

Collembola in grassland - included in the new project SoilEffects

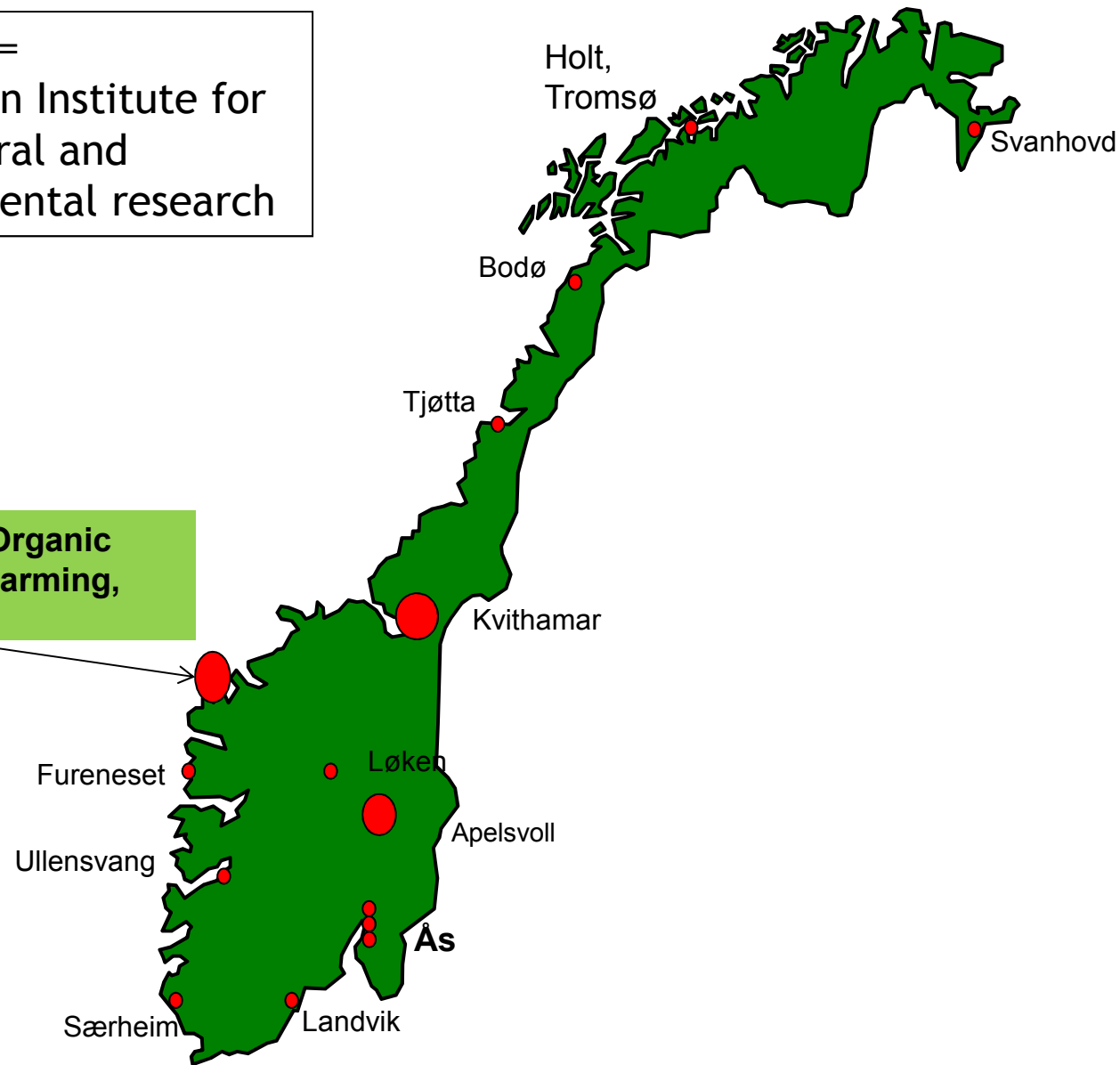


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Bioforsk =
Norwegian Institute for
Agricultural and
Environmental research



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**Bioforsk - Organic
Food and Farming,
Tingvoll**

SoilEffects

- An experiment was established in 2011 to compare fertilization with anaerobically digested slurry and 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.
- Organically managed field trial and manure from an organic farm.

