THE 3RD GLOBAL SOIL BIODIVERSITY CONFERENCE
Dublin, Ireland / 13-15 March 2023

Ungulate effects on root fungi community at Mediterranean montane areas

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The Incremento Consortium

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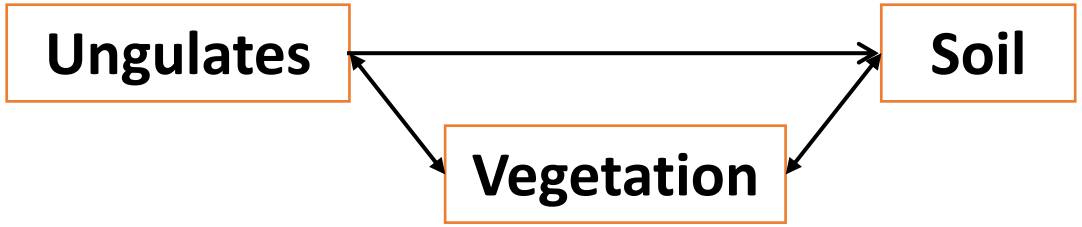
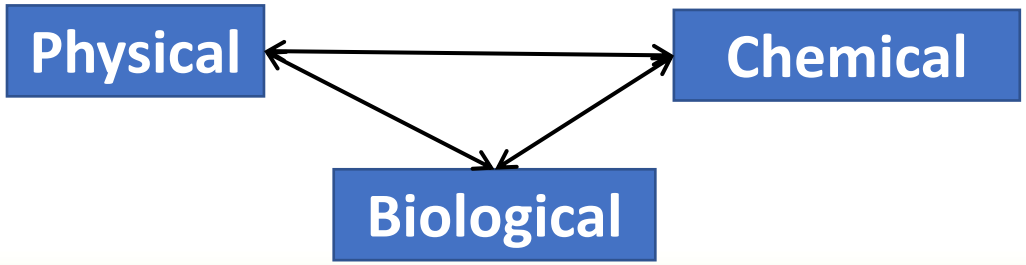


https://alternativa-verde.com/2017/04/02/pastizales-y-desertificacion-la-salvacion-esta-en-la-ganaderia/

Soil Characteristics



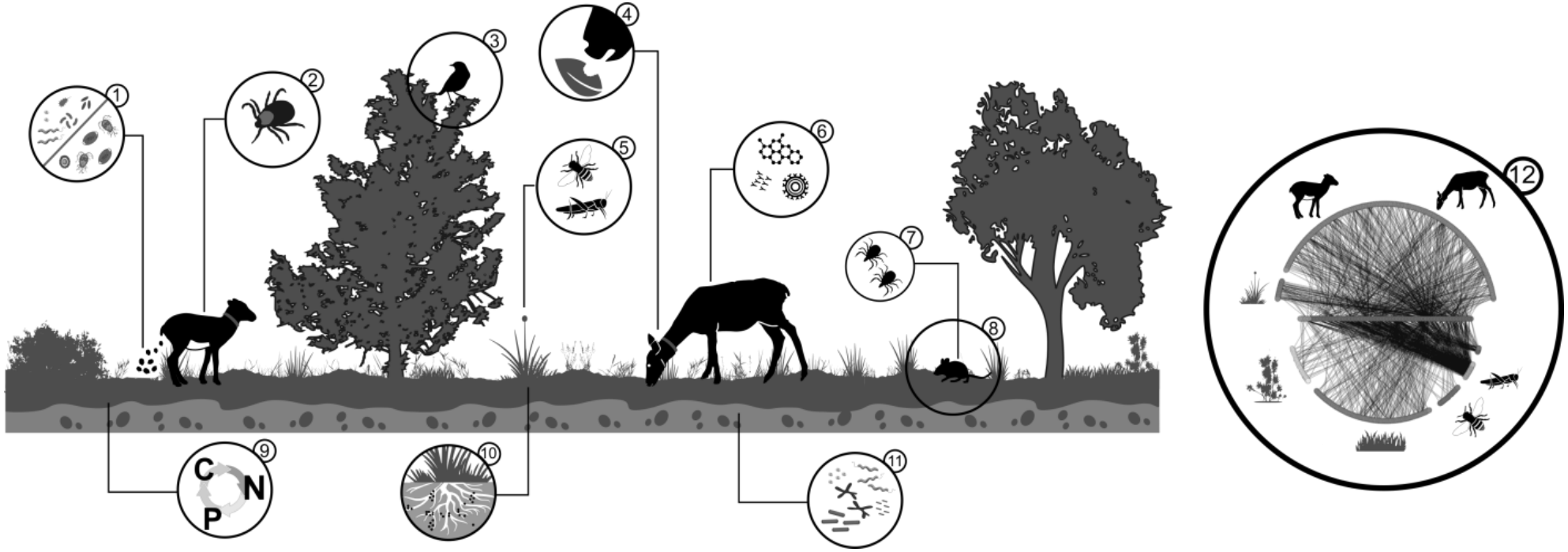
Variable	Decrease	Same	Increase	Variable	Total
Apparent density	70%	19%	0	11%	27
C/N ratio	13%	33%	20%	33%	15
% OM o SOC	9%	30%	51%	11%	47
% N total	12%	28%	4%	2%	25
Microbial activity	**30%**	**15%**	**33%**	**22%**	**27**
Ph	36%	36%	12%	16%	25

