Revision of the Western Palaearctic species of the *Andrena taraxaci*-group with description of four new species (Hymenoptera: Andrenidae)

Hans Richard Schwenninger

Abstract

The Western Palaearctic species belonging to the group of *Andrena taraxaci* Giraud (subgenus *Chlorandrena* Pérez 1890) are revised, and 16 valid species are recognized. Four species new to science are described: *Andrena (Chlorandrena) jerbaensis* **n. sp.** and *Andrena (Chlorandrena) flavomarginata* **n. sp.** from Tunisia, *Andrena (Chlorandrena) maculicornis* **n. sp.** from Tunisia, Libya and Egypt, and *Andrena (Chlorandrena) crepidis* **n. sp.** endemic to Cyprus. The hitherto unknown female of *Andrena pseudotaraxaci* Scheuchl 2010 is defined. Two species are new to the bee fauna of Europe: *Andrena curtivalvis* Morice 1899 from Spain and *A. crepidis* n. sp. from Cyprus. Identification keys for the Western Palaearctic species of the *Andrena taraxaci*-group are provided. The geographical distribution of the newly described species is illustrated in a map.

Keywords: *Andrena*, *Chlorandrena*, Cyprus, Egypt, Libya, Russia, Spain, Tunisia, new records, identification key, distribution.

Zusammenfassung

Die westpaläarktischen Arten der *Andrena taraxaci*-Gruppe der Untergattung *Chlorandrena* Pérez 1890 werden revidiert. Vier neue Arten werden beschrieben: *Andrena (Chlorandrena) jerbaensis* **n. sp.**, *Andrena (Chlorandrena) flavomarginata* **n. sp.**, beide aus Tunesien, *Andrena (Chlorandrena) maculicornis* **n. sp.** aus Tunesien, Libyen und Ägypten sowie *Andrena (Chlorandrena) crepidis* **n. sp.** aus Zypern. Hiermit sind 16 Arten aus der Westpaläarktis bekannt. Das bisher unbekannte Weibchen von *Andrena pseudotaraxaci* Scheuchl 2010 wird beschrieben. Außerdem werden zwei Erstnachweise für Europa dokumentiert: *Andrena curtivalvis* Morice 1899 aus Südspanien und *A. crepidis* n. sp. aus Zypern. Bestimmungsschlüssel für die westpaläarktischen Arten der *Andrena taraxaci*-Gruppe werden erstellt. Die derzeit bekannte geographische Verbreitung der neu beschriebenen Arten ist in einer Karte dargestellt.

Contents

1 Introduction 251
2 Material and methods 252
3 Diagnostic characteristics of the subgenus *Chlorandrena* 253
4 Descriptions of new species 253
5 Description of the hitherto unknown female of *Andrena (Chlorandrena) parataraxaci* Scheuchl 2010 265
6 Keys to the Western Palaearctic species of the *Andrena taraxaci*-group 266
7 Distribution of the species of the *Andrena taraxaci*-group in the Western Palaearctic 268
8 References 270

1 Introduction

In spring the flowers of Dandelion (*Taraxacum officinale* agg.) and other yellow composites are visited by solitary bees. Among them specimens of the genus *Andrena* Fabricius 1775 are most frequently. In the Palaearctic region the genus *Andrena* consists of about 950 species (Gusenleitner & Schwarz 2002, Gusenleitner et al. 2005), which can be spread across 68 subgenera (Gusenleitner & Schwarz 2002, Schmid-Egger 2005, Michener 2007). The subgenus *Chlorandrena* was defined by Pérez (1890), and *Andrena humilis* Imhoff 1832 was designed as its type species. This subgenus is confirmed by phylogenetic analyses (Dubitzky 2005). Nearly all species of the subgenus *Chlorandrena* are visiting yellow composites in spring. Some of them are known as oligolectic (Westrich 1990, Schwenninger 2001).

To date, the well-defined *A. taraxaci*-group in the Western Palaearctic consisted of 12 species (Gusenleitner & Schwarz 2002, Schwenninger 2007, Scheuchl 2010), whereas in the Eastern Palaearctic only one subspecies, *Andrena taraxaci orienticola* Strand 1915 from the Far East, is known (Xu & Tadauchi 2002).

In this study all Western Palaearctic species of the *Andrena taraxaci*-group are revised, and keys for their identification are provided. The investigated material yielded not only a number of new records of zoogeographic interest, but also four new species which are described in section 4.

Acknowledgements

I am indebted to the following persons for the loan of material: Felix Amiet (Solothurn, Switzerland), Hannes Baur (Natural History Museum Berne, Switzerland), Ronald Burger (Haßloch, Germany), Olaf Diestelhorst (Düsseldorf, Germany), Mike Herrmann (Konstanz, Germany), Till Osten † and Lars Krogmann (Stuttgart State Museum of Natural History, Germany), Erwin Scheuchl (Ergolding, Germany), Stefan Schmidt and Johannes Schuberth (ZSM), Andreas Taeger (Senckenberg German Entomological Institute, Müncheberg, Germany), Nicolas Vereecken (Bruxelles, Belgium), Claire Villemant and Agnièle Touret-Alby (MNHN).

In particular, I want to thank Fritz Gusenleitner, Upper Austrian State Museum Linz (Austria) for a long term loan of the *Chlorandrena*-material of the Warncke-collection and also for given information about a hitherto undescribed taxon of Warncke. Furthermore, I am grateful to Maximilian Schwarz (Ansfelden, Austria) for generously lending comprehensive material especially from Central Asia. Theodora Korniotou (Administrator of Cyprus Museum of National History, Nicosia) and Eleftherios Hadjisterkotis (Ministry of the Interior, Nicosia, Cyprus) assisted in finding the collection of George A. Mavromoustakis †. The staff of the Agricultural Research Institute, Nicosia (Cyprus) enabled to check the collection of Mavromoustakis. Rainer Prosi (Crailsheim, Germany) helped with mapping of the records with Quantum GIS. Furthermore, I am indebted to Julian Fricke (Karlsruhe, Germany) for his assistance in making macro photos, for testing the identification keys and for the advice to use the marginal area of the propodeum as a distinguishing feature. Anselm Kratochwil (Osnabrück, Germany) and Erwin Scheuchl kindly read the manuscript and provided valuable improvements. Finally, I thank my wife Karin Wolf-Schwenninger for critically reading the manuscript.

For the field trips in spring 2014, a collecting permit was issued to the author by the government of Andalucía (Ref. SGYB/AF/DBP Re-98/14; February 27, 2014).

2 Material and methods

In this study 379 specimens of the *Andrena taraxaci*-group were examined. Except of *Andrena curtivalvis* Morice 1899, *A. stabiana* Morice 1899, *A taraxaci* Giraud 1861 and *A. turanica* Osytshnjuk 1993, the type material of the taxa could be studied. Specimens of *Andrena curtivalvis*, *A. stabiana* and *A. taraxaci*, which are deposited in OLML, and which have been identified by Warncke, were used for comparison provided that their characters match the original species descriptions. In these cases the author follows the opinion of Warncke. As to *Andrena turanica*, the original description of Osytshnjuk (1993) and the identification key of Osytshnjuk et al. (2005) were used for comparison. With the exception of *Andrena curtivalvis* these taxa are accepted by Gusenleitner & Schwarz (2002). The validity of *Andrena curtivalvis* Morice 1899 has been confirmed by Schwenninger (2007).

Erwin Scheuchl called the author's attention to an unidentified male of *Chlorandrena* from the North Caucasus (Russia) in OLML. After preparation of the genitalia by the author the identification of this worn out, hardly determinable specimen was enabled.

Additional material was found in various collections (see Acknowledgements), forwarded and provided to the author for identification and study. A particularly diverse and comprehensive contribution came from Maximilian Schwarz, who had accumulated material from Middle Asia (Turkmenistan and Kirgizstan), collected by Halada and Denes during a series of field trips to various regions since the 1990s.

The morphological studies were carried out with a stereo microscope SZX16 (Olympus). All measurements were done using a micrometre eyepiece of the SZX16. For the photographs the digital camera DP71 (Olympus) was used. The objects were focused down by 15 to 140 steps beginning at the top. For each focus step a photo was taken. The single shootings were stacked and the montage was done using the freeware CombineZM of Alan Hadley in the version of April 26. 2008.

Males of the *A. taraxaci*-group are easily differentiated by comparing the shapes of sternum 8 (Schwenninger 2007). Since the usually very dense pubescence of the dorsal side of sternum 8 makes the shape not clearly visible, the predominantly bare ventral side of sternum 8 should be used for identification. This implicates the total extraction of sternum 8. Therefore, and for preparation of other body parts, the specimens were soaked in a relaxing chamber (plastic box). This box was provided with wet pulp drenched with water, and the specimens were kept therein for about one day. The dissection was done with fine tweezers (Dumont No. 5) and the genitalia were glued with methylcellulose on pads of white Bristol-cardboard. The pads are pinned under the corresponding specimens.

Each studied specimen was labelled with a unique identification number and letter sequence (= ID-No.) which is also recorded in the database "Entomon" (developed by Rainer Prosi, Crailsheim, Germany, see also www.wildbienen-kataster.de). Each data record includes, as far as available, information about locality, geographic coordinates, date, collector, collection (= depository), and identifier. Observations of the visited plant species, nesting sites and nesting activities are also registered, if available.

The distribution maps were created using QGIS version 2.4.0. As base map the open data "OpenStreetMap" was used, licensed under the Open Data Commons Open Database License (ODbL) (see www.openstretmap.org/copyright).

Acronyms of depositories

MNHN	Muséum National d'Histoire Naturelle, Paris, France
OLML	Upper Austrian State Museum Linz, Austria
OLMW	Upper Austrian State Museum Linz, Austria (collection Klaus Warncke †)
Scer	Collection Erwin Scheuchl, Ergolding, Germany
Scwe	Author's collection (testamentary promised to be deposited in SMNS)
Scwz	Collection Maximilian Schwarz, Ansfelden, Austria
ZSM	Bavarian State Collection of Zoology, Munich, Germany

Abbreviations

Morphological terms and abbreviatons used in this paper mainly follow Michener (1944, 2007).

BL	body length (from antennal base to tip of pygidial plate)
coll.	collection
FL	flagellomere(s)

HL	head length, from top of vertex to lower margin of clypeus excluding process of labrum
HW	head width
L, W	maximum length, respectively width
leg.	legit
N, E, W	latitude respectively longitude
Pd	puncture diameter
S	metasomal sternum
T	metasomal tergum
WL	length of forewing including tegula

3 Diagnostic characteristics of the subgenus *Chlorandrena*

Within the genus *Andrena* the subgenus *Chlorandrena* Pérez 1890 is characterized by distinct, deeply impressed punctures on the meso- and metasoma. The depression of the punctures is encircled by a beaded rim, resembling an impact crater. For this type of punctures the term 'crater punctures' is used in the present paper.

The females have a row of spines on the back side of the hind femur and plumose (strongly branched) hairs on the corbiculae. The facial foveae are long, but not square, extending about as half as long as the compound eyes. The lobes of the gonocoxites are well developed and the gonostyli are shovel-shaped or spatulate. Sternum 8 is densely pubescent and sometimes shows lateral extensions. The species of the subgenus *Chlorandrena* are heterogeneous and differ in both sexes in several traits. WARNCKE (1968) divided this subgenus in three parts: the *humilis*-, *taraxaci*- and *livens*-group (named after the most characteristic species). Especially, the typical shape of the male genitalia and of sternum 8 allows a proper division of these groups. The shape of the facial foveae is the main tool to separate the females of the different taxa-groups within the subgenus *Chlorandrena*. The females of the *Andrena taraxaci*-group are characterized by long facial foveae, which are narrowed near the antennal fossae ('comma-shape'). In males sternum 8 shows conspicuous tooth-like dilatations, and the shovel-like excavations of the gonostyli are faintly developed.

Only a few species within the subgenus *Chlorandrena* do not fit into this diagnostic pattern. *Andrena shteinbergi* Osytshnjuk 1993 is one of these exceptions. The females have comma-shaped facial foveae, but the terga are polished and without typical crater punctures. The males have small shovel like gonostyli and no lateral dilatations on sternum 8 (GUSENLEITNER & SCHWARZ 2002). Another species with inconsistent characters is *Andrena panurgimorpha* Mavromoustakis 1956. Males have tooth-like rounded lateral dilatations on sternum 8 but their gonostyli are broad shovel-like. This character and the oval facial foveae of the females indicate that this taxon belongs to the *A. humilis*-group.

4 Descriptions of new species

Andrena (Chlorandrena) jerbaensis **n. sp.**
(Figs. 5, 20, 37)

Holotype (♀): Tunisia: Governorate de Médenine, Jerba, El May, El Ghriba, E10.9 N33.8, 6.III.2008, leg. SCHWENNINGER (Scwe, ID-No. 0901031scwe075).

