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Identification key to species of sphecini (Hymenoptera: Sphecidae: Sphecinae) in Iraq

Razzaq Shalan Augul[1], Mohammad Saleh Abdul-Rassoul[1], Ibrahim K. Kaddou[2]

[1] *Iraq Natural History Research Center and Meusum, Baghdad University, Iraq*

[2] *Department of Biology, College of Science, Baghdad University, Iraq*

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Abstract

In this study, 150 specimens of the Sphecini tribe (Hymenoptera: Sphecidae: Sphecinae), collected from different region of Iraq are investigated. Nine species belonging to two genera were determined; this species are: *Sphex flavipennis* Fabricius, *S. pruinosus* Germar, *S. zubaidiyacus* Augul, *Prionyx crudelis* (F. Smith), *P. macula* (Fabricius), *P. stschurowskii* (Radoszkowski), *Prionyx viduatus* (Christ,), *Prionyx lividocinctus* (A. Costa), *Prionyx niveatus* (Dufour) and *Prionyx kirbii* (van der Linden). The last two species have been recorded for the first time in Iraq. Identification keys to genera, species and figured of male genitalia are illustrated.

***Corresponding Author:** Razzaq Shalan Augul ✉ razzaqshalan@gmail.com

Introduction

The Sphecidae is a cosmopolitan family of wasps, currently there are more 9660 described species distributed throughout the world (Pulawski, 2014). Adults feed on nectar, pollen and juices containing high amount of sugar while the larvae need adults or larvae of different insect orders and Araneida (Murray, 1940; Gillott, 2005).

In this tribe, there are five genera: *Sphex* Linnaeus, *Prionyx* Vander Linden, *Isodontia* Patton, *Chilosphex* Menke and *Palmodes* Kohl (Bohart and Menke 1976). Honor (1944) designed a diagnostic key to species of *Sphex* Linnaeus in Egypt depending on many morphological characters such as: teeth of tarsal claws, free edge of clypeus, pectin spur that found on in margin of hind tibia, submarginal cells and related with recurrent veins; and the author placed the *Prionyx* van der Linden and *Palmodes* Kohl within the genus of *Sphex* as a subgenera.

The genus of *Prionyx* van der Linden is well distinguished from the related genera, *Palmodes* Kohl and *Chilosphex* Menke. Females of *Prionyx* differ in having a convex clypeus with a straight or arched free margin, in some species with a small median notch. The female clypeus of *Palmodes* and *Chilosphex*, two closely related genera, is more or less flattened, and its free margin is notched and divided into three lobes, developed to varying degrees in different species (Bohart and Menke, 1976).

Previous studies in Iraq are examined the other tribes; Ammophilini and Sceliphronini (Augul *et al.* 2013, 2014) respectively; also the registered the *Sphex zubaidiyacus* Augul as a new species in Iraq (Augul, 2013).

This study was suggested to recognize of the Sphecini species and to complete the formerly works as mentioned above in Iraq by using many morphological characters especially male genitalia.

Materials and methods

The adult of wasps (150 specimens) were collected by aerial net from different regions of Iraq and old specimens be got from Iraq natural history museum, the locality and date of collection were provided on the labels. The new specimens are mounted and deposited in the Iraq natural history museum. The morphological terminology used herein follows that proposed by Bohart & Menke *(1976)*. In preparation of genera and species keys are many publications modification to adequate the Iraqi specimens (Honore, 1944; Bohart & Menke, 1963 and 1976; Guichard, 1986 and 1988; Roche & Gadallah, 1999; Menke & Pulawski, 2000). Complete information including the localities and dates of captures are listed.

The following morphological abbreviations are used: gasteral sternite (S), abdominal tergite (T), Pronotal collar (PC), scutum (S), scutellum (St) , submarginal cell (SMC), propodeum (P), tarsal claw (t), dorsal side of propodeum (DP).