TFG Universitat de les Illes Balears: Abellán Pérez, Rubén

Systematic revision of exclosure experiments to investigate herbivore impacts found strong variability in direction, magnitude, and modifiers of ungulates effects

Global Project

Main Hypothesis: Changes in wild ungulate populations cause significant changes in the structure, composition and functioning of ecosystems, and therefore, in the provision of ecosystem services.



1= Microbes in faeces 2= Ticks 3=Vertebrate diversity and seed dispersal; 4= Plant preferences, herbivory and plant regeneration; 5=Invertebrate diversity, pollination and pests; 6= Haematology, nutritional condition; 7-8= small mammal abundance and disease risk; 9=Biogeochemical cycling; 10= mycorrhizal functioning; 11= microbial diversity; 12=Mutualistic and multi-trophic networks

Specific Objetive:

Does the community of fungi associated with the roots of plants that grow in areas with the presence of ungulate herbivores change compared to those that grow without them?

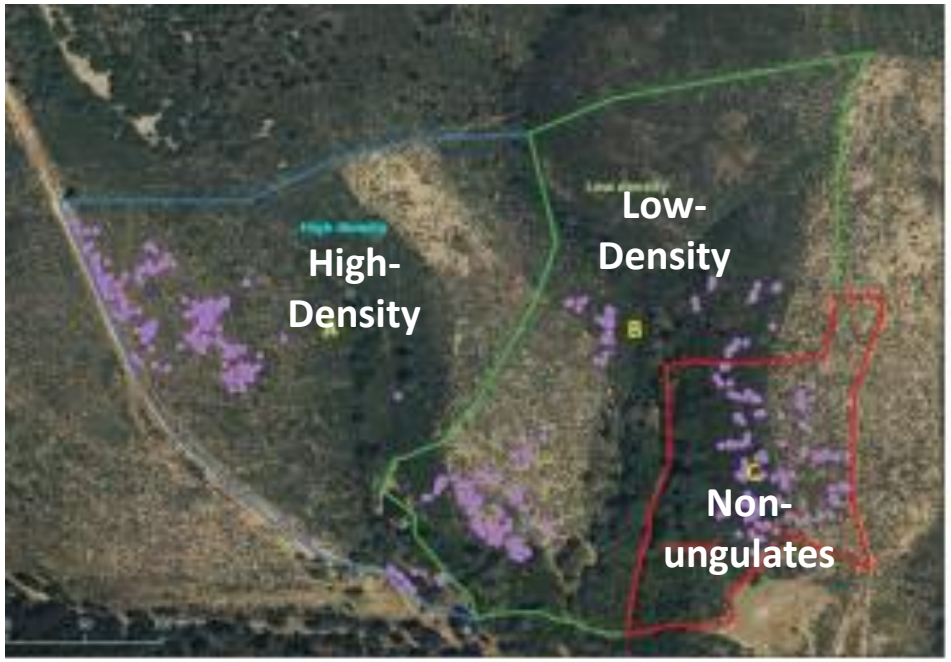
Tow areas of Spain
Quintos (Toledo)
Muela (Valencia)
with a drier climate