Paratypes: Tunisia: Governorate de Médenine: Jerba N, 19.II.1992, 1 ♀; Jerba S, 14.II.1992, 2 ♀♀; Jerba W, 23.II.1992, 1 ♂; all leg. WARNCKE (OLMW); Jerba, El May, El Ghriba, E10.9 N33.8, 6.III.2008, 2 ♀♀; Midoun Mezraia, E11.0 N33.8, 7.III.2008, 2 ♀♀; all leg. SCHWENNINGER (Scwe); Governorate Tatouine: 30 km S Zarzis [also transliterated as Jarjis], 16.II.1992, 1 ♂, leg. WARNCKE (ZSM); 16.II.1992, 1 ♀, 17.II.1992, 1 ♀, 24.II.1992, 1 ♂; all leg. WARNCKE (OLMW); 20 km S Zarzis, 26.II.1992, 2 ♂♂, 1 ♀; 10 km N Foum Tataouine, 15.II.1992, 1 ♂, 21.II.1992, 2 ♂♂, 25.II.1992, 2 ♀♀; all leg. WARNCKE (OLMW).

Etymology

The species name refers to the type locality Jerba [also transliterated as Djerba], the largest island of North Africa (514 km²), located in the Gulf of Gabes, Tunisia. The native name is Girba [also transliterated as Jerba or Jarbah]. WARNCKE had determined several specimens of this new taxon as *Andrena taraxaci djerbaensis*, but never described this subspecies. To avoid confusion with specimens determined by WARNCKE, which may exist in hitherto unexamined collections, the diction '*jerbaensis*' is used for the species name.

Description

Female (holotype, BL = 10.0 mm)

Colouration: Integument black, except inner margin of mandible, lower side of FL5–10 reddish yellow; apical depressions of terga 1–6 brightened reddish brown towards the hind margin, depressions of sterna 2–5 reddish yellow; apex of metatarsus 3 reddish yellow, the other tarsomeres increasingly brightened, inclusive claws reddish yellow, also the tibial spurs; wing membrane hyaline, yellowish obfuscated, veins and pterostigma reddish yellow, radial vein reddish brown; tegulae transparent reddish yellow.

Pubescence: Hairs reddish yellow, especially caudal fimbria, scopa and hind legs except posterior margin of metasomal terga 3 and 4 with rows of whitish hairs; facial fovea with yellow to dark yellow pubescence; on scopa hairs heavily plumose, longer than length of the hind spur.

Head: transverse, HL = 2.3 mm, HW = 3.0 mm, HL/HW = 0.8. – Facial foveae: distance between fovea and lateral ocellus (130 µm) smaller than width of ocellus (170 µm), fovea dorsally occupying about three-quarters of the distance between compound eye and lateral ocellus (see Fig. 37). – Frons and paraocular area with longitudinal rugulae, looking like longitudinal stripes, interrugal space smooth and shiny. – Malar space: linear. – Genal area: about as wide as compound eye. – Antennae: first flagellomere

(420 µm) shorter than FL2–4 (465 µm); FL2–9 transverse, towards the apex continuously longer (FL2: W = 160 µm, L = 200 µm, FL9: W = 240 µm, L = 200 µm), FL10 longer than wide. – Clypeus: slightly convex, with coarse punctures, interpunctural spaces about 1 Pd, towards the apex punctures increasingly transverse; interpunctural spaces weakly shagreened. – Labrum: process trapezoid, moderately emarginate, about ⅔ as wide as labrum, shiny.

M e s o s o m a : Pronotum: without humeral angle, surface shagreened. – Scutum: anterior part strongly shagreened, surface dull, posterior part weakly shagreened and more shiny; punctuation shallow and dense (interspaces 1–2 Pd). – Scutellum: shiny with very fine shagreen, punctuation fine and distinct, punctures deeply impressed, dense on the margins (interspaces < ½ Pd), scattered on the disc (interspaces 2–3 Pd). – Propodeum: propodeal enclosure indicated by a fine boundary line, anterior margin with wrinkles, coarsely shagreened; lateral area of propodeum rugose with coarse punctuation (crater punctures), interspaces 1–2 Pd; marginal area transversely shagreened on the median part, without pubescence or punctures (like Fig. 48), in contrast, the curved hind margin with pubescence. – Mesopleurae: shagreened, dense, rugose punctuation (crater punctures, with interspaces < ½ Pd). – Wing: nervulus strongly postfurcal, distance from basal vein usually 2–3 times the width of nervulus. – Legs: Hind femur with a row of 10 dark brown spines (this character varies, other females of this taxon have rows of 12–14 spines), tarsal claws all bidentate.

M e t a s o m a : Terga: with fine shagreen, density of punctuation from T1 to T4 increasing (interspaces on disc of T1 > 2 Pd, T4 < 2 Pd), in contrast, the impressions of the punctuation decreasing, on T1 the crater punctures projecting from the surface, on the other terga more shallow; depression distinct, especially on T3 and T4. – Sterna: weakly shagreened, moderately shiny, discs with fine punctures (interspaces 2–4 Pd), punctuation on posterior margin denser (interspaces < 1 Pd). – Pygidium: pygidial plate U-shaped, without raised triangular area or carina.

Male (paratype, ID-No. 070915scwe005, BL = 9 mm, WL = 7 mm)

C o l o u r a t i o n : Integument black, except lower side of FL4–11 (yellowish-reddish brown) and mandible teeth (reddish brown); depressions of terga 1–6 brightened reddish brown, hind margins yellowish brown; depressions of sterna reddish yellow; tibiae and basitarsi reddish brown, tarsomeres increasingly brightened, reddish yellow; tibial spurs yellowish; wing membrane hyaline, yellowish obfuscated, veins and pterostigma reddish yellow, except radial vein (reddish brown); tegulae reddish brown, transparent.

P u b e s c e n c e : Hairs reddish yellow; clypeus, genal area, mesepisternum, coxa and femura with white hairs; pubescence on head, meso- and metasoma long, moderately dense, on frons and clypeus very dense; hairs on clypeus shorter (400–500 µm), on the genal area and mesepisternum very long (1000–1100 µm) and conspicuous; on mesosoma and terga 600–700 µm long, on terga 2–5 slightly shorter (400–500 µm); margins of sterna 2–5 with slightly protruding fimbriae (hairs about 500 µm long).

H e a d : transverse, HL = 2.7 mm, HW = 2.2 mm, HL/HW = 0.8. – Frons: Face above antennal fossae with longitudinal rugulae, interrugal space with coarse punctures. – Malar space: linear. – Genal area: width 580 µm, broader than width of compound eye (550 µm). – Clypeus: slightly convex, punctures transverse, imbricative, dense (interspaces ½–1 Pd); surface shiny and smooth. – Labrum: process emarginate, shiny.

M e s o s o m a : Pronotum: without humeral angle, surface weakly shagreened, mostly shiny, with scattered punctures. – Scutum: anterior part shagreened, surface dull, punctuation dense (interspaces 1 Pd), posterior part weakly shagreened and more shiny (like in female), punctuation more scattered (interspaces 2 Pd). – Scutellum: weakly shagreened, more shiny, punctuation in contrast to scutum deeper; density of punctuation towards the posterior part increasing (interspaces anterior part 1 Pd, posterior part ½ Pd). – Propodeum: propodeal enclosure indicated by a very fine boundary line, basally with fine wrinkles; lateral area of propodeum rugose with crater punctures, interspaces 1–2 Pd.; rest as in female.

M e t a s o m a : Terga: mostly shiny, only weakly shagreened, T1 with distinct crater punctures, interspaces up to 2 Pd, punctuation of T2–T4 more shallow and increasingly denser (interspaces until 1 Pd). – Sterna: weakly shagreened, moderately shiny, anterior part without punctures, towards the posterior margin punctuation denser (interspaces < 1 Pd), posterior margin of S6 arched, vertically protruding, in the middle weakly emarginate. – Genitalia: apex of gonostyli broad, not acute (Fig. 5); process of sternum 8 with emarginate apex, width posterior to lateral teeth smaller than anteriorly (Fig. 20).

Diagnosis

Andrena jerbaensis is probably closely related to *Andrena stabiana*. The females of both taxa differ in the colouration of the pubescence of the head. *A. jerbaensis* has no dark hairs whereas *A. stabiana* is predominantly dark brown haired. Dorsally, the facial fovea is broader in *A. jerbaensis*. Thus the minimum distance to the lateral ocellus is distinctly smaller than the diameter of the lateral ocellus (see Fig. 32). In *A. stabiana* this distance is at least as wide as the diameter of the ocellus. The male genitalia differ in the shape of the gonostyli. The apex of the gonostylus of *A. jerbaensis* is much broader (see Figs. 5–6). The process of sternum 8 posterior to its lateral teeth is narrower than anteriorly (Fig. 20). In *A. stabiana*, the pro-

cess posterior to its lateral teeth is much broader than anteriorly (see Fig. 21). For further characteristics see the keys (section 6).

Remark

When studying the *Andrena*-collection of KLAUS WARNCKE in OLML, the author detected specimens with type labels assigned to *Andrena taraxaci djerbaensis*. Neither the publications of WARNCKE nor the worldwide checklist of the genus *Andrena* (GUSENLEITNER & SCHWARZ 2002) refer to this taxon. On enquiry, the curator of the collection in OLML, FRITZ GUSENLEITNER, explained that WARNCKE did not succeed in describing this taxon before his sudden death. To get more information about this taxon the author undertook two field trips to Tunisia. The south of Tunisia, especially the island of Jerba, was visited in spring 2008, the northern part of Tunisia in March 2010.

Observation of flower visits

Females of *A. jerbaensis* with pollen loads were collected by the author on flowers of *Reichardia picroides* (L.). Like the other species of the *A. taraxaci*-group *A. jerbaensis* is supposed to prefer yellow composites.

Andrena (Chlorandrena) crepidis **n. sp.**
(Figs. 11, 16, 38)

H o l o t y p e (♂): Cyprus: Limassol District, 4 km SW Kaminaria, 24.III.2013, leg. SCHWENNINGER (Scwe, ID-No. 121107scwe105).

P a r a t y p e s : Cyprus: Limassol District, 4 km SW Kaminaria, 24.III.2013, 1 ♂, 1 ♀; Kaminaria, Paphos Mountains, 2.IV.2009, 1 ♂, 22.III.2013, 1 ♂, 24.III.2013, 1 ♂, all specimens leg. SCHWENNINGER (Scwe); 2.IV.2009, 1 ♂, leg. SCHWENNINGER (OLML); Limassol Ayia Phyla (Agia Fyla), 11.III.1939, 1 ♂, leg. MAVROMOUSTAKIS (OLMW).

Etymology

The name *crepidis* refers to the preferred pollen source at the type location in the Troodos Mountains, *Crepis reuteriana* Boiss. & Heldr.

Description

Male (holotype, BL = 7 mm, WL = 6 mm)

C o l o u r a t i o n : Integument black except as follows: mandible at the apex (both teeth) reddish, depressions of terga towards hind margin brightened from reddish brown to reddish yellow; depressions of sterna reddish yellow; claws and tibia1 spurs reddish yellow; wing membrane hyaline, brownish obfuscated, veins brown, pterostigma reddish brown; tegulae reddish brown.

P u b e s c e n c e : Hairs all over reddish yellow; especially head, mesopleurae, scutellum, propodeum, tergum 1 and femur with extremely long hairs, approximately as long as the inner spurs of the hind tibia (650 µm), terga with long scattered hairs only on the disc of T1; on the disc of T2–T5 hairs much shorter, about 200 µm, depressions medially with very short hairs forming a narrow band which extends on the sides of the tergum; sterna 2–6 with oblique, erect subapical fimbriae (hairs: 300–370 µm).

H e a d : transverse, HL = 2.0 mm, HW = 2.5 mm, HL/HW = 0.8. – Vertex: behind lateral ocelli wider (190 µm) than diameter of the lateral ocelli (160 µm). – Frons: face above antennal fossae with longitudinal rugulae, interrugal space smooth and shiny. – Malar space: linear. – Genal area: about as wide as compound eye. – Antennae: first flagellomere (360 µm) shorter than FL2–4 (420 µm), but longer than FL2–3 (275 µm); FL2 and FL3 very short, flagellomeres longer towards the apex (FL5: W = 200 µm, L = 180 µm; FL7: W = 205 µm, L = 200 µm), beginning with FL8 longer than wide (FL8: W = 197 µm, L = 205 µm); FL10 distinctly longer than wide (W = 182 µm, L = 255 µm). – Clypeus: shagreened, coarsely punctuated, punctures transverse. – Labrum: process almost as wide as labrum, emarginate, smooth and shiny. – Galea: shagreened, maxillary palpi longer than galea, the last two segments protruding beyond apex of galea.

