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Two new species of *Folsomia* (Collembola, Isotomidae) from Nepal

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ABSTRACT *F. obscuroides* and *F. riozoyoshii* spp. nov. are closest to species distributed mostly in Eastern Palearctic. The former belongs to the *sexoculata* group and mostly differs in having many setae on ventral side of manubrium and dens. The latter resembles *F. quadrioculata* and its relatives and is characterized by the number of setae on the ventral tube (3+3 laterodistally) and ventral side of manubrium (4+4 median setae).

KEY WORDS Collembola / Isotomidae / *Folsomia* / Asia

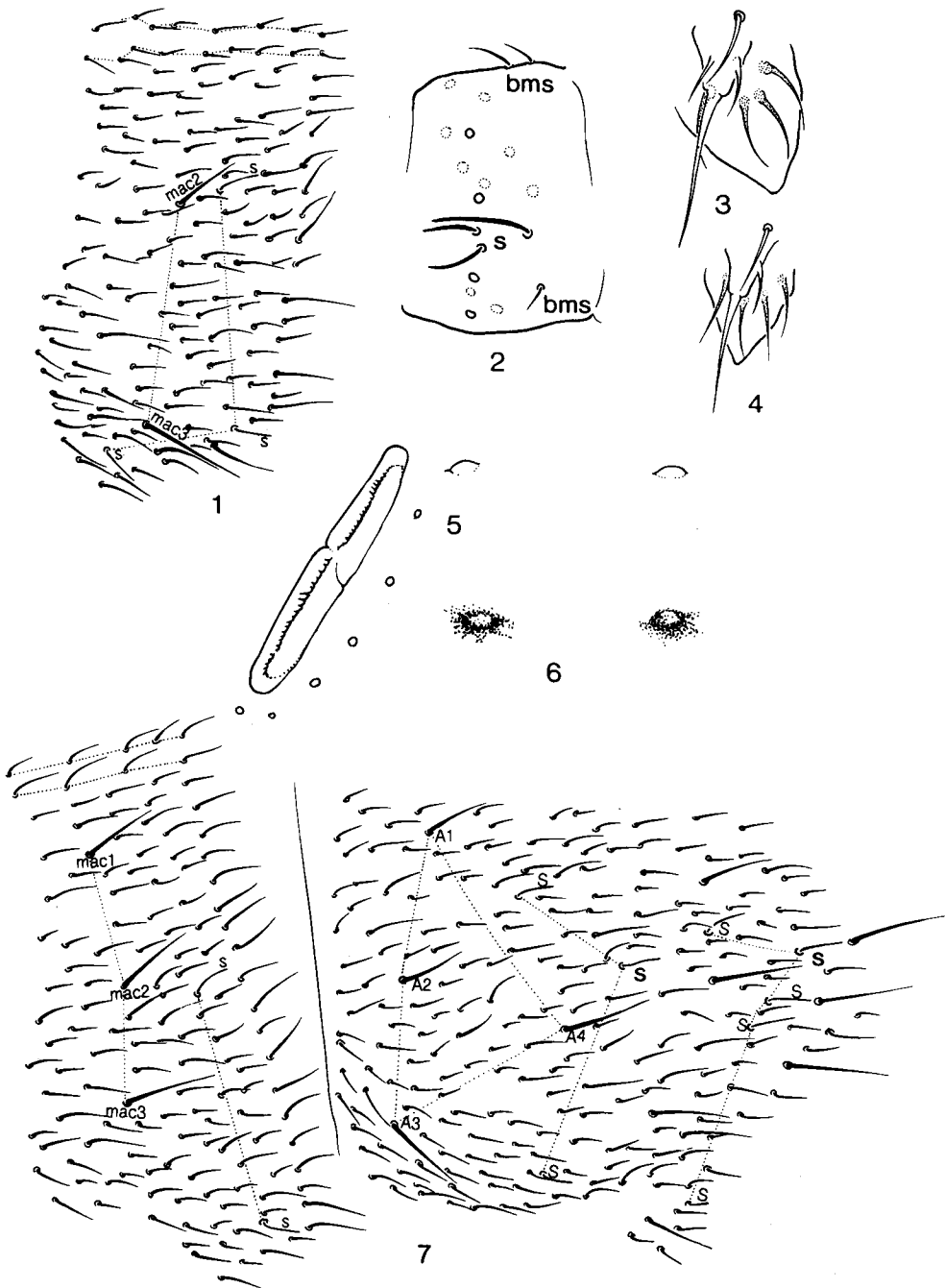
Introduction.

