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## Taxonomic study of the genus *Liris* Fabricius, 1804 (Hymenoptera: Sphecidae) in Iraq

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### Abstract

Four species belonging to genus of *Liris* Fabricius (subfamily; Larrinae): *L. haemorrhoidalis* (Fabricius), *L. subtessellata* (Smith), *L. atratus* (Spinola) and *L. nigricans* (Walker) were studied in different regions of Iraq. Redescription and key with figures are presented here for the diagnosis of these species.

**Keywords:** Hymenoptera, Iraq, Larrinae, *Liris*, Sphecidae.

### 1. Introduction

Sphecids can be distinguished by the posterior margin of the pronotum which is a straight line and terminates laterally into a rounded lobe that does not reach the tegula [1]. The Larrinae is the largest subfamily in Sphecidae, with over 2,000 species; *Liris* is a cosmopolitan and large, predominantly pan-tropical genus of solitary ground-nesting predaceous wasps, and there are more than 260 species, with an estimate that this number will be increased substantially when the poorly known Neotropical fauna will be studied [2].

Recently, Pulawski [3] listed 308 species and 32 subspecies of the genus *Liris* in the electronic catalog of Sphecidae in November 2014, six species and three sub-species occur in the Palaearctic region.

Krombein and Evans [4] reported that this wasp, nesting in sandy soil, flew up to a foot from the nest to gather "small twigs, plant pieces, seeds and lumps of earth," which the females carried forward and placed in the burrow. Finally, the adults scraped sand and debris from various directions over the filled burrow to conceal the entrance.

The *Liris* Fabricius belong to Lirini, the largest tribe Sphecidae, and has over 1100 species; the forms of lirini with hind ocellar deformation, represents a high degree of specialization. These wasps are usually of medium size; nearly all of the Lirini are fossorial and can truly be called "digger wasps" or "sand loving wasps); although Orthoptera are the predominant prey, Hemiptera, Homoptera and Lepidoptera larvae are used in some forms [5, 6].

The diagnosis for *Liris* Fabricius is as follows: lateral ocellus reduced, flat and small; frons just below median ocellus with a transverse swelling extending from eye to eye and interrupted by median frontal line, and a linear swelling along inner orbit which joins transverse swelling to form an M shape; mandible simple, most species with a conspicuous notch on outer margin, mostly with one or two teeth on inner margin; pronotal collar, scutum, scutellum and metanotum punctate, punctures longer than one to less than one diameter apart; forewing with three submarginal cells; pronotum is angular in dorsal view, and gaster without petiole. *Liris* can be distinguished from *Larra* Fabricius by the following combination of the following characters: in female, last tarsomere angled in lateral view and sides parallel on apical half, pygidial plate mostly with setae and in most species with apically a transverse row of stout apical spinules; in male, propodeal side impunctate and dull or if shiny, then at most with sparse pinprick punctures, fore and hind femur excavate ventrally in some species [2, 7].

In general the Sphecid fauna of Iraq have received relatively little attention and only de Beaumont [8] has studied the family of Sphecidae in Iraq, and there are several recent studies conducted on different groups of these wasps [9, 10, 11, 12]. In the present paper, the key to the species of *Liris* in Iraq and redescription supported by figured were studied.

### 2. Materials and Methods

In a faunistic survey in different regions of Iraq during March to November 2014, the materials were collected using aerial and sweeping nets. The materials from Iraq Natural History Museum-university of Baghdad are also included. Terminology and classification follow [2, 7, 13].

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In this study sphecids are treated as one large family including 11 subfamilies, the subfamilies and genera are ordered as in Bohart & Menke [2].

**Abbreviations**

- Epi. S: episternal suture
- F: flagellomere
- Fm: femur
- Gb: gonobase
- Gs: gonostyle
- Mtn: metanotum
- Mspl: mesopleuron
- Mtpl: metapleuron
- Ped: pedicel
- Pl: placoid
- Post.C: postspiracle carina
- Pp: propodeum
- Pr: pronotum
- Pv: penis valve
- S: scutum
- St: gasteral sternite
- Sc: scutellum
- T: gasteral tergite
- Ti: tibia
- t: tarsomere
- V: volsella

**3. Results and Discussions**

Four species were registered in present study; *L. haemorrhoidalis*, *L. atratus*, *L. subtessellata* and *L. nigricans* (this species registered as *L. Nigrita* in checklist and in storage specimens in Iraq Natural History Museum).

**Key to species of *Liris* Fabricius**

**Female:**

- 1- Body reddish-ferruginous with exception some parts are black, gaster covered by golden pubescences color (Fig.1A) ..... *L. haemorrhoidalis* (Fabricius)
- Body in general completely black (Fig.8) ..... 2
- 2- Hind femora with distinctly excavate on posterior side, femora reddish-brown color (Fig. 8 A, 14)..... *L. subtessellata* (Smith)
- Hind femora simple and black ..... 3
- 3- Mesopleuron dull and densely punctuate (Fig.22A); body length 15-18 mm (Fig. 18 A)..... *L. atratus* (Spinola)
- Mesopleuron sparsely punctures leaving polished spaces; body length 8-10 mm..... *L. nigricans* (Walker)

**Male:**

- 1- Body reddish-ferruginous with exception some parts are black, gaster covered by golden pubescences color (Fig.1B) ..... *L. haemorrhoidalis* (Fabricius)
- Body completely black (Fig.8) ..... 2
- 2- Hind femora completely or partially reddish-brown color (Fig. 8 B); flagellomeres II-XI with placoids (Fig. 11) ..... *L. subtessellata* (Smith)
- Hind femora completely black; Flagellomeres III - X with placoids (Fig. 21); body length 10-12 mm (Fig. 18 B)..... *L. atratus* (Spinola)

*L. haemorrhoidalis* (Fabricius, 1804)

**Materials:** (13 specimens; 9 females and 4 males) Baghdad: Abu-Ghraib 22.X.1944 (1♂, 1♀), Wazyria 1.XI.2014 (1♂♂, 3♀♀), Bab- Al-Muadham (3♀♀) 27.V.2014; Wassit, Al-Zubaidiya 30.10.2014 (2♂♂, 1♀); Basra, Al-Qurnah 23.III.1964 (1♀).

