 DOI: 10.1086/659623

# Appendix A from I. Martínez et al., “Disentangling the Formation of Contrasting Tree-Line Physiognomies Combining Model Selection and Bayesian Parameterization for Simulation Models”

(Am. Nat., vol. 177, no. 5, p. E136)

# Detailed Results of the Simulation Experiments

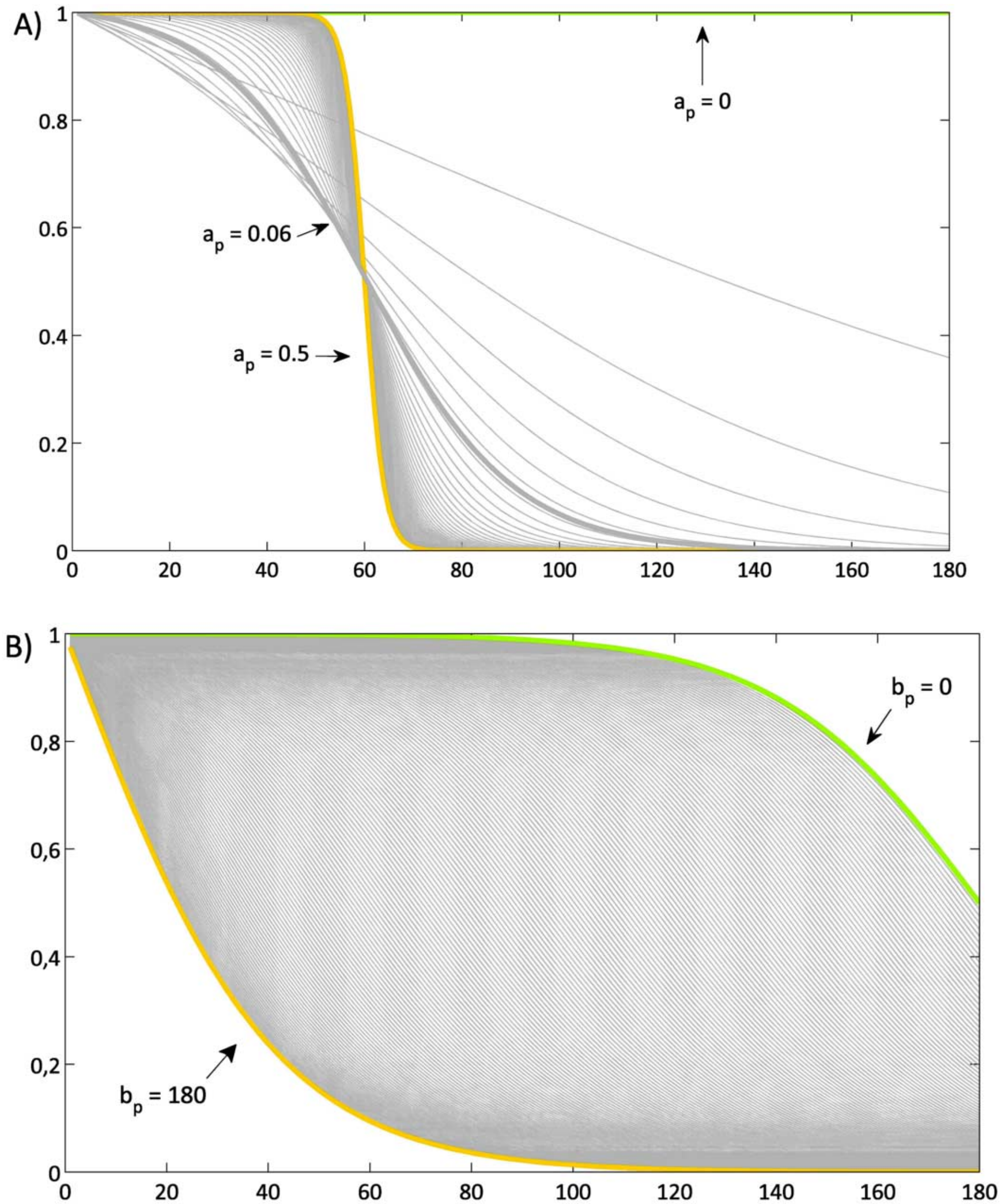


**Figure A1:** Examples of the $g_p(y)$ function (i.e., the logistic functional form used in eq. [1] to describe the decrease in the individual growth and survival rates that depends on the longitudinal position on the gradient; see details in "Methods") for varying values of $a_p$ (*A*) and $b_p$ (*B*). The parameter $a_p$ ranged between 0 and 0.5 and influences the steepness of the gradient response, with larger values corresponding to steeper gradients. The parameter $b_p$ shifts the gradient in the *y*-direction and ranges between 0 and 180 m.

