Supplementary materials

Supplementary material 1 (S1)

Table I. Description of the topographic attributes.

Type		Equation	Description	Reference
Primary attributes	*Elevation*	Value at each point of the DEM	Above sea level (a.s.l) in meters.	(Speight, 1980; Travis et al., 1975)
	Slope	$\arctan[(G^2 + H^2)^{\frac{1}{2}}]$	Steepness in degrees.	(Moore et al., 1991; Speight, 1980; Travis et al., 1975)
Secondary attributes	*Curvature*	$CV = 2E - 2D$	Higher value = convex surface Lower value = concave surface	(Heerdegen & Beran, 1982; Zaslavsky & Sinai, 1981; Zevenbergen & Thorne, 1987)
	Profile curvature	$CVPRO = -2\frac{DH^2 + EH^2 + FGH}{G^2 + H^2}$	Higher value = vertical surface convexity Lower value = vertical surface concavity	(Heerdegen & Beran, 1982; Zaslavsky & Sinai, 1981; Zevenbergen & Thorne, 1987)
	Plan curvature	$CVPLA = 2\frac{DH^2 + EH^2 - FGH}{G^2 + H^2}$	Higher value = horizontal surface convexity Lower value = horizontal surface concavity	(Heerdegen & Beran, 1982; Zaslavsky & Sinai, 1981; Zevenbergen & Thorne, 1987)
	Ruggedness index	$TRI = Y\left[\sum\left(X_{ij} - X_{00}\right)^2\right]^{1/2}$	Terrain heterogeneity. Higher values represent more heterogenous surface.	(Shawn J Riley et al., 1999)
	Topographic Position index	TPI<scalefactor>=int(DEM-focalmean(DEM,annulus,irad,orad)+0.5)	Higher value = overall convexity	(Weiss, 2001)

		Lower value = overall concavity	
Wetness index	$TWI = W = qa/bT \sin\theta$	Greater values correspond to increasing surface wetness.	(Beven & Kirkby, 1979; Montgomery & Dietrich, 1994)
Wind exposure index	$WEI = \frac{\sum_{i=1}^{n}\frac{1}{d_{WHi}}.\tan^{-1}\left(\frac{d_{WZi}}{d_{WHi}}\right)}{\sum_{i-1}^{n}\frac{1}{d_{LHi}}} + \frac{\sum_{i=1}^{n}\frac{1}{d_{LHi}}.\tan^{-1}\left(\frac{d_{LZi}}{d_{LHi}}\right)}{\sum_{i=1}^{n}\frac{1}{d_{LHi}}}$	Higher value = High wind exposed Lower value = Low wind exposed	(Böhner & Antonić, 2009; Gerlitz et al., 2015)
Morphometric protection index	$\mathrm{D\phi L} = 90 - \mathrm{D\beta L}$ $\mathrm{D\psi L} = 90 + \mathrm{D\delta L}$ $\phi_L = (0\phi L + 45\phi L + \cdots + 315\phi L)/8$ $\psi_L = (0\psi L + 45\psi L + \cdots + 315\psi L)/8$	Higher value = Less protected by surroundings Lower value = More protected from surroundings.	(Yokoyama et al., 2005)
Distance from the top ridge	*Linear distance to every plot centre from the top ridge line.*	Value increases with distance from nearest ridge line	

Supplementary material 2 (S2)

Temperature model

A Pearson correlation test was performed to check the degree of association between calculated temperature differences and primary topographic attributes. As temperature differences were captured for different topographic strata through a repeated time series measurement, a linear mixed-effect regression model (Verbeke & Lesaffre, 1996) was applied to explain these differences by using random and fixed effects. In this case, the primary topographic attributes were the fixed effects, whereas the sensors, site and different months were random effects. Once the relationship was established,

$$\mathrm{Y_{ij}} = \mathrm{b_0} + \mathrm{b_1 X_{ij}} + \mathrm{V_{i0}} + \mathrm{V_{i1} X_{ij}} + \varepsilon_{\mathrm{ij}} \quad (1)$$

where, Y_{ij} = the response variables, b_0 = fixed intercept, b_1 = fixed slope, X_{ij} = predictor variable of j-th measurement of the i-th subject, V_{i0} = random intercept of the i-th subject, V_{i1} = random slope of the i-th subject, ε_{ij} = error term.

The full temperature difference mixed effect model indicated that primary topographic attributes (aspect, slope and elevation) had a significant effect on air temperature difference within sites (p = 2.306e-09 and AICc = 1506.06). Temperature difference increased significantly from Southerly to Northerly aspects. Slope was inversely correlated with temperature differences, while elevation was directly correlated with temperature difference (Table 6).

Table S2i. Coefficients for final full linear mixed models for air temperature difference within site.

