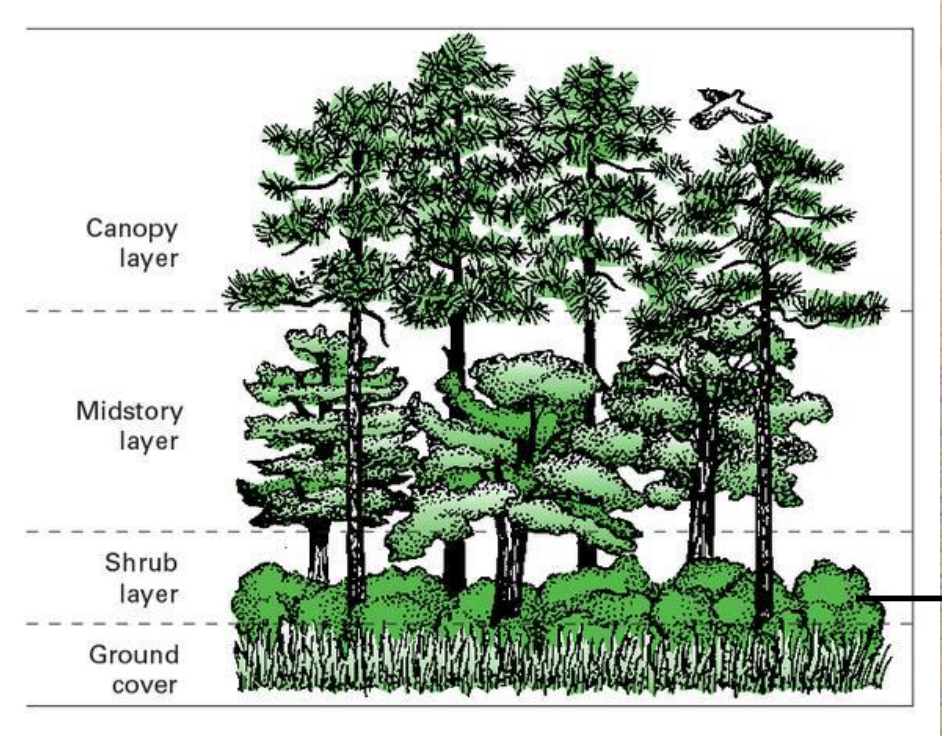
Invertebrate Community of Scots' pine Coarse Woody Debris in the Southwestern Pyrenees under different thinning intensities and tree species

Ximena Herrera-Alvarez, Juan A. Blanco, J. Bosco Imbert, Willin Alvarez and Gabriela Rivadeneira-Barba

Content

1. Introduction



Input of CWD to the soil due the fragmentation of living and standing trees

CWD: any fallen wood material > 2,5 cm in diameter

ECOSYSTEM SERVICES

1. Introduction

HABITAT FOR SPECIES

Carpenter ants (*Camponotus herculeanus* L.)