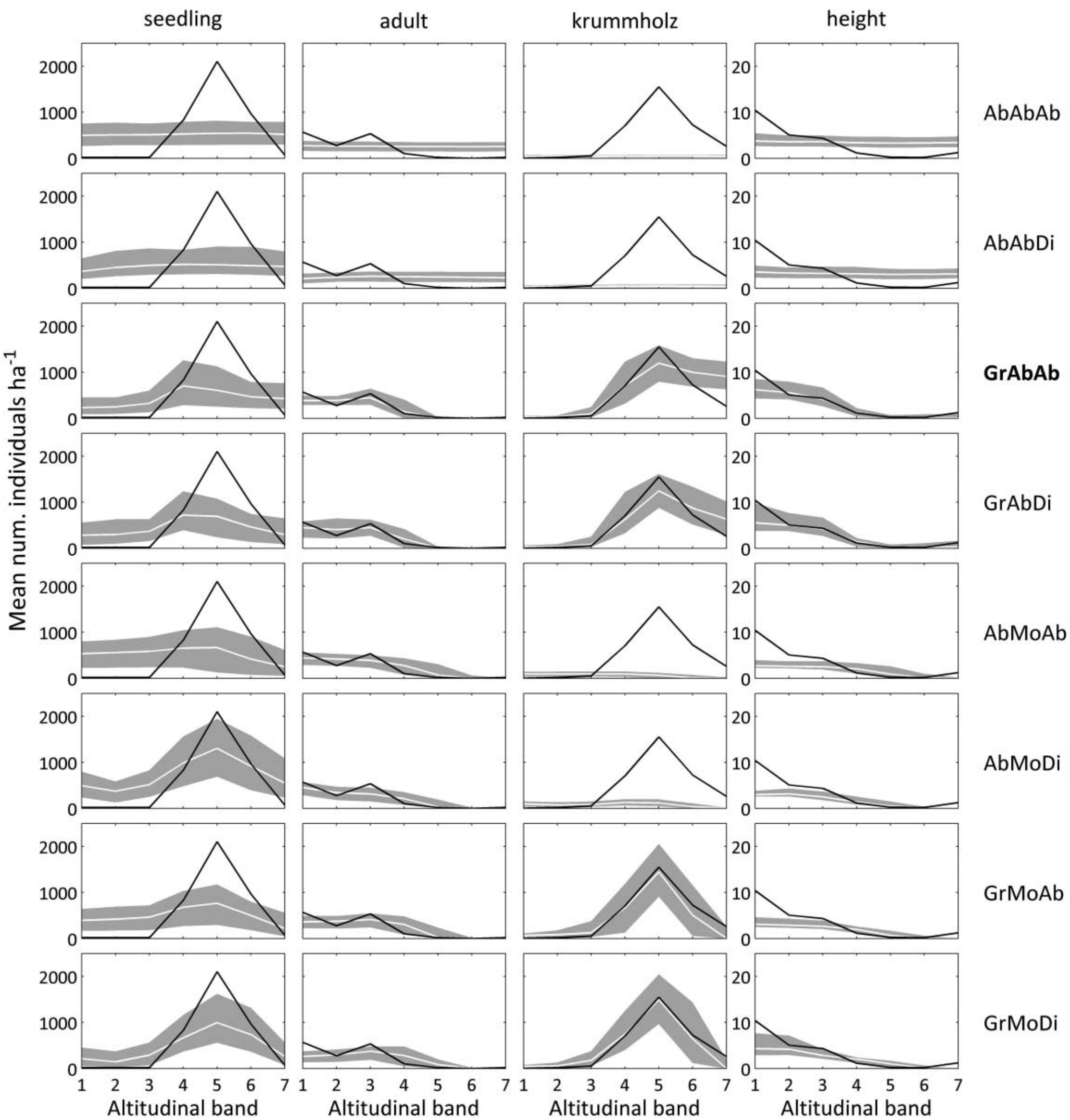


**Figure A2:** Patterns (mean densities of different plant stages and mean tree height along the altitudinal gradient) reproduced by the alternative model structures at Ordesa. Black lines correspond to field data, while the white lines and the shaded areas represent, respectively, the medians and 90% credible intervals obtained from samples of the posterior distribution of the model. Different model structures were designated by trinomials, so GrMoDi corresponds to the most complex structure, including growth (Gr) and mortality (Mo) gradients and dispersal limitation (Di). The absence of any of these components is indicated by "Ab"; thus, model AbAbAb did not include any of the above-mentioned processes. The selected model is highlighted in boldface.