**Distribution:** Cape Verde Islands, Cameroon, Central African Republic, Eritrea,

Ethiopia, Kenya, Mozambique, Oman, Socotra, Somalia, South Africa, Sudan, Tanzania, Zimbabwe, India, Afghanistan, Canary Islands, Egypt, Iran, Iraq, Israel, Italy, Kazakhstan, Libya, Morocco, Palestine, Saudi Arabia, Spain, Western Sahara. [14, 15, 16].

**Female:**

Body length 18-20 mm. color; reddish-ferruginous except the following: flagellomeres III-XII, frons, clypeus, vertex, posterior side of head, apical parts of mandibles, thorax, and gasteral sternites III and IV are black, posterior margin of pronotal lobe ferruginous; coxae, trochanters, mid and hind femora, gasteral sternites I, II, V and VI are dark ferruginous; gasteral tergites I-V black with covered by golden pubescences; fore wings hyaline with tinge slightly orange with blackish apices, hind wings hyaline, tegulae and veins ferruginous (Fig.1A).

Head (Fig. 2 A, B): inner orbits converging at vertex, frons and vertex with densely small punctuates; interocular distance on vertex more than length of flagellomere I, posterior ocelli absent; lateral parts of frons beside inner orbits and upper part of clypeus with silvery pubescences; free margin of clypeus entire and curved; antennal sockets closely to fronto-clypeal suture; sculptures on posterior view of head similar to vertex, with sparsely silvery pubescences and became densely beside outer margin of eyes; scape cylindrical and elongate, pedicel short, length and diameter of flagellomeres gradually decrease toward the apical flagellum.

Thorax (Fig.4):: prothorax with pronotum less level compared with scutum in side view, densely small punctures, covered with sparsely silvery pruinous; neck and posterior margin of pronotum with densely golden pubescences in dorsum, pronotal lobe with surface as in pronotum and with golden short hairs on posterior margin. Surface of propleuron as similar to pronotal lobe.

Scutum: admedian, notauli and parapsidal lines can be clearly characterized; sculptures consist from densely fine punctures, lateral and posterior margins covered with densely goldenish-silver pubescences, but median surfaces glabrous.

Scutellum: flat, sculptures similar to scutum and glabrous too. Metanotum: flat, narrow and linear shaped, sculpture as in previous part.

Propodeum: dorsal surface; dull, curly appearance and appears with transverse and well spaced fine lines at lateral margin, medial part glabrous with longitudinal carina, lateral margins with sparse semi-erect and silvery short hairs; posterior side of propodeum sharply and covered with sparse golden short hairs. Lateral surface dull, curly with longitudinal and well spaced fine lines continuous with lines of dorsal surface, covered with sparsely pruinous.

Mesopleuron: Postspiracle carina, episternal sulcus and scrobe are distinct, dull with densely small punctures, with covered by sparsely silvery pruinous.

Metapleuron, mesosternum and metasternum with surface similar to description of mesopleuron.

Legs: fore leg without distinct tarsal rake (Fig.5); fore and hind coxae simple with triangle shaped, mid coxa with median carina elevation on dorsal surface; fifth tarsomere curved to inner side, claws simple.

Gaster: gasteral tergite with many short and suberect golden hairs at posterior margin; pygidial plate setose with nine spinules at posterior margin (Fig.6). Gasteral sternites II-V with short and golden hairs mixed with many stout, erect and

medium length hairs at posterior margin, sternite VI with hairs much stout and variation in length.

**Male:**

Body length 13-16mm; color similar to female (Fig. 1 B). Head (Fig. 2 C, D) as in female but the mandibles with single tooth at base and free margin of clypeus with prominent median lobe separated by depression laterally; F2- F9 with placoids, its starting as small oval shaped, then became wide and along of flagellomeres (Fig. 3). The further description as similar to female with exception: scutum with sparsely pubescences on medial part compared with glabrous in female; gasteral tergites and sternites can be seen seven segments than six in female.

Male genitalia (Fig.7): apices of gonostyles acuminate at tips, with long hairs; volsellae with broad base and acuminate in apical half with small excrescences. Penis valve apices consist combined club-shaped, and with arrange of distinctly teeth toward down and saw-shaped like on internal sides.

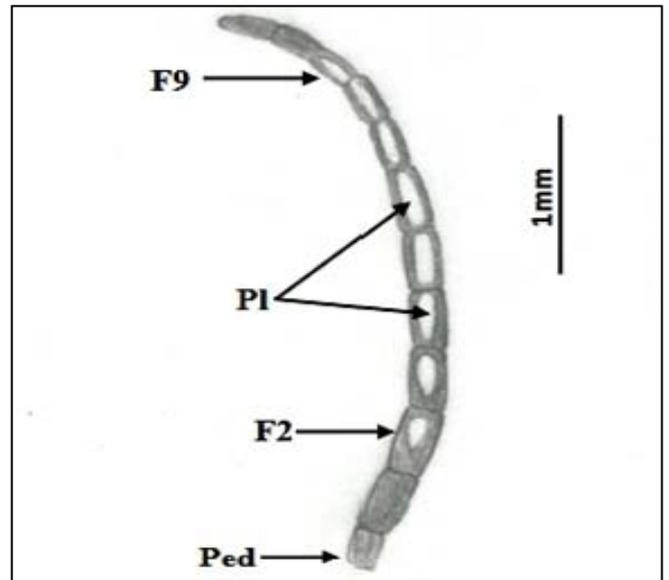


Fig 3: Antenna of *L. haemorrhoidalis*, male



Fig 1: *L. haemorrhoidalis* A- female B-male

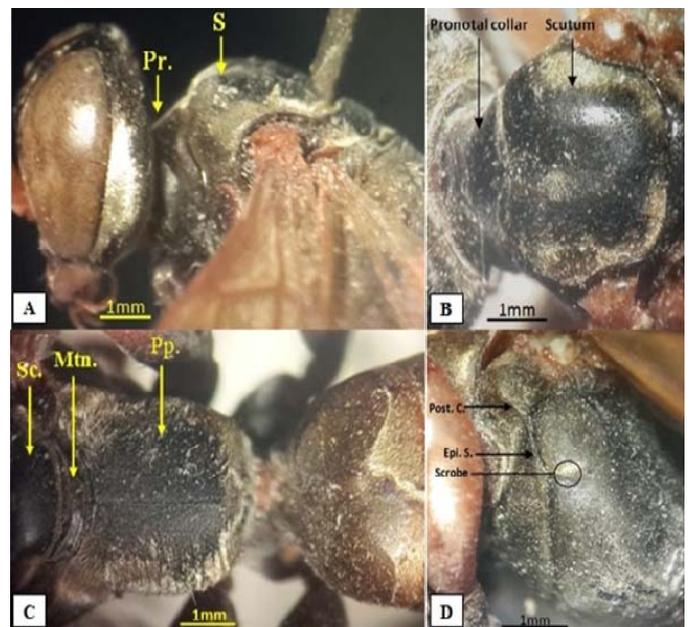


Fig 4: Thorax parts of *L. haemorrhoidalis*, female: A, lateral side of prothorax; B, dorsal view of pronotum and scutum; C, dorsal view of last part of thorax; D, mesopleuraon

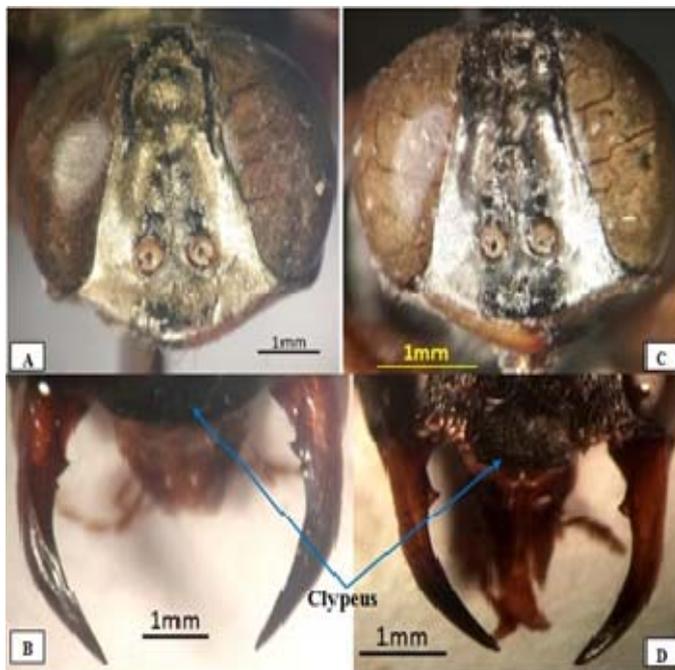


Fig 2: *L. haemorrhoidalis*: anterior view of head A (female) and (male); anterior view of mandibles and clypeus B (female), D (male)

