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Revisiting the diversity of *Ludioctenus* Fairmaire (Elateridae: Agrypninae), with description of a new species from Afghanistan, and discussion on the systematic position of Tetrigusina

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Abstract

The genus *Ludioctenus* Fairmaire, 1893 hitherto included only *L. cyprius* (Baudi di Selve, 1871) from the eastern Mediterranean and *L. pakistanicus* Schimmel & Tarnawski, 2012 from Pakistan. Here, we describe *L. afghanicus* **sp. nov.** from the Nuristan Province in eastern Afghanistan. The distribution and morphological diversity of *Ludioctenus* is discussed, main diagnostic characters for all species are figured, and an identification key to the species of this genus is provided. Female pregenital segments and genitalia are figured for the first time for *Ludioctenus*, and the systematic position of this genus and its relatives is discussed.

Key words: Coleoptera, Elateroidea, click-beetles, diversity, distribution, Hemirhipini, India, Pakistan

Introduction

Ludioctenus Fairmaire, 1893 (Elateridae: Agrypninae) is a small Palaearctic click-beetle genus which was treated as a synonym of *Tetrigus* Candèze, 1857 (Schwarz 1906; Fleutiaux 1947; Preiss & Platia 2003; Cate 2007; Mertlik & Platia 2008). However, Schimmel & Tarnawski (2012) resurrected this genus based on the pubescence, shape of the mesoventral cavity and elytral apices being different from *Tetrigus*. Additionally, they erected the new subtribe Tetrigusina within Agrypninae: Hemirhipini for the morphologically similar genera *Tetrigus*, *Ludioctenus*, *Platianellus* Schimmel & Tarnawski, 2012, *Collisarius* Schimmel & Tarnawski, 2012, and *Cuneateus* Schimmel & Tarnawski, 2012. Although accepted by most students of Elateridae, the placement of *Tetrigus* and *Ludioctenus* in Hemirhipini is controversial based on the morphology of their terminalia and genitalia (Casari-Chen 1993) as well as the molecular phylogeny (Kundrata *et al.* 2016, 2018). Until now, *Ludioctenus* contained two species: *L. cyprius* (Baudi di Selve, 1871) from Greece, Cyprus, Asia Minor, and the Levant, and *L. pakistanicus* Schimmel & Tarnawski, 2012 from Pakistan. Here we describe a new species of this genus from Afghanistan, provide an identification key to the *Ludioctenus* species, and discuss the systematic position of Tetrigusina.

Material and methods

The study is based on the morphology of adults. The genitalia were dissected after treatment in 10% KOH. Most diagnostic characters were photographed using either a digital camera Olympus C-3000 attached to a stereoscopic microscope Olympus SZX-12 or a Canon EOS-6D camera with a Canon MP-E 65 mm lens. Photographs of the genitalia were taken from glycerol mounts using a Micromed 3 trinocular microscope with a ToupCam 5.1 MP video eyepiece. Extended focus technology was used. Body length was measured from the anterior margin of head

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to the apex of elytra, body width at humeri, pronotal length at midline, and pronotal width at posterior angles. Morphological terminology follows Casari (2008), Costa *et al.* (2010), and Schimmel & Tarnawski (2012). The holotype of the new species is deposited in the Naturhistorisches Museum, Vienna, Austria (NHMW). To compare the new species with its congeners, we examined the material from the Muséum national d'Histoire naturelle, Paris, France (MNHN), Naturkundemuseum Erfurt, Germany (NKME), Národní muzeum Praha, Czech Republic (NMPC), and the collections of R. Kundrata, Olomouc, Czech Republic (PCRK) and A.S. Prosvirov, Moscow State University, Moscow, Russia (PCAP). The complete list of material examined with the detailed label data is provided under each species in the Systematics section below. Within the label data, additional information is given in square brackets, and a double slash (//) separates different labels of data. Type specimen of the new species was marked with red label indicating the type status, the name of the species, and the authors.

Systematics

Family Elateridae Leach, 1815

Subfamily Agrypninae Candèze, 1857

Tribe Hemirhipini Candèze, 1857

Subtribe Tetrigusina Schimmel & Tarnawski, 2012

Genus *Ludioctenus* Fairmaire, 1893

Type species: *Ludioctenus akbesianus* Fairmaire, 1893; by monotypy [currently synonym of *Ludioctenus cyprius* (Baudi di Selve, 1871)].
= *Elatrigus* Reitter, 1905
Type species: *Tetrigus cyprius* Baudi di Selve, 1871; by monotypy.

Ludioctenus afghanicus sp. nov.
(Figs 1–14)

Type material. Holotype, male, "AFGHANISTAN, Nuristan [Province], 25 km N v. Barikot, 1800 m, 12.–17.7.1963, Kasy & Vartian [leg.] // *Tetrigus* sp. J. Chassain det. // Holotype *Ludioctenus afghanicus* Kundrata, Sormova & Prosvirov, 2018 [added by the authors]" (NHMW).

Diagnosis. This species belongs to the genus *Ludioctenus* based on the shape of the sides of the mesoventral cavity, which are gradually declined towards apex (horizontal and subparallel with the body axis or slightly concave medially in the remaining genera of Tetrigusina), and rounded elytral apices without spines (variously shaped elytral apices with spines in the remaining genera of Tetrigusina). *Ludioctenus afghanicus* **sp. nov.** differs from its congeners in having the head and pronotum coarsely and densely punctate with large, almost contiguous punctures (punctures smaller and sparser in remaining species; Figs 5, 19, 33, 46, 56–57), and by the slender male genitalia (both median lobe and paramere more robust in remaining species; Figs 13–14, 27–28, 54–55). Additionally, this species can be distinguished from *L. cyprius* by the paler coloration (pitch black in *L. cyprius*; Figs 1–3, 15–17, 29–31), yellowish body pubescence (dark-bronzed in *L. cyprius*), and more divergent posterior angles of the pronotum (Figs 5, 19, 33); and from *L. pakistanicus* by the pronotal disc without an apparent longitudinal glabrous line (present in *L. pakistanicus*; Figs 5, 46, 56–57), and the metacoxal plates evenly emarginate at base (abruptly emarginate near inner margin and then gradually inclined in *L. pakistanicus*) (Figs 7, 48).