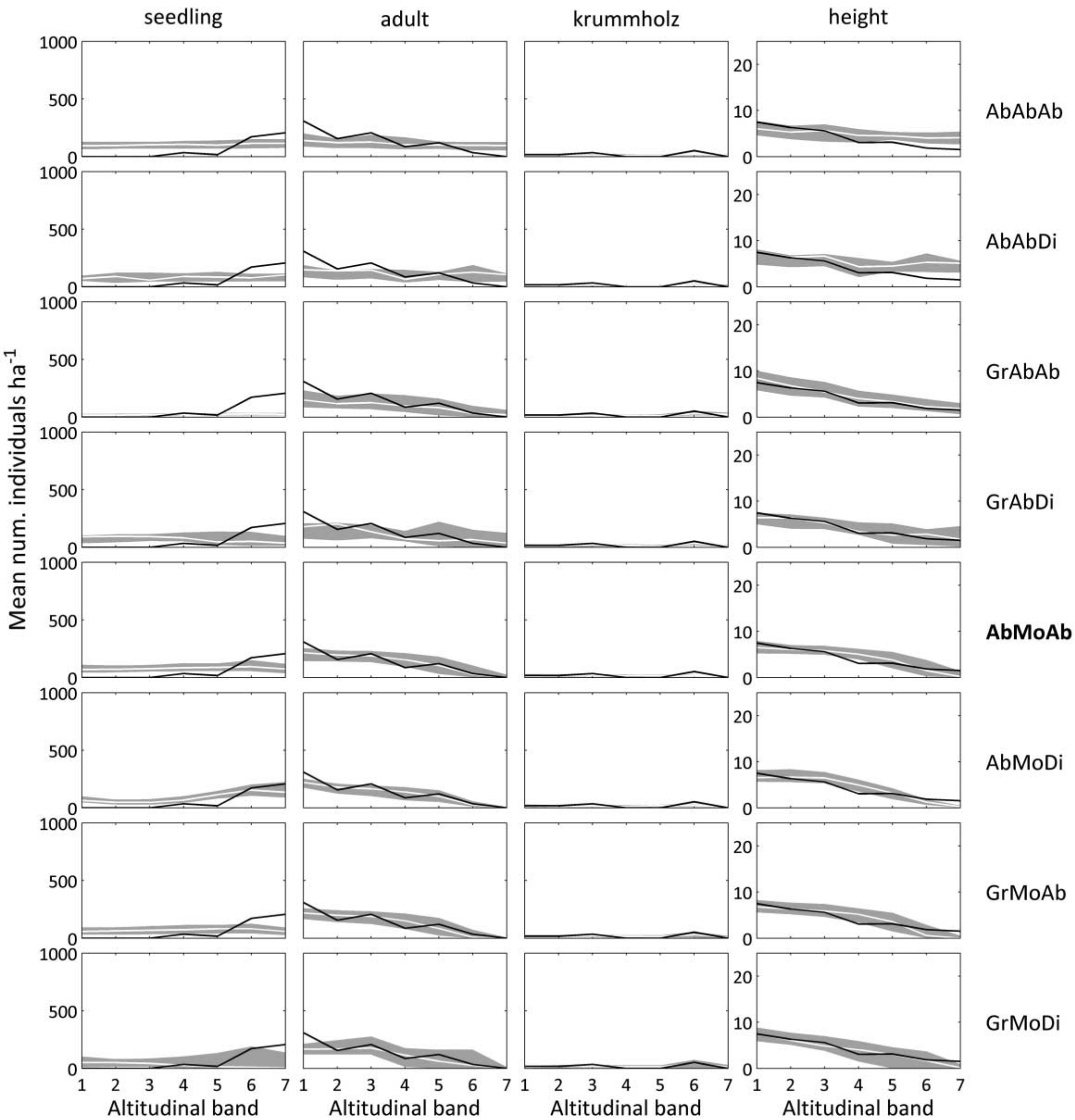


**Figure A3:** Patterns (mean densities of different plant stages and mean tree height along the altitudinal gradient) reproduced by the alternative model structures at Tessó. Other conventions as in figure A2.

