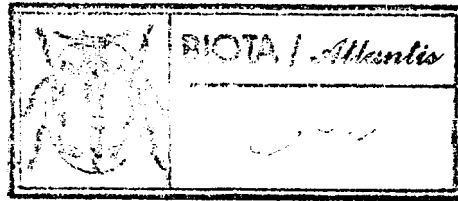


# Tibiotarsal chaetotaxy in Tullbergiinae (Collembola: Onychiuridae)

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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 tibiotarsus 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 Symphyleona 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* Börner (Fig. 6). An even higher complexity is shown by *Tetrodon-tophora bielansensis* (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.

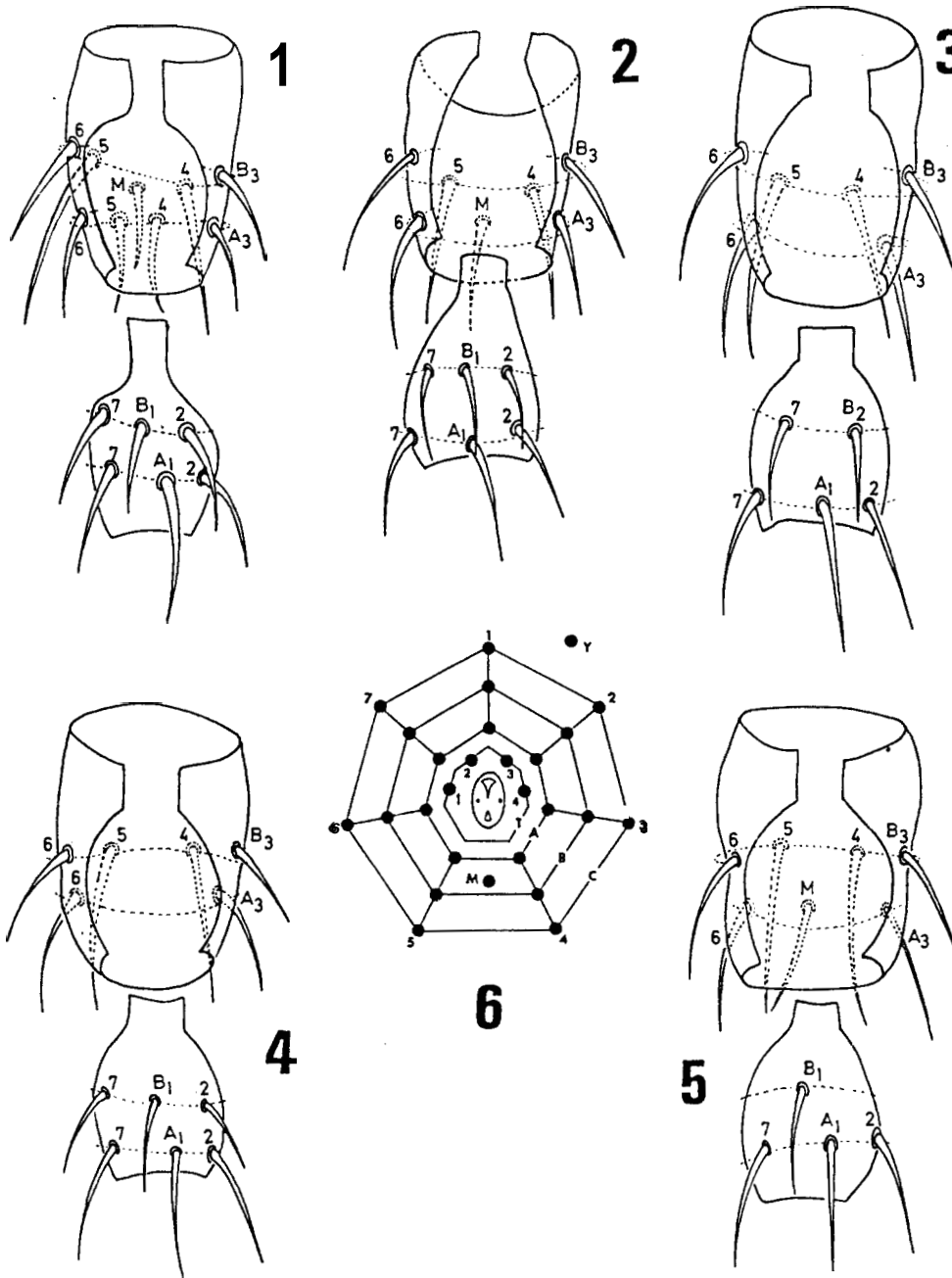
The Nearctic species *Onychiuruseisi* Rusek, 1976 lacks seta M as well as T2 and T3. Some undescribed Alaskan and E Siberian species of the same complex, lack all four T-setae and M.