QUINTOS DE MORA

Long time exclusions since 2007

We colected five samples of *Agrostris sp and Rubus sp* roots per plot

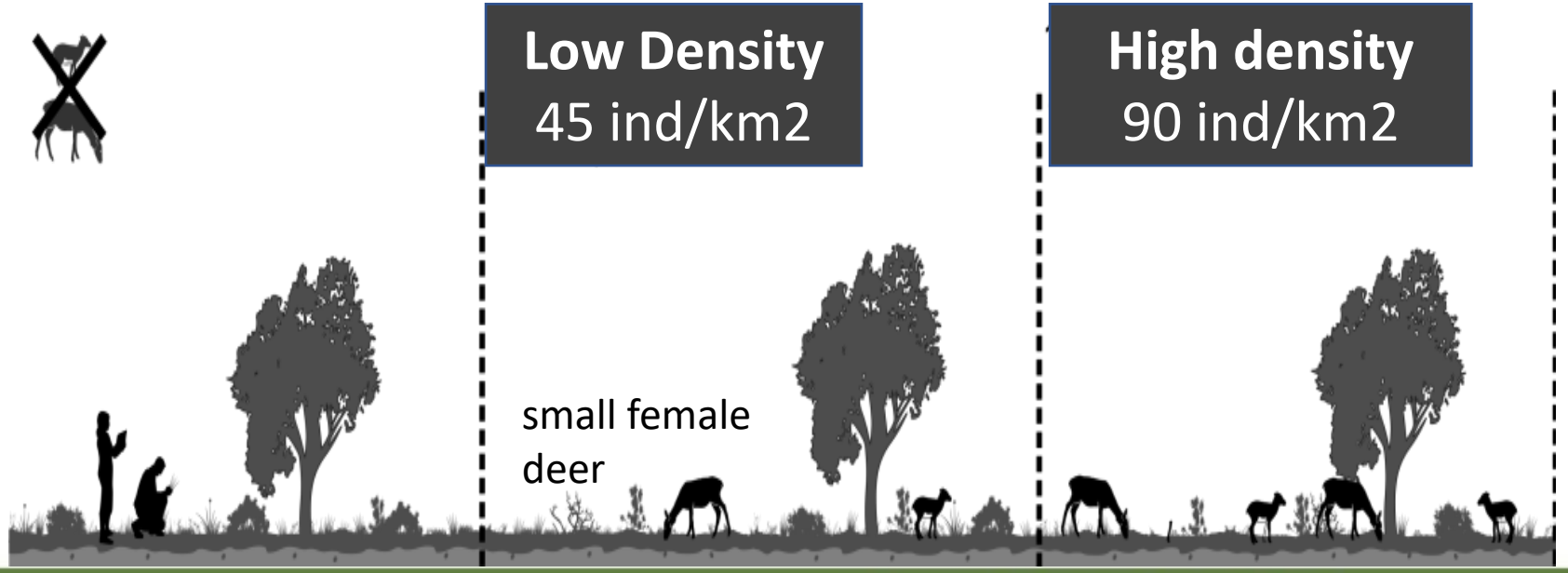
QUINTOS DE MORA



Five samples of *Cistus ladanifer and Thymus communis* roots per plot

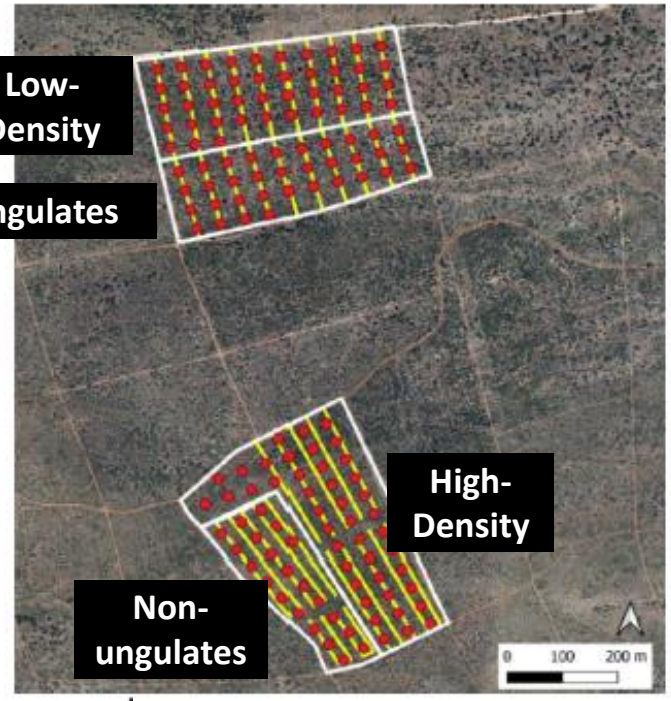
Non-ungulates

Only during 3 months



MUELA DE CORTES

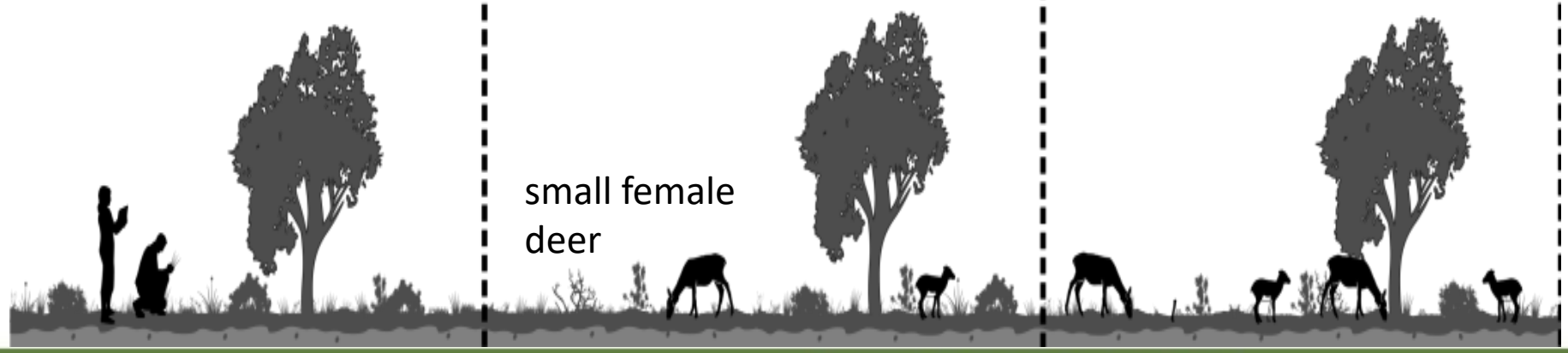
Five samples of *Cistus albidus and Thymus mastichina* roots per plot.



Non-ungulates

Low Density
45 ind/km2

High density
90 ind/km2



DNA was extracted from roots and analyzed via Illumina sequencing of the Internal Transcribed Spacer (ITS)

The primers ITS4Rev/ITS2F-ITS7Fw were used.

