

Abundance patterns of isopod assemblages under different urbanization stages in Hungary and Denmark

**Ferenc Vilisics¹, E. Hornung¹, Z. Elek^{1,2}, G.L. Lövei³,
T. Magura⁴ & B. Tóthmérész⁵**

**1 Szent István University (H); 2 CEMAGREF (F); 3 Aarhus University (DK); 4 Hortobágyi National Park (H); 5
Debrecen University (H)**

Johannesburg, ZA



Kansas City, USA



Kobe, JPN



Sao Paulo, BRA



Key problem:

Urbanization

- Similarities in

FUNCTION

industry, trade,
education, culture
etc.

**LAND
MANAGEMENT**

habitat degradation,
artificial surfaces,
etc.

STRUCTURE

e.g. residential,
industrial,
commercial zones

**ENVIRONMEN
T**

e.g. heat island effect

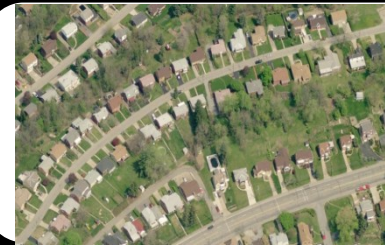
CITIES

- Structure of cities is similar (GlobeNet):

**Rural area;
woods**



**Suburban
zone**



**Densely
built-in city
core**



URBAN SOIL FAUNA

- **Few taxa are well studied from cities**
 - E.g. Carabidae, Aranei
- **Urban soil decomposers are not well known**



- **Dual effect of urbanization is detected:**

**Species
introduction**

**Biotic
homogenization**

METHODS

- **Sampling design, sampling localities and areas: GlobeNet protocol** (Niemelä *et al.* 2000)
- **Observed towns:**
 - Debrecen: medium size
 - Sorø: small town
- **Different disturbance levels**



