

Distribution and geographic variation of *Comaroma simonii* BERTKAU, 1889 (Arachnida, Araneae, Anapidae)

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Abstract: The Central European anapid, *Comaroma simonii* BERTKAU, shows a disjunct distribution area. The main area is situated in Austria and Slovenia. A second, north-western population occurs in Belgium, the Netherlands, western Germany and western Switzerland. In addition, isolated findings are known from Bohemia, Slovakia, northern and central Italy and Montenegro. The few north-western specimens known up till now, differ morphologically from those of the main area by the number of eyes, the structure of female copulatory organs and by their female biased sex ratio. Specimens from Montenegro differ from all other populations in body colouration and in the number of chemosensitive hairs on tibia IV. The data indicate that specimens from the north-western area represent a separate, morphologically differentiated population as compared to specimens from the main area. However, the morphological data reveal no species differentiation between populations of *C. simonii* at present. Because of poor faunistic knowledge about the Balkan peninsula, it cannot be decided if this is also true for specimens from Montenegro.

Introduction

The small armoured spider *Comaroma simonii* BERTKAU, 1889 (Fig. 1-3) is the only Central European member of the Anapidae (WUNDERLICH 1986; KROPF 1990). In 1889 BERTKAU described a female from the surroundings of Bonn (D), and a male, which he had received from E. SIMON, from “Castelnuovo” (= Podgrad, peninsula of Istria, SLO – THALER 1978). Later, specimens were found mainly in the Eastern Alps (WIEHLE & FRANZ 1954; Kritscher 1972; PALMGREN 1973; THALER 1978; SCHUSTER & MOSCHITZ 1984; HORAK 1987, 1989; STEINBERGER 1990; KROPF 1993; KROPF & HORAK 1996) and in Slovenia (POLENEC 1964, 1966a, b, 1970, 1971a, b, 1972). Because of this and the bad condition of the BERTKAU collection (BÖSENBERG 1899), doubts arose about the correctness of BERTKAU’s findings in Germany (e.g. WIEHLE 1960). However, in his work about BERTKAU’s collection BÖSENBERG (1899: 88) recorded the species from several localities near Bonn (“Am Venusberge, im Siebengebirge, bei Rhöndorf und bei Hönningen...”). Other doubtful distribution data of *Comaroma* that have never been confirmed, concern Hungary (BERTKAU 1889) and Bohemia (Czech Republic, SIMON 1894).

The occurrence of *C. simonii* in an area farther west was reported by THALER (1978) and by BAERT & KEKENBOSCH (1980) for western Switzerland and Belgium respectively. DUDICH (1933) and DUDICH et al. (1940), on the other hand, recorded the species from Slovakia, near the Slovak-Hungarian border.

A number of new unpublished findings confirm not only THALER's (1978) assumption of a separate (north-) western area of *C. simonii*, but also most of the earlier distribution data. In this paper I intend to summarise the information about the distribution of *C. simonii* and refer to some morphological differences between specimens of different provenance.

Materials and Methods

Spiders were collected by using different kinds of pitfall traps and litter concentrators. The material is preserved in ethanol (70%), and is stored partly at the Natural History Museum Berne, Switzerland and partly in the private collections of the named researchers.

For morphological comparisons, large series of specimens from Austria (Styria, Erzbachtal near Hieflau, see SCHUSTER & MOSCHITZ 1984: 282, locality g) were available. In addition, the following material was studied:

Five males, five females from Slovenia: Istria, Mount Slavnik, one male; Krizna gora near Loz, four males, one female; Kocevski Rog, one female; Selska dolina near Skofja Loka, one female; Gorjanci near Novo Mesto, two females; POLENEC & TARMAN leg.

Fourteen females, one male from western Germany: Nordrhein-Westfalen, Letmathe, one female, STUMPF leg. – Rheinland-Pfalz, protected area "Ahrschleife bei Altenahr" near Bonn, one female, BLICK leg. – Baden-Württemberg: Sotzenhausen near Blaubeuren, five females, ROSE leg.; Jagsttal near Mulfingen, one female, HARMS leg.; Nussloch near Heidelberg, five females, ALBERTI & PETERSEN leg., one male, KROPF leg. – Bayern, Lkr. Würzburg, Espenloh, one female, STUMPF leg.

One female from the Czech Republic: Bohemia, Rozmitál pod Tremsinem, RUZICKA leg.

Two males, two females from Montenegro (Tara valley, see THALER 1978: 178).

Specimens were investigated by using compound light and stereo microscopy. Vulvae and walking legs were embedded in Hoyer's mixture (KRAUS

1984) without clearing procedure. Walking legs were embedded between two cover glasses in most cases to make investigation from both sides possible.

