

## 1 **Supplementary Information**

2 **Table S1.** Mean values of environmental parameters in recent woodlands and ancient forests (mean  
3  $\pm$  standard deviation). Habitat structure was assessed from canopy cover (visual vertical estimation  
4 above each plot) and basal area (measured with a chain-relascope). We infer abiotic conditions from  
5 Ellenberg Indicator Values (EIV) for moisture, reaction, nitrogen and light, using flora data adapted to  
6 the Western Europe flora (Hill 1999). EIV were weighted by the vegetation cover (in %) to account for  
7 species abundances. We determined differences using Student tests.

	Recent woodlands	Ancient forests	<i>p</i> -value
<i>n</i> sites	2	6	
<b>Site configuration</b>			
Site area	2100 $\pm$ 1900	1488.3 $\pm$ 409	0.80
<i>n</i> plots	12	20	
<b>Habitat structure</b>			
Canopy cover (%)	74.6 $\pm$ 3.1	77.3 $\pm$ 3.1	0.549
Basal area (m <sup>2</sup> ha <sup>-1</sup> )	27.6 $\pm$ 1.9	31.1 $\pm$ 1.9	0.217
<b>Ellenberg Indicator Value (EIV)</b>			
Moisture (F)	5.65 $\pm$ 0.04	5.62 $\pm$ 0.04	0.54
Reaction (R)	5.93 $\pm$ 0.08	4.62 $\pm$ 0.1	< 0.001
Nitrogen (N)	5.72 $\pm$ 0.06	4.52 $\pm$ 0.1	< 0.001
Light (L)	5.12 $\pm$ 0.08	5.42 $\pm$ 0.06	0.008

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9 Hill, M.O., 1999. Ellenberg's Indicator Values for British Plants. DETR, Rotherham.

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15 **Table S2.** Description of functional traits used to characterise plant species, from the LEDA database.  
 16 Trait types: 1=quantitative, 2=qualitative, 3=ordinal. Note that we considered only the dominant  
 17 dispersal syndrome of each species, despite species can have multiple dispersal syndromes. But we  
 18 included other traits related to dispersal to ensure a good characterisation of the dispersal strategy  
 19 of each species, and ensure, later, a good characterisation of their functional groups.

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	Functional traits	Type	Description and units
1	Dispersal syndrome 99 (100%)	2	Anemochory; autochory; barochory; hydrochory; endozoochory; epizoochory and myrmecochory
2	Leaf dry matter content (LDMC) 99 (95%)	1	mg.g <sup>-1</sup>
3	Plant height (Height) 99 (100%)	1	Maximum vegetative height (m)
4	Plant life-form 99 (100%)	2	Geophyte; hemicryptophyte, liana-phanerophyte and phanerophyte
5	Plant life-span 99 (100%)	1	Perennial and short-lived
6	Seed dry mass 89 /99 (89%)	1	mg
7	Pollination 99 (100%)	2	Anemogamy; autogamy; entomogamy; hydrogamy
8	Specific leaf area (SLA) 99 (100%)	1	mm <sup>2</sup> .g <sup>-1</sup>
9	Flowering phenology 99 (100%)	3	Start of flowering: months (1-12)

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23 **Table S3.** Description of functional traits used to characterize spider species, from the literature.

Functional traits	Description and units	Reference
Body size	Categorical (3) Small (<9 mm); Medium (9-15mm); Large (> 15mm)	Roberts (1995)
Guilds	Categorical (7) Ambush hunters, Ground hunters, Orb web, Others hunters, Sheet web, Space web, Wandering web	Cardoso et al., (2011)
Phenology	Categorical (4) Spring, Summer, Autumn-Winter, Eurychron	Harvey et al., (2002)
Circadian activity	Categorical (3) Diurnal, Nocturnal, Both	Cardoso et al., (2011)

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25 Buchar, J. & Ruzicka, V. (2002). *Catalogue of Spiders of the Czech Republic*.

26 Cardoso, P., Pekár, S., Jocqué, R. & Coddington, J.A. (2011). Global Patterns of Guild Composition and  
27 Functional Diversity of Spiders (ed M Somers). *PLoS ONE*, 6, e21710.

28 Harvey, P.R., Nellist, D.R. & Telfer, M.G. (2002). *Provisional Atlas of British Spiders (Arachnida,*  
29 *Araneae)*, Biological Records Center. Huntington, UK.

30 Roberts, M.J. (1995). *Spiders of Britain & Northern Europe*. Harper Collins, London; New York.

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40 **Table S4.** Description of functional entities (FE) identified for spiders.