M e s o s o m a : Pronotum: without humeral angle, densely shagreened. – Scutum: strongly shagreened, more or less dull, except the posterior third where the integument is weakly shagreened and more shiny, punctuation deeply impressed, on the anterior part rather dense (interspaces 1 Pd), towards the scutellum decreasing, more scattered, interspaces sometimes > 3 Pd. – Scutellum: weakly shagreened, shiny, punctuation dense, interspaces on anterior part 1 Pd, interspaces on posterior part towards the hind margin > ½ Pd. – Propodeum: propodeal triangle (enclosure) well defined by a boundary line, shagreened, on basal zone with very fine wrinkles; lateral area of propodeum rugose, with crater-like punctures, interspaces 1–2 Pd; marginal area on the median part transversely striated, without dense pubescence also on the curved hind margin. – Mesopleurae: shagreened, anterior part with dense punctuation (crater punctures, interspaces ½–1 Pd), towards the posterior margin punctuation shallow and scattered (interspaces 2–4 Pd). – Wing: nervulus strongly postfurcal, distance from basal vein usually at least 4 times the width of the nervulus. – Legs: tarsal claws all bidentate.

M e t a s o m a : Terga: shiny, only weakly shagreened, especially disc of T1 with smooth parts; T1 with crater punctures, on T2–T5 punctures increasingly finer, punctuation scattered, interspaces 2–3 Pd; depressions of terga distinctly separated from the discs, shiny with weak shagreen and very fine scattered punctuation, density of punctuation decreasing posteriorly (3–5 Pd), punctures on T5 more or less extinct. – Sterna: in contrast to terga distinctly shagreened, punctuation scattered as on terga,

interspaces 2 Pd; hind margin of S6 curved, in the middle with weak emargination. – Genitalia: very small in comparison to other species of the *Andrena taraxaci*-group (length = 150 µm, see Fig. 11); process of sternum 8 bar-shaped, posterior and anterior to the lateral teeth with the same width (see Fig. 26).

Female (paratype, ID-No. 090102scwe398, BL = 8 mm, WL = 7 mm)

Colouration and pubescence: Mainly as in male, but lower side of flagellomeres 5–10 reddish brown; facial foveae bright yellow; caudal fimbria, hind legs, especially scopa, with plumose reddish yellow pubescence, hairs on scopa longer than length of the hind spur; hind margin of tergal depressions 2–4 with yellowish white hair bands, covering approximately the posterior third of the depressions. Hair bands on T2 broadly interrupted, on T3 reduced in the middle, on T4 complete; S2–5 with rows of erect reddish yellow hairs.

Head: transverse, HL = 2.0 mm, HW = 2.7 mm, HL/HW = 0.7. – Vertex: behind lateral ocelli smaller (145 µm) than diameter of the lateral ocelli (155 µm). – Frons: face above antennal fossae with longitudinal rugulae, interspaces with very fine punctuation. – Facial foveae: comma-shaped, distance between fovea and lateral ocellus (145 µm) smaller than width of ocellus (160 µm), fovea dorsally occupying more than ⅔ of the distance between compound eye and lateral ocellus. – Clypeus: with transverse punctuation. – Antennae: first flagellomere almost as long as FL2–4; FL2–5 very short, transverse, FL6–8 square, FL9–10 longer than wide.

Mesosoma: Pronotum and scutellum: as in male except propodeum. – Propodeum: more shiny as in male, only weakly shagreened; lateral areas of propodeum near apex of the triangle with a zone of weak punctuation, on the lateral declivous area punctuation more distinct, dense and coarse (crater punctures, interspaces 2 Pd); marginal area of propodeum transversely shagreened, without pubescence, curved hind margin posteriorly with extreme fine pubescence (only visible at high magnification). – Legs: hind femur with a row of 16 reddish brown to dark brown spines.

Metasoma: Terga: more dull than in male, intensively shagreened, especially disc of T1 densely shagreened with scattered crater punctures (interspaces 3–5 Pd); T2–T5 with much finer punctures, scattered as T1. – Sterna: S2–5 with dense punctuation, interspaces < 1 Pd, sculptured as in terga, however, punctuation more distinct.

Diagnosis

A. crepidis is the smallest representative of the *A. taraxaci*-group and has the shortest genitalia (length = 1.5 mm, see Fig. 11). The process of sternum 8 is similar to a small *A. taraxaci*, but in contrast to *A. taraxaci* the process is bar-shaped and parallel-sided. For further characteristics see the keys (section 6).

Observation of flower visits

Flower visits were observed by the author on *Crepis reuteriana* Boiss. & Heldr. and *Leontodon tuberosus* (L.) (Asteraceae, Cichorieae). Like the other species of the *A. taraxaci*-group, *A. crepidis* is supposed to prefer yellow composites.

Andrena (Chlorandrena) maculicornis **n. sp.**
(Figs. 12, 27, 36, 39, 40)

Holotype (♀): Tunisia: Gafsa 21.III.1976, leg. U. Lanham, P. Robinson & B. Soluonias (OLML, ID-No. 060112scwe152).

Paratypes: Libya: Cyrenaica, Ain Mara R. U. Agrario [= Royal Agriculture Office], IV.1926, 2 ♀♀, leg. Krüger (Scwe), 1 ♀, leg. Krüger (Scer), 1 ♀, leg. Krüger (OLMW). – Egypt: Omria, Min. Agr. Egypt, 24.II.1918, 1 ♂ ex coll. Storey; Mariout, Dep. Agr. Egy., 07.III.1912, 1 ♀. – Tunisia: 1 ♀ without specification of date, locality or collector (all specimens OLMW).

Etymology

The species name *maculicornis* is a composition of the Latin terms maculatus (= spotted or stained) and cornus (= horn) and refers to the typical feature of this taxon, the dark base of the flagellomeres, which look like spots on the yellow reddish brown antenna.

Description

Female (holotype, BL = 9.5 mm)

Colouration: Antennae mostly reddish yellow; scape, pedicel and FL1–3 reddish brown, lower side of FL4–10 reddish yellow, upper side also reddish yellow, but base of the flagellomeres reddish brown, visible as dark spots (Fig. 39); integument of head and mesosoma black, terga brown, depressions of the terga reddish brown; femur and tibiae reddish brown, tarsi posteriorly brightened, reddish yellow, spurs of tibiae yellow; tegulae pale yellow; wing membrane hyaline, yellowish obfuscate, veins and pterostigma yellow.

Pubescence: Hairs weakly plumose, reddish yellow; apical fringe reddish yellow; facial fovea dark yellow to yellowish brown; scopa and flocculus with plumose hairs, on the scopa hairs almost as long as width of midtibia.

Head: transverse, HL = 2.54 mm, HW = 2.92 mm, HL/HW = 0.87. – Face: above antennal fossae with longitudinal rugulae, interspaces with rows of scattered coarse punctures. – Facial foveae: comma-shaped, minimum distance of fovea to the lateral ocellus about as wide as the diameter of ocellus, fovea dorsally occupying more than ½ of the distance between compound eye and lateral ocel-

lus. – Compound eyes: inner margins converging slightly towards the ocelli. – Malar space: linear. – Genal area: wider than compound eye. – Antennae: first flagellomere (370 µm) shorter than FL2–4 (490 µm), but longer than FL2–3 (295 µm); FL2–8 transverse, FL9 quadratic, only FL10 longer than wide (305 µm/185 µm, see Fig. 39). – Clypeus: punctures coarse and transverse. – Labrum: process trapezoid, apically weakly truncated, surface and margin of process shiny, other parts of the labrum striated.

Mesosoma: Pronotum: without humeral angle. – Scutum: punctuation posteriorly decreasing, anteriorly denser: interspaces 1 Pd, posteriorly more scattered (interspaces 2 Pd); surface densely shagreened with exception of the posterior third where the integument is weakly shagreened. – Scutellum: mostly smooth and shiny, only at the posterior margin densely shagreened, punctuation scattered, interspaces 2 Pd. – Propodeum: propodeal enclosure distinctly indicated by lateral boundary line, strongly shagreened, anterior side only with fine wrinkles, lateral area of propodeum more weakly shagreened, more shiny, here with sparse punctuation, interspaces 3 Pd; marginal area of propodeum with distinct pubescence on the curved hind margin, also on median part, but hairs very fine. – Mesopleurae: surface shagreened, punctuation dense with crater punctures. – Wing: nervulus postfurcal, distance from basal vein twice the width of the basal vein. – Legs: Hind femur with a row of spines (about 14) as usual for this subgenus, tarsal claws all bidentate.

Metasoma: Terga: Surface of terga strongly shagreened, punctuation with crater punctures, especially on T1, on T2–T5 crater punctures more shallow, interspaces 1–2 Pd; depressions of terga well indicated without punctures, depressed marginal zones. – Sterna: anterior part of S2–S5 without punctuation, posterior part with increasingly dense punctuation, interspaces 1 Pd. – Pygidium: pygidial plate V-shaped, without raised triangular area or carina.

Male (paratype, ID-No. 091201scwe033, BL = 8 mm)

Colouration and pubescence: Mainly as in female, especially the mostly reddish yellow flagellum; hairs of the male longer than those of the females, hairs on the terga distinctly longer than the hind spurs.

Head: transverse, HL = 2.0 mm, HW = 2.5 mm, HL/HW = 0.8. – Antennae: FL1 (length: 325 µm) longer than FL2–3 (length: 290 µm) but shorter as FL2–4 (length: 465 µm), FL2–9 transverse, FL10 quadratic, FL11 longer than wide; with tiny tubercle between antennal sockets.

Mesosoma: Pronotum, scutum, scutellum and mesepisternum as in female, except propodeum: enclosure and lateral sides more roughly shagreened, lateral sides with dense punctuation (interspaces 1 Pd);

Metasoma: Terga: mostly as in female, except surface which is more shiny and only weakly shagreened, especially T1 with smooth parts; punctuation shallow, not distinctly impressed; scattered punctuation (interspaces 3 Pd); T1 with more or less distinct crater punctures, on T2–T5 punctures increasingly shallow, depressions of terga well indicated, punctuation on the marginal zones more or less extinct. – Sterna: S2–S5 sculptured as in terga, but punctures more distinct; Sternum 6 erect, apical margin in the middle with weak emargination. – Genitalia: gonostyli and sternum 8 as illustrated in Figs. 12, 27.

Diagnosis

Andrena maculicornis n. sp. is distinguished from *Andrena curtivalvis* by the lack of dark hairs on the integument. Also the facial foveae of the females of *A. maculicornis* are yellowish and not dark brown as typical for *A. curtivalvis.* The antennae are reddish yellow on the upper side with dark spots, whereas the other species of the *A. taraxaci*-group have darker upper sides of antennae. Sternum 8 is similar to *A. pastellensis* and *A. taraxaci* (compare Figs. 27, 29, 30), but the gonostyli are much broader than in *A. pastellensis* and in *A. taraxaci*, and the apex is rounded instead of transverse and acute (compare Figs. 12, 14). For further characteristics see the keys (section 6).

Remark

The new taxon was discovered in the Warncke collection, where specimens without dark pilosity on head and pronotum were assigned to *Andrena curtivalvis.* But in the original description Morice (1899b) alludes to the dark hairs on face and vertex of *A. curtivalvis.* Furthermore, dissection of a male from Egypt determinated by Warncke as *A. taraxaci* ssp. *curtivalvis* showed genitalia with characters different from *A. curtivalvis.* – There are no records of flower visits.

Andrena (Chlorandrena) flavomarginata **n. sp.**
(Fig. 34)

Holotype (♀): Tunisia: Governorate Gabès, 10 km SE Matmata, 9.V.1992, leg. Schwarz (Scwz, ID-No. 121107scwe239).

Paratype: Tunisia: Governorate Sousse, 8 km NE Enfidha, 1 ♀, 23.III.2010, leg. Schwenninger (Scwe).