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Results

Distribution and habitat (Fig. 4-7)

Fig. 4 shows the currently known distribution of *C. simonii*. The map is based on literature data (compare citations above) and on unpublished findings (coll. G. ALBERTI, T. BLICK, K. H. HARMS, C. KOMPOSCH, G. KRISPER, C. KROPF, U. PETERSEN, A. POLENEC, W. ROSE, V. RUZICKA, H. STUMPF, P. J. VAN HELSDINGEN, I. WEISS). The records from Austria, Slovenia and Croatia (one locality, THALER 1978) are situated closely together and are shown as one large area (with the exception of one locality in the country of Salzburg, compare THALER 1978, Fig. 7: locality number 645). The large spot indicates the sampling sites of BERTKAU (BERTKAU 1889; BÖSENBERG 1899) and BLICK (in litt.) in the surroundings of Bonn (D).

The records from Belgium, the Netherlands, western Germany and western Switzerland appear geographically separated from the main distribution area in Austria and Slovenia. Surprisingly, one female with strongly modified eyes was found recently in a cave near Ancona (central Italy) (WEISS, in litt.). Other isolated localities where *Comaroma* was found, are situated in Northern Italy and Montenegro (THALER 1978), Slovakia, “Garamrudnó” = Rudno nad

Hronom (DUDICH 1933: 126; DUDICH et al. 1940: 22) and Bohemia (CS, RUZICKA in litt.).

The preferred habitats of *C. simonii* are deciduous forests (Fig. 5-6), but as Figure 7 shows, the species can also inhabit more open localities.

Geographic variation

Morphological comparisons between specimens from Styria (A), western Germany, Montenegro and Bohemia revealed differences concerning body colouration, number of eyes, number of chemosensitive hairs on the walking legs and structure of the vulva. The spiders from Slovenia did not differ in any respect from Austrian specimens.

Body colouration

The colouration of the body normally varies from light orange to reddish brown (Fig. 1-3). Only the specimens from Montenegro deviate somewhat: The prosoma and the female opisthosoma show a darker brown than it is the case in spiders of the other populations. In males, the red opisthosoma (i.e. the large dorsal scutum) differs considerably from the brown prosoma.

Number of eyes (Fig. 8-12)

Specimens from Styria (A): The eyes are remarkably small and show a tendency towards reduction (Fig. 8). This is especially true for the anterior median eyes (AME) (see also SCHUSTER & MOSCHITZ 1984). 40 specimens were investigated (20 males, 20 females, no sexual dimorphism apparent). 30 individuals show both lenses of the AME (Fig. 9). However, one of them has only one posterior lateral eye, so that only 29 specimens show the full number of eight eyes. In six specimens one AME lens is totally absent so that seven eyes are present (Fig. 10-11). Four individuals have no AME lenses and thus show six eyes only (Fig. 12).

Spiders from western Germany have markedly different numbers of eyes: 12 females and one male show only six eyes because both AME lenses are totally reduced. One female (Nussloch) shows one vestigial AME, another female (Sotzenhausen) has two tiny AME.

The specimens from Montenegro have both AME and so show the full number of eight eyes. The female from Bohemia lacks both AME and one posterior median eye (PME). The second PME of this specimen is tiny.

Chemosensitive hairs (Fig. 13-19)

Chemosensitive hairs (Fig. 13) differ from other hairs on the spider leg by their blunt tips, their slightly “S”-shaped form, by a double lumen and by their insertion at a more or less steep angle relative to the longitudinal axis of the leg segment (FOELIX 1970a, b). A detailed study of their topography on the palps and walking legs revealed no clear differences between specimens from Austria, Slovenia, Bohemia and western Germany. However, the spiders from Montenegro generally show more chemosensitive hairs on the walking legs. This is especially true for tibia IV: Legs of the right hand side of ten males and ten females from Styria (Austria) and all legs of two males and two females from Montenegro were investigated. Distally, there are one dorsal, zero to one retrolateral and one prolateral hair in specimens from both regions. No additional hairs were found at the retrolateral or prolateral side of tibia IV in most specimens from Styria. However, one male showed an additional single hair, another male two of them, on the retrolateral side (Fig. 14). Two males had one and three more hairs respectively (Fig. 15), one female two of them, all situated on the prolateral side. In contrast to this, males from Montenegro had four to eight additional hairs on the retrolateral side (Fig. 16, 18) and seven to ten of them on the prolateral side (Fig. 17, 19) of tibia IV. Females from Montenegro showed six to nine additional hairs on the prolateral and two to seven of them on the retrolateral side of this leg segment.

Vulva (Fig. 20-28)

The vulva of a female *C. simonii* from Styria was illustrated by KROPF (1990). Fig. 20 shows the variation of specimens from this area. The female from Bohemia (Fig. 21), and the females from Austria, Slovenia and Montenegro show no differences in the structure of their copulatory organs. The females from western Germany however, deviate somewhat (Fig. 22-28): five of seven investigated females show a slight bend (Fig. 22, arrow) in the outline of their duct system.