Results and discussion

In the present study there are 10 species belong to two genera(tribe: Sphecini) were diagnosed, keys to genera and species were provided:

Key to genera of Sphecini

1-Length of basal vein of SMC2 equal to or shorter than anterior vein (Fig.1); inner hind tibial spur finely and closely pectinate (Fig.2); propodeum with complete spiracular groove (Fig.3) ..... ***Sphex*** Linnaeus

- Length of basal vein of SMC2 greater than anterior vein (fig.9a); pectin of inner hind tibial spur coarsely and well spaced, at least on the distal half or near the middle (fig9b); spiracular groove absent..... ***Prionyx*** van der Linden

Genus ***Sphex*** Linnaeus, 1758

Sphex **Linnaeus, 1758. Syst. Nat. ed.10, 569; 1767, ed. 12, 941.**

Sphex Linnaeus,1758 belong Sphecini tribe is a cosmopolitan genus with species are moderate to very large wasps (11-47 mm), this genus separated from other closely genus especially *Isodontia* Patton by having complete spiracle groove on propodeal side; species characters are easy to find especially in the males, male genitalia offer good characters and the number and arrangement of placoids on the male flagellum are very useful in species discrimination (Bohart and Menke, 1976; Hensen, 1991); members nest in the ground, often gregariously, their prey is composed of crickets and grasshoppers (Guichard, 1988; Roche, 2007).

Beaumont(1961) studied these wasps in Iraq and registered *S. afer* Lep.(= *S. leuconotus* Brulle), then Kaddou(1967) added *S. maxillosus* F. (= *S. funerarius* Gussak.) and *S. pruinosus* followed by El-Haidari *et al.* (1971) mentioned to that *S. flavipennis* Fabricius found in Iraqi fauna. Augul (2012) redescribed and registered just two species belonging to this genus: *S. flavipennis* and *S. pruinosus* throughout the survey from March 2010 to November 2011 from some governorates of Iraq.

Augul (2013) described the *S. zubaidiyacus* Augul (printing error in abstract of the last paper as *S. zubaidiyanis*) as a new species from Iraq.

Key to species of *Sphex*

Males:

1-Body partially red (fig.4) .....*S. flavipennis* Fabricius

-Body entirely black (fig.5, 8a).....2

2-Flagellomeres from 3 to 6 with wide placoids (fig.6a); dorsal surface of propodeum with transverse ridges (fig. 7a); head of penis valve with coarse and well spaced teeth on ventral side, head and stalk without construction, stalk relatively wide (fig.7b); anal cerci cylindrical shaped (fig.7b) .....
S. pruinosus Gemer

-Flagellomeres from 5 and 6 with slightly placoids (fig.6b); dorsal of propodeum without ridegs; head of penis valve with fine and closed teeth on ventral side, head and stalk with construction, stalk narrow (fig. 8b); anal cerci pear-shaped (fig. 8c)..... ***S. zubaidiyacus*** Augul

Females:

1-

bdomen entirely black (fig.8a) ..... ***S. zubaidiyacus***

Abdomen partially red (Fig. 4, 5) 2

2-Dorsal surface of propodeum black with strongly transverse ridegs (Fig. 7a); forewings clear with smoky tips well defined, hindwings clear (Fig. 5) ..... ***S. pruinosus***

-Dorsal of propodeum dark red without transverse ridegs; wings flavous with darker tips (Fig. 4) ..... ***S. flavipennis***

Sphex zubaidiyacus Augul, 2013

Sphex zubaidiyacus Augul, 2013. Inter. J. Adv. Res. 1(5): 475-484.

Material (9♀♀, 18♂♂): **Wassit**; Sher'han village 12.VII.2010 (1♀,5♂♂), 28.V.2011 (4♀♀,6♂♂), 29.V.2011(5♀♀,7♂♂).

Distribution: Iraq.

Sphex flavipennis Fabricius, 1793

Sphex flavipennis Fabricius, 1793. Ent. Sys. 2:201

Material (10♂♂, 1♀): **Duhok**, Sheranish mountain: 26.IX.2010 (3♂♂, 1♀), Anishka (3♂♂), So'laf (2♂♂),); **Erbil**: Khulifan, 20.VII.2011 (2♂♂).

Distribution: Iraq, United Arab Emirate, Saudi Arabia, Algeria, Bulgaria, China, Croatia, Greece, Italy, Iran, Kazakhstan, Kyrgyzstan, Macedonia, Morocco, Russia, Spain, Syria, Tajikistan, Tunisia, Turkey, Turkmenistan, Afghanistan and Uzbekistan.

Sphex pruinosus Germar, 1817

Sphex pruinosa Germar, 1817 - Reise nach Dalmatien: 261, 6.

Material (36♂♂, 21♀♀): **Duhok**, Sheranish mountain: 26.IX.2010 (6♂♂, 5♀♀), Anishka (4♂♂, 1♀), So'laf (5♂♂, 1♀); **Wassit**: Sek'ran village, 18.IX.2010 (15♂♂, 7♀♀), 3.X.2010 (6♂♂, 5♀♀); **Baghdad**: Abu-Graib, 29.IX.2010 (2♀♀).

