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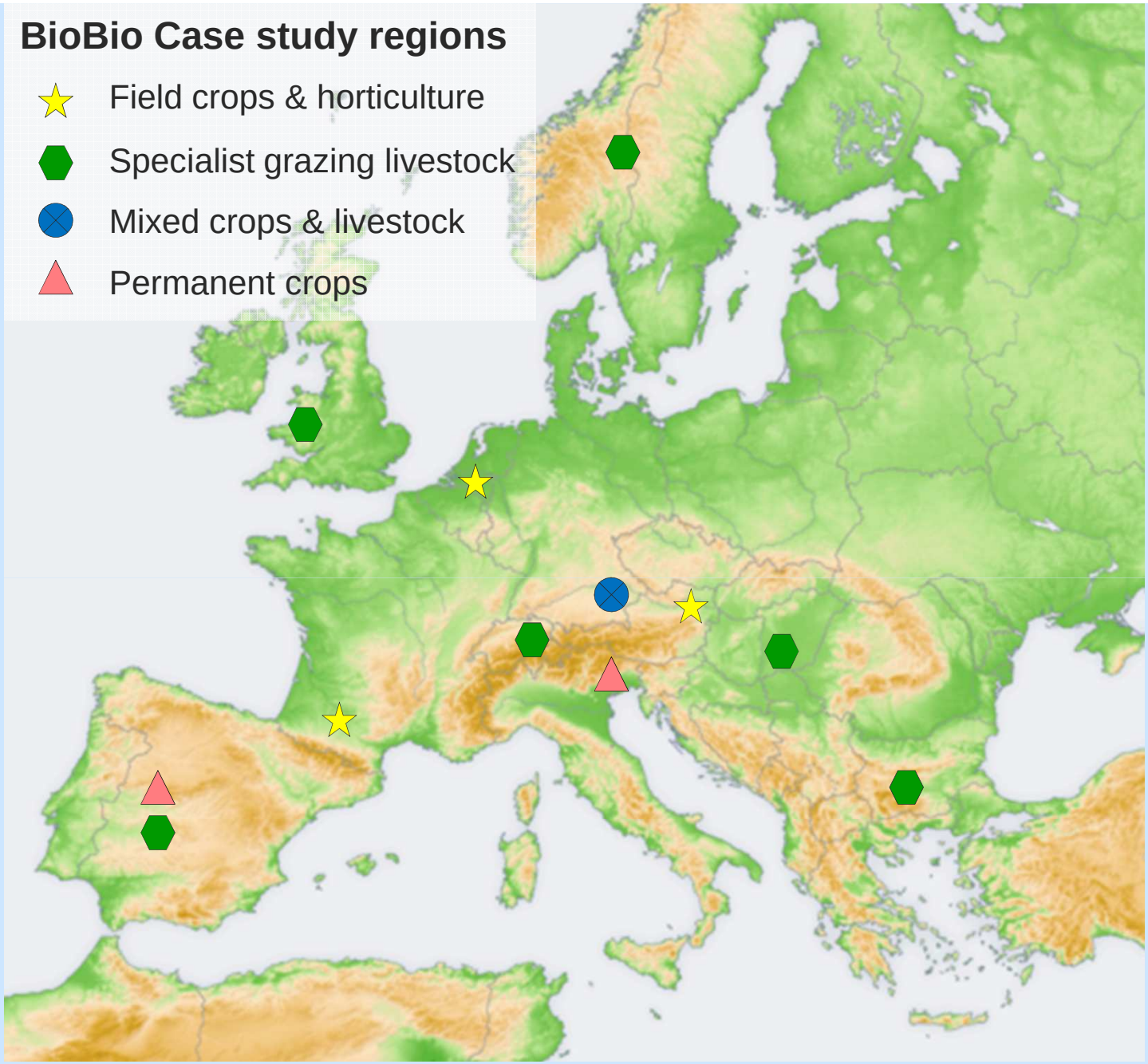
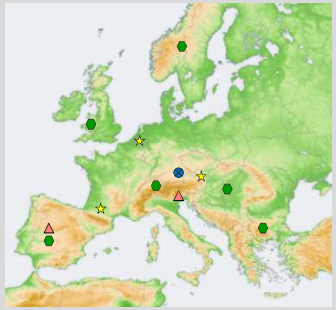
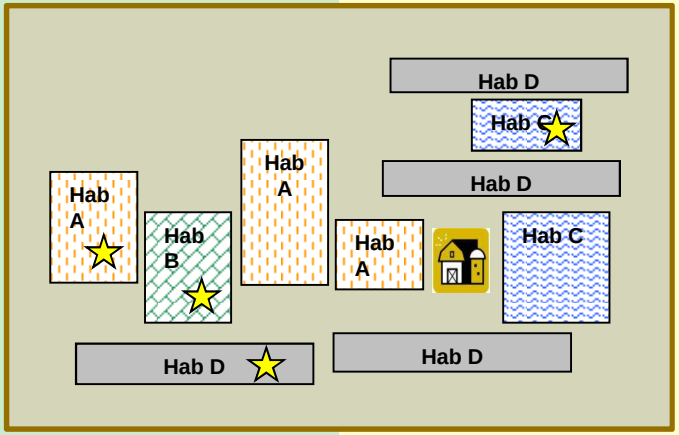
A closer look at species indicators

Gisela Lüscher

BIOBIO Conference, 21.-22.06.2012



Species diversity – Data and indicators – Main pattern – Information gained

European scale	Regional scale	Farm scale	Plot scale
			  
	12 case studies	 195 farms	1490 plots

Species diversity – Data and indicators – Main pattern – Information gained

Farm	sampledPlots	FarmSize_ha	CS	Country	B2_1.1	B4_1.1	B8_1.1	B9_1.1
A_				A_ARA	43	5	21	3
A_				A_ARA	59	3	47	6
A_				A_ARA	69	6	47	9
A_				A_ARA	48	5	19	3
A_					38	3	20	1
A_					77	5	37	8
A_					57	4	27	14
A_					18	3	18	0
A_						4	25	4
A_						3	34	5
A_						3	7	0
A_						5	30	3
A_						6	41	11
A_								8
A_								3
A_								5
B_								15
B_								8
B_								11
B_								4
B_								12
B_								14
B_								13
B_								26
B_								9
B_								11
B_								8
B_								2
B_								11
B_								8
B_								14
B_								16
C_								17

