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Wanda Maria WEINER

North Korean *Collembola*. IX. The Genus *Willemia* BÖRNER, 1901

[With 31 text-figs]

Północnokoreańskie *Collembola*. IX. Rodzaj *Willemia* BÖRNER, 1901

Abstract. Two new species of the genus *Willemia* BÖRNER, 1901 described in this work were collected in North Korea during the expeditions of 1974 and 1981. *Willemia elisabethum* sp. n. resembles *Willemia denisi* MILLS, 1932; while *Willemia barbarae* sp. n. is similar to *Willemia intermedia* MILLS, 1934.

Genus *Willemia* BÖRNER, 1901 is extremely rare in samples collected in People's Democratic Republic of Korea during several expeditions organized by Institute of Systematic and Experimental Zoology, Polish Academy of Sciences in Cracow. In about 300 samples only 18 specimens were found that belong to three species such as had not yet been described. However, as one of them was represented by a single specimen, it was only possible to provide the description for the other two.

Willemia elisabethum sp. n.

Diagnosis. Ant. IV with five ovoid sensillae: s_2 , s_5 , s_7 , s_8 and s_9 . Sensillae s_2 , s_8 , s_9 smaller than othert. PAO with four spherical lobes. Lanceolate sensory setae on the th. II, III and abd. II—V; p_4 on th. II, III and abd. I as blunt sensory seta. Anal lobes with 3 hr, without seta d. Seta F situated close to edge of notch formed by tergite of abd. VI and anal lobes.

Description. Body length: holotype ♀ — 0.55 mm, paratypes — between 0.45—0.59 mm. White in alcohol.

Antennae shorter than head (about 0.6 length) (fig. 1). Ant. III and IV weakly separated — fused dorsally. Ant. IV with simple apical vesicle (fig. 2) in a clearly visible groove, with five ovoid sensillae (s_2 , s_5 , s_7 , s_8 , s_9), one small sensilla (m) in dorso-external position and one very small subapical organ (or) All dorsal setae of ant. IV acuminate. Ant. III organ with two small, thick and

oval sensory rods, each one in a very shallow groove; with a pair of long "guard sensillae" (sgd, sgv) and a ventral sensilla (sa) (fig. 2). Ant. II with 12 setae, ant. I with 7 setae.

Eyes absent. Postantennal organ (PAO) with four spherical lobes (figs 1 and 3) in a not clearly demarked pit.

External mouth cone short. Labral chaetotaxy: 4/454. Labium as on fig. 4. Top of mandible with approximately 6 teeth and with partially reduced molar plate (fig. 5), maxilla with approximately 6 teeth and ledge beneath them (fig. 6).

Tibiotarsus of legs I—III: 17, 17, 16 setae, without tenent clavate hair, claw without teeth. Empodial appendage with small basal inner lamella (fig. 7).

Furcal rudiments absent. Genital plate ♀ as on fig. 8 Anal lobes with 3 hr, without seta D. Seta F situated close (at distance of $1/3$ length of F) to edge of notch formed by anal lobes and tergite of abd. VI.

Dorsal chaetotaxy (fig. 1) with simple acuminate setae, lanceolate sensory setae on th. II, III, abd. II—V; p_4 on th. II, III and abd. I as blunt sensory seta, $1/3$ longer than all other normal setae (figs 9—15). Number of sensory setae: 022/11111 (th. II: two sensory setae and one sensory rod).

