Supplementary Material

Tropical dry forest generalists and specialists: patterns of plant functional variation along secondary succession and topography

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Supplementary material 1. Field sampling of functional traits.

Three to 5 young, healthy and completely expanded leaves were obtained from sun-exposed branches. Samples were weighed using a digital scale, digitized using a flatbed scanner, oven-dried at ~60°C for three days, and weighed again. Petiole length (PL) was measured and leaf or leaflet area (as an average of ten leaves/leaflets) was obtained with the software ImageJ 1.47b (Rasband 2014). Total leaf area (LA) was quantified as the leaf and petiole area for species with simple leaves and as the sum of the area of all the leaflets and petioles for species with compound leaves. The minimum photosynthetic unit (MPU) was considered as the leaf area for the former and the average leaflet area for the latter. Specific leaf area (SLA) and leaf dry matter content (LDMC) were calculated using standard methods (Cornelissen *et al* 2003).

Wood specific gravity (WSG) was obtained from 4 individuals per species with the largest DBH, which on average was 3.2, 4.1 and 16.4 cm for lianas, shrubs and trees, respectively. Lianas and some shrubs were sampled with a knife by taking a 4 to 5 cm long and 1 cm wide slice from the trunk, tapering longitudinally towards the pith (bark was peeled off by hand). For trees, a sample was obtained from cortex to pit at breast height using a 5 mm diameter core borer, and samples were cut every centimeter. Fresh volume was measured using the water displacement method. Samples were oven dried at 100°C and weighed on an analytical scale. Dry weight of each sample was divided over its fresh volume to obtain wood specific gravity. A weighted average per sampled tree was calculated weighting each core section by the cross-sectional area of the corresponding trunk (Muller-Landau 2004).

Figure S1. Change in community weighted means (CWM) of each functional trait in relation to successional age (years) and topographical position (circles represent flat sites and inverted triangles represent hills). Linear trends are shown only for significant HC3 regressions ($p \leq 0.05$; continuous lines for flat sites, dotted lines for hills). Functional traits are the same as in figure 2, plus seed volume (SV).