Code	Surveyor	Date	Plot	Species	Cover
L10a_V_3376	B. Bunce	17-Jun-10	100m2	Agrostis capillaris	1
*L1	ce	17-Jun-10	100m2	Agrostis gigantea	1
*L1	ce	17-Jun-10	100m2	Bromus mollis	1
*L1	ce	17-Jun-10	100m2	Carduus orthocephalus	1
*L1	ce	17-Jun-10	100m2	Ce	
*L1	ce	17-Jun-10	100m2	Cir	
*L1	ce	17-Jun-10	100m2	Epi	
L10a_V_3376	B. Bunce	17-Jun-10	100m2	Epi	
L10a_V_3376	B. Bunce	17-Jun-10	100m2	Ga	
L10a_V_3376	B. Bunce	17-Jun-10	100m2	Ho	
L10a_V_3376	B. Bunce	17-Jun-10	100m2	Jun	
L10a_V_3376	B. Bunce	17-Jun-10	100m2	Lot	
L10a_V_3376	B. Bunce	17-Jun-10	100m2	Po	
L10a_V_3376	B. Bunce	17-Jun-10	100m2	Ra	
L10a_V_3376	B. Bunce	17-Jun-10	100m2	Ru	
L10a_V_3376	B. Bunce	17-Jun-10	100m2	Sa	
L10a_V_3376	B. Bunce	17-Jun-10	100m2	Ta	
L10a_V_3376	B. Bunce	17-Jun-10	100m2	Tri	
L10a_V_3376	B. Bunce	17-Jun-10	100m2	Urt	
L10a_V_3376	B. Bunce	17-Jun-10	100m2	Va	
L10b_V_3377	B. Bunce	17-Jun-10	100m2	Ch	
L10b_V_3377	B. Bunce	17-Jun-10	100m2	Ga	
L10b_V_3377	B. Bunce	17-Jun-10	100m2	Ho	
L10b_V_3377	B. Bunce	17-Jun-10	100m2	Po	
L10b_V_3377	B. Bunce	17-Jun-10	100m2	Po	
L10b_V_3377	B. Bunce	17-Jun-10	100m2	Po	
L10b_V_3377	B. Bunce	17-Jun-10	100m2	Ste	
L10b_V_3377	B. Bunce	17-Jun-10	100m2	Tri	
L10b_V_3377	B. Bunce	17-Jun-10	100m2	Urt	
L10c_V_3378	B. Bunce	17-Jun-10	100m2	Ch	
L10c_V_3378	B. Bunce	17-Jun-10	100m2	Ga	
L10c_V_3378	B. Bunce	17-Jun-10	100m2	Pe	
L10c_V_3378	B. Bunce	17-Jun-10	100m2	Po	

Code	Species	Abundance
I10a_E1x_87	Octodrilus complanatus (Dugès, 1828)	1
*I	Aporrectodea caliginosa (Savigny, 1826)	1
*I	Aporrectodea jassyensis (Michaelsen, 1891)	1
*I	zero.pseudo	0
*I	Aporrectodea caliginosa (Savigny, 1826)	1
*I10a_E3x	zero.pseudo	
I10a_E3y_91	Allolobophora chlorotica (	
*I10aL_E1x	zero.pseudo	
*I10aL_E1y	zero.pseudo	
I10aL_E2x_93	Octodrilus complanatus (	
*I10aL_E2y	zero.pseudo	
*I10aL_E3x	zero.pseudo	
*I10aL_E3y	zero.pseudo	
I10b_E1x_92	Lumbricus terrestris Linna	
*I10b_E1y	zero.pseudo	
*I10b_E2x	zero.pseudo	
*I10b_E2y	zero.pseudo	
*I10b_E3x	zero.pseudo	
*I10b_E3y	zero.pseudo	
*I10bL_E1x	zero.pseudo	
*I10bL_E1y	zero.pseudo	
*I10bL_E2x	zero.pseudo	
*I10bL_E2y	zero.pseudo	
*I10bL_E3x	zero.pseudo	
*I10bL_E3y	zero.pseudo	
I11a_E1x_94	Lumbricus terrestris Linna	
*I11a_E1y	zero.pseudo	

Code	Species	Abundance
C10e_S10d2_11780	Tetragnatha pinicola	1
C	zero.pseudo	0
C	zero.pseudo	0
C	Pachygnatha degeeri	1
C	zero.pseudo	0
C	Mermessus trilobatus	2
C	Cnephalocotes obscurus	1
C10e_S1d1_11585	Mermessus trilobatus	
C10e_S1d1_11585	Pachygnatha degeer	
C10e_S2d1_11630*	zero.pseudo	
C10e_S3d1_11675*	zero.pseudo	
C10e_S4d1_11720	Alopecosa pulverule	
C10e_S4d1_11720	Cnephalocotes obsc	
C10e_S4d1_11720	Mermessus trilobatus	
C10e_S4d1_11720	Pachygnatha degeer	
C10e_S5d1_11765	Enoplognatha thorac	
C10e_S5d1_11765	Mermessus trilobatus	
C10e_S5d1_11765	Pachygnatha degeer	
C10e_S6d2_11600	Ceratinella brevipes	
C10e_S6d2_11600	Cnephalocotes obsc	
C10e_S7d2_11645	Cnephalocotes obsc	
C10e_S8d2_11690	Trochosa terricola	
C10e_S9d2_11735	zero.pseudo	
C10f_S10d2_11779	zero.pseudo	
C10f_S11d3_11614	Collinsia inerrans	
C10f_S11d3_11614	Pachygnatha degeer	
C10f_S12d3_11659	Collinsia inerrans	
C10f_S12d3_11659	Mermessus trilobatus	
C10f_S13d3_11704	zero.pseudo	
C10f_S14d3_11749	Mermessus trilobatus	
C10f_S15d3_11794	Mermessus trilobatus	
C10f_S1d1_11584	Mermessus trilobatus	
C10f_S2d1_11629	Tiso vagans	

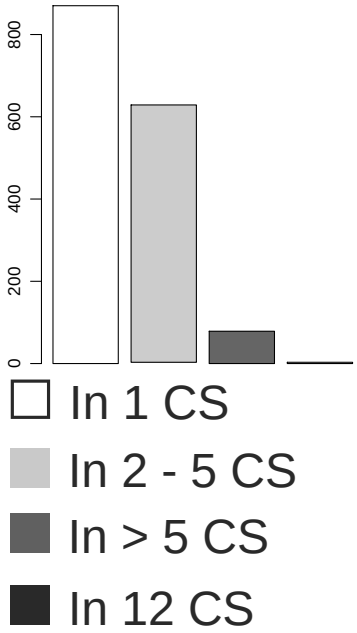
Code	Species	Abundance
F10a_Bd1_3706	Andrena flavipes	1
*F1	Andrena impunctata	5
*F1	Apis mellifera	4
*F1	Bombus gr. terrestris	1
*F1	Halictus seladonius	2
*F1	Halictus simplex	2
F10a_Bd2_3721	Halictus tumulorum	1
F10a_Bd2_3721	Lasioglossum glabriusculum	1
F10a_Bd2_3721	Lasioglossum interruptum	1
F10a_Bd2_3721	Lasioglossum puncticolle	1
F10a_Bd2_3721	Lasioglossum villosulum	1
F10a_Bd3_3736	Halictus maculatus	1
F10b_Bd1_3707	zero.pseudo	0
F10b_Bd2_3722	zero.pseudo	0
F10b_Bd3_3737	zero.pseudo	0
F10c_Bd1_3708	zero.pseudo	0
F10c_Bd2_3723	zero.pseudo	0
F10c_Bd3_3738	zero.pseudo	0
F10d_Bd1_3709	zero.pseudo	0
F10d_Bd2_3724	zero.pseudo	0
F10d_Bd3_3739	zero.pseudo	0
F10e_Bd1_3710	Andrena ventricosa	2
F10e_Bd1_3710	Andrena wilkella	1
F10e_Bd1_3710	Apis mellifera	1
F10e_Bd1_3710	Lasioglossum pauxillum	1
F10e_Bd2_3725	Lasioglossum corvinum	1
F10e_Bd3_3740	zero.pseudo	0