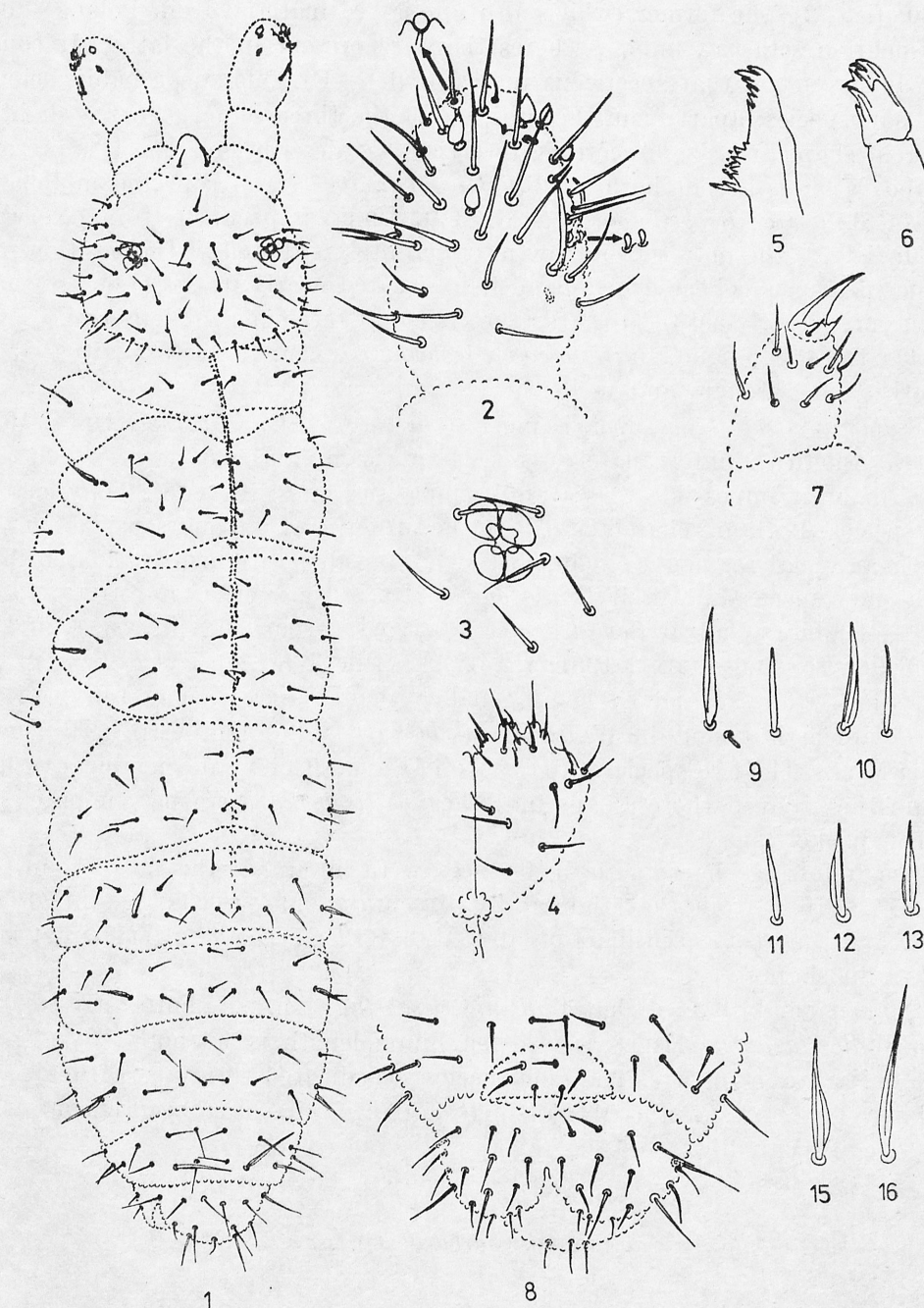
Cuticular ornamentation constituted by secondary granules, but at some places primary granules visible, especially around PAO. The Yos_{II} measure (Yos_{II} , 1962: p. 5) $a = 6$.

Locality of types: holotype ♀ — prov. Phjŏngan-pukto, Mjohjang-san (mts.) ascent to Sangvŏn waterfall, moss and litter from granite rocks in deciduous forest, 24. VI. 1981; paratypes 1 ♀ and 2 juv. — ascent to Habilo (Hapiro) waterfall, deciduous forest, fresh litter, 25. VI. 1981; paratypes 2 ♀ — slope of the Hjangsan-čhŏn river valley, border of forest (chestnut, pine) and meadow with high herbs and grass and small bushes, leaved litter from among rocks, 23. VI. 1981, leg. A. SZEPTYCKI, W. WEINER.

Other localities: prov. Phjŏngjang-si, Tesŏng-san, pine forest with deciduous undergrowth, litter, 18. V. 1974, 1 ex., leg. A. SZEPTYCKI; prov. Hamgjŏng-pukto, bank of the Susŏng-čhŏn river, west from Čhŏngdžin, young pine forest with rich deciduous undergrowth, litter from hazelwood, 22. V. 1974, 1 ex., leg. A. SZEPTYCKI; prov. Phjŏngan-namdo, Thesŏng-ho, deciduous forest on hills over lake, leaved litter, 12. VI. 1981, 4 ex., leg. A. SZEPTYCKI, W. WEINER; prov. Kesong-si, Čhonma-san (mts.), deciduous forest near Pakjŏn waterfall, litter, 15. VII. 1981, 3 ex., leg. A. SZEPTYCKI, W. WEINER.

Discussion. Within the genus *Willemia* BÖRNER, 1901 there exists a group of species most visibly characterized by the presence of ovoid sensillae on the fourth antennal segment. The group includes: *Willemia aspinata* STACH, 1949 (Europe), *Willemia denisi* MILLS, 1932 (North America) and the species described above.