Discussion

Distribution

The distribution data confirm the existence of a north-western distribution area of *C. simonii* that is separated from the main area by the Alps, as it was proposed by THALER (1978). It is sensible to assume that the area disjunction has been caused by pleistocene glaciation events (for further discussion see THALER 1978).

The new records from western Germany, especially BLICK's finding near Bonn, support BERTKAU's original data. The specimen found in Central Bohemia (RUZICKA in litt.) confirms SIMON's (1894: 602) information "...habite la Bohême...". No recent record is available for Hungary. However, the species could possibly occur in the area around Komarom (northern Hungary) close to the Slovakian border as DUDICH's (1933) record and the genus name "*Comaroma*" suggest.

Habitat

The specimen from Ancona (I) is the second record in a cave, the first was from western Switzerland (THALER 1978). The habitat preferences of *C. simonii* were discussed by KROPF (1993, 1997). In most cases, the spiders were found in deep litter layers of humid deciduous forests (Fig. 5-6). However, it also can occur in more open and dry habitats (e.g. STEINBERGER 1990), as in a xerothermophilic slope with sparse vegetation cover and small *Quercus petraea*- and *Pinus silvestris*-trees near Bad Gleichenberg (KROPF & HORAK 1996) in SE Austria (Fig. 7). This locality is characterised by deep crevices in the rocky underground. Possibly, these crevices represent the actual habitat and the warm and dry surface is visited by the spiders only sporadically or during night.

Geographic variation

The morphological data indicate that the specimens from western Germany belong to a separate and morphologically different population. Most probably, this is also true for specimens from Belgium, the Netherlands and western Switzerland (1 female each, not seen by the author). However, the differences as compared to the Austrian/Slovenian population (number of eyes, vulva) do not represent clear character gaps but only deviating character variation. Thus, no species status can be assigned to the populations at present.

The phenomenon of eye reduction was discussed in detail by SCHUSTER & MOSCHITZ (1984), but specimens from the north-western area were not available to them. It seems obvious now, that the different data on the number of eyes of *Comaroma* in the literature (see SCHUSTER & MOSCHITZ 1984 for references) are related to the provenance of the investigated specimens from either the north-western or the main area.

It seems worth noting that up till now only a single male has been collected in the north-western area (Nussloch, D). Its palp does not differ from that of specimens from the main area. On the other hand, more than 20 females have been collected in the north-western area: in addition to the 14 reported here,

two more were collected by W. ROSE (in litt.), one in Belgium (BAERT & KEKENBOSCH 1980), one in the Netherlands (VAN HELSDINGEN in litt.), one in Switzerland (THALER 1978) and several specimens around Bonn (BERTKAU 1889; BÖSENBERG 1899). These data indicate that the north-western population consists mainly of females and may be on the way to parthenogenetic reproduction. Such a trend cannot be detected clearly in the main area, because KROPF (1997) reported a sex ratio males: females of roughly 1:2 for specimens collected in Styria.

At present it is not possible to decide whether the specimens from Montenegro represent a separate population. More intensive collecting on the Balkan peninsula is needed before any conclusions can be drawn. The male and female copulatory organs of the Montenegro specimens are identical to those of Central European individuals (THALER 1978; own observation). The deviating number of chemosensitive hairs on tibia IV and the different body colouration could also be due to clinal variation.

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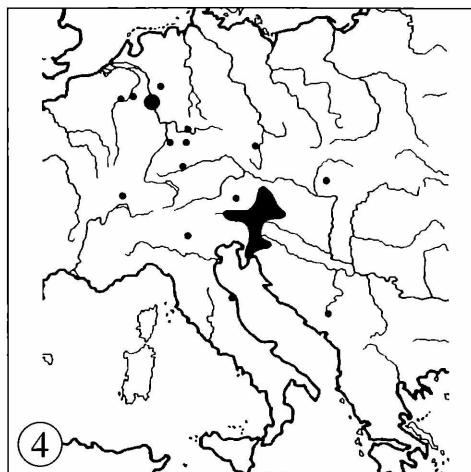
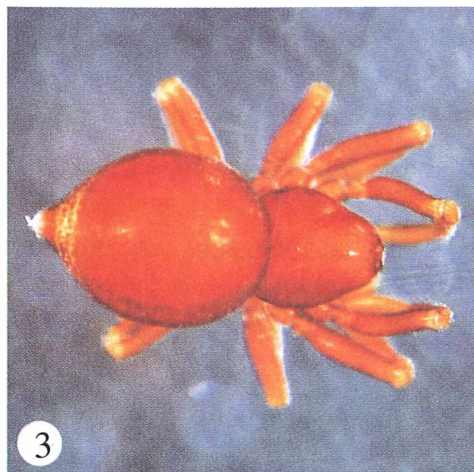
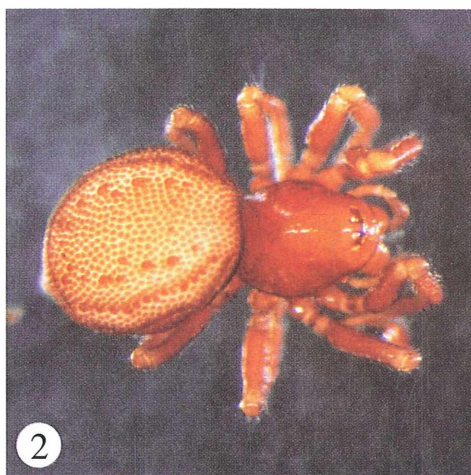


Fig. 1-3: *Comaroma simonii* BERTKAU: 1: Female in its web. 2: Female, alcohol-preserved. 3: Male, alcohol-preserved.