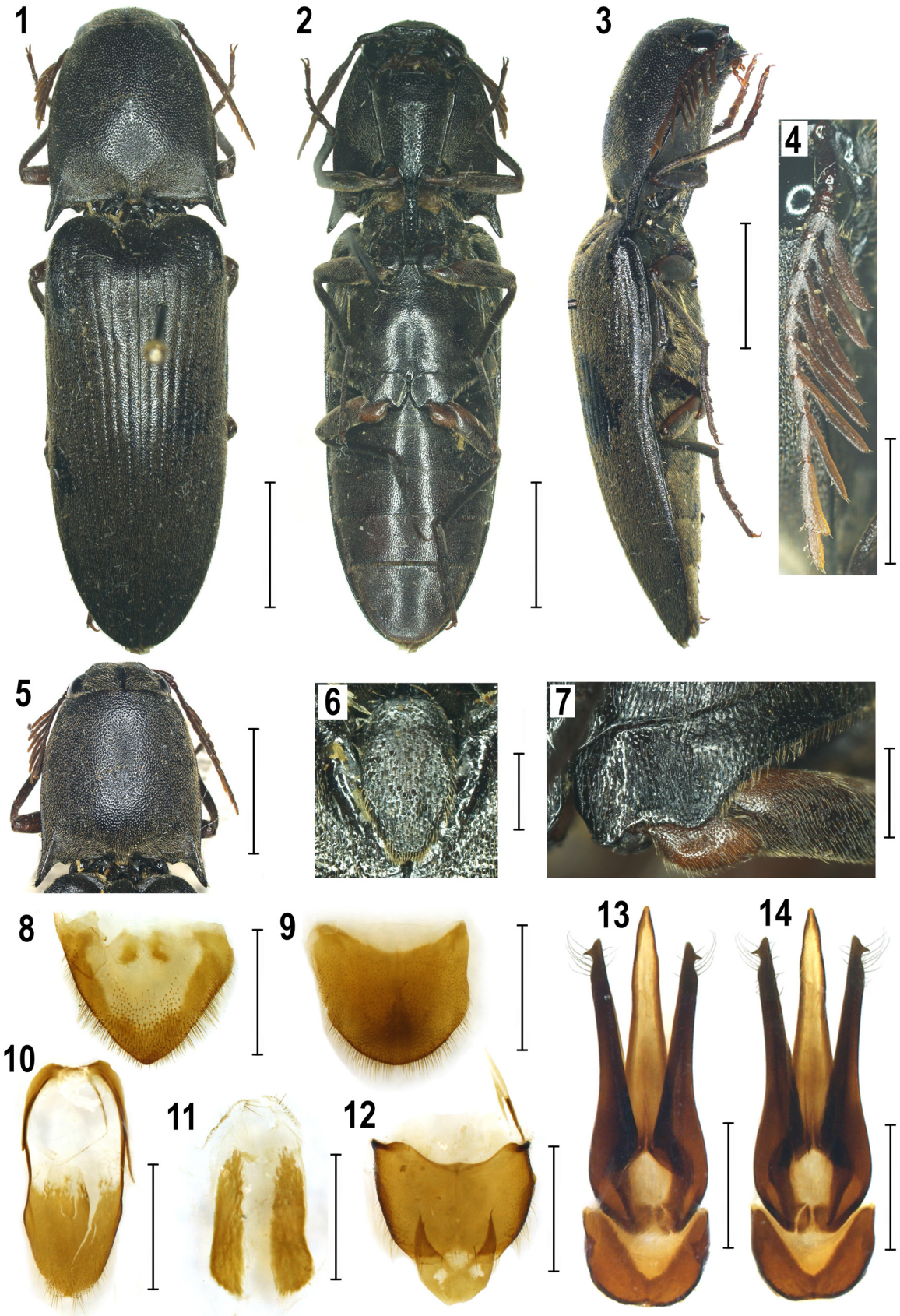
Description. Holotype, male. Body length 26.0 mm; width 7.3 mm. Body (Figs 1–3) elongate, moderately convex, blackish brown in general; antennae, labium, maxillae reddish brown; procoxae, trochanters, and parts of femora reddish; pubescence yellowish.

Head (Fig. 5) including eyes about 1.4 times wider than long, almost as wide as frontal margin of pronotum; frons declined from base to apex, flattened and prominent anteriorly; nasale wide, shallowly concave, about 3.5

times as wide as long. Head surface densely and coarsely punctate; punctures large, umbilicate, almost contiguous, intervals between punctures reduced to wrinkles; covered with moderately dense, short, semi-erect pubescence. Labrum transverse, roughly punctate, covered with long semi-erect to erect pubescence. Mandibles robust, simple, shiny, basally with sparse long pubescence. Maxillary palpi with palpomere III slightly shorter than palpomere II, apical palpomere longer than wide, hatchet-like. Labial palpi with apical palpomere hatchet-like. Antenna (Fig. 4) with 11 antennomeres, slender, short, reaching 3/4 of pronotum length, pectinate from antennomere IV. Length ratio of antennomeres I–V = 6.0 : 1.2 : 1.0 : 2.2 : 2.5. Scape long, robust, notably thicker than remaining antennomeres; pedicel short, minute; antennomere III shortest, transverse; antennomere IV about as long as combined lengths of antennomeres II and III, subsequent antennomeres gradually longer towards apex; antennomeres IV–X elongate, pectinate, with lamellae relatively wide, less than 3 times as long as their respective stems; ultimate antennomere elongate, more than 8 times as long as antennomere III, serrate, distinctly constricted subapically; all antennomeres covered with very sparse, short, semi-erect to erect pubescence.