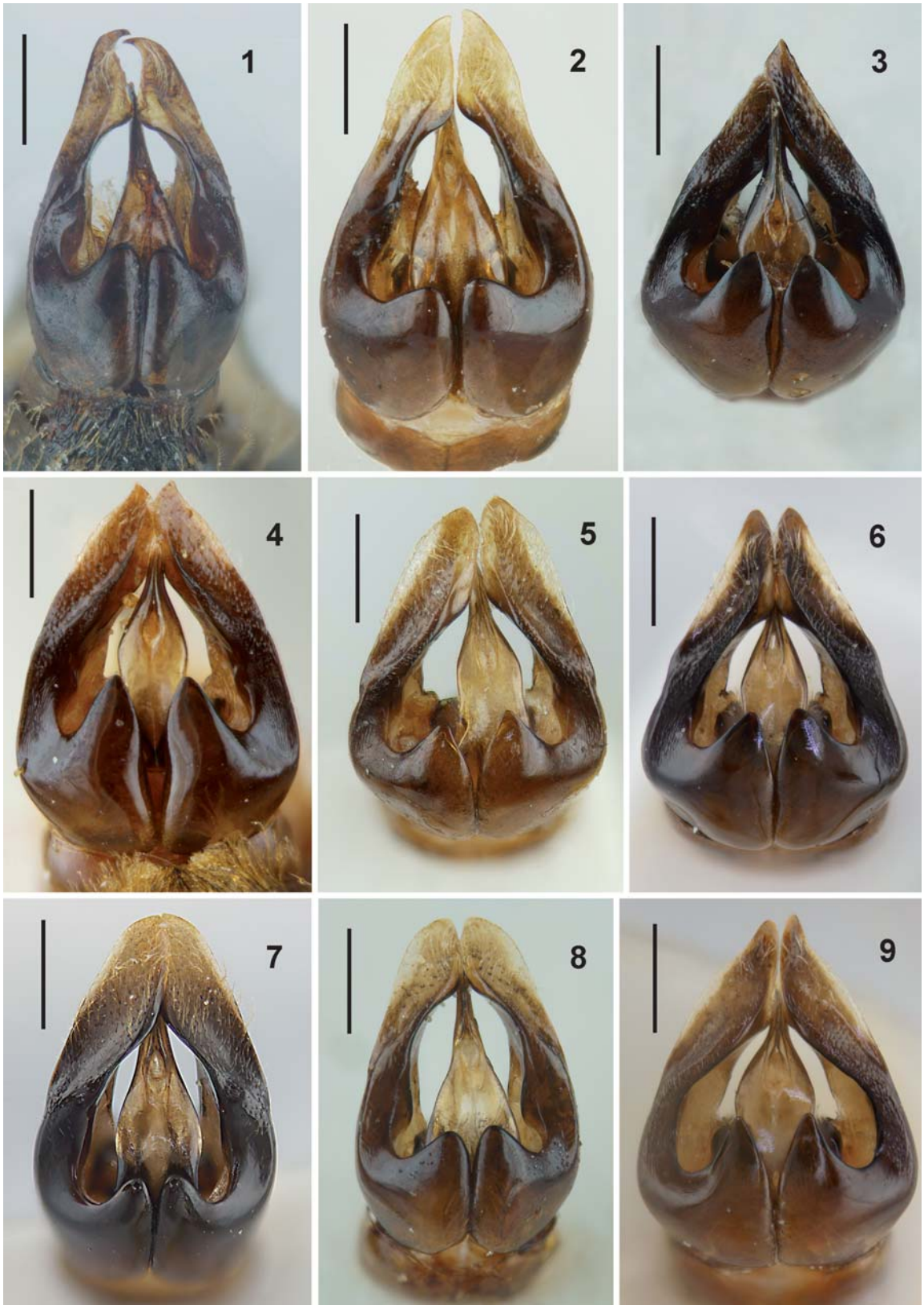
Etymology

The name *flavomarginata* refers to an easily visible feature of this taxon: the broad, transparent, yellowish depressed hind margins of the terga (flavo = Latin for yellow).

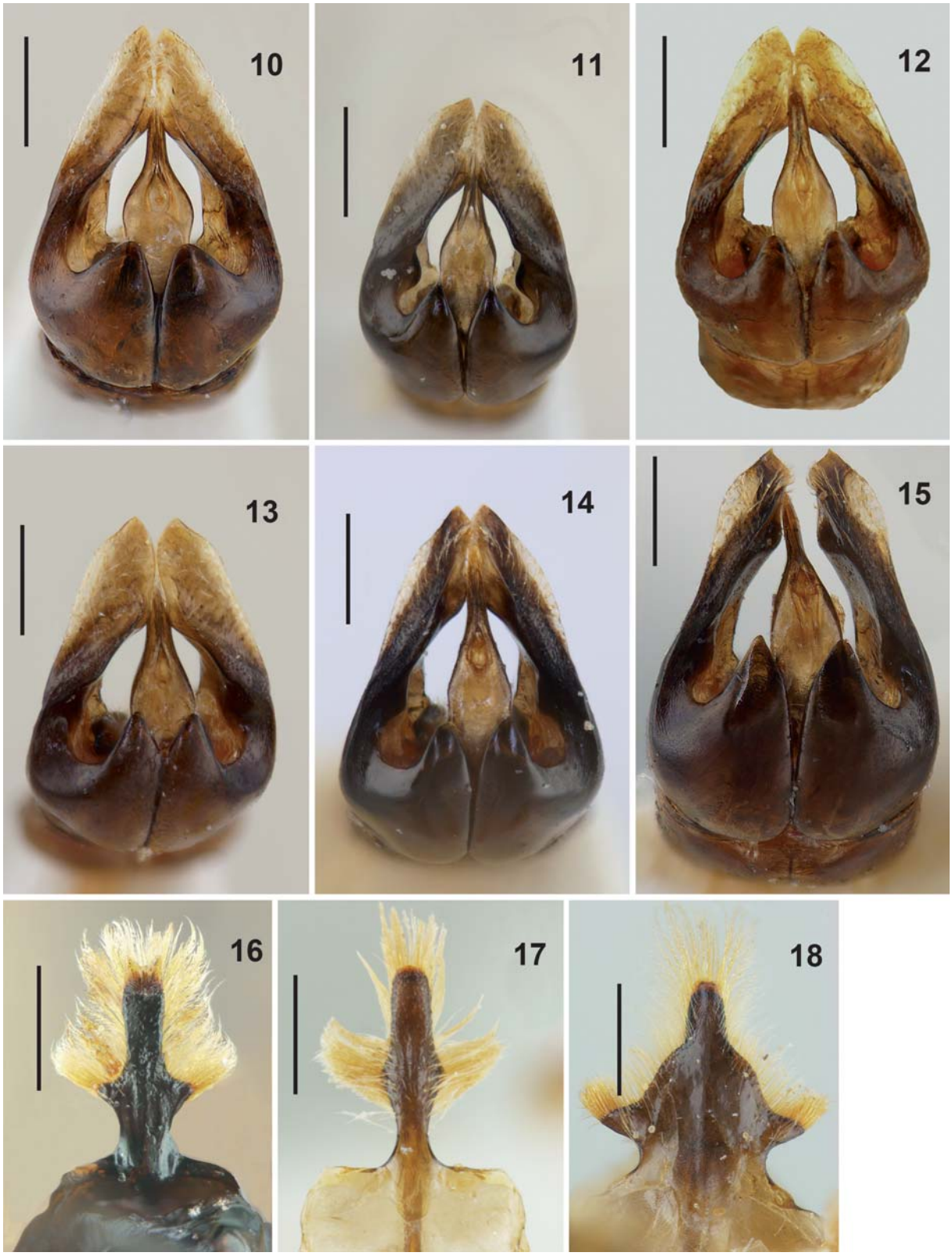
Description

Female (holotype, BL = 9.3 mm)

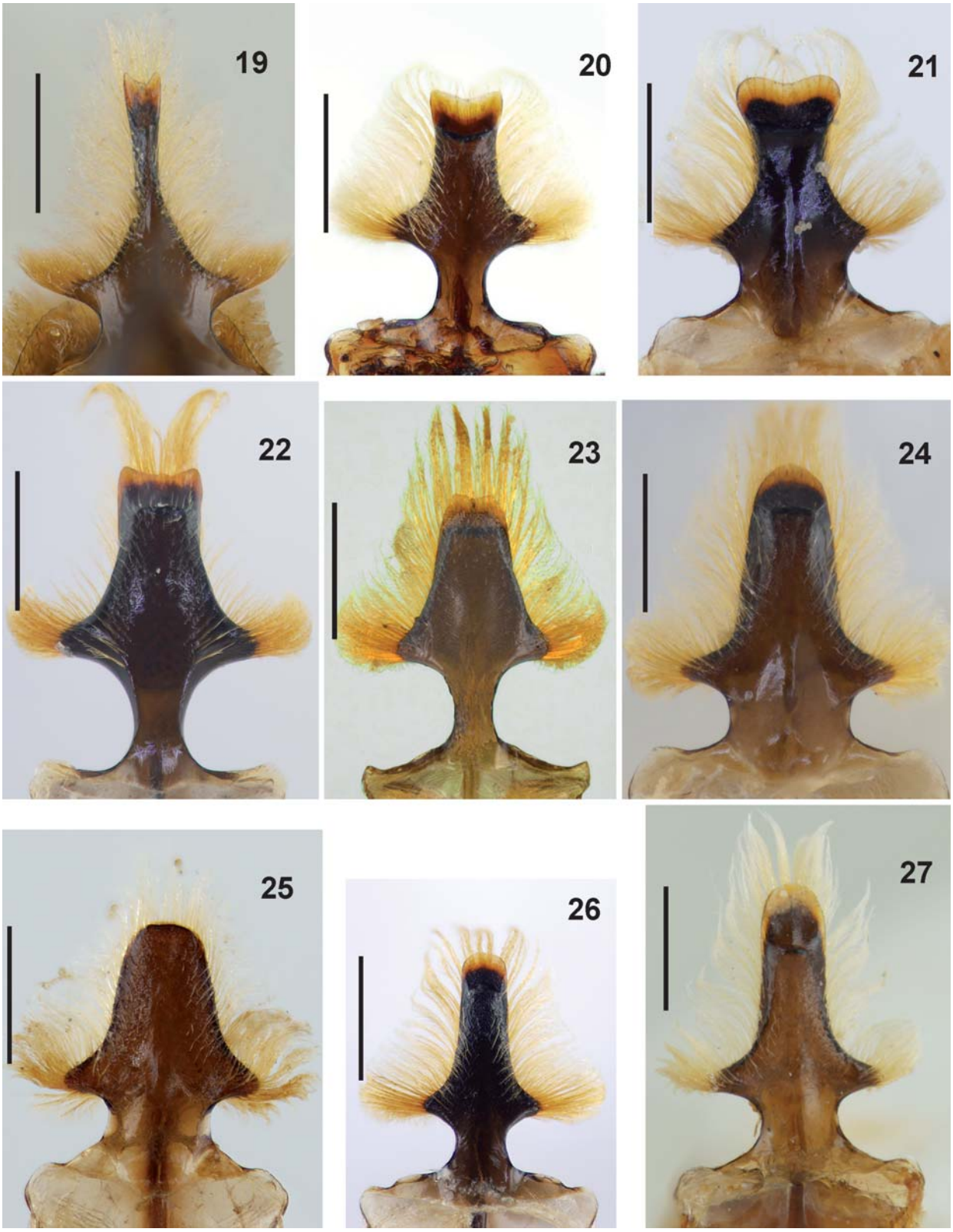
Colouration: Integument black brown, except as follows: mandible at the top (both teeth) reddish, antennal FL4–10 underneath reddish brown, depressions of