Fixed effects	Est.	SE	t	Sig
Intercept	-1.870177	1.145	-1.633	NS
Aspect	-0.321877	0.162	-1.984	*
Slope	-0.108914	0.024	-4.400	***
Elevation	0.026662	0.006	3.964	***
Random effect	Var.	SD		
Month	0.328	0.573		
Site	0.800	0.894		
Sensor	0.720	0.8488		
Residual	1.500	1.225		

Note: Est. = Estimate; SE = Standard error; Sig. = Significance level, Var. = Variance, SD = Standard deviation (*** = p<0.001, ** = p<0.05; NS = p≥0.05)

Supplementary material 3 (S3)

Residual distribution plots

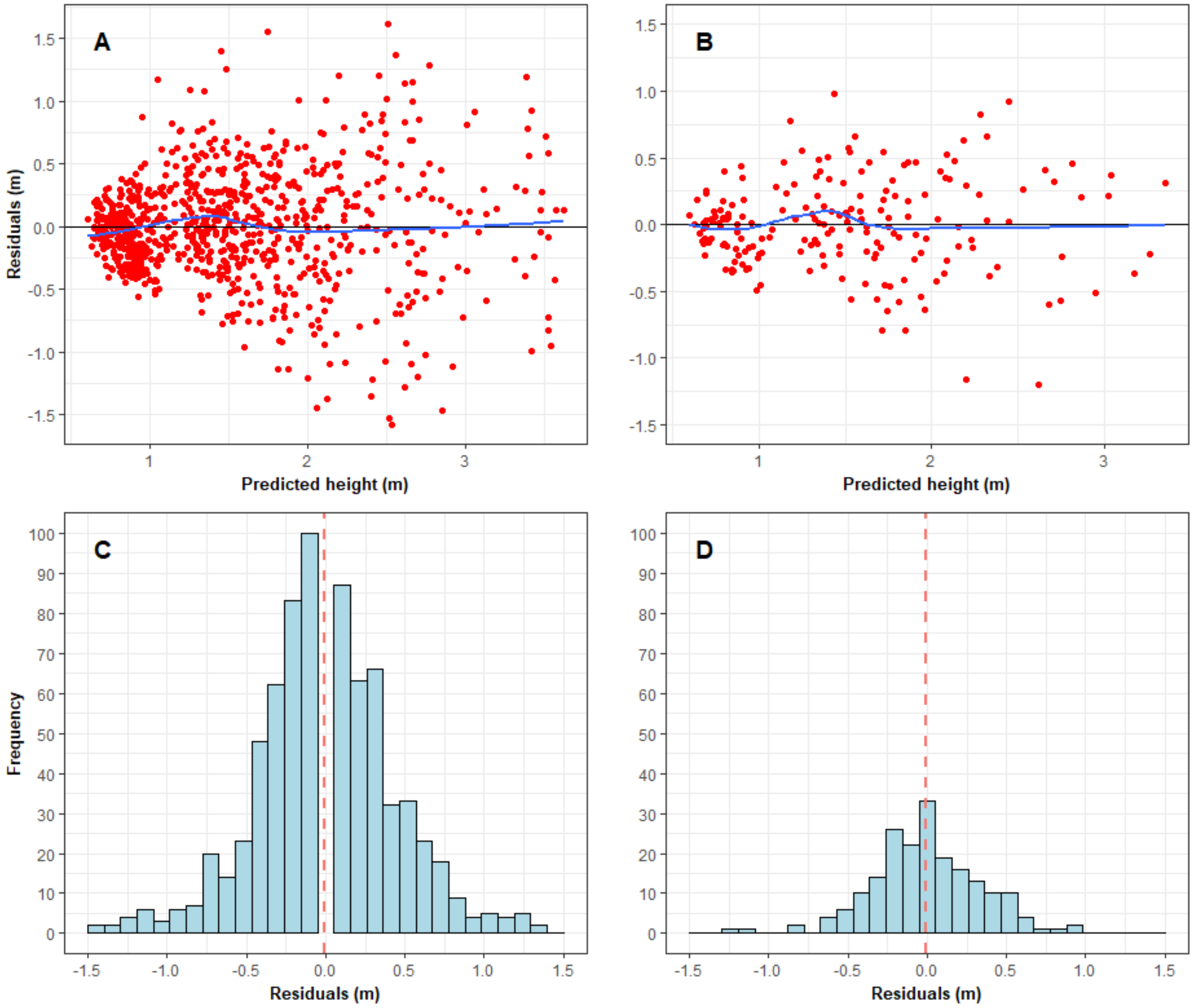

Figure I. Residuals (m) for the *E. globoidea* juvenile height model for site A. A) Final model residuals; B) validation residuals with loess line (blue). C) and D) represent the residual distributions for model fitting and validation datasets, respectively.

