

REDESCRIPTION OF SOME INDIAN *LEPIDOCYRTUS* SP. (COLLEMBOLA-ENTOMOBRYIDAE)

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ABSTRACT

The genus *Lepidocyrtus* of collembola (Arthropalea - Entomobryidae) has been described. The species *Lepidocyrtus lignorum* and *L. curvicollis* are reported for the first time from India. The specimens were collected from soil litter. *L. curvicollis* and *L. lignorum* has characterized by the presence of scales on the 1st and 2nd segments of antennae, legs beyond coxae and dorsal side of manubrium. The species *L. lignorum* is characterized by normal mesonotum. Presence of R macrochaetae on head but S and T setae absent. On abd. 4 lateral macrochaeta E1 set between L2 and L3. *L. curvicollis* is characterized by mesonotum hood-like projecting, blunt at tip. Head without macrosetae. R S and T microsetae present. On abd. 4 lateral macrochaeta E1 set behind L2. Unguiculus of *L. curvicollis* shows serrated structure.

INTRODUCTION

Collembola is one of the most important groups in soil mesofauna, mainly because of their importance in soil genesis, dynamics and evolution. The great diversity of habitats and their prompt response to environmental variations (Pozo et al., 1986), mainly those caused by anthropic modifications, as deforestation and burning, make this group usefull as bioindicators (Zeppelini et al., 2009). While working on the Collembola under Network Project on Insect biosystematics of Indian Council of Agricultural Research much information was generated (Rahuraman et al., 2010) on biodiversity of Collembola. Among different species collected and identified (Santeshwari et al., 2013), the genus *Lepidocyrtus* was recorded as very common on surface soil. Lal et al. (2011) has also reported the presence of *Lepidocyrtus* sp. in crop land ecosystem. It was more abundant during summer month (April and May). Mateos and Petersen (2012) recorded this genus as largest genera within the order Collembola. Janssens (2012) recorded this genus as cosmopolitan in nature with 260 species on global basis. In India 20 species of *Lepidocyrtus* has been described (Mandal, 2011). Therefore, it is necessary to redefine the Indian species of *Lepidocyrtus*. The paper describes *L. lignorum*, *L. fimetarius* and *L. curvicollis*. The *L. lignorum* and *L. fimetarius* are reported from India for the first time. *L. lignorum* and *L. fimetarius* appears to be the 21st and 22nd species of this genus except *L. curvicollis*. Taxonomic features of the genus *Lepidocyrtus* have been discussed by several authors (Mari Mutt, 1988; Soto-Adames, 2008; Mateos, 2008; Mateos and Petersen, 2012).

Mateos and Petersen (2012) reviewed the conventional and introduced several new diagnostic characters.

The described species of *Lepidocyrtus* was collected from soil litter and top soil transition vegetation of Varanasi. Varanasi is situated at a latitude of 28°18 'N and a longitude of 83°03 'E with an altitude of 128.93m above the mean sea level in the eastern part of upper Gangetic plain, which form a district sub-division of India in the State of Uttar Pradesh. The present study describes digital photographic characters of *Lepidocyrtus* species. The chaetotaxy scheme follows the system of Christiansen and Bellinger (2000) modified from Jacquemart (1974).

MATERIALS AND METHODS

The soil samples were collected at the rate of 2 to 3 samples from leaf litter of pedo-ecology vegetation site thrice in month. Every sampling unit was collected in separate polythene bag and brought to the laboratory and the extraction process was done through modified dynamic Tullgren's funnel. Soil samples were put in separate funnels fitted with mesh in the lower side and was placed in funnels. Collecting vials containing 70% alcohol and few drop of glycerol were fitted to the lower sides of funnels. During extraction, the samples were exposed to less intensity of light to give low heat initially for a period of 12 hours and later the samples were given more intensity of light and heat for full extraction with the help of illumination timer and light intensity controller. The specimens were sorted and segregated out under zoom stereomicroscope from vials. Subsequently, they were preserved in

70% alcohol with few drops of glycerol. The specimens were mounted on slides in Canada balsam after serial dehydration method. The digital photographs were taken through Lieca MZ16 microscope fitted with Leica DFC 290 camera.

