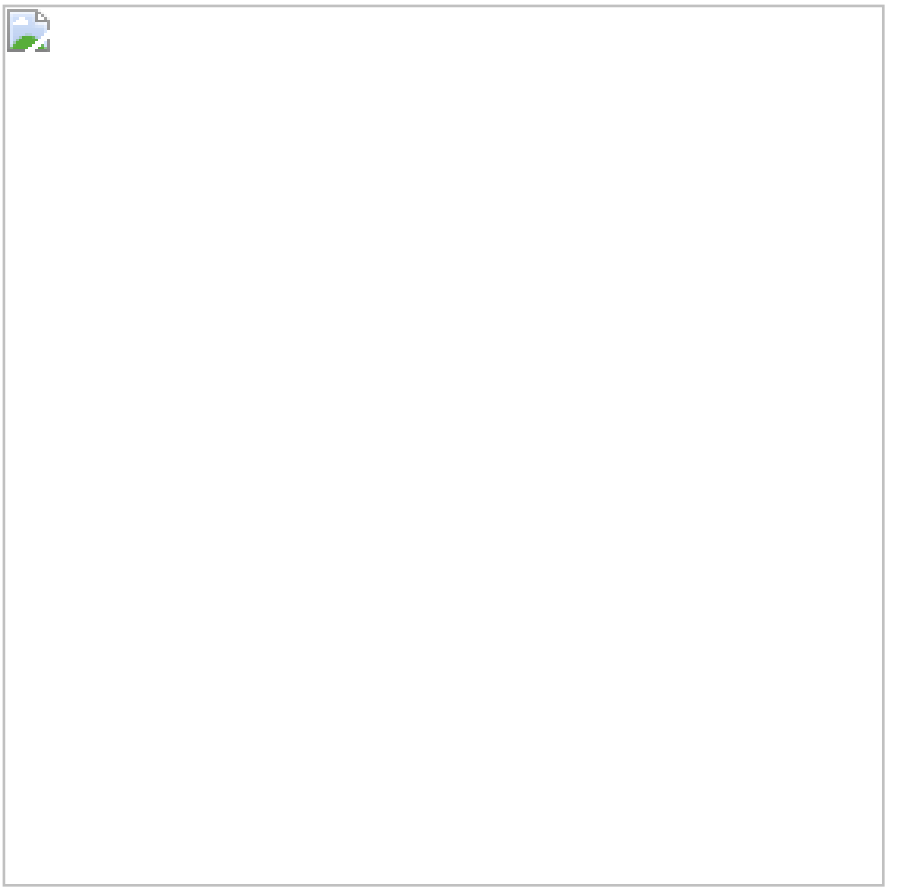

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SINGULAR FAUNA OF ENTOMOBRYIDAE (COLLEMBOLA) FROM "LAND OF PASSES" IN THE HIMALAYAS, INDIA

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ABSTRACT

The present study of collembolan fauna is based on collections made during Aug-Sep 2008 from Ladakh district of Jammu and Kashmir, India, as a part of the "Cold Desert Expedition" of Zoological Survey of India. Ladakh, which means "land of many passes", is in northwestern India, bordering on China (Xinjiang and Tibet), and on its northwest it borders on Pakistan. The collembolans were collected from different parts of Ladakh district. The collections were mainly made through aspirators from leaf litter, mosses, under stones, a flower garden, agricultural fields, an embankment of a river, wetland and sand dunes. For the genera *Corynothrix* and *Himalanura*, an artic-alpine disjunction was found. *Lepidocyrtus* (*Allocyrtus*) *lepidornatus* was referred for a third time after 2 previous references from Philippines and Borneo. Seven new species belonging to Entomobryidae family are described: *Entomobrya diskitensis* **sp. nov.**, *E. ladakhi* **sp. nov.**, *E. choudhurii* **sp. nov.**, *E. mehtai* **sp. nov.**, *Himalanura baijali* **sp. nov.**, *Seira nidarensis* **sp. nov.** and *S. hazrai* **sp. nov.**

Key Words: Ladakh, chaetotaxy, *Entomobrya diskitensis* **sp. nov.**, *E. ladakhi* **sp. nov.**, *E. choudhurii* **sp. nov.**, *E. mehtai* **sp. nov.**, *Himalanura baijali* **sp. nov.**, *Seira nidarensis* **sp. nov.** and *S. hazrai* **sp. nov.**

RESUMEN

El presente studio de fauna de colémbolos está basado en la recolección hecha a lo largo de los meses de agosto y septiembre de 2008, en Ladakh, distrito de Jammu y Kashmi, India. Este muestreo es parte de la "Cold Desert Expedition" del Zoological Survey de India. Ladakh significa "Tierra de muchos pasos", y está localizado en la parte noroccidental de la India, haciendo frontera con China (Tibet), y su parte más occidental hace frontera con Pakistán. Los colémbolos fueron recolectados en diferentes partes del distrito de Ladakh. El muestreo se realizó por medio de aspirador en el mantillo, musgos, bajo piedras, jardines, campos agrícolas, orilla del río, zonas húmedas y dunas de arena. Para los géneros *Corynothrix* e *Himalanura* se ha encontrado una disjunción árticoalpina. *Lepidocyrtus* (*Allocyrtus*) *lepidornatus* ha sido encontrado por tercera vez, después de dos referencias previas de Filipinas y Borneo. Se describen siete nuevas especies de la familia Entomobryidae : *Entomobrya diskitensis* **sp. nov.**, *E. ladakhi* **sp. nov.**, *E. choudhurii* **sp. nov.**, *E. mehtai* **sp. nov.**, *Himalanura baijali* **sp. nov.**, *Seira nidarensis* **sp. nov.** and *S. hazrai* **sp. nov.**

Palabras Clave: Ladakh, quetotaxia, *Entomobrya diskitensis* **sp. nov.**, *E. ladakhi* **sp. nov.**, *E. choudhurii* **sp. nov.**, *E. mehtai* **sp. nov.**, *Himalanura baijali* **sp. nov.**, *Seira nidarensis* **sp. nov.** and *S. hazrai* **sp. nov.**

The Collembola of North West Himalaya have been extensively studied by Baijal (1955a, 1955b, 1958) who described 19 species of Indian Collembola, based on Prof. M.S. Mani's Entomological Expedition to the North West Himalaya of 1954-56. Twelve species among these were from the Nival zone of N.W. Himalaya, under Lahaul Spiti. Baijal described 7 species of *Entomobrya*, and also erected one new genus (*Himalanura*). Denis (1936) described 6 species of Collembola including family Isotomidae and Entomobryidae from North West Himalaya, based on collection made by the Yale North India-Expedition. In the present paper, collembolan fauna is based on extensive collection made during Aug-Sep 2008 at Sakti, Darbuk, Tso Gul Tso wet land, Pangong Tso Lake, Chusul, Nyoma, Nider, Chumathang, Diskit, Hunder and Gangltak areas of Ladakh district of Jammu and Kashmir, India, as a part of the "Cold Desert Expedition" of the Zoological Survey of India.

The combined use of color and macrochaetotaxy allowed the identification the species and provided useful descriptions for subsequent identification of the species. The set of characters proposed by Jordana & Baquero (2005), based on a constant and generally visible set of morphological characters (Christiansen 1958; Christiansen & Bellinger 1980), including the dorsal macrochaetotaxy, proved very useful for the identification of species within the genus *Entomobrya* (Baquero et al. 2010; Jordana & Baquero 2010a; Jordana & Baquero 2010b, Jordana 2012).

Abbreviations: Abd = abdominal segment, Ant = antennal segment, m = mesochaeta, Mc = macrochaeta, MZNA = Museum of Zoology, University of Navarra, psp = pseudopore, Th = thoracic segment, ZSI = Zoological Survey of India, (Kolkata).

Materials and Methods

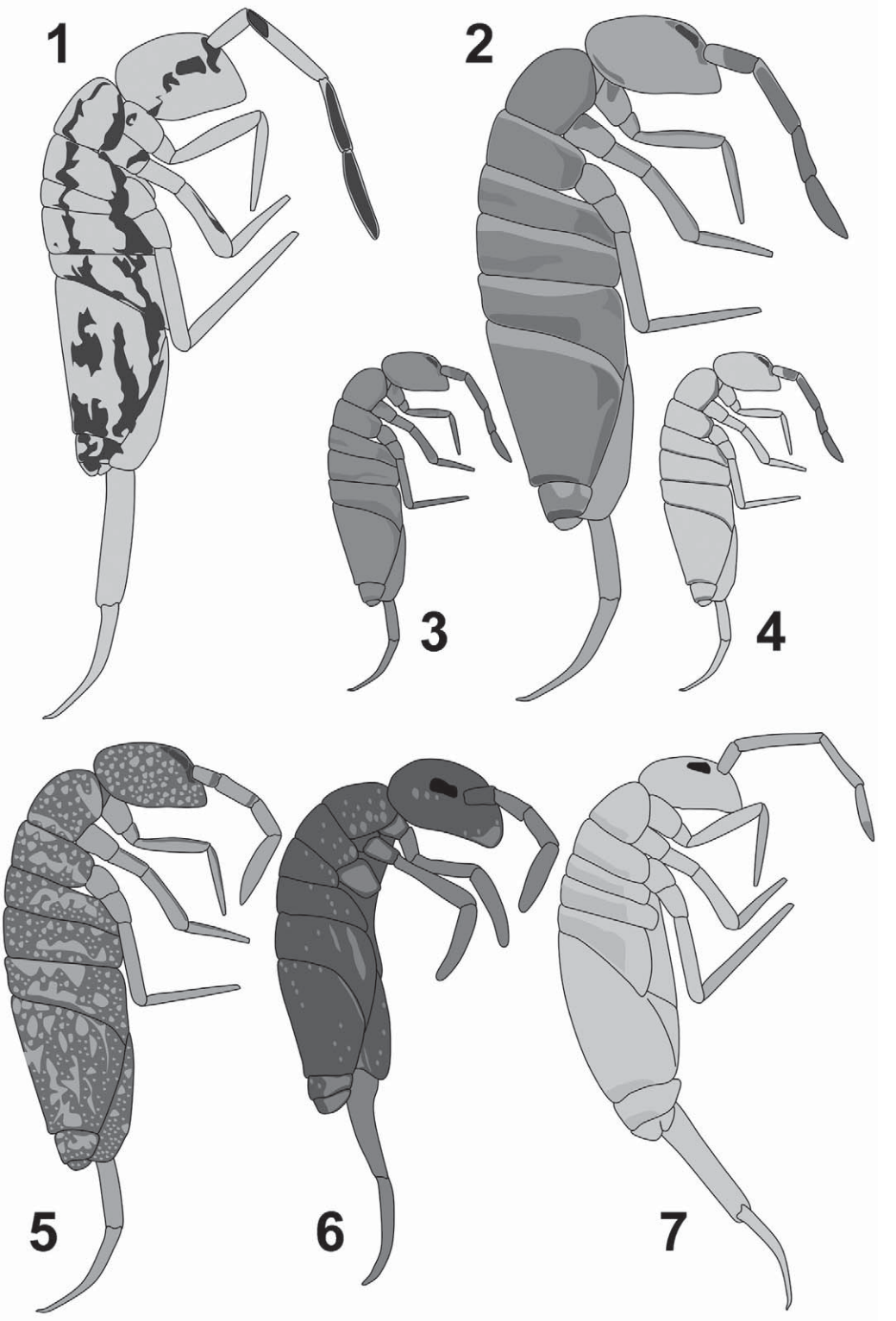
The Sampling Area

Ladakh is the loftiest, largest and remotest district of Jammu and Kashmir state in the Indian Republic, often referred as "Land of Passes". Located north of the main Great Himalayan range between 75° 50´ E to 80° E and 32° 30´ N, Ladakh is one of the most elevated inhabited regions of the earth (2900 to 5900 m). The greatest extent is from northwest to southwest, being about 360 km and the widest distance is 335 km from Karakoram Pass in the north to Rohtang Pass in the south. Ladakh lies on the rain shadow side of the Himalayan range, where dry monsoon winds reach the city of Leh after being robbed of their moisture over the plains and the Himalaya mountains. The district combines the conditions of both arctic and desert climates, and therefore Ladakh is often considered as a "Cold Desert". Ladakh suffers wide diurnal and seasonal fluctuations in temperature with extremes of -40 °C in winter and + 35 °C in summer. Precipitation are very limited with annual precipitation of 10 cm mainly in the form of snow. The air is very dry and the relative humidity ranges from 6-24%. Runoff water comes from glaciar snowmelt. The summer days are hot with brilliant blue skies (max 25 °C, min 10 °C). During winter, days are sunny and warm (max -6 °C, min -15 °C). Ladakh constitutes the bulk of the Trans-Himalayas, one of the 10 main bio-geographic regions in the country, and distinguished by highly evolved life forms. Situated at the confluence of 2 of the World Major Bio-Geographical Realms, the Palaearctic to the North and the Oriental to the South, and despite extreme climatic condition, Ladakh is endowed with a very diverse fauna and flora.

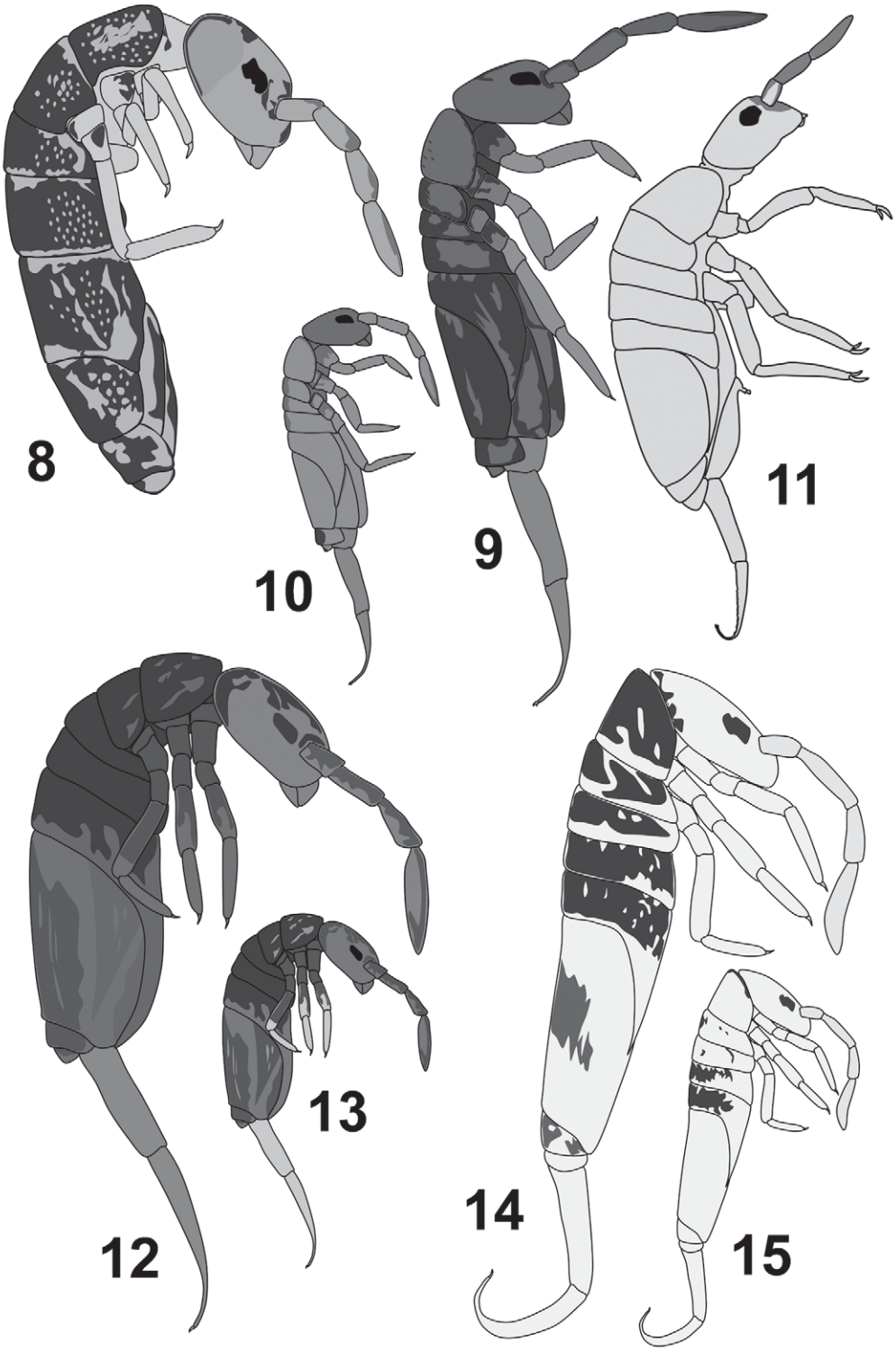
Sampling and Laboratory Work

The "Cold Desert Expedition" of the Zoological Survey of India was led by late Dr. H. S. Mehta, Addl. Director and Co-ordinator of this project. The collembolans were collected from different parts of Ladakh district using mouth operated aspirators under the leadership of Dr. A. K. Sanyal, ex Addl. Director, mainly from leaf litter, moss, under stones, a flowering garden, agricultural fields, a river embankment, wetland and sand dunes. The specimens were received for identification as a loan in the Department of Environmental Biology of the University of Navarra from ZSI in ethyl alcohol, in small vials without air bubbles to prevent the rupture of the specimens. Some specimens were mounted in Hoyer's medium, previously cleared with Nesbitt's solution. Observation of the slides was done by an Olympus BX51TF microscope with a multi- viewing system and phase contrast, and a Zeiss Axio Imager.A1 by differential interference contrast (DIC). For measurements, a UDA drawing attachment UIS (Universal Infinity System) and a scale calibrated with a Graticules Ltd slide (1 mm/0.01 div) were used.

