Running a simple model with no ncp etc

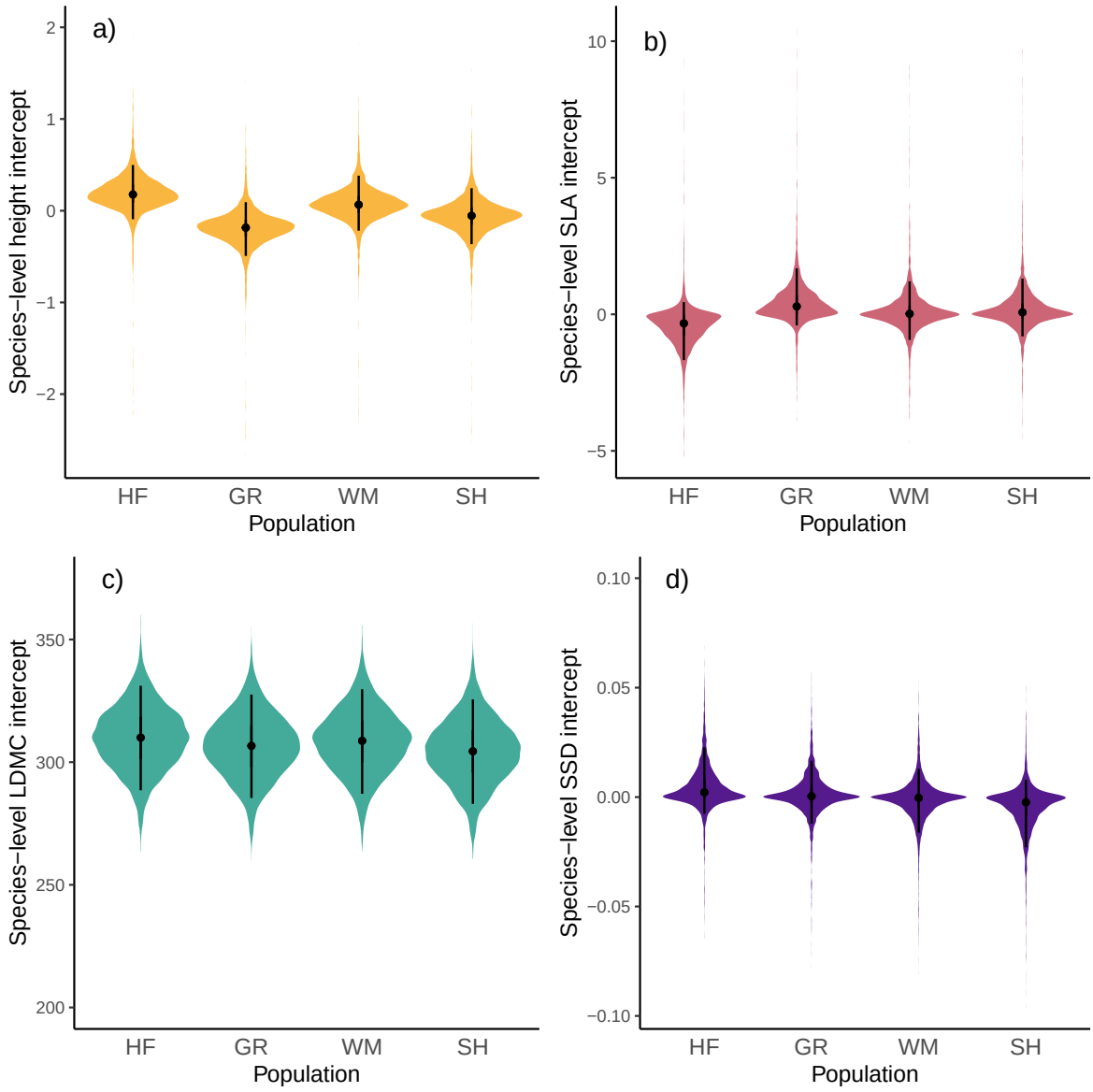


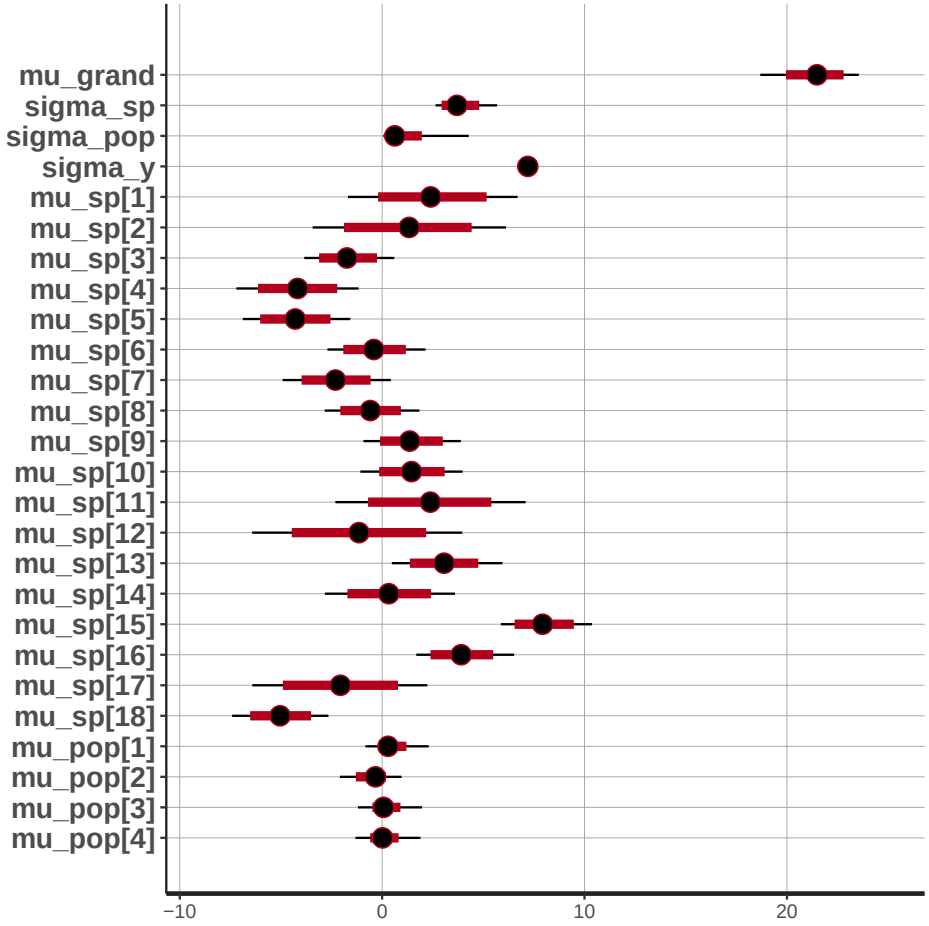
Figure 1: Population-level variation ($\mu_p op$) across traits: (a) height, (b) Specific leaf area, (c) Leaf dry matter content, (d) Specific stem density.

