

Description of *Celonites andreasmuelleri* sp. n. (Hymenoptera, Vespidae, Masarinae) from the Middle East with a key to the Palaeartic species of the *C. abbreviatus*-complex of the subgenus *Celonites* s. str.

Volker Mauss^{1,†}

¹ Staatliches Museum für Naturkunde, Abt. Entomologie, Rosenstein 1, D-70191 Stuttgart, Germany

† [urn:isid:zoobank.org/author:7E658D33-9271-4A3E-B0EA-49EBA1515BD8](https://urn.isid.zoobank.org/author:7E658D33-9271-4A3E-B0EA-49EBA1515BD8)

Corresponding author: *Volker Mauss* (volker.mauss@gmx.de)

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Abstract

Celonites andreasmuelleri, a new species of pollen wasp from Israel and Jordan is described. It belongs to the *Celonites abbreviatus*-complex as indicated by a pollen-collecting apparatus consisting of knobbed setae on clypeus and frons and a corresponding pollen comb on the forelegs. Females of *C. andreasmuelleri* were recorded at nototribic flowers of *Ballota* sp. (Lamiaceae).

Keywords

Hymenoptera, Vespidae, Masarinae, *Celonites*, taxonomy, Palaeartic, Near East, Jordan, Israel

Introduction

Within the pollen wasps (Masarinae) the genus *Celonites* constitutes a well defined monophylum (Carpenter 1993, Krenn et al. 2002). Species of *Celonites* have been recorded from the Afrotropical and Palaeartic region. About two third of the species belong to the Palaeartic from which 45 species have been described (according to the

list of Carpenter 2001, combined with newly described species by Gusenleitner 2002, 2007, 2012). In his world monograph on pollen wasps Richards (1962) revised most of the Palearctic species of *Celonites* with the exception of eight eastern taxa that he had not seen. Additional species from Asia Minor and the Near East were described by Gusenleitner (1966, 1973, 2002, 2012) who also prepared a key to the European species (Gusenleitner 1997). However, the knowledge of *Celonites* in the Palearctic in particular in North Africa and Asia, from which the majority of the Palearctic species have been described, is still limited.

A series of six females of a so far unknown species of *Celonites* was recently collected in Jordan by A. Müller, C. Praz and C. Sedivy and handed to me for identification by A. Müller. A corresponding male was captured by A. Dorchin in Israel. The aim of this study is to describe the new species, to characterize its taxonomic position within the genus *Celonites* and to provide a key to the new species and its close relatives.

Systematics

Celonites andreasmuelleri sp. n.

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http://species-id.net/wiki/Celonites_andreasmuelleri

Figs 1, 3, 6, 7, 11, 14, 17, 19, 21, 25, 26

Holotype. 1♀ (dbM No. 3072) coll. ETH-Zürich, Jordan, Wadi al Hasa S Al-Karak, 30°54'N, 35°41'E, 20.04.2007 leg. C. Praz, C. Sedivy, A. Müller, visiting *Ballota* sp. (Lamiaceae).

Paratypes. 1♀ (dbM No. 3070) coll. Tel-Aviv University, 1♀ (dbM No. 3071) coll. Oberösterreichisches Landesmuseum Linz, 3♀♀ (dbM No. 3073, 3074, 3075) coll. V. Mauss, all data as holotype. 1♂ (dbM No. 3454), Israel, 16km SE Mizpe Ramon, 30°32.833'N, 34°39.15'E, 815 m a.s.l., 03.05.2011 leg. A. Dorchin, coll. V. Mauss.

Diagnosis. 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, about as long as diameter of median ocellus. In females most of these setae with tiny spherical enlargement at tip („knob“), in males setae with distal enlargement only present on frons.

Coloration of body black with extensive *whitish-yellow* markings, mostly bordered with reddish-brown tinge. Terga richly marked posteriorly with a median and two lateral whitish-yellow markings, interrupted on each side of middle by a broad reddish-brown area, while anterior part is blackish (Figs 1, 7).

In females cuticula on central area of frons densely and strongly shagreened leading to a conspicuous semi-circular dull region covered with knobbed pollen-collecting setae, contrasting distinctly to the adjacent smooth, shiny cuticula on vertex and lateral parts of frons and also with the less densely shagreened cuticula on clypeus (Fig 6, 19).

