

## Supplementary Materials

**Supporting Information to the paper:** Valerio, M., Gazol, A., Puy, J., Ibáñez, R., Different taxonomic and functional indices complement the understanding of herb-layer community assembly patterns in a southern-limit temperate forest. *Forests*.

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**Table S1.** List of the 52 vascular plant species studied, with their abundance in terms of frequency, life form and the mean value of the four functional traits measured (LDMC: Leaf Dry Matter Content, SLA: Specific Leaf Area, Leaf size and Plant height). Nomenclature follows Castroviejo (1986-2021).

Taxon	Frequency (max. 86)	Life form Raunkiaer	LDMC (mg g <sup>-1</sup> )	SLA (mm <sup>2</sup> mg <sup>-1</sup> )	Leaf size (mm <sup>2</sup> )	Plant height (cm)
<i>Agrostis capillaris</i> subsp. <i>capillaris</i>	47	Hemicryptophyte	179.4	26.3	70.96	19
<i>Agrostis curtisii</i>	5	Hemicryptophyte	247.6	17.3	42.56	21
<i>Asphodelus albus</i> subsp. <i>albus</i>	2	Geophyte	130.6	13.2	4556.98	46
<i>Athyrium filix-femina</i>	31	Geophyte	173.9	44.6	27454.09	30
<i>Avenella flexuosa</i>	68	Hemicryptophyte	246.2	18.9	80.19	15
<i>Blechnum spicant</i> subsp. <i>spicant</i>	42	Hemicryptophyte	291.4	11.8	7838.10	21
<i>Brachypodium sylvaticum</i> subsp. <i>sylvaticum</i>	9	Hemicryptophyte	278.4	18.8	367.51	31
<i>Calluna vulgaris</i>	20	Chamaephyte	406.1	24.3	4.00	45
<i>Cardamine flexuosa</i>	11	Hemicryptophyte	158.0	30.2	85.86	10
<i>Cardamine pratensis</i> subsp. <i>pratensis</i>	15	Hemicryptophyte	157.1	24.0	233.34	13
<i>Carex pilulifera</i> subsp. <i>pilulifera</i>	13	Hemicryptophyte	282.7	26.2	260.31	19
<i>Carex remota</i>	8	Hemicryptophyte	218.1	24.8	374.79	30
<i>Carex sylvatica</i> subsp. <i>sylvatica</i>	10	Hemicryptophyte	290.2	20.8	680.13	25
<i>Chrysosplenium oppositifolium</i>	8	Hemicryptophyte	125.0	29.8	103.56	7
<i>Circaea lutetiana</i>	1	Geophyte	121.5	74.0	803.59	7
<i>Cytisus scoparius</i> subsp. <i>scoparius</i>	13	Nanophanerophyte	191.9	33.1	155.94	43
<i>Daboecia cantabrica</i>	9	Chamaephyte	377.1	17.7	55.79	28
<i>Daphne laureola</i>	11	Nanophanerophyte	340.7	8.3	869.70	65
<i>Digitalis purpurea</i> subsp. <i>purpurea</i>	2	Hemicryptophyte	100.7	34.1	9435.90	43
<i>Dryopteris affinis</i> subsp. <i>affinis</i>	30	Hemicryptophyte	184.8	27.2	58271.86	61
<i>Erica cinerea</i>	3	Chamaephyte	376.2	16.2	4.99	43
<i>Erica vagans</i>	28	Chamaephyte	236.6	18.2	4.96	33
<i>Euphorbia amygdaloides</i> subsp. <i>amygdaloides</i>	55	Chamaephyte	222.3	29.8	393.66	19
<i>Euphorbia dulcis</i>	16	Hemicryptophyte	195.0	50.1	179.69	10
<i>Festuca rubra</i> subsp. <i>rubra</i>	21	Hemicryptophyte	233.8	21.3	70.29	8
<i>Hedera helix</i> subsp. <i>helix</i>	76	Nanophanerophyte	303.7	13.3	987.64	6
<i>Helleborus viridis</i> subsp. <i>occidentalis</i>	10	Geophyte	188.0	16.2	15534.28	17
<i>Hypericum androsaemum</i>	58	Nanophanerophyte	229.2	33.5	2628.75	43
<i>Hypericum pulchrum</i>	23	Hemicryptophyte	237.6	31.4	98.87	25
<i>Juncus effusus</i>	3	Hemicryptophyte	227.3	7.2	0.00	61
<i>Lathyrus linifolius</i>	13	Hemicryptophyte	257.3	26.5	535.94	13
<i>Luzula multiflora</i> subsp. <i>multiflora</i>	10	Hemicryptophyte	188.4	25.0	334.79	12
<i>Luzula sylvatica</i> subsp. <i>sylvatica</i>	23	Hemicryptophyte	222.2	24.9	2297.31	28
<i>Oxalis acetosella</i>	15	Geophyte	94.1	70.0	528.92	9