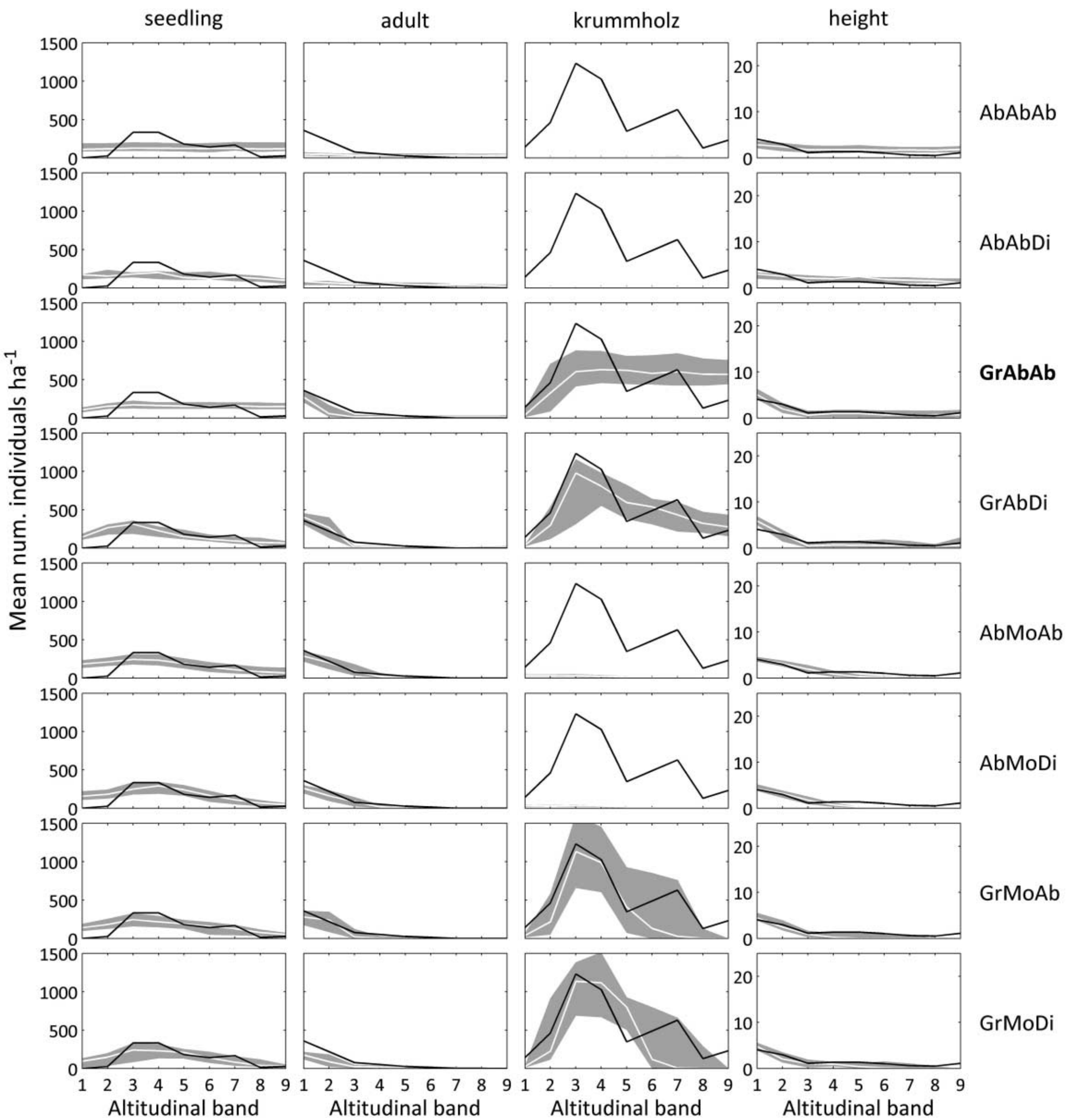


**Figure A4:** Patterns (mean densities of different plant stages and mean tree height along the altitudinal gradient) reproduced by the alternative model structures at Capifonts. Other conventions as in figure A2.

