

## SCIENTIFIC NOTE

**CRITIQUE OF THE ARTICLE “COLLEMBOLA (SPRINGTAILS) (ARTHROPODA: HEXAPODA: ENTOGNATHA) FOUND IN SCRAPINGS FROM INDIVIDUALS DIAGNOSED WITH DELUSORY PARASITOSIS”<sup>1</sup>****Kenneth A. Christiansen<sup>2</sup> and Ernest C. Bernard<sup>3</sup>**

In a recently published paper, Altschuler et al. (2004) argued that Collembola (springtails) can cause “stinging/biting and/or crawling” sensations. The collembological community has been highly critical of this report, but has discussed this issue primarily among the members of this community. However, allegations that springtails cause various dermatological problems, severe itching, and related symptoms have made it into the widely read on-line encyclopedia Wikipedia ([http://en.wikipedia.org/wiki/Delusory\\_parasitosis](http://en.wikipedia.org/wiki/Delusory_parasitosis), accessed August 8, 2008: “People with delusional parasitosis are likely to ask for help not from psychiatrists but from dermatologists, pest control specialists, or entomologists.”). The medical community has firmly rejected the linkage of insects and widespread dermatitis (Berrios 1985, De Leon et al., 1982, Gupta & Voorhees 1990, Wykoff 1987). Janssens and Christiansen (2007) do acknowledge that an allergic reaction to Collembola tissue or integument on the part of some sensitive people is possible and might lead to the crawling-on-skin irritation symptoms. Various sources and publications, however, have gone much farther and have alleged that some springtails may parasitize humans. This allegation is entirely inconsistent with springtail biology, and no such phenomenon has ever been scientifically confirmed. (For a summary of the literature on this subject, see <[www.collembola.org](http://www.collembola.org)>.) Springtails sometimes can be abundant indoors in damp places such as bathrooms and basements, and under such circumstances may be found on one’s person, but this is only accidental. Claims of persistent human skin infection by springtails may indicate a neurological problem, or else delusory parasitosis, a psychological not entomological problem. Berenbaum (2005) commented on the Altschuler et al. paper, suggesting that the report was based on pareidolia; that is, the researchers simply imagined that they saw springtail-like shapes in the images when there were no springtails actually present. In this paper, we more specifically and categorically refute the contention of Altschuler et al. (2004).

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None of the images presented in Altschuler et al. (2004), except possibly the “enhanced” version of Figure 2 (p. 91), bear the slightest resemblance to any springtail or springtail body parts, nor can the pieces in Figs. 1 and 3 be reasonably construed to represent a part of any particular organism. Having examined many Collembola from Canadian and Burmese Cretaceous amber, as well as thousands of preserved pitfall trap and Tullgren funnel-extracted specimens, we can categorically state that the fossils and collected specimens are far more recognizable as Collembola than are these photographed scrapings. As the specimens were freshly taken from new human skin scrapings, the remnants of Collembola should have been distinct. Thus, the statement that “The findings of Collembola in images of scrapings from 18 of the 20 symptomatic study participants supports their contention that they actually have something crawling on or under their skin and are not delusional” (p. 89) is not supported. Under the assumption that the best images were chosen for the article, the assertion that Collembola are the material cause of “delusory parasitosis” is not supported by the evidence.

If Collembola were crawling on the subjects, then these specimens or their distinct parts should have been observed. It is certainly possible that Collembola may have actually walked briefly on the skin of affected persons, just as other insects and spiders occasionally do on everyone, and induced the same kind of crawling sensations; but the claim that they induced continuing symptoms is not supported by the paper. Apparently, no Collembola expert was consulted before publication, and the more than 300 slides of scrapings made in this study have never been made available to a Collembola expert for examination of the supposed specimens.