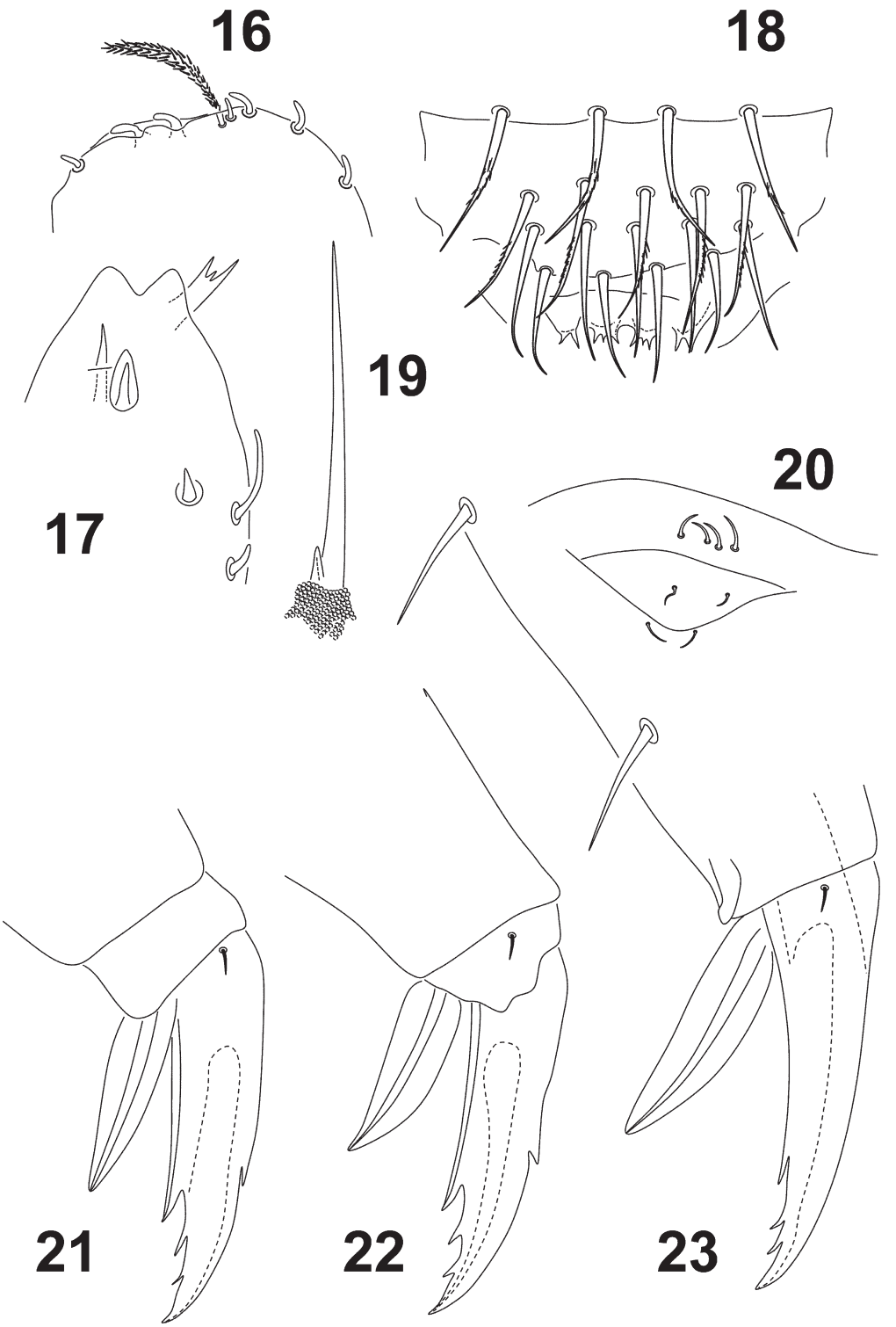
Samples, all collected by G. P. Mandal: **Stn. 01**, Circuit House complex, Karzoo, Leh, Ladakh, Jammu and Kashmir, India, 09.ix.2008, altitude: 3,625 m (11,896 ft.), co-ordinates, Lat: 34° 10' 12.36" N, Long: 77° 35' 8.16" E, habitat: under grass and leaf litter of a flowering garden; **Stn. 07**, Tsogul Tso wetland, Chusul, Ladakh, Jammu and Kashmir, India, 7.ix.2008, altitude: 4,395 m (14,421 ft.), co-ordinates, Lat: 33° 10' N and Long: 77° 55' E, habitat: under stone and litter; **Stn. 08**, Chusul village, Ladakh, Jammu and Kashmir, India, 7.ix.2008, altitude: 4,404 m (14,450 ft.), habitat: leaf Litter; **Stn. 09**, Pong Tso Lake, Ladakh, Jammu and Kashmir, India, 7.ix.2008, Pangong Tso ("long, narrow, enchanted lake"), also referred to as Pangong Lake, is an endorheic (closed drainage) lake in the Himalayas situated at a height of about 4,350 m (14,270 ft). It is 134 km (83 mi) long and extends from India to Tibet. Sixty percent of the length of the lake lies in China. The lake is 5 km (3.1 mi) wide at its broadest point. All together it covers 604 km. During winter the lake freezes completely, despite being saline water, altitude: 4,350 m (14,270 ft), Lat: 33° 43' 4.59" N and Long: 78° 53' 48.48" E, habitat: under stone; **Stn. 12**, Nidar village, Ladakh, Jammu and Kashmir, India, 8.ix.2008, altitude: 4,207 m (13,805 ft.), habitat: leaf litter; **Stn. 13**, Nyoma Forest, Ladakh, Jammu and Kashmir, India, Jammu and Kashmir, India, 9.ix.2008, Alt: 4,182 m (13,721 ft.), co-ordinates, Lat: 33° 12' 33.16" N, Long: 78° 38' 46.96" E, habitat: leaf litter; **Stn. 15**, Chumathang, bank of Indus, Ladakh, Jammu and Kashmir, India, 11.ix.2008, Alt: 3,438 m (11,280 ft), habitat: under stone; **Stn. 17**, Ganglatok Village, Diskit, Ladakh, Jammu and Kashmir, India, 14.ix.2008, altitude: 3,365 m (12,360 ft.), co-ordinates, Lat: 34° 36' 0" N, Long: 77° 42' 0" E, habitat: leaf litter of agricultural products



Figs. 1-7. Color patterns of the species considered in this paper. (1) *Entomobrya diskitensis* **sp. nov.**; (2-4) *Entomobrya ladakhi* **sp. nov.**; (5-6) *Entomobrya choudhurii* **sp. nov.**; (7) *Entomobrya mehtai* **sp. nov.**



Figs. 8-15. Color pattern of the species considered in this paper: *Corynothrix borealis*. (9-10) *Himalanura baijali* **sp. nov.**; (11) *Lepidocyrtus* (*Allocyrtus*) *lepidornatus*; (12-13), *Seira nidarensis* **sp. nov.**; (14-15) *Seira hazrai* **sp. nov.**



Figs. 16-23. *Corynothrix borealis*. (16) Tip of Ant III, showing the special chaetae or sensillae; (17) Tip of Ant IV; (18) Labrum, showing prelabral and labral chaetae, and labral papillae; (19) Terminal chaeta of labial papilla E; (20) Female genital plate; (21) Claw of foreleg; (22) Claw of medial leg; (23) Claw of hind leg.

(wheat, barley); **Stn. 22**, Chakmalsar village, Ladakh, Jammu and Kashmir, India, 16.ix.2008.

RESULTS

Superfamily Entomobryoidea Womersley, 1934, sensu Soto-Adames et al., 2008

Family Entomobryidae Schäffer, 1896

Subfamily Orchesellinae Börner, 1906, sensu Szeptycki, 1979

CORYNOTHRIX BOREALIS TULLBERG, 1877 (Figs. 8, 16-27)

Material Observed

INDIA, Jammu and Kashmir, Ladakh, Pong Tso Lake (**Stn. 09**), 7.ix.2008 (Mandal) (ZSI/H14/887, 1 female in slide, and ZSI/H14/888, in ethyl alcohol, ZSI) (see more data about localities in Material and Methods).

Description

Pigmentation. The typical color pattern (Fig. 8) consists of a light olive-green background with black pigment on the eye patches, dark blue around the bases of the antennae, and on the dorsum of the head as a V-shaped spot; the antennae are whitish and only with scattered pigment; Th II to Abd V dark pigmented dorsally with white scattered spots; some areas are lighter: dorsolateral on Th II, lateral on Abd III-IV; legs and furcula whitish.

Head. Ant I with 4 small basal chaetae. Ant III sensory organ (Fig. 16), with the principal sensory chaetae enclosed in the membrane-skin. Ant IV with a horseshoe-shaped tip (it is not a real papilla), with a special trifurcate chaeta beside it, a pointed and straight chaeta next to the tip, and a small and more rounded "pit" beside the last (Fig. 17). Labrum with 4/554 chaetae (Fig. 18); prelabral chaetae and first labral row ciliated on its half distal; second and third labral row smooth; labral papillae with 2 (external) and 3 (internal) long projections. Terminal differentiated chaeta on external papilla E with a spinelet on its basis (Fig. 19). Labial chaetotaxy. The posterior labial row is asymmetric in the studied specimen: in one side have the typical number (M_1, M_2, R, E, L_1 and L_2), all ciliated, M_2 and R smaller than the other; the other side is apparently duplicated for the chaetae M_1, M_2 and E. The labial triangle has only 3 chaetae: the closer to the row is ciliated and the other 2 apparently smooth.

Body. Female genital plate (Fig. 20). Legs. Trochanteral organ with 7-8 chaetae. Tibiotarsus L3 with 2 smooth and short chaetae, one of them placed immediately opposite the tenent hair and the other is located in the same row but more basal. Unguiculus lanceolate, with external lamella smooth. Claw (all legs) with 3 unpaired teeth on inner edge: the 2 internal lamelles converge in the first unpaired tooth; dorsal tooth at level of first unpaired tooth (Figs. 21-23). Tenaculum with 4 teeth and 2 chaetae.

Body chaetotaxy. It is possible to establish a similarity between the chaetotaxy of *Corynothrix* and *Entomobrya*, and propose at least a partial dorsal macrochaetotaxy formula for this species: 4(5)-2-0-2-2/6(7)-5(6)/3-4/1-2-3/- (Abd IV not applicable). For some chaetae it is complicated to decide meso- or macrochaetae (Figs. 24-30). The distribution of macrochaetae and tricobothria on the body segments follow the setal patterns for other genera of the family. As described by Mari-Mutt (1984) macrochaetae and other setae range considerably in length and in socket diameter. The cephalic tricobothria are absent. The distribution of tricobothria on Abd II-III is similar to that of other entomobryids, but Mari-Mutt (1984) state that the tricobothria of *C. borealis* has the usual 2 tricobothria in a unique position, instead of being located one below the other (Szeptycki, 1979), one is placed towards the outer margin of the segment and inserted higher than the inner hair. In our specimen has been imposible to determine the position of the second trichobothrium because the absence of the chaetae and the similarity of the sockets.

Biology.

In Ladakh, under stone (**Stn. 15**).

Remarks

Originally described by Tullberg from Nova Zembla (1877), subsequently has been found in many other locations, usually at high latitudes (Polar Regions): Wrangel Island in Russia, Northwest Territories of Canada, Prudhoe Bay in Alaska (USA), and further south in Kyrgyzstan, and Rocky Mountain National Forest in Colorado (USA) (Mari-Mutt 1984), with a clear Arctic-Alpine disjunction with exception of the reference from Lake Baykal, Listvianka Village. With the discovery of our specimen in the area of the Himalayas, this disjunctive distribution is confirmed in the area of Asia. No significant differences have been found between our specimen and described ones by previous authors. The coloration and morphological characters are similar. Doubt raised by Mari-Mutt in 1984 about the position of the Abd IV tricobothria remains, as in our specimen the chaetae are absent, so it is impossible to identify with certainty the position for the tricobothria, at the same level or one in front of the other, as is habitual in the other genera of the family.

Subfamily Entomobryinae Schäffer, 1896, sensu Szeptycki, 1979

ENTOMOBRYA DISKITENSIS BAQUERO & JORDANA **SP. NOV.**
(Figs. 1, 31-37)

Type Material

HOLOTYPE male INDIA: Jammu and Kashmir, Ladakh, Diskit, Ganglatok Village (**Stn. 17**), 14-IX-2008 (Mandal) (ZSI/H14/845, slide, ZSI). PARATYPES, same data as Holotype (Mandal) (ZSI/H14/846, female, slide, MZNA; ZSI/H14/847-848, in ethyl alcohol, ZSI).

Additional material, INDIA, Jammu and Kashmir, Ladakh, Chakmalsar village (**Stn. 22**), 16-IX-2008 (Mandal) (ZSI/H14/873-875, in ethyl alcohol, ZSI; ZSI/H14/871-872, in ethyl alcohol, MZNA).

Description

Body length up to 2.6 mm excluding antennae (Holotype). Ground color yellowish very pale, with longitudinal dorsolateral and lateral violet-blue irregular lines, and some patches on Abd IV; basal Ant II blue pigmented; Ant III and IV almost totally pigmented (Fig. 1).

Head. Eight eyes, GH smaller than EF, ⅓ than AB (Fig. 32). Antennae length 1 180 µm (Paratype on slide), 2.36 times the length of the head. Ant IV with a slightly bilobed apical vesicle. Relative length of Ant I/II/III/IV = 1/2.69/2.54/2.85 (Paratype on slide). Central prelabral chaetae slightly ciliated, external ones smooth. Labral papillae wrinkled, with 2-4 small projections (Fig. 33). Labial chaetae all ciliated, only with one M, and r smaller than others.

Body. Length ratio of Abd IV/III = 4.4-4.6 (n = 2). Trochanteral organ with 20-25 chaetae. Tibiotarsus sub-segmented, without differentiated chaetae, with exception of the presence of the smooth terminal chaetae on legs III, characteristic for the genus. Claws with 4 teeth: paired at 60% and first unpaired at 75% from basis; lateral teeth slightly before the level of paired (50% from basis), and dorsal indistinguishable (Fig. 31). Unguiculus lanceolate, with external and internal lamella smooth. Tenent hair clavate. Length of manubrium and dentes 540-600 and 650 µm respectively (n = 2). Manubrial plate with 8-10 chaetae and 2 pseudopores. Mucro with teeth similar in size, and with mucronal spine reaching the tip of subapical tooth.

Macrochaetotaxy. Simplified Mc formula (following Jordana & Baquero 2005): 3(5)-1-1-2-2/0-2/1-6/1-2-1/3-4-4(5)-2-2.

Head chaetotaxy (Fig. 34); there is and additional mesochaetae in H1 in one specimen. Thorax chaetotaxy: T1 without Mc; T2 area on Th II with 2 Mc (a_5 and m_5) (Fig. 35). Abdomen chaetotaxy (Figs. 36 and 37): A1 area on Abd II with 1 Mc (a_2) and A2 area on Abd II with 6 Mc (m_3, m_{3ep}, m_{3ei}, m_{3e}, m_{3ea} and m_{3eai2}); Abd III with 1 Mc on areas A3 (a_1) and A5 (m_3) and 2 on A5 (a_2 and a_3); trichobothrium on m_5 very small, while the located on a_5 is very big; Abd IV macrochaetotaxy (Fig. 37).

Biology

In Ladakh, found in leaf litter of agricultural products in one of the localities (**Stn. 17** and **Stn. 22**).

Remarks

There are few species with 4 longitudinal pigmented bands, and interestingly they are described in some areas near the Himalayas: *E. handschini* Stach, 1922 (Central and South Europe and Iran) (Baquero et al. 2008), *E. indica* (Baijal 1955) (Tibet), *E. longisticta* Baijal, 1958 (Himalaya, India), *E. chooyuae* Yosii, 1971 (Himalaya, Nepal), *E. fjellbergi* Jordana & Baquero, 2008 (Tibet) and *E. mieheorum* Jordana & Baquero, 2008 (Tibet). Although the coloration may be used for the discrimination of species, some morphological characters and dorsal macrochaetotaxyare very useful too. *E. indica* has only 3 teeth on the claw, so that it can be ruled out although its dorsal macrochaetotaxyis unknown. *E. chooyuae* is the only one with the outer lamella of unguiculus serrated. *E. mieheorum* has the simple apical vesicle, while the rest have bi-lobed or three-lobed (*E. handschini*). In the Table 1 the most useful characters for the separation of these species are included.

Etymology

The new species is named after the type locality.

ENTOMOBRYA LADAKHI BAQUERO & JORDANA **SP. NOV**.
(Figs. 2-4, 38-44)

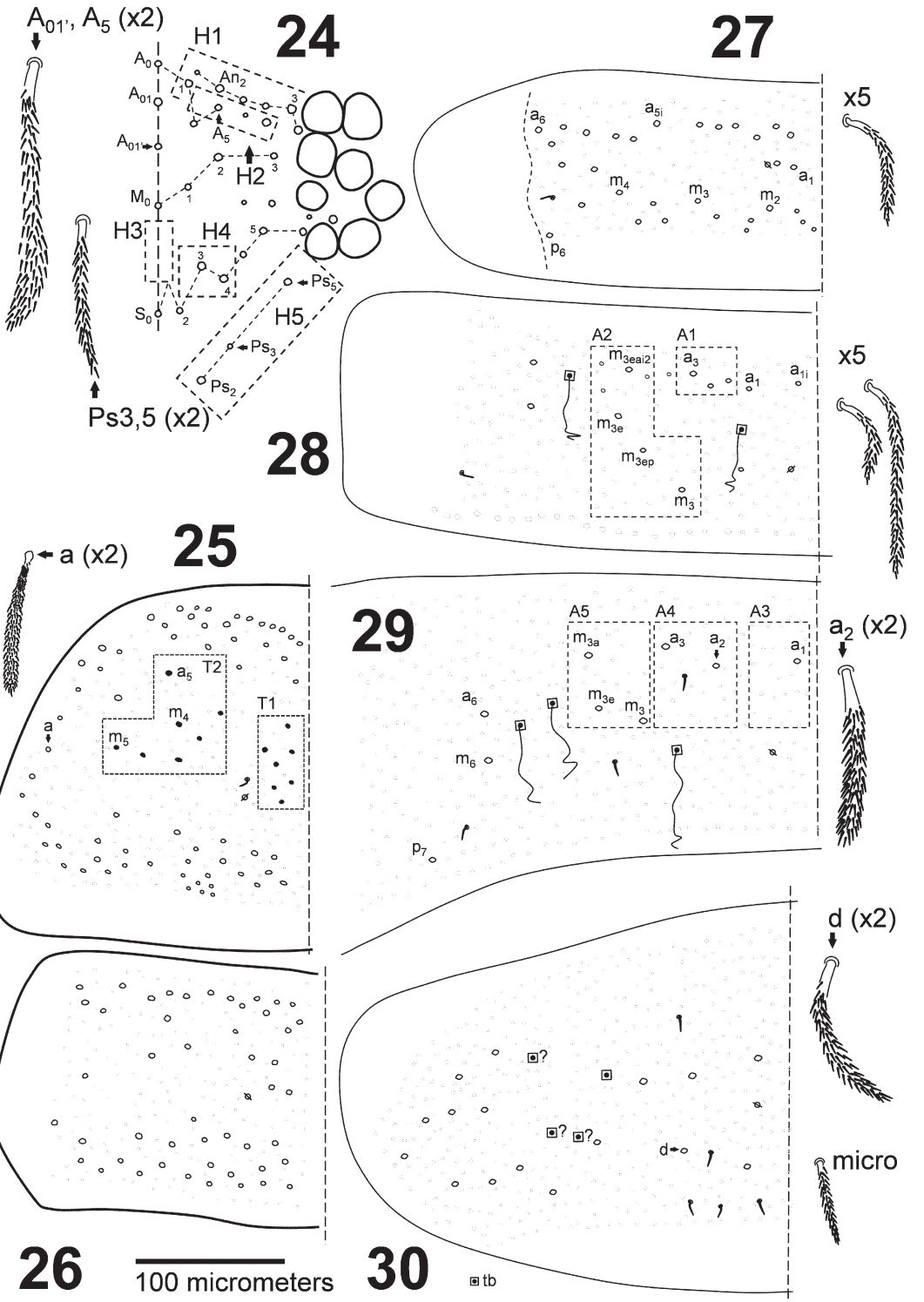
Type Material

HOLOTYPE male INDIA: Jammu and Kashmir, Ladakh, Nyoma Forest (**Stn. 13**), 9.ix.2008, slide, code ZSI/H14/849 (Mandal) (ZSI). PARATYPES, same data as Holotype (Mandal) (ZSI/H14/851-852 in ethyl alcohol, ZSI) (ZSI/H14/850 in ethyl alcohol, MZNA); INDIA, Jammu and Kashmir, Ladakh, Leh, Karzoo, Circuit House complex (**Stn. 01**), 9.ix.2008 (Mandal) (ZSI/H14/853-854, females, in slide, MZNA) (ZSI/H14/855-856, in ethyl alcohol, ZSI); INDIA, Jammu and Kashmir, Ladakh, Chusul, Tsogul Tso wetland (**Stn. 07**),