Field map

Plot size 3 x 8 m

	E/C	E/C			E/C	E/C		E/C		E/C
T	1 UH	2 DH	3 UL	4 DL	5 N	6 DH	7 UL	8 UH	9 DL	10 N
		E/C	E/C	E/C			E/C	E/C		E/C
T	11 DL	12 N	13 DH	14 UH	15 UL	16 UL	17 N	18 UH	19 DL	20 DH
		E	E	E		E	E		E	
	21 DL	22 UL	23 UH	24 DH	25 N	26 DL	27 UH	28 N	29 UL	30 DH
	E	E		E		E		E	E	
	31 DL	32 UH	33 N	34 UL	35 DH	36 DL	37 UH	38 UL	39 DH	40 N

U = Untreated slurry

D = Digested slurry

H = High level of manure

L = Low level of manure

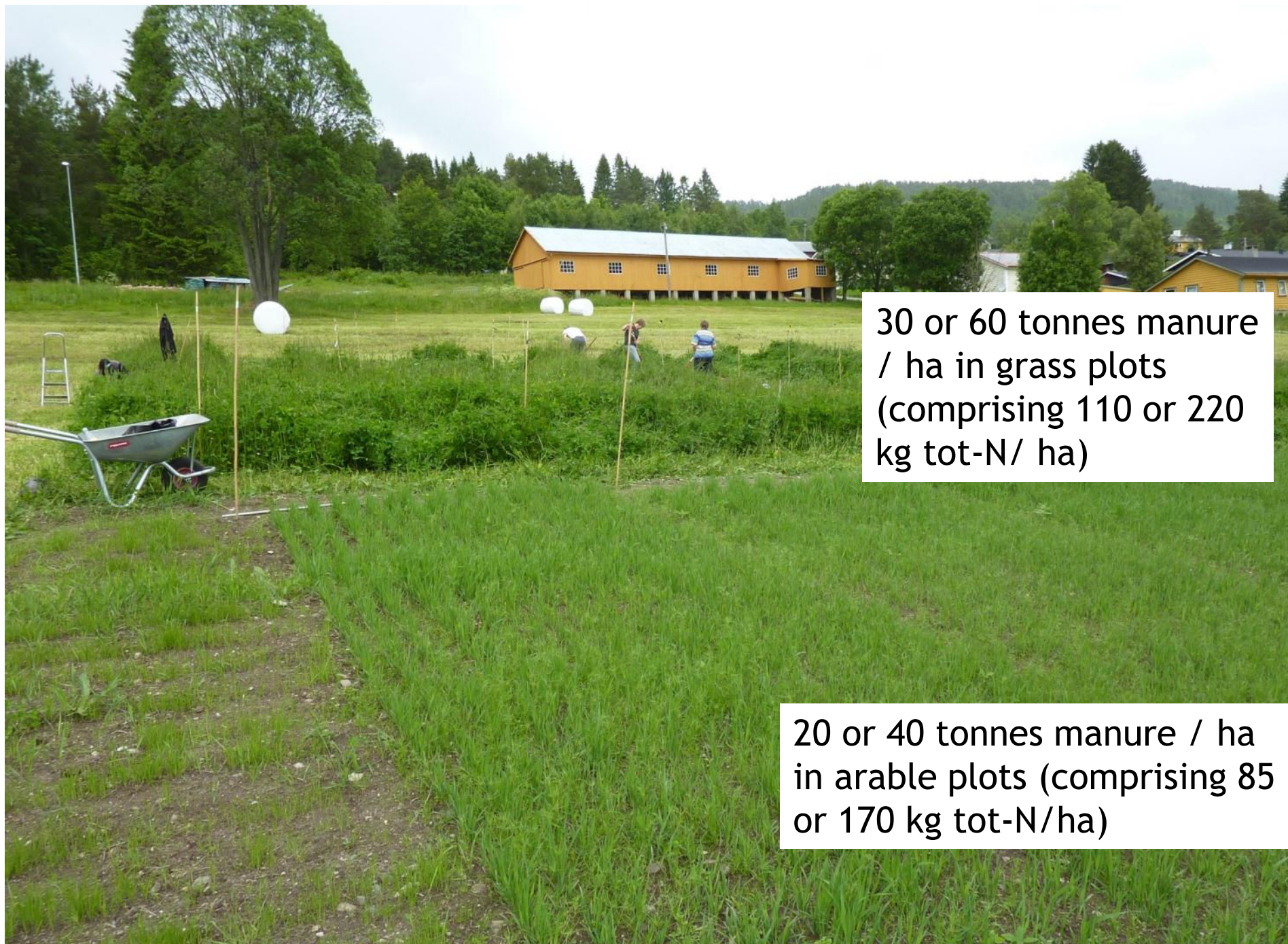
N = No manure

T = Test plots for training

E = earthworm sampling April 13 2011

C = Collembola sampling April 28 2011

2012 og 2013



30 or 60 tonnes manure / ha in grass plots (comprising 110 or 220 kg tot-N/ ha)

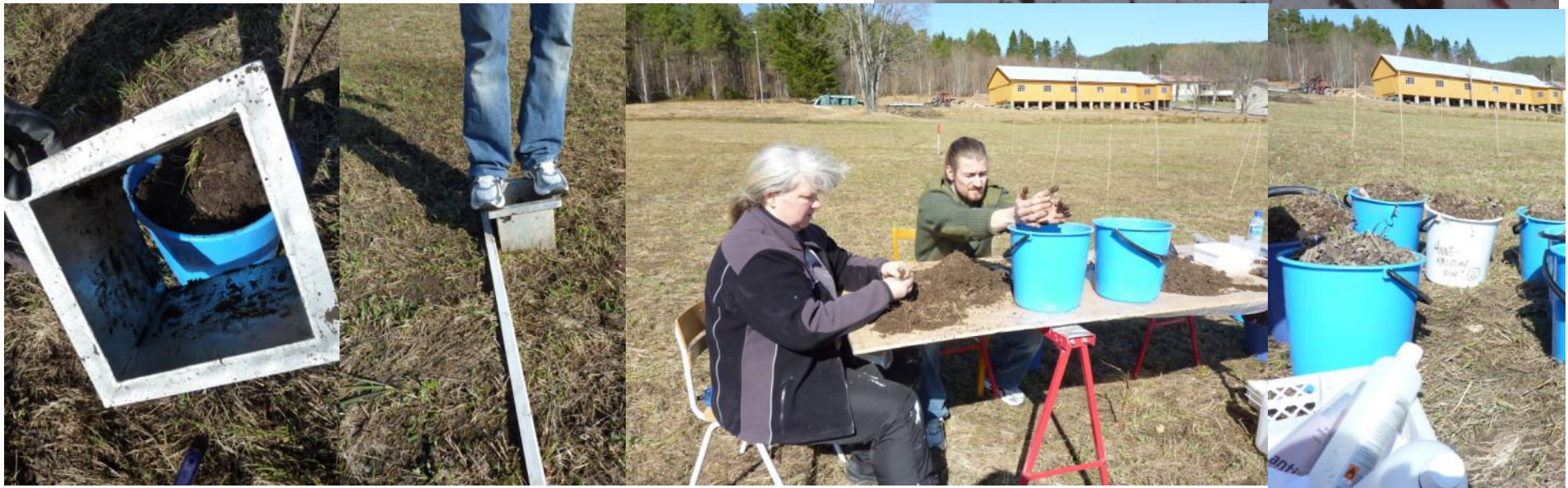
20 or 40 tonnes manure / ha in arable plots (comprising 85 or 170 kg tot-N/ha)

Slurry and digested slurry



Earthworms start characterisation

- Grass and arable
- 5 species
- Grey worm (*A.caliginosa*)
- Blue-grey worm (*O.cyaneum*)
- Dew worm (*L.terrestis*)



Yields

Average dry matter yields, tonne ha⁻¹ and relative yields, in the manure treatments, 2011.

<i>Treatment</i>	<i>Ley, 1st cut</i>	<i>Ley, 2nd cut</i>	<i>Oats + straw</i>
No manure	4.75/100	1.86/100	5.35/100
Digested, low	5.51/116	2.68/145	5.60/105
Digested, high	5.48/115	2.97/160	6.11/114
Untreated, low	5.50/116	2.55/137	5.80/109
Untreated, high	5.54/117	3.24/175	5.98/112



Photo: Wikipedia

Arne Fjellberg (Dr. philos., born 1946)

- Work within systematics, biogeography and ecology in the Northern hemisphere.
- Norwegian specialist on collembolans
- Identification keys: 1998/2007 - The Collembola of Fennoscandia and Denmark
- Different papers on Collembolans in natural and arctic habitats



Photo: A.Fjellberg

Collembola

- Do the number of collembolans and species composition respond negatively to the application of digested manure?
- Which species are commonly found in organically grown grass/clover ley in Western Norway?
- When do we sample collembolans to most likely measure any potential effects of different manure application?