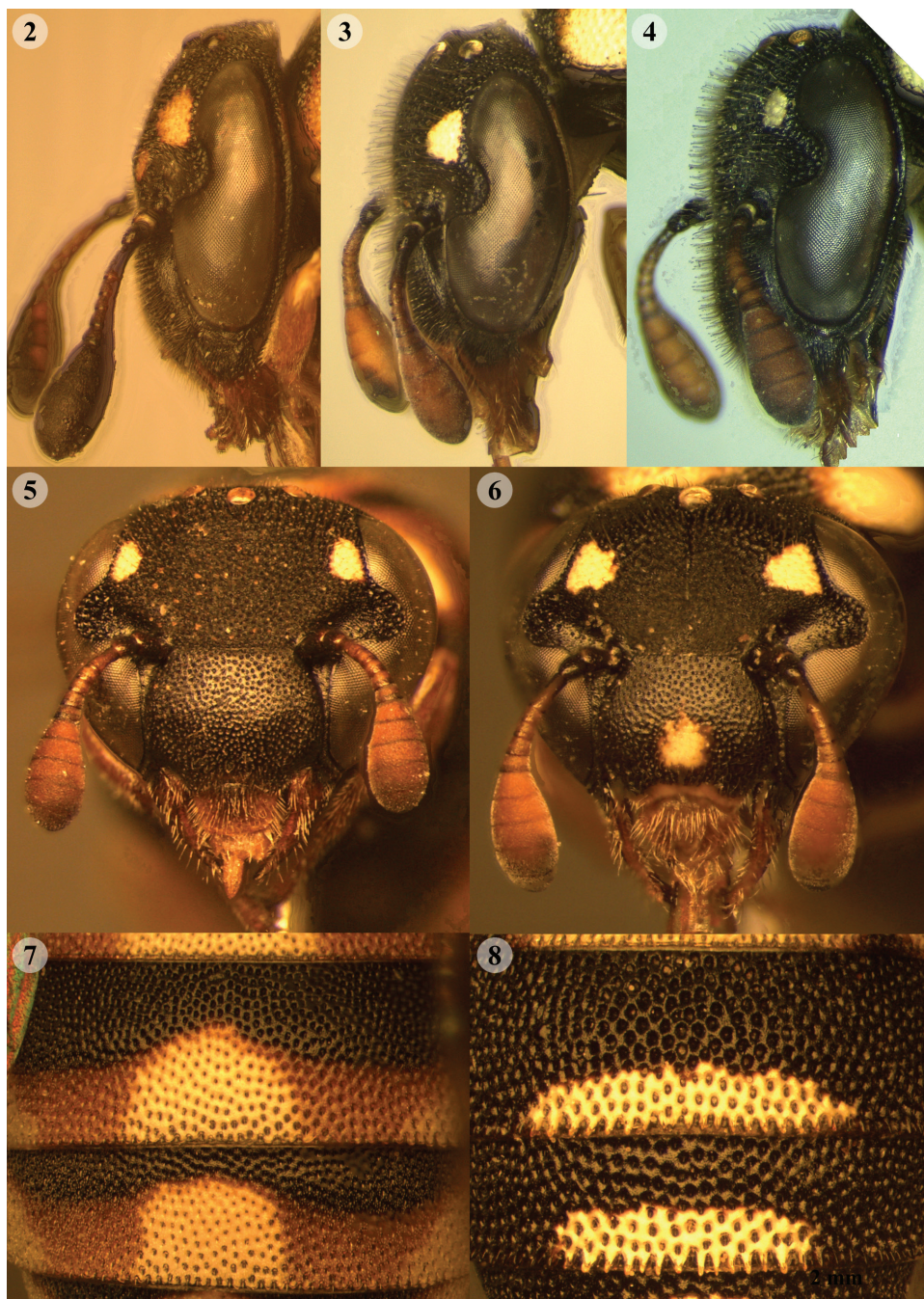


Figure 1. Palearctic species of the *Celonites abbreviatus*-group with knobbed setae on clypeus and frons that represent the *Celonites abbreviatus*-complex in lateral view (*C. mayeti* female dbM No. 3462, male dbM No. 3457; *C. abbreviatus* female dbM No. 3458, male dbM No. 3459, *C. spinosus* female dbM No. 3428, male dbM No. 3430; *C. andreasmuelleri* female dbM No. 3072, male dbM No. 3454; *C. persicus* female dbM No. 3455).

Males with only two oval-shaped tyloids situated ventrally on segments A9 and A10 of club-shaped antennae. Midcoxa of males 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, with undivided medial projection leading to trilobed appearance of posterior margin (Fig. 21). Posterior margin of sternum VIII emarginate. Emargination medially angled, continuing laterally directly into sides of sternum VIII, without postero-lateral transverse section or small spine at lateral corner of emargination (Fig. 14).

Description. Female. Colour: Black. The following are yellowish-white mostly bordered with reddish-brown tinge: central spot on clypeus; two triangular marks on frons; small median spot on vertex posterior to median ocellus; narrow streak on occiput and gena along occipital carina at dorso-lateral corner of head; large spot on antero-dorsal angle of pronotum (humeral spot); broad stripe along dorso-medial (inner) margin of pronotum; large spot on dorsal mesopleura; tip of axilla; large median spot on scutellum; median third of metanotum; propodeal lamella; median and two lateral markings posteriorly on terga I–V; median and two small lateral spots on tergum VI that do not extend over posterior margin; small spots on postero-lateral edges of sterna II–IV. Reddish-brown are: distal two third of mandible; labrum; narrow stripe along ventral margin of clypeus; pronotal lobe; tegula; large marking between median and lateral spot posteriorly on each side of middle of terga I–V; tergum VI; distal part of femora, tibiae and tarsi. Blackish-brown are: sterna; coxae; trochanters and basal third of femora. Antenna with A1–2 black. A3 proximally black and distally reddish-brown. A4–11 reddish-brown. A11 distally blackish dorsally but distinctly lighter with nearly whitish-yellow spot ventrally that contrasts to distally adjacent black marking of tip of club on A12. Wings translucent blackish-brown.

