

# Status Assessment Survey for Springtails (Collembola) in Caves of Illinois' Salem Plateau

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Caves contain unique habitats populated by specialized, endemic invertebrates. Despite the harsh conditions of subterranean life, caves are vulnerable to invasion by exotic species, with potentially devastating effects on native communities. To detect changes in the health of cave invertebrate communities, we must first develop baseline information on species diversity.

Springtails are small insectlike arthropods commonly found in soil, leaf litter, and caves. Many cave springtails exhibit adaptations to subterranean habitats and may be indicators of the health of cave communities. However, knowledge of the springtails of Illinois caves is incomplete. Four of Illinois five karst regions have been partially surveyed for springtails; 60% of those reported are known from single caves, and fully 88% are restricted to a single karst region.

To develop baseline information on the diversity and abundance of springtails in Illinois caves, we surveyed eight caves in the Salem Plateau of southwestern Illinois. We evaluated several sampling protocols including: pitfall traps, Berlese funnel processing of plant litter, quadrat and drip pool sampling, bait stations, and random searches.

Pitfall trapping, hand collections, and Berlese funnel extractions accounted for 85% of the specimens and 45% of the species collected. Examination of drip pools



Steve Taylor and Felipe Soto conducting quadrat sampling at Illinois Caverns. Photo by JoAnn Jacoby, UIUC

produced only 2% of the specimens, but 30% of the species identified. Future studies of Illinois caves should utilize

pitfall traps, Berlese funnels, examination of drip pools, and hand collections, as these are the most effective sampling methods for cave springtails.

In total, 49 species of springtails were found, 7 of which are new to science, with 8 others representing new state records. This more than doubles the number of springtails species known from caves in the Salem Plateau. More than half the species were ranked as rare at the state level (i.e., S1–S2). For some species, this ranking may reflect incomplete sampling, but others (*Pygmarrhopalites* spp.) are rare regional endemics. Interestingly, the most common species of Entomobryidae, *Coecobrya tenebricosa*, appears to be an introduced, invasive species of a genus otherwise known from Asia. *Coecobrya tenebricosa* is the only member of the *Sinella-Coecobrya* complex found in our study, but further south, in Illinois' Shawnee Hills, there are several native, cave-adapted *Sinella* species that could be threatened by *C. tenebricosa*.

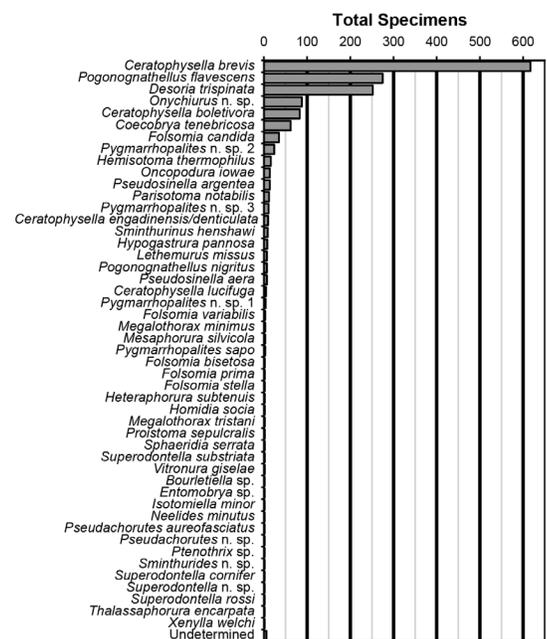
Three springtail species accounted for 71% of all individuals collected, whereas 49% of the species were represented by only one or two specimens. Based on the observed diversity and endemism, we determined that protecting six of the eight caves would preserve 95% of the species. Protecting three caves — Wanda's Waterfall Cave, Stemler Cave, and Wizard Cave — would provide some protection for 75% of the species. The two caves with the least conservation value, Illinois Caverns and Hidden Hand Cave, are those most impacted by human visitation.



*Coecobrya tenebricosa*, the most common member of the family Entomobryidae in the caves surveyed, appears to be an introduced, invasive species. Photo by Felipe N. Soto, INHS

Our sampling is incomplete, and we estimate that the true number of species lies in the range of 60 to 105, implying that 11 to 56 springtail species remain undetected in caves of this region. Clearly, additional species and state records will be found as more caves are examined.

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Individual frequency distribution of species collected in eight caves in the Salem Plateau region of Illinois.