B_06	11							
B_07	10							
B_08	9							
B_09	4	14.575	B	B_G				
B_10	6	7.6644	B	B_G				
B_11	8	49.727	B	B_G				
B_12	5	6.9005	B	B_G				
B_13	9	9.6277	B	B_G				
B_14	10	35.037	B	B_GRA	76			
B_15	8	31.712	B	B_GRA	84			
B_16	11	60.979	B	B_GRA	88			
C_01	6	6.8322	C	C_GRA	67	11	22	

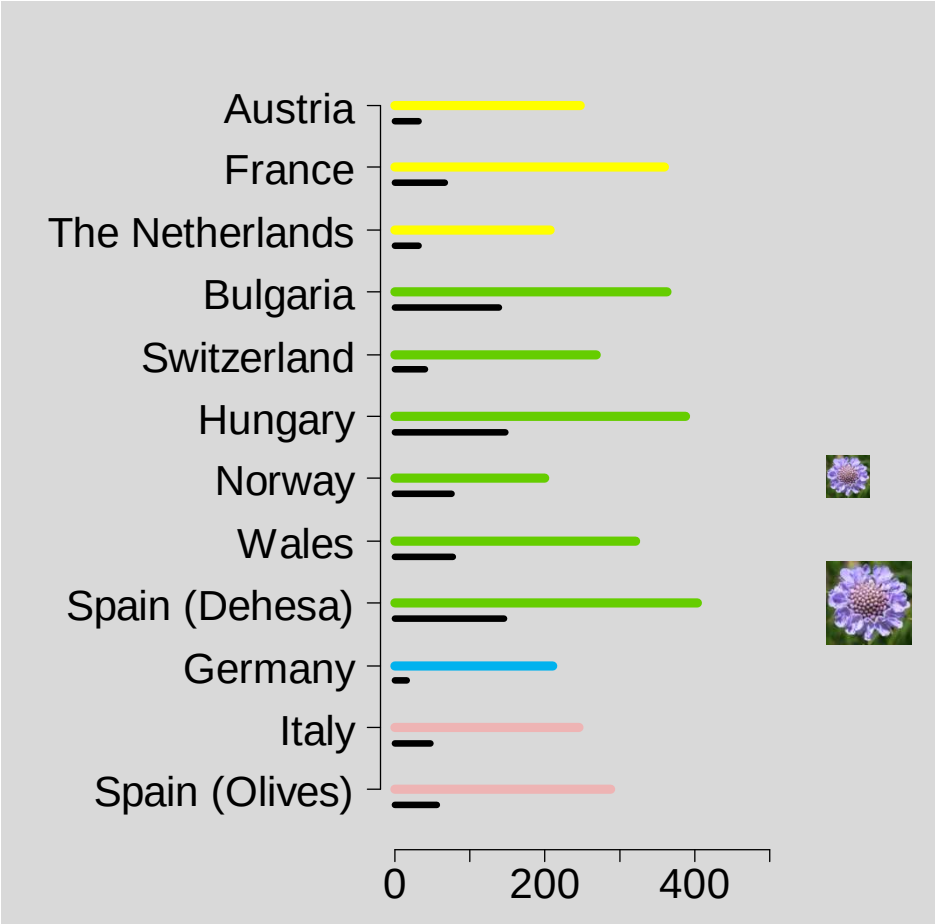
Species diversity – Data and indicators – Main pattern – Information gained

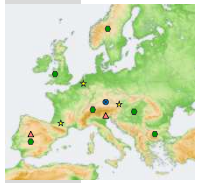
Plants

Total
~ 1581 species



Dactylis glomerata
Stellaria media
Trifolium repens

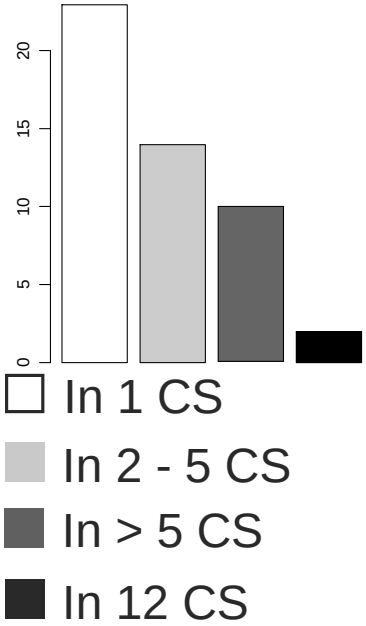




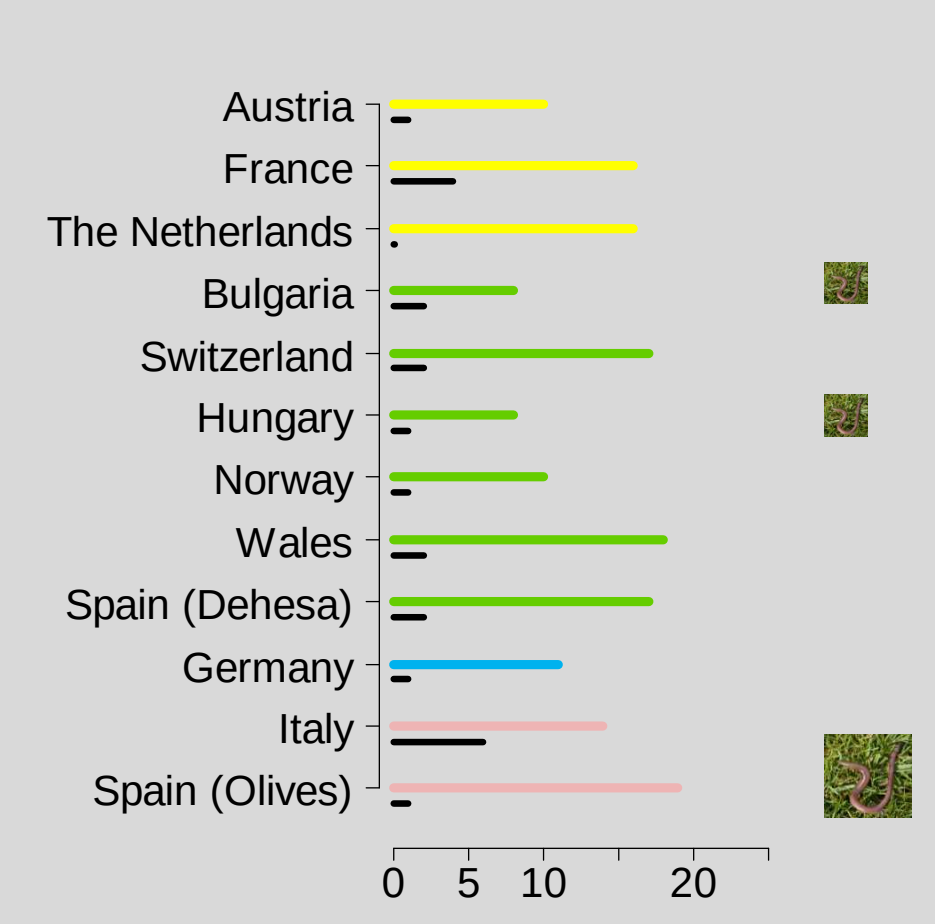
Species diversity – Data and indicators – Main pattern – Information gained