Willemia elisabethum sp. n. differs from *Willemia aspinata* STACH, 1949 by the number of ovoid sensillae on ant. IV: 5, as compared to 6 in *W. aspinata*. Other features differentiating the new species: a shorter distance between "guard sensillae" in ant. org. III, absence of seta d on anal lobes. Differences concerning chaetotaxy are impossible to state because of discrepancies in descriptions and drawings of *Willemia aspinata* STACH. Chaetotaxy of abd. IV in the re-description by HÜTHER (1962: p. 520) differs from that in the drawing by FJELLBERG



Figs 1—15: *Willemia elisabethum* sp. n. 1 — dorsal chaetotaxy, 2 — antenna, 3 — postantennal organ (PAO), 4 — labium, 5 — mandible, 6 — maxilla, 7 — leg III, 8 — genital plate ♀ 9—10: sensory setae on th. II (9), th. III (10), abd. I (11), abd. II (12), abd. III (13), abd. IV (14), abd. V (15)

(1980: fig. 72): the former (which also applies to material from Poland) does not mention setae a_5 , m_5 , p_5 , whereas they are present in the latter. It could then be assumed that specimens represented by FJELLBERG probably belong to a new species: apart from the presence of the three setae, p_4 has a slightly different shape and size. According to HÜTHER'S description, seta p_2 is present on abd. V; it is absent both in *Willemia aspinata* STACH collected in Poland and in *Willemia elisabethum* sp. n. In FJELLBERG'S specimens from Norway (1980: fig. 72) the only seta in row m is definitely situated in the position m_4 ; in the specimens collected in Poland it is situated nearly in the same position, being only slightly shifted towards the centre of tergite (as compared to a_5 and p_5). On the other hand, in *Willemia elisabethum* sp. n. the seta is situated in a position between p_4 and m_3 or m_4 .

Willemia elisabethum sp. n. is most similar to *Willemia denisi* MILLS, 1932 (North America); unfortunately, lack of precision in the descriptions of the latter make it impossible to state all similarities and differences between the two species. Both are characterized by the presence of 5 ovoid sensillae on the fourth antennal segment. A comparison of the disposition of ovoid sensillae in the new species and in *Willemia denisi* MILLS (represented by MILLS, 1932: figs 1—4) shows that *Willemia denisi* MILLS have sensillae s_1 , s_2 , s_4 , s_7 and s_8 (according to DEHARVENG, 1981: fig. 1 A), while *Willemia elisabethum* sp. n. possess: s_2 , s_5 , s_7 , s_8 and s_9 , being smaller than the rest. The top part of apical vesicle is round in *Willemia elisabethum* sp. n. and oval in *Willemia denisi* MILLS. The two species differs also by the positioning of the apical vesicle within the groove, whose shape in *Willemia elisabethum* can be compared to a deep pocket.

The following chaetotactic differences were observed: the position m_3 on abd. IV differs from that figured by BELLINGER and CHRISTIANSEN (1980: fig. 173 A); moreover sensilla s on abd. V in *Willemia denisi* MILLS is not lanceolate in shape.

It must be also added that *Willemia elisabethum* sp. n. significantly smaller than *Willemia denisi* MILLS, whose maximum length is 1.1 mm.

Derivatio nominis. The new species is dedicated to my two friends Dr. Elzbieta TABAKOWSKA and Mrs Elzbieta JOGALLA who have been encouraging me to cope with life.

Willemia barbarae sp. n.

Diagnosis. Ant. IV with two sensillae (s_5 and s_7) with basal heel and one sensilla (s_8) more slender than others, with little basal heel. PAO with four spherical lobes in clearly demarked pit. Lanceolate sensory setae on the th. II, III, abd. II—V; p_4 as a blunt sensory seta on th. II, III and abd. I. Anal lobes with 3 hr, seta F at a distance from edge of notch between tergite of abd. VI and anal lobes.

Description. Body length: holotype ♀ — 0.45 mm, paratype ♀ — 0.48 mm. White in alcohol.

Antennae somewhat shorter than the head (fig. 16) Ant. III and IV (fig. 17) weakly fused. Ant. IV with simple apical vesicle, slightly oval in shape situated on a "stem" in shallow groove, two sensillae (s_5 and s_7) with basal heel, and one sensilla (s_8) more slender than others, with little basal heel; one small sensilla (m) in dorso-external position and small subapical organ (or). Nearly all dorsal setae blunt with very fine basal heel. Ant. III organ with two short sensory rods (si) in shallow groove, with a pair of "guard sensillae" (sgd, sgv) almost identical in respect of size and shape, and ventro-external sensilla (sa) Ant. II with 12, antennae I with 7 setae.

