

A new species of *Dioxys* Lepeletier & Audinet-Serville from southern Spain, with notes on the classification of Dioxyini (Hymenoptera: Megachilidae)

BY MICHAEL S. ENGEL

Division of Invertebrate Zoölogy, American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024-5192, U.S.A.

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ABSTRACT

A new Palearctic species of the cleptoparasitic bee genus *Dioxys* Lepeletier & Audinet-Serville (Megachilinae: Dioxyini) is described and figured from southern Spain. *Dioxys falsificus* sp. n. is most similar to *D. pumilus* Gerstäcker, a species that occupies areas more easterly around the Mediterranean (at least from Sardinia eastward and potentially in eastern Morocco eastward). It is possible that historical records of *D. pumilus* from southern Spain apply to *D. falsificus*. A revised key is provided to the genera of Dioxyini, and the South African *Dioxoides alata* Michener is transferred to *Notodioxytes* gen. n.

Keywords: Apoidea, Dioxyini, Megachilinae, taxonomy, South Africa, Spain

INTRODUCTION

The genus *Dioxys* Lepeletier & Audinet-Serville (Megachilinae: Dioxyini) is a rather distinctive Holarctic lineage of cleptoparasitic bees whose species victimize bees of the tribes Anthidiini, Megachilini, and Osmiini (Michener 2007). There are 18 described species, most of which are found in the Western Palearctic, with five species in western North America and the Old World species extending from the Canary Islands to Turkmenistan and Uzbekistan (Michener 2007). Species can be notoriously difficult to distinguish and sometimes differ by seemingly minor differences. *Dioxys pumilus* Gerstäcker is a fairly common widespread circum-Mediterranean species (Warncke 1977), most often encountered from Italy eastward to eastern Turkey and southward to Israel. A recent examination of a population from southern Spain, north of Gibraltar, however, has revealed a second, seemingly cryptic species, easily confused with *D. pumilus*. That species is described here and compared with *D. pumilus*. It is likely that historical records of *D. pumilus* from Spain (e.g., Warncke 1977) are actually of the species described herein and the same may be true for some occurrences in western Morocco. Appended is a revised key to the genera of Dioxyini, relegating the South African *Dioxoides alata* Michener to a separate genus.

MATERIAL AND METHODS

Specimens reported herein are deposited in the Division of Entomology, University of Kansas Natural History Museum, Lawrence, Kansas, USA (SEMC) and Division of Invertebrate Zoölogy, American Museum of Natural History, New York, New York, USA (AMNH). Comparative material of other species of *Dioxys* as

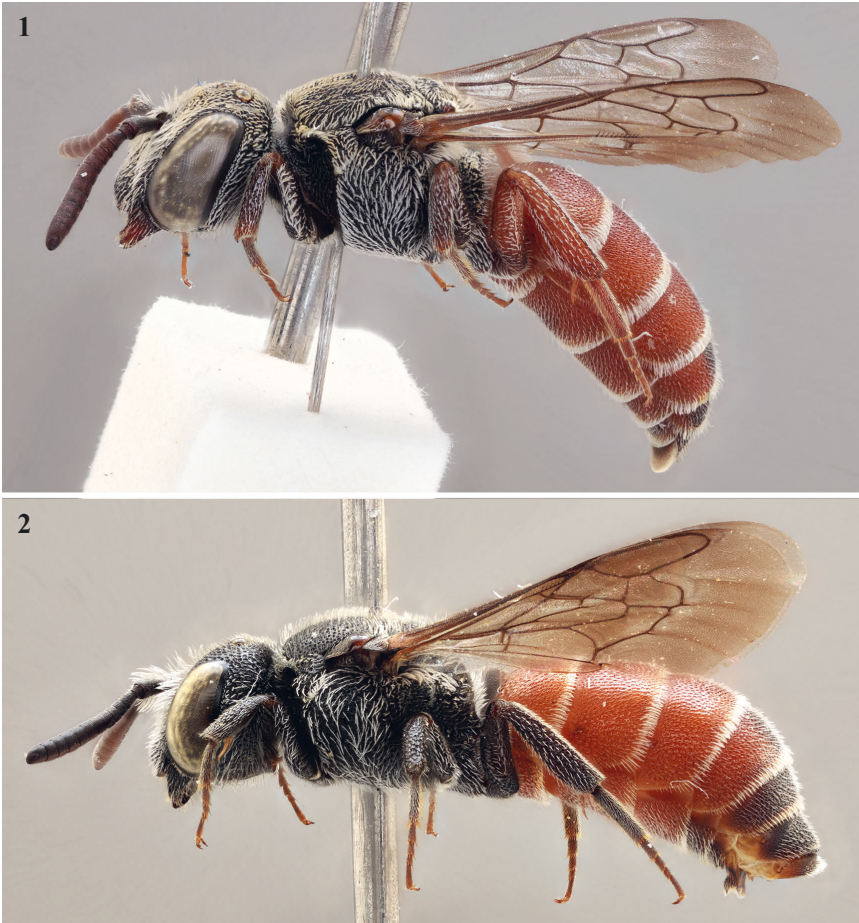
well as other dioxyine genera were examined in both the SEMC and the AMNH. Morphological terminology follows Engel (2001) and Michener (2007), while metrics were made with an Olympus SZX-9 stereomicroscope. The publication is registered in ZooBank (<https://zoobank.org>): urn:lsid:zoobank.org:pub:085B97CC-E118-4CF6-A694-CE359F519828