Fig. 4: Presently known distribution of *C. simonii*. The large black area indicates numerous finding localities in Austria, Slovenia and Croatia. The large spot indicates several localities in the surroundings of Bonn (D).



Fig. 5-7: Habitat of *C. simonii*. 5: Mixed deciduous forest in Styria, Erzbachtal near Hieflau (A). 6: *Fagus sylvatica* forest at Nussloch near Heidelberg (D). 7: Xerothermic slope with *Quercus petraea* and *Pinus silvestris* near Bad Gleichenberg (A).

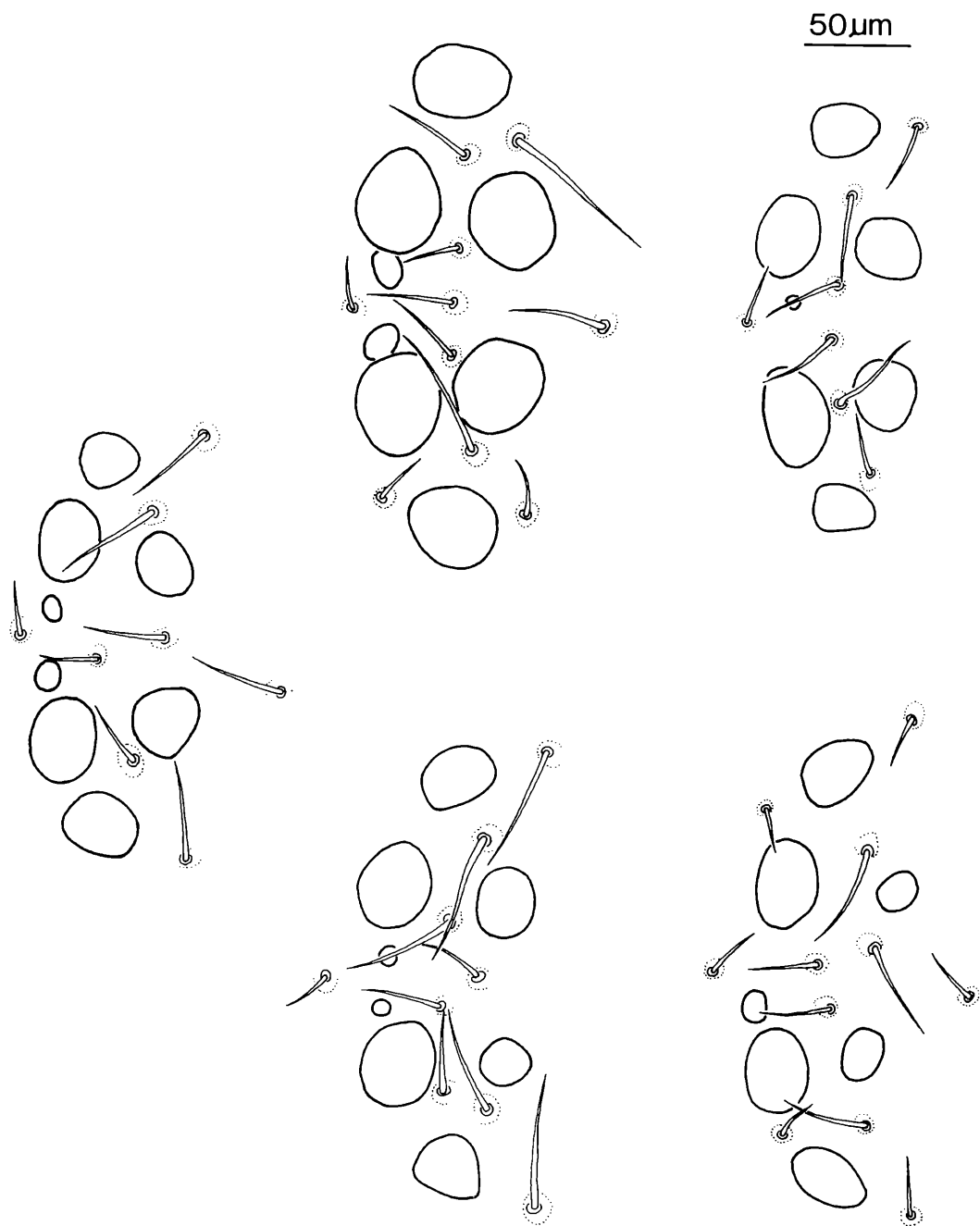


Fig. 8: Specimens from Styria: variation of eyes, frontal view.