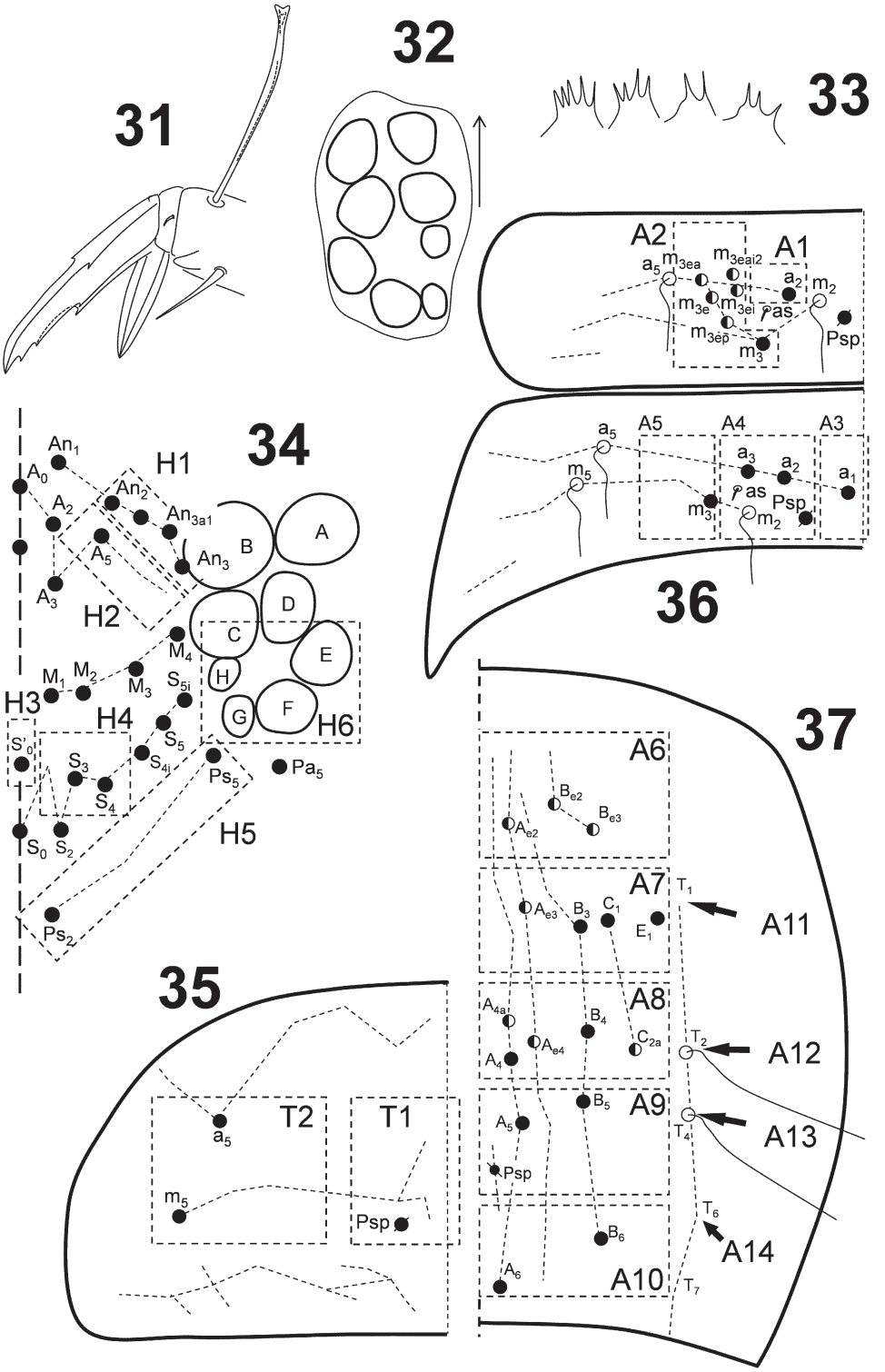
TABLE 1. MACROCHAETOTAXY AND SOME OTHER CHARACTERS FOR THE SPECIES OF *ENTOMOBRYA* THAT SHARE A PATTERN OF COLORATION (FOUR LONGITUDINAL PIGMENTED BANDS) WITH THE SPECIES *E. DISKITENSIS* JORDANA & BAQUERO **SP. NOV.**

Species/Ch	1	2	3	4	5	6	8	11	12	14	17	18	19	20	21	22	23	25	27	29	30	D
E. chooyuae	5	1	0	3*	2	3	3	—	—	4	2*	2*	4*	0*	2	2*	—	—	—	—	—	6
E. fjellbergi	5	1	0*	2	1*	3	3	0	1*	4	1	2*	3*	0*	2	2*	1*	2*	3*	2	2	10
E. handschini	3	1	0*	3*	2	4*	4*	4*	5-6*	4	1	2*	5*	0*	2	2*	0*	3-4	3-4	3*	2	12
E. indica	—	—	—	—	—	—	—	—	—	3*	1	—	—	—	—	—	—	—	—	—	—	1
E. longisticta	4	1	1	2	2	3	3	—	—	4	1	2*	5*	1	2	1	0*	0*	3*	2	2	5
E. mieheorum	4	2*	0*	2	2	3	2*	0	1*	4	1	1	3*	1	1*	2*	1*	1*	3*	2	2	10
E. fjellbergi	5	1	0*	2	1*	3	3	0	1*	4	1	2*	3*	0*	2	2*	1*	2*	3*	2	2	10
E. *diskitensis* **sp. nov.**	3-5	1	1	2	2	3	3	0	2	4	1	1	6	1	2	1	3	4	4-5	2	2	

Acronyms, abbreviations and comments. **Ch1 (Character 1)**: H1 area (head), Mc on series sd'4-sd'4' (An2-An3), total number; **Ch2**: H2 area (head), Mc on series sd4-sd'3a (A5-A7), total number; **Ch3**: H3 area (head), Mc on series d'0 (S'0), total number; **Ch4**: H4 area (head), Mc on series d1-sd1-sd'1 (S1-S3-S4), total number; **Ch5**: H5 area (head), Mc on series v1-v3-v4 (Ps2-Ps3-Ps5), total number; **Ch6**: labral papilla, 1. without/ 2. simple and smooth papilla/ 3. wrinkled or with some projections/ 4. a projection setae like; **Ch7**: eyes, G and H size, 1. = E and F/ 2. <E and F; **Ch8**: antennal vesicle, 1. no bulb/ 2.lobule simple/ 3. bilobed/ 4. trilobed; **Ch9**: antennae/head ratio, 1. >or = 3/ 2. >or = 2 < 3/ 3. < 2; **Ch11**: T1 area (Th II), Mc on series m1-m2i2; total number; 5. if>4; **Ch12**: T2 area (Th II), Mc on series a5-m5; total number; 9. if>8; **Ch14**: unguis, internal teeth, total number; **Ch15**: unguis, dorsal tooth, 1. absent/ 2. Basal/ 3.internal teeth level/ 4. intermediate; **Ch17**: unguiculus, externally, 1. smooth/ 2. serrate/ 3. with tooth; **Ch18**: A1 area (Abd II), Mc on series a2-a3, total number; **Ch19**: A2 area (Abd II), Mc on series m3 series, total number; **Ch20**: A3 area (Abd III), Mc on series a1, total number; **Ch21**: A4 (Abd III), Mc on series above m2, total number; **Ch22**: A5 (Abd III), Mc on series m3-m4 series, total number; **Ch23**: A6 (Abd IV), Mc on series a1-a5 (A1-E1a), total number; 9. if>8; **Ch25**: A7 (Abd IV), Mc on series ma1-ma4 (A2-E1), total number; 10. if>9; **Ch27**: A8 (Abd IV), Mc on series m1-m3 (A4p-C4), total number; 6. if>5; **Ch29**: A9 (Abd IV), Mc on series mp1-mp3 (A5-B5), total number; 6. if>5; **Ch30**: A10 (Abd IV), Mc on series p1a-p3 (A6i-B6), total number; 6. if>5. "-", unknown data. *,differences of each of the species with new species; D, sum of the differences between the new species and each of them.



Figs. 24-30. *Corynothrix borealis* macrochaetotaxy. (24) Head (at left, 2 chaetae with indication of its insertion); (25) Th II; (26) Th III; (27) Abd I; (28) Abd II; (29) Abd III; (30) Abd IV (the microchaeta drawing show the shape of the small chaetae different to macrochaetae; it can have different sizes).



Figs. 31-37. *Entomobrya diskitensis* **sp. nov.** (31) Claw of hind leg; (32) Eye patche; (33) Labral papillae; (34) Head dorsal macrochaetotaxy; (35) Th II dorsal macrochaetotaxy; (36) Abd II-III dorsal macrochaetotaxy; (37) Abd IV dorsal macrochaetotaxy.

7.ix.2008 (Mandal) (ZSI/H14/859, in ethyl alcohol, and ZSI/H14/860, female, slide, ZSI).

Description

Body length up to 1.5 mm excluding antennae (Holotype). Ground color variable, yellowish, grey or brown, always with antennae darker (except the proximal Ant I), with transversal bands on central Abd I-II, posterior some lateral Abd III, and especially darker on final Abd IV-V; there are dark patches too on lateral Th II to Abd I and Abd IV (Fig. 2). Some specimens have a greyish or more pale coloration (Figs. 3 and 4).

Head. Eight eyes, GH smaller than EF, ⅓ than AB (Fig. 39). Antennae length 600 µm (Holotype), 2.14 times the length of the head. Ant III sensory organ with rod-like sensillae; 2-3 additional rod-like sensillae on mid part of Ant III, and one more on distal Ant II; Ant IV with bilobed apical vesicle, almost a double vesicle. Relative length of Ant I/II/III/IV = 1/1.5/1.5/2.0 (Holotype). Labral papillae wrinkled, with 3 small projections (Fig. 40). Labial chaetae all ciliated, only with one M, and r smaller than other. Prelabral chaetae ciliated.

Body. Length ratio of Abd IV/III = 2.5 (Holotype). Trochanteral organ with 10 chaetae.Tibiotarsus slightly sub-segmented, without differentiated chaetae, with exception of the presence of the smooth terminal chaetae on legs III, characteristic for the genus. Claws with 4 teeth: paired at 70% and first unpaired at 80% from basis; dorsal and lateral teeth before the level of paired (50% from basis) (Fig. 38). Unguiculus lanceolate, with external lamella serrated on its terminal half (8 teeth). Tenen hair clavate, similar in length to the claw. Length of manubrium and dentes 230 and 300 µm respectively (Holotype). Manubrial plate with 4 chaetae and 2 pseudopores. Mucro with apical tooth slightly bigger than subapical one, and with mucronal spine reaching the tip of subapical tooth. Length of not ringed terminal dens 3 times the length of mucro.

Macrochaetotaxy. Simplified Mc formula (following Jordana & Baquero 2005): 3(4)-1-0-2-1/0-1/1-2/0-1-1/0-0-3-2-2.

Head chaetotaxy (Fig. 41); Ps_5 is a mesochaeta. Thorax chaetotaxy: T1 without Mc; T2 area on Th II with 1 Mc (a_5); m_5 and an additional chaeta besides a_5 are mesochaetae (Fig. 42). Abdomen chaetotaxy (Figs. 43 and 44): A1 area on Abd II with 1 Mc (a_2) and A2 area on Abd II with 2 Mc (m_{3ep} and m_{3eai}); Abd III with 1 Mc on areas A4-A5 (a_3 and m_{3a}); Abd IV macrochaetotaxy (Fig. 44).

Biology

In Ladakh, found in leaf litter (**Stn. 04**), under grass and leaf litter of flowering garden (**Stn. 05**) and under stones and litter (**Stn. 07**).

Remarks

When the species that shared dorsal macrochaetotaxy formula for Abd II-III and labral papillae wrinkled (or species for which this information is not available) are studied, the new species can be separated from them by the following data: *E. arborea* (Tullberg, 1871) Lameere, 1895, *E. chomolungmae* Yosii, 1971, and *E. karasukensis* Jordana & Baquero Potapov, 2011 because they not share the dorsal macrochaetotaxyfor Th II; *E. disjuncta* (Nicolet, 1842) Parona, 1895, sensu Bonet, 1934, *E. himalayensis* (Baijal , 1955), *E. imitabilis* Stach, 1963, *E. indica*, *E. ozeana* Yosii, 1954, *E. spectabilis* Reuter, 1890 and *E. xerothermica* Stach, 1963 because have only 3 teeth on the inner claw; *E. afghanistanensis* Stach, 1960, *E. albanica* Stach, 1922, *E. amethystina* Börner, 1909, nec Yosii 1942, *E. japonica* Uchida, 1954, *E. manii* (Baijal , 1955) and *E. wojtusiaki* Stach, 1963 that have smooth external lamella of unguiculus; *E. bauciana* Moniez, 1894 is from France and totally avoid of pigment; *E. obscurella* Brown, 1925 is totally dark; *E. margaretae* Gruia, 1967 and *E. mesomelaina* Latzel, 1918 with the first half of the body totally pigmented. *E. miljevici* Palissa, 1968 has dark bands on head, Th II, Abd II-IV; *E. stenonyx* Börner, 1909 has 2 dark bands, one in front and one on the back of the body; *E. styriaca* Latzel, 1918 has brown-black coloration, with extremely fine and dense cover of yellow dots. The more proximately species is *E. chungseensis* Baquero & Jordana, 2008, that differ in the macrochaetotaxy of head, the position of dorsal tooth on claw, and the relative size of distal tooth of mucro, in addition of the coloration, with the pigmentation on posterior area of Th II to Abd IV very narrow. The Table 2 present the differences in macrochaetotaxy and other characters among the nearest species. This table shows the lack of knowledge for many characters of macrochaetotaxy and morphology of some of the species, despite the hard work done on this genus (Jordana 2012).

Etymology

The new species is named after the type locality.

ENTOMOBRYA CHOUDHURII BAQUERO & JORDANA **SP. NOV.**

(Figs. 5 and 6, 45-51)

Type Material

HOLOTYPE female INDIA: Jammu and Kashmir, Ladakh, Pong Tso Lake (**Stn. 09**), 7-IX-2008 (Mandal) (ZSI/H14/867, slide, ZSI). PARATYPES, same data as Holotype (Mandal) (ZSI/H14/869-870 and 890, in ethyl alcohol, ZSI; ZSI/H14/868,

TABLE 2. MACROCHAETOTAXY AND SOME OTHER CHARACTERS FOR THE SPECIES OF *ENTOMOBRYA* THAT SHARE DORSAL MACROCHAETOTAXY FORMULA FOR ABD II- III AND LABRAL PAPILLAE WRINKLED (OR SPECIES FOR WHICH THIS INFORMATION IS NOT AVAILABLE) WITH THE SPECIES *E. LADAKHI* JORDANA & BAQUERO **SP. NOV.**

Species	Occurrence/Ch	1	2	3	4	5	6	7	8	9	11	12	13	14	15	17	18	19	20	21	22	23	24	25	26	27	28	29	30	D
E. afghanistanensis		—	—	—	—	—	—	2	2*	1*	—	—	1	4	4*	1*	—	—	—	—	—	—	—	—	—	—	—	—	—	4
E. albanica	Albania, Hungary	—	—	—	—	—	3	2	2*	2	—	—	1	4	1	1*	—	—	—	—	—	—	—	—	—	—	—	—	—	2
E. amethystina	Japan	—	—	—	—	—	—	—	—	2	—	—	1	—	2*	1*	—	—	—	—	—	—	—	—	—	—	—	—	—	2
E. arborea	Europe	3	1	1*	2	2*	3	2	3	2	2*	3*	2*	4	3*	1*	1	2	0	1	1	0	0	0	0	1*	0	2	2	8
E. bauciana	France	—	—	—	—	—	—	—	—	2	—	—	1	4	3*	2	—	—	—	—	—	—	—	—	—	—	—	—	—	3
E. chomolungmae	Nepal	4	1	0	3*	1	3	2	3	1*	0	3—4*	2*	4	1	2	1	2	0	1	1	—	—	—	—	—	—	—	—	4
E. chungseensis	China, Tibet	4	1	0	2	2*	3	2	2*	2	0	1	1	4	3*	2	1	2	0	1	1	0	0	0	0	3	0	2	2	3
E. disjuncta	Europe	—	—	—	—	—	—	—	—	—	—	—	—	3*	—	1*	—	—	—	—	—	—	—	—	—	—	—	—	—	2
E. himalayensis	India, Himalaya	—	—	—	—	—	—	1*	—	1*	—	—	—	3*	—	1*	—	—	—	—	—	—	—	—	—	—	—	—	—	4
E. imitabilis	China	—	—	—	—	—	—	2	—	—	—	—	—	3*	1	1*	—	—	—	—	—	—	—	—	—	—	—	—	—	2
E. indica	China, Tibet	—	—	—	—	—	—	2	—	2	—	—	—	3*	1	1*	—	—	—	—	—	—	—	—	—	—	—	—	—	2
E. japonica	Japan	—	—	—	—	—	—	—	—	3*	—	—	—	4	1	1*	—	—	—	—	—	—	—	—	—	—	—	—	—	2
E. karasukensis	Russia	4	1	0	2	1-2	3	2	2*	2	1*	3*	1	4	3*	1*	1	2	0	1	1	0	0	0	0	3	0	2	2	5
E. manii	India, Himalaya	—	—	—	—	—	—	2	—	1*	—	—	1	4	1	1*	—	—	—	—	—	—	—	—	—	—	—	—	—	2
E. margaretae	Romania	—	—	—	—	—	3	2	3	1*	—	—	1	4	2*	2	—	—	—	—	—	—	—	—	—	—	—	—	—	2
E. obscurella	Afghanistan, Palestine, Iraq	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2*	0	2	1	1
E. ozeana	Japan	—	—	—	—	—	—	1*	1*	3*	—	—	1	3*	1	1*	—	—	—	—	—	—	—	—	—	—	—	—	—	5
E. spectabilis	Germany	—	—	—	—	—	—	—	—	—	—	—	1	3*	2*	1*	—	—	—	—	—	—	—	—	—	—	—	—	—	3
E. wojtusiaki	Russia	—	—	—	—	—	3	2	3	2	—	—	1	4	1	1*	—	—	—	—	—	—	—	—	—	—	—	—	—	1
E. xerothermica	Poland	—	—	—	—	—	3	2	3	2	—	—	1	3*	1	1*	—	—	—	—	—	—	—	—	—	—	—	—	—	2
E. ladakhi **sp. nov.**	India, Himalaya	3-4	1	0	2	1b	3	2	3	2	0	1	1	4	1	2	1	2	0	1	1	0	0	0	0	3	0	2	2	

Acronyms, abbreviations and comments. **Ch1 (Character 1)**: H1 area (head), Mc on series sd'4-sd'4' (An2-An3), total number; **Ch2**: H2 area (head), Mc on series sd4-sd'3a (A5-A7), total number; **Ch3**: H3 area (head), Mc on series d'0 (S'0), total number; **Ch4**: H4 area (head), Mc on series d1-sd1-sd'1 (S1-S3-S4), total number; **Ch5**: H5 area (head), Mc on series v1-v3-v4 (Ps2-Ps3-Ps5), total number; **Ch6**: labral papilla, 1. without/ 2. simple and smooth papilla/ 3. wrinkled or with some projections/ 4. a projection setae like; **Ch7**: eyes, G and H size, 1. = E and F/ 2. <E and F; **Ch8**: antennal vesicle, 1. no bulb/ 2.lobule simple/ 3. bilobed/ 4. trilobed; **Ch9**: antennae/head ratio, 1. >or = 3/ 2. >or = 2 < 3/ 3. < 2; **Ch11**: T1 area (Th II), Mc on series m1-m2i2; total number; 5. if>4; **Ch12**: T2 area (Th II), Mc on series a5-m5; total number; 9. if>8; **Ch14**: unguis, internal teeth, total number; **Ch15**: unguis, dorsal tooth, 1. absent/ 2. Basal/ 3.internal teeth level/ 4. intermediate; **Ch17**: unguiculus, externally, 1. smooth/ 2. serrate/ 3. with tooth; **Ch18**: A1 area (Abd II), Mc on series a2-a3, total number; **Ch19**: A2 area (Abd II), Mc on series m3 series, total number; **Ch20**: A3 area (Abd III), Mc on series a1, total number; **Ch21**: A4 (Abd III), Mc on series above m2, total number; **Ch22**: A5 (Abd III), Mc on series m3-m4 series, total number; **Ch23**: A6 (Abd IV), Mc on series a1-a5 (A1-E1a), total number; 9. if>8; **Ch25**: A7 (Abd IV), Mc on series ma1-ma4 (A2-E1), total number; 10. if>9; **Ch27**: A8 (Abd IV), Mc on series m1-m3 (A4p-C4), total number; 6. if>5; **Ch29**: A9 (Abd IV), Mc on series mp1-mp3 (A5-B5), total number; 6. if>5; **Ch30**: A10 (Abd IV), Mc on series p1a-p3 (A6i-B6), total number; 6. if>5. "-", unknown data. *,differences of each of the species with new species; D, sum of the differences between the new species and each of them.

in ethyl alcohol, and ZSI/H14/889, female, slide, MZNA); INDIA, Jammu and Kashmir, Ladakh, Tsogul Tso wetland, 7-IX-2008 (Mandal) (ZSI/H14/861, male, slide, MZNA; ZSI/H14/862, female, slide, ZSI).

