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New data on the morphology and distribution of the cryptic species *Dasypoda morawitzi* Radchenko, 2016 (Hymenoptera: Melittidae) with corrections to the diagnosis of *Dasypoda s. str.*

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Summary. *Dasypoda morawitzi* Radchenko, 2016, a cryptic bee species separated from *D. hirtipes* (Fabricius, 1793) and recently described from Eastern Europe, Western Kazakhstan, Caucasus and Turkey, is for the first time recorded from Czech Republic, Romania and Spain. We also provide additional new records for several other countries. An additional comparative morphological analysis of *D. morawitzi* with *D. hirtipes* using light and electron microscopy is provided. New morphological differences between these two species are highlighted. Significant variation in hair morphology on some parts of the female body of these two species are shown. Differences and similarities between *D. morawitzi* and *D. hirtipes* are discussed and the impossibility of a synonymy of *D. graeca* Lepeletier & Serville, 1828 with *D. morawitzi* is discussed. Corrected and new diagnostic features of the subgenus *Dasypoda s. str.* are given.

Résumé. Nouvelles données sur la morphologie et la distribution de l'espèce cryptique *Dasypoda morawitzi* Radchenko, 2016 (Hymenoptera : Melittidae) et corrections à la diagnose des *Dasypoda s. str.* *Dasypoda morawitzi* Radchenko, 2016, une espèce d'abeille cryptique séparée de *D. hirtipes* (Fabricius, 1793) et récemment décrite d'Europe de l'Est et de Turquie, est pour la première fois recensée en Tchéquie, Roumanie et Espagne. Nous présentons également le premier recensement de cette espèce pour la Grèce continentale ainsi que de nouvelles données d'occurrence pour d'autres pays. Une analyse comparative additionnelle de *Dasypoda morawitzi* avec l'espèce proche *D. hirtipes* par microscopie optique et électronique est également présentée. De nouvelles différences morphologiques entre ces deux espèces sont mises en évidence. Une grande variété de type de pilosité sur les corps des femelles est mise en évidence. Les différences et similarités entre *D. morawitzi* et *D. hirtipes* sont discutées et l'impossibilité de synonymie entre *D. graeca* Lepeletier & Serville, 1828 et *D. morawitzi* est montrée. Les caractères diagnostiques du sous-genre *Dasyposa s. str.* sont revus et corrigés.

Keywords: Czech Republic; Romania; Spain; taxonomy; host plant; *Dasypoda hirtipes*; *D. graeca*

The melittid bee genus *Dasypoda* Latreille, 1802 encompasses the so-called pantaloon bees characterized by an abundant pubescence of the scopa on the hind legs of the females. This genus presents a Palearctic distribution and is currently represented by 19 species in Europe (Rasmont et al. 2017; Radchenko 2017). The bees belonging to this genus build their nests in the soil and collect pollen from a variety of plant families including Asteraceae, Cistaceae, Caprifoliaceae, Malvaceae, Plumbaginaceae, Apiaceae, Boraginaceae, and Lamiaceae (Michez et al. 2004a; Radchenko 2016, 2017; Radchenko et al. 2019).

Dasypoda morawitzi is a species recently described by Radchenko (2016) from Ukraine (mainland and Crimea), the European part of Russia (from St Petersburg to Caucasus), Kazakhstan and Turkey based on material initially identified as *Dasypoda hirtipes* (Fabricius, 1793), a common and widespread species in the Palearctic Region. *D. morawitzi* has remained cryptic until it was distinguished from *D. hirtipes* on the basis of several morphological features, such as the structure of the galea surface in both sexes and the structure of male genitalia (Radchenko 2016). The species status of *D. morawitzi* was also supported by DNA analyses, which showed significant genetic divergence from *D. hirtipes* (Schmid-Egger & Dubitzky 2017).

So far, *Dasypoda morawitzi* has been recorded in Russia, Ukraine, Kazakhstan, Turkey (Radchenko 2016), Austria, Bulgaria, Germany (Schmid-Egger & Dubitzky 2017; Wiesbauer et al. 2017), Greece (known only from Aegian island Limnos [39°59'45.6"N 25°8'45.6"E], 24.VI.2016, 2♀, visiting *Reichardia picroides*, leg. & det. Jelle Devalez, pers. com.; Rasmont et al. 2017), Serbia, Slovakia, France (Ghisbain et al. 2018; BOLD System

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2020), Hungary (Shebl et al. 2018), and Poland (Posłowska 2018; Wendzonka et al. 2020). In this paper, we present the first records of *D. morawitzi* for Czech Republic, Romania, and Spain. Before this study, three species belonging to this genus were already recorded from the Czech Republic: *Dasypoda argentata* Panzer, 1809, *D. hirtipes* (Fabricius, 1793), and *D. suripes* (Christ, 1791) (Straka et al. 2007). The same three species have also been recorded for Romania, in addition to *D. spinigera* Kohl, 1905 (Tomozii 2019). Ten species were known from mainland Spain, a diversity center of this genus (Michez et al. 2004a, 2004b): *D. albimana* Pérez, 1905, *D. argentata, D. cingulata* Erichson, 1835, *D. crassicornis* Friese, 1896, *D. dusmeti* Quilis, 1928, *D. hirtipes, D. iberica* Warncke, 1973, *D. morotei* Quilis, 1928, *D. pyrotrichia* Förster, 1855, and *D. visnaga* (Rossi, 1790).

Material and method

The examined material belongs to the collections of the "Ion Borcea" Museum of Natural Science Complex Bacău, Romania (MNSB), Oberösterreichisches Landesmuseum of Linz, Austria (OÖLL), Institute for Evolutionary Ecology of the NAS of Ukraine, Kiev (IEEK) and Laboratory of Zoology, Institute of Biosciences, University of Mons, Belgium (UMONS). In these collections, we found 223 specimens of *D. morawitzi*, most of them previously identified as *Dasypoda hirtipes* (Fabricius, 1793) or as its junior synonym *Dasypoda plumipes* (Panzer, 1797) and that had been collected between 1968 and 2020. We also used the information associated to these specimens, including their geographical coordinates following the World Geodetic System 1984 (WGS84).

We separated specimens belonging to *Dasypoda morawitzi* from other material by comparing the morphology of the galea both in females and males, by the appearance of the gonostylus pubescence and other structures of the male genitalia (Radchenko 2016). We also tried to use the color of the fore tarsi pubescence in females, an additional feature proposed by Schmid-Egger & Dubitzky (2017), and differences in the sculpture and the punctation of mesonotum alleged by Wendzonka et al. (2020).

The following abbreviations (after Michener 2007) were used to describe morphological structures: S1, S2, etc. = first, second, etc., metasomal sterna; T1, T2, etc. = first, second, etc., metasomal terga. L and W mean the length and width, accordingly.