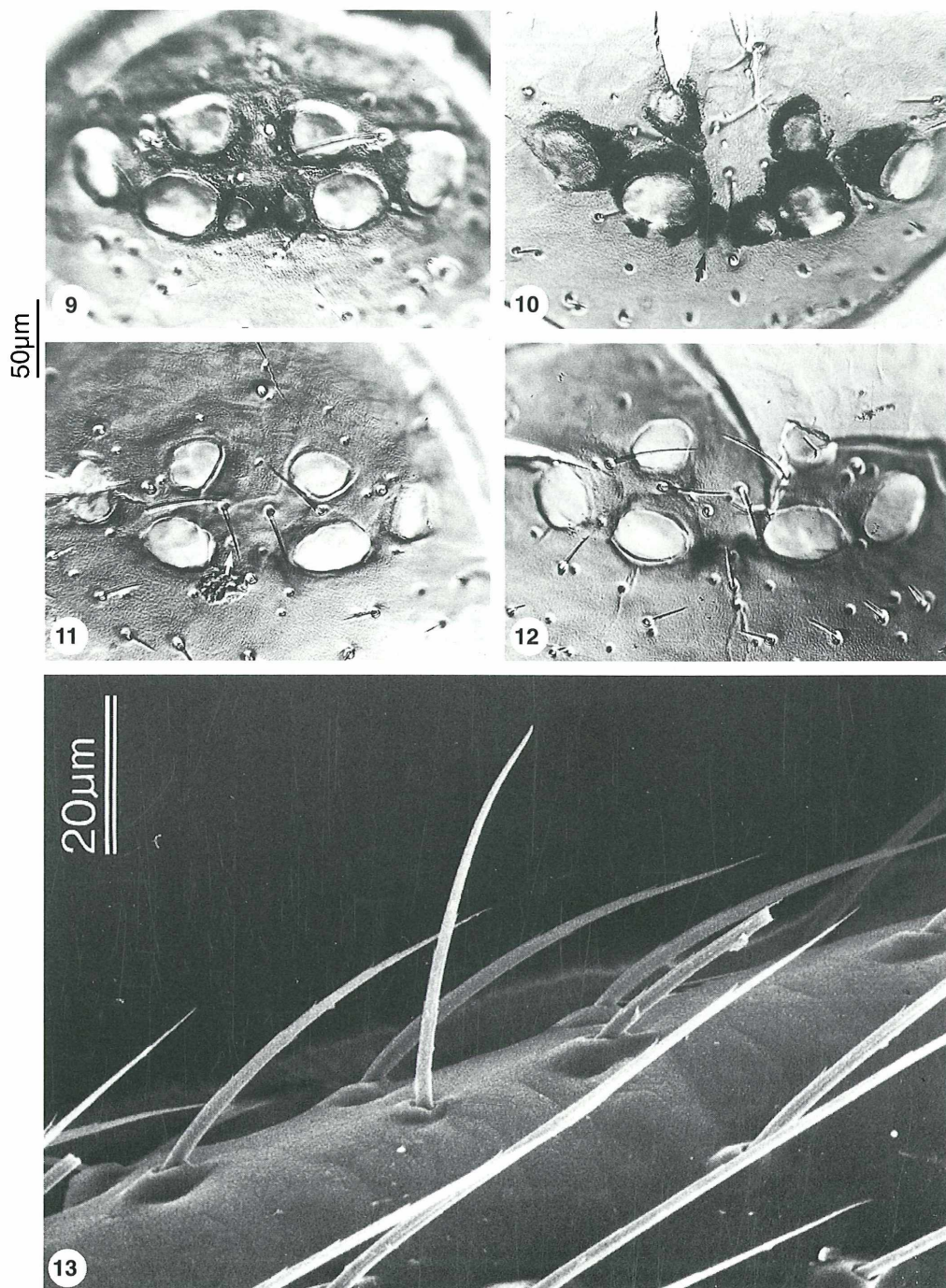


Fig. 9-12: Specimens from Styria: Reduction of anterior median eyes (AME), frontal view. 9: AME normally developed. 10: Right AME reduced, only pigment visible (arrow). 11: Left AME reduced, right AME tiny (arrow). 12: Both AME reduced, only six eyes present.

Fig. 13: Chemosensitive hair situated dorsally on tibia II, specimen from Styria.