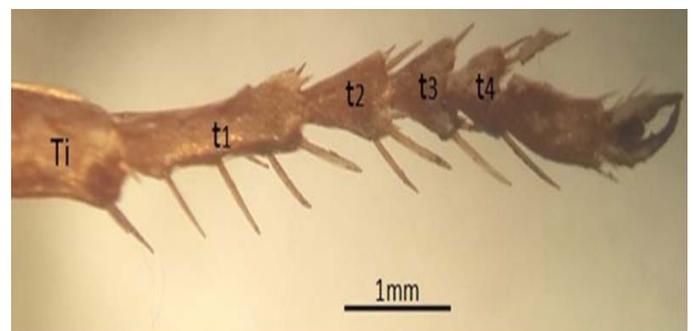


Fig 5: *L. haemorrhoidalis*, tarsal rake of female

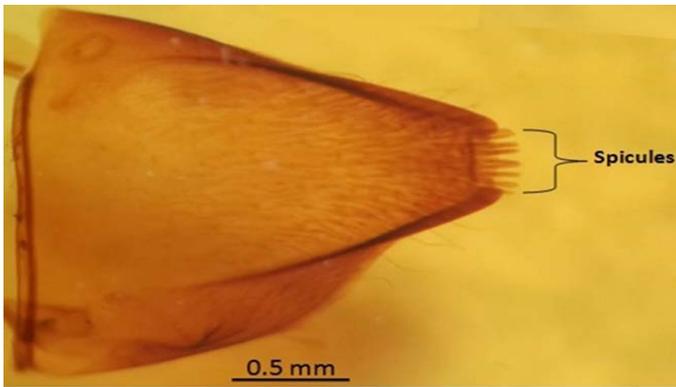


Fig 6: Pygidial plate of *L. haemorrhoidalis*, female

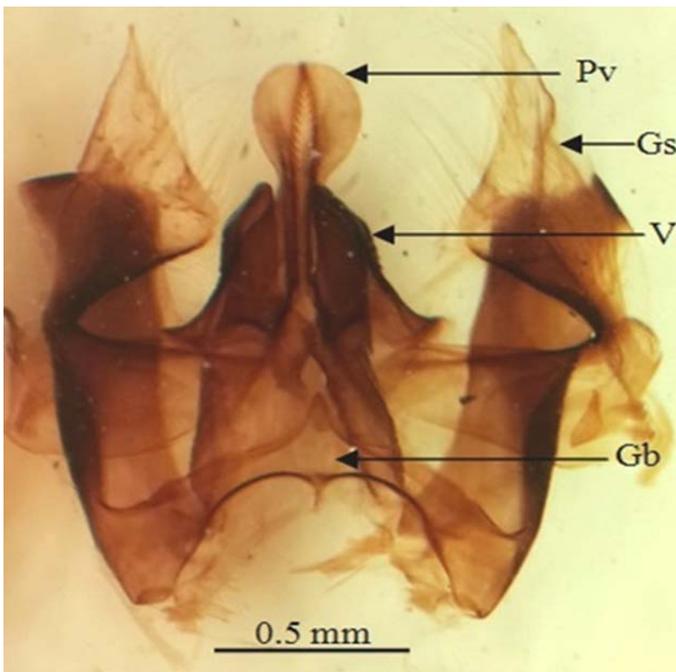


Fig 7: Genitalia of *L. haemorrhoidalis*

#### *L. subtessellatus* (Smith, 1856)

**Materials:** (47 specimens; 9♂♂, 28♀♀); Baghdad, Jaddria 22.V.2014 (1♂, 2♀♀), Sha' ab 1.VI.2014 (3♂♂, 17♀♀), Wazyria 15.X.2014 (2♂♂, 3♀♀); Erbil 3.VIII.1962 (3♂♂, 6♀♀).

**Distribution:** China, Taiwan, Hong Kong, Central to South Asia, Fiji, Hawaiian Islands, Japan, Iran, Iraq (registered as mistake *L. subtessellata*) [7, 17].

#### Female

Body length 12-16 mm; color: completely black with the exception some parts: anterior side of scape dark ferruginous, hind femora reddish-brown, mandibles dark brown and shining; fore wings hyaline and slightly smoky with darker tips, hind wings hyaline, veins black, tegulae dark brown (Fig.15).

Head (Fig.9 A, 10 A): inner orbits distinctly diverging at lower part, converging at upper part; clypeus with silvery shining, densely and decumbent pubescences. Clypeus broad and short, free margin slightly convex with small indentation medially, glabrous with sparsely and different sizes punctures with leave polished spaces, free margin with some suberect, short and black hairs. Middle and upper parts of frons with less pubescences than lateral parts; medio-longitudinal line distinct, sculptures consist from sparsely minute punctures; interocular

distance at vertex equal to flagellomere I; vertex with pubescences and sculpture similar to upper part of frons. Posterior surfaces behind eyes with densely, silvery shining and decumbent pubescences. Antennomeres with dark pruinous with exception the anterior part of scape is glabrous and shiny. Mandibles with two teeth after first quarter, last slightly smaller than first tooth.

Thorax (Fig.12): pronotum depressed much below compare with level of scutum, pronotum with densely and silvery fine pubescences on lateral and less on dorsum side, therefore; can be seen densely and minute punctures. Propleuron with pubescences and sculptures such as lateral side of pronotum.

Scutum with densely minute punctures and leave very narrow polished spaces, dark and sparsely pubescences on whole surface but lateral sides with densely and silvery shining.

Scutellum and metanotum with sculpture similar to scutum and without pubescences. Dorsal side of propodeum dull with reticulate sculptures composed from densely small punctures and covered by shorter hairs and well spaced short ridges at lateral margins that continuous to upper lateral sides of propodeum; posterior sides of propodeum with transverse and well spaced ridges; Lower parts of lateral sides with closely obliquely ridges and continuous with ridges that found on upper parts.

Mesopleuron with distinguish postspiracle carina, episternal sulcus and scrobe, meso and metapleuron dull with densely small punctures, surface covered by densely and silvery pubescences; meso and metasternum with same sculptures but covered by more shiny and densely pubescences.

Tarsal rake (Fig.13) composed from eight thick and moderately length of spines: four on outer side of basitarsus; two on second tarsomere, first spine on outer side of middle part, second spine on outer margin of apex; one spine on outer sides of apices belong to third and four tarsomeres. Hind femora with distinctly excavate on posterior side (Fig.14).

Gaster: first three gasteral tergites with wide and shiny bands on posterior margins covered with densely silvery pruinous, other parts of tergites covered by densely dark pruinous; pygidial plate setose and with eight spicules on posterior margin (Fig.16), covered by silvery with goldenish tinge and densely pubescences.

Gasteral sternites from S3-S5 with long and black setae on posterior margin, S6 with different length and sparsely setae; pale pruinous on sternites few but more little on S4-S6, then surfaces of last sternites more shining.

#### Male:

Body length 8-11 mm; color as to female. Head (Fig.9 B, 10 B): clypeus and lower parts of frons with densely and silvery shining pubescences; clypeus wider than long, free margin with large prominent lobe and slightly convex; free margin with bare stripe and polished surface covered by suberect long and thick black hairs. Upper part of frons with pubescences less density and shiny, therefore; small punctures appeared leave narrow and polished spaces that less than diameter of punctures. The interocular distance at vertex as long as combined the length of pedicel and F1, and distinctly less than combined length of F1 and F2. Vertex with minute punctures and more densely than upper part of frons, and covered by moderately dense and dark pruinous; other parts behind outer orbits with densely, silver shining and decumbent pubescences; mandibles with single small tooth at on submedian of internal margin.