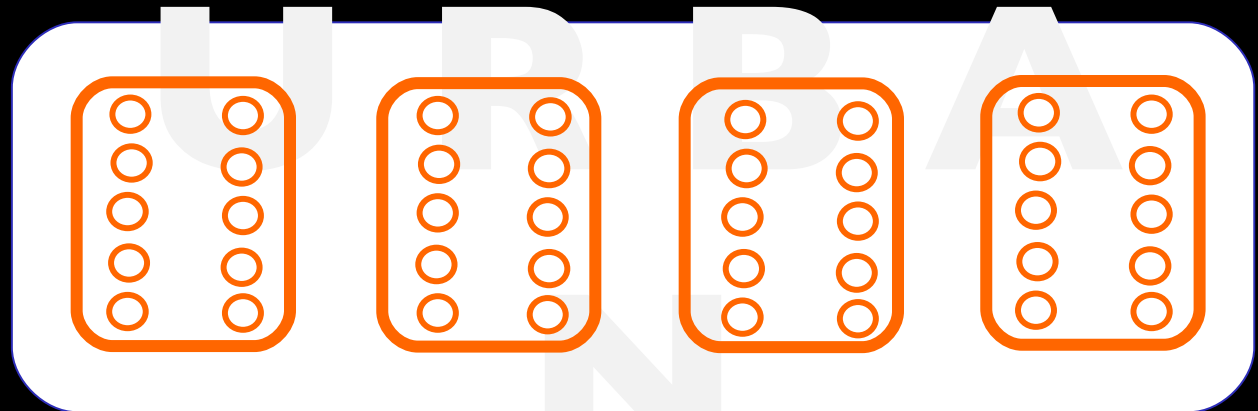
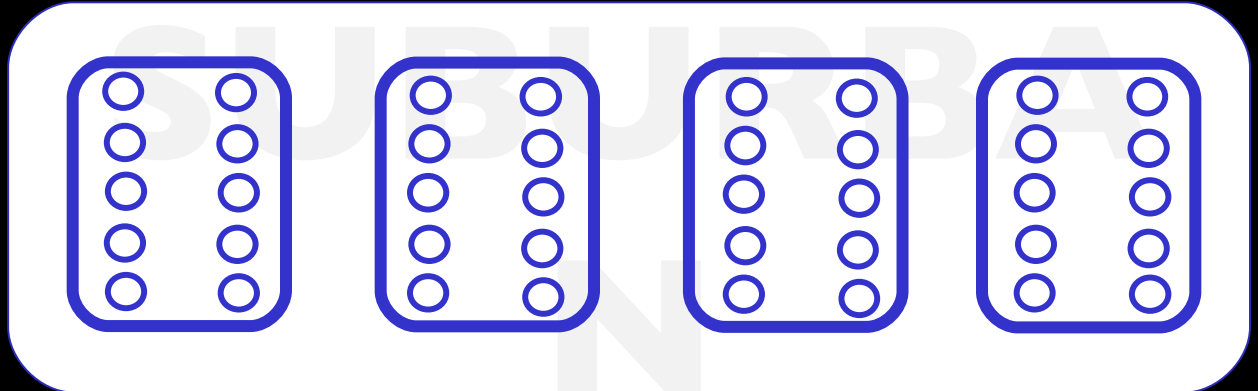
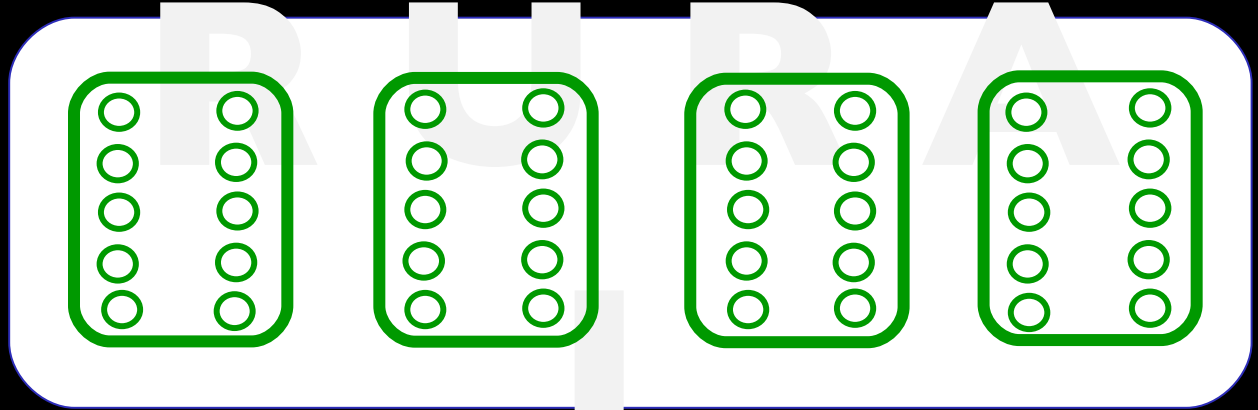
Rural, forest
Suburban area
Urban park



forested areas

METHODS

- 3 habitat types (areas)
- 4 replicates (sites) / areas, 50 m distance
- 10 pitfall traps, 10 m distance
- Total:
120 pitfall traps (3*40)
- Sampling periods:
May – October