Folsomia is one of the richest Collembola genera of the Palearctic. Asiatic species remain poorly studied, in spite of the fact that Asia's leading taxonomist, Riozo Yoshii described six species. Some species of *Folsomia* were found in the materials collected in Nepal by researchers from University of Paul Sabatier. Two of these are described below as new to science. The type material is kept in University of Paul Sabatier (UPS) and Moscow State Pedagogical University (MSPU).

***Folsomia obscuroides* sp. nov.** Figs. 1-10.

Length 1.4 mm for the largest subadult female. Pigment absent on body excluding eyepatch (on old *Phoera* slides). 2+2 ommatidia with weak cornea, recognized mostly by pigmentation. PAO narrow, about as long as Ant.I width, with distinct constriction and inner denticles. Maxillary palp bifurcate, in one specimen trifurcate (Figs. 3, 4), outer maxillary lobe with 4 sublobal hairs. Labral formula 4/554. Ventral side of head with 4+4(5) postlabial setae. Ant. I with 3 basal ms and 3 s, Ant. II with 3 basal ms and 1 s, Ant. III with 4 common and a lateral s, with 1 ms. Ant. IV without strongly broadened sensilla. Apical organ rod-like.

Body sensilla weakly differentiated from common setae. Sensillar formula for Th. II-Abd. V: 4,3/2,2,2,3,5 (s), 1,0/1,0,0,0 (ms). On Th. II-Abd. IV medial sensilla are



Figs. 1-7. *Folsomia obscurocellata* sp. nov.: 1, Th. III; 2, Ant. I; 3, maxillary outer lobe; 4, the same, other specimen; 5, PAO and ommatidia; 6, pigmentation of ocular area; 7, chaetotaxy of Abd. III-VI. s, sensillum; bms, basal microsensillum.

situated in front of p-row, on Abd.I situated between mac1 and mac2 or just behind mac2, on Abd. II-III between mac2 and mac3. Abd. V with 4+4 nearly equal dorsal and 1+1 shorter ventral sensilla. Macrosetae 1,2/3,3,3,4 in number, short and pointed. The largest macrosetae of the last abdominal segments 2,0-2,2 times longer than mucro. Th. III with 30-35 setae in p-row. No ventral setae on thorax.

Claw with tiny lateral teeth, no inner tooth. Upper and lower subcoxa with 3 and 6-8 (leg II), 5-6 and 7-8 (leg III) setae, respectively. Retinaculum with 4+4 teeth and one seta on corpus. Ventral tube with 4+4 latero-distal and 6-8 posterior setae. Anterior furcal subcoxa with 8-11, posterior with 4 setae. Anterior side of manubrium with 8+8-10+10 setae, apically usually with 3+3 in transverse row of which one pair is the longest. Manubrium on posterior side with 4+4 latero-basal, 6+6(5+6) central, 2+2 distal, and 1+1 apical setae. Lateral sides of manubrium normally with 1+1 setae. Dens with 18-21 anterior and 6 posterior setae (3 in basal, 2 in middle part and one minute near mucro), with distinct crenulations. Mucro bidentate. Ratio manubrium : dens : mucro as 4,4-4,7:5,8-5,9:1.

Holotype: (subadult female slide). Nepal. Annapurna Massif. Taounja Range, near Deorali, labelled "Massif des Annapurna, crête du Taounja, au-dessus de Deorali, Litière de Rhododendron, froide et humide en profondeur, humus et terre profonde. Flanc Sud 3740m, 5/11/1976, leg. P. Cassagnau (Nepal 76 103)", deposited in UPS. **Paratypes:** 6 specimens from holotype sample (3 in UPS, 3 in MSPU), leg. P. Cassagnau. Known only from the type locality.

