

## **SUPPLEMENTARY INFORMATION**

### **Bark investment is key to forest expansion into African savannas by conferring resistance to fire and seasonal drought**

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**Supplementary Table S1.** Models predicting outer bark thickness (OBT) based on stem diameter (SD) and ecological categories (closed-canopy, clump-forming, savanna). Estimates are shown for coefficients with 95% confidence intervals in parenthesis. \*P<0.05, \*\*P<0.01, \*\*\*P<0.001. <sup>a-c</sup> homogeneous groups for intercepts, <sup>x-z</sup> homogeneous groups for slopes.

	Endwell	Sudwala	Sites pooled
Final model	log <sub>10</sub> OBT ~ log <sub>10</sub> SD * Ecological category	log <sub>10</sub> OBT ~ log <sub>10</sub> SD * Ecological category	log <sub>10</sub> OBT ~ log <sub>10</sub> SD * Ecological category
n	206	253	459
Marginal r <sup>2</sup> (fixed only)	0.741	0.779	0.766
Conditional r <sup>2</sup> (random and fixed)	0.793	0.857	0.833
Equality of slopes test (SD * Ecological category interaction)	P<0.001	P<0.001	P<0.001
Intercept test	P=0.002	P=0.083	P<0.001
Closed-canopy slope	0.338 (0.112, 0.563)** <sup>x</sup>	0.357 (0.076, 0.638)** <sup>x</sup>	0.349 (0.158, 0.540)** <sup>x</sup>
Clump-forming slope	0.901 (0.759, 1.043)** <sup>y</sup>	0.883 (0.649, 1.116)** <sup>y</sup>	0.895 (0.758, 1.031)** <sup>y</sup>
Savanna slope	0.794 (0.464, 1.125)** <sup>y</sup>	1.256 (1.075, 1.438)** <sup>z</sup>	1.186 (1.029, 1.342)** <sup>z</sup>
Closed-canopy intercept	-1.096 (-1.513, -0.679)** <sup>a</sup>	-1.238 (-1.624, -0.853)* <sup>a</sup>	-1.169 (-1.439, -0.899)** <sup>a</sup>

Clump-forming intercept	-1.350 (-1.615, -1.086) <sup>***, a</sup>	-1.300 (-1.622, -0.978) <sup>***, a</sup>	-1.330 (-1.524, -1.136) <sup>***, a</sup>
Savanna intercept	-1.397 (-2.009, -0.784) <sup>***, a</sup>	-1.897 (-2.152, -1.642) <sup>***, b</sup>	-1.823 (-2.050, -1.597) <sup>***, b</sup>

**Supplementary Table S2.** Models for intraspecific allometries of outer bark thickness (OBT) and stem diameter (SD) between the two examined sites for the different ecological categories (closed-canopy, clump-forming, savanna). Estimates are shown for coefficients with 95% confidence intervals in parenthesis. \*\*\*P<0.001.

	Closed-canopy	Clump-forming	Savanna
Final model	$\log_{10}\text{OBT} \sim \log_{10}\text{SD}$ + Site	$\log_{10}\text{OBT} \sim \log_{10}\text{SD}$ + Site	$\log_{10}\text{OBT} \sim \log_{10}\text{SD}$ * Site
n	105	202	152
Marginal $r^2$ (fixed only)	0.309	0.737	0.820
Conditional $r^2$ (random and fixed)	0.399	0.863	0.843
Equality of slopes test (SD * Site interaction)	P=0.867	P=0.864	P=0.042
Equality of intercepts	P=0.310	P=0.817	P=0.027
Endwell intercept	-1.182 (-1.341, -1.022)***	-1.344 (-1.542, -1.146)***	-1.397 (-2.134, -0.659)***
Endwell slope	0.359 (0.214, 0.504)***	0.895 (0.782, 1.009)***	0.794 (0.389, 1.199)***
Sudwala intercept	-1.182 (-1.341, -1.022)***	-1.310 (-1.549, -1.069)***	-1.893 (-2.206, -1.581)***
Sudwala slope	Same as Endwell	Same as Endwell	1.249 (1.082, 1.416)***

**Supplementary Table S3.** Models predicting inner bark thickness (IBT) based on stem diameter (SD) and ecological categories (closed-canopy, clump-forming, savanna). Estimates are shown for coefficients with 95% confidence intervals in parenthesis. \*P<0.05, \*\*P<0.01, \*\*\*P<0.001. <sup>a-c</sup> homogeneous groups for intercepts, <sup>x,y</sup> homogeneous groups for slopes

	Endwell	Sudwala	Sites pooled
Final model	log <sub>10</sub> IBT ~ log <sub>10</sub> SD * Ecological category	log <sub>10</sub> IBT ~ log <sub>10</sub> SD + Ecological category	log <sub>10</sub> IBT ~ log <sub>10</sub> SD + Ecological category
n	206	253	459
Marginal r <sup>2</sup> (fixed only)	0.828	0.890	0.854
Conditional r <sup>2</sup> (random and fixed)	0.916	0.940	0.931
Equality of slopes test (SD * Ecological category interaction)	P=0.030 (P=0.072 without <i>Olea europaea</i> )	P=0.086	P=0.094
Equality of intercepts	P=0.082	P<0.001	P<0.001
Closed-canopy slope	0.621 (0.509, 0.733) <sup>***, x,y</sup>	0.661 (0.585, 0.737) <sup>***</sup>	0.611 (0.506, 0.716) <sup>***</sup>
Clump-forming slope	0.505 (0.434, 0.575) <sup>***, x</sup>	Same as closed canopy	Same as closed canopy
Savanna slope	0.715 (0.551, 0.877) <sup>***, y</sup>	Same as closed canopy	Same as closed canopy
Closed-canopy intercept	-0.750 (-0.890, -0.610) <sup>***, a</sup>	-0.946 (-1.083, -0.808) <sup>***, a</sup>	-0.811 (-0.974, -0.648) <sup>***, a</sup>
Clump-forming intercept	-0.516 (-0.605, -0.428) <sup>***, b</sup>	-0.712 (-0.833, -0.590) <sup>***, b</sup>	-0.639 (-0.792, -0.486) <sup>***, b</sup>
Savanna intercept	-0.524 (-0.733, -0.315) <sup>***, a,b</sup>	-0.422 (-0.530, -0.315) <sup>***, c</sup>	-0.377 (-0.535, -0.219) <sup>***, c</sup>