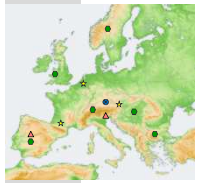
Earthworms

Total
49 species



Aporrectodea rosea
Octolasium lacteum

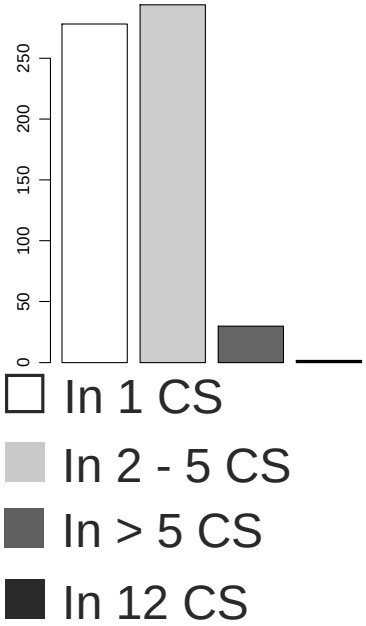




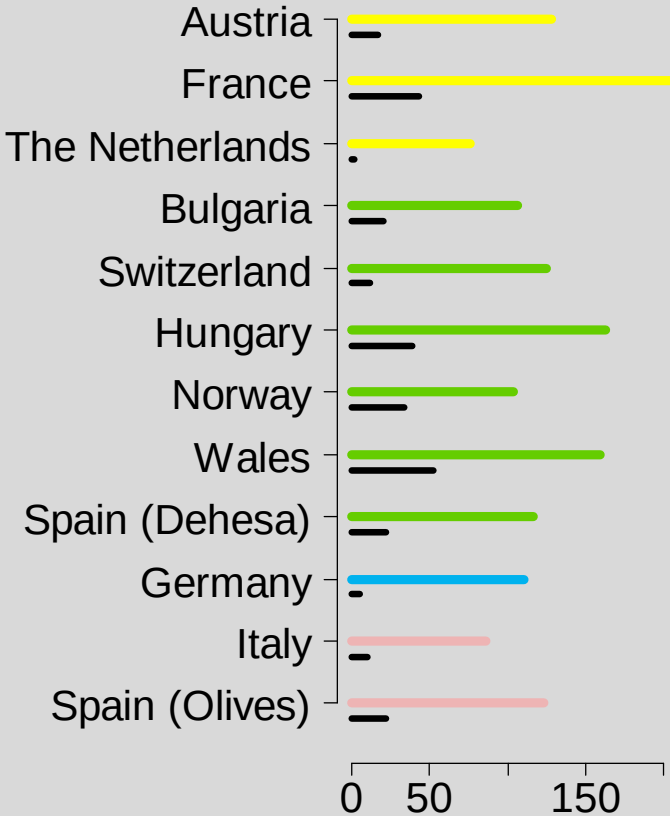
Species diversity – Data and indicators – Main pattern – Information gained

