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Supplementary Material

Functional evaluation of height–diameter relationships and tree development in an Australian subtropical rainforest

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Supplementary Figures

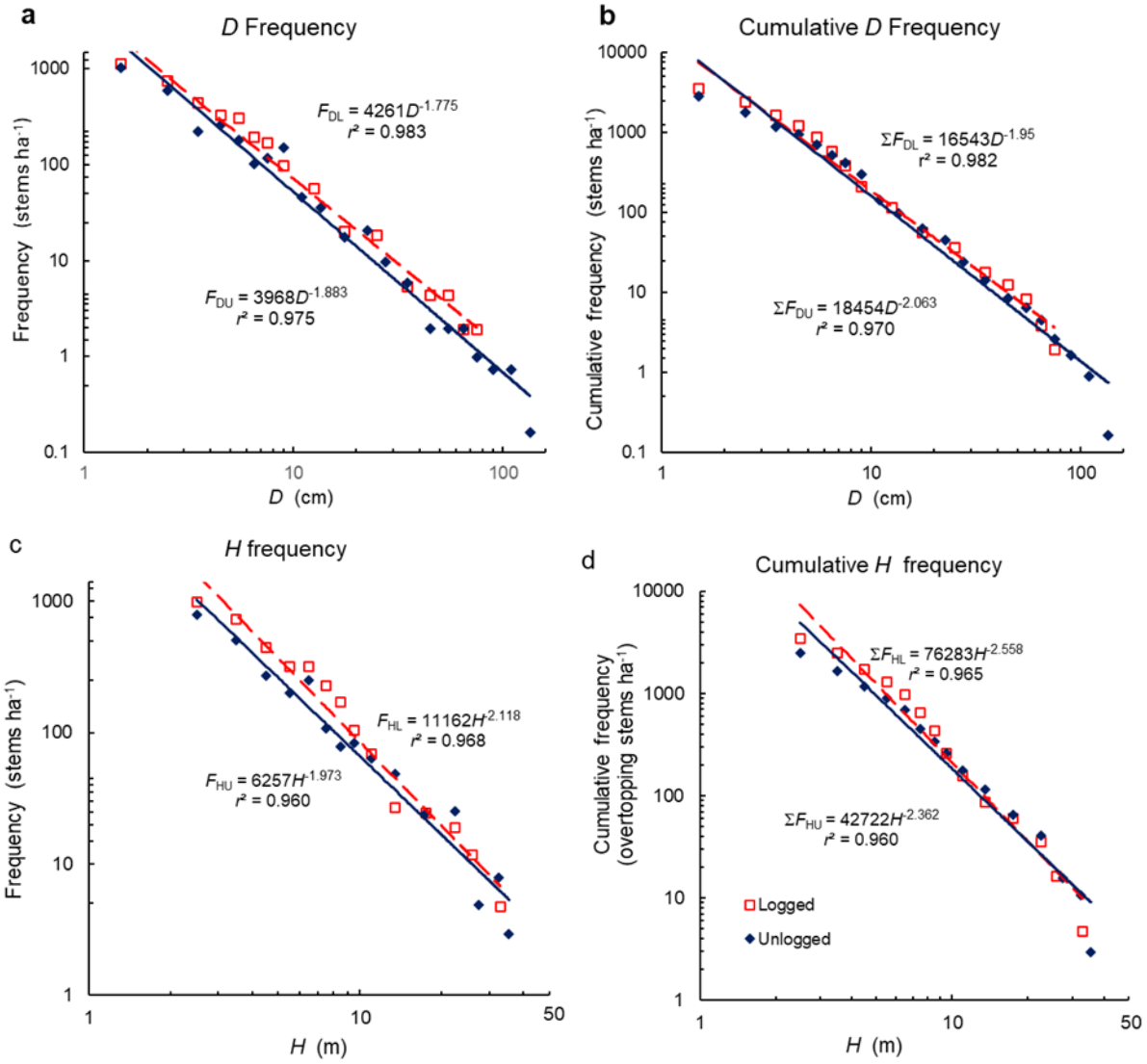


Fig. S1. Frequency distributions of diameter at breast height (*D*) for (a) 1-cm *D*-class means, (b) cumulative frequency (total number of larger stems), and distributions of total tree height (*H*) for (c) 1-m *H*-class means, (d) cumulative frequency (total number of taller trees), for unlogged (F_{DU}) and logged (F_{DL}) rainforest plots 41 years after initial disturbance.