Eyes absent. Postantennal organ (PAO) with four spherical lobes (figs 16 and 18) visibly bent upwards — in consequence, front and back lobes seemingly differ in shape from the later ones. PAO situated in clearly demarked pit.

External mouth cone short. Labral chaetotaxy: 4/554, labium as on fig. 19. Mandible and maxilla similar to those in *Willemia elisabethum* sp. n. Mandible with visible 5 teeth and with molar plats partially reduced (fig 20), maxilla with 6 teeth (fig. 21)

Tibiotarsus of legs I—III: 17, 17, 16 setae without tenent clavate hair, claw without teeth. Empodial appendage without lamella (fig. 22).

Furcal rudiments absent. Genital plate ♀ as on the fig. 23. Anal spines present (figs 16 and 24). Anal lobes with 3 hr, seta F at a distance from edge of notch between anal lobes and tergite of abd. VI.

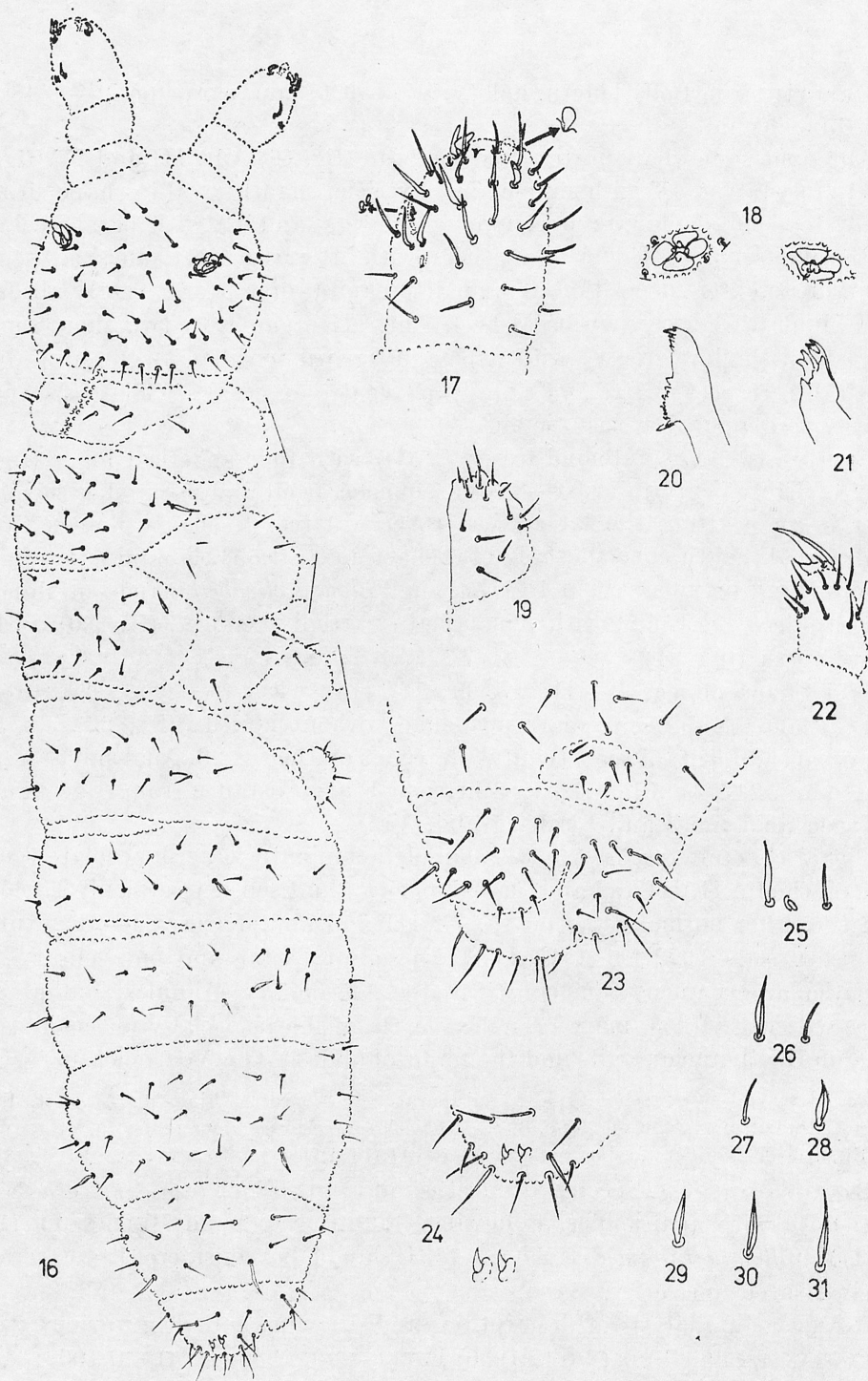
Dorsal chaetotaxy (fig. 16) with simple acuminate setae, lanceolate sensory setae on the th. II, III and abd. II—V, p_4 as a blunt sensory seta only 1/4 longer than the other normal setae on th. II, III and abd. I (figs 25—31). Number of sensory setae: 022/11111 (th. II: two sensory setae and one sensory rod).