Structure. Head in front view as long as broad (Fig. 6). Clypeus a little broader than long; shiny with shallow moderately spaced macropunctuation (interstices a little larger than diameter of punctures) becoming more distinct towards dorsal margin; slightly shagreened especially dorso-laterally; covered with pale, stiff setae arising from macropunctures; setae about as long as diameter of median ocellus; most with tiny spherical enlargement at tip (“knob”) (Fig. 3); lateral setae with distal ends curved towards centre of clypeus. Frons with shallow moderately spaced macropunctuation; cuticula on central area densely and strongly shagreened leading to a conspicuous semi-circular dull area, contrasting distinctly to adjacent smooth shiny cuticula on vertex and lateral parts of frons (Fig. 19); obliquely striated from ventromedial to dorsolateral on both sides of median axis; covered with pale outstanding knobbed setae arising from macropunctures. Frontal line raised to form small carina in centre of frons. Vertex with moderately spaced macropunctuation becoming denser, more distinct and somewhat reticulate posterior to ocelli; cuticula smooth shiny with only very few micropunctures; covered with short, thin setae arising from macropunctures. Compound eye sparsely covered with small setae. Gena very narrow; preoccipital carina sharp. Antennal segments A8–12 forming ventrally flattened club nearly 2 times as long as broad (viewed dorsally).

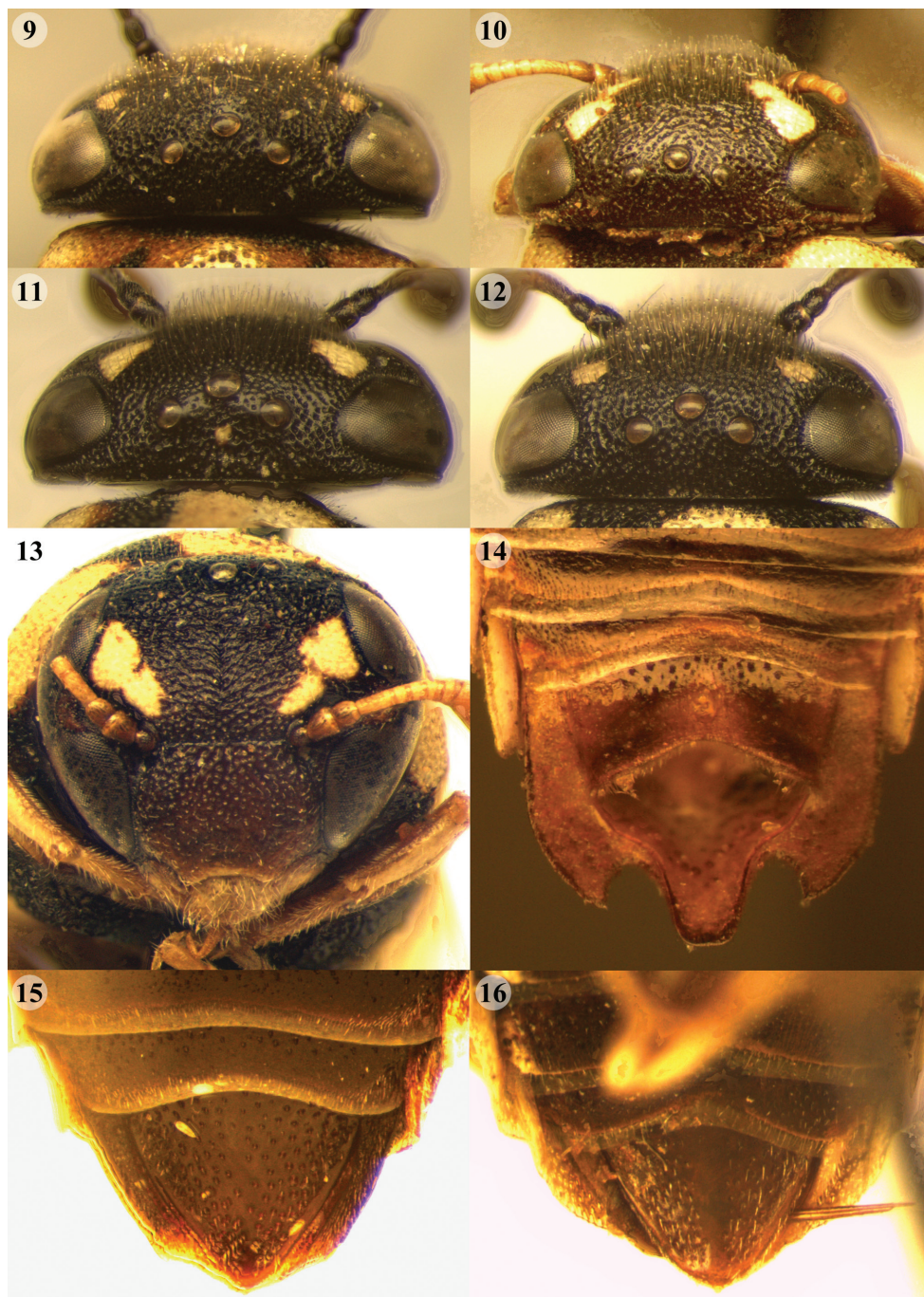


Figures 2–8. 2–4 Head of female in lateral view showing pilosity on frons and clypeus 2 *C. fischeri* (dbM No. 3065) 3 *C. andreasmuelleri* (dbM No. 3072) 4 *C. spinosus* (dbM No. 3428). 5–6 Head of female in frontal view 5 *C. mayeti* (dbM No. 3462) 6 *C. andreasmuelleri* (dbM No. 3072). 7–8 Cuticle structure of metasomal terga II and III of female in dorsal view 7 *C. andreasmuelleri* (dbM No. 3073) 8 *C. spinosus* (dbM No. 3428).

