

Appendix 2.1

A2.1.1 Summary of bioclimatic data used in hydrological habitat analyses

Functional type	Subfamily	Genus	Species	<i>n</i>	MAP (mm) mean	MAP (mm) range	AI (mm mm ⁻¹) mean	AI (mm mm ⁻¹) range	AET/PET (mm mm ⁻¹) mean	AET/PET (mm mm ⁻¹) range
CAM terrestrial	Bromelioideae	<i>Ananas</i>	<i>ananassoides</i> (Baker) L.B.Sm.	190	1697.42	2547.50	9944.85	17133.49	0.71	0.59
CAM terrestrial	Bromelioideae	<i>Ananas</i>	<i>bracteatus</i> (Lindl.) Schult. & Schult.f.	46	1528.67	1519.00	10600.67	13583.65	0.80	0.62
CAM terrestrial	Bromelioideae	<i>Ananas</i>	<i>lucidus</i> Mill.	12	2415.79	2310.92	15190.39	13960.21	0.84	0.29
CAM terrestrial	Bromelioideae	<i>Ananas</i>	<i>paraguayensis</i> Camargo & L.B.Sm.	47	2568.67	1784.75	15027.37	12014.89	0.85	0.35
CAM terrestrial	Bromelioideae	<i>Ananas</i>	<i>sagenaria</i> (Arruda) Schult. & Schult.f.	168	1324.32	1307.08	8630.54	8268.96	0.71	0.52
C ₃ mesic terrestrial	Navioideae	<i>Brewcaria</i>	<i>hohenbergioides</i> (L.B.Sm.) B.Holst	7	2898.64	786.25	15846.41	4763.30	0.83	0.20
C ₃ mesic terrestrial	Navioideae	<i>Brewcaria</i>	<i>marahuacae</i> L.B.Sm., Steyerem.& H.Rob.	13	3058.78	508.00	20419.38	9009.57	0.97	0.06
C ₃ mesic terrestrial	Navioideae	<i>Brewcaria</i>	<i>reflexa</i> (L.B.Sm.) B.Holst	12	3254.56	600.67	18426.89	9413.03	0.92	0.14
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>delicatula</i> L.B.Sm.	3	3337.82	249.75	23687.54	3205.47	0.99	0.01
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>hechtoides</i> Mez	32	2826.52	1522.50	18319.33	13288.97	0.93	0.25
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>paniculata</i> Schult. & Schult.f.	28	3136.92	1204.75	19066.90	8010.36	0.95	0.22
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>prismatica</i> L.B.Sm.	15	3218.32	493.92	17644.27	1661.95	0.90	0.11
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>reducta</i> Baker	19	2545.85	1419.08	17094.66	10105.76	0.91	0.12
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>rupestris</i> (Gleason) B.Holst	3	1747.36	662.67	11193.19	4018.83	0.85	0.18
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>tatei</i> L.B.Sm.	30	2806.91	1838.25	18182.63	12788.46	0.92	0.20
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>vestita</i> L.B.Sm.	8	3224.30	340.92	20599.18	6578.93	0.99	0.03
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>antiacantha</i> Bertol	73	1287.63	1907.33	9192.34	13733.69	0.74	0.69
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>arenaria</i> Ule	6	741.08	235.00	4062.30	1011.37	0.34	0.09
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>balansae</i> Mez	161	1510.18	2397.50	9184.74	14951.13	0.71	0.78
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>binotii</i> E.Morren ex Mez	9	1263.76	1436.08	8977.13	11178.29	0.71	0.55
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>braunii</i> Leme & Esteves	4	1411.25	343.33	7978.41	1289.93	0.63	0.02
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>chrysantha</i> Jacq	11	1184.40	743.50	7190.33	4383.91	0.58	0.33
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>goyazensis</i> Mez	5	1517.83	1354.25	9011.29	7580.95	0.64	0.41
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>grandiflora</i> Mez	3	1624.69	1033.92	9008.72	4531.01	0.65	0.15
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>hemisphaerica</i> Lamarck	5	1411.55	379.00	8109.26	3205.94	0.56	0.12
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>ignaciana</i> R. Vásquez & P.L. Ibisch	3	1430.08	799.75	7943.52	4547.04	0.62	0.28
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>interior</i> L.B.Sm.	19	1583.53	832.25	9513.13	6738.49	0.68	0.25
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>irwinii</i> L.B.Sm.	6	1893.83	435.25	12238.50	2033.16	0.76	0.08
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>karatas</i> L.	159	1675.65	3642.08	10242.44	20949.70	0.65	0.77
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>lagopus</i> Mez	6	1258.75	1104.50	7875.33	5939.04	0.60	0.39
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>macedoi</i> L.B.Sm.	5	1587.55	233.00	9603.97	1840.29	0.69	0.09

CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>minima</i> Leme & E. Esteves	4	1658.19	317.75	10342.46	3329.65	0.71	0.10
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>pinguin</i> L.	208	1401.48	5379.67	8505.14	35417.51	0.60	0.84
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>reversacantha</i> Mez	6	1650.54	695.92	9652.74	2365.13	0.69	0.02
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>serra</i> Griseb.	67	1080.74	1946.75	6675.42	11796.45	0.54	0.68
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>tarapotina</i> Ule	3	2385.92	1151.75	13826.31	7233.76	0.93	0.21
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>tubulosa</i> L.B.Sm.	16	2422.97	2105.50	14911.90	13349.93	0.88	0.32
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>unaensis</i> Leme & Scharf	8	1407.65	679.70	10161.93	7042.27	0.78	0.33
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>villosa</i> Mez	11	1583.09	1255.50	8902.56	5959.39	0.66	0.28
C ₃ mesic terrestrial	Lindmanioideae	<i>Connellia</i>	<i>augustae</i> (M.R.Schomb.) N.E.Br.	7	2049.19	733.00	13583.24	3281.03	0.86	0.16
C ₃ mesic terrestrial	Lindmanioideae	<i>Connellia</i>	<i>caricifolia</i> L.B.Sm.	3	1928.00	272.00	13749.71	2166.41	0.86	0.05
C ₃ mesic terrestrial	Lindmanioideae	<i>Connellia</i>	<i>quelchii</i> N.E.Br.	7	2087.24	645.75	14504.72	4271.94	0.87	0.12
C ₃ mesic terrestrial	Navioideae	<i>Cottendorfia</i>	<i>florida</i> Schult. & Schult.f.	43	912.84	282.67	5824.18	1375.66	0.75	0.58
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>bahianus</i> L.B.Sm.	14	910.51	1092.83	6426.53	9446.66	0.53	0.60
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>beuckeri</i> E.Morren	20	1313.98	851.00	9442.64	7521.68	0.77	0.41
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>capitellatus</i> Leme & L. Kollmann	3	1207.00	10.50	7758.50	22.25	0.66	0.00
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>dianae</i> Leme	11	1497.70	634.67	10902.51	5314.94	0.71	0.13
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>ferrarius</i> Leme & Paula	4	1529.31	116.25	10713.20	1920.39	0.77	0.05
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>giganteus</i> Leme & A. P Fontana	3	1185.92	23.75	7581.15	125.85	0.64	0.65
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>maritimus</i> L.B.Sm.	4	1296.58	595.92	9381.80	4726.90	0.76	0.31
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>micrus</i> Louzada, Wand. & Versieux	3	1318.72	68.50	8685.84	647.93	0.71	0.73
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>pickelii</i> L.B.Sm.	6	1614.81	1003.25	12019.93	8609.51	0.74	0.24
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>pseudopetiolatus</i> Philcox	31	1832.94	1238.10	14112.89	10799.27	0.94	0.33
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>sanctaluciae</i> Leme & L. Kollmann	8	1225.46	135.25	8459.25	1369.40	0.72	0.12
C ₃ succulent terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>schwackeanus</i> Mez	25	1502.61	450.75	10256.03	5163.50	0.75	0.21
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>sergipensis</i> I.Ramirez	12	1401.58	934.00	9418.55	6097.54	0.67	0.33
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>venecianus</i> Leme & L. Kollmann	3	1140.78	2.33	7250.63	20.55	0.61	0.61
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>warren-loosei</i> Leme	4	1045.50	1245.00	7442.29	9834.40	0.55	0.53
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>zonatus</i> (Vis.) Vis.	4	1417.08	608.00	9491.98	3739.64	0.68	0.09
CAM terrestrial	Bromelioideae	<i>Deinacanthon</i>	<i>urbanianum</i> (Mez) Mez	12	592.43	525.17	3507.71	3707.84	0.30	0.31
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>brevifolia</i> (Griseb.) M.A.Spencer & L.B.Sm.	4	407.75	412.50	2744.31	2404.04	0.23	0.20
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>haumanii</i> A.Cast.	12	244.85	414.75	1746.49	3263.63	0.15	0.28
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>longipetala</i> (Baker) Mez	36	596.52	1263.75	3734.42	6497.86	0.32	0.54
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>lorentziana</i> (Mez) M.A.Spencer & L.B.Sm.	7	256.80	253.00	1836.67	1688.06	0.16	0.14
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>meziana</i> Kuntze ex Mez	20	924.68	882.83	5479.17	4988.49	0.46	0.42
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>scapigera</i> (Rauh & L.Hrom.) M.A.Spencer & L.B.Sm.	4	637.98	419.83	4276.74	3089.96	0.36	0.26
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>schreiteri</i> A.Cast.	10	241.03	367.00	1724.98	2519.34	0.15	0.21
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>seramisiana</i> R. Vasquez, Ibisch & E. Gross	3	585.00	45.50	4061.36	290.85	0.34	0.03

CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>strobilifera</i> Mez	10	621.73	2834.55	3946.08	16548.72	0.28	0.86
CAM terrestrial	Bromelioideae	<i>Disteganthus</i>	<i>basilateralis</i> Lem.	25	3491.51	956.25	22345.97	7284.59	0.92	0.08
CAM terrestrial	Bromelioideae	<i>Disteganthus</i>	<i>calatheoides</i> (L.B.Sm.) L.B.Sm. & Read	7	3324.49	960.67	21489.71	6178.60	0.91	0.10
CAM terrestrial	Bromelioideae	<i>Disteganthus</i>	<i>lateralis</i> (L.B.Sm.) Gouda	21	2709.89	1601.00	17294.38	9769.31	0.89	0.17
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>affinis</i> Baker	3	1347.75	277.25	8545.85	2842.09	0.72	0.24
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>aurea</i> L.B.Sm.	5	1516.90	395.25	9250.57	3063.92	0.70	0.07
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>brachyphylla</i> L.B.Sm.	4	1452.50	128.65	10137.78	1108.60	0.76	0.04
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>brasiliانا</i> L.B.Sm.	35	1533.80	852.25	9755.18	4680.75	0.72	0.16
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>brevifolia</i> Baker	11	1634.38	448.00	11474.87	4147.70	0.90	0.25
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>burchellii</i> Baker	13	1467.96	914.50	8525.51	6136.33	0.64	0.32
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>consimilis</i> Mez	7	1611.05	788.50	10472.95	1924.18	0.74	0.03
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>dawsonii</i> L.B.Sm.	3	1779.33	380.75	10519.26	2680.84	0.69	0.07
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>distachya</i> Hassl.	10	1679.85	343.00	11464.37	4748.12	0.87	0.16
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>duckei</i> L.B.Sm.	8	2082.55	901.17	11363.77	3621.60	0.73	0.04
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>dusenii</i> L.B.Sm.	9	1571.85	278.50	11671.51	4229.42	0.93	0.15
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>elata</i> Mez	3	1497.50	26.00	10753.19	600.60	0.77	0.02
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>encholirioides</i> (Gaudich.) Mez	11	1619.22	1098.58	11982.22	9788.70	0.87	0.27
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>exserta</i> L.B.Sm.	3	1399.81	5.42	8610.80	104.75	0.73	0.01
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>ferox</i> Mez	23	1304.54	1154.00	8280.31	7723.94	0.69	0.58
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>ferruginea</i> Mez	10	1374.87	416.00	7924.41	2173.64	0.67	0.18
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>floribunda</i> Griseb.	11	806.95	1283.50	5485.11	8208.83	0.47	0.69
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>fosteriana</i> L.B.Sm.	3	1357.92	176.00	9343.95	1131.95	0.79	0.10
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>goiana</i> L.B.Sm.	4	1578.40	770.00	9453.99	2518.31	0.70	0.06
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>gracilis</i> Mez	4	1765.19	2523.50	10112.45	15264.90	0.65	0.52
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>grandidentata</i> P.J. Braun & E.Esteves	3	1486.12	5.05	8654.19	384.29	0.73	0.03
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>horridula</i> Mez	5	1722.83	622.00	10095.63	1947.67	0.72	0.05
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>ibiramensis</i> Reitz	5	1538.98	18.60	11399.68	87.54	0.92	0.01
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>leptostachya</i> Baker	45	1350.54	1059.25	8731.13	11375.26	0.69	0.68
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>limae</i> L.B.Sm.	8	824.82	420.25	5726.21	2785.55	0.48	0.21
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>linearifolia</i> Baker	10	1281.37	190.08	8759.23	1197.91	0.73	0.07
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>macedoi</i> L.B.Sm.	9	1484.80	447.42	9752.51	2985.59	0.74	0.05
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>maracasensis</i> Ule	3	751.50	62.25	5436.49	1345.78	0.46	0.11
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>maritima</i> Baker	10	1495.17	651.00	12712.86	6453.45	0.90	0.15
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>marnier-lapostollei</i> L.B.Sm.	6	1527.60	242.90	10045.23	2012.81	0.74	0.06
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>microcalyx</i> Baker	13	1473.13	556.50	9371.02	4223.27	0.78	0.33
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>minarum</i> Mez	15	1510.48	945.50	10166.85	8657.36	0.77	0.32
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>niederleinii</i> Mez	17	1722.90	306.00	10912.73	2194.60	0.86	0.10
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>pernambucana</i> L.B.Sm.	4	972.60	555.75	6137.46	1834.42	0.52	0.15
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>pulquinensis</i> Wittm.	3	1331.10	2491.30	8103.35	14425.05	0.51	0.68
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>pumila</i> L.B.Sm.	4	1725.60	942.75	9946.19	4017.18	0.71	0.09
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>racemosa</i> Baker	3	1421.83	166.00	8321.05	1629.37	0.66	0.08

CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>ragonesei</i> A.Cast.	3	1191.67	916.25	7272.22	6455.11	0.62	0.55
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>rariflora</i> Schult. & Schult.f.	10	1411.96	177.00	9513.85	2424.84	0.74	0.09
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>reitzii</i> L.B.Sm.	9	1634.99	414.20	13417.68	5517.48	0.95	0.18
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>remotiflora</i> Otto & Dietrich	9	1423.22	643.75	10170.02	2419.82	0.80	0.11
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>saxatilis</i> Mez	27	1455.74	955.75	9931.59	8009.81	0.73	0.31
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>sordida</i> Baker	7	1454.01	247.25	9861.20	1801.71	0.75	0.06
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>stenophylla</i> L.B.Sm.	8	2268.54	1707.25	13794.13	10548.60	0.84	0.35
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>tenebrosa</i> Leme & H.Luther	3	1516.17	43.00	10383.08	804.66	0.75	0.03
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>tobatiensis</i> Hassl.	5	1370.51	238.80	8840.00	2640.45	0.75	0.22
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>trichostachya</i> Baker	17	1294.50	576.08	8567.30	3964.49	0.70	0.17
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>tuberosa</i> (Vell.) Beer	32	1424.99	968.50	9963.18	8456.87	0.78	0.42
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>uleana</i> Mez	4	1450.69	229.75	8180.43	502.03	0.65	0.02
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>ursina</i> L.B.Sm.	3	1355.42	64.25	8588.19	465.85	0.70	0.02
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>velascana</i> Mez	9	308.15	400.25	2184.87	2437.80	0.19	0.20
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>weddelliana</i> Baker	22	1446.57	2186.55	9060.68	12186.45	0.69	0.49
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>agavoides</i> Forzza & Zappi	4	1488.13	25.50	9871.66	934.04	0.75	0.04
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>biflorum</i> (Mez) Forzza	3	1458.83	30.75	10397.27	213.03	0.77	0.01
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>brachypodium</i> L.B.Sm. & R.W.Read	15	776.68	405.33	4741.39	2711.74	0.40	0.23
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>ctenophyllum</i> Forzza & Zappi	5	1420.05	374.50	9351.10	3473.74	0.72	0.18
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>disjunctum</i> Forzza	3	1324.08	478.00	7610.07	3741.55	0.60	0.26
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>erectiflorum</i> L.B.Sm.	4	1179.17	901.33	6577.57	3828.23	0.49	0.18
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>gracile</i> L.B.Sm.	6	1104.08	115.00	6813.21	1000.86	0.58	0.08
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>heloisae</i> (L.B.Sm.) Forzza & Wanderley	8	1471.95	281.00	9692.12	2120.86	0.74	0.09
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>horridum</i> L.B.Sm.	30	1158.24	299.25	7297.51	2697.39	0.62	0.23
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>irwinii</i> L.B.Sm.	4	1024.63	215.50	6097.82	887.43	0.51	0.08
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>longiflorum</i> Leme	3	962.67	10.00	5282.51	367.10	0.45	0.03
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>luxor</i> L.B. Smith & R.W. Read	11	1320.64	852.75	8241.14	6290.37	0.62	0.40
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>lymanianum</i> Pereira & Martinelli	4	1424.00	91.50	8417.16	129.61	0.71	0.01
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>magalhaesii</i> L.B.Sm.	4	1441.50	100.50	10248.54	1272.90	0.77	0.04
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>maximum</i> Forzza & Leme	4	748.75	224.25	4124.83	640.64	0.35	0.05
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>scrutor</i> (L.B.Sm.) Rauh	4	1419.63	44.75	9675.79	819.84	0.75	0.03
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>spectabile</i> Mart. ex Schult. & Schult.f.	83	745.91	1777.25	4640.60	10275.64	0.38	0.79
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>subsecundum</i> (Baker) Mez	13	1395.72	1083.42	9286.64	6870.96	0.70	0.43
C ₃ succulent terrestrial	Bromelioideae	<i>Fascicularia</i>	<i>bicolor</i> (Ruiz & Pavon) Mez	11	1901.89	1470.40	23607.15	27358.62	0.84	0.49
C ₃ succulent terrestrial	Bromelioideae	<i>Fernseea</i>	<i>itatiaiae</i> (Wawra) Baker	10	1821.65	1393.75	14413.26	11370.78	0.83	0.31
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>albicans</i> (Griseb.) L.B.Sm.	23	957.46	1543.17	6129.65	9449.48	0.49	0.53
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>caulescens</i> Rauh	4	1618.63	243.33	11389.15	1139.66	0.84	0.04
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>chaparensis</i> Ibisch, R.Vasquez & E.Gross	7	2117.30	2927.50	12794.82	16078.65	0.77	0.42
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>christophii</i> Ibisch, Leme & J. Peters	7	1171.13	445.75	7305.37	3331.30	0.62	0.27
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>cotacajensis</i> Kessler, Ibisch & E.Gross	6	1298.16	866.75	8093.64	5134.54	0.65	0.30
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>gracilis</i> (Rusby) L.B.Sm.	9	1526.41	1099.83	9545.05	6368.45	0.73	0.42