Specific leaf area - all species

1. Variation due to sppecies is much greater than pop
2. Harvard forest has a negative population effect - most souther
3. St. Hippolyte (most northern) is positive, but Grant has the largest population effect
4. Spitom has the largest positive species effect, Vibcas the most negative
5. No clear divide between shrubs and tree species

Table 1: Summary of the intercept only model for SLA across the two years of data (2019 and 2022) (n = 599) with species (n = 18) and population (n = 4).

	mean	25%	75%	n_eff	Rhat
alpha	21.38	20.73	22.18	342.71	1.01
ACEPEN	2.43	0.97	3.78	1579.21	1.00
ACESPI	1.30	-0.33	2.93	2002.18	1.00
ALNINC	-1.70	-2.47	-0.95	539.22	1.00
AMECAN	-4.17	-5.20	-3.12	1146.55	1.00
AROMEL	-4.27	-5.17	-3.39	756.26	1.00
BETALL	-0.39	-1.21	0.42	580.88	1.00
BETPAP	-2.29	-3.22	-1.40	791.68	1.00
BETPOP	-0.57	-1.35	0.18	590.84	1.00
DIELON	1.40	0.56	2.19	597.30	1.00
MYRGAL	1.46	0.61	2.31	687.18	1.00
QUEALB	2.37	0.76	3.94	1985.06	1.00
QUERUB	-1.13	-2.81	0.64	2570.28	1.00
SAMRAC	3.07	2.16	3.92	689.65	1.00
SORAME	0.32	-0.79	1.38	1020.35	1.00
SPIALB	7.98	7.19	8.75	497.47	1.01
SPITOM	3.94	3.12	4.77	623.95	1.01
VACMYR	-2.08	-3.57	-0.60	2034.15	1.00
VIBCAS	-5.03	-5.82	-4.24	545.06	1.00
GR	0.44	0.02	0.71	271.32	1.02
HF	-0.41	-0.78	-0.03	315.89	1.02
SH	0.19	-0.15	0.41	284.76	1.02
WM	0.10	-0.22	0.31	282.80	1.02
sigma_a_sp	3.81	3.27	4.22	1441.62	1.00
sigma_a_pop	0.96	0.33	1.11	356.64	1.01
sigma_y	7.20	7.09	7.31	3112.14	1.00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mu_pop[2]
mu_pop[3]
mu_pop[4]
−10
0
10
20

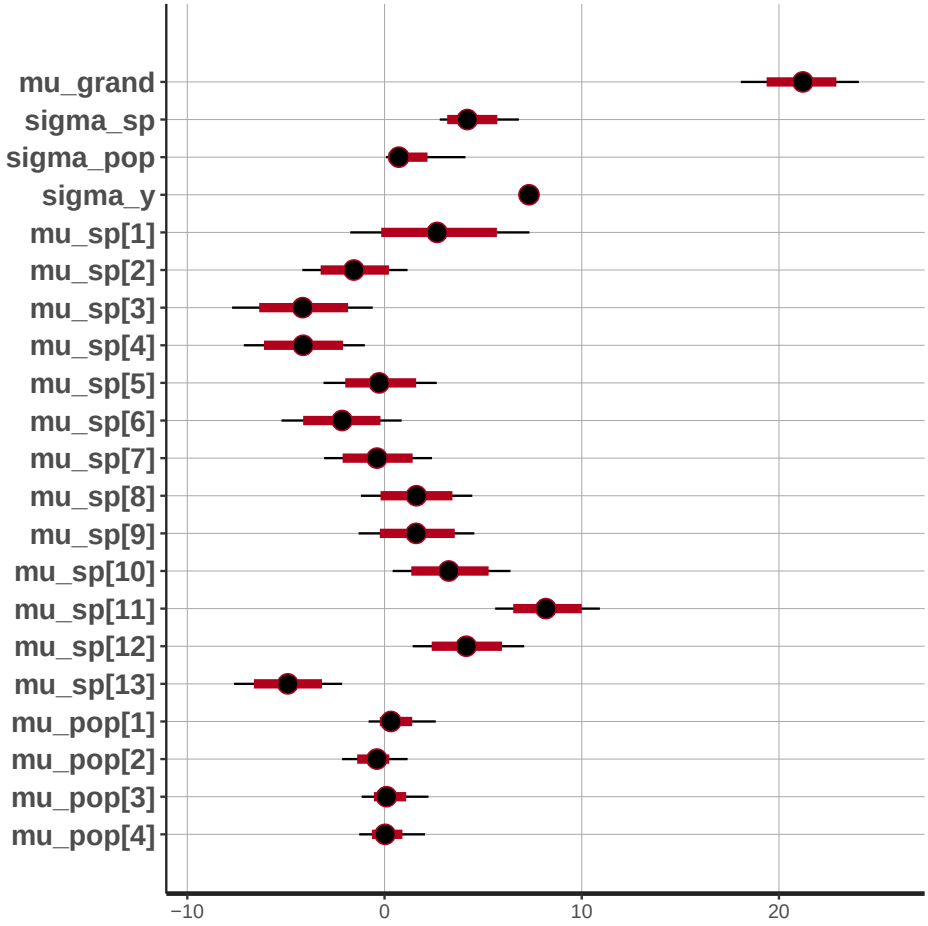
8

Specific leaf area - only species alive by 2022

1. Similar overall trend with samller spp subset, but slightly stronger responses
2. Species level estimates are different though

