

Identity and distribution of *Celonites hermon* Gusenleitner, 2002 (Hymenoptera, Vespidae, Masarinae) from the Middle East with a description of the hitherto unknown male

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Academic editor: M. Ohl | Received 16 September 2018 | Accepted 23 October 2018 | Published 31 October 2018

<http://zoobank.org/ADA1A7C2-3976-4FA1-A63C-8D6EDB8EA71C>

Citation: Mauss V, Prosi R (2018) Identity and distribution of *Celonites hermon* Gusenleitner, 2002 (Hymenoptera, Vespidae, Masarinae) from the Middle East with a description of the hitherto unknown male. Journal of Hymenoptera Research 66: 55–70. <https://doi.org/10.3897/jhr.66.29795>

Abstract

Based on the morphological examination of the exoskeleton and the male genitalia of newly discovered specimens from Syria the status and taxonomic position of *Celonites hermon* Gusenleitner, 2002 is re-investigated. The hitherto unknown male is formally described. *Celonites hermon* is a member of the *C. abbreviatus*-complex. It shares several probably derived characters with *C. andreamuelleri*, from which it is considered to be reproductively isolated by differences in the male genitalia, the form of sternum VIII and tergum VII as well as the colour pattern of the male antennae. Therefore *C. hermon* is hypothesized to represent a separate biospecies. It has been recorded only from a small area in the mountain ranges along the Lebanese section of the Dead Sea Transform in Syria and Israel.

Keywords

Pollen wasps, biogeography, taxonomy, Palearctic, Israel, Syria

Introduction

The genus *Celonites* is very distinct from other pollen wasps in the wide horizontal lamellae on the propodeum and the acute sides of the metasoma (Richards 1962). Both characters are related to the outstanding ability of the imagines to roll up (Gess and Gess 2010). Approximately 46 species of the genus (including six well separated subspecies) have been recognized in the Palaearctic region (according to the list of Carpenter 2001, combined with newly described or synonymized species by Gusenleitner 2002, 2007, 2012, 2018; Mauss 2013, Mauss et al. 2016). Within the Palaearctic *Celonites abbreviatus*-group (sensu Richards 1962) the *Celonites abbreviatus*-complex constitutes a well defined monophylum characterized by the existence of knobbed setae at the front of the head forming a pollen collecting apparatus (Mauss 2013). All members of this species-complex for which flower visits have been recorded were observed to visit nototribic flowers of Lamiaceae (Bequaert 1940, Schremmer 1959, Müller 1996, Mauss 2006, Mauss 2013, Mauss et al. 2016). During pollen uptake from these flowers a female would stand on the lower lip of the corolla, while she performs at a high frequency slight back and forth movements, rubbing her head over the nototribic anthers. In this manner pollen grains are removed from the anthers with the stiff knobbed setae on frons and clypeus of the female (Schremmer 1959, Müller 1996, Mauss 2006, Mauss et al. 2016). The species-complex includes six nominate species, namely *Celonites abbreviatus* (Villers), *C. andreasmuelleri* Mauss, *C. hermon* Gusenleitner, *C. mayeti* Richards, *C. persicus* Richards and *C. tauricus* Kostylev (= *C. spinosus* Gusenleitner) (Mauss 2013, Mauss et al. 2016).

Celonites hermon was described from a single female collected by Bytinski-Salz at Mount Hermon in the Golan Mountains by Gusenleitner in 2002. He separated the specimen from the “very similar” *Celonites abbreviatus* because of its extremely long proboscis that reaches the distal end of the abdomen (Gusenleitner 2002). As already pointed out by Mauss (2013) proboscis length can not be examined in most *Celonites* specimens, since the mouthparts are usually retracted, while the protruded proboscis of the type specimen is an exception. This may have misled Gusenleitner (2002) into believing, that the length of the proboscis is outstanding in *C. hermon*. In fact, the careful investigation by Schremmer (1961) had already demonstrated that the proboscis of *C. abbreviatus* clearly exceeds the tip of the metasoma. Moreover, Mauss (2013) referred to a female of *C. abbreviatus* in his collection with protruded mouthparts extending beyond the end of the metasoma as well. Therefore *C. hermon* does not distinctly differ from *C. abbreviatus* in the character that mainly substantiated its description and was considered to be a junior synonym of *C. abbreviatus*.

However, Mauss (2013) avoided formal synonymy of both taxa as the situation appeared to be more complicated. The club of the antenna of the type of *C. hermon* is completely orange, which is also the case in specimens of *C. abbreviatus* from the

Balkan and Aegean populations whereas the antennae of Central and West European specimens of *C. abbreviatus* are much darker suggesting that the eastern populations might belong to a different subspecies or even species that could be identical with *C. hermon*. Subsequently Mauss et al. (2016) demonstrated that *Celonites tauricus* differs distinctly from *C. abbreviatus* in that the likewise orange antennal club of *C. tauricus* has always a dark tip, which is possibly related to different male signals during mating behaviour. Since the tip of the antennal club of the holotype of *Celonites hermon* is completely orange, it can not be identical with *C. tauricus*. The distribution area of *Celonites abbreviatus* extends from Northwest Africa over the Iberian Peninsula, Southern and Central Europe eastwards to the Balkan and the western Aegean. *Celonites tauricus* is allopatrically distributed with regard to *Celonites abbreviatus* and has been recorded from the Crimea, Kos, Rhodes, Cyprus and Asia Minor (Mauss et al. 2016, Mauss unpubl.) (Fig. 11), separating the locus typicus of *C. hermon* by more than 1000 km from the eastern margin of the distribution range of *C. abbreviatus*. Therefore *C. hermon* could be hypothesized to represent a relict population of *C. abbreviatus* in the Golan Mountains that was separated from the Balkan and Aegean populations of *C. abbreviatus* as a result of range expansion of *C. tauricus*. An alternative hypothesis is that *Celonites hermon* is an indigenous biospecies. In this case one would expect closer relationship to other members of the *C. abbreviatus*-complex from geographically adjacent areas in the Middle East, that is *Celonites tauricus* or *Celonites andreasmuelleri*.