Anterior pronotal carina low but distinctly present along anterior margin of pronotum, especially sharp medially. Posterior pronotal carina forms narrow translucent sinuate crest on humeral angle of pronotum. Dorso-medially pronotum slopes down towards mesoscutum resulting in slight depression along the dorso-medial margin of pronotum; posterior margin raised to carina dorsally in front of tegula; cuticula shiny, with close, reticulate macropunctuation, interstices smooth, rounded, nearly without micropunctures; postero-lateral cuticula horizontally striated due to more sharply raised interstices. Cuticula of mesoscutum and mesoscutellum shiny, with close, reticulate macropunctuation; interstices slightly raised but rounded and somewhat longitudinally arranged leading to striated appearance especially laterally (Fig. 17); interstices weakly shagreened along median axis and laterally smooth nearly without microsculpture. Mesoscutellum and metanotum medially with small tooth-like projections along posterior margin. Axilla with short blunt lateral projection only slightly projecting over adjacent, somewhat emarginated, posterior part of tegula. Tegula shiny, closely covered by macropunctures except 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 posteriorly faintly shiny, finely but densely shagreened. 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 almost straight; 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 point; dorsal cuticula of lamella shiny, smooth, with moderately spaced macropunctuation. Claws ventrally with small tooth.

Metasomal terga with dark anterior part continuing into posterior pale part by slight declivity especially laterally; postero-lateral corners slightly produced; posterior margins weakly crenulated medially, becoming more pronounced postero-laterally on terga II-IV but crenulation not produced into distinct spines and not projecting over smooth translucent lower posterior margin of terga (Fig. 7); cuticula with silken sheen, densely covered with moderately coarse macropunctuation, diameter of punctures and distance between them increasing towards posterior and lateral margins of terga, with about 15 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. Tergum VI with sides converging almost as



Figures 9–16. 9–12 Head of female in dorsal view 9 *C. mayeti* (dbM No. 3456) 10 *C. persicus* (dbM No. 3455) 11 *C. andreasmuelleri* (dbM No. 3072) 12 *C. spinosus* (dbM No. 3428). 13 Head of *C. persicus* female (dbM No. 3455) in frontal view. 14–16 Tip of metasoma from ventral 14 *C. andreasmuelleri* male (dbM No. 3454) 15 *C. mayeti* female (dbM No. 3456) 16 *C. persicus* female (dbM No. 3455).

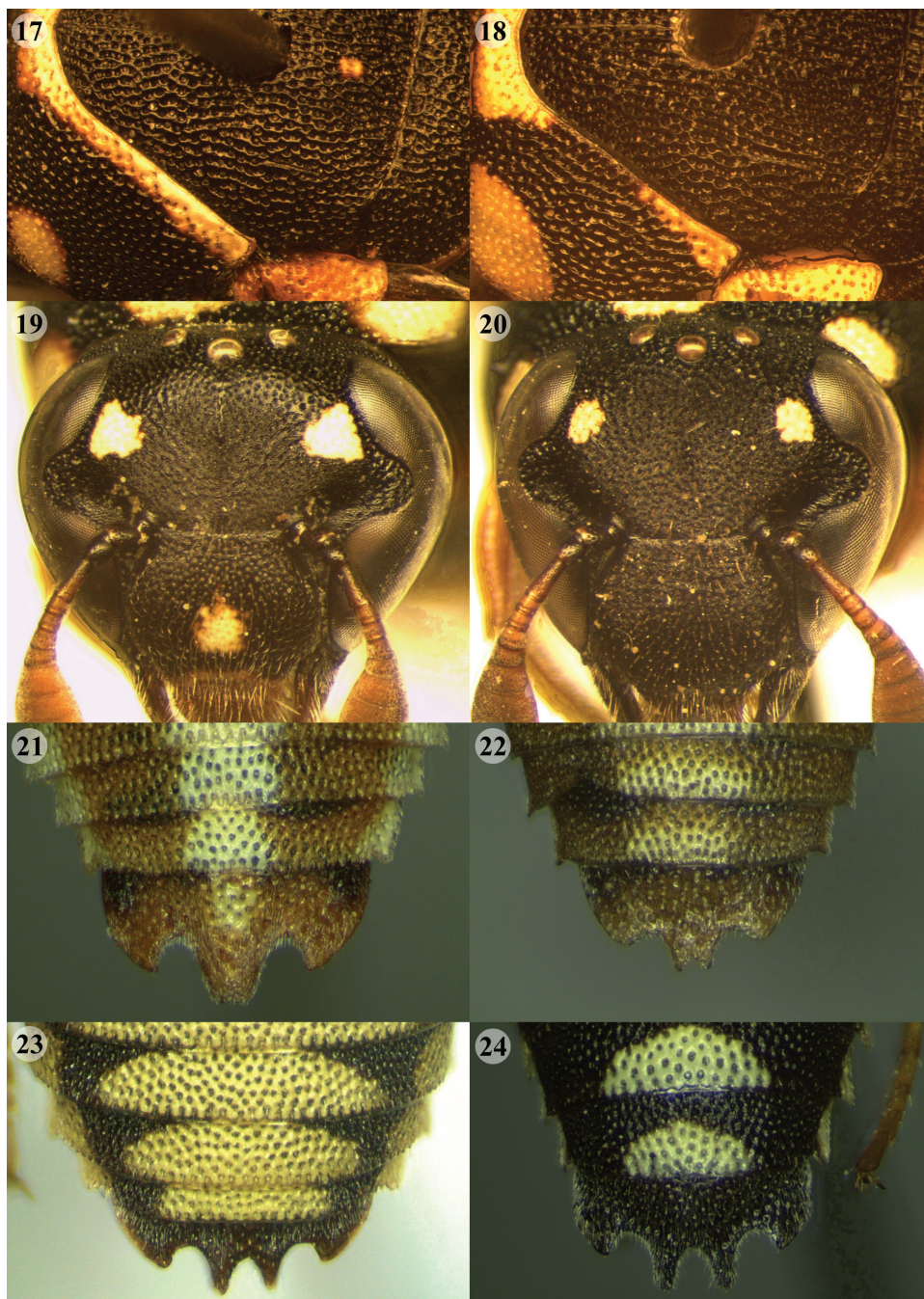
straight lines; posterior margin with curved protrusion over central two-thirds, laterally transverse, forming a distinct angle to side.