Table 2: Summary of the intercept only model for SLA in 2022 (n = 446) with species still alive by 2022(n = 13) and population (n = 4).

	mean	25%	75%	n_eff	Rhat
alpha	21.17	20.27	22.13	481.32	1.00
ACEPEN	2.71	1.17	4.25	1378.96	1.00
ALNINC	-1.53	-2.44	-0.63	655.56	1.00
AMECAN	-4.13	-5.28	-2.96	973.53	1.00
AROMEL	-4.11	-5.15	-3.07	865.17	1.00
BETALL	-0.22	-1.19	0.75	686.36	1.00
BETPAP	-2.16	-3.17	-1.13	788.64	1.00
BETPOP	-0.37	-1.29	0.54	669.90	1.00
DIELON	1.62	0.61	2.56	703.71	1.00
MYRGAL	1.64	0.65	2.67	735.50	1.00
SAMRAC	3.29	2.24	4.29	810.81	1.00
SPIALB	8.22	7.34	9.10	645.03	1.00
SPITOM	4.16	3.21	5.06	683.53	1.00
VIBCAS	-4.90	-5.83	-3.99	697.15	1.00
GR	0.49	0.02	0.81	543.80	1.00
HF	-0.45	-0.85	-0.04	635.54	1.00
SH	0.23	-0.17	0.51	569.42	1.00
WM	0.12	-0.25	0.39	586.04	1.00
sigma_a_sp	4.36	3.63	4.93	1801.74	1.00
sigma_a_pop	1.05	0.40	1.26	563.11	1.00
sigma_y	7.33	7.22	7.44	2647.75	1.00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mu_sp[13]
mu_pop[1]
mu_pop[2]
mu_pop[3]
mu_pop[4]
−10
0
10
20

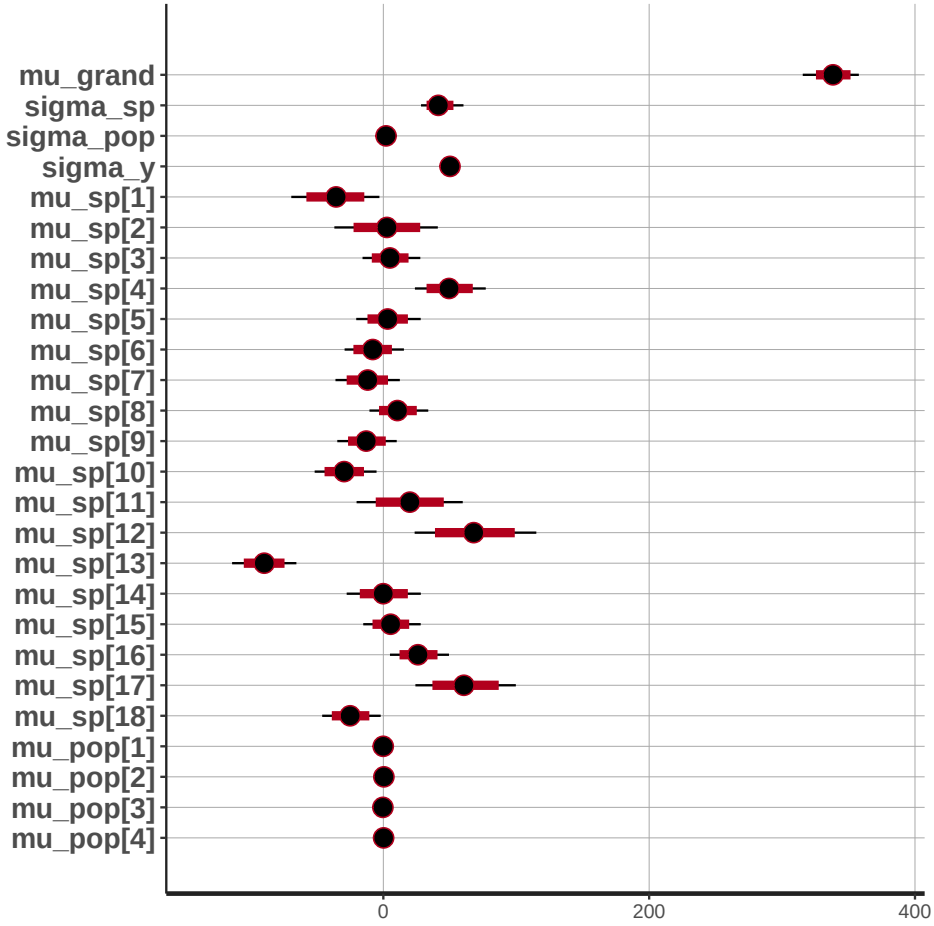
12

Leaf dry matter content - all species

1. variation due to population is twice as great as species
2. There are no strong differences across populations, but estimate is oddly large
3. Spitom has the largest positive species effect, Vibcas the most negative
4. Quite a lot of species level variaiton, ranging from very negative for Samrac to greater positive values for Querub

Table 3: Summary of the intercept only model for LDMC in 2019 and 2022 (n = 599) with species (n = 18) and population (n = 4).