**Supplementary Table S4.** Models for intraspecific allometries of inner bark thickness (IBT) and stem diameter (SD) across ecological categories (closed-canopy, clump-forming, savanna) excluding *Olea europaea* subsp. *africana* from the Endwell analyses and the analyses of the sites pooled. The model for Sudwala is the same as that presented in Supplementary Table S2. Estimates are shown for coefficients with 95% confidence intervals in parenthesis. \*P<0.05, \*\*P<0.01, \*\*\*P<0.001. <sup>a-c</sup> homogeneous groups for intercepts, <sup>x,y</sup> homogeneous groups for slopes.

	Endwell	Sudwala	Sites pooled
Final model	log <sub>10</sub> IBT ~ log <sub>10</sub> SD + Ecological category	log <sub>10</sub> IBT ~ log <sub>10</sub> SD + Ecological category	log <sub>10</sub> IBT ~ log <sub>10</sub> SD + Ecological category
n	180	253	433
Marginal r <sup>2</sup> (fixed only)	0.784	0.890	0.856
Conditional r <sup>2</sup> (random and fixed)	0.914	0.940	0.931
Equality of slopes test (SD * Ecological category interaction)	P=0.072	P=0.086	P=0.099
Equality of intercepts	P=0.103	P<0.001	P<0.001
Closed-canopy slope	0.577 (0.500, 0.653)***	0.661 (0.585, 0.737)***	0.620 (0.529, 0.711)***
Clump-forming slope	Same as closed-canopy	Same as closed-canopy	Same as closed-canopy
Savanna slope	Same as closed-canopy	Same as closed-canopy	Same as closed-canopy
Closed-canopy intercept	-0.731 (-0.850, -0.612)***, a	-0.946 (-1.083, -0.808)***, a	-0.817 (-0.961, -0.673)***, a
Clump-forming intercept	-0.568 (-0.655, -0.480)***, a	-0.712 (-0.833, -0.590)***, b	-0.653 (-0.787, -0.519)***, b

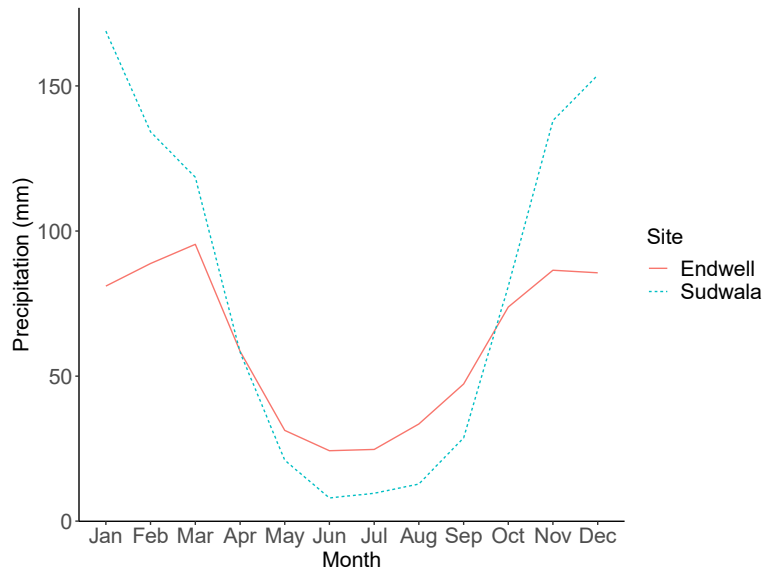
Savanna intercept	-0.459 (-0.632, - 0.285) <sup>***, a</sup>	-0.422 (-0.530, - 0.315) <sup>***, c</sup>	-0.390 (-0.529, - 0.252) <sup>***, c</sup>
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**Supplementary Table S5.** Models for intraspecific allometries of inner bark thickness (IBT) and stem diameter (SD) between the two examined sites for the different ecological categories (closed-canopy, clump-forming, savanna). Estimates are shown for coefficients with 95% confidence intervals in parenthesis. \*\*\*P<0.001.