Description

Body length up to 1.22 mm excluding antennae (Holotype). Ground color uniform violet, with small patches and spots green or brownish; legs yellowish-brown, as manubium and furca; antennae grey with terminal segments I and II darker (Fig. 5-6).

Head. Eight eyes, GH similar in size to EF (Fig. 46). Antennae length 390 µm (Holotype), 1.34 times the length of the head. Ant IV with bilobed apical vesicle with additional bifurcate chaeta beside it. Relative length of Ant I/II/III/IV = 1/1.5/1.33/2.67 (Holotype). Labral papillae with one or 2 projections (Fig. 47). Prelabral chaetae ciliated. Labial chaetae all ciliated, only with one M, and r smaller than other.

Body. Length ratio of Abd IV/III = 3.5 (Holotype). Trochanteral organ with 11 chaetae. Tibiotarsus slightly sub-segmented, without differentiated chaetae, with exception of the presence of the smooth terminal chaetae on legs III, characteristic for the genus. Claws only with paired teeth, at 50-60% from basis; dorsal and lateral teeth undistinguishable (Fig. 45). Unguiculus lanceolate, with external lamella smooth. Tenen hair clavate. Length of manubrium and dentes 220 and 290 µm respectively (Holotype). Manubrial plate with 4 chaetae and 2 pseudopores. Mucro with teeth similar in size, and with mucronal spine reaching the tip of subapical tooth. Length of not ringed terminal dens 2 times the length of mucro.

Macrochaetotaxy. Simplified Mc formula (following Jordana & Baquero 2005): 3(4)-1(2)-0-2-2/1(4)-1(2)/1-4/0(1)-1-1(2)/0-0-3-2-2.

Head chaetotaxy (Fig. 48); A_5 always present, A_6 present in a single specimen. Thorax chaetotaxy: T1 with between one(m_{2i}) and 4 Mc in some specimens (m_1, m_2, m_{2i} and m_{2i2}); T2 area on Th II with 2 or 3 Mc (a_5 and m_4, not always m_{4i}; m_5 sometimes as mesochaeta) (Fig. 49). Abdomen chaetotaxy (Figs. 50 and 51): A1 area on Abd II with 2 Mc (a_2 and a_3, in a more proximal position than the habitual or absent) and A2 area on Abd II with 4 Mc (m_3, m_{3ep}, m_{3e} and m_{3ea}; m_{3ei} as mesochaeta in one specimen); Abd III with 0-1 Mc on area A3 (a_1), one on area A4 (a_2 or a_3), and one or 2 on area A5 (m_3 and m_{3e}); Abd IV macrochaetotaxy (Fig. 51).

Biology

In Ladakh, found under stones (**Stn. 10**), and under stones and litter (**Stn. 07**).

Remarks

This species is characterized by having only 2 teeth in the internal part of the claw (the paired ones), labral papillae with 1-2 small projections, similar eyes size, with G and H slightly smaller than E and F, and a macrochaetotaxy of Abd II and III that, combined (though variable between segments), is not among those of other species of the genus. In the Table 3 the species that shared the formula of Abd III and the shape of labral papillae are compared: *E. arborea* (Western Europe -not Mediterranean-, Sweden, Finland, Czech Republic, Germany, Switzerland, Russia, France, British Islands, Italy, Poland, Austria, Ukraine, Latvia, Hungary), *E. chomolungmae* (Nepal), *E. chungseensis* Baquero & Jordana, 2008 (China, Tibet), *E. corticalis* (Nicolet, 1842) Rondani, 1861 (North and Central Palaearctic, Switzerland, Scandinavia, Sweden, Finland, Italy, Germany, Norway, France, Russia, Poland, Denmark, Japan, Austria, Hungary, Netherland, China, Latvia, Lithuania, Belarus, Slovakia, Belgium, British Islands), *E. huangi* Chen & Ma, 1998 (China, Tibet), *E. karasukensis* Jordana, Potapov & Baquero, 2011 (Russia), *E. lhotseae* Yosii, 1971 (Nepal), *E. mieheorum* (China, Tibet), *E. nigrocincta* Denis 1923 (France, Spain, Slovakia, Hungary, Austria, Bulgaria, Romania, Serbia, Ukraine, Georgia, Greece, Europe, Azores, Turkey, Egypt, Morocco), *E. pseudolanuginosa* Jordana, Potapov & Baquero, 2011 (Russia) and *E. tenkyniensis* Tshelnokov, 1987 (Russia).

Etymology

The new species is named after Prof. D. K. Choudhuri, who has made significant contribution of Indian Collembola.

ENTOMOBRYA MEHTAI BAQUERO & JORDANA **SP. NOV.**

(Figs. 7, 52-58)

Type Material

HOLOTYPE female INDIA: Jammu and Kashmir, Ladakh, Nyoma Forest (**Stn. 13**), 9-IX-2008 (Mandal) (ZSI/H14/877, slide, ZSI). PARATYPES, same data as Holotype (Mandal) (ZSI/H14/880, in ethyl alcohol, ZSI; ZSI/H14/878, female, slide, and ZSI/H14/879, in ethyl alcohol, MZNA).

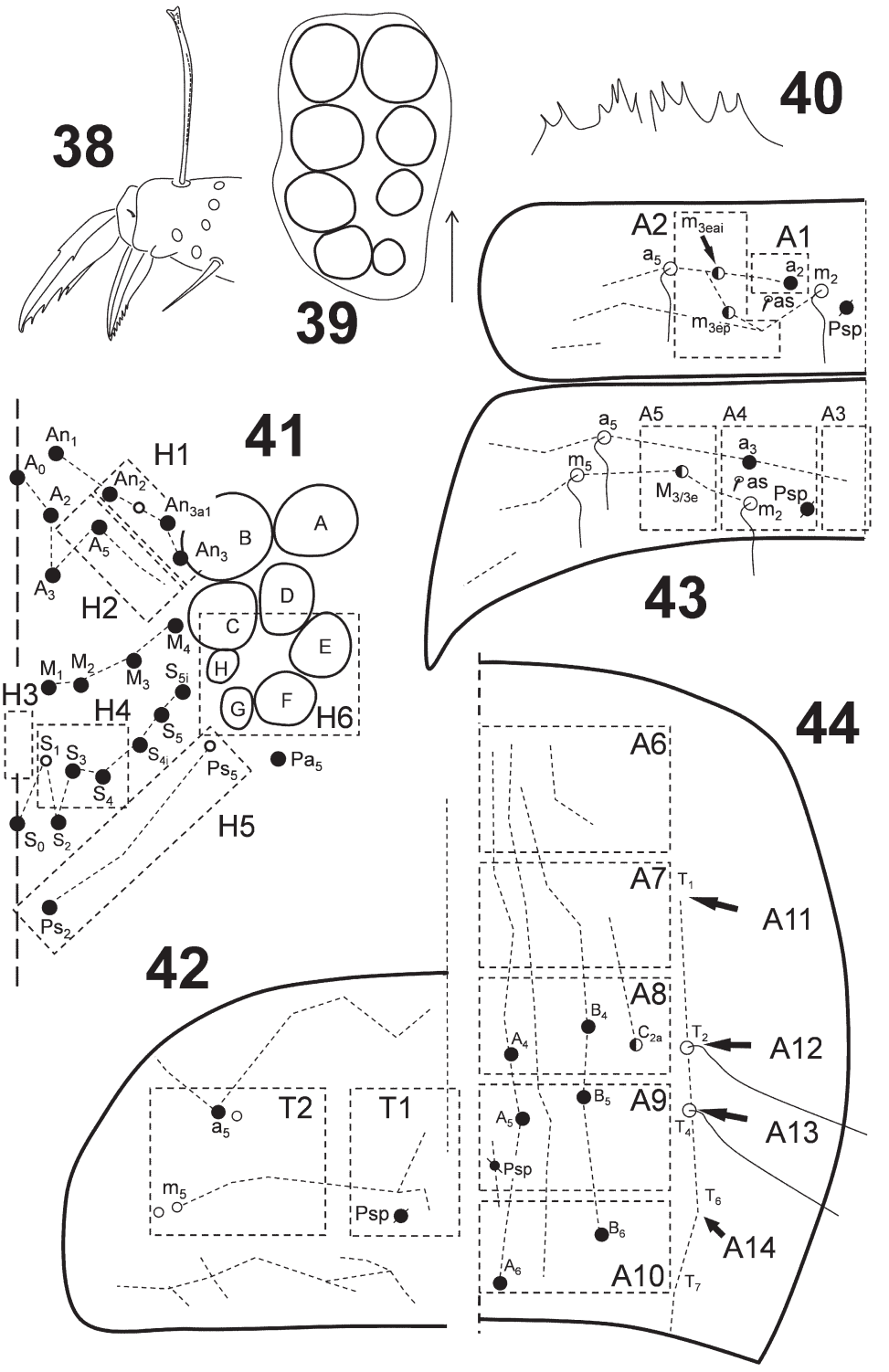
Description

Body length up to 1.98 mm excluding antennae (Holotype). Ground color uniform pale grey or very pale bluish, with transversal bands slightly darker on posterior half of dorsal Th II-Abd V; legs pale grey, with tibiotarsus darker; antennae

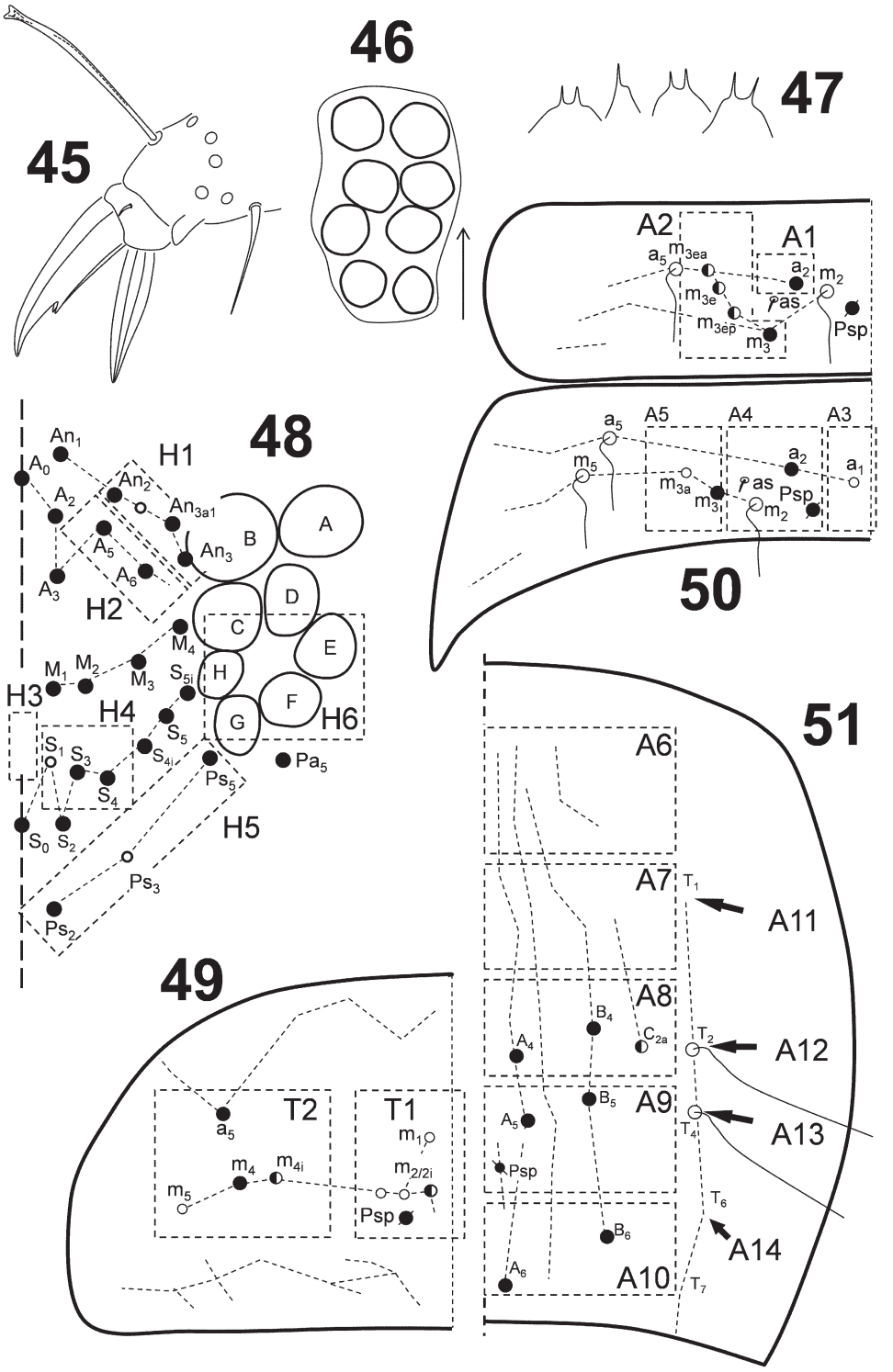
TABLE 3. MACROCHAETOTAXY AND SOME OTHER CHARACTERS FOR THE SPECIES OF *ENTOMOBRYA* THAT SHARE DORSAL MACROCHAETOTAXY FORMULA FOR ABD III AND LABRAL PAPILLAE WRINKLED WITH THE SPECIES *E. CHOUDHURII* JORDANA & BAQUERO **SP. NOV.**

Species/Ch	1	2	3	4	5	6	7	8	9	11	12	13	14	15	17	18	19	20	21	22	23	24	25	26	27	28	29	30	D
E. arborea	3	1	1*	2	2	3	2*	3	2*	2	3	2*	4*	3*	1	1	2*	0	1	1	0	0	0	0	1*	0	2	2	8
E. chomolungmae	4	1	0	3*	1*	3	2*	3	1*	0*	3-4	2*	4*	1*	2*	1	2*	0	1	1	—	—	—	—	—	—	—	—	10
E. chungseensis	4	1	0	2	2	3	2*	2*	2*	0*	1	1	4*	3*	2*	1	2*	0	1	1	0	0	0	0	3	0	2	2	8
E. corticalis	3	2	0	2	3*	3	2*	3	2*	1	3	1	4*	3*	2*	0*	2*	1	1	1	0	0	0	0	1*	0	1*	2	10
E. huangi	4	1	0	3*	3*	3	1	3	2*	0*	2	1	4*	3*	2*	1	3*	0	1	2	0	0	0	0	3	0	2	2	8
E. karasukensis	4	1	0	2	1-2	3	2*	2*	2*	1	3	1	4*	3*	1	1	2*	0	1	1	0	0	0	0	3	0	2	2	6
E. lhotseae	4	1	0	2	2	3	2*	3	1*	2	3	1	4*	1*	1	1	3*	0	1	1	0	0	0	0	3	0	2	2	5
E. mieheorum	4	2	0	2	2	3	2*	2*	2*	0*	1*	1	4*	3*	1	1	3*	1	1	2	1*	0	1*	0	3	0	2	2	10
E. nigrocincta	3	1	0	2	2	3	2*	2*	2*	2	3	1	4*	3*	1	1	2*	1	1	1	0	0	2*	0	3	0	2	2	7
E. pseudolanuginosa	6*	1	1	2	2	3	2*	2*	2*	0*	2	1	4*	4	1	1-2	3*	1	1	2	0	0	4*	0	4*	0	2	2	9
E. tenkyniensis	5-7	1	0	3*	2	3	2*	2*	2*	1	3	1	4*	4	1	1	3*	1	1	2	0	0	4-5*	0	4*	0	2	2	8
E. ladakhi **sp. nov.**	3-4	1	0	2	1b*	3	2*	3	2*	0*	1*	1	4*	1*	2*	1	2*	0	1	1	0	0	0	0	3	0	2	2	9
E. choudhurii **sp. nov.**	3-4	1-2	0	2	2	3-4	1	3	3	1-4	2-3	1	2	4	1	1	4	0-1	1	1-2	0	0	0	0	3	0	2	2	

Acronyms, abbreviations and comments. **Ch1 (Character 1)**: H1 area (head), Mc on series sd'4-sd'4' (An2-An3), total number; **Ch2**: H2 area (head), Mc on series sd4-sd'3a (A5-A7), total number; **Ch3**: H3 area (head), Mc on series d'0 (S'0), total number; **Ch4**: H4 area (head), Mc on series d1-sd1-sd'1 (S1-S3-S4), total number; **Ch5**: H5 area (head), Mc on series v1-v3-v4 (Ps2-Ps3-Ps5), total number; **Ch6**: labral papilla, 1. without/ 2. simple and smooth papilla/ 3. wrinkled or with some projections/ 4. a projection setae like; **Ch7**: eyes, G and H size, 1. = E and F/ 2. <E and F; **Ch8**: antennal vesicle, 1. no bulb/ 2.lobule simple/ 3. bilobed/ 4. trilobed; **Ch9**: antennae/head ratio, 1. >or = 3/ 2. >or = 2 < 3/ 3. < 2; **Ch11**: T1 area (Th II), Mc on series m1-m2i2; total number; 5. if>4; **Ch12**: T2 area (Th II), Mc on series a5-m5; total number; 9. if>8; **Ch14**: unguis, internal teeth, total number; **Ch15**: unguis, dorsal tooth, 1. absent/ 2. Basal/ 3.internal teeth level/ 4. intermediate; **Ch17**: unguiculus, externally, 1. smooth/ 2. serrate/ 3. with tooth; **Ch18**: A1 area (Abd II), Mc on series a2-a3, total number; **Ch19**: A2 area (Abd II), Mc on series m3 series, total number; **Ch20**: A3 area (Abd III), Mc on series a1, total number; **Ch21**: A4 (Abd III), Mc on series above m2, total number; **Ch22**: A5 (Abd III), Mc on series m3-m4 series, total number; **Ch23**: A6 (Abd IV), Mc on series a1-a5 (A1-E1a), total number; 9. if>8; **Ch25**: A7 (Abd IV), Mc on series ma1-ma4 (A2-E1), total number; 10. if>9; **Ch27**: A8 (Abd IV), Mc on series m1-m3 (A4p-C4), total number; 6. if>5; **Ch29**: A9 (Abd IV), Mc on series mp1-mp3 (A5-B5), total number; 6. if>5; **Ch30**: A10 (Abd IV), Mc on series p1a-p3 (A6i-B6), total number; 6. if>5. "-", unknown data. *,differences of each of the species with new species; D, sum of the differences between the new species and each of them.