Based on new material of *Celonites hermon*, the aim of this study is to reinvestigate the status of the taxon carefully, to characterize its taxonomic position within the genus *Celonites* and to describe the newly discovered male.

Material and methods

The specimens of *Celonites* studied belong to the public collection of the Upper Austrian State Museum (Linz, Austria) (OLML), as well as to the private collection of J. Gusenleitner (Linz, Austria) (JG). The specimens were investigated under a WILD M3 stereo microscope (maximum magnification 80 times). Measurements of the exoskeleton were made using an ocular micrometer (highest resolution 0.011 mm). Distances between the ocelli, the compound eyes and the mesonotum width were measured according to Eck (1978). The genitalia of all males were extracted after re-softening the specimens and were then studied in 80% ethanol or 85% glycerol. Nomenclature of male genitalia follows that of Birker-Smith (1981). Drawings were made with a drawing tube (WILD Type 308700). Micro-photos were taken with a Leica IC 80 HD camera mounted on a Leica MS 5 stereomicroscope. Multifocus-pictures were generated with Leica Application Suite (LAS) software. The scapus of the antenna is referred to as antennal article A1 and the pedicellus as A2, the flagellum consists of the articles A3–A12.

Systematics

Celonites hermon Gusenleitner, 2002

Figs 1–9

Material studied. **Israel:** Mt. Hermon, 33.416111N, 35.857500E, 1900 m a.s.l., 17.07.1971, 1♀ (holotype, dbM No. 3579), leg. Bytinski-Salz, coll. JG. **Syria:** 40 km NE of Damascus, 33.416667N, 35.866667E, 13.05.1996, 4♀♀ (dbM No. 3684, 3685, 3686, 3687), 2♂♂ (dbM No. 3688, 3689), leg. Mi. Halada, coll. OLML; West Syria, Tartus env., 34.900000N, 35.883333E, 25.05.1996, 2♀♀ (dbM No. 3691, 3692), leg. Mi. Halada, coll. OLML.

Diagnosis. Pale markings light yellowish to yellow without reddish tinges (Fig. 1). Immediate tip of antennal club (A8–12) and especially ventral side of A12 orange to orange-brown, not markedly contrasting in colour from adjacent light ventral side of antennal club. Axilla of mesoscutellum with short blunt lateral projection that only slightly projects over adjacent posterior part of tegula. Frons and clypeus covered with pale, stiff pollen collecting setae (Fig. 3). In females most, in males at least some of these setae with tiny spherical enlargement at tip (“knob”). Diameter of median ocellus distinctly larger than diameter of lateral ocelli, ocelli larger than in *C. abbreviatus* and *C. tauricus*. Median ocellus circular, lateral ocelli more or less obliquely oval (Figs 4, 7). Vertex falling away obliquely towards the occipital carina immediately behind ocelli (Figs 4, 7).

Females with head in front view more elongated in relation to its length. Clypeus with lateral margins more continuously rounded leading to elongated appearance (Fig. 2). Cuticula on frons and at least dorsal half of clypeus densely and strongly shagreened leading to a conspicuous dull region covered with knobbed pollen-collecting setae, changing gradually into the adjacent smooth, shiny cuticula on vertex and less densely shagreened cuticula ventrally on clypeus (Figs 2, 4). Knobbed pollen collecting setae on frons distinctly longer and relatively thinner in comparison with *Celonites abbreviatus* and *C. tauricus*, up to 1.4 times as long as diameter of median ocellus, with diameter almost equal along most of length, only weakly broadened towards base (Figs 3, 4).

Males with only two oval-shaped tyloids situated ventrally on articles A9 and A10 of club-shaped antennae. Midcoxa with a small but distinct spine at distal end, on anterior side of midcoxa close to its antero-medial angle. Tergum VII markedly lobed posteriorly (Fig. 6). Sternum VIII only shallowly emarginate, surface not much sunk in towards emargination (Fig. 8). Tergum VII with medial lobe distinctly emarginate leading to quadrilobed appearance of posterior margin (Fig. 6). Emargination of posterior margin of sternum VIII medially angled, laterally with a transverse section well set off by protruded edge with distinct little spine on each side of posterior margin (Fig. 8). Posterior margin of stipes of male genitalia with dorso-medial concavity (Figs 9, 10). Stipes in dorsal view elongated, with medial and lateral margin running more or less parallel towards posterior end (Figs 9, 10). Posterior process of volsella