	mean	25%	75%	n_eff	Rhat
alpha	338.19	331.64	345.02	354.15	1.01
ACEPEN	-35.67	-46.69	-24.18	1018.52	1.00
ACESPI	2.79	-10.35	16.21	1288.35	1.00
ALNINC	5.13	-2.08	12.15	401.12	1.01
AMECAN	49.68	40.53	58.31	532.95	1.01
AROMEL	3.26	-5.24	11.20	499.14	1.01
BETALL	-7.89	-15.53	-0.69	434.56	1.01
BETPAP	-11.86	-19.94	-3.89	506.70	1.01
BETPOP	10.87	3.39	18.11	415.69	1.01
DIELON	-12.63	-20.26	-5.25	432.09	1.01
MYRGAL	-29.29	-36.86	-21.83	452.21	1.01
QUEALB	19.69	6.23	32.73	1094.98	1.01
QUERUB	68.43	52.47	84.19	1471.59	1.00
SAMRAC	-89.55	-97.78	-81.45	486.24	1.01
SORAME	-0.02	-9.86	9.30	632.11	1.01
SPIALB	5.65	-1.36	12.60	396.59	1.01
SPITOM	26.39	18.92	33.56	444.11	1.01
VACMYR	61.28	48.16	74.25	917.87	1.01
VIBCAS	-24.87	-32.44	-17.81	415.12	1.01
GR	-0.23	-1.15	0.77	1408.74	1.00
HF	0.88	-0.40	1.93	1192.03	1.00
SH	-0.74	-1.81	0.48	1173.30	1.00
WM	0.50	-0.54	1.48	1231.79	1.00
sigma_a_sp	42.23	36.57	47.24	1699.38	1.00
sigma_a_pop	2.78	0.97	3.72	655.68	1.00
sigma_y	50.19	49.43	50.91	2498.15	1.00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mu_pop[4]
0
200
400

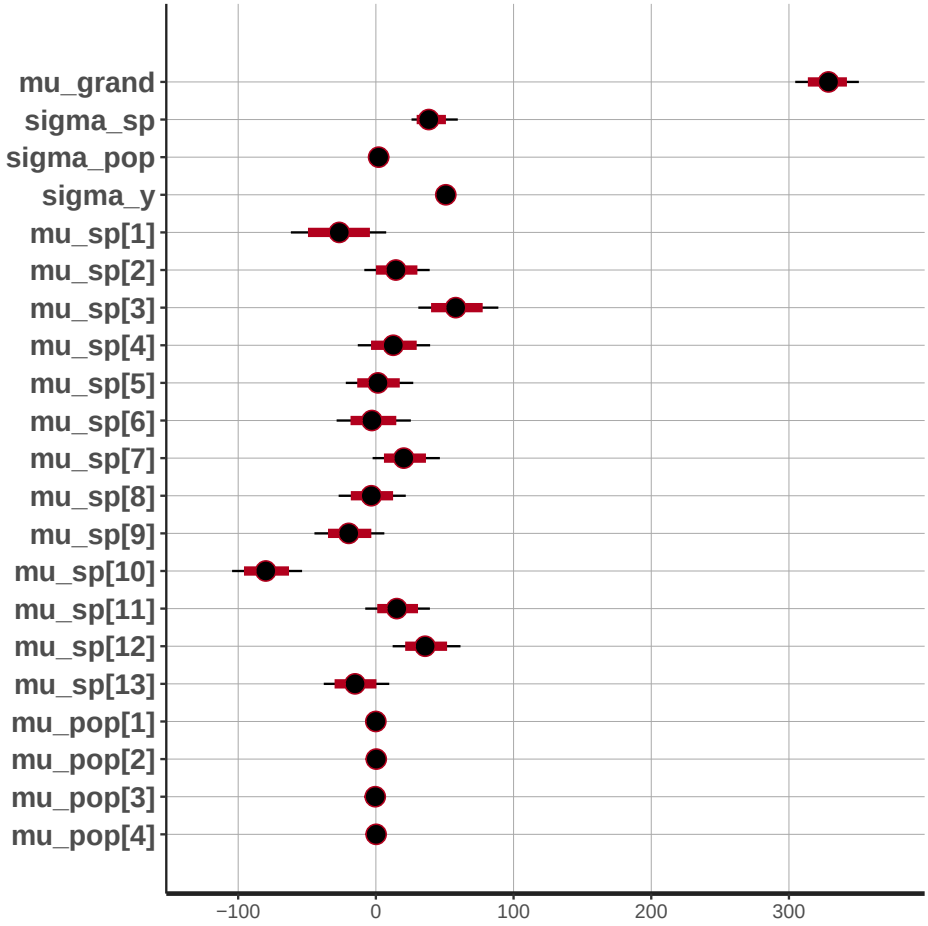
19

Leaf Dry Matter Content - only species alive by 2022

1. Variation due to population is about twice that due to species
2. Again all populations have similar estimaes
3. species level estiamtes are different from the full species model in variable ways across species

Table 4: Summary of the intercept only model for LDMC in 2019 and 2022 (n = 446) with species still alive by 2022 (n = 13) and population (n = 4).

	mean	25%	75%	n_eff	Rhat
alpha	328.35	321.34	335.45	315.54	1.01
ACEPEN	-26.84	-38.79	-15.02	883.52	1.00
ALNINC	14.84	7.21	22.34	353.74	1.01
AMECAN	58.57	48.74	68.10	474.06	1.01
AROMEL	12.85	4.62	21.11	462.87	1.00
BETALL	1.84	-6.19	9.65	385.49	1.01
BETPAP	-2.35	-11.21	5.98	462.45	1.01
BETPOP	20.67	12.66	28.30	373.46	1.01
DIELON	-3.08	-11.18	4.91	372.38	1.01
MYRGAL	-19.35	-27.84	-11.04	410.62	1.00
SAMRAC	-79.76	-88.41	-71.68	385.25	1.01
SPIALB	15.51	7.93	22.70	354.37	1.01
SPITOM	36.05	27.96	43.66	366.11	1.01
VIBCAS	-15.04	-23.06	-7.51	360.84	1.01
GR	-0.16	-1.06	0.79	1412.62	1.00
HF	0.72	-0.47	1.65	870.31	1.01
SH	-1.10	-2.10	0.27	1191.68	1.00
WM	0.39	-0.70	1.42	1416.23	1.00
sigma_a_sp	39.48	33.24	44.40	1350.96	1.00
sigma_a_pop	2.79	0.95	3.82	459.02	1.01
sigma_y	50.82	50.02	51.61	2039.02	1.00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mu_pop[2]
mu_pop[3]
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−100
0
100
200
300