Pronotum (Figs 3, 5) about as wide as long (length 7.3 mm; width 7.2 mm), moderately convex, gradually narrowed towards anterior margin, widest at posterior angles. Anterior margin almost straight; anterior angles inconspicuous; lateral sides slightly convex; posterior angles elongate, prominent, sharp, distinctly divergent, with distinct short carina. Lateral carina distinct, complete anteriorly, clearly visible from dorsal view. Disc densely and coarsely punctured; punctures umbilicate, almost contiguous, most of them large, several smaller; interstices short, flattened medially, wrinkled towards margins of pronotum; surface with moderately dense, short, decumbent to semi-erect pubescence. Hypomeron with raised margin along prosternal suture, moderately densely punctate, punctures large, umbilicate, sparser and smaller towards base; prosternal suture deeply grooved, open anteriorly. Prosternal lobe short, with anterior margin widely rounded. Prosternum (Fig. 2) elongate, punctation similar to hypomeron, punctures larger medially, smaller towards margins. Prosternal process narrow, elongate, about 3 times as long as diameter of procoxal cavity, with sides subparallel-sided, only very slightly bent inwards; surface uneven, shiny; apex narrowly rounded. Scutellar shield (Fig. 6) almost flat, tongue-shaped, elongate, about 1.8 times as long as wide, gradually narrowed towards apex after middle; anterior margin slightly convex; posterior margin widely rounded; surface slightly uneven, covered with moderately dense small punctures and dense short pubescence. Mesoventrite (Fig. 2) finely punctate, covered with short decumbent to semi-erect pubescence; mesoventral cavity with sides subparallel in frontal two thirds, gradually declined towards frontal margin in lateral view (Fig. 3). Mesocoxae separated by less than half of mesocoxal diameter; mesocoxal cavity open to both mesepimeron and mesepisternum. Metaventrite large, finely punctate, covered with short decumbent pubescence; discrimen long, narrow, simple. Metacoxal plate (Fig. 7) with its inner broad portion posteriorly more or less evenly and moderately deeply emarginate near its inner margin, followed by small and shallow emargination; outer narrow portion subparallel-sided in its entire length. Elytra (Figs 1, 3) elongate, together 2.5 times as long as wide, widest at humeri, subparallel-sided from humeri to posterior third, then gradually narrowed towards apex, narrowly rounded apically; surface of elytra with striae formed by lines of moderately large, deep, oval punctures; interstriae almost flattened, densely covered by punctures distinctly smaller than in striae; pubescence dense, short, usually decumbent. Leg elongate, slender, moderately long; tibia longer than femur; tarsomeres I–IV gradually decreasing in length, tarsomere I slightly longer than tarsomere II and III combined, tarsomere IV shortest, apical tarsomere elongate, about 0.75 times as long as tarsomere I; pubescence moderately dense and long, usually decumbent; ventral and apical portions of tibia and tarsomeres covered with short, stout, bristle-like setae; pretarsal claw simple, moderately curved, basally with distinct long seta and several shorter setae.

Abdomen (Fig. 2) with ventrite 1 shorter than remaining ventrites; intercoxal process slender, narrow, narrowly rounded apically; apical ventrite slightly truncate apically; all ventrites densely punctate; punctures fine, simple; surface covered with moderately long, decumbent to semi-erect pubescence, sparser medially, denser at margins. Tergite VIII (Fig. 9) about 1.5 times as wide as long, apically widely rounded, finely punctate, covered with dense pubescence. Sternite VIII (Fig. 8) subtriangular, partly sclerotized, about 1.4 times as wide as long, apically narrowly rounded, medially and apicolaterally finely punctate, covered with dense pubescence. Tergites IX and X (Fig. 12) connected by membrane; tergite IX about 1.7 times as wide as long, emarginate apically; tergite X small, widely rounded apically. Sternite IX (Fig. 10) elongate, about 2.3 times as long as wide, apically rounded, apicolaterally finely punctate, with dense pubescence. Sternite X (Fig. 11) connected by membrane to sternite IX, partly membranous, with two elongate sclerotized plates. Aedeagus (Figs 13–14) trilobate, elongate, 3.2 times as long as wide. Median lobe elongate, slightly surpassing parameres, gradually narrowed towards apex, apically



FIGURES 1–14. *Ludioctenus afghanicus* **sp. nov.**, holotype, male. 1, habitus, dorsal view; 2, habitus, ventral view; 3, habitus, lateral view; 4, antenna; 5, pronotum; 6, scutellar shield; 7, interior part of metacoxal plate, 8, abdominal sternite VIII; 9, abdominal tergite VIII; 10, abdominal sternite IX; 11, abdominal sternite X; 12, abdominal tergites IX–X; 13, aedeagus, dorsal view; 14, aedeagus, ventral view. Scale bars = 5.0 mm (Figs 1–3, 5), 2.0 mm (Fig. 4), 1.0 mm (Figs 6–14).

narrowly rounded, with moderately long basal struts. Paramere elongate, gradually narrowed from base toward apex, abruptly constricted subapically, with subapical hook, apical portion covered with long setae, apex narrowly rounded; subapical hook short, thick, its outer portion distinctly emarginate. Phallobase robust, transverse, about 1.4 times as wide as long.

Distribution. Eastern Afghanistan: Nuristan Province.

Etymology. The specific epithet refers to Afghanistan, where the holotype was collected.

Ludioctenus cyprius (Baudi di Selve, 1871)

(Figs 15–41)

Tetrigus cyprius Baudi di Selve, 1871: 50.
Elatrigus cyprius: Reitter 1905: 10.
Ludioctenus akbesianus Fairmaire, 1893: lxix.