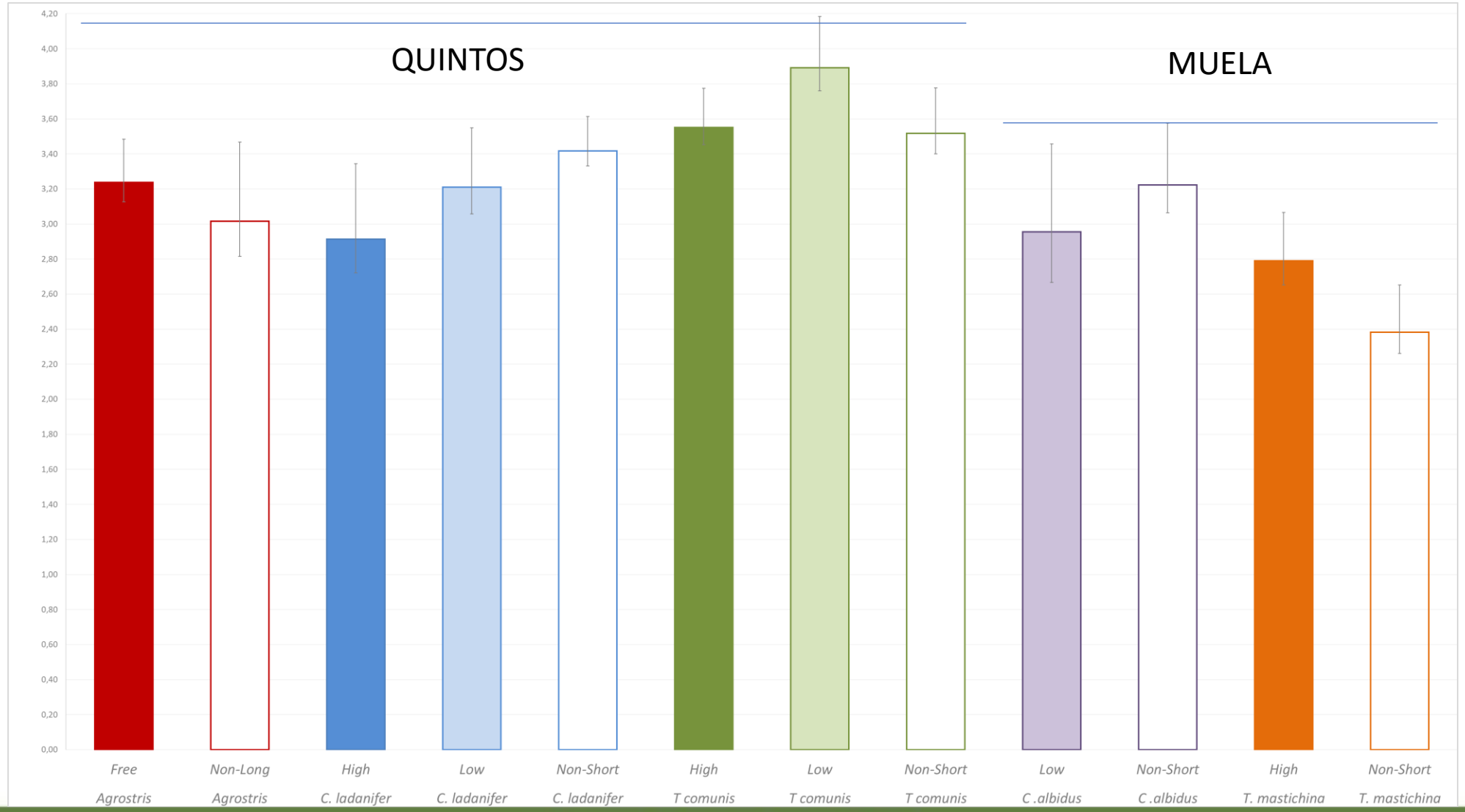
DADA2 pipeline in QUIMEII

5105 ASV classify as Fungi

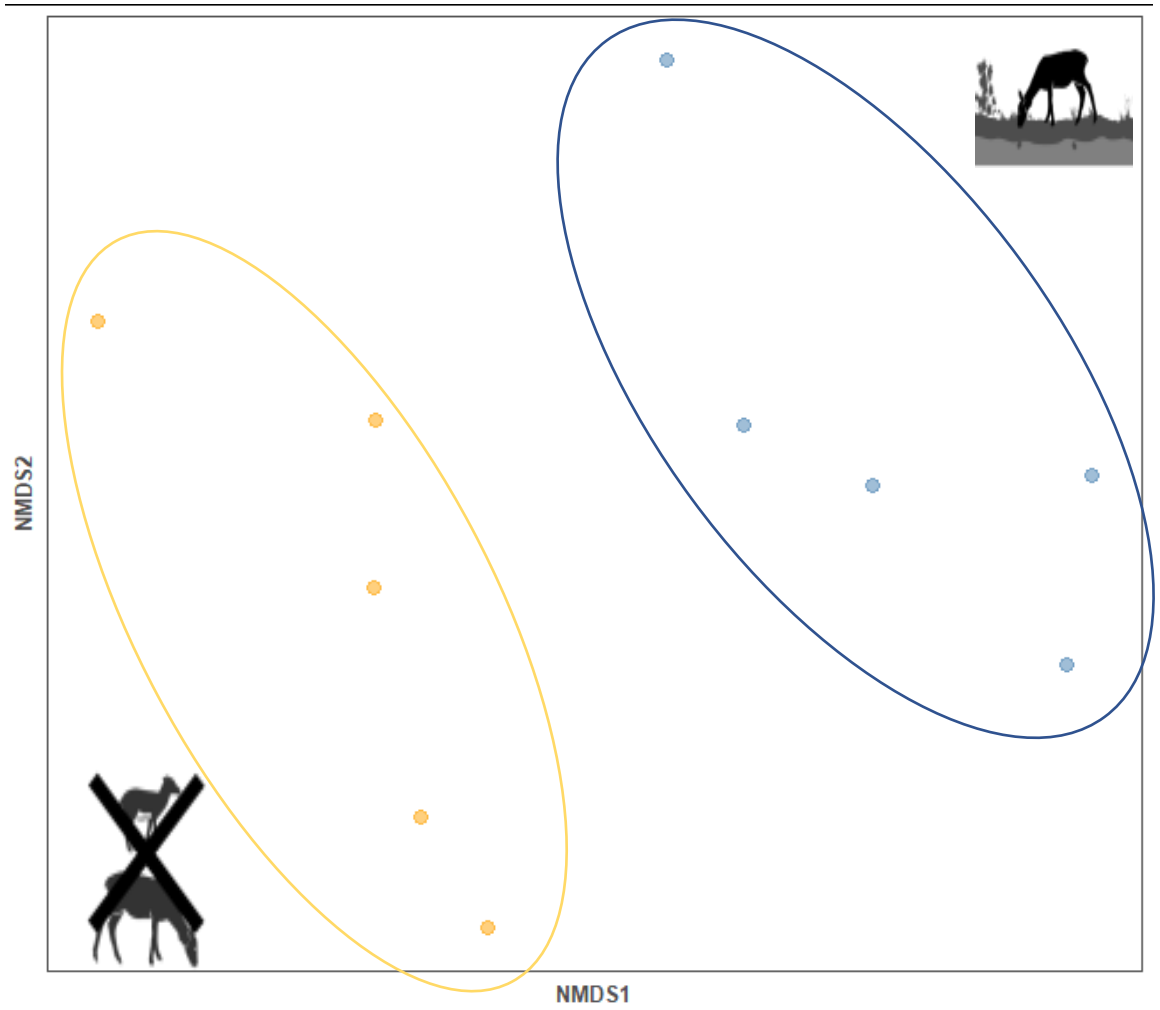
ASVs with less tan 25 reads were eliminate

2560 ASVs considered

General Shannon Index diversity of ASVs
Not statistically significant effects



After 14 years of ungulate exclusion fungi community associate to roots of *Agrostis sp* is significantly different.



