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ORIGINAL ARTICLE

NEW TAXA OF DIGGER WASPS: TRIBE, OXYBELINI (CRABRONIDAE, HYMENOPTERA) FROM IRAQ

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ABSTRACT

New distinguishing genus, *Oxybelochardus* gen. nov., belonging to the tribe Oxybelini (Hymenoptera: Crabronidae), with the type species *Oxybelochardus iraqensis* sp. nov. from Iraq, have been described and illustrated. The diagnostic characters and differences from the close genera that were distributed and listed in the Palearctic Region are presented.

Keywords: Crabronidae, Digger wasp, Iraq, Oxybelini, *Oxybelochardus*.

INTRODUCTION

Oxybelini tribe is easily distinguished by the two squamae projecting back from the metanotum and by a median spine borne by the base of the propodeum; the inner orbit of the eyes convex, not converging toward the clypeus; and the longitudinal free part of vein A1 is lost or present as a trace. These wasps nest in sand and provide their nests with flies (Comstock and Comstock, 1895). These wasps small and partly bee-like forms with fast motions and rapid flight, mostly seen as they light on sand and other dry ground, or as they fly around the tops of flowering bushes (Bohart and Menk, 1976).

A tribe is a world-wide distribution simply recognizable by the combination of the following features: fore-wing with a single submarginal cell that is confused with discoidal cells, exception the genus of *Wojus* Antropov, 1999 has two submarginal cells; metanotum with lateral extending, semi translucent squamae; and the propodeum with projection which is called the propodeal mucro (Lomholdt, 1984).

According to Pulawski (2023), there are fifteen genera belonging to this tribe, which include: *Belarnoldus* Antropov, 2007; *Belokohlus* Antropov, 2007; *Belomicrinus* Antropov, 2000; *Belomicroides* Kohl, 1899 ; *Belomicrus* A. Costa, 1867; *Brimocelus* Arnold, 1927; *Enchemicrum* Pate, 1929; *Gessus* Antropov, 2001; *Guichardus* Antropov, 2007; *Minimicroides* Antropov, 2000; *Nototis* Arnold, 1927; *Oxybelomorpha* Brauns, 1897; *Oxybelus* Latreille, 1797; *Pseudomicroides* Antropov, 2001 and *Wojus* Antropov, 1999 .

New taxa of digger wasps

In Iraq, the taxonomic articles are few and scattered about Hymenoptera are and restricted about some guilds (Augul, 2019; Kareem *et al.*, 2021; Pham and Dang, 2021); we describe in this paper a new genus of Oxybelini be included in Hymenoptera represented by ten specimens caught from different regions of Iraq, and provide a type species for this taxon.

MATERIALS AND METHODS

Collection: The specimens examined during this study were collected throughout the survey and sought to determine whether the wasps belong to the Crabronidae that distribution in Iraq. Adults were collected by sweep nets, and then mounted with insect pins. Three specimens of them are deposited in Iraq Natural History Research Center and Museum –University of Baghdad under the museum number (HYC.1.023).

Morphology and Identification: The identification keys of Schmid-Egger (2021) and Antropov (2005a, b, c, d; 2006) are used to diagnose the wasps. The specimens were observed and figured with the aid of Honor X8 mobile camera and a digital microscope camera on OPTIKA microscope, also camera Lucida with ZEISS microscope to illustrate the mandibles, fore coxa, and lateral view of the thorax carina. The morphological terms used for the descriptions of the new taxa were mostly taken from Bohart and Menke (1976).

Abbreviations: The abbreviations used in the current investigation are as follows:

Ad: admedian line

Ax: axillae paired areas on scutum associated with scutellum.

Ed: edegus

Ep: episternal sulcus

Gs: gonostyles

INHRCM: Iraq Natural History Research Center and Museum –University of Baghdad

Mc: mucro spine like projection of propodeum.

Oc: occipital

Om: omaulus

Poc: preoccipital

Pc: precoxal

Sm: subomaulus

Sq.: metanotum squama a scale like structure

St: sternaulus

Abbreviation of measurements: (Fig. 1)

X: distant between posterior ocelli

Y: distant between posterior and anterior ocellus

Z: distant between posterior ocelli and eye

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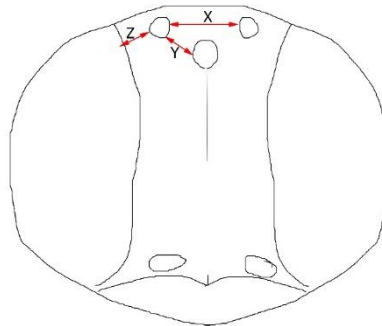


Figure (1): Shows the distances between ocelli and compound eyes.

