

Collembola in grassland – included in the new project Soileffects

Reidun Pommeresche and Anne-Kristin Løes, Bioforsk, Norwegian Institute for Agricultural and Environmental Research. Division Organic Food and Farming, Gunnars veg 6, 6630 Tingvoll, Norway. Reidun.Pommeresche@bioforsk.no. Tlf: +47- 404 81 526.

Abstract: Little is known about Collembola in arable soil, at least in Norway. Recently, a study includ. this group has been initiated in a Norwegian field experiment (Soileffects).

Collembola (springtails) are a group of small animals (1-3 mm) living in vegetation, litter and in the pores and caves in the soil to a depth of ca 15 cm. They are important decomposers of dead plant material, eating fungi, algae and microorganisms in soil and on organic debris. Their grazing and decomposing activity contribute significantly to the nutrient circulation in the soil. The name springtail refers to a furca on their back, usually folded in under the body, but released in need of a rapid escape. In one jump, Collembola can jump more than 50 times their own body length. In Norway 334 species are known; in the world more than 6000. Two main groups are found:

Entomobryomorpha; species with a clearly elongated segmented body and *Symphyleona*; species with a more or less globular body with fused segments, reminding of small "rabbits". Whereas species living in the vegetation and in the upper soil litter are often pigmented, have long antennas, large furca and visible eyes, soil living species are smaller (< 0.5 mm), and have shorter extremities and lack eyes or have small eyespot. They are often white or grey in color. The general distribution of species in Norway is well studied by Arne Fjellberg¹. European papers about Collembola in agricultural soil are available^{2,3}, but not too much is known about this group of animals in arable soil.

On the organic research farm in Tingvoll, NW Norway, an experiment was established in 2011 to compare anaerobically digested manure with undigested slurry in perennial ley and arable crops. Effects on crop yields, soil fauna, microbial communities, soil structure, organic matter and nutrient concentration are recorded. There is limited information on how the manure digestion impacts soil fertility in the long run. A reduced supply of carbon to the soil may impact the soil fauna, which is dependent on this source of energy, because almost none of them produce organic matter themselves. In addition to earthworms, Collembola are studied in this project, called "Soileffects".

Collembola were sampled from 12 plots in the ley part of the Soileffects experimental trail in April 2011. This, to get a start characterization of the fauna. We used small metal rings (5,8 cm in diam, 3,8 cm high) to take out soil cores. The fauna in the samples were extracted by using a variant of Tullgren funnels, where drying the soil force the Collembola out. In cooperation with Arne Fjellberg, we found 250 collembolas and identified them to 17 species, comprising a large variation in colors and body forms. A mean of 21 individuals in each sample, gave an estimate of 7980 individuals m⁻² in our ley field. We found species belonging to the *Entomobryomorpha* and species belonging to the *Symphyleona*. A numerous species was *Isotomurus graminis*, with a greenish color, medium long antenna and a solid furca. *Isotoma viridis*, also greenish, but with purple edges of each segment. In this species, the body hairs are better preserved in alcohol, than mostly found for *I. graminis*. Of the small, white soil living species, *Protaphorura armata*, *Stenaphorura lubbocki* and *Mesaphorura macrochaeta* were the most numerous species. Possible effects of 3 years manure application with anaerobically digested manure and non-digested manure (slurry) will be measured in 2013.

¹ Fjellberg. 1998 and 2007. The Collembola of Fennoscandia and Denmark. Part I and II. Fauna Entoml. Scand.

² Bardgett and Cook. 1998. Functional aspects of soil animal diversity in agricultural grasslands. Appl. Soil Ecol.

³ Gutierrez-Lopez et al.2011. Movement response of Collemb. to the excreta of two earthw....Soil Biol. Biochem.