

**THREE NEW SPECIES OF
ORCHESELLIDES FROM NORTH KOREA (COLLEMBOLA:
ENTOMOBRYIDAE: ORCHESELLINAE)**

José A. Mari Mutt¹

Abstract. Three new species of *Orchesellides*, *O. viridis*, *O. szeptyckii*, and *O. lineatus*, are described from material collected in many localities of North Korea. Intraspecific variation of pigmentation, labial chaetotaxy, and number of setae on the tenaculum are discussed. Fifty-one drawings complement the descriptions.

Through the courtesy of Dr Andrzej Szeptycki, of the Institute for Systematic Zoology, Polish Academy of Sciences, I have had the opportunity to study the *Orchesellides* gathered during the Institute's expeditions of 1971 and 1974 to North Korea. Dr Szeptycki collected most of the specimens described herein and realized that 3 species were present in his samples. Along with the material, he kindly furnished his preliminary notes and drawings.

Slightly different systems for the transliteration of Korean names are followed in various dictionaries and maps. The topographical names used in this paper follow the system described by Mroczkowski (1972). Mroczkowski's paper may be consulted for additional data on some of the localities.

Morphological abbreviations used in this paper are as follows: Ant. 2, Th. 2, Abd. 2, etc. = 2nd antennal segment, 2nd thoracic segment, 2nd abdominal segment, etc.

The macrochaetal patterns presented for the head and Th. 2 to Abd. 1 are based on only a few properly cleared specimens that had accidentally lost most of their setae and had not suffered much folding of the cuticle during mounting. These specimens, with lost setae, provided reduced interference caused by setae obscuring positions of macrochaetal sockets. The large number of macrochaetae on Th. 2 to Abd. 1 renders difficult and exasperating the accurate study of variation of setal patterns. The 2nd, 3rd, and 4th abdominal segments are larger and possess fewer macrochaetae; their setal patterns were studied for most specimens.

One-third of the paratypes from the type-locality are retained in my collection; the holotypes and other paratypes are deposited in the Institute for Systematic Zoology, Polish Academy of Sciences, Krakow, Poland. Unless otherwise stated in the collection data, all specimens were collected by A. Szeptycki.

The following characters are shared by all 3 species described below and are omitted from their descriptions.

1. Department of Biology, University of Puerto Rico, Mayagüez, P.R. 00708.

Antennae 5-segmented, about $1.8\times$ length of head, apical segments not annulated. Position of cephalic bothriothrix (**X**, Fig. 1) occupied by an erect, apically pointed ciliated seta about $\frac{2}{3}$ length of a posterior head macrochaeta; similar setae present laterally on head. Eyes 8+8, g and h reduced. Prelabral and all labral setae smooth. Venter of head clothed by numerous unilaterally ciliated setae. Setae of anterior labial row smooth, labial setae L_1 and L_2 ciliated. Subapical seta of maxillary palp longer than apical seta (Fig. 21). Differentiated seta of outer labial papilla (Fig. 10, 11) not reaching apex of its papilla. Inner margin of tibiotarsi with several (in *O. szeptyckii*, n. sp., 5–9, usually 6) strong, erect, very finely ciliated setae (Fig. 25) amidst regular bent ciliated setae. A smooth seta opposite tenent hair of metathoracic legs. Inner margin of unguis with basal pair of equal teeth, outer margin with 2 teeth. Unguiculus with an outer tooth. Tenent hair clavate. Anterior face of colophore with many ciliated setae (Fig. 9). Dorsum of manubrium and dentes covered with many ciliated hairs, dens without spines. Mucro (Fig. 12) with 2 teeth and a basal spine. Male genital plate multisetaceous (cf. Yosii 1966: 344, Fig. N).

Orchesellides viridis Mari Mutt, **new species**

Fig. 1–22

Length to 2.2 mm. Background color light green. Intense green-olive pigment over head, body and appendages (Fig. 6). Apex of Ant. 5 with large, bilobed papilla and well-developed 3-pointed pin seta (Fig. 3, 4). Head macrochaetotaxy as in Fig. 1. Five interocular setae present, constant in position (Fig. 8). Labral papillae with hooked, spinelike projections (Fig. 19, 20). Posterior labial row to seta E (Fig. 5) with 4–7 ciliated setae. Body macrochaetotaxy and distribution of bothriotricha as Fig. 13–18. Tronchanteral organ (Fig. 22) with up to 22 setae. Claw morphology as in Fig. 2, inner margin of unguis with 2 distal unpaired teeth. Tenaculum with 1 seta (Fig. 7).

Holotype ♀, N KOREA: Prow Janggang-do, Samdžijon Distr, Mt Pektu-san, SW slope, ca. 2000 m, 5.IX.1971, under rotting wood and mushrooms in a park with larch trees and *Rhododendron* undergrowth, nr upper tree line, loc. 71/87. Paratypes: 30 (9 mounted on slides), same data as holotype; 8 (1 on slide), same data except on dry bed of small stream, on sand among scattered grasses, loc. 71/88; 4 (1 on slide), same data except under tufts of plants growing among scattered larch trees and numerous bushes (*Dryas*, *Vaccinium*, *Rhododendron*), on pumice, loc. 71/80; 1, same data except between 2100–2200 m, pumice and obsidian covered by scattered small bushes, under stones, loc. 71/89; 1, same data except inside of crater, about 2300 m, a slope over lake covered by small bushes, grasses and moss, under stones and in moss covering stones, loc. 71/85; 1, Samdžijon Distr, southern slope of Soroynsan, about 40 km NW of Samdžijon, 10.IX.1971, xerophilous turfs of granite, under stones and lichens, loc. 71/106.

Remarks. The species can be readily recognized by its green coloration; all other species described so far possess violet-black pigment. The shape of the labral papillae, number of interocular setae, degree of development of the apical papilla of Ant. 5, larger number of macrochaetae on Abd. 2 to Abd. 4, and tenaculum with 1 seta, also isolate this form from the other 2 Korean species described below.

Szeptycki (pers. commun.) advises that the species reported as *Orchesellides* sp. in his work on the chaetotaxy of the Entomobryidae (Szeptycki 1979) is *O. viridis*. The reader should compare my diagrams with those presented by Szeptycki; they are generally in close agreement.