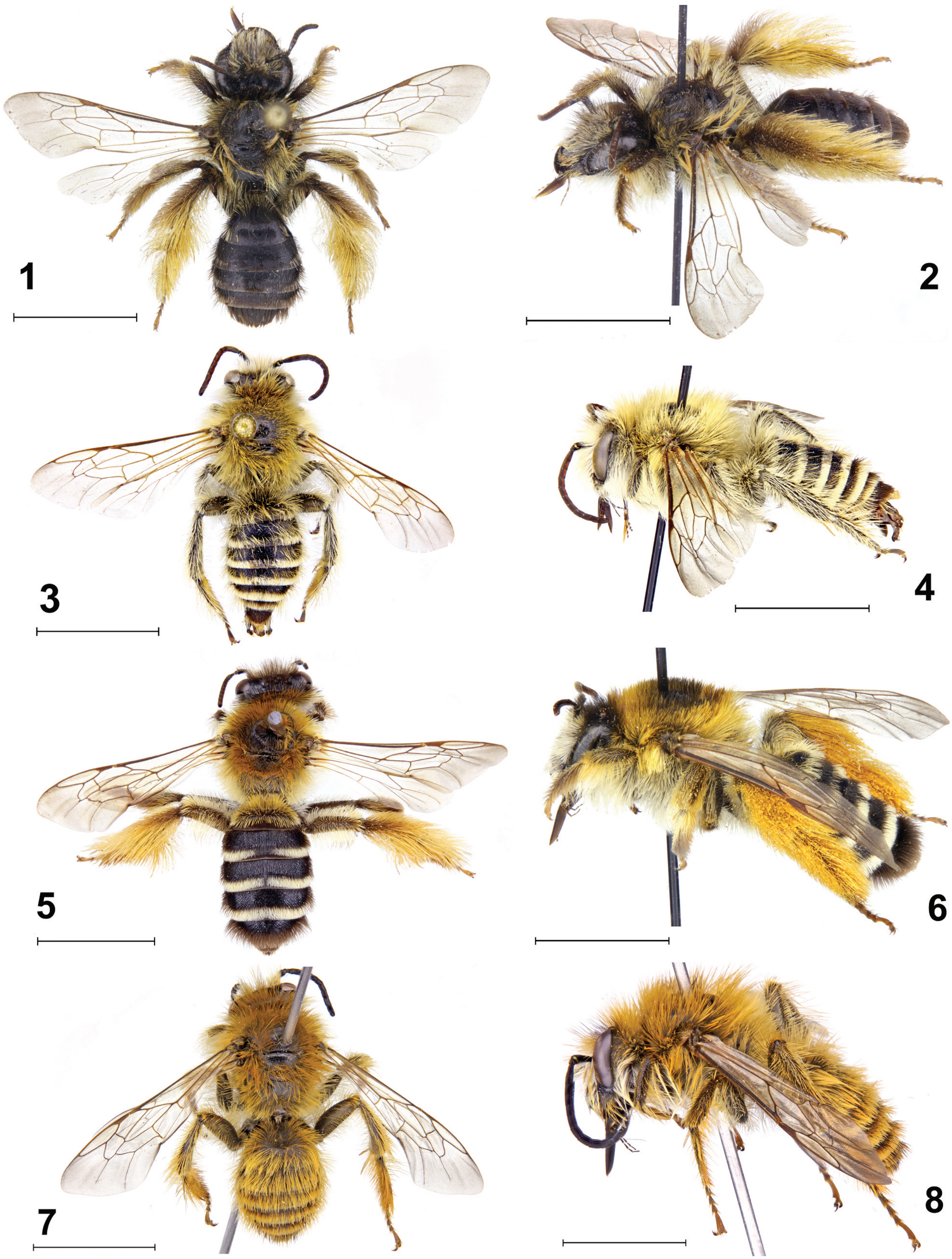
Male genitalia of both species were extracted and mounted on small triangular pieces of celluloid. The integument ultrastructures were studied in 16 specimens (5♀ 3♂ of *D. morawitzi* and 5♀ 3♂ of *D. hirtipes*) using scanning electron microscopy (JEOL JCM 6000) associated to the software Semafore (JEOL, Sollentuna, Sweden). Samples for SEM study were coated thin gold film using JEOL Smart Coater. Color photographs were made using a Canon EOS 5DS R (Canon Inc., Tokyo, Japan) cameras attached to Leica M205C stereomicroscope (Leica Microsystems, Wetzlar, Germany) with Leica LED5000 HDI illuminator under Helicon Remote 3.9.7.w software; stereomicroscopes Olympus SZ61 and Olympus SZH10 were also used for species determination. Photographs were combined into single images using Helicon Focus 7.5.6 Pro (Helicon Soft Ltd, Kharkiv, Ukraine) automontage software. All images were prepared in the IEEK except two photographs of the sampling sites in Romania taken by B. Tomozii. Quick-Photo Micro v2.3 (PROMICRA, s. r. o., Czech Republic) software was used for measurements, and optimized in Photoshop CS4 and Photoshop CC (Adobe Inc., San Jose, CA, USA).

Results and discussion

Dasypoda morawitzi Radchenko, 2016

Examined material

Austria, Niederösterreich: Bez. Hollabrunn, Retz, Gollitsch, [48°45'0"N 15°55'48"E], ca. 300 m SH, 27. VIII.2005, 1♂, leg. H. Wiesbauer [OÖLL]; **Bulgaria**, Pirin Mts., [village] Lilyanovo [41°36'59.4"N 23° 18'52.9"E], 2♂, leg. Hoffer; Primorsco [42°16'22.4"N 27°45'15.4"E], 2♂, leg. Tkalců; Galata [43°10'4.44"N 27°56'5.6"E], 1♂, leg. Tkalců; Lozenec [42°12'25.2"N 27°47'42"E], 2♂, leg. M-Z Halada; Varna [43° 13'16.3"N 27°56'25.8"E], 1♂, leg. Tkalců; Varna-Galata [43°10'8.4"N 27°55'58.8"E], 1♀, 1♂, leg. Tkalců [OÖLL]; **Czech Republic [first record]**, CZ-Morawia, Mikulov, Mušov [48°46'58.8"N 16° 40'58.8"E], 200 m., 9.VIII.2010, 2♂, 3♀, leg. M-Z Halada [UMONS]; **France**, Agde [43°17'60"N 3° 31'58.8"E], 2♀, leg. Bartak; Var, La Môle [43° 12'34.2"N 6°27'59.4"E], 1♀ (on *Stachys recta*) [OÖLL]; **Greece [first record on mainland]**, Chalkidiki, SE Kassandria, Paliouri env. [39° 56'20.4"N 23°39'50.4"E], 3♂, leg. Snižek; Polichrono [40°0'46.8"N 23°31'51.6"E], 1♀, leg. Karas [UMONS]; **Hungary**, Kecskemét env. [46°54'50.7"N 19° 46'55.5"E], 2♂, leg. Halada; 50 km SE Budapest, Örkeny [47°7'46.2"N 19°27'31.3"E], 2♂, leg. Halada [OÖLL]; **Romania [first record]**, Gherăiești, Bacău [46°36'39.6"N 29°54'18"E], 7.VIII.1996, 1♂, leg. B. Tomozii, 3.IV.1994, 2♀, 12♂, leg. B. Tomozii [MNSB]; Hemeiuș, Bacău [46°37'55.2"N 26° 51'7.2"E], 26.VII.1995, 2♂, 28.VII.1994, 1♂, leg. M. Hongu [MNSB]; Valea Uzului, Bacău [46° 20'34.8"N 26°14'52.8"E], 12.VII.1993, 1♂, leg. A. Dima [MNSB]; Lespezi, Iași [47°22'1.2"N 26° 41'59.9"E], 1.VIII.1966, 1 ♂, leg. I. Nemeș [MNSB]; Constanța [44°9'36"N 28°38'6"E], 17.VIII.1994, 1♀, leg. A. Dima [MNSB]; Agigea, Constanța [44° 4'58.8"N 28°38'27.6"E], 26.VII.2001, 6♂, leg. B. Tomozii, on *Cichorium intybus*, 26.VII.2001, 2♀, on *Carduus* sp. [MNSB]; Gârla Mare, Mehedinți [44° 12'25.2"N 22°46'19.2"E], 30.VII.1978, 2♂, leg. A. Dima [MNSB]; Dudașul Schelei, Mehedinți [44° 38'27.6"N 22°35'45.6"E], 6.VII.1968, 2♂, leg. I. Nemeș [MNSB]; Crișana, Arad, N Sâmbăteni, W Ghioroc [46°9'14.4"N 21°33'54"E], 2♂, leg.