C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>graminea</i> (L.B.Sm.) L.B.Sm.	5	1246.00	1012.75	8715.19	5447.18	0.70	0.31
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>hatschbachii</i> L.B.Sm. & Read	15	1437.84	228.75	8459.56	1291.90	0.71	0.06
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>heterophylla</i> Rauh	3	1359.00	485.25	8690.41	2726.28	0.71	0.17
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>kroemeri</i> Ibisch, Leme & J. Peters	3	1379.17	343.75	8711.72	2260.77	0.71	0.13
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>micrantha</i> (Lindl.) L.B.Sm.	31	2287.85	3015.83	13612.43	18101.86	0.71	0.52
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>nicoliana</i> Peters, Weising & Ibisch	4	2015.46	1543.50	11433.40	8395.85	0.83	0.31
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>pearcei</i> (Baker) L.B.Sm.	70	2587.00	3645.50	17419.83	23623.94	0.91	0.63
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>penduliflora</i> (C.H.Wright) L.B.Sm.	31	1029.77	1326.50	6349.54	9271.01	0.53	0.64
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>petiolata</i> (Mez) L.B.Sm.	11	1155.98	420.50	7841.75	3239.59	0.65	0.24
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>robertreadii</i> Ibisch, Leme & J. Peters	4	1332.15	665.67	7619.81	2649.42	0.64	0.22
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>rojasii</i> (L.B.Sm.) L.B.Sm.	7	1408.58	45.25	8713.55	554.51	0.73	0.03
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>rusbyi</i> (Mez) L.B.Sm.	25	1460.73	2040.80	9475.25	11377.40	0.73	0.42
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>schidosperma</i> (Baker) L.B.Sm.	7	1827.40	1976.50	11021.53	10006.40	0.76	0.40
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>vasquezii</i> E.Gross & Ibisch	5	1463.04	107.00	8182.47	1040.32	0.67	0.05
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>villosula</i> (Harms) L.B.Sm.	12	2036.94	2115.08	12897.19	11072.90	0.85	0.28
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>weberbaueri</i> (Mez) L.B.Sm.	11	1776.74	2556.50	10909.82	14746.29	0.74	0.58
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>weddelliana</i> (Brongn. ex Baker) L.B.Sm.	13	1400.44	1869.75	8656.18	10655.97	0.68	0.45
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>windischii</i> L.B.Sm. & Read	4	1573.75	1272.75	9053.58	6394.58	0.67	0.26
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>yuvinkae</i> Ibisch, R. Vásquez, E. Gross & S. Reichle	5	1479.21	1954.05	8450.85	12031.61	0.61	0.48
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>alborosea</i> (Griseb.) Mez	5	1378.82	523.50	9669.78	723.02	0.75	0.13
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>columbiana</i> L.B.Sm.	23	2474.31	2269.75	22810.67	20889.71	0.92	0.23
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>danielii</i> L.B.Sm.	24	1684.20	1712.25	14645.95	15418.83	0.89	0.26
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>kessleri</i> H.Luther	3	990.56	313.00	7242.34	3287.96	0.59	0.24
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>leymebambana</i> H. Luther	4	1231.50	174.75	8399.18	3296.90	0.68	0.20
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>mulfordii</i> L.B.Sm.	24	1379.66	2053.50	12125.52	18036.76	0.84	0.38
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>nubigena</i> L.B.Sm.	5	1307.75	883.50	7971.60	4160.61	0.62	0.28
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>oaxacana</i> L.B.Sm.	6	1997.87	598.20	14879.04	4990.13	0.83	0.14
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>rohweri</i> L.B.Sm.	3	1905.25	105.00	13857.12	4834.75	0.75	0.17
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>sanctae-martae</i> L.B.Sm.	3	1971.89	1461.00	16252.97	8066.08	0.90	0.07
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>sodiroana</i> Mez	10	1548.33	4828.00	10910.91	26915.47	0.73	0.49
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>sphacelata</i> (Ruiz & Pavon) Regel	5	1557.63	1084.00	18425.94	22696.37	0.73	0.44
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>stenolepis</i> L.B.Sm.	7	1345.77	1043.67	12875.17	12260.80	0.81	0.47
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>steyermarkii</i> L.B.Sm.	15	2391.50	1407.33	15230.02	8521.71	0.88	0.31
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>sylvicola</i> Standl.	50	2904.99	2269.50	24573.60	20359.48	0.94	0.32
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>van-hyningii</i> L.B.Sm.	6	1618.24	1417.00	11295.78	9801.19	0.71	0.48
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>vilcabambae</i> H.Luther	4	1269.38	668.00	7552.25	2957.58	0.63	0.25
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>vulcanica</i> André	14	1664.80	3035.50	15235.37	19144.40	0.88	0.39
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>bracteata</i> Mez	7	645.94	1484.75	4406.83	10501.34	0.33	0.59
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>caudata</i> L.B.Sm.	7	887.86	155.17	5253.51	1405.80	0.44	0.12
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>confusa</i> L.B.Sm.	3	699.75	305.00	4589.92	2368.23	0.39	0.19

CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>conzattiana</i> L.B.Sm.	6	622.28	884.67	3669.57	5431.68	0.29	0.38
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>fragilis</i> Burt-Utley & Utley	5	817.63	608.92	4789.97	4230.18	0.38	0.28
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>galeottii</i> Mez	5	647.30	360.08	3941.64	3324.40	0.33	0.28
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>glabra</i> Brandegee	5	1276.60	828.00	8004.68	5548.22	0.61	0.25
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>glomerata</i> Zuccharini	39	813.11	1625.25	4937.11	9505.88	0.40	0.57
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>guatemalensis</i> Mez	44	1330.27	1218.42	8311.27	7062.47	0.61	0.32
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>jaliscana</i> L.B.Sm.	5	905.68	261.58	4925.82	1997.28	0.41	0.14
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>laevis</i> L.B.Sm.	5	857.00	106.00	4693.27	583.57	0.39	0.04
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>Liebmannii</i> Mez	5	530.85	233.25	3133.13	1201.53	0.26	0.10
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>lundelliorum</i> L.B.Sm.	5	1574.52	1034.40	9846.29	7467.58	0.68	0.30
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>lyman-smithii</i> Burt-Utley & Utley	5	455.15	232.25	2283.00	1066.73	0.19	0.09
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>montana</i> Brandegee	23	435.15	599.65	2517.03	3329.94	0.21	0.28
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>pedicellata</i> S.Watson	4	918.81	71.25	5237.02	310.66	0.44	0.03
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>podantha</i> Mez	41	579.41	1110.83	3487.48	7291.32	0.29	0.52
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>pringlei</i> H.Rob. & Greenm.	7	636.74	218.17	3792.97	2175.77	0.32	0.18
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>purpusii</i> Brandegee	3	1225.67	1292.50	8233.44	9337.93	0.58	0.60
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>rosea</i> E.Morren ex Baker	22	934.30	1214.00	5523.43	6819.63	0.44	0.32
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>schottii</i> Baker	15	1186.79	1009.50	6988.88	7693.11	0.56	0.33
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>sphaeroblasta</i> B.L. Robinson	4	717.21	500.25	4044.36	2709.14	0.34	0.23
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>stenopetala</i> Klotzsch	7	1258.74	1769.42	8189.92	12618.96	0.59	0.39
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>subalata</i> L.B.Sm.	6	908.60	1048.42	5096.35	5663.52	0.40	0.32
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>texensis</i> S. Watson	17	444.03	827.58	2703.68	5748.66	0.23	0.47
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>tillandsioides</i> (André) L.B.Sm.	5	1428.10	899.25	8975.30	5307.42	0.67	0.27
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>arachnoidea</i> (L.B.Sm., Steyermark & H.Rob.) L.B.Sm.	10	2958.95	1470.00	19907.46	14045.13	0.97	0.05
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>brachyphylla</i> L.B.Sm.	6	2554.01	1237.25	17281.57	4209.33	0.90	0.05
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>cylindrostachya</i> L.B.Sm.	3	3041.83	508.75	19928.51	3482.00	0.87	0.13
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>geniculata</i> L.B.Sm.	7	2575.94	1379.50	17057.32	9640.63	0.87	0.11
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>guianensis</i> (Beer) Mez	7	2434.30	1103.67	16161.85	6365.66	0.93	0.09
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>holstii</i> Steyermark & L.B.Sm.	4	2343.63	256.50	15606.23	357.44	0.88	0.01
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>marahuacae</i> (L.B.Sm., Steyermark & H.Rob.) L.B.Sm.	6	3082.82	508.00	21094.49	9009.57	0.97	0.05
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>navioides</i> L.B.Sm.	3	2517.25	1284.00	16068.73	8425.12	0.90	0.07
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>nubigena</i> (L.B.Sm.) L.B.Sm.	3	3348.75	299.75	23876.13	2438.13	0.98	0.01
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>serrulata</i> L.B.Sm.	7	2801.85	1171.75	17831.94	3162.02	0.91	0.10
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>steyermarkii</i> L.B.Sm.	3	2599.22	699.00	18538.19	281.01	0.91	0.04
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>subsimplex</i> L.B.Sm.	6	2508.98	1284.00	17313.06	8797.30	0.91	0.07
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>thyrsioidea</i> L.B.Sm.	3	2897.75	106.92	18374.21	2478.28	0.83	0.04
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>wurdackii</i> L.B.Sm.	6	2804.03	948.42	18473.80	5721.86	0.93	0.12
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>acaulis</i> Mart. ex Schult. & Schult.f.	32	2727.49	840.25	16423.67	5001.20	0.92	0.21
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>affinis</i> L.B.Sm.	3	3335.42	249.75	23449.89	3295.27	0.99	0.01