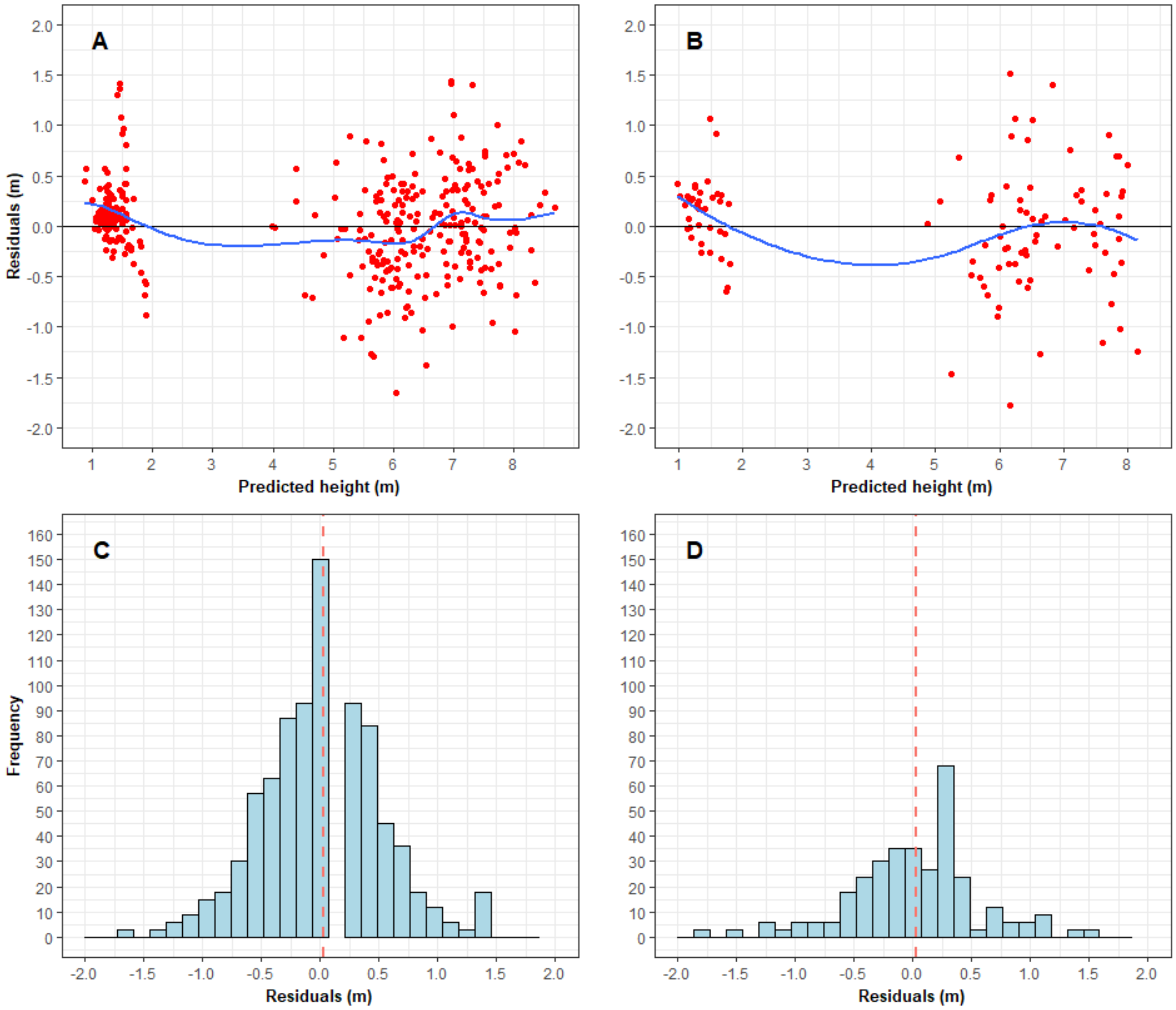

Figure II. Residuals (m) for the *E. bosistoana* juvenile height model for site B. A) Final model residuals; B) validation residuals with loess line (blue). C) and D) represent the residual distributions for model fitting and validation datasets, respectively.