Material examined. **GREECE.** 1 male, "Greece, Macedonia mer., Chalkidiki, Modi, 20.–25.7.2009; Kraus leg. // RK0228" (PCRK); 1 male, "Graecia, Makedonia, mer. Asprovalta, 1–31.VII.2003, Zdeněk Kraus leg." (PCAP); 1 female, "Greece—Sivota, 10–20.7.[20]07, Rak J." (PCAP). **SYRIA.** 1 female, "Syria, Prov. Latakia, Salah Addin citadel, ex larva from oak, 5.–20.VI.2010, Tamás Németh leg." (PCRK).

Description of terminal abdominal segments and genitalia. Male. Tergite VIII (Fig. 23) subtriangular, about 1.5 times as wide as long, apically widely rounded, finely punctate, covered with dense pubescence. Sternite VIII (Fig. 22) subtriangular, partly membranous, about 1.4 times as wide as long, apically narrowed, slightly emarginate, medially and apicolaterally finely punctate, covered with long dense pubescence. Tergites IX and X (Fig. 26) connected by membrane; tergite IX about 1.7 times as wide as long, emarginate apically; tergite X small, widely rounded apically. Sternite IX (Fig. 24) elongate, about 2.3 times as long as wide, apically widely rounded, apicolaterally finely punctate, with dense pubescence. Sternite X (Fig. 25) connected by membrane to sternite IX, partly membranous, with two elongate sclerotized plates. Aedeagus (Figs 27–28) 3.2 times as long as wide. Median lobe elongate, robust, slightly surpassing parameres, subparallel-sided, apically distinctly narrowed, with apex narrowly rounded, with moderately long basal struts. Paramere elongate, subparallel-sided for most of its length, abruptly constricted subapically, with subapical hook, apical portion covered with long setae, apex narrowly rounded; subapical hook short, thick, its outer portion indistinctly emarginate. Phallobase robust, transverse, about 1.3 times as wide as long. **Female**. Tergite VIII (Figs 37–38) subtriangular, slightly longer than wide, posteriorly widely rounded, finely punctate, covered with dense pubescence, denser and longer at margins. Sternite VIII (Figs 37–38) U-shaped, apically rounded, finely punctate, covered with dense pubescence, spiculum ventrale slender, long, about 2.6 times sternite length. Ovipositor (Figs 39–40) elongate; paraprocts about 6.5 times as long as gonocoxites, styli absent. Vagina with plate-like sclerotized structures. Bursa copulatrix (Fig. 41) mebranous, sac-like, anteriorly elongate, with long rows of jointly connected spines. Two elongate spermathecae attached to anterior part of bursa copulatrix.

Distribution. Cyprus, Greece, Israel, Lebanon, Turkey, Syria (Cate 2007, Platia & Németh 2011).

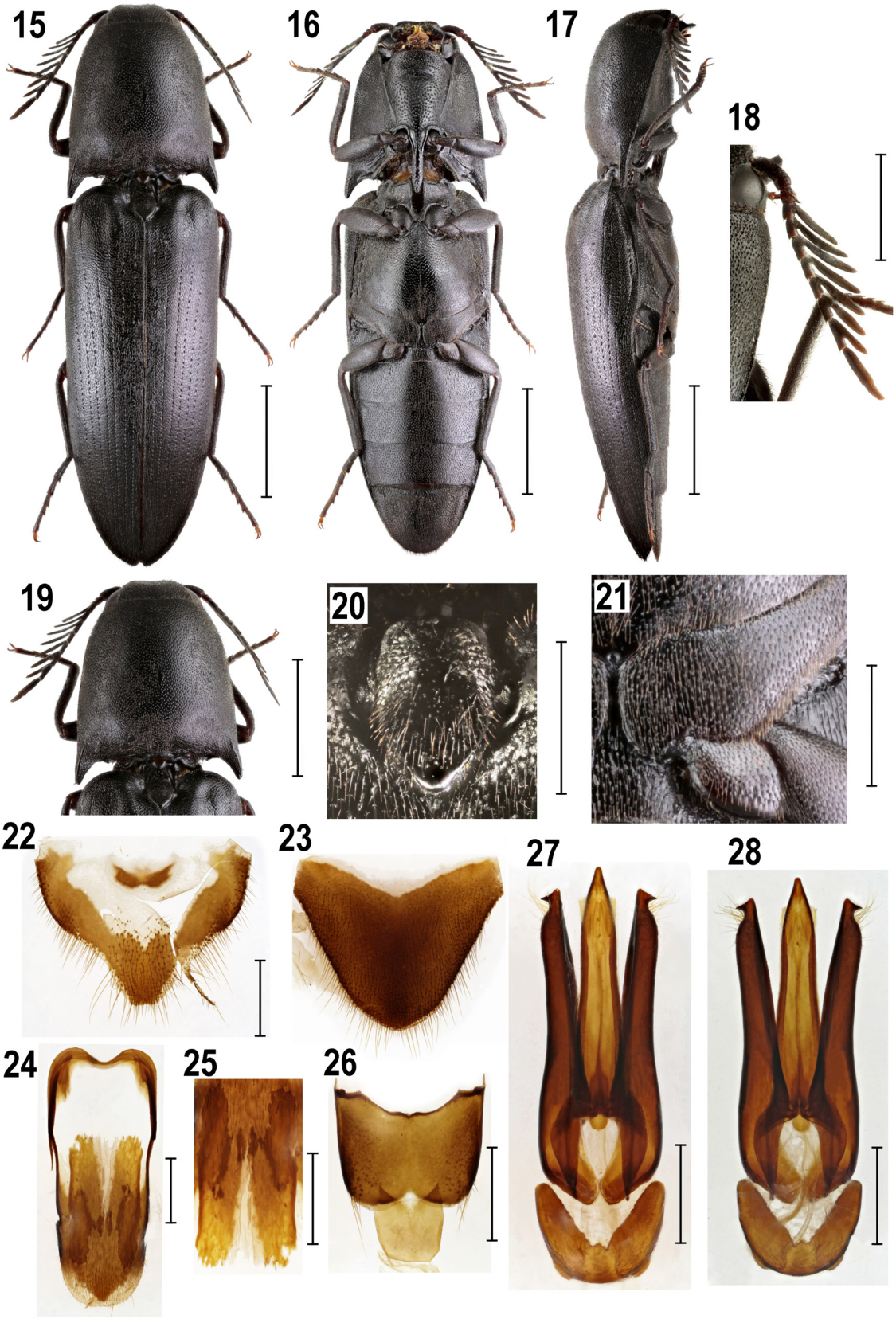
Ludioctenus pakistanicus Schimmel & Tarnawski, 2012

