The high diversity of the carabid fauna of Anatolia, and its biogeographical interest, have recently been stressed by Casale & Vigna Taglianti (1999). In particular, the limestone region of the Western Toros is markedly characterized by the presence of many peculiar endemic taxa, both epigean and hypogean. The subgenus Antisphodrus Schauffuss, 1865 of Laemostenus Bonelli, 1810, including presently - in the widest sense of Casale (1988) - some 55 species in the circum-mediterranean area, is represented in Anatolia by 19 species described so far, nine of which endemic to the Toros chain.

During biospeleological explorations by the Dutch Speleological Society in 1987, several specimens of the terrestrial and aquatic cave- and groundwater fauna were collected in the western Toros mountains (south-west Anatolia). From this collection, Casale & Giachino (1990) published a note about the genus Huetherielia Jeannel, 1934 (Coleoptera, Cholevidae), with the description of a new species. The present paper deals with a new cave-dwelling species of Laemostenus (Antisphodrus) discovered during the same expedition. A second, related species, collected by Fulvio Gasparo (Trieste) in another cave of the same area in 1998, is also described. The only male specimen known so far of the latter species, with description of its genitalia, was previously incorrectly attributed to L. (A.) longicornis Casale, 1988 (Casale & Vigna Talianti 1999). Therefore, the male genitalia of L. (A.) longicornis are here described for the first time.

Information about the caves cited in the present paper is given by Aygen (1984).

Abbreviations
TL = body overall length, mandibles included
MW = body maximum width
LP/WP = length of pronotum/width of pronotum
LE/WE = length of elytra/width of elytra (LE: linear distance from basal ridge to apex of one elytron, along the suture).

Laemostenus (Antisphodrus) kestelensis Casale, Felix & Muijlik, sp. n.
(figs. 1-5)

Diagnosis
A small-medium sized, microphthalmic, ferrugineous Laemostenus (Antisphodrus) species of the bodemeyeri
species group (sensu Casale 1988), close to *L. (A.) patrizii* Vigna Taglianti 1999, from which it is mostly distinguished by the smaller size (TL: 12.0 - 14.4 in *kestelensis*, 13.5-15.0 in *patrizii*), the narrower and more elongate head with slightly oblique genae, neck constriction vanished and fully flattened eyes, the pronotum with lateral sides reflexed along their overall length and with basal edge interrupted at the middle, and the shorter, dull, more depressed elytra. Median lobe of aedeagus short, with basal bulb elongate.


Description

TL: 12.0-14.4 mm; MW: 4.0-4.9; LP/WP: 1.0-1.1; LE/WE: 1.6-2.1.

Habitus as in fig. 1. Colour fully reddish to brown reddish; elytra without bluish reflection. Head and pronotum shining, elytra rather dull. Microsculpture isodiametric, vanished on head; pronotum with transversal, slightly distinct microlines; elytra with distinct, isodiametric meshes.

Head small, elongate, narrow; genae long, slightly oblique; neck constriction vanished; eyes small, as long as 2/3 of genae, flattened and not prominent outside; two supraorbital setae on each side present; frontal impressions very short and deep; with shallow trans-

![Fig. 1](image1.png)  ![Fig. 2](image2.png)  ![Fig. 3](image3.png)  ![Fig. 4](image4.png)  ![Fig. 5](image5.png)

Figs. 1-5. *Laemostenus (Antiophodrus) kestelensis* male paratype. – 1, Head, pronotum and base of left elytron; 2, aedeagus, median lobe, left side; 3, righ paramere; 4, left paramere; 5, median lobe, apex in dorsal side. Scales 1 mm (1), 0.5 mm (2-5).
versal wrinkles often extended to the frons; antennae long, exceeding with five antennomeres the base of pronotum; antennomere 3 with a few (2-3) short accessory setae in addition to the apical fixed setae.

Pronotum elongate-cordate, longer than wide, its maximum width at the anterior fourth; lateral sides narrowly beaded, reflexed through their overall length, regularly sinuate in the basal third and constricted to the basolateral angles, which are right; anterolateral angles prominent; basal margin with edge widely interrupted at the middle. Disc with shallow transversal wrinkles; median furrow deep; basal impressions elongate, deep, each with some deep punctures extended to the lateral furrow; anterolateral and basolateral setiferous pores inserted as in fig. 1.

Mesosternum denticulate in front of mesocoxae.

Elytra ovate, basally narrow, widened at the distal third, subdepressed. Base very narrow; basal ridge incavate, humeral angle rounded but evident, humeral tooth almost vanished. Striae deep, vaguely punctate; intervals subconvex, the even distinctly wider than the odd. Chaetotaxy: basal pore present; umbilicate series with 15-17 setiferous punctures, interrupted at the middle; the apex of stria 7 with 1 seta just before the apex and 1 at the very end.