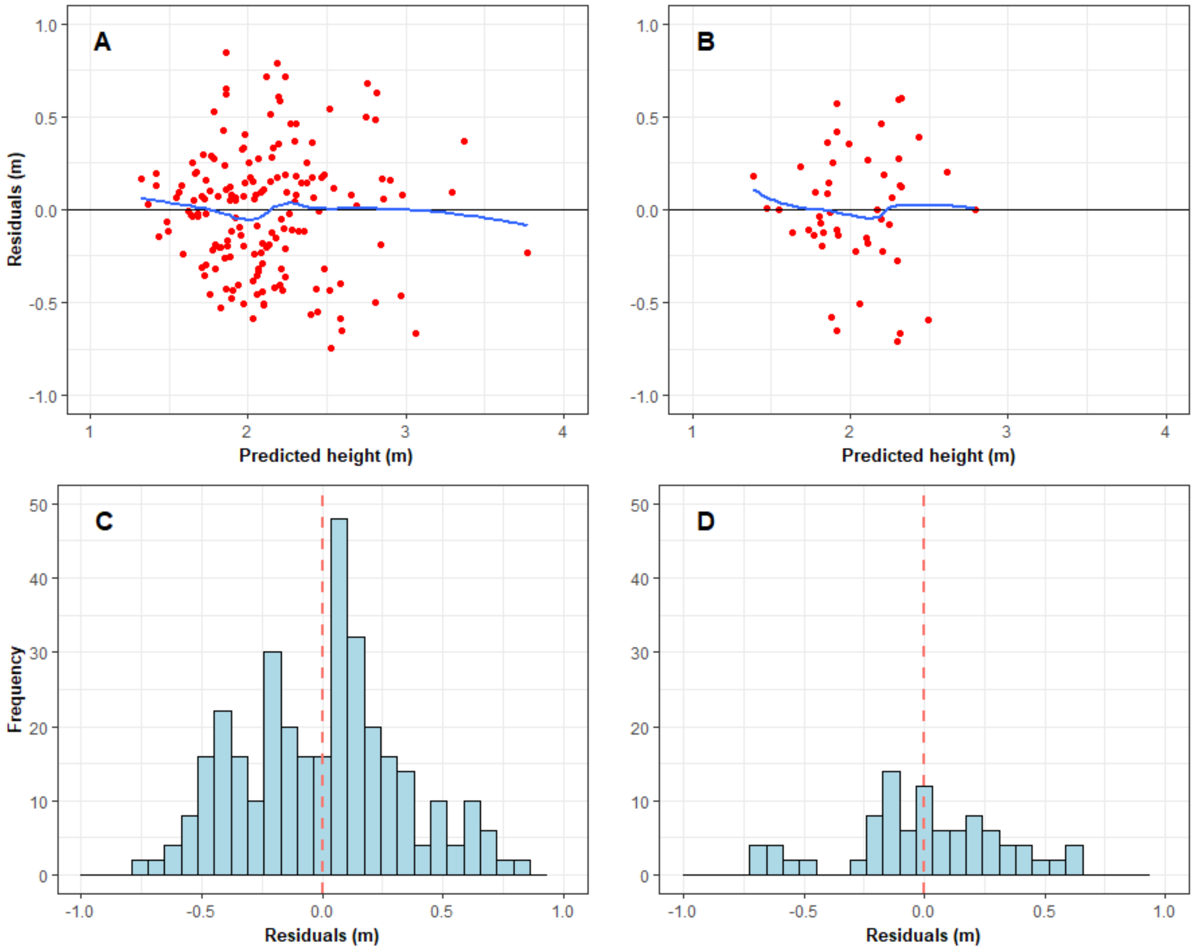

Figure III. Residuals (m) for the *E. bosistoana* juvenile height model for site C. A) Final model residuals; B) validation residuals with loess line (blue). C) and D) represent the residual distributions for model fitting and validation datasets, respectively.