Asymmetry in the number of setae on the posterior labial row, up to seta E, is very

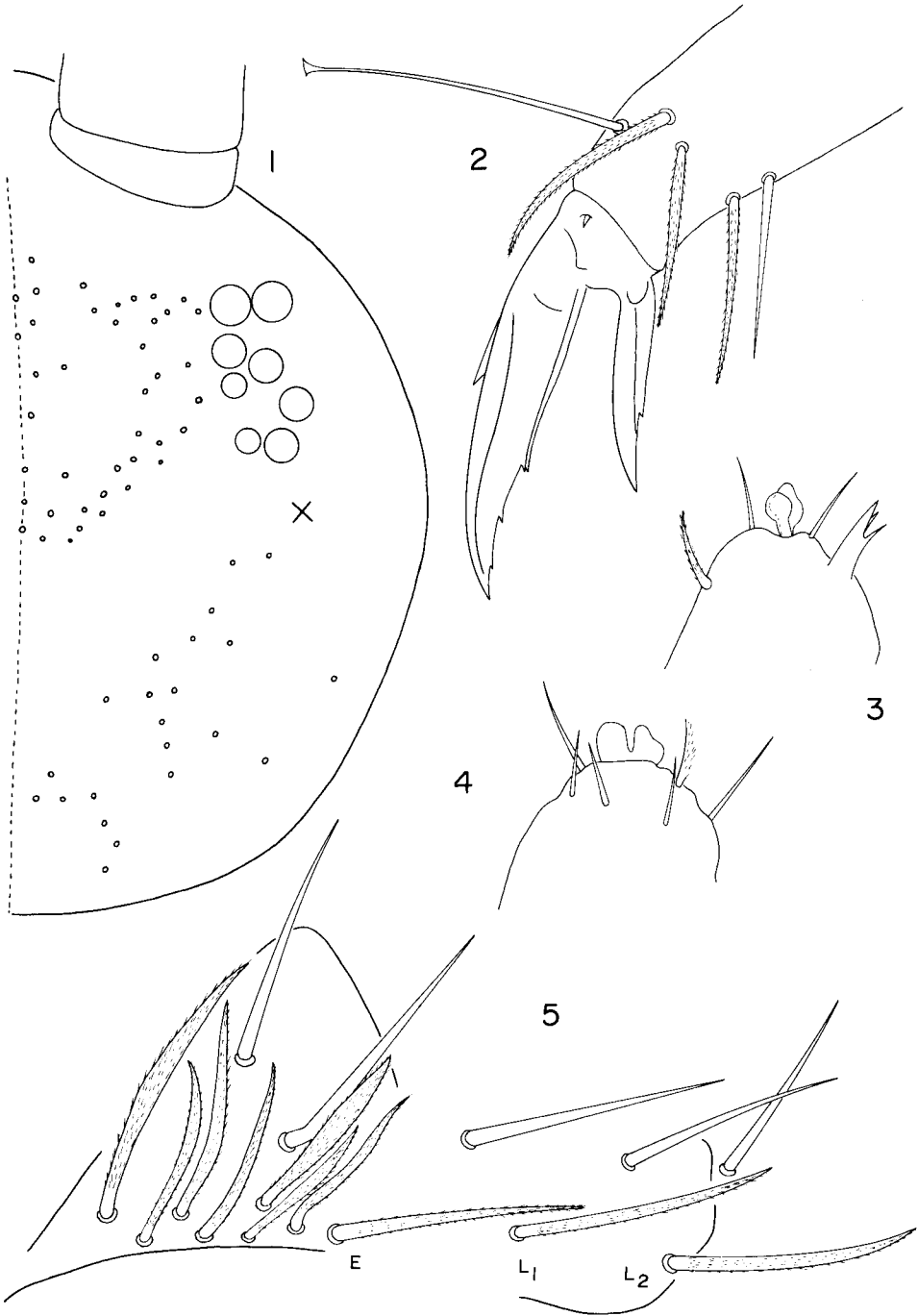


FIG. 1-5. *O. viridis*: 1, head macrochaetotaxy; 2, metathoracic claws; 3-4, apex of Ant. 5 (pin seta omitted in Fig. 4); 5, labial chaetotaxy.