Figs. 38-44. *Entomobrya ladakhi* **sp. nov.** (38) Claw of hind leg; (39) Eye patch; (40) Labral papillae; (41) Head dorsal macrochaetotaxy; (42) Th II dorsal macrochaetotaxy; (43) Abd II-III dorsal macrochaetotaxy; (44) Abd IV dorsal macrochaetotaxy.



Figs. 45-51. *Entomobrya choudhurii* **sp. nov.** (45) Claw of hind leg; (46) Eye patch; (47) Labral papillae; (48) head dorsal macrochaetotaxy; (49) Th II dorsal macrochaetotaxy; (50) Abd II-III dorsal macrochaetotaxy; (51) Abd IV dorsal macrochaetotaxy.

darker too, with the same coloration as transversal bands and tibiotarsus, tip very dark (Fig. 7).

Head. Eight eyes, GH smaller than EF, ⅓ than AB (Fig. 53). Antennae length 1040 µm (Holotype), 2.4 times the length of the head. Ant IV with bilobed apical vesicle with additional bifurcate chaeta beside it. Relative length of Ant I/II/III/IV = 1/2.29/2.21/1.93 (Holotype). Sensory organ of Ant III with rod-like sensilla in addition of the 3 guard sensillae; there are 2 small rod-like sensilla on distal Ant II. Labral papillae with 2-3 projections, very long (Fig. 54). Prelabral chaetae ciliated. Labial chaetae all ciliated, only with one M, and r smaller than other (⅔ of M).

Body. Length ratio of Abd IV/III = 3.33 (Holotype). Trochanteral organ with 11-13 chaetae (Holotype and Paratype on slide respectively). Tibiotarsus slightly sub-segmented, without differentiated chaetae, with exception of the presence of the smooth terminal chaetae on legs III, characteristic for the genus. Claws with 4 teeth: paired at 70% and first unpaired at 80% from basis; dorsal and lateral teeth at level of paired ones (Fig. 52). Unguiculus lanceolate, with external lamella smooth. Tenent hair clavate. Length of manubrium and dentes 400 and 460 µm respectively (Holotype). Manubrial plate with 3-5 chaetae and 1 or 2 pseudopores. Mucro with teeth similar in size, and with mucronal spine reaching the tip of subapical tooth. Length of not ringed terminal dens 3 times the length of mucro.

Macrochaetotaxy. Simplified Mc formula (following Jordana & Baquero 2005): 3-1-0-2-2/0-1(2)/1-3/0-2-1/1-4-4-2-2.

Head chaetotaxy (Fig. 55); there is an additional mesochaeta in H1 area in the Holotype; A_5 always present. Thorax chaetotaxy: T1 without Mc; T2 area on Th II with one or 2 Mc (the additional one is a mesochaeta beside a_5) (Fig. 56). Abdomen chaetotaxy (Figs. 57 and 58): A1 area on Abd II with one Mc (a_2) and A2 area on Abd II with 3 Mc (m_3 orm_{3ep}, m_{3e} and m_{3ea}); Abd III with 0 Mc on area $A3_1$), 2 on area A4 (a_3 smaller in one specimen), and one on area A5 (m_3); Abd IV macrochaetotaxy (Fig. 58), and pseudopores very small.

Biology

In Ladakh, found in leaf litter **(Stn. 12)**.

Remarks

There are no matches in the combined dorsal macrochaetotaxy of Abd II and Abd III between species with known chaetotaxy. Considering also the species with unknown chaetotaxy, the new species can be distinguished from them by having the labral papillae wrinkled , eyes H and G smaller than E and F, outer lamella of unguiculus smooth, or mucro with 2 similar teeth size, and from those that are not separated by these characters (for the lack of information about them on the original descriptions), it can be clearly distinguished by the coloration, as they all have some kind of dark pigmentation not present in the new species. Comparing the new species with those without pigment or similar coloration distributed in a wide geographical radius from the type locality of the new species (China, Tibet, India, Nepal and Russia), can be differentiated by a minimum of 7 characters between those considered by Jordana & Baquero in 2005 except for 2 species, *E. himalayensis* and *E. rohtangensis* sensu Yoshii, 1990 with many characters unknown, but clearly different by having only 3 internal teeth on the unguis. The differences with all of these species are presented in Table 4.

Etymology

The new species is named after Dr. H. S. Mehta, who was principal investigator of the Cold Desert Expedition by the Zoological Survey of India.

HIMALANURA BAIJALI BAQUERO & JORDANA **SP. NOV.**
(Figs. 9 and 10, 59-75)

Type Material

HOLOTYPE male INDIA: Jammu and Kashmir, Ladakh, Diskit, Ganglatok Village (**Stn. 17**), 14-IX-2008 (Mandal) (ZSI/H14/841, slide, ZSI). PARATYPES, same data as Holotype (Mandal) (ZSI/H14/837, female, slide, ZSI/H14/838 and ZSI/H14/844, in ethyl alcohol, ZSI; ZSI/H14/837, female, slide, and ZSI/H14/840, male, slide, MZNA).

Additional material, INDIA, Jammu and Kashmir, Ladakh, Chakmalsar village (**Stn. 22**), 16-IX-2008 (Mandal) (ZSI/H14/876, in ethyl alcohol, ZSI).

Description

Body length up to 1.59 mm excluding antennae. Body color greenish, very pale in some specimens, and areas with a more intense color (Figs. 9 and 10).

Head. Eight eyes, GH smaller than EF, ⅓ than AB. Antennae length 600-720 µm, 2.0 times the length of the head. Ant IV with bilobed apical vesicle, and 3-4 small apical sensillae. Ant III sensory organ with the central sensillae rod-like; the accessory small, shorter. Ant II with a small sensillae at the upper side, similar to the accessory of Ant III sensory organ. Relative length of Ant I/II/III/IV = 1/1.56-2.22/1.56-1.78/2.44-3.0 (n = 2). Labral papillae wrinkled, with 2 small projec-

TABLE 4. MACROCHAETOTAXY AND SOME OTHER CHARACTERS FOR THE SPECIES OF *ENTOMOBRYA* THAT SHARE A PATTERN OF PALE COLORATION DISTRIBUTED OVER A WIDE GEOGRAPHICAL RADIUS AROUND THE TYPE LOCALITY OF *E. MEHTAI* BAQUERO & JORDANA **SP. NOV.** (CHINA, TIBET, INDIA, NEPAL AND RUSSIA).

Species/Ch	1	2	3	4	5	6	7	8	9	11	12	14	15	17	18	19	20	21	22	23	25	27	29	30	D
E. cheni	3	1	0	3*	1*	4*	2	—	—	4*	6*	4	3*	1	2*	5-7*	0	2	2*	0*	7-11*	7-10*	3-5*	8-10*	14
E. chungseensis	4*	1	0	2	2	3	2	2*	2	0	1	4	3*	2*	1	2*	0	1*	1	0*	0*	3	2	2	8
E. himalayensis	—	—	—	—	—	—	1*	—	1*	—	—	3*	—	1	—	—	—	—	—	—	—	—	—	—	3
E. huangi	4*	1	0	3*	3*	3	1*	3	2	0	2	4	3*	2*	1	3	0	1*	2*	0*	0*	3*	2	2	11
E. lhotseae	4*	1	0	2	2	3	2	3	1*	2*	3*	4	1	1	1	3	0	1*	1	0*	0*	3*	2	2	8
E. mieheorum	4*	2*	0	2	2	3	2	2*	2	0	1	4	3*	1	1	3	1*	1*	2*	1	1*	3*	2	2	9
E. pseudolanuginosa	6*	1	1*	2	2	3	2	2*	2	0	2	4	4*	1	1-2	3	1*	1*	2*	0*	4	4	2	2	8
E. rohtangensis	4*	1	0	2	1a*	3	2	3	3*	0	3*	3*	1	1	1	3	0	0*	1	0*	0*	3*	2	2	9
*E. rohtangensis***	5*	1	—	—	1b*	3	2	3	1*	—	—	—	—	—	2*	4*	1*	2	1	—	—	—	—	—	6
E. taigicola	3	3*	0	3*	2	—	2	2*	2	6*	6*	4	—	1	2*	5*	0	2	2*	0*	6*	1*	5*	3*	13
E. *mehtai* **sp. nov.**	3	1	0	2	2	3	2	3	2	0	1-2	4	1	1	1	3	0	2	1	1	4	4	2	2	

Acronyms, abbreviations and comments. Ch1 (Character 1): H1 area (head), Mc on series sd'4-sd'4' (An2-An3), total number; Ch2: H2 area (head), Mc on series sd4-sd'3a (A5-A7), total number; Ch3: H3 area (head), Mc on series d'0 (S'0), total number; Ch4: H4 area (head), Mc on series d1-sd1-sd'1 (S1-S3-S4), total number; Ch5: H5 area (head), Mc on series v1-v3-v4 (Ps2-Ps3-Ps5), total number; Ch6: labral papilla, 1. without/ 2. simple and smooth papilla/ 3. wrinkled or with some projections/ 4. a projection setae like; Ch7: eyes, G and H size, 1. = E and F/ 2. <E and F; Ch8: antennal vesicle, 1. no bulb/ 2.lobule simple/ 3. bilobed/ 4. trilobed; Ch9: antennae/head ratio, 1. >or = 3/ 2. >or = 2 < 3/ 3. < 2; Ch11: T1 area (Th II), Mc on series m1-m2i2; total number; 5. if>4; Ch12: T2 area (Th II), Mc on series a5-m5; total number; 9. if>8; Ch14: unguis, internal teeth, total number; Ch15: unguis, dorsal tooth, 1. absent/ 2. Basal/ 3.internal teeth level/ 4. intermediate; Ch17: unguiculus, externally, 1. smooth/ 2. serrate/ 3. with tooth; Ch18: A1 area (Abd II), Mc on series a2-a3, total number; Ch19: A2 area (Abd II), Mc on series m3 series, total number; Ch20: A3 area (Abd III), Mc on series a1, total number; Ch21: A4 (Abd III), Mc on series above m2, total number; Ch22: A5 (Abd III), Mc on series m3-m4 series, total number; Ch23: A6 (Abd IV), Mc on series a1-a5 (A1-E1a), total number; 9. if>8; Ch25: A7 (Abd IV), Mc on series ma1-ma4 (A2-E1), total number; 10. if>9; Ch27: A8 (Abd IV), Mc on series m1-m3 (A4p-C4), total number; 6. if>5; Ch29: A9 (Abd IV), Mc on series mp1-mp3 (A5-B5), total number; 6. if>5; Ch30: A10 (Abd IV), Mc on series p1a-p3 (A6i-B6), total number; 6. if>5. "-", unknown data. *,differences of each of the species with new species; D, sum of the differences between the new species and each of them.

tions (Fig. 60). Prelabral chaetae ciliated; labral chaetae smooth.

Body. Chaetae of body with several morphologies, with a with a clear tendency to look flattened (Figs. 65-75). Length ratio of Abd IV/III = 4.1-4.3 (n = 2). Trochanteral organ with 14 to 15 chaetae. Tibiotarsus sub-segmented, without differentiated chaetae, with exception of the presence of the smooth terminal chaetae on legs III, characteristic for the genus. Claws with 4 teeth: paired at 50% and first unpaired at 65% from basis; lateral teeth at the level of paired, and dorsal approximately at 40% from basis (Fig. 59). Unguiculus with external lamella serrated (only 3-5 teeth); internal lamella smooth. Tenent hair clavate. Length of manubrium and dentes 300-370 and 380-400 µm respectively (n = 2). Mucro with teeth similar in size, and with mucronal spine reaching the tip of subapical tooth.

Macrochaetotaxy. Simplified Mc formula (following Jordana & Baquero 2005): 7-1-0-3-2/0-2/2-5/0-2-2/0(2)-2(3)-$1_0$4-2(3)-2 (maximum into brackets; 1_0, unpaired chaeta).

Head chaetotaxy (Fig. 61); there are some mesochaetae in H1, and occasionally additional macro-mesochaetae beside S_2. Thorax chaetotaxy: T1 without Mc; T2 area on Th II with 2 Mc (a_5 and an additional chaeta beside it) (Fig. 62). Abdomen chaetotaxy (Figs. 63 and 64): A1 area on Abd II with 2 Mc (a_2, a_3) and A2 area on Abd II with 5 Mc (m_3, m_{3ep}, m_{3e}, m_{3ea} and probably m_{3ei}); Abd III with 2 Mc on areas A4 (a_2, a_3) and A5; Abd IV macrochaetotaxy (Fig. 64).

Biology

In Ladakh, found in leaf litter of Agricultural products (**Stn. 17**).

Remarks

The described species of *Himalanura* have a relatively grouped distribution, with 3 areas if considering *H. zaitzewi* (Linnaniemi, 1919) as *Himalanura* (Jordana, 2012) and not as *Entomobrya* (Fig. 76). The closest ones to the new species described are at 250 km (*H. indica* Baijal, 1958 from NW Himalaya) and 500 km (*H. bulunkuli* Tshelnokov, 1977, *H. glauca* Tshelnokov, 1977, *H. martinovae* Tshelnokov, 1977 and *H. pamirensis* Yosii, 1966, from Tadjikistan and Afghanistan). It is possible to differentiate the new species from them by the coloration: while the new species is bright green, the rest are yellow (*H. bulunkuli* and *H. glauca* Tshelnokov, 1977), brown (*H. martynovae* and *H. pamirensis*) or violet (*H. indica*, that have too a broad ochreus-brown band along Abd I and Abd V-VI). More geographically distant species are been described from the Polar Urals and East Siberia: *H. zaitzewi*, *H. bermani* Tshelnokov, 1977, *H. gelmani* Tshelnokov, 1987 and *H. tundricola* Tshelnokov, 1987 (possibly synonymous with *H. gelmani*). Specimens of most species of *Himalanura* described have been studied, and for all of them has been able to study the dorsal macrochaetotaxy (Table 5). The dorsal macrochaetotaxy formula for the new species can differentiate it from all other using only the tergites Th II and Abd II-III. There are also differences if the labral papillae shape is considered.

Etymology

The new species is named after Dr. H. N. Baijal, one of the important contributors of taxonomy of Indian Collembola.

Subfamilia Lepidocyrtinae Wahlgren, 1906, sensu Szeptycki, 1979

LEPIDOCYRTUS (*ALLOCYRTUS*) *LEPIDORNATUS* (HANDSCHIN, 1930)
(Figs. 11, 77-84)

Material Observed

Female INDIA: Jammu and Kashmir, Ladakh, Diskit, Ganglatok Village (**Stn. 17**), 14-IX-2008 (Mandal) (ZSI/H14/839, slide, ZSI).

Description

Body length (without head nor furca) 0.8 mm. Body color pattern whitish-pinkish, only with pigment violet on antennae (darker distally) and dark blue in ocular areas. Th II not projected over the head (Fig. 11).

Head. Antenna without scales. Ratio antenna : cephalic diagonal = 2.25, ratio Ant I : II : III : IV such as 1 : 2.4 : 2.4 : 3.2. Basis of Ant I dorsally with 3 microchaetae arranged in triangle. Ant IV without apical bulb (Fig. 77). Ant III organ composed by 2 sensillae somewhat thickened in its middle part and curved, and 3 short and smooth sensillae. Ant II with an additional sensilla similar to the Ant III ones. Eight eyes disposed in a rounded patch, GH slightly smaller than EF. Head tricobothrium next to F eye, short (17 micrometers) (Fig. 83). Prelabral and labral setae 4/554, prelabral setae smooth, labral setae smooth, apical row of labral setae curved on tubercles; labral papillae absent or smooth and not visible. Outer maxillary palp with 2 smooth macrochaetae. Lateral process (sensu Fjellberg 1999) of outer labial papilla long and pointed, exceeding the apex of the papilla. Mandible with 4-6 teeth. Labium anterior row (a_1-a_5) formed by setae apparently smooth (really with minute pointed projections on its basal two-thirds), posterior row formed by slightly more ciliated setae ($M_1M_2REL_1L_2$), with M_1 and R half in length on seta M_2 (m1 absent on one side). Ven-

TABLE 5. MACROCHAETOTAXY AND SOME OTHER CHARACTERS FOR THE SPECIES OF *HIMALANURA* INCLUDING THE NEW SPECIES DESCRIBED IN THIS PAPER. "—", UNKNOWN DATA. *, NEW SPECIES DIFFERS FROM ESTABLISHED SPECIES; D, SUM OF THE DIFFERENCES BETWEEN THE NEW SPECIES AND EACH OF THE ESTABLISHED SPECIES.

Species	Distribution	Color	Head					ThII		AbdII		AbdIII			AbdIV					lp	ey	D
H. zaitzewi	Polar Urals	Yellowish, with additional dark longitudinal pattern	4*	1	1*	3	—	—	—	2	4*	1*	2	1*	—	—	—	—	—	4*	—	6
H. kangbachensis	Nepal	Uniform brownish-yellow	5*	2*	1*	2*	2	—	—	2	4*	0	2	2	0	3	3*	2	2	2*	2	7
H. khumbuensis	Nepal	Brownish-yellow, violet patches on lateral Th III, Abd I-IV	4*	2*	0	3	2	2*	3*	2	7*	0	2	2	3*	5*	3*	2	2	2*	2	9
H. makaluae	Nepal	Uniform dark-violet, dark bands on posterior margins of anterior half of body	4—6*	1	0	2*	2	3*	3*	1*	2*	0	1*	1*	1	4*	0*	2	2	2*	2	11
H. nuptseae	Nepal	White, deep blue patches on tergites	4*	2*	0	2*	2	3*	3*	2	7*	0	2	2	2	2	3*	2	2	3	2	7
H. pangpochensis	Nepal	Uniform dusky grey, bluish tinge	—	—	—	—	—	—	—	1*	2*	0	1*	1*	—	—	—	—	—	3	—	4
H. bulunkuli	Tadjikistan	Uniform yellowish-white	4*	1	0	2*	2	1*	2	2	3*	0	2	1*	0	0*	3*	2	2	3	2	7
H. glauca	Tadjikistan	Yellow with grey and blue	—	—	—	—	—	—	—	2	4*	1*	2	1*	—	—	—	—	—	3	2	3
H. martynovae	Tadjikistan	Brownish-yellow, dark patches on lateral and posterior tergites	4*	1	0	2*	2	0	1*	1*	3*	0	2	1*	0	0*	3*	2	2	3	2	8
H. pamirensis	Afghanistan	Brown and narrow dark margin	4*	2*	0	2*	2	0	4*	2	4*	1*	2	2	0	4*	3*	2	2	3	2	8
H. indica	NW Himalaya	Deep violet, brown bands Abd I, V-VI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	
H. bermani	E Siberia	Grey-blue with light spots	5*	1	0	2*	2	1*	2	1*	2*	0	1*	1*	0	0*	3*	2	2	3	1*	10
H. neriensis	E Siberia		6*	1	0	2*	1a*	1*	2	1*	2*	0	1*	1*	0	0*	3*	2	2	3	1*	11
H. gelmani	E Siberia	Yellow with dark violet patches	4*	1	0	3	2	3*	5*	2	5	0	2	1*	0	2	3*	3	2	4*	1*	7

TABLE 5. (CONTINUED) MACROCHAETOTAXY AND SOME OTHER CHARACTERS FOR THE SPECIES OF *HIMALANURA* INCLUDING THE NEW SPECIES DESCRIBED IN THIS PAPER. "—", UNKNOWN DATA. * NEW SPECIES DIFFERS FROM ESTABLISHED SPECIES; D, SUM OF THE DIFFERENCES BETWEEN THE NEW SPECIES AND EACH OF THE ESTABLISHED SPECIES.

