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The Sphodrina of the southern Levant (Coleoptera: Carabidae, Sphodrini)

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Abstract
Here we present a synthesis on the current knowledge of sphodrine carabids of the southern Levant (Israel, areas under Palestinian control, Lebanon, Jordan, Egypt east of Suez Channel: Sinai). A key for the identification of genera, subgenera and species is provided. Two new species are described: *Taphoxenus* (*Lychnifugus*) *ziegleri* **sp. n.** is described from Jordan (Type locality: Madaba), close to *T.* (*L.*) *meridionalis* Casale, 1988 (valid species), but markedly distinct for several characters both in external features and male genitalia. *Laemostenus* (*Laemostenus*) *sinaiticus* **sp. n.** is described from southern Sinai (Type locality: St. Catharina Monastery). This species belongs to the *L. quadricollis* species group (in the sense of Casale, 1988), and is close to *L. aegyptiacus* Schatzmayr, 1936. An updated key for the identification of the species of this group known so far in that area, which includes both epigean and subterranean species, is provided. The diagnostic features of all species newly described are illustrated, and their possible relationships are discussed. Furthermore, the features of male genitalia of *Laemostenus* (*Laemostenus*) *aegyptiacus* Schatzmayr, 1936 and *Laemostenus* (*Laemostenus*) *libanensis* (Piochard de la Brûlerie, 1876) are illustrated for the first time. The latter, known so far from the remains of the holotype specimen, is redescribed from material recently sampled in Lebanon.

Key words: Coleoptera, Carabidae, *Taphoxenus (Lychnifugus) ziegleri* sp. n., *Laemostenus sinaiticus* new species, *Laemostenus quadricollis* species group, Israel, Lebanon, Jordan, Egypt, Sinai.

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Introduction

Carabid beetles of the tribe Sphodrini - in particular, Sphodrina of the *Laemostenus* and *Sphodrus* phyletic lineages – include many species in Anatolia and the Middle East, and most of them have been treated and illustrated by Casale (1988), with some maps of distribution ranges of various taxa. Several forest or desert dwelling, montane or troglophilic species belonging to this group of carabids are of relevant biospeleological and biogeographic interest for the given area (Casale & Vigna Taglianti 1999). Further, new *Laemostenus* species have been described or listed from this region by several authors in recent years (see, for a synthesis, Casale & Wrase 2012). However, large areas have not been adequately investigated so far; therefore, we expect that a large number of new species awaits discovery.

This is also true for the southern Levant, a region which comprises Israel, areas under Palestinian control, Lebanon, Jordan and Egypt east of the Suez Channel (Sinai). The high interest and diversity of the carabid fauna in this area has been recently illustrated in several contributions by Assmann et al. (2012, 2015a, 2015b).

In this contribution, we describe and illustrate two new Sphodrina species sampled in the southern Levant, with additional notes and identification keys for all Sphodrina genera, subgenera and species of the region.

Material and methods

The material examined is housed in the collections listed below:
cCA Collection Achille Casale, Torino, Italy
cAS Collection Thorsten Assmann, Lüneburg, Germany (part of the Zoological State Collection, Munich)
cHE Collection Walter Heinz, Schwanfeld, Germany
cRE Collection Christoph Reuter, Hamburg, Germany
cSC Collection Peer Schnitter, Halle, Germany
cWR Collection David Wrase, Berlin, Germany (part of the Zoological State Collection Munich)
cZI Collection Wolfgang Ziegler, Rondeshagen, Germany

MNHN Muséum National d'Histoire Naturelle, Paris, France
MSNM Museo Civico di Storia Naturale, Milano, Italy
ZSCM Zoological State Collection, Munich, Germany

The total body length (TL) is measured from the anterior margin of the clypeus to the apex of the elytra as the maximum linear distance; the overall length (L) from the apex of the mandibles to the apex of the elytra, measured along the suture; the length of the pronotum (PL) as linear distance from the anterior to the basal margin, measured along the midline; the width of the pronotum (PW) at its broadest point; the length of the elytra (EL) as linear distance from the basal ridge to the apex, measured along the suture; the width of the elytra (EW) at its broadest point. These measurements were combined as ratios as follows: PL/PW and EL/EW, using an ocular micrometer in a Wild M-3 or Wild M-5 stereomicroscope.

Dissections were made using standard techniques: male genitalia were dissected and examined in dry condition, before their final inclusion on labels pinned beneath the specimens from which they had been removed. Line drawings were made using a camera lucida attached to a Wild M-3 or Wild M-5 stereo microscope.

Most of the habitus photographs were taken by G. Allegro with the Leica DFC295 camera mounted on a Leica M205 C Stereomicroscope, using the software Leica Application System V4.0.

Taxonomic treatment and morphological terms

The genera *Taphoxenus* Motschulsky, 1865 and *Laemostenus* Bonelli, 1810 are treated in the widest sense of Casale (1988), in which the limits of subgenera and species groups are clear in some cases, but not yet defined in other cases.

The median lobe of aedeagus is synonym of phallus of some authors.

Results

Description of new species and taxonomic notes

***Taphoxenus* (*Lychnifugus*) *ziegleri* sp. n.**

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Type locality: Jordan, Madaba.

Type material: Holotype male, labeled : « Jordanien 762 m sü Madaba Bodenfalle W. Ziegler 13.3.2015 » « Olivenhain bei AUM N31°39'30 E35°47'47 » (cAS); paratypes : 1 male, same date as holotype (cZI) ; 1 male « Jordan SW, N of Petra SE Shawbak 1.4.2013 lgt. Snižek » (cWR); 1 female « N30°37'08.9 » E035°37'34.4 » « Jordanien, Dhana, Camp. Ruderal 05-09.05.2010 1327 m ÜNN leg. Schnitter JD 04 LF/HF » (cCA); 1 male « N30°37'08.9 E035°37'34.4 Jordanien, Dhana, Camp. Ruderal 24.04. 2016 1327 m üNN leg. Schnitter JD 31 » (cSC); 1 specimen (remains: prothorax, abdomen and elytra) "Tafila Rashadiyya 1500 m G. Sama leg. 15.V.99" (cCA).

Note about the type series: The four examined specimens not sampled in the type locality, from Petra, Dhana and Tafila respectively, slightly differ from the two specimens from the type locality (Madaba) for the pronotum with lateral margins not sinuate, regularly curved and constricted to the basal margin. All other morphological features are consistent with those described of the new species, and genitalia of the male from N of Petra are identical to those of the holotype. For the time being, as a consequence of the scarcity of material, we cannot provide further information about the variability of this species.

Diagnosis. A *Taphoxenus* species with the character states of the subgenus *Lychnifugus* Motschulsky, 1864 in the sense of Casale (1988), mostly characterized by its large size (L: 28.5-32.0 mm, 25.5 in male holotype; TL: 26.0-29.0 mm, 22.5 in male holotype), the transverse pronotum, the long, markedly curved mesotibiae in males and the elongate, parallel-sided, depressed and deeply striate elytra. Similar and close to *T.* (*L.*) *meridionalis* Casale, 1988 (valid species, see below), but markedly distinct from it by the longer antennae, extending beyond the base of elytra, the more transverse pronotum, the parallel-sided elytra, the deeper, deeply punctured elytral striae, the angular, curved mesotibiae, the less furnished brush of setae at apex of metatibiae, and the different shape of the median lobe of aedeagus, which is more elongate and slender (Figs 9-16).