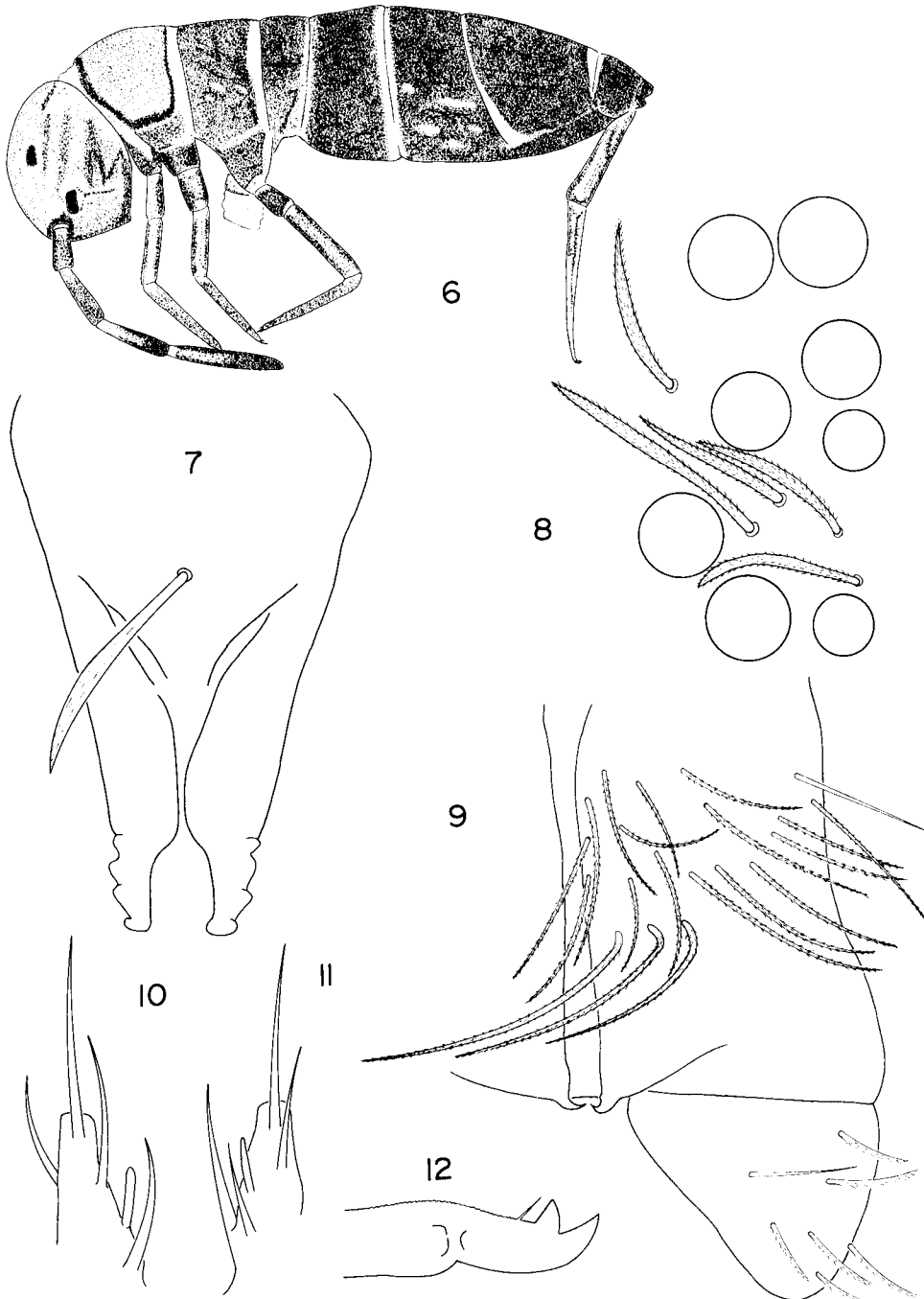


FIG. 6-12. *O. viridis*: 6, habitus and distribution of dark green pigment; 7, tenaculum; 8, eyes and distribution of interocular setae; 9, chaetotaxy of anterior face of collophore; 10-11, differentiated seta of outer labial papilla; 12, mucro.

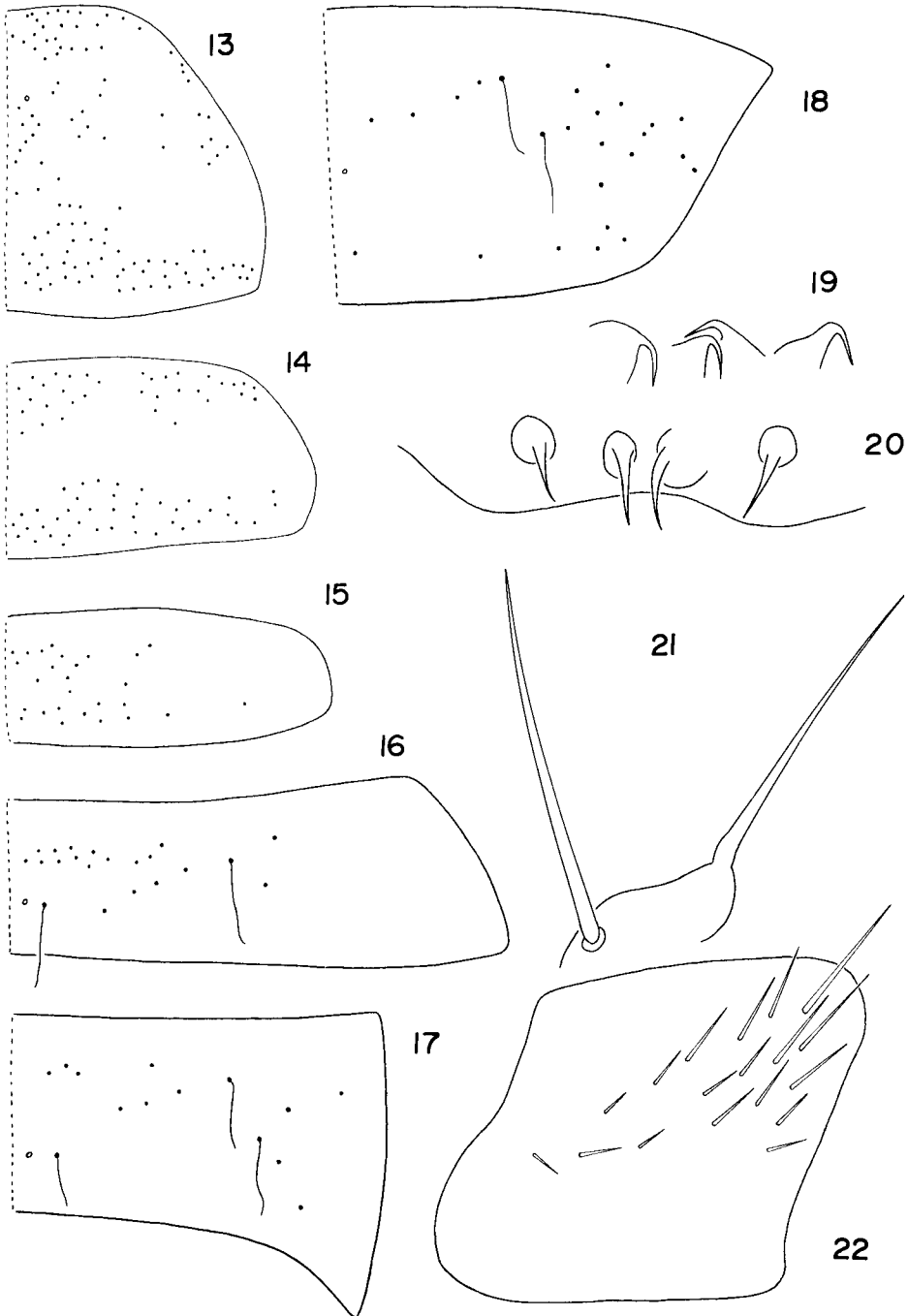


FIG. 13-22. *O. viridis*: 13-18, body macrochaetotaxy (dots) of Th. 2 to Abd. 4 and distribution of pseudopores (circles) and bothriotricha (lines); 19, labral papillae, ventral view; 20, labral papillae, anterior view; 21, maxillary palp; 22, trochanteral organ.

frequent. Only 4 out of 10 individuals examined have the same number of setae on both sides of the head. The total number of setae in this area (both sides of specimen) ranges from 10 to 14. Two specimens have labial seta 1₂ smooth but only on the right side of the head; in every other instance this seta is ciliated.