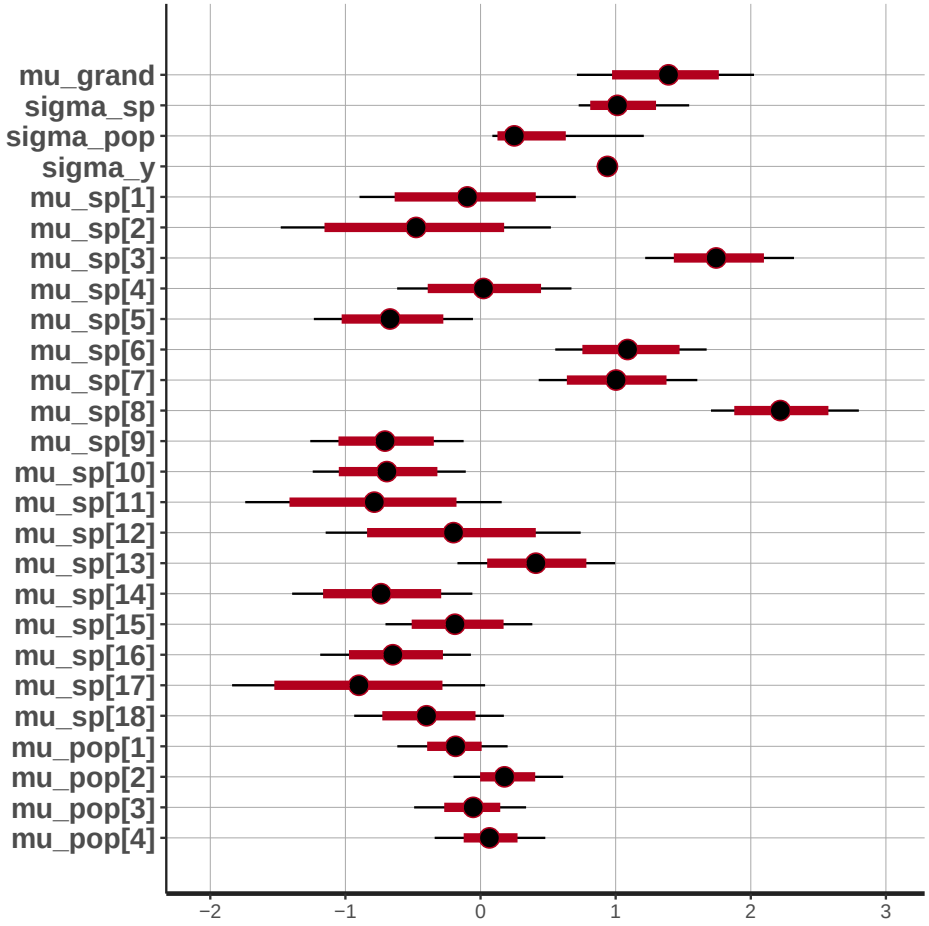
24

Height - all species

1. variation due to sppecies is much greater than pop, about three times
2. Harvard forest and white mountain are positive (the two more southern sites)
3. but grant has a much stronger negative effect than St. Hippolyte
4. Betpop has the strongest positive response and Vacmyr the strongest negative response
5. No clear divide between shrubs and tree species, but possible weak clade differences (all Acer Betula, Quercus, and Spirea have the same sign at least)

Table 5: Summary of the intercept only model for plant height in 2019, 2021, 2022 (n = 302) with species (n = 18) and population (4).

	mean	25%	75%	n_eff	Rhat
alpha	1.39	1.19	1.59	416.99	1.01
ACEPEN	-0.11	-0.38	0.15	1167.32	1.01
ACESPI	-0.48	-0.85	-0.14	2007.49	1.00
ALNINC	1.75	1.57	1.92	505.74	1.01
AMECAN	0.03	-0.20	0.25	763.69	1.01
AROMEL	-0.66	-0.86	-0.47	639.97	1.01
BETALL	1.10	0.91	1.28	519.50	1.01
BETPAP	1.00	0.81	1.19	623.85	1.01
BETPOP	2.22	2.03	2.40	550.62	1.01
DIELON	-0.70	-0.88	-0.52	542.73	1.01
MYRGAL	-0.69	-0.87	-0.50	596.41	1.01
QUEALB	-0.79	-1.11	-0.45	1591.65	1.00
QUERUB	-0.20	-0.53	0.12	1717.92	1.00
SAMRAC	0.41	0.22	0.60	632.69	1.01
SORAME	-0.73	-0.96	-0.50	776.30	1.01
SPIALB	-0.18	-0.36	-0.01	502.77	1.01
SPITOM	-0.64	-0.83	-0.47	533.17	1.01
VACMYR	-0.91	-1.22	-0.58	1647.09	1.00
VIBCAS	-0.39	-0.57	-0.21	541.49	1.01
GR	-0.20	-0.28	-0.10	427.93	1.01
HF	0.18	0.09	0.29	448.23	1.01
SH	-0.06	-0.15	0.03	435.03	1.01
WM	0.07	-0.02	0.16	439.58	1.01
sigma_a_sp	1.04	0.90	1.15	2612.49	1.00
sigma_a_pop	0.35	0.17	0.39	567.54	1.01
sigma_y	0.94	0.92	0.96	3498.92	1.00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mu_pop[3]
mu_pop[4]
−2
−1
0
1
2
3

