

1 **Subgeneric classification and biology of the leafcutter and**
2 **dauber bees (genus *Megachile* Latreille) of the western**
3 **Paleartic (Hymenoptera, Apoidea, Megachilidae)**

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7 **Supplementary Material I**

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9 **Additional notes on the new synonymies**

10

11 Spinola (1808: 57) indicates that the specimens that he had previously (Spinola
12 1806) referred to as *punctatissima* do not belong to Latreille's (or Kirby's)
13 species ("*Megachile punctatissima* Latr. *prorsùs distincta et in Liguria nondum*
14 *inventà*": *M. punctatissima* Latr. is certainly distinct and has not been found in
15 Liguria) and he describes *Heriades pusilla* Spinola, 1808 for these specimens.
16 *Heriades pusilla* was considered as a species of *Megachile* by Schletterer (1889:
17 688), based on the examination of a presumed syntype by F. Morawitz; these
18 presumed syntypes were in the "Helsingfors Museum" according to Schletterer
19 (1889), an institution that I have not been able to locate (possibly the Finnish
20 Museum of Natural History). However, it is probable that Spinola's type series
21 was mixed ("*Variat spinulis scutellaribus nullis*": the species varies, with the
22 scutellum sometimes without spine); specimens without spine may have been a
23 *Megachile*. However Spinola's main description (1806, under *M. punctatissima*
24 Latr.) excludes a species of *Megachile* ("*scutello spinulis suabus armato*":
25 scutellum with two spines) and possibly points to an osmiine of the subgenus
26 *Hoplosmia*. Spinola (1808: 57) also gives indications on the nesting biology of *H.*
27 *pusilla*: the nest is placed in pithy stems of *Rubus* ("*nidum habitat cylindricum,*
28 *simplicem, et in medulla Rubi profundè atque tortuosè fossum*") and the cell
29 partitions are made of "worn leaves of *Rubus* assembled with some glue" ("*Muri*
30 *interjacentes foliis Rubi efficiuntur detritis glutine quodam coadunatis*"). I do not
31 formally transfer *H. pusilla* into *Osmia* as this would create homonymy with

32 *Osmia pusilla* Cresson. Future work, including the designation of a lectotype or a
33 neotype is needed to settle this taxonomic issue.

34

35 The rather precise description of the male of *Heriades sinuata* Spinola, 1808
36 suggests a species of *Heriades*: "*segmentis 4°, 5° et 6° subtùs incurvis: 6° producto,*
37 *marginè sinuato ferè bi-emarginato*": terga 4-6 curved; T6 produced, margin
38 sinuate and with two emarginations; "*Segmentum secundum ventrale in laminam*
39 *productum (...), cum sexto dorsali quasi cohaerens*": S2 produced and nearly in
40 contact with T6; "*Segmentum 7um anale, genitalia obtegens, muticum, breve,*
41 *marginè retuso, et sub sexto valde productiore omnino reconditum*": T7 covering
42 the genital capsule, small, short, with margin blunt, and entirely hidden under T6.
43 The description of the female ("*Foemina ab Heriade pusilla vix discernenda*":
44 female barely distinguishable from *H. pusilla*) may refer to either a *Heriades* or a
45 *Hoplosmia*. I consider the name to be based on the male and thus place *H. sinuata*
46 as a junior synonym of the common species *Heriades truncorum*.

47

48 The lectotype of *Osmia (Megachile) albohirta* Brullé, 1839 has been examined
49 (MNHN). This specimen was likely the specimen designated as a lectotype by
50 Lieftinck (1958); it is a male labeled as follows: 1. "Museum Paris Iles Canaries
51 Webb Berthelot 3-41"; 2. a blue, round disc; 3. "Type"; 4. "*albo-hirta*". The
52 specimen is in poor condition with considerable *Anthrenus* damage, but its
53 identity is clear based on the mandible without inferior projection, the
54 multidentate carina of tergite 6, the apical margin of tergite 7, produced and
55 inserted into tergite 6, and the front tarsal segments 1 and 2 white, with a black
56 maculation on the underside. All these features clearly point to the species
57 currently known as *Megachile lanigera* Alfken, 1933, of which I studied the
58 holotype (ETHZ) and which I place here in synonymy with *M. albohirta* (New
59 synonymy). The type species of *Anodonteutricharaea*, *Megachile larochei* Tkalcù,
60 1993, itself placed as a synonym of *M. lanigera* briefly after its description
61 (Hohmann et al. 1993: 390), is also placed as a synonym of *M. albohirta* (New
62 Synonymy).