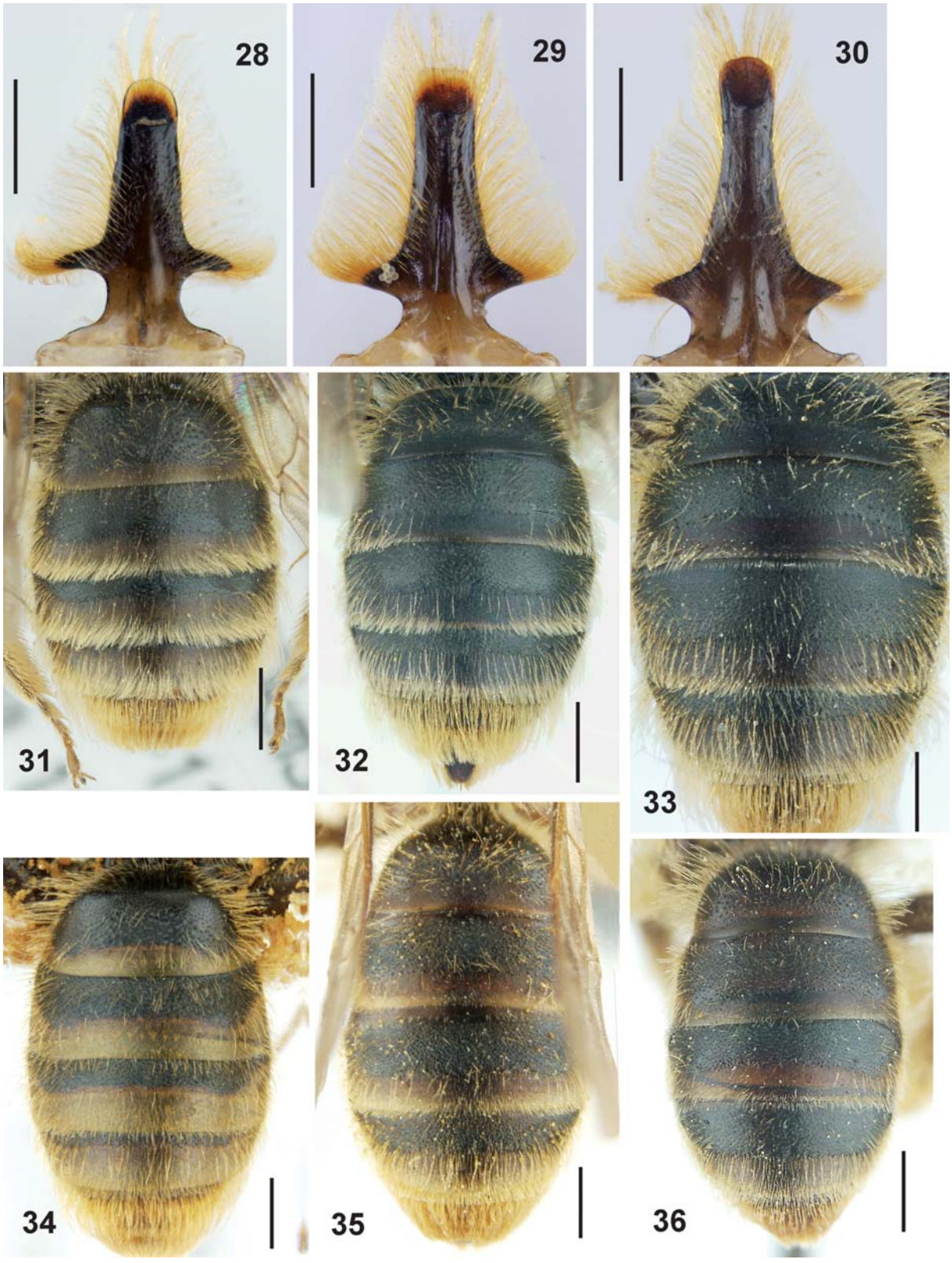
Figs. 1–9. *Andrena* spp., male genitalia in dorsal view. – **1**. *A. galbula*. **2**. *A. turanica*. **3**. *A. tricuspidata*. **4**. *A. pseudotaraxaci*. **5**. *A. jerbaensis*. **6**. *A. stabiana*. **7**. *A. senecionis*. **8**. *A. astica*. **9**. *A. rhenana*. – Specimen data see Tab. 1. – Scales: 0.5 mm.



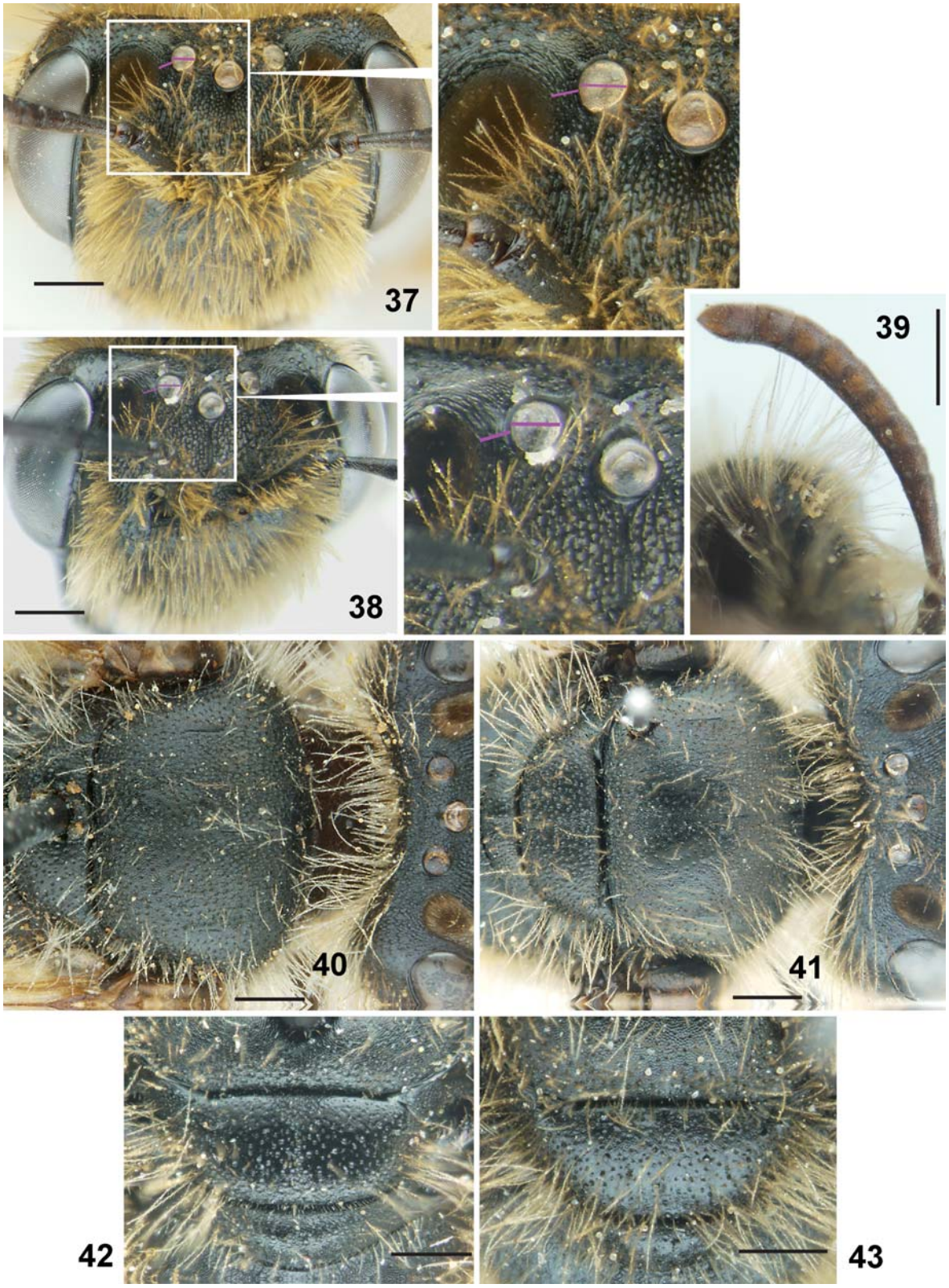
Figs. 10–18. *Andrena* spp., male genitalia (10–15) and apical process of male sternum 8 (16–18) in dorsal view. – **10**. *A. curtivalvis*. **11**. *A. crepidis*. **12**. *A. maculicornis*. **13**. *A. orientana*. **14**. *A. pastellensis*. **15**. *A. taraxaci*. **16**. *A. galbula*. **17**. *A. turanica*. **18**. *A. tricuspidata*. – Specimen data see Tab. 1. – Scales: 0.5 mm.



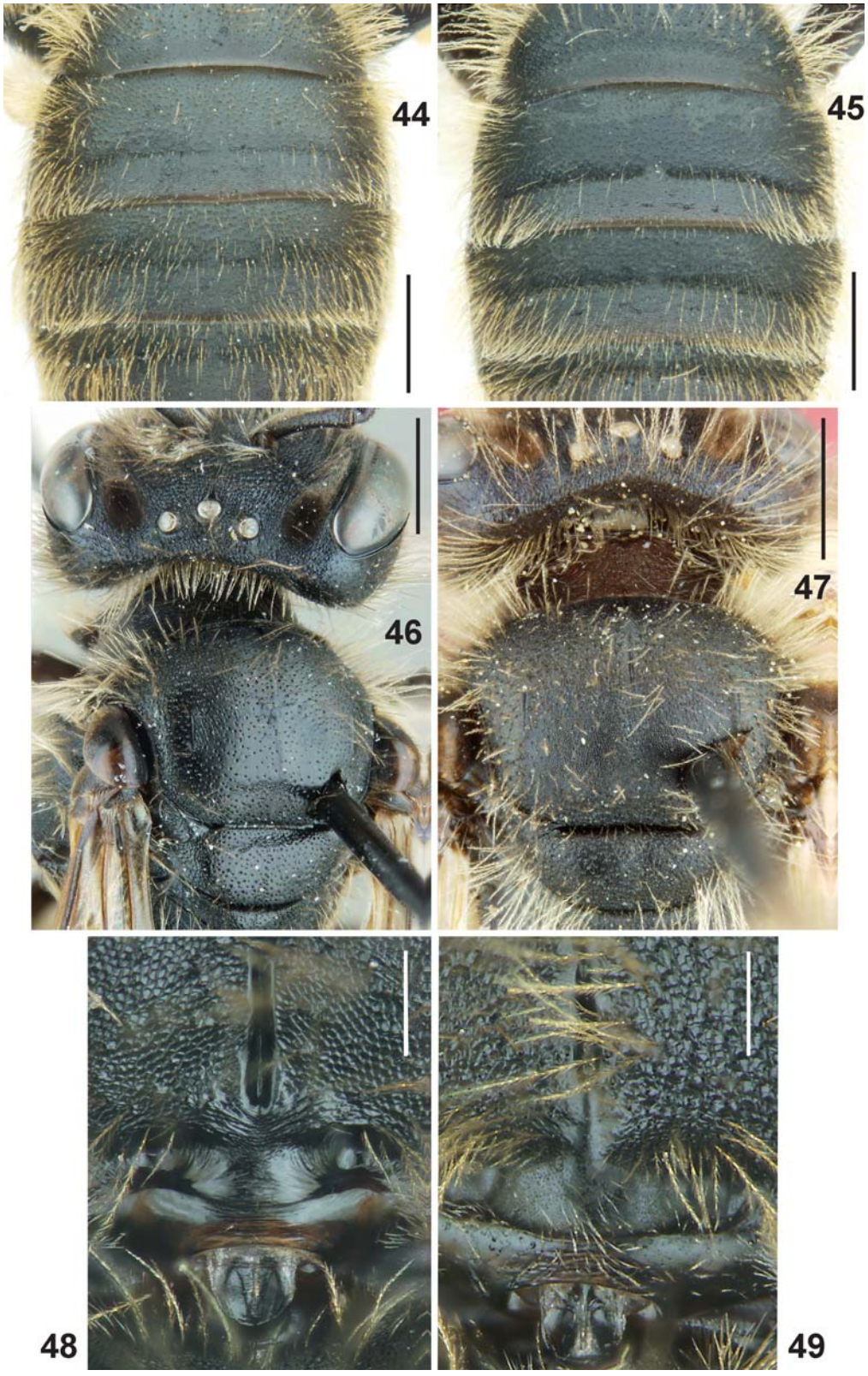
Figs. 19–27. *Andrena* spp., apical process of male sternum 8 in dorsal view. **19**. *A. pseudotaraxaci*. **20**. *A. jerbaensis*. **21**. *A. stabiana*. **22**. *A. senecionis*. **23**. *A. astica*. **24**. *A. rhenana*. **25**. *A. curtivalvis*. **26**. *A. crepidis*. **27**. *A. maculicornis*. – Specimen data see Tab. 1. – Scales: 0.5 mm.



Figs. 28–36. *Andrena* spp., apical process of male sternum 8 (28–30) and female metasoma (31–36) in dorsal view. – **28**. *A. orientana*. **29**. *A. pastellensis*. **30**. *A. taraxaci*. **31**. *A. turanica*. **32**. *A. orientana*. **33**. *A. rhenana*. **34**. *A. flavomarginata*. **35**. *A. senecionis*. **36**. *A. maculicornis*. – Specimen data see Tab. 1. – Scales: 0.5 mm (28–30), 1 mm (31–36).



Figs. 37–43. *Andrena* spp., frons and area of ocelli of females (37, 38), female left antenna (39), female metasoma (40, 41), and female scutellum (42, 43) in dorsal view. – **37**. *A. jerbaensis*. **38**. *A. crepidis*. **39**–**40**. *A. maculicornis*. **41**. *A. orientana*. **42**. *A. parataraxaci*. **43**. *A. pastellensis*. – Specimen data see Tab. 1. – Scales: 0.5 mm.



Figs. 44–49. *Andrena* spp., female metasomal terga 1–4 (44–45), female mesosoma (46–47), and marginal area of female propodeum (48–49). – **44**. *A. rhenana*. **45**. *A. pastellensis*. **46**. *A. curtivalvis*. **47**–**48**. *A. astica*. **49**. *A. taraxaci*. – Specimen data see Tab. 1. – Scales: 1 mm (44–47), 0.2 mm (48–49).