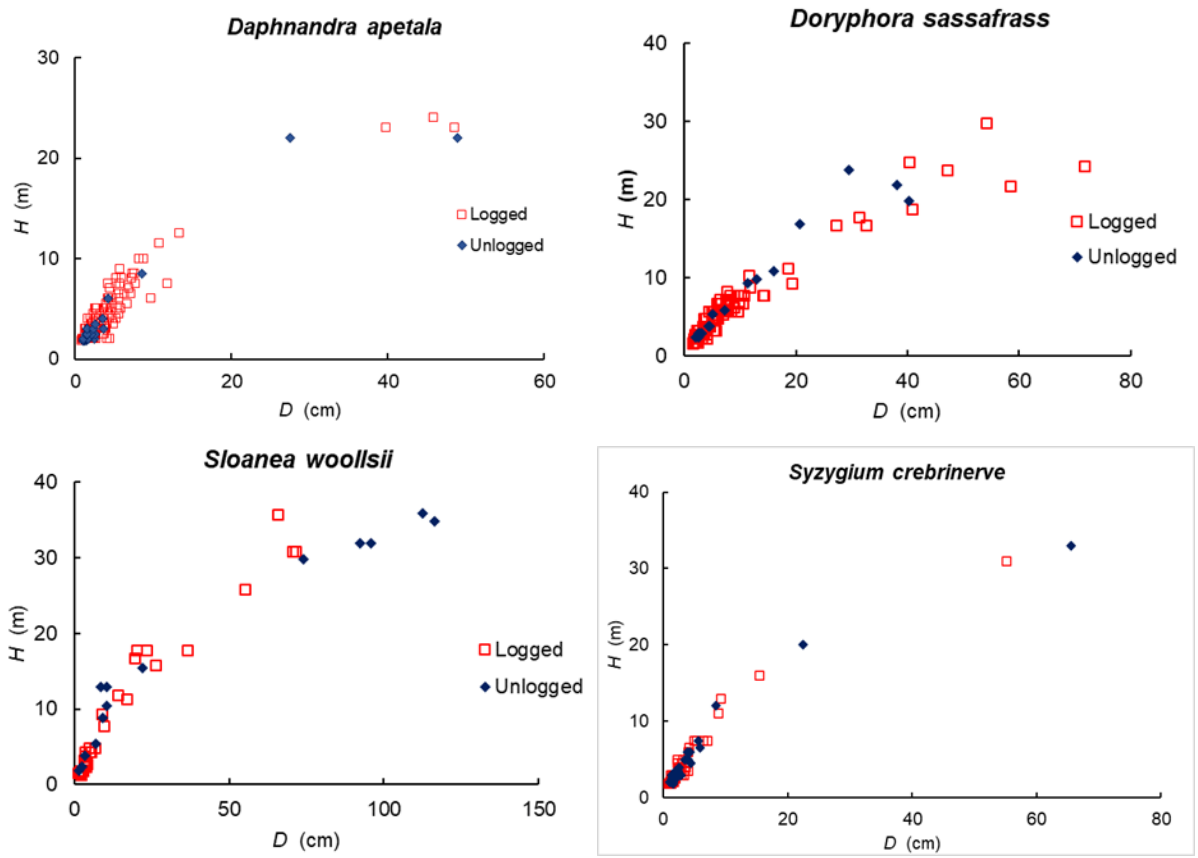


Fig. S2. Height (*H*) and diameter breast height (*D*) relationships in unlogged and logged plots for *Daphnandra apetala*, *Doryphora sassafras*, *Sloanea woollsii* and *Syzygium crebrinerve*. Note different *D* and *H* scales for each species.

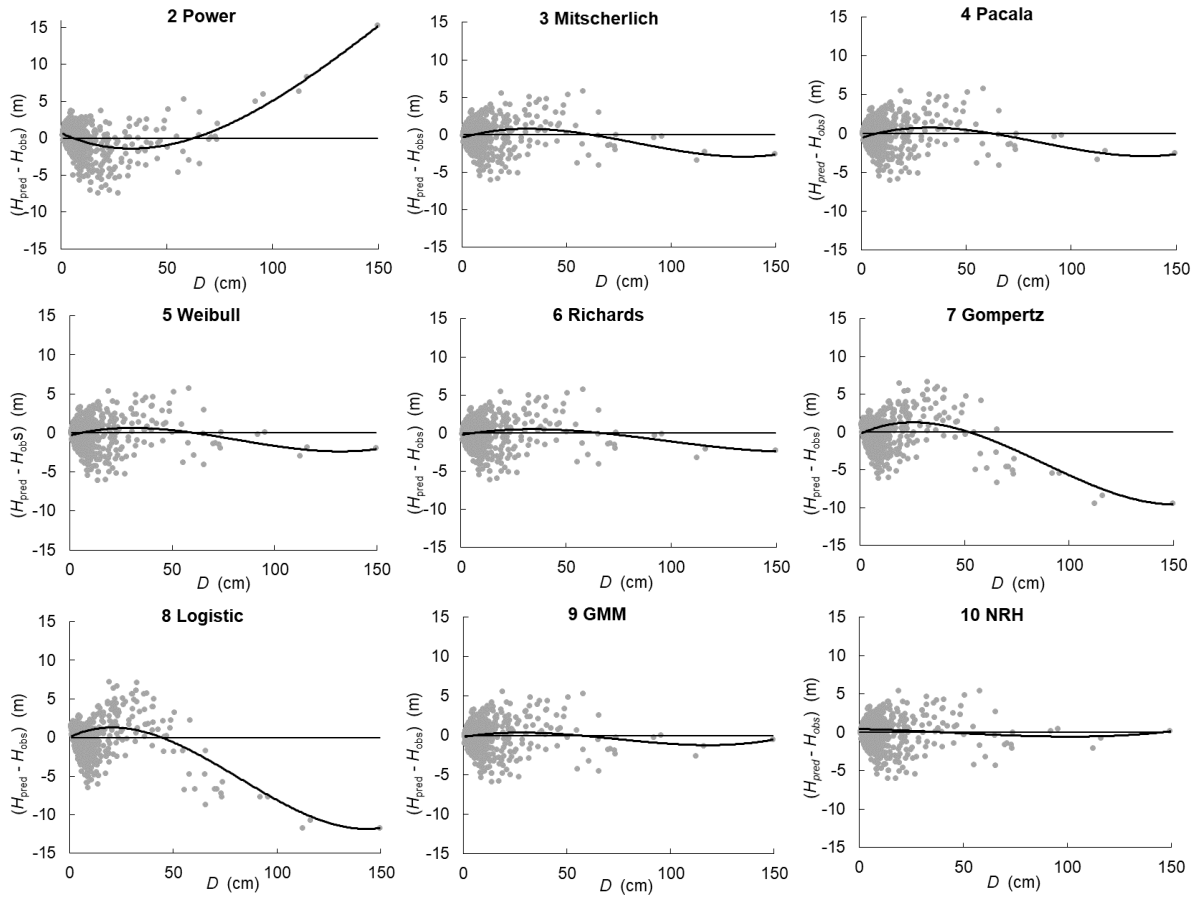
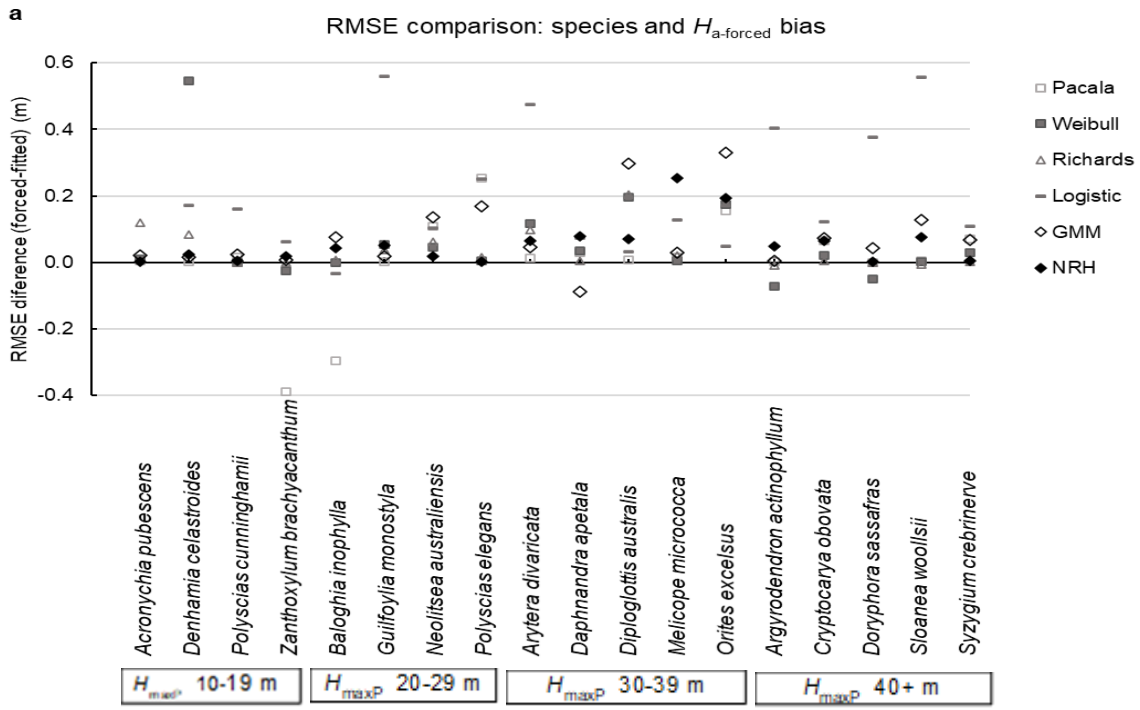
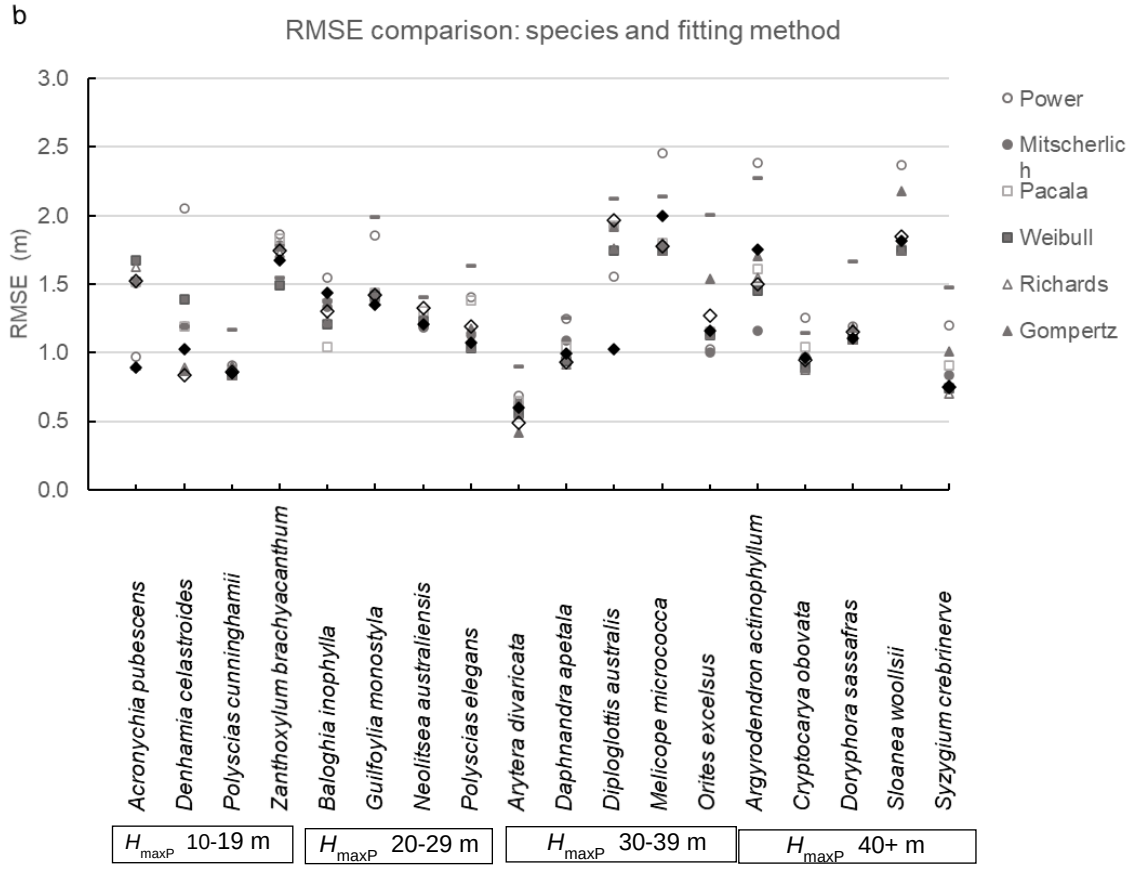