Etymology. We dedicate this new, very interesting species to our friend Wolfgang Ziegler, who sampled in Jordan the two type specimens from the type locality here designated for the new taxon.

Description. Large-sized species (TL: 26.0-29.0 mm; L: 28.5-32.0 mm), brachypterous.
Colour: uniformly black. Palpi reddish, antennomeres 5-11 piceous brown (Fig. 4).
Microsculpure: Head, pronotum and elytra relatively shiny, with shallow, transversal microlines on pronotum and almost vanished, isodiametric meshes on elytral intervals.
Head: large, moderately convex; frons irregularly, shallowly striate. Tempora moderately convex, slightly narrowed to the neck constriction; frontal impressions small, short, slightly impressed; eyes relatively large, as long as genae, slightly prominent laterally.
Antennae: moderately long, if stretched backwards exceeding with two antennomeres the base of elytra.
Prothorax: transverse (ratio PL/PW: 0.92), widest at its anterior third, its lateral margins reflexed in the posteri-

Figs 1-2 – *Taphoxenus* (*Lychnifugus*) spp., habitus in dorsal aspect. 1: *T.* (*L.*) *cerberus cerberus*, female specimen from Amasya (Anatolia, Turkey); 2: *T.* (*L.*) *cellarum*, male specimen from Baku (Azerbaijan).

Figs 3-4 - *Taphoxenus* (*Lychnifugus*) spp., habitus in dorsal aspect. 3: *T.* (*L.*) *meridionalis*, male paratype from Homs (Syria); 4: *T.* (*L.*) *ziegleri* sp. n., male holotype from Madaba (Jordan).

or half, briefly or not sinuate anteriorly to the basolateral angles; anterolateral angles slightly prominent; base moderately concave, beaded. Disc depressed, with sparse and shallow transversal wrinkles; basal impressions wide and deep; anterolateral setiferous punctures present, basolateral setiferous punctures absent.

Elytra: elongate (ratio EL/EW: 1.71), parallel-sided, depressed on disc; pre-humeral (basal) margins oblique, humeral angles rounded, with an obtuse, reduced humeral tooth. In one male paratype, elytral suture deeply impressed. Striae deep, strong punctured; intervals flat, smooth. Chaetotaxy: basal pore absent; umbilicate series with numerous (31-33) setiferous punctures, uninterrupted in the middle; 1 seta at apex of stria 7.

Legs: long, very robust; profemora on ventral side longitudinally shallowly concave for entire length, their outer sides glabrous; mesotibiae elongate, bent in both sexes, very markedly and angularly curved in the middle in males; metatibiae each with apical brush of short, sparse yellow-reddish setae. Tarsomeres short and wide, glabrous on the dorsal side, except tarsomere 1 of metatarsi, which is setulose; metatarsomeres 3-5 with shallow, longitudinal wrinkles in the basal half. Males with fore tarsomeres 1-3 not dilated and without biseriate adhesive vestiture on the ventral side. Tarsal claws smooth.

Male genitalia: as in Figs 13-16. Median lobe of aedeagus elongate and slender, regularly curved, very narrowed apically, its apex short, rounded in dorsal aspect; right paramere elongate and slender, rounded apically; left paramere with reduced apical membranous lobe.

Female genitalia: not examined.

Distribution and habitat. Known from several localities of Jordan at different altitudes, in steppic or desertic habitats (Fig. 17). As indicated above, specimens from the southern localities slightly differ from those from the type locality (Madaba).

Comparisons and taxonomic notes about the *Taphoxenus* species of the subgenus *Lychnifugus* in Anatolia and the Middle East

T. (*L.*) *ziegleri* Casale & Assmann, sp. n. is similar and close to *T.* (*L.*) *meridionalis* Casale, 1988, valid species, see below, not subspecies of *T.* (*L.*) *cellarum* (as in Casale, 1988, 2003), of which it represents the southern geographical substitutive, but is markedly distinct from it by the features described in the diagnosis, description, and see 'Key to the Species' below.

The study of this new species, and other additional material, allowed one of the authors of the present contribution to check again several specimens examined at the time of the monograph (Casale 1988) (in particular, the features of male genitalia, when available), and to modify the taxonomic treatment of some taxa.

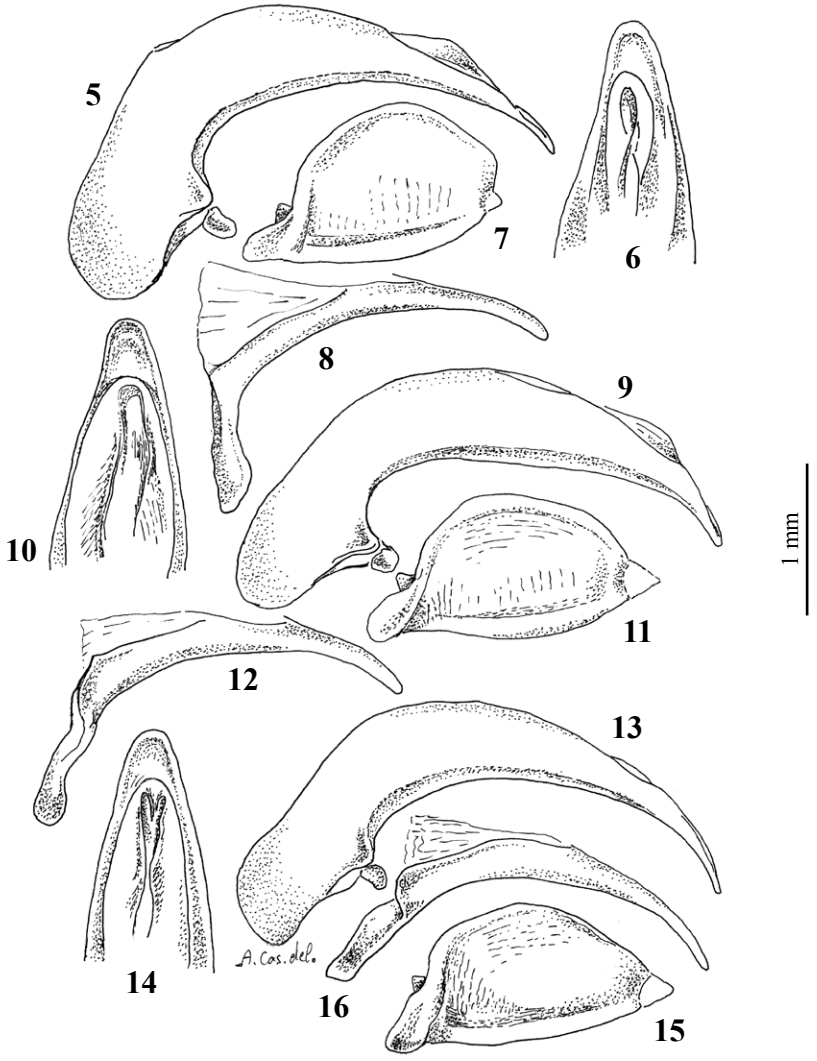
These main facts were ascertained: 1. *T.* (*L.*) *cellarum* (Adams, 1817) is localized to Caucasus and Transcaucasus only (NE Anatolia, Armenia, Georgia, Azerbaijan). *T.* (*L.*) *meridionalis* from Syria (Homs, Palmyra) and Iraq (Baghdad) is specifically distinct from it by several morphological features (Figs. 2-3), in particular in the shape of male genitalia (Figs. 5-8, 9-12). 2. Female specimens from E Anatolia: Agri and Dogubayazit-Igdir 1600-2000

m, attributed by Casale (1988) to *meridionalis*, should belong to *T.* (*L.*) *cellarum* or *T.* (*Lychnifugus*) *sahendensis* (Morvan, 1981), but further material is necessary for a correct identification. To *T.* (*Lychnifugus*) *sahendensis*, to *T. cellarum* or to a not yet described species, should belong also a female specimen from Iran (Kurdistan) "Pass zw. Baneh u. Saqez 2000-2150 m 13/14.IV.2014 (Gardeneh-Khan Tunnel) Heinz leg. (cHE)".