Tab. 1. Data of *Andrena* specimens used for Figs. 1–49

Fig.	Species	ID-No.	Country	Locality	Coordinates	Date	♂/♀	Leg.	Coll.
1	*A. galbula*	121220scwe392	IL	Jerusalem	E35.20 N31.76	15.I.1940	♂	H. Bytinski-Salz	Scer
2	*A. turanica*	091121scwe485	RU	Kubán	E40.44 N45.37	20.IV1972	♂	M. Kocourek	OLML
3	*A. tricuspidata*	141022scwe074	UA	Michurino	E36.41 N45.36	15.IV.1998	♂		Scer
4	*A. parataraxaci*	141022scwe075	TM	Ashgabat	E58.36 N37.94	20.III.1976	♂		Scer
5	*A. jerbaensis*	061024scwe084	TN	Zarzis	E11.10 N33.30	16.II.1992	♂	K. Warncke	OLMW
6	*A. stabiana*	051216scwe154	IT	Giardini Naxos	E15.26 N37.82	15.IV.2005	♂	H. Schwenninger	Scwe
7	*A. senecionis*	061212scwe239	ES	Alicante	W0.56 N38.31	10.IV.2007	♂	H. Schwenninger	Scwe
8	*A. astica*	061024scwe085	TR	Adana	E37.06 N35.26	25.III.1967	♂	K. Warncke	OLMW
9	*A. rhenana*	050301scwe450	DE	Neuried	E7.80 N48.50	3.IV.2000	♂	H. Schwenninger	Scwe
10	*A. curtivalvis*	061212scwe183	TN	Medjez el-Bab	E9.69 N36.65	30.III.1976	♂	U. Lanham et al.	Scwe
11	*A. crepidis*	090102scwe399	CY	Kaminaria	E32.77 N34.90	2.IV.2009	♂	H. Schwenninger	Scwe
12	*A. maculicornis*	091201scwe033	EG	Cairo	E31.29 N30.11	24.II.1918	♂	G. Storey	OLMW
13	*A. orientana*	061212scwe173	TR	Side	E31.37 N36.79	4.IV.1972	♂	K. Warncke	Scwe
14	*A. pastellensis*	060112scwe030	IT	Dolcé	E10.87 N45.59	23.IV.2006	♂	H. Schwenninger	Scwe
15	*A. taraxaci*	091002scwe437	AT	Kappern	E14.13 N48.18	17.IV.2003	♂	F. Gusenleitner	Scwe
16	*A. galbula*	070915scwe098	TR	Diyarbakir	E40.23 N37.94	16.IV.1972	♂	K. Warncke	OLMW
17	*A. turanica*	091121scwe485	RU	Kubán	E40.44 N45.37	20.IV.1972	♂	M. Kocourek	OLML
18	*A. tricuspidata*	141022scwe074	UA	Michurino	E36.41 N45.36	15.IV.1998	♂		Scer
19	*A. parataraxaci*	141022scwe075	TM	Ashgabat	E58.36 N37.94	20.III.1976	♂		Scer
20	*A. jerbaensis*	061024scwe084	TN	Zarzis	E11.10 N33.30	16.II.1992	♂	K. Warncke	OLMW
21	*A. stabiana*	051216scwe154	IT	Giardini Naxos	E15.26 N37.82	15.IV.2005	♂	H. Schwenninger	Scwe
22	*A. senecionis*	061212scwe238	ES	Salinas	W0.89 N39.00	11.IV.2007	♂	H. Schwenninger	Scwe
23	*A. astica*	061024scwe085	TR	Adana	E37.06 N35.26	25.III.1967	♂	K. Warncke	OLMW
24	*A. rhenana*	050301scwe450	DE	Neuried	E7.80 N48.50	3.IV.2000	♂	H. Schwenninger	Scwe
25	*A. curtivalvis*	061212scwe183	TN	Medjez el-Bab	E9.69 N36.65	30.III.1976	♂	U. Lanham et al.	Scwe
26	*A. crepidis*	090102scwe400	CY	Kaminaria	E32.77 N34.90	2.IV.2009	♂	H. Schwenninger	Scwe
27	*A. maculicornis*	091201scwe033	EG	Cairo	E31.29 N30.11	24.II.1918	♂	G. Storey	OLMW
28	*A. orientana*	090102scwe401	CY	Paramytha	E32.98 N34.75	30.III.2009	♂	H. Schwenninger	Scwe
29	*A. pastellensis*	060112scwe143	IT	Dolcé	E10.87 N45.59	23.IV.2006	♂	H. Schwenninger	Scwe
30	*A. taraxaci*	091002scwe437	AT	Kappern	E14.13 N48.18	17.IV.2003	♂	F. Gusenleitner	Scwe
31	*A. turanica*	121107scwe206	KZ	Schymkent	E69.59 N42.30	11.IV.1992	♀	J. Halada	Scwe
32	*A. orientana*	0901031scwe082	CY	Paramytha	E32.98 N34.75	30.III.2009	♀	H. Schwenninger	Scwe
33	*A. rhenana*	061024scwe481	DE	Neuried	E7.78 N48.47	3.IV.2000	♀	H. Schwenninger	Scwe
34	*A. flavomarginata*	121107scwe239	TN	Matmâta	E10.07 N33.49	9.V.1992	♀	M. Schwarz	Scwz
35	*A. senecionis*	100511scwe611	DZ	Annaba (Bône)	E7.77 N36.90		♀	J. Pérez	MNHN
36	*A. maculicornis*	060112scwe152	TN	Gafsa	E8.79 N34.41	21.III.1976	♀	U. Lanham et al.	OLML
37	*A. jerbaensis*	0901031scw076	TN	El May	E10.87 N33.81	06.III.2008	♀	H. Schwenninger	Scwe
38	*A. crepidis*	090102scwe398	CY	Kaminaria	E32.77 N34.90	2.IV.2009	♀	H. Schwenninger	Scwe
39	*A. maculicornis*	060112scwe152	TN	Gafsa	E8.79 N34.41	21.III.1976	♀	U. Lanham et al.	OLMW
40	*A. maculicornis*	061024scwe058	LY	Sahdhdat	E22.38 N32.75	IV.1926	♀	C. Krüger	OLMW
41	*A. orientana*	120120scwe601	CY	Pyrgos	E33.16 N34.72	24.III.2011	♀	H. Schwenninger	Scwe
42	*A. parataraxaci*	121107scwe203	TM	Sandykathy	E62.51 N36.59	28.III.1992	♀	J. Halada	Scwz
43	*A. pastellensis*	061212scwe191	IT	Luino	E8.76 N46.03	4.IV.2007	♀	H. Schwenninger	Scwe
44	*A. rhenana*	061212scwe210	FR	Guillestre	E6.62 N44.67	4.IV.2007	♀	H. Schwenninger	Scwe
45	*A. pastellensis*	061212scwe190	IT	Luino	E8.76 N46.03	4.IV.2007	♀	H. Schwenninger	Scwe
46	*A. curtivalvis*	091121scwe166	ES	Estepona	W5.16 N36.43	1.IV.1985	♀	H. Wolf	OLML
47	*A. astica*	091201scwe052	TR	Ayvalik	E26.70 N39.32	13.IV.1965	♀	K. Warncke	OLMW
48	*A. astica*	120120scwe152	CY	Beylerbeyi	E33.36 N35.30	28.ÎII.2012	♀	H. Schwenninger	Scwe
49	*A. taraxaci*	100511scwe527	RS	Futog	E19.69 N45.26	24.IV.2010	♀	R. Burger	Scwe

terga on the entire surface brightened reddish yellow, posterior margins of the tergal discs also brightened reddish brown, marginal zone of sterna entirely reddish yellow, all tarsi and the apex of the hind tibia reddish yellow, except anterior part of metatarsus 1, which is reddish brown at its base, tibial spurs yellow; wing membranes yellowish, veins and pterostigma reddish yellow, radial vein reddish brown, margin of pterostigma slightly obfuscated.

Pubescence: Hairs mostly reddish yellow; on terga, middle and hind legs, especially scopa, apical fringe more intensive reddish yellow; all hairs plumose, especially trochanteral floccus and scopa; facial foveae light yellow.

Head: transverse, HL = 2.42 mm, HW = 2.98 mm, HL/HW = 0.81. – Frons: face above antennal fossae with longitudinal rugulae, interspaces with coarse punctuation. – Facial foveae: comma-shaped, distance between fovea and lateral ocellus approximately the diameter of the ocellus, fovea dorsally occupying more than ½ of the distance between compound eye and lateral ocellus. – Paraocular area and supraclypeal area: with dense, imbricative punctuation. – Antennae: first flagellomere (425 µm) longer than FL2–3 (353 µm), but shorter than FL2–4 (501 µm); FL2–9 transverse, FL10 longer than wide. – Clypeus: with transverse punctuation. – Labrum: with trapezoidal process, apically weakly truncated, surface of process polished.

Mesosoma: Pronotum: without humeral angle. – Scutum: surface shagreened, posterior third only weakly shagreened, punctuation significant, deeply impressed and moderately dense, interspaces about 1–2 Pd. – Scutellum: smooth, like polished, only at posterior margin intensively shagreened; punctuation of anterior margin and median area dense (interspaces about ½–1 Pd), beside the median area more scattered and coarser (interspaces 2–3 Pd). – Propodeum: enclosure (propodeal triangle) indicated by a fine lateral boundary line, outer margin with wrinkles, shagreened, anterior margin with wrinkles; lateral area of propodeum with coarse crater punctures (interspaces 2 Pd), marginal area of propodeum on the median part without pubescence or punctures, shagreen finely transverse (like Fig. 48). – Legs: hind femur with a row of spines (left side 14, right side 13) as usual for this subgenus, tarsal claws all bidentate. – Mesopleurae: surface shagreened, on ⅔ of the anterior part punctuation densely imbricated, towards the posterior margin punctuation decreasing and more shallow, interspaces up to more than 3 Pd. – Wing: nervulus interstitial.

Metasoma: Terga: T1 mostly polished, but depressions distinctly shagreened, T2–T5 entirely shagreened; density of punctuation increasing towards apex, disc of T1 more scattered (interspaces > 2 Pd), especially lateral parts of T2–T4 with dense, imbricative punctuation (interspaces < ½ Pd); predominantly with crater punctures, except declining anterior part of T1. – Pygidium: pygidial plate U-shaped, without raised triangular area or carina. – Sterna: anterior parts of S2–S5 without or with extremely fine scattered punctuation, up to the posterior margin increasingly denser and coarser, sometimes imbricative.

Diagnosis (females)

The yellowish depressions of the terga of *A. flavomarginata* resemble those of *A. senecionis*, but in *A. senecionis* the depressions are reddish brown in their anterior quarter, whereas they are entirely yellow in *A. flavomarginata*. All tarsi of *A. flavomarginata* are reddish yellow, whereas the tarsi of *A. senecionis* are reddish brown. The scutellum of *A. flavomarginata* is finely punctured, and in the middle of the lateral part the punctuation is scattered (interspaces of 3–4 Pd). In contrast, the punctuation of *A. senecionis* is coarse and the interspaces are smaller (almost 2 Pd). For further characteristics see the keys (section 6).

Remark

In Tunisia the author collected a female of the *Andrena taraxaci*-group with yellowish depressions of terga that looked like a small *A. senecionis*. On closer examination some characters were found that indicated a new species. As the description on the base of a single specimen can be problematic due to interspecific variability, the finding of another female in the collection of Maximilian Schwarz with corresponding features enabled the description of the new species.

Observation of flower visits

Only one record of flower visit is known. The author collected the female paratype on a yellow composite (Asteraceae, Cichorieae).

5 Description of the hitherto unknown female of *Andrena (Chlorandrena) parataraxaci* Scheuchl 2010

Examined material

Turkmenistan: Sandykathy: 28.III.–4.IV.1992, 1 ♀, leg. J. Halada (Scwe, ID-No. 121107scwe183); 28.III.–4.IV.1992, 9 ♀♀, 1 ♂, leg. J. Halada; 11 ♀♀, 1 ♂, leg. K. Denes (all Scwz); 4 ♀♀, 3 ♂♂, leg. K. Denes, 2 ♀♀, leg. J. Halada (all Scwe).

Female [BL = 9.3–10.9 mm (n = 29)]

Colouration: Integument dark brown, except as follows: FL6–11 underneath reddish brown, top of flagellum, also on upper side, dark reddish brown, mandible at the top (both teeth) reddish, depressions of terga on nearly the entire surface reddish brown, marginal zone of sterna and claws reddish yellow, tibial spurs transparent reddish yellow, wing membranes hyaline, slightly yellowish, veins and pterostigma reddish yellow, radial vein reddish brown.

Pubescence: Hairs light yellow, plumose, especially trochanteral floccus and scopa; facial fovea light yellow.