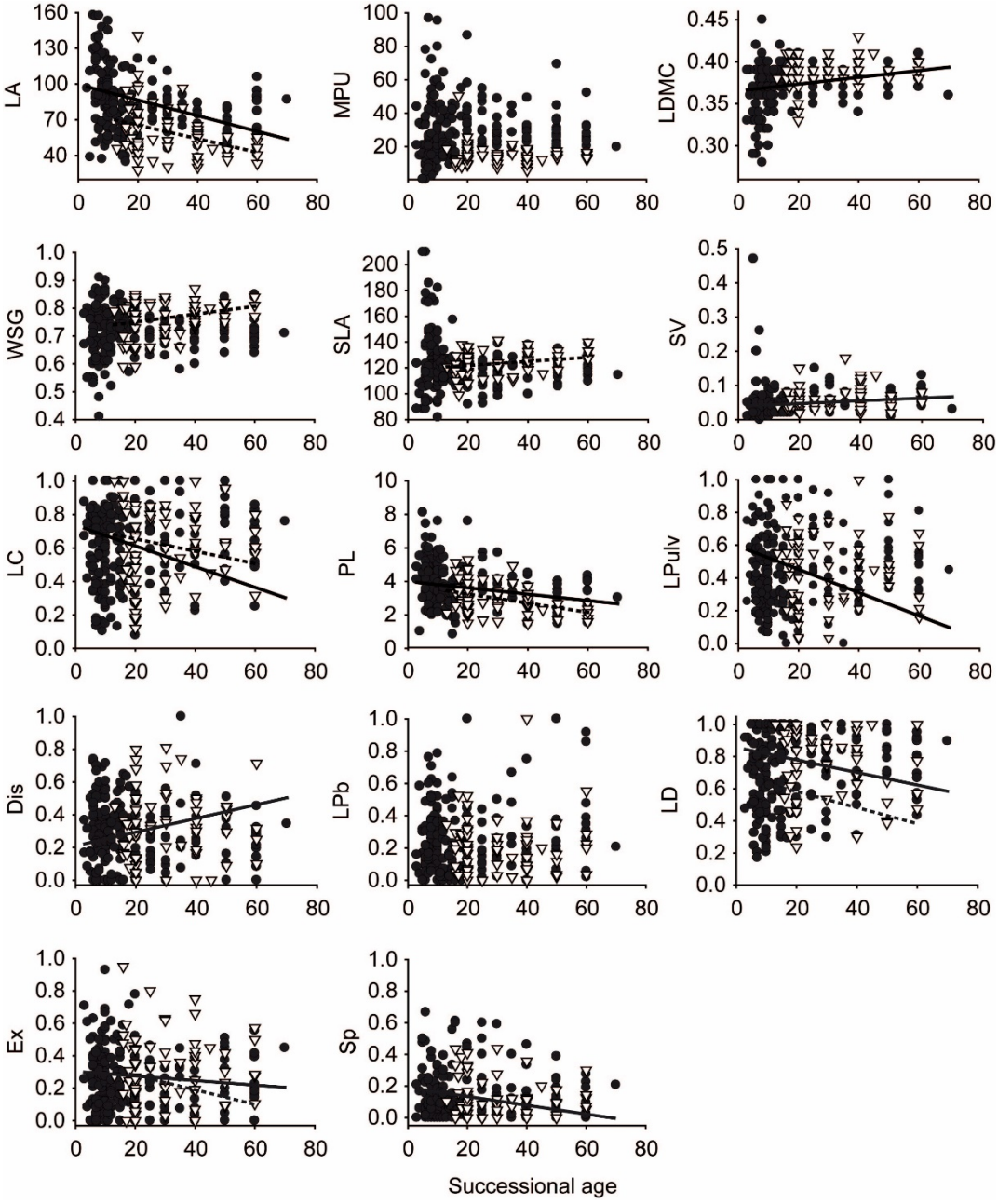

Figure S2. Generalists are the dominant element on this forest, as shown by their relative abundance on successional and topographic gradients. Different letters indicate significant differences ($p \leq 0.05$). Successional age categories as in figure 2.

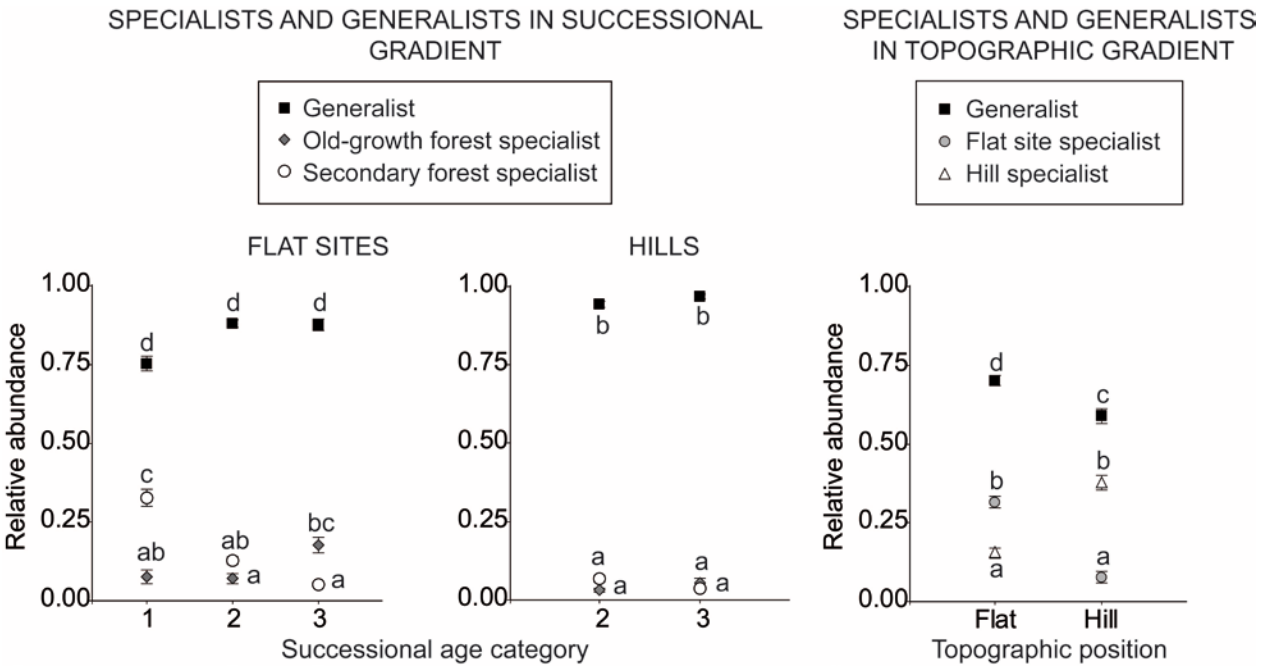

Table S1. Species classification according to multinomial model. Blank cells indicate those habitats in which a species was absent.