Collembola - from grassland - start characterisation

- Before manure application spring 2010
- 12 samples (0.1 dm³)



Loamy sand



Berlese funnel system - extracting the springtails from the soil



Symphyleona - rabbit shaped springtails



Many
pollen
eaters

Photos: Arne Fjellberg

Arthropleona - segmented springtails

Poduomorpha – plump body/short extremities

Entomobryomorpha – insect like



Eating
fungi,
debris and
bacteria

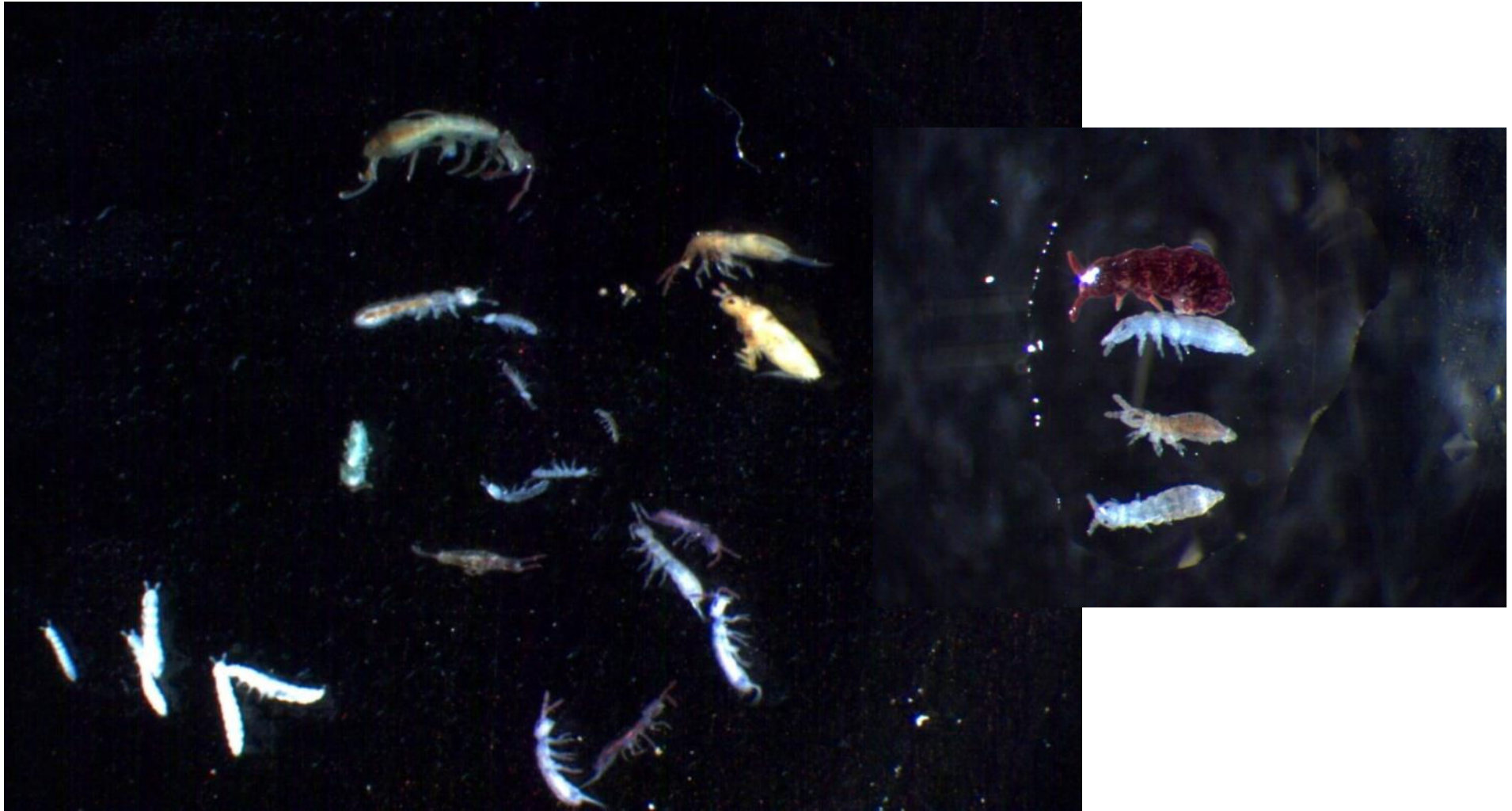
Photos: Arne Fjellberg

Results

- 17 species
- 250 springtails in 12 samples (mean 21 in each)
- $21 \times 380 = 7980$ springtails /m²



Springtails in Soil Effects



«Insect like”
springtails

Surface
dwelling

- colours
- hairy
- long ant.
and legs
- long furca

Parisotoma notabilis, 1 mm

Isotomurus graminis, 3 mm

Isotoma viridis,
2 mm ?