C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>aliciae</i> L.B.Sm., Steyer. & H.Rob.	5	2937.04	1432.50	17577.62	9964.77	0.95	0.04
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>angustifolia</i> Mez	4	3042.40	1239.50	20806.83	7081.93	0.98	0.02
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>caulescens</i> Mart. ex Schult. & Schult.f.	15	2952.35	997.70	18323.17	6930.15	0.92	0.18
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>connata</i> L.B.Sm. & Steyer.	3	3236.50	1619.00	18770.97	9671.58	0.94	0.12
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>crispa</i> L.B.Sm.	3	2844.58	137.75	16154.69	3645.87	0.80	0.01
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>duidae</i> L.B.Sm.	20	2759.84	1684.25	17962.56	12740.61	0.93	0.19
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>jauana</i> L.B.Sm., Steyer. & H.Rob.	4	3298.42	95.00	21243.76	2178.96	0.95	0.01
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>linearis</i> L.B.Sm., Steyer. & H.Rob.	3	3102.83	130.50	21160.14	2478.72	0.97	0.01
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>luzuloides</i> L.B.Sm., Steyer. & H.Rob.	5	3228.45	14.50	22306.60	1131.32	0.95	0.01
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>maguirei</i> L.B.Sm.	9	2744.04	475.92	17492.58	3895.43	0.90	0.03
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>nubicola</i> L.B.Sm.	11	3144.08	512.67	19635.17	8980.08	0.97	0.06
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>octopoides</i> L.B.Sm.	3	3139.75	76.75	18384.88	2602.19	0.94	0.04
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>ovoidea</i> L.B.Sm., Steyer. & H.Rob.	3	3095.08	207.00	19185.23	655.95	0.86	0.01
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>pauciflora</i> L.B.Sm.	3	3194.36	85.08	21274.17	2918.24	0.97	0.02
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>pulvinata</i> L.B.Sm.	4	3148.13	644.25	18460.75	4695.85	0.95	0.04
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>scirpiflora</i> L.B.Sm., Steyer. & H.Rob.	3	3296.06	95.00	21362.98	2178.96	0.95	0.00
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>subpetiolata</i> L.B.Sm.	3	3204.67	88.75	22040.69	2088.62	0.94	0.03
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>terramarae</i> L.B.Sm. & Steyer.	3	3082.44	122.67	18568.89	1930.84	1.00	0.00
CAM terrestrial	Bromelioideae	<i>Neoglaziovia</i>	<i>variegata</i> (Arruda) Mez	139	702.09	1504.00	4391.50	11296.34	0.36	0.65
C ₃ succulent terrestrial	Bromelioideae	<i>Ochagavia</i>	<i>carnea</i> (Beer) L. B. Sm. & Looser	8	1163.46	669.50	10003.43	7026.09	0.54	0.17
C ₃ succulent terrestrial	Bromelioideae	<i>Ochagavia</i>	<i>litoralis</i> (Phil.) Zizka	4	908.35	1736.00	9981.86	21779.51	0.51	0.50
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>albopictum</i> Philcox	13	915.51	188.27	5925.25	1177.29	0.50	0.10
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>amoenum</i> (Ule) L.B.Sm.	11	914.27	287.25	5707.89	1522.76	0.48	0.13
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>boudetianum</i> Leme & L. Kollmann	5	1280.00	70.50	8548.26	1255.64	0.72	0.11
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>burle-marxii</i> L.B.Sm.& Read	21	914.41	324.17	5866.63	1975.43	0.50	0.17
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>compactum</i> L.B.Sm.	4	1041.21	163.58	6386.50	1483.58	0.54	0.13
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>diamantinense</i> Leme	4	1346.02	446.25	8990.40	3746.97	0.70	0.23
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>disjunctum</i> L.B.Sm.	41	725.80	804.75	4887.09	5675.87	0.41	0.42
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>foliosum</i> L.B.Sm.	16	1158.27	747.25	7460.55	4650.90	0.62	0.29
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>harleyi</i> Leme & M. Machado	4	815.19	96.25	4856.63	932.12	0.41	0.08
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>hatschbachii</i> Leme	24	922.31	263.33	6128.14	2017.58	0.52	0.17
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>horridum</i> Leme	7	907.75	176.00	5625.91	1830.42	0.48	0.16
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>jabrense</i> Baracho & J.A. Siqueira	3	890.48	155.73	5738.80	1056.88	0.48	0.09
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>lemei</i> Pereira & I.A.Penna	6	811.51	289.17	5121.39	2014.10	0.43	0.17
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>leprosum</i> (Mez) Mez	5	835.00	134.00	5090.81	1560.78	0.43	0.13
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>magalhaesii</i> L.B.Sm.	13	1112.97	119.25	6963.87	688.62	0.59	0.06
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>maracasense</i> L.B.Sm.	26	726.27	484.75	4664.13	3269.00	0.39	0.27
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>mello-barretoii</i> L.B.Sm.	6	1334.25	506.50	9060.45	4783.41	0.70	0.29
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>navioides</i> (L.B.Sm.) L.B.Sm	14	928.12	273.40	5870.65	1453.88	0.50	0.12
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>ophiuroides</i> Louzada & Wanderley	3	1072.19	189.25	6387.26	1078.67	0.54	0.09
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>piranianum</i> Leme & C. C.Paula	8	963.17	65.25	5820.41	741.43	0.49	0.06

CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>pseudovagans</i> Leme & L. Kollmann	7	1155.21	13.50	7250.61	26.83	0.61	0.00
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>riocontense</i> Leme	4	918.50	194.75	5926.49	1477.29	0.50	0.12
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>rubiginosum</i> Leme	4	1105.27	1.50	6931.96	54.62	0.59	0.00
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>saxicola</i> (Ule) L.B.Sm.	27	762.78	1322.50	5112.07	10534.51	0.42	0.59
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>schulzianum</i> Leme & M. Machado	6	1375.42	223.50	9270.97	2449.29	0.72	0.11
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>triunfense</i> J. A. Siqueira & Leme	3	925.56	67.00	6301.11	706.01	0.53	0.06
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>ulei</i> Louzada & Wand.	3	942.67	19.00	5975.24	54.61	0.51	0.00
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>zanonii</i> Leme	3	1192.25	36.75	7505.14	301.29	0.63	0.02
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>abyssicola</i> Leme & L. Kollmann	3	1201.25	297.75	8130.27	1785.83	0.69	0.15
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>aequatorialis</i> L.B.Sm.	21	1235.09	3559.83	8596.02	23625.19	0.59	0.76
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>alata</i> L.B.Sm.	6	1691.39	1821.75	11575.94	10407.85	0.82	0.26
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>albiflos</i> Herbert	3	1353.67	85.25	10166.38	417.48	0.85	0.02
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>alborubra</i> Baker	3	3084.83	390.50	20345.70	6326.13	0.98	0.02
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>alexanderi</i> (H. Luther) D.C. Taylor & H.Rob.	5	2629.72	280.75	16431.63	1564.08	1.00	0.01
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>amblyosperma</i> L.B.Sm.	4	1795.85	2218.17	11437.02	14536.38	0.73	0.47
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>amboroensis</i> Ibsich, R.V. Squez, E.Gross & Kessler	5	1481.65	387.50	9119.00	2139.29	0.74	0.12
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>angustifolia</i> Aiton	39	2048.42	2197.25	14063.30	16803.03	1.00	0.01
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>aphelandriflora</i> Lem.	40	2743.74	3212.50	17551.03	15220.22	0.93	0.21
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>archeri</i> L.B.Sm.	10	4094.21	6328.00	25665.79	31861.08	0.98	0.10
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>arcuata</i> André	178	3054.56	3541.33	20353.24	21954.36	0.93	0.38
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>arenaria</i> H.Luther	4	1298.69	734.00	8234.63	3075.48	0.69	0.26
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>arida</i> L.B.Sm. & Betancur	4	2472.88	1281.00	15313.52	6469.32	0.93	0.14
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>armata</i> Maury	22	2448.50	1892.92	13699.42	9833.38	0.76	0.34
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>atrorubens</i> (Beer) Baker	112	3120.61	5678.50	21299.50	34589.74	0.91	0.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>azouryi</i> Martinelli & Forzza	10	1047.43	707.00	6590.51	5059.75	0.56	0.43
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>bakeri</i> (André) André ex Mez	46	2905.79	3682.67	19633.67	24291.56	0.96	0.56
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>barbatostigma</i> Leme & A. P. Fontana	7	1162.48	115.75	7304.64	719.81	0.62	0.06
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>barrigae</i> L.B.Sm.	10	2794.38	1689.67	19296.59	10939.81	0.95	0.19
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>basincurva</i> L.B.Sm. & Betancur	5	2788.90	177.00	17914.95	1501.97	0.94	0.04
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>bella</i> L.B.Sm.	10	3273.08	1666.67	21607.26	7232.98	0.97	0.05
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>bergii</i> H.Luther	3	979.58	185.75	6772.64	642.29	0.56	0.03
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>bicolor</i> L.B.Sm. & Read	13	3287.99	5229.83	21635.31	28138.56	0.99	0.05
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>biflora</i> L.B.Sm.	8	2418.76	1430.67	15903.61	9745.57	0.94	0.26
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>billbergioides</i> L.B.Sm.	4	762.56	699.50	4896.25	4385.09	0.40	0.37
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>brachysperma</i> André	9	2069.68	1664.00	13865.06	11265.79	0.88	0.27
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>brackeana</i> Manzan. & Till	4	1721.48	1108.75	11095.79	5969.84	0.79	0.22
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>bradei</i> Markgr.	10	1083.20	664.00	6745.12	4302.38	0.55	0.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>breedlovei</i> L.B.Sm.	7	1069.81	755.67	6248.47	5420.61	0.49	0.26
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>brevicalycina</i> Mez	11	1405.61	1773.25	9701.01	9974.81	0.74	0.32