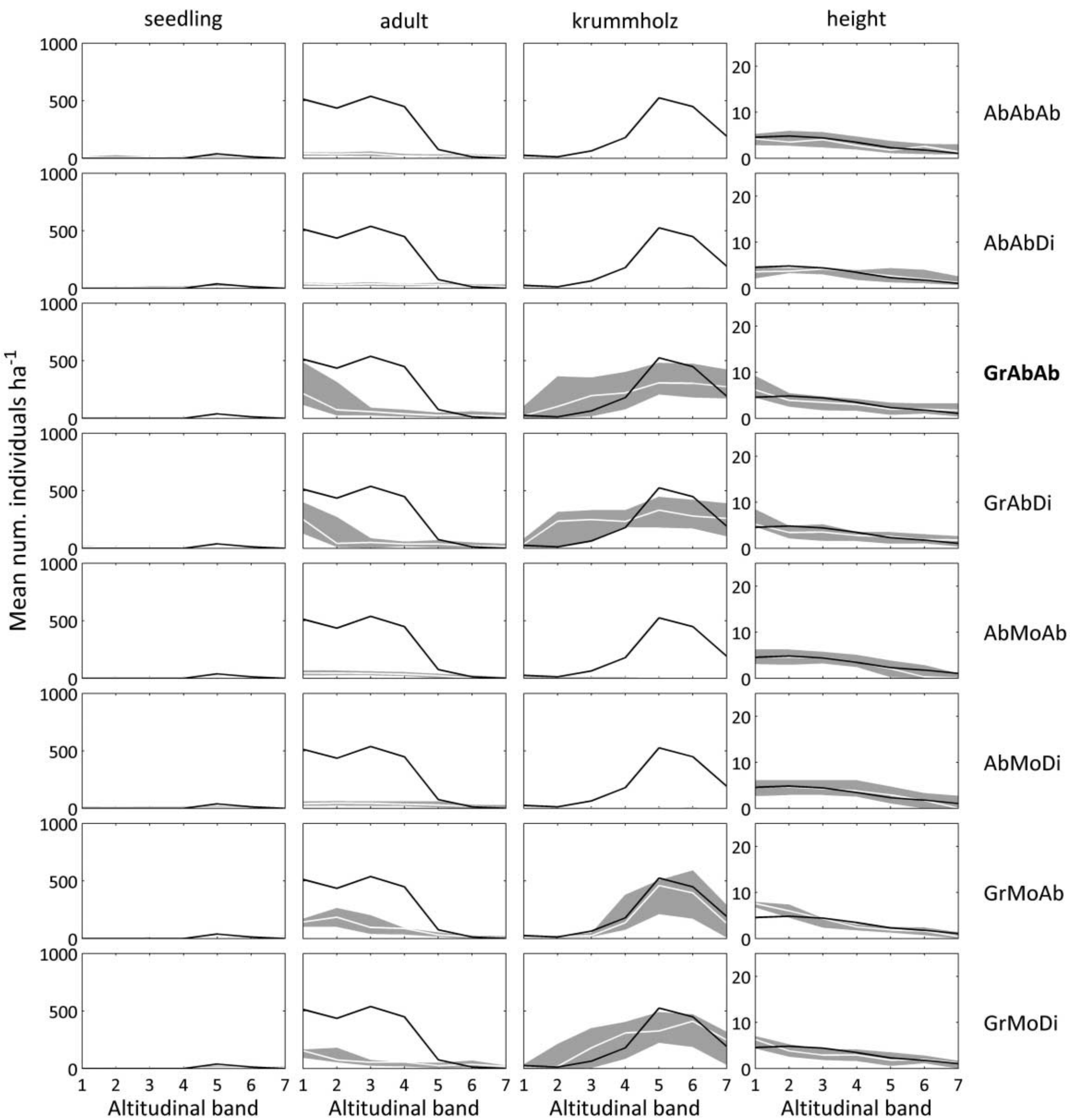


**Figure A5:** Patterns (mean densities of different plant stages and mean tree height along the altitudinal gradient) reproduced by the alternative model structures at Portell. The normal likelihood function includes the four patterns of interest (i.e., seedling, krummholz, adult, and height). Other conventions as in figure A2.