(Figs 42–61)

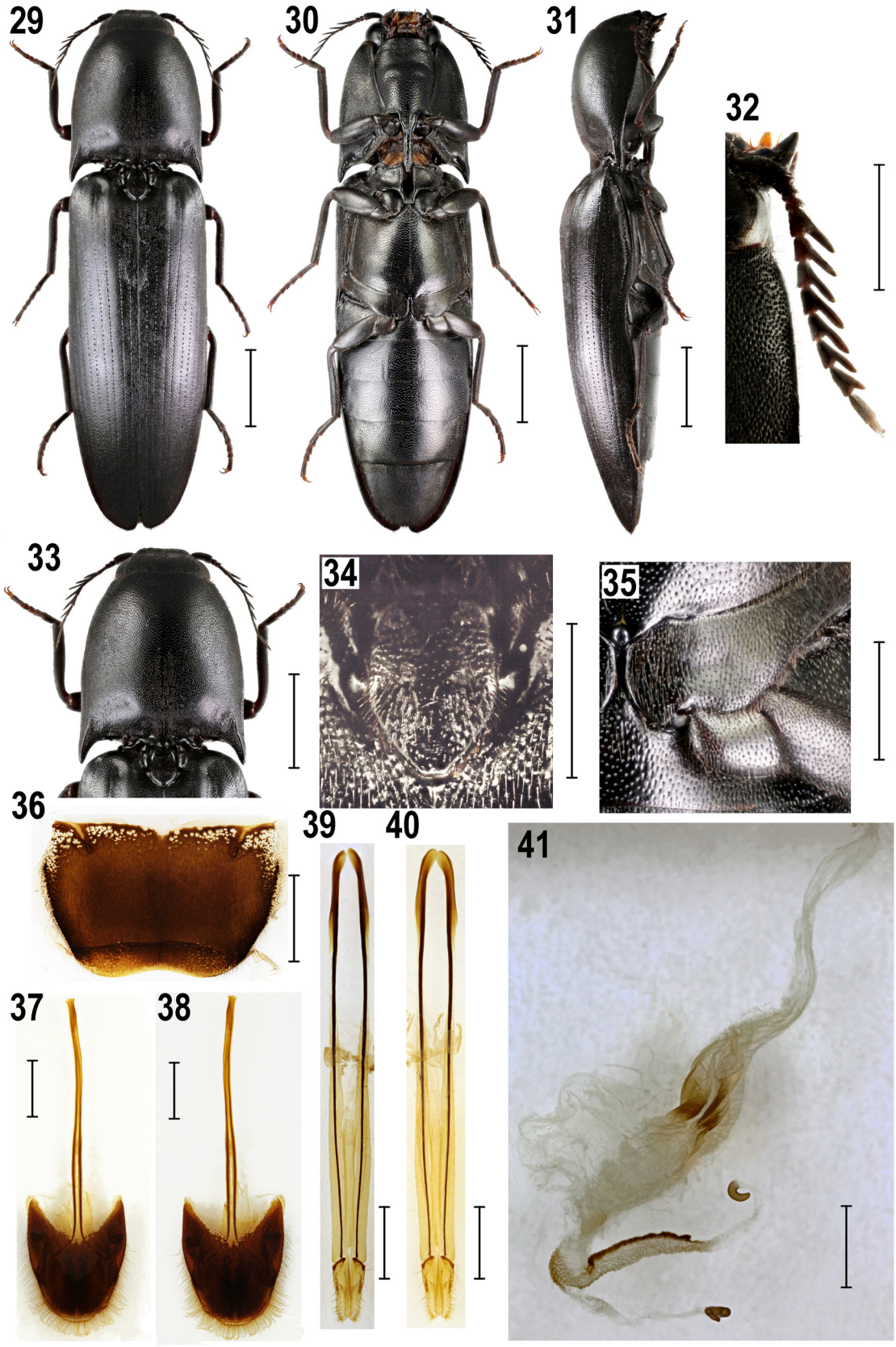
Ludioctenus pakistanicus Schimmel & Tarnawski, 2012: 127.

Material examined. **PAKISTAN.** Holotype, male, "NW-Pakistan, Prov. Swat, 71°90'L/35°70'B, Madyan, 1400 m, am Licht, 19.6.–4.7.1971, leg. C. Holzschuh" (NKME). 2 paratypes, males, same data as for the holotype (NKME); 2 paratypes, male and female, "Pakistan-N, NWF prov., Chitral env., 27.–29.vii.1998, L. Čížek & L. Černý leg." (NMPC); 1 paratype, male, "T. R. Pell, Karachi, Coll. E. Fleutiaux" (MNHN). **INDIA.** 1 paratype, male (?), "Shembaganur [Shenbaganur], Sd. Ind. [southern India]" (MNHN).