Species	Fig. 1 Labels	Family	Life form	Topography	Succession
Acacia pennatula	*Ac.pen*	Fabaceae	Tree	Generalist	Secondary specialist
Amphilophium paniculatum var molle	*Am.pan*	Bignoniaceae	Liana	Too rare	Too rare
Aphelandra scabra	*Ap.sca*	Acanthaceae	Shrub	Too rare	
Arrabidaea pubescens	*Ar.pub*	Bignoniaceae	Liana	Too rare	Too rare
Bauhinia divaricata	*Ba.div*	Fabaceae	Shrub	Too rare	Too rare
Bauhinia ungulata	*Ba.ung*	Fabaceae	Tree	Flat specialist	Generalist
Bourreria pulchra	*Bo.pul*	Boraginaceae	Tree	Generalist	Generalist
Bunchosia swartziana	*Bu.swa*	Malpighiaceae	Shrub	Too rare	Too rare
Bursera simaruba	*Bu.sim*	Burseraceae	Tree	Generalist	Generalist
Caesalpinia gaumeri	*Ca.gau*	Fabaceae	Tree	Flat specialist	Generalist
Calyptranthes pallens	*Ca.pal*	Myrtaceae	Tree	Generalist	Generalist
Cardiospermum corindum	*Ca.cor*	Sapindaceae	Liana		Too rare
Chloroleucon mangense	*Ch.man*	Fabaceae	Tree	Generalist	Old-growth specialist
Cnidoscolus aconitifolius	*Cn.aco*	Euphorbiaceae	Shrub		Too rare
Coccoloba acapulcensis	*Co.aca*	Polygonaceae	Tree	Generalist	Too rare
Coccoloba spicata	*Co.spi*	Polygonaceae	Tree	Generalist	Generalist
Cochlospermum vitifolium	*Co.vit*	Bixaceae	Tree	Flat specialist	Generalist
Croton reflexifolius	*Cr.ref*	Euphorbiaceae	Tree	Generalist	Too rare
Crossopetalum rhacoma	*Cr.rha*	Celastraceae	Shrub	Too rare	Too rare
Cydista diversifolia	*Cy.div*	Bignoniaceae	Liana	Too rare	
Cydista potosina	*Cy.pot*	Bignoniaceae	Liana		Too rare
Dalbergia glabra	*Da.gla*	Leguminoceae	Liana	Too rare	Too rare
Diospyros anisandra	*Di.ani*	Ebenaceae	Tree	Generalist	Generalist
Diospyros tetrasperma	*Di.tet*	Ebenaceae	Tree	Generalist	Generalist
Diospyros yucatanensis ssp yucatanensis	*Di.yuc*	Ebenaceae	Tree	Generalist	Generalist
Erythroxylum rotundifolium	*Er.rot*	Erythroxylaceae	Tree	Generalist	Old-growth specialist
Eugenia axillaris	*Eu.axi*	Myrtaceae	Tree	Flat specialist	Generalist
Eugenia buxifolia	*Eu.bux*	Myrtaceae	Tree	Generalist	Too rare
Exostema caribaeum	*Ex.car*	Rubiaceae	Tree	Generalist	Generalist
Guettarda elliptica	*Gu.ell*	Rubiaceae	Tree	Generalist	Generalist
Gymnopodium floribundum	*Gy.flo*	Polygonaceae	Tree	Generalist	Generalist
Heliocarpus donnell-smithii	*He.don*	Malvaceae	Tree	Too rare	Generalist
Heteropterys brachiata	*He.bra*	Malpighiaceae	Liana	Too rare	Too rare
Jatropha gaumeri	*Ja.gau*	Euphorbiaceae	Tree	Generalist	Old-growth specialist