Taxon	Frequency (max. 86)	Life form Raunkiaer	LDMC (mg g <sup>-1</sup> )	SLA (mm <sup>2</sup> mg <sup>-1</sup> )	Leaf size (mm <sup>2</sup> )	Plant height (cm)
<i>Polystichum setiferum</i>	34	Hemicryptophyte	220.2	20.6	42181.61	47
<i>Potentilla sterilis</i>	6	Hemicryptophyte	227.9	20.5	477.51	7
<i>Primula acaulis</i> subsp. <i>acaulis</i>	4	Hemicryptophyte	115.1	38.1	3288.70	7
<i>Pteridium aquilinum</i> subsp. <i>aquilinum</i>	57	Geophyte	256.2	15.8	178280.25	38
<i>Ranunculus tuberosus</i>	20	Hemicryptophyte	149.9	21.3	838.84	17
<i>Rubus ulmifolius</i>	8	Nanophanerophyte	412.5	13.9	3957.95	36
<i>Ruscus aculeatus</i>	45	Chamaephyte	442.1	6.6	0.00	37
<i>Saxifraga hirsuta</i> subsp. <i>hirsuta</i>	7	Hemicryptophyte	115.3	27.5	616.53	7
<i>Scilla lilio-hyacinthus</i>	5	Geophyte	65.2	35.2	2390.36	12
<i>Scrophularia alpestris</i>	1	Hemicryptophyte	131.0	31.8	3003.78	25
<i>Solanum dulcamara</i>	1	Chamaephyte	146.4	46.0	721.50	36
<i>Solidago virgaurea</i>	4	Hemicryptophyte	180.1	29.2	1783.48	13
<i>Taraxacum</i> gr. <i>officinale</i>	3	Hemicryptophyte	307.9	45.3	1519.83	9
<i>Ulex gallii</i> subsp. <i>gallii</i>	4	Nanophanerophyte	491.4	2.8	0.00	128
<i>Vaccinium myrtillus</i>	8	Chamaephyte	300.7	32.3	150.69	12
<i>Veronica chamaedrys</i> subsp. <i>chamaedrys</i>	32	Chamaephyte	162.8	45.6	124.67	6
<i>Veronica officinalis</i>	1	Chamaephyte	245.5	22.6	69.00	5
<i>Viola riviniana</i>	18	Hemicryptophyte	175.7	29.7	430.82	7

**Table S2.** Pearson's correlation values between the functional traits studied (Leaf size and Plant height are not transformed). Significant correlations ( $p < 0.05$ ; 50 d.f.) are marked in shaded numbers.

