



Taxonomic revision of genus *Lithurgus* (Hymenoptera: Megachilidae) of Egypt with a new record

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ABSTRACT

Two *Lithurgus* species previously recorded from Egypt, *Lithurgus chrysurus* Fonscolombe, 1834 and *Lithurgus tibialis* Morawitz, 1875 and newly recorded species, *Lithurgus collaris* Smith, 1873 are taxonomically studied. The species are described, illustrated and a key to the species occurring in Egypt is provided and a faunistic list is given.

INTRODUCTION

The genus *Lithurge* Latreille, 1825 was emended for *Lithurgus* by Berthold since 1827 and it is a cosmopolitan genus of tribe Lithurgini, subfamily Megachilinae, Family Megachilidae (Earlly 1988). It is the lonely genus included within tribe Lithurgini in Egypt. This genus has a broad distribution in tropical and warm to moderate regions, such as Eurasia, Africa, Australia, and Old World (Michener2007).

Members of the genus *Lithurgus* are characterized by the robust body; midfacial prominence distinct in females (Fig.3&17), absent or indistinct in most males (Fig.10&24); posterior margin of T6 in the female with apical spine and pygidial plate not distinct (Fig.1&13); T6 in male with distinct pygidial plate, in most species, protruded apically (Fig.8&23) (Michener2007). *Lithurgus* species attracted to the flowers of Malvaceae, Asteraceae, and Compositae. The female laid its eggs in nests in dead or dry wood, the nest without lining, and also without cell partitions (Snelling, 1983; Banaszeck and Romasenko, 1998 and Pachinger, 2004).

The Egyptian species of *Lithurgus* received little attention where Zanden (1986) keyed the seven species of the Palearctic region, all of them belong to subgenus *Lithurgus*. In Egypt, *Lithurgus* represented by two species *Lithurgus chrysurus* Fonscolombe, 1834, and *Lithurgus tibialis* Morawitz, 1875 (Salem *et al.*, 2017), the present study added a new record *Lithurgus collaris* Smith, 1873 to the Egyptian fauna.

An illustrated key for identifying the Egyptian species, a faunistic list, and a distribution map are also given.

MATERIALS AND METHODS

The present study is based on fourteen specimens, eleven are collected between 2015 to 2019 by using the sweeping net from Mashtole, Zagazig (Sharkia) [30°37'34.28"N, 31°30'35.50"E], Zanklon, Zagazig (Sharkia) [30°35'7.85"N, 31°28'31.97"E], Kafr Al-Hamam, Zagazig (Sharkia) [30°36'42.60"N, 31°30'39.99"E], and the remain three specimens, one in each Repositories PPDD: Maadi (Cairo) [29°57'36.56"N; 31°15'24.89"E], CUE: Zagazig (Sharkia) [30°34'54.27"N 31°30'4.23"E], and ASUA: The description of female *L. tibialis* based on photos from discovering life site.

Specimens were pinned, and are deposited in the Zoology department, faculty of science (boys), Al Azhar University, Cairo, Egypt. Morphological terms follow (Michener 2007). Body sculpture terminology follows (Harris,1979). Measurements, description, and drawings were made with the help of square and micrometer eyepieces. Further image processing was done using the software Adobe Photoshop (v. 7.0 ME). The map obtained from WIKIMEDIA COMMONS in raster format was then referenced and the localities determined by ArcGIS 9.3.1.

The following Repositories (Insect collections) were searched for specimens belong to the target genus:

ASUA: Entomological Collection of Faculty of Science, Ain Shams University.

CUE: Entomological Collection of Faculty of Science, Cairo University. Efflatoun Bey Collection, Entomology Department.

PPDD—Ministry of Agriculture collection, Plant Protection Institute, Giza, Egypt.

Abbreviations. F1, F2, F3, etc. = first, second, third, etc. antennal flagellomeres; IOD = interocellar distance; OOD = ocellocular distance; SMC1= first submarginal cell; SMC2= second submarginal cell; T1, T2, T3, etc. = first, second, third, etc. abdominal terga; S1, S2, S3, etc. = first, second, third, etc. abdominal sterna.

RESULTS AND DISCUSSION

Lithurgus Latreille, 1825

Lithurge Latreille, 1825:463; Sandhouse 1943:565; Michener 1983:182-184.

Lithurgus Berthold, 1827:467; Fox 1902: 137-138

Type species: *Andrena cornuta* Fabricius, by monotype.

Key to the Egyptian species of the genus *Lithurgus* Latreille (after Zanden, 1986)

1. With eleven antennal segments; humeral angle of pronotum normal (Fig. 18); claws bifid (Fig. 23); T6 without lateral spine (Fig. 8) [♂].....**4**
- With ten antennal segments 10; humeral angle enlarged (Fig. 1&13); claws simple; T6 with a lateral spine (Fig. 1) [♀]**2**
2. Scopa black; body shiny black; the outer surface of fore and mid tibiae with longitudinal 2 rows of short acute tubercles; 11–13 mm.....***L. collaris* Smith**
- Scopa white or red, posterior margin of the abdominal segment with strong and dense bandages of snow-white hairs**3**
3. Small species, 8–10 mm; clypeal margin with reddish hairs; scope snow-white, dark on S6.....***L. tibialis* Mor.**
- Large species 13–15 mm; mesoscutum and scutellum rugulose (Fig. 1), with sharp edges in mesoscutum apically and shallow edges in scutellum; scope and T6 with densely dark yellow hairs***L. chrysurus* Fonsc.**
4. Hind femur enlarged, 2.3 x broader than mid femur(Fig. 27); hind tibia internally with the apical dull spine, the later with a wide base and 0.4 x smaller than tibial spurs; small species, 8–9 mm***L. tibialis* Mor.**

- Hind femur and tibia normal, large species, 11–19mm.....5
 5. Body shiny black; hind tibia and tarsus with black hairs; tarsal claws with small arolium, 12.5 mm..... *L. collaris* Smith.

