Supplementary Material

Complementary effects of species abundances and ecological neighborhood on the occurrence of fruit-frugivore interactions

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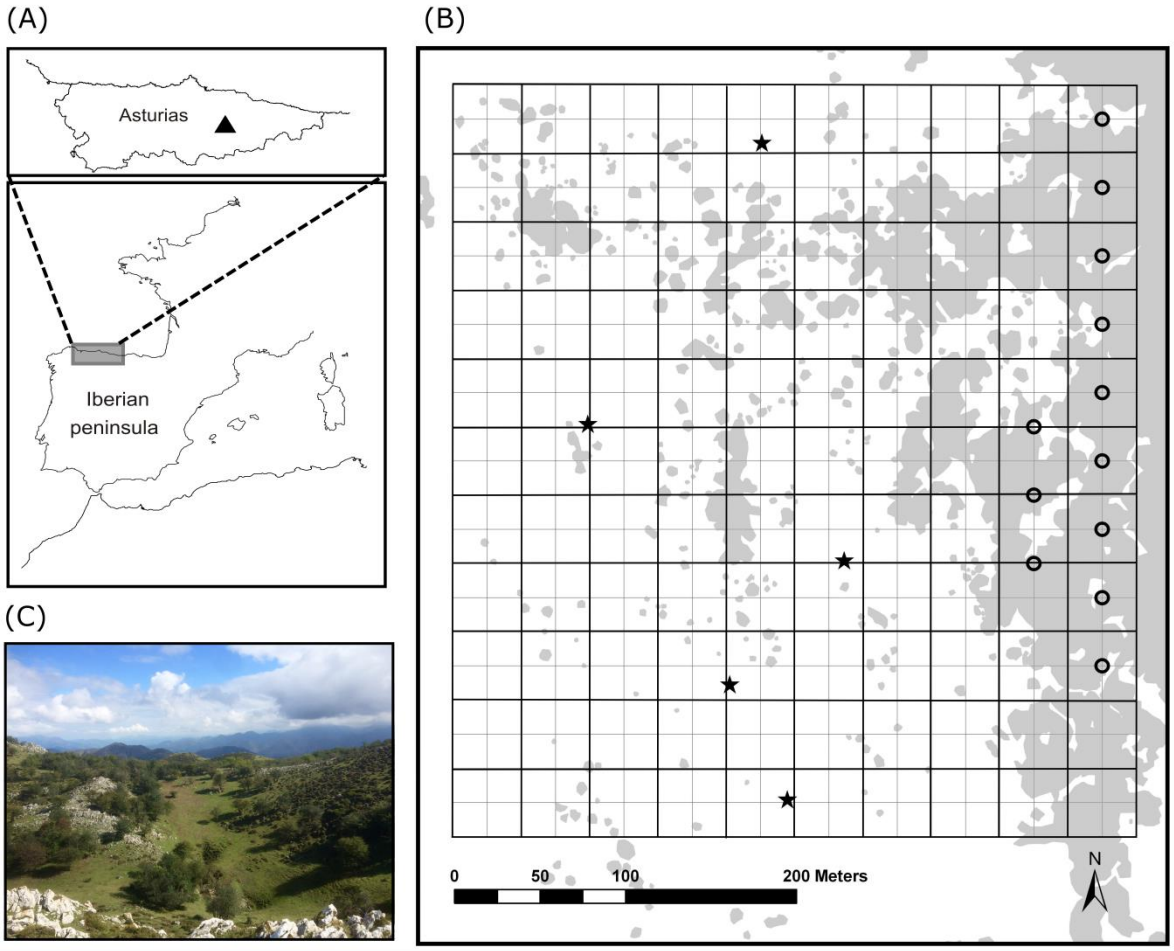
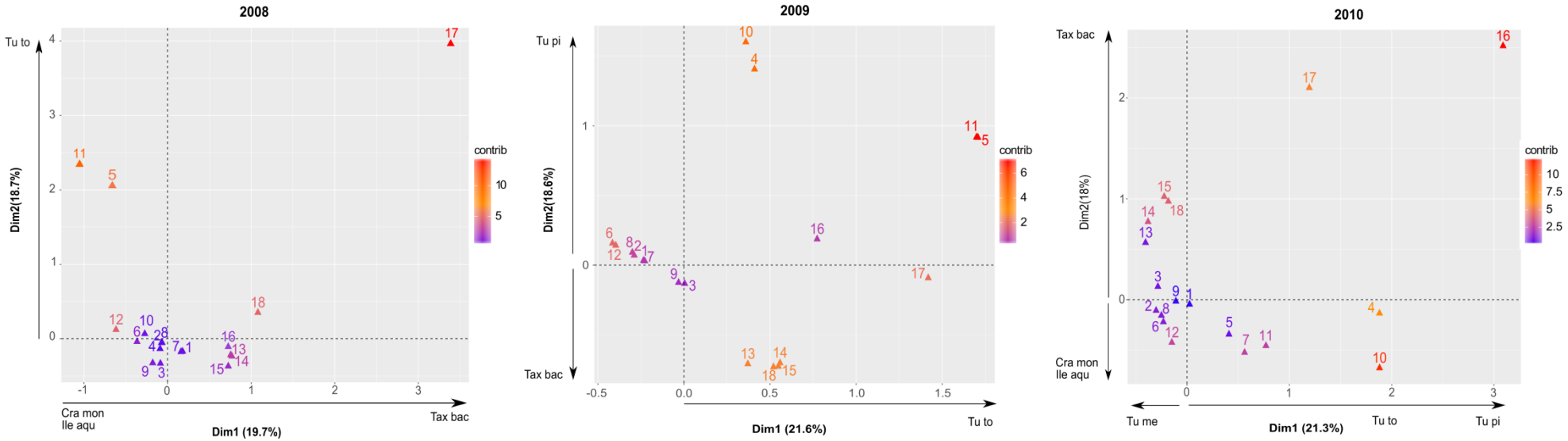
Supplementary Figures and Tables



