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Postembryonic development of the dorsal chaetotaxy in *Seira dowlingi* (Collembola, Entomobryidae); with an analysis of the diagnostic and phylogenetic significance of primary chaetotaxy in *Seira*

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Abstract

Chaetotaxy is probably the most important character system used to diagnose species in Entomobryidae, but its use in studies of phylogenetic relationships of suprageneric taxa has been hampered by difficulties in identifying the homology of individual setae. Currently there is developmental information for three (*Orchesella*, *Entomobrya sensu lato* and *Lepidocyrtus sensu lato*) of the four largest groups of entomobryids. *Seira* is the only major genus for which the postembryonic development of the chaetotaxy has not been described. To fill this gap a complete description of the postembryonic development of the dorsal chaetotaxy of *Seira dowlingi* (Wray, 1953) is presented. Based on this description and by comparisons with up to 96 additional *Seira* species, it is suggested that the loss of second abdominal segment primary setae **m4** and **p4** (by transformation into scales during postembryonic development) is the only chaetotaxic character diagnostic for the genus. The posterior botriothricum (homologous to **D3**) on the fourth abdominal segment is absent only in *S.* (*Afroseira*) *rowani* Yosii, from South Africa. It is suggested that the presence of seta **p3** and absence of **p4** on the third abdominal segment support a more recent relationship between *Seira* and *Lepidocyrtus*/*Pseudosinella* than between *Seira* and *Entomobrya sensu lato*.

Key words: Entomobryidae, Lepidocyrtinae, Seirinae, primary chaetotaxy, phylogeny

Introduction

Entomobryidae is the largest family of springtails, comprising approximately 16 % of all described species (Hopkin 1997). Traditionally, species identification in this family has been based on claw morphology, number of eyes, color pattern, and structure of the mucro (part of the jumping organ complex). However, the great variation in some of these characters promoted a proliferation of names that resulted in great taxonomic confusion. The introduction of characters related to the arrangement of setae (chaetotaxy) during the late 1950s-early 1960s (Yosii 1959, Gisin 1963, 1964) helped to solve many species-level taxonomic problems and led to the recognition of large number of species. Following these early instances of success, the use of chaetotaxy grew to become the most important set of morphological characters currently used in species identification in Entomobryidae (e.g., Mari Mutt 1986a, Yoshii & Greenslade 1994, Christiansen & Bellinger 2000). In addition to their utility in species-level taxonomy, the constancy of some chaetotaxic characters suggested they could be used to infer deep phylogenetic relationships among genera (Yosii 1961a). However, the large number of setae, their many shapes, and apparent lack of coherent arrangement greatly limited their realized potential as phylogenetic characters. It was often impossible to establish the homology of an individual seta in comparisons across genera. However, Szeptycki (1969) observed that primary chaetotaxy (i. e., setae present in newborn larvae) is almost identical in all entomobryid species, even when adults have markedly different

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