Fig. S3. Error in estimated height (H_{pred}-H_{obs}) of individual trees using selected $H_{a\text{-}fitted}$ allometric equations (cf. Table 1) using Excel Solver fitting routines. In each graph, points above and below the horizontal line represent, respectively, overestimates and underestimates by the equations; the thick curve represents the size class mean trend.

Fig S4. (Below). Comparisons of residual mean square error (RMSE) values calculated for H/*D* relationships for 18 subtropical rainforest species, grouped in four structural classes as determined by Equations described in Table 1, with (a) increase in RMSE in $H_{a\text{-}forced}$ as compared with $H_{a\text{-}fitted}$ equations and (b) RMSE for $H_{a\text{-}forced}$ equations.


a
RMSE comparison: species and $H_{a\text{-forced}}$ bias
RMSE diference (forced-fitted) (m)
0.6
0.4
0.2
0.0
-0.2
-0.4
Pacala
Weibull
Richards
Logistic
GMM
NRH
Acronychia pubescens
Denhamia celastroides
Polyscias cunninghamii
Zanthoxylum brachyacanthum
Baloghia inophylla
Guilfoylia monostyla
Neolitsea australiensis
Polyscias elegans
Arytera divaricata
Daphnandra apetala
Diploglottis australis
Melicope micrococca
Orites excelsus
Argyrodendron actinophyllum
Cryptocarya obovata
Doryphora sassafras
Sloanea woollsii
Syzygium crebrinerve
H_{maxP} 10-19 m
H_{maxP} 20-29 m
H_{maxP} 30-39 m
H_{maxP} 40+ m


b
RMSE comparison: species and fitting method
RMSE (m)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Power
Mitscherlich
Pacala
Weibull
Richards
Gompertz
Acronychia pubescens
Denhamia celastroides
Polyscias cunninghamii
Zanthoxylum brachyacanthum
Baloghia inophylla
Guilfoylia monostyla
Neolitsea australiensis
Polyscias elegans
Arytera divaricata
Daphnandra apetala
Diploglottis australis
Melicope micrococca
Orites excelsus
Argyrodendron actinophyllum
Cryptocarya obovata
Doryphora sassafras
Sloanea woollsii
Syzygium crebrinerve
H_{maxP} 10-19 m
H_{maxP} 20-29 m
H_{maxP} 30-39 m
H_{maxP} 40+ m

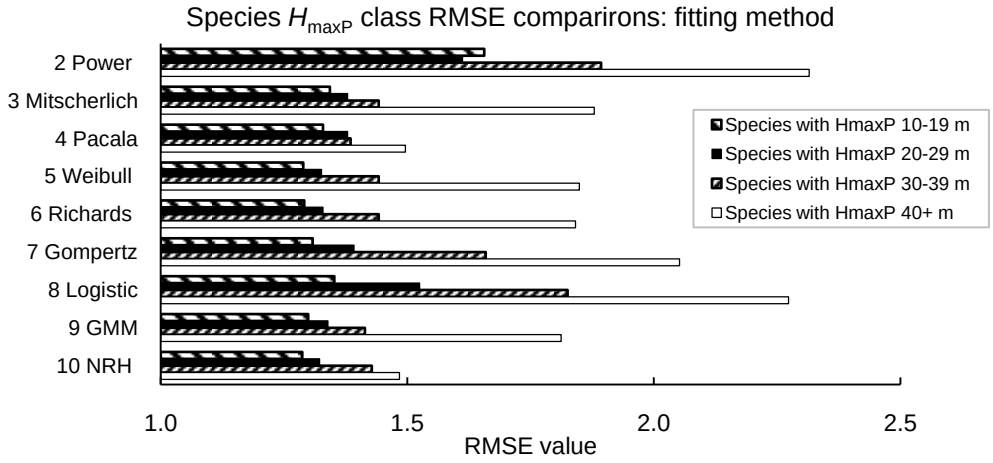


Fig S5. Comparison of residual mean square error (RMSE) values calculated by $H_{\text{a-fitted}}$ equations, defined in Table 1, for selected *H/D* relationships applied to subtropical rainforest species belonging to four species maximum height (published H_{maxP}) classes.