- Body dark black; legs and body clothed with yellow-brown setae; clypeus flat; T2–5 basally with light yellow red to light brown setae.....*L. chrysurus* Fonsc.

Faunistic List:

Lithurgus chrysurus Fonscolombe, 1834

Lithurgus chrysurus Fonsc., 1834, Ann.Soc.ent.France 3:220, ♀♂

L. analis Lepeletier, 1841:347, ♀

L. haemorroidalis Lepeletier, 1841: 346, ♀

L. chrsurus var. *sicula* Pérez, 1897: X, ♀

Female Description:

Body length: 15 mm; fore wing: 8.6 mm.

Color: head including mandible, thorax dorsally, T4–T6 and S4–S6 black; gena, mesopleuron, propodeum, T3 and S2&S3 reddish-brown; antenna, tegula, legs (except tibiae darker), T1 & T2 and S1 ferruginous red; wing hyaline with yellow veins; tibial spurs yellow.

Pubescence: head with long dense recumbent white setae on supraclypeal area, paraocular area, clypeus apically and gena; apical margin of clypeus intermixed with few yellow setae; pronotum, thorax laterally, mesopleuron, propodeum, and legs with long erect white setae; mandible, tarsus, scopa and T6 with dark yellow setae, denser on T6; disk of T1 clothed with short scattered white setae; apical margin of abdominal segments with fringes of short white setae, denser on tergites.

Head: in dorsal view 1.2 X slightly broader than pronotum and 1.4 X wider than long (Fig. 1); frons and vertex coarsely or slightly rugulosity punctuate (Fig. 1); supraclypeal area with horizontal raised protuberance (Fig. 3); clypeus basally coarsely punctuate (Fig. 12), apical margin with four lobes (two small laterally and large two lobes medially) (Fig. 2); ocellocular distance (OOD) as long as interocellar distance (IOD); malar space neglected; gena as wide as an eye in lateral view; densely punctate; mandible tridentate with a large middle tooth (Fig. 2); F1 1.5 X longer than broad and 1.5 X longer than F2, narrow basally; F2 1.4 X broader than long and 1.4 X broader than F1; F2–F9 wider than long (Fig. 7); F10 1.3 x longer than broad.

Thorax: pronotum hardly visible from dorsal view, with enlarged humeral angle (Fig. 1); mesoscutum with incomplete parapsidal lines and complete median line in the concave apical area (Fig. 1); mesoscutum and scutellum rugulose, with sharp edges in mesoscutum apically and shallow edges in scutellum (Fig. 1); mesopleuron rugipunctate; propodeum coarse punctate; fore wing with SMC1 1.4 X longer than SMC2; basal vein roughly convex and meeting vein Cu at an acute angle; 2nd m-cu meeting SMC2 subapically; marginal cell distal to stigma on costa, 0.5 X shorter than stigma; stigma 2 X longer than broad; margin of stigma in SMC1 0.5 X longer than the width of stigma (Fig. 4); vannal lobe of hind wing 1.6 x longer than jagual lobe; the outer surface of tibia armed with acute short spines, more visible in mid and hind legs.

Abdomen: flat, parallel-sided, twice longer than broad (Fig. 1); the anterior surface of T1 strongly concave with very fine and sparse punctures; T2–T3 sparsely punctuate, punctures larger than that of T1; T3–T5 coarse punctate, densely punctate laterally, more sparse medially; S1 strongly depressed and hardly visible; S2–S6 densely punctate with very fine punctures.

Male description:

Body length: 14 mm; fore wing: 8 mm.

Color: Body including legs black; antenna, mandible, tegula and apical segments of tarsus reddish brown

Pubescence: Face clothed with long and recumbent white hairs, vertex with sparse reddish hairs; gena clothed with long recumbent white hairs; mesoscutum laterally clothed with long and erect reddish hairs, medially bare; mesopleuron clothed with long and dense white hairs; tibia ventrally with dense, short and erect red setae, tibia dorsally with short velvet setae; tibial spure red; posterior margin abdominal segment with a dense and strong apical fringe of pale hairs.

Head: Head rounded as long as broad (Fig. 10); vertex densely punctuate (Fig. 10); supraclypeal area slightly raised (Fig. 10); clypeus basally coarsely punctuate (Fig. 12), apical margin truncate (Fig. 9); ocellocular distance (OOD) as long as interocellar distance (IOD) (Fig. 8); malar space neglected; gena as wide as an eye in lateral view; densely punctate; mandible tridentate with large middle tooth (Fig.9); F1 1.3 x longer than broad and slightly longer than F2, narrow basally; F2 longer than broad (Fig. 12).

Thorax: pronotum hardly visible from dorsal view, mesoscutum slightly convex and scutellum densely punctate; fore wing as female.

Abdomen: slightly convex dorsally, parallel-sided, twice longer than broad (Fig. 8); the anterior surface of T1 strongly concave with very fine and sparse punctures; T2–T4 sparsely punctuate, punctures denser laterally; T1 and T2 with median depression; T5 densely punctuate medially; T6 with distinct pygidial plate, protruded and pointed apically (Fig. 8); S1 strongly depressed and hardly visible; S2–S6 densely punctate with very fine punctures.

Material examined: 1♀, Zagazig (Sharkia) [30°34'54.27"N 31°30'4.23"E], VI.1913 (leg. Adaic) [AUCE]; 1♂, [ASUA]

Extralimital distribution: Italy, Greece, Bulgaria, Romania, Turkey, Russia, Syria, Israel, Spain (Zanden, 1986).