Distribution: Mediterranean area, N Africa, Saudi Arabia, Iraq.

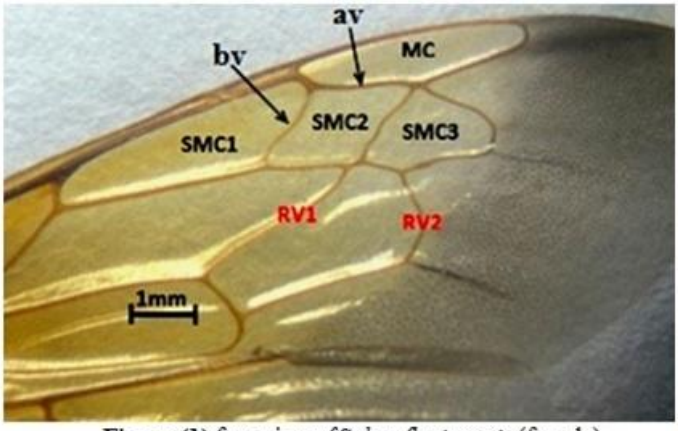

Figure (1) forewing *of Sphex flavipennis* (female)

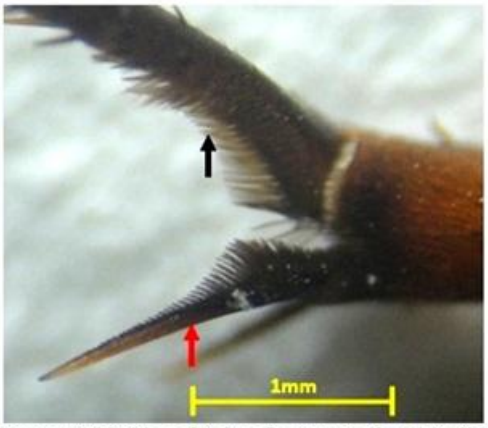

Figure (2) hind leg of *Sphex flavipennis* (female): tibial spur (red pointer) and basitarsus (black pointer)

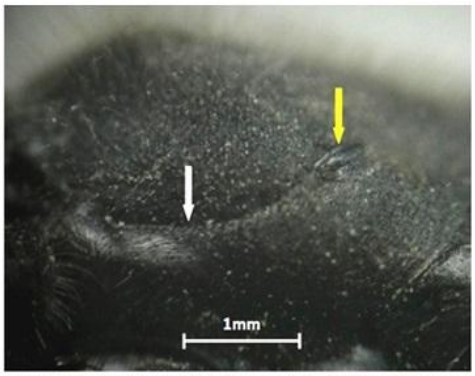

Figure (3) male of *Sphex flavipennis*, lateral side of propodeum (Yellow pointer: Propodeal Spiracle; white pointer: spiracle groove)

Figure (4) habits of *Sphex flavipennis*

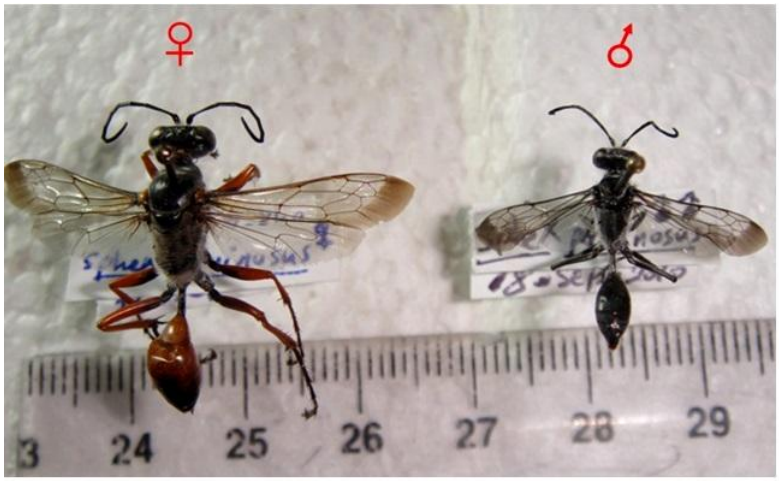

Figure (5) habits of *Sphex pruinosus*

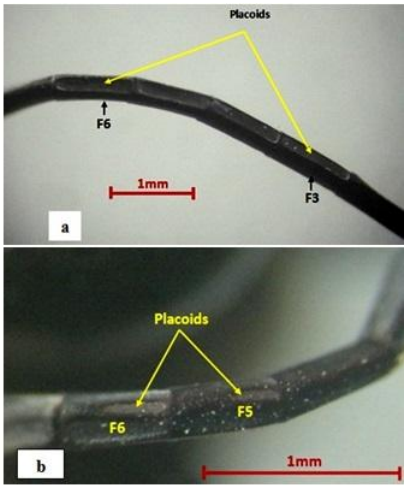

Figure (6) flagellomeres of antennae in males a) *Sphex pruinosus* b) *S. zubaidiyacus*