63

64 *Megachile troodica* Mavromoustakis, 1953 was described based on several
65 specimens collected on Mount Troodos, Cyprus. I was not able to examine the
66 holotype female (DAAN) but a paratype female (RMNH) that perfectly agrees
67 with the original description. Mavromoustakis (1953) pointed to the lack of
68 continuous fringes of hairs on the sterna beneath the scopa and correctly stated
69 "this character excludes the Cyprian new bee from the subgenus *Eutricharaea*";
70 indeed *M. troodica* is a member of the subgenus *Anodonteutricharaea*. The
71 holotype and several paratypes of *Megachile (Neoeutricharaea) mavromoustakisi*
72 Zanden, 1992 have been studied (RMNH, MSCA). This species was also described
73 from the Troodos Mountains; it fully agrees with *M. troodica* and *M.*
74 *mavromoustakisi* is placed here in synonymy with *M. troodica* (New Synonymy).
75

76 *Chalicodoma (Parachalicodoma) pasteelsi* Zanden, 1998, was described from a
77 male from the Sinai (Convent Sta. Catherina, Sinai mer., 10.4.1958) and a female
78 from "Tall el Amaran, Règ. de Mellavi, 17.3.1958" (probably Amarna,
79 approximately 5 km S of Mallawi, Egypt], both leg. W. J. Pulawski and deposited
80 in the collection Mavromoustakis (DAAN). I could not examine these specimens
81 but Margarita Hadjistylli and Stuart Roberts kindly examined them and send me
82 pictures of both specimens. According to the original description, the male
83 should be the holotype but the female bears the holotype label; this does not
84 reflect Zanden's intentions and the labels may have been switched after the
85 description. I consider the male to be the holotype, as precisely indicated by
86 Zanden (1998). As evidenced by the original description, both specimens do not
87 belong to the same species: the male belongs to the *parietina* group of the
88 subgenus *Chalicodoma* (T6 without lateral tooth; T7 without median spine)
89 while the female belongs to the *incana* group of *Pseudomegachile*
90 ("*Parachalicodoma* Pasteels, 1966") (mandible 5-toothed). Based on a picture of
91 the male and its precise description by Stuart Roberts, who examined the
92 specimen (pers. comm., October 2016), I consider *M. pasteelsi* as a valid species
93 of the subgenus *Chalicodoma*. It perfectly agrees with the undescribed male of *M.*
94 *judaea* (Tkalcù, 1999), of which I examined two paratype females (MSCA); no
95 other species of *Chalicodoma* in this region has dense, snow white tergal fasciae,
96 partly red legs, a smooth apical margin of S4 without premarginal groove.

97 Females of this species have been recorded from Egypt under the name *M.*
98 *desertorum* Morawitz, 1875 (Alfken 1933a: 227): two females from Egypt
99 identified as "*C. desertorum*" by Alfken (ZMHB) are in fact females of *M. pasteelsi*.
100 *M. desertorum* is a Central Asian species that has so far not been recorded from
101 Egypt (the taxon *M. desertorum* var. *atorrufa* Friese, 1898, from Egypt, refers to
102 another species).