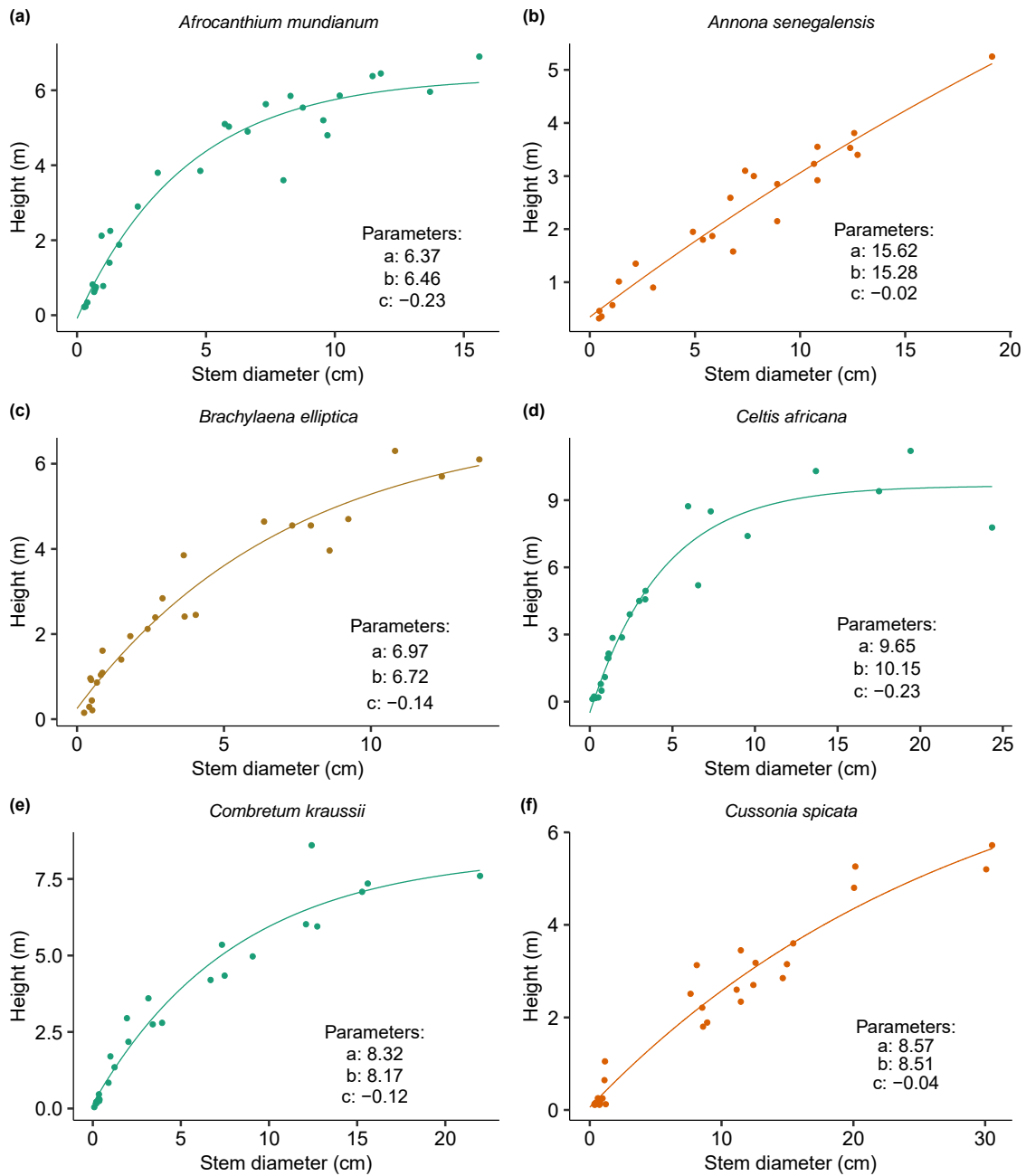
	Closed-canopy	Clump-forming	Savanna
Final model	$\log_{10}\text{IBT} \sim \log_{10}\text{SD}$	$\log_{10}\text{IBT} \sim \log_{10}\text{SD}$	$\log_{10}\text{IBT} \sim \log_{10}\text{SD}$
n	105	202	152
Marginal $r^2$ (fixed only)	0.851	0.781	0.924
Conditional $r^2$ (random and fixed)	0.886	0.914	0.936
Equality of slopes test (SD * Site interaction)	P=0.111	P=0.051	P=0.919
Equality of intercepts	P=0.088	P=0.443	P=0.453
Endwell intercept	-0.779 (-0.844, -0.715)***	-0.595 (-0.721, -0.470)***	-0.481 (-0.555, -0.407)***
Endwell slope	0.573 (0.488, 0.658)***	0.570 (0.468, 0.672)***	0.709 (0.666, 0.752)***
Sudwala intercept	Same as Endwell	Same as Endwell	Same as Endwell
Sudwala slope	Same as Endwell	Same as Endwell	Same as Endwell

**Supplementary Table S6.** Explained variance and loadings for the first three principal components (PC) of the principal component analysis for IB density and water content, wood density and water content, leaf length, IB (IBT<sub>2m</sub>) and OB thickness (OBT<sub>2m</sub>) for individuals 2m in height.

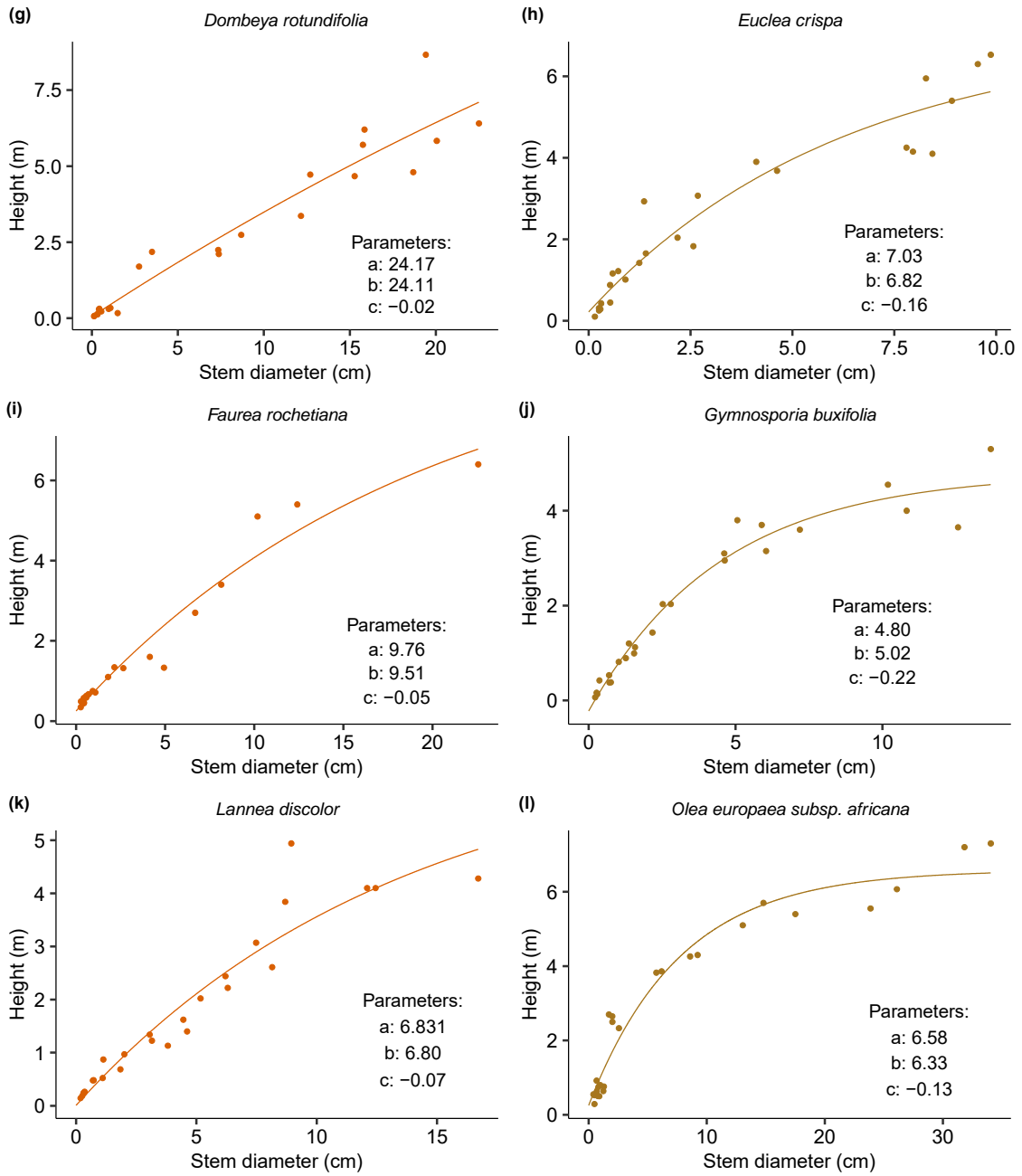
	PC1	PC2	PC3
Explained variance (%)	74.6	12.5	6.9
Cumulative explained variance (%)	74.6	87.0	93.9
IB density	-0.401	-0.157	0.537
IB water content	0.395	0.166	-0.573
Wood density	-0.399	-0.205	-0.355
Wood water content	0.406	0.194	0.391
leaf length	0.372	0.274	0.314
IBT <sub>2m</sub>	0.371	-0.456	0.016
OBT <sub>2m</sub>	0.289	-0.765	0.063