# FE	Functional entities	Body	Phenology	Circadian activity	Hunting	n species
1	Bla_Peu_Dbo_Hgr	Large	Eurychron	Both	Ground_hunters	3
2	Bsm_Psu_Dbo_Hsh	Small	Summer	Both	Sheetweb	1
3	Bla_Psu_Ddi_Hgr	Large	Summer	Diurnal	Ground_hunters	6
4	Bme_Peu_Dbo_Hgr	Medium	Eurychron	Both	Ground_hunters	2
5	Bla_Peu_Dbo_Ham	Large	Eurychron	Both	Ambush_hunters	1
6	Bsm_Peu_Dbo_Hsh	Small	Eurychron	Both	Sheetweb	10
7	Bsm_Pau_Dbo_Hsh	Small	Autumn-Winter	Both	Sheetweb	4
8	Bme_Peu_Dbo_Hsh	Medium	Eurychron	Both	Sheetweb	6
9	Bsm_Psu_Dbo_Hwa	Small	Summer	Both	Wandering_web	4
10	Bla_Psu_Dno_Hot	Large	Summer	Nocturnal	Otherhunters	1
11	Bla_Peu_Dno_Hot	Large	Eurychron	Nocturnal	Otherhunters	1
12	Bla_Psp_Dno_Hsh	Large	Spring	Nocturnal	Sheetweb	1
13	Bsm_Peu_Dbo_Hwa	Small	Eurychron	Both	Wandering_web	15
14	Bla_Psp_Dbo_Hgr	Large	Spring	Both	Ground_hunters	1
15	Bla_Peu_Dno_Hgr	Large	Eurychron	Nocturnal	Ground_hunters	1
16	Bme_Peu_Dbo_Hsp	Medium	Eurychron	Both	Spaceweb	2
17	Bla_Pau_Dbo_Hsh	Large	Autumn-Winter	Both	Sheetweb	1
18	Bme_Peu_Dbo_Hwa	Medium	Eurychron	Both	Wandering_web	5
19	Bme_Psu_Dbo_Hwa	Medium	Summer	Both	Wandering_web	1
20	Bla_Psu_Dbo_Hgr	Large	Summer	Both	Ground_hunters	3
21	Bla_Psp_Ddi_Hgr	Large	Spring	Diurnal	Ground_hunters	1
22	Bla_Peu_Dbo_Hsh	Large	Eurychron	Both	Sheetweb	1
23	Bme_Psp_Dbo_Hsh	Medium	Spring	Both	Sheetweb	1
24	Bla_Psu_Dbo_Hor	Large	Summer	Both	Orbweb	1
25	Bsm_Peu_Ddi_Hot	Small	Eurychron	Diurnal	Otherhunters	1
26	Bme_Peu_Dbo_Ham	Medium	Eurychron	Both	Ambush_hunters	2
27	Bla_Peu_Dbo_Hor	Large	Eurychron	Both	Orbweb	1
28	Bme_Peu_Dbo_Hor	Medium	Eurychron	Both	Orbweb	1
29	Bla_Peu_Ddi_Hgr	Large	Eurychron	Diurnal	Ground_hunters	3
30	Bsm_Psu_Dbo_Hgr	Small	Summer	Both	Ground_hunters	1
31	Bsm_Psp_Dbo_Hwa	Small	Spring	Both	Wandering_web	2
32	Bsm_Pau_Dbo_Hwa	Small	Autumn-Winter	Both	Wandering_web	1
33	Bsm_Psu_Dbo_Hsp	Small	Summer	Both	Spaceweb	1
34	Bme_Psp_Dbo_Hwa	Medium	Spring	Both	Wandering_web	1
35	Bla_Psu_Dbo_Ham	Large	Summer	Both	Ambush_hunters	2

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46 **Table S5.** Occurrence frequency (percentage of the plots where the species and FGs are recorded) in  
 47 ancient and recent forests of observed diversity of (i) functional groups of plants (in bold) and plant  
 48 species and (ii) functional entities of spiders (in bold) and spider species. The average observed  
 49 diversity in each forest type is also given, in terms of specific richness and richness in functional  
 50 groups and entities. Overall, there were more plant species and plant functional groups in recent  
 51 forests than in ancient ones, and spiders showed no significant differences of specific richness nor  
 52 functional richness between both forest types. See Table S4 and Figure S1 for description of  
 53 functional groups and entities.

<b>PLANTS</b>			
<b>FG/FE</b>	<b>Species</b>	<b>Ancient forests</b>	<b>Recent woodlands</b>
<b>FG #1</b>	<b>Spring perennials herbs</b>	<b>0,55</b>	<b>0,92</b>
	<i>Euphorbia amygdaloides</i>	0,15	0,67
	<i>Heracleum sphondylium</i>	0,00	0,08
	<i>Lamium galeobdolon</i>	0,05	0,00
	<i>Ranunculus repens</i>	0,00	0,08
	<i>Scrophularia nodosa</i>	0,00	0,08
	<i>Stachys officinalis</i>	0,00	0,08
	<i>Stachys sylvatica</i>	0,00	0,33
	<i>Stellaria holostea</i>	0,45	0,25
	<i>Teucrium scorodonia</i>	0,15	0,17
	<i>Veronica chamaedrys</i>	0,00	0,17
	<i>Vinca minor</i>	0,05	0,00
	<i>Viola reichenbachiana</i>	0,10	0,42
<b>FG #2</b>	<b>Small, mid-spring flowering herbs</b>	<b>0,25</b>	<b>0,75</b>
	<i>Ajuga reptans</i>	0,05	0,58
	<i>Geum urbanum</i>	0,00	0,75
	<i>Hypericum pulchrum</i>	0,25	0,00
	<i>Lysimachia nemorum</i>	0,05	0,00
	<i>Potentilla sterilis</i>	0,00	0,17
<b>FG #3</b>	<b>Vernal geophytes</b>	<b>0,50</b>	<b>1,00</b>
	<i>Anemone nemorosa</i>	0,10	0,08
	<i>Circaea lutetiana</i>	0,00	0,67
	<i>Conopodium majus</i>	0,05	0,17
	<i>Hyacinthoides non-scripta</i>	0,20	0,08
	<i>Listera ovata</i>	0,00	0,33
	<i>Mercurialis perennis</i>	0,00	0,17
	<i>Polygonatum multiflorum</i>	0,35	0,33
	<i>Tamus communis</i>	0,05	0,42
<b>FG #4</b>	<b>Short-lived herbs</b>	<b>0,35</b>	<b>0,75</b>
	<i>Cardamine flexuosa</i>	0,00	0,08
	<i>Digitalis purpurea</i>	0,05	0,08