prey - predator

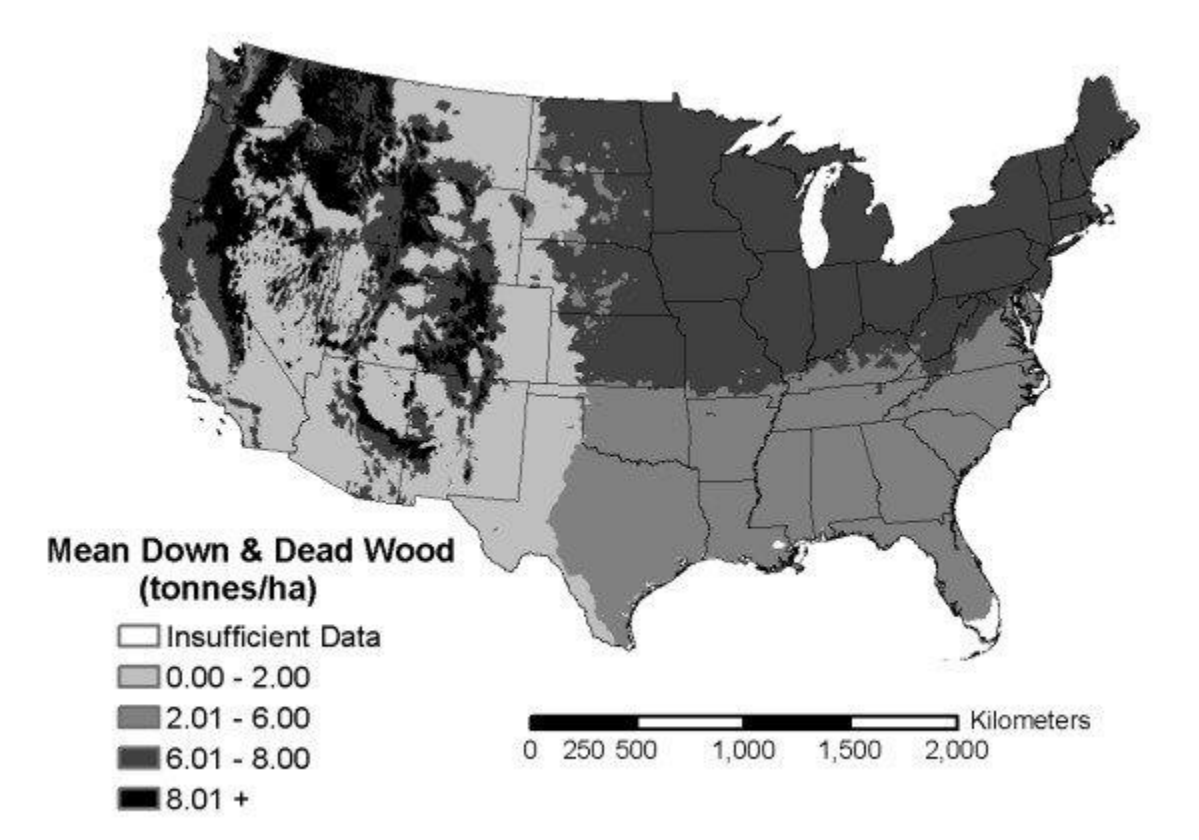
Brown bears (*Ursus arctos* L.)

Nurse log

KEY in diversity conservation

1. Introduction

CARBON STOCK AND CLIMATE CHANGE



Carbon Balance and Management BioMed Central

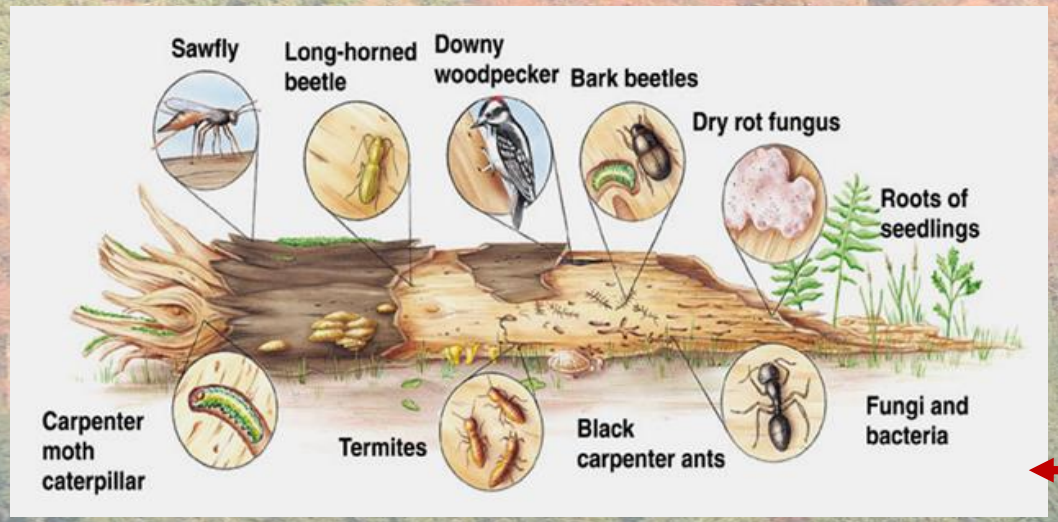
Research Open Access

Climatic regions as an indicator of forest coarse and fine woody debris carbon stocks in the United States