The abdomen of 1 paratype from the type-locality (specimen no. 3) is packed with the spores of a microsporidian. I have observed these parasites with some frequency during the study of slide-mounted springtails; their presence in Collembola has been reported recently by Weiser & Purrini (1980) and Maddox et al. (1982).

Orchesellides szeptyckii Mari Mutt, **new species**

Fig. 23–41

Length to 2.2 mm. Background color white. Dark violet-black pigment over head and body, forming series of generally well-defined spots and bands (Fig. 38–41). Apex of Ant. 5 with poorly defined bilobed papilla (Fig. 34, 35). Head macrochaetotaxy as in Fig. 23. Four interocular setae present, constant in position (Fig. 26). Labral papillae with stout, conelike projections (Fig. 36, 37). Posterior labial row to seta E with 3–4 ciliated setae (see Remarks). Body macrochaetotaxy and distribution of bothriotracha as in Fig. 28–33. Trochanteral organ with up to 15 setae. Claw morphology as in Fig. 27, inner margin of unguis with 2 unpaired teeth. Tenaculum (Fig. 24) with 2 setae (see Remarks).

Holotype ♀, N KOREA: Prov Kangvŏn-do, Vonsan Town, 15.VI.1974, border between sandy beach and dunes, in old wracks, loc. 74/92 (J. Pawlowski). Paratypes: 25 (9 mounted on slides), same data as holotype; 2, Prov Janggang-do, Hjesan Town, park around a monument, 31.VIII.1971, under stones, loc. 71/60; 8 (1 on slide), Prov Janggang-do, Pŏchŏn Distr, road from Hjesan to Samdžijon, below Poso-ri, 11.IX.1971, grassy gravel terrace of a stream, under stones and small pieces of decaying wood, loc. 71/110; 1, Pŏchŏn Distr, Karim-čhŏn Val, about 5 km from Pŏchŏn-bo, 1.IX.1971, on low plants between a gravel heap and a slope covered with brushwood, loc. 71/64; 1, Prov Phjŏngan-namdo, Sunan Distr, southern bank of Sŏkam-čŏsudži lake, 23.VIII.1971, an artificial turf over the lake, on plants, loc. 71/35; 1, Prov Phjŏngan-namdo, Nampho Distr, Vaudo, 18.IX.1971, slope of a stony dam, under tufts of cut grasses, loc. 71/120; 4 (1 on slide), Phjŏngjang Town, park at Tedong Riv, 19.VIII.1971, under stones and on soil after rain, loc. 71/27; 1, same data except 28.V.1974, sandy bank with scattered grasses on soil surface and under stones, loc. 74/142; 14 (3 on slides), same data except near Tedong Riv, 1.VI.1974, in plant debris from rock crevices, loc. 74/58; 1, Prov Hamgjŏng-pukto, W of Čhongdžin Town, valley of Susŏng-čhŏn (stream), 22.V.1974, young pine forest with undergrowth of oaks and hazel, under stones, loc. 74/14; 1, same data except sandy river bank with stones, in litter under willows, loc. 74/19 (J. Pawlowski); 1, Prov Hamgjŏng-pukto, Džuyr Distr, Onpho-ri, slopes of a valley, 25.V.1974, in litter on dry rocks under pines, loc. 74/29; 2 (1 on slide), Džuyr Distr, seashore about 4 km N of Jonghen-ri, ca. 70 m, 25.V.1974, dry stone heap nr a road under stones and in plant debris under grasses, loc. 71/41.

Remarks. The species is close to *O. lineatus*, n. sp., but both can be distinguished by the coloration (in particular the presence of a median dorsal line of pigment along the body of *O. lineatus*), by the presence of a small bilobed papilla on Ant. 5 of *O. szeptyckii*, by the number of unpaired teeth along the inner margin of the unguis, and by the number of setae on the tenaculum.

In overall coloration the species resembles *O. sinensis* (Denis, 1929), a species de-