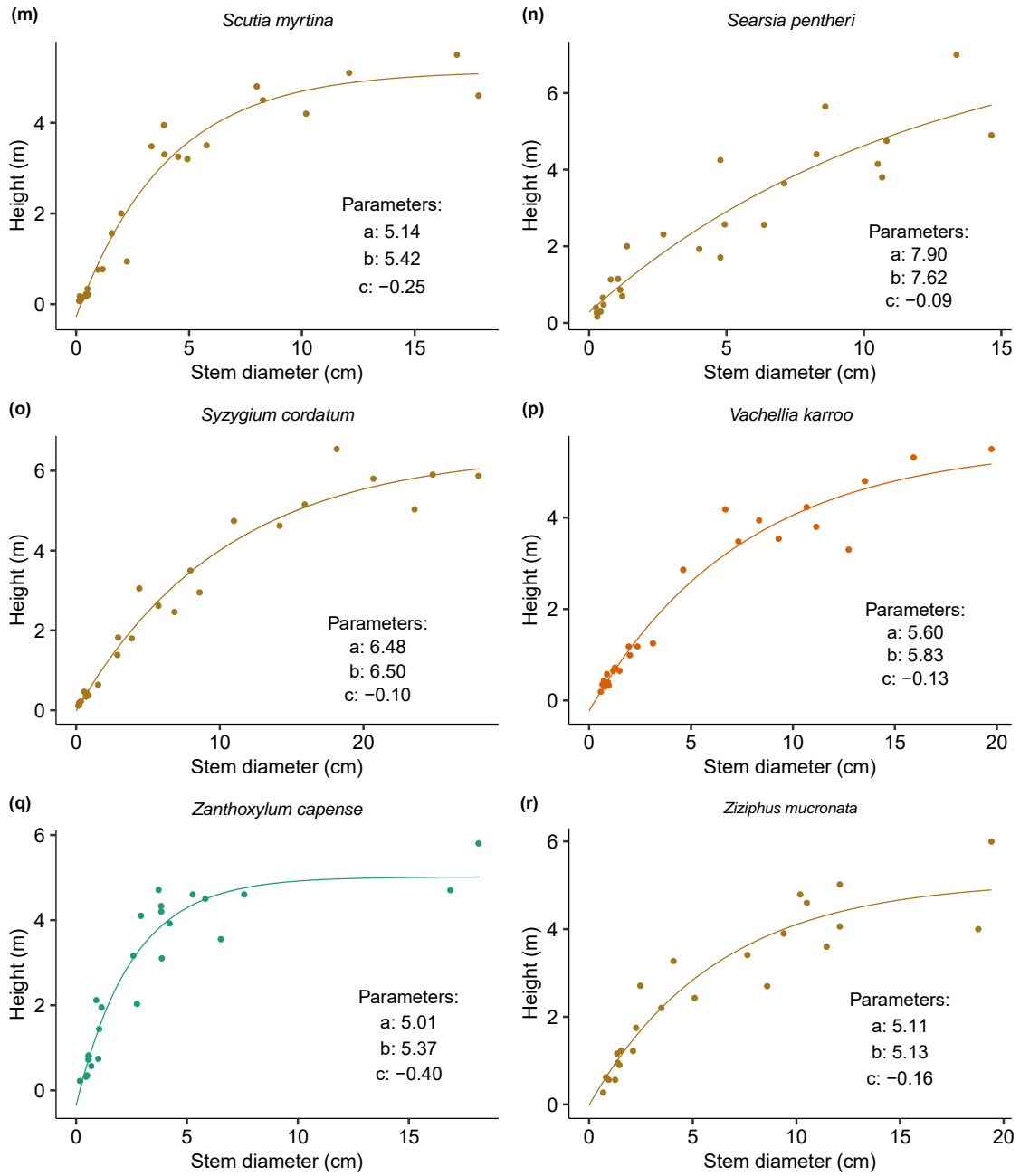
**Supplementary Figure S1.** Monthly precipitation for Endwell and Sudwala showing that total precipitation is much higher in Sudwala, but that the dry season is characterized by markedly lower precipitation than Endwell.