Ungulates exclusion explanatory value for the fungal communities was fitted into multidimensional scaling ordination (beta diversity was calculated using Bray-Curtis dissimilarity indices) and tested using permutation test using “envfit” function in vegan package.

Ungulates exclusion Goodness of fit:

R^2 =0.5576 P= 0.007

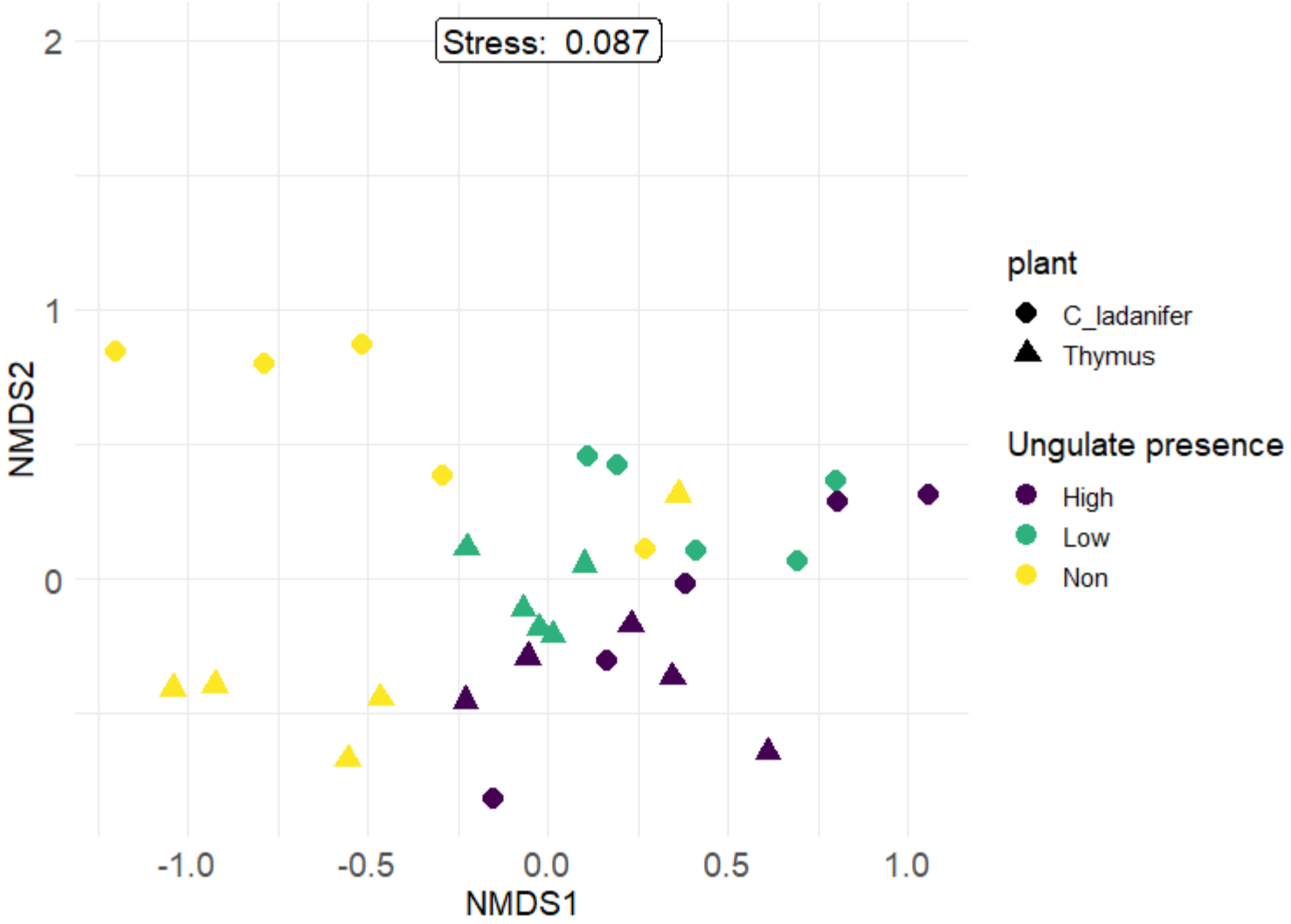
No Rubus root samples amplify

Quintos after 3 month of Ungulate presence

Quintos after 3 month of Ungulate presence

Ungulates density and plant species explanatory value for the fungal communities was fitted into multidimensional scaling ordination (beta diversity was calculated using Bray-Curtis dissimilarity indices) and tested using permutation test using “envfit” function in vegan package.