RESULTS AND DISCUSSION

Oxybelochar dus gen. nov.

Generic diagnosis: Morphological characters of *Oxybelochar dus* gen. nov. and close related genera that are distributed in the Palearctic Region according to Antropov (2006) and Schmid-Egger (2021) as shown in Table (1), in addition to unique features such as axillae and serrated hind tibia.

Based on the previous studies, there are two genera belonging to Oxybelini: *Oxybelus* (Roche and Gadallah, 1999) and *Guichardus* (Antropov, 2007) recorded in Iraq. *Oxybelus* can be recognized by having carinae on lateral T1-T2 only (Roche and Gadallah, 1999); whereas the differences between *Guichardus* and *Oxybelochar dus* are given in Table (1).

Table (1): The different features between *Oxybelochar dus* and related closely genera.

Characters	<i>Oxybelochar dus</i> sp. nov.	<i>Oxybelomorpha</i> Brauns, 1897	<i>Belomicrus</i> Arnold, 1927	<i>Guichardus</i> Antropov, 2007
Psammophore	Absent	Present	Absent	Absent
Mesopleuron with joint postspiracular carina, omaulus, sternalus, and precoxal carinae	All present	All present	All absent	Omaulus, precoxal present only
Mucro	Straight	Strongly curved downwards	Straight	Curved inwards apically
Metanotum squama	Separated and not close metanotum behind	United to a semicircle platform	Separated and not close metanotum behind	Very widely spaced and expose metanotum behind

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Etymology: The genus name of the new taxon was given, because it combines the morphological characters of the three genera: *Oxybelomorpha*, *Belomicrus* and *Guichardus* together.

Type species *Oxybelocharidus iraqensis* sp. nov.

Holotype: 1♂ 27.ix.2022 collected from one banks of Great Zab River, nearby the Veen Waterfall, Duhok Province (37°02'05.2"N 43°44'36.5"E) (Pl. 1).

Allotype: ♀ unknown.

Paratype: 3 ♂♂ 27.ix.2022, collected from one banks of Great Zab River, nearby the Veen Waterfall, Duhok Province (37°02'05.2"N 43°44'36.5"E) (Pl. 1); 2 ♂♂ in 25.ix.2022 specimens collected from Bejeel Waterfall, Duhok Prov. (36°43'40.3"N 44°00'58.6"E); 2 ♂♂ in 29.x.2023 specimens collected from Tarmiyah, Baghdad Prov. (33.658038, 44.384402); 2 ♂♂ undiagnosed specimens previously and stored in INHMRCM collected from Baghdad, Al Mushahidah District; Current specimens are deposited in INHMRCM under the museum number (HYC.1.023).

Etymology: The species was named according to the specimens' distribution country "Iraq".



Plate (1): Bank of the Great Zab River, near the Veen Waterfall, Duhok Province.

Morphology

General description: Body length about 5.5-6.0 mm, mainly shiny black except the following parts: pronotal collar, pronatal lobe, scutellum, squama, and axillae (apical margin transparent), metasoma marking and spots on tergites with whitish yellow; three antennal segments apically, tegulae, mandibles, middle and hind tibia, pygidium, and tarsi brown; wings venation mainly dark brown, sculpture of body irregularly covered with semi-erect

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silver and gilded silver hair in different directions and lengths. Metasoma has an irregular coloring pattern (Pl. 6A).