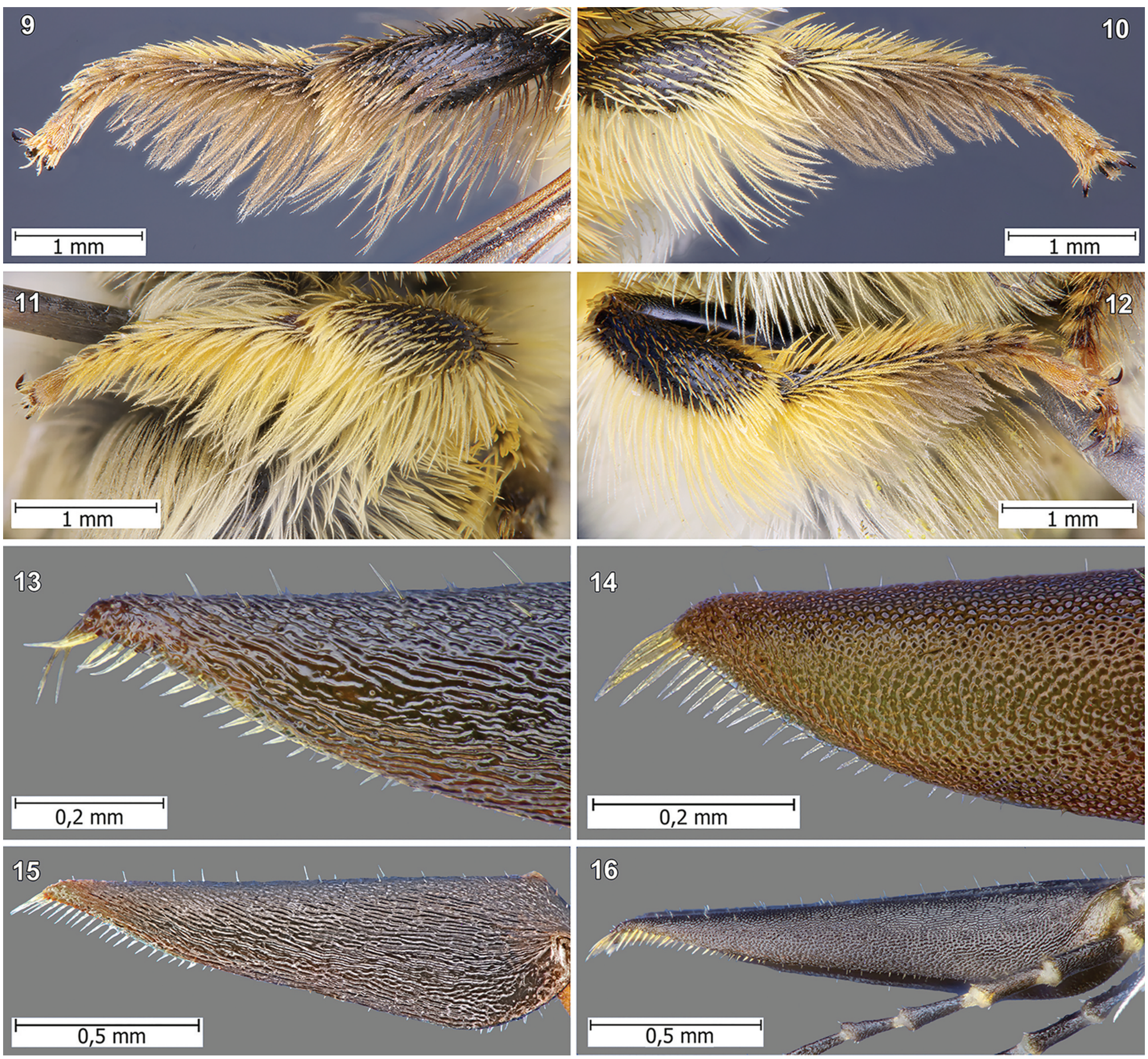


Figures 1-8. Habitus of the bees: **1–4**, *Dasypoda morawitzi*; **5–8**, *D. hirtipes*. (1, 2, 5, 6, females; 3, 4, 7, 8, males; 1, 3, 5, 7, dorsal view; 2, 6, 8, laterodorsal view; 4, lateral view).

Rausch [OÖLL]; **Russia**, Ulyanovskaya obl. Cherdakly, Staroe Eremkino NV [54°12'14.4"N 49°9'10.8"E], 7♂, 5♀♀, leg. Markus Franzén; Bryandino [54°13'58.8"N 49°13'22.8"E], 1♂, leg. Markus Franzén; Novospasskoe [53°4'44.4"N 48°4'19.2"E], 1♂, leg. Markus Franzén [UMONS]; **Slovakia**, Parkan, Kováčovské kopce [47° 50'16.8"N 18°47'16.8"E], 2♂, leg. Hoffer [OÖLL]; **Spain [first record]**, 91♂, 44♀ Costa Brava, 15 km SE Figueres [42°13'8.4"N 3°2'49.2"E] 27–30. VII.2011, leg. J. Halada [OÖLL]; **Ukraine**, Kyiv region, Chernobyl Radiation and Ecological Biosphere Reserve [51°16'22.8"N 30°8'45.2"E], 2.IX.2020, 3♀, leg. H. Honchar; [51°17'27.9"N 30°13'25.3"E], 1. IX.2020, 2♀, leg. H. Honchar (IEEK)**; Turkey**, Kütahia, 20 km NEE Kütahia [39°32'49.2"N 30° 14'2.4"E], 1♂, leg. Halada [OÖLL].

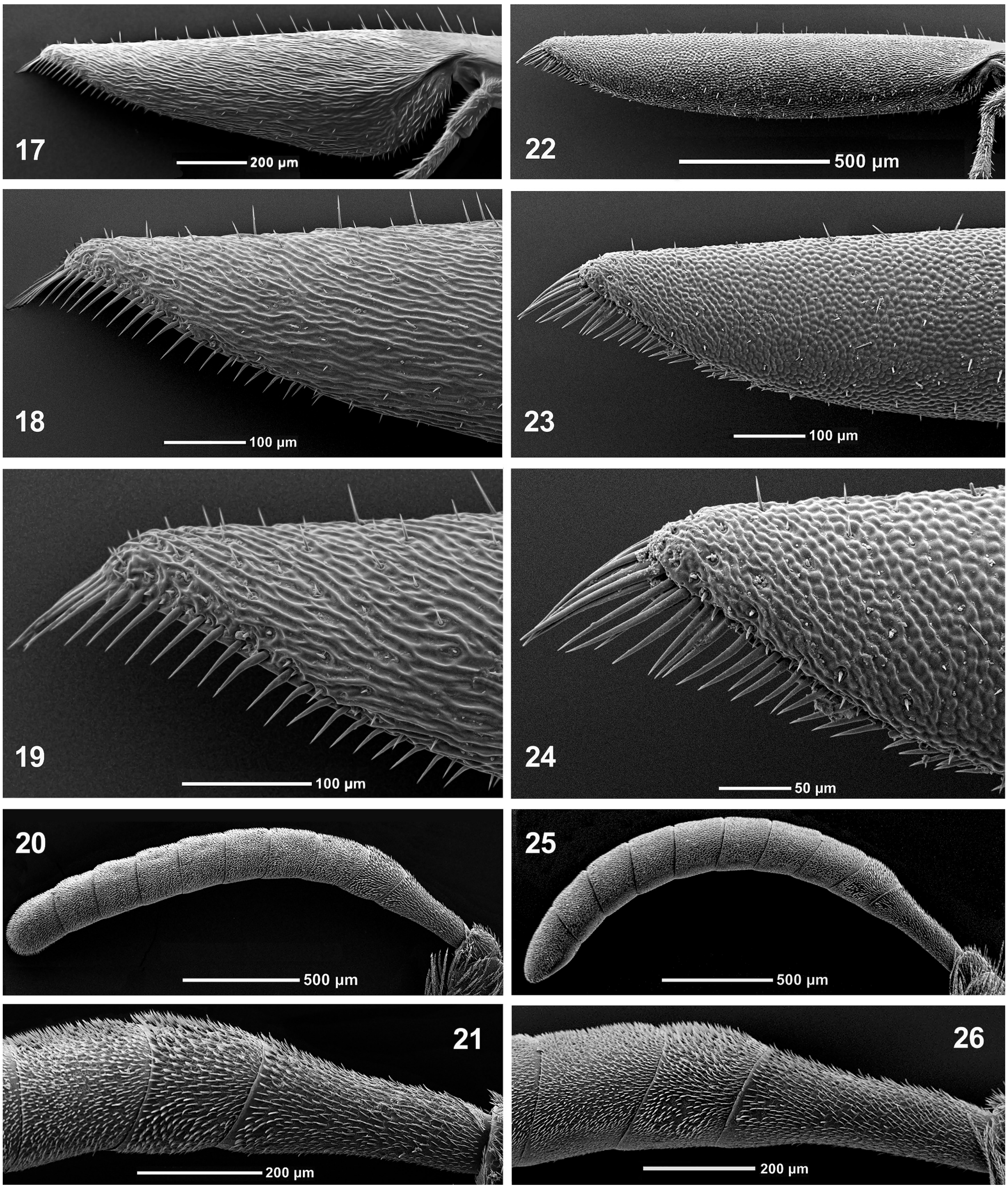
Morphology

Study of large series of *Dasypoda hirtipes* and *D. morawitzi* showed that they are generally almost indistinguishable based on their external morphology alone. The coloration of the body pubescence in both