RESULTS AND DISCUSSION

The characteristic of the family Entomobryidae is known by 4th Abdomen in dorsal midline more than twice as long as abd.3. The distinguishing characters of the genus *Lepidocyrtus* as it is recognized today are the four-jointed antennae and Ant.1 not subdivided (Fig. 1A). The presence of transparent blunt scales (which easily fall off) is found all over the body (Fig. 1B). The number of ocelli 8+8, on large ocellar spots (Fig. 1C) has been given as characteristic, but this cannot be depended upon.

Genus *Lepidocyrtus* Bourlet, 1839

The scales which are present on head, body and ventral side of furca are blunt-tipped and appear smooth (microstriae present) (Fig. 1B). Some species are with scales also on antennae and legs (Fig. 2C and 4D). The ground cover consists of ciliate setae. Macrochaetae present but reduced in number. Trichobothria present on abd.2-4 (2-3-2 on each side). The setal arrangement around the trichobothria on abd.2-4 offer diagnostic characters, but carefully mounted specimens are necessary. Maxillary outer lobe with simple palp and 3 sublobal hairs (0 in *fimetarius*). Labrum with smooth setae and 4 ciliate prelabrals (smooth in *curvicollis*). Labral edge with 4 pointed (hooked) papillae. Labial palps with a normal set of papillae and guards, proximal setae 5. Lateral papillae with 4 guards (3 in *fimetarius*) and a variable lateral process. Basomedian field of labium with a variable chaetotaxy, often species specific. Basolateral field always with 5 setae, usually 3 smooth and 2 ciliate (all smooth in *curvicollis*). Ocelli 8+8, PAO absent. Maxilla with a 3-toothed capitulum, lamellary complex fused to form short pads with a delicate denticulate surface, no long cilia or serrations. Mandibles normal, strong. Retinaculum with 4 + 4 teeth and one macrochaeta. Manubrial ventroapical thickening blunt, without teeth/serrations. Mucro with two teeth and a spine. Tibiotarsi with a spatulate apical tenent hair. Claws with a pair of lateral teeth and a dorsomedian tooth in basal 1/3. Inner edge has a double tooth in the middle and a single tooth more distally. Unguiculus of variable shape, ventral edge sometimes serrated.

Lepidocyrtus lignorum Fabricius, 1793

Live specimens silvery metallic. Body size up to 2.83 mm (Fig. 2A). Mesonotum normal (Fig. 2B) with uniform yellowish body colour. The blue pigmented area is only distal part of antennae. Colour whitish, often blue at base of legs (Fig. 2C), on dorsal side of head and in posterior part of abd.4. Scales present on the 1st and 2nd segments of antennae (Fig. 2D). Scales present on legs beyond coxae. Dorsal side of manubrium is scaled. Inner edge of unguis with a double tooth in the middle and a single tooth in distal 1/3. Unguiculus lanceolate, without teeth. Eye with 8 ocelli. Ant.IV without apical bulb. Head with R Macrochaetae (Fig. 2E). Head macrochaetae S and T not developed only short setae present (Mateos 2011). Well developed furca. Crenulated dens is present (Fig. 2F). Chaetotaxy in median parts of abd.2 as Fig. 2G. Chaetotaxy of the trichobothrial fields of abd.4 as Fig. 2H, anterior and posterior groups set wide apart. On abd.4 lateral macrochaeta E1 set between L2 and L3 (Fig. 2H). Seta associated with the trichobothria distinctly ciliate (Fig. 2I). Abd.4 with 4+4 macrochaetae in the median field (Fig. 2J). Base of labium with 4 ciliate setae in the median field and prelabral setae ciliated. Outer maxillary palp with two smooth macrochaetae. Outer differentiated seta of labial appendage curved, tip not reaching the apex of the papilla. Ventral cephalic groove with 4+4 ciliated setae.