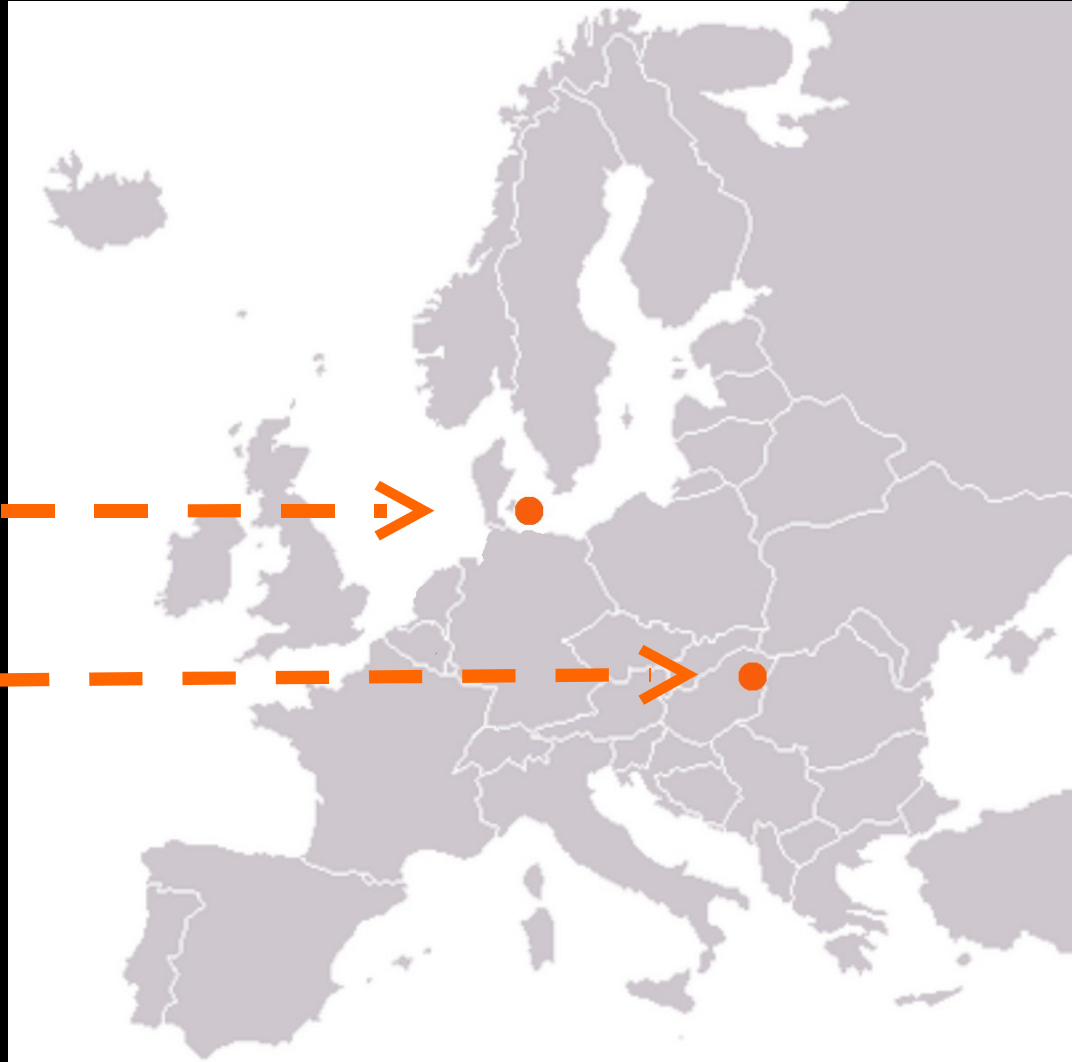
LOCALITIES

- Denmark

- Hungary

• **Sorø**

• **Debrecen**



Debreccen



Oak forest

Suburban area

Urban park



HYPOTHESES

- **Intermediate disturbance h.**
 - Species richness is highest under intermediate disturbance level
- **Increasing disturbance h.**
 - Species richness is highest under intermediate disturbance level
- **Species introduction h.**
 - The number of introduced and synanthropic species is highest in the urbanized areas.

RESULTS

- **Debrecen (H)**

- 6 species, 9000 ind.

- **Sorø (DK)**

- 6 species, 99,569 ind. (2 species excluded)



Porcellio scaber

RESULTS

Debrecen:

Armadillidium vulgare

Porcellio scaber

Trachelipus rathkii

Trachelipus ratzeburgii

Porcellium collicola

Cylisticus convexus

Sorø:

