MITTEILUNGEN DER SCHWEIZERISCHEN ENTOMOLOGISCHEN GESELLSCHAFT
BULLETIN DE LA SOCIÉTÉ ENTOMOLOGIQUE SUISSE
85: 27–35, 2012

Osmia (*Orientosmia*) *maxschwarzi* sp. n., a new Palaearctic osmiine bee with extraordinarily long mouthparts (Hymenoptera, Apiformes, Megachilidae)

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In the present publication, a new bee species of the genus *Osmia* is described: *Osmia* (*Orientosmia*) *maxschwarzi* sp. n. The new species occurs from western Turkey to central Iran, possesses very long mouthparts, which are as long as the whole body, and has a strong or even exclusive preference for Fabaceae as pollen hosts. The reexamination of the three currently recognized subspecies of *Osmia* (*Orientosmia*) *maxillaris* Morawitz, 1875 revealed that *Osmia m. scheherazade* Peters, 1978 is identical to *Osmia m. dinazade* Peters, 1978, syn. n. and that *Osmia m. scheherazade* deserves species rank: *Osmia scheherazade* Peters, 1978. A key to the three *Orientosmia* species is given including the morphologically similar and closely related *Osmia* (*Monosmia*) *apicata* Smith, 1853.

Key words: *Astragalus*, Fabaceae, identification key, *Monosmia*, Osmiini, pollen host, species description.

INTRODUCTION

Bees of the two subgenera *Orientosmia* Peters, 1978 and *Monosmia* Tkalců, 1974, which consist of a single described species each (Peters 1978; Michener 2007; Ungricht *et al.* 2008), possess the longest mouthparts among the Palaearctic representatives of the genus *Osmia* in terms of both their absolute and relative length. The long mouthparts, which are as long as the whole body when fully extended and still reach beyond the thorax when folded together, might be a synapomorphy indicating monophyly of these two subgenera. In fact, molecular sequence data (M. Haider, S. Dorn and A. Müller, unpublished) as well as other morphological characters (Peters 1978) clearly suggest that *Orientosmia* and *Monosmia* are sister taxa.

The examination of a large undetermined osmiine bee material from the Palaearctic revealed the existence of a still undescribed *Orientosmia* species from western Asia, which is described and diagnosed in the present publication. The description of this new species required the reexamination of the three currently recognized subspecies of *Osmia* (*Orientosmia*) *maxillaris* Morawitz, 1875, which resulted in the synonymization of one subspecies and the elevation of another subspecies to species rank. To facilitate identification, a key is given including all species of *Orientosmia* and *Monosmia*.

MATERIAL AND METHODS

Morphological terminology follows Michener (2007) including definitions for body measurements. Measurements were taken using an ocular micrometer on an Olympus VMT stereomicroscope. Photomicrographs were taken with a Leica MZ16 stereomicroscope using the digital imaging software ImageAccess 10 Standard (Imagic, Glattbrugg). To assess the pollen hosts of the new species, scopal pollen contents of all available females were analysed by light microscopy applying the method of Sedivy *et al.* (2008). The type specimens are deposited in the Entomological Collection of the ETH Zurich, Switzerland (ETHZ).

RESULTS

The subgenus *Orientosmia*

Peters (1978) described the subgenus *Orientosmia* based on a single species, *Osmia maxillaris* Morawitz, 1875. He considered this species to consist of three subspecies: *Osmia m. maxillaris* Morawitz, 1875, which is restricted to Central Asia, *Osmia m. scheherazade* Peters, 1978, which occurs in Turkey and Iran, and *Osmia m. dinazade* Peters, 1978, which is known only from two males collected in northwestern Iran and at the Iranian/Turkmenian border. Based on the recent examination of a large amount of material of bees of the subgenus *Orientosmia*, both the validity of *Osmia m. dinazade* as a subspecies as well as the conspecificity of the nominate subspecies with the other two subspecies require reconsideration, and the subgenus *Orientosmia* is considered here to consist of three species: *Osmia maxillaris* Morawitz, 1875, *Osmia scheherazade* Peters, 1978 and *Osmia maxschwarzi* sp. n. While the distribution of *O. maxillaris* is restricted to Central Asia, the distribution ranges of *O. scheherazade* and *O. maxschwarzi* widely overlap in Turkey and Iran.