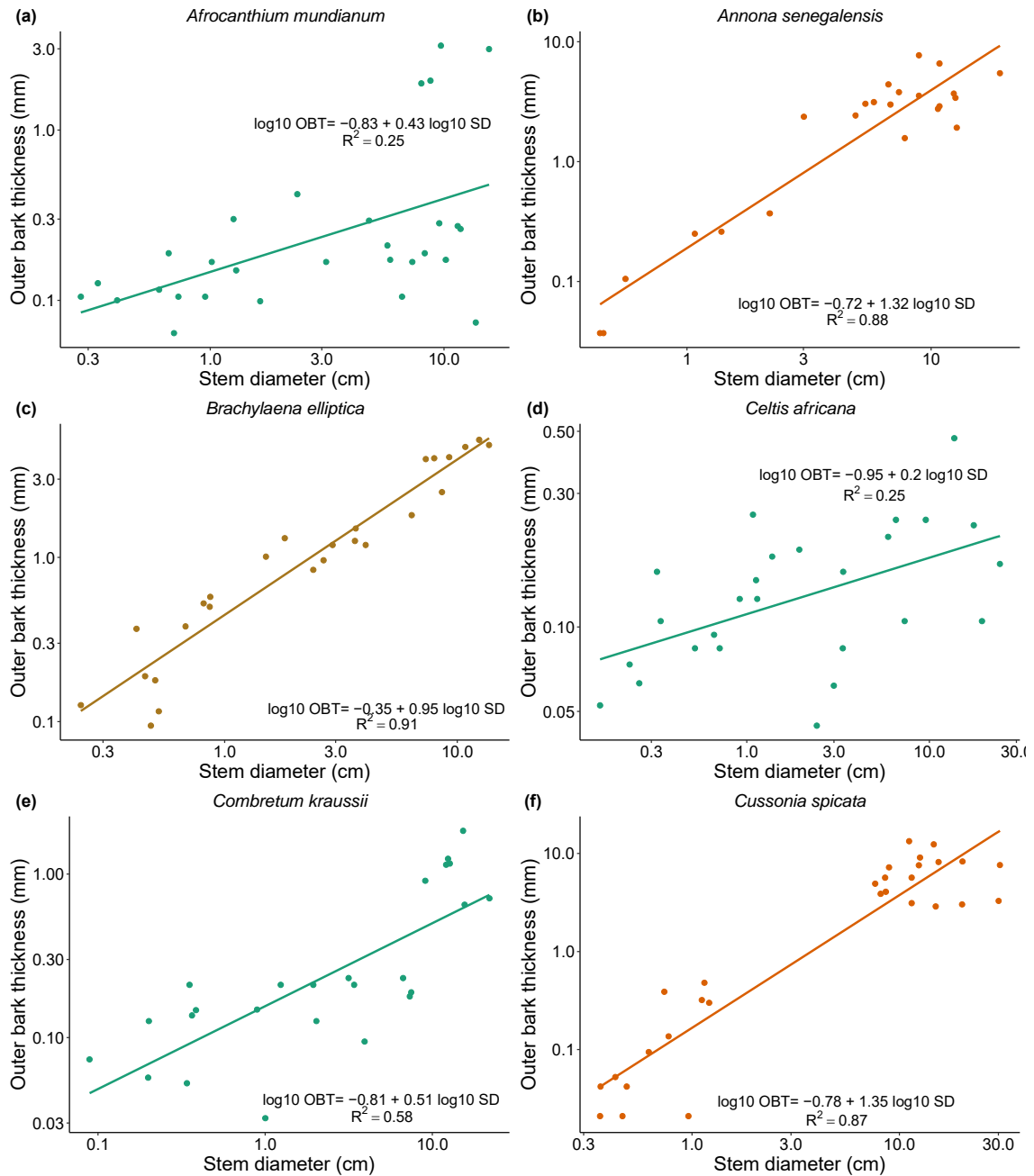
**Supplementary Figure S2.** Models for height vs. stem diameter relationships per species. These models were used to calculate stem diameter for individuals with 2m in height. Closed-canopy species in green, clump-forming species in brown, savanna species in orange.



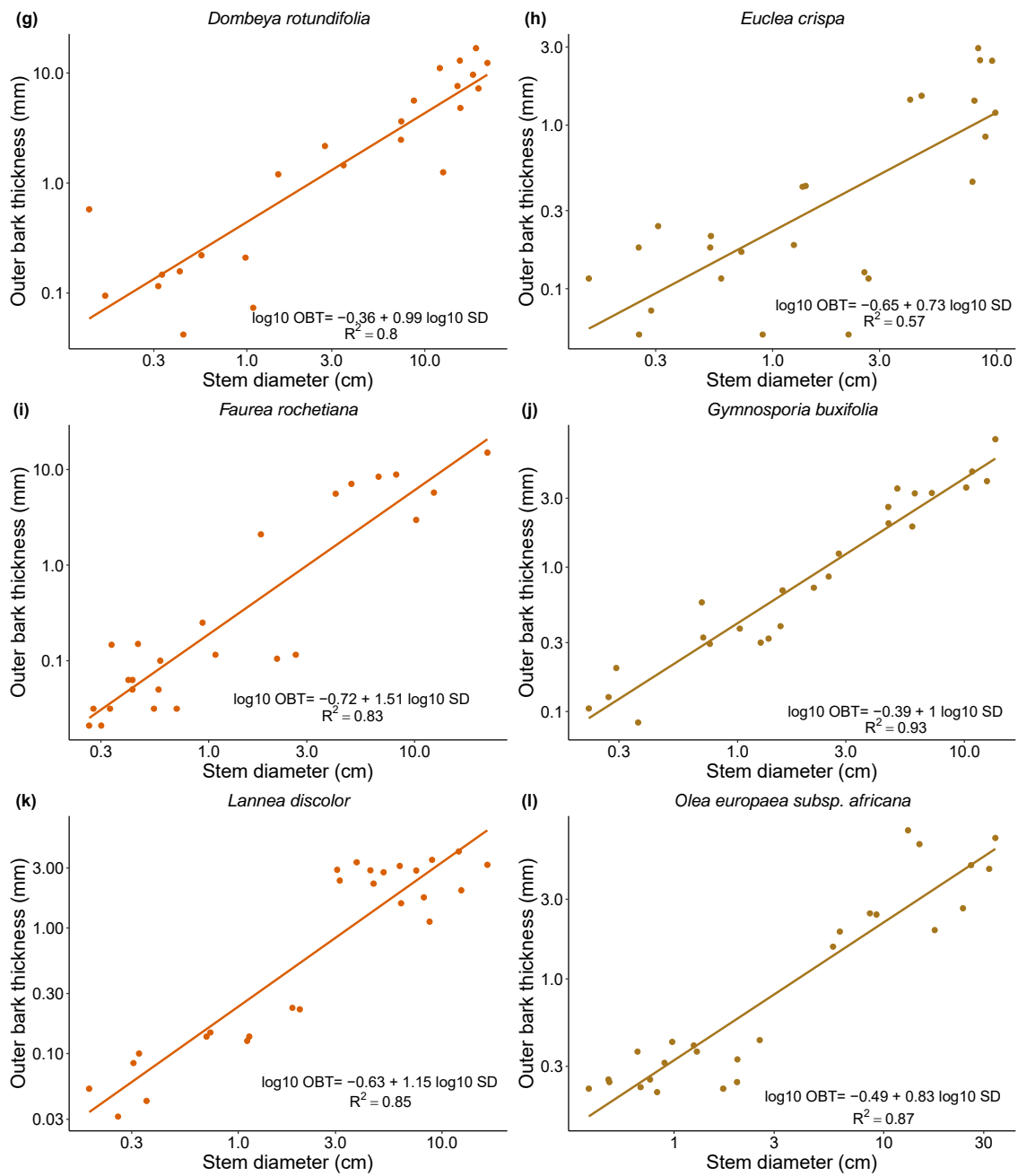
Supplementary Figure S2. cont.