Species	Fig. 1 Labels	Family	Life form	Topography	Succession
Karwinskia humboldtiana	*Ka.hum*	Rhamnaceae	Tree	Hill specialist	Too rare
Lasianthaea fruticosa	*La.fru*	Asteraceae	Shrub		Too rare
Leucaena leucocephala	*Le.leu*	Fabaceae	Tree	Generalist	Secondary specialist
Lonchocarpus guatemalensis	*Lo.gua*	Fabaceae	Tree	Hill specialist	Generalist
Lonchocarpus rugosus	*Lo.rug*	Fabaceae	Tree	Flat specialist	Generalist
Luehea speciosa	*Lu.spe*	Malvaceae	Tree	Flat specialist	Generalist
Lysiloma latisiliquum	*Ly.lat*	Fabaceae	Tree	Generalist	Generalist
Machaonia lindeniana	*Ma.lin*	Rubiaceae	Tree	Generalist	Generalist
Malpighia glabra	*Ma.gla*	Malpighiaceae	Tree	Generalist	Old-growth specialist
Mansoa verrucifera	*Ma.ver*	Bignoniaceae	Liana		Too rare
Mimosa bahamensis	*Mi.bah*	Fabaceae	Tree	Generalist	Secondary specialist
Neea psychotrioides	*Ne.psy*	Nyctaginaceae	Tree	Hill specialist	Generalist
Neomillspaughia emarginata	*Ne.ema*	Polygonaceae	Tree	Flat specialist	Generalist
Pisonia aculeata	*Pi.acu*	Nyctaginaceae	Liana	Too rare	Too rare
Piscidia piscipula	*Pi.pis*	Fabaceae	Tree	Generalist	Generalist
Platymiscium yucatanum	*Pl.yuc*	Fabaceae	Tree	Generalist	Too rare
Psidium sartorianum	*Ps.sar*	Myrtaceae	Tree	Flat specialist	Old-growth specialist
Randia truncata	*Ra.tru*	Rubiaceae	Shrub	Too rare	Too rare
Samyda yucatanensis	*Sa.yuc*	Salicaceae	Shrub	Too rare	
Semialarium mexicanum	*Se.mex*	Celastraceae	Tree	Generalist	Generalist
Senna atomaria	*Se.ato*	Fabaceae	Tree	Too rare	Generalist
Senegalia gaumeri	*Se.gau*	Fabaceae	Tree	Hill specialist	Generalist
Senna racemosa	*Se.rac*	Fabaceae	Tree	Generalist	Too rare
Sideroxylon obtusifolium	*Si.obt*	Sapotaceae	Tree	Hill specialist	Generalist
Tabernaemontana alba	*Ta.alb*	Apocynaceae	Shrub		Too rare
Tabebuia chrysantha	*Ta.chr*	Bignoniaceae	Tree	Generalist	Generalist
Talisia oliviformis	*Ta.oli*	Sapindaceae	Tree	Generalist	Too rare
Thouinia paucidentata	*Th.pau*	Sapindaceae	Tree	Hill specialist	Generalist
Vitex gaumeri	*Vi.gau*	Lamiaceae	Tree	Generalist	Generalist
Ximenia americana	*Xi.ame*	Olacaceae	Shrub	Too rare	Too rare
Zapoteca formosa	*Za.for*	Fabaceae	Shrub	Too rare	Too rare

Table S2. Comparison by Kruskall-Wallis Analysis of continuous functional traits among specialists/generalists on successional and topographic gradients. Functional traits as in table 1.