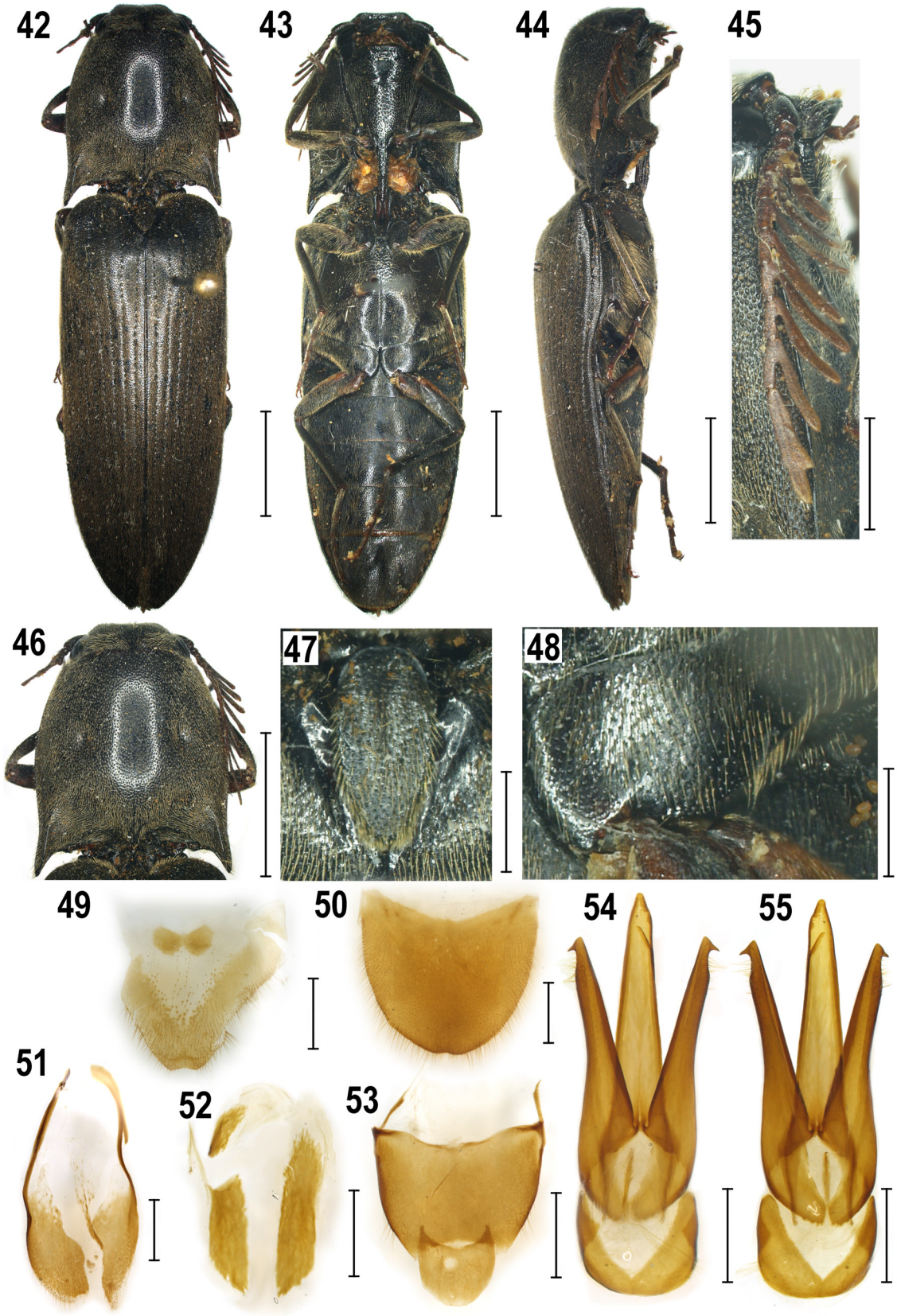
Description of terminal abdominal segments and genitalia. Male. Tergite VIII (Fig. 50) about 1.3 times as wide as long, apically widely rounded, finely punctate, covered with dense pubescence. Sternite VIII (Fig. 49)



FIGURES 15–28. *Ludioctenus cyprius* (Baudi di Selve, 1871), male (Greece). 15, habitus, dorsal view; 16, habitus, ventral view; 17, habitus, lateral view; 18, antenna; 19, pronotum; 20, scutellar shield; 21, interior part of metacoxal plate, 22, abdominal sternite VIII; 23, abdominal tergite VIII; 24, abdominal sternite IX; 25, abdominal sternite X; 26, abdominal tergites IX–X; 27, aedeagus, ventral view; 28, aedeagus, dorsal view. Scale bars = 5.0 mm (Figs 15–17, 19), 2.0 mm (Fig. 18), 1.0 mm (Figs 20–28).