Figures 9-16. 9–12, hind legs of the females: **9, 11**, *Dasypoda morawitzi*; **10, 12**, *D. hirtipes*. **13–16**, structure of the galea (lateral view): **13, 15**, *D. morawitzi*; **14, 16**, *D. hirtipes* (13, 14, females; 15, 16, males).

species is largely variable, and widely overlaps when larger series of specimens are compared. Nevertheless, some *D. hirtipes* males may be completely covered with an aberrant rich ginger coloration of pubescence that does not occur in *D. morawitzi*, and a few aberrant *D. morawitzi* females may have extremely dark

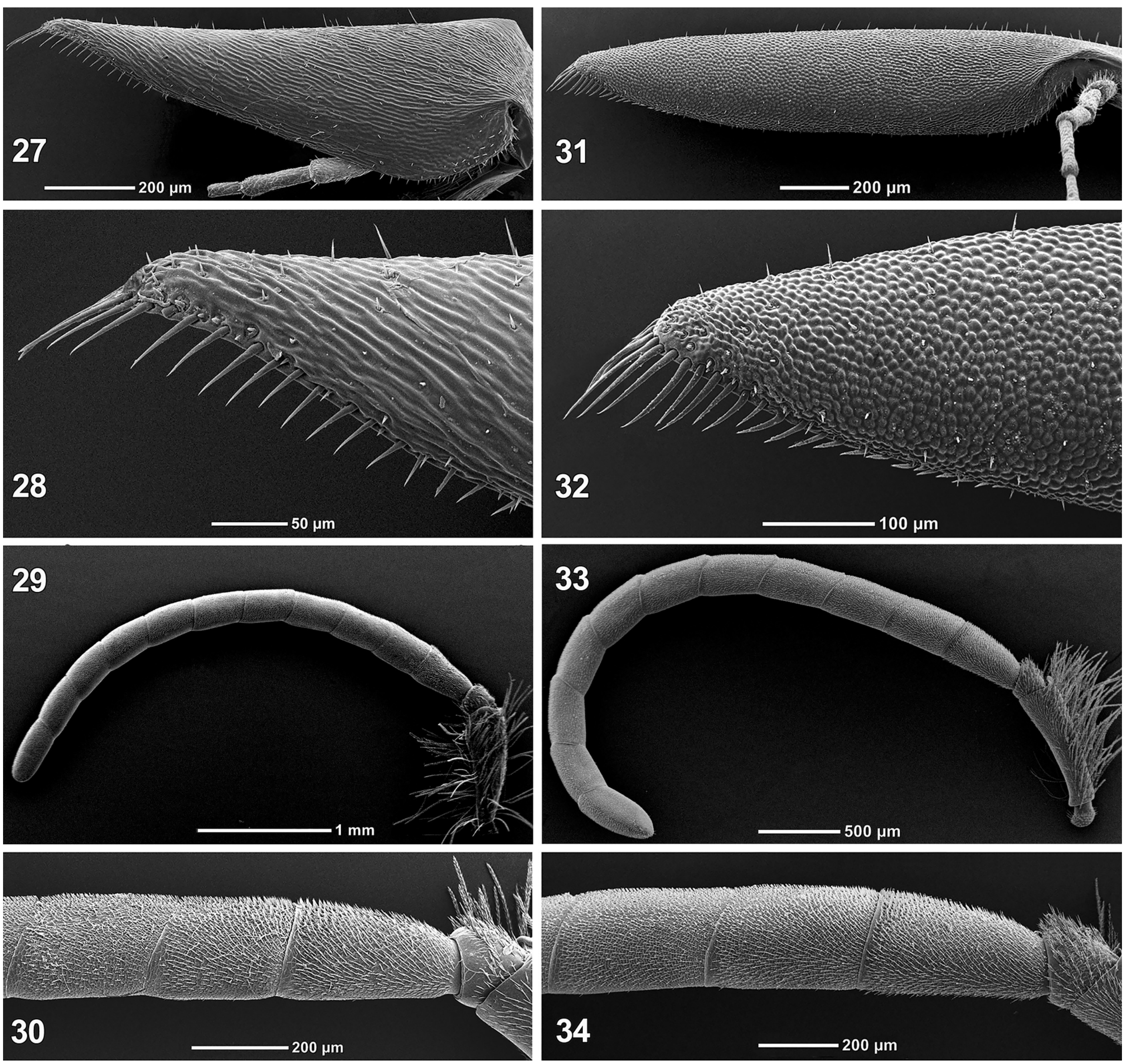


Figures 17-26. Structure of the female head. **17–21**, *Dasypoda morawitzi*; **22–26**, *D. hirtipes*. **17, 22**, galea; **18, 19, 23, 24**, apical part of the galea; **20, 25**, flagellum; **21, 26**, 1–3rd flagellomeres.

pubescence that has not been found among *D. hirtipes* females (Figures 1–8).

In general, both species also broadly overlap in size (Radchenko 2016), although *Dasypoda morawitzi* is usually smaller than *D. hirtipes*. The size of *D. hirtipes* varies between 13 and 15 mm in females and between 12 and 15 mm in males. The specimens of *D. morawitzi* vary in size between 11 and 14 mm in females and between 8.5 and 13 mm in males.

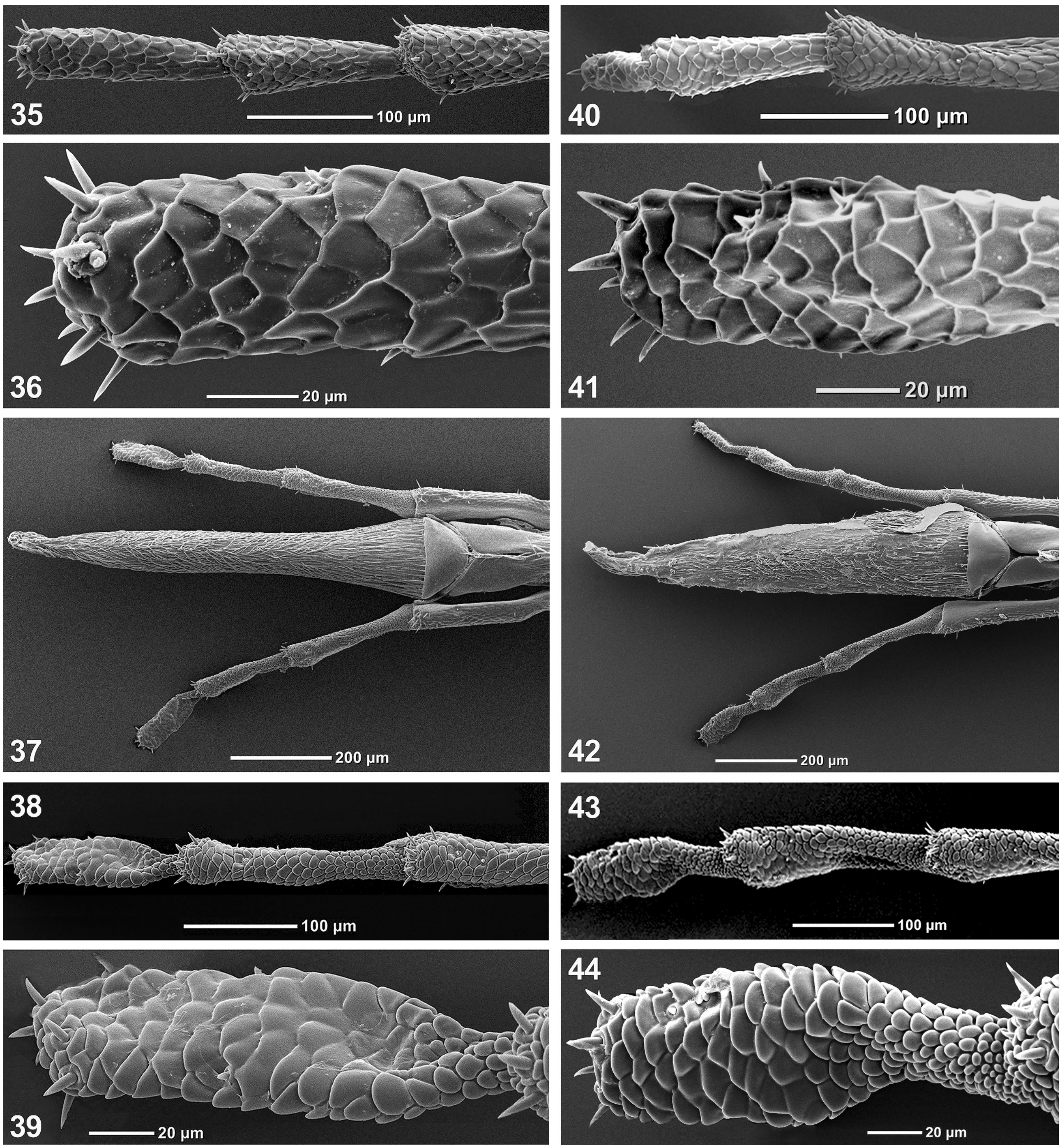
The main morphological feature to distinguish both species therefore remains the galeal surface covered by small, fine tubercles in both females and males of *D. hirtipes* (Figures 14, 16, 22–24, 31, 32) and rippled by fine wave-like lines in *D. morawitzi* (Figures 13, 15, 17–19, 27, 28). Images of the galea of *D. hirtipes* using SEM clearly show that its surface does not present tight and deep points as indicated earlier by Michez et al. (2004a) based on a study using a simple light microscope that can play optical tricks, and it is not clear whether these structures are concave or convex. We therefore present figures of galea at different magnifications, with light and SE microscopy to analyze them more in detail. Based on these data, we made adjustments to the diagnosis of the subgenus *Dasypoda s. str.* in which the