	<i>Galeopsis tetrahit</i>	0,00	0,08
	<i>Galium aparine</i>	0,00	0,58
	<i>Geranium robertianum</i>	0,00	0,58
	<i>Moehringia trinervia</i>	0,00	0,25
	<i>Oxalis acetosella</i>	0,30	0,00
<b>FG #5 Ferns</b>		<b>1,00</b>	<b>1,00</b>
	<i>Athyrium filix.femina</i>	0,20	0,42
	<i>Blechnum spicant</i>	0,50	0,00
	<i>Dryopteris affinis</i>	0,00	0,50
	<i>Dryopteris carthusiana</i>	0,15	0,08
	<i>Dryopteris dilatata</i>	0,25	0,58
	<i>Dryopteris filix-mas</i>	0,00	0,83
	<i>Polypodium vulgare</i>	0,35	0,08
	<i>Polystichum setiferum</i>	0,00	0,50
	<i>Pteridium aquilinum</i>	1,00	0,67
<b>FG #6 Tall, summer flowering herbs</b>		<b>0,95</b>	<b>0,92</b>
	<i>Agrostis capillaris</i>	0,25	0,00
	<i>Agrostis curtisii</i>	0,05	0,00
	<i>Arrhenatherum elatius</i>	0,10	0,00
	<i>Brachypodium sylvaticum</i>	0,10	0,67
	<i>Carex laevigata</i>	0,05	0,00
	<i>Carex pallescens</i>	0,05	0,00
	<i>Carex pendula</i>	0,05	0,00
	<i>Carex pilulifera</i>	0,55	0,08
	<i>Carex remota</i>	0,00	0,50
	<i>Carex sylvatica</i>	0,15	0,08
	<i>Dactylis glomerata</i>	0,10	0,00
	<i>Deschampsia cespitosa</i>	0,10	0,00
	<i>Holcus lanatus</i>	0,00	0,17
	<i>Holcus mollis</i>	0,60	0,17
	<i>Juncus effusus</i>	0,10	0,08
	<i>Luzula sylvatica</i>	0,15	0,00
	<i>Luzula multiflora</i>	0,05	0,00
	<i>Melica uniflora</i>	0,10	0,00
	<i>Milium effusum</i>	0,35	0,00
	<i>Molinia caerulea</i>	0,30	0,00
	<i>Rumex acetosa</i>	0,00	0,08
	<i>Rumex conglomeratus</i>	0,00	0,08
	<i>Rumex sanguineus</i>	0,00	0,58
	<i>Urtica dioica</i>	0,00	0,42
<b>FG #7 Mesophanerophytes</b>		<b>0,50</b>	<b>1,00</b>
	<i>Betula pendula</i>	0,15	0,00
	<i>Carpinus betulus</i>	0,15	0,50
	<i>Corylus avellana</i>	0,35	0,67
	<i>Fraxinus excelsior</i>	0,00	0,83
	<i>Frangula alnus</i>	0,15	0,00

<i>Populus tremula</i>	0,10	0,08
<i>Taxus baccata</i>	0,05	0,00
<i>Tilia cordata</i>	0,05	0,00
<b>FG #8 Megaphanerophytes</b>	<b>0,95</b>	<b>0,67</b>
<i>Castanea sativa</i>	0,45	0,25
<i>Fagus sylvatica</i>	0,70	0,17
<i>Quercus petraea</i>	0,50	0,00
<i>Quercus rubra</i>	0,05	0,08
<i>Quercus robur</i>	0,30	0,58
<b>FG #9 Schrubs</b>	<b>1,00</b>	<b>1,00</b>
<i>Calluna vulgaris</i>	0,05	0,00
<i>Cornus sanguinea</i>	0,00	0,42
<i>Crataegus monogyna</i>	0,10	0,58
<i>Cytisus scoparius</i>	0,15	0,08
<i>Euonymus europaeus</i>	0,00	0,58
<i>Hedera helix</i>	0,95	1,00
<i>Ilex aquifolium</i>	0,90	0,58
<i>Malus communis</i>	0,05	0,00
<i>Prunus avium</i>	0,05	0,17
<i>Prunus laurocerasus</i>	0,10	0,00
<i>Prunus spinosa</i>	0,10	0,50
<i>Pyrus pyraeaster</i>	0,20	0,00
<i>Ribes rubrum</i>	0,00	0,17
<i>Ruscus aculeatus</i>	0,20	0,17
<i>Sambucus nigra</i>	0,00	0,33
<i>Sorbus aucuparia</i>	0,20	0,00
<i>Viburnum opulus</i>	0,00	0,08
<b>FG #10 Nanophanerophytes</b>	<b>1,00</b>	<b>1,00</b>
<i>Lonicera periclymenum</i>	0,85	0,83
<i>Rosa arvensis</i>	0,05	0,08
<i>Rubus fruticosus</i>	1,00	1,00
<i>Vaccinium myrtillus</i>	0,35	0,00
<b>TOTAL</b>		
<i>Mean FG richness ± se</i>	7.0 ± 1.7	9.2 ± 1.2 *
<i>Mean species richness ± se</i>	16.4 ± 7.0	24.1 ± 8.1 **

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## SPIDERS

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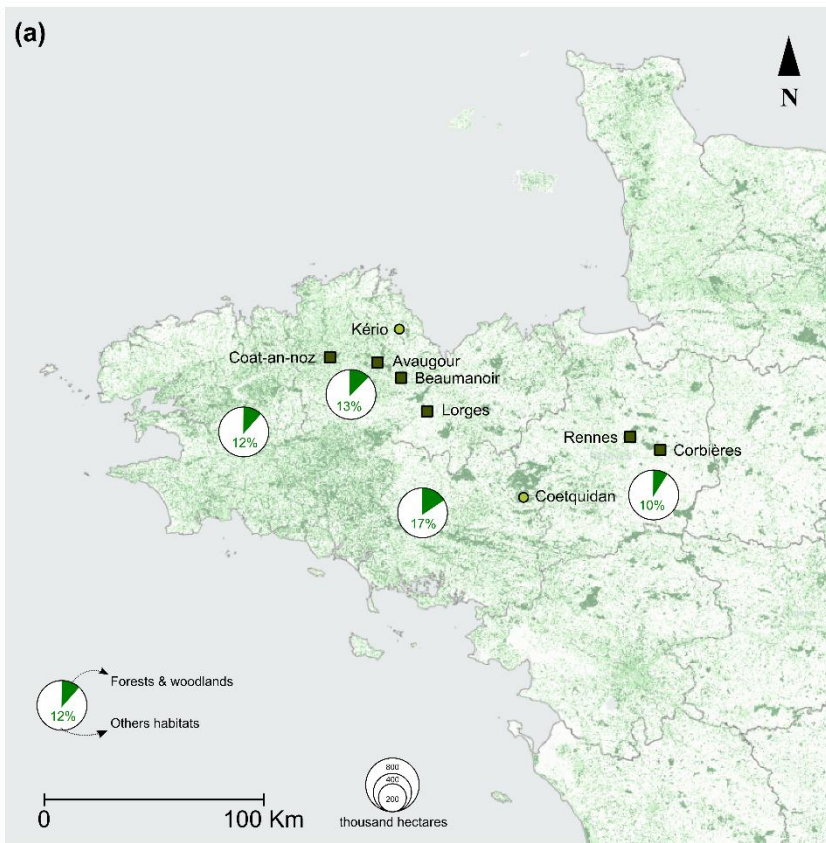
<b>1-Large ground-hunters eurychron both</b>	<b>0,2</b>	<b>0,50</b>
<i>Agroeca brunnea</i>	0,05	0,42
<i>Cicurina cicur</i>	0,05	0,08
<i>Zora spinimana</i>	0,1	0,00
<b>2-Small sheetweb summer both</b>	<b>0,2</b>	<b>0,58</b>
<i>Agyneta ramosa</i>	0,2	0,58
<b>3-Large ground-hunters summer diurnal</b>	<b>0,75</b>	<b>0,75</b>