Supplementary Figure 1. **(A)** Location of the study site. **(B)** Map of the study plot representing forest cover (gray area) in the 110, 40 x 40 m sampling blocks depicted by black grid (original 440 cells depicted by grey), as well as the vantage and point-count positions for bird observation (black stars and circles, respectively). (C) Partial view of the study plot showing some secondary forests together with a deforested matrix composed by heathland, pastures and rocky outcrops.

Supplementary Table 1. Results of the Correspondence Analyses (CA) based on the matrix of presence/absence of 18 pairwise fruit-frugivore interactions (Inter. ID) in each of the 110 blocks in the study plot. Scores of each interaction for the dimensions 1 (Dim1) and 2 (Dim2), as well as the contribution (proportion of inertia explained) of each interaction are shown for each sampling year. Plant species abbreviations: Ile aqu: *Ilex aquifolium*; Cra mon: *Crataegus monogyna*; Tax bac: *Taxus baccata*. Bird species abbreviations: Tu il: *Turdus iliacus*; Tu me: *Turdus merula*; Tu ph: *Turdus philomelos*; Tu pi: *Turdus pilaris*; Tu to: *Turdus torquatus*; Tu vi: *Turdus viscivorus* (see Fig S2 for graphical results of the CA).

		2008			**2009**			**2010**		
Inter. code	Inter. ID	Dim 1	Dim 2	Contribution	Dim 1	Dim 2	Contribution	Dim 1	Dim 2	Contribution
1	Tu il – Ile aqu	0.179	-0.169	0.464	-0.228	0.030	0.464	0.025	-0.046	0.009
2	Tu me – Ile aqu	-0.066	-0.051	0.070	-0.289	0.071	0.855	-0.302	-0.108	1.131
3	Tu ph – Ile aqu	-0.086	-0.332	0.624	0.004	-0.132	0.139	-0.284	0.129	0.768
4	Tu pi – Ile aqu	-0.090	-0.135	0.150	0.410	1.406	4.068	1.881	-0.135	6.287
5	Tu to – Ile aqu	-0.663	2.063	5.827	1.699	0.918	7.074	0.410	-0.343	0.674
6	Tu vi – Ile aqu	-0.347	-0.040	1.166	-0.415	0.157	2.174	-0.231	-0.221	1.103
7	Tu il – Cra mon	0.160	-0.175	0.440	-0.230	0.034	0.456	0.563	-0.524	2.670
8	Tu me – Cra mon	-0.074	-0.055	0.085	-0.300	0.091	0.897	-0.250	-0.156	1.061
9	Tu ph – Cra mon	-0.178	-0.325	0.803	-0.031	-0.125	0.132	-0.109	-0.016	0.112
10	Tu pi – Cra mon	-0.273	0.067	0.490	0.359	1.601	4.643	1.881	-0.677	11.781
11	Tu to – Cra mon	-1.050	2.335	10.456	1.699	0.918	7.074	0.771	-0.456	2.524
12	Tu vi – Cra mon	-0.617	0.122	4.629	-0.396	0.142	1.894	-0.148	-0.424	2.820
13	Tu il – Tax bac	0.770	-0.236	2.645	0.371	-0.709	2.651	-0.405	0.565	0.856
14	Tu me – Tax bac	0.757	-0.223	2.650	0.558	-0.701	3.323	-0.381	0.772	3.497
15	Tu ph – Tax bac	0.726	-0.369	1.528	0.548	-0.726	3.568	-0.223	1.022	4.940
16	Tu pi – Tax bac	0.726	-0.107	1.240	0.773	0.187	0.546	3.088	2.516	12.468
17	Tu to – Tax bac	3.383	3.960	14.433	1.419	-0.092	2.091	1.195	2.101	5.740
18	Tu vi – Tax bac	1.081	0.352	4.811	0.520	-0.731	3.607	-0.182	0.974	4.248



Supplementary Figure 2. Graphical results of the Correspondence Analyses (CA) on the presence/absence of 18 pairwise fruit-frugivore interactions in different years. The cumulative variance explained by the eigenvectors considering the principal dimensions (i.e. Dim1 and Dim2) was 38.36%, 40.22% and 39.34% in 2008, 2009 and 2010 respectively. The color scale represents the contribution of each pairwise interaction to the definition of the dimensions and is proportional to the distance of each interaction from the centroid (marked by the dashed lines). The biological meaning of CA factors is depicted with black arrows along the x and y axes. They represent the gradients of occurrence of certain plant and bird species in the interactions, and hence show global trends of variation regarding the more important species in those interactions, and their positive or negative sign. For example, in 2009, the y-axis represents those interactions where *Turdus pilaris* was abundant (positive y-axis), or where *Taxus baccata* was scarce (negative y-axis). In the same way, positive values of the x-axis involved interactions where *Turdus torquatus* was frequent. See Table S1 for the equivalence of species codes.

Supplementary Table 2. Results of Kendall's tests of spatial concordance across years in the distribution of pairwise interactions in the study plot, distinguishing an overall test (a) and *a posteriori* tests (b) assessing the contribution of individual year under test to the overall concordance (*W* per year). The mean values of the Spearman correlations between the year under test and all the other years are also shown. P= permutational probability, based upon 1000 random permutation. *Reject H_0 at α=0.05

(a) Overall test of the W statistic.

H_0: the spatial distribution of interactions of the three years are not concordant with one another