The investigated specimens show the morphological and chaetotaxic characters described by Gisin (1964a, b) and Mateos (2008) for *L. lignorum* although showing some minor differences such as: body size, and unguis with two teeth (instead of only one). As Gama (1973) indicated while studying specimens from different localities, not all specimens have the apical setae of labrum distinctly tri-branched (Szeptycki, 1967) and some of them have these setae bi-branched. No specimens with the color pattern described by Gama (1973) for *L. lignorum*.

Lepidocyrtus fimetarius Gisin, 1964

Body size up to 1.88 mm (Fig. 3A). Pale yellow to gray with dark blue eyepatches. Eyes 8 + 8. Unpigmented apart from eye-spots, or large individuals with a faint violet blue colour over head and most of body including base of legs (Fig. 3A). Mateos (2008) described absence of scales from antennae and legs, colophore, and dorsum of furcula. Tip of antennae with a retractile apical bulb (Fig. 3B). Ant III organ with setae. Mesonotum hood like (Fig. 3C. i). Violet pigments present on

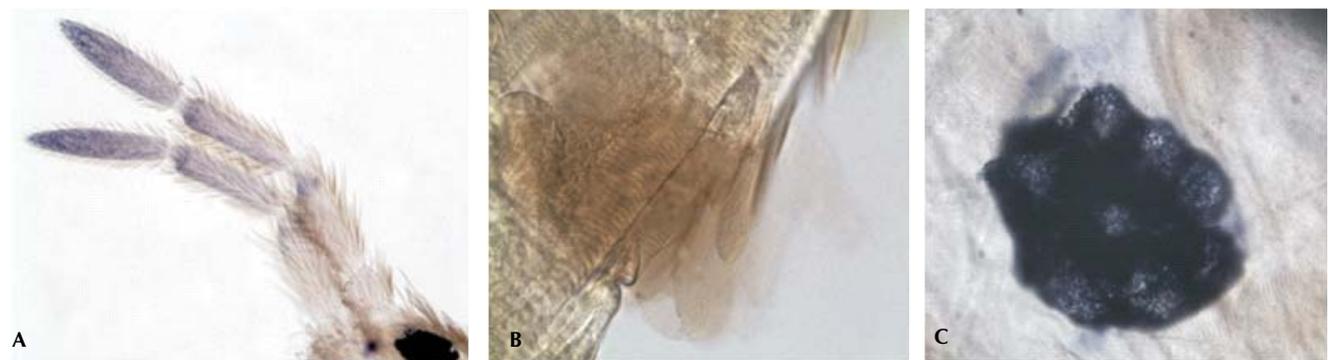


Figure 1: (A) Antenna; (B) Blunt Scale; (C) Ocelli



Figure 2: (A) Habitus (*Lepidocyrtus lignorum*); (B) Mesonotum normal; (C) Blue pigments at base of legs; (D) Antennae with scale; (E) Head with R Macrochaetae; (F) Crenulate dens and Mucro; (G) Trichobothria and microchaetae on abd. 2 (H) Lateral macrochaetae and trichobothria on abd.4; (I) Trichobothria and associated setae on abd. 4; (J) Macrochaetae on abd. 4 (Right Side).

mesonotum (Fig. 3C. ii). Subapical seta of outer maxillary palp slightly longer than apical seta. Maxillary outer lobe without sublobal hairs (Fig. 3D). Wang *et al.* (2003) describe high variability in labial chaetotaxy of *L. fimetarius*, including presence of M and E ciliated, r vestigial setae (Fig. 3E). Labral

setae 4-5-5-4, prelabral setae ciliate, remainder smooth; labral intrusion reduced to narrow slit and labral papillae absent. Papillae D and E of the labial palp with 3 guard setae only. Head without dorsal macrochaetae behind the antennal group, R, S and T microsetae present (Fig. 3F). Chaetotaxy of abd.2 as Fig. 3G. Setae associated with the trichobothria ciliate, but not clearly expanded towards tip. Trichobothria on abd.2 set close together, no macrochaetae between them (Fig. 3G). Lateral chaetotaxy of abd.4 as Fig. 3H, seta e1 in front of L2 (Fig. 3H). Central field of abd.4 with 2 + 2 macrochaetae (Fig. 3I). Inner edge of unguis with a paired tooth in the middle and two small distal teeth, of which the inner one show a tendency of becoming split (paired). Unguiculus pointed, lanceolate (Fig. 3J). Tenent hair clavate, slightly shorter than inner edge of unguis. Manubrium and dentes scaled ventrally (Fig. 3K). Manubrial plaque with 2 sometimes 3 inner ciliated setae and 3 sometimes 2 outer ciliate setae. Uncrenulate portion of dens more than two times longer than mucro. Mucro with apical and subapical tooth, Apical setae present on mucro (Fig. 3L).