Armadillidium vulgare

Porcellio scaber

Trachelipus rathkii

Ligidium hypnorum

Oniscus asellus

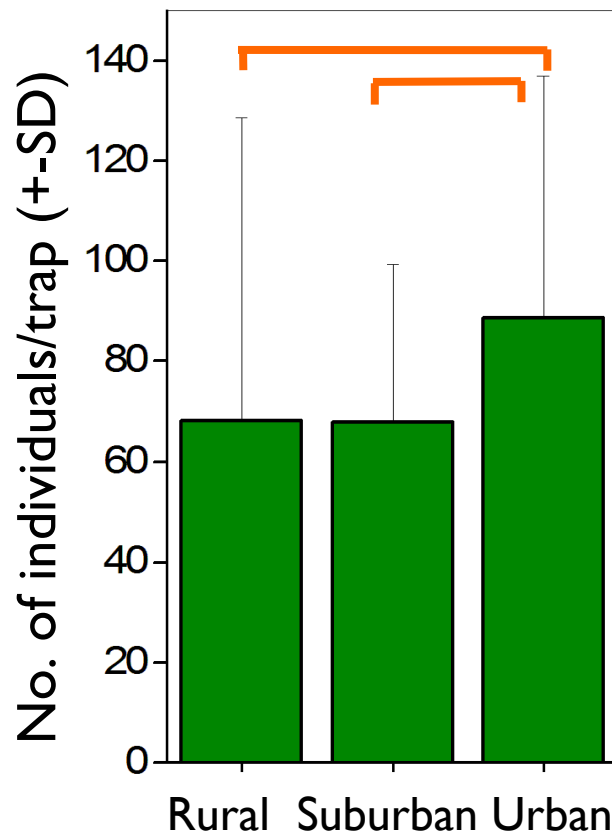
Philoscia muscorum

- **High uniformity between cities**
- **Native generalist, or cosmopolitan species**
- **No exotic species**
- **No differences in species compositions among R – S - U areas**

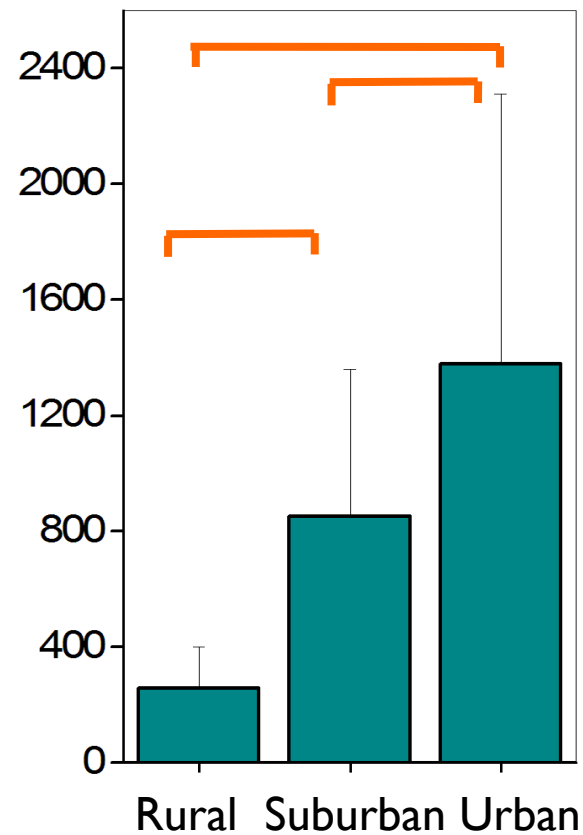
INDIVIDUALS / TRAP

Egipigeic activity

Debrecen (H)



Sorø (DK)



Kruskal-Wallis test, $p < 0,01$

ABUNDANCE OF SITES AND AREAS

Nested ANOVA

		Df.	F	p	Fisher LSD
Debrecen	Area	2	0,69	*	R = S S < U R < U
	Site (Within area)	9	4,43	**	
Sorø	Area	2	8,63	***	R < S R < U R < U
	Site (Within area)	9	4,98	**	