Supplementary Tables

Table S1. Adult tree structural category and selected characteristics of 18 species in a subtropical rainforest.

Symbols: *n*, number of stems; [A], For study site trees: maximum local tree height (H_{maxL}) and maximum local diameter at breast height (D_{maxL}); [B], H_{maxP}, D_{maxP} from published sources: (Francis 1970; Boland *et al*. 2006; Floyd 2008); [C], ρ, dry wood basic density from Cause *et al*. (1989); n.a., not available. [D], For convenience, *Argyrodendron actinophyllum* ssp. *actinophyllum* is referred to in text and tables as *Argyrodendron actinophyllum*.

Structural category	Species	Family	*n*	H_{maxL} [A] (m)	D_{maxL} [A] (cm)	H_{maxP} [B] (m)	D_{maxP} [B] (cm)	ρ [C] (kg m^{-3})
Understorey	*Acronychia pubescens* (F.M.Bailey) C.T.White	Rutaceae	55	10	12	15	18-30	640
	Denhamia celastroides (F.Muell.) Jessup	Celastraceae	18	17	30	15	50	n.a.
	Polyosma cunninghamii (F.Muell.) Harms	Polyosmaceae	67	15	22	15	25	720
	Zanthoxylum brachyacanthum F.Muell.	Rutaceae	63	16	25	15-18	20-35	825
Subdominant	*Baloghia inophylla* (G.Forst.) P.S.Green	Euphorbiaceae	47	20	30	20-24	30-50	720
	Guilfoylia monostylis (Benth.) F.Muell.	Surianaceae	18	25	55	20-25	30-65	930
	Neolitsea australiensis Kosterm.	Lauraceae	49	22	25	15-25	25	675
	Polyscias elegans (C.Moore & F.Muell.) Harms	Araliaceae	21	23	45	25-30	75	400
Codominant	*Arytera divaricata* F.Muell.	Sapindaceae	69	12	10	35	30	735
	Daphnandra apetala Schodde	Atherospermataceae	158	24	50	30	20-50	655
	Diploglottis australis (R.Br.) Hiern	Ebenaceae	20	31	60	30-35	75	800
	Melicope micrococca (F.Muell.) T.G.Hartley	Rutaceae	50	26	65	30-35	90	610
	Orites excelsus R.Br.	Proteaceae	25	32	70	30-35	75	575
Emergent	*Argyrodendron actinophyllum* ssp. *actinophyllum* (F.M.Bailey) Edlin[D]	Malvaceae	84	32	100	35-50	110-170	800
	Cryptocarya obovata R.Br.	Lauraceae	22	30	60	40	90	640
	Doryphora sassafras Endl.	Atherospermataceae	114	30	70	30-50	120	595
	Sloanea woollsii F.Muell.	Elaeocarpaceae	50	36	120	40-55	120-250	610
	Syzygium crebrinerve (C.T.White) L.A.S.Johnson	Myrtaceae	92	33	65	40-45	90	705

Table S2. Parameters of tree height/diameter relationships determined by R and Excel nonlinear regression routines

Abbreviations: *n*, sample size; Fitting: sources for statistical software: R *modelr* package (Wickham 2020); Microsoft Excel Solver; H_a, *a*, *b* and *k* values all obtained by fitting equations; SE, standard error of estimate; H_{D150}, estimated *H* for the largest tree (*D* = 149.6 cm, *H* = 36 m); H_{maxC}, calculated maximum tree height for the dataset (H_a + 1.3 m); R^2, regression coefficient of determination; RMSE, root mean square error; AIC, Akaike's information criterion; Bias, mean bias of equation; '-' indicates a parameter not estimated by the relevant procedure.

Equation	n	Fitting	H_a	SE_{Ha}	H_{D150}	H_{maxC}	a	SE_a	b	SE_b	R^2	RMSE	AIC	Bias
(1) Linear (H<8 m)	869	R	-	-	-	-	0.760	0.008	-	-	0.917	0.946	2372.7	-0.048
		Excel	-	-	-	-	0.760	-	-	-	0.733	0.946	-	-0.048
(2) Power	1122	R	-	-	51.0	-	1.578	0.033	0.688	0.006	0.907	1.759	4456.8	0.288
		Excel	-	-	51.5	-	1.563	-	0.692	-	0.903	1.756	-	0.279
(3) Mitscherlich	1122	R	32.59	0.51	33.4	33.9	0.029	0.010	-	-	0.937	1.430	3992.9	0.059
		Excel	32.61	-	33.4	33.9	0.029	-	-	-	0.937	1.426	-	0.081
(4) Pacala	1122	R	32.59	0.51	33.5	33.9	0.938	0.010	-	-	0.937	1.430	3992.9	0.058
		Excel	32.59	-	33.4	33.9	0.936	-	-	-	0.937	1.424	-	0.057
(5) Weibull	1122	R	33.32	0.79	34.0	34.6	0.029	0.001	0.983	0.014	0.937	1.429	3993.4	0.077
		Excel	33.37	-	34.0	34.2	0.029	-	0.989	-	0.937	1.422	-	0.082
(6) Richards	1122	R	32.86	0.69	33.7	34.2	0.028	0.001	0.990	0.018	0.937	1.430	3994.7	0.067
		Excel	32.90	-	33.7	34.2	0.028	-	0.989	-	0.937	1.422	-	0.067
(7) Gompertz	1122	R	25.23	0.32	26.5	26.5	0.089	0.002	2.906	0.037	0.908	1.725	4416.1	0.114
		Excel	25.27	-	26.6	26.6	0.088	-	2.902	-	0.908	1.719	-	0.113
(8) Logistic	1122	R	22.94	0.29	24.2	24.2	0.167	0.004	11.47	0.38	0.883	1.955	4696.5	0.173
		Excel	22.98	-	24.1	24.1	0.167	-	11.43	-	0.882	1.949	-	0.172
Equation	n^A	Fitting	H_a	SE_{Ha}	H_{D150}	H_{maxC}	a	SE_a	b	SE_b	R^2	RMSE	AIC	
(9) GMM	1122	R	41.42	1.30	35.5	42.7	$48.43^{(k)}$	1.36	1.083	0.019	0.939	1.407	3957.8	0.044
		Excel	41.42	-	35.4	42.7	$48.43^{(k)}$	-	1.083	-	0.939	1.399	-	0.044
(10) NRH	1122	R	43.27	2.14	36.2	44.6	0.968	0.019	0.240	0.114	0.938	1.416	3973.3	0.101
		Excel	43.36	-	36.2	44.6	0.968	-	0.236	-	0.938	1.409	-	0.100