The Iranian species of *Lychnifugus* will be the object of another contribution (Casale & Wrase in preparation).

Key for identification of *Taphoxenus* (*Lychnifugus*) species of Caucasus, Anatolia and S Levant

1. Humeral angle with an obtuse, not or slightly prominent tooth. Basal ridge of elytra straight or moderately bent. Metatarsomeres 3-5 with shallower longitudinal wrinkles on the dorsal side in the basal half (species from Caucasus, Anatolia and southern Levant) 2
- Humeral angle with an acute, prominent tooth. Basal ridge of elytra markedly bent. Metatarsomeres 3-5 with deeper longitudinal wrinkles on the dorsal side (species from N, Central and S Iran; not discussed herein)
2. Pronotum very widened in front, constricted to the basal margin. Elytra with deeply impressed, concave suture; elytral intervals with evident transversal wrinkles (Fig. 1). Metatibiae with inner brush of setae reduced to the apex of tibia (Central- and South-Western Anatolia) .... ***T.* (*Lychnifugus*) *cerberus*** (Ganglbauer, 1905) (*sensu lato*, incl. ssp. *muchei* Jedlička, 1961)
- Pronotum moderately widened in front. Elytral intervals smooth. Metatibiae with well-developed inner brush of setae on the apical half or third of tibiae 3
3. Pronotum very elongate, cordate, with lateral margins deep-



Figs 5-16 - *Taphoxenus* (*Lychnifugus*) spp., male genitalia. **5**, *T.* (*L.*) *cellarum*, male specimen from Baku (Azerbaidjan), median lobe of aedeagus, left lateral aspect; **6**, idem, median lobe of aedeagus, apex, dorsal aspect; **7**, idem, left paramere; **8**, idem, right paramere; **9**, *T.* (*L.*) *meridionalis*, male paratype from Homs (Syria), median lobe of aedeagus, left lateral aspect; **10**, idem, median lobe of aedeagus, apex, dorsal aspect; **11**, idem, left paramere; **12**, idem, right paramere; **13**, *T.* (*L.*) *ziegleri* sp. n., male holotype from Madaba (Jordan), median lobe of aedeagus, left lateral aspect; **14**, idem, median lobe of aedeagus, apex, dorsal aspect; **15**, idem, left paramere; **16**, idem, right paramere.

Fig. 17 – Jordan, Dhana, habitat of *Taphoxenus* (*Lychnifugus*) *ziegleri* sp. n. (photo P. Schnitter).

ly sinuate anteriorly to the basal angles (Fig. 2). Median lobe of aedeagus as in Figs. 5-8 (Caucasus and Transcaucasus: Georgia, Armenia, NE Azerbaijan: Baku, Lankaran [=Lenkoran]) ... ***T.* (*Lychnifugus*) *cellarum*** (Adams, 1817)

- Pronotum transverse or moderately elongate, with lateral margins not or shortly sinuate anteriorly to the basal angles. Large-sized species (L: 24-32 mm) (Syria, Iraq and Jordan) 4

4. Pronotum cordate and narrower (ratio PL/PW: 1.0). Elytra elongate-oval, moderately and uniformly convex, with shallow, superficially punctured striae. Antennae shorter, not extending beyond the base of elytra (Fig. 3). Median lobe of aedeagus shorter and stout, as in Figs. 9-12 (W Syria: Homs, Palmyra; Iraq: Mesopotamia, Baghdad) .... ***T.* (*Lychnifugus*) *meridionalis*** Casale, 1988 (valid species, **status nov.)**

- Pronotum transverse (ratio PL/PW: 0.92). Elytra parallel-sided, moderately depressed on disc, with deep, deeply punctured striae. Antennae longer, extending beyond the base of elytra (Fig. 4). Median lobe of aedeagus elongate and slender, as in Figs. 13-16 (Jordan) .... ***T.* (*Lychnifugus*) *ziegleri*** Casale & Assmann **sp. n.**

Laemostenus (*Laemostenus*) *sinaiticus* sp. n.

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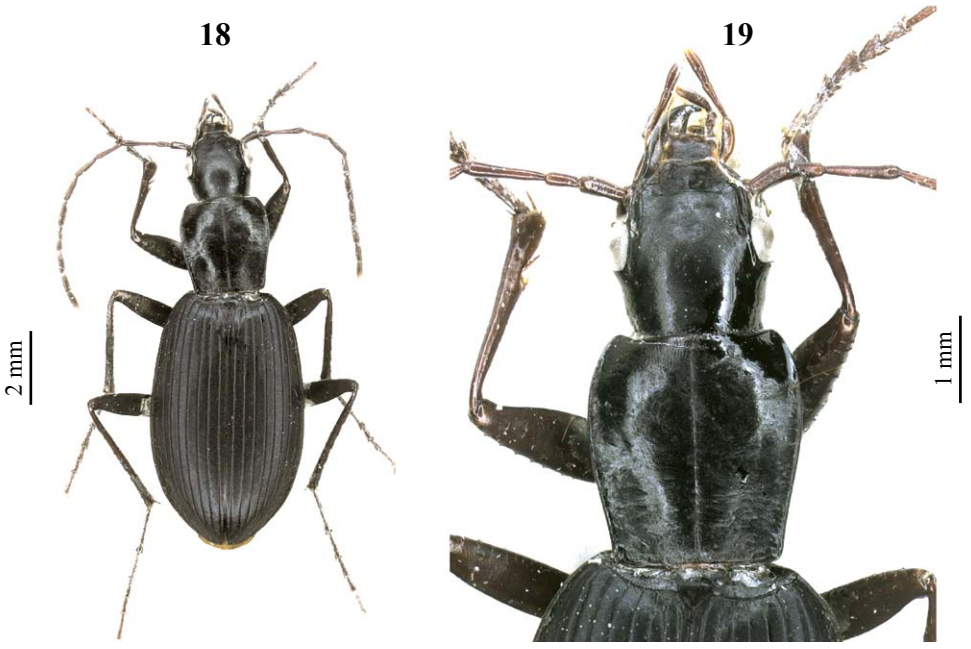
Type locality: Egypt, South Sinai, Saint Katherina Mountains.