Goodness of fit:
Ungulate density R^2=0.3356 P= 0.0002
Plant species R^2 =0.1681 P= 0.005



Muela after 3 month of Ungulate presence

Muela after 3 month of Ungulate presence

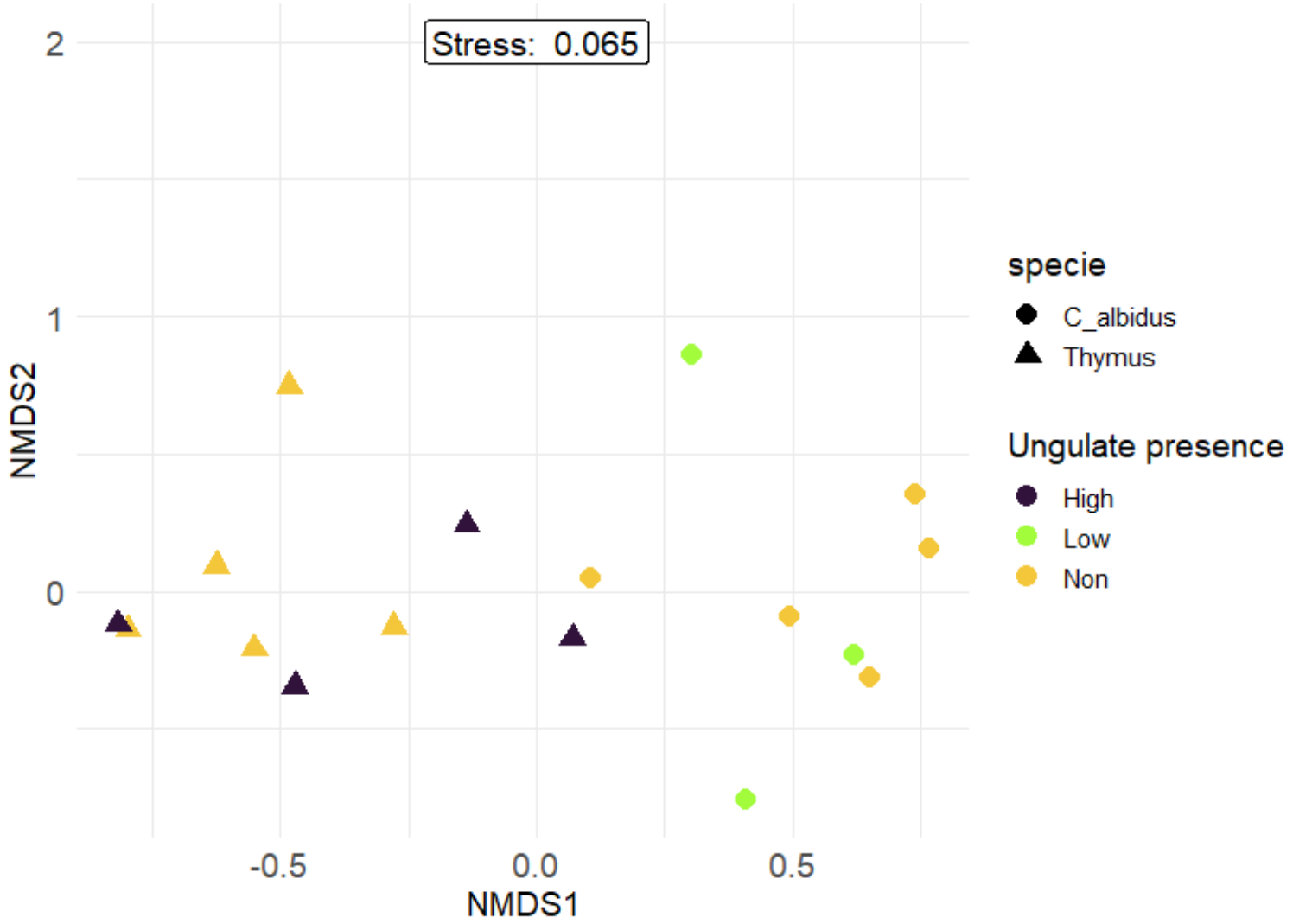
Some samples did not amplify, losing important information¡

Ungulates density and plant species explanatory value for the fungal communities was fitted into multidimensional scaling ordination (beta diversity was calculated using Bray-Curtis dissimilarity indices) and tested using permutation test using "envfit" function in vegan package.