Cuticular ornamentation constituted by secondary granules, but at some places cuticula with primary granules clearly visible (especially on head around PAO, on the thoracic tergites and the tergite of abd. I). The YOSII measure $a = 6$.

Locality of types: holotype ♀ and paratype ♀ — prov. Phjǽngjang-si, dist. Sunan, Sǽkam- ċsudzı, pine wood on slope over lake, with scarce forest floor (grass, fern), no undergrowth, litter of conifer needles and moss, 7. VII. 1981, leg. A. SZEPTYCKI, W. WEINER.

Discussion. The species is most similar to *Willemia intermedia* MILLS, 1934: both with anal spines. Following CHRISTIANSEN and BELLINGER (1980: p. 241) *Willemia intermedia* MILLS, 1934 should be considered as a series of closely related species.

However an analysis of descriptions and drawings found in various studies (CHRISTIANSEN and BELLINGER, 1980; FJELLBERG, 1980; HÜTHER, 1962; MILLS, 1934), as well as specimens from SZEPTYCKI's collection (collected in the region of Wielkopolska, Poland), justifies ascribing to *Willemia barbarae* sp. n. the status of a separate species. Sensory setae on thorax and abdomen of *Willemia barbarae* sp. n. are clearly lanceolate in shape, while in *Willemia intermedia* MILLS they are only weakly flame-shaped; the lanceolate shape can be only



Figs 16—31: *Willemia barbarae* sp. n. 16 — dorsal chaetotaxy, 17 — antenna, 18 — postantennal organ (PAO), 19 — labium, 20 — mandible, 21 — maxilla, 22 — leg III, 23 — genital plate ♀, 24 — anal spines, 25—31: sensory setae on th. II (25), th. III (26), abd. I (27), abd. II (28), abd. III (29), abd. IV (30), abd. V (31)

seen in the specimens from SZEPTYCKI's collection. Another feature common to *Willemia intermedia* from Poland and *Willemia barbarae* sp. n. is the shape and disposition of sensillae on ant. IV. The former have seta F on the anal lobe, situated relatively close to the border of tergite VI, while in the latter seta F is situated exactly on the borderline between the anal lobe and tergite of abd. VI. The distance between seta F and the edge of the notch formed by the anal lobe and tergite of abd. VI is different in *Willemia intermedia* from Poland (where it equals the length of the seta F) and *Willemia barbarae* sp. n. ($1/3$ of the length of the seta).

The comparison of *Willemia barbarae* sp. n. with *Willemia intermedia* MILLS, 1934 sensu: HÜTHER (1962) shows significant differences in the disposition, number, shape and size of sensillae on ant. IV. *Willemia barbarae* sp. n. has 3 sensillae: s_5 , s_7 and s_8 , the two first being much thicker than the third. *Willemia intermedia* sensu HÜTHER has 5 sensillae: s_1 , s_2 , s_4 , s_8 and s_9 , of which s_4 , s_9 and particularly s_3 are most distinguishable. On the other hand when comparing with *Willemia intermedia* sensu CHRISTIANSEN and BELLINGER (1980: fig. 175 D) it differs completely in the shape of sensillae (3 sensillae, all of them nearly cylindric and equal in length).

Derivatio nominis. The new species is dedicated to Mrs Barbara BRZYCKA-KAPLAN as a token of long friendship.

Willemia sp. juv.

A single juvenile specimen found differs completely from the remaining two species.

Locality: prov. Phjõngan-namdo, Thesõng-ho, hills over lake, deciduous forest (oak, chesnut, pine), litter, 12. VII. 1981, 1 ex., leg. A. SZEPTYCKI, W. WEINER.

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Translated into English
by Dr. E. TABAKOWSKA

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STRESZCZENIE

W niniejszej pracy opisano dwa nowe dla wiedzy gatunki z rodzaju *Willemia* BÖRNER, 1901. *Willemia elisabethum* sp. n. najbardziej podobna do *Willemia denisi* MILLS, 1932, a *Willemia barbarae* sp. n. — do *Willemia intermedia* MILLS, 1934.

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