103

104 The type of *Megachile transitoria* Benoist, 1934, described from a single
105 specimen from "Forêt d'Azrou" in northern Morocco, could not be located
106 (MNHN); the original description and the subsequent description (Benoist 1935)
107 do not refer to any known species (or subgenus) of *Megachile*, but point to an
108 intersex specimen of the subgenus *Chalicodoma*: body length 16mm, vestiture as
109 in *M. pyrenaica* Lepeletier, 1841, but hairs abundant on face; mandibles shorter
110 than in *pyrenaica*, tridentate, with teeth 1 and 2 further apart than in typical
111 females of *Chalicodoma*; apical margin of clypeus crenulate but with median
112 tooth particularly large; scopa present. The description of the mandible, of the
113 clypeus and of the facial vestiture points to a male, while the abdomen is likely
114 predominantly female. Based on the vestiture color of *M. transitoria* and the
115 occurrence of *M. parietina* (Geoffroy, 1785) in Azrou (C. Praz, unpublished), I
116 place *M. transitoria* as a junior synonym of *M. parietina* (new synonymy). Almost
117 contemporaneously, Alfken (1931) described two intersex specimens of *M.*
118 *parietina* as a new species, *Chalicodoma valesina* Alfken, 1931; de Beaumont
119 (1957) identified these specimens as intersex individuals of *M. parietina* and
120 placed *valesina* as a junior synonym of *M. parietina*. Intersex specimens of
121 *Megachile* usually do not have a fully developed scopa and are thus easy to
122 identify as anomalous specimens (Fateryga et al. 2011). In the subgenus
123 *Chalicodoma*, it seems that intersex individuals regularly develop a scopa; in
124 addition, the lack of specialized male structures in the front legs and mandibles
125 of the subgenus *Chalicodoma* (lack of front coxal spine and mandible without
126 inferior projection) have likely contributed to the confusion.

127

128 The holotype of *Megachile (Metamegachile) rhodosiaca* Rebmann, 1972 (SMNS),
129 from Rhodes, was not examined but based on comparative studies of numerous

130 specimens of both genders from Rhodos, Turkey, Israel, Iran and Egypt, this
131 species is placed in synonymy with *Megachile doriae* Magretti, 1890, although
132 the type material of the latter could not be located. Magretti's description of the
133 male is rather precise and indicates that the "last metasomal segment" (in fact
134 the sixth tergum) has its apex (in fact the preapical carina) multidentate and that
135 its disc is covered with light pilosity and bears medially a small carina produced
136 to a hook ("*in dorso cano tomentoso, disco in medio carinula unciformi praedito*");
137 these features clearly point to the species of the subgenus *Creightonella* found in
138 collections either under the name *M. doriae* or *M. rhodosiaca* (see Alfken 1935:
139 155, Özbek and Zanden 1994: 158). The holotype of *Megachile heinrichi* (Tkalců,
140 1979) (SMFD) has been studied and as suspected by Özbek and Zanden (1994:
141 158), who considered it as "probably a subspecies of *Cr. rhodosiaca*", it is
142 identical to *M. doriae* and considered here as a junior synonym of the latter.

143

144 Much confusion has remained on the identity and subgeneric affinity of
145 *Megachile marginata* Smith, 1853, considered alternatively as a *Pseudomegachile*
146 (Friese 1911, Ornos et al. 2007) or a *Eutricharaea* (e. g., Alfken 1933b). The
147 holotype has been examined (OUM); it is a well-preserved female labeled as
148 follows: 1. "*Megachile* (164.) (Albania)". 2. "*marginata* Sm. (Type) alb.". 3. Type
149 *Megachile marginata* (= *M. picicornis* Mor. 1878) D. B. B. '77 [D. Baker 1977]".
150 This specimen corresponds to the species that has been referred to as *Megachile*
151 *picicornis* Morawitz, 1877 in European literature (e. g., Benoist 1940, Müller and
152 Bansac 2004). *Stelis megachiloides* Alfken, 1942 was described on the base of two
153 specimens from Irak; Warncke (1992: 362) considered *S. megachiloides* as a
154 *Eutricharaea* lacking metasomal scopa. Maximilian Schwarz and Jakub Straka
155 (pers. comm., November 2014) kindly examined the holotype (NMPC) and
156 confirmed that it is a gynandromorph specimen of *M. marginata* (see Fateryga et
157 al. 2011), which is also the case for the female paratype that I examined (ZMHB);
158 *S. megachiloides* is placed here as a junior synonym of *M. marginata* (New
159 Synonymy).