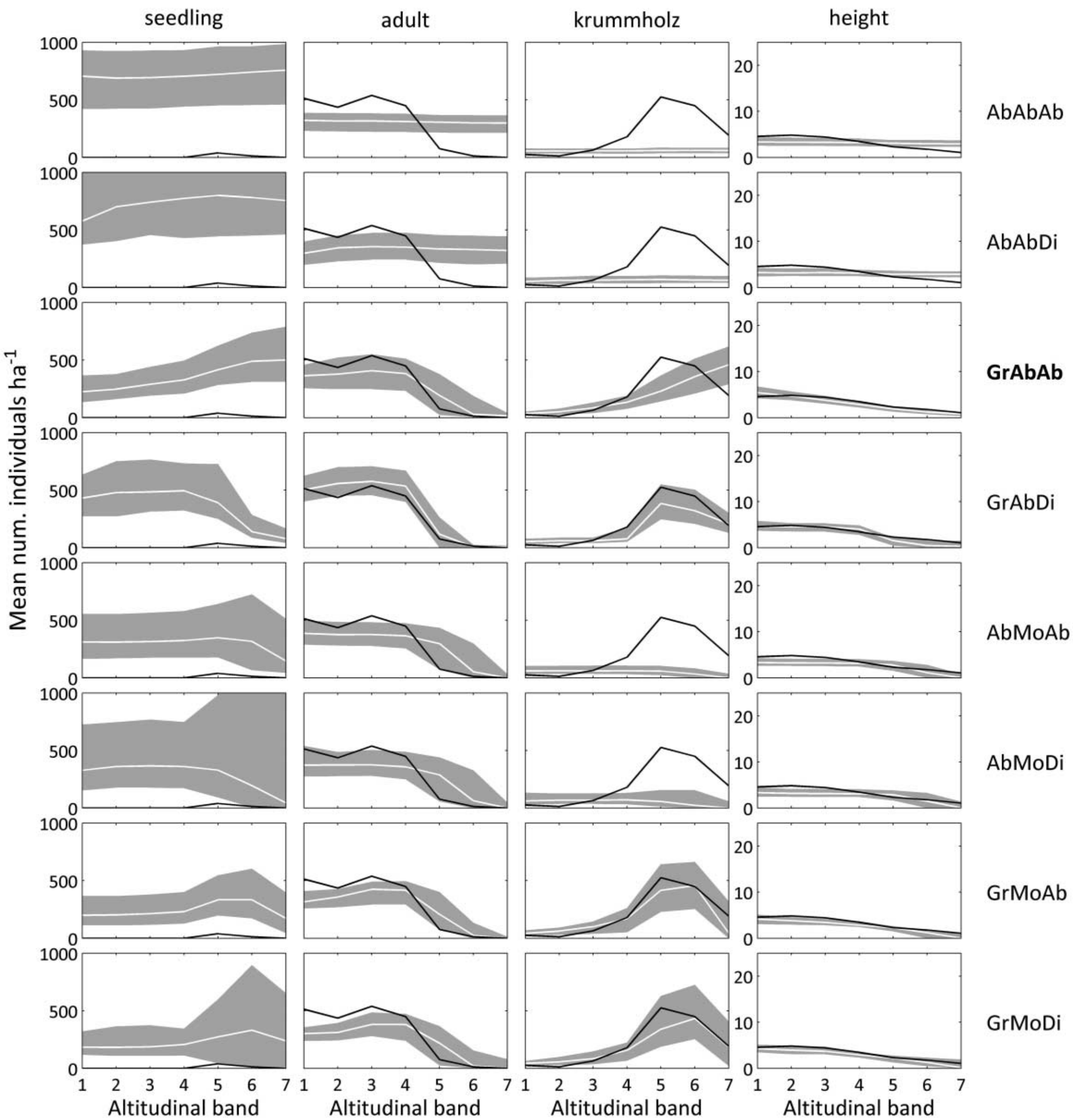


**Figure A6:** Patterns (mean densities of different plant stages and mean tree height along the altitudinal gradient) reproduced by the alternative model structures at Portell. The seedling pattern, which presented very low densities (only four recruits were found at this site), was excluded from the likelihood estimation because of the inability of the models to produce reliable densities for the remaining patterns, especially in the case of adults (fig. A5; see details in "Methods"). Other conventions as in figure A2.