Christopher W Woodall* and Greg C Liknes

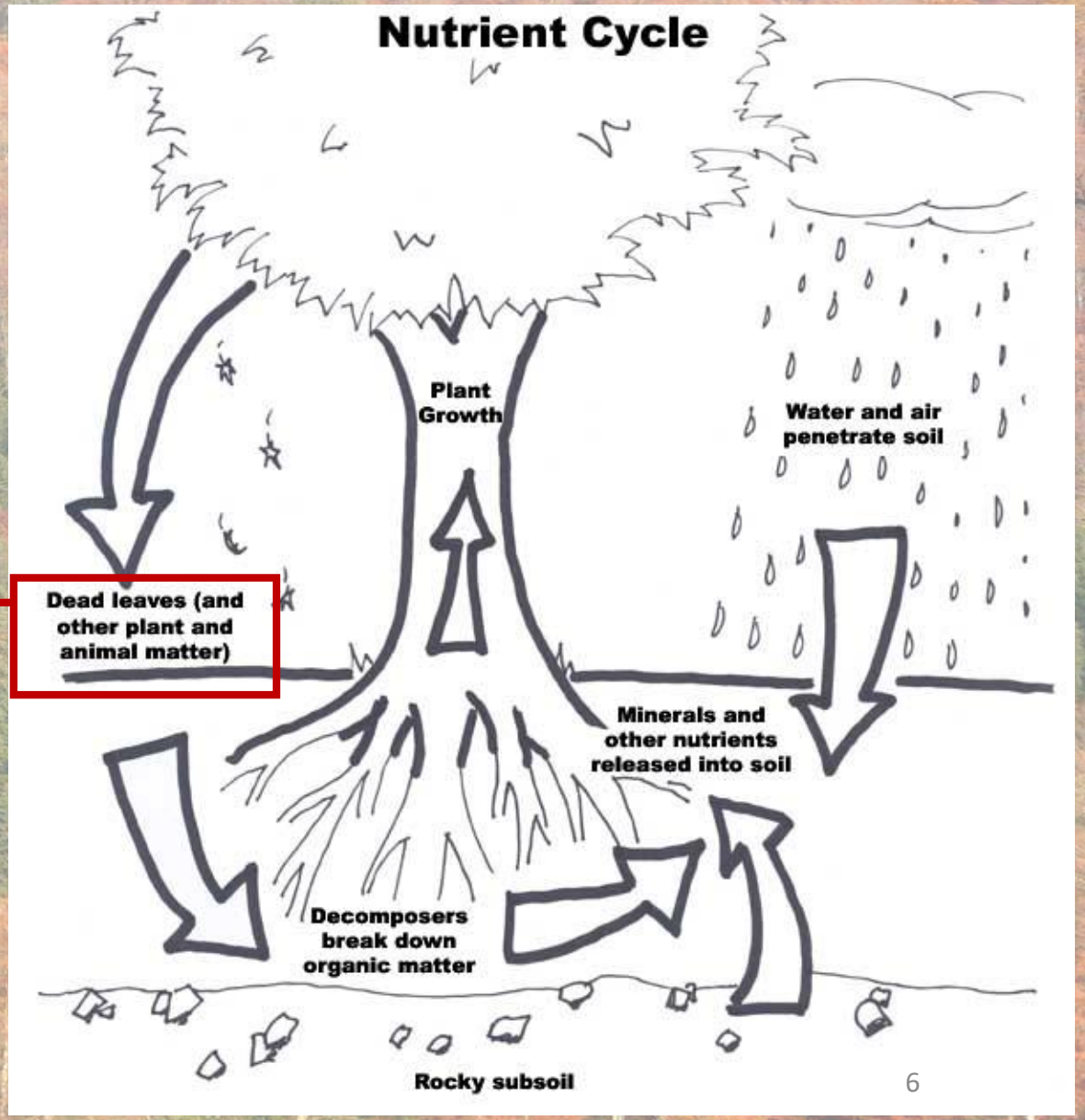
1. Introduction

NUTRIENT CYCLE IN THE ECOSYSTEM



- No branches
- Large sections of sapwood can be separated by hand

- Rotten heartwood