<i>Alopecosa pulverulenta</i>	0,15	0,00
<i>Pardosa hortensis</i>	0,1	0,00
<i>Pardosa prativaga</i>	0,05	0,00
<i>Pardosa saltans</i>	0,75	0,75
<i>Pirata uliginosus</i>	0,1	0,00
<i>Piratula hygrophila</i>	0,2	0,00
<b>4-Medium ground-hunters eurychron both</b>	<b>0,35</b>	<b>0,00</b>
<i>Apostenus fuscus</i>	0,25	0,00
<i>Scotina celans</i>	0,1	0,00
<b>5-Large ambush-hunters eurychron both</b>	<b>0,05</b>	<b>0,00</b>
<i>Atypus affinis</i>	0,05	0,00
<b>6-Small sheetweb eurychron both</b>	<b>1</b>	<b>1,00</b>
<i>Bathyphantes gracilis</i>	0,05	0,08
<i>Centromerus dilutus</i>	0,35	0,25
<i>Centromerus serratus</i>	0,15	0,08
<i>Diplostyla concolor</i>	0,1	0,83
<i>Hahnia helveola</i>	0,2	0,00
<i>Iberina montana</i>	0,05	0,00
<i>Maro minutus</i>	0,1	0,00
<i>Microneta viaria</i>	1	1,00
<i>Palliduphantes pallidus</i>	0,8	0,67
<i>Tenuiphantes flavipes</i>	0,25	0,75
<b>7-Small sheetweb autumn-winter both</b>	<b>0,8</b>	<b>0,67</b>
<i>Centromerus brevipalpus</i>	<b>0,8</b>	<b>0,58</b>
<i>Hahnia ononidum</i>	0,05	0,00
<i>Saloca diceros</i>	0,05	0,00
<i>Tenuiphantes cristatus</i>	0	0,25
<b>8-Medium sheetweb eurychron both</b>	<b>1</b>	<b>1,00</b>
<i>Centromerus sylvaticus</i>	0,25	0,25
<i>Macrargus rufus</i>	0,9	0,33
<i>Nerienne clathrata</i>	0,1	0,00
<i>Saarestoa abnormis</i>	0,7	0,67
<i>Tenuiphantes tenuis</i>	0,15	0,25
<i>Tenuiphantes zimmermanni</i>	1	1,00
<b>9-Small wandering-web summer both</b>	<b>0,75</b>	<b>0,75</b>
<i>Ceratinella scabrosa</i>	0,3	0,67
<i>Diplocephalus picinus</i>	0,55	0,42
<i>Gongyliellum latebricola</i>	0,1	0,00
<i>Walckenaeria atrotibialis</i>	0,05	0,25
<b>10-Large otherhunters summer nocturnal</b>	<b>0,25</b>	<b>0,08</b>
<i>Clubiona comta</i>	0,25	0,08
<b>11-Large otherhunters eurychron nocturnal</b>	<b>0,15</b>	<b>0,08</b>
<i>Clubiona terrestris</i>	0,15	0,08
<b>12-Large sheetweb spring nocturnal</b>	<b>0,4</b>	<b>0,08</b>
<i>Coelotes terrestris</i>	0,4	0,08
<b>13-Small wandering-web eurychron both</b>	<b>1</b>	<b>1,00</b>



<i>Dicymbium tibiale</i>	0,1	0,33
<i>Diplocephalus latifrons</i>	0	0,58
<i>Erigone atra</i>	0,05	0,00
<i>Gongylidiellum vivum</i>	0,05	0,00
<i>Jacksonella falconeri</i>	0,05	0,00
<i>Micrargus apertus</i>	0,45	0,17
<i>Micrargus herbigradus</i>	0,1	0,50
<i>Monocephalus fuscipes</i>	0,75	0,83
<i>Ostearius melanopygius</i>	0	0,25
<i>Parapelecopsis nemoralis</i>	0,05	0,00
<i>Sintula corniger</i>	0	0,08
<i>Walckenaeria cucullata</i>	0,7	0,00
<i>Walckenaeria cuspidata</i>	0,45	0,00
<i>Walckenaeria nudipalpis</i>	0	0,08
<i>Wiehlea calcarifera</i>	0,05	0,00
<b>14-Large ground-hunters spring both</b>	<b>0</b>	<b>0,08</b>
<i>Drassyllus lutetianus</i>	0	0,08
<b>15-Large ground-hunters eurychron nocturnal</b>	<b>0,65</b>	<b>0,33</b>
<i>Dysdera erythrina</i>	0,65	0,33
<b>16-Medium spaceweb eurychron both</b>	<b>0,5</b>	<b>0,75</b>
<i>Enoplognatha thoracica</i>	0,05	0,00
<i>Robertus lividus</i>	0,5	0,75
<b>17-Large sheetweb autumn-winter both</b>	<b>0,55</b>	<b>0,00</b>
<i>Eratigena picta</i>	0,55	0,00
<b>18-Medium wandering-web eurychron both</b>	<b>0,75</b>	<b>0,33</b>
<i>Gonatium rubellum</i>	0,1	0,00
<i>Oedothorax apicatus</i>	0	0,08
<i>Walckenaeria acuminata</i>	0,5	0,25
<i>Walckenaeria incisa</i>	0,05	0,08
<i>Walckenaeria obtusa</i>	0,55	0,08
<b>19-Medium wandering-web summer both</b>	<b>0,05</b>	<b>0,00</b>
<i>Gongylidium rufipes</i>	0,05	0,00
<b>20-Large ground-hunters summer both</b>	<b>0,25</b>	<b>0,08</b>
<i>Haplodrassus silvestris</i>	0,2	0,00
<i>Trachyzelotes pedestris</i>	0,05	0,00
<i>Zelotes apricorum</i>	0,05	0,08
<b>21-Large ground-hunters spring diurnal</b>	<b>0,05</b>	<b>0,00</b>
<i>Hygrolycosa rubrofasciata</i>	0,05	0,00
<b>22-Large sheetweb eurychron both</b>	<b>0,05</b>	<b>0,00</b>
<i>Labulla thoracica</i>	0,05	0,00
<b>23-Medium sheetweb spring both</b>	<b>0</b>	<b>0,08</b>
<i>Linyphia hortensis</i>	0	0,08
<b>24-Large orbweb summer both</b>	<b>0,1</b>	<b>0,08</b>
<i>Metellina mengei</i>	0,1	0,08
<b>25-Small otherhunters eurychron diurnal</b>	<b>0,05</b>	<b>0,00</b>
<i>Neon reticulatus</i>	0,05	0,00