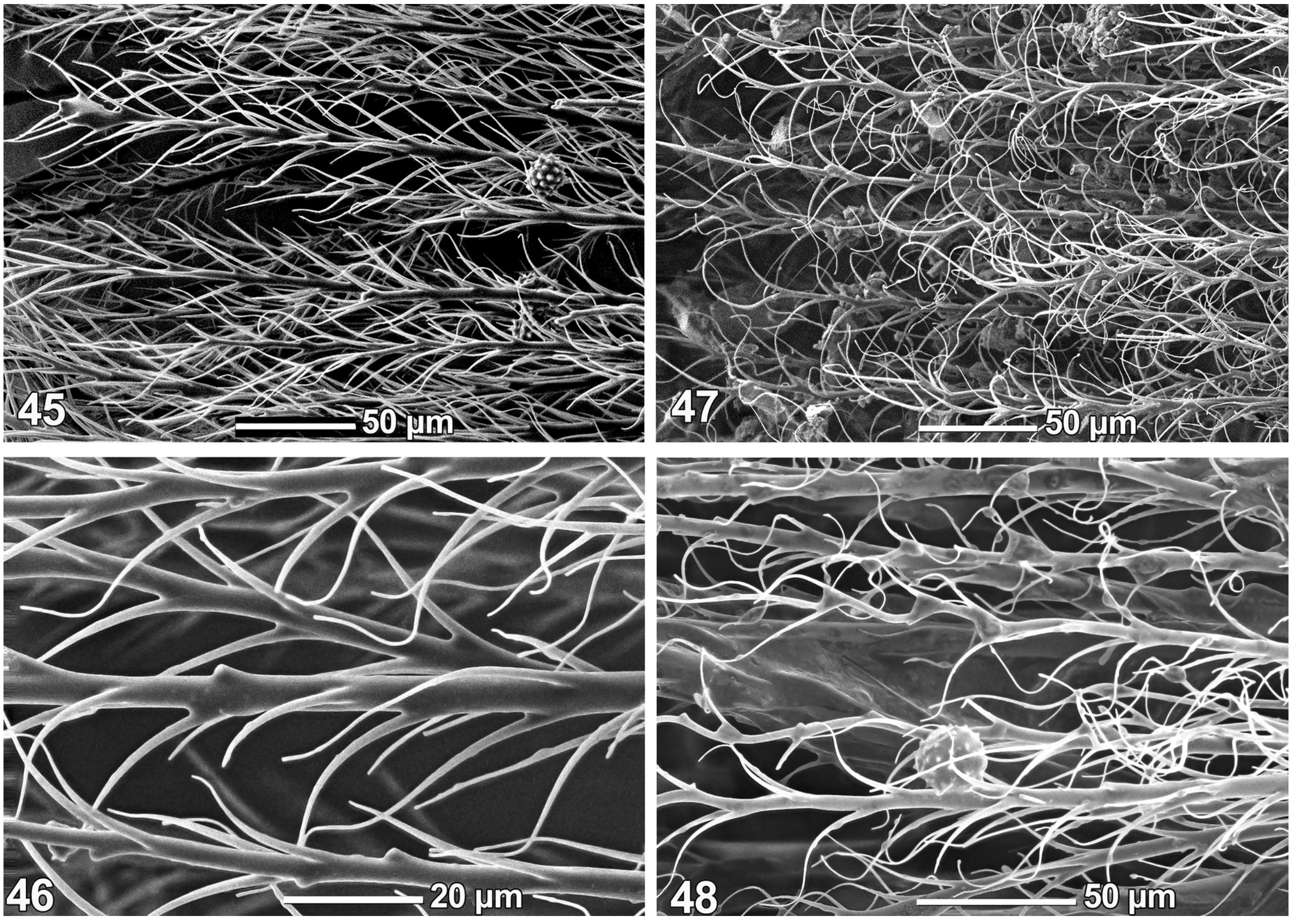
Figures 27-34. Structure of the male head. **27–30**, *Dasypoda morawitzi*; **31–34**, *D. hirtipes*. **27, 31**, galea; **28, 32**, apical part of the galea; **29, 33**, flagellum; **30, 34**, 1–3rd flagellomeres.

surface of the galea of both sexes is densely covered by small, fine tubercles (most species) or rippled by fine wave-like lines (*D. morawitzi* and partly *D. sinuata* Pérez, 1895).

Wendzonka et al. (2020) noted that additional key features for both sexes are the sculpture and the punctation of mesonotum. Nevertheless, these authors do not specify exactly what differences were found in the mesonotum surface sculpture. Among the studied specimens of both species, we only found minor differences in these structures, which overlap widely and cannot therefore be used as diagnostic criteria.



Figures 35-44. Proboscidial structures of the females. **35–39**, *Dasypoda morawitzi*; **40–44**, *D. hirtipes*. **35, 40**, maxillary palpus; **36, 41**, apical segment of maxillary palpus; **37, 42**, glossa and labial palpus; **38, 43**, labial palpus; **39, 44**, apical segment of labial palpus.