SYSTEMATICS

Genus *Dioxys* Lepeletier & Audinet-Serville***Dioxys falsificus* sp. n.**

(Figs 1–6, 9, 11–12)

Diagnosis: The new species is exceptionally similar to *Dioxys pumilus* Gertäcker but can be distinguished by the following combination of characters: metasomal tergum I of female lacking carina separating anterior-facing concavity and densely punctate dorsal-facing surface (carina present in *D. pumilus*: Fig. 7); metasomal apex of



Figs 1–2. — *Dioxys falsificus* sp. n., lateral habitus: 1, ♀; 2, ♂.

female more broadly rounded (Fig. 9) (more pointed and acutely rounded in *D. pumilus*: Fig. 8); apical margin of sternum V slightly and broadly convex, with minute, concave, medial emargination medially on convexity (medial emargination lacking in *D. pumilus*: Fig. 10); metasomal sternum VI of male with short mediolontigudinal carina (absent in *D. pumilus*: Fig. 10).

Description

♀: Total body length 6.08–7.25mm; forewing length 3.83–4.50mm. Head wider than long, length in facial view (peak of vertex to apex of clypeus) 1.59–1.69mm, maximum width (across compound eyes) 1.72–2.06mm; upper interorbital distance 1.04–1.30mm, lower interorbital distance 0.91–1.04mm; inner compound eye margins roughly straight (with faint indentation at level above antennal toruli), slightly converging below; median ocellus just above upper tangent of compound eyes; ocellocular distance 2.25–2.5× median ocellar diameter, distance between median ocellus and lateral ocellus about one median ocellar diameter, distance between lateral ocelli subequal to ocellocular distance. Intertegular distance 1.20–1.41mm. Metasomal tergum I lacking distinct carina separating anterior-facing concavity and densely punctate dorsal-facing surface; metasomal apex broadly rounded (Fig. 9).



Figs 3–4. — *Dioxys falsificus* sp. n., dorsal habitus: 3, ♀; 4, ♂.

Integument smooth and shining between coarse punctures. Clypeus with coarse, contiguous to nearly contiguous, setigerous punctures; remainder of head sculptured as on clypeus except punctures of postgena distinctly larger and those of labrum distinctly smaller. Mesosoma with coarse, contiguous to nearly contiguous, setigerous punctures similar to those of head, punctures of mesoscutellum and pleura slightly larger than those of mesoscutum; basal area of propodeum with longitudinal well-raised rugae extending to posterior margin, rugae separating a single row of irregular areolae, integument within areolae relatively smooth and shining, posterior margin delimited by irregular carina; posterior surface of propodeum weakly and minutely rugulose, with scattered faint minute punctures. Metasoma with coarse, contiguous to nearly contiguous, largely setigerous punctures except anterior-facing surface of tergum I with punctures weaker and more separated.