Type material. Holotype male, **Egypt:** labeled: "Egypt South Sinai Saint Katherina Mountains Wadi Shagg (Tinya) » «West of Abu Sila Riparian habitats ~ 1600 m asl, 14.12.2009 leg. Th. Assmann" (cAS); Paratypes: 2 males, 1 female, same data as holotype (cAS, cCA); 1 male (genitalia mounted): Egypt: South Sinai / Saint Katherina / Mountains / Wadi Shagg (Tinya) (1. label) West of Abu Sila / Riparian habitats / ~1600 m asl, 14.12.2009 / leg. Th. Assmann (2. label) (cAS); 1 female: Egypt: South Sinai / Saint Katherina / Mountains / Wadi Shagg Musa (1. label) Riparian habitats / ~1500 m asl 06.02.2010 / leg. Th. Assmann (2. label) (cAS); 1 female: Egypt: South Sinai, Saint Katherina Mountains, Wadi Shagg (Tinya)", "West of Abu Sila Riparian habitats ~ 1600 m asl, 14.12.2009 leg. Th. Assmann" (cWR).

Diagnosis. A small sized (L: 13-14.5 mm), *Platynus*-like *Laemostenus* (*Laemostenus*) species of the *L. quadricollis* species group (sensu CASALE 1988), mostly characterized by the uniformly black colour, slender, brachypterous, depressed body, and elongate antennae and legs.

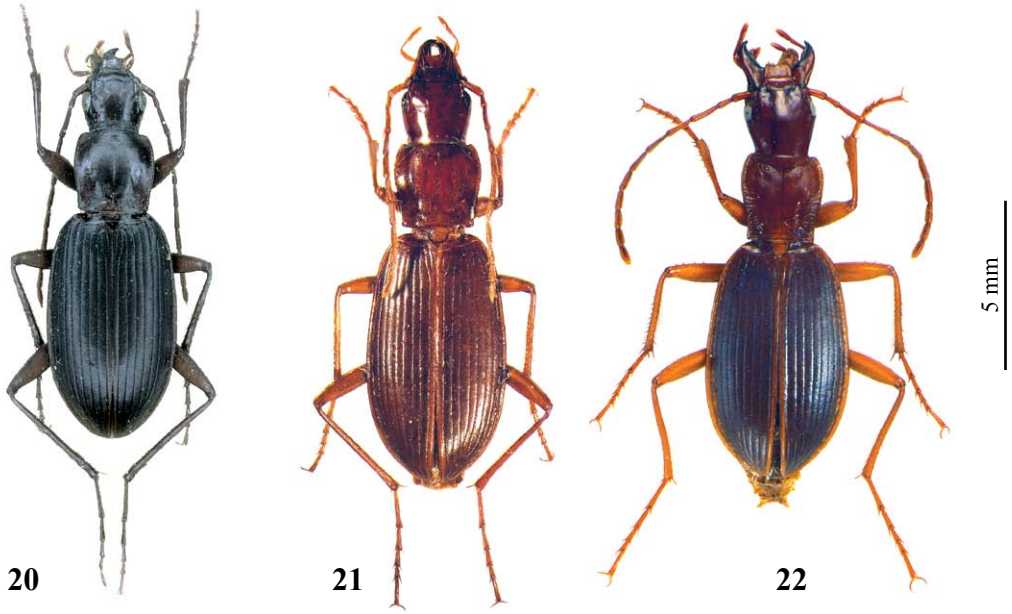
Etymology. From the type locality (South Sinai) of the new species.

Description. Body small: TL: 12.0 – 13.3 mm; L: 13.2-14.5 mm; in holotype: TL: 12.4 mm; L: 13.0.
Colour: uniformly black. Antennae, legs and mouth parts dark reddish brown (Fig. 18).
Microsculpure: Head and pronotum relatively shiny, with shallow, almost vanished transversal microlines; elytra opaque, with distinct, isodiametric meshes.
Head: very elongate and narrow (Fig. 19); dorsal surface smooth; tempora slightly oblique, narrowed to the neck constriction; frontal impressions small, short, slightly impressed; eyes small, moved forward, as long as two/thirds of genae, slightly prominent laterally.



Figs 18-19 – *Laemostenus* (*Laemostenus*) *sinaiticus* sp. n., male holotype. **18**, habitus in dorsal aspect ; **19**, head and pronotum.

Antennae: long, if stretched backwards exceeding by four antennomeres the elytral base.
Pronotum: very elongate and narrow, longer than wide (ratio PL/PW: 1.09-1.2), its lateral sides slightly reflexed in the posterior half, briefly sinuate anteriorly to the basolateral angles, which are rectangular; anterolateral angles fully effaced, not prominent; base straight or moderately oblique at sides, beaded. Disc depressed, with sparse and shallow transverse wrinkles; basal impressions wide, shallow, each with several, deep punctures extended to the basal area and the lateral furrows; anterolateral and basolateral setiferous punctures present.
Mesosternum: denticulate in front of mesocoxae.
Elytra: ovate, relatively short and wide (ratio EL/EW: 1.60-1.70), depressed, slightly widened in the posterior third. Base narrow, almost straight; basal ridge incavate; humeral tooth absent, shoulders obtusely rounded. Striae deep, very shallowly punctured, almost smooth; intervals flat,



Figs 20-22 – *Laemostenus* (*Laemostenus*) spp., habitus in dorsal aspect. **20**, *L.* (*L.*) *aegyptiacus*, female holotype; **21**, *L.* (*L.*) *antonrichteri*, male holotype from Mt. Hermon (Israel); **22**, *L.* (*L.*) *antonrichteri*, female specimen from Nakhal Bezet, Sharakh Cave (Israel, Upper Galilee).

smooth. Chaetotaxy: basal pore present; umbilicate series with 16-17 setiferous punctures; 3 setae at apex of stria 7. *Legs*: long and slender; profemora on ventral side longitudinally shallowly concave for entire length, its outer side with an oblique series of 3-4 setae, one of them reaching the apical third of the outer margin, which is smooth; mesotibiae straight; metatibiae each with apical group of short, sparse yellow-reddish setae. Tarsomeres narrow, thin, very elongate, with dorsal pubescence short and sparse. Males with fore tarsomeres 1-3 slightly dilated and with ventral, biseriate adhesive vestiture. Tarsal claws smooth or with 2-3 small teeth along the basal half of the internal margin. *Male genitalia*: as in Figs. 25-26. Aedeagus smallest in size; median lobe slightly curved, its apex short, in dorsal aspect rounded distally; right paramere elongate and slender, subtruncate apically; left paramere with reduced apical membranous lobe.
Female genitalia: not examined.

Distribution and habitat. Known so far from localities in the surrounding of the Saint Catherina Monastery (southern Sinai, Egypt), at about 1600 m a.s.l. All specimens of the type series were collected in montane *wadis* in arid regions (Fig. 34).

Comparisons. Close to *L.* (*L.*) *aegypticus* Schatzmayr, 1936, an enigmatic species known so far from the type locality (holotype from Egypt, North Sinai, Wadi Garraui, South Seluan: Fig. 20) and Eilat (Israel) (see Casale, 1988) (two female specimens in MSNM), of which it represents the South-Western substitutive at high altitude in the Sinai peninsula.

