distributed in the Balkan region (Casale, 1988).

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