	Leaf Dry Matter Content	Specific Leaf Area	Leaf size	Plant height
Leaf Dry Matter Content	<b>1</b>	-0.576	-0.012	0.481
Specific Leaf Area	<b>-0.576</b>	<b>1</b>	-0.100	-0.443
Leaf size	-0.012	-0.100	<b>1</b>	0.179
Plant height	<b>0.481</b>	<b>-0.443</b>	0.179	<b>1</b>

**Table S3.** List of the environmental variables studied with their range, mean and unit.

Environmental variables	Range	Mean	Unit
altitude	262 - 635	391	m
slope	6 - 42	23	sexagesimal degrees
moisture	28 - 44	36	% vol
radiation	0.03 - 0.61	0.17	.
CV moisture	0.09 - 0.37	0.22	.
CV radiation	0.03 - 0.99	0.26	.
leaf litter	10 - 98	69	percentage
<i>Quercus</i> basal area	0 - 97	16	percentage
basal area	6 - 115	48	m <sup>2</sup> ha <sup>-1</sup>
DBH mean	8 - 80	41	cm

**Table S4.** Pearson's correlation values between the environmental variables studied and the two axes scores of the taxonomic ordination analysis. Significant correlations ( $p < 0.05$ ; 84 d.f.) are marked in shaded numbers.

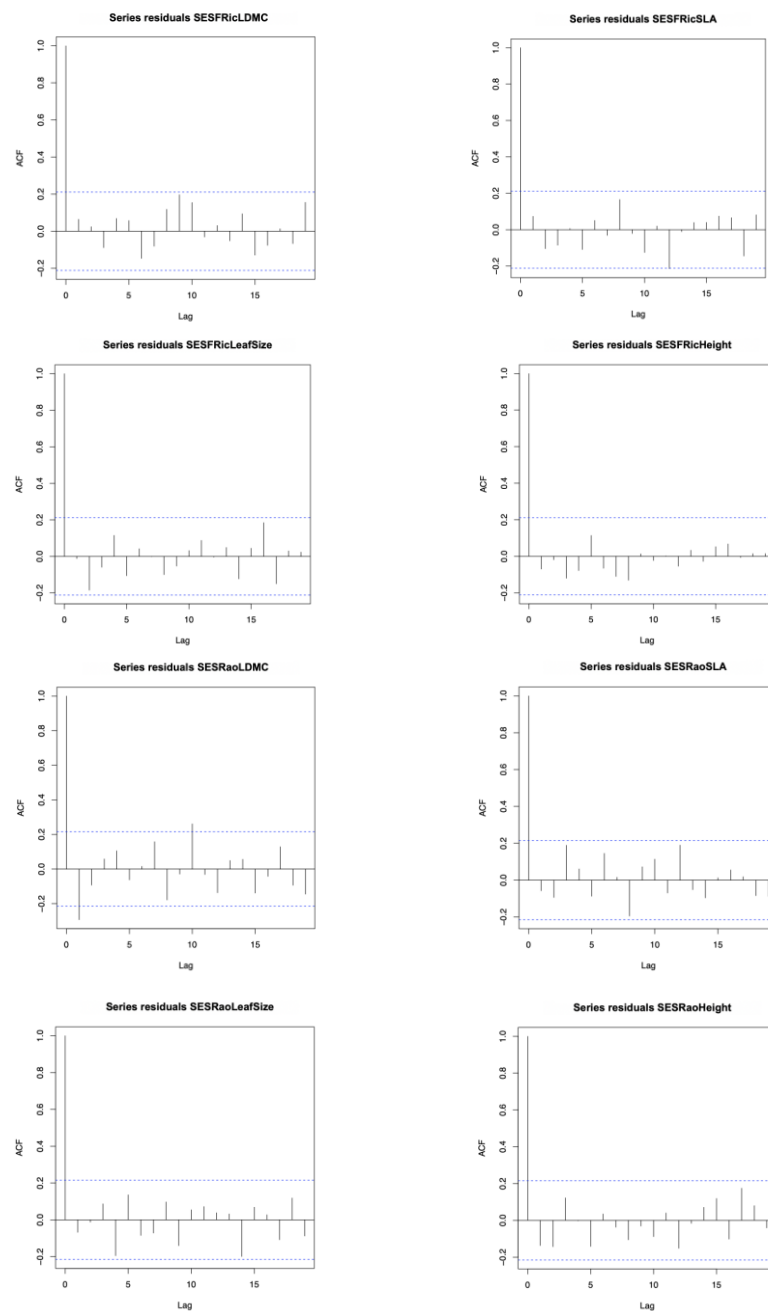
Environmental variables	Species composition	
	NMDS1	NMDS2
altitude	0.095	<b>-0.299</b>
slope	0.192	0.135
moisture	<b>0.269</b>	<b>-0.264</b>
radiation	<b>-0.439</b>	<b>0.513</b>
CV moisture	0.085	0.073
CV radiation	0.145	<b>0.219</b>
leaf litter	<b>0.342</b>	<b>-0.430</b>
<i>Quercus</i> basal area	<b>-0.292</b>	<b>0.313</b>
basal area	0.121	-0.104
DBH mean	0.160	-0.057
<b>Herb-layer characteristics</b>		
species richness	0.157	<b>0.696</b>