We had the opportunity to re-examine the two specimens of *L.* (*L.*) *aegypticus* in MSNM, two further male specimens labeled: “JO – Wadi Rum 29°30'48.2"N 35°23' 00.7"E 21/III/2016 lg. E. Boutaud” “Chasse à vue Desert – Wadi sous pierre” and “JO – Wadi Rum 29°34' 13.0"N 35°24'40.3"E – Desert – Wadi under stone”, one female from “S-Jordan: Wadi Rum / Qatar Spring / N 29.51°E 35.41° / 1000-1100 m asl” “dry wadi with *Ficus* trees, 28. III.2017 / leg. Th. Assmann” and one female from “S-Israel: Negev (208, 265) / Ro’a Wadi/Halukim Ridge / near Sede Boqer N30°52.6' E034°42.1' / 4.12.2007 / leg. Th. Assmann”, respectively. The locality Wadi Rum in Jordan is rather close to Eilat, a site already reported by Casale (1988). In general, these sites are habitats shaded by the walls of canons (Fig. 35). Some beetles were recorded close to small springs. The specimen from the Negev was found after strong rainfall in winter on a north exposed slope with sparse vegetation of semi-shrubs. All habitats are characterized by herbal and grass vegetation, in general without trees or shrubs.

This material allowed us to better stress the diagnostic features of these two taxa (see key to species in this contribution), and illustrate for the first time the male genitalia of *L. aegyptiacus* (Figs. 27-29).

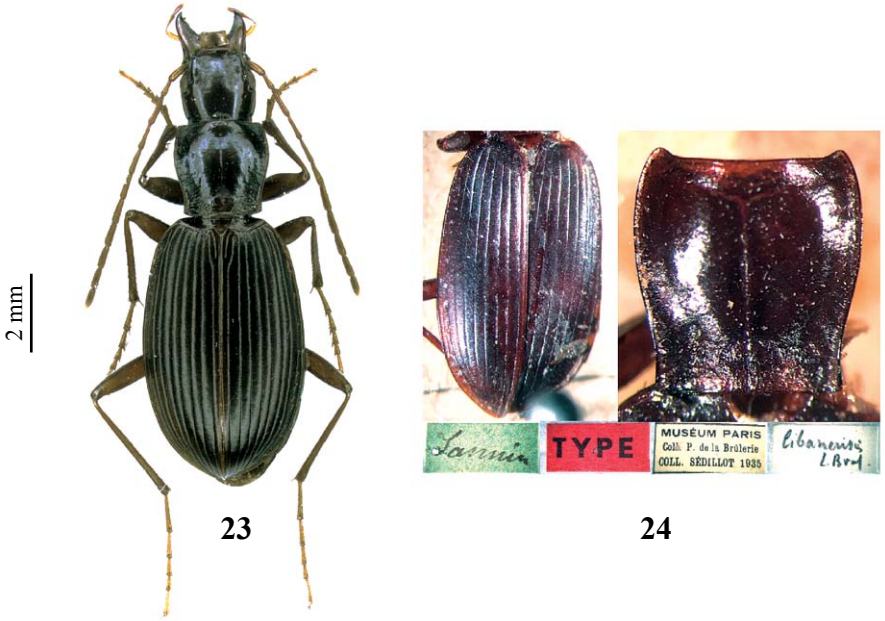
***Laemostenus* (*Laemostenus*) *libanensis* (Piochard de la Brûlerie, 1876)**
Sphodrus (*Laemostenes*) (sic!) *libanensis* Piochard de la Brûlerie, 1876: 421.
Laemostenus (*Antisphodrus*) *libanensis*: Casale, 1988: 610.

Type locality: Jebel Shannin (=Jabal Sannine), Lebanon

Type material. Holotype, remains of one specimen (prothorax, elytra, left prothoracic profemur and metathoracic legs) labeled: “Sannin” “TYPE” “Muséum Paris Coll. P. de la Brûlerie Coll. Sédillot 1935” “libanensis L. Brul.” (examined) (MNHN, general collection) (Fig. 24).

Further material examined. (cAS, cCA, cRE, cWR): 1 female “Rayfoun ca. 33°58'N, 35°42'E, 18.XI.2012, mixed decid. forest, 800-900 m pitfall trap, leg. Reuter”; 2 females, same locality and collector, mixed oak forest, 990 m, X.2013; 2 females, same data, 3.-20.XI.2013; 1 male, 2 females, same data, 20.XI.-1.XII.2013; 1 female, same data, XII.2013; 1 female, same data, 28.III.-9-IV.2014; 2 females, same data, XI.2014; 3 females, same data, 14.II.-24.III.2016; 1 male, 1 female, same data, 31.III.-9. IV.2016; 2 males, same data, III.2015; 1 female, same data, 24.-31.III.2016; 4 males, 11 females, “27 km NE Beirut, env. Kfardebian mixed oak forest, ca. 1100 m 20.XI-1. XII.2013 pitfall trap leg. Reuter”.

Redescription
A small to medium-sized (L: 12-13.5 mm) *Laemostenus* (*Laemostenus*) species of the *L. quadricollis* species group (sensu Casale 1988), primarily characterized by the dark reddish brown colour , the slender, brachypterous body, the small eyes, elongate antennae and legs, the markedly cordate pronotum, the almost smooth elytral striae, and the tarsal claws with developed denticulation along the basal half of the internal margin (Figs. 23-24).
Body: small, TL: 11.0-12.7; L: 12.0-13.5 mm.
Colour: dark reddish brown. Elytra without bluish reflection. Antennae, legs and mouth parts reddish.
Microsculpure: Head, pronotum and elytra shiny, with shallow transversal microlines; elytra with shallow but distinct, isodiametric meshes.
Head: elongate and narrow; dorsal surface smooth, with shallow, irregular wrinkles on frons and frontal impressions; tempora slightly oblique, narrowed to the neck constriction; frontal impressions small, slightly impressed; eyes small, moved forward, as long as two/thirds of genae, slightly or not prominent laterally; antennae long, if stretched backwards exceeding by four antennomeres the base of pronotum.
Pronotum: elongate and narrow (ratio PL/PW: 1.00-1.05), cordate, its lateral sides slightly reflexed in the posterior half, briefly but markedly sinuate anteriorly to the basolateral angles, which are rectangular or acute; anterolateral angles very prominent; base straight or moderately oblique



Figs 23-24 – *Laemostenus* (*Laemostenus*) *libanensis*, habitus in dorsal aspect. **23**, male specimen from Lebanon, Rayfoun; **24**, holotype (remains) from Lebanon, Jebel Shannin.

and beaded at sides. Disc depressed, with shallow or moderately impressed transversal wrinkles; basal impressions wide, shallow, each with several, deep punctures extended to the basal area and the lateral furrows; anterolateral and basolateral setiferous punctures present.

Mesosternum: denticulate in front of mesocoxae; mesosternal teeth obtuse and reduced in size.

Elytra: elongate-ovate (ratio EL/EW: 1.55 - 1.70), subconvex, slightly widened in the posterior third. Base narrow, almost straight; basal ridge incavate; humeral tooth absent, shoulders obtusely rounded. Striae very deep, smooth or shallowly punctured; intervals subconvex. Chaetotaxy: basal pore present; umbilicate series with 17-18 setiferous punctures; 2-3 setae at apex of stria 7.