- Branch structures are rotten



2. Hypothesis

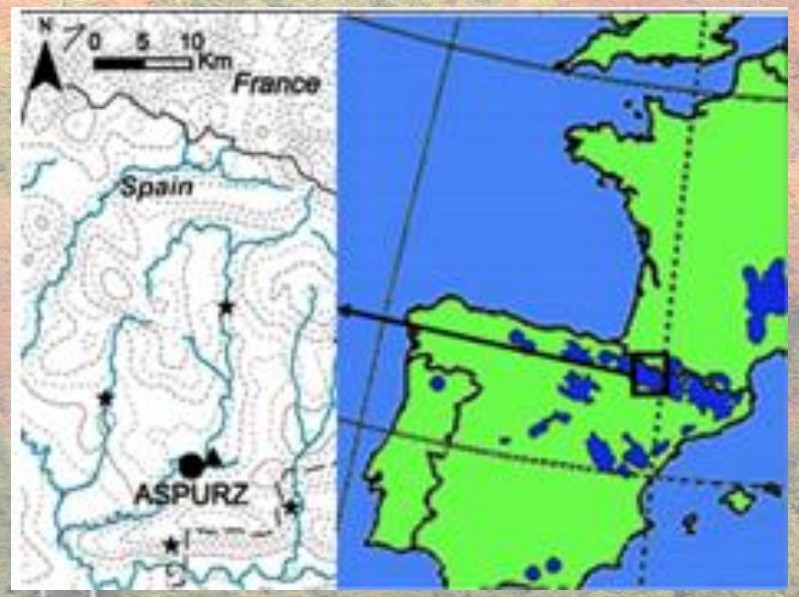
Litter invertebrates have been affected by forest management and canopy type (Jabat, 2006), woody debris decomposition by invertebrates may have been altered.