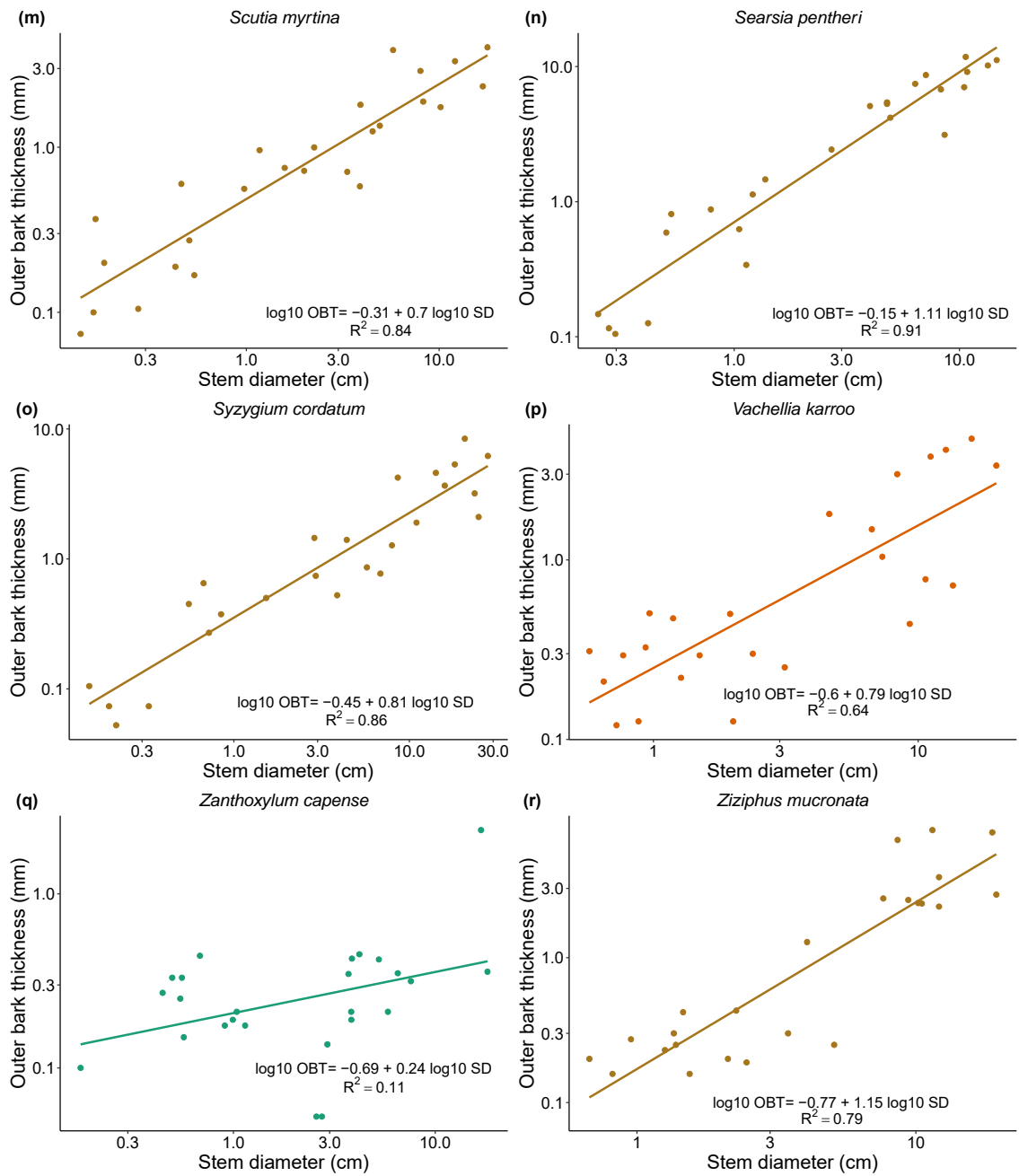
Supplementary Figure S2. cont.