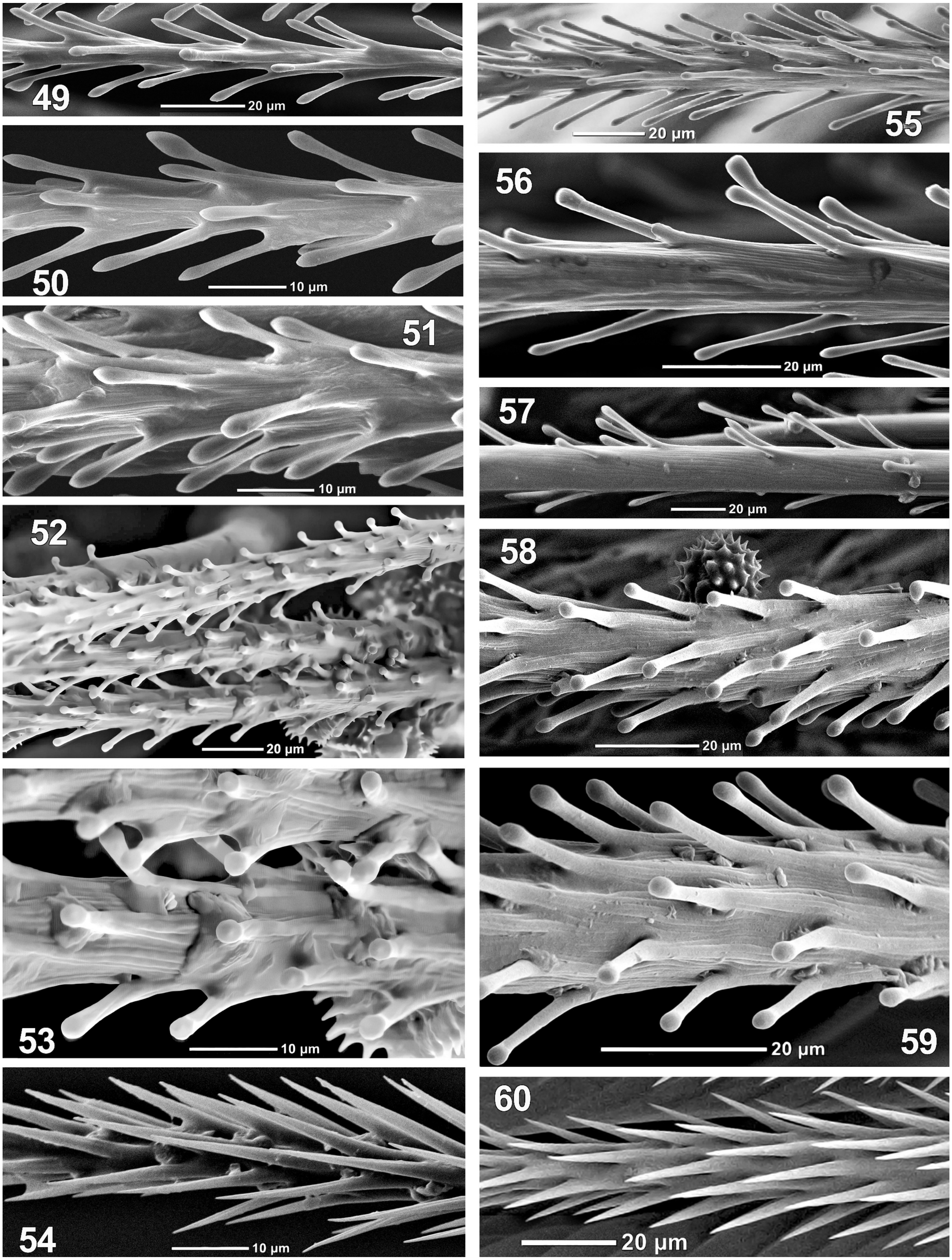
Figures 45-48. Hairs on the ventral part of the females mesosoma. **45, 46**, *Dasypoda morawitzi*; **47, 48**, *D. hirtipes.*

Additionally, we have checked the color of the pubescence of the fore tarsi in females, considered to be different by Schmid-Egger & Dubitzky (2017), i.e. dark brown in *D. hirtipes* and light yellowish in *D. morawitzi*. Indeed, females of *D. hirtipes* generally present fore basitarsi with black-brown hairs (or occasionally dark gray to dark brown), whereas the females of *D. morawitzi* generally possess fore basitarsi with blond hairs only. However, some specimens of *D. hirtipes* bear completely blond hairs on forelegs, and conversely, some females of *D. morawitzi* may have almost completely dark hairs on the forelegs (Figures 9–12).

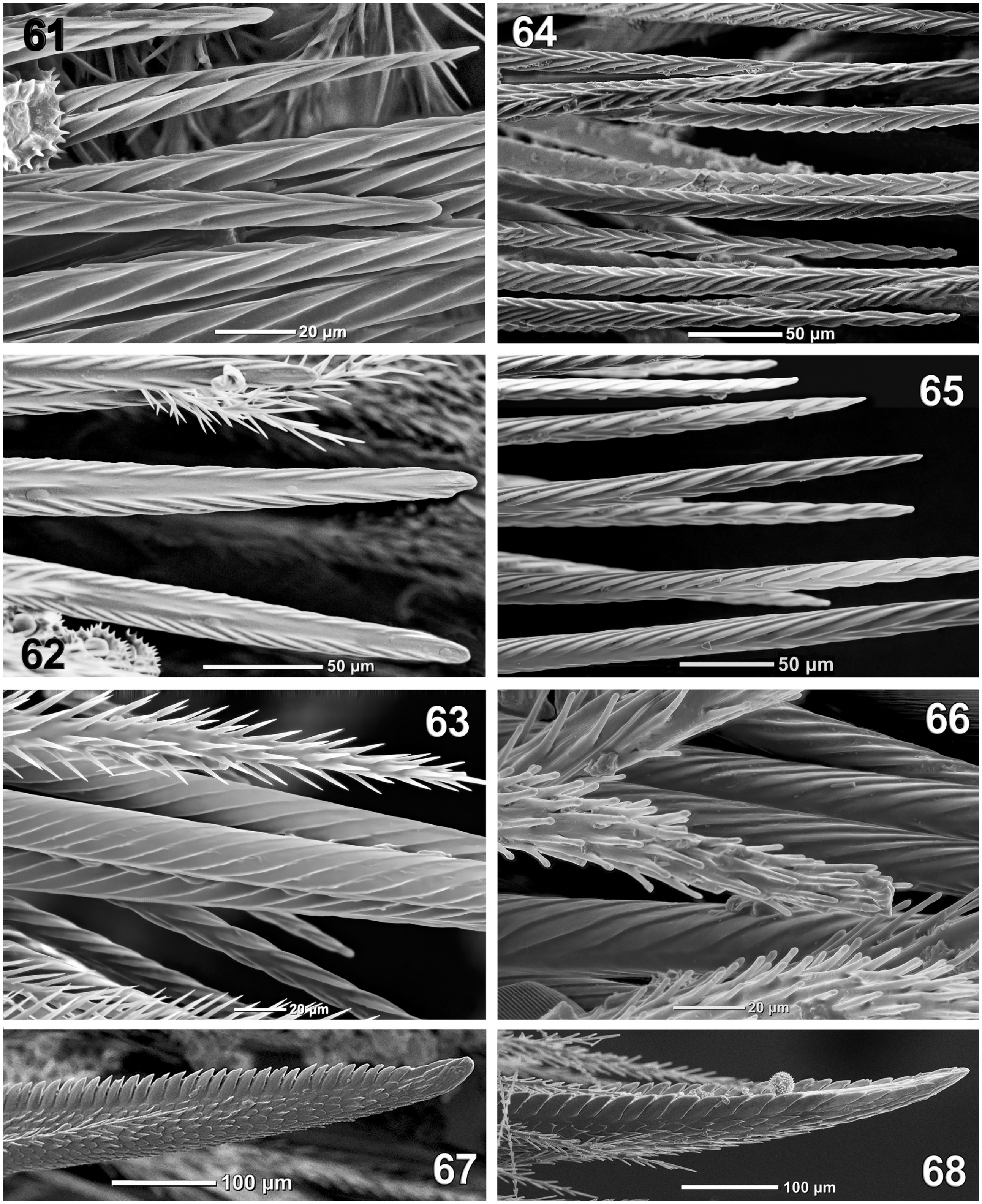
The difference in the color of pubescence between *Dasypoda morawitzi* and *Dasypoda hirtipes* was discussed earlier by Radchenko (2016), who reported it as an unreliable and variable character. This was supported by the analysis of more than 1000 specimens from localities ranging from Kazakhstan to Ukraine and Turkey. New records from Romania and Spain confirm this variability.

Schmid-Egger & Dubitzky (2017) also noted a possible conspecificity between *Dasypoda graeca* Lepeletier & Serville, 1828 and *D. morawitzi*, and indicated the inability to verify this, because the type material of *D. graeca* was lost. We consider such assumption of synonymy more than doubtful based on the limited available information in the original description. One of the details to be stressed is the size difference between both species. The original description of *D. graeca* (Lepeletier & Serville 1828) includes size measurements provided in "*lignes*", an old French measurement, where 1 *ligne* equals 2.256 mm. The male of this species was characterized by a much larger body size: its length is equal to 8 *lignes* which equates to ~18.05 mm, whereas the length of the male of *D. morawitzi* is only 9–11 mm (only one unusually large specimen of this species barely reaches 13.5 mm).