Species	Distribution	Color	Head				ThII	AbdII		AbdIII		AbdIV			lp	ey	D
H. tundricola	E Siberia	Brownish—yellow, dark with bands on Th II, Abd II-III, and middle Abd IV	3*	1	0	3	3*	7*	2	5	0	2	1*	0	2	3*	2	4*	2	6
H. magadani	E Siberia	Yellowish, dark lateral spots on Abd IV	—	—	—	—	—	—	2	3*	1*	0*	1*	—	—	—	—	3	2	4
H. baijali **sp. nov.**	Ladakh, India	Green, with brown irregular patches	7	1	0	3	2	0	2	5	0	2	2	0-2	2-3	4	2-3	2	3	2

tral cephalic groove with 5 + 5 ciliated macrochaetae and without scales (Fig. 78).

Body. Scales only on dorsal head, body and ventral manubrium and dens. V-shaped trochanteral organ formed by a maximum of 13 smooth straight setae. Unguis with basal paired teeth at40% of the inner edge in L3 (25% in L1), and with 2 inner unpaired teeth at 65% and 70% of the L3 inner edge respectively (50% and 70% in L1); lateral teeth and dorsal tooth in basal position. Smooth setae on L3 very short (0.4 times the total unguis). Tibiotarsal tenent hair clavate (Fig. 79-80). Unguiculus truncate with smooth outer margin. Ratio manubrium : dens such as 1 : 1.2. Manubrial plate with 3 inner setae and 3 outer setae, and 2 pseudopores. Dental plate with 3 big and densely ciliated spines and approximately 13 accessory chaetae (Figs. 81 and 82).

Chaetotaxy. Dorsal macrochaetae formula (following Gisin 1967) R000/00/0101+3 (R formed by A_0, An_1, A_1 and A_2) (Figs. 83 and 84). Number of macrochaetae An on the head 8 + 8. Interocular chaetotaxy with s, t, q, p setae. Abbreviated formula for Abd II (following Gisin 1967): pa**B**q_1q_2. Th II-Abd IV chaetotaxy (Fig.84). Most setae associated with the tricobothria on Abd II-III leaf-shaped and ciliate, not exactly fan-shaped. Abd IV with only 2 microchaetae above T1 (tricobothrium), and are only 2 between T1 and T4 (T3 is absent); macrochaetae and mesochaetae are lose in the specimen, but the insertions can be differentiated. Five or 6 posterior microchaetae on Abd IV present.

Biology

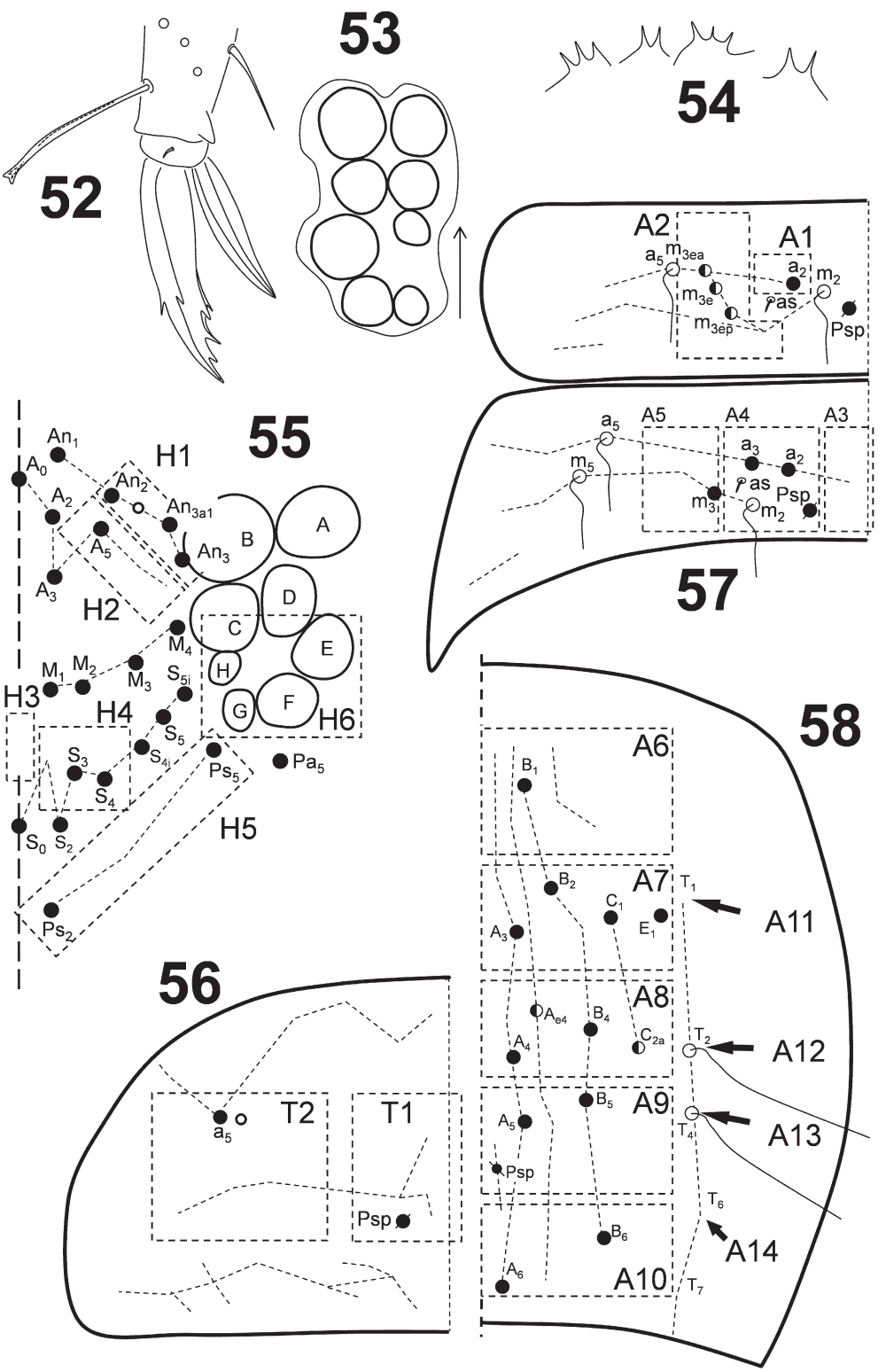
In Ladakh, found in leaf litter of Agricultural products (wheat, barley) (**Stn. 17**).

Distribution

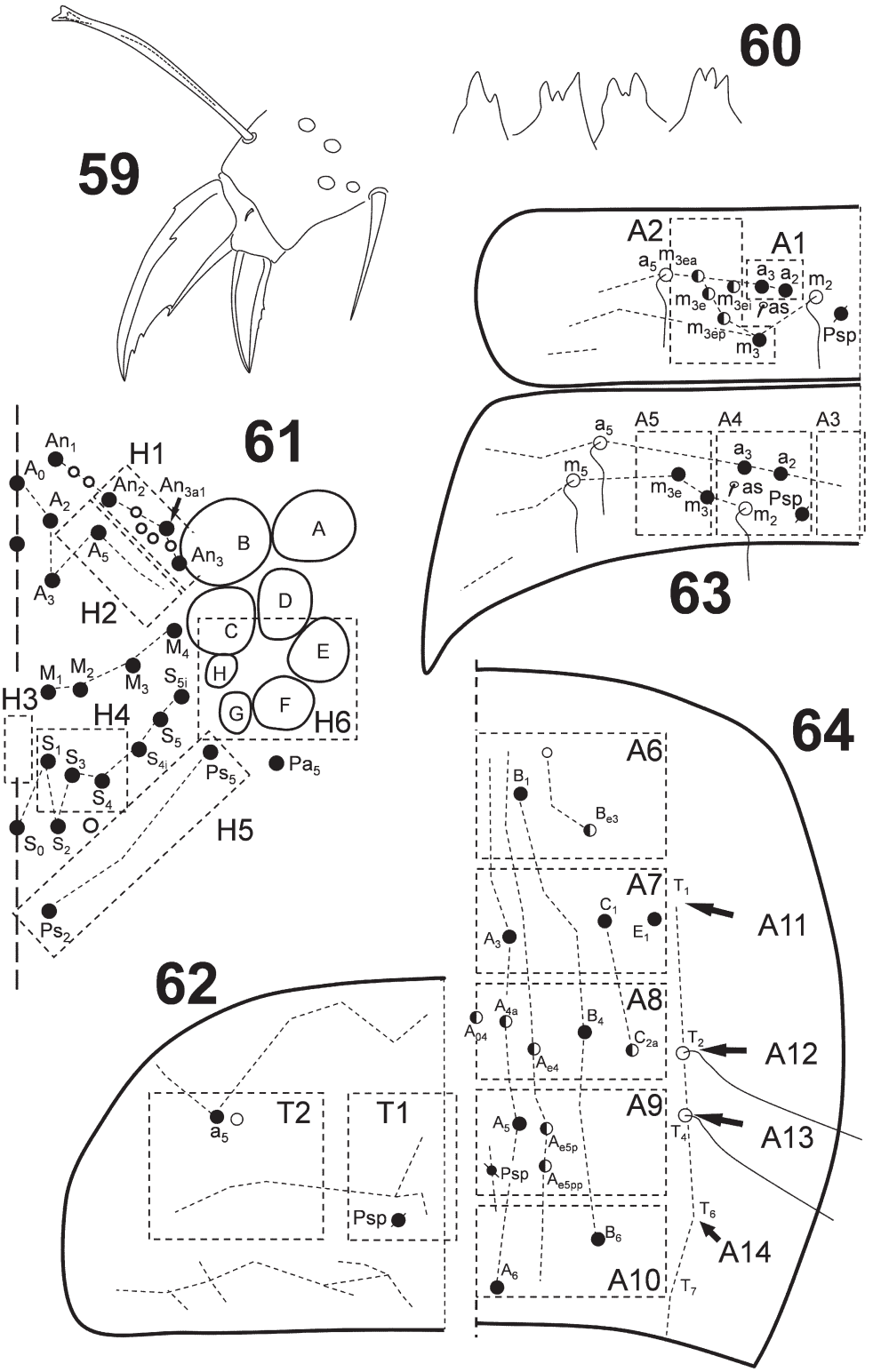
It had been found so far in Philippines (original description, on soil and moss) and Borneo (Yoshii 1982).

Remarks

The only described species for the subgenus so far as it was described as belonging to *Acanthurella*, later transferred to *Lepidocyrtus* (*Acrocyrtus*) by Yoshii in 1982. Yoshii & Suhardjono (1989) transfered it posteriorly to *Lepidocyrtus* (*Allocyrtus*). The species is referred here for a third time after its description by Handschin (1930) from Mt Makiling in the Philippines, from a single specimen found in moss and soil. Gapud (1971) mentioned that the Holotype is lost. Yoshii (1982) added a reference from Borneo (7 specimens), one from Sepilok and 6 from Labuk Road, Sandakan), described with some differences than the Philip-



Figs. 52-58. *Entomobrya mehtai* **sp. nov.** (52) Claw of hind leg; (53) Eye patch; (54) Labral papillae; (55) Head dorsal macrochaetotaxy; (56) Th II dorsal macrochaetotaxy; (57) Abd II-III dorsal macrochaetotaxy; (58) Abd IV dorsal macrochaetotaxy.



Figs. 59-64. *Himalanura baijali* **sp. nov.** (59) Claw of hind leg; (60) Labral papillae; (61) Head dorsal macrochaetotaxy; (62) Th II dorsal macrochaetotaxy; (63) Abd II-III dorsal macrochaetotaxy; (64) Abd IV dorsal macrochaetotaxy.

pines. Yoshii affirmed that he was in doubt about a different number of spines on dental plaque, so it keeps they belong to the same species. The specimen described here is fully consistent with that described by Yoshii, except the number of accessory setae in dental plaque (4 in Yoshii and 14 in this paper), the size of R chaetae on labium last row (vestigial in Yoshii), and the eye size G and H. About distribution, it is interesting the discovering of the subgenus in the Himalayas after being referred only from Philippines and Borneo. Due to the availability of a single specimen, it seems prudent to maintain their identity as *A. lepidornatus* despite the small differences observed.

Subfamily Seirinae Yosii, 1961, sensu Szeptycki, 1979

SEIRA NIDARENSIS BAQUERO & JORDANA **SP. NOV.**
(Figs. 12 and 13, 85-89)

Type Material

HOLOTYPE female INDIA: Jammu and Kashmir, Ladakh, Nidar village (**Stn. 12**), 8-IX-2008 (Mandal) (ZSI/H14/865, slide, ZSI). PARATYPES, same data as Holotype (Mandal) (ZSI/H14/857, female, slide, and ZSI/H14/866, in ethyl alcohol, MZNA; ZSI/H14/858, in ethyl alcohol, ZSI).

Description

Length to 1.2 mm. Background color grey or reddish, with blue and brown pigment over some parts of the body (Figs. 12 and 13).

Head. Scales dorsally on Ant 1-3 and absent on Ant. IV, head, coxa, trochanter, femur, body and anterior and posterior face of furcula (manubrium and dens). Antennae with a more or less visible annulation on Ant IV, with 5 spiral whorls, and with apical bulb simple; pin seta present; Ant III with 2 rod-like and 3 very short sensillae on sensory organ; there are 2 additional rod-like sensillae in the final third of Ant II and III. Eyes G and H similar in size to E and F. Labrum with 4/5,5,4 setae; prelabral setae ciliate, all labral setae smooth; medial trio on first row longer than all other setae; internal labral papillae at most with 2 very small projections, lateral papillae triangular or rounded but smooth. Plate of outer maxillary lobe with 3 seta-like structures; subapical seta smooth and 1.4x longer than apical seta. Modified seta of outer maxillary palp curved, inserted on the distal half of the papilla and reaching the middle of the setae. Labial chaetotaxyA1-4, M1, M2, r, E, L1-4; M1 and R 2/3 of the other ones.

Body. Mesothoracic hood absent. Trochanteral organ with 11-13 setae. Unguis with 4 internal teeth: basal paired teeth subequal, ending at about half length of unguiculus; proximal unpaired tooth larger than distal, ending at 75% from basal unguis; dorsal and lateral teeth at level of paired (Fig. 89). Unguiculus lanceolate, serrate externally. Smooth subapical inner seta on L_3 0.66x length of tenet hair and 0.57x length of claw. Tenent hair strongly acuminate. Collophore with 7+7 anterior setae, 7 + 7 setae on distal flaps, and without posterior setae. Manubrium ventrally with 1(2) + 1(2) subapical and short smooth setae; 4(5) + 4(5) setae and 2 pseudopores on manubrial plate. Mucro without setae inserted beyond end of crenulations; not ringed length 2.5-3 times the mucro.

Macrochaetotaxy (Figs. 85-88). Dorsal cephalic macrochaetae distributed by region as follows (regions according to Yosii 1959, Jacquemart 1973, 1974, and Christiansen & Bellinger 2000): head region 1:7(8)+1; 2:5 (with and additional mesochaeta behind A_3 in the paratype on slide); 3: 4; 4A:2; 4B:4; 4C:3; 4D:2; 5:3; 6:4. Th II region 1A:3; 1B:4; 2:4; 2A: 6; 2B: 4; 2C: 4; there are 4 + 1 (p_6) lateral macrochaetae. Th III with 14 macrochaetae arranged in 3 groups of 6, 4, 4 setae. Abd I with 6 macrochaetae. Abd II with 4 macrochaetae between tricobothria and 1 lateral (m_5) to the external tricobothrium; internal and external tricobothria associated with up to 5 and 6 setulae, respectively, not fan-shaped. Abd III with 1 macrochaeta between internal and lateral tricobothria (m_3), and 3 large macrochaetae associated with postero-external tricobothrium; internal tricobothrium associated with 5 setulae, not fan-shaped; external tricobothria associated with 3(4) and 5 setulae, not fan-shaped. Abd IV: region 1 with 4 macrochaetae; region 2 with 4 macrochaetae; region 3 with 3 macrochaetae; 5 + 5 posterior setae.

Biology

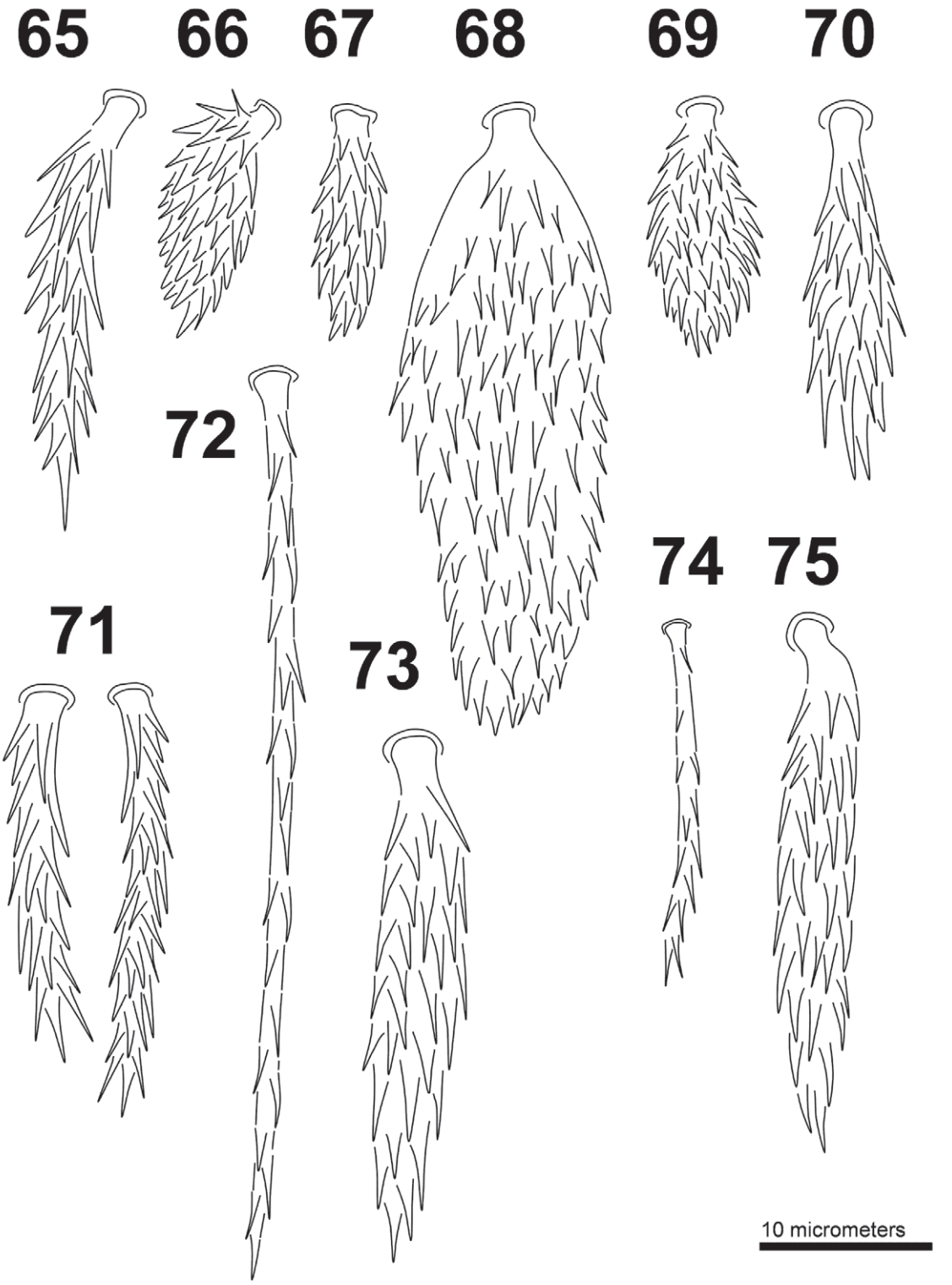
In Ladakh, found in leaf litter (**Stn. 12**).