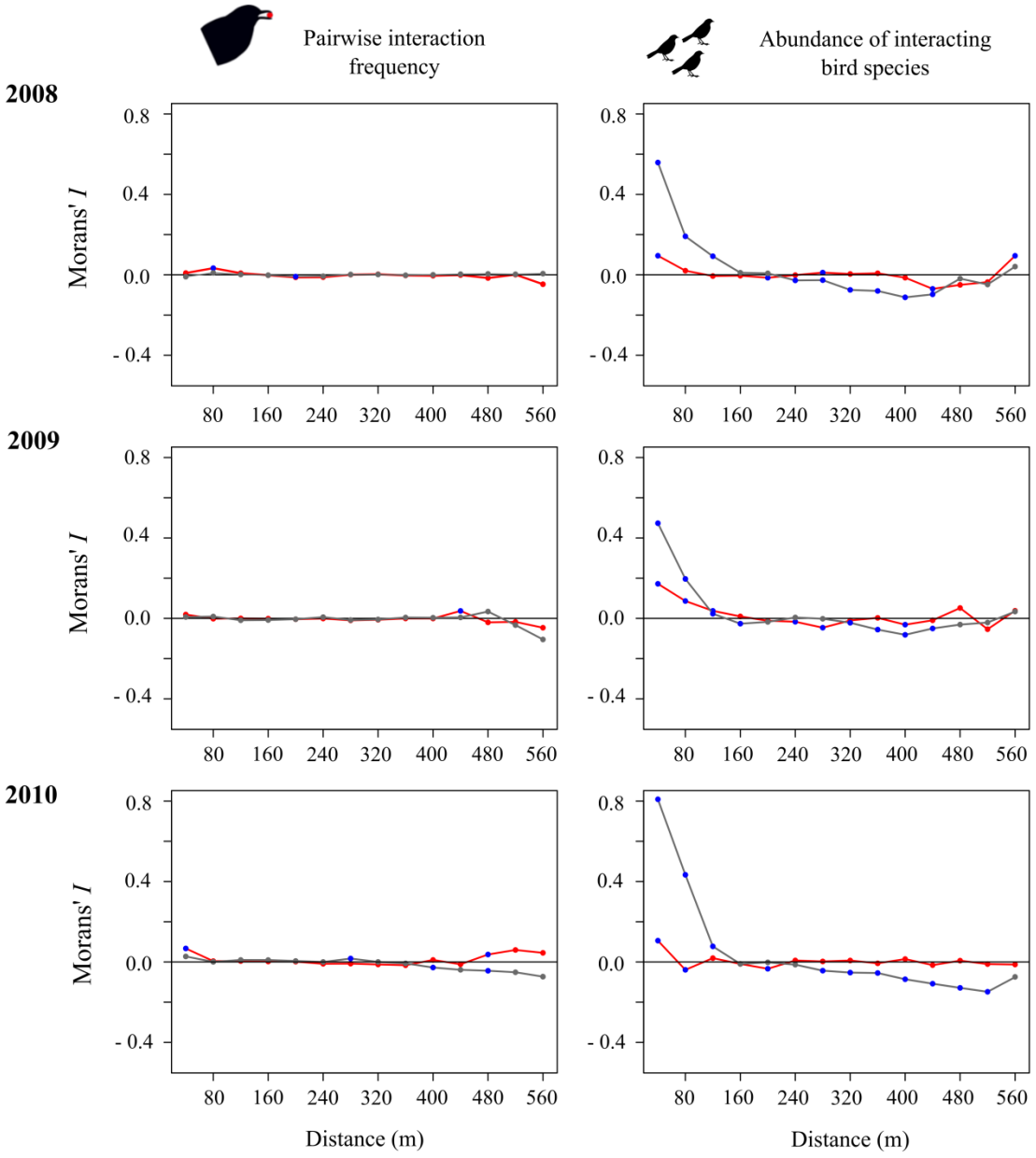
Kendall's *W*=0.45

Friedman's chi-square=95.2 P=0.006*

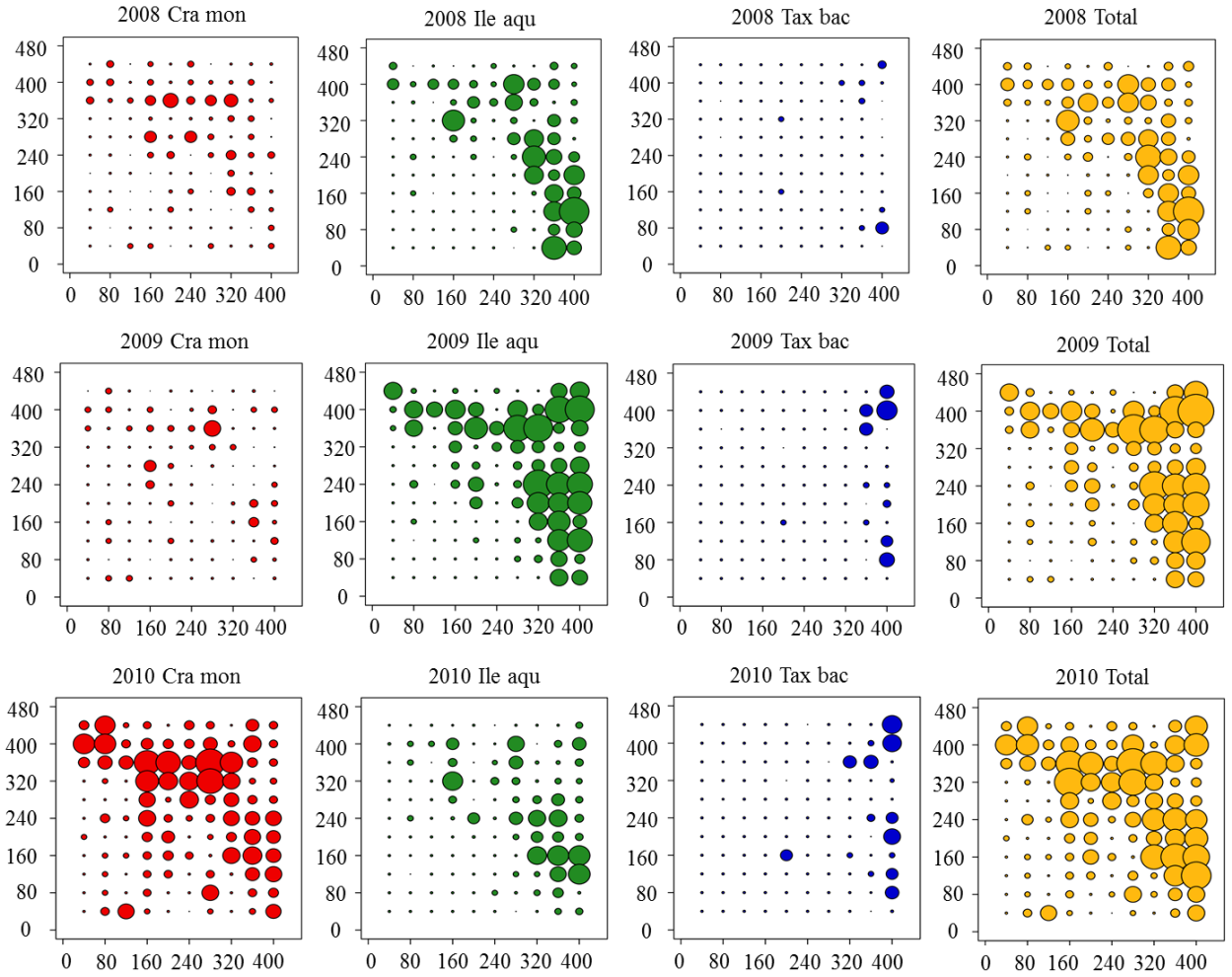
(b) A posteriori tests

H_0: the spatial distribution of interactions this year is not concordant with the other two

Year	Spearman mean	*W* per year	P
2008	0.205	0.470	0.026
2009	0.200	0.467	0.013
2010	0.128	0.418	0.096



Supplementary Figure 3. Correlograms showing Moran´s *I* spatial autocorrelation values as a function of the distance between blocks of the study plot for three different years (upper, middle and lower panels). Panels on the left describe the residuals of the models considering pairwise interaction frequency (based on fruit consumption) in each block as the response variable (in red). Panels on the right correspond to residuals of models considering the abundance of the interacting bird species in each block as the response variable (also in red). We also included the correlograms of the raw data for each response variable (in grey). Filled blue circles represent significant Moran's *I* values ($p < 0.05$ after a permutation test).



Supplementary Figure 4. Abundance and spatial distribution of fruits of the tree species under study (red: *Crataegus monogyna*; green: *Ilex aquifolium*; blue: *Taxus baccata*; yellow: sum of the three species) across the study plot during three sampling years (2008, 2009 and 2010). Dots represent the centroids of each block and their size is proportional to the number of fruits per block. X and Y axes represents the dimensions of the plot in meters.