Figure (7) male of *Sphex pruinosus* **a)** dorsal of propodeum **b)** penis valve **c)** eight abdominal tergite (T8) with anal cerci

Figure (8) *Sphex zubaidiyacus* **a)** habits **b)** penis valve of male **c)** eight abdominal tergite (T8) with cerci

Prionyx Van der Linden, 1827

The genus *Prionyx* Vander Linden includes 59 described species and is represented in all zoogeographical regions, predominantly in the Palearctic (Pulawski, 2014). The genus is a characteristic component of arid and semiarid areas. Among 32 Palearctic species, five occur in the Central Europe and south of European Russia, three penetrate into Southern Siberia, and one is founded in the Russian Far East. Twenty-two species occur in North Africa, Middle East and Central Asia (Kazenas, 1978, 2001 & 2002).

In Iraq, previously there are five species were recorded in *Prionyx crudelis* (F. Smith), *P. macula* (Fabricius), *P. stschurowskii* (Radoszkowski), *P. viduatus* (Christ,), *P. lividocinctus* (A. Costa) (Beaumont, 1961; Kaddou, 1967; Khalaf and Al-Omar, 1974; Gadallah, 2013). In the present study the species *P. niveatus* (Dufour) and *P. kirbii* (van der Linden) have been recorded for the first time in Iraq.

Key to species of *Prionyx*

Males:

1-Body entirely black; tarsal claws with two teeth; large-sized insects (19-27mm) (fig.10) 2

-Body partially red; tarsal claws with three teeth; smaller insects (13-16mm) (fig.11) ..... ***P. kirbii*** (van der Linden)

2-Wings yellowish orange with black tips(fig.12a); Metanotum with pyramidal-shaped process(fig.12b); posterior margin of sixth sternite (S6) simple; head of penis valve clearly shorter than stalk(fig.12c) ..... ***P. crudelis*** (Smith)

-Wings smoky with violet reflections (fig.10b); Metanotum simple; posterior margin of sixth sternite (S6) with process laterally (fig.13a); head of penis valve equal to length of stalk (fig.13b) ..... *P. macula* (Fabricius)

Females:

1-Tarsal claws with two teeth (fig.10c) 2

-Tarsal claws with three (fig.11c) or more teeth (fig.14a) 4

2-Abdomen reddish ferruginous with ivory strip; medium sized insects (fig.15a, b) ..... ***P. niveatus* (Dufour)**

- Abdomen black (fig.15c); relatively large sized insects 3

3- Wings yellowish orange with black tips, second recurrent vein (Rv2) received in SMC3 (fig.12a); metanotum with pyramidal-shaped process (fig.12b) ..... ***P. crudelis***

-Wings hyaline with black light tips, second recurrent vein (Rv2) received between SMC2 and SMC3 (fig. (fig.15d); metanotum simple ..... ***P. stschurowskii*** (Radoszkowski)

4-Tarsal claws with three teeth; posterior margin of tergites with ivory color strips (fig.11c)..... ***P. kirbii***

- Tarsal claws with four teeth (fig.14a), posterior margin of tergites with pale color strips (fig.14d) 5

5-Level surface of pronotal collar lower than scutum (fig.14b); scutellum with simple median- longitudinal depression, pronotal collar, scutum and scutellum relatively bare; dorsal of propodeum with U shaped bare(fig.14c) ..... ***P. viduatus*** (Christ)

-Level surface of pronotal collar and scutum equally in side view; scutellum without median- longitudinal depression; pronotal collar, scutum and scutellum completely covered by hairs and pubescences .....***P. lividocinctus*** (A. Costa)

Prionyx kirbii (van der Linden, 1827)

Ammophila kirbii van der Linden, 1827. N. Mem. Ac. Roy. Brux , IV:360.