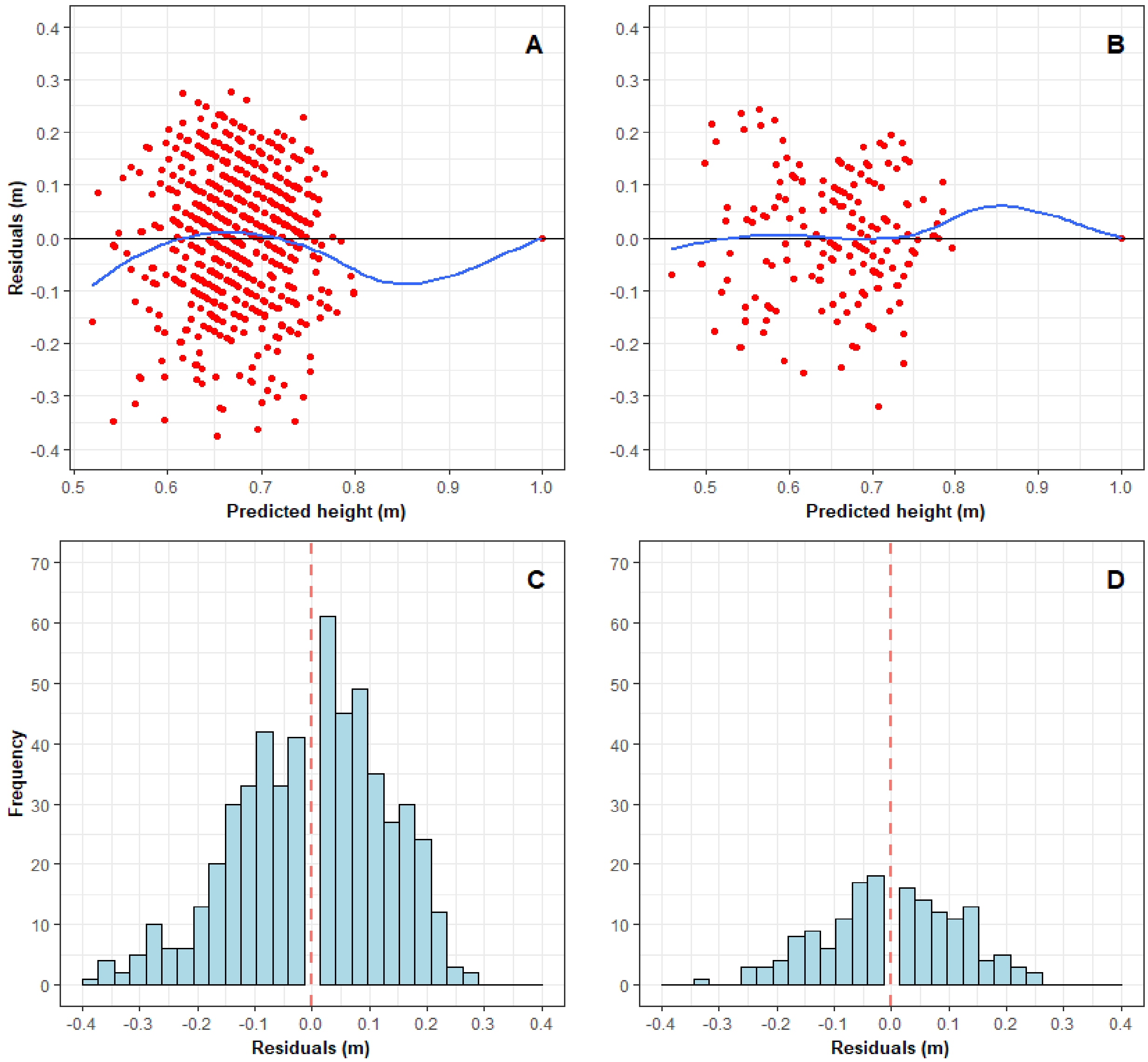

Figure IV. Residuals for the *E. globoidea* juvenile survival model for site A. A) Final model residuals. B) validation residuals with loess line (blue). C) and D) Residual distributions for model fitting and validation datasets, respectively.