Legs long and slender; profemora each with two-three long setae along the outer margin of the ventral side; metatibiae each with numerous apical yellow reddish setae; tarsomeres with long, strigose dorsal pubescence; males with fore tarsomeres 1-3 dilated and with ventral, biseriate adhesive vestiture. Tarsal claws with traces of teeth along their inner margin.

Male genitalia (figs. 2-5). – Aedeagus with median lobe short, slightly arcuate, inflated at the middle, with basal bulb developed, prominent; apex short, sub-truncate, markedly prominent on the dorsal side.

Figs. 6-7. Laemostenus (Antisphodrini) males, head, pronotum and base of left elytron. – 6. L. gasparoi holotype; 7. L. longicornis, topotype. Scale: 1 mm.
Right paramere rounded at apex; left paramere with short apical membranous lobe.

**Etymology**

We named the species, according to a suggestion of Mr. C. Jeanne, after the karstic region ‘Kestel ovasi’, where the Yarasa cave is located.

**Distribution and ecology**

A very specialized hypogean species, known from station 87-5/53 (May 25 1987); ‘Incirli mağara’si’ or ‘Yarasa mağarası’ cave (Aygen 1984) about 1 km west of ‘Incir Han’, about 7 km west northwest of Buçak, Villayet (administrative area) Burdur, UTM coordinates TG8153, altitude 850 m. Temperature at about 30 m depth: 13.8 °C. The cave was harboured by a guano and bats associated invertebrate community of: Coleoptera, Myriapoda, Diplopoda, Orthoptera: Rhaphidophoridae, Diptera: Nycteribiidae, Araneae, Scorpiones, and Crustacea: Oniscidae.

The second cave in which the species was found is named Sefer Yitig˘i mağarası, about 2.2 km on the road from Buçak to Incir Han and then about 2 km to the right. The first specimen was taken from the wall of the right. The first steep descent, about 30 m depth and the other two from the walls in the first room right after the descent at about 40 m depth. There was a pile of guano in the room, but no Laemostenus specimens were seen there.

Laemostenus (Antisphodrus) gasparoi Casale, sp. n.

(figs. 6, 8-11)


**Diagnosis**

A small-medium sized, micropthalmic, ferruginous *Laemostenus (Antisphodrus)* species group (sensu Casale 1988), close to *L. (A.) patrizii* Vigna Taglianti, 1999, and *L. (A.) kestelensis* sp. n. In particular, it seems closer to *patrizii*, owing to the general shape of head, with parallel sided genae, marked neck constriction and prominent eyes. From both *patrizii* and *kestelensis*, it is markedly distinguished by the smaller size (TL: 11.9 in *gasparoi*, male holotype, 12.0-14.4 in *kestelensis*, 13.5-15.0 in *patrizii*), the longer antennae, the markedly prominent shoulders, and the different shape of the aedeagus, which is elongate, slender and distinctly narrowed to the apex.

Material examined. – Holotype male, labelled: ‘Ak-ayarlar mağarası m 50 sulla strada Antalya-Kemer (TR)’, ‘F. Gasparo Lg. 16.VI. 1998’ (Museo Civico di Storia Naturale, Trieste, Italy).

**Description**

TL: 11.9 mm (male holotype); MW: 4.0; LP/WP: 1.1; LE/WE: 1.9.

Habitus as in fig. 6. Colour fully brown reddish; elytra without bluish reflection. Head, pronotum and elytra shining. Microsculpture isodiametric, vanished on head; pronotum with transversal, slightly distinct microlines; elytra with shallow but distinct, isodiametric meshes.

Head rather wide and larger in size; genae long, almost parallel sided; neck constriction distinct and deep; eyes small, as long as 2/3 of genae, but prominent outside; two supraorbital setae on each side present; frontal impressions short, wide and very deep, a little bent and convergent to the frons, with shallow transversal wrinkles; antennae very long, exceeding with six antennomeres the base of pronotum; antennomere 3 with a few (2-3) short accessory setae in addition to the apical fixed setae. The left mandible, in the male holotype, overlaps the right, in this differing from the other species here illustrated (see figs. 1, 6 and 7).

Pronotum elongate-cordate, longer than wide, its maximum width at the anterior fourth; lateral sides narrowly beaded, reflexed through their overall length, regularly sinuate in the basal third and constricted to the basolateral angles, which are obtusely rounded; anterolateral angles very prominent; basal margin fully beaded. Disc with shallow transversal wrinkles; median furrow deep, but interrupted both anteriorly and posteriorly; basal impressions very elongate and deep, each with some transversal wrinkles extended to the lateral furrow; anterolateral and basolateral setiferous pores inserted as in fig. 6.

Mesosternum denticulate in front of mesocoxae.

