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THE GENUS COSMOCHTHONIUS BERLESE, 1910, 
(ORIBATIDA : COSMOCHTHONIIDAE)

BY Nusret AYYILDIZ 1, and Malcolm LUXTON 2

ABSTRACT: The genus Cosmochthonius is redefined and a key provided to the known species. Cosmochthonius lanatus is redescribed, compared with C. domesticus, and their synonymy confirmed. A new species from Turkey (C. macrosetosus) is established.

BERLESE (1910) established the genus Cosmochthonius with Hypochthonius lanatus Michael, 1885 as type-species. Following MICHAEL (1885, 1888) he characterized the new genus as being monodactylous with a punctulate or reticulate notogastral surface. However, subsequent citations by SELNICK (1928) and WILLMANN (1931) described all legs as being tridactylous, and similar doubts arose concerning the sculpture of the notogaster. Later, GRANDJEAN (1947) created a new species, Cosmochthonius domesticus, for specimens from the environs of Périgueux (Dordogne) distinguished by the presence of two claws on leg I and three claws on each of the remaining legs. Later, VAN DER HAMMEN (1952) claimed that, in fact, all species of Cosmochthonius were similarly clawed. Consequently he synonymized C. domesticus with C. lanatus but LEE (1982) rejected this synonymy as not satisfactorily established. He also stated that the position of the poorly described C. lanatus was uncertain; therefore, a redescription of the type-specimen was an urgent requirement.

Currently the main diagnostic characters used in description of Cosmochthonius species are: the notogastral sculpturing, the ciliation and the length of the four erectile setae (el, e2, f1, f2), the shape of the rostrum, and the insertion of setae d. Cosmochthonius species, in general, have a convex body covered with a patterned cerotegument (often masking the integumental sculpture beneath), a rostrum bent ventrad (frequently disguising the structure of the rostral tip), and prodorsal setae ciliated in a brush shape (a shape which may be interpreted differently according to orientation). These features, also, should be considered in any description or redescription. In C. lanatus, C.
Setae reticulatus, C. nayoroensis, C. macrosetosus sp. nov. (described below), and in Grandjean's specimens of C. domestica, the femora of legs I each bear a projection near their bases, which here is considered a generic characteristic of Cosmochthonius. It is worth noting that two "species groups" can be distinguished within the genus based on the tarsal claw formula. Thus the tarsal claws may number 2-2-2-2 (e.g. C. bengalensis), or 2-3-3-3 (e.g. C. plumatus).

In this study, C. lanatus is redescribed, a new taxon (C. macrosetosus) is established, and a key to all known species of Cosmochthonius provided. The terminology used to describe the surface sculpturing follows that of Mahunka and Zombori (1985).

COSMOCHTHONIIDAE Grandjean, 1947

Genus Cosmochthonius Berlese

Cosmochthonius Berlese, 1910 : 221. Type-species Hypochthonius lanatus Michael, 1885.

Redefinition: Small (160-360 µm) ivory white to brown mites; notogaster with 3 transverse furrows; prodorsal setae and notogastral setae h and ps densely ciliate; setae e and f simpler although still densely ciliate, setae e and f long and erect; genital setae number 10 pairs, anal setae 4 pairs, anal setae 4 pairs; tarsi I with 2 claws, tarsi II, III and IV with 2 or 3 claws; femora I each with a projection near their bases.