Table S3. Parameters of equations, defined in Table 1 and fitted by Microsoft Excel Solver, describing tree *H/D* relationships for selected subtropical rainforest species

Abbreviations: H_{maxP}, maximum height; *n*, number of stems; NRH, non-rectangular hyperbola; *a*, slope coefficient; *k*, half-saturation rate for Generalised Michaelis-Menten function (Equation 9); *b*, curvature coefficient; R^2, coefficient of determination; RMSE, root mean square error. H_a values in Roman face obtained by fitting equation, H_{maxL} values in italics applied to equation (forced) from field data. For NRH $H_{a\text{-fitted}}$ functions (10A), values of *b* in bold type are constraints applied to achieve a solution.

H_{maxP}	Species	(1)	Linear <8 m		(2A) Power <8 m				(2B) Power all data				
(m)		*n*	*a*	R^2	*a*	*b*	R^2	RMSE	*n*	*a*	*b*	R^2	RMSE
10-19	*Acronychia pubescens*	26	0.85	0.641	0.774	0.633	0.660	1.024	55	1.198	0.797	0.765	0.971
	Denhamia celastroides	12	0.832	0.816	0.906	0.859	0.832	0.572	18	1.943	0.565	0.832	2.054
	Polyosma cunninghamii	38	0.848	0.850	0.875	0.98	0.85	0.728	67	1.135	0.794	0.787	0.906
	Zanthoxylum brachyacanthum	12	0.897	0.852	1.084	0.884	0.85	0.747	63	1.452	0.788	0.757	1.864
20-29	*Baloghia inophylla*	31	0.738	0.790	0.657	1.05	0.788	0.799	45	0.814	0.953	0.927	1.545
	Guilfoylia monostylis	6	0.812	0.934	0.955	0.88	0.793	0.87	18	1.650	0.675	0.937	1.855
	Neolitsea australiensis	24	0.854	0.717	0.904	0.579	0.911	0.434	49	1.075	0.866	0.915	1.186
	Polyscias elegans	10	0.843	0.849	0.973	0.857	0.888	0.832	21	1.283	0.783	0.958	1.407
30-39	*Arytera divaricata*	17	1.039	0.917	0.813	1.179	0.933	0.476	69	1.124	0.879	0.893	0.690
	Daphnandra apetala	110	0.818	0.677	0.682	1.135	0.729	0.904	156	1.121	0.789	0.786	1.248
	Diploglottis australis	9	1.344	0.917	1.176	1.088	0.866	0.556	20	2.285	0.623	0.958	1.558
	Melicope micrococca	12	0.798	0.672	0.749	0.789	0.904	0.709	49	1.764	0.678	0.636	2.453
	Orites excelsus	16	0.772	0.833	0.520	1.276	0.868	0.561	25	1.118	0.774	0.984	1.028
40+	*Argyrodendron actinophyllum*	61	0.814	0.666	1.128	0.799	0.695	0.863	82	1.839	0.686	0.842	2.385
	Cryptocarya obovata	16	0.844	0.725	0.719	1.125	0.838	0.921	22	1.437	0.736	0.954	1.257
	Doryphora sassafras	74	0.737	0.784	0.674	1.082	0.778	0.738	114	1.096	0.777	0.278	1.189
	Sloanea woollsii	26	0.658	0.785	0.753	0.888	0.699	0.576	50	1.919	0.627	0.915	2.371
	Syzygium crebrinerve	81	0.914	0.828	1.073	0.903	0.828	0.655	92	1.322	0.779	0.944	1.202

Table S3 contd.

H_{maxP}	Species		(3) Mitscherlich				(4A) Pacala H_a fitted			
(m)		*n*	$H_{a\text{-fitted}}$	*a*	R^2	RMSE	$H_{a\text{-fitted}}$	*a*	R^2	RMSE
10-19	*Acronychia pubescens*	55	12.6	0.080	0.515	1.511	12.6	1.003	0.515	1.511
	Denhamia celastroides	18	16.7	0.077	0.943	1.193	16.7	1.282	0.943	1.193
	Polyosma cunninghamii	67	17.7	0.055	0.929	0.845	17.7	0.964	0.924	0.845
	Zanthoxylum brachyacanthum	63	21.9	0.054	0.777	1.785	18.5	1.580	0.655	2.220
20-29	*Baloghia inophylla*	45	49.0	0.018	0.948	1.335	49.0	0.860	0.948	1.335
	Guilfoylia monostylis	18	25.3	0.039	0.962	1.439	25.3	0.977	0.962	1.439
	Neolitsea australiensis	49	39.0	0.023	0.914	1.194	39.0	0.908	0.914	1.194
	Polyscias elegans	21	30.7	0.032	0.973	1.128	30.7	0.969	0.973	1.128
30-39	*Arytera divaricata*	69	15.2	0.077	0.917	0.631	15.1	1.161	0.917	0.631
	Daphnandra apetala	156	29.1	0.032	0.923	1.089	28.5	0.946	0.935	1.013
	Diploglottis australis	20	29.8	0.04	0.936	1.917	29.8	1.181	0.936	1.916
	Melicope micrococca	49	28.2	0.035	0.903	1.786	28.2	0.9790	0.903	1.786
	Orites excelsus	25	40.9	0.017	0.985	0.999	40.9	0.710	0.985	0.999
40+	*Argyrodendron actinophyllum*	82	32.9	0.034	0.934	1.161	32.9	1.104	0.934	1.611
	Cryptocarya obovata	22	33.5	0.031	0.972	0.973	33.5	1.030	0.972	0.974
	Doryphora sassafras	114	29.6	0.026	0.949	1.101	29.6	0.784	0.949	1.101
	Sloanea woollsii	50	35.2	0.026	0.988	1.744	35.2	0.911	0.988	1.744
	Syzygium crebrinerve	92	37.9	0.028	0.973	0.840	37.9	1.079	0.973	0.840

Table S3. contd.