Lithurgus collaris Smith, 1873

Lithurgus collaris Smith, 1873, Trans. Ent. Soc. London: 202, ♂

Female description

Body length: 11-13 mm; fore wing: 7-8 mm.

Color: body shiny black; flagellum ventrally yellowish-brown; wing hyaline with a yellowish-brown tint, wing veins black.

Pubescence: paraocular area, around antennal socket and clypeus apically with short suberect white setae; apical margin of clypeus with a fringe of long intermixed red and white setae; frons clothed with sparsely short black setae; mandible with scattered red setae; gena clothed with very fine sparsely white setae; the anterior face of pronotum with long white and yellowish-brown setae; mesepisternum and metepisternum dorsally and axilla with long white setae; legs clothed with long erect black setae; abdominal tergites clothed with very fine black setae; T1 & T2 laterally, apical margin of T1– T5 and apical margin of abdominal sterna with fringes of white setae; T5 laterally with long black setae; T6 with long erect and dense black setae; scope blackish brown.

Head: in dorsal view 1.4 X slightly broader than long and 1.1 X scarcely wider than pronotum (Fig. 13); frons and vertex punctuate reticulate, punctures on vertex smaller than that on frons (Fig. 14); lateral ocelli with horizontal impunctate strip not reaching eye, wider adjacent to ocelli; frontal line convex and impunctate; supraclypeal area with horizontal enlarged protuberance, densely punctuate, depressed medially by horizontal line (Fig. 17); clypeus punctuate reticulate with longitudinal median convex line, apical margin lobed laterally and straight medially, punctures on clypeus and protuberance deeper and larger than that on frons (Fig. 14); ocellocular distance (OOD) as long as interocellar distance (IOD); gena 0.7 X smaller than eye width in lateral view, punctuate sub reticulate (punctures small and shallow); eye margin from gena sparsely punctuate; malar space neglected; mandible tridentate with large middle tooth, outer surface of mandible basally densely punctate (Fig.

14); F1 1.2 X longer than broad and 2.3 X longer than F2, narrow basally; F2 1.25 X broader than F1 (Fig. 16); F2-F9 wider than long; F10 1.2 X longer than broad.

Thorax: pronotum hardly visible from dorsal view, with enlarged humeral angle that densely punctate(Fig. 13); anterior surface of mesoscutum densely punctate, mesoscutum with horizontal undulating strigate that shallow and fine sub apically, mesoscutum with incomplete parapsidal lines and complete median line in concave apical area(Fig. 13); apical margin of mesoscutum and scutellum punctate reticulate; mesopleuron and metapleuron densely punctate, punctures on metapleuron shallow and small; propodeum slightly convex medially with sparsely fine punctures; fore wing with SMC1 scarcely longer than SMC2; basal vein roughly convex and meeting vein Cu at acute angle; 2nd m-cu meeting SMC2 subapically; marginal cell distal to stigma on costa, 0.5 X shorter than stigma; stigma sclerotize, 3 X longer than broad; margin of stigma in SMC1 2 X longer than width of stigma (Fig. 15); vannal lobe of hind wing 1.4 X longer than jagual lobe; outer surface of hind tibia armed with acute short spines; outer surface of fore and mid tibiae with longitudinal 2 rows of short acute spines; tarsal claws with arolium.

Abdomen: flat, parallel-sided, 1.5 X longer than broad (Fig. 13); T1–T5 with a depressed apical margin more noticed on T1; the disk of T1 impunctate; T2–T5 with very fine punctures, laterally densely punctate and medially sparsely punctate, T6&S6 densely punctate; S1–S5 sparsely punctate.

Male description:

Body length: 10–13 mm, fore wing 6.5–8.5mm

Color: as female.

Pubescence: frons and vertex with long erect blackish-brown setae, subclypeal area, and clypeus with long recumbent white setae; apical margin of clypeus intermixed with red setae; gena clothed with long white setae intermixed with few blackish setae; pronotum, anterior face of tegula and mesoscutum clothed with erect short blackish-brown setae; apical margin and laterals of mesoscutum, scutellum, propodeum, axillae, and mesopleuron dorsally with long white setae; mesopleuron ventrally with blackish-brown setae; pubescence on the abdomen as in female, in addition, T1 clothed with long white setae and abdominal terga clothed with short black setae.

Head: in dorsal view 1.2 X slightly broader than long and 1.15 X scarcely wider than pronotum(Fig. 18); head densely punctate, punctures on clypeus slightly larger than elsewhere; supra clypeal area with enlarged protuberance (Fig. 20); frontal line as in female; lateral ocelli with impunctate stripe as in female; clypeus slightly convex medially, apical margin as female; malar space neglected; ocellocular distance (OOD) 0.8 X smaller than interocellar distance (IOD); gena 0.6 x smaller than eye width in lateral view; mandible and antenna as female except F2– F10 scarcely wider than long and F11 1.2 X longer than wide.

Thorax: completely densely punctate, punctures shallow than punctures on the head (Fig. 18); fore wing with SMC1 1.2 X longer than SMC2; basal vein as female; 2nd m-cu meeting SMC2 subapically; marginal cell distal to stigma on costa, 0.5 X shorter than stigma; stigma semi sclerotized, 2 X longer than broad; margin of stigma in SMC1 1.4 X longer than the width of stigma (Fig. 21); vannal lobe and jagual lobe as female; tarsal claws with arolium.

Abdomen: flat, parallel side, 1.6 x longer than broad (Fig. 18); punctures as female.