KEY TO SPECIES OF Cosmochthonius

1. Notogaster patterned with longitudinal bands of a woven or plaited shape... foliatus Subias, 1982
   — Notogaster granulate; setae c and d short, not extending to NM1 and NM2 respectively... juvenalis Kamill, 1986
2. Notogaster punctate; setae c and d long, extending to NM1 and NM2 respectively... plumatus Berlese, 1910
   — Notogaster maculate; setae eI with 5 or 6 medium length (8-10 µm) cilia on each side near base... panticus Gordeeva, 1980
3. Notogaster foveolate; setae eI with 6 or 7 long cilia on each side, evenly spaced along seta... temulatus Gordeeva, 1980
   — Notogaster smooth... 5
4. Notogaster reticulate... 7
   — Notogaster alveolate... 11
5. Cilia of setae fI more than 5 times the length of those of setae f2... desaussurei Mahunka, 1982
   — Cilia of setae fI similar in length to those of setae f2... 6
6. Setae eI with 8 long cilia on each side; body length 319 µm... asianticus Gordeeva, 1980
   — Setae eI with about 25 long cilia on each side; body length 220 µm... suramericanus Hammer, 1958
7. All legs bidactylos... 9
   — Setae e more than twice as long as setae f... sublanatus Mahunka, 1977
   — Setae e and f not greatly differing in length... 9
9. Setae h3 narrower than the other posteromarginal setae... lanatus diversiseta Sarkar & Subias, 1982
   — Setae h3 similar to the other posteromarginal setae... 10
10. Setae dI on the anterior ridge of NM1... wallworki Lee, 1982
    — Setae dI not on the anterior ridge of NM1... reticulatus Grandjean, 1947
11. Alveoli large, star shaped in outline... ugamensis Gordeeva, 1980
    — Alveoli large, circular or oval in outline... 12
12. Setae eI 1 1/2 times or more the length of setae fI... 13
    — Setae eI less than 1 1/2 times the length of setae fI... 15
13. Cilia of setae e and f two different lengths... nayoroensis Fujikawa, 1980
    — Cilia of setae e and f of the same length... 14
14. Setae eI each with 18-23 medium length (8-10 µm) cilia on each side; alveoli on NA of different sizes... lanatus (Michael, 1885)
   — Setae eI each with 35 long (> 10 µm) cilia on each side; alveoli on NA of approximately the same size... foveolatus Beck, 1962
15. Setae e and f thick (about 10 µm at base); setae eI with 15-16 cilia of equal length on each side... macrosetosus sp. nov.
   — Setae e and f thin (less than 10 µm at base); setae eI with 17-60 cilia of equal or unequal length on each side... 16
16. Setae el with about 60 cilia of equal length on each side .......... *semiareolatus* Hammer, 1966
   — Setae el with 17-24 long cilia and about 30-100 short cilia on each side ................. 17

17. Setae e and f flagellate at tips ..................... .. *semifoveolatus* Subias, 1982
   — Setae e and f rigid at tips ......................... *australicus* Womersley, 1945

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*Cosmochthonius lanatus* (Michael, 1885)
(Fig. 1 A-E)

*Hypochthonius lanatus* Michael, 1885 : 396; 1888 : 541.
*Cosmochthonius domesticus* Grandjean, 1947 : 354.

Redescription of slide specimens labelled “Hypothionius lanatus A. D. Michael 1930.8.25.1302”

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**FIG. 1 : Cosmochthonius lanatus.**
A. — Dorsal view. B. — Ventral view. C. — Dorsal view of seta le on the slide designated lectotype. D & E. — Rostrum and lateral view of seta le respectively in Grandjean’s specimens (= C. domesticus). (Scale bar = 50 µm).
and "Hypochthonius lanatus Chaff House/ 87 117" from the Michael Collection of the British Museum (Natural History), London. The former specimen is designated the lectotype.

**Dimensions** : Lengths 310 and 330 µm; widths 155 and 165 µm.

**Prodorsum** : Rostrum bent ventrad with, behind its apparent apex, 3 pairs of longitudinal, narrow, characteristic spots when viewed in this distorted position. All prodorsal setae branched and brush shaped. Sensilli about 1 1/2 times the distance ro-ro, fusiform and densely ciliate. Surface covered with circular and oval alveoli differing in size, smaller laterally.

**Notogaster** : Oval with a straight anterior margin. Surface ornamented with circular and oval alveoli. On the pronotaspis (PN) the alveoli are oval or more or less circular and differ in size (the alveoli at the base are larger and slightly columnar in shape); on first and second median notaspis (NM1 and NM2) the alveoli are somewhat oval with one or two per row; on the pygidium (PY) the alveoli are circular or somewhat oval and about equal in size. Setae c and d extend to NM1 and NM2 respectively. The distance between setae dl greater than 10 µm. Setae d arise behind anterior furrow on NM1. Setae e and f with 18-23 medium length (8-10 µm) cilia evenly spaced on each side; the thickness of these setae at their bases equal to 1/2 or 1/3 of the diameter of the alveoli on the pygidium. Setae el about 1 1/2 times the length of setae fl. Setae f not extending beyond the pygidium. Setae h and ps heavily ciliate.