Osmia (*Orientosmia*) *maxillaris* Morawitz, 1875

Osmia maxillaris Morawitz, 1875, Travel to Turkestan by A. P. Fedtschenko, p. 82.

Type material. Lectotype ♂, by designation of Peters (1978: 317), «in valle Sarafschan, Warsaminor, Obburden, Iskander» (Tajikistan), ZIN (Russian Academy of Sciences, Zoological Institute, St. Petersburg); paralectotypes ♂, ♀♀. Type species of *Orientosmia* Peters.

Distribution. Kyrgyzstan, Tajikistan, Uzbekistan (Müller 2012).

Biology. Preliminary pollen analytical work suggests that Fabaceae species with long flower corollas play an important role as host plants (M. Haider, S. Dorn and A. Müller, unpublished). Nesting site and nesting material are unknown.

Osmia (*Orientosmia*) *scheherazade* Peters, 1978

Osmia (*Orientosmia*) *maxillaris scheherazade* Peters, 1978, Senckenbergiana Biologica 58: 319.

Type material. Holotype ♂, «Gürün» (Turkey), SMFD (Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt am Main); paratypes ♂♂, ♀♀.

Osmia (*Orientosmia*) *maxillaris dinazade* Peters, 1978, Senckenbergiana Biologica 58: 319. New synonymy.

Type material. Holotype ♂, «Pul-i-chatum, an der Grenze von Turkmenien» (Iran), ZIN (Russian Academy of Sciences, Zoological Institute, St. Petersburg); paratype ♂.

The only diagnostic character given by Peters (1978) to separate *Osmia m. scheherazade* from *Osmia m. dinazade* is the colour of the pilosity on male tergal discs 4–6, which is blackish in the former and whitish to yellowish in the latter. Closer inspection of many specimens of *Osmia m. scheherazade* from different localities in Turkey and Iran, however, revealed considerable variation in the colour of the pilosity on tergal discs 4–6 ranging from blackish and brownish to yellowish and whitish. As the males of *Osmia m. scheherazade* and *Osmia m. dinazade* agree morphologically in all characters including the genitalia and the peculiar shape of tergum 7 (see below), *Osmia m. dinazade* is synonymized here with *Osmia m. scheherazade*.

Osmia m. scheherazade distinctly differs from *Osmia m. maxillaris* in the shape of male tergum 7 (Figs 5, 6). The material examined so far revealed no morphological transition between the roof-shaped tergum 7 of the Turkish and Iranian specimens and the evenly convex tergum 7 of the Central Asian specimens. Thus, conspecificity of these two taxa, which was already questioned by Peters (1978), is rejected and *Osmia m. scheherazade* is elevated here to species rank.