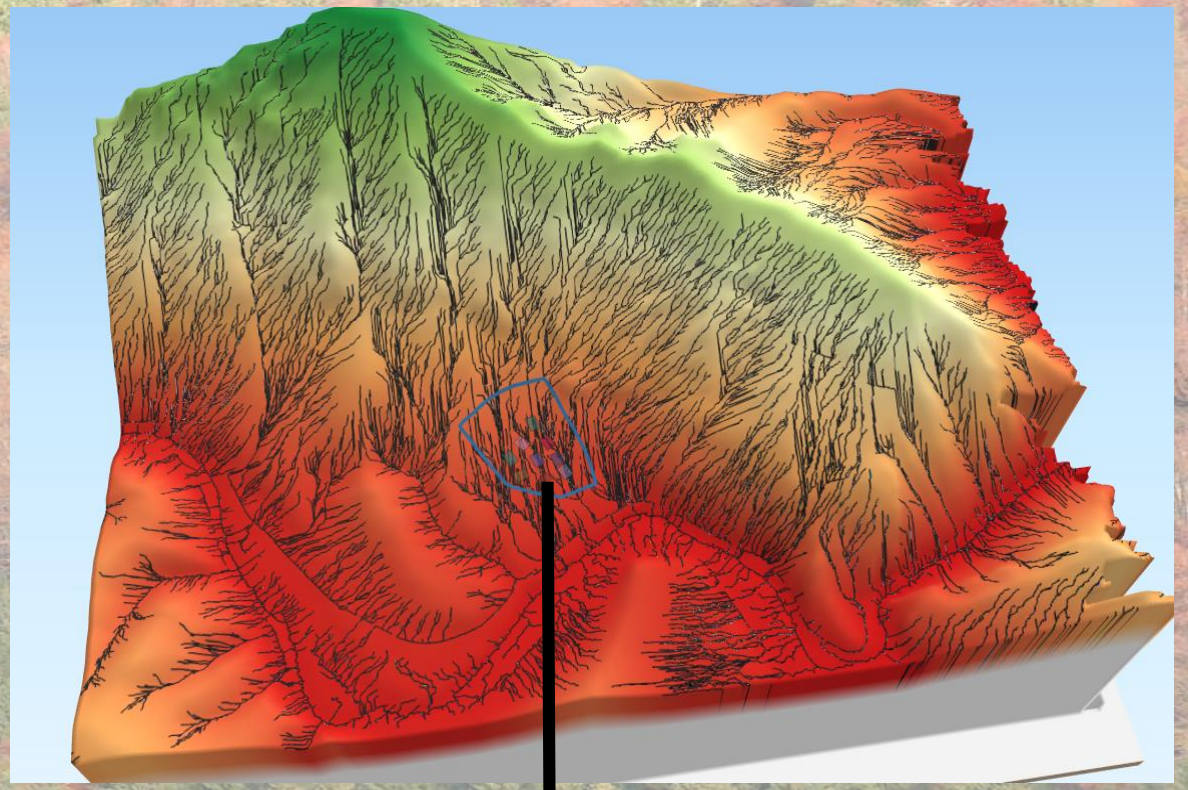
2. Objective

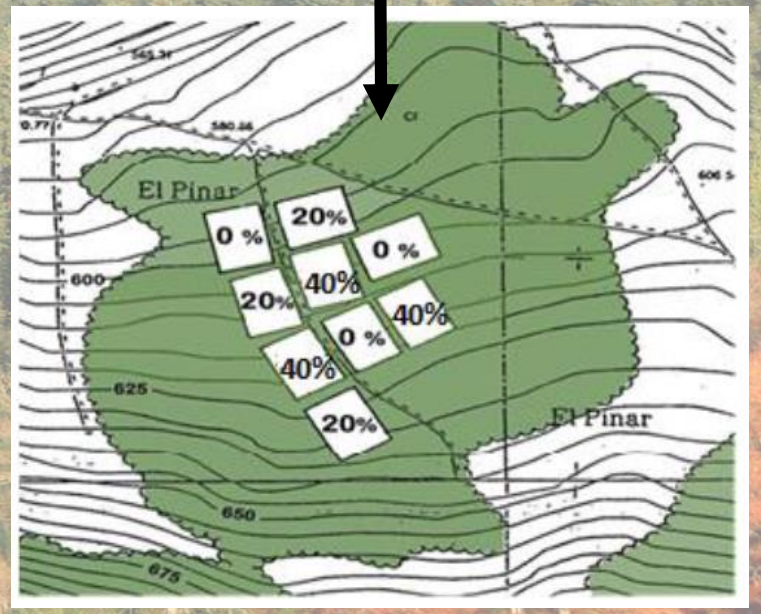
To study the decomposition process by mesofauna in CWD after applying different thinning intensities, as well as to determine whether the type of canopy and the decomposition class of CWD could influence the abundance, richness, and diversity of invertebrate present.

3. Materials and Methods

Study area and experimental Design







3. Materials and Methods

Study area and experimental Design

0% Thinning intensity (control)
Pure pine canopy (more light)

30% Thinning intensity
Mixed canopy (less light)

3. Materials and Methods

Samples collection and lab work

1. Samples collection in the field

2. Tullgren Berlese funnel (6 days)

3. Samples cleaning

4. Invertebrate identification and labelling

- Spring 2015
- 36 CWD random samples collected
- 10 cm long and 5 diameter
- 18 samples under mixed canopy and 18 under pure pine canopy
- Subdivided in 9 samples decay class 3 and 9 samples decay class 4
- The samples were weighed in fresh and dry