Figure 2 is purported to represent a springtail, but this image received contrast enhancement to bring out a springtail-like blob. The authors also stated that “Identification of Collembola in scrapings...required intensive scrutiny of the photographs and was initially very difficult” (p. 89). Collembola simply are not that difficult to detect and if present should have been readily visible. Collembola are arthropods and have exoskeletons composed of a head and usually nine distinct body segments; the mouthparts, especially, are sclerotized and should have been easily visible at the magnifications mentioned in the paper. The mere labeling of a vaguely recognizable blob, as in Fig. 2, does not validate the identification of the parts, which in this case is more similar to identifying animals by looking at clouds. Berenbaum (2005), referring to the Altschuler et al. paper, recognized this mistaken identification as an example of pareidolia: a type of illusion or misperception involving a vague or obscure stimulus being perceived as something clear and distinct (Carroll 2008). Therefore, neither the original nor enhanced Figure 2 can be accepted as proof of springtails inhabiting human skin lesions.

There are many records of Collembola found on humans (Janssens and Christiansen, 2007). Almost all of the validated cases have involved Collembola

in head hair. In most but not all of these cases, the people involved have been associated with horses, and it has been suggested, although never proven, that fungi associated with horses were growing on the hair and that Collembola were feeding on the fungi. In another interesting case in Sweden, a number of springtails were reported to inhabit the genital region of a woman experiencing a "nervous disorder," including weak but annoying itching (Bryk 1955). Bryk's review of the case suggests that the initial source of this infestation was poor hygiene or housekeeping, as the floor of the bathroom was damp and "the toilet brush was teeming with these parasites;" and Bryk himself discounted the ability of springtails to bite people. In all the above-mentioned cases, the springtails involved were one or more members of the family Entomobryidae, several members of which are often found in drier environments, including homes and hospitals, than most Collembola prefer. There is a single clearly validated case of a biologist, who had been actively aspirating springtails in the Arctic, getting an infestation of Collembola in his nasal passages. In all of the cases mentioned above, large numbers of active Collembola were seen and could be collected easily. (The nasal passage infection became apparent when Collembola appeared abundantly in nasal discharge.) Other apparently dispassionate reports have lacked the necessary scientific rigor to be taken seriously. For instance, Amin (2003) presented an image (Fig. 5) of a supposed springtail from a human lesion, but this arthropod does not seem to have been examined by a specialist in the group, and certainly is no springtail. If live Collembola are involved in the various infections, then the springtails should be visible to the unaided eye on the surface. To our knowledge, there is no recorded case of a Collembola burrowing in anything, anywhere, or found imbedded in any tissue.

Only a few species of Collembola are known to live even commensally with other animals: two species of Coenaletidae with hermit crabs in the spaces between the animal and the adopted shell (Bellinger 1985); Cyphoderidae, commensal with bees, ants, or termites (Hopkin 1997); and *Axelsonia johnstoni* (Isotomidae) from the gill chambers of a land crab on Java (Jordana 1997).

Collembola are morphologically and physiologically ill-suited for burrowing. Their respiration requires gaseous exchange through the cuticle, impossible if the specimen is surrounded by tissue. If there were forms burrowing in human tissue, they certainly would be highly specialized in form. Those that live in the soil are limited to the interstices of the soil between soil grains; those living on plants restrict themselves entirely to the surfaces. Where soil particles have very small spaces between grains (e.g. some clays), Collembola do not occur. Thus, if Collembola were in fact the cause of the crawling sensation, they should be on the surface of the human skin, visible to the naked eye, and collectible.

We have been deeply involved with analysis of these supposed infections for years. Between us, we have studied hundreds of photographs and received over 200 samples of specimens and allegedly infected tissues; many of our colleagues here and overseas have had similar experiences. The samples have only one thing

in common: none involved whole Collembola or, among the specimens and tissue samples, even springtail fragments. The photographs in Altschuler et al., supposedly of Collembola, require considerable imagination and cannot be taken as definitive evidence of human infestation by Collembola.

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The Editor sent electronic requests for review to the authors of Altschuler et al. (2004). No reviews were received.