Remarks

The described species that share the macrochaetae number in the areas "Head 4" (M, S and P rows), "Th II 1A" (a5) and the sum of chaetae on the posterior Th III (p1-p4) are 9: *S. arenaria* da Gama, 1966, *S. dagamae* Dallai, 1973, *S. dinizi* da Gama, 1988, *S. domestica* (Nicolet, 1842), *S. elisae* Gers & Deharveng, 1985, *S. jacquemarti* Bar, 2004, *S. polysperes* Bar, 2004, *S. sanaaensis* Bar, 2004 and *S. uwei* Barra, 2010. The Table 6 shows the differences in dorsal macrochaetotaxy between the new species and the above mentioned species. The closest species is *S. arenaria*, which differs by only 2 chaetotactic characters (Head 5 and Abd IV 1), but the coloration is totally different: *S. arenaria* is described with a very general dark coloration, with the sides of the segments Th II-Abd II completely dark, and too completely dark the Abd III and almost totally the Abd IV.

TABLE 6. MACROCHAETOTAXY CHARACTERS FOR THE SPECIES OF *SEIRA* THAT SHARE THE FOLLOWING CHARACTERS (DORSAL MACROCHAETOTAXY AREAS FOLLOWING JACQUEMART, 1973): HEAD 2, 4 AND 6; TH II A; TH III (A+B+C); AND ABD I. * AND D1, NUMBER OF DIFFERENCES (IN CHARACTERS) BETWEEN *S. NIDARENSIS* BAQUERO & JORDANA **SP. NOV.** AND THE REST. ** AND D2, SAME FOR *S. HAZRAI* BAQUERO & JORDANA **SP. NOV.**

	S. nidarensis **sp. nov.**	*S. arenaria*	*S. hazrai* n.sp.	*S. polysperes*	*S. dinizi*	*S. domestica*	*S. jacquemarti*	*S. uwei*	*S. sa-naaensis*	*S. elisae*	*S. dagamae*
Characters	India	Palaearctic	India	Yemen	Canary Is. (Spain)	Palaearctic	Yemen	Palaearctic	Yemen	Palaearctic	Palaearctic
Head 1	8-9	9	9	9	9	9	10*/**	10*/**	7*/**	6*/**	10*/**
Head 2	5	5	5	5	5	5	5	5	5	5	5
Head 3	4**	4**	5*	4**	4**	4**	4**	5*	4**	4**	3*/**
Head 4	2432	2432	2432	2432	2432	2432	2432	2432	2432	2432	2432
Head 5	3**	2*/**	1*	2*/**	2*/**	2*/**	2*/**	2*/**	2*/**	1*	2*/**
Head 6	4	4	4	4	4	4	4	4	4	4	4
TII 1A	3	3	3	3	3	3	3	3	3	3	3
TII 1B	3-4	4	3-4	4	3	4	4	4	4	4	4
TII 2	4	4	4	3*/**	4	4	4	4	4	4	4
TII 3A	6	6	6	7*/**	6	7*/**	6	7*/**	5*/**	6	7*/**
TII 3B	2	2	2	2	3*/**	2	2	2	2	3*/**	3*/**
TII 3C	6	6	6	6	5*/**	10*/**	7*/**	6	7*/**	5*/**	5*/**
TIII (A+B+C)	6+4+4	6+4+4	6+4+4	6+4+4	6+4+4	6+4+4	6+4+4	6+4+4	6+4+4	6+4+4	6+4+4
Abd I	6	6	6	6	6	6	6	6	6	6	6
Abd II	4+1	4+?	4+1	4+1	3+?*/**	5+?*/**	5+1*/**	4+1	4+1	4+0*/**	5+1*/**
Abd III	1+3**	1+?	1+2*	1+3**	1+?	1+?	1+3**	1+3**	1+3**	1+0*/**	1+3**
Abd IV1	4**	5*	5*	5*	4(5)	5*	8*/**	5*	5*	5*	5*
Abd IV2	4	4	4	4	4	4	4	4	3*/**	4	4
Abd IV3	3	3	3	3	4*/**	3	3	3	8*/**	4*/**	3
D1	—	2	4	4	5	5	5	5	7	8	8
D2	4	2	—	5	6	5	7	4	8	7	8



Figs. 65-75. *Himalanura baijali* **sp. nov.**, different shapes of body chaetae. (65) Front head; (66) Head, behind eye; (67) Th II, lateral; (68) Th III, dorsal; (69) Abd III, dorsal; (70 Abd V, dorsal; (71) Manubrium, dorsal; (72) Manubrium, lateral; (73) Manubrium, ventral; (74) Dens, lateral; (75) Dens, ventral.

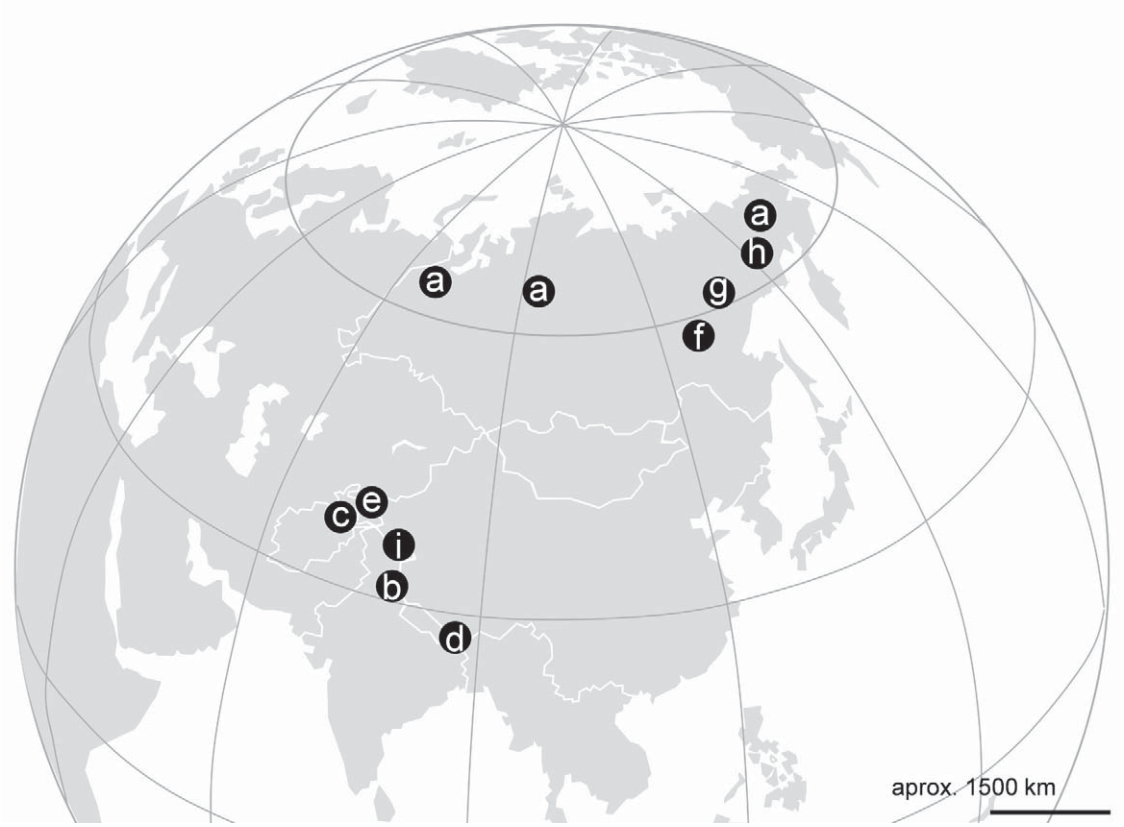


Fig. 76. Distribution of described species of *Himalanura*: a, *H. zaitzewi* (*Entomobrya* in Bellinger et al. 1996-2014); (b) *H. indica*; (c) *H. pamirensis*; (d) *H. kangbachensis*, *H. khumbuensis*, *H. makaluae*, *H. nuptseae*, *H. pangpochensis*; (e) *H. bulunkuli*, *H. glauca*, *H. martinovae*; (f) *H. bermani*; (g) *H. neriensis* (syn. of *H. bermani*); (h) *H. gelmani*, *H. magadani*, *H. tundricola* (*H. gelmani* and *H. tundricola* could be synonyms) (*H. magadani*: *Entomobrya* in Bellinger et al. 1996-2014); (i) *H. baijali* **sp. nov.**

Etymology

The new species is named after type locality.

SEIRA HAZRAI BAQUERO & JORDANA **SP. NOV.**
(Figs. 14 and 15, 90-95)

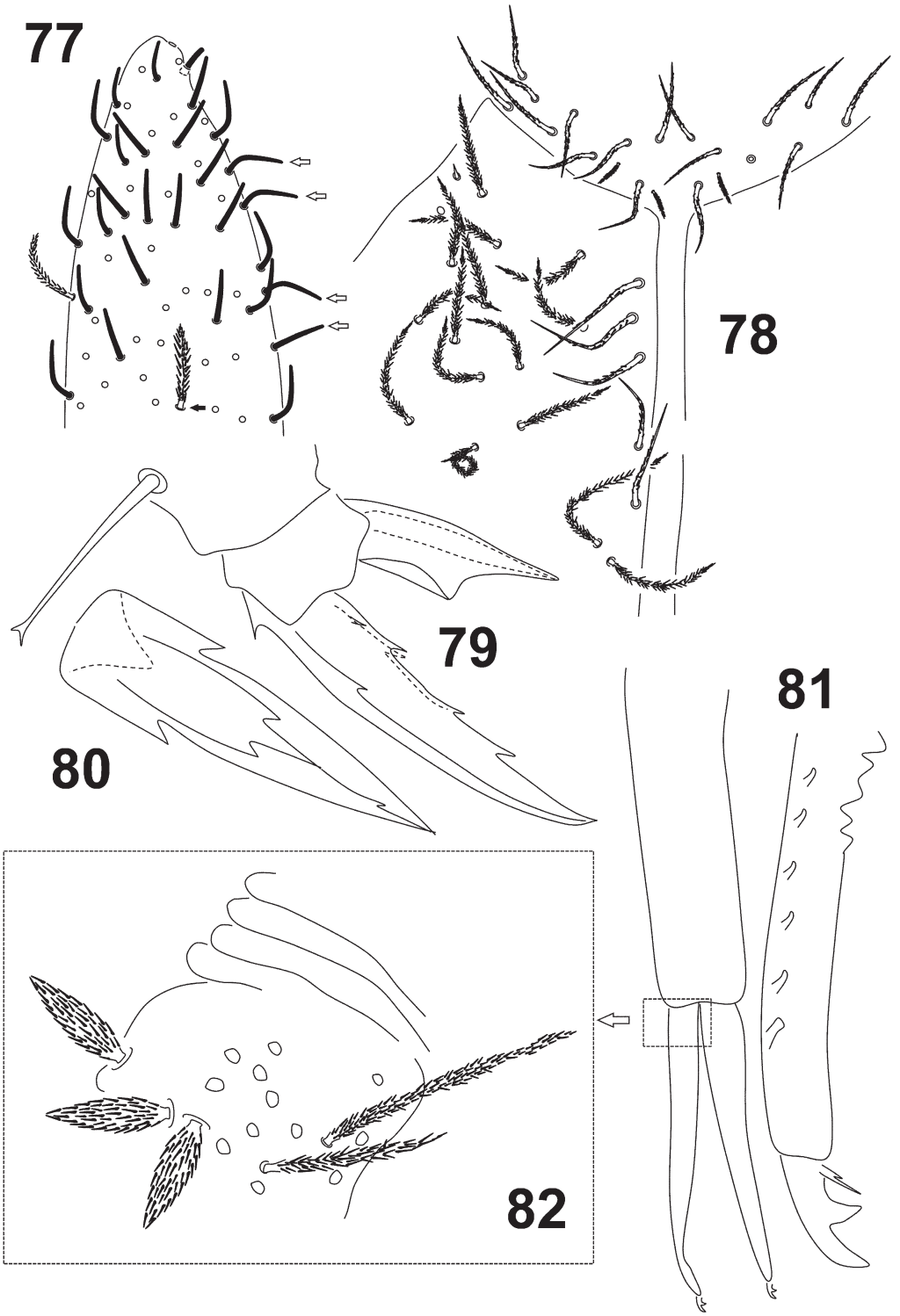
Type Material

HOLOTYPE female INDIA: Jammu and Kashmir, Ladakh, Chusul village (**Stn. 08**), 7-IX-2008 (Mandal) (ZSI/H14/863, slide, ZSI). PARATYPES, same data as Holotype (Mandal) (ZSI/H14/864, in ethyl alcohol, ZSI); INDIA, Ladakh, Chumathang, bank of Indus (**Stn. 15**), 11-IX-2008 (Mandal) (ZSI/H14/881, female, slide, MZNA; ZSI/H14/882-886, in ethyl alcohol, ZSI).

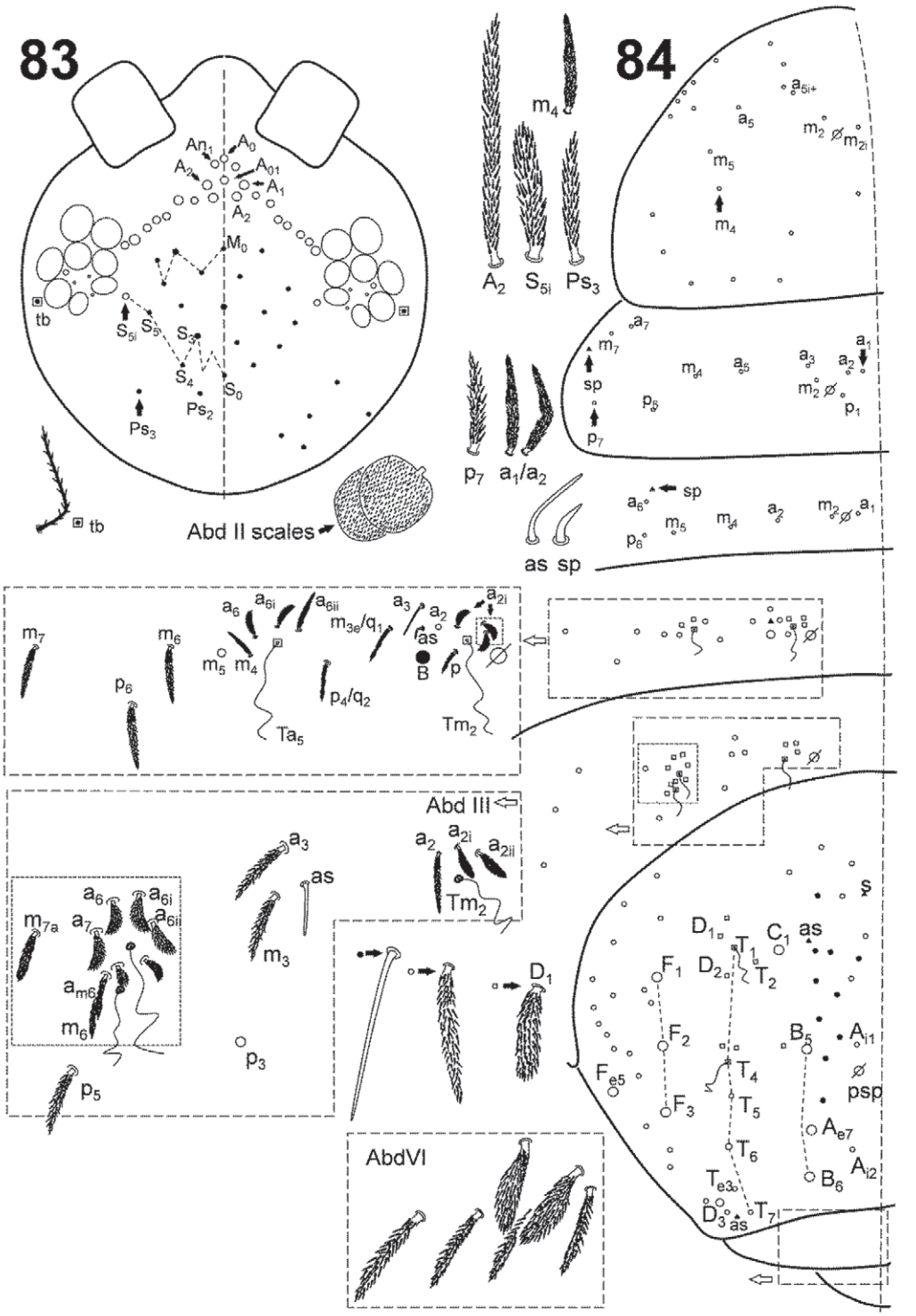
Description

Length to 1.5 mm (Holotype). Background color whitish, with blue pigment disposed in transversal bands over some segments of the body: only on Abd II-III in the minimal pigmentation and on Th II-Abd III + a central patch on Abd IV in the more pigmented specimens; there is too a narrow band along anterior area in Th II (Figs. 14 and 15).