- Glass cointainers with 70% ethanol
- We used Unzu Jabat (2006) guide identification of litter invertebrates in Aspurz
- The invertebrates were classified in order and suborder
- Abundance/ sample weight

3. Materials and Methods

Data analysis

PAST 4.03

- **Invertebrates:** total abundance, richness and Shannon – Wiener index per simple

- **Response variables:** invertebrate results and CWD water content
- **Treatments:** Thinning intentisy, canopy type and CWD decay class
- **Non parametric Kruskal–Wallis test**
- **Generalized mixed models (GLM) with Poisson distribution**

4. Results

4.1. Community composition

Table 1. Total number of individuals of the taxonomic groups identified in decomposing woody debris, the taxa are classified by size (mesofauna and macrofauna). Cl.: class, Sb. Cl.: sub-class; O.: order; Fil.: Filum. In bold the taxonomic groups divided in Fil and Class.

Taxonomic Group	No. of Individuals	Fraction (%)
All samples	8348	100
Mesofauna	**8077**	**96.75**
Cl. Arachnida	**6684**	**80.07**
Sb. cl. Acarina		
Super O. Acariform	6684	80.07
O. Oribatid	1595	19.11
Other mites	1212	14.52
Immature mites	3877	46.44
Cl. Entognatha	**1392**	**16.67**
Sb. cl. Collembola		
O. Collembola	1392	16.67
Fil. Nematoda	1	0.01
Macrofauna	**271**	**3.25**
Cl. Insecta	**91**	**1.09**
Sb. cl. Pterygota		
O. Diptera	17	0.17
O. Thysanoptera	4	0.05
O. Coleoptera	44	0.53
O. Hymenoptera	25	0.3
O. Hemiptera	1	0.01
Cl. Arachnida	**16**	**0.19**
O. Pseudoscorpionida	1	0.01
O. Araneae	15	0.18
Cl. Chilopoda	**16**	**0.19**
O. Geophilomorpha	9	0.11
O. Lithobiomorpha	9	0.11
Unidentified Chilopoda	3	0.04
Cl. Pauropoda	**6**	**0.07**
Cl. Clitellata	**3**	**0.04**
Sb. cl. Oligochaeta	3	0.04
Cl. Symphyla	**20**	**0.24**
Immature macrofauna stages (larvae)	**119**	**1.43**

8348 individuals in total

19 taxonomic groups in total

Mesofauna (body size < 2mm) 96,75%

Super O. Acari 80,7%

O. Collembola 16,67%

Fil. Nematoda 0,01 %

19,11%

Oribatida mites

46,44%

Immature mites

14,52 %

Other mites

4. Results

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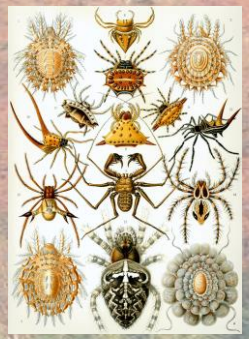
Macrofauna (body size > 2mm) 96,75%

Cl. Insecta 1,09%

Cl. Arachnida 0,19%



Cl. Chilopoda 0,19 %

Cl. Pauropoda 0,07%

Cl. Clitellata 0,04%

Cl. Symphila 0,24%

General larvae 1,43%

4. Results

4.2. Influence of treatments in CWD invertebrate community

Table 2. Mean and SE number of captured individuals per gram of CWD in different treatments of thinning intensity, canopy type, and CWD decay class (significant differences at $p < 0.05$ in bold, $n = 36$).