160

161 *Megachile sexmaculata* Alfken, 1942, *Megachile sexmaculata thracia* Tkalců, 1979
162 and *Megachile (Megachile) pilicrus flavida* Zanden, 1998, are considered here as

163 junior synonyms of *M. melanogaster*. A paratype female (ZMHB) of *M.*
164 *sexmaculata* and a paratype female of *M. sexmaculata thracia* (RMNH) have been
165 examined, as well as the holotype of *M. pilicrus flavidus* (RMNH), confirming
166 these synonymies. In these three taxa, the scopa is more or less white, but no
167 sculptural difference is found between these forms and typical *melanogaster*
168 populations, which have an entirely black scopa.

169

170 *Megachile cyrenaica* Schulthess, 1924 and *Megachile fumosa* Alfken, 1934 are
171 newly placed in synonymy with *M. sedilloti* (New synonymies) based on the
172 examination of the holotypes females (*M. cyrenaica*: ETHZ; *fumosa*: ZMHB). The
173 type material of *M. fulvocrinita* could not be located; this species originating from
174 Egypt was only described in the identification key in Alfken (1934: 159, 160)
175 without locality data or repository details. While the description of the female is
176 unclear, the description of the male clearly refers to *M. sedilloti* and this species
177 is also placed in synonymy with *M. sedilloti* (New Synonymy). *M. sedilloti* has
178 been suggested to be a synonym of *M. (Eutricharaea) leucomalla* Gerstäcker,
179 1869 (Schwarz et al. 1996, Ornos et al. 2007) but it is a valid species closely
180 related to *M. deceptoria*, although larger. The colour of the vestiture of *M. sedilloti*
181 varies from white (lectotype and paralectotype of *M. sedilloti*) to black (type
182 specimens of *fumosa* and *cyrenaica*), although this variation does not follow a
183 geographic pattern and in some localities, both forms as well as intermediate
184 specimens are found.

185

186 I could examine several syntypes of *Megachile soikai* Benoist, 1961 (MNHN,
187 OLML), described from the Hoggar (Algeria). This widely distributed (Arabian
188 Peninsula, Israel, Algeria; possibly Africa; see comments below) and well-
189 characterized species has subsequently been described as *Megachile insignis*
190 Zanden, 1996, of which I could examine paratypes (RMNH; MSCA). *M. insignis* is
191 placed as a junior synonym of *M. soikai*.

192

193 The lectotype of *M. vicina* Morawitz, 1894 (ZIN) is a female from "Seravschan, Fl.
194 Woru Kschtut, Glasunov 1892" [Tadjikistan, approximately 39°22'N/68°2'E, leg.
195 Glasunov], designated by Zanden (1995). This specimen perfectly agrees with

196 the Central Asian populations of *M. giraudi* and it is unclear why Zanden placed it
197 into *Pseudomegachile*. *M. giraudi* is a widely distributed species; the coloration of
198 the vestiture is strongly variable geographically. Given that I do not see constant
199 differences in the sculpture among these geographic forms, I consider them as
200 belonging to one widely distributed species (the status of the closely related *M.*
201 *altantica* Benoist, 1934 remains to be investigated).

202

203 *Megachile semipleta* Cockerell, 1921, has been described based on a single male
204 specimen; Cockerell added "As E. Saunders remarked, it seems to be nearest to *M.*
205 *versicolor*, Smith". I have not examined the holotype (OUMNH). However, given
206 that *M. versicolor* has been recorded from Madeira (Fellendorf et al. 1999) and
207 that Cockerell's minimal description points to a member of the subgenus
208 *Megachile* and even suggests *M. versicolor* ("joints of tarsi reddish, the last bright
209 ferruginous"), I see no compelling reason to recognize *M. semipleta* Cockerell,
210 1921 as a distinct species.

211

212 *M. albocincta* Radoszkowski, 1874 is placed here in synonymy with *M.*
213 *cyanipennis* Guérin-Méneville, 1845; I have not examined the type of the latter
214 but specimens of both sexes identified by Pasteels (BMNH), who examined the
215 type (Guiglia and Pasteels 1961); Pasteels (1965) mentions *M. cyanipennis* from
216 Egypt and suggests that *M. albocincta* should be placed in synonymy with *M.*
217 *cyanipennis*, which he refrained to do because he did not examine the type of *M.*
218 *albocincta*.

219

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