Head: transverse, HL = 2.85 mm, HW = 3.22 mm, HL/HW = 0.9. – Antennae: first flagellomere (472 µm) longer than FL2–3 (374 µm), but shorter than FL2–4 (580 µm); FL2–7 transverse, FL8–9 square, FL10 longer than wide. – Compound eyes: inner margins more or less parallel. – Facial foveae: dorsally deeply impressed and broad, comma-shaped, ending beneath the base of antennae, here as wide as the width of scape; fovea dorsally occupying about ¾ the distance between compound eye and lateral ocellus, distance between fovea and lateral ocellus smaller than width of lateral ocellus. – Frons: face above antennal fossae with longitudinal rugulae, interspaces with rows of punctures. – Clypeus: punctures transverse and coarse, punctuation giving the impression of horizontal stripes. – Labrum: process trapezoid, medially emarginate, surface shiny; labrum beneath process with dense pubescence covering the entire surface.

Mesosoma: Pronotum: without humeral angle, strongly shagreened. – Scutum: surface shagreened, punctuation with interspaces mostly twice as large as Pd, interspaces on posterior third of scutum sometimes more than twice of Pd. – Scutellum: posterior part smooth and shiny, anterior part densely shagreened, median part with extremely dense punctuation (Pd < ½), indicating a median zone (Fig. 42). – Mesopleurae: anterior part with coarse and dense punctuation (interspaces < 1 Pd), on posterior part, especially above mesocoxa, punctuation much more scattered (interspaces up to 3 Pd). – Propodeum: triangle area indicated by a thin lateral boundary line, strongly shagreened, anterior part with small wrinkles, without distinct medial line, uniformly shagreened; lateral parts of propodeum lesser shagreened with large punctures (interspaces 3 Pd). – Wing: nervulus strongly postfurcal, distance from basal vein usually more than twice the width of basal vein. – Legs: Hind femur with a row of about 16 spines, tarsal claws all bidentate.

Metasoma: Terga: T1–T5 shagreened, medial area of T1 weakly shagreened, more shiny, punctures on T1 deep (crater punctures), T2–T5 punctures more shallow, punctuation more or less dense (interspaces about 1–2 Pd), depressions of terga distinctly separated from the disc without punctuation. – Pygidium: pygidial plate V-shaped, without raised triangular area or carina. – Sterna: anterior parts of S2–S5 with a small pointless area, towards posterior margin punctuation increasingly denser and coarser, imbricative (distances ½ Pd).

Diagnosis

The female of *Andrena parataraxaci* can be distinguished from the other females of the group by the combination of the following characters: Without apical hair bands on the depressions of terga 2–4, nearest distance of foveae to lateral ocelli as wide as the diameter of one ocellus, pubescence yellowish brown, depressions of terga reddish brown, upper side of antennae entirely dark brown, scutum all over shagreened without polished areas, foveae light yellow, median part of scutellum with extremely dense punctuation (interspaces Pd < ½) indicating a median zone or line (Fig. 42).

Remark

Among the comprehensive material of the *Andrena taraxaci*-group from Turkmenistan in the collection of M. Schwarz the author could identify males belonging to the taxon *A. parataraxaci*. Together with these males a series of females had been collected in the same localities at the same time. Since some characters of these females match with those of the males, the description of the hitherto unknown female of *A. parataraxaci* was possible. Common characters are, e. g., wing venation, punctuation of scutum and tergal sterna, as well as the shape of the triangle area of the propodeum. – There are no records of flower visits.

6 Keys to the Western Palaearctic species of the *Andrena taraxaci*-group

The most reliable way to identify the species of the *A. taraxaci*-group is to compare the male genitalia. Already Morice (1899a) stated the importance of the differential diagnostic characteristics of sternum 8 and the genitalia. Therefore, a careful preparation of this body parts is recommended (see section 2). To facilitate the application of the key, sterna 8 and genitalia of similar species are grouped together in Figs. 1–27. Males of *A. flavomarginata* n. sp. are still unknown.

Gusenleitner & Schwarz (2002: 746) pointed out that in many cases the identification of females within the *Andrena taraxaci*-group can be difficult or even impossible. Worn specimens may cause problems, thus fresh specimens are needed to use the key. The knowledge of the provenance of the specimens is of importance (see Tab. 2). Females of *A. galbula* and *A. tricuspidata* are still unknown.

Males

1 Apex of the gonostyli curved proximally, claw-shaped, ending in a spine (Fig. 1). – Process of sternum 8 with distinct lateral teeth (Fig. 16)..... ***A. galbula*** Warncke
– Apex of the gonostyli not claw-shaped..... **2**
2 Process of sternum 8 without lateral teeth, only with lateral protuberances (Fig. 17)..... ***A. turanica*** Osytshnjuk
– Process of sternum 8 with distinct lateral teeth. **3**
3 Process of sternum 8 posterior to lateral teeth strongly triangular (Fig. 18). .....***A. tricuspidata*** Scheuchl
– Process of sternum 8 slender..... **4**

4 Process of sternum 8 apically emarginate (concave) or truncated (Figs. 20–23). **5**
– Process of sternum 8 apically rounded (convex). **9**
5 Apical part of sternum 8 extremely slender, rod shaped, base of process 3 times as wide as the apex (Fig. 19). – Inner margin of gonostyli with a straight, strong rim, apex acute (Fig. 4). ..... ***A. parataraxaci*** Scheuchl
– Apical part of sternum 8 wider, base of process approximately as wide as apex. **6**
6 Apex of sternum 8 distinctly emarginate (concave); gonostyli tapering apically (Figs. 20–21). **7**
– Apex of sternum 8 truncated, more or less straight (Figs. 22–23); apex of gonostyli broadening, more rounded (Figs. 7, 8). **8**
7 Base of process of sternum 8 smaller than apex (Fig. 20); outer margin of gonostyli widened to the apex (convex) and translucent (on one third of its width) (Fig. 5). .... ***A. jerbaensis* n. sp.**
– Base of process of sternum 8 broader than apex (Fig. 21); outer margin of gonostyli straight, translucent area smaller than a quarter of the width of gonostylus (Fig. 6). .... ***A. stabiana*** Morice
8 Apical part of sternum 8 with parallel sides, apex truncated; teeth of process protruding (Fig. 22); gonocoxal lobes well developed (Fig. 7). ..... ***A. senecionis*** Pérez
– Sides of sternum 8 tapering apically, apex straight or weakly convex; teeth of process small, only weakly developed (Fig. 23); gonocoxal lobes smaller (Fig. 8). .... ***A. astica*** Warncke
9 Apical part of process of sternum 8 stocky, apex broadly rounded (conical) (Figs. 24–25). **10**
– Apical part of process of sternum 8 slender, rod-shaped (Figs. 26–30). **11**
10 Apex of gonostyli with dense, deeply impressed punctuation, gonocoxal lobes strongly pronounced, ending in a point (Fig. 9); process of sternum 8 longer (Fig. 24). .... ***A. rhenana*** Stoeckhert
– Punctuation of gonostyli scattered, especially on the rim of the inner margin, gonocoxal lobes smaller, apex broadly rounded (Fig. 10); process of sternum 8 shorter (Fig. 25). .... ***A. curtivalvis*** Morice
11 Process of sternum 8 very small, bar-shaped, equal width posterior and anterior to the lateral teeth (Fig. 26); genitalia very small, smallest within the *A. taraxaci*-group, about one third smaller than in *A. taraxaci* (compare Figs. 11 and 15). ..... ***A. crepidis* n. sp.**
– Process of sternum 8 broader, especially posterior to lateral teeth (Figs. 27–30); genitalia and apical process of sternum 8 larger. **12**
12 Apex of gonostyli between internal rim and outer margin widened, broadly rounded (Figs. 12–13). **13**
– Apex of gonostyli between internal rim and outer margin more or less parallel, ending in a point (Figs. 14–15). **14**
13 Lateral teeth of sternum 8 obtuse, process posterior to lateral teeth parallel, smaller; margin of gonostyli apically convex (Figs. 12, 27). ..... ***A. maculicornis* n. sp.**
– Lateral teeth of sternum 8 acute, process posterior to lateral teeth broader, converging; margin of gonostyli apically concave (Figs. 13, 28). ..... ***A. orientana*** Warncke
14 Genitalia and process of sternum 8 shorter; apex of gonostyli smaller, only weakly convex (Figs. 14, 29). .... ***A. pastellensis*** Schwenninger
– Genitalia and process of sternum 8 longer; apex of gonostyli wider and outer margin bulged (Figs. 15, 30). .... ***A. taraxaci*** Giraud

F e m a l e s

1 Terga 2–4 with bands of dense, yellowish white hairs covering almost 50 % of the surface of the depressions, bands on T2 in the middle narrowly interrupted, T3 and T4 complete (Fig. 31); T1 with distinct crater punctures, punctuation of T2–T4 more shallow and weaker. .... ***A. turanica*** Osytshnjuk
– Terga 2–4 without strongly developed hair bands on the depressions, hind margins of terga generally with a row of sparse hairs that do not cover the entire surface; if bands on the hind margins are present, they are covering at most a quarter of the surface of the depressions (Figs. 32, 33). **2**
2 Fovea dorsally wider, nearest distance to the lateral ocellus distinctly smaller than the diameter of the lateral ocellus (see pink markers in Figs. 37, 38). **3**
– Fovea dorsally smaller, nearest distance to the lateral ocellus as wide as the diameter of ocellus (Figs. 41, 46). **4**
3 Flagellum underside brightened reddish yellow; anterior and posterior part of scutum with dense punctuation (interspaces about 1 Pd); veins and pterostigma of wings yellowish brown; nervulus weakly postfurcal (distance to basal vein < 2 times the width of nervulus); lateral parts of propodeum with imbricative rugose punctures; metasoma shagreened with distinct crater punctures, also on tergum 2; body length on average 9.1 mm. ..... ***A. jerbaensis* n. sp.**
– Flagellum underside not brightened, more or less reddish brown; punctures of scutum scattered, interspaces 3 Pd; wing veins and pterostigma reddish brown; nervulus strongly postfurcal (distance to basal vein > 4 times the width of nervulus); lateral parts of propodeum with finer punctures, margins of punctures lesser protruding; metasoma more brilliant, only weakly shagreened, especially tergum 1, punctures on terga 2 and 3 not distinctly crater-like; body length on average 8.25 mm. ..... ***A. crepidis* n. sp.**
4 Facial foveae bright, yellow or yellowish brown; scape and head in frontal view with uniformly bright pubescence, predominantly yellow brown or reddish brown, at most single dark brown hairs around the upper margin of compound eyes, often visible only at magnification ≥ 40× (Figs. 37–38). **5**
– Foveae dark, brown; scape and head with brown hairs, at least on the apex of the scape; hairs around compound eyes, on the paraocellar area (Fig. 46) and on frons extensively dark, brown to dark brown, pubescence sometimes covering more parts of the head. **11**
5 Depressions of terga, especially T3 and T4, extensively yellowish brightened, transparent (Figs. 34–35); nervulus antefurcal or interstitial. **6**
– Depressions of terga reddish brown, at least the hind margin narrowly yellowish brightened (Fig. 36); nervulus postfurcal, except in *A. rhenana* (interstitial). **7**
6 Tarsi and tibia 3 at least at the apex reddish yellow; entire depressions of the terga yellowish brightened and posterior margin of the discs also brightened, here reddish brown (Fig. 34); distance of fovea to the lateral ocellus as wide as the diameter of the ocellus; body length 9 mm. .... ***A. flavomarginata* n. sp.**
– Tarsi reddish brown; depressions posteriorly brightened, reddish yellow, but anterior quarter reddish brown (Fig. 35); distance of fovea to the lateral ocellus wider than the diameter of the ocellus; body length 11 mm. ..... ***A. senecionis*** Pérez
7 Upper side of antenna reddish yellow, only the base of the flagellomeres brown (dark spotted) (Fig. 39), underneath from flagellomere 5 towards the apex bright reddish yellow.