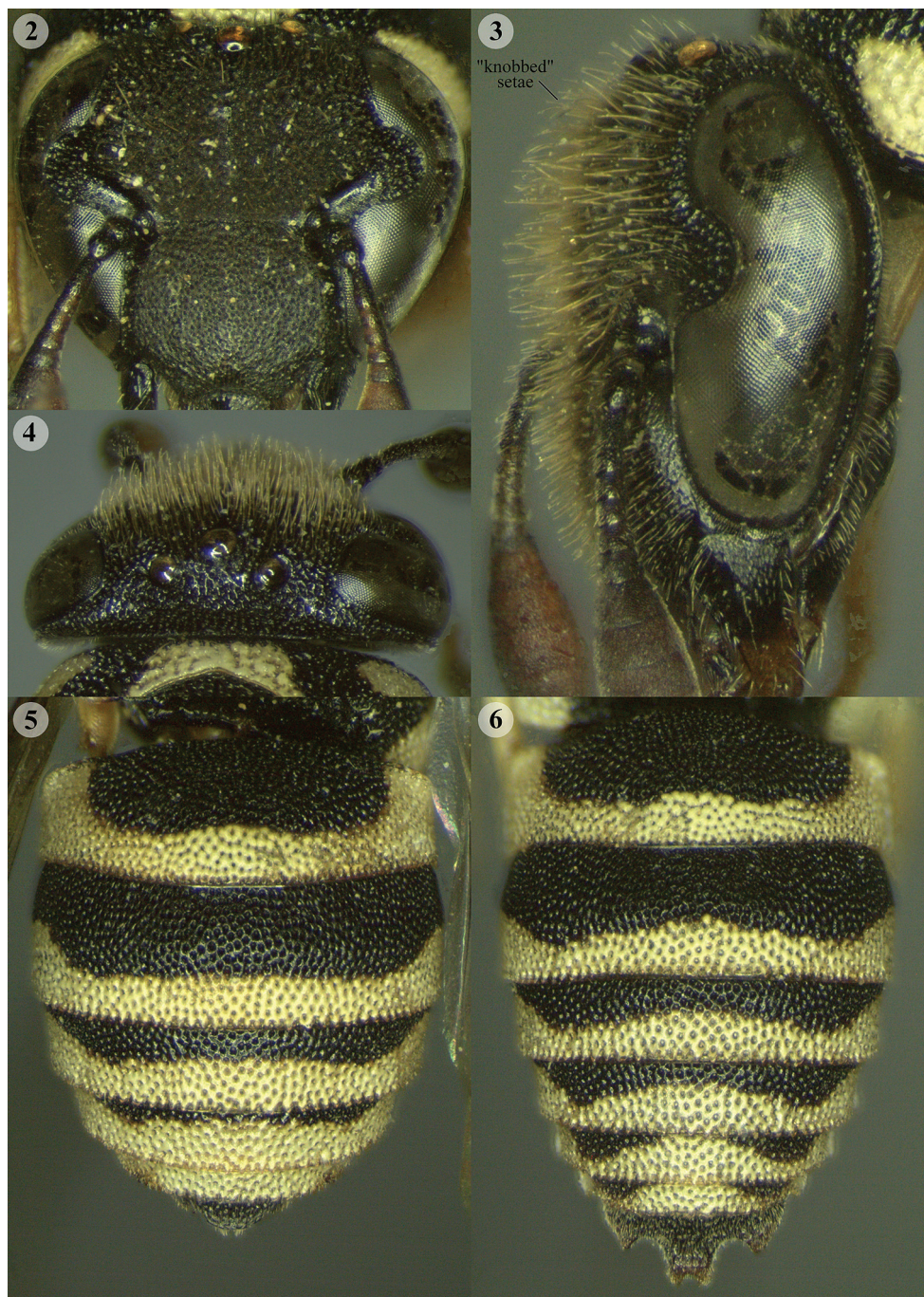


Figure 1. Imagines of *Celonites hermon* in lateral view (female dbM No. 3692, male dbM No. 3689).

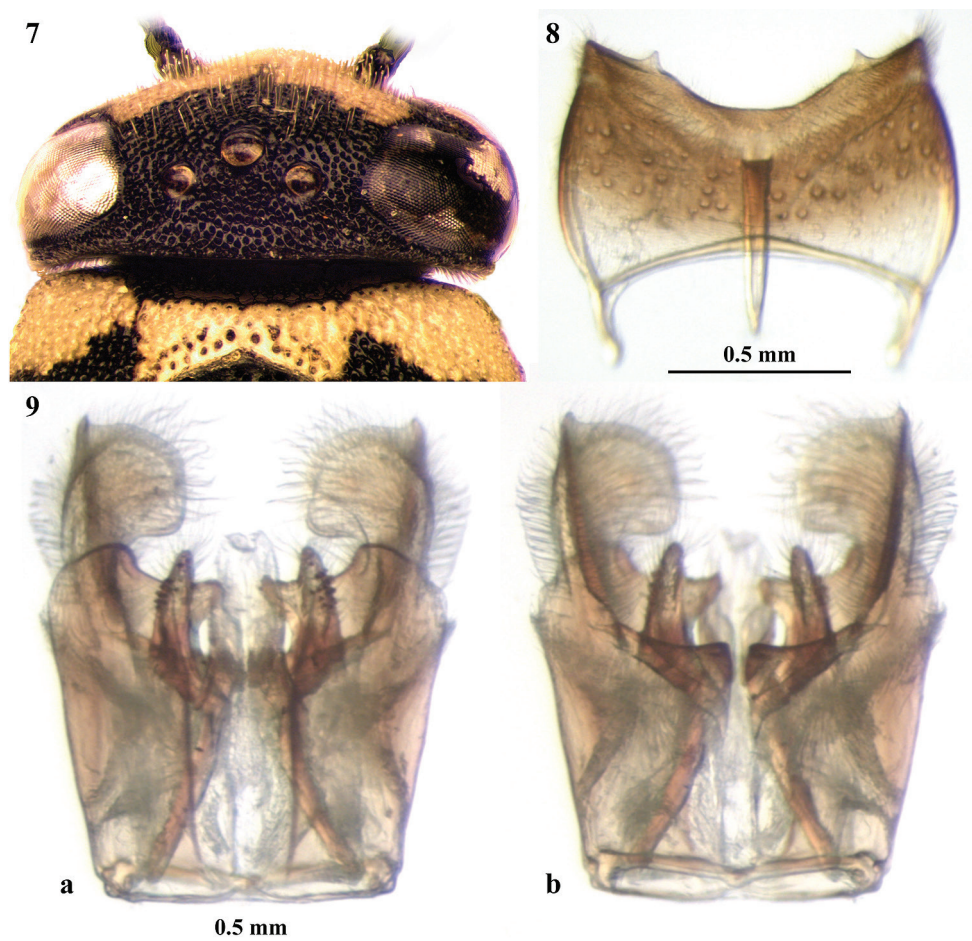
conically rounded, proximally continuing into shaft of volsella. Medial process of volsella set off distinctly from shaft by longitudinal fold (Figs 9, 10).