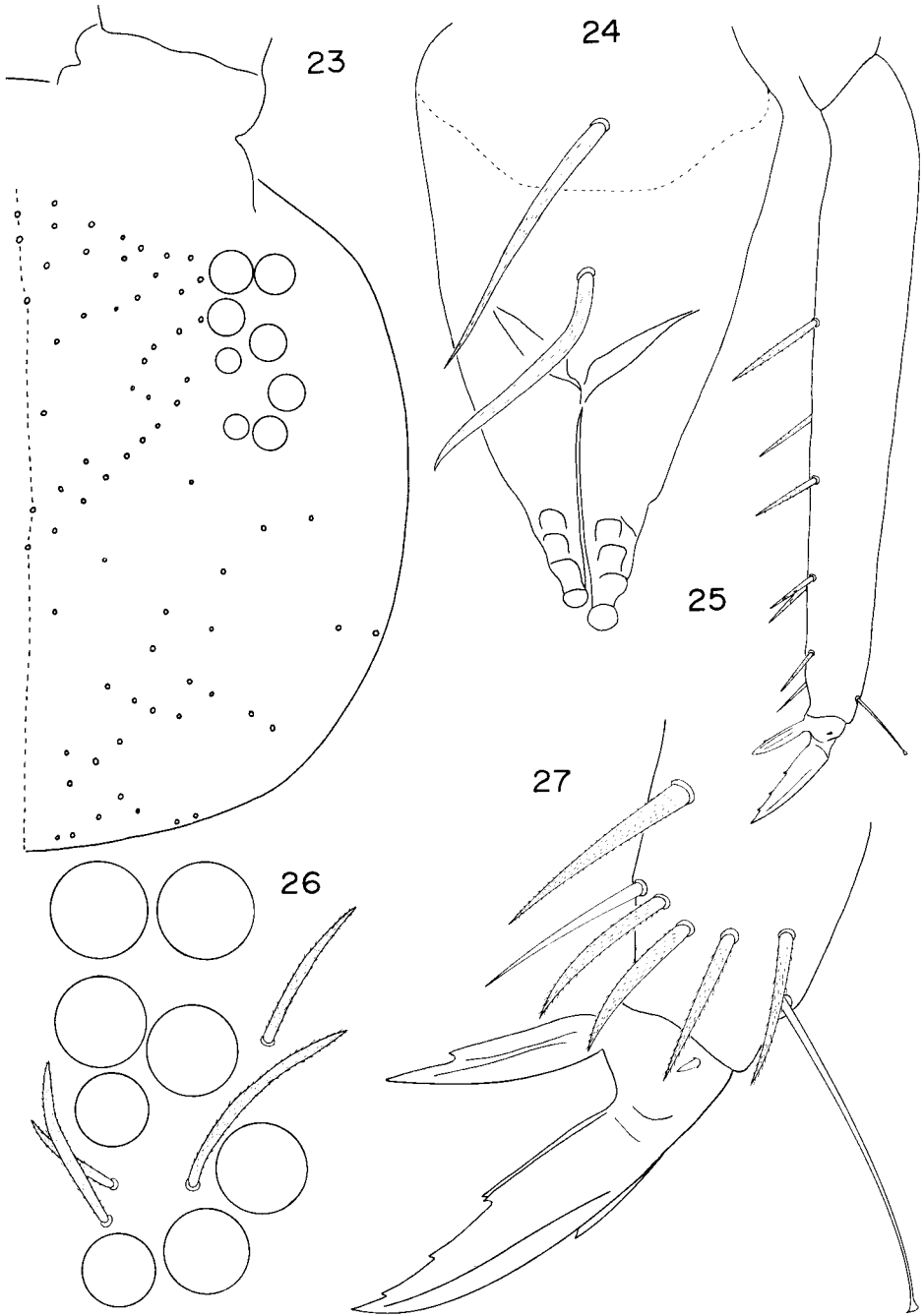


FIG. 23–27. *O. szeptyckii*: 23, head macrochaetotaxy; 24, tenaculum; 25, metathoracic leg, showing distribution of finely ciliated, erect setae; 26, eyes and distribution of interocular setae; 27, meta-thoracic claws.

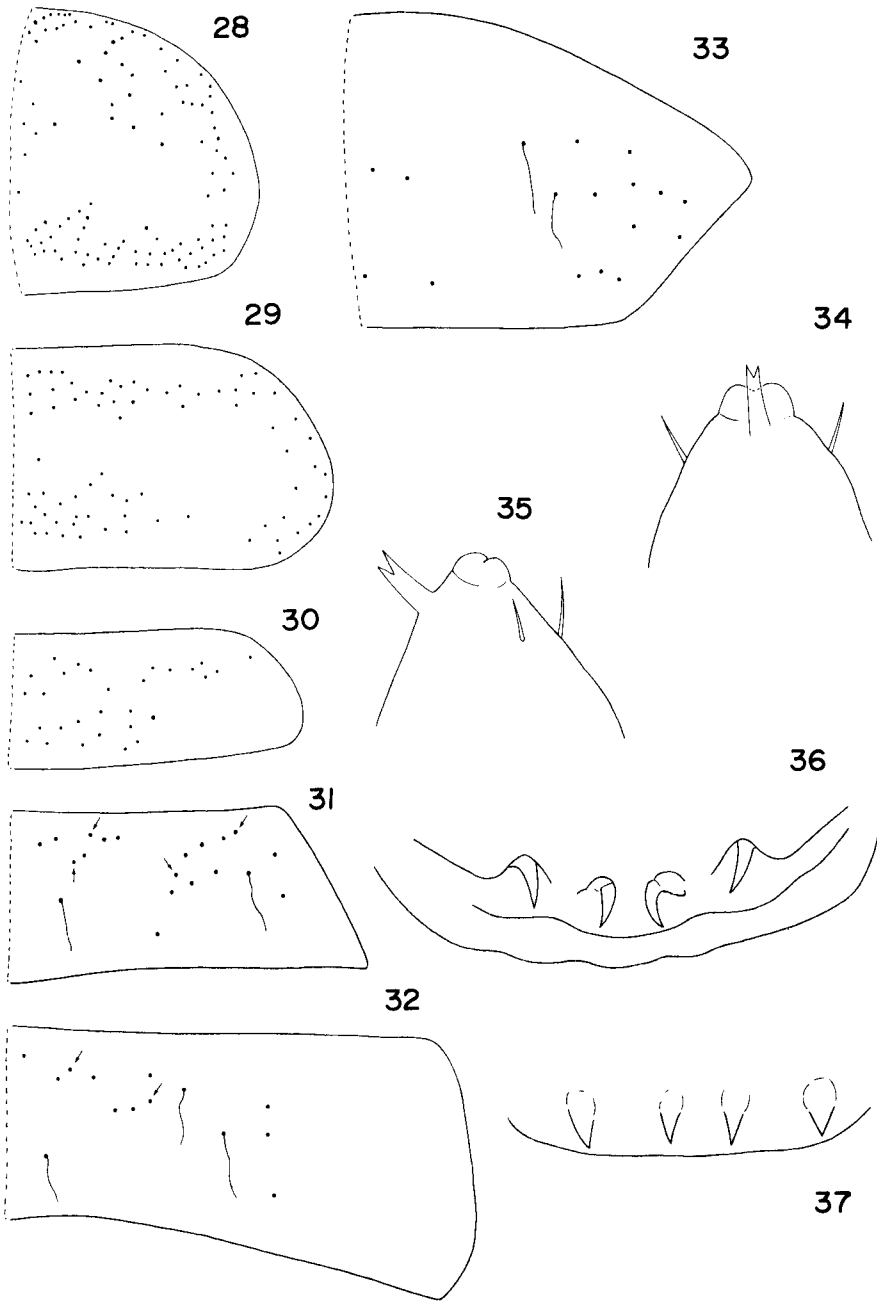


FIG. 28-37. *O. szeptyckii*: 28-33, body macrochaetotaxy (dots) of Th. 2 to Abd. 4 and distribution of bothriotricha (lines) (arrows signal setae absent in some specimens); 34-35, apex of Ant. 5 with pin seta and poorly defined bilobed papilla; 36, labral papillae, anterior view; 37, labral papillae, ventral view.