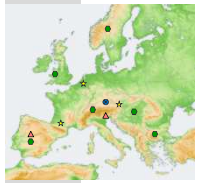
Spiders

Total
~604 species



Erigone dentipalpis
Meioneta rurestris

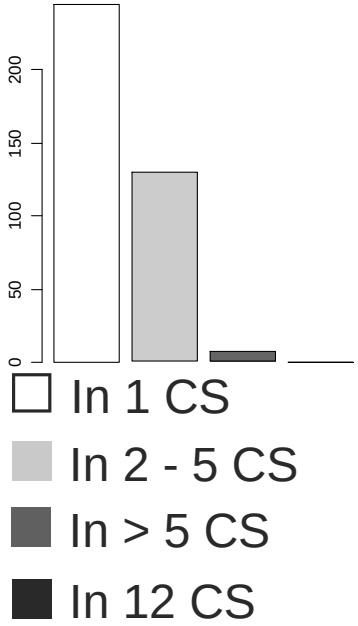


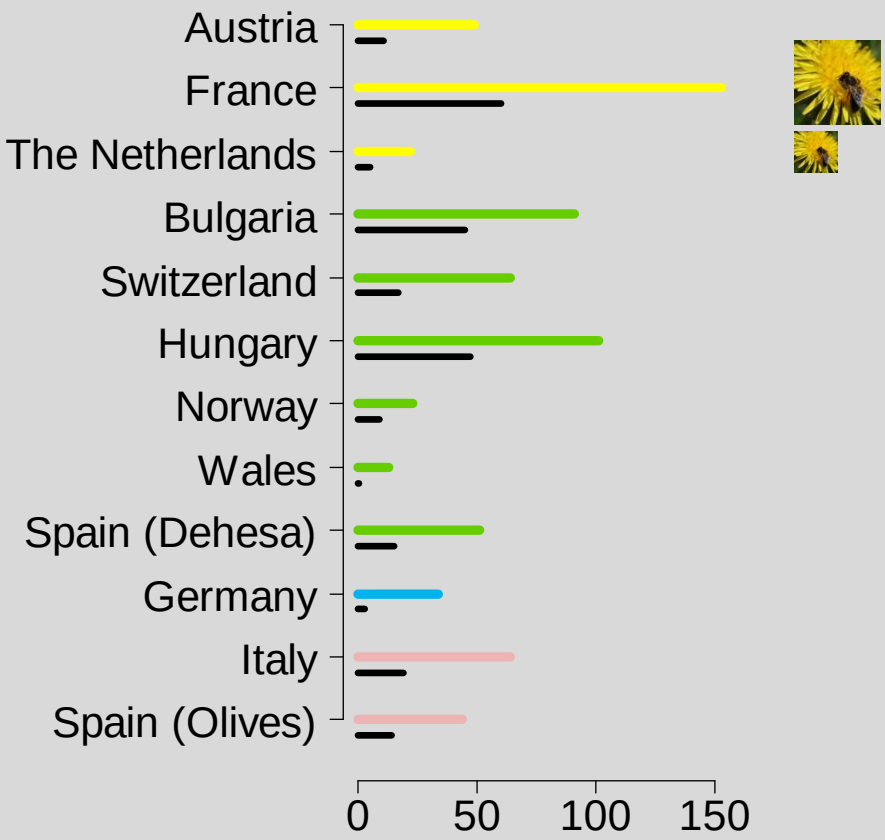


Species diversity – Data and indicators – Main pattern – Information gained

Bees

Total
~382 species

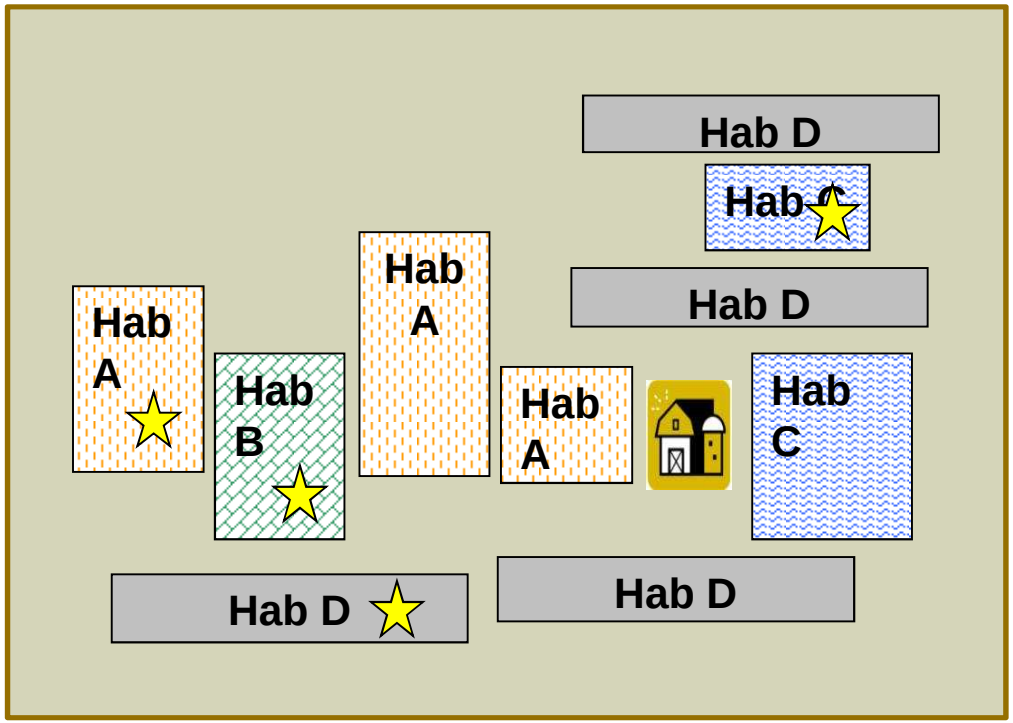




Species diversity – Data and indicators – Main pattern – Information gained

Different species indicators for a farm

- Total number of species (e.g. 40 species)
- Average number of species per plot
- Area weighted number of species
- Estimated number of species

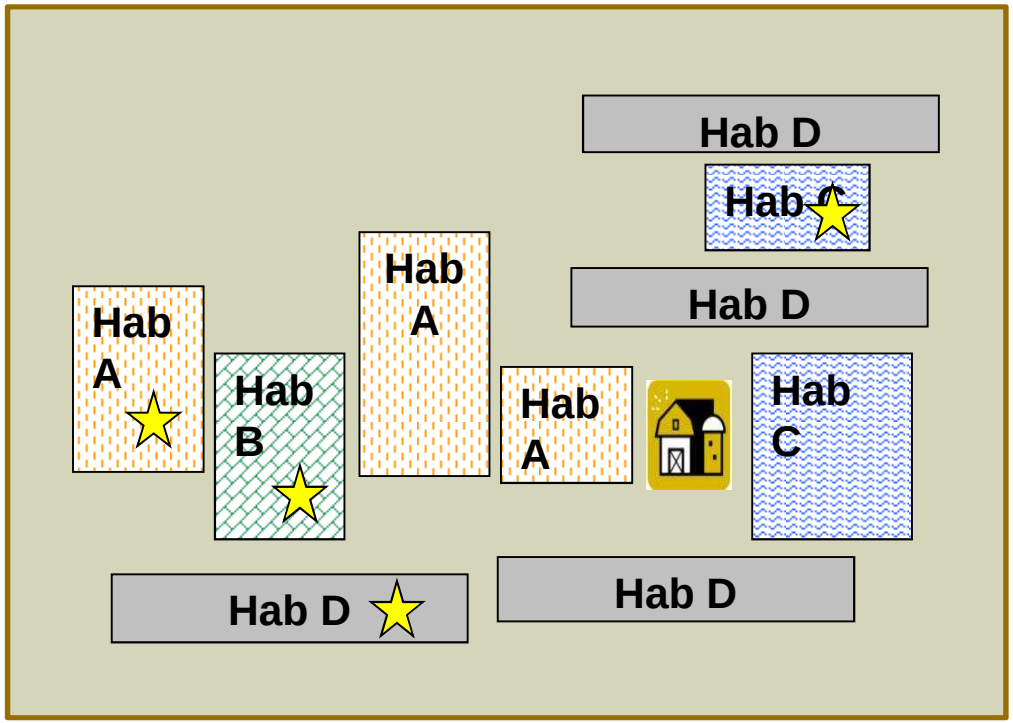


e.g.

Hab A 10 species
Hab B 15 species
Hab C 25 species
Hab D 10 species

Different species indicators for a farm

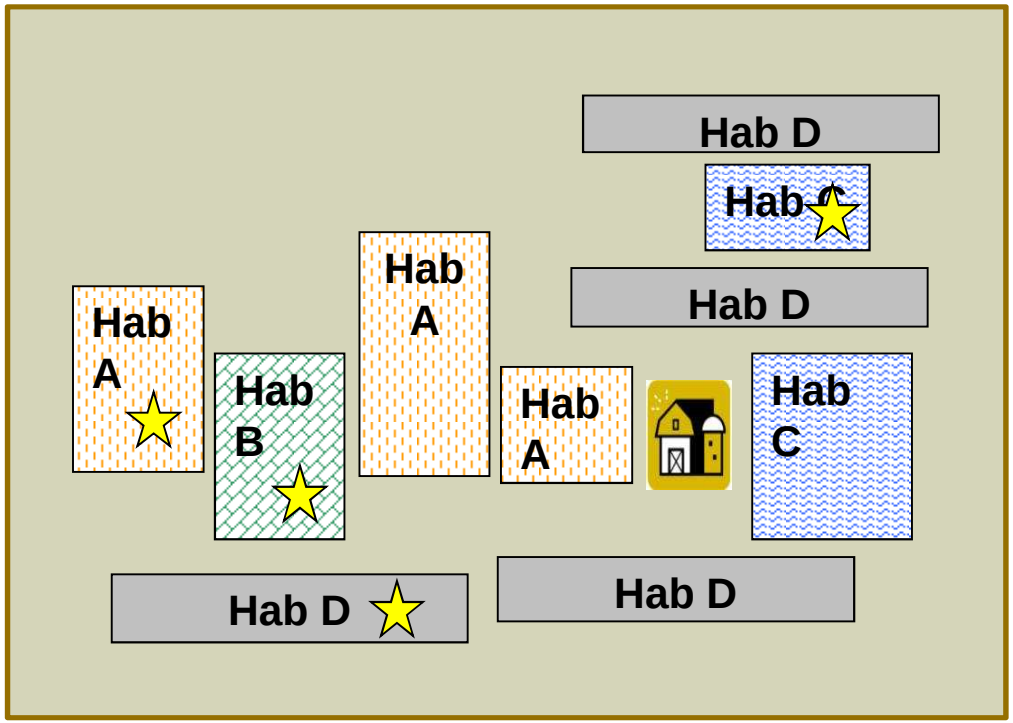
- Total number of species (40)
- Average number of species per plot (e.g. 15 species)
- Area weighted number of species
- Estimated number of species