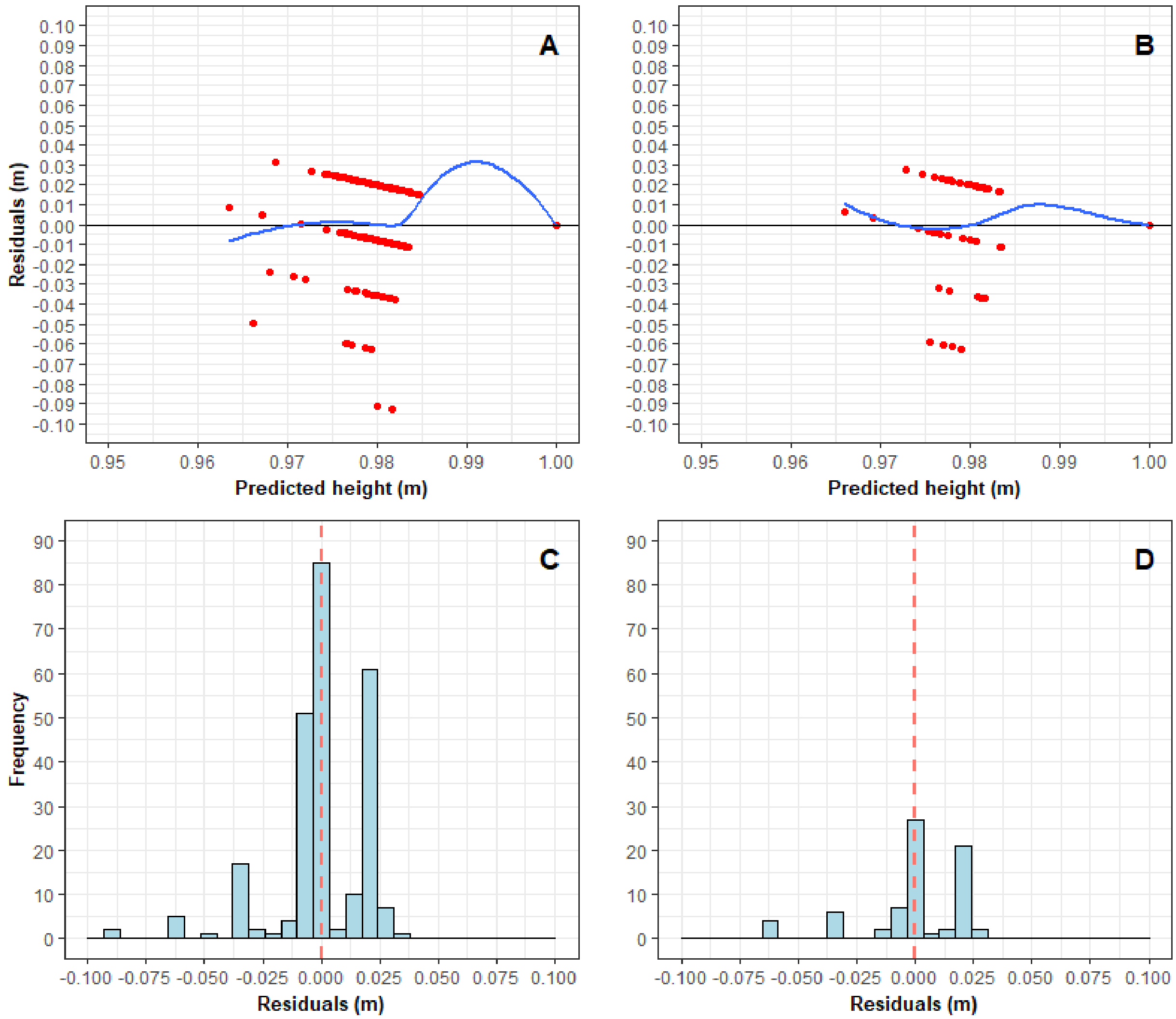

Figure V. Residuals for the *E. bosistoana* juvenile survival models for site C; A) Final model residuals; B) validation residuals with loess line (blue); C) and D) Residual distributions for model fitting and validation datasets, respectively.

Supplementary material 4 (S4)

Observed height and survival variability

Figure I. *E. globoidea* height growth and survival variability at site A.