Pseudisotoma sensibis, 1.7 mm

Rabbit shaped species

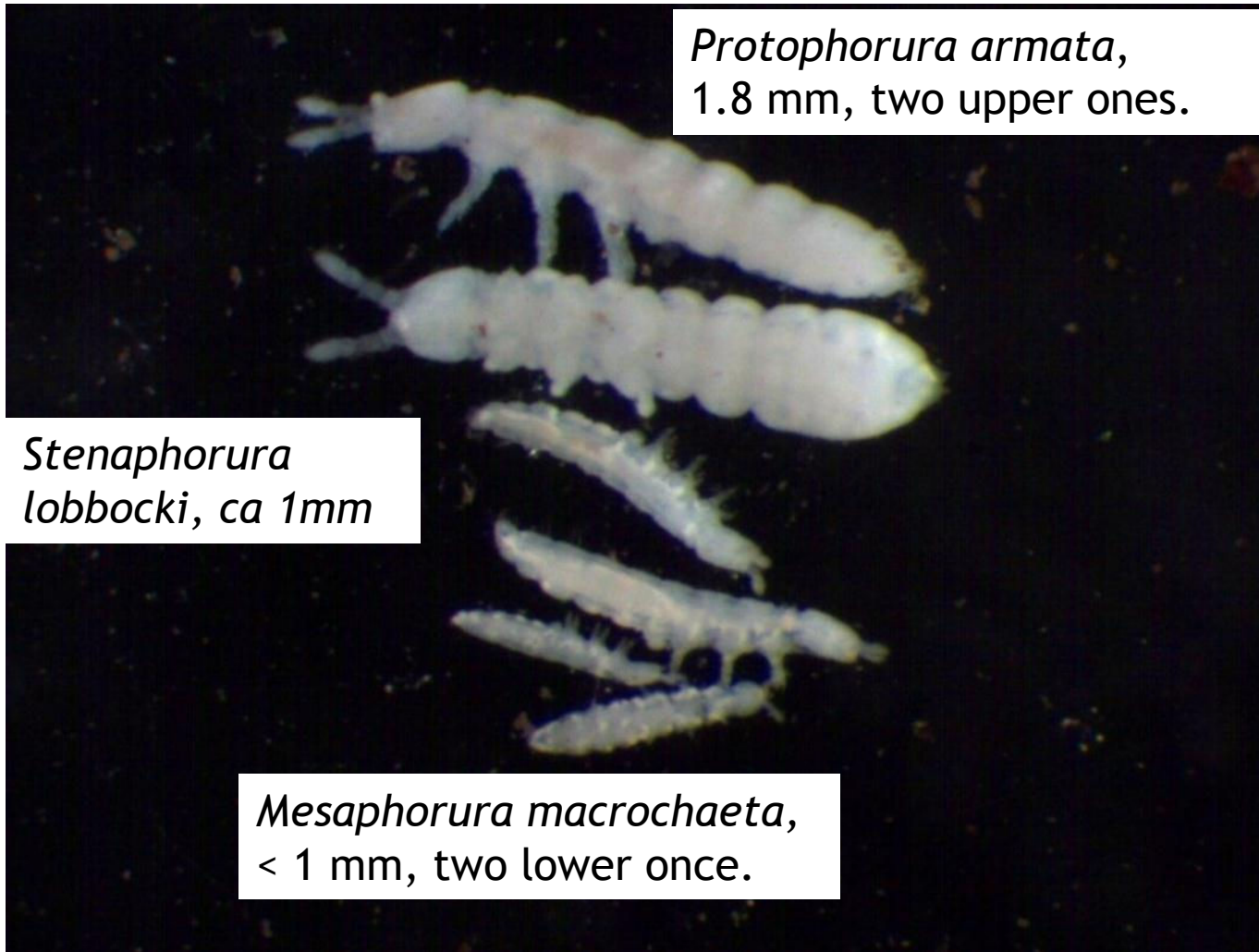


Sphaeridia pumilis, < 0,5mm

Sminthurus viridis juv.,
green or more pale,
adult up to 3mm

Dicyrtomina
minuta, 2.5 mm

