Iberian Meeting on **Agroecological Research**

Establishing the ecological basis for sustainable agriculture

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BOOK OF ABSTRACTS

I Iberian Meeting on Agroecological Research

Establishing the ecological basis for sustainable agriculture

22 / 23 November 2018 - Évora, Portugal

Agroecosystems as scenarios for biodiversity conservation

Linking biodiversity and ecosystem functions and services

Impact of farming practices on biodiversity and associated ecosystem functions

Agroecological restoration

Agroecosystems under global environmental change

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Évora, Portugal 2018

I Iberian Meeting on Agroecological Research

Establishing the ecological basis for sustainable agriculture

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Spatial variability of the spider community in the olive grove agroecosystem in Trás-os-Montes (Portugal)

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Agricultural practices can affect the species composition of natural enemies within agroecosystems and it is crucial to know how spatial variability of natural enemies within crops could affect their distribution. Here we aim to characterize the spatial structure of the spider community in the olive grove in Mirandela (Trás-os-Montes; Portugal). In may 2014 we sampled spiders in five olive groves and the corresponding adjacent shrubland areas. The horizontal variability of ground spiders was studied by sampling two plots (central and margin area) within the olive groves and one more plot within the shrubland area. To assess their vertical variability, we sampled the soil, trunk, and canopy strata within olive groves. Ground spiders were sampled using pitfall traps, whereas canopy spiders were sampled by shaking tree branches and individuals inhabiting the trunk were sampled using sticky traps. All the captured spiders were identified and grouped in functional groups, and we calculated the relative proportion of each functional group. We assessed the diversity of functional groups with accumulation curves and a NMDS was carried out for the horizontal gradient data. We captured a total of 1,191 spiders encompassing 28 families, 83 species and nine functional groups: ambushers, foliage runner hunters, ground hunters, orb-web builders, sheet web builders, space web builders, sensing web builders, stalkers, and wandering sheet/tangle weavers. Ground spiders were significantly more diverse than trunk and canopy spiders. The diversity of functional groups was increasingly higher from center of the olive grove to the shrubland area. The distribution of functional groups also followed a clear pattern vertically within the olive grove. For efficient pest management, it is necessary to consider the spatial variability of functional groups of spiders within the olive crop with the aim to enhance species communities of natural enemies.

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Spatial structure of the spider community in the olive grove agroecosystem in Trás-os-Montes (Portugal)

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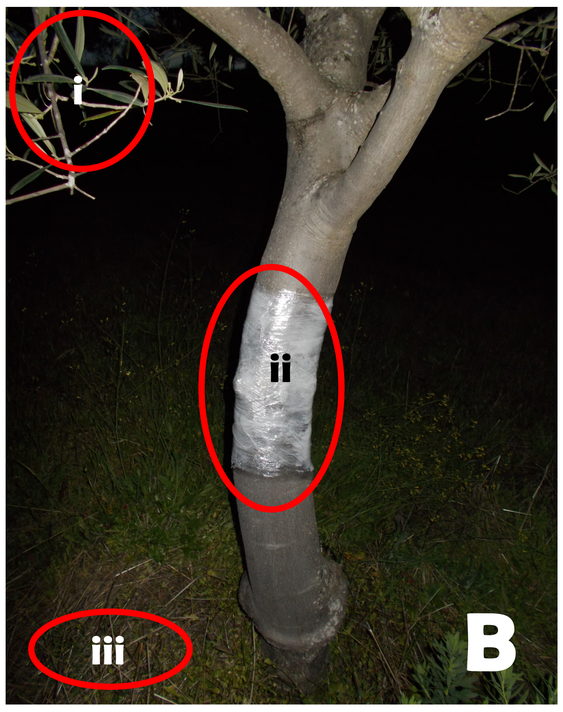

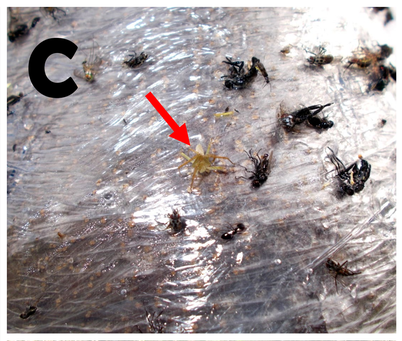

Figure 1. Scheme of the spatial gradients studied in each olive grove. A: horizontal gradient (1: olive grove central area; 2: olive grove margin area, and 3: adjacent shrubland area); B: vertical gradient (i: ground; ii: trunk, and iii: canopy); C: detail of a sticky trap; D: detail of a pitall trap. The arrow indicates a male of the ambusher spider *Philodromus* sp. captured with the sticky trap.

Introduction

Agricultural practices can affect the efficiency of natural enemies within agroecosystems. However, before evaluating the effects of agricultural management it is crucial to know the structure of the different communities of natural enemies (e.g. generalist predators such as spiders) at different spatial scales such as the vertical and horizontal distribution of populations across the crop. The objective of this work was to characterize the spatial structure of the spider community in the olive agroecosystem in Trás-os-Montes (Portugal).