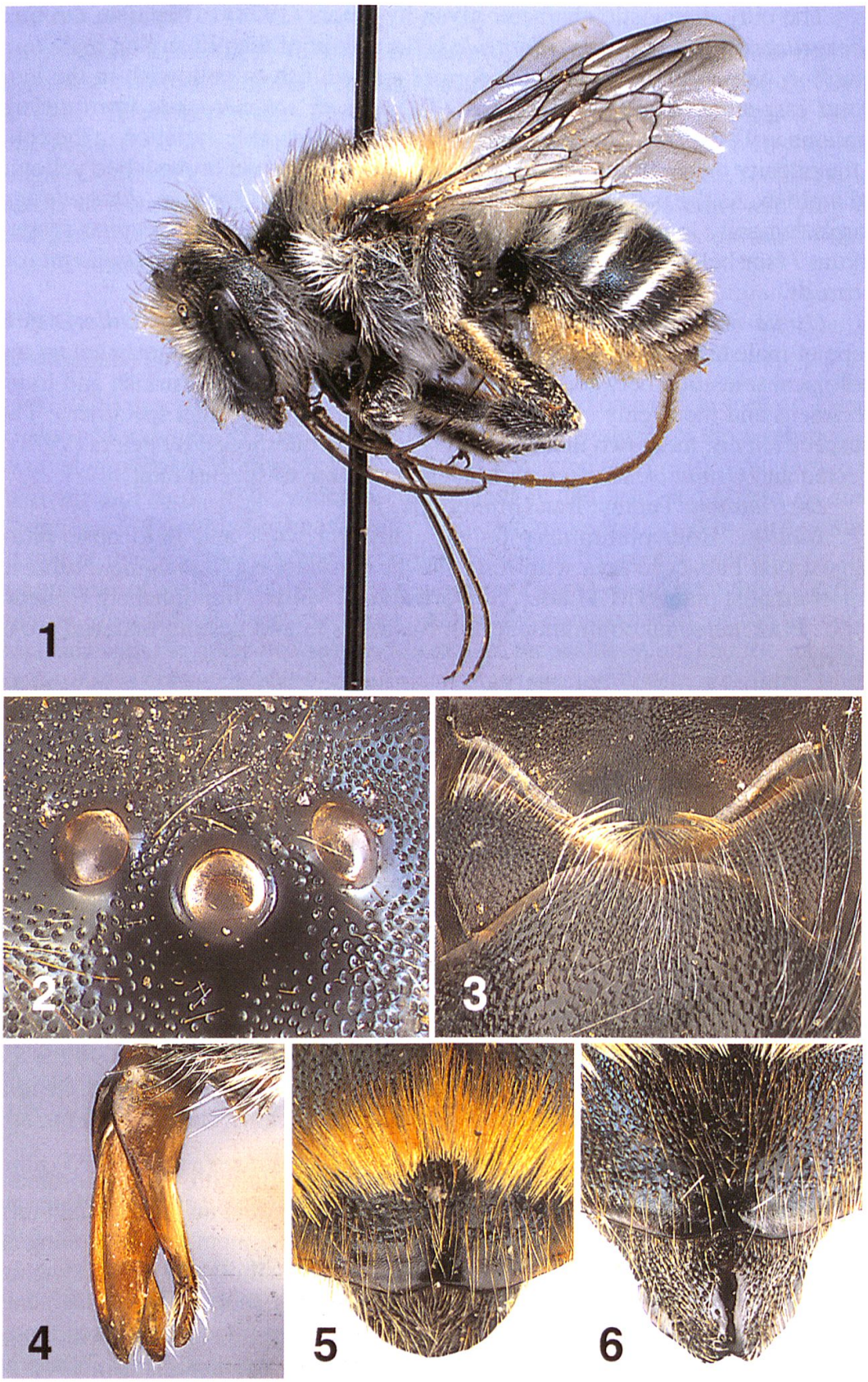
Distribution. Turkey, Iran (Müller 2012).

Biology. Both preliminary pollen analytical work and field observations suggest that Fabaceae taxa with long flower corollas, e.g. *Astragalus,* represent important host plants (M. Haider, S. Dorn and A. Müller, unpublished; C. Sedivy and C. Praz, personal communication). Nesting site and nesting material are unknown.

***Osmia* (*Orientosmia*) *maxschwarzi* sp. n.**

Type material. Holotype: Iran: Tehran: Firuzkuh county, Markazi district, 28 km E of Firuzkuh, Peynap valley, 2450 m, 3.6.2005, ♂ (leg. Ø. Berg), ETHZ (Entomological Collection of ETH, Zurich). Paratypes: Turkey: Antalya: 10 km N of Akseki, 1400 m, 16.6.1987, 1 ♀ (leg. K. Warncke); 4 km E of Saklikent, 36°52'51"N/30°30'95"E, 1600 m, 30.5.2009, 1 ♂ (leg. J.S. Ascher, J.G. Rozen & H. Özbek); 3–6 km E of Saklikent, 31.5.2009, 1 ♂ (leg. J.S. Ascher, J.G. Rozen & H. Özbek); 6 km E of Saklikent, 1.6.2009, 1 ♂ (leg. J.S. Ascher, J.G. Rozen & H. Özbek); Seklik Mevkii, 3.6.2009, 1 ♀, 1 ♂ (leg. J.S. Ascher, J.G. Rozen & H. Özbek). Mersin: Kirobasi, 60 km E of Mut, 19.6.1997, 2 ♂♂ (leg. M. Halada). Hakkari: Suvari-Halil-Pass, 2500 m, 2.6.1980, 2 ♀♀, 1 ♂ (leg. M. Schwarz). Iran: Fars: Yasuj region, Road Yasuj-Kakan, 30°38'25''N/51°46'53''E, 29.5.2009, 2 ♀♀, 2 ♂♂ (leg. C. Sedivy, C. Praz & A. Monfared); Yasuj region, 10 km NE of Sepidan, 30°20'16''N/51°50'22''E, 2270 m, 31.5.2009, 1 ♀ (leg. C. Sedivy, C. Praz & A. Monfared).