<b>26-Medium ambush-hunters eurychron both</b>	<b>0,15</b>	<b>0,33</b>
<i>Ozyptila praticola</i>	0,05	0,08
<i>Ozyptila trux</i>	0,1	0,33
<b>27-Large orbweb eurychron both</b>	<b>0</b>	<b>0,08</b>
<i>Pachygnatha clercki</i>	0	0,08
<b>28-Medium orbweb eurychron both</b>	<b>0,05</b>	<b>0,00</b>
<i>Pachygnatha degeeri</i>	0,05	0,00
<b>29-Large ground-hunters eurychron diurnal</b>	<b>0,6</b>	<b>0,50</b>
<i>Pardosa pullata</i>	0,1	0,00
<i>Trochosa ruricola</i>	0,05	0,00
<i>Trochosa terricola</i>	0,5	0,50
<b>30-Small ground-hunters summer both</b>	<b>0,05</b>	<b>0,00</b>
<i>Phrurolithus festivus</i>	0,05	0,00
<b>31-Small wandering-web spring both</b>	<b>0,1</b>	<b>0,08</b>
<i>Pocadicnemis pumila</i>	0,05	0,00
<i>Walckenaeria dysderoides</i>	0,05	0,08
<b>32-Small wandering-web autumn-winter both</b>	<b>0,15</b>	<b>0,00</b>
<i>Tapinocyba mitis</i>	0,15	0,00
<b>33-Small spaceweb summer both</b>	<b>0</b>	<b>0,33</b>
<i>Theridion mystaceum</i>	0	0,33
<b>34-Medium wandering-web spring both</b>	<b>0,15</b>	<b>0,08</b>
<i>Walckenaeria mitrata</i>	0,15	0,08
<b>35-Large ambush-hunters summer both</b>	<b>0,1</b>	<b>0,00</b>
<i>Xysticus cristatus</i>	0,05	0,00
<i>Xysticus luctator</i>	0,05	0,00
<b>TOTAL</b>		
Mean FE richness $\pm$ se	11.3 $\pm$ 2.9	9.7 $\pm$ 1.7
Mean species richness $\pm$ se	18.8 $\pm$ 6.0	16.6 $\pm$ 3.3



55

56 **Figure S1** Map of western France with the 8 study sites. In background, the forest density within the  
 57 study area, which is overall homogeneous within the region. The circle charts illustrate the overall  
 58 proportion of forests within the four counties of the study region (source: IFN, 2010). Ancient forests  
 59 are represented by dark green squares and recent woodlands by clear green circles.

60 **Reference:**

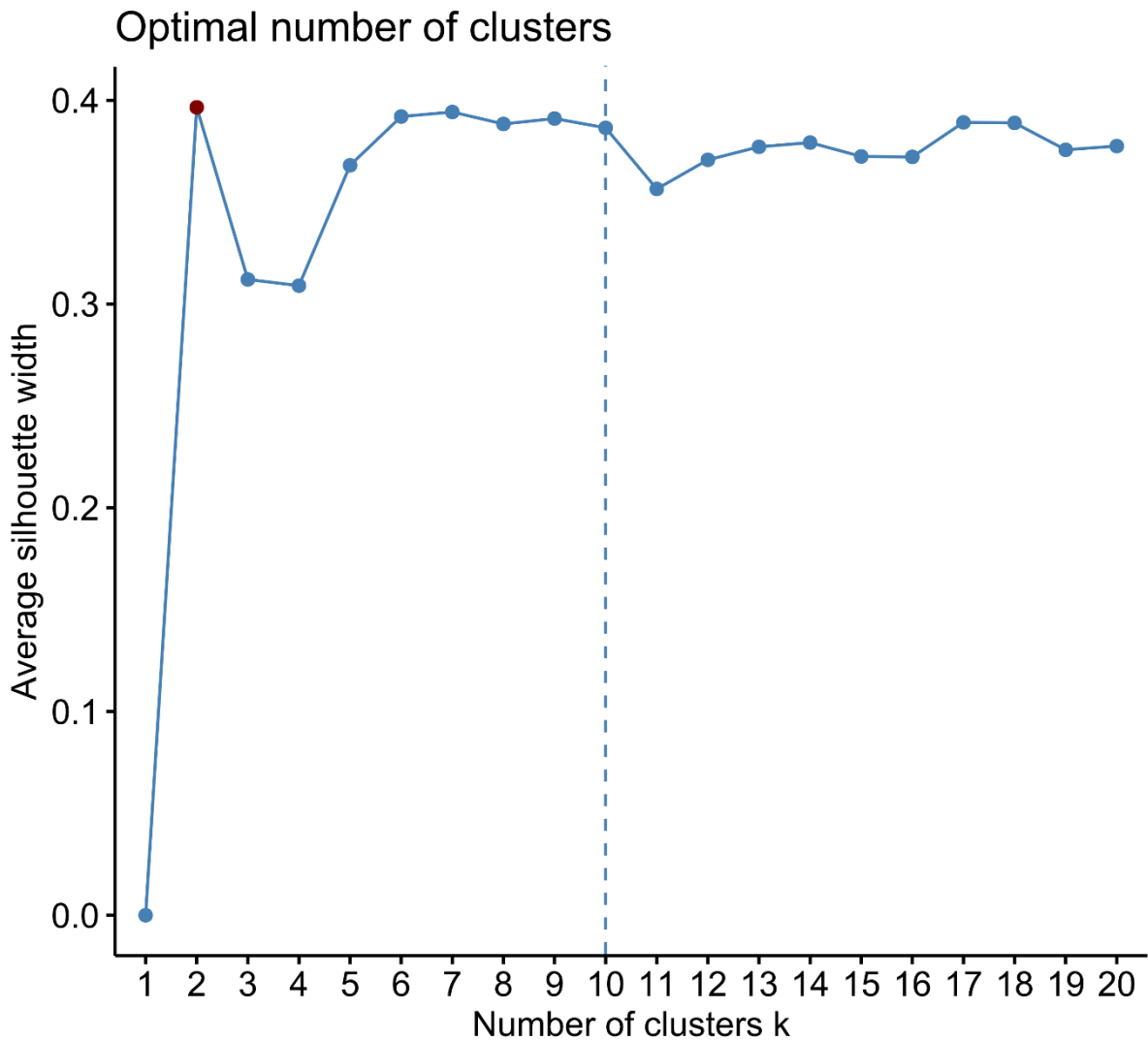
61 National Forest Inventory (IFN), 2017. La forêt française. Les résultats issus des campagnes  
 62 d'inventaire 2005 à 2009. Les résultats pour la région Bretagne.