Description of the male. Colour (Fig. 1): Black, changing into blackish-brown on strongly sclerotized parts of labio-maxillary complex, sterna, coxae, trochanters and femora. The following are light yellowish: large basal spot on mandible; labrum; central area of clypeus except small lateral and ventral margin; broad parallel-sided band at front of frons, shortly interrupted medially on the supra-antennal area, laterally extending obliquely towards upper inner margin of eye where it terminates with straight truncated end; small spot on ocular sinus; narrow streak on tempora along occipital carina at dorso-lateral corner of head; large spot on antero-dorsal angle of pronotum (humeral spot); stripe along dorso-medial (inner) margin of pronotum, posteriorly small becoming distinctly broader antero-medially where it continues into humeral spot in one specimen (Fig. 7); large spot on dorsal mesopleura; tegula except small black marking along anterior part of medial margin; medium-sized median spot on scutellum; propodeal lamella; distal part of femora, tibiae and tarsi (weakly mixed with reddish-brown in parts especially distally); continuous posterior bands on terga I–VI, somewhat smaller on each side of middle (Fig. 6), extending over lateral margin on ventral part of tergum; continuous broad posterior band on sternum II; small spots postero-laterally on sternum III. Reddish-brown are: distal two thirds of mandible; ventral margin of clypeus; claws. Antenna with A1–2 black; A3–6 anteriorly with light yellowish stripe otherwise blackish to dark orange-brown; A7–A12 orange-brown, posteriorly with blackish marking becoming lighter distally, anteriorly and on ventral side markedly orange without black. Wings translucent, weakly yellowish-brown.

Structure: Head in front view as long as broad. Clypeus a little broader than long, distal margin deeply emarginate; cuticula shiny and smooth with close macropunctuation becoming less distinct towards distal margin; pale stiff setae arising from macropunctures without distal “knob”; lateral setae with distal ends frequently curved in distal-medial direction. Frons diagonally striated with moderately spaced to close macropunctuation, interstices smooth; bearing pale stiff setae, up to 0.22 mm long, 1.1 times as long as diameter of median ocellus, laterally some with curved distal end, in centre mainly with tiny distal “knob”; frontal line in one specimen raised to form a small pro-



Figures 2–6. Head of female of *Celonites hermon* (dbM No. 3685) **2** in frontal view **3** in lateral view showing pollen collecting apparatus with “knobbed” setae on frons and clypeus **4** in dorsal view **5–6** Metasoma of *Celonites hermon* in dorsal view **5** female (dbM No. 3685) **6** male (dbM No. 3689).



Figures 7–9. Head of male *Celonites hermon* in dorsal view (dbM No. 3456) **8** Metasomal sternum VIII of male of *C. hermon* in ventral view (dbM No. 3689) **9** Male genital of *Celonites hermon* (dbM No. 3689) **a** in dorsal **b** ventral view.

tubercle in centre of frons. Median ocellus circular, lateral ocelli more or less obliquely oval; diameter of median ocellus distinctly larger than diameter of lateral ocelli. Vertex falling away obliquely towards occipital carina immediately behind ocelli (Fig. 7); cuticula with close macropunctuation becoming more distinct and closely reticulate behind ocelli, where longitudinal interstices are more strongly raised forming lines; cuticula of interstices shiny and smooth; covered with short setae arising from macropunctures. Compound eye sparsely covered with small setae. Gena very narrow; preoccipital carina sharp. Antenna with articles A8-A12 forming ventrally flattened club about 2.0 times as long as broad (viewed dorsally) (Fig. 1); two oval-shaped, perhaps sensory, depressions (tyloids) on concave, ventral side of club, situated within antennal articles A9 and A10.

