Springtails: The Ancient Key to Global Macroinvertebrate Biodiversity and Soil Health

Czempinski, Alexander (School: Lane Technical College Prep High School)

Biodiversity is essential for ecosystem health and stability. Though springtails are widely accepted as decomposers, recent studies suggest they may also be keystone organisms. Since native springtail populations exist in every soil on Earth, it may be possible to artificially boost their populations to support higher biodiversity and improve ecosystem quality without risking harm or introducing invasives. For international data, three soil samples per woodland were collected from four countries. Each sample was collected in a transect method, 142.24cm apart. For artificial transplant data, 10 native springtails were transferred from LaBagh Woods in Chicago to a privately owned woodland in Wisconsin. Soil samples, each from a 10x10x10cm hole, were placed into Berlese funnel traps to extract macroinvertebrates. Captured specimens were identified to the genus with a microscope and peer review on iNaturalist. The Shannon-Weaver Index calculated a biodiversity value compared to a remnant (pristine natural) and degraded (polluted/containing invasives) ecosystem. Regardless of geography, woodland type, or the springtail species themselves, biodiversity was always highest when there were the most springtails numerically present. On average, 0-5 springtails accompanied a biodiversity value of 1.0, around 12 springtails reached 1.80, and over 18 springtails exceeded 2.0. This trend remained evident even when secondary calculations excluded springtails. Additionally, the private Wisconsin woodland, which prior to springtail introduction held a biodiversity value of 1.52, reached 2.25 in just two weeks, surpassing what traditional restoration achieved after 7 years (a 0.16 increase) in a previously sampled ecosystem.

Awards Won: