

SUPPORTING INFORMATION

Biodiversity as the source of heterospecific social information: the effect on territory selection in the marsh warbler

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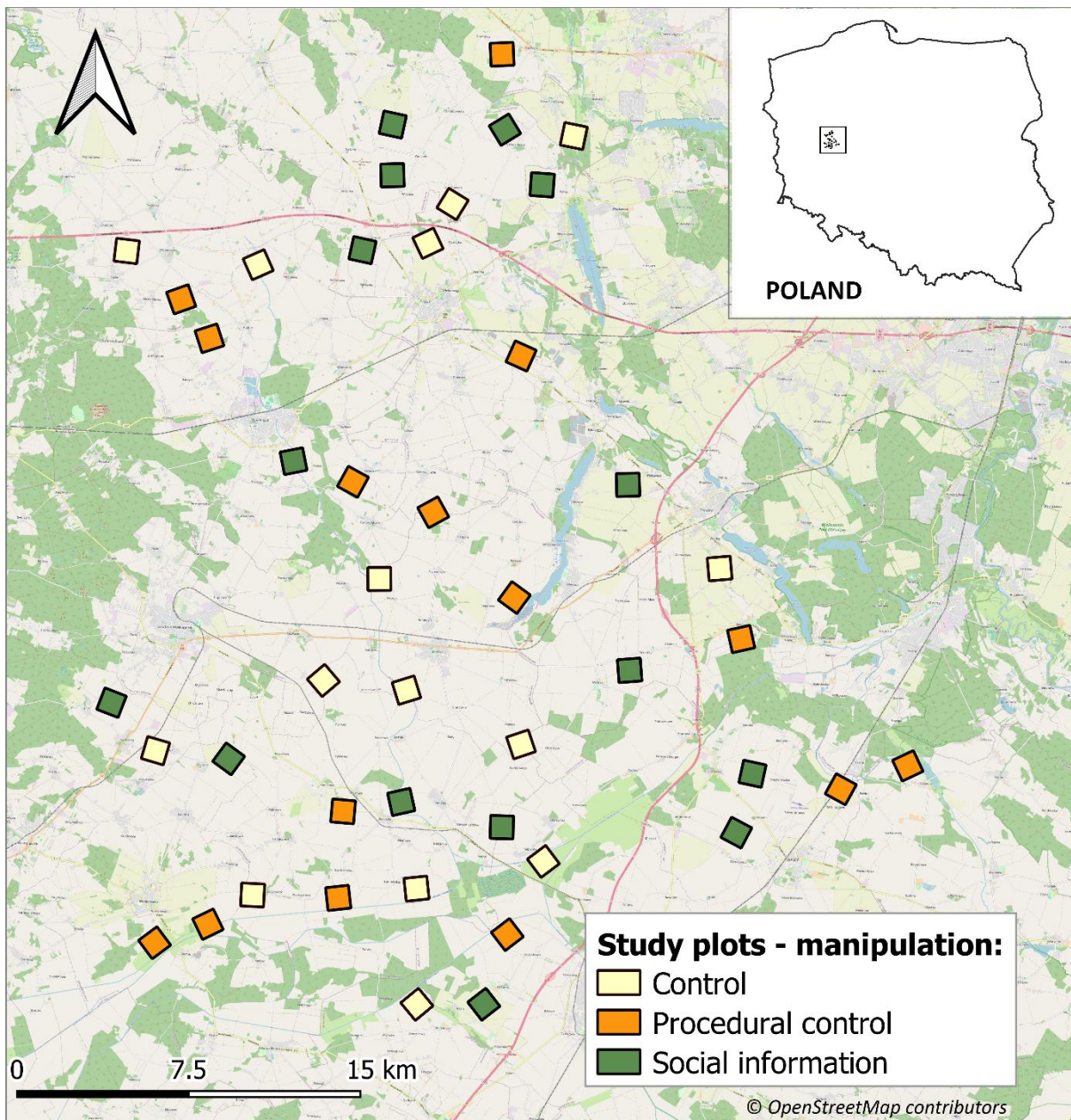


Figure S1. Location of study plots in Poland, along with the division into types of experimental manipulation (broadcast type). Map background: OpenStreetMap contributors (2025)

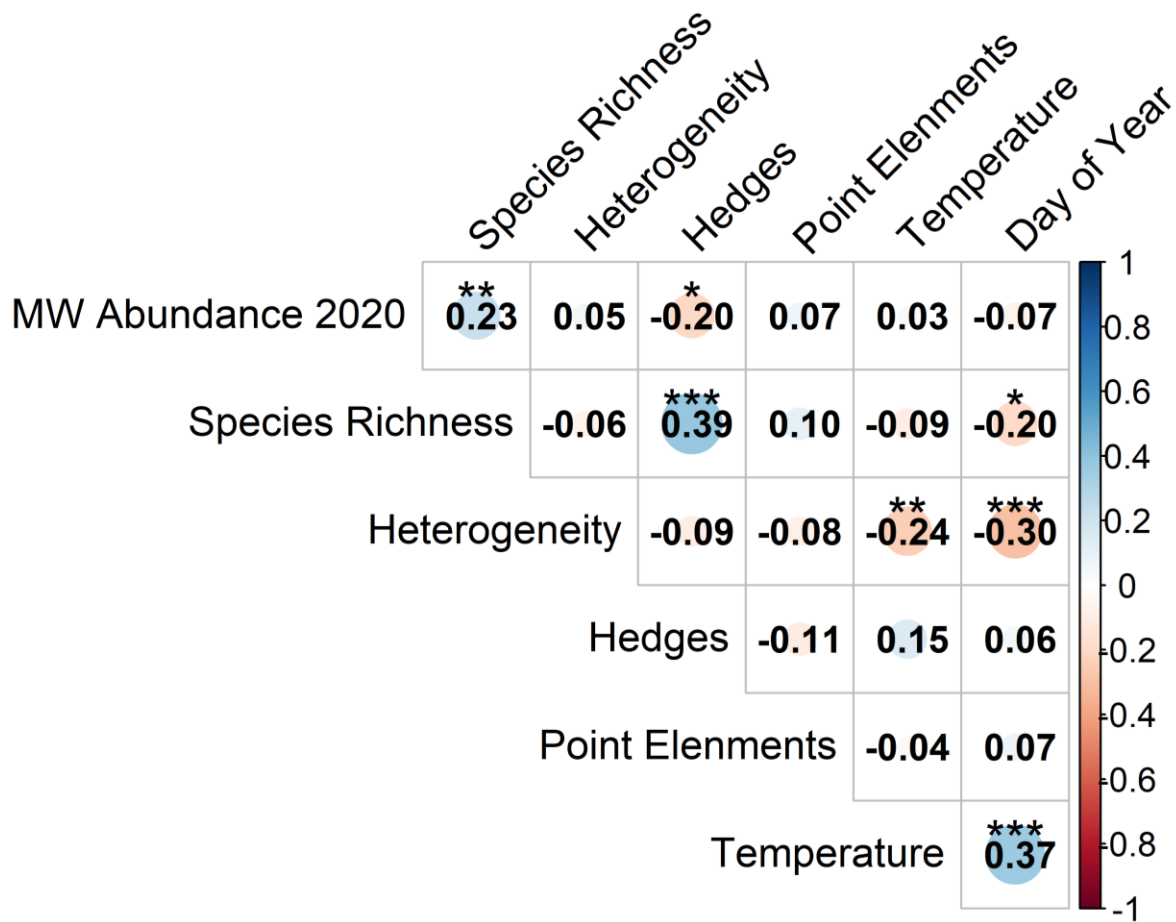


Figure S2. Spearman's rank correlation matrix for the continuous variables included as predictors in the Generalized Additive Models (GAM). Asterisks denote the level of statistical significance: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. The color gradient, ranging from blue (positive) to red (negative), illustrates the direction and strength of the associations.

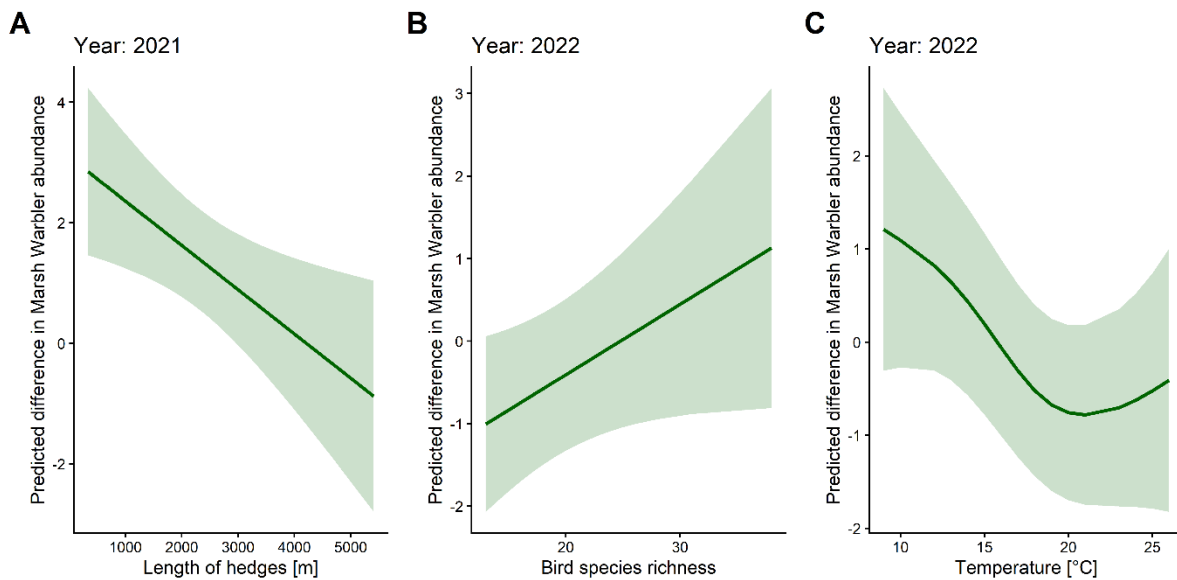


Figure S3. Prediction plots illustrating the significant effect of continuous environmental variables on annual change in marsh warbler abundance. Results were obtained from separate annual models (GAM2021, GAM2022). The y-axis represents the predicted numerical difference in abundance relative to the pre-treatment baseline (2020). (A) In the first year after the experiment (2021), population change was negatively correlated with total hedge length. (B) In the second year after the experiment (2022), abundance change was positively associated with overall bird species richness and (C) showed a significant nonlinear response to ambient temperature. Solid green lines represent estimated marginal effects, and shaded areas indicate 95% confidence intervals.

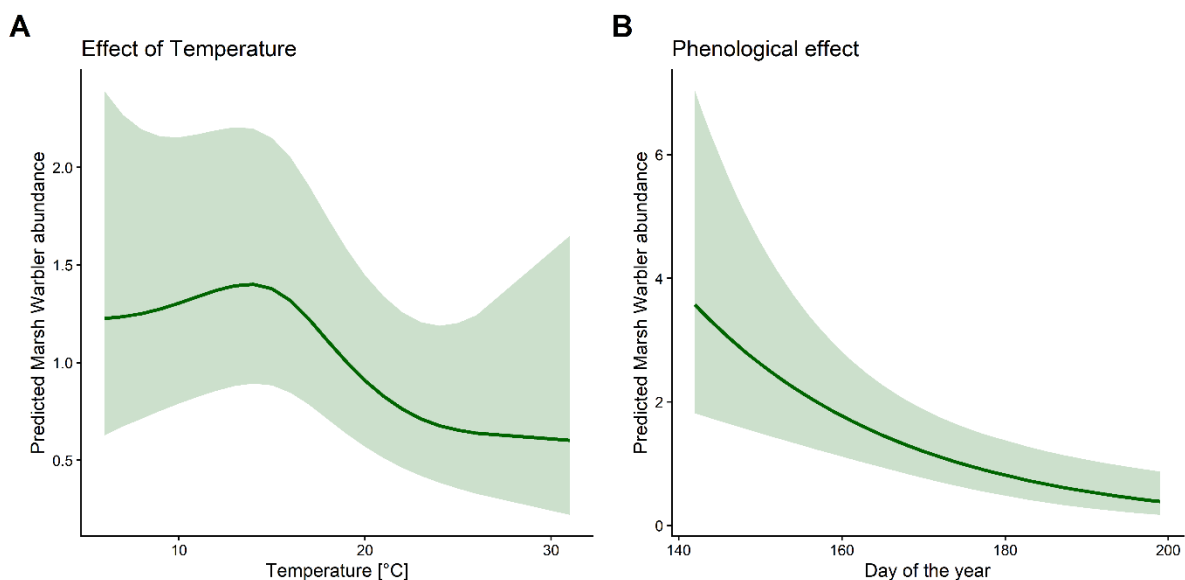


Figure S4. Predicted marginal effects of significant continuous temporal and environmental variables on marsh warbler abundance, based on the Generalized Additive Model (GAM1). The plots display the non-linear relationship between the predicted bird abundance and (A) ambient temperature [°C] and (B) survey day of the year. Solid lines represent the predicted values averaged over all other model predictors, and shaded ribbons denote the 95% confidence intervals.

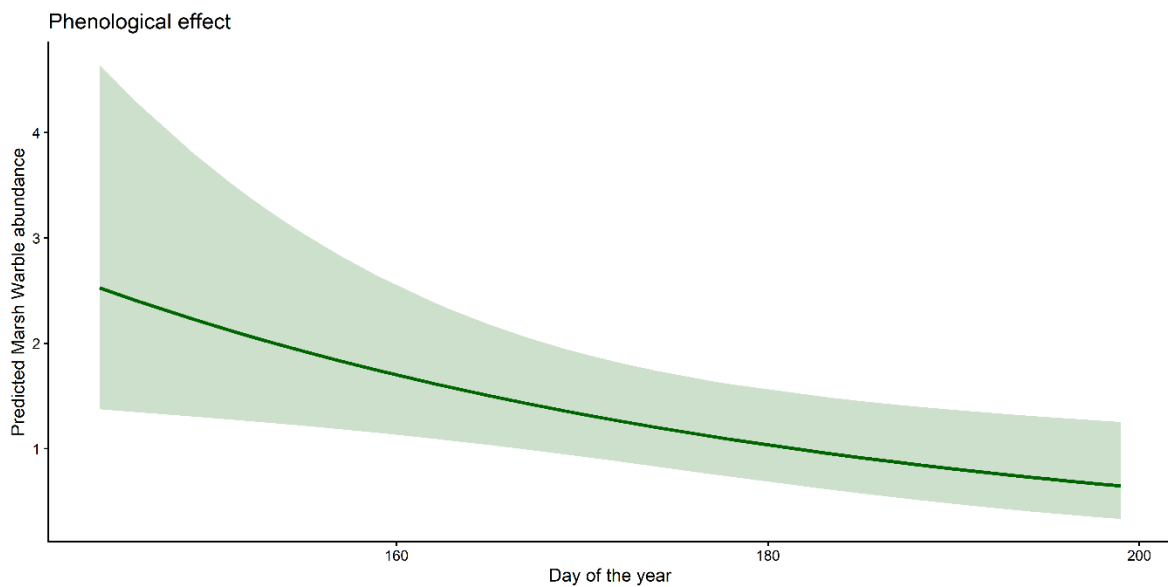


Figure S5. Predicted non-linear phenological effect on marsh warbler detectability and abundance based on the (GAM2) model. The adjusted prediction plot illustrates the within-season dynamics as a function of the survey day of the year, with all other model predictors held constant. The solid line represents the predicted values, and the shaded area indicates the 95% confidence interval.