Anterior margin of pronotum raised to carina especially sharp medially (erroneously termed anterior pronotal carina by Mauss 2013). Short anterior pronotal carina (sensu Carpenter 1988) distinctly present at antero-ventral angle of pronotum running parallel to anterior margin, preceding crenate groove; distance between anterior pronotal carina and anterior margin of pronotum about width of fore metatarsus. Posterior pronotal carina forms narrow translucent sinuate crest on humeral angle of pronotum. Posterior margin of pronotum raised to short carina dorsally in front of tegula. Cuticula of pronotum shiny, with close to reticulate macropunctuation, interstices smooth, rounded, with very sparse uneven micropunctuation; laterally fairly horizontally striated due to slightly more raised interstices. Cuticula of mesoscutum and mesoscutellum shiny, reticulate with close, deep macropunctuation and raised interstices. Postero-medial cuticula of mesoscutum and especially of mesoscutellum with longitudinal interstices becoming narrower and more strongly raised to sharp edges leading to distinctly striated appearance; interstices smooth, laterally on mesoscutellum somewhat finely longitudinally wrinkled. Mesoscutellum laterally with distinct carina along posterior margin, carina medially reduced to a few small tooth-like projections along posterior margin. Carina along posterior margin of metanotum medially with small tooth-like projections. Axilla with short blunt lateral projection only slightly projecting over adjacent, somewhat emarginate, posterior part of tegula. Tegula shiny, closely covered by macropunctures except less densely punctured or completely smooth central convex area. Mesepisternum with pronounced epicnemial carina deflexed backwards to run transversely in front of mid coxa; cuticula shiny, with close macropunctuation; horizontally striated by raised interstices; area ventral to scrobal groove coarsely punctured with some interstices strongly raised to knife-like edges forming coarse honeycomb-like sculpture. Process at mesepisternal scrobal groove of moderate size; cuticula on posterior side shiny in centre with irregularly moderately spaced distinct micropunctuation, ventrally densely longitudinally wrinkled. Horizontal propodeal triangle laterally delimited by a perpendicular declivity, somewhat laterally produced at postero-lateral edge of propodeal triangle, posteriorly bordered by serrated carina; cuticula shiny, coarsely punctured, interstices almost knife-like. Posterior surface of propodeum striated by strong vertical cuticula-folds; cuticula shiny, without punctuation, weakly coriaceous and covered with short fine pale setae. Cuticula of sides of propodeum and metepisternum shiny, densely horizontally wrinkled. Lateral lamella broad and somewhat convex; lateral margin slightly convex; posterior margin straight, not crenate; medially where lamella joins central part of propodeum with a rounded emargination, ventro-medial edge of which produced to a small blunt protrusion; dorsal cuticula of lamella shiny, with moderately spaced macropunctuation, interstices medially smooth, dorso-laterally shagreened. Midcoxa with small but distinct spine at distal end on anterior side close to antero-medial angle. Claws ventrally with small tooth.

Metasomal terga with dark anterior part continuing into posterior pale part by slight declivity; postero-lateral corners slightly produced; posterior margin of tergum I weakly crenulated, crenulation not produced into spines and not projecting over smooth translucent posterior margin of tergum; posterior margin of terga II–VI crenulated, crenulation produced into short partially posteriorly truncated spines, not or only slightly projecting over smooth translucent lower posterior margin of terga (Fig. 6);

cuticula with silken sheen, densely covered with moderately coarse macropunctuation, diameter of punctures and distance between them fairly larger on posterior pale part of tergum, with about seven macropunctures along median axis of tergum III; single thin seta arises from bottom of each macropuncture, only slightly protruding over rim of puncture; interstices finely shagreened, moderately covered with very tiny, decumbent, pale setae, all setae orientated towards caudal end. Posterior margin of tergum VII with two lateral deep emarginations, resulting in two lateral lobes that continue laterally into margins of tergum and single medial lobe divided into two lanceolate more or less pointed medial projections of variable length (Fig. 6). Metasomal sternum I shiny, finely shagreened, with tiny setae but without punctures. Sterna II–VI posteriorly with broad stripe of aetose, translucent cuticula adjacent to posterior margin of more strongly sclerotized cuticula; small sparse band of setae along posterior sclerotized margin somewhat projecting over anterior part of translucent stripe of cuticula; sclerotized cuticula shiny, close to anterior margin faintly shagreened, on posterior half of sternum II–VI medially and laterally with sparse punctuation of shallow micropunctures from which short pale setae arise, on sternum II antero-laterally with a few small shallow macropunctures from which short pale setae arise, on sternum III–VI anteriorly with moderate to sparse shallow macropunctuation. Sternum VIII with distinct little spine on each side of posterior margin; emargination of posterior margin medially angled, laterally with a transverse section well set off by protruded edge (Fig. 8).

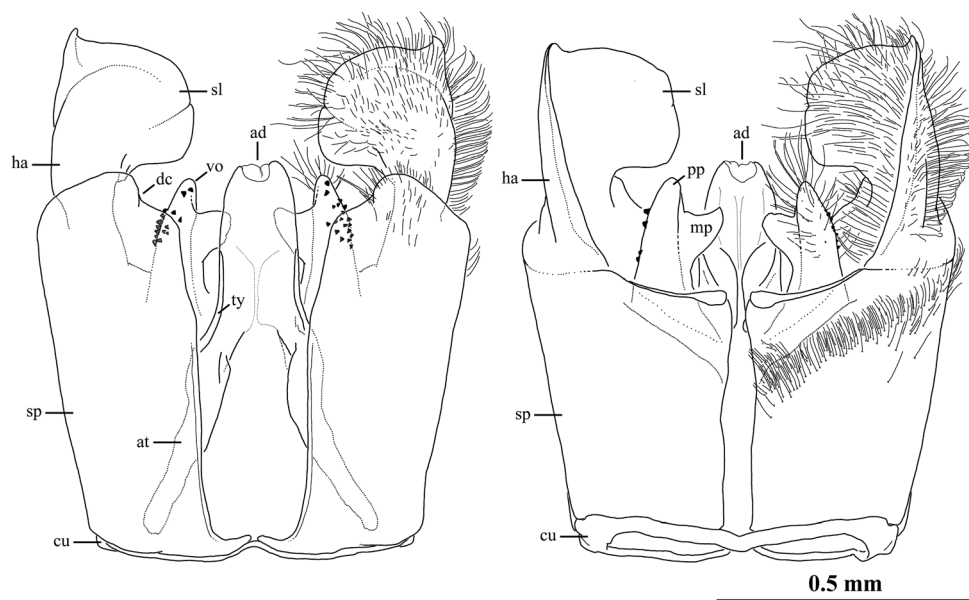


Figure 10. Male genital of *Celonites hermon* (dbM No. 3689) in dorsal (left) and ventral view (right). Setae only shown on one side of each drawing. Nomenclature follows that of Birket-Smith (1981): ad, aedeagus; at, apodema thyrsos; cu, cupula; dc, dorso-medial concavity of the posterior margin of the stipes; ha, harpide; mp, medial process of volsella; pp, posterior process of volsella; sl, shovel-like dorso-medial lobe of harpide; sp, stipes; ty, thyrsos; vo, volsella.