Material examined: 3♀, Mashtole, Zagazig (Sharkia) [30°37'34.28"N, 31°30'35.50"E], 16. X. 2015 (leg. A. Shahat), (sweeping net); 2♀, 2♂ Zanklon, Zagazig (Sharkia) [30°35'7.85"N, 31°28'31.97"E], 27.VIII.2015 (leg. A. Shahat) (sweeping net); 4♂, K. Hamam, Zagazig (Sharkia) [30°36'42.60"N, 31°30'39.99"E], 16. X. 2018 (leg. A. Shahat) (sweeping net) [author collection]

Extralimital distribution: Japan, China, Taiwan (Zanden, 1986).

***Lithurgus tibialis* Morawitz, 1875**

Lithurgus tibialis Morawitz, 1875, Fedtschenko 1:103, ♂; 1876, Horae Soc.ent. Ross.12:46, ♂♀
Pseudosmia tibiodentata Radoszkovsky, 1888:340, ♀

Female Description:

Color: Body including mandible, antenna, and legs black; an apical segment of antenna, tegula, and an apical segment of tarsus reddish-brown; wing hyaline with a brown vein.

Pubescence: Face clothed with dense and long recumbent white hairs; clypeus medially and supraclypeal area bare; clypeus margin with long reddish hairs; vertex with sparse and erect long pale hairs; gena clothed with long recumbent white hairs; desk of mesoscutum bare, laterally with long pale hairs; mesopleuron with long and recumbent white hairs; posterior margin of the abdominal segment with a fringe of dense and white hairs; scope white with red hairs on S6.

Head: rounded; vertex densely punctate; malar space neglected; ocellocular distance (OOD) slightly smaller than interocellar distance (IOD); mandible tridentate; F1 1.3 x longer than broad and slightly longer than F2; F2 broader than F1 and slightly broader than its length; F3–F10 slightly wider than long.

Thorax: robust, convex from dorsal view; mesoscutellum and scutellum densely punctuate.

Abdomen: flat, parallel-sided, 1.3 X longer than broad; the anterior surface of T1 strongly concave; T2–T5 densely punctate.

Male Description:

Body length: 9 mm; fore wing: 5 mm.

Color: head including mandible, thorax reddish-brown; antenna, legs, T1–T3 and S1 & S2 ferruginous red; T4–T7 and S3–S5 blackish brown; tegula, tibial spurs and distal segment of tarsus yellow; wing hyaline with yellow veins

Pubescence: head, thorax, and legs clothed with long recumbent and erect white setae, slightly on vertex and thorax dorsally, face completely covered by setae; abdomen clothed with white setae, short on terga and long on sterna; T6&T7 with yellowish-brown setae; apical margin of abdominal segments with dense fringes of long white setae, more dense and strong on terga.

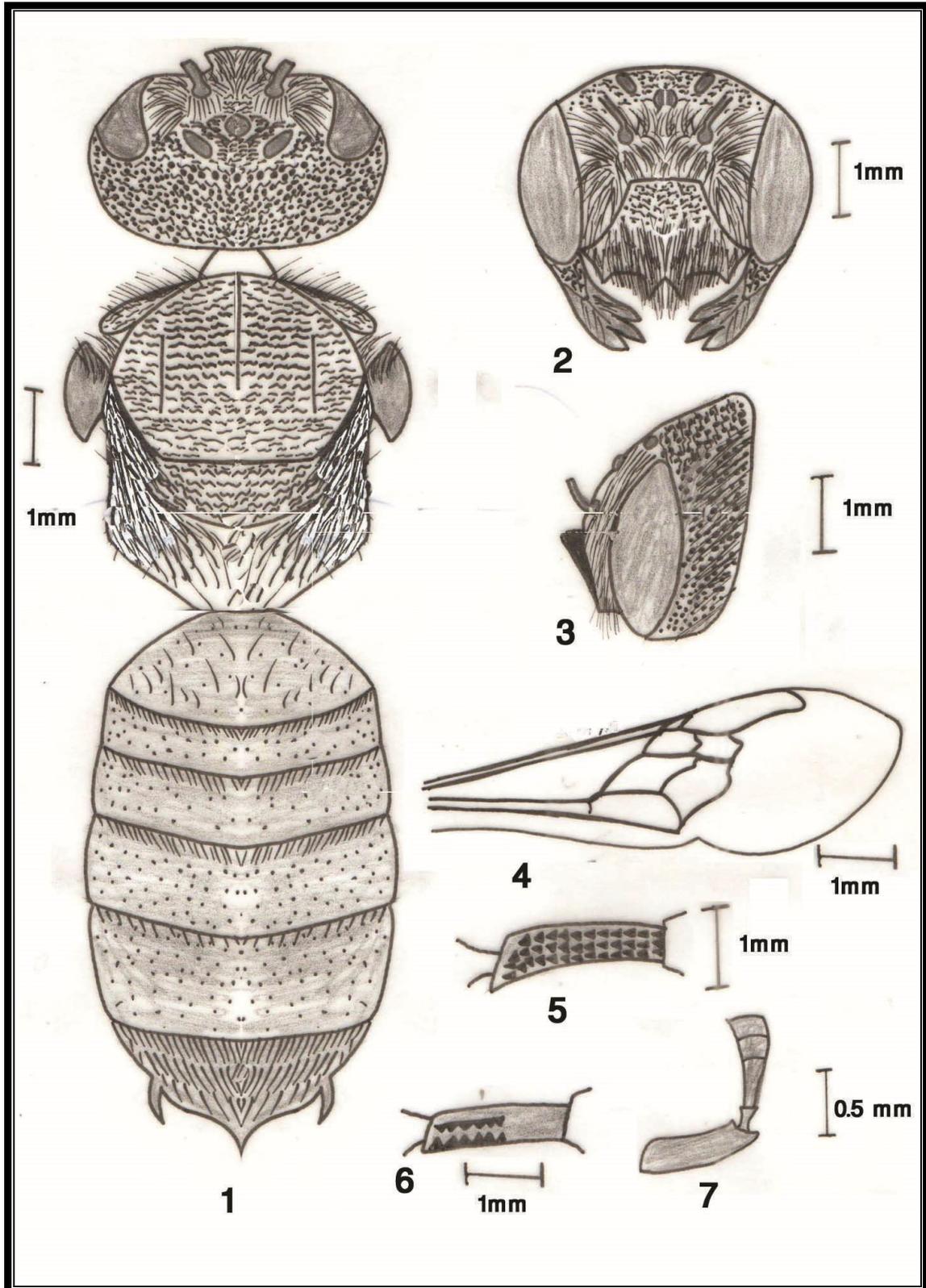
Head: rounded, 1.25 X broader than pronotum (Fig.23); vertex punctate reticulate; clypeus basally coarsely punctate, apical margin of clypeus straight and slightly raised medially (Fig. 25); gena densely punctuate, 0.5 x shorter than eye width from lateral view (Fig. 24); malar space neglected; ocellocular distance (OOD) 0.7 X interocellar distance (IOD); mandible tridentate with a large middle tooth (Fig.25); F1 1.2 X longer than broad and as long as F2; F2 1.4 X broader than F1 and slightly broader than its length; F3–F11 longer than wide.