**Table S5.** Pearson's correlation values between taxonomic composition (expressed as the axes scores obtained from the NMDS) and species richness, and functional composition (CWM), Standardized Effect Size of functional richness (SESFRic) and diversity (SES Rao) indices for each trait (LDMC: Leaf Dry Matter Content, SLA: Specific Leaf Area, Leaf size, Plant height). Significant correlations ( $p < 0.05$ ; 84 d.f.) are marked in shaded numbers.

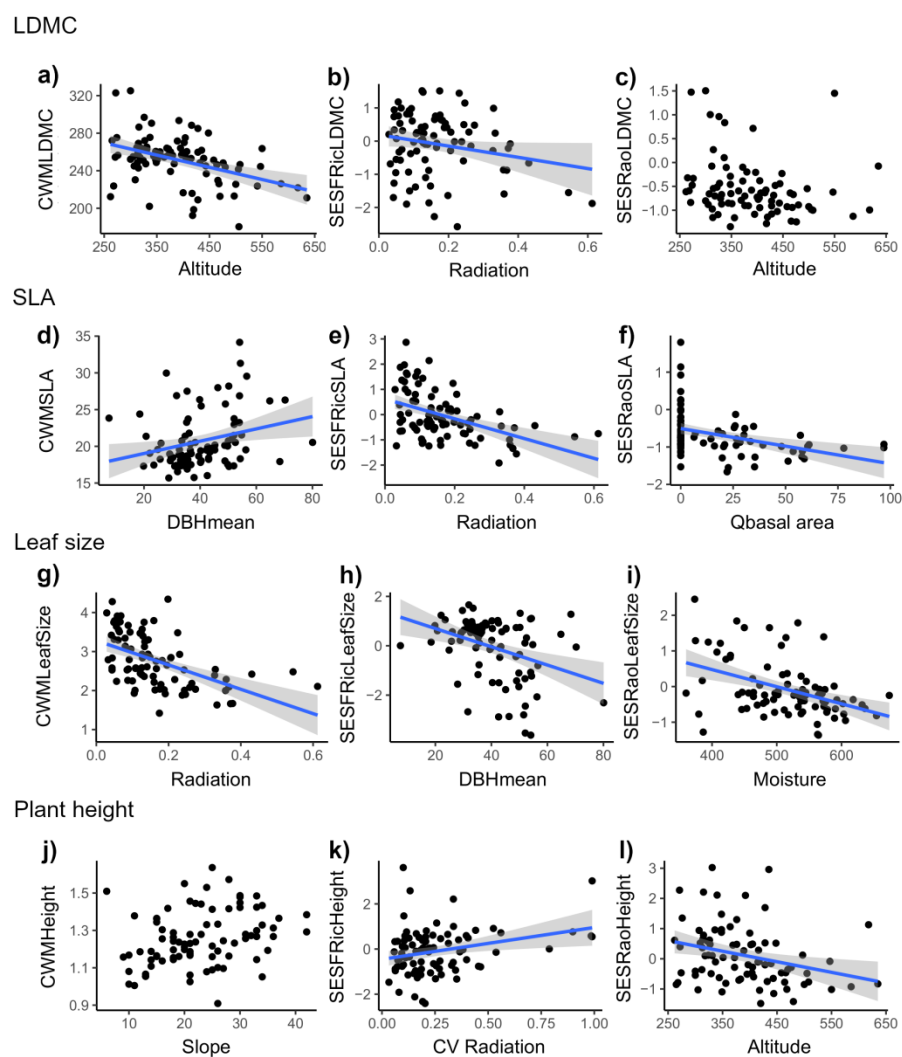
Traits	Species composition		Species richness
	NMDS1	NMDS2	
<i>CWM</i>			
LDMC	-0.644	-0.005	-0.003
SLA	0.669	-0.039	-0.025
Leaf Size	<b>0.756</b>	-0.127	0.041
Height	0.426	0.102	0.006
<i>SESFRic</i>			
LDMC	-0.138	-0.076	-0.029
SLA	<b>0.382</b>	<b>-0.302</b>	0.040
Leaf Size	<b>-0.347</b>	-0.072	-0.057
Height	0.095	0.112	-0.082
<i>SES Rao</i>			
LDMC	<b>-0.230</b>	0.013	-0.139
SLA	<b>0.271</b>	0.044	0.073
Leaf size	-0.203	<b>0.231</b>	0.095
Height	<b>0.255</b>	0.106	0.200