Metasomal sternum I shiny, with tiny setae but without punctures. Sterna II-V posteriorly with broad strip of asetose, translucent cuticula adjacent to posterior margin of more strongly sclerotized cuticula (Fig. 14); cuticula shiny, finely shagreened, with sparse punctation of shallow, moderate to small macropunctures from which short pale setae arise, becoming denser laterally; small sparse band of setae along posterior sclerotized margin somewhat projecting over anterior part of translucent strip of cuticula. Margin of sternum VI laterally raised to rim; posteriorly protruded into little blunt spine; cuticula shiny, with rather narrow smooth mid-line and at sides strong macropunctures from which short pale setae arise.

Male. Colour: Resembles female, except as follows. Whitish-yellow: large basal spot on mandible; labrum; clypeus except small margin; sinuate band at front of frons, shortly interrupted medially on the supra-antennal area, laterally extending towards upper inner margin of eye where it bends ventrally into ventral half of ocular sinus; large spot on each side of sternum II in addition to small spot on each postero-lateral corner. Vertex completely black. Tip of axilla reddish-brown. Terga I-VI anteriorly blackish, posteriorly with a median and two lateral whitish-yellow markings interrupted on each side of mid-line by a broad reddish-brown area. Tergum VII anteriorly blackish, posteriorly reddish-brown with whitish-yellow median spot. Antenna with A1–2 black; A3–6 anteriorly with whitish-yellow stripe otherwise blackish to reddish-brown; A7–12 reddish-brown running into blackish-brown dorso-posteriorly and at distal end of the club. On ventral side the black tip contrasts to the adjacent light reddish-brown surface of A11.

Structure. Resembles female, except as follows. Clypeus shiny; cuticula smooth with moderately spaced, shallow macropunctation; pale stiff setae arising from macropunctures without distal “knob”; lateral setae with distal ends curved towards centre of clypeus. Frons with semi-circular dull central area smaller and less densely shagreened; bearing at least some knobbed setae. Antenna with two oval-shaped, perhaps sensory, depressions (tyloids) on concave, ventral side of club, situated within antennal segments A9 and A10 and a very small circular cuticula-plate on A8. (Tyloid plate-like structure, distinctly delimited from adjacent cuticula by small rim, diameter about a quarter of width of antennal segment). Midcoxa with small but distinct spine at distal end on anterior side close to antero-medial angle. Macropunctures posteriorly and laterally on terga somewhat larger and crenulation on terga II-VI more pronounced but also not projecting over the smooth translucent lower posterior margin of terga. Tergum VII with medial projection of posterior margin truncated and undivided, appearing trilobed (Figs 14, 21). Posterior emargination of sternum VIII medially angled laterally continuing directly into sides of sternum, so that a postero-lateral transverse section is lacking (Fig. 14).

Male genitalia as in Figs 25–26. Dorso-medial shovel-like lobe of harpide very large, densely covered ventrally with long setae. Posterior margin of stipes with dorso-medial concavity angled. Sides of stipites mostly parallel along their posterior half,



Figures 17–24. 17–18. Cuticle structure of pronotum and mesoscutum of female in dorsal view 17 *C. andreasmuelleri* (dbM No. 3073) 18 *C. abbreviatus* (dbM No. 3461). 19–20 Cuticle structure of frons and clypeus of female in frontal view 19 *C. andreasmuelleri* (dbM No. 3072) 20 *C. spinosus* (dbM No. 3428). 21–24 Tip of metasoma of male in dorsal view 21 *C. andreasmuelleri* (dbM No. 3454) 22 *C. mayeti* (dbM No. 3457) 23 *C. abbreviatus* (dbM No. 3459) 24 *C. spinosus* (dbM No. 3430).

converging slightly anteriorly towards the cupula. Volsella large and broad, extending over antero-medial margin of dorso-medial lobe of harpide; dorsal area with strongly sclerotized, large, dark tubercles; distances between tubercles comparatively large; medial process broad with approximately rectangular distal apex, continuing posteriorly into posterior process at very blunt angle. Sides of thyrsoid converge straight towards posterior end of aedeagus. Ventral margin of cupula medially barely protruded towards anterior end so that whole dorsal margin of cupula remains visible in ventral view of genital capsule.

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

Floral association. All females from the Jordanian locality were recorded visiting flowers of *Ballota* sp. (Lamiaceae).

Distribution. The species is known only from two localities in Jordan and Israel, 90 km apart. Both sites are associated with the drainage system of the Wadi al Jayb.