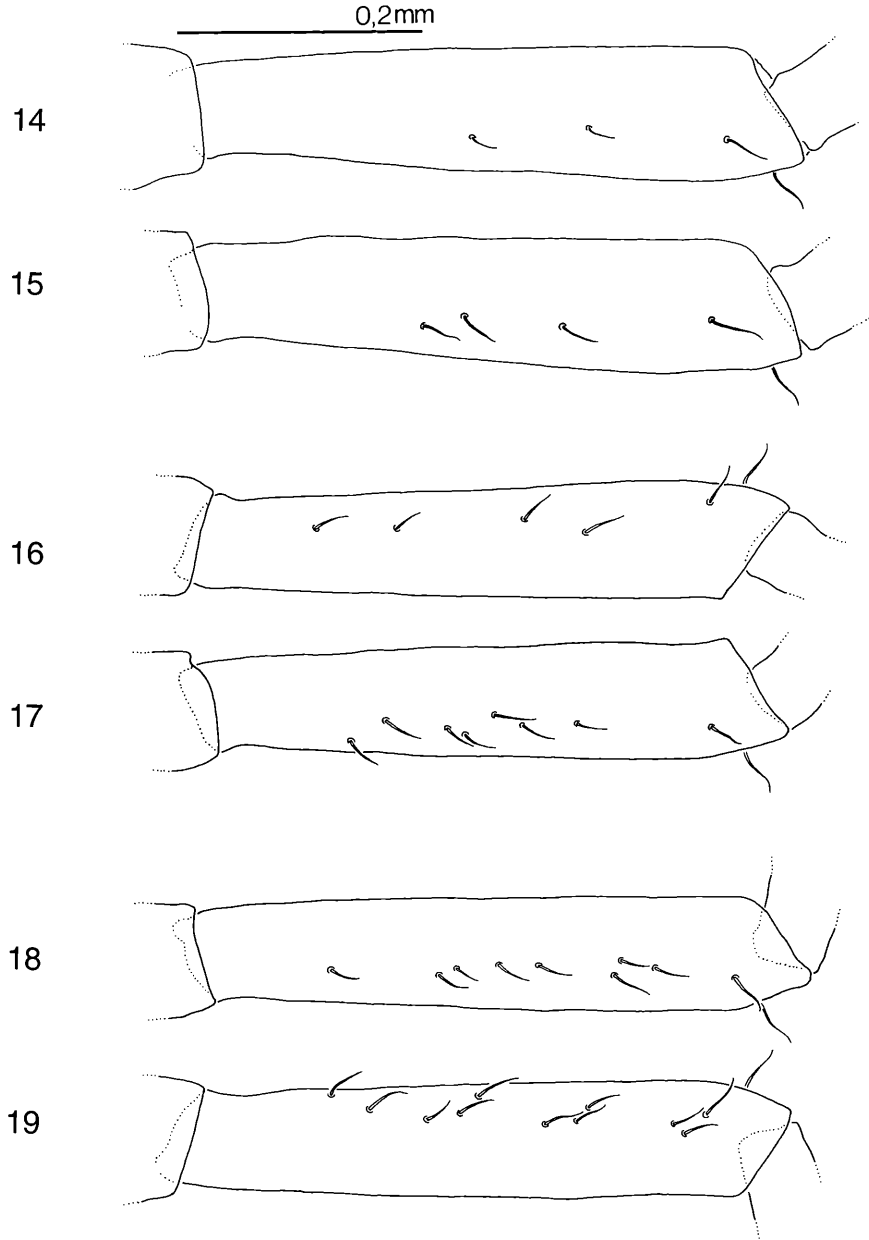


Fig. 14-19: Tibiae IV, lateral views, chemosensitive hairs. Two distal hairs (top) are always visible, variation in number of additional hairs. All other hairs and bristles omitted. 14: Male from Styria, retrolateral view. Two additional hairs. 15: Male from Styria, prolateral view. Three additional hairs. 16: Male from Montenegro, retrolateral view. 17: Male from Montenegro, prolateral view. 18: Second male from Montenegro, retrolateral view. 19: Second male from Montenegro, prolateral view.