Male genitalia as in Figs 9–10. Dorso-medial shovel-like lobe of harpide large, densely covered ventrally with long setae. Dorso-posterior margin of stipes with dorso-medial concavity angled. Stipes in dorsal view elongated, with medial and lateral margin running more or less parallel towards posterior end. Sides of stipites converging continuously anteriorly towards cupula. Volsella moderately large and broad, not reaching antero-medial margin of dorso-medial lobe of harpide; dorsal area with strongly sclerotized, large, dark tubercles; distances between tubercles moderate; plane medial process curved more or less hook-like towards posterior end, set off distinctly from shaft by longitudinal fold; posterior process conically rounded, proximally continuing into shaft of volsella. Sides of thyrsos more or less parallel only slightly converging towards posterior (apical) end of aedoeagus. Each thyrsos continues anteriorly into apodema thyrsos with a distinct outwardly directed curve. On ventral side cupula medially protruded towards anterior end projecting over dorsal margin of cupula in ventral view of genital capsule.

Measurements. Measurements of the exoskeleton are summarized in Table 1.

Floral association. Unknown.

Distribution. *Celonites hermon* is known only from three localities in the ranges of the Lebanon and Anti-Lebanon Mountains along the Lebanese section of the Dead Sea Transform (Fig. 11).

Table 1. Measurements of the exoskeleton of imagines of *Celonites hermon* (x = median; min = minimum, max = maximum; measurements were made with a Wild M3 stereomicroscope with maximum magnification 80×, maximum accuracy 0.011 mm, all distances in mm).

Parameter	Female				Male			
	x	min	max	n	x	min	max	n
lateral ocelli distance	0.46	0.42	0.47	7	0.43	0.42	0.45	2
median/lateral ocellus distance	0.17	0.15	0.18	7	0.15	0.15	0.15	2
compound eyes distance	1.28	1.22	1.36	7	1.16	1.16	1.16	2
A1 length	0.18	0.17	0.20	7	0.19	0.19	0.19	2
A3 length	0.24	0.22	0.26	7	0.24	0.23	0.24	2
A3 width	0.11	0.11	0.11	7	0.13	0.13	0.13	2
A4–5 length	0.20	0.19	0.20	7	0.21	0.21	0.21	2
A8–12 length	0.77	0.73	0.87	7	1.08	1.08	1.08	2
A8–12 width	0.40	0.37	0.42	7	0.53	0.52	0.55	2
antennal sockets distance	0.81	0.76	0.84	7	0.61	0.59	0.62	2
clypeus maximum width	1.11	1.04	1.16	7	0.99	0.98	1.00	2
clypeus apical width	0.52	0.51	0.61	7	0.46	0.44	0.48	2
clypeus length	0.90	0.84	1.38	7	0.79	0.76	0.81	2
mesonotum width	2.74	2.55	2.80	6	2.60	2.49	2.72	2
mesoscutum length	1.96	1.88	2.10	6	1.96	1.88	2.04	2
wing length	5.54	5.25	5.68	7	5.47	5.40	5.54	2
R+Sc length	2.94	2.81	3.13	7	2.88	2.85	2.90	2
number of hamuli	12	10	14	7	10	10	10	2
femur I length	1.39	1.34	1.48	6	1.33	1.31	1.34	2
tibia I length	0.95	0.87	0.98	7	0.89	0.88	0.89	2
metatarsus I length	0.56	0.55	0.57	7	0.50	0.46	0.53	2
tergum I width	2.74	2.58	2.81	7	2.65	2.60	2.69	2
tergum I length	1.00	0.95	1.14	7	1.04	0.94	1.14	2
tergum II width	2.77	2.63	2.90	7	2.67	2.60	2.74	2
total length	7.2	6.7	7.5	7	7.3	7.0	7.5	2

