SUPPLEMENTARY ELECTRONIC MATERIAL (APPENDIX 2)

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VARIATIONS IN NICHE BREADTH AND POSITION OF ALPINE BIRDS ALONG ELEVATION GRADIENTS IN THE EUROPEAN ALPS

VARIACIONES EN LA AMPLITUD Y POSICIÓN DEL NICHO DE LAS AVES ALPINAS A LO LARGO DE LOS GRADIENTES DE ALTITUD EN LOS ALPES EUROPEOS

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Appendix 2.

Gaussian models for niche position and niche breadth in relation to elevation for subsets of data.

[Modelos gaussianos para la posición y la amplitud de nicho en relación con la altitud para subconjuntos de datos.]

Main results from Gaussian models for subsets of data

- Results of the first survey (2010-2012)

The main analyses used data from two combined surveys with slightly differing methods (the first used a settling period, the second did not). Previous evidence has shown that the use of a settling period made virtually no difference to the probability of detecting a species at a point count (Chamberlain & Rolando, 2014). Nevertheless, we repeated our analyses using only data from the first survey (the largest sample) to see if consistent results were obtained compared to the full dataset.

The results of the analyses with only the data from the first survey were comparable to the results presented in the study. Before analysis, Rock Partridge *Alectoris graeca* was removed from the data set because of the scarce number of records (n = 2).

Niche position was positively associated with elevation on both linear and quadratic models, the latter model performing better (ΔAICc = 3.9; **Table B1**). As in the results presented in the study, one species (Snowfinch) was considered an outlier after checking the qq-plot regarding the relationship between niche breadth and elevation. Niche breadth was not related to elevation (ΔAICc < 2 with the null model) until we removed the outlier species. Niche breadth was then positively linked with elevation (linear model performed better, ΔAICc = 2.2; **Table B1**).

Standard deviation of elevation was positively related to niche breadth in both linear and quadratic models which performed equally (ΔAICc < 2; **Table B1**). The same results were observed when the outlier (Snowfinch) was removed.

As for the complete data set, niche position was negatively associated with habitat diversity (estimated with the Shannon index). The linear model performed better than the quadratic model (ΔAICc = 2.3; **Table B1**). Niche breadth did not show any relationship with habitat diversity (ΔAICc < 2 with the null model) until we removed one outlier (Snowfinch). Niche breadth was then negatively related to habitat diversity (the linear model performed better than the quadratic model, ΔAICc < 2). However, this trend was driven by two high elevation species (Alpine Accentor and Yellow-billed Chough) and running the models without these species confirmed the absence of a relationship between niche breadth and habitat diversity (ΔAICc < 2 with the null model).

Results of the Gaussian models run to study niche position and niche breadth in relation to elevation. See Table 1 for species code.

TABLE B1

Results for the first survey (2010-2012).
[Resultados del primer muestreo (2010-2012).]

Dependent variable	**Parameter**	**Estimate ± SE**	***t***	***p***
Niche position	Elevation	0.066 ± 0.095	0.694	0.493
	Elevation²	0.133 ± 0.053	2.504	0.017
Niche breadth (without MN)	Elevation	0.124 ± 0.032	3.830	<0.001
Niche position	SD elevation	-0.665 ± 0.272	-2.448	0.002
	SD elevation²	$3.190e10^{-5}$ ± $1.125e10^{-5}$	2.834	0.008
Niche breadth	SD elevation	0.131 ± 0.040	3.265	0.002
Niche position	Habitat diversity	-3.188 ± 0.724	-4.402	<0.001

Results for the breeding data set

In this section, results are presented based only on records that indicated evidence of breeding (rather than on all records, as in the main text). The results were broadly similar to those for all records.

Niche position was positively associated with elevation in both linear and quadratic models which performed equally (ΔAICc < 2). Niche breadth was positively related to elevation (ΔAICc=2.2 with the quadratic model; **Table B2**).

Standard deviation of elevation was positively related to niche breadth, the linear model performing better than the quadratic one (ΔAICc = 2.4; **Table B2**).

As for the complete data set, niche position was negatively associated with habitat diversity (estimated with the Shannon index). The linear model performed equally to the quadratic model (respectively ΔAICc < 2; **Table B2**). Niche breadth did not show any relationship with habitat diversity (ΔAICc < 2 with the null model).

TABLE B2

Results for the breeding data set

[Resultados para el conjunto de datos en época reproductora.]

Dependent variable	**Parameter**	**Estimate ± SE**	***t***	***p***
Niche position	Elevation	0.290 ± 0.094	3.079	0.005
Niche breadth	Elevation	0.061 ± 0.025	2.447	0.021
Niche position	SD elevation	-1.087 ± 0.452	-2.406	0.024
	SD elevation²	$6.976e10^{-5} \pm 2.575e10^{-5}$	2.709	0.012
Niche breadth	SD elevation	0.198 ± 0.092	2.158	0.402
	SD elevation²	$-4.461e10^{-6} \pm 5.232e10^{-6}$	-0.853	0.040
Niche position	Habitat diversity	-4.716 ± 1.414	-3.336	0.002