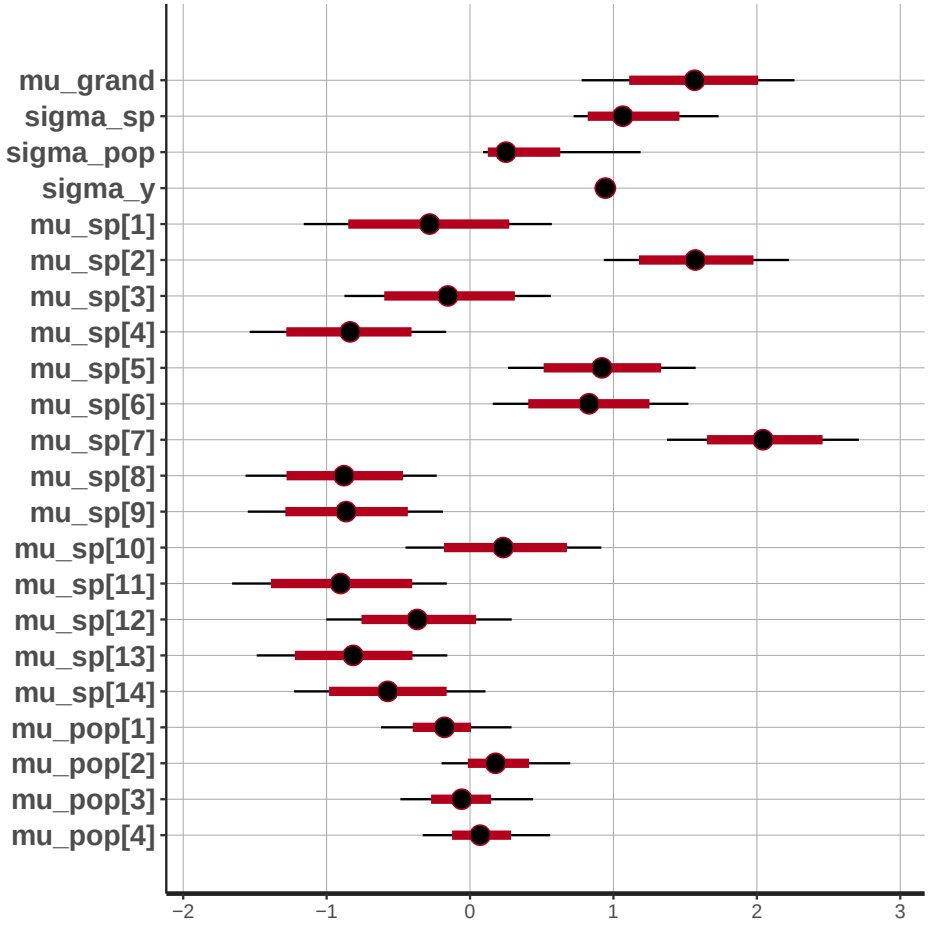
32

0.1 Height - only species alive by 2022

1. variation due to sppecies is still much greater than pop
2. population level estimates are similar to the full species model
3. Species level estimates are quite different

Table 6: Summary of the intercept only model for plant height (n = 257) with species still alive by 2022 (n = 14) and population (4).

	mean	25%	75%	n_eff	Rhat
alpha	1.55	1.33	1.79	443.03	1.01
ACEPEN	-0.28	-0.57	0.00	933.49	1.00
ALNINC	1.57	1.37	1.78	484.54	1.01
AMECAN	-0.15	-0.38	0.08	612.93	1.00
BETPAP	-0.84	-1.06	-0.62	546.02	1.01
BETPOP	0.92	0.71	1.13	543.67	1.01
BETALL	0.83	0.61	1.05	556.20	1.01
VIBCAS	2.05	1.84	2.26	521.68	1.01
SPIALB	-0.88	-1.08	-0.67	475.20	1.01
SPITOM	-0.86	-1.08	-0.65	539.82	1.01
MYRGAL	0.24	0.01	0.45	569.39	1.01
AROMEL	-0.90	-1.15	-0.65	708.72	1.00
SAMRAC	-0.36	-0.57	-0.16	500.25	1.01
DIELON	-0.82	-1.02	-0.61	504.99	1.01
SORAME	-0.57	-0.77	-0.36	501.06	1.01
GR	-0.18	-0.28	-0.09	479.57	1.01
HF	0.20	0.08	0.28	449.43	1.01
SH	-0.05	-0.15	0.04	455.80	1.01
WM	0.08	-0.03	0.17	461.50	1.01
sigma_a_sp	1.11	0.92	1.25	1559.69	1.00
sigma_a_pop	0.34	0.17	0.39	624.94	1.00
sigma_y	0.94	0.93	0.96	2193.02	1.00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−1
0
1
2
3