- the Peloponnesus with small reddish markings close to the lateral margin of the terga) **3**
- 3 Pollen collecting knobbed setae on frons longer and thinner, up to 1.4 times as long as diameter of median ocellus (Figs 3, 4). Ocelli larger, with diameter of median ocellus distinctly larger than diameter of lateral ocelli (Fig. 4). Lateral ocelli more or less obliquely oval (Fig. 4). Vertex falls away obliquely towards the occipital carina immediately behind the ocelli (Fig. 4). Mesoscutum shiny with dense, moderately coarse punctures separated by rounded, not knife-like interstices..... ***Celonites hermon* Gusenleitner, 2002**
- Pollen collecting knobbed setae on frons shorter and more robust, not more than 1.0 times as long as diameter of median ocellus. Ocelli smaller, with median ocellus only slightly larger than lateral ocelli. Lateral ocelli more evenly rounded. Vertex continues more or less horizontally behind ocelli towards occipital carina. Mesoscutum less shiny, with dense, moderately coarse punctures separated by knife-like interstices, especially anteriorly resulting in a more comb-like appearance **4**
- 4 Antennal club (A8–12) with dark tip, that is, at least distal end of A12 is blackish markedly contrasting on ventral side to adjacent light reddish brown area of antennal club. On dorsal side blackish marking extends usually over distal parts of A11 fading gradually towards proximal end (for differences between geographic populations see Mauss et al. 2016) ***Celonites tauricus* Kostylev, 1935**
- Antennal club (A8–12) of individuals from Balkan populations completely orange, in some dark coloured individuals from western populations club becomes darker dorsally, while immediate tip and especially ventral side of A12 remain lighter..... ***Celonites abbreviatus* (Villers, 1789)**
- 5 Tergum VII trilobed. Posterior emargination of sternum VIII medially bent at an angle of about 135°. Laterally the posterior, angled margin of sternum VIII continues directly into the lateral surface of the sternum without a prominent edge or a distinct spine, so that even a small postero-lateral transverse section is lacking. Genitalia as in Mauss 2013: fig. 26. Metasoma black with extensive yellowish-white and reddish markings..... ***Celonites andreasmuelleri* Mauss, 2013**
- Tergum VII quadrilobed, since the median lobe is medially distinctly emarginate (Fig. 6). Sternum VIII different, with a distinct little spine on each side of the posterior margin (Fig. 8). Genitalia different. Metasoma black with extensive yellowish-white or yellow but without reddish markings (exception being made for *C. abbreviatus* from the Peloponnesus with small reddish tinges close to the lateral margins of the terga) **6**
- 6 Posterior margin of stipes of male genitalia with dorso-medial concavity (Figs 9, 10). Stipes in dorsal view elongated, with medial and lateral margin running more or less parallel towards posterior end (Figs 9, 10). Posterior process of volsella conically rounded. Medial process of volsella set off dis-

- tinctly from shaft by longitudinal fold (Figs 9, 10). Ocelli larger. Vertex falling away obliquely towards occipital carina immediately behind ocelli.....
 ***Celonites hermon* Gusenleitner, 2002**
- Posterior margin of stipes of male genitalia straight, without dorso-medial concavity. Stipes in dorsal view shorter, with medial and lateral margin diverging continuously towards posterior end. Posterior process of volsella flat. Medial process of volsella continues gradually into shaft. Ocelli smaller. Vertex running more or less horizontally towards occipital carina behind ocelli7
- 7 Antennal club (A8–12) orange, ventrally with distinct blackish marking on A12 extending on distal parts of A11 well set off from orange of adjacent ventral area, orange on dorso-posterior parts of A8–A12 can be darkened to variable extend. Clypeus white to whitish-yellow. Emargination of sternum VIII more evenly concave. Male genital broader. Volsella strongly sclerotized, with a larger medial process ***Celonites tauricus* Kostylev, 1935**
- Antennal club (A8–12) of individuals from Balkan populations completely orange, in some dark coloured individuals from western populations club becomes darker dorsally, while immediate tip and especially ventral side of A12 remain lighter. Clypeus yellow, except in one rare variety from Switzerland in which it is nearly white. Emargination of sternum VIII medially angled. Genital less broad. Volsella less sclerotized, with a smaller medial process.....
 ***Celonites abbreviatus* (Villers, 1789)**

Discussion

Status and taxonomic position of *Celonites hermon*

Celonites hermon can be assigned to the subgenus *Celonites* s.str., the *Celonites abbreviatus*-group and finally the *C. abbreviatus*-complex without contradiction as it shares all characters of these taxa established by Richards (1962) and Mauss (2013). Among the members of the *C. abbreviatus*-complex *Celonites hermon* resembles *C. andreasmuelleri* most of all in the comparatively thin pollen collecting knobbed setae that are of equal diameter along most of their length, the enlarged ocelli, with a distinctly large circular median ocellus and smaller oval shaped lateral ocelli and the characteristic form of the head, that falls away obliquely towards the occipital carina immediately behind the ocelli. Moreover, in the male genitalia the posterior margin of the stipes has a characteristic dorso-medial concavity and the medial and lateral margin of the stipes are running more or less parallel towards the posterior end. These distinctive similarities are probably synapomorphic characters of both taxa, as they are not present in other members of the *C. abbreviatus*-complex and even the whole *C. abbreviatus*-group.

On the other hand, *Celonites hermon* is lacking some of the potential autapomorphies of *C. andreasmuelleri* recognized by Mauss (2013), i.e. the characteristic semi-

circular cuticula structure on the frons of the females, as well as the differing form of sternum VIII and tergum VII and the considerably larger shovel-like dorso-medial lobe of the harpide in the males of *C. andreasmuelleri*. Moreover, both taxa differ in colour, the colour pattern on the ventral side of the tip of the antennal club and the form of the volsella. The distinct differences in the male genitalia, the form of sternum VIII and tergum VII as well as the colour pattern on the ventral side of the antennal club that has been assumed by Mauss et al. (2016) to be associated with mate recognition, lead to the conclusion that both taxa are probably reproductively isolated and represent two separate biospecies (*sensu* Mayr 1967).

The hypotheses proposed by Mauss (2013) that *Celonites hermon* is identical with *C. abbreviatus*, is rejected. Both species differ clearly in form and length of the pollen collecting knobbed setae, the size of the ocelli and the shape of the vertex. Moreover, there are distinct differences in the male genitalia. The misinterpretation of the morphological characters of the type by Mauss (2013) resulted to some extend from the mediocre condition of the female specimen, of which the setae on frons and vertex are stuck together to a high degree by remnants of a viscous liquid, giving them a shorter and stouter appearance and partly covering the exoskeleton.