Material (11♂♂, 17♀♀): Wassit: Al-Zubaidiya (Sherhan village) 26.VII.2010 (1♂, 5♀♀), 6.VIII.2010 (6♂♂, 4♀♀); Sek'ran village 9.X.2010 (2♂♂, 3♀♀); Duhok, Ser'senk (Gara mountain) 27.IX.2010 (2♂♂, 3♀♀); Baghdad: Abu-Graib, 30.IX.2010 (2♀♀)

Distribution: Southern Europe, Africa, western and central Asia, Italy, Switzerland, Spain, France and Greece, Austria, Hungary, Slovakia and Czech Republic, newly recorded in Iraq.

P. crudelis (F. Smith, 1856)

Harpactopus crudelis F. Smnith, 1856. Cat. Hym. Insects Brit. Mus., 4: 264.

Material (8♂♂, 11♀♀): Wassit: Al-Zubaidiya (Sherhan village) 6.VIII.2010 (3♂♂, 2♀♀), Sek'ran village 19.IX.2010 (1♂, 4♀♀); Kerbala, Ain Al-Tamar 24.IX.2010 (1♂); Baghdad: Abu-Graib, 30.IX.2010 (1♂, 3♀♀); Basra: Safwan 5.IV.1986 (2♂♂, 2♀♀)

Distribution: Ethiopia, Kenya, Madagascar, Mauritania, Mauritius,
Oman, Somalia, Sudan, Tanzania, UAE, Yemen, Zaire), OR (India), PA (Bulgaria, Cyprus, Egypt, Germany, Greece, Iraq, Iran, Israel, Kazakhstan, Kuwait, Saudi Arabia, Seychelles, Tajikistan, Turkey, Turkmenistan.

P. macula (Fabricius, 1804)

Pepsis macula Fabricius, 1804. Sys. Piez.: 210, n.14.

Material (1♂): Basra province: Safwan 5.IV.1986

Distribution: Iraq, Saudi Arabia, Kuwait, North Africa, Kenya, Palestine, Israel, Iran, Afghanistan,

Armenia, Azerbaijan, Kazakhstan, Tajikistan, Turkmenistan, Uzbekistan.

P. niveatus (Dufour, 1863)

Sphex niveata Dufour, 1863. Ann. Soc. Ent. France , 3 (1):377.

Material (2♀♀): Basra province: Basra 9.VI.1982.

Distribution: Saudi Arabia, UAE, Qatar, Oman, Yemen, North Africa, Palestine, Iran, Djibouti, Malawi, Mauritania, Niger, South Africa, Sudan, Afghanistan, Israel, Jordan, Kazakhstan, Kuwait, Mongolia, Spain, Tajikistan, Tunisia, Turkey, Turkmenistan, Uzbekistan, newly recorded in Iraq.

P. stschurowskii (Radoszkowski, 1877)

Sphex stschurowskii Radoszkowski, 1877. Bull. Soc. Ent. Fr. (5):7.

Material (1♀): Baghdad: Abu-Graib, 26.III.1958.

Distribution: Iraq, Saudi Arabia, Algeria, Egypt, Palestine. Israel, Libya, Morocco, Tunisia, Western Sahara.

P. lividocinctus (A. Costa, 1858)

Enodia lividocinctus A. Costa, 1858. : 377.

Prionyx lividocinctus (A. Costa, 1858). Mus. Zool. Uni. Coimbra No. 294: 1-5.

Material (2♀♀): Diyala province: Adhaim 27.III.1977 (1♀); Baghdad: Abu-Graib, 26.IV.1983.

Distribution: Iraq, Algeria, Libya, Egypt, Turkey, Iran, Spain, France, Italy, Greece, sw USSR.

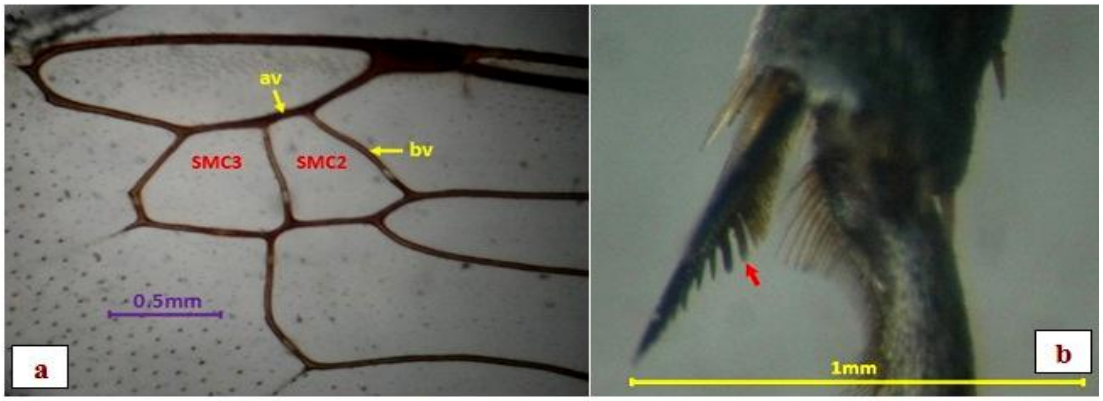

Figure (9) forewing of *Prionyx kirbii* (male): tibial spur (red pointer) of hind leg