63

64

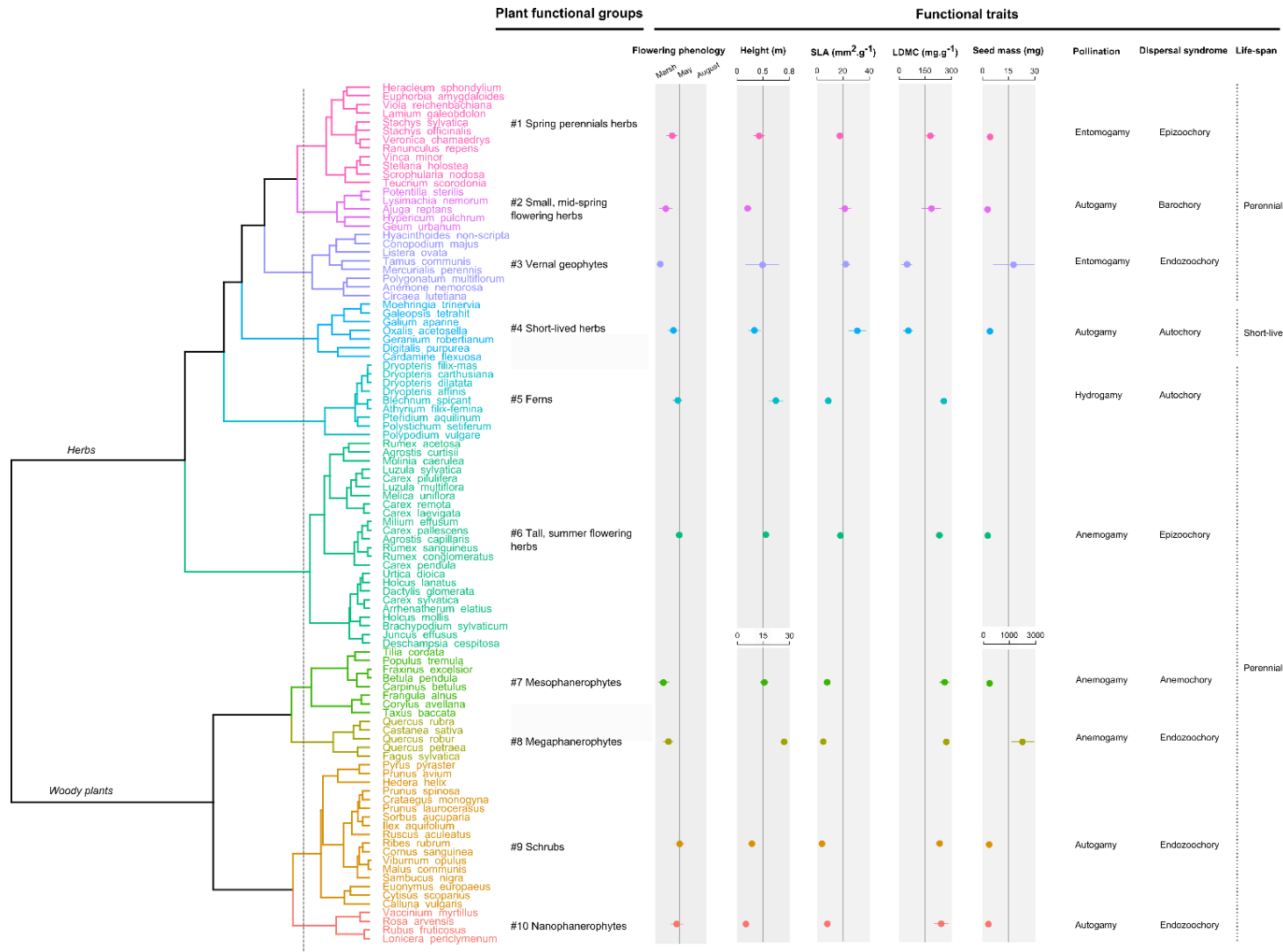
65

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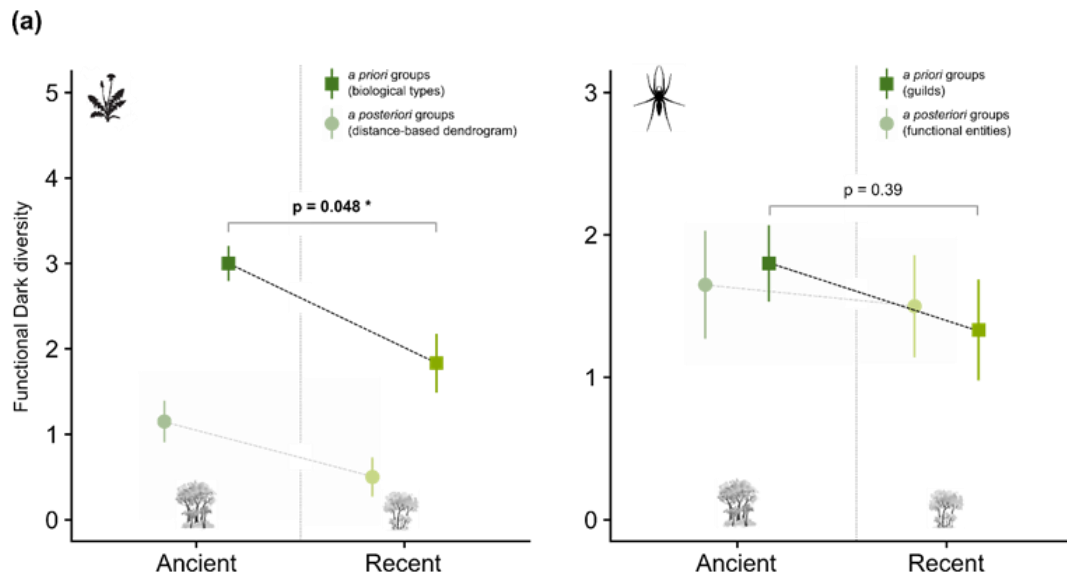