H_{maxP}	Species		(4B) Pacala H_{maxL} forced				(5A) Weibull H_a fitted				
(m)		*n*	H_{maxL}	*a*	R^2	RMSE	$H_{a\text{-fitted}}$	*a*	*b*	R^2	RMSE
10-19	*Acronychia pubescens*	55	*10*	1.087	0.512	1.516	850	0.001	0.83	0.478	1.661
	Denhamia celastroides	18	*17*	1.272	0.943	1.195	15.6	0.038	1.459	0.972	0.846
	Polyosma cunninghamii	67	*15*	1.025	0.926	0.861	15.1	0.057	1.083	0.819	0.84
	Zanthoxylum brachyacanthum	63	*16*	1.341	0.766	1.830	14.5	0.037	1.467	0.839	1.519
20-29	*Baloghia inophylla*	45	*20*	1.145	0.969	1.039	19.8	0.023	1.385	0.956	1.212
	Guilfoylia monostylis	18	*25*	0.986	0.962	1.440	22.1	0.028	1.199	0.966	1.356
	Neolitsea australiensis	49	*22*	1.045	0.897	1.304	1198	0.001	0.869	0.915	1.186
	Polyscias elegans	21	*23*	1.130	0.959	1.383	23.8	0.027	1.211	0.978	1.031
30-39	*Arytera divaricata*	69	*12*	1.238	0.914	0.644	7.8	0.088	1.623	0.957	0.44
	Daphnandra apetala	156	*25*	0.988	0.931	1.042	22.4	0.026	1.302	0.948	0.902
	Diploglottis australis	20	*31*	1.146	0.936	1.924	102	0.021	0.674	0.958	1.55
	Melicope micrococca	49	*26*	1.013	0.901	1.803	24.7	0.027	1.167	0.816	1.744
	Orites excelsus	25	*32*	0.816	0.980	1.154	56.7	0.016	0.896	0.986	0.952
40+	*Argyrodendron actinophyllum*	82	*32*	1.115	0.933	1.614	28.9	0.025	1.178	0.700	1.527
	Cryptocarya obovata	22	*30*	1.081	0.969	1.039	28.4	0.023	1.256	0.978	0.869
	Doryphora sassafras	114	*30*	0.781	0.949	1.101	53.4	0.017	0.905	0.944	1.152
	Sloanea woollsii	50	*36*	0.982	0.988	1.750	35.4	0.026	0.995	0.954	1.744
	Syzygium crebrinerve	92	*33*	1.140	0.968	0.911	31.8	0.025	1.192	0.981	0.71

Table S3 contd.

H_{maxP}	Species		(5B) Weibull H_a forced					(6A) Richards H_a fitted				
(m)		*n*	H_{maxL}	*a*	*b*	R^2	RMSE	$H_{a\text{-fitted}}$	*a*	*b*	R^2	RMSE
10-19	*Acronychia pubescens*	55	*10*	0.088	1.104	0.471	1.672	99.7	0.003	0.787	0.517	1.508
	Denhamia celastroides	18	*17*	0.039	1.371	0.948	1.393	15.7	0.158	1.813	0.975	0.805
	Polyosma cunninghamii	67	*15*	0.058	1.085	0.977	0.839	15.2	0.077	1.120	0.930	0.838
	Zanthoxylum brachyacanthum	63	*16*	0.050	1.216	0.844	1.493	15.2	0.134	1.659	0.791	1.729
20-29	*Baloghia inophylla*	45	*20*	0.023	1.376	0.956	1.212	21.9	0.075	1.503	0.955	1.222
	Guilfoylia monostylis	18	*25*	0.032	1.066	0.964	1.411	22.8	0.058	1.273	0.966	1.368
	Neolitsea australiensis	49	*22*	0.035	1.141	0.908	1.233	607	0.001	0.869	0.915	1.180
	Polyscias elegans	21	*23*	0.026	1.243	0.977	1.035	24.6	0.058	1.306	0.978	1.025
30-39	*Arytera divaricata*	69	*12*	0.079	1.189	0.935	0.557	8.2	0.349	2.141	0.958	0.453
	Daphnandra apetala	156	*25*	0.029	1.17	0.944	0.937	23.1	0.073	1.400	0.947	0.910
	Diploglottis australis	20	*31*	0.054	0.871	0.945	1.746	80.7	0.004	0.650	0.960	1.554
	Melicope micrococca	49	*26*	0.028	1.123	0.907	1.749	25.2	0.052	1.249	0.913	1.725
	Orites excelsus	25	*32*	0.021	1.053	0.981	1.127	52.7	0.010	0.887	0.986	0.956
40+	*Argyrodendron actinophyllum*	82	*32*	0.028	1.09	0.934	1.456	27.0	0.068	1.415	0.938	1.555
	Cryptocarya obovata	22	*30*	0.025	1.165	0.977	0.890	29.2	0.056	1.325	0.978	0.874
	Doryphora sassafras	114	*30*	0.026	0.997	0.949	1.101	29.6	0.027	1.001	0.949	1.101
	Sloanea woollsii	50	*36*	0.027	0.980	0.984	1.745	35.2	0.026	1.005	0.988	1.755
	Syzygium crebrinerve	92	*33*	0.046	0.994	0.979	0.740	32.4	0.052	1.273	0.981	0.696

Table S3 contd.

H_{maxP}	Species		(6B) Richards H_{maxL} forced					(7) Gompertz				
(m)		*n*	H_{maxL}	*a*	*b*	R^2	RMSE	$H_{a\text{-fitted}}$	*a*	*b*	R^2	RMSE
10-19	*Acronychia pubescens*	55	*10*	0.121	1.129	0.479	1.629	8.4	0.284	2.636	0.787	0.904
	Denhamia celastroides	18	*17*	0.132	1.641	0.969	0.890	15.4	0.231	3.673	0.970	0.870
	Polyosma cunninghamii	67	*15*	0.079	1.132	0.930	0.838	13.7	0.166	2.155	0.918	0.906
	Zanthoxylum brachyacanthum	63	*16*	0.125	1.593	0.791	1.729	12.4	0.227	3.035	0.779	1.778
20-29	*Baloghia inophylla*	45	*20*	0.092	1.659	0.955	1.231	20.1	0.119	3.261	0.940	1.399
	Guilfoylia monostylis	18	*25*	0.044	1.116	0.964	1.405	21.4	0.095	2.788	0.966	1.373
	Neolitsea australiensis	49	*22*	0.060	1.200	0.907	1.243	19.6	0.115	2.784	0.905	1.252
	Polyscias elegans	21	*23*	0.069	1.414	0.977	1.042	21.4	0.119	3.192	0.971	1.180
30-39	*Arytera divaricata*	69	*12*	0.149	1.340	0.937	0.550	7.9	0.472	3.795	0.964	0.416
	Daphnandra apetala	156	*25*	0.066	1.342	0.947	0.914	21.7	0.147	3.516	0.946	0.993
	Diploglottis australis	20	*31*	0.031	0.825	0.946	1.758	31.0	0.053	2.171	0.936	1.923
	Melicope micrococca	49	*26*	0.048	1.207	0.908	1.745	23.1	0.101	2.981	0.902	1.800
	Orites excelsus	25	*32*	0.027	1.062	0.981	1.135	30.3	0.053	2.982	0.964	1.543
40+	*Argyrodendron actinophyllum*	82	*32*	0.043	1.169	0.939	1.545	25.5	0.112	3.291	0.931	1.703
	Cryptocarya obovata	22	*30*	0.051	1.271	0.978	0.879	27.7	0.123	3.560	0.977	0.89
	Doryphora sassafras	114	*30*	0.026	0.994	0.949	1.101	22.1	0.080	2.772	0.941	1.183
	Sloanea woollsii	50	*36*	0.024	0.977	0.988	1.748	32.9	0.059	2.525	0.981	2.177
	Syzygium crebrinerve	92	*33*	0.050	1.251	0.981	0.699	29.6	0.117	3.499	0.961	1.009

Table S3 contd.