Thorax: slightly longer than broad; mesoscutum coarse (Fig.23); scutellum and mesopleuron densely punctuate; propodeum sparsely punctuate, punctures finer than that on vertex; fore wing with SMC1 1.2 X longer than SMC2; basal vein roughly convex and meeting vein Cu at an acute angle; 2nd m-cu meeting SMC2 sub apically; marginal cell distal to stigma on costa, 0.4 X shorter than stigma; stigma 3.6 X longer than broad; margin of stigma in SMC1 2.3 x longer than the width of stigma (Fig.26); hind femur enlarged, 2.3 X broader than mid femur (Fig.27); hind tibia internally with an apical dull spine, the later with a wide base and 0.4 X smaller than tibial spurs.

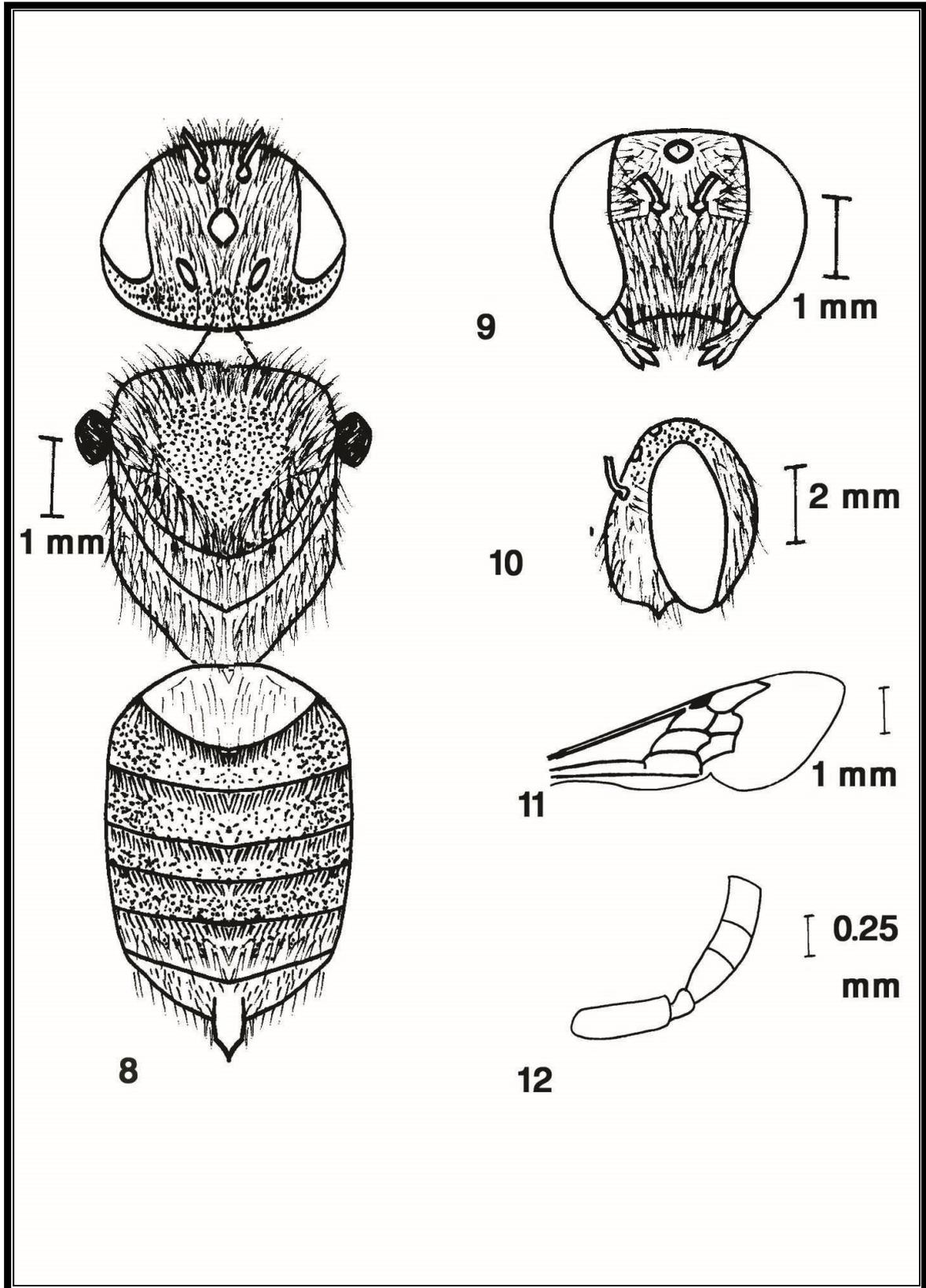
Abdomen: flat, parallel-sided, 1.5 X longer than broad (Fig.23); the anterior surface of T1 strongly concave; T2–T7 densely punctate; S2–S6 densely punctate.