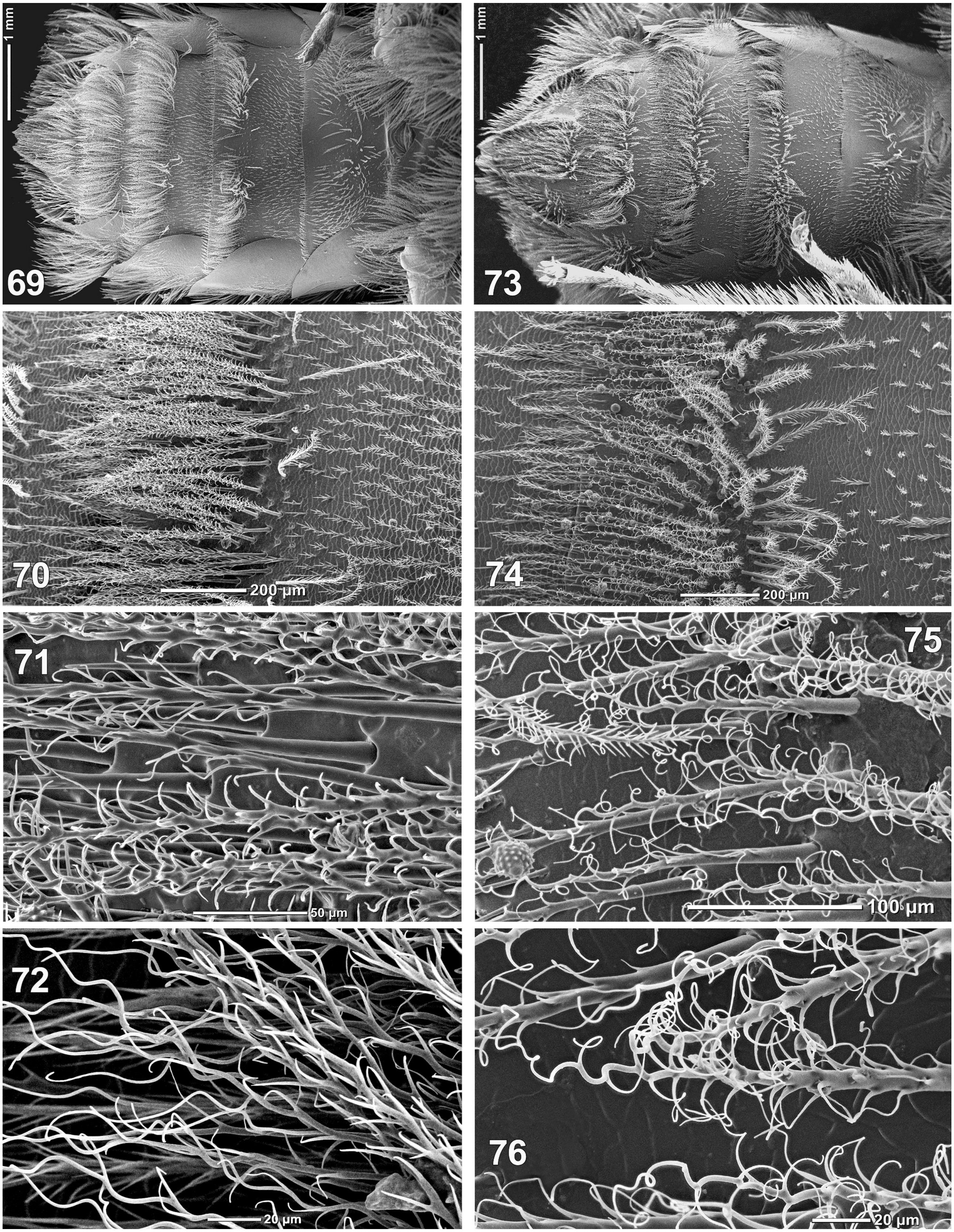
Another distinct morphological character used to separate the males of *D. morawitzi* from *D. hirtipes* is the structure of genitalia: the most obvious being the extent of the pubescence on the inner process of gonostylus. The pubescence appears short and dense in *Dasypoda morawitzi* (Figure 77), whereas it is clearly longer in *Dasypoda hirtipes* (Figure 78). The



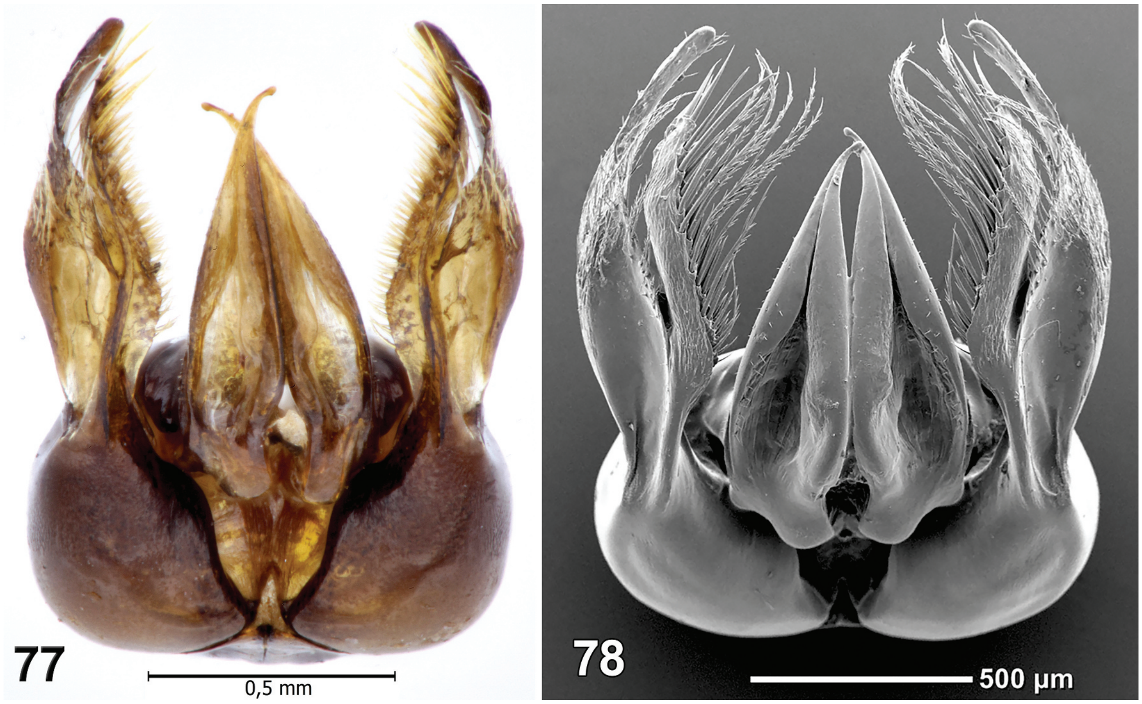
Figures 49-60. Hairs on the female's hind tibia. **49–55**, *Dasypoda morawitzi*; **55–60**, *D. hirtipes*. **49–53, 55–59**, hairs of the scopa; **54, 60**, hair on the side edges of hind tibia.



Figures 61-68. **61–63, 67**, *Dasypoda morawitzi*; **64–66, 68**, *D. hirtipes*. **61–66**, hairs on the inner part of the female's hind basitarsus; **67, 68**, distal part of inner tibial spur.



Figures 69-76. Pubescence of the female metasoma (ventral view). **69–72**, *Dasypoda morawitzi*; **73–76**, *D. hirtipes*. **69, 73**, common view of metasoma; **70, 74**, hairs on the 4th sternum; **71, 72, 75, 76**, hairs of the apical brush on the 4th sternum.



Figures 77, 78. Male genitalia (dorsal view). **77**, *Dasypoda morawitzi*. **78**, *D. hirtipes*.

shapes of the male sternum 7 and 8 are also useful to distinguish both species (Radchenko 2016).

New additional discriminant features are following: the 1st flagellomere in *D. morawitzi* females is 2.5 times longer than the second, while in *D. hirtipes* the 1st flagellomere is 3 times longer than 2nd; the ratio between L and W of the 2nd flagellomere in *D. morawitzi* females is 1/6 longer than in *D. hirtipes* (Figures 20, 21, 25, 26). Conversely, in *D. morawitzi* males the 2nd flagellomere is 1/7 shorter than in *D. hirtipes* (Figures 29, 30, 33, 34). The differences between both species in the structures of the maxillary palpus (Figures 35, 36, 40, 41), glossae (Figures 37, 42) and labial palpus (Figures 38, 39, 43, 44) are not significant.

In addition, we found some differences between *D. hirtipes* and *D. morawitzi* in the hair structure. Females of *D. hirtipes* have more curly hair on the ventral part of the mesosoma (Figures 45–48) and on the marginal parts of S3–S6 (Figures 69–76). Only the apical part of the hair on the sterna of both species are similarly curly (Figures 72, 73).