**Legs** : Legs I bidactylous, legs II-IV tridactylous. Claws arising from a short stalk.

**Remarks** : VAN DER HAMMEN (1952) regarded C. domesticus as a synonym of C. lanatus but LEE (1982) rejected this as being insufficiently well established. Grandjean's specimens of C. domesticus have been studied here and compared with Michael's slides of C. lanatus. In consequence, van der Hammen's opinion is upheld. However, differences between the specimens can be observed although these probably result from the different orientations of the material. In Grandjean's two specimens, for example, the rostrum is trimucronate, a feature that has so far been observed only in C. nayoroensis Fujikawa, 1980 from Japan. GRANDJEAN (1947) did not mention the shape of the rostrum, or use it as a diagnostic character, whereas MICHAEL (1885, 1888) stated that the rostrum of C. lanatus was blunt. In Cosmochtonius species the rostrum is curved ventrad and in consequence the tip is frequently flattened underneath in slide preparations making it difficult to observe. In Grandjean's alcohol preserved specimens this feature could be seen by careful orientation, but in Michael's slide mounted specimens the rostral tip had been folded under and its shape masked. Relative orientation may also conceal the true shape of the lamellar setae. Thus, in Grandjean's specimens the lamellar setae seem to be branched (T shaped) when viewed laterally (Fig. 1 E). Michael's specimens, on the other hand, could only be observed dorsally (Fig. 1 C) and in only one of the specimens did the lamellar setae appear to be branched.

**Cosmochtonius macrosetosus** sp. nov. (Fig. 2 A-F)

**Cosmochtonius lanatus** (Michael, 1885) : AYYILDIZ & ÜZKAN (in press) [Misidentification].

**Dimensions** : Mean length 306 µm (range 300-310) (n = 7); mean width 160 µm (range 150-165) (n = 7).

**Prodorsum** : Rostrum rounded, projecting medially and with 3 pairs of spots. Prodorsal setae uniramous, ciliated, brush shaped. Sensilli long (mean 60 µm), fusiform, the distal portion densely ciliated.

**Notogaster** : Cerotegument thick and reticulate above an integument ornamented with circular alveoli. Setae c placed at the same mutual distance. Setae dl less than 10 µm apart, arising behind anterior furrow on the first median notaspis (NM1) and reaching posterior margin of the second median
notaspis (NM2). Setae e and f thicker, with their basal diameter equal to the diameter (10 µm) of the alveoli on the pygidium, much longer and more sparsely ciliated than the other notogastral setae. Relative lengths of setae e and f: e1 > e2 > f1 > f2. Setae h and ps originating on posterior margin of body and heavily ciliated.

**Venter** : All setae of ventral plates bilaterally ciliated. Epimeral setal formula 3-2-3-4. Setae h of mentum close together near the posterior border.

Genital plate large, rectangular, somewhat narrower posteriorly than anteriorly. Anal plates smaller than genital plates, long, rectangular. Aggenital plates narrower than adanal plates. Ten pairs of genital setae, four pairs of anal setae and four pairs of adanal setae. Three pairs of genital papillae.

**Legs** : Legs I bidactylous, legs II-IV tridactylous; a short stalk (10 µm in length) bearing the claws. Femora of legs I each carry a projection near their bases.

**Fig. 2** : *Cosmoechthonius macrosetosus*, sp. nov.

Types: Holotype (male) and 4 paratypes at the British Museum (Natural History), London; 2 paratypes at the Zoological Museum of Atatürk University, Erzurum, Turkey.

Locality: Pasture soil, Aziziye Tabyalari, Erzurum, Turkey, 2.6.1985, leg. N. AYYILDIZ.

Remarks: The new species differs from its congeners by virtue of its thick, strong setae e and f.

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The authors are grateful to Dr. J. TRAVÉ and Dr. A. BAKER for arranging the loan of GRANDJEAN’s and MICHAEL’s specimens respectively. The senior author was in receipt of a post doctoral award from Atatürk University, Turkey and wishes to record his thanks for this and the facilities and hospitality afforded him at the Department of Biology, Liverpool Polytechnic during the tenure of the award.

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Paru en Décembre 1990.
Acarologia, Tome XXXI, Fascicule 3, pages 280 et 281 : remplacer le paragraphe “KEY TO SPECIES OF
Cosmochthonius” par le paragraphe suivant :