Material examined: 1♂, Maadi [29°57'36.56"N; 31°15'24.89"E], 3.VIII.1933 (leg. Malard.ouk) [PPDD]

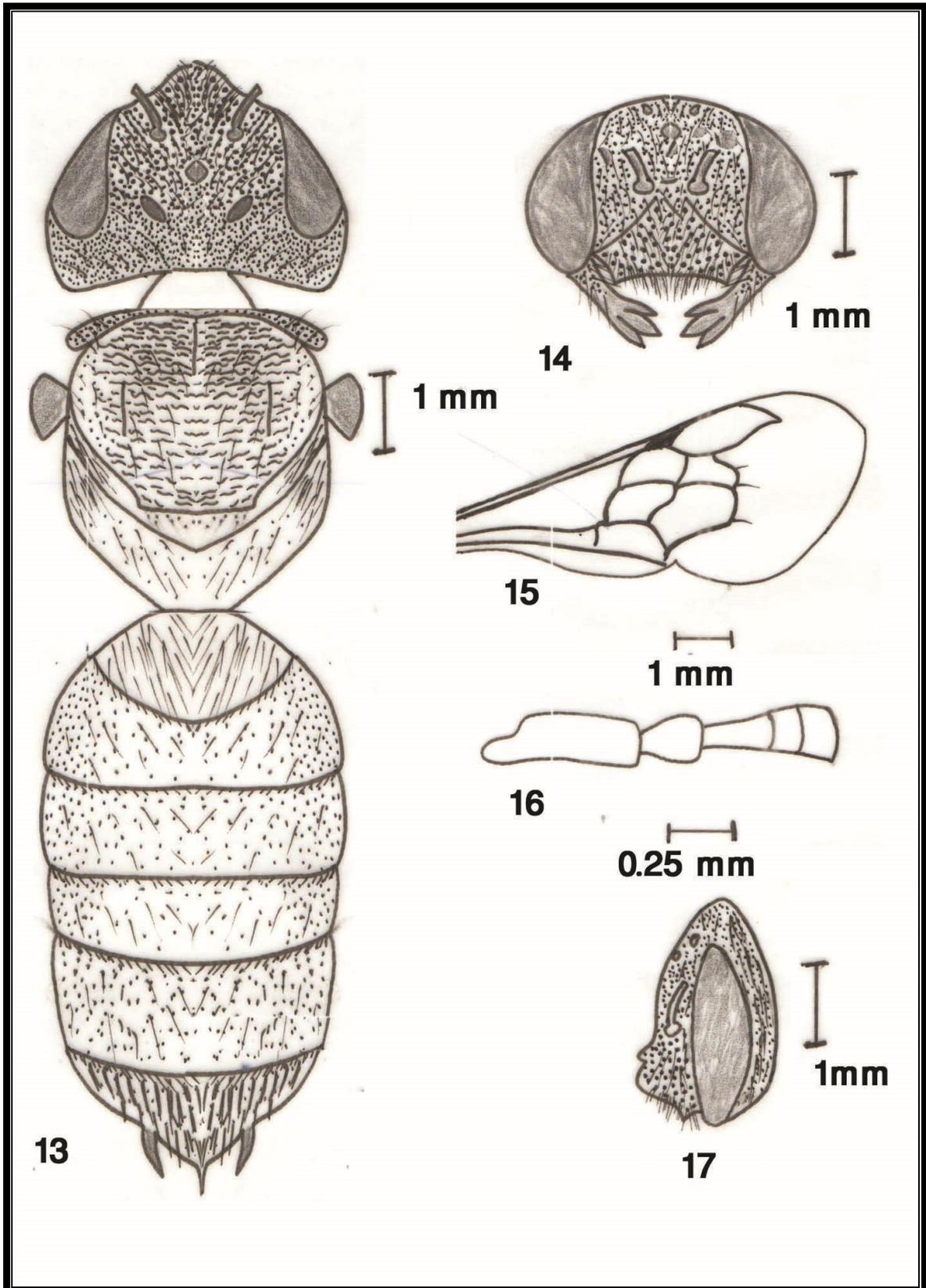
Extralimital distribution: Portugal, Spain, Italy, Turkey, and Greece (Zanden, 1986)