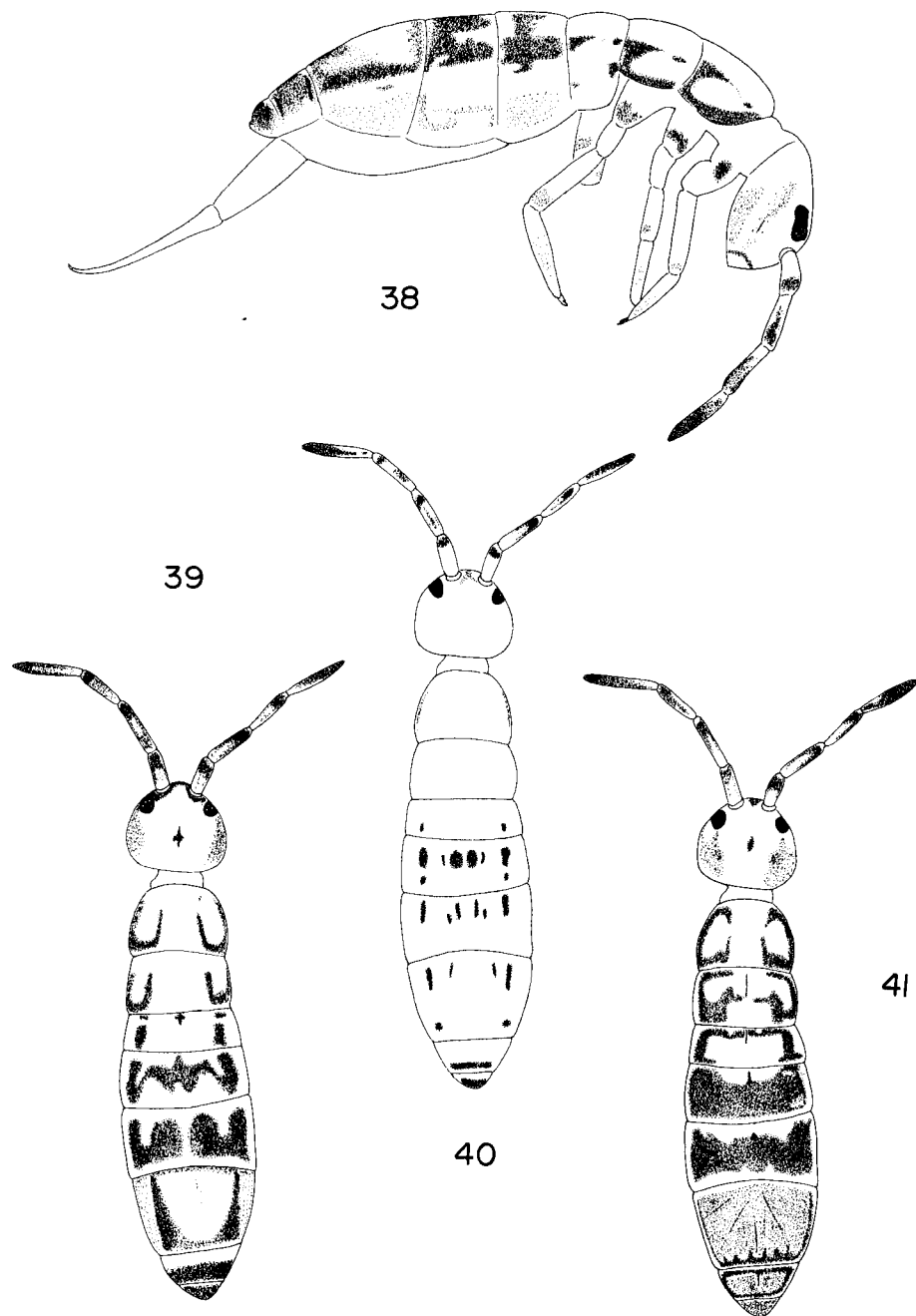


FIG. 38-41. *O. szeptyckii*: 38-39, habitus and distribution of dark violet-black pigment in deeply pigmented specimen from the type-locality; 40, lightest individual from the type-locality; 41, specimen from Hamgjong-pukto Province (loc. 71/41).

scribed from China (Foochow) and later reported from Japan by Yosii (1924, 1966). Dr J.-M. Thibaud, Museum National d'Histoire Naturelle, Brunoy, France, has kindly forwarded Denis' type material, which consists of deteriorated fragments of 2 specimens mounted on 4 slides. Very little can be added to Denis' brief description, but I have been able to verify that the inner pair of unguual teeth is in a proximal position (Denis 1929: 318, Fig. 6). In *O. szeptyckii* this pair of teeth is more distal (Fig. 27). Denis overlooked the presence of a second, very small, distal unpaired tooth; the ungues of *O. sinensis* are hence quadridentate, not tridentate.

Orchesellides szeptyckii has a poorly defined bilobed papilla on the apex of Ant. 5; this structure is well developed and conspicuous in 4 species of the genus (*O. viridis*, n. sp., *O. boraoui* Bonet, 1930, from Pakistan; *O. kabulensis* Yosii, 1966, from Afghanistan and the Babatag Mountain Ridge, USSR; and *O. poli* Yosii, 1966, from Afghanistan) and absent in *O. lineatus*, n. sp. Other characters (pigmentation of head and body, number of unpaired inner unguual teeth, number of setae on tenaculum) also distinguish *O. szeptyckii* from these 3 species.

Fig. 38 and 39 present the distribution of pigment in a heavily pigmented specimen from the type-locality. Fig. 40 corresponds to the lightest specimen in the same sample. Considerable variation between these extremes is present in the population, although most specimens resemble more closely the darker individual. Similar variation in pigmentation was not observed in *O. viridis*, but it occurs in *O. lineatus*, n. sp., and has been reported for *O. boraoui* by Bonet (1930) and Denis (1936). The 5 individuals from Hamgjøng-pukto Province are darker than those from the other localities (cf. Fig. 39, 41).

Only 1 of the 10 specimens studied from the type-locality has different numbers of setae (3+4) on the posterior labial row, up to seta E, on the 2 sides of the head. Six specimens have 4+4 setae and 3 possess 3+3 hairs. All specimens from other localities exhibit 4+4 setae except for an individual from locality 71/27 with 6+6 setae.

The tenaculum was seen clearly in 12 specimens. In 10 of these, the appendage has 2 setae (Fig. 24). One individual from the type-locality has 3 setae; the extra hair is similar to the others and is inserted next to the basal seta. An individual from locality 71/110 also exhibits 3 setae, but the extra hair is small and located between the usual pair.