Placoids on F2-F11 wide and distinct but on F11 incomplete and narrow with gradually acuminate apically (Fig.11).

Thorax and propodeum similar to female; gaster: T1-T5 with

bands composed from silvery and shining pruinosis at near the posterior margins, other tergites with less shiny and mixed with dark pubescences and increased gradually toward last tergites. Gaster sternites with dark pruinosis and some erect, short and thick hairs on the posterior margins from S2-S8.

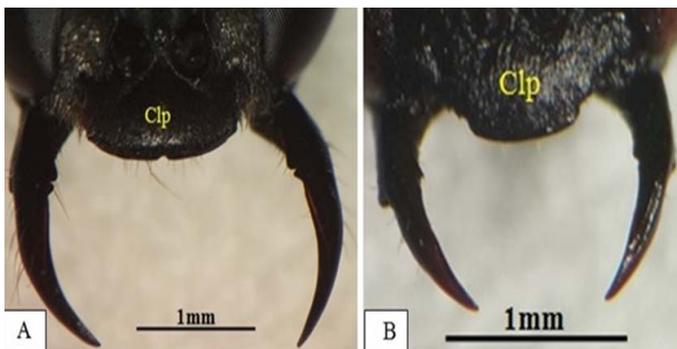
Genitalia (Fig. 17): penis valves similar to *L. haemorrhoidalis*, but the internal sides with smaller teeth, gonostyles with much hairs and the apical part of volsellae thin compare with this species.



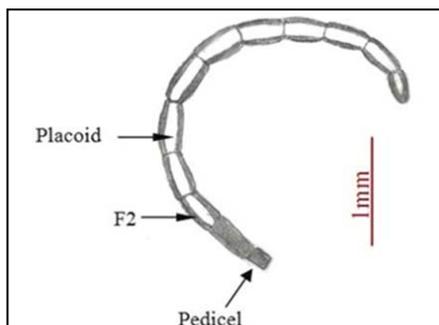
**Fig 8:** *L. subtessellatus* A) female B) male



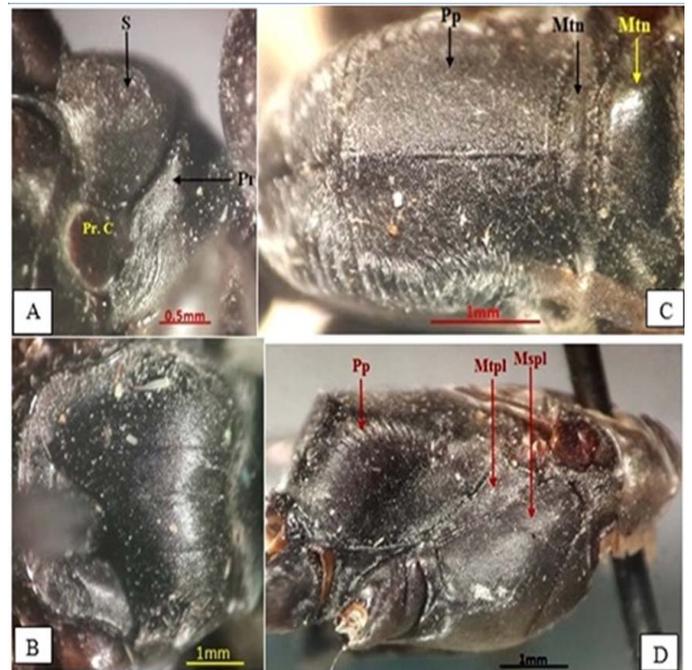
**Fig 9:** Head of *L. subtessellatus*, anterior view A) female B) male



**Fig 10:** *L. subtessellatus*, lower part of head, anterior view: A) female B) male



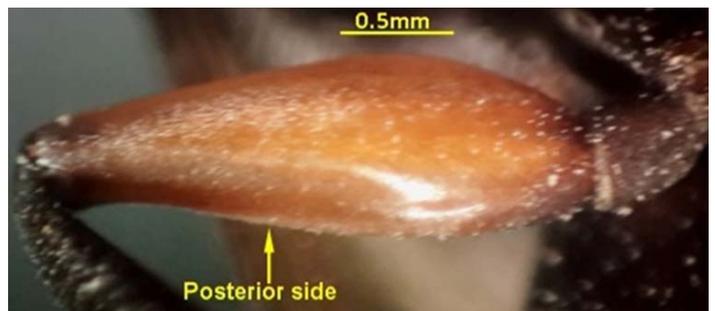
**Fig 11:** Antenna of *L. subtessellatus*, male



**Fig 12:** Thorax of *L. subtessellatus*, female A) lateral side of anterior parts B) scutum C) dorsal surface of posterior part D) lateral side thorax



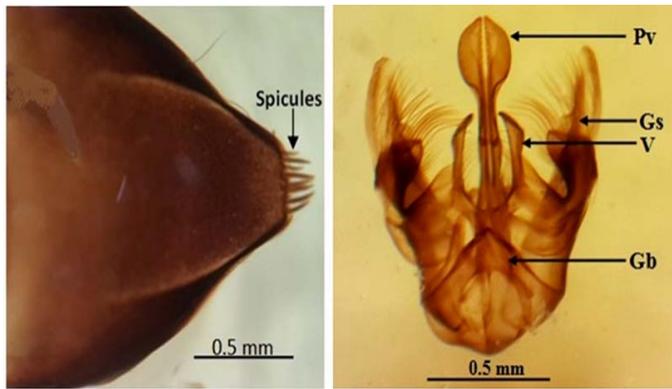
**Fig 13:** *L. subtessellatus*, tarsal rake of female



**Fig 14:** Hind femur of *L. subtessellatus*, female



**Fig 15:** Wings of *L. subtessellatus*, female



**Fig 16:** Pygidial plate of *L. subtessellatus*, **Fig 17:** Male genitalia of *L. subtessellatus*

### *L. atratus* (Spinola)

**Materials:** (35 specimens; 11♂♂ males, 24♀♀) Baghdad, Dora 1.IV.2014 (3♂♂, 7♀♀), Wazyria 1.XI.2014 (1♂, 3♀♀), Bab- Al-Muadham (1♂, 4♀♀); Wassit, Al-Zubaidiya 4.V.2014 (6♂♂, 10♀♀).