Variable	Group	n	Mean	SD	Median	H	p	Ranks		
Secondary succession										
WSG	Generalist	30	0.77	0.19	0.8	1.43	0.487			
	Old-growth specialist	5	0.74	0.22	0.85					
	Secondary specialist	3	0.91	0.15	0.91					
LDMC	Generalist	30	0.37	0.06	0.38	0.68	0.709			
	Old-growth specialist	5	0.38	0.08	0.42					
	Secondary specialist	3	0.38	0.08	0.41					
SLA	Generalist	30	123.62	34.99	118.76	1.98	0.371			
	Old-growth specialist	5	129.04	17.61	128.52					
	Secondary specialist	3	157.52	45.53	137.34					
MPU	Generalist	30	33.8	42.01	17.78	7.73	0.021	21.73		B
	Old-growth specialist	5	21.33	34.24	9.4			15.4	A	B
	Secondary specialist	3	0.37	0.31	0.51			4	A	
LA	Generalist	30	68.28	57.69	54.4	3.13	0.209			
	Old-growth specialist	5	28.48	33.18	12.07					
	Secondary specialist	3	79.47	75.03	62.75					
PL	Generalist	30	3.1	3.12	2.44	1.50	0.472			
	Old-growth specialist	5	2.09	3.12	0.5					
	Secondary specialist	3	1.72	1.13	1.27					
SV	Generalist	27	0.07	0.13	0.02	0.41	0.813			
	Old-growth specialist	5	0.11	0.19	0.02					
	Secondary specialist	3	0.02	0.01	0.02					
Topography										
WSG	Generalist	28	0.79	0.17	0.79	1.49	0.474			
	Flat specialist	8	0.77	0.23	0.83					
	Hill specialist	6	0.88	0.12	0.88					
LDMC	Generalist	28	0.37	0.06	0.37	1.89	0.387			
	Flat specialist	8	0.4	0.06	0.41					
	Hill specialist	6	0.4	0.02	0.4					
SLA	Generalist	28	122.64	33.46	127.04	0.50	0.780			
	Flat specialist	8	127.48	23.68	113.93					
	Hill specialist	6	128.67	36.7	139.19					
MPU	Generalist	28	24.05	28.06	12.74	1.90	0.387			
	Flat specialist	8	54.86	67.22	22.63					
	Hill specialist	6	10.53	6.44	10.47					
LA	Generalist	28	61.14	54.2	51.49	1.49	0.474			
	Flat specialist	8	80.2	66.11	70.87					
	Hill specialist	6	30.3	21.63	22.41					
PL	Generalist	28	2.76	2.59	1.94	0.01	0.994			
	Flat specialist	8	3.39	4.44	2.08					
	Hill specialist	6	1.88	0.97	1.88					
SV	Generalist	24	0.11	0.18	0.03	0.30	0.861			
	Flat specialist	7	0.04	0.04	0.02					
	Hill specialist	5	0.04	0.05	0.03					

Table S3. Comparison by X^2 Analysis of binary functional traits among specialists/generalists on successional and topographic gradients. Functional traits as in table 1.

Secondary Succession

Trait		**Pearson**	**df**	**p**		
LC		5.49	2	0.064		
Ex		0.65	2	0.724		
Sp		12.16	2	0.002		
	Generalist				A	
	Old-growth specialist				A	B
	Secondary specialist					B
Dis		2.86	2	0.240		
LD		2.05	2	0.358		
LPb		3.14	2	0.208		
Lpulv		7.15	2	0.028		
	Generalist				A	B
	Old-growth specialist				A	
	Secondary specialist					B

Topography

Trait	**Pearson**	**df**	**p**
LC	1.09	2	0.581
Ex	1.31	2	0.519
Sp	1.24	2	0.537
Dis	1.09	2	0.581
LD	0.96	2	0.619
LPb	3.2	2	0.202
Lpulv	0.25	2	0.882

Table S4. Eigenvector scores of species and Community Weighted Means (CWM) on the two main principal components. Functional traits as in table 1.

	Species		CWM	
Functional traits	**PC1 (28.1 %)**	**PC2 (22.7 %)**	**PC1 (28.7 %)**	**PC2 (22.2 %)**
WSG	-0.32	-0.25	-0.36	0.34
LC	0.32	-0.36	0.32	0.28
Ex	0.25	0.30	0.27	-0.31
Sp	0.02	-0.20	0.04	0.37
Dis	-0.32	0.22	-0.10	-0.45
LD	0.22	-0.29	0.38	0.17
LPb	0.12	0.05	0.02	0.08
Lpulv	0.16	-0.44	0.22	0.47
PL	0.45	-0.004	0.44	-0.18
MPU	0.10	0.45	0.12	-0.21
LA	0.45	-0.03	0.44	0.00
LDMC	-0.29	-0.35	-0.30	0.07
SLA	0.22	0.14	0.07	0.17