Legs: long and slender; profemora on ventral side longitudinally shallowly concave for entire length, its outer side with an oblique series of 3-4 setae, one of them reaching the apical third of the outer margin, which is smooth; mesotibiae straight; metatibiae each with apical group of short, sparse yellow-reddish setae. Tarsomeres narrow, thin, very elongate, with dense, long dorsal pubescence on the dorsal side. Males with fore tarsomeres 1-3 slightly dilated and with ventral, biseriate adhesive vestiture. Tarsal claws denticulate, with 4-5 evident teeth along the basal half of the internal margin.

Male genitalia: as in Figs. 30-33. Aedeagus small-sized; median lobe markedly bent in the basal third in lateral aspect, its apex short, in dorsal aspect subtruncate, slightly emarginate distally; right paramere short and slender, rounded apically; left paramere with reduced apical membranous lobe.

Female genitalia: not examined.

Distribution and habitat. Known so far from localities in the Mount Lebanon range: Jebel Shannin (=Jabal Sannine) at high altitude (2600 m) and surroundings of Rayfoun and Kfardebian NE to Beirut at 800-1100 m a.s.l. The remains of the type specimen were collected in alpine habitat on Jebel Shannin; all other examined specimens were sampled by C. Reuter in mixed deciduous and oak forests by pitfall traps.

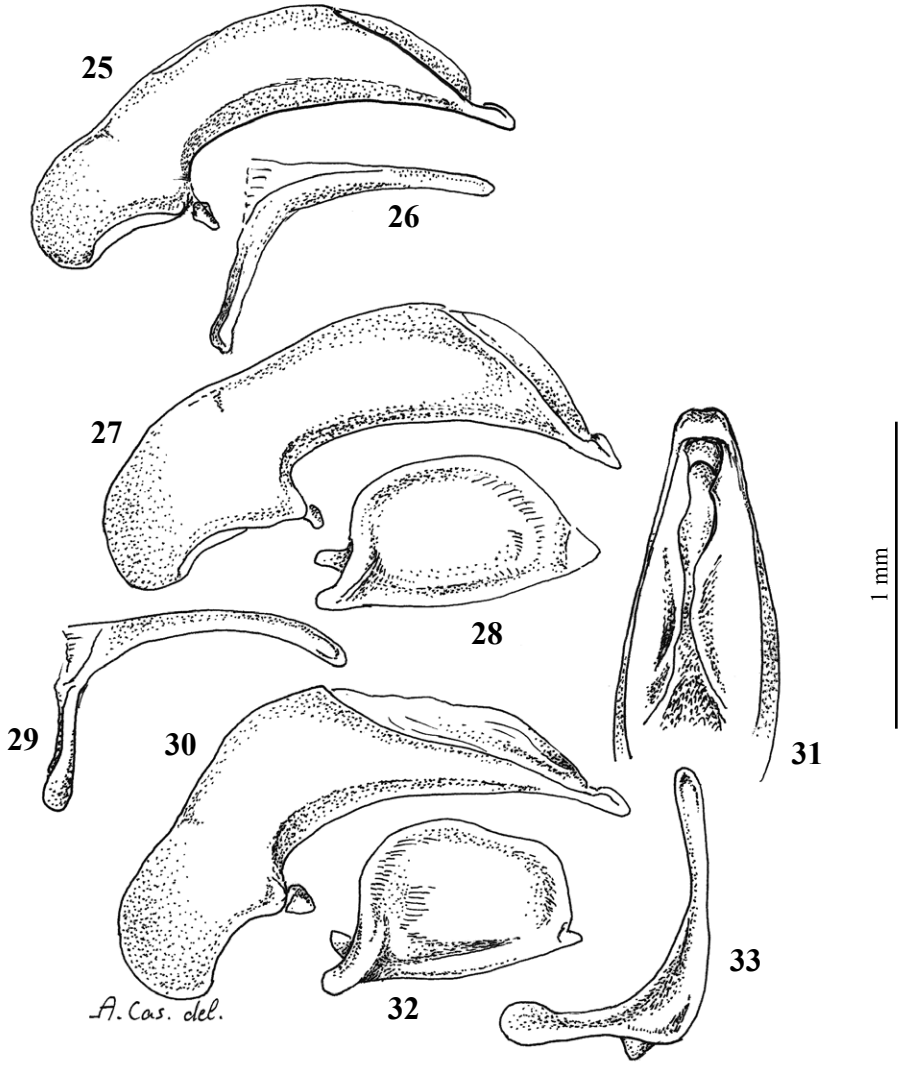
Comparisons and taxonomic notes

Close to *L.* (*L.*) *aegypticus* Schatzmayr, 1936, *L. sinaiticus* sp. n. and *L. phoenicius* Casale & Wrase, 2012, from which *L. libanensis* is distinct by the morphological features stressed in the key to the species of the *Laemostenus quadricollis* species group (see below).

"*Sphodrus libanensis*" was originally described by Piochard de la Brûlerie (1876) from the remains of one specimen collected "under a huge stone" on the Jebel Shannin ("Sannin") at 2600 m a.s.l. (Fig. 24). Later, the species was provisionally attributed to *Laemostenus* Subgen. *Antisphodrus* of the *bodemeyeri* species group by Casale (1988, 2003).

The rediscovery of this not rare species (as it appears by the long series of examined specimens), previously known from remains of one only specimen, is particularly surprising because it happened after many years in an area close to Beirut, in the Mount Lebanon range, apparently well known thanks to ancient and recent entomological investigations.

On the contrary, the occurrence of this species at lower altitude (800-1100 m) in forests is not an extraordinary



Figs 25-33 – *Laemostenus* (*Laemostenus*) spp., male genitalia. **25**, *L.* (*L.*) *sinaiticus* sp. n., male holotype, median lobe of aedeagus, left lateral aspect; **26**, idem, right paramere; **27**, *L.* (*L.*) *aegyptiacus*, male from Wadi Rum (Jordan), median lobe of aedeagus, left lateral aspect; **28**, idem, right paramere; **29**, idem, right paramere; **30**, *L.* (*L.*) *libanensis,* male from Kfardebian, Beirut (Lebanon), median lobe of aedeagus, left lateral aspect; **31**, idem, median lobe of aedeagus, apex, dorsal aspect; **32**, idem, left paramere; **33**, idem, right paramere.

fact: it is well known that some Sphodrina species are spread in ranges of altitudes from 300 to 2200 m on the Alps and other mountain chains in Eurasia (Casale 1988).

Remarkable is the fact that *L. libanensis* is sympatric with *L. phoenicius* Casale & Wrase, 2012, described from 2 males and 4 female specimens from two localities (Maifouq, Saida) close to Beirut at 650-800 m a.s.l. The latter shows marked adaptive features to superficial subterranean environment, and is distinct from *L. libanensis* by the head more thickened and robust, the depigmented body (head, pronotum and appendages bright yellow reddish), the elytra shorter, ovate, wider in the posterior third, sericeous on disc with bluish metallic reflection (absent in *L. libanensis*), with shallowly but more distinctly punctured striae, and the apex of median lobe of aedeagus wider and more deeply emarginated in the middle in dorsal aspect.