***Lepidocyrtus curvicollis* Bourlet, 1839**

The first described species of the group was *L. curvicollis*, and hence the group gets its name. Body size up to 2.76 mm (Fig.

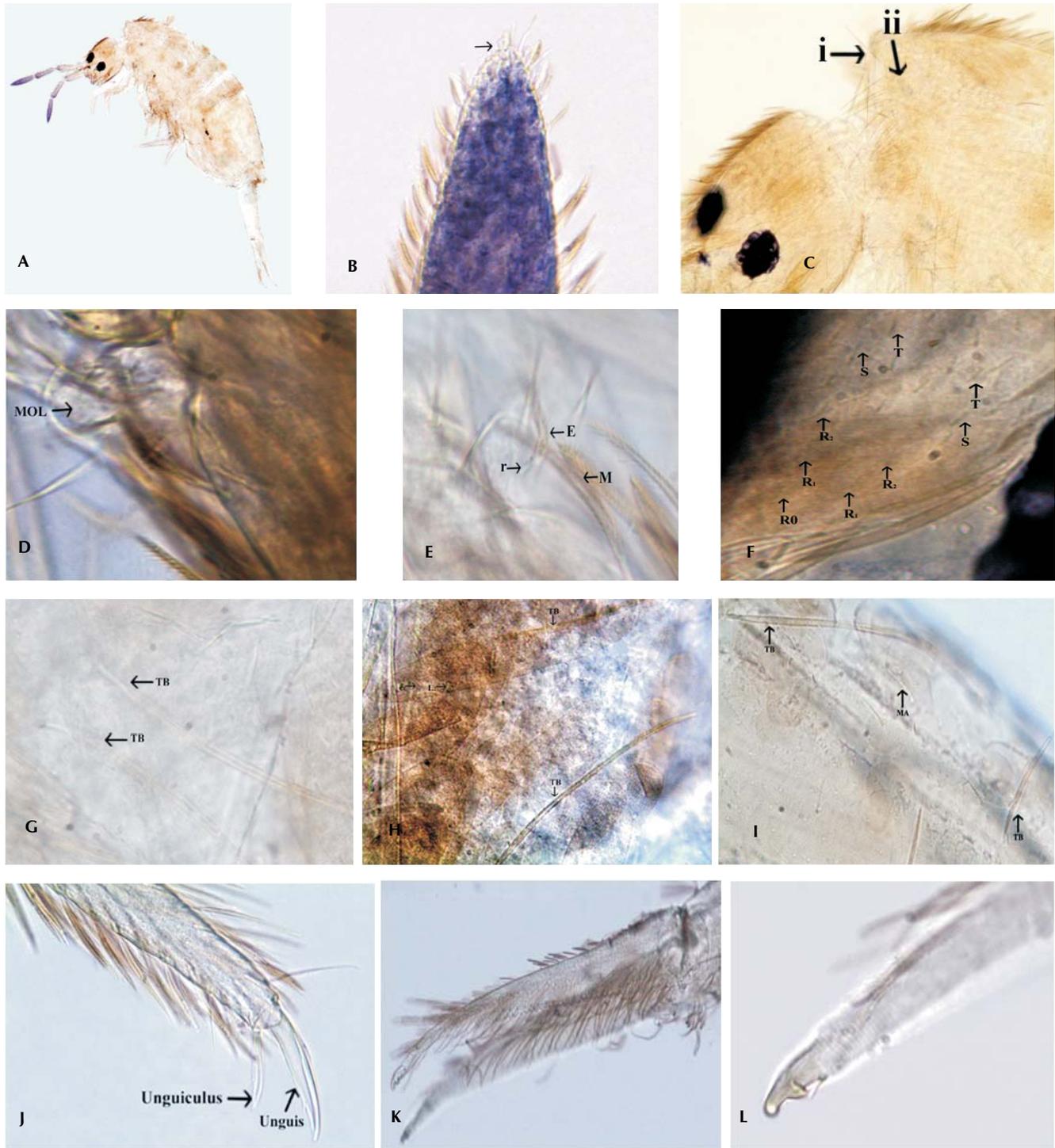


Figure 3: (A) Habitus (*Lepidocyrtus fimetarius*); (B) Apical bulb on the tip of Antenna; (C) i. Mesonotum hood like and ii. Violet pigment on Mesonotum; (D) Maxillary outer lobe (MOL) without sublobal hairs; (E) Labial base with setae M and E ciliated, r vestigial setae; (F) Head with R, S and T Microchaetae; (G) Abd. 2 with Trichobothria and without macrochaetae; (H) Lateral Chaetotaxy of Abd. 4 (Seta e1 in front of L2); (I) Central Chaetotaxy of Abd. 4. Trichobothria (TB), Macrochaetae (MA); (J) Claw; (K) Dens with scales and mucro; (L) Mucro with apical setae

4A). Mesonotum hood-like projecting, blunt at tip characters shared with species of the *lignorum* group sensu (Mateos, 2011). Body with blunt scale. Dallai (1969) described basomedian field of labium with 6 setae, of which only the

two short ones are ciliated (Fig. 4B). The 4 prelabral setae all smooth. Violet blue pigments are present in the distal parts of the antennae. Antennae and legs beyond coxae with scales (Fig. 4C and 4D) (Mateos and Petersen 2012), Violet blue or