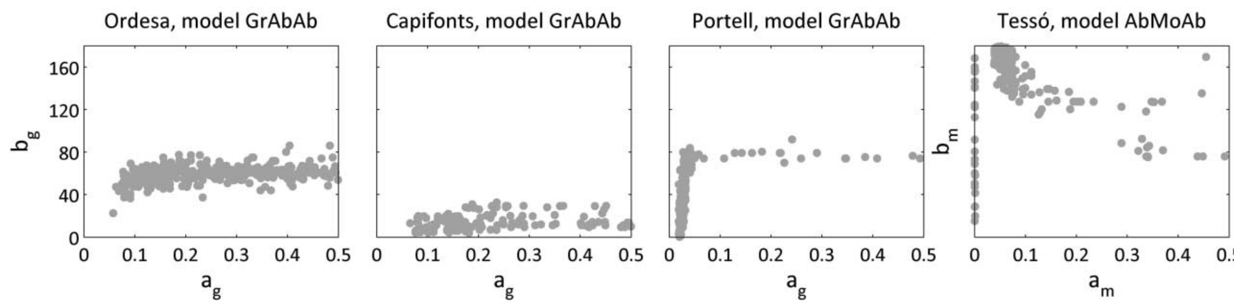


**Figure A7:** Correlations between the two gradient parameters for the selected models.

**Table A1.** Spearman correlations between model parameters, the partial likelihood functions, and model predictions

| | $m_0$ | $e$ | $m_a$ | $f_{facil}$ | $p_{rep}$ | $a_g$ | $b_g$ | $a_m$ | $b_m$ |
|---|---|---|---|---|---|---|---|---|---|
| *a*, Capifonts, model GrAbAb: | | | | | | | | | |
| $m_0$ | ... | .67 | .03 | .18 | .55 | .15 | .08 | | |
| $e$ | .67 | ... | .22 | −.03 | −.04 | .15 | −.38 | | |
| $m_a$ | .03 | .22 | ... | −.09 | −.01 | −.13 | −.15 | | |
| $f_{facil}$ | .18 | −.03 | −.09 | ... | .10 | −.16 | .01 | | |
| $p_{rep}$ | .55 | −.04 | −.01 | .10 | ... | −.06 | .55 | | |
| $a_g$ | .15 | .15 | −.13 | −.16 | −.06 | ... | .21 | | |
| $b_g$ | .08 | −.38 | −.15 | .01 | .55 | .21 | ... | | |
| $\mathrm{Lik}_s$ | −.07 | −.04 | −.04 | −.22 | .03 | .27 | .07 | | |
| $\mathrm{Lik}_a$ | .11 | .13 | −.14 | −.06 | −.26 | .54 | −.28 | | |
| $\mathrm{Lik}_k$ | −.15 | −.25 | −.07 | .07 | .14 | −.29 | .24 | | |
| $\mathrm{Lik}_h$ | −.21 | −.17 | .09 | −.17 | .05 | .09 | .35 | | |
| $M_s$ | .13 | −.44 | −.07 | .28 | .81 | −.23 | .47 | | |
| $M_a$ | −.05 | .09 | .16 | .01 | .15 | −.45 | .16 | | |
| $M_k$ | −.13 | .45 | .13 | −.16 | −.53 | .26 | −.53 | | |
| $M_h$ | .09 | .35 | .12 | −.11 | −.13 | .06 | .05 | | |
| *b*, Ordesa, model GrAbAb: | | | | | | | | | |
| $m_0$ | ... | .43 | −.04 | −.06 | .51 | .03 | .12 | | |
| $e$ | .43 | ... | .09 | −.16 | −.29 | −.07 | −.31 | | |
| $m_a$ | −.04 | .09 | ... | .05 | −.01 | −.06 | −.02 | | |
| $f_{facil}$ | −.06 | −.16 | .05 | ... | −.26 | −.33 | −.03 | | |
| $p_{rep}$ | .51 | −.29 | −.01 | −.26 | ... | .27 | .45 | | |
| $a_g$ | .03 | −.07 | −.06 | −.33 | .27 | ... | .61 | | |
| $b_g$ | .12 | −.31 | −.02 | −.03 | .45 | .61 | ... | | |
| $\mathrm{Lik}_s$ | −.29 | .36 | −.01 | −.19 | −.62 | .30 | −.28 | | |
| $\mathrm{Lik}_a$ | −.02 | −.21 | −.02 | .12 | −.11 | −.02 | .18 | | |
| $\mathrm{Lik}_k$ | −.13 | .06 | .00 | −.45 | .18 | .39 | .09 | | |
| $\mathrm{Lik}_h$ | .15 | −.48 | −.01 | .01 | .54 | .33 | .56 | | |
| $M_s$ | .38 | −.50 | .02 | .10 | .88 | −.02 | .34 | | |
| $M_a$ | .11 | −.01 | .03 | .31 | .28 | −.09 | .31 | | |
| $M_k$ | −.01 | .05 | .00 | .08 | .26 | −.09 | −.21 | | |