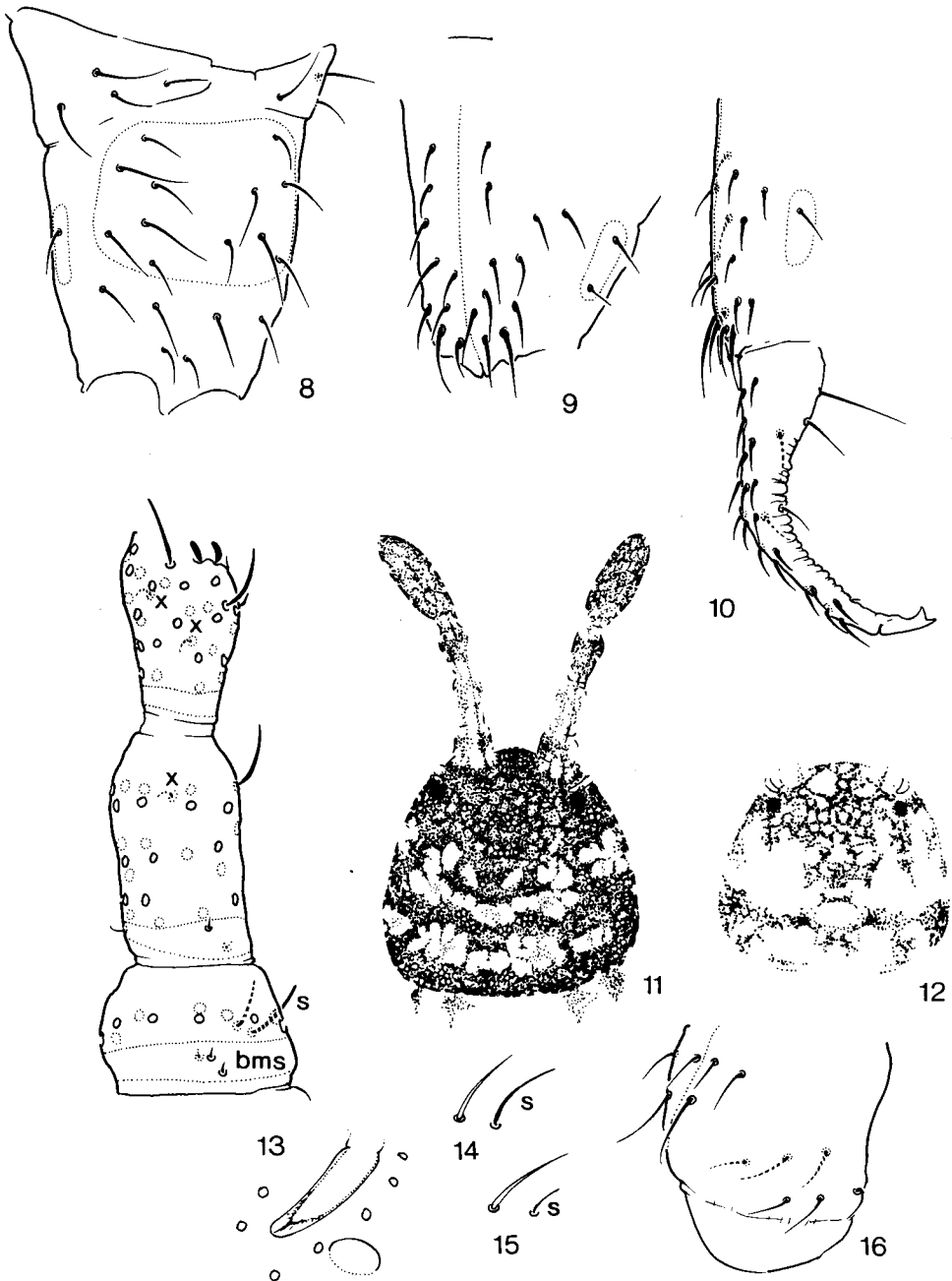
Remarks: *F. obscurocellata* sp. nov. belongs to *sexoculata* group in having specific arrangement of medial sensilla on Abd. II and III and 3 sensilla on Ant. I. Species of this group with 2+2 ommatidia, viz. *F. microchaeta* Agrell, 1939, *F. volgensis* Martynova, 1967 bear much fewer setae on anterior side of dens and manubrium.

Etymology. The corneas of ommatidia are hardly visible and can be overlooked.

***Folsomia riozoyoshiii* sp. nov.** Figs. 11-19.

Body length from 0,9 to 1,3mm, moderately plump. Pigmentation from diffuse to mottled grey, sometimes rather dark (see variability). 1+1 well pigmented ommatidia. PAO narrow, normally a little longer than Ant. I width, constriction and inner denticles usually weak (see variability). Maxillary palp bifurcate, outer maxillary lobe with 4 sublobal hairs. Labral formula 4/554. 4+4 postlabial setae. Ant. I with 3 basal ms (2 ventral and 1 dorsal) and 2 thin s. Ant. II with 3 basal ms and 1 s. Ant. III with 5 s: 4 common and a small lateral seta, without basal ms. Sensilla on Ant. IV weakly broadened. Males with special setae on Ant. II-IV (Fig. 13).