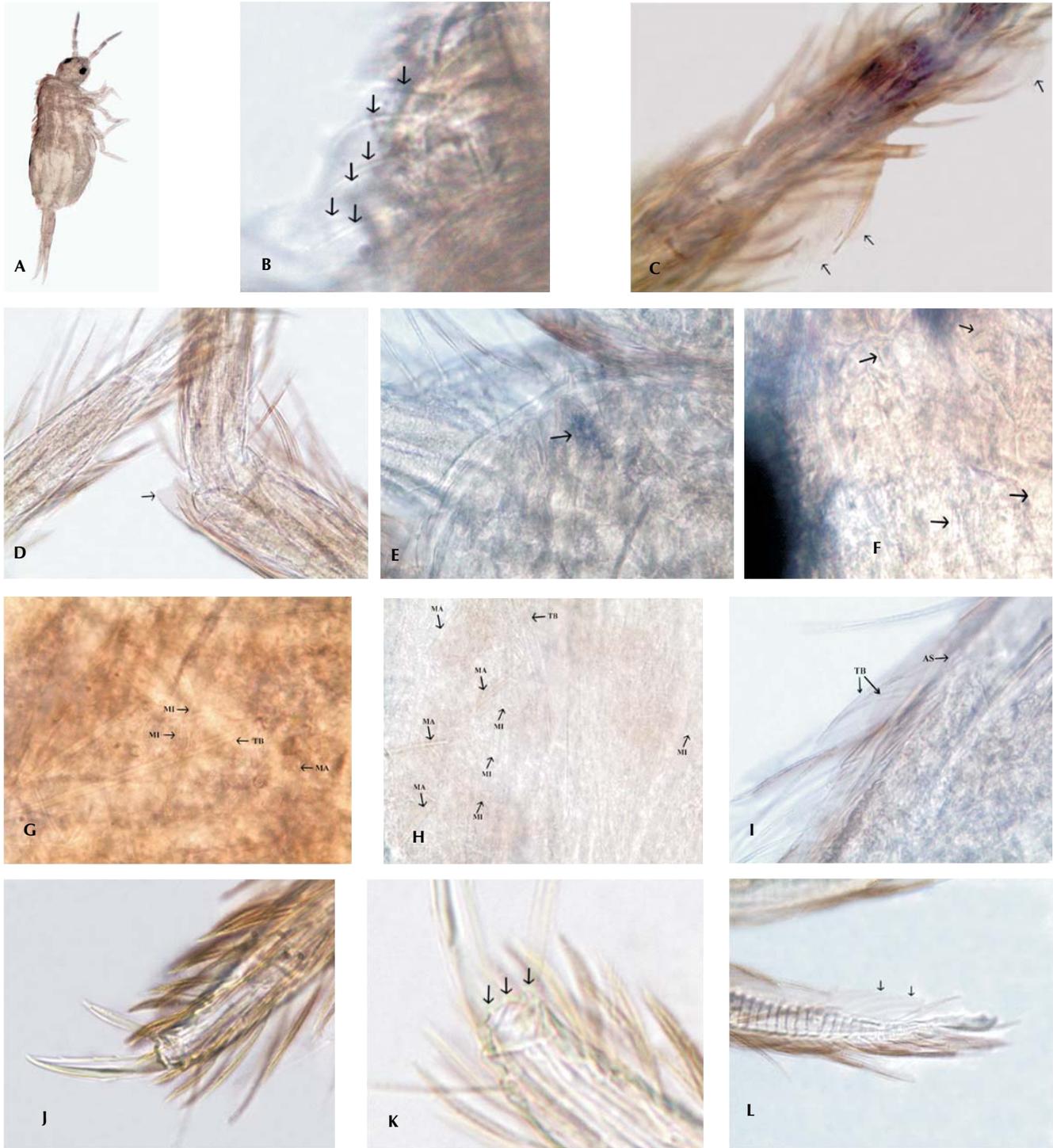


Figure 4: (A) Habitus (*Lepidocyrtus curvicollis*); (B) Labium with 6 ciliated setae; (C) Antennae with scale; (D) Legs beyond coxae with scale; (E) Blue pigments at base of 1st legs; (F) Head without Macrochaetae, Microchaetae present; (G) Trichobothria (TB), Macrochaetae (MA) and Microchaetae (MI) on 2nd abdomen; (H) Trichobothria (TB), Macrochaetae (MA) and Microchaetae (MI) on 4th abdomen; (I) Trichobothria (TB), Associated setae (AS) on 4th abdomen; (J) Claw (Ventral edge of Unguiculus Serrated); (K) Claw with strong basal teeth; (L) Scale Dens and mucro

reddish pigment present at base of the two first pair of legs (Fig. 4E), in ventral and lateral sides of the head, on frontal side of mesonotum. Head without macrochaetae between eyes (Fig. 4F). Eyes with 8 ocelli. Chaetotaxy in median fields of abd.2 as

Fig. 4G. Microsetae surrounding the trichobothria distinctly ciliate, slightly expanded. Abd.4 with 4 + 4 macrochaetae. Trichobothrial field with anterior and posterior groups set at a distance (Fig. 4H and 4I). Lateral macrochaeta E1 set behind

L2. Unguiculus lanceolate, ventral edge finely serrated (Fig. 4J). Claws with very strong basal teeth (Fig. 4K). Inner edge with a paired tooth in the middle and a single tooth in distal position. Basal appendix absent on manubrium. Christiansen and Bellinger (1998) indicated the presence of a small basal dental tubercle in North American *L. curvicollis*. This structure has not been described in European specimens of this species or any other species of the *L. curvicollis* group. Scales are present on dens and mucro (Fig. 4L). Apical setae present on mucro.

Mateos (2011) has defined the *L. lignorum* by the presence of R marchochaetae on head but S and T setae absent. Whereas, *L. fimetarius* and *L. curvicollis* exhibit head without macrosetae. R S and T microsetae present. *L. fimetarius* (Gisin, 1964 a and b) differs from the *L. curvicollis* (Bourlet, 1839) and *L. lignorum* (Fabricius, 1793) because of the absence of labial seta and presence of apical bulb on ant. IV. Unguiculus of *L. curvicollis* shows serrated structure. *L. curvicollis* and *L. lignorum* has characterized by the presence of scales on the antennae, legs and dorsal side of manubrium, and by having the mesothorax more or less protruded.

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