Tibiotarsal chaetotaxy in Tullbergiinae (Collembola: Onychiuridae)

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Six types of tibiotarsal chaetotaxy are recognised among genera of the subfamily Tullbergiinae. The most complete chaetotaxy is found in the Nearctic species Tullbergia clavata Mills, while the most reduced type is displayed by many species of Mesaphorura and related genera.

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Introduction

Different systems for identification of individual setae on the collembolan leg have been proposed. Yosii (1962) developed a numeric system for the tibiotorus of Hypogastruridae, based on the arrangement of setae in three separate whorls, each with 4, 7 and 8 setae. Lawrence (1977), after examination of several Anurophorus and Cryptopygus of the family Isotomoidae, concluded that these genera had up to 5 whorls of setae, each with a basic number of 7. Deharveng (1983) designed a general system for the 1. instar juvenile of all Poduromorpha and Isotomidae consisting of one apical whorl of 4 setae, three proximal whorls of 7 setae, and three single setae of intermediary or external position. An analogous system was made for the primary setae of Symphypleona by Nayrolles (1988).

In the search for new diagnostic characters among various taxa of the subfamily Tullbergiinae, the system of Deharveng (1983) was applied to adult specimens. It proved to be excellent in characterisation of groups on generic or subgeneric level.

Onychiuridae in general

The most complete regular tibiotarsal chaetotaxy is found in Lophognathella choreutes Borner (Fig. 6). An even higher complexity is shown by Tetrodon tophora bielanensis (Waga), but this is due to polychaetosis and the primary condition is not known. In Onychiurus s.lat., the C-whorl is more or less reduced, and there is a tendency to reduction of setae T and M. Members of Oligaphorura s. Gisin have all T-setae present, while all examined species of Onychiurus s. Gisin are lacking T2 and T3. Members of Protaphorura s. Gisin show both conditions, certainly reflecting the heterogeneity of the group.

The Nearctic species Onychiurus ruseki Rusek, 1976 lacks seta M as well as T2 and T3. Some undescribed Alaskan and E Siberian species of the same complex, lack all four T-setae and M.

In Tullbergiinae all T-setae are absent, as well as the entire C-whorl and seta Y. The following setae are always present: 5 setae of whorl A (A1, A2, A3, A6, A7), and 4 setae of whorl B (B3, B4, B5, B6). The variable setae are M, A4, A5, B1, B2, and B7. When B7 is present on the two first pairs of legs, it is always absent from the hind leg.

Tullbergiinae

The clavata type (Fig. 1)

The Nearctic species Tullbergia clava Mills has the most complete chaetotaxy so far observed in Tullbergiinae, with the following setae present: A1-7, M, B1-7. On the hind leg B7 is absent. Because of lack of relevant information from most of the Nearctic Tullbergia, it is not possible to say if clavata belongs to a subgroup which deserves generic status. T. clava does not appear to be particularly 'plesiomorphic' in other characters.
Figs 1-6. Chaetotaxy of right mesotibiotarsus: (1) Tullbergia clavata; (2) Tullbergia simplex; (3) Metaphorura affinis; (4) Sfenaphorura gisinii; (5) Paratullbergia callipygus; (6) Lophognathella choreutes.

The Tullbergia type (Fig. 2)

The following setae are present: Al–3, A6, A7, M, B1–7. On the hind leg B7 is absent. This type is observed in Tullbergia arctica Wahlgrén, T. simplex Gisin, T. bella Fjellberg, T. mala Christiansen & Bellinger, Sfenaphorura quadrispina Borner, and Chaetaphorura vancouverica Rusek.
The *gisini/duplex* type (Fig. 4)

The two species *Stenaphorura gisini* (Selga) and *Tullbergia (T.) duplex* Gama display an unique setup with the following setae present: A1-3, A6, A7, B1-7. On the hind leg B7 is absent. Another autapomorphy of the two species is the unique postanal organ which was briefly described from *S. gisini* by Simon Benito (1985). The presence of the same type of PAO was verified from a study of two original type specimens of *duplex* as well as from new material of both species from the Canary islands (A. Fjellberg). Probably these two species should be transferred to a new genus.

The *Metaphorura* type (Fig. 3)

The following setae are present: A1-3, A6, A7, B2-7. It is not obvious which of the three outer proximal setae are absent. However, the anterior one is on level between A1 and A2, which is the normal position of B2. The posterior setae set between A1 and A7, and could be either B1 or B7. Since it is absent on the hind leg, it is assumed to be B7.

This type is observed in *Metaphorura affinis* (Borner), and also in *Sensiphorura marshallii* Rusek which belongs to the subfamily Pachytullbergiinae.

The *Multivesicula* type (Fig. 7)

The following setae are present: A1-3, A6, A7, M, B2-7. As to the identity of setae B2 and B7, see discussion of previous type. This type is only found in the genus *Multivesicula* (*M. dolomiticata* Rusek, *M. giljarovi* Rusek, *M. punctata* Rusek, *M. sp.*)

The *Mesaphorura* type (Fig. 5)


Discussion

Parallellism is common in evolutionary sequences among Collembola involving reduction of eyes, fur.
ca., number of setae in various parts of the body, etc. It is therefore premature to make phylogenetic conclusions on the basis of the above tibiotarsal chaetotaxy patterns. However, a purely typological arrangement might be illustrative (Fig. 7). The Tullbergia type is easily derived from clavata by loss of the two inner apical setae A4 and A5. From the Tullbergia type three lines seem plausible:

1. Reduction of M gives the gislini/duplex type. A further reduction of B1 gives the Metaphorura type.
2. Reduction of B1 gives the multivesicula type. A further reduction of M gives an alternative line to Metaphorura.
3. Reduction of B2 and B7 gives the Mesaphorura type.

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References

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