Table S1. Summary statistics of bird counts across all study plots by year

	Mean	SD	SE	Median	Min	Max	Range
Year: 2020							
Marsh warbler abundance	1.8	1.8	0.3	1	0	6	6
Species count (excl. marsh warbler)	21.2	5.6	0.8	21	11	38	27
Overall abundance	125.3	50.2	7.5	119	56	262	206
Overall abundance (excl. marsh warbler)	123.5	49.9	7.4	115	53	258	205
Year: 2021							
Marsh warbler abundance	3.4	3.2	0.5	3	0	12	12
Species count (excl. marsh warbler)	23.8	5.5	0.8	23	15	39	24
Overall abundance	176.3	89.4	13.3	162	30	437	407
Overall abundance (excl. marsh warbler)	173.0	88.3	13.2	162	30	436	406
Year: 2022							
Marsh warbler abundance	1.2	1.8	0.3	0	0	7	7
Species count (excl. marsh warbler)	20.5	5.2	0.8	20	13	38	25
Overall abundance	147.4	123.0	18.3	131	31	816	785
Overall abundance (excl. marsh warbler)	146.2	122.9	18.3	128	31	816	785

Table S2. Summary of annual models (GAM2020, GAM2021, GAM2022) representing the baseline (abundance in 2020) and subsequent changes in abundance of the marsh warbler relative to the base year 2020 (2020 - 2021, 2020 - 2022). Significant effects ($p < 0.05$) are marked in bold.

Explanatory variables	GAM 2020		GAM 2021		GAM 2022	
	Est (SE) / edf	z / χ^2	Est (SE) / edf	z / χ^2	Est (SE) / edf	z / χ^2
<i>Parametric coefficients</i>						
Intercept	0.620 (0.187)***	3.322	2.148 (0.556)***	3.862	-0.756 (0.379)*	-1.998
Broadcast: PC	0.357 (0.241)	1.481	-0.865 (0.798)	-1.083	-1.034 (0.527)*	-1.962
Broadcast: SI	-0.926 (0.354)**	-2.614	-1.122 (0.812)	-1.382	1.370 (0.565)*	2.424
<i>Approximate significance of smooth terms</i>						
s(Bird species richness)	< 0.001	0.000	0.406	0.528	0.787*	3.684
s(Simpson diversity)	< 0.001	0.000	1.206 .	3.084	1.255	2.724
s(Hedge length)	0.269	0.361	0.873**	7.082	0.300	0.339
s(Total SPELs)	< 0.001	0.000	0.628	1.190	< 0.001	0.000
s(Temperature)	< 0.001	0.000	< 0.001	0.000	1.776**	8.396
s(Day of year)	0.773	1.215	< 0.001	0.000	< 0.001	0.000
s(Spatial coordinates [x, y])	1.414**	5.837	0.392	0.567	1.358	2.638

Note: For parametric terms, values represent Estimates and Standard Errors (SE), tested with z-statistics. For smooth terms, values represent estimated degrees of freedom (edf), tested with Chi-square (χ^2) statistics. Significance codes: *** $p < 0.001$; $p < 0.01$; * $p < 0.05$; . $p < 0.1$.

Sound References:

Saxicola rubicola

Volker Arnold, XC99734. Accessible at www.xeno-canto.org/99734

Jarek Matusiak, XC571194. Accessible at www.xeno-canto.org/571194

Jarek Matusiak, XC640294. Accessible at www.xeno-canto.org/640294

Corydalla campestris

Jarek Matusiak, XC417767. Accessible at www.xeno-canto.org/417767

Lars Lachmann, XC90992. Accessible at www.xeno-canto.org/90992

Poecile palustris

Jarek Matusiak, XC405072. Accessible at www.xeno-canto.org/405072

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