Variable	Thinning Intensity				Canopy Type			CWD Decay Class		
	0%	20%	40%	*p*	Mixed	Pure Pine	*p*	Class 3	Class 4	*p*
Water content (%)	56.10 ± 11.63	57.84 ± 20.20	45.54 ± 11.51	0.695	60.45 ± 8.75	60.20 ± 17.04	0.462	31.27 ± 8.33	89.47 ± 13.30	**0.002**
Total abundance (individuals g^{-1})	5.46 ± 6.52	4.14 ± 5.44	3.04 ± 3.93	0.671	3.97 ± 4.91	3.20 ± 4.61	0.155	1.32 ± 1.67	5.86 ± 5.63	**<0.001**
Richness (number of taxa)	6.83 ± 2.37	6.33 ± 2.35	5.83 ± 1.99	0.571	7.08 ± 1.62	5.08 ± 2.19	**0.031**	5.42 ± 1.98	6.75 ± 2.78	**0.008**
Shannon–Wiener Index	1.20 ± 0.28	1.11 ± 0.29	1.17 ± 0.39	0.742	1.07 ± 0.35	1.18 ± 0.40	0.837	1.13 ± 0.34	1.14 ± 0.35	0.899

\+ → -

Thinning intensity + decay class

↓

Total abundance
Z= 3.557, p = 0.05

Pure Pine canopy + decay class

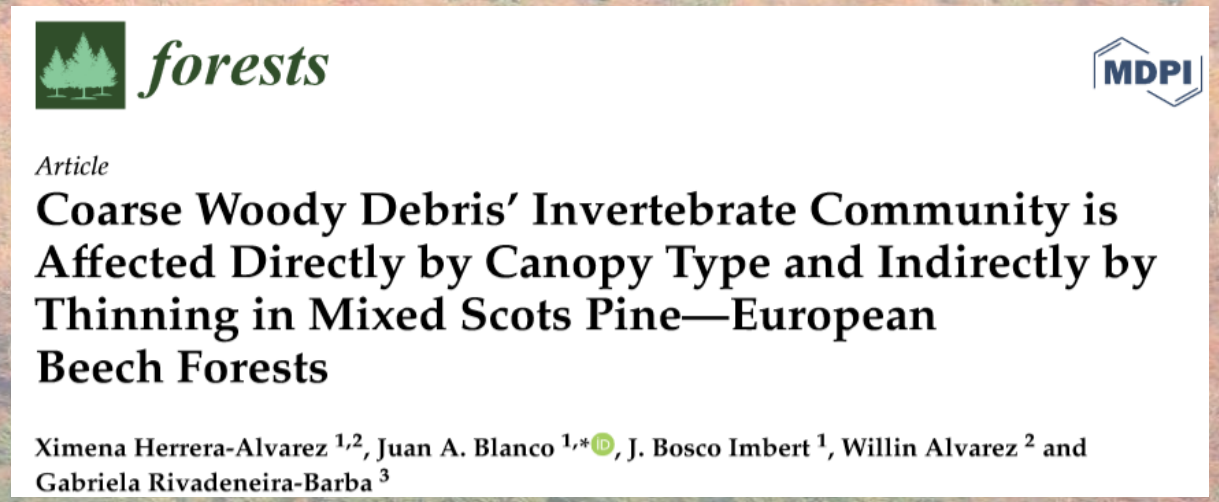
↓

Total abundance
Z=2.148, p=0,032

INTERACTIONS
GLM

5. Conclusions

- **1st evidence of the interactive effects that canopy type and thinning effects can have on CWD invertebrate taxonomic groups and richness in mixed forests of the two European tree species more widely distributed (*Pinus sylvetris* and *Fagus sylvatica* L.).**
- **Thinning and canopy type modifies the moisture–radiation–wind balance in the forest soil, CWD moisture content seems to be reduced when tree density reduction crosses a threshold around 20% of initial basal area.**
- **The results related to CWD moisture content have coherence with the invertebrate community results, it means under a heavy thinning intensity where the canopy is more open, the invertebrate community decreased, similar findings are described under a pine canopy (open canopy).**
- **The main influence in our results was related to canopy type instead of thinning intensity.**
- **Some invertebrate taxa are more sensitive to moisture reduction than others are.**
- **We recommend to include CWD in Forest Management due to its importance in the ecosystem.**



Thank you for your attention

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