– Nervulus distinctly postfurcal; scutum with dense crater punctures, interspaces on median area about 1 Pd (Fig. 40).. .....***A. maculicornis* n. sp.**

– Upper side of antenna completely dark brown, flagellum underneath at most reddish brown..... **8**

8 Scutum in its posterior half polished or very faintly shagreened, punctures on this shining area scattered, interspaces of about 4–5 Pd (Fig. 41); depressions on T3 and T4 with yellowish white hair bands covering the posterior quarter of the depressions, on T4 complete, on T3 interrupted medially (Fig. 32).....***A. orientana*** Warncke

– Scutum all over shagreened, without polished areas, and punctuation much denser; pubescence on terga sparsely, not densely covering the surface of the posterior margins..... **9**

9 Facial foveae light yellow; scutellum medially with extremely dense punctuation (Pd < ½), indicating a median zone or line (Fig. 42).....***A. parataraxaci*** Scheuchl

– Foveae darker, yellowish brown; scutellum without distinct median zone, punctuation medially mostly scattered, interspaces < 1 Pd (Fig. 43).....**10**

10 Nervulus interstitial or weakly postfurcal (distance from basal vein at most 1 diameter of nervulus); depressions of terga only weakly impressed, not well separated from the disk (Fig. 44).....***A. rhenana*** Stoeckhert

– Nervulus distinctly postfurcal, distance from basal vein at least 2 diameters of nervulus; depressions of terga distinctly separated from the disk, impression step-like (Fig. 45). ....***A. pastellensis*** Schwenninger

11 Posterior half of scutum with scattered punctuation, interspaces about 3 Pd, polished (Fig. 46) (western populations: MA, ES) or at most weakly shagreened (eastern populations: DZ, TN). .....***A. curtivalvis*** Morice

– Scutum all over intensively shagreened, without polished or extremely weak shagreened areas and with denser punctuation (interspaces almost 2 Pd) (Fig. 47)..... **12**

12 Punctuation of scutum very shallow, disappearing in the shagreen especially in the posterior area (like *A. subopaca*); scutum and scutellum strongly shagreened (Fig. 47); median part of marginal area of propodeum without pubescence or punctures (Fig. 48).....***A. astica*** Warncke

– Punctuation of scutum in the posterior part deeply impressed; mainly scutellum with weak shagreen, partly polished and shiny; median part of marginal area of propodeum with pubescence and punctuation (Fig. 49)..... **13**

13 Punctuation of scutum dense and deeply impressed (interspaces of 1–2 Pd), scutellum on anterior part mostly polished, surface near posterior margin rougher due to extremely dense punctuation (interspaces of ½ Pd); terga with regular dense punctuation (interspaces of 1–2 Pd)..... .....***A. taraxaci*** Giraud

– Punctuation of scutum and scutellum more scattered, especially on the posterior part of scutum (interspaces 3–4 Pd), scutellum on anterior part with fine shagreen, more brilliant; terga more shiny, weakly shagreened, punctuation extremely shallow.....***A. stabiana*** Morice

7 Distribution of the species of the *Andrena taraxaci*-group in the Western Palaearctic

The country records of the 16 currently known species of the *Andrena taraxaci*-group in the Western Palaearctic are listed in Tab. 2.

Tab. 2. Distribution of the species of the *Andrena taraxaci*-group, according to Gusenleitner & Schwarz (2002) and Scheuchl (2010), supplemented by own results. – Abbreviations of countries following International Organization for Standardization (ISO 3166).

Species	Country records
A. astica Warncke 1965	CY, GE, GR, IL, TR
A. crepidis n. sp.	CY (endemic)
A. curtivalvis Morice 1899	DZ, ES, MA, TN
A. flavomarginata n. sp.	TN
A. galbula Warncke 1975	TR, IL
A. jerbaensis n. sp.	TN
A. maculicornis n. sp.	EG, LY, TN
A. orientana Warncke 1965	BG, CY, HU, IL, JO, MK, RO, SY, TR; UA
A. parataraxaci Scheuchl 2010	TM, TR
A. pastellensis Schwenninger 2007	CH, IT
A. rhenana Stoeckhert 1930	CH, DE, ES, FR, MA, PT
A. senecionis Pérez 1895	DZ, ES, FR, IT, LY, MA, PT, TN
A. stabiana Morice 1899	F (Corsica), IT,CH
A. taraxaci Giraud 1861	AT, CZ, DE, GR, HU, HR, PL, RO; RS, RU, SK, SL, TR, UA
A. tricuspidata Scheuchl 2010	UA
A. turanica Osytshnjuk 1993	RU, TJ, TM, UZ

Andrena taraxaci has a wide range and is spread from Central Europe to Eastern Europe, reaching the northern parts of Greece and Turkey in the south.

Also *Andrena senecionis* has a wide distribution. This species ranges in North Africa from Libya to Morocco and northwards from the Iberian Peninsula across France to Italy.

A more western distribution has *Andrena rhenana*. Its range extends from South-West Germany to France and the Iberian Peninsula and reaches Morocco in the south.

A western Mediterranean range, but with main occurrence in the south, has *Andrena curtivalvis*. This species is distributed from Libya in the east, across Tunisia, Algeria and Morocco to the west. In this study the author had discovered *Andrena curtivalvis* among hitherto unidentified female specimens. They were collected from the following localities: ES, Andalucía: Algeciras, W5.46 N36.12, 26.III.1975, 4 ♀♀; San Roque, W5.395 N36.211, 31.III.1975, 1 ♀; Estepona, W5.16 N36.43, 26.III.1975, 6 ♀♀, all specimens leg. Grünwald (ZSM); Estepona, W5.16 N36.43, 26.III.1975, 1 ♀, leg. H. Wolf (OLML). Thus, *Andrena curtivalvis* is recorded for the first time in Europe and Spain. During a field trip to Andalucía in April 2014 the author checked flowers of Asteraceae (Cichorieae) at the reported localities, in the hope to find *A. curtivalvis*. Espe-

cially in the vicinity of Estepona and Algeciras, but also in a radius of 100 km, a total of 36 localities were investigated. Despite the tightly focused examination of suitable food sources, only two females (both in Scwe) could be collected from the following localities: Estepona, 5 km SE Casares (W6.74 N40.74, 11.IV.2014, 1 ♀) and San Martin de Tessorilo (W5.36 N36.33, 6.IV.2014, 1 ♀). Based on this findings *A. curtivalvis* is considered as an indigenous species of Europe with an extremely rare occurrence in Spain.

Andrena stabiana and *A. pastellensis* occur in Italy and Switzerland. *A. stabiana* could be detected in Corsica, *A. pastellensis* reaches northward to the southern part of the Alps in Switzerland (SCHWENNINGER 2007). The male of *A. stabiana* recorded in the same paper from Tunisia (leg. et coll. F. AMIET) should be, according to the current knowledge, assigned to *A. jerbaensis*.

Andrena astica and *A. galbula* show an Eastern Mediterranean distribution. *A. astica* occurs northwards up to Georgia. *A. orientana* is also distributed in the Eastern Mediterranean but occurs on the Balkan Peninsula and has its northern border in the Ukraine. *A. tricuspidata* is so far only known from two specimens found in Crimea on the Kerch Peninsula (Ukraine) (pers. comm. ERWIN SCHEUCHL).

Species of the Middle Asian steppes, *Andrena turanica* and *A. parataraxaci*, reach the West Palaearctic. Among yet unidentified material a male of *A. turanica* could be detected from the Northern Caucasus (South-East Russia). It was collected on the 24.IV.1972 by KOCOUREK and is labelled "Kuban" (OLML, ID-No. 091121scwe485). *A. parataraxaci* is also recorded from Turkey (SCHEUCHL 2010).

The distribution of the four newly described species is illustrated in Fig. 50. This map shows that *Andrena jerbaensis* occurs in the south-eastern part of Tunisia, on the island of Jerba and adjacent areas within 100 km (Tataouine).

Andrena crepidis is endemic to Cyprus. The currently known locations are clearings and rocky slopes within the pine forests of the Troodos Mountains at an altitude from 400 to 600 m. Excursions during the flight season of *A. crepidis* in March or April 2009, 2011, 2012 and 2013 had been undertaken. Although potential available food plants in appropriate habitats were intensively examined in other parts of Cyprus including the Kyrenia Mountains, especially the Pentadactylos Mountains, and also in the vicinity of Limassol, these attempts yielded no further records of this taxon. According to the current state of knowledge this species is extremely rare and restricted to a very small area in the Troodos Mountains. The former locality Ayia Phyla, today situated within the settlement area of Limassol, is probably destroyed for this bee.

Fig. 50. Distribution of the new species of the *Andrena taraxaci*-group (base map: © OpenStreetMap contributors).

Andrena maculicornis was found in the south eastern Mediterranean region from Tunisia (Gafsa) in the west and Libya (Cyrenaica) up to Nile River delta in Egypt in the east. Most records originate from the Cyrenaica on the eastern coastal region of Libya.

Andrena flavomarginata is known only from two localities in the northern and southern part of Tunisia. The author collected one specimen on a field margin near Enfidha.

8 References

Dubitzky, A. (2005): Studies in phylogeny and biosystematics of bees: The bee genus *Andrena* (Andrenidae) and the tribe Anthophorini (Apidae) (Insecta: Hymenoptera: Apoidea). – PhD dissertation, Ludwig-Maximilian Universität, München, 214 pp.

Gusenleitner, F. & Schwarz, M. (2002): Weltweite Checkliste der Bienengattung *Andrena* mit Bemerkungen und Ergänzungen zu paläarktischen Arten (Hymenoptera, Apidae, Andreninae, *Andrena*). – Entomofauna Supplement, **12**: 1280 pp.

Gusenleitner, F., Schwarz, M., Ascher, J. S. & Scheuchl, E. (2005): Korrekturen und Nachträge zu Gusenleitner & Schwarz (2002) Weltweite Checkliste der Bienengattung *Andrena* mit Bemerkungen und Ergänzungen zu paläarktischen Arten (Hymenoptera, Apidae, Andrenidae, *Andrena*). – Entomofauna **26**: 437–472.

Michener, C. D. (1944): Comparative external morphology, phylogeny, and classification of the bees. – Bulletin of the American Museum of Natural History **82**: 151–326.

Michener, C. D. (2007): The Bees of the World (2nd edition), 992 pp.; Baltimore & London (Johns Hopkins University Press).

Morice, F. D. (1899a): Illustrations of specific characters in the armature and ultimate ventral segments of *Andrena* ♂. – Transactions of the Entomological Society of London **1899**: 229–243.

Morice, F. D. (1899b): Notes on *Andrena taraxaci*, Giraud, and the species most resembling it, with synoptic tables, and descriptions of two new species. – Transactions of the Entomological Society of London **1899**: 243–252.

Osytshnjuk, A. Z. (1993): New subgenera and new species of Palaearctic *Andrena* bees (Hymenoptera, Andrenidae). Communication 1. – Vestnik Zoologii Kiev **1993** (3): 17–23.

Osytshnjuk, A. Z., Romasenko, L., Banaszak, J. & Cierzniak, T. (2005): Andreninae of the Central and Eastern Palaearctic, Part 1, 235 pp.; Poznań (Polish Entomological Society).

Pérez, J. (1890): Catalogue des Mellifères du Sud-Ouest (part Andrénides). – Actes de la Société Linnéenne de Bordeaux **44**: 170–176.

Scheuchl, E. (2010): Beitrag zur Kenntnis westpaläarktischer Bienen der Gattung *Andrena* (Hymenoptera: Apidae: Andreninae). – Linzer biologische Beiträge **42 (2)**: 1445–1455.

Schmid-Egger, C. (2005): *Proxiandrena* subgen. nov. und Revision der West und zentralpaläarktischen Arten der *Andrena proxima*-Gruppe (Hymenoptera, Apidae). – Revue Suisse de Zoologie **112**: 1029–1044.

Schwenninger, H. R. (2001): Verbreitung und Gefährdung von *Andrena rhenana* Stoeckhert 1930 in Deutschland (Hymenoptera: Apidae). – Mitteilungen des Entomologischen Vereins Stuttgart **36**: 9–14.

Schwenninger, H. R. (2007): Eine neue Art der *Andrena taraxaci*-Gruppe aus Italien und der Schweiz (Hymenoptera, Andrenidae, *Andrena*, Subgenus *Chlorandrena*). – Linzer biologische Beiträge **39 (1)**: 637–650.

Warncke, K. (1968): Die Untergattungen der westpaläarktischen Bienengattung *Andrena* F. – Memórias e Estudos do Museu Zoológico da Universidade de Coimbra **307**: 1–111.

Westrich, P. (1990): Die Wildbienen Baden Württembergs (2nd edition), 2 vols., 972 pp.; Stuttgart (E. Ulmer).

Xu, H. L. & Tadauchi, O. (2002): A revision of the subgenus *Chlorandrena* of the genus *Andrena* of Eastern Asia (Hymenoptera, Andrenidae). – Esakia **42**: 55–73.

Author's address:

Hans Richard Schwenninger, Entomologie + Ökologie, Goslarer Straße 53, 70499 Stuttgart, Germany;
e-mail: h.u.k.schwenninger@t-online.de

Manuscript received: 24.X.2014, accepted: 11.XI.2014.

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: Stuttgarter Beiträge Naturkunde Serie A [Biologie]

Jahr/Year: 2015

Band/Volume: NS_8_A

Autor(en)/Author(s): Schwenninger Hans Richard

Artikel/Article: Revision of the Western Palaearctic species of the Andrena taraxaci-group with description of four new species (Hymenoptera: Andrenidae) 251-270