Table 1. Measurements of the exoskeleton of imagines of *Celonites andreasmuelleri* sp. n. (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	n
lateral ocelli distance	0.41	0.41	0.44	6	0.36	1
front./lat. ocellus distance	0.15	0.13	0.17	6	0.12	1
compound eyes distance	1.24	1.22	1.31	6	1.07	1
A1 length	0.17	0.17	0.19	6	0.15	1
A3 length	0.25	0.24	0.26	6	0.24	1
A3 width	0.10	0.10	0.11	6	0.11	1
A4–5 length	0.19	0.19	0.20	6	0.22	1
A8–12 length	0.72	0.70	0.76	6	0.95	1
A8–12 width	0.38	0.36	0.40	6	0.43	1
antennal sockets distance	0.73	0.67	0.74	6	0.54	1
clypeus max. width	1.03	1.01	1.07	6	0.87	1
clypeus apical width	0.51	0.50	0.61	6	0.47	1
clypeus length	0.83	0.79	0.86	6	0.72	1
mesonotum width	2.59	2.49	2.66	6	2.41	1
mesoscutum length	1.82	1.76	1.90	6	1.55	1
wing length	5.47	5.25	5.75	6	5.33	1
R+Sc length	2.99	2.76	3.08	6	2.81	1
number of hamuli	11.0	10	12	6	12.0	1
femur I length	1.27	1.26	1.28	2	1.17	1
tibia I length	0.89	0.84	0.90	5	0.80	1
metatarsus I length	0.51	0.47	0.55	5	0.42	1
tergum I width	2.69	2.69	2.69	1	2.49	1
tergum I length	0.91	0.91	0.91	1	0.79	1
tergum II width	2.72	2.63	2.77	5	2.44	1
total length	7.2	7.1	7.7	4	7.1	1



Figure 25. Male genitalia of Palearctic species of the *Celonites abbreviatus*-complex in dorsal (left) and ventral view (middle) and metasomal sternum VIII of male in ventral view (right) (*C. mayeti* dbM No. 3452; *C. abbreviatus* dbM No. 3451, *C. spinosus* dbM No. 3431; *C. andreasmuelleri* dbM No. 3454).

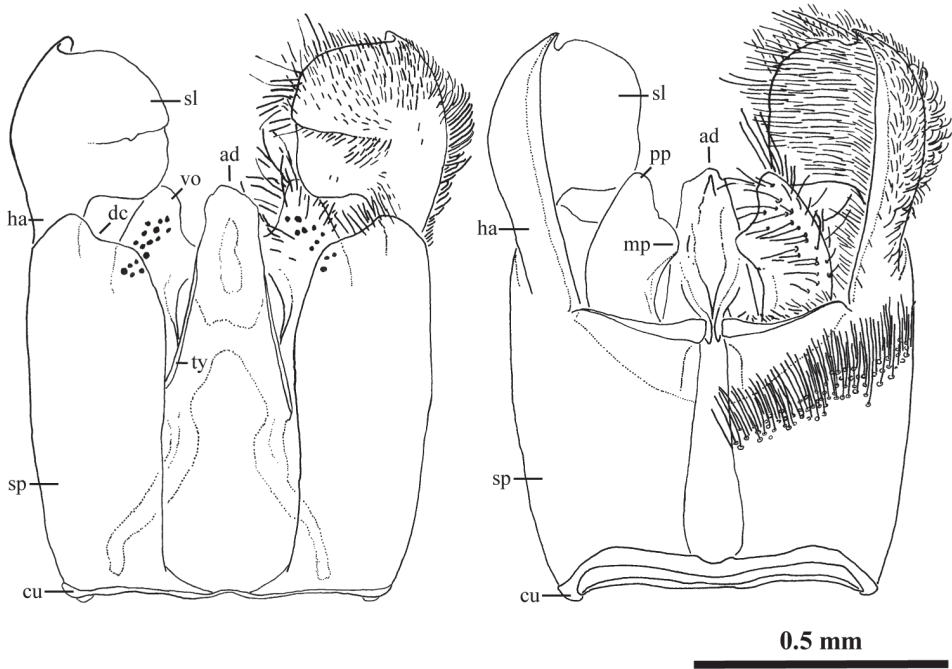


Figure 26. Male genital of *C. andreamuelleri* (dbM No. 3454) in dorsal (left) and ventral view (right). (Setae only shown on one side of each drawing; Nomenclature follows that of Birket-Smith (1981): ad, aedoeagus; cu, cupula; dc, dorso-medial concavity of the posterior margin of the stipes; ha, harpide; mp, medial process of volsella; pp, posterior process of volsella; sl, shovel-like dorso-medial lobe of harpide; sp, stipes; ty, thyrsos; vo, volsella).

Etymology. Named for Dr. Andreas Müller (Zürich, Switzerland) in appreciation of his valuable support and contribution to research into Mediterranean Masarinae.

Key to separate *Celonites andreamuelleri* from other members of the *C. abbreviatus* group of the subgenus *Celonites* s. str.