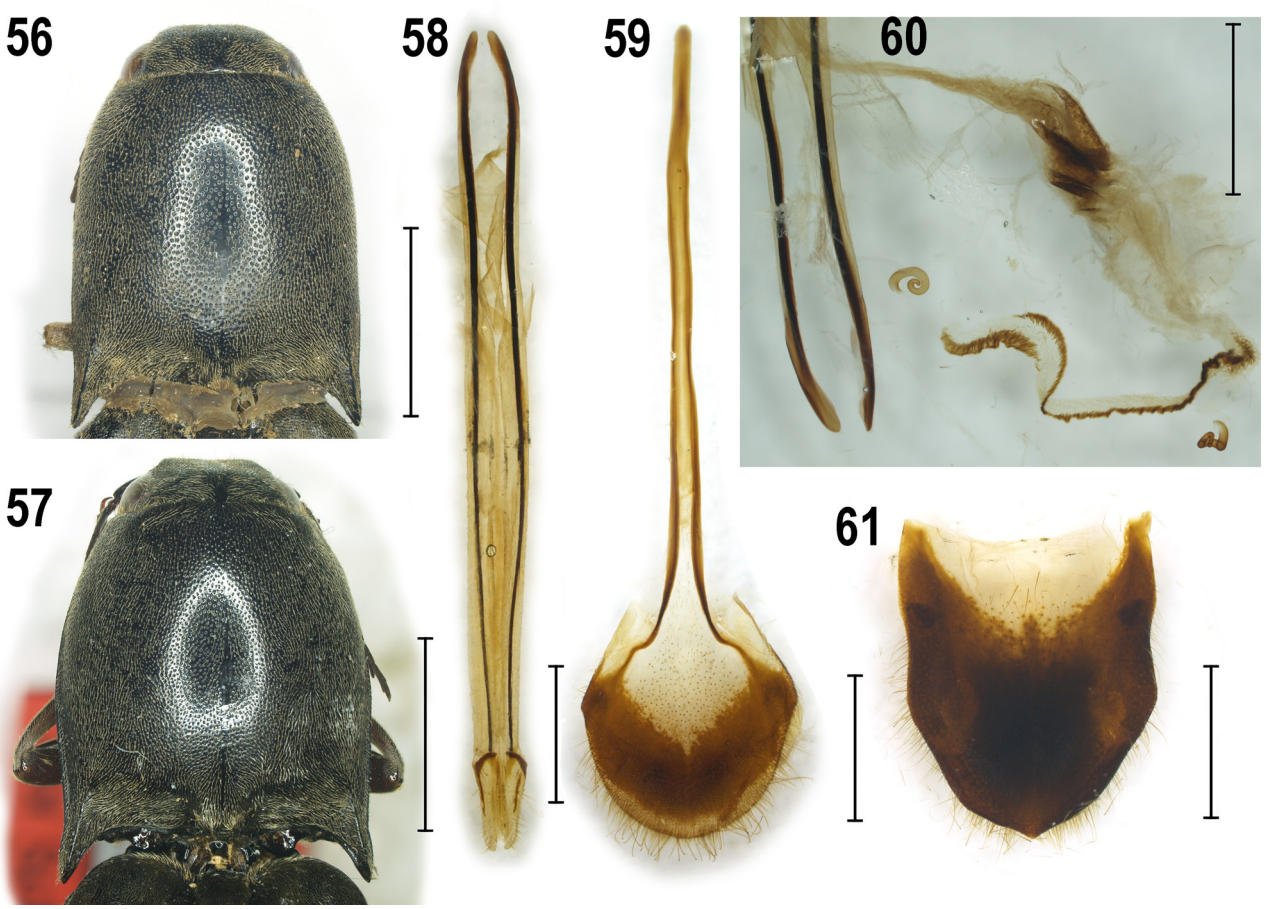


FIGURES 29–41. *Ludioctenus cyprius* (Baudi di Selve, 1871), female (Greece). 29, habitus, dorsal view; 30, habitus, ventral view; 31, habitus, lateral view; 32, antenna; 33, pronotum; 34, scutellar shield; 35, interior part of metacoxal plate, 36, abdominal tergite VII; 37, abdominal tergite VIII and sternite VIII, ventral view; 38, abdominal tergite VIII and sternite VIII, dorsal view; 39, ovipositor, ventral view; 40, ovipositor, dorsal view; 41, female genital tract. Scale bars = 5.0 mm (Figs 29–31, 33), 2.0 mm (Fig. 32–40), 1.0 mm (Figs 34–35, 41).



FIGURES 42–55. *Ludioctenus pakistanicus* Schimmel & Tarnawski, 2012, holotype, male. 42, habitus, dorsal view; 43, habitus, ventral view; 44, habitus, lateral view; 45, antenna; 46, pronotum; 47, scutellar shield; 48, interior part of metacoxal plate, 49, abdominal sternite VIII; 50, abdominal tergite VIII; 51, abdominal sternite IX; 52, abdominal sternite X; 53, abdominal tergites IX–X; 54, aedeagus, dorsal view; 55, aedeagus, ventral view. Scale bars = 5.0 mm (Figs 42–44), 2.0 mm (Fig. 45–46), 1.0 mm (Figs 47–55).

subtriangular, partly membranous, about 1.3 times as wide as long, apically slightly emarginate, medially and apicolaterally finely punctate, covered with short dense pubescence. Tergites IX and X (Fig. 53) connected by membrane; tergite IX about 1.8 times as wide as long, emarginate apically; tergite X small, widely rounded apically. Sternite IX (Fig. 51) elongate, about 2.1 times as long as wide, apically rounded, apicolaterally finely punctate, with short dense pubescence. Sternite X (Fig. 52) connected by membrane to sternite IX, partly membranous, with two elongate, subparallel-sided sclerotized plates. Aedeagus (Figs 54–55) elongate, about 3.3 times as long as wide. Median lobe elongate, robust, slightly surpassing parameres, gradually narrowed towards apex, apically abruptly narrowed, apex narrowly rounded, with moderately long basal struts. Paramere elongate, gradually narrowed from base toward apex, gradually constricted subapically, with subapical hook, apical portion covered with short setae, apex narrowly rounded; subapical hook short, thin, its outer portion not or only shallowly emarginate. Phallobase robust, transverse, about 1.2 times as wide as long. **Female**. Tergite VIII (Fig. 61) subtriangular, slightly longer than wide, narrowed toward apex, subacute apically, finely punctate, covered with moderately dense pubescence, mainly at margins. Sternite VIII (Fig. 59) slightly longer than wide, with sides and apex rounded, finely punctate, covered with dense pubescence, spiculum ventrale slender, long, about 2.6 times sternite length. Ovipositor (Fig. 58) elongate; paraprocts about 7.5 times as long as gonocoxites, styli absent. Vagina with plate-like sclerotized structures. Bursa copulatrix (Fig. 60) mebranous, sac-like, anteriorly elongate, with long rows of jointly connected spines. Two elongate spermathecae attached to anterior part of bursa copulatrix.



FIGURES 56–61. 56, *Ludioctenus pakistanicus* Schimmel & Tarnawski, 2012, paratype, male? (India), pronotum; 57–61 *L. pakistanicus*, paratype, female (Pakistan). 57, pronotum; 58, ovipositor; 59, abdominal sternite VIII; 60, female genital tract; 61, abdominal tergite VIII. Scale bars = 5.0 mm (Figs 56–57), 2.0 mm (Figs 58–61).

Distribution. India, Pakistan.