H_{maxP}	Species		(8A) Logistic H_a fitted					(8B) Logistic H_{maxL} forced				
(m)		*n*	$H_{a\text{-fitted}}$	*a*	*b*	R^2	RMSE	H_{maxL}	*a*	*b*	R^2	RMSE
10-19	*Acronychia pubescens*	55	9.3	0.301	6.035	0.499	1.535	*10*	0.280	6.234	0.499	1.536
	Denhamia celastroides	18	15.1	0.395	17.57	0.958	1.023	*17*	0.342	16.69	0.943	1.194
	Polyosma cunninghamii	67	11.5	0.312	9.93	0.899	1.008	*15*	0.217	9.500	0.864	1.169
	Zanthoxylum brachyacanthum	63	10.9	0.401	10.50	0.845	1.489	*16*	0.251	9.040	0.832	1.550
20-29	*Baloghia inophylla*	45	7.9	0.219	14.09	0.939	1.415	*20*	0.189	13.46	0.934	1.382
	Guilfoylia monostylis	18	20.7	0.147	9.28	0.962	1.434	*25*	0.102	7.880	0.927	1.993
	Neolitsea australiensis	49	17.0	0.223	9.81	0.897	1.306	*22*	0.150	9.230	0.88	1.409
	Polyscias elegans	21	20.0	0.217	13.78	0.960	1.382	*23*	0.156	10.79	0.944	1.632
30-39	*Arytera divaricata*	69	7.5	0.782	16.29	0.963	0.421	*12*	0.385	11.07	0.833	0.897
	Daphnandra apetala	156	31.4	0.247	17.29	0.910	1.180	*25*	0.224	18.84	0.885	1.254
	Diploglottis australis	20	28.9	0.087	6.01	0.924	2.093	*31*	0.079	6.18	0.921	2.124
	Melicope micrococca	49	21.8	0.171	10.58	0.891	2.015	*26*	0.131	9.250	0.864	2.143
	Orites excelsus	25	28.9	0.087	12.44	0.943	1.954	*32*	0.078	13.02	0.94	2.004
40+	*Argyrodendron actinophyllum*	82	22.5	0.220	12.56	0.917	1.871	*32*	0.134	10.95	0.858	2.275
	Cryptocarya obovata	22	27.6	0.245	21.14	0.970	1.022	*30*	0.238	22.59	0.962	1.145
	Doryphora sassafras	114	20.5	0.140	9.99	0.930	1.293	*30*	0.082	10.72	0.882	1.670
	Sloanea woollsii	50	39.6	0.107	11.41	0.986	1.887	*36*	0.067	9.570	0.957	3.225
	Syzygium crebrinerve	92	28.6	0.211	19.18	0.877	1.369	*33*	0.178	20.00	0.856	1.479

Table S3 contd.

H_{maxP}	Species	(9A) Generalised Michaelis-Menten (GMM) H_a fitted						(9B) Generalised Michaelis-Menten (GMM) H_{maxL} forced				
(m)		*n*	$H_{a\text{-fitted}}$	*k*	*b*	R^2	RMSE	H_{maxL}	*k*	*b*	R^2	RMSE
10-19	*Acronychia pubescens*	55	82.9	72.30	0.823	0.517	1.508	*10*	11.27	1.320	0.508	1.528
	Denhamia celastroides	18	19.4	37.25	1.803	0.973	0.818	*17*	34.90	1.720	0.972	0.833
	Polyosma cunninghamii	67	20.5	24.47	1.156	0.931	0.835	*15*	21.55	1.358	0.927	0.859
	Zanthoxylum brachyacanthum	63	18.5	36.92	1.580	0.788	1.739	*16*	44.43	1.805	0.768	1.748
20-29	*Baloghia inophylla*	45	27.3	65.54	1.461	0.956	1.228	*20*	87.49	1.851	0.950	1.304
	Guilfoylia monostylis	18	27.3	51.32	1.333	0.964	1.400	*25*	58.79	1.456	0.963	1.418
	Neolitsea australiensis	49	69.7	64.92	0.867	0.915	1.186	*22*	40.39	1.422	0.894	1.323
	Polyscias elegans	21	30.4	54.30	1.325	0.978	1.025	*23*	76.34	1.690	0.970	1.194
30-39	*Arytera divaricata*	69	9.0	14.36	1.909	0.959	0.447	*12*	14.90	1.515	0.950	0.492
	Daphnandra apetala	156	29.9	47.07	1.275	0.933	1.021	*25*	55.03	1.499	0.944	0.934
	Diploglottis australis	20	163.4	76.46	0.684	0.958	1.549	*31*	24.71	1.122	0.933	1.966
	Melicope micrococca	49	30.2	56.09	1.318	0.908	1.745	*26*	67.80	1.496	0.904	1.774
	Orites excelsus	25	86.1	97.76	0.920	0.987	0.945	*32*	69.47	1.252	0.975	1.274
40+	*Argyrodendron actinophyllum*	82	33.7	57.54	1.365	0.943	1.494	*32*	60.31	1.422	0.942	1.499
	Cryptocarya obovata	22	34.9	57.15	1.331	0.978	0.877	*30*	72.13	1.556	0.974	0.951
	Doryphora sassafras	114	44.6	58.10	1.027	0.948	1.107	*30*	51.57	1.211	0.944	1.151
	Sloanea woollsii	50	43.5	55.94	1.113	0.988	1.720	*36*	72.92	1.334	0.986	1.849
	Syzygium crebrinerve	92	38.3	54.41	1.310	0.982	0.677	*33*	56.85	1.456	0.978	0.746

Table S3 contd.