Sminthurinus
elegans, <0.7 mm



Protophorura armata,
1.8 mm, two upper ones.

*Stenaphorura
lobbocki*, ca 1mm

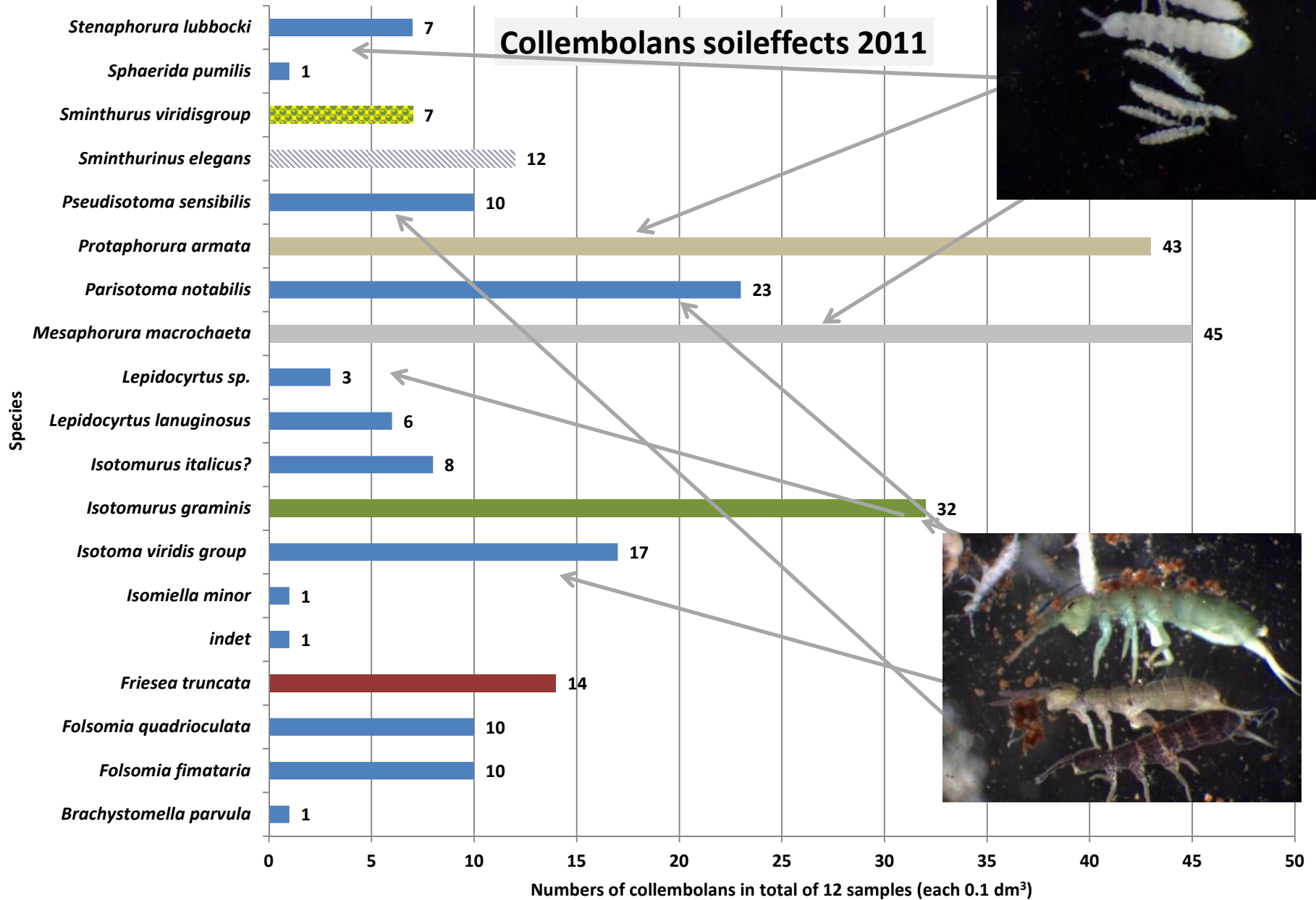
Mesaphorura macrochaeta,
< 1 mm, two lower ones.