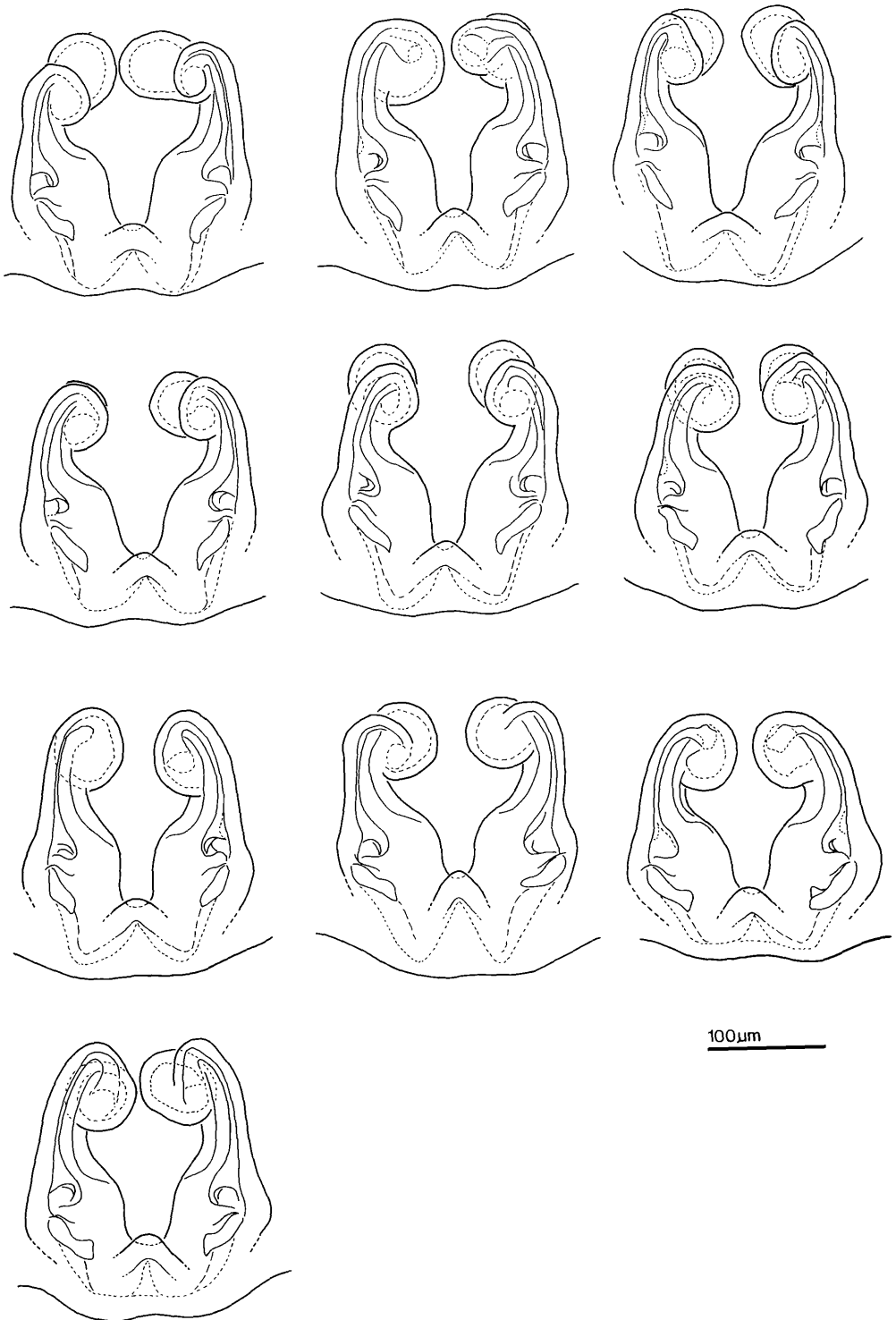


Fig. 20: Vulvae, dorsal view. Variation of specimens from Styria.

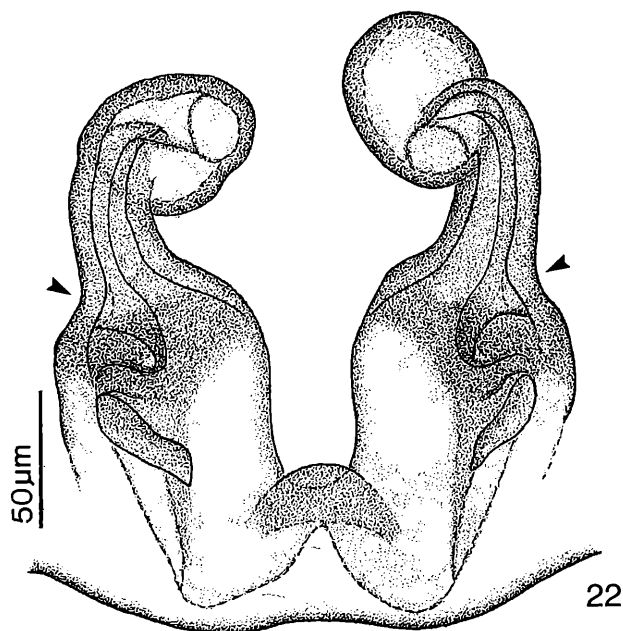
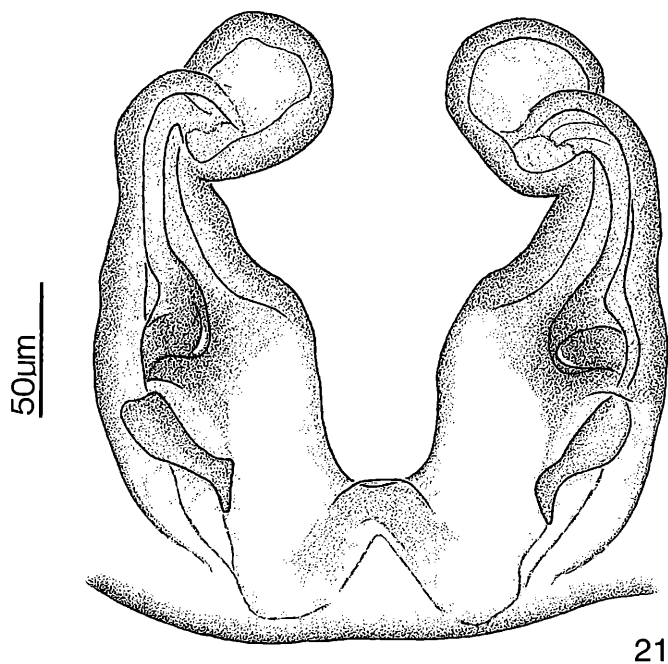


Fig. 21: Vulva, dorsal view. Female from Bohemia.