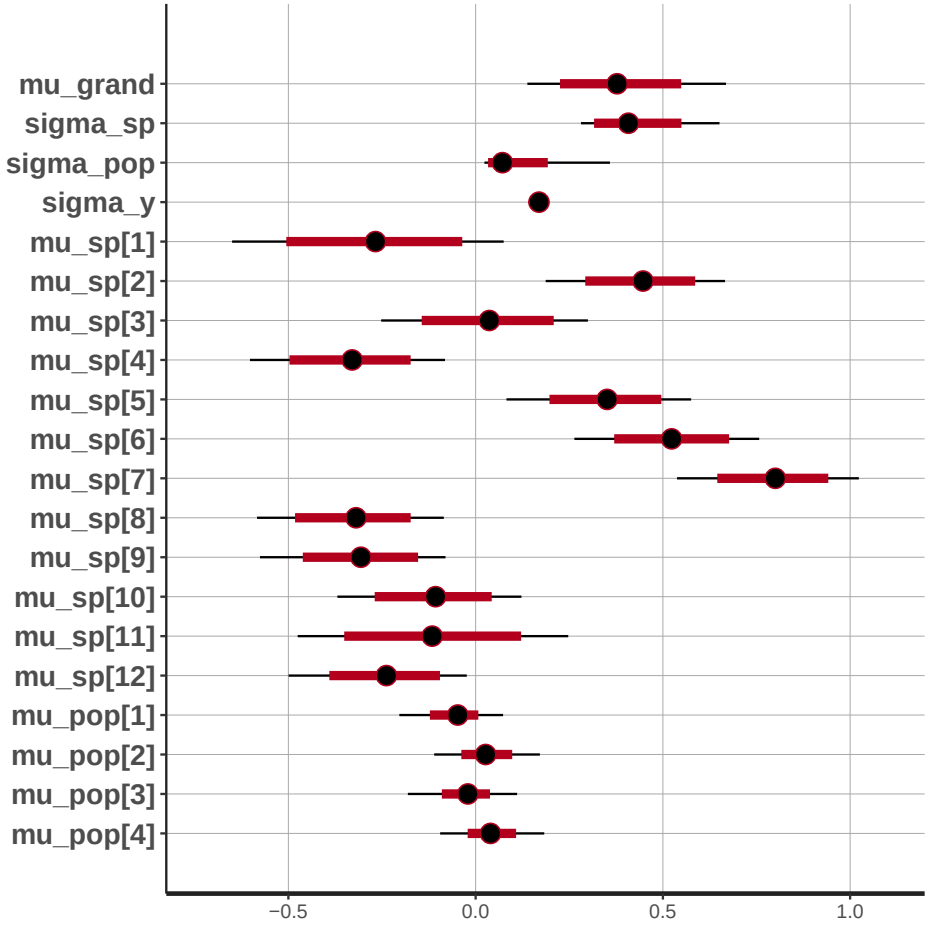
37

Stem specific density - only species alive by 2022

1. variation due to sppecies is much greater than pop; but values are very small
2. Population estimates are essentailly 0
3. Very weak effects across species relative to other species
4. More of a divide, mostly shrubs are negative, trees are positive, but estimates are small

Table 7: Summary of the intercept only model for plant SSD in 2022 (n = 240) with species (n = 12) and population (n = 4).

	mean	25%	75%	n_eff	Rhat
alpha	0.44	0.42	0.45	378.00	1.01
ALNINC	-0.02	-0.04	-0.00	425.22	1.01
AMECAN	0.08	0.05	0.10	676.62	1.01
AROMEL	0.07	0.05	0.09	489.93	1.01
BETALL	0.03	0.02	0.05	453.54	1.01
BETPAP	0.04	0.02	0.06	560.61	1.01
BETPOP	0.06	0.04	0.07	459.13	1.01
DIELON	-0.12	-0.14	-0.10	469.54	1.01
MYRGAL	-0.07	-0.08	-0.05	493.18	1.01
SAMRAC	-0.14	-0.16	-0.12	510.04	1.01
SPIALB	-0.00	-0.02	0.02	429.45	1.01
SPITOM	0.02	0.00	0.04	475.36	1.01
VIBCAS	0.06	0.04	0.08	446.64	1.01
GR	0.00	-0.00	0.00	724.72	1.01
HF	0.00	-0.00	0.01	719.06	1.00
SH	-0.00	-0.01	0.00	700.47	1.01
WM	-0.00	-0.00	0.00	738.87	1.01
sigma_a_sp	0.09	0.07	0.10	1071.28	1.00
sigma_a_pop	0.01	0.00	0.01	559.24	1.00
sigma_y	0.06	0.06	0.06	1727.99	1.00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mu_pop[4]
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0.0
0.5
1.0

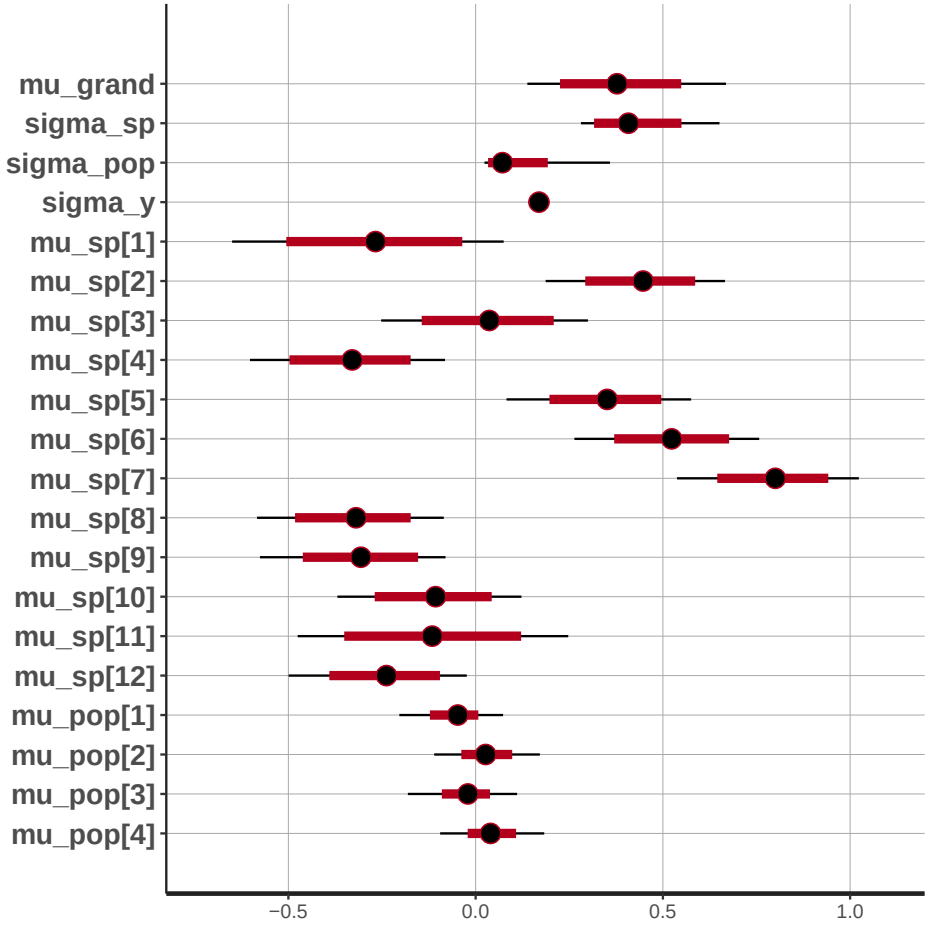
43

Relative Growth Rate - only species alive by 2022

1. Variation due to sppecies is much greater than pop, about four times
2. The two southern sites are positive, but two more northern sites are negative
3. Again Grant has a more negative effect that St. Hippolyte, but effect sizes are small across populations
4. There might be some divide, with shrubs having negative estimates, but there are not many trees in this dataset (which excludes any indiviudal that had negative growth over the years)