**Distribution:** France, Iberian peninsula, Canary Is., Mauritania, Spanish Sahara, Algeria, Chad, Libya, Egypt, Palestine, Syria, Turkey, Cyprus, Iraq, Iran<sup>[7, 18]</sup>.

### Female

Body completely black; wings dark smoky, veins black (Fig. 18 A).

Head (Fig. 19 A, 20 A): inner orbits converging at vertex; clypeus short and wider, swollen medially with small punctures the leave polished wide spaces, apical margin with curved free edge; frons and vertex with relatively dense with small punctures and leave shining spaces in some parts. Lateral area of clypeus depressed, with densely black pubescences. Frons covered with moderately dense of black pubescences at nearly of inner orbits; anterior ocellus found only; posterior part of vertex with moderately dense punctuations and black pubescences but silvery and densely at alongside of the outer orbits.

Prothorax (Fig. 22 A, 23 A): pronotum with sparsely black pubescences, but more densely and mixed with dissimilar length hairs on propleuron, punctures small and densely; Level of pronotum less than scutum; neck with densely black pubescences on dorsal side.

Scutum covered by moderately dense of pubescences, punctures small and densely but there are many spaces shining. Scutellum and metanotum with densely small punctures and glabrous and dull. Dorsal side of propodeum dull and densely small punctures, glabrous, longitudinal line or fissure can be seen clearly; posterior side with surface sharp, coarsely and transverse ridges; lateral sides dull and coarse surface, and can be characterized with very thin longitudinal lines.

Mesopleuron: Postspiracle carina, episternal sulcus and scrobe are distinct, dull with densely small punctures, with covered by sparsely, moderately densely length and silvery pruinous.

Legs: fore legs with distinctly on tarsal rake (Fig. 24), composed from seven long spines: three on outer margin of basitarsus and there are two on outer side of the apical of second tarsomere, one spine on each outer sides of tarsomeres three and four; tarsal claws simple without teeth. Hind femora without distinctly excavate on posterior sides.

Gaster covered with densely pruinous, posterior margin of gaster sternites II-V with some short and erects stout hairs,

sternite VI with sparsely short and erect stout hairs but more length laterally. Pygidial plate (Fig. 25) with densely small punctures, the apical part and lateral sides covered by short setosa; posterior margin with eight different spinules.

### Male:

Body length 10-12mm; color: body completely black, wings slightly smoky with darker tips, hind wings hyaline; apical part of mandibles dark brown; pubescences silvery color.

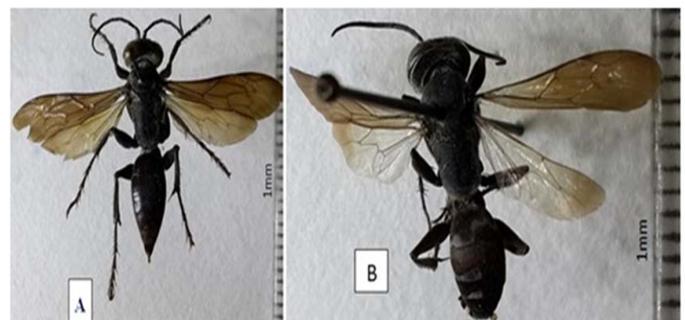
Head (Fig. 19 B, 20 B): inner orbits strongly diverging at lower and distinctly converging at upper part; Clypeus short, wide and slightly swollen; apical margin with prominent large lobe and curved free edge, with some moderately length and thick black hairs, lateral sides depressed. Clypeus and frons with densely and prone pubescences on lateral parts, middle parts glabrous and polished with densely and small punctures. Interocular distance at vertex distinctly more than combined length of pedicel and flagellomere I; vertex and posterior parts behind compound eyes with sculptures similar to that on clypeus and covered by sparsely pubescences. Internal margin with large single tooth at basal half; Antennomeres with dark pruinous, flagellomeres from III to X with wide placoids (Fig. 21).

Prothorax (Fig. 22 B, 23 B) : pronotum with dorsal surface level more depressed than level of scutum; sculptures such as that on sculptures on clypeus and covered by silvery and shiny pubescences especially on neck and propleuron.

Scutum dull, with notauli, admedian and parapsidal lines distinctly; with densely and minute punctures and leave narrowed shining spaces; lateral sides covered by dark pruinous. Scutellum and metanotum without medio-longitudinal depression, sculptures as on scutum. Propodeum: dorsal side rough and consist from densely small punctures and characteristic by medio-longitudinal depression and continuous on posterior sides, posterior side with acute surface and reticulate appearance; dorsal and posterior sides with moderately density, erect, short and dark hairs. Hairs and sculptures on lateral sides similar to dorsal side.

Mesopleuron: postspiracle carina, episternal sulcus and scrobe are distinct, sculptures on mesopleuron, metapleuron, mesosternum and metasternum such as sculptures of scutum and covered by moderately density and black pubescences.