Body sensilla rather long and thin. Sensillar formula for Th. II-Abd. V: 4,3/2,2,2,3,5 (s), 1,0/1,0,0,0,0 (ms). On Th.II-Abd. III medial sensilla in front of p-row, on Abd. IV they at the level with or slightly in front of, on Abd.I-III they between macrosetae mac1 and mac2. Abd. V with 3+3 long and thin medial, 1+1 shorter and weakly broaden lateral, and 1+1 the shortest and thin ventral. Macrosetae 1,1/3,3,3,4 in number, pointed

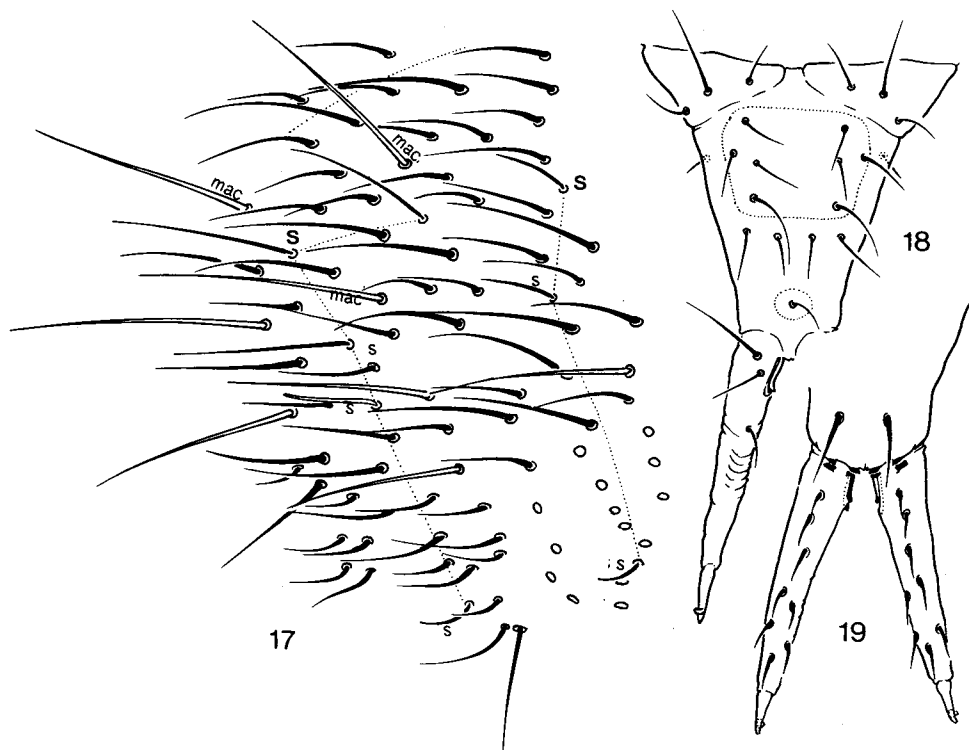


Figs. 8-16. *Folsomia obscurocellata* (8-10) and *F. riozoyoshiii* (11-16) spp. nov.: 8,9, posterior and anterior side of manubrium; 10, furca from lateral side; 11, 12, variants of pigmentation of head; 13, Ant.I-III, PAO and ommatidium, dorsally, male seta marked with x; 14, common seta and medial sensillum on Abd.I, Form A; 15, the same in form C; 16, ventral tube. s, sensillum; bms, basal microsensillum; x, "male seta".

and smooth. The largest macrosetae of the last abdominal segments 2,8-3,6 times longer than mucro. Axial setae on Th. II-Abd. III: 9-10,6-7,4(5),4(5),4(5). Th. III with 29-31 setae in p-row. No ventral setae on thorax.

Claw without teeth. Upper and lower subcoxa with 2 and 7-9 (leg II), 4-5 and 7-8 (leg III) setae, respectively. Retinaculum with 4+4 teeth and one seta. Ventral tube with 3+3 latero-distal and 6-7 posterior setae. Anterior furcal subcoxa with 3-4(5), posterior with 3 seta. Anterior side of manubrium with a pair of setae. Manubrium on posterior side with 3+3 latero-basal, 4+4 central, 2+2 distal, and an unpaired apical seta, in all with 9+9 paired and 1 unpaired setae; sides of manubrium with 1+1 setae. Dens "quadrioculata"-like, with 8 anterior and 3 posterior of which two basal ones very close to each other, posterior side with distinct crenulations. Mucro bidentate. Ratio manubrium : dens : mucro as 4.3-5.0:3.2-3.8:1.