KEY TO SPECIES OF *Cosmochthonius*

1. Notogaster smooth ........................................ 2
   - Notogaster patterned, granulate, or punctate 4
2. Cilia of setae *f1* more than 5 times the length of cilia
   - Cilia of setae *f1* similar in length to cilia of setae
   *f2* ........................................... 3
3. Setae *e1* with 8 long cilia on each side, body length
   - Setae *e1* with about 25 long cilia on each side, body
   length 220 μm ... *suramericanus* Hammer, 1958.
4. Notogaster granulate or punctate .................. 5
   - Notogaster otherwise ........................ 6
5. Notogaster granulate; setae *c* and *d* short, not
   extending to NM1 and NM2 respectively ......................
   - Notogaster punctate; setae *c* and *d* long, extending to
   NM1 and NM2 respectively ................................
   - *juvenalis* Kamill, 1986
   - Notogaster punctate; setae *c* and *d* long, extending to
   NM1 and NM2 respectively ........................ 8
6. Notogaster with longitudinal bands of a woven or
   plaited shape ........... *foliatus* Subias, 1982
   - Notogaster without such longitudinal bands... 7
7. Notogaster reticulate .................. 12
   - Notogaster otherwise ........................ 14
8. All legs bidactylous ....................................
   - *bengalensis* Chakrabarti et al., 1972
   - Legs I bidactylous; legs II-IV tridactylous ........ 9
9. Setae *e* more than twice as long as setae *f* ........
   - *sublanatus* Mahunka, 1977
   - Setae *e* and *f* not greatly differing in length .. 10
10. Setae *h3* narrower than the other postermarginal
    setae. ........................................ *lanatus diversiseta* Sarkar & Subias, 1982
    - Setae *h3* similar to the other postermarginal
    setae ........................................ 11
11. Setae *d1* on the anterior ridge of NM1 ............
    - Setae *d1* not on the anterior ridge of NM1 .......... *wallworki* Lee, 1982
    - *reticulatus* Grandjean, 1947
12. Notogaster maculate or foveolate .................. 13
    - Notogaster alveolate ........................ 14
13. Notogaster maculate; setae *e* 1 with 5 or 6 medium
    length (8-10 μm) cilia on each side near base ....
    - Notogaster foveolate; setae *e1* with 6 or 7 long cilia
    on each side, evenly spaced along seta .............
    - *temisetus* Gordeeva, 1980
14. Alveoli large, star shaped in outline..............
    - *ugamensis* Gordeeva, 1980
    - Alveoli large, circular or oval in outline ...... 15
15. Setae *el* 1 1/2 times or more the length of setae *f1*... 16
    - Setae *el* less than 1 1/2 times the length of setae
    *f1* ........................................... 18
16. Cilia of setae *e* and *f* of two different lengths...
    - *nayoroensis* Fujikawa, 1980
    - Cilia of setae *e* and *f* of same length .... 17
17. Setae *e1* each with 18-23 medium length (8-19 μm)
    cilia on each side; alveoli on NA of different sizes
    ........................................... *lanatus* (Michael, 1885)
    - Setae *el* each with 35 long (> 10 μm) cilia on each
    side; alveoli on NA of approximately the same size
    ........................................... *foveolatus* Beck, 1962
18. Setae *e* and *f* thick (about 10 μm at base); setae *e1*
    with 15-16 cilia of equal length on each side.
    - *macrosetosus* Ayyildiz et Luxton, 1990
    - Setae *e* and *f* thin (less than 10 μm at base); setae *e1*
    with 17-60 cilia of equal or unequal length on each
    side ................................................................
    - *semiareolatus* Hammer, 1966
19. Setae *e1* with about 60 cilia of equal length on each
    side ...........................................
    - *semiareolatus* Hammer, 1966
    - Setae *e1* with 17-24 long cilia and about 30-100 short
    cilia on each side ................................ 20
20. Setae *e* and *f* flagellate at tips ................
    - *semifoveolatus* Subias, 1982
    - Setae *e* and *f* rigid at tips ................
    - *australicus* Womersley, 1945

CORRIGENDUM

*Acarologia,* Tome XXXI, Fascicule 3, pages 280 et 281 : remplacer le paragraphe suivant :

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   - Cilia of setae *f1* similar in length to cilia of setae
   *f2* ........................................... 3
3. Setae *e1* with 8 long cilia on each side, body length
   - Setae *e1* with about 25 long cilia on each side, body
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4. Notogaster granulate or punctate .................. 5
   - Notogaster otherwise ........................ 6
5. Notogaster granulate; setae *c* and *d* short, not
   extending to NM1 and NM2 respectively ......................
   - *juvenalis* Kamill, 1986
   - Notogaster punctate; setae *c* and *d* long, extending to
   NM1 and NM2 respectively ................................
   - *plumatus* Berlese, 1910
6. Notogaster with longitudinal bands of a woven or
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   - Notogaster without such longitudinal bands... 7
7. Notogaster reticulate .................. 12
   - Notogaster otherwise ........................ 14
8. All legs bidactylous ....................................
   - *bengalensis* Chakrabarti et al., 1972
   - Legs I bidactylous; legs II-IV tridactylous ........ 9
9. Setae *e* more than twice as long as setae *f* ........
   - *sublanatus* Mahunka, 1977
   - Setae *e* and *f* not greatly differing in length .. 10
10. Setae *h3* narrower than the other postermarginal
    setae. ........................................ *lanatus diversiseta* Sarkar & Subias, 1982
    - Setae *h3* similar to the other postermarginal
    setae ........................................ 11