| $M_h$ | −.21 | .54 | −.03 | −.04 | −.62 | .17 | .06 | | |
| *c*, Portell, model GrAbAb (without-seedlings summary statistic): | | | | | | | | | |
| $m_0$ | ... | .58 | −.08 | .02 | .56 | .19 | .19 | | |
| $e$ | .58 | ... | .16 | .00 | .03 | .02 | −.23 | | |
| $m_a$ | −.08 | .16 | ... | −.05 | −.15 | .05 | .03 | | |
| $f_{facil}$ | .02 | .00 | −.05 | ... | −.22 | .10 | .05 | | |
| $p_{rep}$ | .56 | .03 | −.15 | −.22 | ... | −.09 | .12 | | |
| $a_g$ | .19 | .02 | .05 | .10 | −.09 | ... | .75 | | |
| $b_g$ | .19 | −.23 | .03 | .05 | .12 | .75 | ... | | |
| $\mathrm{Lik}_s$ | .32 | −.19 | −.14 | .00 | .90 | −.14 | .04 | | |
| $\mathrm{Lik}_a$ | .23 | −.32 | .00 | .05 | .12 | .16 | .53 | | |
| $\mathrm{Lik}_k$ | .19 | −.04 | .05 | .04 | .29 | .21 | .36 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $Lik_h$ | .04 | .27 | .02 | .04 | −.26 | .07 | −.32 | | |
| $M_s$ | .32 | −.21 | −.14 | −.02 | .90 | −.14 | .06 | | |
| $M_a$ | −.03 | .23 | −.05 | −.09 | .38 | −.35 | −.27 | | |
| $M_k$ | −.12 | −.05 | −.01 | .09 | .24 | −.02 | −.33 | | |
| $M_h$ | −.21 | .36 | .06 | .07 | −.40 | .00 | .00 | | |
| *d*, Tessó, model AbMoAb: | | | | | | | | | |
| $m_0$ | ... | .21 | .07 | .09 | .78 | | | .34 | −.05 |
| $e$ | .21 | ... | −.12 | .11 | −.03 | | | −.13 | .08 |
| $m_a$ | .07 | −.12 | ... | .00 | .10 | | | .10 | −.08 |
| $f_{facil}$ | .09 | .11 | .00 | ... | .06 | | | .01 | .06 |
| $p_{rep}$ | .78 | −.03 | .10 | .06 | ... | | | .40 | −.01 |
| $a_m$ | .34 | −.13 | .10 | .01 | .40 | | | ... | −.52 |
| $b_m$ | −.05 | .08 | −.08 | .06 | −.01 | | | −.52 | ... |
| $Lik_s$ | .05 | −.26 | .05 | .11 | .20 | | | .29 | −.37 |
| $Lik_a$ | .14 | −.39 | .09 | −.07 | .13 | | | .31 | −.30 |
| $Lik_k$ | −.06 | .18 | −.06 | .08 | −.19 | | | −.12 | −.04 |
| $Lik_h$ | .15 | −.11 | .10 | −.06 | .10 | | | .55 | −.36 |
| $M_s$ | .29 | −.20 | .04 | .13 | .73 | | | .21 | .18 |
| $M_a$ | −.18 | .28 | −.04 | .15 | .05 | | | .18 | .11 |
| $M_k$ | −.16 | .02 | −.01 | .12 | .21 | | | .05 | .14 |
| $M_h$ | .22 | .14 | .08 | −.02 | .00 | | | .25 | .03 |

Note: The parameters $Lik_p$ and $M_p$ are the partial likelihoods and average densities (or heights), respectively, taken over all altitudinal bands; $p$ = s, a, k, h, referring to seedlings, adults, krummholz, and height, respectively.