Head and mesosoma black except labrum ferruginous, mandible ferruginous except darker at apex, antenna dark ferruginous but lighter on flagellum ventrally, fore and midlegs dark brown except lighter on pro- and mesotarsi, hindleg ferruginous except metacoxa black, tegula semitranslucent brown. Wing membranes hyaline and parchment-coloured, veins dark brown. Metasoma ferruginous except blending to dark reddish brown and black either centrally or entirely on tergum IV, entirely on terga V and VI, sometimes apically on sternum IV, and entirely on sterna V and VI.

Pubescence generally off-white, in some places tinged yellowish; setae of punctures typically minutely vibrissate, in shorter setae minute branches tapering in length from base to apex and giving such setae a sometimes scale-like appearance, such setae largely decumbent to appressed although longer on face and more erect on lower frons above supraclypeal area, and some setae more erect on scape, vibrissate setae giving way on clypeal disc and apical margin to more scattered, minute, fine, simple to sometimes forked setae; setae of labrum minute, fine, simple to pectinately branched; setae longer and more suberect on gena and postgena. Mesoscutum with setae longer along anterior and lateral borders, shorter and finer on disc and posteriorly; setae of axilla like those of mesoscutal lateral border; mesoscutellum with setae along borders and arising from apical margin and under mesoscutellar spines longer and more erect; metanotum with setae as on posterior border of mesoscutellum; setae of pleura long, more whitish, and decumbent to suberect; metasomal terga with minute to short, fine, decumbent to erect, simple setae on discs, blending to slightly longer, decumbent to erect, vibrissate setae laterally, apical margins of terga I–V with bands of minutely branched, appressed, white to off-white setae; exposed, dorsal-facing margin of sternum VI with dense, minute, fine, erect, simple to minutely branched setae giving a velvety appearance; sterna with scattered, minute to short, fine, largely suberect, minutely pectinate setae and minute apical fringes; sternum VI with velvety appearance as described for dorsal-facing surface.

♂: As described for ♀ except in usual sexual differences and as follows: Total body length 7.00–7.25mm; forewing length 4.58–4.67mm. Head wider than long, length in facial view (peak of vertex to apex of clypeus) 1.77–1.80mm, maximum width (across compound eyes) 2.01–2.08mm; upper interorbital distance 1.25–1.28mm, lower interorbital distance 1.04mm. Intertergular distance 1.35–1.41mm. Apical margins of metasomal sterna I–III straight, apical margin of sternum IV weakly concave medially; apical margin of sternum V slightly and broadly convex, with minute, concave, medial emargination medially on convexity; sternum VI of ♂ with raised, transverse, subapical ridge between apicolateral angles, beyond transverse ridge apical margin comparatively straight and semitranslucent, with more strongly sclerotized mediolongitudinal carina from raised subapical ridge to medial apex on semitranslucent margin; genital capsule as in Figs 11, 12.

Labrum black, mandible black except dark brown at apex, antenna black to dark brown except dark ferruginous on flagellum ventrally, legs black except pro- and mesotarsi dark brown. Metasoma ferruginous except blending to dark brown and black centrally or dark reddish brown entirely on tergum IV, entirely dark brown to black on terga V–VII, black proximally on sternum I, and entirely black on sterna IV–VI.

Pubescence generally white to off-white; setae simpler and often slightly longer than in ♀, such that ♂ not appearing as densely pubescent on head and mesosoma; setae of mesoscutum and mesoscutellum more erect; setae laterally on terga less vibrissate than in ♀.