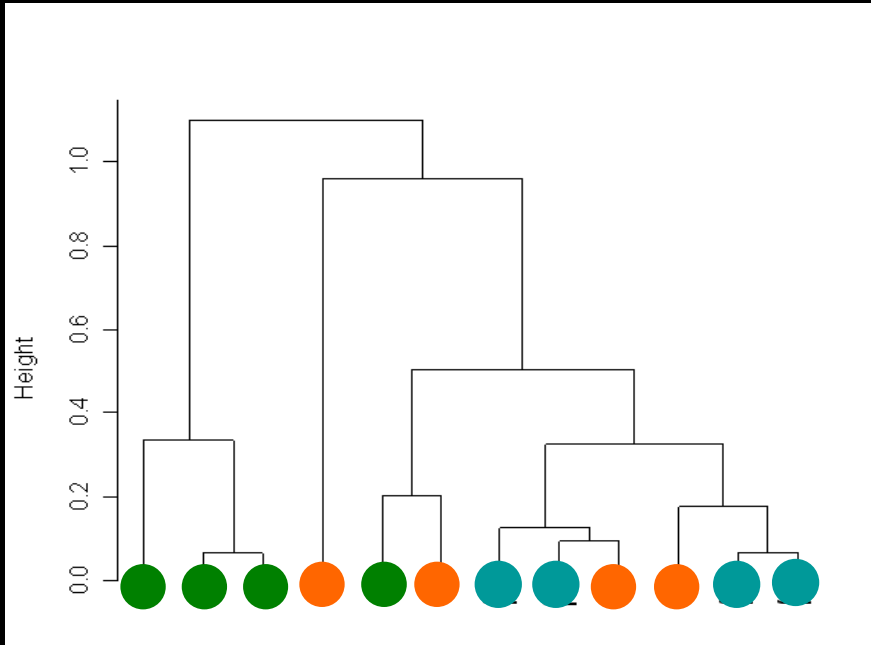
R = Rural,
S =
Suburban, U
= Urban

* < 0,1 ** < 0,05
*** < 0,001

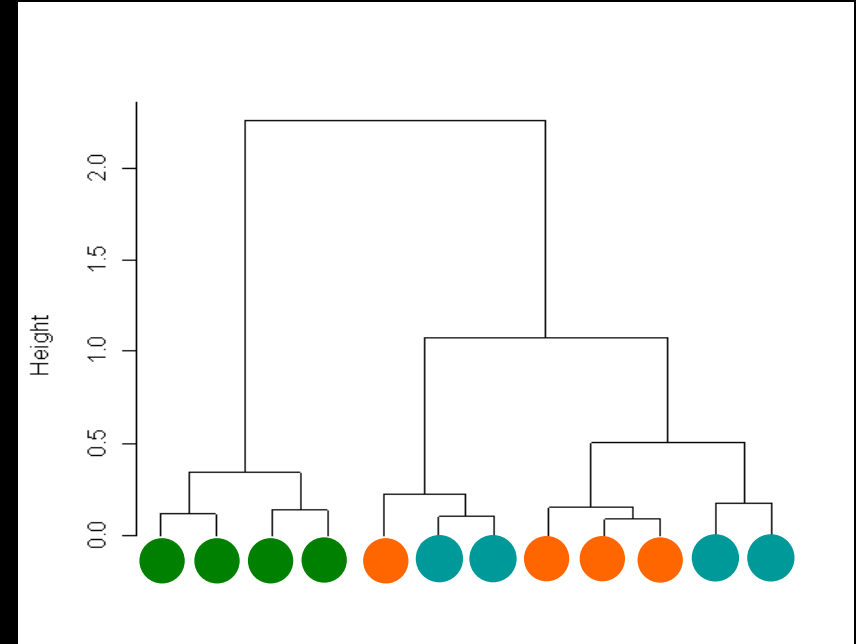
- **Significant differences among areas,**
- **Significant differences among sites within each area**
(spatial aggregation of isopods)

SIMILARITY OF SITES AND AREAS

Debrecen (H)



Sorø (DK)