Fore femora with slightly excavate on ventral sides; hind femora with distinct excavate posteriorly. T1-T5 with densely black pruinous but there are silvery shining and densely at posterior margin; T6 with less and black pubescences; T7 with short, decumbent and silvery tend to pale hairs. S1-S5 with densely black pruinous, S2-S6 with some short and thick black hairs but there are more and sparsely on S7 and S8. Head of penis valves elongate compared with previous species, and with small and closely teeth on internal side; apical half of volsellae thin and undulating surface (Fig. 25).



**Fig 18:** *L. atratus* A) female B) male

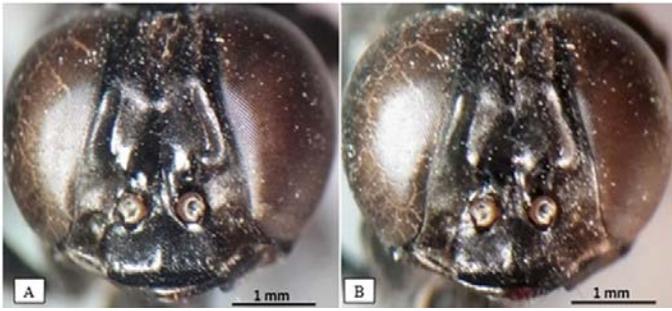


Fig 19: *L. atratus*, anterior view of head A) female B) male

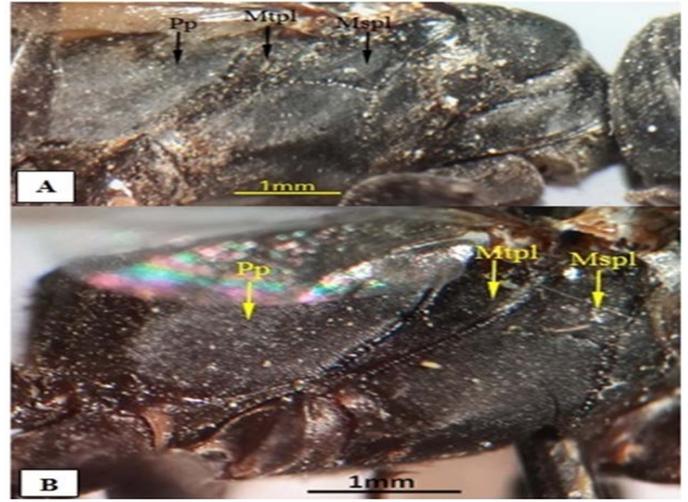


Fig 23: Lateral side of thorax, *L. atratus*; A) female B) male



Fig 20: Lower part of *L. atratus*, A) female B) male

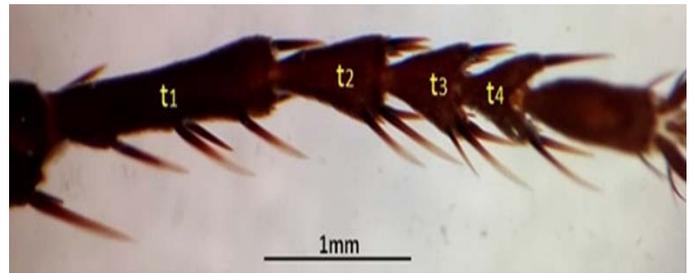


Fig 24: Tarsal rake of *L. atratus*, female

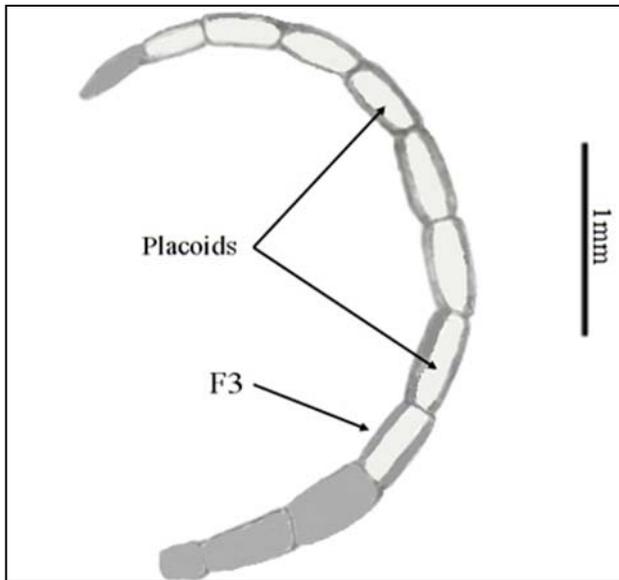


Fig 21: Antenna of *L. atratus*, male

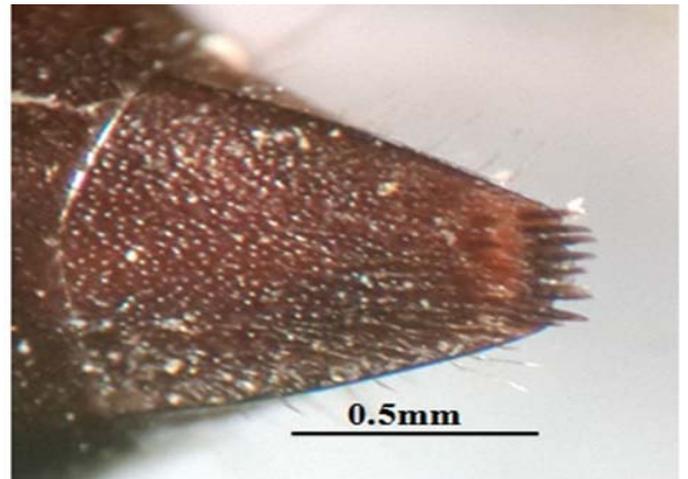


Fig 25: Pygidial plate of *L. atratus*, female

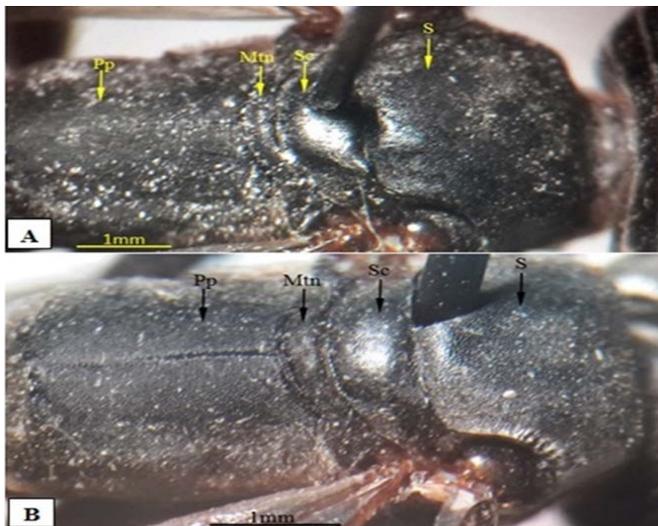


Fig 22: Dorsal side of thorax, *L. atratus*; A) female B) male

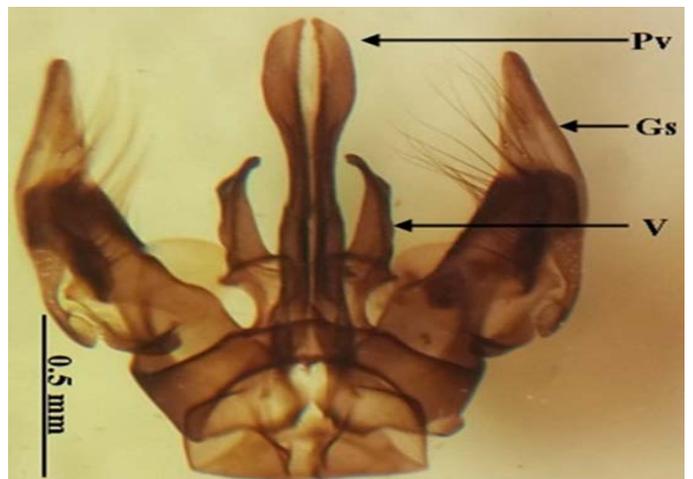


Fig 26: Male genitalia of *L. atratus*

***L. nigricans* (Walker, 1871)**

**Materials:** (2♀ specimens); Baghdad, Wazyria 9.IV.1963 (1♀); Wassit, Aziziya 4.V.2014 (1♀).

**Distribution:** Canary Islands, Spanish Sahara, Algeria, Libya, Chad, Egypt, Palestine, Syria, Cyprus, Turkey, Iraq, Oman [18, 19, 20, 21].

**Female**

Body length 8-10 mm (Fig. 27); color: completely black with exception the parts are dark brown: mandibles, anterior side of scape, posterior margin of pronotal lobe, tegulae, tarsi, wing veins and lateral sides of gasteral tergites. Fore wings hyaline and tend to smoky with darker tips, hind wings transparent.

Head(Fig. 28): inner orbits divergent in lower part and convergent at the upper part; clypeus wider than length, covered with somewhat long decumbent and silver shining pubescences, apical margin with many long and black hairs, free margin with small notch medially, and small and single indentation laterally; frons with medio-longitudinal depressed line but less distinct compare with female of *L. subtessellatus*, lower part of frons with