C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>brittoniana</i> (Mez) Mez	110	3038.31	3753.00	21642.60	30557.38	0.93	0.29
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>bromeliifolia</i> L'Heritier	3	1529.33	242.00	9550.78	1638.50	0.76	0.03
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>brongniartiana</i> André	22	2706.88	2983.58	19236.61	16639.94	0.94	0.19
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>brunnescens</i> L.B.Sm.	13	1951.58	1848.00	14117.03	10549.38	0.91	0.22
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>bulbosa</i> L.B.Sm.	20	2845.62	1941.25	16218.63	12305.22	0.89	0.34
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>calicicola</i> J.R.Grant & J.F.Morales	26	1850.56	1061.00	10625.72	5633.90	0.67	0.11
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>calderonii</i> Standl. & L.B.Sm.	6	1766.38	798.25	10806.81	5190.75	0.72	0.17
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>cardenasii</i> L.B.Sm.	6	921.25	795.75	5696.16	4011.04	0.48	0.31
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>caricifolia</i> Mart. ex Schult. & Schult.f.	52	2630.27	2178.50	15439.62	12628.95	0.88	0.35
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>carinata</i> Mez	11	1399.98	446.50	10226.27	5283.84	0.80	0.26
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>chiapensis</i> Miranda	3	1428.25	474.50	8450.74	3263.12	0.65	0.23
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>chiquitana</i> Vasquez & Ibisch	3	1155.58	12.75	6566.64	84.30	0.56	0.01
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>chiriquensis</i> L.B.Sm.	6	2995.17	883.00	18529.89	4937.78	0.84	0.06
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>clarkii</i> H.Luther	3	2083.33	27.00	14996.65	142.32	0.81	0.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>commixta</i> L.B.Sm.	22	2031.03	2061.42	14251.16	15459.61	0.84	0.30
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>compostelae</i> McVaugh	4	1042.96	276.17	6526.07	1437.84	0.52	0.08
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>condorensis</i> Manzan. & Till	4	2303.38	11.25	14112.14	238.44	0.99	0.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>corallina</i> Linden & André	11	2419.45	1896.33	14667.10	11355.97	0.94	0.30
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>costata</i> L.B.Sm.	3	2682.67	2584.50	19207.31	15647.25	0.93	0.18
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>cremersii</i> Gouda	3	2602.94	187.50	16429.75	1779.88	0.89	0.04
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>crinita</i> Pereira & Martinelli	3	2557.25	18.75	15221.46	119.23	0.89	0.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>ctenophylla</i> L.B.Sm.	14	2866.10	1489.50	18101.79	7420.34	0.86	0.18
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>cubensis</i> (Mez) L.B.Sm.	9	1645.74	1013.17	10912.33	8258.26	0.82	0.37
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>curvidens</i> L.B.Sm. & Read	4	1531.69	573.25	10822.33	6040.91	0.77	0.17
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>cuzcoensis</i> L.B.Sm.	4	1374.77	849.25	8170.20	2719.34	0.69	0.23
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>cylindrostachya</i> L.B.Sm.	4	1258.66	616.00	7286.97	4031.30	0.53	0.15
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>decidua</i> L.B.Sm.	30	1311.87	510.17	9115.82	5752.46	0.74	0.29
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>dendroidea</i> André	14	1730.96	2028.08	12845.50	15102.79	0.83	0.26
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>deroosei</i> Manzan. & Till	4	1832.63	859.75	12885.58	5705.63	0.88	0.14
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>diffusa</i> L.B.Sm.	51	2123.39	2949.75	15172.76	20841.13	0.89	0.54
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>dodsonii</i> H.Luther	24	2356.71	3190.00	15820.95	20476.55	0.93	0.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>domingensis</i> L.B.Sm.	4	1729.65	995.25	10646.87	7281.65	0.83	0.48
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>echinata</i> Hook.	24	2480.55	5107.17	15511.05	31095.33	0.89	0.40
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>elizabethae</i> L.B.Sm.	4	1555.06	364.25	10915.58	4100.04	0.79	0.17
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>elongata</i> L.B.Sm.	15	1869.96	5148.17	11759.55	32329.88	0.70	0.51
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>elvira</i> D.C.Taylor & H.Rob.	7	3249.56	3311.25	21023.21	20720.56	0.95	0.34
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>encholirioides</i> L.B.Sm.	5	1405.65	60.50	9930.35	1728.39	0.81	0.12
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>ensifolia</i> Mez	9	1610.49	381.75	10077.41	3997.93	0.71	0.14
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>ferrell-ingramiae</i> H.Luther & Dalström	29	2914.98	2446.25	20163.50	14030.40	0.97	0.19
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>filispina</i> L.B.Sm.	4	2954.46	297.67	18408.27	2194.43	0.85	0.10
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>flammea</i> Lindl.	126	1454.80	1775.75	10662.09	15745.29	0.80	0.43

C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>flexuosa</i> L.B.Sm.	11	1479.89	1063.25	9014.46	8739.85	0.59	0.39
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>fluvialis</i> L.B.Sm. & Betancur	3	2693.06	461.50	16268.99	3800.04	0.95	0.05
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>fruticosa</i> L.B.Sm. & Betancur	3	2534.36	101.33	17739.84	645.73	0.97	0.01
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>fuertesii</i> Mez	6	1376.21	826.75	8813.40	5616.48	0.72	0.34
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>funkiae</i> M.A.Spencer & L.B.Sm.	6	3457.33	1559.25	22110.87	11143.78	0.91	0.16
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>fusca</i> H.Luther	24	1524.10	1820.75	10728.99	11918.35	0.75	0.47
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>geyskesii</i> L.B.Sm.	7	2085.17	933.08	12820.97	6024.40	0.79	0.22
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>glaziovii</i> Baker	7	1645.40	860.75	11670.35	5716.96	0.82	0.22
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>goudae</i> Manzanares & W.Till	4	3110.73	2590.33	21622.06	17196.47	0.94	0.21
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>guzmanoides</i> L.B.Sm.	34	2024.50	3512.50	14902.92	32224.77	0.76	0.56
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>halophila</i> L.B.Sm.	38	3450.80	3380.50	19646.83	17944.68	0.84	0.28
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>harlingii</i> L.B.Sm.	7	4076.33	4354.00	25266.85	25156.76	1.00	0.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>harrylutheri</i> D.C. Taylor & H.Rob.	9	2675.77	762.67	16989.43	5624.44	1.00	0.02
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>heterophylla</i> (Lindl.) Beer	201	1971.46	3953.75	13225.56	32281.90	0.73	0.82
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>hintoniana</i> L.B.Sm.	5	1305.00	343.50	7456.77	3105.25	0.54	0.14
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>hirtzii</i> H.Luther	15	2526.35	1998.33	16325.32	11960.55	0.96	0.20
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>hooveri</i> (H. Luther) D.C. Taylor & H.Rob.	12	1533.27	1947.75	11810.84	10760.23	0.86	0.23
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>imbricata</i> (Brongn.) Regel	78	2256.33	4120.00	15025.73	28407.89	0.80	0.62
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>integrifolia</i> Ker Gawl.	4	1946.19	1690.33	12712.34	13128.84	0.75	0.45
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>irwiniana</i> L.B.Sm.	11	1575.32	647.75	9620.60	5551.51	0.70	0.26
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>juncoides</i> L.B.Sm.	38	3106.69	1674.25	17029.82	8338.44	0.89	0.34
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>kalbreyeri</i> Baker	51	2937.99	3518.75	21308.24	30791.20	0.95	0.22
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>karwinskyana</i> Schult. & Schult.f.	45	1133.11	1353.00	6993.75	9333.78	0.52	0.52
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>kniphofoides</i> L.B.Sm.	3	1600.08	322.75	10614.47	2375.75	0.84	0.10
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>kressii</i> H.Luther	7	2980.40	529.50	20383.71	4552.84	0.97	0.06
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>lanuginosa</i> Ruiz & Pav.	70	1684.58	2307.50	10225.25	13279.84	0.73	0.58
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>lehmannii</i> Baker	35	2467.08	3632.58	17026.47	22709.63	0.90	0.55
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>leprosa</i> L.B.Sm.	6	1222.75	390.75	7327.79	5137.09	0.52	0.17
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>lignosa</i> L.B.Sm.	4	1216.69	1218.00	8396.27	5408.10	0.67	0.38
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>longipes</i> Mez	3	4282.94	4553.00	26928.97	32237.11	0.93	0.17
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>longissimiflora</i> Ibsch, R.Vasquez & E.Gross	3	1120.25	797.75	6916.71	4636.67	0.57	0.34
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>luteyniorum</i> L B Sm. & R W Read	8	1772.85	2207.33	13413.15	11751.32	0.90	0.22
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>lymansmithiana</i> H.Luther	8	3434.63	1189.00	23968.56	10243.34	0.97	0.04
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>macarenensis</i> L.B.Sm.	6	2837.31	2072.00	16936.48	12885.70	0.92	0.14
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>macranthera</i> André	24	3335.58	6926.00	22201.36	41182.25	0.90	0.38
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>maidifolia</i> (C.Morren) Decne. ex Planch.	138	2542.84	4332.50	16353.23	31698.85	0.87	0.68
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>marinii</i> Manzan. & W Till	3	2697.61	73.00	16974.62	127.45	1.00	0.01
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>megasepala</i> Baker	43	2880.31	3503.00	17548.40	20550.03	0.86	0.38
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>melanopoda</i> L.B.Sm.	3	1346.62	63.47	8493.19	438.37	0.72	0.04
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>meridensis</i> (Klotzsch ex Mez) Mez	7	2145.56	2221.25	14836.71	14421.04	0.83	0.32