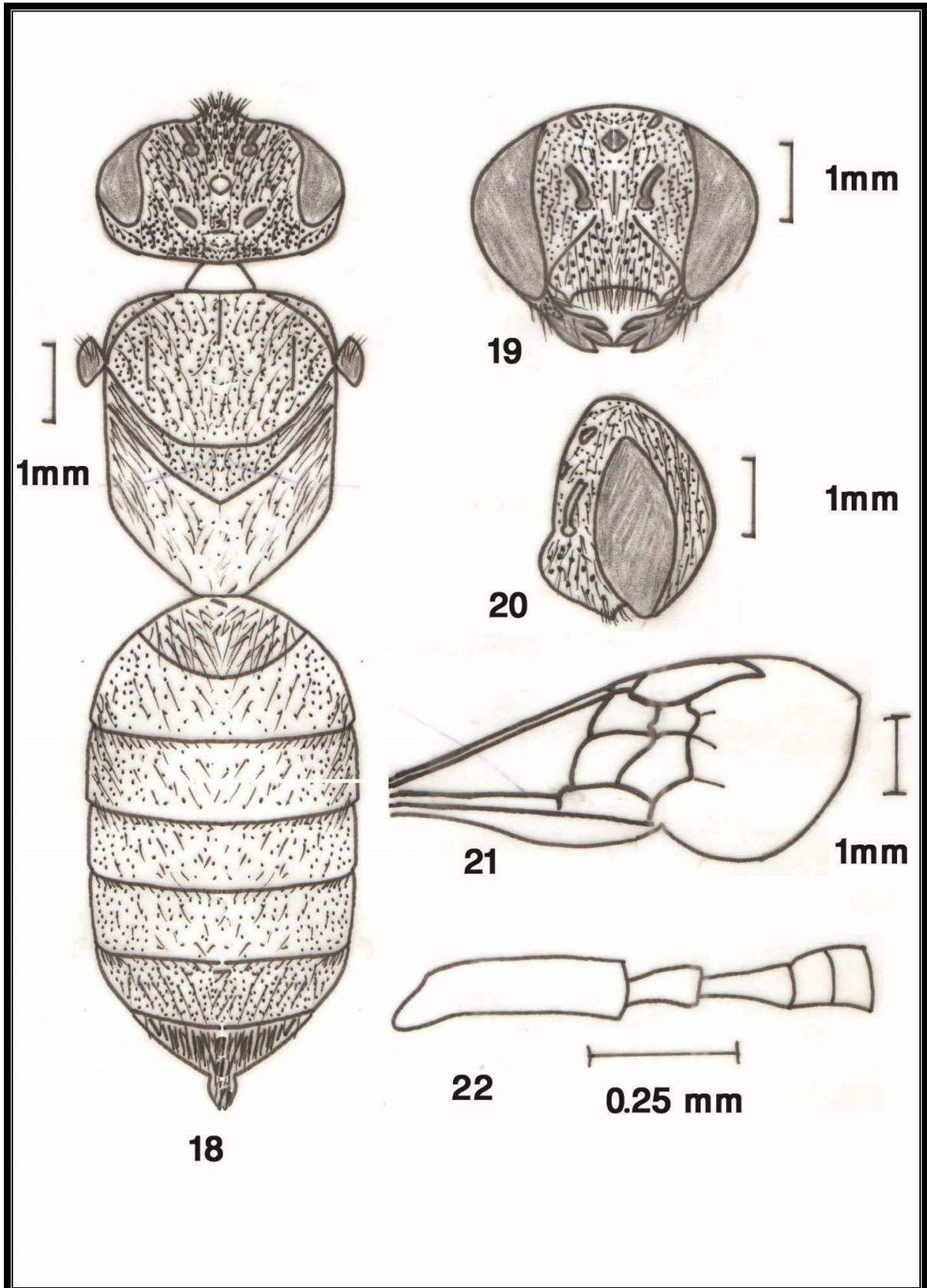
Figs. 1-7. *Lithurgus chrysurus* ♀. 1. Habitus dorsal view, 2. Head frontal view, 3. Head lateral view, 4. Fore wing, 5. Hind tibia, 6. Middle tibia, 7. Basal segments of antenna



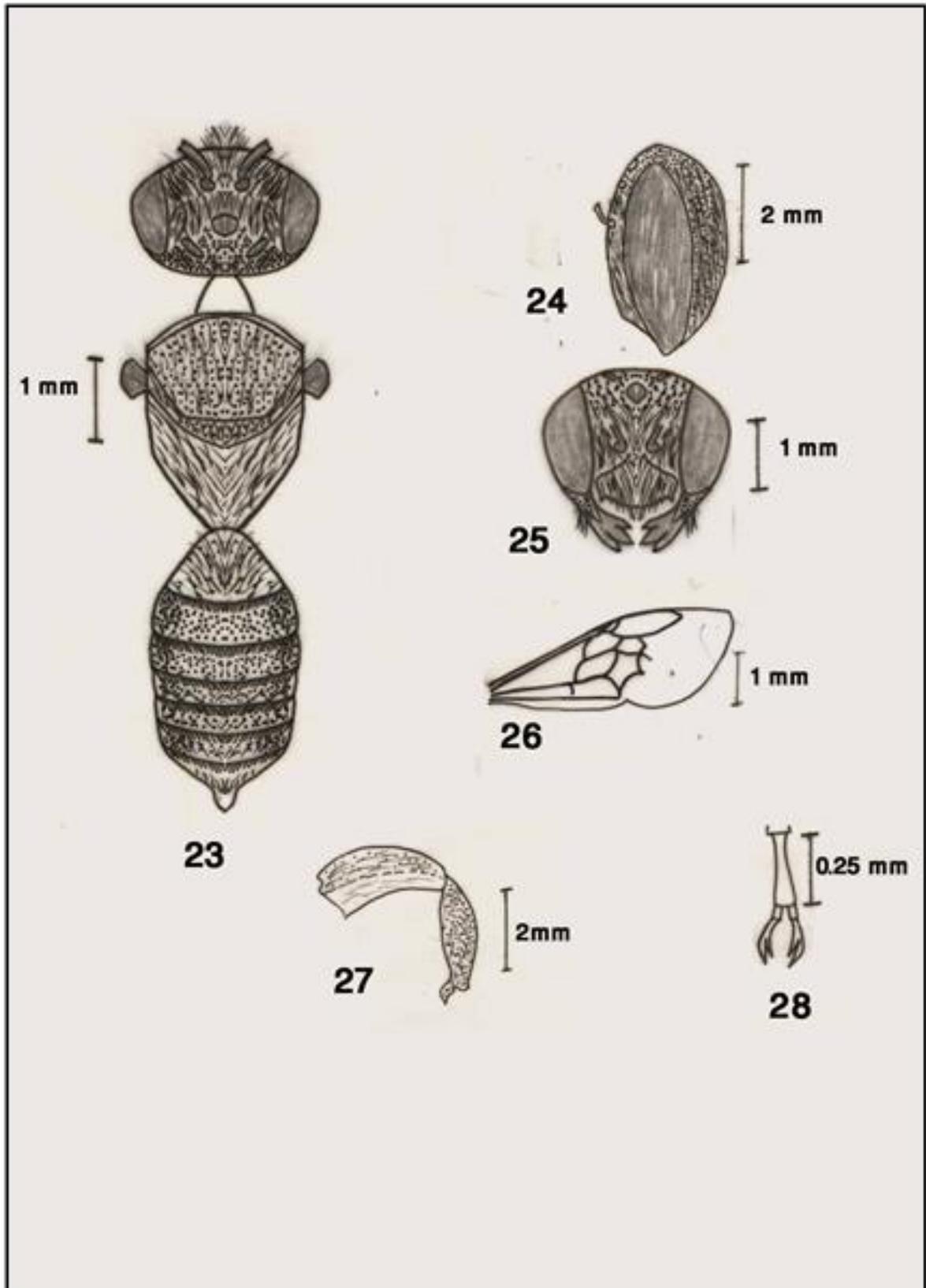
Figs. 8-12. *Lithurgus chrysurus* ♂. 1. Habitus dorsal view, 9. Head frontal view, 10. Head lateral view, 11. Fore wing, 12. Basal part of antenna