e.g. **Hab A** 10 species
Hab B 15 species
Hab C 25 species
Hab D 10 species

Different species indicators for a farm

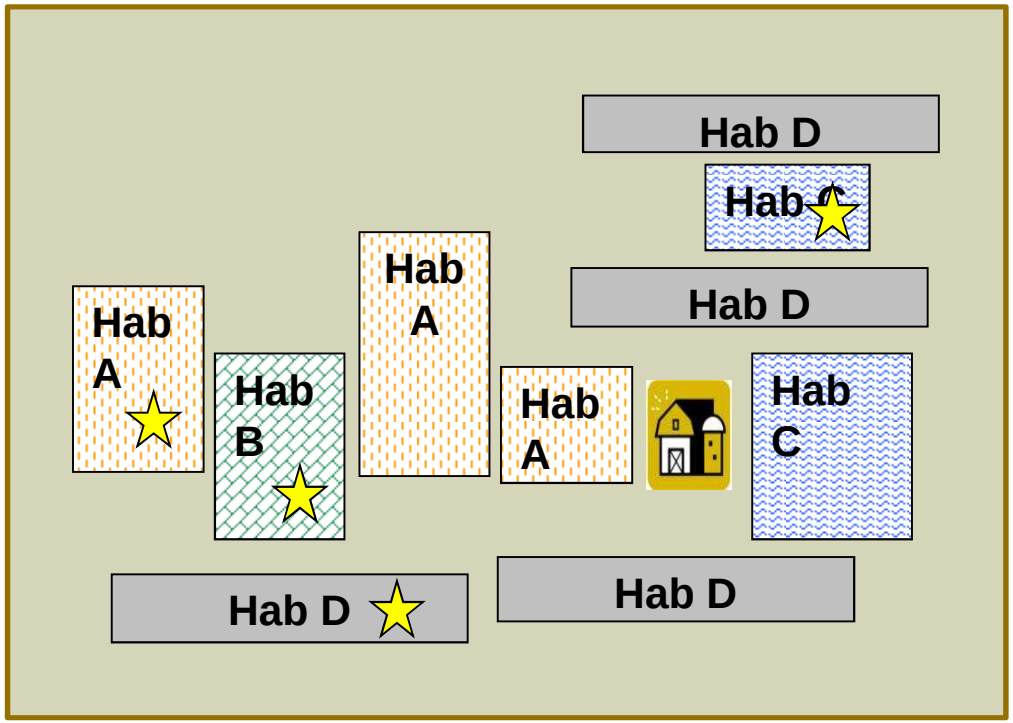
- Total number of species (40)
- Average number of species per plot (15)
- Area weighted number of species (e.g. 13.5 species)
- Estimated number of species



e.g. **Hab A** 10 species, 50 % of area
Hab B 15 species, 10 % of area
Hab C 25 species; 20 % of area
Hab D 10 species, 20 % of area

Different species indicators for a farm

- Total number of species (40)
- Average number of species per plot (15)
- Area weighted number of species (13.5)
- Rarefied number of species (30)
- Estimated number of species (e.g. 45 species)



e.g.

Hab A 10 species
Hab B 15 species
Hab C 25 species
Hab D 10 species

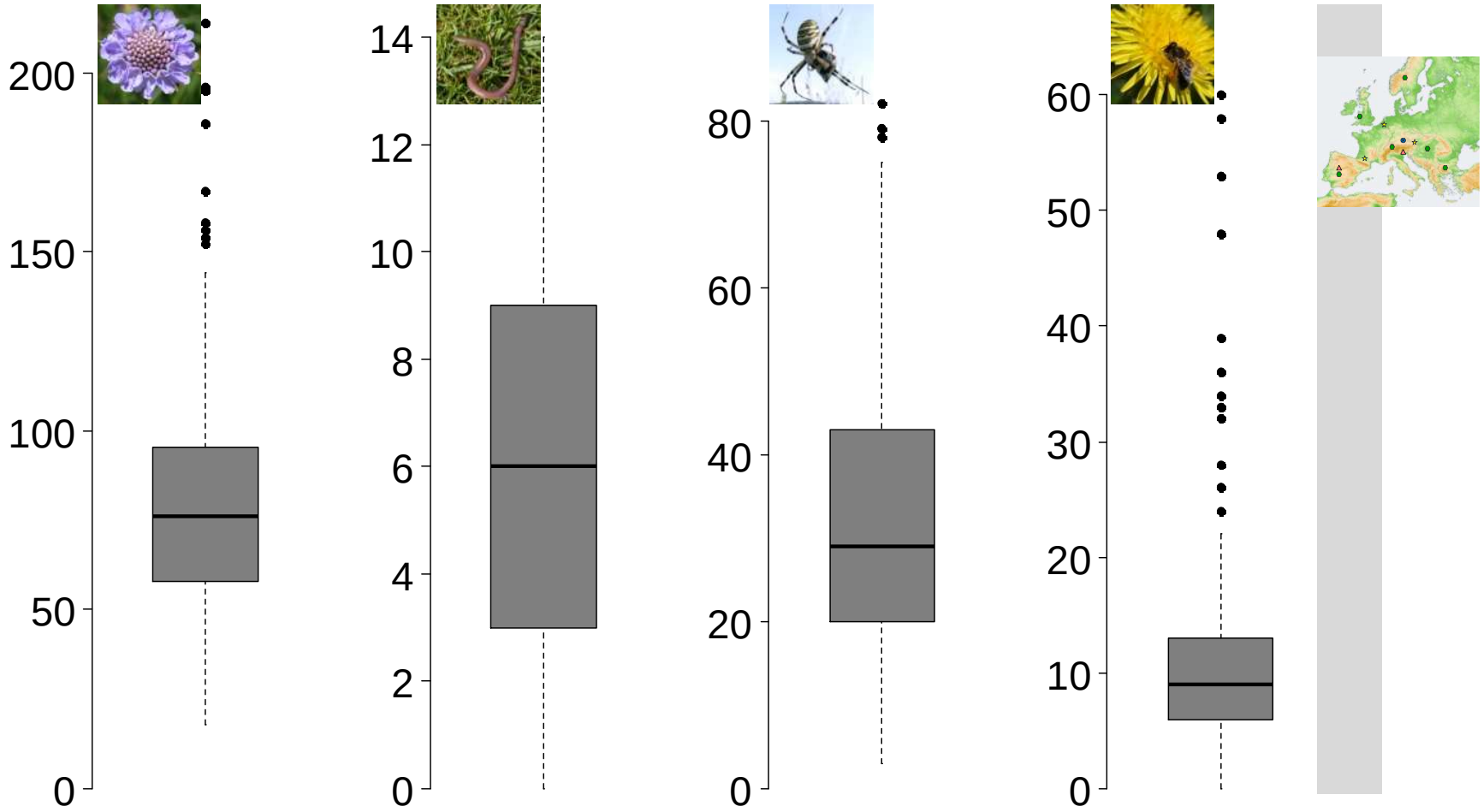
Different species indicators for a farm

- Total number of species
- Average number of species per plot
- Area weighted number of species
- Estimated number of species