- 1 Frons and clypeus covered with especially long setae, 2–5 times as long as diameter of median ocellus. Males with three oval-shaped tyloids ventrally on antennal club ***Celonites phlomis*-group** (see Gusenleitner 1973)
- Frons and clypeus covered with distinctly shorter setae, at most about as long as diameter of median ocellus. Males with two oval-shaped tyloids ventrally on antennal club ***Celonites abbreviatus*-group (2)**
- 2 Pubescence of frons and to lesser extent also clypeus less dense, consisting of finer setae without knob-like distal swellings, not forming a pollen brush. Setae only 0.5 times as long as diameter of median ocellus (Fig. 2) ***Celonites fischeri*-complex** (see Richards 1962)

- Pubescence of frons and clypeus denser, consisting of long, stiff setae bearing at least a small, knob-like, spherical swelling at the distal end, forming a pollen brush. Knobbed setae about as long as diameter of median ocellus (Figs 3–4) ***Celonites abbreviatus*-complex (3)**
- 3 Female **4**
- Male **8**
- 4 Head appears in front view broader in relation to its length (Fig. 5, 13). Clypeus broad with nearly parallel lateral margins on ventral half. Ocelli smaller, forming an obtuse triangle (Figs 9–10) **5**
- Head appears in front view more elongated in relation to its length (Fig. 6). Clypeus with lateral margins more continuously rounded leading to an elongated appearance. Ocelli larger, forming a more acute triangle (Figs 11–12) **6**
- 5 Frons rather shiny, moderately shagreened (Fig. 13). Posterior margin of sternum V deeply concave (Fig. 16). Sternum VI medially with a broad longitudinal area of unpunctured cuticula widening towards the anterior end (Fig. 16). Pale markings whitish yellow, antennae mainly orange-yellow with a little dark spot at the distal end, wings less darkened (Fig. 1).....
..... ***Celonites persicus* Richards, 1962**
- Frons dull, densely shagreened (Fig. 5). Posterior margin of sternum V only slightly concave (Fig. 15). Sternum VI medially only with a small diffuse zone of unpunctured cuticula (Fig. 15). Pale markings whitish yellow with extensive red tinges, antennae mainly dark brown, wings somewhat darker (Fig. 1)..... ***Celonites mayeti* Richards, 1962**
- 6 Crenulation at the posterior end of terga II-IV produced into small spines that project over the lower, smooth posterior margin of the tergum (Fig. 8). Terga coarsely punctured, with macropunctures nearly two times as large as in the remaining species, leading to a number of about eight macropunctures along the median axis of tergum III (Fig. 8).....
..... ***Celonites spinosus* Gusenleitner, 1966**
- Crenulation at the posterior ends of terga II-IV not produced into spines and not projecting over the smooth lower posterior margin of the tergum (Fig. 7). Terga are distinctly less coarsely punctured, leading to a number of about fifteen macropunctures along the median axis of tergum III (Fig. 7) **7**
- 7 Clypeus, vertex and frons dull and densely shagreened (Fig. 20). Mesoscutum less shiny with dense, moderately coarse punctures separated by knife-like interstices, especially anteriorly resulting in a comb-like appearance (Fig. 18). Pale markings mainly yellow (Fig. 1), except in one rare variety from Switzerland in which they are white. In east Mediterranean specimens yellow markings may have somewhat reddish tinges
***Celonites abbreviatus* (Villers, 1789)** (*Celonites hermon* Gusenleitner, 2002)
- Clypeus and vertex much more shiny (Fig. 6). Frons with a dull, semi-circular central area of densely shagreened cuticula, contrasting distinctly to the adjacent smooth, shiny cuticula (Fig. 19). Mesoscutum shiny with dense,

- moderately coarse punctures separated by rounded, not knife-like interstices (Fig. 17). Pale markings whitish yellow mostly bordered with reddish tinges (Fig. 1)..... ***Celonites andreasmuelleri* Mauss, sp. n.**
- 8 Tergum VII trilobed (Fig. 14, 21). Posterior emargination of sternite VIII medially bent at an angle of about 135°. Laterally the posterior, angled margin of sternite VIII continues directly into the lateral surface of the sternite without a prominent edge or a distinct spine, so that even a small postero-lateral transverse section is lacking (Fig. 14). Genital as in Fig. 25.....
..... ***Celonites andreasmuelleri* Mauss, sp. n.**
- Tergum VII quadrilobed, since the median lobe is medially distinctly emarginated (Figs 22–24). Sternum VIII different, with a distinct little spine on each side of the posterior margin (Fig. 25). Genital different **9**
- 9 Sternum VIII deeply angularly emarginated, surface deeply sunk in towards emargination (Fig. 25). Genital as in Fig. 25.....
..... ***Celonites mayeti* Richards, 1962**
- Sternum VIII shallow angularly or even concavely emarginated, surface not much sunk in towards emargination (Fig. 25). Genital different **10**
- 10 Clypeus yellow, except in one rare variety from Switzerland in which it is nearly white. Terga denser but less coarsely punctured (Fig. 23), leading to a number of about 13 macropunctures along the median axis of tergum III. Emargination of sternum VIII medially angled (Fig. 25), laterally with a transverse section well set off by a protruded edge. Genital less broad. Volsella less sclerotized, with a smaller distal-median process (Fig. 25).....
..... ***Celonites abbreviatus* (Villers, 1789)**
- Clypeus whitish-yellow. Terga less densely but more coarsely punctured, leading to a number of about 9 macropunctures along the median axis of tergum III. Emargination of sternum VIII more evenly concave (Fig. 25). Genital broader. Volsella strongly sclerotized, with a large distal-median process (Fig. 25)..... ***Celonites spinosus* Gusenleitner, 1966**

Remarks

As the sexes of *Celonites andreasmuelleri* are recorded from different localities they are only associated on the basis of general similarity, allowance being made for secondary sexual differences. The association of the sexes should be confirmed by the study of material of both sexes found flying together in one or more localities.