Figs. 13-17 *Lithurgus collaris* ♀. 13. Habitus dorsal view, 14. Head frontal view, 15. Fore wing, 16. Basal part of antenna 17. Head lateral view.



Figs. 18-22 *Lithurgus collaris* ♂. 18. Habitus dorsal view, 19. Head frontal view, 20. Head lateral view 21. Fore wing, 22. Basal part of antenna.



Figs. 23-28 *Lithurgus tibialis* ♂. 23. Habitus dorsal view, 24. Head lateral view 25. Head frontal view, 26. Fore wing, 27. Femure and tibia of hind leg, 28. Apical segment of tarsus and claw.

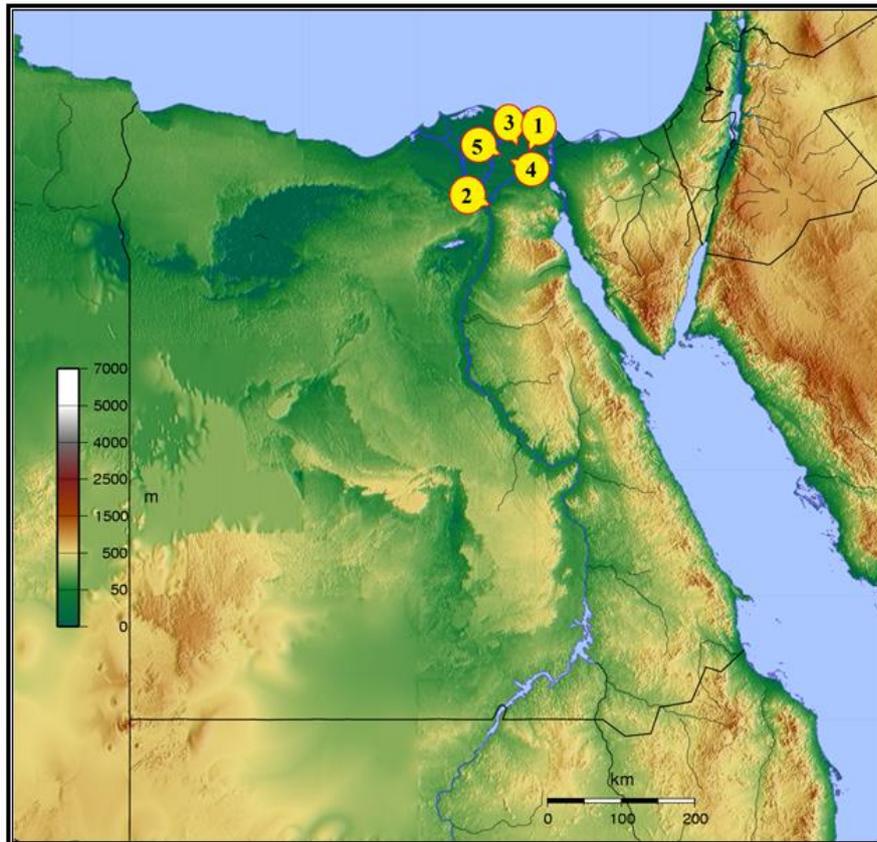
Distributional map:

Fig. 29. Egyptian localities for *Lithurgus* species: 1, Kafer El-Hamam (Sharqiya); 2, Maadi (Cairo); 3, Mashtule Alqadi (Sharqiya); 4, Zagazig (Sharqiya); 5, Zanklon (Sharqiya).

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ARABIC SUMMARY

مراجعة تصنيفية لجنس ليثورجس، عائلة ميجاكيلدي من مصر مع تسجيل نوع جديد

أحمد محمد الشحات – محمد طه حسنى – أحمد مصطفى جلهوم
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هذا البحث يحتوي على دراسة تصنيفية ومراجعة لجنس ليثورجس، عائلة ميجاكيلدي وهذه المراجعة هي الأولى لهذا الجنس حيث سابقا كان ممثلا بنوعين فقط الاول هو كريزورس والثاني تيبيلس وفي هذه الدراسة تم إضافة وتسجيل نوع جديد للبيئة المصرية وهو كوللاريس. وتمت الدراسة بناء على العينات المحفوظة في المجموعات الحشرية المصرية وكذلك العينات التي تم تجميعها في الفترة من ٢٠١٥-٢٠١٩. واشتملت الدراسة على مفتاح للانواع المصرية وكذلك وصف ورسومات توضيحية للانواع المصرية وأيضا خريطة توضيحية لأماكن انتشار هذه الانواع.