Diagnosis. The overall morphology in combination with the extraordinarily long mouthparts (Fig. 1), the blunt spur of the fore leg tibia and the distinct tergal hair bands (Fig. 1) clearly identify *O. maxschwarzi* as a member of the subgenus *Orientosmia*. The female can be differentiated from the similar and often sympatric *O. scheherazade* by the smaller body size, the relatively shorter second segment of the labial palpus, the more scattered and slightly coarser punctation of scutum and tergal discs, more extended unpunctured areas around the ocelli (Fig. 2) and narrower tergal hair bands (see description and key for details). The male is distinctive among the *Orientosmia* species due to the enlarged sternum 2 (Fig. 3), which largely covers sternum 3, and the broadly and deeply emarginate apical margin of



Figs 1–6: *Osmia maxschwarzi* sp. n., 1: habitus of ♀; 2: ocelli of ♀; 3: sterna 2–4 of ♂; 4: genitalia of ♂. — *Osmia maxillaris* Morawitz, 1875, 5: terga 5–7 of ♂. — *Osmia scheherazade* Peters, 1978, 6: terga 6–7 of ♂.

sternum 3 (Fig. 3). It shares the evenly convex and apically rounded tergum 7 with *O. maxillaris* (Fig. 5) but not with *O. scheherazade*, which has a roof-shaped tergum 7 provided posteriorly with a polished longitudinal keel (Fig. 6).

Description. Female: Body length 9–10.5 mm. Body metallic green to blue, clypeus often with a metallic violet lustre. **Head**: Mouthparts very long: when fully extended, they are as long as the total body length (Fig. 1); when folded together, they distinctly exceed the hind coxa reaching the base of metasomal sternum 2. Second segment of the labial palpus about 3.5x as long as the first segment. Punctation of clypeus, frons and vertex dense, interspaces only rarely exceeding the diameter of half a puncture except around the ocelli, where the interspaces may reach the diameter of one puncture. Each ocellus surrounded anteriorly and laterally by an extended polished unpunctured area, which is lateral from the anterior half of each ocellus about one third as wide as the ocellar diameter and in front of the median ocellus more than half as wide as the ocellar diameter (Fig. 2). Apical margin of clypeus truncated. Head as long as broad. Distance between lateral ocellus and preoccipital ridge about 1.75x as long as the ocellar diameter. Pilosity of clypeus, paraocular area and genal area long and whitish, of frons and vertex long, light yellowish-brown and intermixed with single blackish hairs. **Thorax**: Scutum rather shiny in its anterior half. Punctation of scutum dense with interspaces reaching the diameter of one half to rarely one puncture except medially, where the interspaces may reach the diameter of two to three, rarely up to four or five punctures. Tegula dark brown. Basal zone of the propodeum entirely shagreened. Pilosity of scutum and scutellum light yellowish-brown, on scutum often with single intermixed blackish hairs; pilosity of the other parts of the thorax whitish. Apex of fore leg tibia with a single short spine of triangular shape. Tibial spur of fore leg apically blunt. Outer surface of fore leg basitarsus flat to slightly convex and densely beset with rather short hairs, which are about as long as the basitarsal width to slightly longer. Spurs of the hind leg yellowish, long and slender, nearly straight and evenly tapering towards the apex. Pilosity of the inner surface of the hind leg basitarsus yellowish-white. **Metasoma**: Punctation of tergal discs, which are finely shagreened, moderately dense with interspaces on medial part of tergal discs 2–4 reaching the diameter of up to three or four, rarely five punctures. Marginal zone of terga 1–5 very densely punctured in the basal half, unpunctured and polished in the apical half. Apical margin of terga 1–5 with uninterrupted whitish hair bands (Fig. 1), which are narrowest on terga 2–3, where they only partly cover the base of the marginal zone. Disc of terga 1–4 covered with long, erect and whitish hairs, which are usually intermixed with single blackish hairs on tergum 4. Disc of tergum 5 covered with long, erect and blackish hairs. Tergum 6 densely covered with appressed hairs varying in colour from whitish to blackish. Scopa white.