Table 8: Summary of the intercept only model for plant relative growth rate averaged over 3 years (n = 222) with species (n = 12) and population (n = 4). For this analysis I excluded any individual that had negative growth rates.

	mean	25%	75%	n_eff	Rhat
alpha	0.38	0.30	0.47	565.01	1.01
ACEPEN	-0.27	-0.39	-0.14	1245.20	1.00
ALNINC	0.44	0.37	0.52	637.41	1.01
AMECAN	0.03	-0.06	0.12	840.24	1.01
AROMEL	-0.33	-0.41	-0.25	715.29	1.01
BETALL	0.35	0.27	0.43	648.92	1.01
BETPAP	0.52	0.44	0.60	692.55	1.01
BETPOP	0.80	0.72	0.88	644.22	1.01
DIELON	-0.32	-0.40	-0.24	677.06	1.01
MYRGAL	-0.31	-0.39	-0.22	673.49	1.01
SAMRAC	-0.11	-0.19	-0.03	697.58	1.01
SORAME	-0.11	-0.24	0.02	1326.93	1.00
SPIALB	-0.24	-0.31	-0.16	622.07	1.01
SPITOM	-0.29	-0.37	-0.21	656.81	1.01
VIBCAS	-0.24	-0.31	-0.16	645.10	1.01
GR	-0.05	-0.08	-0.02	542.18	1.01
HF	0.03	-0.00	0.06	552.77	1.00
SH	-0.02	-0.05	0.01	547.36	1.01
WM	0.04	0.01	0.07	531.84	1.01
sigma_a_sp	0.42	0.36	0.47	2254.62	1.00
sigma_a_pop	0.10	0.05	0.11	681.82	1.00
sigma_y	0.17	0.16	0.18	2568.16	1.00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sigma_y
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51

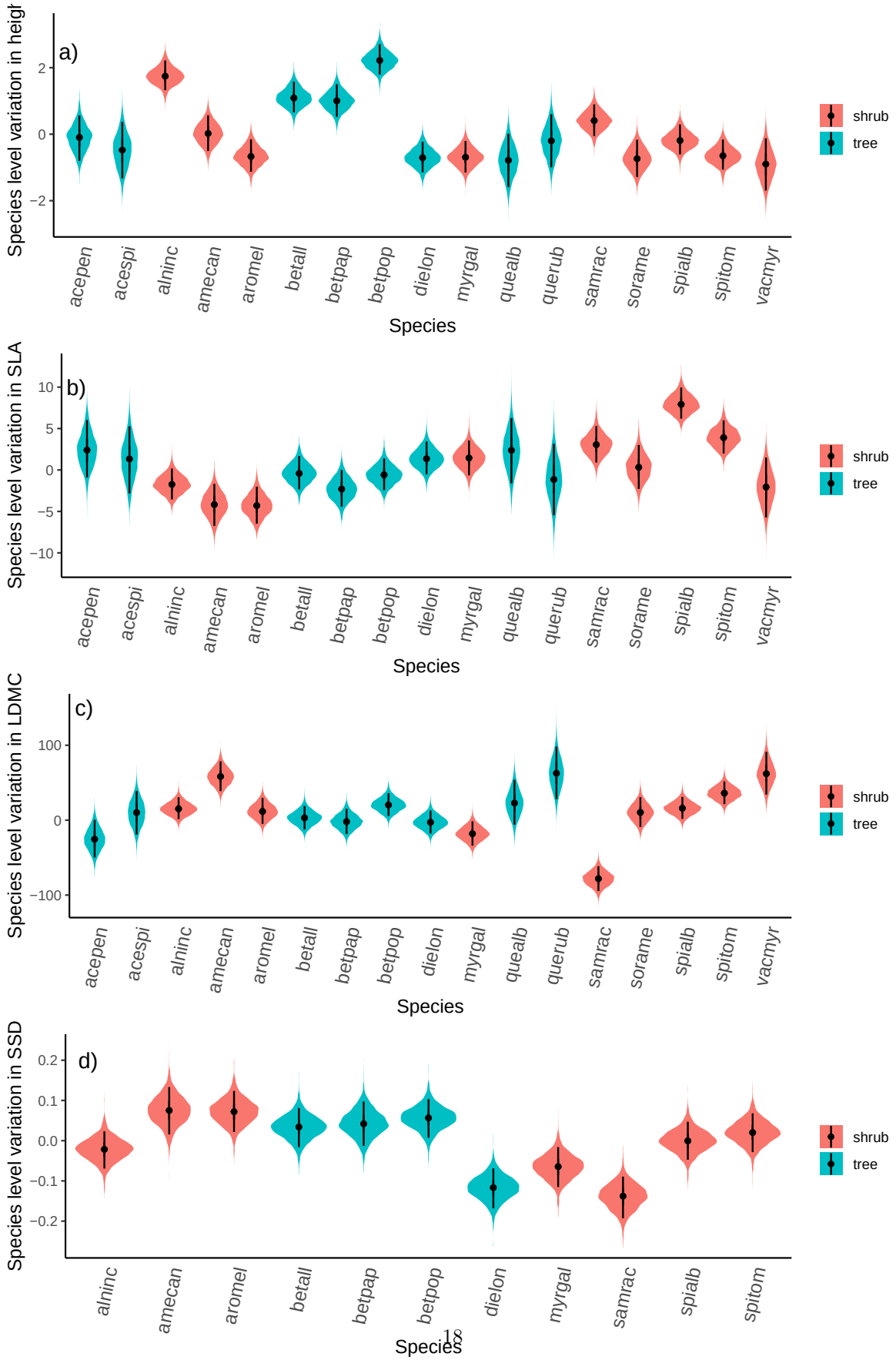

Figure 2: Species-level variation ($\mu_s p$) across traits: (a) height, (b) Specific leaf area, (c) Leaf dry matter content, (d) Specific stem density. Species are coloured by their architecture, with shrub species shown in red and trees in blue.