67

68 **Figure S2.** Number of optimal clusters  $k$  using the average silhouette method. The optimal number of  
 69 clusters  $k$  is the one that maximise the average silhouette width over a range of possible values for  $k$ .  
 70 The higher the value, the better the clustering quality, indicating a maximization of the functional  
 71 similarity within groups and of the dissimilarity between groups. Here, the higher value for  $k$  is 2 (red  
 72 circle). However, this number of clusters is totally unsatisfactory to correctly describe the functional  
 73 variation within our species pool, so we visually refined the number of clusters using the  
 74 dendrogram. We wanted a number of clusters that allows a precise and discriminant characterization  
 75 of functional variation, so we chose the maximum number of clusters that allows to maintain the  
 76 highest average silhouette width (very close of those obtain with two groups). We hence selected 10  
 77 clusters, since beyond this number, we see a gap indicating that the clustering quality decreases.



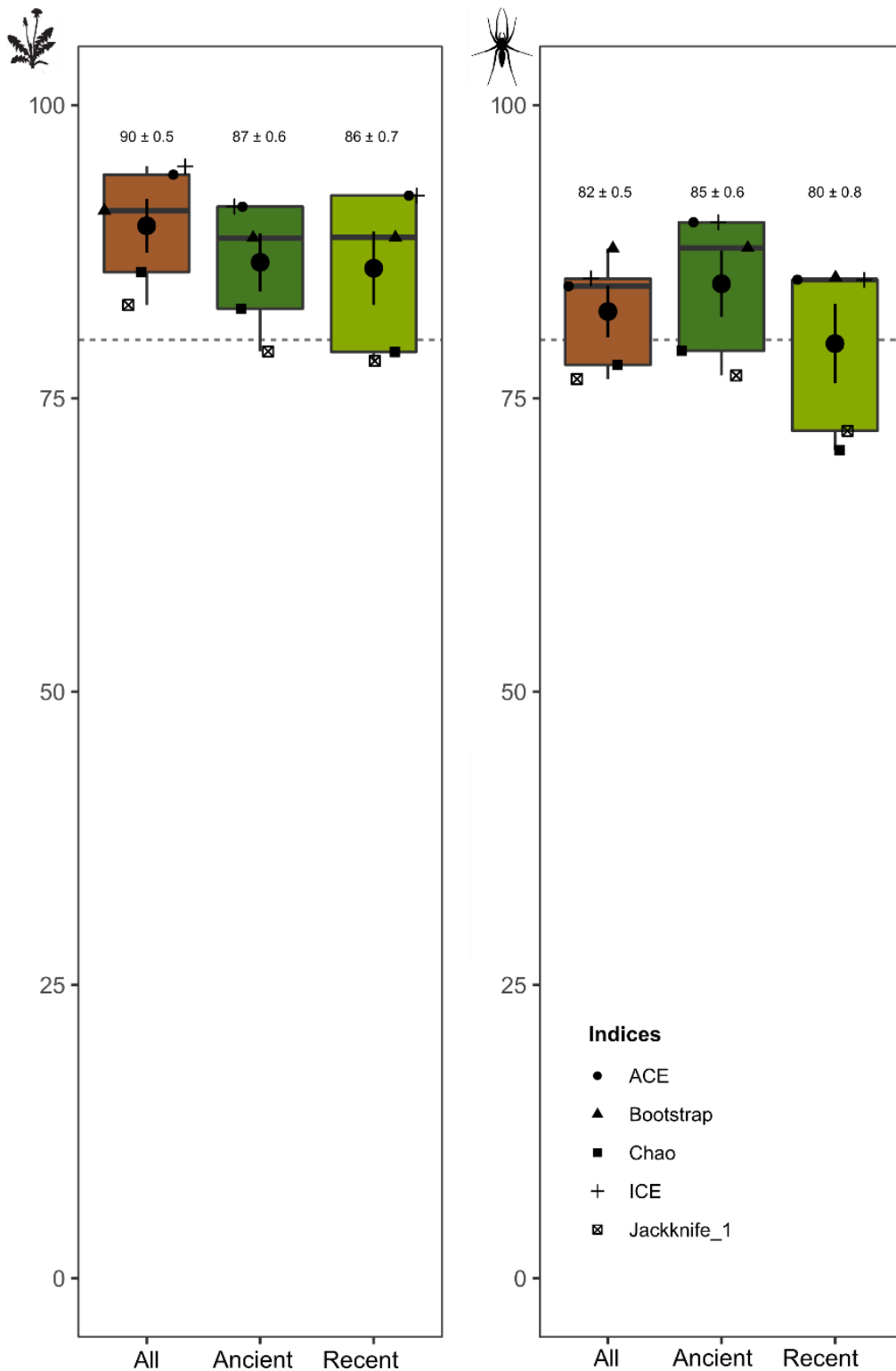
**Figure S3.** Functional groups of plant species identified with the dendrogram method (see Materials and Methods for more details). For each functional group, the mean of continuous traits and the dominant modality of categorical traits are given.