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 clavata* 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. clavata* 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) *Stenaphorura gisini*; (5) *Paratullbergia callipygos*; (6) *Lophognathella choreutes*.

**The *Tullbergia* type (Fig. 2)**

The following setae are present: A1-3, A6, A7, M, B1-7. On the hind leg B7 is absent. This type is observed in *Tullbergia arctica* Wahlgren, *T. simplex*

*Gisin*, *T. bella* Fjellberg, *T. mala* Christiansen & Bellinger, *Sfenaphorura quadrispina* Börner, and *Chaetaphorura vancorrvetica* Rusek.

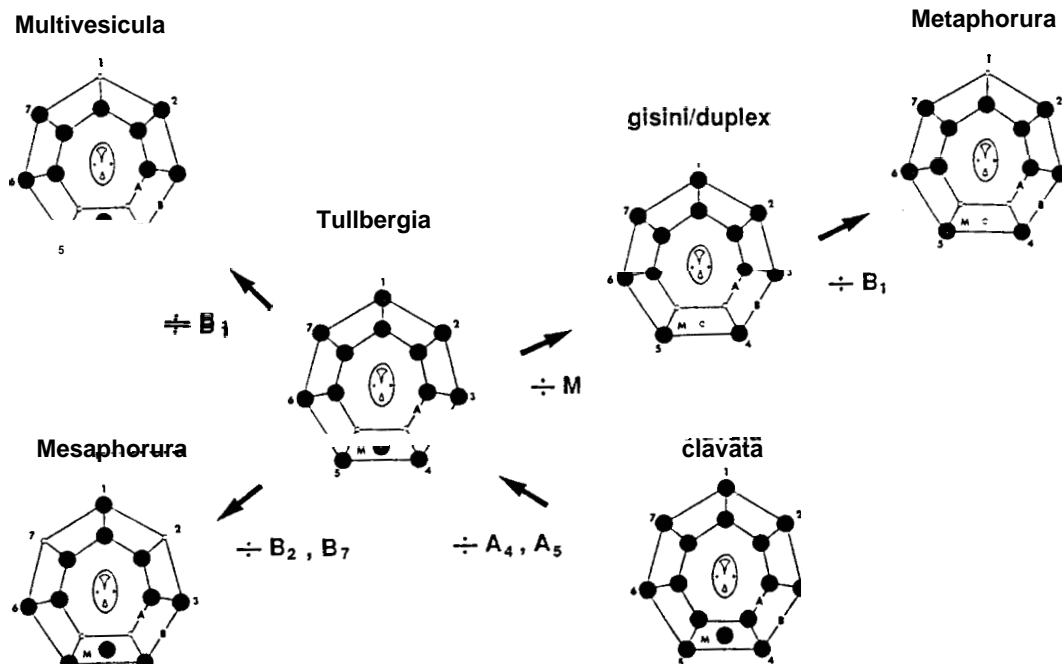


Fig. 7. Typological arrangement of tibiotarsal chaetotaxy in Tullbergiinae (right mesotibiotarsus).

**The *gisini/duplex* type (Fig. 4)**

The two species *Stenaphorura gisini* (Selga) and *Tullbergia (T.) duplex* Gama display a unique set-up 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 postantennal 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 lands (A. Fjellberg). Probably these two species should be transferred to a new genus.

(*Stenaphorura gisini*)

**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 seta is 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 marshalli* 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. dolomitica* Rusek, *M. giljarovi* Rusek, *M. punctata* Rusek, *M. sp.*)

**The *Mesaphorura* type (Fig. 5)**

The following setae are present: A1-3, A5, A6, M, B1, B3-6. Hind leg has the same chaetotaxy as anterior two pairs. This type is observed in the following species: *Mesaphorura macrochaeta* Rusek, *M. italica* (Rusek), *M. critica* Ellis, *M. hylophila* Rusek, *M. yosii* (Rusek), *M. sylvatica* (Rusek), *M. pasifica* Rusek, *M. krausbaueri* Borner, *Paratullbergia callipygos* Borner, *P. macedougalli* (Bagnall), *Neotullbergia tricuspis* (Borner), *Doutnacia xerophila* Rusek, *Scaphaphorura arenaria* (Peterson), *Wankeliella mediochaeta* Rusek, *Karlstejnina norvegica* Fjellberg.

**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 *gisini/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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