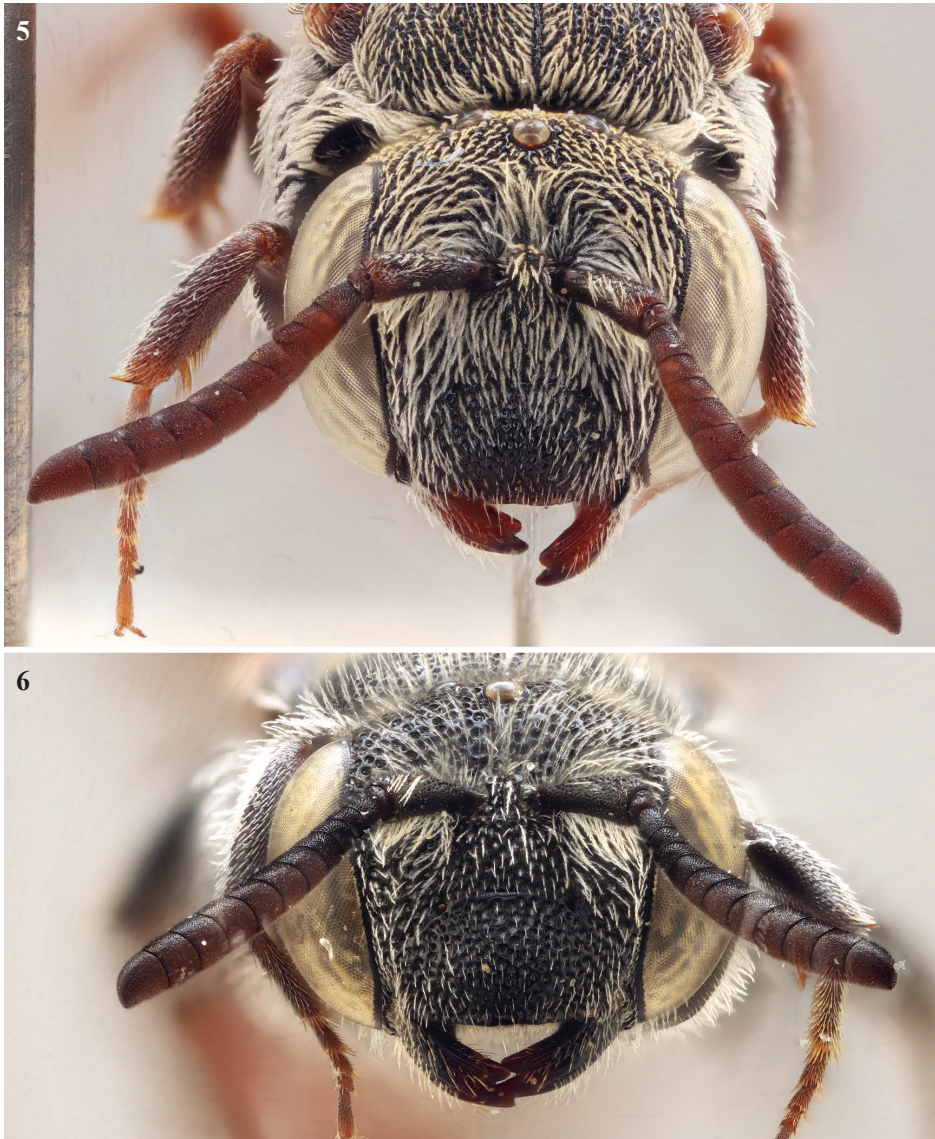
Material examined

Holotype, ♀, S. SPAIN: Algeciras, nr. Ho. Solimar, 17–30.v.1974, K.M. Guichard (SEMC).

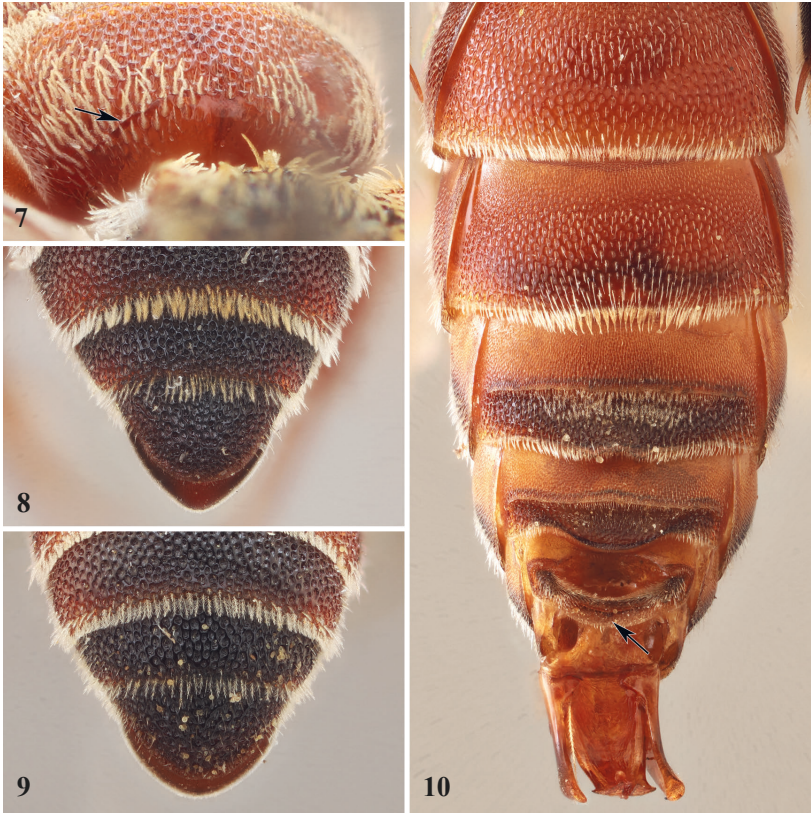
Paratypes, 1♀, 2♂♂, S. SPAIN: Algeciras, nr. Ho. Solimar, 17–30.v.1974, K.M. Guichard (1♂ SEMC; 1♀, 1♂ AMNH).