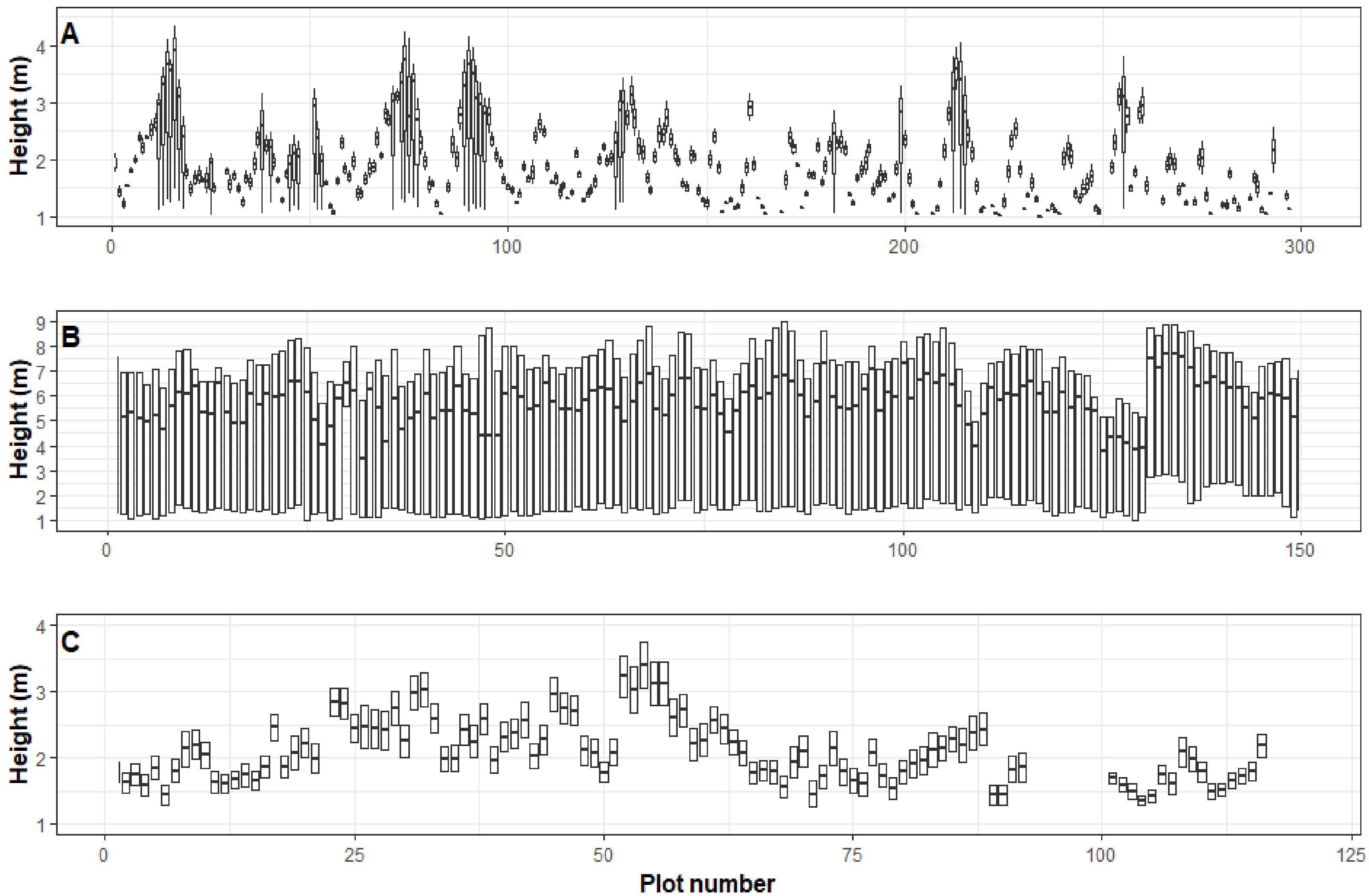

Figure II. Observed height at different plots A) *Eucalyptus globoidea* at site A, B) *E. bosistoana* at site B, and C) *E. bosistoana* at site C.