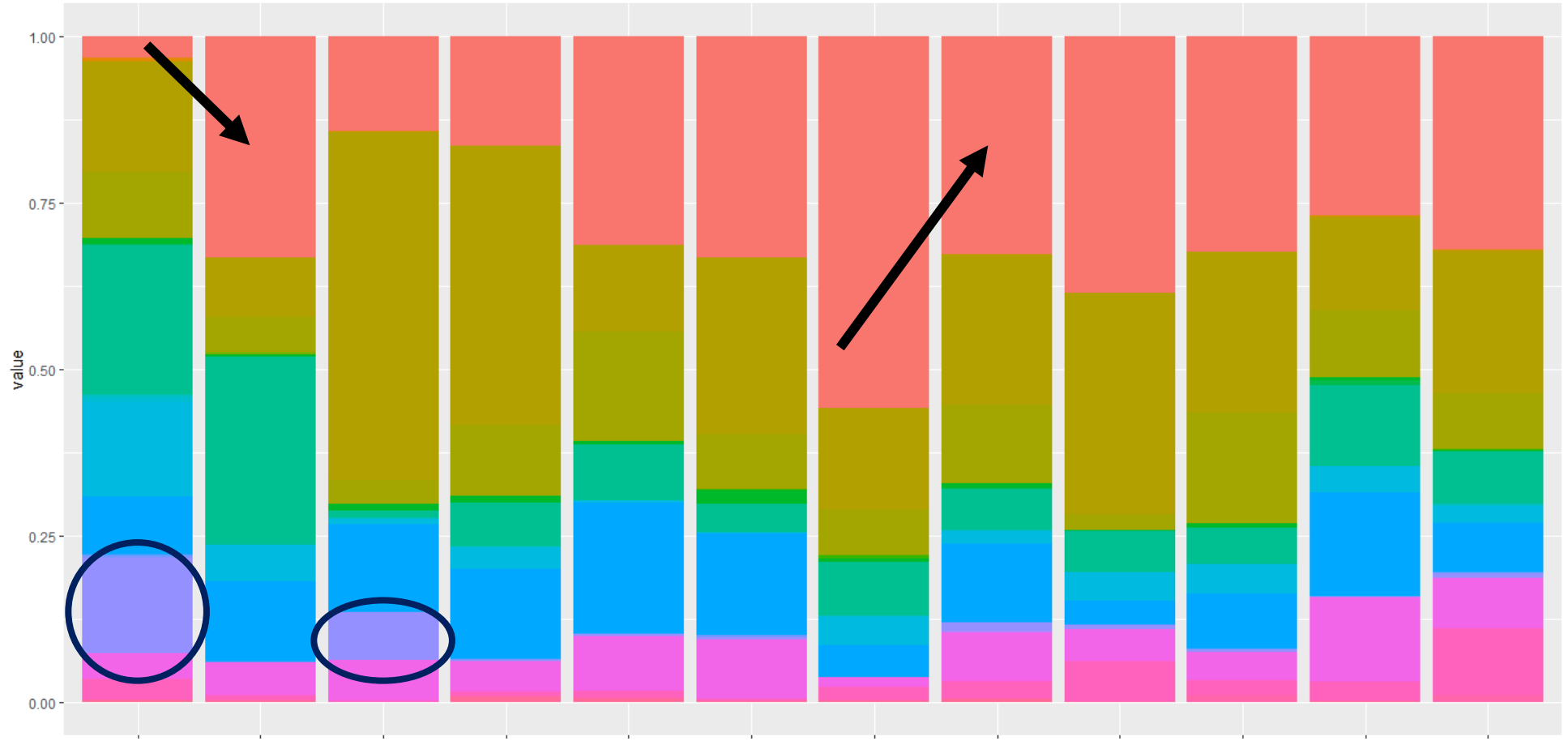
Goodness of fit:

Ungulate density R^2 =0.149 P= 0.3144

Plant species R^2 =0.526 P< 0.0001



Fungi class relative abundance per area, plant specie and ungulate density.



High Non | Non High | Non Low | Non Low High | Non High Low — Ungulate presence

Agrostris sp | *Thymus mastichina* *Cistus albidus* | *Cistus ladanifer* *Thymus communis* — Plant specie

QUINTOS | MUELA | QUINTOS — Area

Conclusions:

- Fungi community associate to root change with ungulate density.
- This differentiation between fungi community of roots depended on time of exclusion and environmental conditions.
- The differentiation between grazing plots and ungrazing plots, of fungi class composition community associated to roots, is different depending on the species of plant analyzed.
- The observation of the variation in the community of fungi associated with the roots of shrubs that grow in areas with and without the presence of ungulates may be the result of a direct effect of herbivores on the plant, which varies its physiology by altering its microbiome, or it could be an indirect effect resulting from changes in the soil fungal community.

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Thank you

RESERVA VALENCIANA DE CAZA DE MUELA DE CORTES

OAPN
ORGANISMO AUTÓNOMO PARQUES NACIONALES

Junta de Castilla y León

GOBIERNO DE ESPAÑA
MINISTERIO DE CIENCIA E INNOVACIÓN

INCREMENTO Project

The Incremento Consortium

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