Etymology: The specific epithet is the Latin adjective *falsificus*, meaning, 'that acts falsely'.

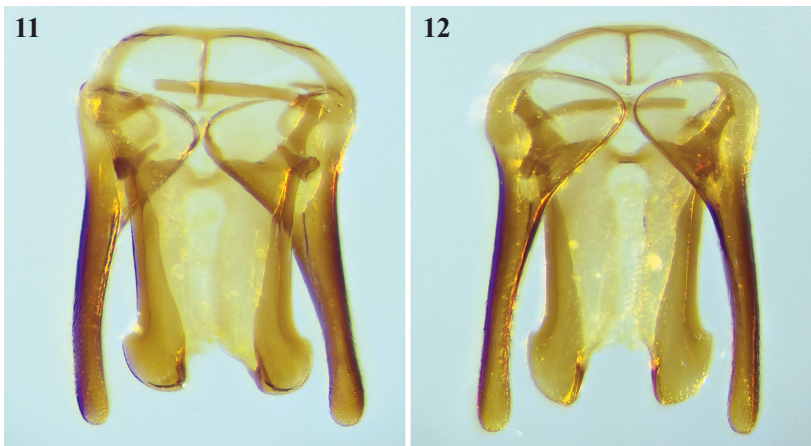
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Figs 5–6. — *Dioxys falsificus* sp. n., facial view: 5, ♀; 6, ♂.



Figs 7–10. — Details of species of *Dioxys* Lepeletier & Audinet-Serville: 7, Anterior oblique view of metasomal tergum I of ♀ of *Dioxys pumilus* Gerstäcker, arrow indicates carina; 8, Metasomal apex of ♀ of *D. pumilus*; 9, Metasomal apex of ♀ of *D. falsificus* sp. n. (note the broader form relative to *D. pumilus* in Fig. 8); 10, Metasomal venter of ♂ of *D. pumilus*, arrow indicates absence of mediolongitudinal carina.



Figs 11–12. — *Dioxys falsificus* sp. n., ♂ genital capsule: 11, Ventral view; 12, Dorsal view.

Key to genera of Dioxyini
(modified from Michener 1996)