- Mostly correlated
  - Helpful to investigate specific questions

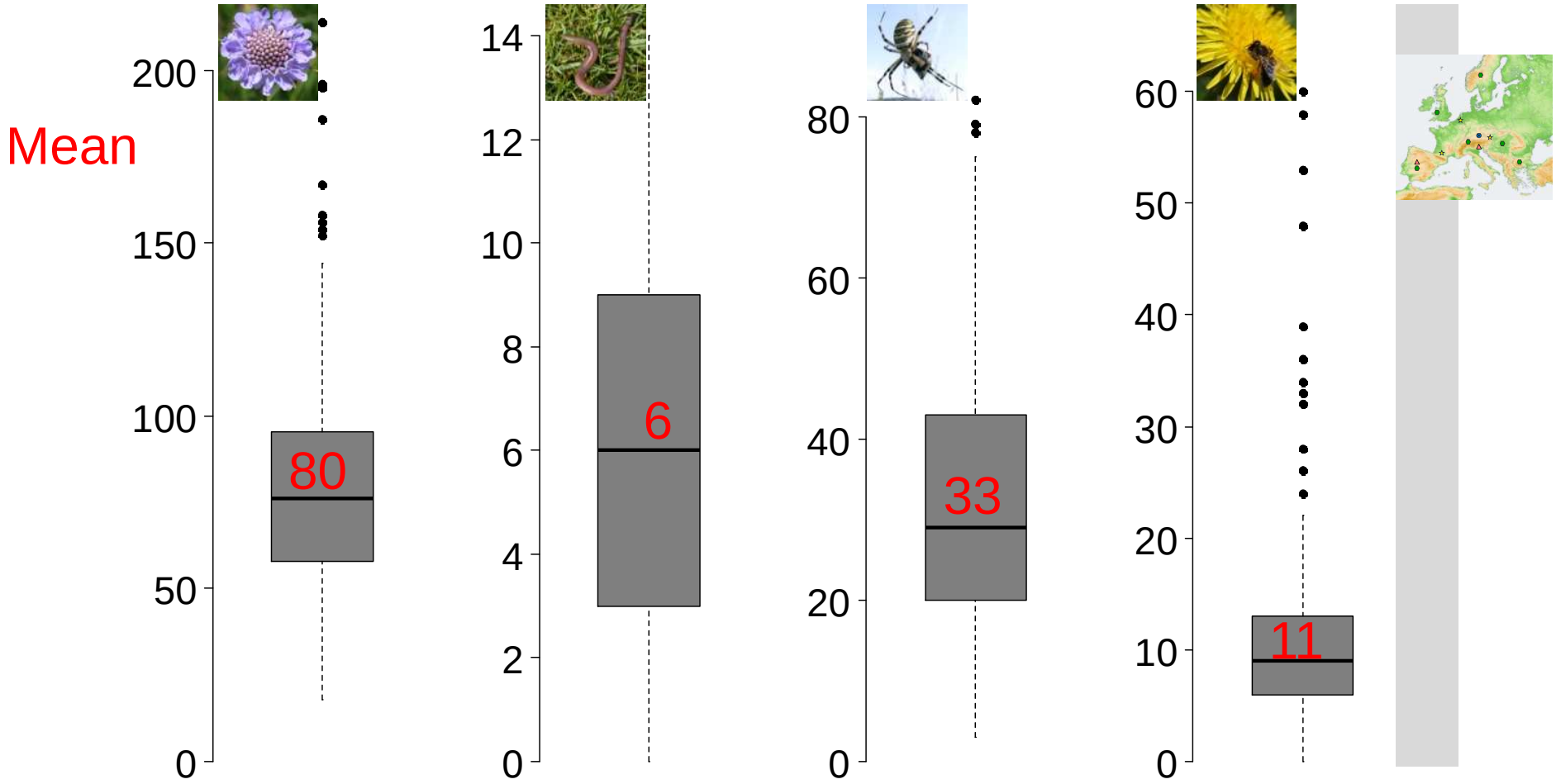
→ For general use: Total number of species

Number of species per farm



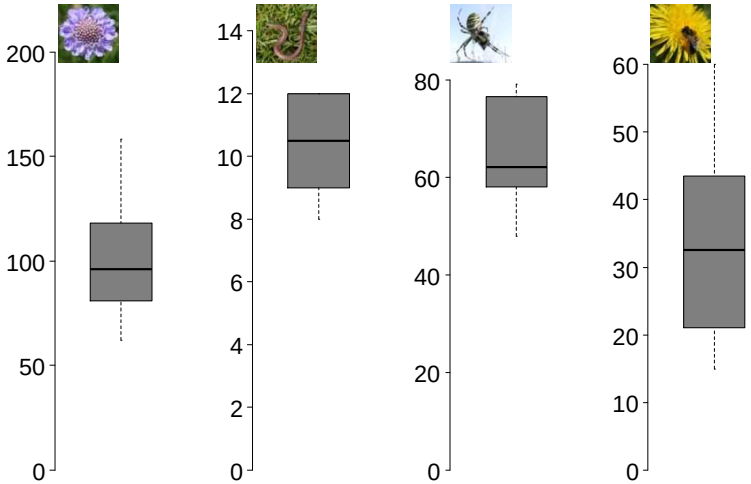
Species diversity – Data and indicators – Main pattern – Information gained

Number of species per farm



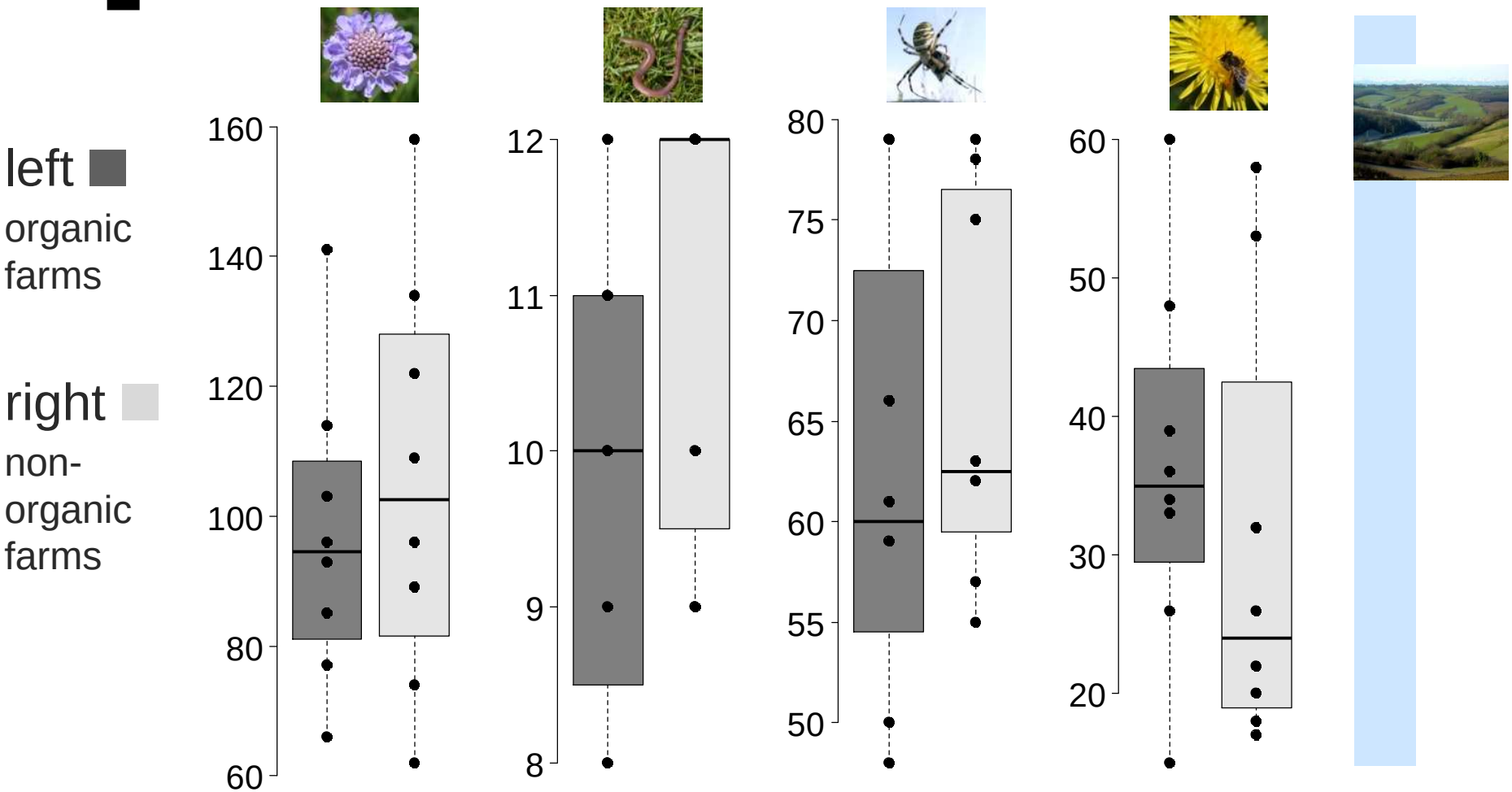
Species diversity – Data and indicators – Main pattern – Information gained