Material and Methods

- **The spider assemblage of five olive groves and the corresponding adjacent semi-natural habitats (shrublands) were sampled in May 2014 near Mirandela (northeastern Portugal).**
- **The horizontal distribution of the ground spider community was studied by sampling three areas, two plots within the olive groves: (1) a central area (Fig. 1A1), and the (2) margin area (Fig. 1A2) adjacent to the shrubland area, and one more plot within the shrubland area (Fig. 1A3).**
- **The vertical distribution of the community was studied by sampling (1) the soil, (2) trunk, and (3) canopy strata in the same central and margin areas within the groves (Fig. 1B).**
- **The ground spiders were sampled using a regular square of four pitfall traps (Fig. 1Biii & 1D) for each plot (acting during 14 days). The canopy spiders were sampled by shaking two branches of four trees (corresponding to the pitfall traps allocation) (Fig. 1Bi), and one sticky trap was allocated in the trunk of the same trees (Fig. 1Bii) in order to capture the individuals inhabiting or using the trunk to disperse (Fig. 1C).**
- **All the captured spiders were sorted, preserved in 70% ethanol, identified to the species level (when possible) and grouped in functional groups. The samples of all the groves were pooled and an individual-based species accumulation curve was calculated for each vertical and horizontal strata. The relative proportion of each functional group was calculated and plotted together and a NMDS was carried out for the horizontal gradient data both for species and functional groups.**

Results

- ✓ **A total of 1191 spiders were captured (679 immatures and 512 adults) encompassing 28 families, 83 species and nine functional groups: (1), Ambushers, (2) Foliage runner hunters, (3) Ground hunters, (4) Orb-web builders, (5) Sheet web builders, (6) Space web builders, (7) Sensing web builders (8) Stalkers, and (9) Wandering sheet/tangle weavers (Fig. 2).**
- ✓ **The ground spider community was significantly more diverse than the trunk and canopy communities within the grove (Fig. 3A). The species accumulation curves showed an increasing pattern in species richness from the olive central area to the shrubland area (Fig. 3B).**
- ✓ **The distributions of functional groups followed a clear pattern both vertically (Fig 4A) and horizontally (Fig 4B) and the NMDS confirmed that the ground spiders community followed a significant horizontal gradient of species (Fig. 3C) and functional groups distribution (Fig. 3D).**

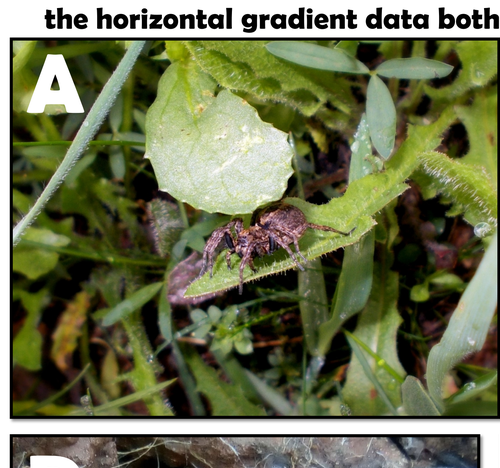

Figure 2. Different functional groups of spiders captured during this work. A and B: female and male of the ground hunter *Alopecosa albofasciata* (Brullé, 1832) (Lycosidae); C: female of the ambusher *Xystcus* sp. (Thomisidae) Hunting ants; D: femalle of the sheet web builder *Eratigena* sp. (Agelenidae) in the nest; E: orb-web of *Mangora acalypha* (Walckenaer, 180) (Araneidae); F: web of a Linyphiidae (wandering sheet/tangle weaver); G: female fo the ambusher *Philodromus* sp. (Philodromidae) guarding its cocoon; H: a Dictynidae in its space web, and I: the stalker *Oxyopes* sp. (Oxyopidae).