(b)

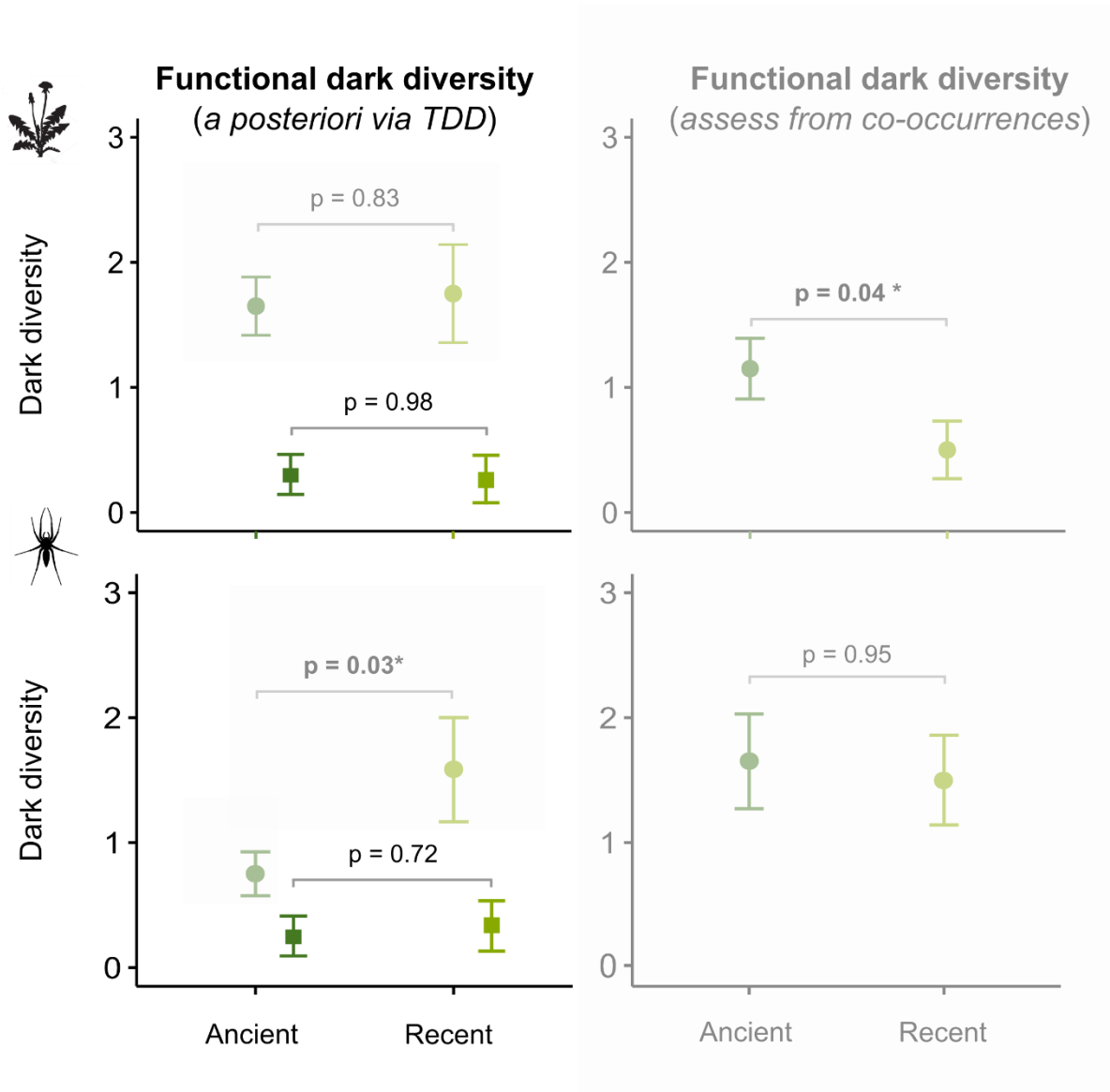
	Functional group	n species	Occurrence frequency in DD <sub>Ancient</sub> (%)	Occurrence frequency in DD <sub>Recent</sub> (%)
Plants	Bulb geophytes	4	60.0	58.3
	Chamaephytes	4	45.0	25.0
	Deciduous mesophanerophytes	11	55.0	8.3
	Erect hemicryptophytes	6	65.0	8.3
	Evergreen phanerophytes	3	10.0	16.7
	Liana phanerophytes	3	0.0	0.0
	Megaphanerophytes	14	5.0	0.0
	Rhizome geophytes	9	0.0	0.0
	Rosette hemicryptophytes	7	45.0	25.0
	Runner hemicryptophytes	10	10.0	25.0
	Therophytes	4	5.0	16.7
	Tufted hemicryptophytes	24	0.0	0.0
Spiders	Ambush hunters	5	60	50.0
	Ground hunters	21	0	0.0
	Orb web	3	40	16.7
	Other hunters	3	35	58.3
	Sheet web	25	0	0.0
	Space web	3	45	8.3
	Wandering web	29	0	0.0

**Figure S4.** Comparisons between ancient and recent forests of (a) functional dark diversity and (b) its composition (i.e. the occurrence frequency of species and functional groups in the dark diversity), based on functional groups defined *a priori* (Julve's groups for plants and Cardoso's guilds for spiders). Results are very similar to those obtained with groups defined *a posteriori* (Figure 4 and in light grey here): functional dark diversity is higher in ancient forests for plant communities (and with a different composition), and functional dark diversity is equivalent between both forest types for spiders (also with a different composition).



**Figure S5.** Percentage of sample coverage for the overall dataset (brown), for ancient forests (dark green), and for recent woodlands (clear green), for both plants and spiders. Sample coverage is calculated as the ratio between observed and estimated richness. We used several indices, each one of them estimating richness with a different method (Soberón et al., 2007). Average sample coverage corresponds to the mean of the 5 indices selected. Graphs show the boxplots and the mean  $\pm$  the standard error, and dashed line represent the threshold of 80% of sample coverage.

- Functional dark diversity whose functional redundancy with observed diversity has been controlled
- raw Functional dark diversity (previous calculus which treat all species from all groups)



**Figure S6.** Comparisons between ancient and recent forests for functional dark diversity assessed *a posteriori*, with (circles) or without (squares) the functional groups that are redundant among observed and dark diversity (see "Community 2" in Fig. 1 for a conceptual view). Results shown in Figure 4 are kept for comparison (in light grey). We see that, for spiders, when functional redundancy among observed and dark diversity is taken into account during indirect estimation of functional dark diversity (i.e. *a posteriori* assessment, from taxonomic dark diversity), there is no difference between forest types anymore, and the pattern become similar to those of functional dark diversity calculated directly (i.e. *a priori* assessment from co-occurrence of functional groups). For plants, the consideration of functional redundancy during indirect estimation of functional dark diversity does not change anything, and the pattern is still different from that of functional dark diversity calculated directly, probably due to the detection of functional features hosted by rare species.