Fig. 22: Vulva, dorsal view. Female from Nussloch (D).

Arrows: Bends in the duct system.

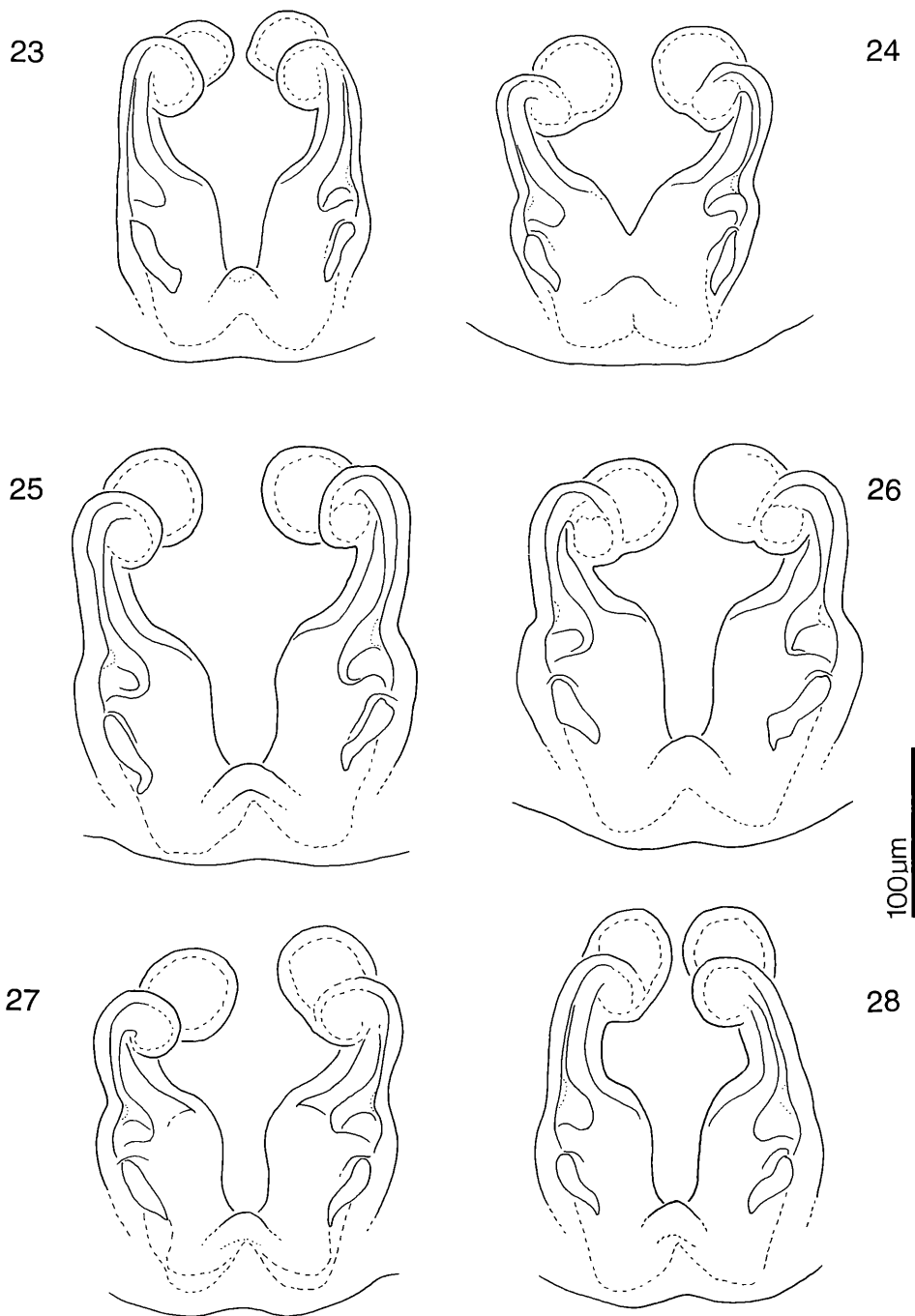


Fig. 23-28: Vulvae, dorsal view. Variation of specimens from western Germany. 23-24: Females from Sotzenhausen. 25-26: Females from Nussloch. 27: Female from Letmathe. 28: Female from Espenloh.

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