Sterna of the females of both species are covered with 4 types of hairs (Figures 70, 74). Basal parts of all sterna present sparse short straight branched hairs. The marginal part of the 3–5 sterna has a dense apical brush with three types of plumose hair:

- semi-adjacent long hairs with short straight or crescent-shaped curved side branches, being situated posteriorly, after the basal part (Figures 70, 71, 74);
- long curly hairs with similarly long and curling side branches presenting extremely curly tips (Figures 72, 75, 76); and
- shorter adjacent straight hairs with similarly straight short branches located anteriorly to the apical margins of the sterna; this apical row of hairs constitutes the fringe (Figures 70–74).

The number of curly hairs on S3–S5 in *D. hirtipes* is 1.5–2 times greater than in *D. morawitzi* as concluded from the SEM-assisted observations of 10 specimens (five specimens of each of the species that were collected in different regions).

The presence of branching curly hairs located on the marginal parts of S3–S6 at females is a new diagnostic feature for the species belonging to the subgenus *Dasypoda s. str.* (except *D. pyriformis* Radoszkowski, 1887 and *D. tubera* Warncke, 1973; both species also exhibit branched hairs on the marginal parts of S3–S6, however not curly, and with a spherical ball at the apex of each hair branch, like the hairs of the scopa; see below).

The scopa on the anterior part of the hind tibia and basitarsus of *D. morawitzi*, as in *D. hirtipes*, consists of long hairs bearing very short lateral branches being evenly acute or blunt at the apex (Figures 49, 54–57, 60). The long scopal hairs distributed on the posterior outer edge of the tibia and basitarsus are with an elongate-ellipsoid or spherical extension at the apex of each short lateral branch (Figures 50–53, 58, 59). The ratio of

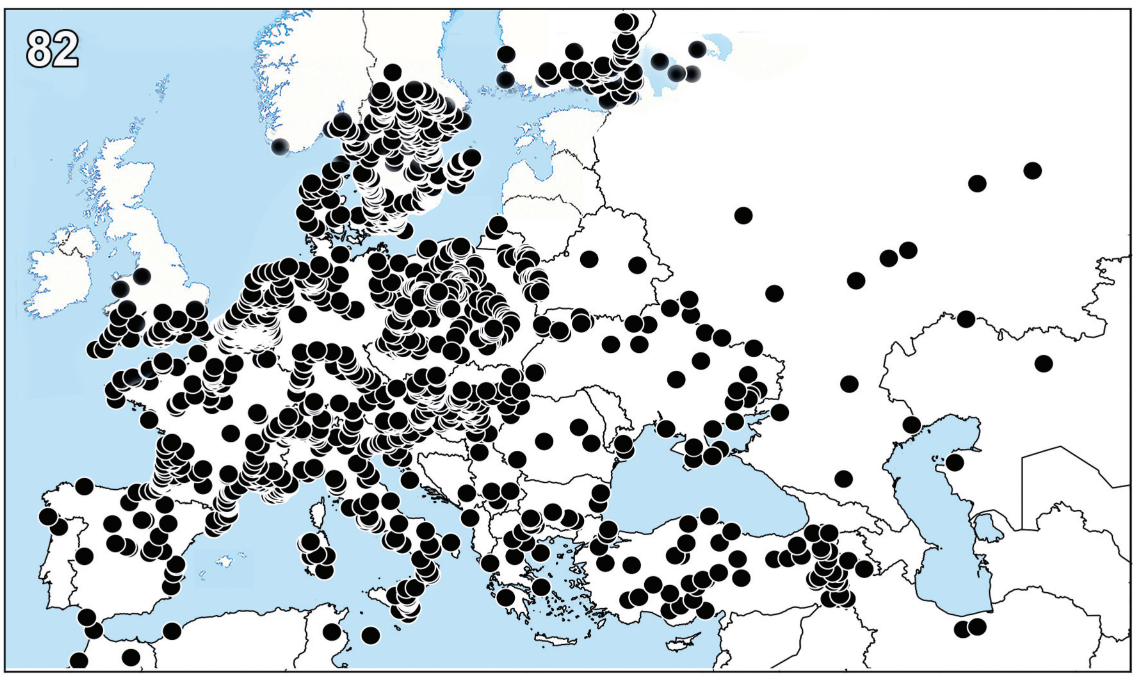
Figures 79, 80. Sampling sites of *Dasypoda morawitzi*. **79**, Gherăiești, Bacău (Romania). **80**, Agigea, Constanța (Romania).

the abundance of the different types of scopal hairs varies between different specimens in both species. Such types of scopal hairs are common to all other representatives of the subgenus *Dasypoda s. str.*

The inner surfaces of the tibiae and basitarsi of all legs of the females of *D. morawitzi* and *D. hirtipes* possess long auger-shaped hairs with crew-thread consisting of slanting ribs on the sides (Figures 63, 66). The ribs either converge into a sharp wedge on one or both sides (Figures 61, 64, 65), or are separated from each other at one, usually flatter side (Figures 62, 65). Such a surface with stiffeners could provide more strength to the hairs, potentially making them more difficult to bend and may therefore be involved in pollen removal. The distal part of inner tibial spur of *D. hirtipes* hind legs (Figure 68) is more pointed than in *D. morawitzi* (Figure 67).

Ecology

In Romania, as well as in Ukraine, the southern part of European Russia and Western Kazakhstan, most distribution records of *Dasypoda morawitzi* are from steppic areas, except for one male specimen found in a mountain forest area (Valea Uzului, Romania) (Figures



Figures 81, 82. Distribution maps. **81**, *Dasypoda morawitzi* (using data from Radchenko 2016; Rasmont et al. 2017; Schmid-Egger & Dubitzky 2017; Shebl et al. 2018; Ghisbain et al. 2018; Wendzonka et al. 2020; BOLD System 2020, and this study). **82**, *D. hirtipes* (modified from Michez et al. 2004b, with additions).

79, 80). In Spain, the species was collected in the Costa Brava region, where dry sandy soils predominate. In Poland, the species also seems to be associated with sandy areas (Wendzonka et al. 2020). Such a predisposition to dry sites can be linked to the fact that *Dasypoda* bees predominantly build nests in dry sandy soils, since they do not line the cell walls in the nests with a moisture-proof secretory film (Radchenko 1988, 1996).

Radchenko (2016) reported females of *D. morawitzi* as visitors of a wide spectrum of host plants of various plant families whereas *D. hirtipes* demonstrates an association with Asteraceae. Our additional material identified as *D. morawitzi* was poorly labelled with regard to the visited plants. Only two females and seven male specimens were labelled as being collected on flowers of *Carduus* and *Cichorium* (Asteraceae), one female on *Stachys recta* (Lamiaceae), and in the scopa of the females examined under SEM, pollen grains of *Cichorium* and Lamiaceae were found.

Distribution

Our new data show that *Dasypoda morawitzi* is present in most regions of Romania (Crisana, Transylvania, Banat, Moldavia, and Dobrogea), suggesting a possible wide distribution in this country, whereas the distribution in the Czech Republic and Spain seems limited. Additional material of this species from France, Bulgaria, Slovakia, Hungary, Ukraine, the European part of Russia and Turkey examined in the present study were collected from new locations. We also record *D. morawitzi* for the first time in mainland Greece. It should be noted that *D. hirtipes* has wider distribution (Figure 82) than *D. morawitzi* (Figure 81), although both species co-occur simultaneously in the same habitats throughout most of the known range of *D. morawitzi*. However, the ratio of the collected specimens of these two species differs significantly in different parts of their shared distribution range. For example, only two specimens of *D. hirtipes* compared to 135 specimens of *D. morawitzi* occurred among materials collected in Costa Brava (Spain). In the materials from Romania, Crimea (Ukraine) and western Kazakhstan, this ratio was approximately 1:2. For Hungary there were 43 specimens of *D. hirtipes* and 31 of *D. morawitzi* (Shebl et al. 2018), whereas the number of the specimens of *D. hirtipes* was found to be four times greater than that of *D. morawitzi* in the north of Ukraine and about nine times greater in Poland: 1291 specimens against 148 specimens respectively (Wendzonka et al. 2020). A more extensive revision of *D. hirtipes* specimens from other museum collections is required to get a more appropriate view of its complete distribution. Based on the available data, we can assume that this species is present in most European countries.

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