Remarks. Schimmel & Tarnawski (2012) listed only Pakistan for the distribution of *L. pakistanicus*. However, they included in the type series a specimen from MNHN with the data "Shembaganur, without further data". We examined this specimen and in fact it bears the label "Shembaganur, Sd. Ind.". Because Shembaganur (or

Shenbaganur) lies in the state of Tamil Nadu in southern India, we include here also India in the distribution of *Ludioctenus*. Schimmel & Tarnawski (2012) suggested that the specimen from Shembaganur is a female. Unfortunately, it is in a bad condition and most of abdomen including the soft tissues and genitalia is missing. However, based on the shape of pronotum (Fig. 56) and antenna it is most probably a male. What is more, this specimen has much sparser pronotal punctation than the specimens from Pakistan (Figs 56–57) and might represent an undescribed species. Since several morphological characters such as the shape of the scutellar shield are variable in *L. pakistanicus* (scutellar shield about 2.1 times as long as wide in the holotype (Fig. 47) but 1.8–2.0 times in the examined male paratypes), we prefer to include the specimen from Shembaganur tentatively under *L. pakistanicus* until more specimens are available for more detailed study.

The male holotype of *L. pakistanicus* was not originally dissected and therefore we figure here the pregenital sclerites and aedeagus (Figs 49–55). For the first time, we figure here also pregenital segments and genitalia of a female of this species (Figs 58–61).

An identification key to the species of *Ludioctenus* Fairmaire, 1893

1. Body pitch black; pubescence dark-bronzed; posterior angles of pronotum not or only slightly divergent (Figs 15–17, 19, 29–31, 33) . . . . . *L. cyprius* (Baudi di Selve)
-. Body reddish brown, brown or blackish-brown; pubescence yellowish; posterior angles of pronotum divergent 2
2. Punctures on pronotum moderately dense, separated about 0.5–1.5 times of their diameter; interstices flat, shiny; pronotal disc with well developed medial longitudinal glabrous line (Figs 42, 46, 56–57); posterior emargination of metacoxal plate abrupt near inner margin and then gradually inclined (Fig. 48); median lobe robust; paramere gradually constricted subapically, with outer portion of subapical hook not or only slightly emarginate (Figs 54–55). . . . . *L. pakistanicus* Schimmel & Tarnawski
-. Punctures on pronotum very dense, almost contiguous; interstices flattened to wrinkled; pronotal disc without apparent medial longitudinal glabrous line (Fig. 1, 5); posterior emargination of metacoxal plate even (Fig. 7); median lobe slender; paramere abruptly constricted subapically, with outer portion of subapical hook distinctly emarginate (Figs 13–14) . . . . . *L. afghanicus* **sp. nov.**

Discussion

Diversity of Elateridae in Afghanistan is very poorly known, and so far only 81 species classified in 31 genera have been recorded from the area (Prosvirov 2016, 2017a, 2017b; this study). Until now, the Agrypninae in Afghanistan included genera *Adelocera* Latreille, 1829, *Agrypnus* Eschscholtz, 1829, *Compsolacon* Reitter, 1905, *Lacon* Laporte, 1838 and *Meristhus* Candèze, 1857 (all are members of the tribe Agrypnini), *Aeoloides* Schwarz, 1906, *Aeolosomus* Dolin, 1982, *Conoderus* Eschscholtz, 1829, *Drasterius* Eschscholtz, 1829 and *Heteroderes* Latreille, 1834 (all Oophorini), and *Calais* Laporte, 1838 (Hemirhipini) (*e.g.*, Cate 2007; Németh & Platia 2014; Prosvirov 2016). The here described *Ludioctenus afghanicus* **sp. nov.** is the third species of the tribe Hemirhipini known to occur in this country. *Ludioctenus* has a disjunct distribution, with *L. cyprius* in the eastern Mediterranean, *L. afghanicus* **sp. nov.** in eastern Afghanistan, and *L. pakistanicus* in Pakistan and India. The closely related genus *Tetrigus* occurs east of the *Ludioctenus* distribution range; its species are known from the Himalayan, East Palaearctic, Oriental, and Australian regions (Schimmel & Tarnawski 2012). Taking into consideration that the click-beetle fauna of Afghanistan and adjacent areas is understudied and many species were described from these regions only recently (*e.g.*, Schimmel & Tarnawski 2012, 2016; Akhter *et al.* 2014; Németh & Platia 2014; Platia 2015a, b, 2017; Prosvirov 2016, 2017a; Kundrata 2017; this study), we can expect many new elaterid taxa will be reported from there in near future.

The study of the pregenital segments and genitalia of *Ludioctenus* species suggested that this genus is not closely related to the true Hemirhipini. The aedeagus of *Ludioctenus* species has parameres not fused at base and with a subapical tooth (Figs 13–14, 27–28, 54–55) while the aedeagus of *Calais* Laporte, 1838, *Cryptalaus* Ôhira, 1967, *Alaus* Eschscholtz, 1829 and other Hemirhipini genera has parameres usually notably fused at base and without a tooth or with tooth in a different position (see Casari-Chen 1994). The female sternite VIII of *Ludioctenus* has a rather long spiculum ventrale (Figs 37–38, 59) while in other Hemirhipini this is much shorter. The ovipositor of *Ludioctenus* (Figs 39–40, 58) is less sclerotized and relatively longer than the ovipositor of other Hemirhipini. The bursa copulatrix of *Ludioctenus* (Figs 41, 60) is without the sac-like structures and horseshoe-

shaped sclerites which are present in most Hemirhipini. Moreover, the type of sclerotization and general shape of the bursa copulatrix of *Ludioctenus* species are rather similar to those of the Agrypnini, especially to *Lanelater* Arnett, 1952, though these taxa distinctly differ in many other characters. The position of *Ludioctenus* outside of Hemirhipini was already suggested by Casari-Chen (1993) and confirmed by the recent four-gene molecular phylogenies of Elateridae by Kundrata *et al*. (2016, 2018) who recovered *L. cyprius* sister to *Adelocera* but with a limited statistical support. Therefore, additional morphological and DNA-based research including various Agrypninae lineages is required for clarification of the exact systematic position of *Ludioctenus* and the rank of the Tetrigusina.

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