Rural



Suburban

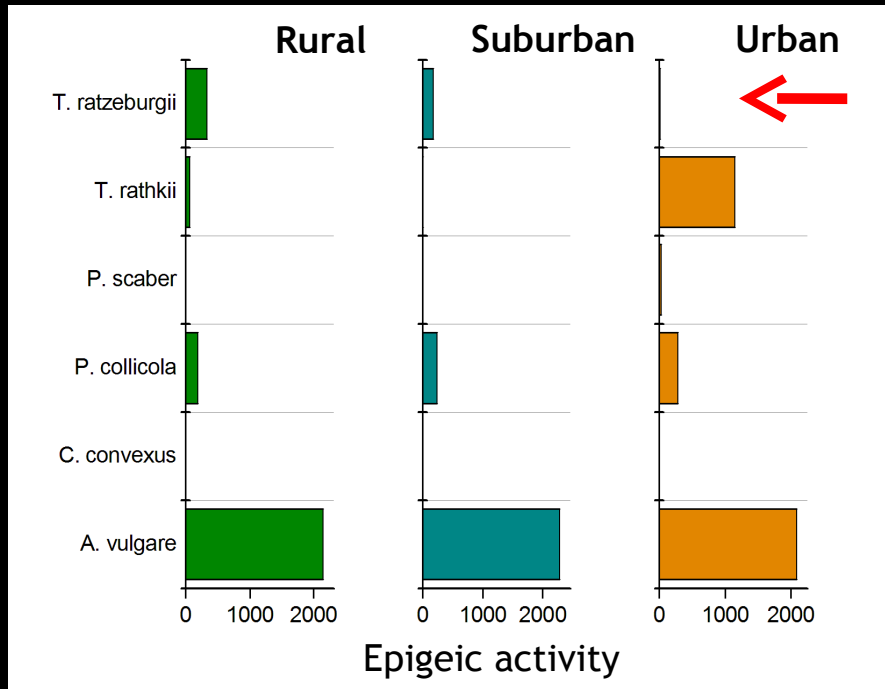


Urban

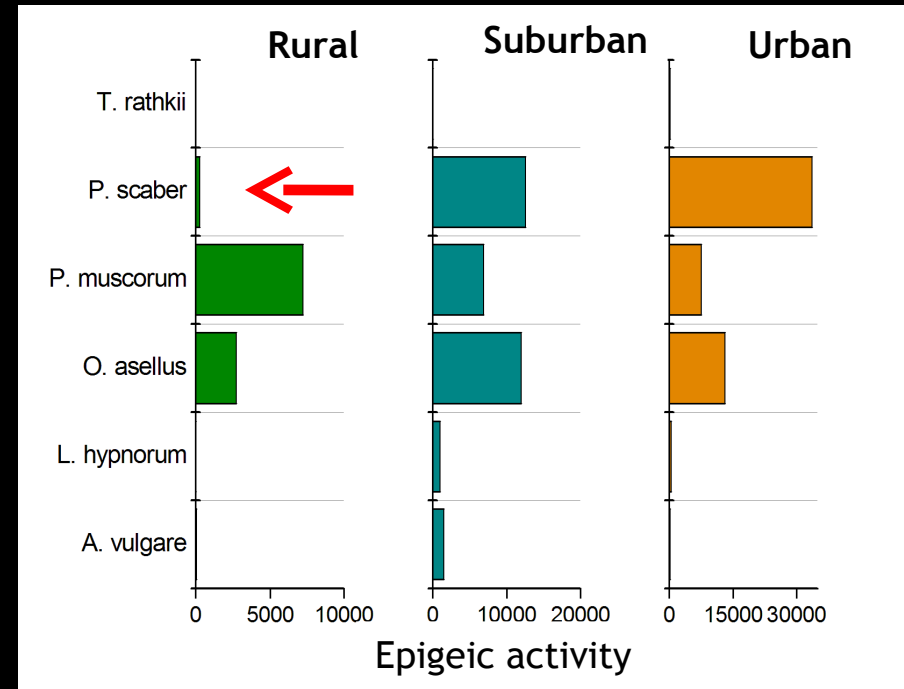


SPECIES FREQUENCY IN AREAS

Debrecen



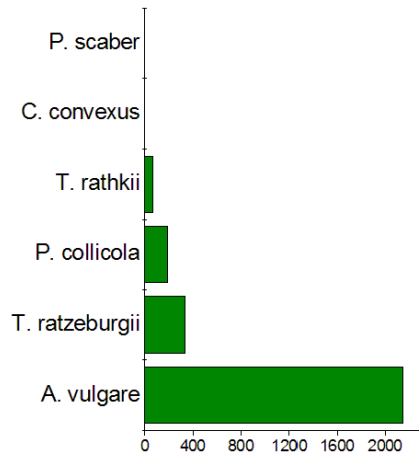
Sorø



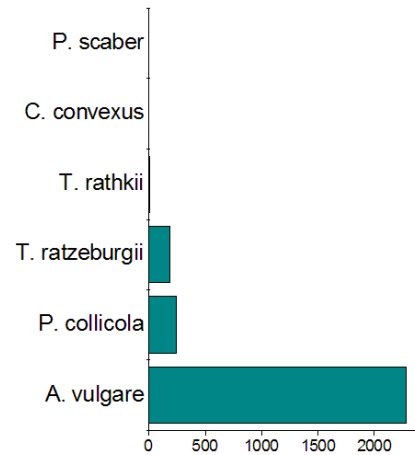
RANK-ABUNDANCE OF ASSEMBLAGES

Debrecen

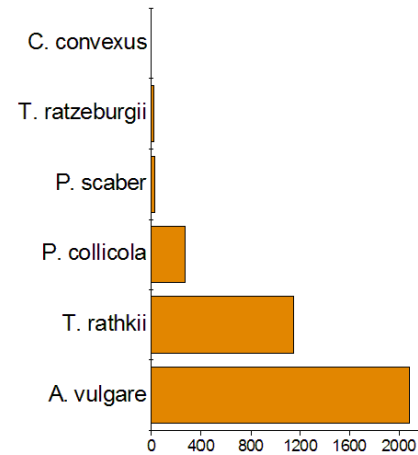
Rural



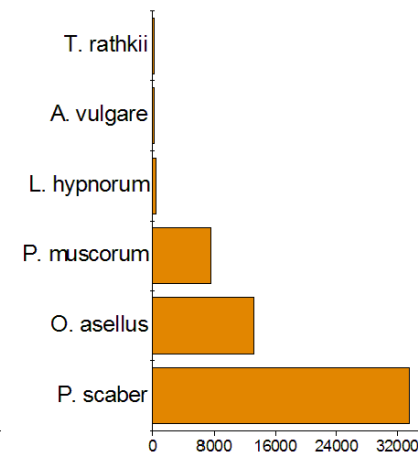
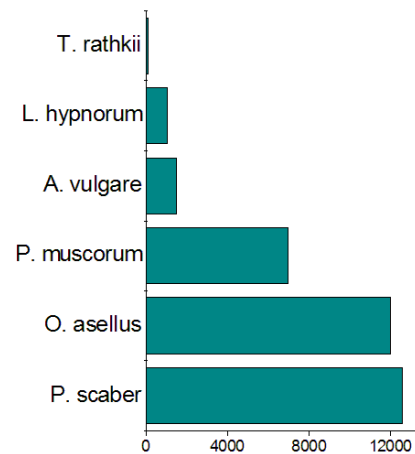
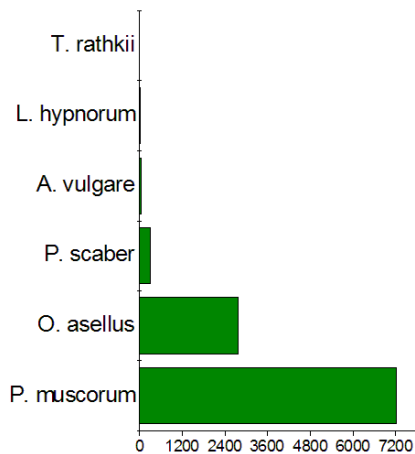
Suburban



Urban



Sorø



SUMMAR

For both towns:

- 1. Species richness: no differences among areas rural, suburban, urban.**
- 2. No introduced, exotic species captured by pitfall traps.**
- 3. The differences among areas were indicated by abundance patterns of species.**
- 4. Rank-abundance of assemblages show unevenness regardless to level of urbanization.**

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TERRESTRIAL ISOPODS (Crustacea, Isopoda, Oniscidea)

- **Appr. 4000 species world-wide**
- **Soil and litter dwellers**
- **Diverse morphology**
- **Important role as decomposers**

Hungary -

57

Denmark -



- Hungary: **Sporadic but regular samplings**
- Denmark: **Data older than 50 years**

Meinertz, T (1964) *Vidensk Medd dansk*

Schmalfuss, H (2003) *Stuttg Beitr Naturk*

Vilisics, F (2007) *Folia Nat Hist Mus Matr*