C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>melchiana</i> André	11	898.67	516.75	4535.62	3360.96	0.37	0.19
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>minicorallina</i> (H.Luther) Grant	3	2279.22	612.67	13528.10	3852.64	0.95	0.08
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>mituensis</i> L.B.Sm.	3	3487.83	66.50	21536.48	392.31	1.00	0.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>modesta</i> L.B.Sm.	3	1343.58	297.75	7524.80	849.98	0.54	0.02
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>mucida</i> L.B.Sm. & Read	3	2892.42	1528.08	18737.32	7594.57	0.97	0.08
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>multiflora</i> L.B.Sm.	15	2540.17	2197.00	17225.90	16530.36	0.82	0.57
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>multiramosa</i> Mez	6	1242.66	2190.05	7697.31	12750.93	0.56	0.54
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>neillii</i> Manzanares & Till	7	2472.90	1329.42	15774.40	8306.35	0.98	0.13
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>nigra</i> (Carrière) André	62	2091.97	3794.08	14963.76	25997.82	0.85	0.41
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>nobilis</i> Mez & Sodiro	3	1368.33	375.67	7440.90	2351.31	0.63	0.20
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>nubigena</i> Planch. & Linden	4	1349.44	688.25	9336.77	2175.49	0.72	0.16
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>nuda</i> Baker	16	2284.04	2031.25	14043.83	10105.05	0.81	0.36
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>oaxacana</i> L.B.Sm.	9	1243.40	548.20	7088.89	2235.28	0.53	0.09
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>oblongifolia</i> L.B.Sm.	3	1106.97	567.92	7416.14	1972.67	0.58	0.07
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>occidentalis</i> L.B.Sm.	9	3211.25	2206.00	19400.57	10775.81	0.95	0.16
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>palmeri</i> S.Watson	17	941.87	987.25	5746.86	6393.05	0.47	0.41
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>palmaoides</i> Mez & Sodiro	14	2556.25	3331.25	17007.36	21756.75	0.90	0.51
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>paniculata</i> Ruiz & Pav.	40	1359.65	2236.55	8606.94	13424.36	0.67	0.62
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>paraguayensis</i> L.B.Sm.	3	1413.72	44.00	8722.98	308.14	0.74	0.03
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>patentiflora</i> L.B.Sm.	41	2798.64	1186.75	17053.96	12380.47	0.93	0.19
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>pavonii</i> (Mez) Mez	13	937.59	1621.67	6956.23	12651.02	0.55	0.76
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>peruana</i> (H.Luther) Grant	3	1249.42	134.50	8317.50	643.39	0.70	0.05
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>petraea</i> L.B.Sm.	3	1030.67	61.00	7924.11	563.63	0.67	0.05
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>pomacochae</i> Rauh	12	1418.17	1499.00	8464.49	9014.72	0.67	0.48
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>poortmanii</i> André	9	2057.52	1399.50	13038.07	10732.64	0.90	0.35
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>prolifera</i> Rauh	3	1053.11	86.50	6143.39	958.59	0.48	0.06
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>pruinosa</i> Kunth	16	2517.47	1674.25	14022.97	8554.37	0.79	0.32
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>puberula</i> Mez & J.D.Sm.	4	1727.31	1260.42	11495.96	10872.69	0.67	0.38
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>pulverulenta</i> Ruiz & Pav.	8	1460.50	1382.33	8529.12	7298.02	0.66	0.41
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>pungens</i> Kunth	142	1158.01	2771.08	8930.81	17966.43	0.66	0.93
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>punicea</i> Scheidw.	28	2720.13	2202.25	16925.89	12815.00	0.90	0.18
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>quesnelioides</i> L.B.Sm.	4	3307.25	641.00	18887.33	3362.05	0.86	0.02
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>recurvata</i> (Scheidweiler) C.Koch	16	2302.54	2633.00	15141.49	18934.01	0.82	0.63
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>reflexiflora</i> André	6	1466.97	1433.00	9552.56	8890.73	0.73	0.51
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>ringens</i> Klotzsch	32	1399.40	1521.50	9363.73	12505.73	0.66	0.54
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>riparia</i> Mez	52	2140.96	3589.33	14115.16	23969.16	0.85	0.54
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>roseana</i> L.B.Sm.	11	974.72	545.50	5675.72	2006.40	0.47	0.16
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>rubiginosa</i> Baker	11	3063.33	2060.67	19212.54	13727.01	0.96	0.11
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>rundelliana</i> J.R.Grant	13	2673.49	1490.25	19155.71	10793.74	0.91	0.24
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>samuelssonii</i> L.B.Sm.	3	1517.42	383.42	8487.14	1908.70	0.70	0.12
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>sastrei</i> L.B.Sm. & Read	8	2498.35	1116.50	15583.56	7694.88	0.86	0.11

C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>saxicola</i> L.B.Sm.	8	2412.26	1822.50	15421.20	9965.85	0.80	0.14
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>scandens</i> Ule	6	1464.92	1445.50	9357.60	7812.02	0.75	0.41
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>sceptriformis</i> Mez	24	2993.65	3107.25	19604.41	20035.81	0.96	0.31
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>sceptrigera</i> Mez	20	2117.14	2459.00	14624.96	15935.97	0.77	0.70
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>schultzei</i> Harms	7	2140.05	2600.17	12592.40	12776.60	0.74	0.42
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>semaphora</i> L.B.Sm.	6	3320.40	1258.17	22972.35	5515.84	0.98	0.03
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>simulans</i> H.Luther	27	2386.91	2944.50	16980.55	20256.73	0.89	0.66
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>sodiroi</i> Mez	34	1726.93	1987.75	12077.52	11507.98	0.79	0.37
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>spectabilis</i> (Mez) Mez	26	2625.80	4543.25	18711.83	26776.25	0.94	0.22
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>sprucei</i> Baker	54	2804.49	1191.05	16915.59	7387.28	0.97	0.15
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>squarrosa</i> L.B.Sm.	6	2575.89	2266.00	18325.38	14272.48	0.93	0.20
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>staminea</i> Lodd.	7	1265.20	573.17	9425.30	3646.92	0.78	0.20
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>stenophylla</i> André	4	1634.79	114.17	9980.17	4260.81	0.80	0.18
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>stevensonii</i> H.Luther & Whitten	7	2475.45	2151.50	16708.01	16602.08	0.81	0.35
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>suaveolens</i> Lindl.	6	1571.31	553.83	11969.16	6235.87	0.85	0.29
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>susannae</i> Manzan. & Till	3	3058.83	827.50	20824.31	7100.57	0.99	0.01
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>tarapotensis</i> Baker	8	1337.44	582.67	8605.53	4811.74	0.71	0.23
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>tillandsioides</i> L.B.Sm.	3	1380.47	136.92	8401.58	956.58	0.57	0.03
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>tillii</i> Manzan.	4	3127.52	476.33	21000.93	3367.29	1.00	0.01
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>torresiana</i>	4	1631.65	872.42	8989.07	4585.00	0.67	0.16
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i> trianae</i> André	74	1606.67	2513.25	11470.33	20488.42	0.80	0.52
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>truncata</i> L.B.Sm.	5	1335.94	907.75	8509.97	2834.03	0.71	0.24
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>turbinella</i> L.B.Sm.	20	2903.84	2695.75	17645.48	14672.17	0.92	0.41
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>uaupensis</i> Baker	30	3078.74	1040.25	18126.09	7272.06	0.97	0.14
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>ulei</i> L.B.Sm. emend. L.B.Sm. & R.W.Read	10	1486.63	837.25	9688.58	6149.78	0.71	0.31
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>undulata</i> Scheidw.	4	3353.38	1185.00	20102.51	6569.72	0.71	0.31
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>unilateralis</i> L.B.Sm.	3	879.08	220.25	5415.06	1773.72	0.46	0.15
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>valerioi</i> Standl.	73	3133.42	2625.00	21665.22	18226.45	0.91	0.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>vallisoletana</i> Lexarza	3	961.75	282.50	6358.70	2144.31	0.51	0.13
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>wendlandii</i> Baker	43	2999.44	2627.75	20599.13	21600.65	0.93	0.41
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>aequatorialis</i> André	12	1030.88	1751.25	7517.22	11136.06	0.87	0.37
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>alpestris</i> (Poeppig) Gay	30	663.71	1439.25	5765.97	12987.84	0.57	0.18
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>angelensis</i> E.Gross & Rauh	3	889.89	179.67	7997.90	2805.12	0.90	0.15
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>angulonis</i> L.B.Sm.	6	872.49	718.75	6612.94	6322.15	0.68	0.49
C ₃ —CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>angusta</i> L.B.Sm.	5	955.42	529.92	9052.24	2405.66	1.00	0.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>argentea</i> L.B.Sm.	8	2602.78	1327.00	16943.12	8543.61	0.70	0.31
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>aristeguietae</i> L.B.Sm.	3	1741.69	1373.75	21094.85	22140.47	0.53	0.52
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>atra</i> L.B.Sm.	6	483.08	418.75	3341.47	2663.03	0.70	0.45
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>berteroana</i> Mez	7	938.26	364.25	6735.95	2893.03	0.59	0.07

CAM terrestrial	Puyoideae	<i>Puya</i>	<i>x berteroniana</i> Mez	7	662.28	988.75	5527.32	8306.24	0.18	0.28
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>bicolor</i> Mez	4	1250.31	1476.00	8668.53	7091.00	0.49	0.09
C ₃ –CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>boliviensis</i> Baker	15	561.04	3504.75	3328.68	20686.25	0.61	0.53
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>brackeana</i> Manzanares & W.Till	4	986.54	199.50	9147.59	2625.84	0.67	0.24
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>brittoniana</i> Baker	5	1028.90	594.25	8114.63	4113.57	0.63	0.17
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>cajasensis</i> Manzanares & W.Till	6	947.74	424.83	8515.38	6065.14	0.96	0.00
C ₃ –CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>cardenasii</i> L.B.Sm.	3	1447.77	2381.55	9255.15	13454.80	0.89	0.13
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>castellanosii</i> L.B.Sm.	6	157.14	58.00	1161.20	336.29	0.41	0.05
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>chilensis</i> Molina	17	662.28	988.75	5527.32	8306.24	0.71	0.49
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>claudiae</i> Ibisch, R.Vasquez & E.Gross	3	782.83	358.00	5294.23	2337.76	0.45	0.21
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>clava-herculis</i> Mez & Sodiro	26	1176.05	674.42	12880.64	10966.61	0.56	0.52
C ₃ –CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>coerulea</i> Lindley	18	663.13	673.58	5961.03	5951.94	0.17	0.11
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>cryptantha</i> Cuatrec.	6	1672.67	1500.67	15249.33	15175.90	0.74	0.10
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>ctenorrhyncha</i> L.B.Sm.	4	678.04	149.25	5644.87	1028.22	0.45	0.18
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>cuevae</i> Manzanares & W.Till	5	1072.85	189.67	8222.91	2231.81	0.37	0.04
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>cylindrica</i> Mez	3	1117.92	1433.50	6486.17	7442.45	0.90	0.07
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>dasyliroides</i> Standl.	31	2774.44	943.08	26144.57	11961.66	0.63	0.31
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>densiflora</i> Harms	3	846.89	193.58	6740.63	1367.27	0.58	0.18
C ₃ –CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>dyckioides</i> (Baker) Mez	16	375.42	618.75	2721.38	3848.70	0.35	0.57
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>entre-riosensis</i> Ibisch & E.Gross	3	717.00	105.75	4390.03	490.60	0.42	0.25
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>eryngioides</i> André	15	1092.01	660.25	8385.04	5340.99	0.90	0.18
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>exigua</i> Mez	6	1253.68	2142.25	9755.62	12712.55	0.82	0.37
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>ferreyrae</i> L.B.Sm.	5	1420.10	2182.25	8825.88	11871.57	0.44	0.20
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>ferruginea</i> (Ruiz & Pav.) L.B.Sm.	64	1050.05	3117.50	7078.54	20390.03	0.75	0.41
C ₃ –CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>floccosa</i> (Linden) E.Morren ex Mez		2373.79	2440.17	16011.79	21956.64	0.55	0.23
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>fulgens</i> L.B.Sm.	4	1792.71	1527.17	11385.54	7741.87	0.89	0.34
C ₃ –CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>glandulosa</i> L.B.Sm.	3	928.83	1320.00	5682.07	6792.06	0.81	0.03
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>glaucovirens</i> Mez	3	1792.67	1487.00	11440.18	6110.36	0.19	0.97
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>glomerifera</i> Mez & Sodiro	22	1133.88	2341.33	10227.83	13741.06	0.48	0.08
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>goudotiana</i> Mez	29	1072.46	2423.30	7948.00	13330.57	0.48	0.53
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>harmsii</i> (A.Cast.) A.Cast.	7	335.46	752.50	2415.52	4678.58	0.17	0.08
C ₃ –CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>herrerae</i> Harms	8	1040.00	1148.25	7293.98	5138.59	0.19	0.01
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>herzogii</i> Wittm.	12	1334.76	2290.30	8317.94	12458.34	0.69	0.07
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>hirtzii</i> Manzanares & W.Till	3	1246.06	984.67	8670.50	7753.51	0.54	0.63