Head (Pl. 3A): Rounded frontally; Inner orbits semi parallel, facets at median part of eye 2–3 times as large as those in upper part; frons with longitudinal median depression (Pl. 3A), but not reach to anterior ocellus; clothes by densely hairs triangle near antennal sockets; hairs on upper part silver with golden tint and semi erect in various direction, whereas recumbent toward below and silvery on lower part; vertex regularly convex, large, distance between posterior ocelli and posterior margin of vertex as long as length of scape, covered with moderately density, silvery, short and erect hairs; sculptures with irregular size punctures and separated by narrow inter space that appeared rogues surface; clypeus wider than long, divided by three longitudinal strongly carinae, particularly the median one composed of keel-shaped, with margin tridentate apically, medial point with acute angle, covered by slightly recumbent hairs silver on upperpart then bronze on lower part; ocelli distinct, consist of an obtuse triangle with down apex, X twice distances Y and Z. Mandible (Fig 2.A) slightly arcuate and acuminate apically and with longitudinal carina on outer surface, inner margin with single and simple tooth medially; antennal scape excavated and emarginated entirely (Pl. 3C), first two and four terminal flagellomere longer than wide, third segments wider than long (Fig 2 B), color ranges from dark brown to ferruginous apically and covered with pubescence; temples widened obviously laterally with punctures and semi- erect gilded silver hair like top of vertex; with occipital carina distinct dorsally (Pl. 3B), incomplete ventrally; not reaches the hyposotomal carina ventrally and distinct preoccipital carina do not complete too distinct laterally; parietal areas narrow with large punctures leave surface shiny and rugose also covered with gilded silver hairs in various density forward.

Thorax and appendages: Pronotal collar margin concave apically, divided with fine narrow medial impression covered with sparse and whitish pubescence that increase toward pronotal lobe; pronotal lobe rounded posteriorly, clothed by tufts and whitish short hairs; mesoscutum convex (Pl. 2), with scattered puncture larger than vertex puncture and covered with golden semi-erect short hair, admedian line (Pl. 4) clearly marked, scutellum convex too with pair of axillae (Pl. 4) translucent laterally derived from scutum and clear carina for long way admedian line and with same mesoscutum puncture in first part, second half rugose and with some long hairs; metanotum short transversely convex admedian lines clearly mark as well, squama metanotum (Pl. 4) separated in the curved inwards with raised hairs along inner margins in varying length. Propodeum rugose with short mucro (Pl. 4), color ranges from black at the base to ferruginous, then transparent apically, concave on anterior portion, length of spine (in dorsal view) more than triple its width at apex, apex of spine like (W-shaped); mesopleuron convex (Pl. 4) at sides, flatly at anterior part; rugose like second half of scutellum covered with gilded silver hairs at upper three-quarters and silver hairs on remaining part, episternal sulcus fine, omalus, submodules, postspiracular and sternaulus carina present; precoxal sulcus curved downwards reaching sternaulus (Fig. 2 C). Metapleuron narrow, with a rugose appearance covered with silver pubescence with a bronze tint at apex (Fig.2 C).

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Fore wigs: Characterized by truncate of marginal cell apically) (Pl 5).

Legs (Pl. 2): Shiny, covered with white hairs vary in length and density, tarsi and trochanters not modified; Fore coxa excavated (Fig1 D), fore femur (Pl. 2) longitudinally depressed along outer margin; hind femur (Pl. 2) depressed as well; hind tibia (Pl. 2) with several spines that well-spaced and composed of serrate shaped dorsally.

Metasoma: Tergites (Pl. 6A) with an irregular coloration pattern, having carinae laterally, sculpture mainly formed by large punctures with smooth intervals between punctures, except anterior first tergite with dense and smaller punctures covered with silver hairs increasing in length and decreasing in density toward posterior margin; rest of tergites covered with sparse silver and short hairs, increase in length and density toward apex, hairs on last tergites slightly longer than first; pygidial plate truncate apically, and has fine punctures and recumbent hairs (Fig 2. E). Sternites (Pl. 6.B) shiny with mixed and irregular punctures, covered with sparse recumbent silver and short hairs that increase on S1 laterally.

Male genitalia (Pl. 6C): Volsella absent; penis valve apices consist of combined club-shaped; gonostyles simple with several short hairs apicolaterally on external sides.