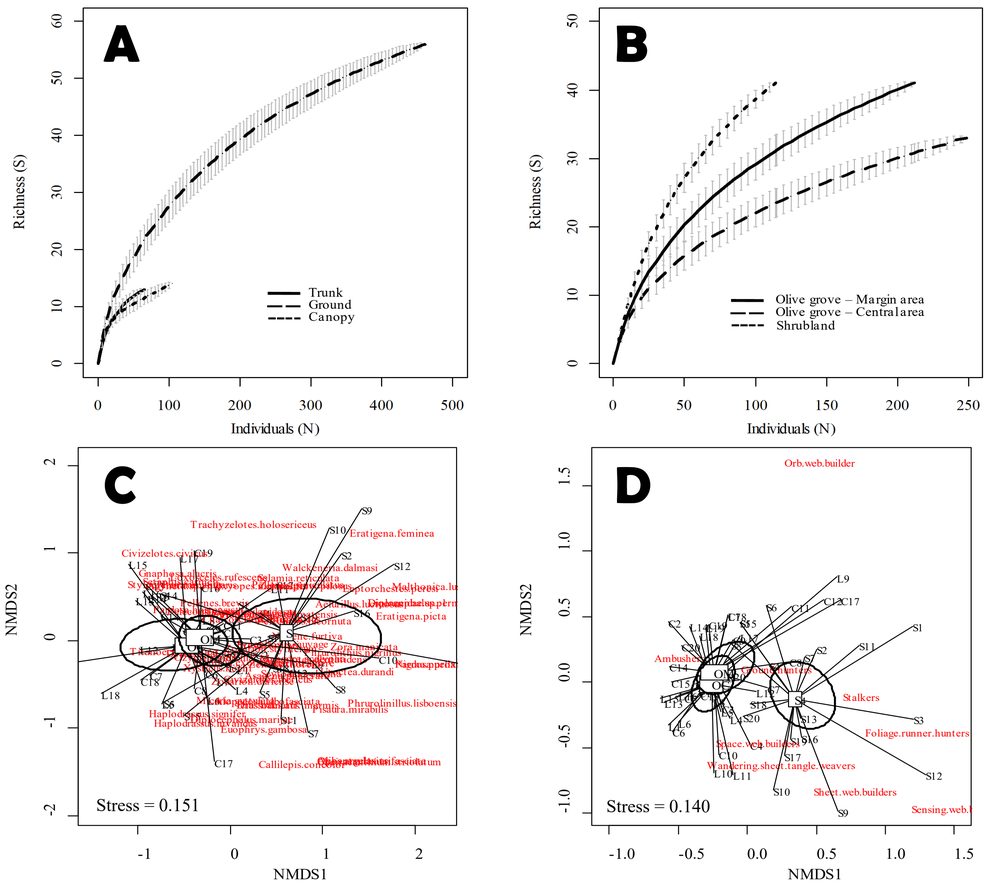

Figure 3. Distribution of the spider community along the different strata of a vertical and horizontal gradient in the olive agro-ecosystem in Trás-os-Montes (Portugal). A: Species accumulation curves for the vertical and B: horizontal spatial gradient. C: Results of the NMDS analysis for species and D: functional groups. S: Shrubland; OM: Olive grove margin area, and OC: Olive grove central area.

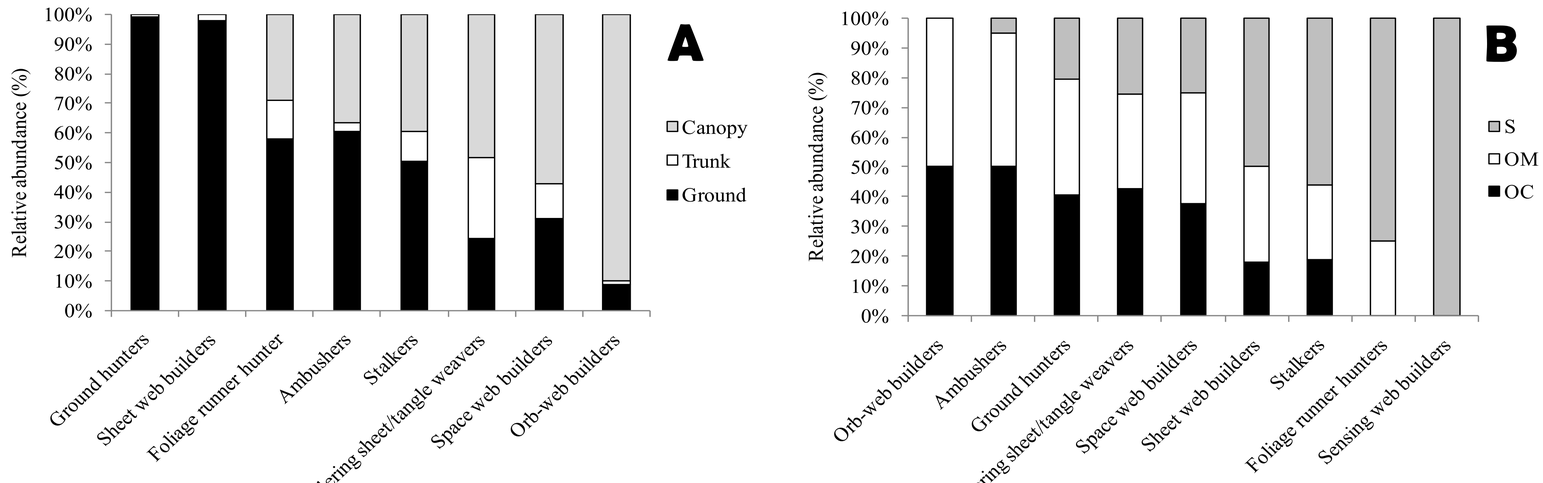

Figure 4. A: Spatial distribution of the spider functional groups identified in this work along the vertical, and B: horizontal gradient in the olive grove and its adjacent semi-natural area. S: Shrubland; OM: Olive grove margin area, and OC: Olive grove central area.

Conclusions

- ✓ **The spider community is unequally distributed across the olive crop.**
- ✓ **The distribution of spider functional groups within the olive crop must be taken into account for pest management purposes, i.e. promoting management practices that could enhance the population of the most effective guilds.**

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