**Table S6.** Pearson's correlation values between the environmental variables studied. Significant correlations ( $p < 0.05$ ; 84 d.f.) are marked in shaded numbers.

	altitude	slope	moisture	radiation	CV moisture	CV radiation	leaf litter	<i>Quercus</i> basal area	basal area	DBH mean
altitude	<b>1</b>	-0.013	-0.174	-0.018	0.296	0.080	0.073	-0.177	0.076	0.098
slope	-0.013	<b>1</b>	-0.261	-0.059	-0.014	0.094	-0.074	0.291	0.023	-0.046
moisture	-0.174	<b>-0.261</b>	<b>1</b>	-0.395	-0.204	-0.006	0.249	-0.395	0.058	0.047
radiation	-0.018	-0.059	<b>-0.395</b>	<b>1</b>	0.039	-0.029	-0.513	0.389	-0.191	-0.061
CV moisture	<b>0.296</b>	-0.014	-0.204	0.039	<b>1</b>	0.145	-0.074	0.044	-0.088	-0.094
CV radiation	0.080	0.094	-0.006	-0.029	0.145	<b>1</b>	0.070	-0.047	-0.093	-0.217
leaf litter	0.073	-0.074	<b>0.249</b>	<b>-0.513</b>	-0.074	0.070	<b>1</b>	-0.311	0.191	0.002
<i>Quercus</i> basal area	-0.177	<b>0.291</b>	<b>-0.395</b>	<b>0.389</b>	0.044	-0.047	<b>-0.311</b>	<b>1</b>	-0.006	-0.108
basal area	0.076	0.023	0.058	-0.191	-0.088	-0.093	0.191	-0.006	<b>1</b>	0.326
DBH mean	0.098	-0.046	0.047	-0.061	-0.094	<b>-0.217</b>	0.002	-0.108	<b>0.326</b>	<b>1</b>



**Figure S1.** Autocorrelation plots showing the spatial autocorrelation of the residuals obtained from 8 of the multiple regression models carried out in the study. The models had as response variable the SESFRic or SESRao of the four traits studied (Leaf Dry Matter Content, Specific Leaf Area, Leaf size and Plant height), and as explanatory variables different environmental variables (see Table 1). Blue dashed lines show the confidence interval beyond which the spatial autocorrelation is significant.



**Figure S2.** Scatter plot representing relationships between the functional composition (CWM), Standardized Effect Size of functional richness (SEsFRic) and diversity (SEsRao) of the traits studied (LDMC: Leaf Dry Matter Content (a–c), SLA: Specific Leaf Area (d–f), Leaf size (g–i), and Plant height (j–l)), and the most influential environmental factors in each case. Regression lines with the confidence interval (0.95) show significant relationships ( $p < 0.05$ ). Each circle represents one community (86 for CWM and SEsFRic, and 83 for SEsRao).