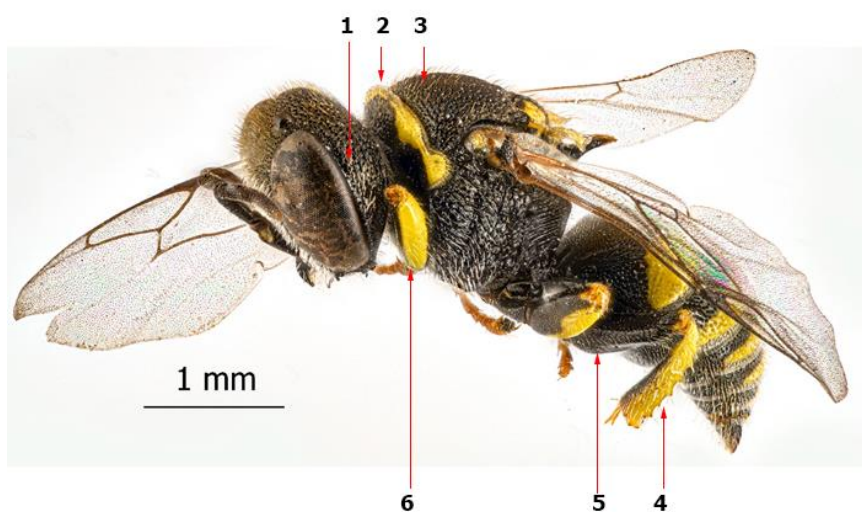


Plate (2): Male of *Oxybelocharodus iraqensis* sp. nov.; lateral view; (1) Temple; (2) Pronatal collar; (3) Scutum; (4) Hind tibia; (5) Hind femur; (6) Fore femur.

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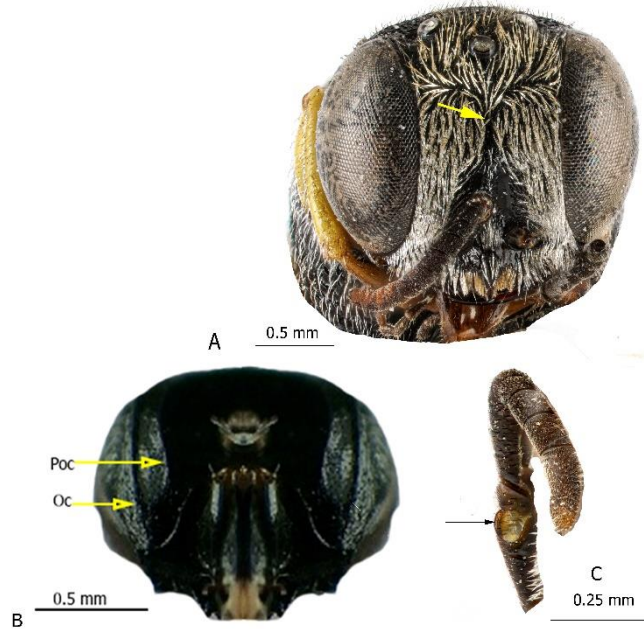


Plate (3): Head of *Oxybelocharodus iraqensis* sp. nov. (♂); (A) Front view (yellow arrow: longitudinal median depression); (B) Head ventral view and (C) Antennal scape.

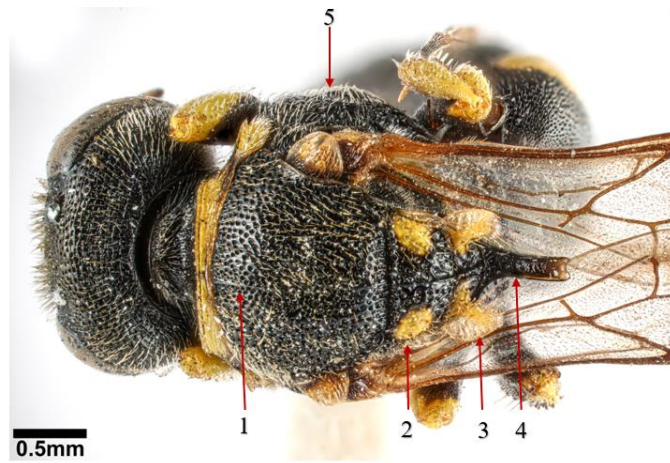


Plate (4): Thorax of *Oxybelocharodus iraqensis* sp. nov. (♂); (Dorsal view); (1) Ad; (2) Ax; (3) Sq; (4) Mc; (5) Mesopleuron.

New taxa of digger wasps

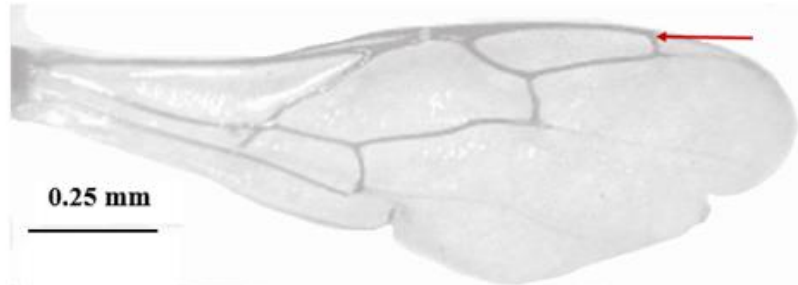


Plate (5): Forewing of *Oxybelocharodus iraqensis* sp. nov. (♂); Red arrow: marginal cell.