pubescences similar to that found on clypeus, upper part with sculpture consist from small punctures that leave narrow and polish spaces, but in some parts that spaces wider than diameter of punctures. Vertex with a surface similar as upper part of frons, an interocular distance at vertex as long as combined the length of F1 and F2. Parts behind the eyes and vertex with densely, decumbent and silvery pubescences. Antenna; interspace between antennal sockets less than diameter of antennal pits, antennomeres covered with densely dark pruinous.

Thorax(Fig. 29): prothorax with sparsely and silvery pubescences; pronotum in middle raised nearly to level of scutum, lateral sides of pronotum with obliquely striae, pronotal lobe without sculptures; neck and propleuron with densely small punctures.

Scutum with densely small punctures that leave narrow and polished spaces, black pubescences sparsely and more densely at near the lateral sides. Scutellum and metanotum with densely minute punctures but leave polished spaces that wider than spaces on scutum. Propodeum: dorsal and posterior sides with reticulate surface that composed from moderately, densely and coarsely punctures; lateral side with obliquely rugae and tend to horizontal at near of metapleuron; dorsal and lateral sides with sparsely and silvery pubescences that mixed with some suberect and short silvery hairs; posterior side covered with short, moderately density, erect and silvery hairs. Mesopleuron with sparsely small punctate, interspaces between punctures polished and covered with sparsely, short, decumbent, suberect and silvery hairs. Metanotum similar to lateral side of propodeum; meso and metasternum such as mesopleuron for about sculptures and hairs.

Legs: tarsal rake not development compared with other species, fore femur with distinctly excavate on ventral side (Fig.30); hind femur simple.

T1-5 and S1-5 with silvery and densely pruinous; T5 with some erect, black and short hairs; pygidial plate similar to *L.*

*subtessellatus*. S3-S5 with long some erect and black setae on posterior margin, more and sparsely on S6.



**Fig 27:** Female of *L. nigricans*



**Fig 28:** *L. nigricans* A) anterior view of head B) mandibles



**Fig 29:** Thorax of *L. nigricans*, female A) dorsal side B) lateral side



**Fig 30:** Fore leg of *L. nigricans*, female

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