Elytra ovate, basally narrow, widened at the distal third, convex. Base markedly prominent laterally; basal ridge slightly bent, humeral angle evident, humeral tooth vanished. Striae rather deep, almost smooth; intervals sub-equal and almost flat. Chaetotaxy: basal pore present; umbilicate series with 15 setiferous punctures, interrupted at the middle; the apex of stria 7 with 1 seta just before the apex and 1 at the very end.

Legs long and slender; pretarsomera each with 2 to 3 long setae along the outer margin of the ventral side; metatibiae each with numerous apical yellow reddish setae; tarsomeraes with long, striate dorsal pubescence; males with fore tarsomerae 1-3 dilated and with ventral, biseriate adhesive vestiture. Tarsal claws with very reduced traces of 2 to 3 blunt teeth along their inner margin.

Male genitalia (figs. 8-11). – Aedeagus with median lobe slender, slightly arcuate, markedly constricted to the apex; with basal bulb rather small; apex narrow,
sub-truncate, prominent on the dorsal side. Right paramere rounded at apex; left paramere with long apical membranous lobe.

**Etymology**

The species is dedicated to Dr. Fulvio Gasparo (Trieste), active biospeologist and arachnologist, who collected the only specimen known so far.

**Distribution and ecology**

This specialized hypogean species is known so far only from the Akyarlar magarasi, a well-known cave located some 20 km SW of Antalya, at 50 m altitude near the road Antalya-Kemer. The original hypogean system has been partially obstructed by debris, and can be visited presently only for a short distance, to a depth of about 10 m. The only specimen of the new species has been collected under a stone on wet ground, far from the entrance, associated to some Araneae (Leptonetidae gen. sp., and *Hoplopholcus patrizii* [Roewer]) (F. Gasparo in litt.).

**Laemostenus (Antisphodrus) longicornis** Casale, 1988

(figs. 7, 12-15)

Laemostenus (Antisphodrus) longicornis Casale, 1988: 608, figs. 870-871.

Laemostenus (Antisphodrus) longicornis; Casale & Vigna Taglianti 1999: 327 [but not figs. 24-28].

As specified above, the male genitalia of this species have been unknown so far. In fact, the male specimen of the species described above was erroneously attributed to *longicornis* (Casale & Vigna Taglianti 1999). The genitalia are here illustrated (figs. 12-15), from a toptype specimen with the following data "Turchia
vil. Antalya, Akseki m 1100, 27.VI.1990, grotta presso Akseki, P.F. Cavazzuti leg.' (coll. A. Casale). They are evidently different from those of the two species described in this paper, and from those of other species described in Casale & Vigna Taglianti (1999).

In external features, *longicornis* is highly similar both to *kestelensis* and *gasparoi*, both in general shape and size. From *kestelensis* is mostly distinguished by the wider head, with parallel sided genae and prominent eyes (see figs.1 and 7); from *gasparoi*, mostly by the different shape of pronotum, which is more elongate and markedly cordate (see figs. 6 and 7). From both, *longicornis* is also distinct in having antennomere 3 glabrous, or at most with one seta in addition to the apical fixed setae.

**TAXONOMIC AND BIOGEOGRAPHIC REMARKS**

The main questions concerning both phylogeny, relationships and biogeography of the subgenus *Antisphodrus* (in the widest sense of Casale 1988) in the southern Anatolia have been stressed and debated by Casale & Vigna Taglianti (1999).

The discovery of the new *Antisphodrus* species described above is very interesting owing to three main reasons. Firstly, it increases the diversity of the carabid fauna in the south-western Anatolia, an area that is already well known for its richness in peculiar, endemic epigean and hypogean species. Secondly, it furnishes further information on the speciation processes in this lineage of sphodrid carabids; these processes, in the western Toros chain (the ‘Lycian refugium’ in the sense of Schweiger 1966), have been peculiarly intense, probably favoured by heterochronic colonization of the subterranean environment and isolation in xeric, Mediterranean areas. As result, the present biotic scenario is a high number of allopatric or sympatric taxa, with different degrees of adaptation to different hypogean compartments, all highly localized and vicarious in contiguous montane massifs. Thirdly, it confirms the *bodemeyeri* species group as a homogeneous, monophyletic unit, widely spread all over the Toros chain, and extended to the Aegean islands and to Peloponnese. In this group, *Laemostenus (Antisphodrus) kestelensis* is closely related to, and adelphotaxon of a pair of species formed by *L. (A.) patrizii* and *L. (A.) gasparoi*, of which it represents the northern geographic vicariant. *L. (A.) longicornis* Casale, 1988, and the other taxa localized east of Antalya, appear related to the preceding ones, but more isolated. This fact confirms the different origins of some both epigean and hypogean insect lineages in the massifs located respectively west and east of the line Isparta-Antalya, an important geological and biogeographic barrier that C. Jeanne (in litt.) correctly names ‘Antalya break’.

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