

THE GREAT OUTDOORS



Naturalists report at least seven different species in New Jersey. This is Malmgren's springtail, Deptford, NJ. Photo: J. Mole, iNaturalist.

Nature's Cleanup Crew

Springtails break down decaying vegetation; in doing so their waste produces natural fertilizers for plants.

J. Morton Galetto

It was going to be one of those days where the more I learned, the less I knew, or at least that was how it felt. I was at a CU Maurice River meeting where an entomology professor's presentation began with a challenge. Could we identify the fauna that he displayed on the screen at the front of the

room? Know this – I am not a biologist; in fact by education I am a Social Studies major, meaning I know a little bit about everything and not much about anything. The challenge was compounded by the fact that there are more than a million kinds of insects worldwide and about 7,000 new species discovered each year. So my chances of success were doomed as doomed could be.

He began with birds, where I did pretty well even with some of the exotic species. But in short order, as anticipated, the entomologist began to show insects and their cohorts. Butterflies, not bad, but then he displayed what looked a bit like a fat termite. He described the hexapod as being integral to the decomposition of matter in soils. A woman less than half my age (not a big lift these days) said, “Springtail.”

Knowing her I turned and raised an eyebrow as if to say, “You’re kidding! How did you know that?”

“Entomology 101 Rutgers University,” she said.

My eyebrows, tilt of the head, and downward smirk relayed, “Nice going.”

Her head tilt confidently responded, "I know."

After class I decided to embark on a personal enrichment program to find out more about springtails. And in case you think this was all going to get a lot better, sadly I now know less than less.

But as any good teacher will do, I will relay what I did learn. First, don't start with the scholarly articles when there are 6,000 different species of an animal. Sneak up on your subject. I should have begun with the University of Michigan's BioKids article, a curriculum on springtails, as opposed to reading a scholarly commentary by DeGruyer as to why these six-legged critters are no longer considered insects by the majority of the scientific community, but rather ancient hexapods.

My next piece of advice: look for interesting facts presented by popular yet erudite folks, my favorite being Sir David Attenborough, who will speak at a layman's level. I got lucky; thank you, BBC. Lying on the ground, Attenborough took a round-headed pin like those that hold new dress shirts' stiff collars in place. He held it between his forefinger and thumb. Slowly he approached the ground to touch a springtail. Just as the pin approached it disappeared into thin air.

Further explanations revealed that this hexapod is especially equipped, aptly named *springtail* for its *furcula*, a structure held in place by its *tenaculum*. When the tenaculum is retracted the furcula slaps the substrate beneath its abdomen and sends it airborne at an astonishing 18 milliseconds of speed. One scholarly article relayed that they can reach up to 100 Gs, or 10 times the speed of a fighter pilot in a tight turn.

While airborne they are often flipping. In fact they can backflip faster than any other animal, at a rate of 368 flips per second. They can complete these rotations in less than 1/100th of a second. We know this thanks to new high-speed photography that enables us to see worlds that were once undetectable.

How big are they? They are 3/32 of an inch to as long as a quarter of an inch. They can leap three-four inches depending on the species. Attenborough relayed that if a person were to jump an equivalent distance, they could vault over the Eifel Tower in one bound. No wonder entomologists get so jazzed about springtails!

They leap and flip to escape predation or simply to move on. Predators include harvestmen (a type of daddy longlegs),

spiders, ground beetles, and most anything that eats small invertebrates. Their normal mode of locomotion is crawling about.



Some species are simply cute, Bourletiella arvalis. Boxford, MA. Photo: Solomon Hendrix.

Springtails are *collembola*, an anthropoid, more specifically a hexapod. Their name comes from Greek roots, *coll* meaning glue and *embol* meaning wedge. The wedge refers to the springboard or furcula. They come in many shapes and sizes and are one of the most abundant macroscopic animals on earth.

Springtails prefer moist, cool conditions. The only difference between nymphs and adults is their size. They grow larger with each molt until they reach their adult size, which takes five molts. However in warmer than usual

conditions they can actually reduce their size by 30 percent by molting to smaller dimensions. This reduction lowers their metabolic rate and decreases their energy requirements.



Springtails have two dark spots that can be mistaken for eyes. Each is actually a cluster of up to eight single eyes. These are not considered compound eyes; generally, six sense dark or light, and two detect polarized light. Three-lined springtail, Newfield, NJ. Photo: J Stippick, iNaturalist.

During drought conditions some species of collembola will build shelters using their own droppings.

These creatures live on the ground, in water, in trees, in caves, and are present primarily where there are soils. They are found in altitudes as high as Mt. Everest and they are abundant. Penn State Extension reports estimates of 100,000 springtails in approximately 35 cubic feet of soil. They are especially plentiful in high humidity environments like leaf litter, mulch, and damp lawns. If you have potted plants in your home you likely have hundreds if not thousands in their soil.

Two famed springtail species, *hypogastrura nivicola* and *h. harveyi*, are called snow fleas because thousands of them will gather in sizeable patches on the surface of snow. They can accumulate in a footprint making the snow appear black.

With six legs, why are they no longer considered insects? Because their mouth parts are *entognathous*, meaning retracted inside their head, whereas the mouth parts of insects are not retracted but visible and outside their head.

When classifying the 6,500 some species of springtail, taxonomists rely on characteristics

of their habitat usage. Those that live primarily above ground are separated from those that live below, and then various depths further define each type. Soil composition is a factor in classification as well. There are three main orders: globular, elongate-bodied, and water springtails.



Springtails' bodies are covered with scales similar to a butterfly's wings. These can give them an iridescent appearance when light is reflected. Giant silver bullet springtail. Photo: K Himmler.

They are omnivores, eating mold, fungi, and algae, essentially fragmenting decaying vegetation into smaller sizes: nature's clean-up crew. In doing so their waste produces natural fertilizers for plants. They play a role in the transport of mycorrhizal fungus, enabling the symbiotic relationship between

plants and fungus. In doing so they also control pathogenic fungi.

Certain species are harmful for crops; one Australian species, *Sminthurus viridis*, is known to cause severe damage to yields. But primarily they are soil enhancers. By and large they play a positive planetary role in the soil community.

In the end I have discovered that something of which I was totally unaware was pretty much everywhere, with an abundant diversity of shapes and colors. Who knew?

Sources

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