Male: Body length 10–11 mm. Body metallic green to blue. **Head**: Mouthparts of similar length as in the female. Second segment of the labial palpus about 3.5x as long as the first segment. Antennal segments 3–13 about twice as long as broad. Punctation of clypeus, frons and vertex dense, interspaces usually less than the diameter of half a puncture except around the ocelli and on the lateral parts of the vertex, where the interspaces may reach the diameter of one puncture. Extended polished unpunctured area around the ocelli as in the female. Apical margin of clypeus truncated. Head 0.95x as long as broad. Distance between lateral ocellus and preoccipital ridge about 1.75x as long as the ocellar diameter. Pilosity of clypeus, paraocular area and genal area long and whitish, of frons and vertex long and light

yellowish-brown, on vertex and along the upper margin of the compound eye often intermixed with single blackish hairs. **Thorax**: Punctation of scutum as in the female. Tegula dark brown. Basal zone of the propodeum entirely shagreened. Pilosity of the thorax as in the female except that the scutum usually lacks blackish hairs. Apex of fore leg tibia with a single and very short spine. Tibial spur of fore leg apically blunt except for freshly eclosed specimens, where it ends in a very short spine. Hind leg spurs as in the female. **Metasoma**: Punctation of tergal discs, which are at most imperceivably shagreened, denser than in the female with interspaces on medial part of tergal discs 2–4 varying between the diameter of one half to two, rarely three punctures. Marginal zone of terga 1–5 very densely punctured in the basal half, unpunctured and polished in the apical half. Apical margin of tergum 6 very slightly emarginate medially. Tergum 7 evenly convex, its apical margin slightly elevated and evenly rounded to very shallowly emarginate medially. Apical margin of terga 1–5 with uninterrupted whitish hair bands, which are narrowest on terga 2–3, where they only partly cover the base of the marginal zone. Disc of terga 1–4 covered with long, erect and whitish to yellowish hairs, which are more or less intermixed with blackish hairs on tergum 4. Disc of terga 5–6 covered with long, erect and blackish hairs, on tergum 6 occasionally intermixed with single whitish hairs. Tergum 7 covered with erect whitish hairs. Sternum 2 of regular trapeziform shape (Fig. 3), largely covering sternum 3 and loosely beset with long and whitish hairs, which are rarely intermixed with single blackish hairs. Apical margin of sternum 3 with a broad and deep emargination, which is about 4x as wide as deep and provided medially with incurved whitish to yellowish hairs (Fig. 3). Apical margin of sternum 4 very shallowly emarginate medially and ciliated with whitish hairs. Apical margin of sternum 5 straight. Sternum 6 of broadly triangular shape, its apicalmost part bent back and loosely beset with long and yellowish to white bristles. Sternum 7 very long and narrowly triangular with a rounded apex, its margin ciliated with whitish hairs, which are densest at its apex. Genitalia long and narrow (Fig. 4), penis valve broad, medially more than 1.5x as wide as the maximal apical width of the gonoforceps.

Distribution. From western to eastern Turkey and from northern to central Iran. At three Turkish and two Iranian localities, *O. maxschwarzi* occurs syntopically with *O. scheherazade* indicating that both *Orientosmia* species have similar habitat, pollen and/or nesting requirements.