P. viduatus (Christ)

Sphex viduata Christ, 1791. Naturgesch. Insekt, 305.

Material (2♀♀): Baghdad: Abu-Graib, 26.IV.1983 (1♀); Nineveh, Mosul 18.V.1985 (1♀).

Distribution: Iraq, UAE, Saudi Arabia, Yemen, Egypt, Algeria, Morocco, Libya, Cameroon, Ethiopia, Gabon, Mauritania, Niger, Senegal, Somalia, Tanzania, Zaire, Iran, India, Sri Lanka, Thailand, Taiwan, Vietnam, Afghanistan, Canary Islands, China, Cyprus, France, Greece, Israel, Italy, Japan, Kazakhstan, Kyrgyzstan, Malta, Portugal, Russia, Spain, Tajikistan, Tunisia, Turkey, Turkmenistan, Ukraine, Uzbekistan, Western Sahara.

Figure (10) a) *Prionyx crudelis*, male b) *P. macula*, male c) *P. crudelis*, male tarsal claws of hind leg: teeth (black pointer); apico-ventral setae (yellow pointer); arolium (red pointer)

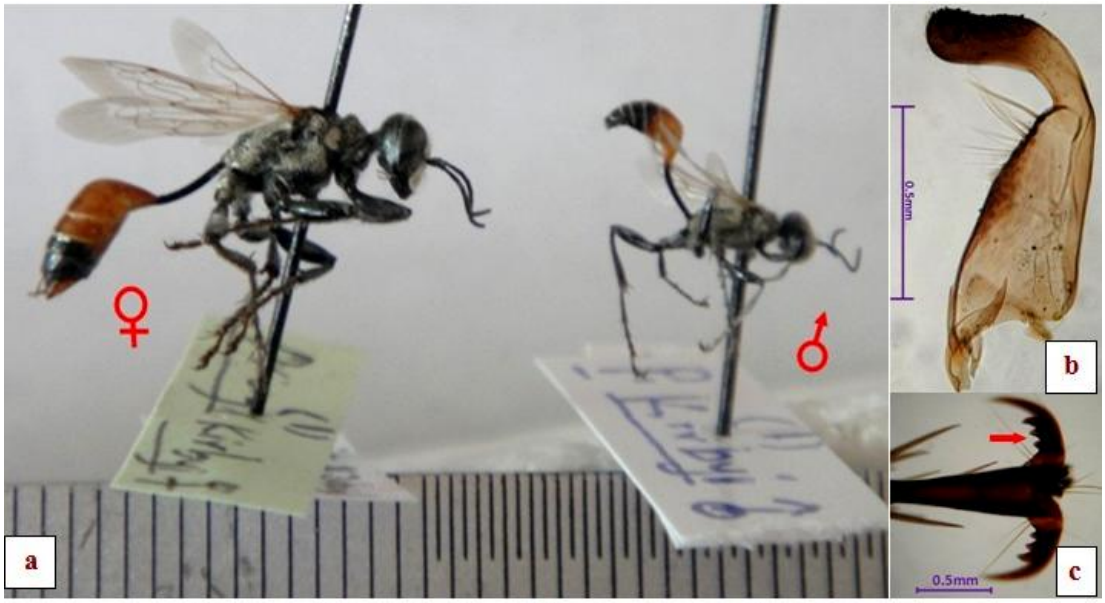

Figure (11) *Prionyx kirbii* a) habits b) penis valve c) tarsal claws of hind leg