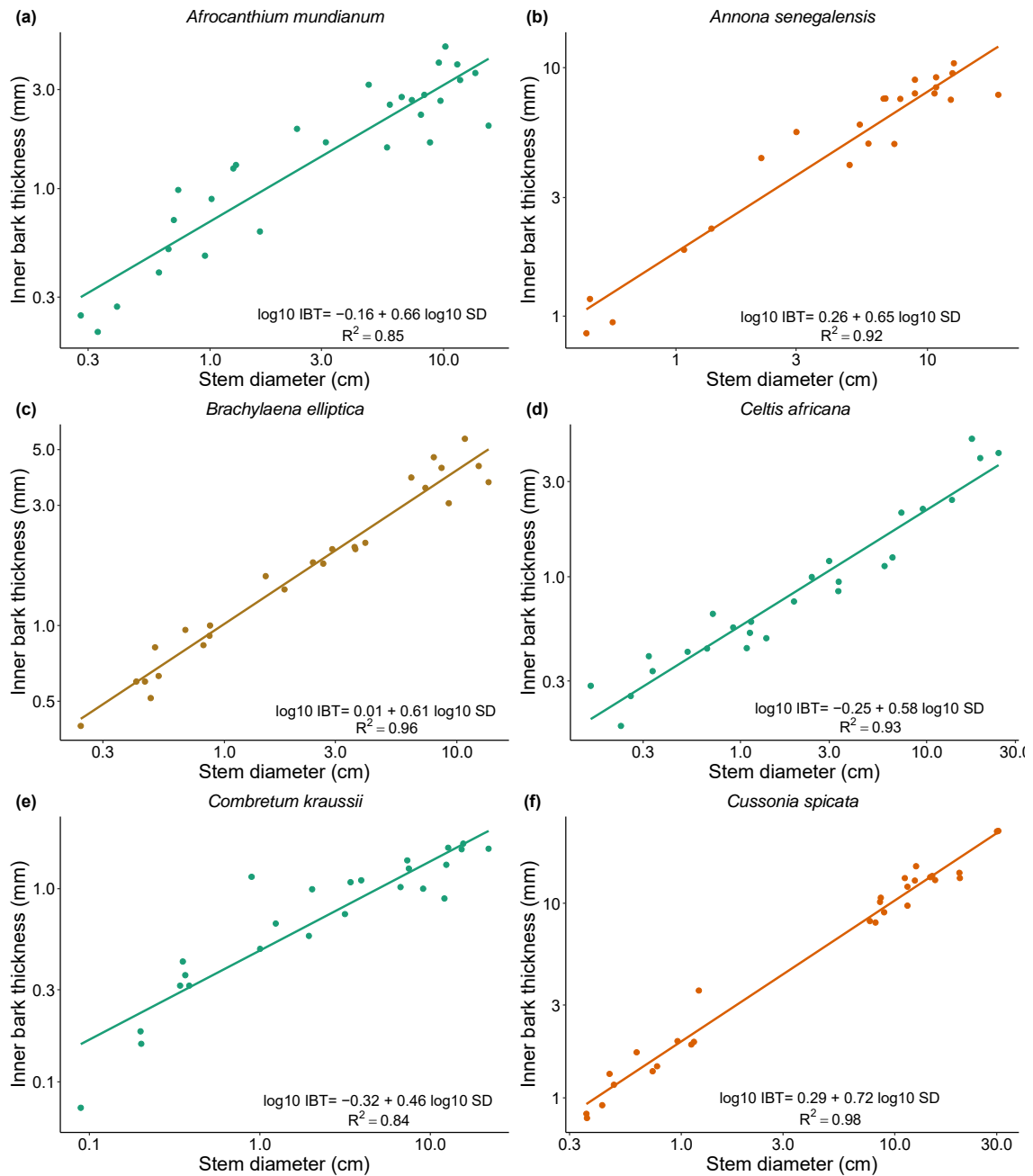
**Supplementary Figure S3.** Models for outer bark thickness (OBT) vs. stem diameter (SD) relationships per species. These models were used to calculate OBT for individuals with 2m in height. Closed-canopy species in green, clump-forming species in brown, savanna species in orange.



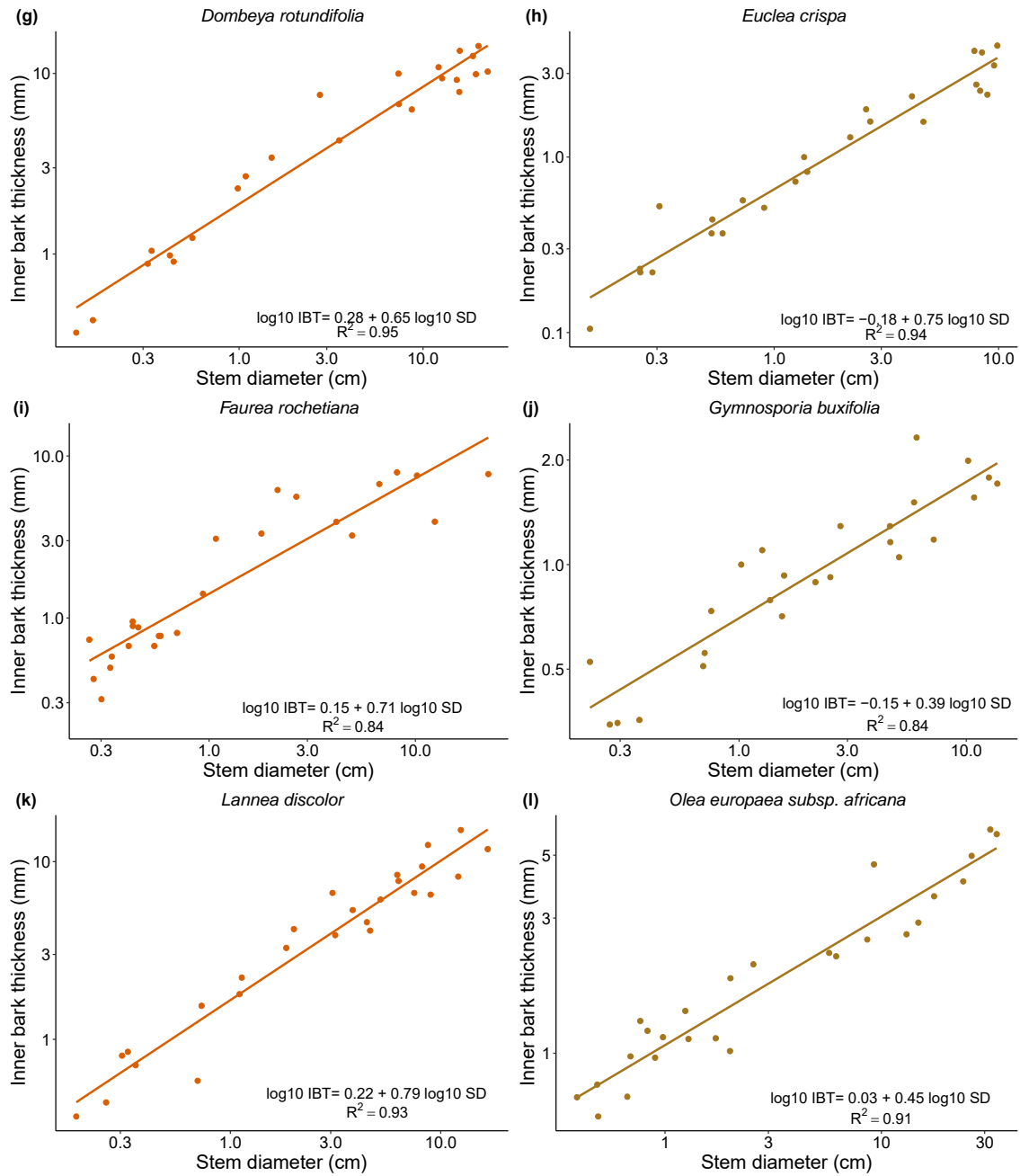
Supplementary Figure S3 cont.