Celonites andreasmuelleri differs from its near relatives in colour, in the structure of the cuticula of the clypeus, frons and vertex associated with the pollen collecting apparatus, and in the shape of sternum VIII and tergum VII that form the walls of the genital chamber of the male and in the morphology of male genitalia. These differences are probably the result of reproductive isolation so that it can be hypothesized that *C. andreasmuelleri* constitutes a distinct biospecies (*sensu* Mayr 1967).

The taxonomic position of *C. andreasmuelleri* within the genus *Celonites* can be deduced from its morphological characters. In *Celonites andreasmuelleri* the lateral projection of the axilla is short and blunt and projects only slightly over the tegula. This is similar to the morphology of the axilla in members of the subgenus *Celonites s.str* (Richards 1962). Therefore *C. andreasmuelleri* belongs to this taxon. Within this subgenus *C. andreasmuelleri* can be assigned to the *Celonites abbreviatus*-group (*sensu* Richards 1962) as indicated by four characters that males of *C. andreasmuelleri* have in common with males of other species of this group. Firstly, they have only two oval-shaped tyloids, situated on antennal segments A9 and A10. The very small cuticula-plate on antennal segment A8 is presumably homologous with the third tyloid that still exists in other species of *Celonites* and that has probably been reduced within the stem-line of the *C. abbreviatus*-group. Secondly, males from this species-group bear a small spine at the distal end of the midcoxa. Furthermore, tergum VII of the males is markedly lobed posteriorly and the posterior margin of sternum VIII is specifically emarginate.

Females of *C. andreasmuelleri* bear characteristically knobbed setae on frons and clypeus, where they form a distinct pollen brush. A comparable pollen collecting apparatus composed of knobbed setae at the front of the head is known only from *Celonites abbreviatus*, *C. hermon*, *C. mayeti*, *C. persicus* and *C. spinosus* (Schremmer 1959, Müller 1996, pers. obs.), though the spherical enlargement at the distal end of the knobbed setae is smaller in *C. andreasmuelleri* than in the other species (Figs 3, 4). It is an adaptation to pollen uptake from nototribic flowers (Schremmer 1959, Müller 1996). I suggest naming the subtaxon of the *C. abbreviatus*-group that is characterized by the existence of knobbed setae at the front of the head the *C. abbreviatus*-complex. All members of this species-complex for which flower visits have been recorded were observed to visit flowers of Lamiaceae (*C. mayeti*: Bequaert 1940, *C. abbreviatus*: Schremmer 1959, Müller 1996, Mauss 2006). This is in accord with all females of *C. andreasmuelleri* having been collected at the nototribic flowers of *Ballota* (Lamiaceae).

The key to the species of the *C. abbreviatus*-complex does not include the male of *Celonites persicus*, because it is unknown. *Celonites hermon* is not included in the key, because the status of this taxon is unclear to me, although I have studied the type. *Celonites hermon* is very similar to *C. abbreviatus* from which it has been separated because of its extremely long proboscis that reaches the distal end of the abdomen (Gusenleitner 2002). However, proboscis length can not be measured in most *Celonites* specimens, since the mouthparts are usually retracted. This may have misled Gusenleitner (2002) into believing, that the length of the proboscis is outstanding in *C. hermon*, only known from the type, a single female with protruded mouthparts. In fact even the investigation by Schremmer (1959) has already demonstrated that the proboscis of *C. abbreviatus* clearly exceeds the tip of the metasoma. Moreover the proboscis of the only female of *C. abbreviatus* with protruded mouthparts in my collection (dbM No. 3460) extends beyond the end of the metasoma. Therefore *C. hermon* does not differ from *C. abbreviatus* in the character that mainly substantiated its description and it may be a junior synonym of *C. abbreviatus*. However, the situation is more

complicated, since the flagellum of *C. hermon* is conspicuously orange. This is also the case in specimens of *C. abbreviatus* from the East Mediterranean whereas the antennae of Central and West European specimens of *C. abbreviatus* are much darker. Therefore the status of *C. hermon* should be reinvestigated with care.

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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 (1993) Biogeographic Patterns in the Vespidae (Hymenoptera): Two Views of Africa and South America. In: Goldblatt P (Ed) *Biological Relationships Between Africa and South America. Proceedings of the 37th Annual Systematics Symposium, held at Missouri Botanical Gardens, 4–6 October 1990*. Yale University Press, NewHaven and London, 139–155. doi: 10.1206/0003-0082(2001)325<0001:CO&SOT;2
- Carpenter JM (2001) Checklist of species of the subfamily Masarinae (Hymenoptera: Vespidae). *American Museum Novitates* 3325: 1–40.
- Gusenleitner J (1966) Vespidae, Eumenidae und Masaridae aus der Türkei. Teil I. *Polskie Pismo Entomologiczne* 36: 343–363.
- Gusenleitner J (1973) Über Masaridae aus dem nahen Osten (Vespoidea, Hymenoptera). *Bolletino della Museo Civico di Storia Naturale di Venezia* 24: 55–69.
- Gusenleitner J (1997) Die europäischen Arten der Gattung *Celonites* Latreille 1802 (Hymenoptera, Masaridae). *Linzer Biologische Beiträge* 29: 109–115.
- 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.

- Krenn HW, Mauss V, Plant J (2002) Evolution of the suctorial proboscis in pollen wasps (Masarinae, Vespidae). *Arthropod structure & development* 31: 103–120. doi: 10.1016/S1467-8039(02)00025-7
- 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.
- 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.
- 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. doi: 10.1007/BF00408580