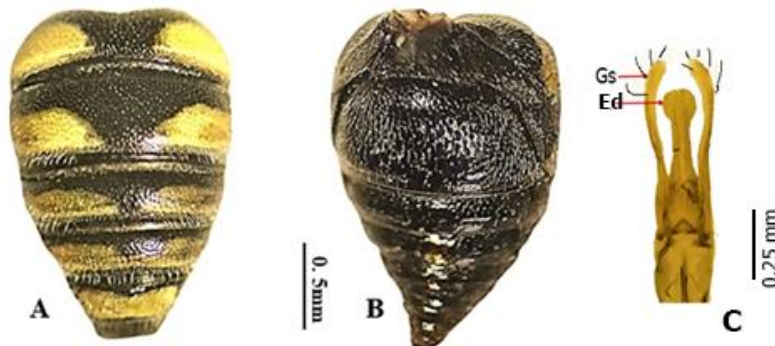


Plate (6): Metasoma of *Oxybelocharodus iraqensis* sp. nov. (♂); (A) Dorsal view, (B) Ventral view, (C) Genitalia ventrally. [Red arrow: (1) Gs; (2) Ed].

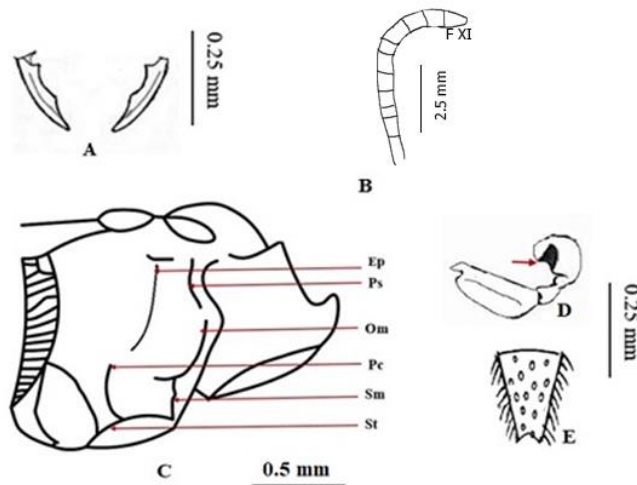


Figure (2): *Oxybelocharodus iraqensis* sp. nov. (♂); (A) Mandible, (B) Antennal segments, (C) Thorax (side view; red arrow: represented important diagnostic characters), (D) Fore coxa (red arrow: excavation), (E) Pygidia plate.

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CONCLUSIONS

According to our observations, there is a high similarity among the genera belonging to Oxybelini that causes confusion in the diagnosis of the study specimens; so we recommend to conduct more investigations about those wasps in other regions of Iraq; especially the ecological studies, to get acquainted with their habitat to know the behavior of them, for the purpose of catching females, and studying them taxonomically. This conclusion in agreement with Bohart and Menke (1976).

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CONFLICT OF INTEREST STATEMENT

The results of the present study are part of the requirements of the M.Sc. in Zoology, Department of Biology, College of Science, Al Mustansiriyah University for the first author. As well, we are the authors of this manuscript, declare and confirm that we have no significant financial or other relationship with any official institution.

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اصنوفات جديدة من الزنايير الحفارة قبيلة *Oxybelini*
(Hymenoptera, Crabronidae) من العراق

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تأريخ الاستلام: 2023/4/9، تأريخ القبول: 2023/6/12، تأريخ النشر: 2023/12/20

الخلاصة

جنس مميز جديد للعلم *Oxybelochardus* gen. nov. يعود إلى قبيلة *Oxybelini* من عائلة زنايير *Crabronidae* رتبة غشائية الاجنحة Hymenoptera، و النوع الجديد النمطي له *Oxybelochardus iraqensis* sp. nov. وصفت و صورت من العراق. تم عرض الصفات التشخيصية والاختلافات مع الأجناس القريبة منه المنتشرة و المسجلة للمنطقة القطبية القديمة.