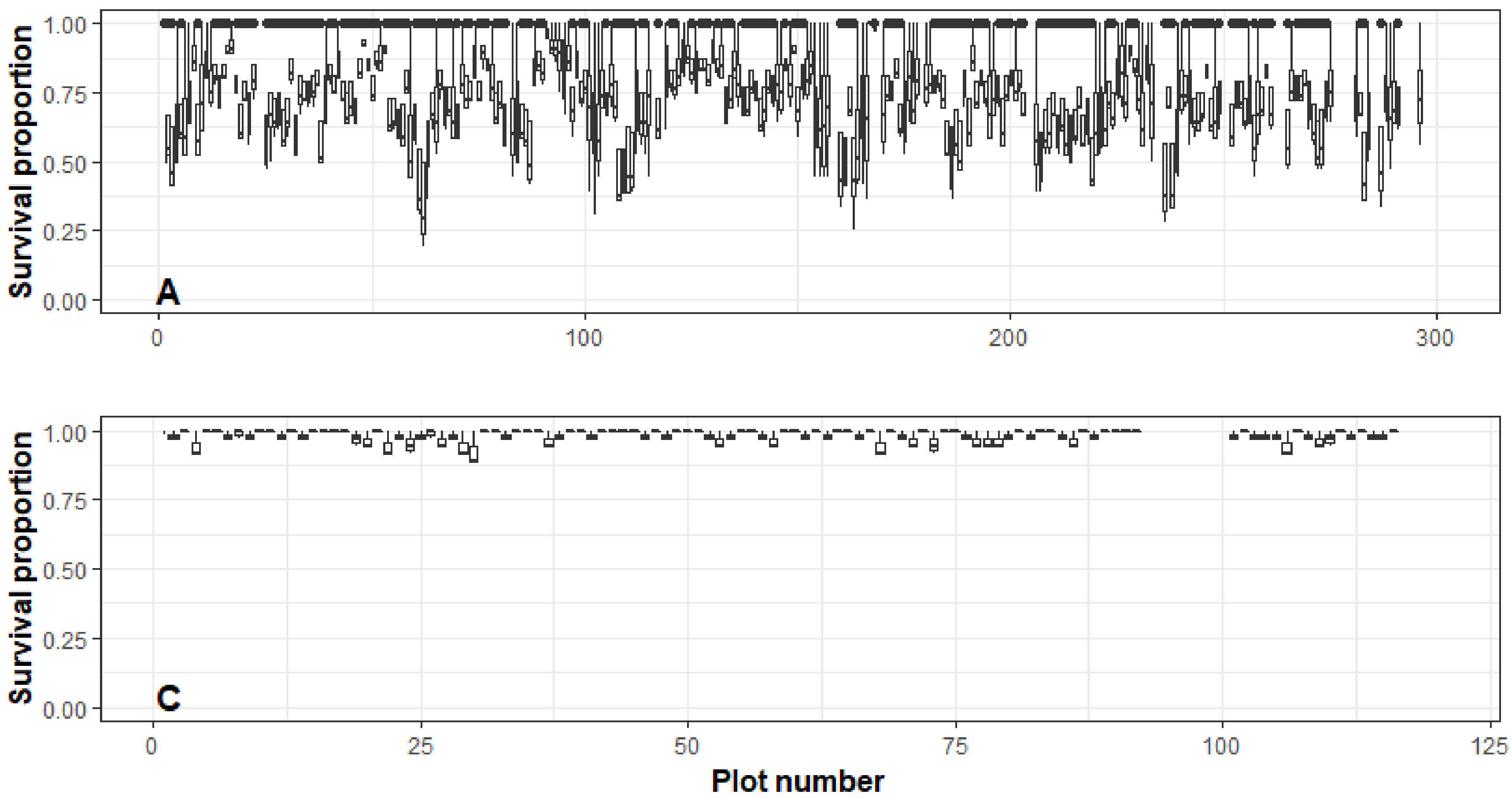

Figure III. Observed survival proportion in different plot A) *Eucalyptus globoidea* at site A and C) *E. bosistoana* at site C.

Supplementary material 5 (S5)

Model parameters

List I. Height yield Models

$$h_{EGT_A} = h_{EG0} + (\alpha_0 + \alpha_1 * WEI + \alpha_2 * DIST) * T_{EGT}^{(\beta_0+\beta_1*DIST+\beta_2*WEI+\beta_3*MPI)}$$

$$h_{EBT_B} = h_{EB0} + (\alpha_0 + \alpha_1 * CVPLA + \alpha_2 * TPI + \alpha_3 * WEI + \alpha_4 * MPI) * T_{EBT}^{(\beta_0+\beta_1*CVPLA+\beta_2*WEI+\beta_3*MPI+\beta_4*TPI+\beta_5*DIST+\beta_6*WEI:DIST)}$$

$$h_{EBT_c} = h_{EB0} + (\alpha_0 + \alpha_1 * WEI + \alpha_2 * WTI + \alpha_3 * TPI + \alpha_4 * MPI + \alpha_5 * DIST) * T_{EBT}^{(\beta_0+\beta_1*TPI+\beta_2*DIST)}$$

Table I. Final juvenile height model summaries with parameters

Species	Site	Sat	α_0	α_1	α_2	α_3	α_4	α_5	β_0	β_1	β_2	β_3	β_4	β_5	β_6
E. globoidea	A	Est	-2.051	2.010	0.0043	-	-	-	1.871e+016	-1.398e-02	-1.584e+01	-2.829e+00	-	-	-
		SE	0.525	0.517	0.0005	-	-	-	1.656	9.245e-04	1.652e+00	8.838e-01	-	-	-
		p	0.001	0.0001	2.59e-1	-	-	-	< 0.000002	< 2e-16	< 2e-16	0.001607	-	-	-
E. bosistoana	B	Est	0.53609	-0.0977	0.01260	1.25919	-8.445493	-	1.478807	0.042378	-1.04705	-0.01461	-0.01276	6.573568	0.015729
		SE	0.16774	0.00936	0.00216	0.19244	0.430181	-	0.141687	0.008319	0.154006	0.001257	0.002026	0.337177	0.001469
		p	0.00144	< 2e-16	6.84e-1	9.58e-11	< 2e-16	-	< 2e-16	4.18e-07	1.81e-11	< 2e-16	4.39e-10	< 2e-16	< 2e-16
	C	Est	3.34557	-2.447348	0.00245	-0.0086	-0.016512	-1.36	0.537881	0.0199025	0.0447812	-	-	-	-
		SE	0.73907	0.627552	0.00095	0.00152	0.004243	0.268	0.1293038	0.0015926	0.0046178	-	-	-	-
		p	8.43e-06	0.000117	0.01022	3.83e-08	0.00012	6.62e-07	4.09e-05	< 2e-16	< 2e-16	-	-	-	-

List II. Survival Models

$$S_{EGT_A} = -e^{(\alpha_0+\alpha_1*CVPLA+\alpha_2*CVPRO)*T^{(\beta_0+\beta_1*WEI+\beta_2*DIST+\beta_3*CVPLA)}}$$

$$S_{EBT_C} = -e^{\alpha_0*T^{(\beta_0+\beta_1*CVPRO)}}$$

Table II. Final juvenile survival model summary with parameters

Species	Site	Stat.	α_0	α_1	α_2	β_0	β_1	β_2	β_3
E. globoidea	A	Est	0.292	0.0465	-0.04293	-3.2431	3.1882	0.00359	-0.10117
		SE	0.015	0.0187	0.0121	1.1201	1.0708	0.00057	0.04987
		p	< 2e-16	0.0130	0.00043	0.0038	0.0029	5.48e-10	0.04286
E. bosistoana	C	Est	0.01036	-	-	0.51373	0.1154	-	-
		SE	0.0120	-	-	0.8424	0.0519	-	-
		p	0.3907	-	-	0.542	0.0272	-	-