Three soil
swelling species

- Pale/white
- Blind
- Reduced furca

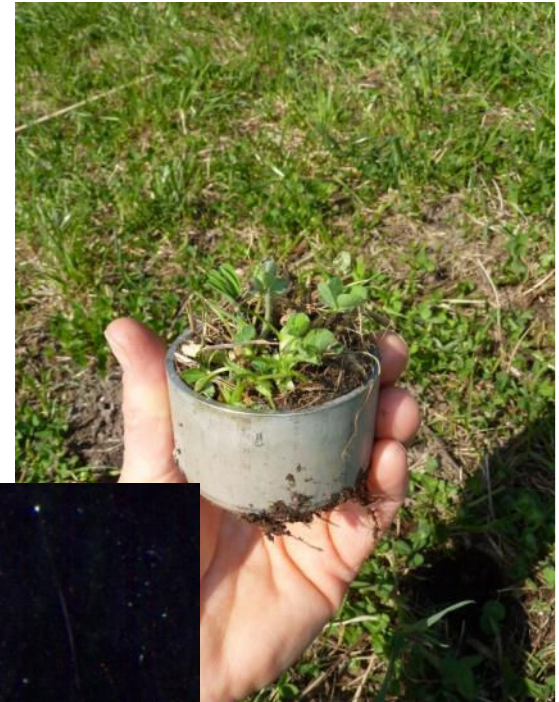
Fungi eaters?

Collembolans soileffects 2011



Further work

- A new sampling of earthworms after manuring this spring
- New sampling of collembolans spring 2012 and 2013
- Pot experiment with grey worm



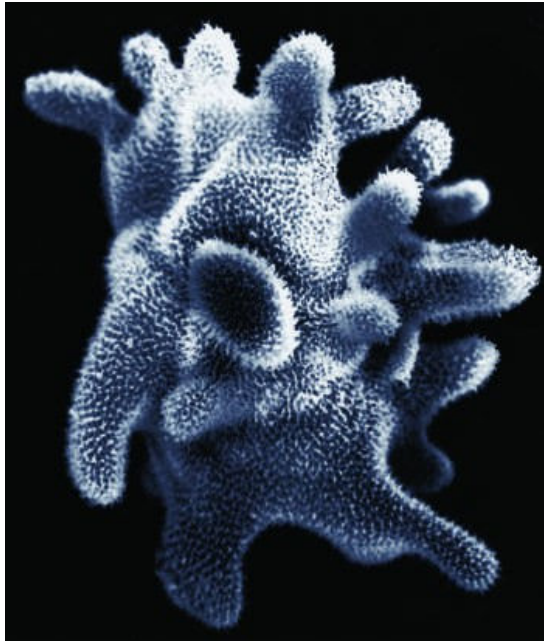
The project “Effects of anaerobically digested manure on soil fertility - establishment of a long-term study under Norwegian conditions” (SoilEffects) runs 2010-2013.

We are interested in new project that can use this field experiment and contribute to future financing. 😊



Facta sheets
in Norwegian about
soil fauna
Livet i jorda -temaark

Reidun Pommeresche
2011



Photos: W. Foissner, European
Atlas of Soil Biodiversity and
R.Pommeresche

7 + 3 temaark

1. Et yrende liv rundt røttene
 2. Spretthaler - jordas små kaniner
 3. Nematoder - sirkulering av næringsstoffer
 4. Jordlevende bakterier
 5. Jordlevende sopp
 6. Protozoer - de minste "dyra" i jorda
 7. Kompostering
- tre fra 2007 om meitemark



Photo: Arne Fjellberg





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