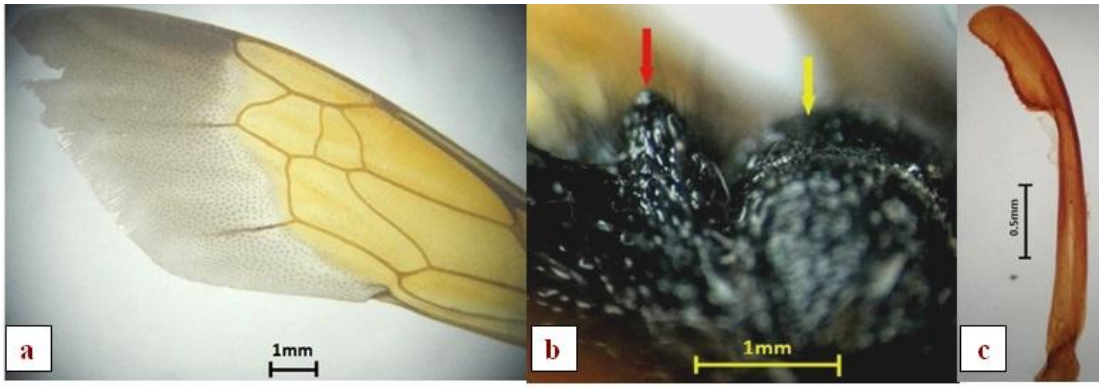

Figure (12) male of *Prionyx crudelis* a) forewings b) some parts of thorax: side view (scutellum: Yellow pointer: red pointer: metathorax c) penis valve