- 1 Mesoscutellum with posterior margin rounded 2
 – Mesoscutellum produced laterally to form posteriorly directed tooth or spine 3
- 2(1) Metanotum with median tooth; posterior lateral angle of mesoscutum produced to a strong spine; metasomal sternum V of female without teeth [Palearctic] *Allodioxys* Popov
 – Metanotum without or with scarcely developed median tubercle or tooth; posterior lateral angle of mesoscutum not produced; metasomal sternum V of female with tooth on each side of base of sternum VI [Palearctic] *Ensliniana* Alfken
- 3(1) Axilla not spined or produced to a small, straight spine that lies close to and usually slightly below lateral margin of mesoscutellum; metanotum with median tubercle or tooth, rarely weakly developed 4
 – Axilla produced to a strong, curved spine; metanotum without median tubercle or tooth [Palearctic] *Eudioxys* Mavromoustakis
- 4(3) Dorsolateral angle of pronotum distinct; 1m-cu entering second submarginal cell; jugal lobe of hind wing about one-third as long as vannal lobe, as measured from wing base; body with shorter, usually pale setae, some of them densely plumose and superficially almost scale-like 5
 – Dorsolateral angle of pronotum unrecognizable; 1m-cu entering first submarginal cell or nearly meeting 2Rs; jugal lobe of hind wing about one-seventh as long as vannal lobe, as measured from wing base; body covered with long red setae, branches short and inconspicuous [Palearctic] *Prodioxys* Friese
- 5(4) Mesoscutellum without carina between lateral teeth; exposed part of metasomal tergum V of female shorter than exposed part of tergum VI, similar in form to preceding terga, its apex over two-thirds as wide as base of exposed part; tergum VI of female with exposed part about as broad as long or broader than long, punctured and setose like other terga; sternum VI of female broad, not or slightly exceeding tergum VI, thus no needle-like metasomal apex 6
 – Mesoscutellum with often strong carina (sometimes weaker in *Paradioxys ruyanensis* Baker), arcuate posteriorly, between lateral teeth; exposed part of metasomal tergum V of female 2.5–4.0× as long as exposed part of tergum VI, tapering posteriorly to subtruncate apex only about one-seventh as wide as base of tergum; tergum VI of female with exposed part two or more times as long as broad, smooth and shining, asetose; sternum VI of female needle-like, extending well beyond apex of tergum VI [Palearctic] . . . *Paradioxys* Mocsáry
- 6(5) Labrum with transverse carina close to base (visible above closed mandibles); male genital capsule as a whole much less than twice as long as width of gonobase; procoxa with tubercle or strong carina at summit of anterior surface 7
 – Labrum without transverse basal carina; male genital capsule as a whole more than twice as long as width of gonobase; procoxa with anterior surface rounded [Holarctic]
 *Dioxys* Lepeletier & Audinet-Serville
- 7(6) Procoxa with tubercle at summit of punctate anterior surface; metanotum with strong median spine; third valvula (gonostylus) of female with only minute setae 8
 – Procoxa with strong carina at summit of smooth anterior surface; metanotum with small median tubercle; third valvula (gonostylus) of female with row of coarse bristles [Palearctic] *Metadioxys* Popov
- 8(7) Dorsolateral angle of pronotum carinate; basal area of propodeum with longitudinal rugae separating large, smooth pits, posterior margin carinate; concavity of metasomal tergum I separated from dorsal-facing surface by a carina [Palearctic southward into India]
 *Aglaopis* Cameron
 – Dorsolateral angle of pronotum lamellate; basal area of propodeum finely reticulate, posterior margin rounded, not carinate; concavity of metasomal tergum I not separated from dorsal-facing surface by a carina [South Africa] *Notodioxytes* gen. n.

Notodioxytes gen. n.

Type species: Dioxoides alata Michener, 1996.

Diagnosis: This genus differs notably from *Aglaopis* Cameron by the lamellate (vs. simply carinate in *Aglaopis*) dorsolateral angle to the pronotum, the finely reticulate basal area of the propodeum that is not margined posteriorly by a carina (areolae separated by longitudinal rugae and a posterior carina in *Aglaopis*), and the absence of a carina separating the concavity of metasomal tergum I from the dorsal-facing surface (present in *Aglaopis*). In addition, the metasoma of *Notodioxytes* is red, while it is simply black in *Aglaopis*. *Aglaopis* is distributed across the Palearctic and southward into India, while *Notodioxytes* is known only from South Africa. The establishment of the genus results in the following new combination: *Notodioxytes alata* (Michener) comb. n.

Etymology: The new generic name is a combination of *Dioxyis*, itself composed in Ancient Greek of *dis* (δίς, meaning, 'twice' or 'doubly') and the masculine adjective *oxús* (ὄξύς, meaning, 'sharp' or 'pointed'), with *nótos* (νότος, meaning, 'south') and the feminine suffix *-tēs* (-τής, which forms nouns representing a state of being). The combined name therefore effectively means, 'southern doubled sharpness'. The gender of the name is feminine.

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