***Orchesellides lineatus* Mari Mutt, new species**

Fig. 42–51

Length to 2.5 mm. Background color white. Dark violet-black pigment over head and body, forming series of generally well-defined spots and bands (Fig. 46–48). Apex of Ant. 5 without papilla, with large 3-pointed pin seta (Fig. 42). Head macrochaetotaxy as in Fig. 44. Four interocular setae present, constant in position (Fig. 44). Labral papillae with somewhat stout, conelike projections (Fig. 50, 51) intermediate in shape between those of *O. viridis* (Fig. 19, 20) and *O. szeptyckii* (Fig. 36, 37). Posterior labial row to seta E with 4–7 ciliated setae. Body macrochaetotaxy and distribution of bothriotracha as in Fig. 49. Trochanteral organ with up

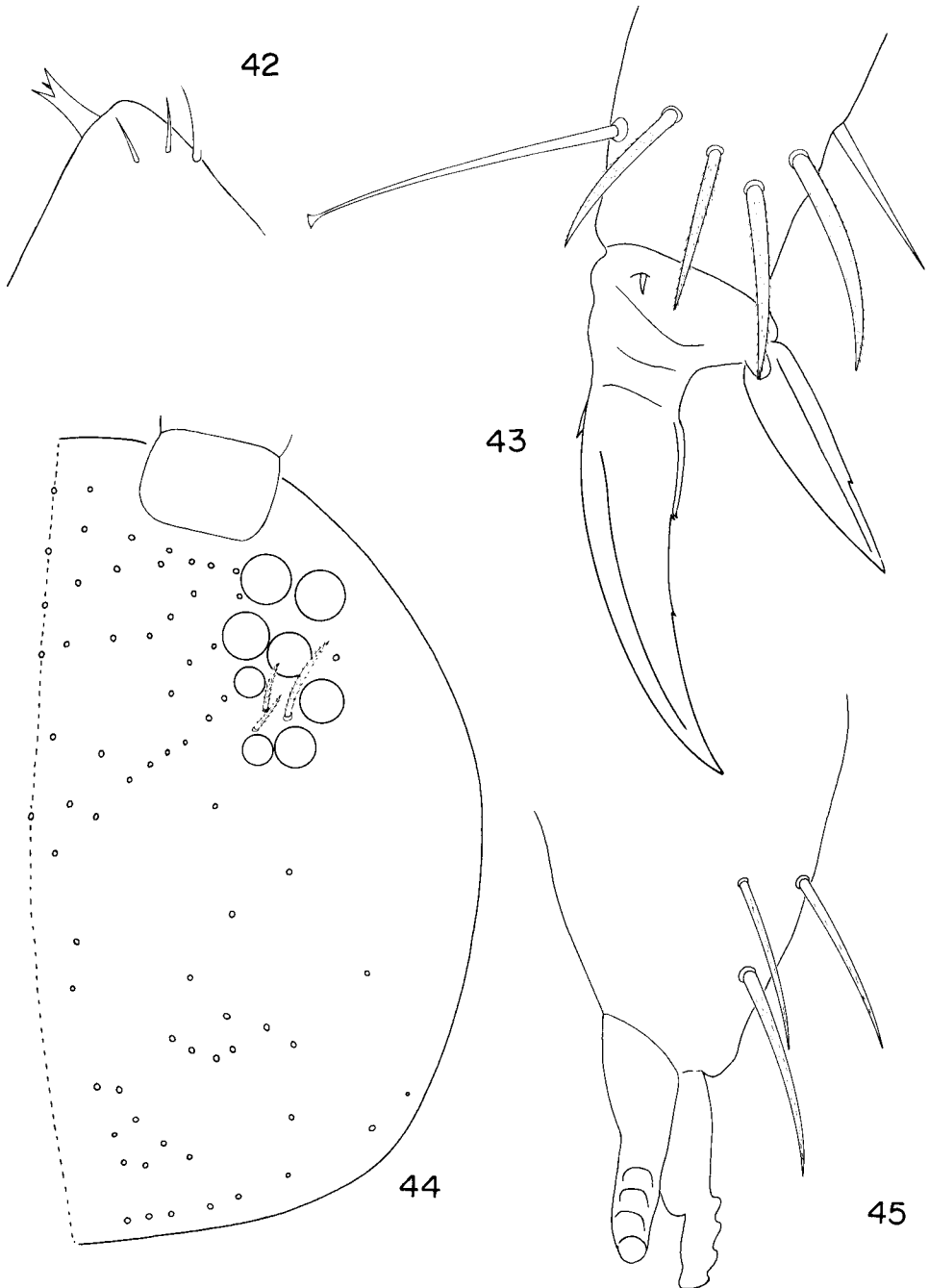


FIG. 42-45. *O. lineatus*: **42**, apex of Ant. 5 (note absence of apical papilla); **43**, metathoracic claw; **44**, head macrochaetotaxy; **45**, tenaculum.