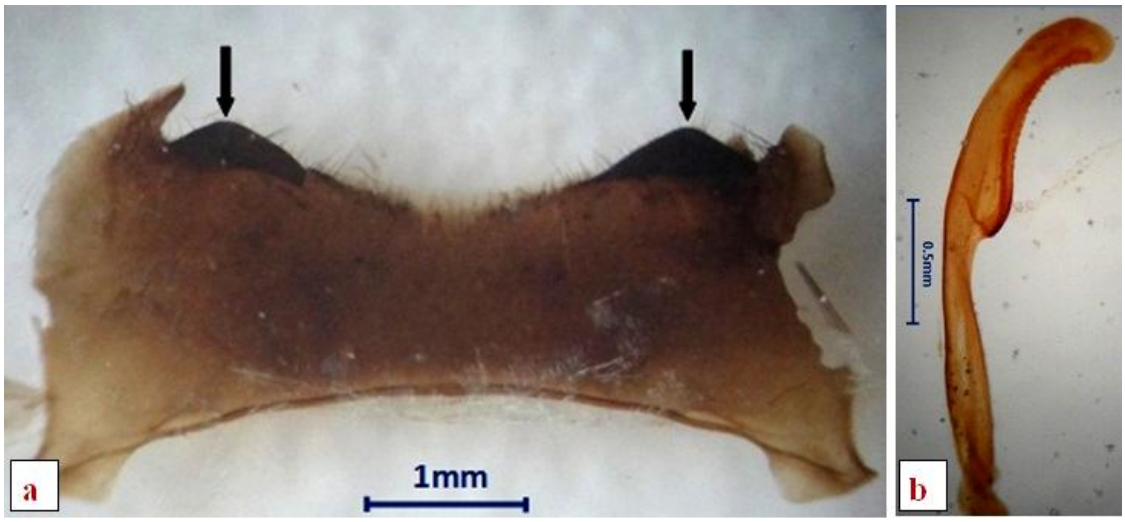

Figure (13) male of *P. macula* a) sixth abdominal sternite (S6) b) penis valve

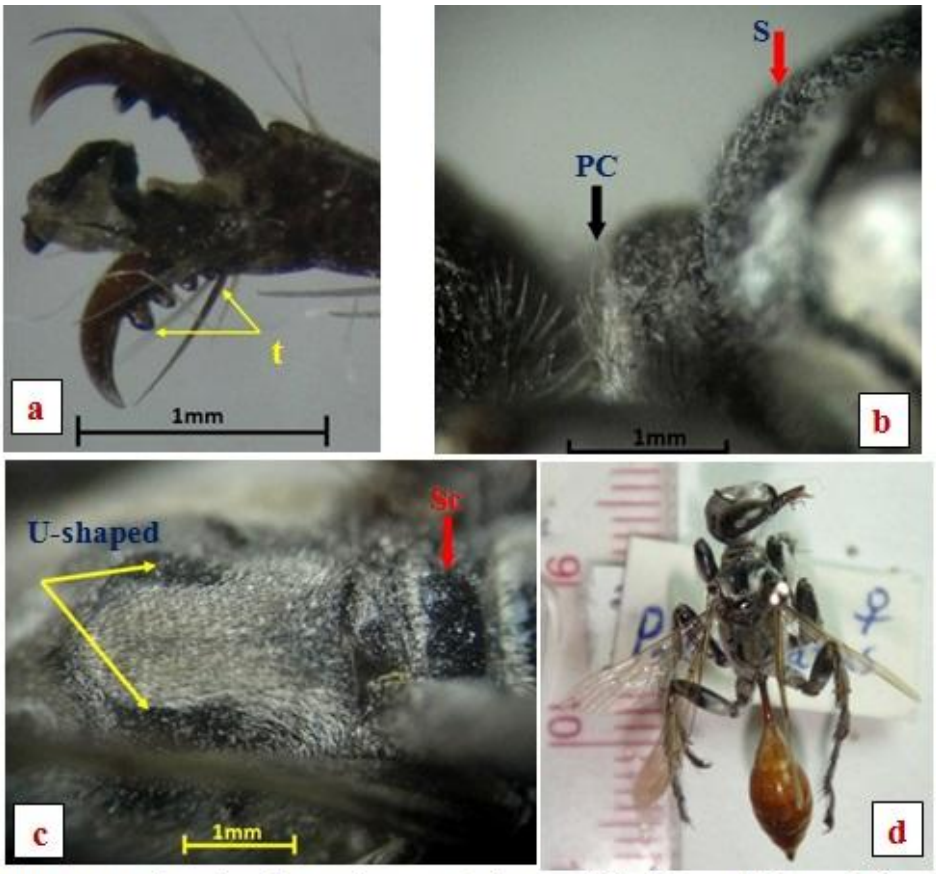

Figure (14) female of *P. viduatus* a) claws of hind leg b) lateral thorax c) dorsal side of end thorax and propodeum d) habit

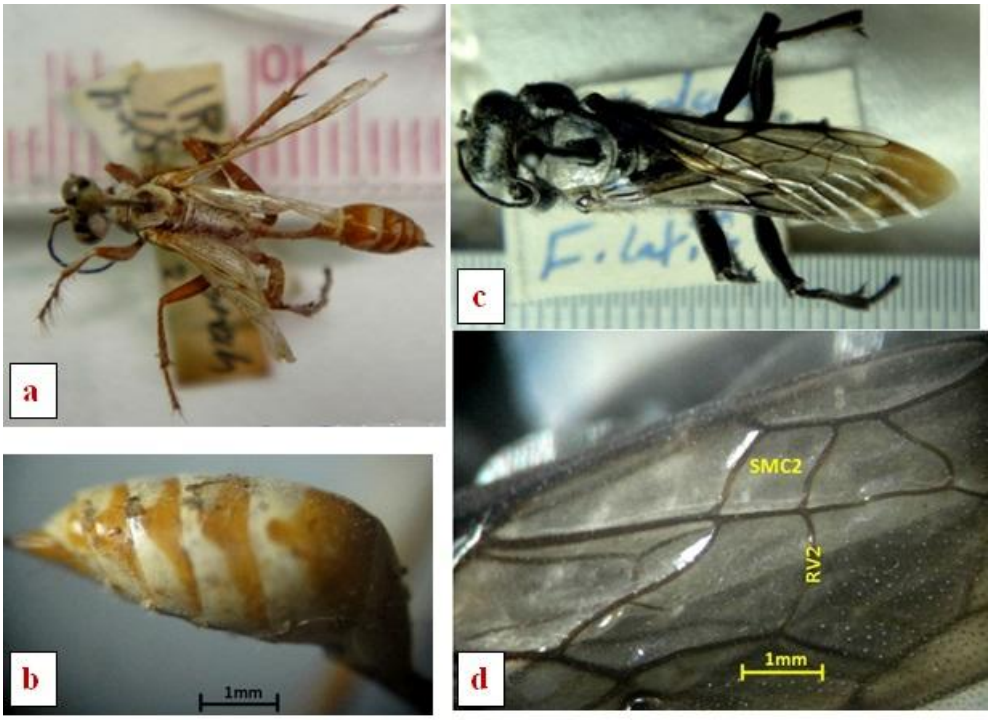

Figure (15) *P. niveatus*: female (a) and gaster (b); *P. stschurowskii* (c) female and forewing (d)

Discussion

The taxonomical keys in the present paper depended on actual specimens which have collected throughout this study or that stored in Iraq natural history museum, university of Baghdad and other collections in different universities. The purpose of this is to emphasize the actual species in the Iraqi fauna, supported by images of male genitalia. The study also concludes the possibility for error in the diagnosis of some of the species mentioned in the previous lists, or to the large changes in environmental elements, especially in the Iraqi environment and successive wars that have led to the disappearance of some species.

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