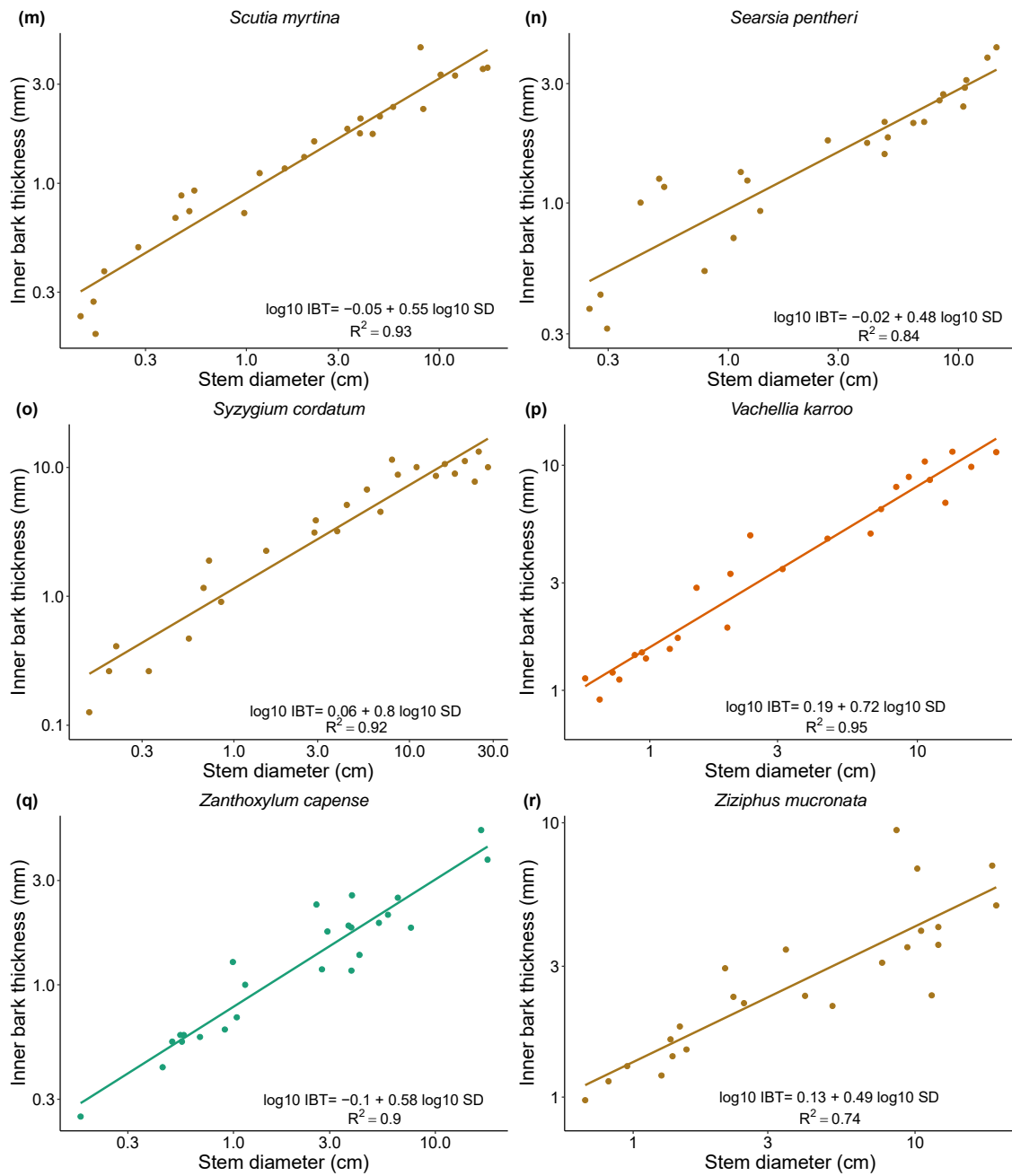
Supplementary Figure S3 cont.



**Supplementary Figure S4.** Models for inner bark thickness (IBT) vs. stem diameter (SD) relationships per species. These models were used to calculate IBT for individuals with 2m in height. Closed-canopy species in green, clump-forming species in brown, savanna species in orange.



Supplementary Figure S4 cont.



Supplementary Figure S4. Cont.