Laemostenus (*Laemostenus*) *antonrichteri* Casale, 1988

L. (*Laemostenus*) *antonrichteri* Casale, 1988: 923.

This species was described by Casale (1988: 923), without figures, in a supplementary note to his monograph from one male (holotype: cHE) and one female (paratype: cCA) specimens sampled on Mount Hermon (=Jebel esh-Sheikh) at 1100-1400 m a.s.l. (Fig. 21).

In recent years, we had the opportunity to examine some additional specimens collected in Upper Galilee: Nakhal Bezet, esp. Sharakh Cave, Nakhal Kziv and Mount Meron region (Tel Aviv University Museum, cAS, cWB, cCA), which should be attributed to this species. They slightly differ from the two specimens of the type series by a few characters, especially having a more elongate and

cordate pronotum, the more deeply wrinkled lateral furrows of pronotum, the slight bluish-violet reflection on the elytral disc in one specimen, and the more widened elytra in the apical third (Fig. 22).

Presently, we believe that all these individuals feet into the variation range of a rather variable species, but this identity should be clarified if more material will be available. This morphological variability is well known in some other Sphodrina species that are epigean at high altitude and hypogean in low altitude localities, as *Sphodropsis ghilianii* Schaum, 1858 in Western Alps and *L.* (*Antisphodrus*) *schreibersi* Kuster, 1846 in Eastern Alps (see Casale 1988).

On the other hand, there is an arc-like formation of limestone from Upper Galilee through southern Lebanon to Mount Hermon, so that there is not any barrier between both massifs able to divide these populations.

The habitus of the holotype from Mt. Hermon and one individual from Upper Galilee (Sharakh Cave) are illustrated in Figs 21-22.

Key for identification of Sphodrina of S Levant (Note: the features described below are valid for the southern Levant species only. The Iranian and Anatolian species are excluded from the following key)

Key to genera

1. Tarsomeres 2-5 glabrous on the dorsal side. Tarsal claws smooth on the inner side 2
- Tarsomers 2-5 pubescent on the dorsal side. Tarsal claws smooth or denticulate on the inner side ..... 3. ***Laemostenus*** Bonelli, 1810 (in the widest sense, see key to species)
2. Winged. Pronotum with basolateral setae. Metatrochanters acute at apex, spine-like in males. Tarsomeres smooth on the dorsal side ..... 1. ***Sphodrus*** Clairville, 1806
- Metathoracic wings fully reduced. Pronotum without basolateral setae. Metatrochanters rounded at apex. Tarsomeres

Fig. 34 – Egypt, Sinai, Saint Catharina Monastery, habitat of *Laemostenus* (*Laemostenus*) *sinaiticus* sp. n. (photo T. Assmann).

Fig. 35 – Jordan, Wadi Rum, habitat of *Laemostenus* (*Laemostenus*) *aegyptiacus* (photo T. Assmann).

with shallow longitudinal wrinkles on the dorsal side .... 2. ***Taphoxenus*** Motschulsky, 1864 (Subgen. ***Lychnifugus*** Motschulsky, 1864)

Key to species

1. Genus ***Sphodrus*** Clairville, 1806

Only one species in this area: *S. leucophthalmus* Linné, 1758, with the character states as indicated in the key to genera. Winged species, able to fly. Large-sized (22-30 mm); colour black or dark brown.

Distribution. Widely spread in Europe, N (Mediterranean and Saharian) Africa, Middle East and Asia. Steppic, eremic and anthropophilic species, rare and disappearing in several European countries (see Casale, 1988). Cited from Iraq and Syria (Casale, 2003). We have new records from Israel (unpublished, cAS, cDW) and Jordan: Wadi Rum (cAS, cZI) and Dhana, Camp. Ruderal (cSC) (syntopic with *T.* (*L.*) *ziegleri* sp. nov.).

The second species of the genus, *S. trochanteribus* Mateu, 1990, is only known from Yemen.

2. Genus ***Taphoxenus*** Motschulsky, 1864
(Subgen. ***Lychnifugus*** Motschulsky, 1864)

Large-sized beetles (20-34 mm); colour black or dark brown, without metallic reflection. Wings fully reduced. Species adapted to desert or steppe environments. *Taphoxenus* (sensu stricto) includes species from central, northern and north-eastern Asia. Subgenus *Lychnifugus* is characterised by the pronotum without basolateral setae and metatarsomeres 2-5 with evident longitudinal dorsal wrinkles. It includes species from Caucasus, Anatolia and Middle-East (Iran, Iraq, Syria and southern Levant: see key provided above)

1. Pronotum elongate, cordate (ratio PL/PW: 1.0). Antennae shorter, not extending beyond the base of elytra. Elytra elongate-oval, moderately and uniformly convex, with shallow, superficially punctuate striae (Fig. 3). Median lobe of aedeagus shorter and stout, as in Figs. 9-12. Range: W Syria: Homs, Palmyra; Iraq: Mesopotamia, Baghdad) .... ***T.* (*Lychnifugus*) *meridionalis*** Casale, 1988 (valid species, **status nov.)**
- Pronotum transverse (ratio PL/PW: 0.90-0.93). Antennae longer, extending beyond the base of elytra. Elytra parallel-sided, moderately depressed on disc, with deep, deeply punctured striae (Fig. 4). Median lobe of aedeagus elongate and slender, as in Figs. 13-16 (Jordan) .... ***T.* (*Lychnifugus*) *ziegleri*** Casale & Assmann **sp. n.**

3. Genus ***Laemostenus*** Bonelli, 1810

(including Subgenera *Sphodroides* Schaufuss, 1865, *Pristonychus* Dejean, 1828, *Laemostenus* Bonelli, 1810 and *Antisphodrus* Schaufuss, 1865, in the widest sense of Casale, 1988). Medium-sized beetles, winged or with reduced metathoracic wings. Colour blue, violet, black or depigmented piceous or testaceous. [*Note*: Some species are difficult to distinguish. Examination of male genitalia or wing development is sometimes necessary].