Holotype: (female, slide). Nepal. Annapurna Massif. Taounja Range, nearby Deorali, labelled "Massif des Annapurna, crête du Taounja, au-dessus de Deorali, Litière décomposée, épaisse. Prélèvement en profondeur, vers 2860m, 6/11/1976, leg. P. Cassagnau (Nepal 76 106)", deposited in UPS. **Paratypes:** 5 specimens from holotype sample (deposited in MSPU) and 10 specimens from sample of moss and soil on the



Figs. 17-19. *Folsomia riozoyoshiii* sp. nov.: 17, chaetotaxy of posterior part of abdomen; 18, 19, posterior and anterior side of furca. s, sensillum.

ground at the same locality, leg. P. Cassagnau (Nepal 76 115), in UPS.

Remarks: The 1+1 ommatidia and "*quadrioculata*"-like anterior face of the furca of *F. riozoyoshiii* sp. nov. resembles several species found mostly in Siberia and N. Europe. Certain of them resemble the *taimyrica* group in having 4+4 laterodistal setae on ventral tube and 4+4-6+6 central setae on posterior face of the manubrium, the other members of the group are similar to the *quadrioculata* group in having 3+3 and 2+2 setae, respectively. *F. riozoyoshiii* shares characters with the both groups because of 3+3 setae on ventral tube and 4+4 setae on the manubrium. It is most similar to three forms whose descriptions are in press (see Table 1)

Table 1. Diagnostic features of the species which formally belong to "*Folsomia diplophthalma*" in traditional understanding

Characters	Folsomia species			
	sp. 1 ^a	sp. 2 ^b	sp. 3 ^a	riozoyoshiii
PAO/Ant. I width	1,6-1,9	1,0-1,2	1,0	1,1
basal ms on Ant. III	-	-	+	-
ms on Th. III	+	-	-	-
upper coxa of leg. II	3(2-4)	1	3-4	2
Latero-distal setae on ventral tube	3+3	3+3	4+4	3+3
anterior furcal subcoxa	5(4-6)	3	9-11	3-4(5)
anterior setae on dens	8	7	8	8
central setae on posterior side of manubrium	2+2	2+2	4+4	4+4
apical setae on posterior side of manubrium	1+1	1+1	1+1	1
Distribution	Mongolia, S & W Siberia, N European Part of Russia	Far East, Siberia, N Europe	Mongolia, S Siberia	Nepal

^a Potapov & Dunger (in press)

^b Potapov & Babenko (in press)

In the system of Grow & Christiansen (1976) *F. riozoyoshiii* has arrangement of sensilla on Th. II-Abd. III of type 2 and chaetotaxy of Ant. I of pattern A.

There is little doubt that this is the form described by Yosii (1966) from Nepal under the name *F. diplophthalma* Axelson, wherein he showed 3+3 lateral setae on the ventral tube and 4+4 medial setae on the posterior face of the manubrium. While *F. riozoyoshiii* fits older redescriptions of Axelson's species, Potapov & Dunger (in press) show that *F. diplophthalma* is similar to *F. similis* and not similar to species of the *F. quadrioculata* group.

Variability: The commonest form of *F. riozoyoshiii* (Form A) has dark pigmentation, weakly constricted middle-sized PAO and long sensillae on the body. Two other forms were found in our material from Nepal.

Form B has longer (about 1.5 as long as Ant. I is wide) and more constricted PAO and a paler coloration (Fig. 12). Form A, however, has variable PAO and body coloration resulting in an intergradation between the forms. Form B is found at high altitudes (2920-3070m.) in Central and Eastern Nepal (Massif Gosainkund and Jaljale Himal

Range, respectively).

Form C is characterized by having body sensilla half as long as normal setae (Fig. 15). Specimens with sensilla only slightly shorter than normal setae are found in form A. Form C is found only in alpine meadows and steppes at very high altitude (4000-4200 m), Massif Annapurna (Thorong Pass and Jargeng Khola Valley). In two samples from Jaljale Himal Range (Eastern Nepal, 2920 and 2950m.); another, probably, undescribed species, was found together with *F. riozoyoshiii*. It differs in lacking ommatidia and having much paler coloration.

Etymology: Named after Riozo Yoshii who was the first to deal with this species.

Distribution and ecology. Nepal. Massif Annapurna (Taounja Range, S Machhapuchhare Range, road Pisang-Chame), Massif Gosainkund (to the north of Kathmandu), Kathmandu Valley (Royal Forest in Gokarna), Jaljale Himal Range (to the north of Dhankuta). The records of specimens with uncommon characters are given above. The species mostly inhabits litter, soil and mosses under *Rhododendron* and coniferous trees, rarely grasslands, at rather high altitudes (from 2860 to 3300m.), a few records came from lower areas (with the lowest of 1430m) in oak and other deciduous litter.

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