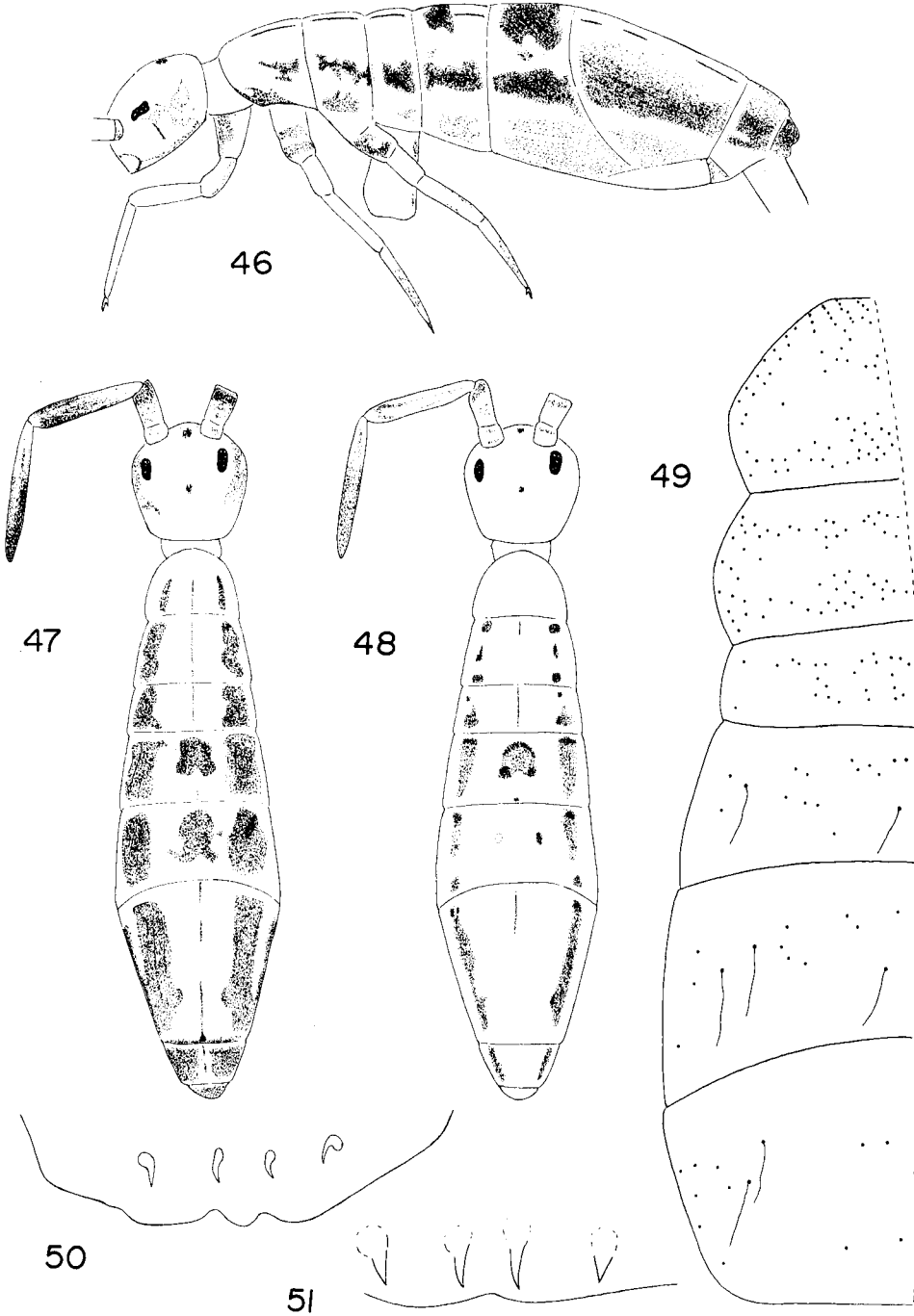


FIG. 46–51. *O. lineatus*: 46–47, habitus and distribution of dark violet-black pigment in a deeply pigmented specimen from the type-locality; 48, lightest individual from the type-locality; 49, body macrochaetotaxy; 50, labral papillae, anterior view; 51, labral papillae, ventral view.

to 27 setae. Claw morphology as in Fig. 43, inner margin of unguis with 1 unpaired tooth. Proximal pair of inner unguis teeth placed closer to base of unguis (cf. Fig. 2, 27, 43). Tenaculum (Fig. 45) with 1 or 3 setae (see Remarks).

Holotype ♂, N KOREA: Prov Hange-namdo, Sarivon Distr, bank of Hvangdžu-čhôn, nr road at Hvangdžu, 16.IX.1971, on slime under a tuft of rotting grasses, loc. 71/117. Paratypes: 6 (2♀, 1♂ mounted on slides), same data as holotype; 1, Sarivon Distr, Sinčhôn, 16.IX.1971, bank of river, under grasses on slime, loc. 71/113; 1, Prov Phjôngan-namdo, Sunan Distr, S bank of Sökam-čösudži lake, 30.V.1974, muddy sections of beach, on soil, loc. 74/53.

Remarks. The species is close to *O. szeptyckii* (see remarks under that species for differences). *O. lineatus* is also close to *O. sinensis* (Denis), whose description is too brief for a meaningful comparison. The unguis of *O. lineatus* consistently lack the 2nd inner unpaired tooth and, according to Denis' Fig. 1, *O. sinensis* lacks the median dorsal line of pigment on the body.

Orchesellides lineatus lacks a papilla on the apex of Ant. 5, but this structure is present in all the other species of the genus. Other characters (head and body pigmentation, number of inner unpaired unguis teeth, number of setae on tenaculum) also separate *O. lineatus* from the other species.

Fig. 46 and 47 detail the typical distribution of pigment. A dorsal longitudinal line extends from Th. 2 to Abd. 4, and on both sides of it the patches of pigment on each segment form 2 broad longitudinal bands. The extent of the patches varies somewhat, especially on Abd. 4, which may be almost uniformly pigmented. Fig. 48 presents the color pattern of the lightest individual from the type-locality.

One specimen has 5+7 setae along the posterior labial row, up to seta E, on the 2 sides of the head. Two specimens possess 4+4 hairs and the other exhibits 5+5 setae. Two specimens (1♂, 1♀) possess 3 setae on the tenaculum (Fig. 45), the other individuals (1♂, 1♀) from the type-locality have only the distal seta.

LITERATURE CITED

- Bonet, F.** 1930. Sur quelques Collemboles de l'Inde. *Eos* 6(3): 249-73.
- Denis, J.R.** 1929. Seconde note sur les Collemboles d'extreme Orient. *Boll. Lab. Zool. Portici* 22: 305-20.
1936. Yale North India expedition: report on Collembola. *Mem. Conn. Acad. Arts Sci.* 10: 261-82.
- Maddox, J.V., J.A. Mari Mutt & V. Brunjes.** 1982. Microsporidia from five species of entomobryid Collembola. *J. Invertebr. Pathol.* 40: 340-49.
- Mroczkowski, M.** 1972. Field investigations in the Democratic Peoples Republic of Korea by staff members of the Institute of Zoology of the Polish Academy of Sciences. *Fragm. Faun., Warszawa* 18: 313-43.
- Szeptycki, A.** 1979. Chaetotaxy of the Entomobryidae and its phylogenetical significance. Morpho-systematic studies on Collembola. IV. *Pol. Akad. Nauk, Zasl. Zool. Syst. Doswiad.* Krakow. 218 p.
- Weiser, J. & K. Purrini.** 1980. Seven new microsporidian parasites of springtails (Collembola) in the Federal Republic of Germany. *Z. Parasitenkd.* 62: 75-84.
- Yosii, R.** 1942. Japanische Entomobryinen (Ins., Collemb.). *Arch. Naturgesch. N. F.* 10: 476-95.
1966. On some Collembola of Afghanistan, India and Ceylon, collected by the Kuphe-expedition, 1960. *Results Kyoto Univ. Sc. Exped. Karakoram and Hindukush* 8: 333-405.