A single case study as example - France



- Field crops
- Rich in spider and bee species
- 16 farms

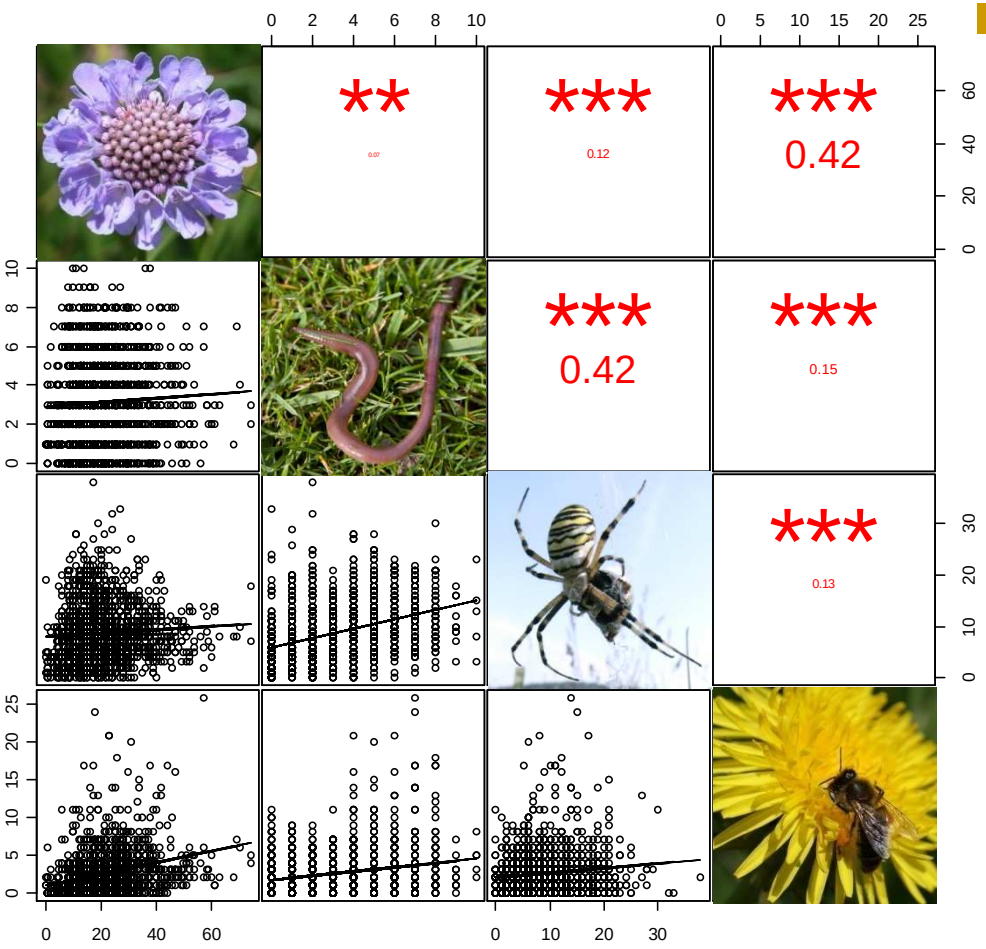
A single case study as example - France



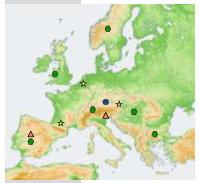
Species diversity – Data and indicators – Main pattern – Information gained

Correlations among the species groups

All data

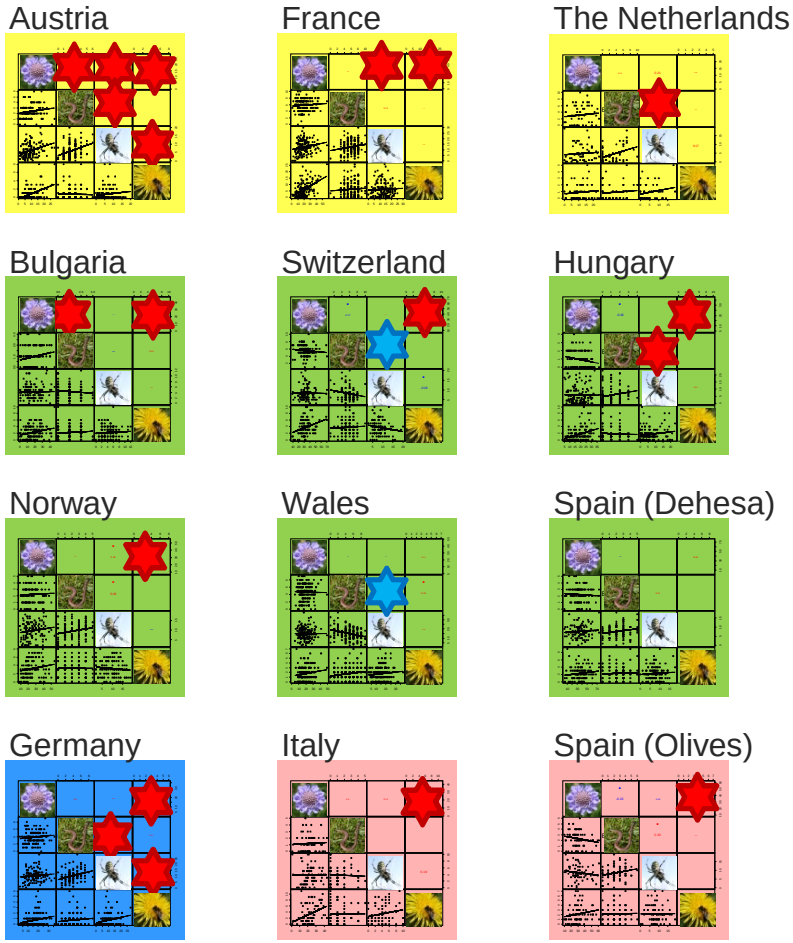


- Depending on data set
  - Significant positive correlations among all species groups if all data combined

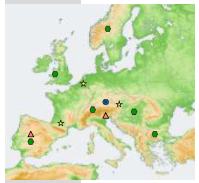


Correlations among the species groups

Case studies separate



- Depending on data set
  - Different pattern across the case studies
- Species groups are complementary
  - Different habitat requirements



Species diversity – Data and indicators – Main pattern – Information gained

Concluding remarks

- Species indicators provide differentiated information of farm scale species diversity.
  - Comparisons within a case study are more meaningful than among case study regions.
- Combining ten case study regions and four taxonomic groups results in a moderate positive effect of organic farming on species richness.
- Plant, earthworm, spider and bee diversity are complementary.
  - Relation to habitat types is different for the four species groups.

Thank you!