1. Profemora in males with a prominent tooth on the anterior margin of the ventral side, close to the base of femur, in some individuals of reduced size. Basal margin of elytra oblique from the humeral angle to the scutellum, so that the shoulders appear to protrude markedly forward and/or upward. Pronotum cordiform, markedly widened anteriorly, strongly narrowed to the base. Range: from eastern Mediterranean (Anatolia) to the Middle East .... ***L.* (*Sphodroides*) *cordicollis*** **(Chaudoir, 1854)**
- Profemora in males without a prominent tooth on the anterior margin of the ventral side. Basal margin of elytra straight or oblique from the scutellum to the humeral angle, so that the shoulders appear angulate or rounded 2
2. Meso– and/or metatibiae bent, inside distally with developed brush of hairs. Mesosternum without tooth anteriorly to the mesocoxae. Tarsal claws with a series of small teeth along the basal half of the internal margin (Subgenus *Pristonychus*) 3
- Meso– and metatibiae straight, inside distally with scarce, reduced, scattered hairs. Mesosternum with tooth anteriorly to the mesocoxae. Tarsal claws with or without teeth along the basal half of the internal margin (Subgenus *Laemostenus* s. stricto) 5
3. Profemora with the posterior margin of the ventral side denticulate, with several (6 to >10) setae; tarsal claws with teeth developed in the basal half. Elytra bluish or violet. E Mediterranean species. Its occurrence in southern Levant should be possible, but so far not confirmed ..... [***L.* (*Pristonychus*) *cimmerius*** **(Fischer-Waldheim, 1823)**]
- Profemora on the ventral side longitudinally shallowly concave for entire length, with their posterior margin smooth or with a few very small teeth and a few (3-5) short setae, the apical one reaching the outer margin of femur; tarsal claws without or with reduced teeth in the basal half. Colour piceous black; elytra without or with slight bluish reflection 4
4. Pronotum cordate and narrower (ratio PL/PW: 0.91). Profemora with both external and internal margins smooth, their outer margin with 3 short setae. Larger in size (L: 19.0 mm). Known so far from only one female specimen from Crac des Chevaliers (Syria). Its occurrence in the southern Levant is possible .... [***L.* (*Pristonychus*) *bellicosus*** **Casale & Wrase, 2012**]
- Pronotum markedly transverse (ratio PL/PW: 0.85). Profemora with their posterior margin smooth or with a few very small teeth and 2-5 short setae. Smaller in size (L: 15.0-18.0 mm). Known so far from the surroundings of Aleppo (Syria). Its occurrence in the southern Levant is possible .... [***L.* (*Pristonychus*) *eggeri*** **Casale & Wrase, 2012**]
5. Winged, epigean species, with large and prominent eyes, which are distinctly longer than genae. Humeral angles evident. Dorsal surface, at least on elytra, bluish, greenish or violet 6
- Brachypterous, micropterous or pteri-dimorphic (*L. quadricollis*) species, with eyes not or slightly prominent, as long as or shorter than genae. Humeral angles rounded. Dorsal surface piceous black or reddish brown, without or with slight bluish or violet reflection on elytra (***Laemostenus*** **of the *L. quadricollis* species group** sensu Casale, 1988) **(Note**: the features described below are valid for the southern Levant species only. *L. croyi* Casale & Wrase 2012, *L. heinzi* Casale, 1988 and *L. bergvalli* Jeanne, 1996, from South and Southeastern Anatolia, and *L. luristanus* Casale, 1988 from Central Iran, respectively, are excluded from the following key**)** 7
6. Head with dense punctuation and wrinkles on frons; elytra convex, with deeply punctured striae and wrinkled inter-

vals; mesosternum with a small tooth in front of mesocoxae; dorsal surface black-violet. Euro-Mediterranean species ..... ***L.* (*Laemostenus*) *venustus* (Dejean, 1828)**

- Head smooth, at most with traces of wrinkles; elytra depressed, elongate, with superficially punctured striae and smooth intervals; mesosternum with small, sometimes absent callosity in front of mesocoxae; dorsal surface dark brownish, elytra with blue, greenish or violet reflection. (Mediterranean, now cosmopolitan, sometimes synanthropic species) ..... ***L.* (*Laemostenus*) *complanatus* (Dejean, 1828)**

7. Pronotum markedly cordate, with lateral sides sinuate, constricted to the base. Elytral striae deep, almost smooth. Small-sized (L: 12.0-13.5 mm); colour dark brownish, elytra without bluish or violet reflection. Male genitalia as in Figs. 30-33. Montane and forest dweller species. Range: Lebanon, known from remains of one specimen collected at high altitude (2600 m) in Jebel Shannin and several specimens from two localities NE to Beirut al lower altitude (900-1100 m), in mixed deciduous and oak forests ..... ***L.* (*Laemostenus*) *libanensis* (Piochard de la Brûlerie, 1876)**

- Pronotum quadrate or rectangular, with lateral sides not or moderately sinuate in front of basolateral angles. Small to medium-sized, pigmented or depigmented species, with shortened, rhomboidal metepisterna. Aedeagus peculiarly small, its median lobe slightly curved, with thickened, rounded or truncate apex. Species from Near and Middle East (Turkey [SE Anatolia], Cyprus, W Iran, Syria, Lebanon, Israel, N Egypt) 8

8. Elytral intervals very convex, in most individuals carinate in the middle. Body wide, depressed; colour black, elytra ovate, with bluish or blue-violet reflection. Larger in size species (L: 15-17 mm). Range: SE Anatolia, Syria, Lebanon, Northern Israel ... ***L.* (*L.*) *parallelocollis* (Reiche, 1855)**

- Not as above. Elytral intervals flat or slightly convex. Species smaller in size 9

9. Pronotum subquadrate, with lateral furrows densely and deeply punctuate. Elytra elongate, moderately sericeous, with marked bluish or violet reflection. A pteri-dimorphic, epigean species. Range: Turkey (SE Anatolia), Cyprus, Syria, Lebanon, Israel, Jordan ..... ***L.* (*L.*) *quadricollis* (Redtenbacher, 1843** (sensu lato, including *L. quadricollis turcicus* Casale, 1988)

- Pronotum subquadrate or longer than wide. Elytra brownish or black, without or with slight bluish or violet reflection. Brachypterous, montane, desert dweller or subterranean species 10

10. Pigmented, brown or blackish, epigean species from Israel, Jordan and Egypt 11

- Markedly depigmented, reddish brown, montane or subterranean species from Lebanon, Upper Galilee and Mount Hermon 12

11. Dorsal surface dark brown or blackish, reddish brown in immature specimens; elytra relatively shiny, in some individuals with slight violet reflection. Eyes larger in size, prominent, as long as genae and placed in lateral position (Fig. 20). Pronotum subquadrate (PL/PW: 1.00-1.08), parallel-sided, slightly constricted forward. Median lobe of aedeagus as in Fig. 27. Range: Egypt: Sinai, Seluan; Israel: Eilat, Negev; Jordan: Wadi Rum ..... ***L.* (*L.*) *aegyptiacus* Schatzmayr, 1936**

- Dorsal surface black, without violet reflection. Elytra opaque, elytral microsculpture evident, with distinct, isodiametric meshes. Eyes smaller in size, shorter than genae, moved forward, as long as two/thirds of genae and slightly prominent (Figs. 18-19). Pronotum narrower, subquadrate or longer than wide (PL/PW: 1.09-1.20), slightly constricted to the base. Median lobe of aedeagus as in Fig. 25. Range: Egypt, South Sinai: Saint Catherina mountains ..... ***L.* (*L.*) *sinaiticus* Casale & Assmann, sp. n.**

12. Head elongate, genae oblique. Elytra markedly elongate, parallel-sided or slightly widened in the posterior third (Figs. 21-22). Tarsal claws without denticulation or with one to three small, obtuse teeth on the internal side in the basal half. In dorsal aspect, tip of median lobe of aedeagus almost straight. Range: Israel: Mount Hermon (type locality) and Upper Galilee (see notes above) ..... ***L.* (*L.*) *antonrichteri* Casale, 1988**

- Head robust, stout; genae parallel-sided. Elytra shorter, ovate. Tarsal claws with evident denticulation on the internal side in the basal half. In dorsal aspect, tip of median lobe of aedeagus emarginated. Range: Lebanon (Maifouq, Saida) ..... ***L.* (*L.*) *phoenicius* Casale & Wrase, 2012**

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