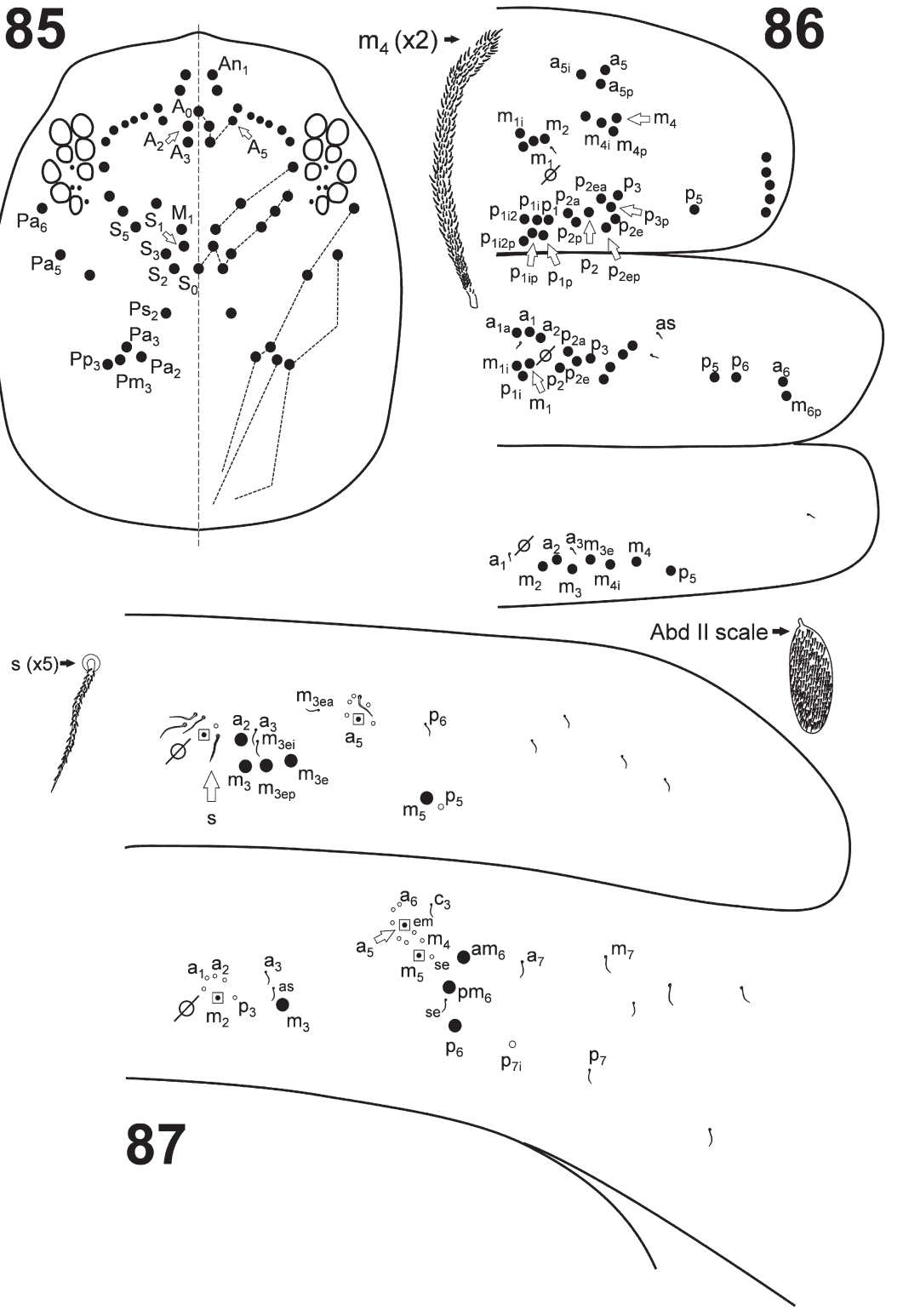
Head. Scales dorsally on Ant 1-2, head, coxa, trochanter, femur, tibiotarsus, body and anterior face of furcula (manubrium and dens). Antennae without annulation on Ant IV, with apical bulb simple and pin seta (Fig. 94); Ant III with 2 rod-like (with some sculpture) and 3 accessory sensillae on sensory organ; there are 5 additional rod-like sensillae in the final half of Ant III (1, 2, 1) and 3 on Ant II (1, 1, 1). Eye G similar in size to E and F; H slightly smaller. Labrum with 4/5,5,4 setae; prelabral setae ciliate, all labral setae smooth; medial trio on first row longer than all other setae; internal labral papillae smaller and more pointed than lateral ones. Plate of outer maxillary lobe with 3 seta-like structures, and subapical seta smooth. Modified seta of outer



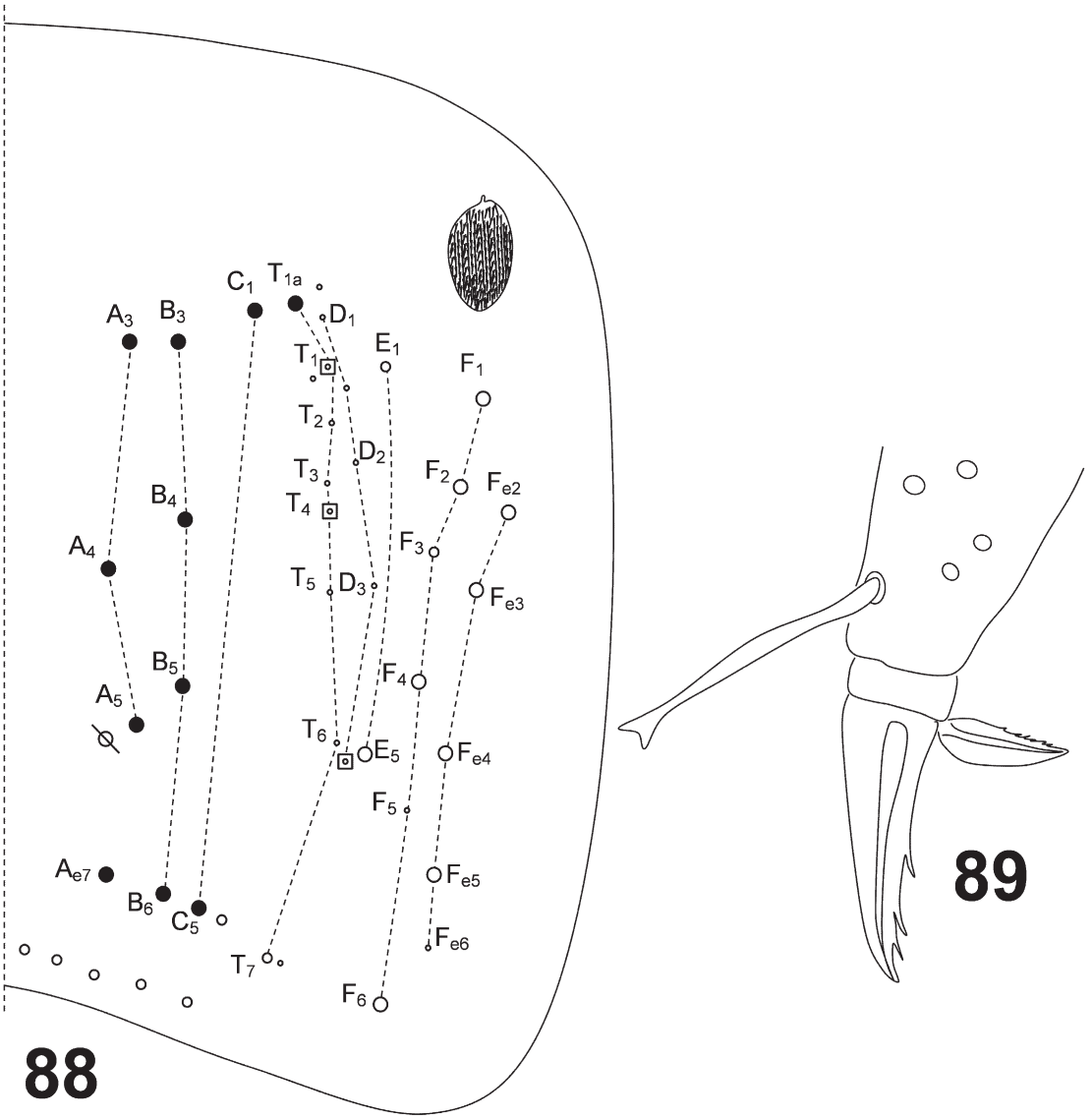
Figs. 77-82. *Lepidocyrtus* (*Allocyrtus*) *lepidornatus*. (77) Tip of Ant IV; (78) Labial triangle (in part) and ventral cephalic groove area; (79) Claw of fore leg in lateral view; (80) Claw of fore leg in ventral (internal) view; (81) Part of manubrium, dens and mucro (with detail at right); (82) Enlarged area of dental plate, showing the insertion of spines and chaetae.



Figs. 83 and 84. *Lepidocyrtus* (*Allocyrtus*) *lepidornatus*. (83) Head dorsal macrochaetotaxy (tricobothrium enlarged at left); (84) Body dorsal macrochaetotaxy (some chaetae, scales or sensillae with information about its insertion at left; the polygonal enlarged areas show the morphology of the chaetae and the nomenclature proposed for them).



Figs. 85-87. *Seira nidarensis* **sp. nov.** (85) Head dorsal macrochaetotaxy; (86) Th II-Abd I dorsal macrochaetotaxy; (87) Abd I-III dorsal macrochaetotaxy.

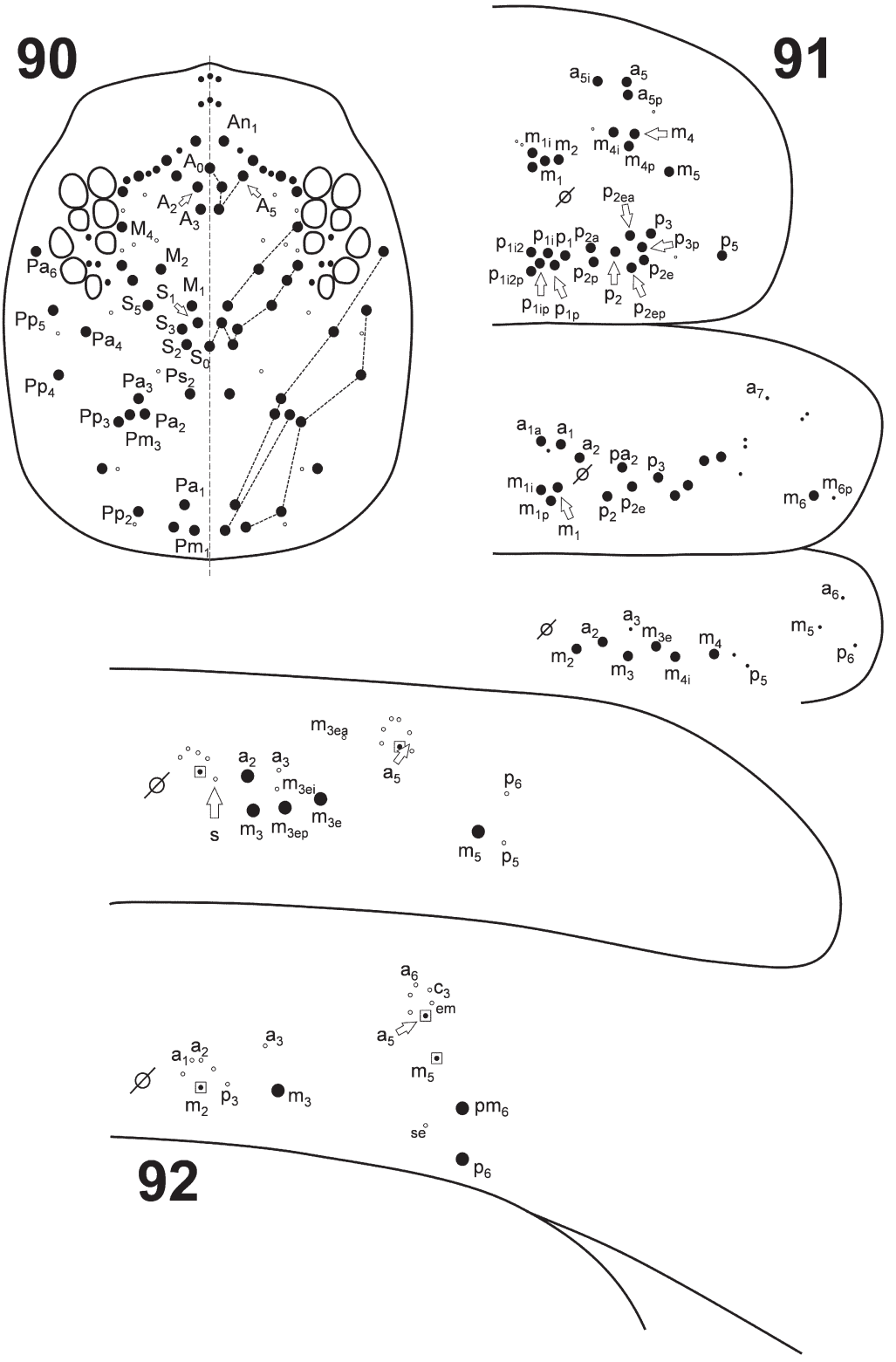


Figs. 88 and 89. *Seira nidarensis* **sp. nov.** (88) Abd IV dorsal macrochaetotaxy; (89) Claw of fore leg.

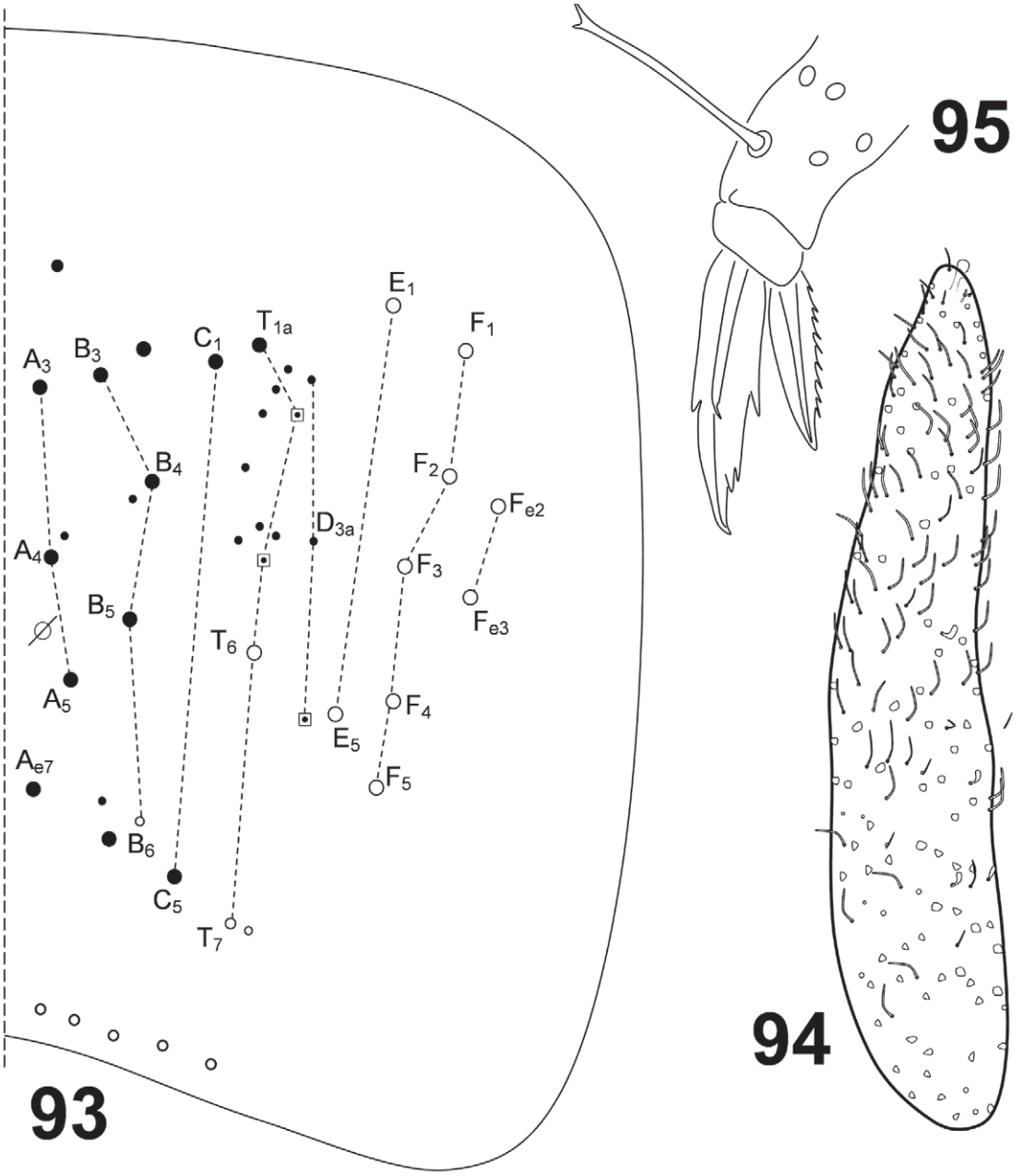
maxillary palp curved, inserted on the distal half of the papilla and reaching the middle of the setae. Labial chaetotaxy A1-4, M1, M2, r, E, L1-4; R ⅔ of the other ones.

Mesothoracic hood totally absent. Trochanteral organ with only 7 setae. Unguis with 4 internal teeth: basal paired teeth subequal, ending at about half length of unguiculus; proximal unpaired tooth larger than distal, ending at 60% and 70% from basal unguis respectively; dorsal and lateral teeth at level of paired (Fig. 95). Unguiculus lanceolate, serrate externally. Smooth subapical inner seta on L3 18 micrometers in length. Tenent hair clavate. Manubrium ventrally without smooth setae; 4 + 4 setae and 2 pseudopores on manubrial plate. Mucro without setae inserted beyond end of crenulations; not ringed length 2-2.5 times the mucro.

Macrochaetotaxy (Figs. 90-93). Dorsal cephalic macrochaetae distributed by region as follows (regions according to Yosii 1959, Jacquemart 1973, 1974, and Christiansen & Bellinger 2000): head region 1:8+1; 2:5; 3:5; 4A:2; 4B:4; 4C:3; 4D:2; 5:1; 6:4. Th II region 1A:3; 1B:4; B:4; 2A: 6; 2B: 4; 2C: 4. Th III with 14 macrochaetae arranged in 3 groups of 6, 4, 4 setae. Abd I with 6 macrochaetae. Abd II with 4 macrochaetae between tricobothria and 1 lateral (m_5) to the external tricobothrium; inter-



Figs. 90-92. *Seira hazrai* **sp. nov.** (90) Head dorsal macrochaetotaxy; (91) Th II-Abd I dorsal macrochaetotaxy; (92) Abd I-III dorsal macrochaetotaxy.



Figs. 93-95. *Seira hazrai* **sp. nov.** (93) Abd IV dorsal macrochaetotaxy; (94) Ant IV segment; (95) Claw of fore leg.

nal and external tricobothria associated with up to 5 and 6 setulae, respectively, not fan-shaped. Abd III with 1 macrochaeta between internal and lateral tricobothria (m_3), and 2 large macrochaetae associated with postero-external tricobothrium; internal tricobothrium associated with 5 setulae, not fan-shaped. Abd IV: region 1 with 5 macrochaetae and an additional external mesochaetae; region 2 with 4 macrochaetae; region 3 with 3 macrochaetae and an additional external mesochaetae; 5 + 5 posterior setae (Fig. 93).

Biology

In Ladakh, found in leaf litter (**Stn. 08**) and under stone (**Stn. 15**).

Remarks

This new species of *Seira* can be distinguished of the remaining described species of *Seira* as the previously described *S. nidarensis* Baquero & Jordana **sp. nov.** (Table 6). *S. arenaria* is too the closest species if the dorsal macrochaetotaxy is considered, but the coloration is completely different between them.

Etymology

The new species is named after Dr. Ashis Kumar Hazra, one of the important contributors of India Collembola.

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