Biogeography

Celonites hermon has been recorded only from a small area in the mountain ranges along by both sides of the Lebanese section of the Dead Sea Transform (Fig. 11). Since *C. hermon* differs significantly from *C. abbreviatus* in various morphological characters, it cannot represent a relict population of *C. abbreviatus* as implied by Mauss (2013). Moreover, the morphological similarities between *C. hermon* and *C. andreasmuelleri* indicate a close relationship between them and a more distant relationship to *C. abbreviatus* and *C. tauricus*. Therefore, it can be hypothesized that *C. hermon* and *C. andreasmuelleri* originated from a common stem species that inhabited the area along the Dead Sea Transform. Geographic isolation and succeeding speciation may have led to the recent allopatric distribution with *C. hermon* being restricted to the northern Lebanese section of the Dead Sea Transform and *C. andreasmuelleri* to the southerly adjacent area of the Jordan Rift Valley (Fig. 11).

Acknowledgements

Fritz Gusenleitner (Upper Austrian State Museum, Linz) and Josef Gusenleitner (Linz) generously provided the investigated specimens of *Celonites hermon*. We are especially grateful to Jim Carpenter (American Museum of Natural History, New York) for valuable comments on the manuscript and improvement of our English and Rainer Neu-meyer and Andreas Müller for their careful reviews.

References

- Bequaert J (1940) Notes on the distribution of *Pseudomasaris* and the food plants of Masaridinae and Gayellinae (Hymenoptera Vespidae). Bulletin of the Brooklyn Entomological Society 35: 37–45.
- Birket-Smith SJR (1981) The male genitalia of Hymenoptera – a review based on morphology in Dorylidae (Formicidae). Entomologica scandinavica Supplement 15: 377–397.
- Carpenter JM (1989/1988) The phylogenetic system of the Gayellini (Hymenoptera: Vespidae, Masarinae). Psyche 95: 211–241. <https://doi.org/10.1155/1988/45034>
- Carpenter JM (2001) Checklist of species of the subfamily Masarinae (Hymenoptera: Vespidae). American Museum Novitates 3325: 1–40. [https://doi.org/10.1206/0003-0082\(2001\)325<0001:COOTS>2.0.CO;2](https://doi.org/10.1206/0003-0082(2001)325<0001:COOTS>2.0.CO;2)
- Eck R (1978) Biometrische Untersuchung zur Klärung der Artunterschiede bei sozialen Faltenwespen (Hymenoptera: Vespidae). Entomologische Abhandlungen des Staatlichen Museums für Tierkunde Dresden 42: 315–344.
- Gess S, Gess F (2010) Pollen wasps and flowers in southern Africa. SANBI Biodiversity Series 18: 1–147.
- Gusenleitner J (2002) Neue oder bemerkenswerte Vespoidea aus dem Nahen Osten (Hymenoptera: Eumenidae, Masaridae). Linzer biologische Beiträge 34: 335–343.
- Gusenleitner J (2007) Eine neue *Celonites*-Art aus Sibirien (Hymenoptera: Vespidae, Masarinae). Linzer Biologische Beiträge 39: 133–135.
- Gusenleitner J (2012) Neue Masarinae aus der paläarktischen Region (Hymenoptera: Vespidae: Masarinae). Linzer Biologische Beiträge 44: 319–326.
- Gusenleitner J (2018) Neue asiatische Faltenwespen (Hymenoptera, Vespidae: Eumeninae, Masarinae). Linzer Biologische Beiträge 50: 303–308.
- Mauss V (2006) Observations on flower association and mating behaviour of the pollen wasp species *Celonites abbreviatus* (Villers, 1789) in Greece (Hymenoptera: Vespidae, Masarinae). Journal of Hymenoptera Research 15: 266–269.
- Mauss V (2013) Description of *Celonites andreasmuelleri* sp. n. (Hymenoptera, Vespidae, Masarinae) from the Middle East with a key to the Palearctic species of the *C. abbreviatus*-complex of the subgenus *Celonites* s.str. Journal of Hymenoptera Research 31: 79–95. <https://doi.org/10.3897/JHR.31.4235>
- Mauss V, Fateryga A, Prosi R (2016) Taxonomy, distribution and bionomics of *Celonites tauricus* Kostylev, 1935, stat. n. (Hymenoptera, Vespidae, Masarinae). Journal of Hymenoptera Research 48: 33–66. <https://doi.org/10.3897/JHR.48.6884>
- Mayr E (1967) Artbegriff und Evolution. Paul Parey, Hamburg, 617 pp.
- Müller A (1996) Convergent evolution of morphological specializations in Central European bee and honey wasp species as an adaptation to the uptake of pollen from nototribic flowers (Hymenoptera, Apoidea and Masaridae). Biological Journal of the Linnean Society 57: 235–252. <https://doi.org/10.1111/j.1095-8312.1996.tb00311.x>
- Richards OW (1962) A revisional study of the masarid wasps (Hymenoptera, Vespoidea). British Museum (Natural History), London, 294 pp.

- Schremmer F (1959) Der bisher unbekannte Pollensammelapparat der Honigwespe *Celonites abbreviatus* Vill. (Vespidae, Masarinae). Zeitschrift für Morphologie und Ökologie der Tiere 48: 424–438. <https://doi.org/10.1007/BF00408580>
- Schremmer F (1961) Morphologische Anpassungen von Tieren - insbesondere Insekten - an die Gewinnung von Blummahrung. Verhandlungen der Deutschen Zoologischen Gesellschaft (Zoologischer Anzeiger Supplement) 25: 375–401.