Biology. Six scopal pollen loads from five different localities were found to exlusively consist of pollen of Fabaceae, suggesting that flowers of Fabaceae are the preferred or even exclusive pollen hosts of *O. maxschwarzi*. Due to the long mouthparts, Fabaceae taxa with long flower corollas, such as *Astragalus*, are expected to be the main hosts. In fact, most pollen loads analysed contained putative *Astragalus* pollen, and *Astragalus* species with long flower corollas were flowering at several localities where *O. maxschwarzi* was collected (Fig. 7; C. Sedivy, personal communication). The nesting biology of *O. maxschwarzi* is unknown as is the nesting biology of the other two *Orientosmia* species. However, as all species of the subgenera *Osmia* and *Monosmia*, which probably form a monophyletic clade together with *Orientosmia* (Peters 1978; Praz *et al.* 2008), nest in insect borings in dead wood, rock crevices or other cavities (Müller 2012), *O. maxschwarzi* is supposed to nest in preexisting cavities as well.

Etymology. The new species is named in honour of Maximilian Schwarz (Ansfelden, Austria) in recognition of his outstanding contribution to bee taxonomy.

Key to the *Osmia* species of the subgenera *Orientosmia* and *Monosmia*

As *Osmia apicata*, Smith, 1853, the only representative of the subgenus *Monosmia*, can easily be confounded with the three species of the subgenus *Orientosmia* due to its long mouthparts, it has been included in the identification key.

Females

1 Apex of fore leg tibia with both a long and a short spine widely separated from each other. Tibial spur of fore leg extended into a long spine. Outside of fore leg basitarsus longitudinally impressed and sparsely beset with long hairs, which are up to twice as long as the basitarsal width. Terga 1–5 lacking distinct apical hair bands. Scopa yellowish-red. Body length 10–12 mm. Southeastern Europe to Iran ..... ***Osmia* (*Monosmia*) *apicata* Smith, 1853**

1* Apex of fore leg tibia with only one spine, which is rather short and of triangular shape. Tibial spur of fore leg apically blunt. Outside of fore leg basitarsus flat to slightly convex and densely beset with rather short hairs, which are about as long as the basitarsal width to slightly longer. Terga 1–5 with distinct whitish to yellowish apical hair bands (Fig. 1). Scopa white 2

2 Disc of terga 5–6 with whitish to yellowish hairs. Body length 11–13 mm. Central Asia ..... ***Osmia* (*Orientosmia*) *maxillaris* Morawitz, 1875**

2* Disc of tergum 5 and often also of tergum 6 with blackish hairs 3

3 Second segment of the labial palpus about 3.5x as long as the first segment. Scutum rather shiny in its anterior half. Punctation of scutum dense with interspaces often reaching the diameter of one half to rarely one puncture except medially, where the interspaces may reach the diameter of two to three, rarely more punctures. Punctures between lateral ocellus and compound eye slightly smaller than punctures beside scutal midline. Ocelli surrounded anteriorly and laterally by an extended polished unpunctured area, which is lateral from the anterior half of the median ocellus about one third as wide as the ocellar diameter (Fig. 2). Punctation of terga less dense with interspaces on medial part of tergal discs 2–4 reaching the diameter of three to four, rarely five punctures. Apical hair bands of terga narrower, only partly covering the base of the marginal zone of terga 2–3. Body length 9–10.5 mm. Turkey, Iran ..... ***Osmia* (*Orientosmia*) *maxschwarzi* sp. n.**

3* Second segment of the labial palpus about 4x as long as the first segment. Scutum rather mat in its anterior half. Punctation of scutum very dense with interspaces usually not reaching the diameter of half a puncture. Punctures between lateral ocellus and compound eye slightly larger than punctures beside scutal midline. Polished unpunctured area around the ocelli less extended, punctation lateral from the median ocellus almost reaching the ocellar border. Punctation of terga denser with interspaces on medial part of tergal discs 2–4 usually not exceeding the diameter of two to three punctures. Apical hair bands of terga wider, covering the whole marginal zone. Body length 11.5–13 mm. Turkey, Iran ..... ***Osmia* (*Orientosmia*) *scheherazade* Peters, 1978**

Fig. 7: Habitat of *Osmia maxschwarzi* sp. n. near Sepidan, Fars province, Iran. Several *Astragalus* species with long flower corollas, probably the main pollen hosts of *O. maxschwarzi*, were flowering at this locality. Photo C. Sedivy.

Males

1 Apex of fore leg tibia with both a long and a short spine widely separated from each other. Tibial spur of fore leg extended into a long spine. Terga 1–5 without distinct apical hair bands. Penis valve narrow, medially only slightly wider than the maximal apical width of the gonoforceps. Apical margin of sternum 4 distinctly rounded. Body length 10–11 mm. Southeastern Europe to Iran ..... ***Osmia* (*Monosmia*) *apicata* Smith, 1853**

1* Apex of fore leg tibia with only one short spine. Tibial spur of fore leg blunt. Terga 1–5 with distinct whitish to yellowish apical hair bands. Penis valve broad, medially more than 1.5x as wide as the maximal apical width of the gonoforceps (Fig. 4). Apical margin of sternum 4 more or less straight and inconspicuously emarginate medially 2

2 Sternum 2 enlarged, largely covering sternum 3 (Fig. 3). Apical margin of sternum 3 with a broad and deep emargination, which is about 4x as wide as deep and provided medially with incurved whitish to yellowish hairs (Fig. 3). Body length 10–11 mm. Turkey, Iran ..... ***Osmia* (*Orientosmia*) *maxschwarzi* sp.n.**

2* Sternum 2 small, covering sternum 3 only at its base. Apical margin of sternum 3 straight to very shallowly emarginate and sparsely beset with straight whitish hairs. Body length exceeding 11 mm 3

3 Tergum 7 evenly convex without a longitudinal keel (Fig. 5), its apical margin evenly rounded. Pilosity of disc of terga 4–6 whitish to yellowish. Body length 12–14 mm. Central Asia .... ***Osmia* (*Orientosmia*) *maxillaris* Morawitz, 1875**

3* Tergum 7 roof-shaped with a polished longitudinal keel in the posterior half (Fig. 6), its apical margin emarginate medially. Pilosity of disc of terga 4–6 varying in colour from whitish and yellowish to brownish and blackish. Body length 12–14 mm. Turkey, Iran ..... ***Osmia* (*Orientosmia*) *scheherazade* Peters, 1978**

ACKNOWLEDGEMENTS

The discovery of the new osmiine bee species was only possible thanks to material kindly provided by C. Praz (Neuchâtel), C. Sedivy (Zürich), M. Schwarz (Ansfelden, Austria), Ø. Berg (Baerum, Norway), the American Museum of Natural History New York (J. Rozen) and the Oberösterreichische Landesmuseum Linz (F. Gusenleitner). H. Baur (Naturhistorisches Museum Bern) kindly provided access to a digital imaging system for taking photomicrographs. C. Sedivy and C. Praz provided information on the host plants of *O. scheherazade* and *O. maxschwarzi* in Iran. D. Wyniger, L. A. Nilsson and C. Schmid-Egger made useful comments on an earlier draft of the manuscript.

ZUSAMMENFASSUNG

Eine neue paläarktische Mauerbienenart aus der Gattung *Osmia* wird beschrieben: *Osmia* (*Orientosmia*) *maxschwarzi* sp. n. Die neue Art kommt von der westlichen Türkei bis in den zentralen Iran vor, besitzt einen aussergewöhnlich langen Rüssel und sammelt Pollen bevorzugt oder ausschliesslich auf Schmetterlingsblütlern (Fabaceae) mit langen Kronröhren, z. B. *Astragalus*. Die Untersuchung der drei bislang unterschiedenen Unterarten von *Osmia* (*Orientosmia*) *maxillaris* Morawitz, 1875 ergab, dass *Osmia m. scheherazade* Peters, 1978 mit *Osmia m. dinazade* Peters, 1978, syn. n. identisch ist und dass *Osmia m. scheherazade* in den Artrang erhoben werden muss: *O. scheherazade* Peters, 1978. Ein Bestimmungsschlüssel für die drei Arten der Untergattung *Orientosmia* unter Einschluss der ähnlichen und nah verwandten Art *Osmia* (*Monosmia*) *apicata* Smith, 1853 wird gegeben.

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(received April 6, 2012; accepted May 5, 2012; published June 30, 2012)