H_{maxP}	Species	(10A) Nonrectangular hyperbola (NRH) H_a fitted						(10B) Nonrectangular hyperbola (NRH) H_{maxL} forced				
(m)		*n*	$H_{a\text{-fitted}}$	*a*	*b*	R^2	RMSE	H_{maxL}	*a*	*b*	R^2	RMSE
10-19	*Acronychia pubescens*	55	13.1	1.042	0.666	0.794	0.887	*10*	0.993	0.861	0.793	0.89
	Denhamia celastroides	18	16.0	1.026	0.972	0.960	1.000	*17*	1.062	0.923	0.958	1.024
	Polyosma cunninghamii	67	19.8	0.937	0.583	0.929	0.844	*15*	0.887	0.838	0.928	0.849
	Zanthoxylum brachyacanthum	63	14.0	0.94	**0.995**	0.813	1.656	*16*	0.995	0.950	0.808	1.674
20-29	*Baloghia inophylla*	45	19.9	0.778	0.975	0.945	1.392	*20*	0.812	0.950	0.937	1.435
	Guilfoylia monostylis	18	20.9	0.707	0.987	0.969	1.302	*25*	0.821	0.847	0.966	1.354
	Neolitsea australiensis	49	68.9	0.916	**0.001**	0.914	1.192	*22*	0.873	0.862	0.912	1.210
	Polyscias elegans	21	25.6	0.868	0.883	0.976	1.074	*23*	0.862	0.898	0.976	1.075
30-39	*Arytera divaricata*	69	7.8	1.046	**0.995**	0.942	0.596	*12*	1.000	0.834	0.926	0.596
	Daphnandra apetala	156	21.8	0.854	0.995	0.947	0.914	*25*	0.863	0.743	0.937	0.992
	Diploglottis australis	20	37.6	1.472	0.336	0.985	0.957	*31*	1.358	0.747	0.983	1.027
	Melicope micrococca	49	26.0	0.855	0.87	0.908	1.744	*26*	0.847	0.911	0.893	1.998
	Orites excelsus	25	63.9	0.764	**0.001**	0.986	0.964	*32*	0.665	0.812	0.980	1.158
40+	*Argyrodendron actinophyllum*	82	30.3	1.002	0.891	0.932	1.708	*32*	1.037	0.764	0.927	1.756
	Cryptocarya obovata	22	27.8	0.927	**0.995**	0.971	0.898	*30*	1.005	0.540	0.973	0.963
	Doryphora sassafras	114	31.5	0.756	0.660	0.949	1.101	*30*	0.745	0.712	0.949	1.102
	Sloanea woollsii	50	42.1	0.939	0.352	0.988	1.740	*36*	0.833	0.778	0.987	1.815
	Syzygium crebrinerve	92	34.8	1.021	0.867	0.98	0.746	*33*	1.005	0.835	0.979	0.751

Table S4. Parameters of fitted functions describing tree *H/D* relationships for all species in a subtropical rainforest selected according to published maximum height classes (cf. Table S1)

[A], H_{maxP} class sample sizes: 10-19 m, 227; 20-29 m, 150; 30-39 m, 359; 40+ m, 386; 30+ m, 745; all, 1122; [B], H_a values in Roman face obtained by fitting equation, values in italics applied to equation (forced) from field data; [C], values for Generalised Michaelis-Menten function (Equation 9) are for half-saturation rate; RMSE, root mean square error; '-' indicates a parameter not estimated by the relevant equation.

Equation	H_{maxP} class[A]	H_a[B]	a[C]	b	R^2	RMSE
(2) Power	H_{maxP} 10-19 m	-	1.635	0.673	0.801	1.656
	H_{maxP} 20-29 m	-	1.289	0.770	0.922	1.612
	H_{maxP} 30-39 m	-	1.629	0.678	0.894	1.893
	H_{maxP} 40+ m	-	1.523	0.698	0.881	2.315
	All data	-	1.563	0.692	0.903	1.756
(3) Mitscherlich	H_{maxP} 10-19 m	18.6	0.059	-	0.869	1.343
	H_{maxP} 20-29 m	28.1	0.034	-	0.943	1.379
	H_{maxP} 30-39 m	32.1	0.030	-	0.938	1.442
	H_{maxP} 40+ m	34.6	0.027	-	0.922	1.879
	All data	32.6	0.029	-	0.937	1.426
(4) Pacala	H_{maxP} 10-19 m	14.8	0.917	-	0.779	1.744
	H_{maxP} 20-29 m	28.1	0.956	-	0.943	1.379
	H_{maxP} 30-39 m	32.1	0.951	-	0.938	1.442
	H_{maxP} 40+ m	34.1	0.949	-	0.937	1.692
	All data	32.6	0.936	-	0.937	1.424
(5) Weibull	H_{maxP} 10-19 m	15.6	0.48	1.231	0.879	1.289
	H_{maxP} 20-29 m	22.8	0.03	1.172	0.947	1.326
	H_{maxP} 30-39 m	32	0.03	1.003	0.939	1.442
	H_{maxP} 40+ m	31.6	0.024	1.106	0.924	1.849
	All data	33.4	0.028	0.989	0.937	1.422
(6) Richards	H_{maxP} 10-19 m	16	0.1	1.337	0.879	1.291
	H_{maxP} 20-29 m	23.6	0.055	1.23	0.947	1.329
	H_{maxP} 30-39 m	31.6	0.031	1.02	0.939	1.442
	H_{maxP} 40+ m	31.7	0.038	1.172	0.925	1.841
	All data	32.9	0.028	0.989	0.917	1.422

Table S4 contd.

Equation	H_{maxP} class[A]	H_a[B]	a[C]	b	R^2	RMSE
(7) Gompertz	H_{maxP} 10-19 m	14.3	0.183	3.001	0.876	1.308
	H_{maxP} 20-29 m	20.5	0.112	2.975	0.942	1.392
	H_{maxP} 30-39 m	24.2	0.098	3.013	0.919	1.659
	H_{maxP} 40+ m	27.5	0.09	3.138	0.907	2.052
	All data	25.3	0.088	2.902	0.908	1.719
(8) Logistic	H_{maxP} 10-19 m	13.3	0.312	10.68	0.867	1.352
	H_{maxP} 20-29 m	19.2	0.189	10.97	0.93	1.525
	H_{maxP} 30-39 m	22.4	0.189	12.81	0.902	1.825
	H_{maxP} 40+ m	25.6	0.168	13.90	0.886	2.273
	All data	23.0	0.167	11.43	0.882	1.949
(9) Generalised Michaelis-Menten (GMM)	H_{maxP} 10-19 m	18.6	28.35	1.393	0.878	1.299
	H_{maxP} 20-29 m	29.6	47.50	1.267	0.946	1.339
	H_{maxP} 30-39 m	38.6	47.48	1.123	0.941	1.414
	H_{maxP} 40+ m	37.2	62.90	1.266	0.927	1.812
	All data	41.4	48.43	1.083	0.939	1.416
(10) Nonrectangular hyperbola (NRH)	H_{maxP} 10-19 m	14.8	0.917	0.961	0.880	1.287
	H_{maxP} 20-29 m	23.1	0.829	0.915	0.947	1.322
	H_{maxP} 30-39 m	38.8	0.958	0.438	0.940	1.428
	H_{maxP} 40+ m	36.8	0.888	0.697	0.923	1.862
	H_{maxP} 30+ m	38.3	0.917	0.578	0.930	1.669
	All data	43.9	0.968	0.236	0.938	1.409