C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>hofstenii</i> Mez	3	1296.43	2664.55	7900.91	15589.15	0.67	0.44
C ₃ –CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>humilis</i> Mez	8	1370.29	3146.50	8704.11	17509.58	0.33	0.38
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>hutchisonii</i> L.B.Sm.	7	1304.71	656.75	8562.95	1735.30	0.45	0.20
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>joergensenii</i> H. Luther	4	792.31	64.58	6989.87	519.60	0.61	0.43
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>killipii</i> Cuatrecasas	6	1168.90	148.83	12195.43	5307.17	0.40	0.01
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>kuntzeana</i> Mez	12	1454.15	2132.00	9161.98	11634.08	0.64	0.27
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>lanata</i> (Kunth) Schult. & Schult.f.	5	979.98	1051.75	6338.88	4142.58	0.66	0.47
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>lasiopoda</i> L.B.Sm.	3	1402.11	832.08	9335.14	6299.80	0.85	0.41
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>leptostachya</i> L.B.Sm.	4	991.67	643.50	6511.82	2830.30	0.53	0.08
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>lilloi</i> A.Cast.	27	564.12	661.75	3986.62	4485.17	0.61	0.10
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>lineata</i> Mez	5	1656.28	1246.75	14230.23	6623.14	0.23	0.32
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>longispina</i> Manzanares & W.Till	4	1211.83	330.00	14071.28	4390.23	0.70	0.07
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>maculata</i> L.B.Sm.	12	1193.22	2100.25	9832.13	13051.01	0.70	0.45
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>micrantha</i> Mez	6	1086.63	3142.25	6620.25	18272.94	0.92	0.20
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>mirabilis</i> (Mez) L.B.Sm.	19	769.16	2655.20	4967.42	15394.19	0.75	0.03
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>mollis</i> Baker ex Mez	8	1072.46	2423.30	7948.00	13330.57	0.81	0.34
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>nana</i> Wittm.	9	777.28	363.75	5243.98	2380.04	0.95	0.07
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>navarroana</i> Manzanares & W.Till	6	1184.51	1342.50	9302.05	6852.92	0.57	0.61
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>nitida</i> Mez	29	1298.53	1984.00	12339.19	19734.08	0.91	0.49
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>novarae</i> Varadarajan ex Gomez Romero & A. Grau	3	300.17	42.50	2234.31	171.17	0.83	0.48
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>nutans</i> L.B.Sm.	6	810.36	279.83	7628.06	3175.11	0.64	0.24
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>obconica</i> L.B.Sm.	9	1383.20	1879.75	9768.29	11713.62	0.69	0.18
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>ochroleuca</i> Betancur & Callejas	3	2308.25	225.00	22181.04	949.06	0.28	0.22
C ₃ –CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>olivacea</i> Wittm.	6	1026.04	2428.55	6449.11	14049.50	0.66	0.26
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>parviflora</i> L.B.Sm.	4	1076.88	182.25	8199.70	815.28	0.61	0.36
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>pattersoniae</i> Manzanares & W.Till	5	766.25	147.33	6329.04	1037.78	0.67	0.37
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>pearcei</i> (Baker) Mez	13	1227.91	871.58	8570.94	6753.94	0.75	0.36
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>pichincae</i> Mez & Sodiro emend Manzan & W. Till	5	1344.08	1285.75	9353.82	7486.55	0.95	0.07
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>pygmaea</i> L.B.Sm.	19	967.85	2282.50	8432.65	13792.58	0.76	0.19
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>raimondii</i> Harms	11	685.77	1193.25	5787.67	7273.55	0.60	0.13
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>reducta</i> L.B.Sm.	18	1970.75	2405.00	13561.39	14944.33	0.48	0.38
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>retrorsa</i> Gilmartin	7	821.80	462.00	8010.27	8323.00	0.56	0.20
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>robin-fosteri</i> G.S.Varadarajan & H.Luther	8	1435.50	1571.50	9126.34	8152.97	0.53	0.34
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>roldanii</i> Betancur & Callejas	4	2207.33	744.58	17770.39	10548.43	0.10	0.03
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>roseana</i> L.B.Sm.	3	780.69	188.42	6815.80	2257.26	0.67	0.24
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>rusbyi</i> (Baker) Mez	10	1585.23	1896.30	10408.33	10618.16	0.73	0.24

C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>sanctae-crucis</i> (Baker) L.B.Sm.	9	814.71	368.17	5295.93	2441.93	0.88	0.10
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>sanctae-martae</i> L.B.Sm.	3	1971.89	1461.00	16252.97	8066.08	0.59	0.04
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>santosii</i> Cuatrec.	54	1916.38	920.75	15111.01	1491.01	0.54	0.99
C ₃ —CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>smithii</i> A.Cast.	9	527.16	542.80	3709.17	3487.57	0.61	0.39
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>sodiroana</i> Mez	4	1054.50	1.00	7779.71	598.33	0.62	0.52
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>spathacea</i> (Griseb.) Mez	34	544.19	699.93	3877.71	4548.36	0.50	0.06
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>stenothyrsa</i> (Baker) Mez	7	1055.63	1105.40	7840.06	7880.16	0.68	0.54
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>thomasiana</i> André	6	1045.67	430.42	7454.81	1674.12	0.37	0.05
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>tillii</i> Manzan.	4	1846.60	996.75	13548.20	6379.78	0.85	0.35
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i> trianae</i> Baker	60	1420.34	1669.33	14880.14	17241.64	0.60	0.60
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>tuberosa</i> Mez	16	728.82	508.25	4988.89	2912.37	0.69	0.39
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>tunarensis</i> Mez	9	723.53	494.50	5346.02	2993.98	0.86	0.16
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>venusta</i> (Baker) Phil.	11	341.16	868.50	2764.29	7156.05	0.39	0.76
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>vestita</i> André	3	817.97	135.00	9004.62	278.25	0.72	0.15
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>volcanensis</i> A.Cast.	5	279.23	198.33	2036.50	1285.48	0.96	0.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>weberbaueri</i> Mez	9	1433.91	1958.67	9422.40	9650.13	0.34	0.38
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>weberiana</i> E. Morren ex Mez	8	285.23	510.25	2111.81	3320.50	0.27	0.54
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>weddelliana</i> (Baker) Mez	3	1650.85	2186.55	10562.94	12186.45	0.46	0.65
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>wrightii</i> L.B.Sm.	3	1171.17	895.50	7296.28	4709.20	0.70	0.43
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>yakespala</i> A.Cast.	3	247.02	224.75	1888.07	1223.12	0.70	0.17
C ₃ mesic terrestrial	Navioideae	<i>Sequencia</i>	<i>serrata</i> (L.B. Smith) Givnish	5	3025.17	35.33	18656.77	170.60	0.97	0.04
C ₃ mesic terrestrial	Navioideae	<i>Steyerbromelia</i>	<i>deflexa</i> L.B.Sm. & H.Rob.	3	3171.50	64.50	19528.40	2177.25	0.96	0.04
C ₃ mesic terrestrial	Navioideae	<i>Steyerbromelia</i>	<i>discolor</i> L.B.Sm. & H.Rob.	9	3099.66	368.25	20952.33	8014.53	0.97	0.05
C ₃ mesic terrestrial	Navioideae	<i>Steyerbromelia</i>	<i>ramosa</i> (L.B.Sm.) B.Holst	4	3209.92	249.50	20847.73	2907.56	0.97	0.05

Functional type	Subfamily	Genus	Species	P _{dry} (mm) mean	P _{dry} (mm) range	P _{seas} (%) mean	P _{seas} (%) range
CAM terrestrial	Bromelioideae	<i>Ananas</i>	<i>ananassoides</i>	23.83	102.25	64.60	86.00
CAM terrestrial	Bromelioideae	<i>Ananas</i>	<i>bracteatus</i>	59.42	107.50	43.41	78.75
CAM terrestrial	Bromelioideae	<i>Ananas</i>	<i>lucidus</i>	79.47	209.25	50.88	83.33
CAM terrestrial	Bromelioideae	<i>Ananas</i>	<i>parguazensis</i>	67.55	194.50	53.49	62.50
CAM terrestrial	Bromelioideae	<i>Ananas</i>	<i>sagenaria</i>	48.96	101.33	41.40	71.25
C ₃ mesic terrestrial	Navioideae	<i>Brewcaria</i>	<i>hohenbergioides</i>	46.55	84.33	61.69	29.75
C ₃ mesic terrestrial	Navioideae	<i>Brewcaria</i>	<i>marahuacae</i>	102.62	17.75	43.24	4.75
C ₃ mesic terrestrial	Navioideae	<i>Brewcaria</i>	<i>reflexa</i>	122.97	151.25	40.95	40.00
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>delicatula</i>	168.13	80.08	30.53	16.25
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>hectioides</i>	80.40	117.33	46.63	38.50
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>paniculata</i>	137.45	208.25	31.94	48.00
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>prismatica</i>	79.59	88.00	51.02	19.00
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>reducta</i>	66.53	63.75	51.65	26.25
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>rupestris</i>	80.28	41.42	36.22	5.67
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>tatei</i>	88.93	172.58	47.69	49.83
C ₃ mesic terrestrial	Brocchinioideae	<i>Brocchinia</i>	<i>vestita</i>	177.70	102.33	26.38	24.08
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>antiacantha</i>	49.40	100.83	43.82	74.42
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>arenaria</i>	2.79	11.25	80.95	56.75
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>balansae</i>	38.69	160.25	51.45	82.00
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>binotii</i>	55.07	96.67	41.60	32.33
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>braunii</i>	1.67	3.00	84.58	3.00
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>chrysantha</i>	15.86	35.83	64.10	44.83
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>goyazensis</i>	5.52	12.33	77.86	19.73
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>grandiflora</i>	3.53	0.75	83.69	18.08
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>hemisphaerica</i>	4.02	3.33	104.67	8.75
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>ignaciana</i>	14.89	5.00	65.72	10.17
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>interior</i>	7.32	24.92	77.45	27.70
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>irwinii</i>	4.38	2.00	79.04	8.00
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>karatas</i>	27.18	194.50	73.78	103.75
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>lagopus</i>	16.83	70.75	69.09	62.00
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>macedoi</i>	3.00	6.00	82.73	8.25
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>minima</i>	3.06	2.25	82.44	2.75
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>pinguin</i>	18.66	181.67	81.58	90.75
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>reversacantha</i>	3.15	0.67	81.06	8.75
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>serra</i>	22.23	78.00	62.39	72.83
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>tarapotina</i>	122.83	113.75	26.08	24.50
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>tubulosa</i>	82.98	109.25	43.87	36.67

CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>unaensis</i>	63.51	84.53	37.45	51.33
CAM terrestrial	Bromelioideae	<i>Bromelia</i>	<i>villosa</i>	5.70	20.00	77.33	28.25
C ₃ mesic terrestrial	Lindmanioideae	<i>Connellia</i>	<i>augustae</i>	54.55	73.65	52.20	42.50
C ₃ mesic terrestrial	Lindmanioideae	<i>Connellia</i>	<i>caricifolia</i>	45.92	1.50	52.75	1.50
C ₃ mesic terrestrial	Lindmanioideae	<i>Connellia</i>	<i>quelchii</i>	46.95	40.75	54.99	25.50
C ₃ mesic terrestrial	Navioideae	<i>Cottendorfia</i>	<i>florida</i>	20.09	14.92	56.58	35.00
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>bahianus</i>	33.33	80.33	41.48	41.50
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>beuckeri</i>	64.79	89.75	31.22	46.00
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>capitellatus</i>	32.00	0.75	57.58	1.25
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>dianae</i>	33.57	22.00	61.08	10.00
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>ferrarius</i>	13.90	3.08	82.35	4.58
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>giganteus</i>	30.58	1.75	59.08	1.25
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>maritimus</i>	67.44	62.75	32.79	34.42
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>micrus</i>	8.86	1.17	86.31	0.92
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>pickelii</i>	37.42	24.58	60.99	10.33
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>pseudopetiolaris</i>	110.87	81.65	17.89	27.17
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>sanctaluciae</i>	40.25	1.75	51.03	1.93
C ₃ succulent terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>schwackeanus</i>	12.52	8.00	83.64	11.00
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>sergipensis</i>	47.54	38.00	54.60	11.67
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>venecianus</i>	33.14	0.92	55.17	0.83
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>warren-loosei</i>	40.13	55.50	40.88	21.00
CAM terrestrial	Bromelioideae	<i>Cryptanthus</i>	<i>zonatus</i>	34.33	18.67	53.40	33.08
CAM terrestrial	Bromelioideae	<i>Deinacanthos</i>	<i>urbanianum</i>	8.37	12.25	65.99	34.80
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>brevifolia</i>	1.19	1.75	105.25	22.00
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>haumanii</i>	0.60	2.25	109.25	27.42
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>longipetala</i>	6.63	23.75	82.29	66.25
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>lorentziana</i>	1.21	4.25	103.73	22.25
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>meziana</i>	19.95	41.50	60.75	46.50
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>scapigera</i>	5.42	8.00	85.19	21.92
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>schreiteri</i>	1.28	4.25	103.20	48.10
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>seramisiana</i>	3.06	1.67	92.75	1.25
CAM terrestrial	Pitcairnioideae	<i>Deuterocohnia</i>	<i>strobilifera</i>	9.79	97.60	99.54	79.25
CAM terrestrial	Bromelioideae	<i>Disteganthus</i>	<i>basilateralis</i>	81.25	42.25	47.71	11.25
CAM terrestrial	Bromelioideae	<i>Disteganthus</i>	<i>calatheoides</i>	66.50	45.83	50.58	11.83
CAM terrestrial	Bromelioideae	<i>Disteganthus</i>	<i>lateralis</i>	65.19	73.33	47.48	20.08
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>affinis</i>	45.75	36.75	35.25	7.25
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>aurea</i>	8.15	9.00	75.84	14.95
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>brachyphylla</i>	8.09	2.45	85.03	3.95

CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>brasiliانا</i>	5.30	7.50	77.70	11.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>brevifolia</i>	88.47	90.50	25.34	34.25
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>burchellii</i>	6.40	24.25	78.79	29.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>consimilis</i>	11.45	10.83	83.76	12.33
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>dawsonii</i>	4.00	0.10	83.58	4.75
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>distachya</i>	102.00	71.50	17.16	22.75
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>duckeii</i>	14.58	11.50	66.73	7.50
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>dusenii</i>	79.13	16.25	28.56	6.83
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>elata</i>	13.92	0.25	82.42	0.25
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>encholirioides</i>	59.54	81.42	42.11	57.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>exserta</i>	43.00	0.10	34.08	0.25
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>ferox</i>	45.42	92.00	37.69	50.50
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>ferruginea</i>	27.55	18.25	58.45	18.75
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>floribunda</i>	21.68	55.25	61.30	90.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>fosteriana</i>	59.50	18.50	33.50	14.75
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>goiana</i>	4.98	3.50	81.00	12.75
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>gracilis</i>	42.13	100.25	56.38	16.75
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>grandidentata</i>	29.48	6.35	59.42	4.25
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>horridula</i>	6.43	7.75	72.72	15.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>ibiramensis</i>	87.97	0.85	20.98	0.70
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>leptostachya</i>	41.18	98.25	47.25	73.67
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>limae</i>	17.88	27.25	57.47	9.75
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>linearifolia</i>	36.32	29.50	56.03	30.50
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>macedoi</i>	7.74	7.50	84.51	6.67
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>maracasensis</i>	21.89	4.17	43.33	1.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>maritima</i>	97.89	53.20	11.80	10.25
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>marnier-lapostollei</i>	7.63	9.00	76.38	13.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>microcalyx</i>	66.54	76.25	26.23	24.25
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>minarum</i>	31.99	73.25	64.47	61.50
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>niederleinii</i>	100.96	28.00	18.59	10.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>pernambucana</i>	9.73	13.67	75.10	20.75
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>pulquinensis</i>	37.39	91.27	70.08	32.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>pumila</i>	9.35	14.25	73.40	21.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>racemosa</i>	3.58	5.50	82.00	6.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>ragonesei</i>	40.08	69.25	39.50	27.25
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>rariflora</i>	11.32	7.75	84.33	7.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>reitzii</i>	87.56	61.75	26.78	26.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>remotiflora</i>	87.25	48.00	13.67	15.25

CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>saxatilis</i>	13.87	27.50	79.02	29.75
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>sordida</i>	9.23	3.42	84.73	4.58
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>stenophylla</i>	68.68	177.58	52.32	72.83
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>tenebrosa</i>	13.62	3.15	84.03	4.10
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>tobatiensis</i>	44.22	23.00	35.12	6.50
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>trichostachya</i>	27.94	35.25	61.76	32.90
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>tuberosa</i>	48.39	114.75	47.79	76.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>uleana</i>	4.75	7.00	82.50	6.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>ursina</i>	7.42	0.25	88.50	1.50
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>velascana</i>	2.38	8.25	95.39	42.00
CAM terrestrial	Pitcairnioideae	<i>Dyckia</i>	<i>weddelliana</i>	25.08	95.85	67.09	36.75
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>agavoides</i>	8.56	0.75	83.19	0.75
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>biflorum</i>	8.58	0.75	86.08	0.75
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>brachypodium</i>	8.97	28.00	75.89	54.17
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>ctenophyllum</i>	8.10	2.00	83.75	2.25
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>disjunctum</i>	2.58	4.00	82.58	7.00
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>erectiflorum</i>	7.83	8.00	88.67	40.67
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>gracile</i>	26.46	7.75	62.54	9.00
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>heloisae</i>	8.33	2.00	85.86	6.75
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>horridum</i>	28.40	38.50	60.59	47.83
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>irwinii</i>	5.31	1.25	89.19	5.00
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>longiflorum</i>	0.58	1.75	91.17	0.50
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>luxor</i>	4.09	6.75	82.14	20.25
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>lymanianum</i>	31.44	5.75	49.63	8.00
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>magalhaensis</i>	8.13	2.50	85.81	2.00
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>maximum</i>	0.75	1.75	86.75	5.25
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>scrutor</i>	8.13	0.75	86.25	0.50
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>spectabile</i>	12.32	106.25	70.25	106.17
CAM terrestrial	Pitcairnioideae	<i>Encholirium</i>	<i>subsecundum</i>	9.11	16.67	82.62	47.17
C ₃ succulent terrestrial	Bromelioideae	<i>Fascicularia</i>	<i>bicolor</i>	59.62	89.00	57.46	55.83
C ₃ succulent terrestrial	Bromelioideae	<i>Fernseea</i>	<i>itatiaiae</i>	30.42	16.00	66.15	44.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>albicans</i>	12.18	53.75	79.97	42.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>caulescens</i>	39.50	17.67	54.17	4.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>chaparensis</i>	53.87	103.50	61.76	17.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>christophii</i>	29.42	28.00	51.94	10.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>cotacajensis</i>	23.09	29.50	68.95	16.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>gracilis</i>	38.83	60.33	60.43	37.83
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>graminea</i>	24.85	38.00	60.95	20.00

C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>hatschbachii</i>	28.70	23.00	54.73	18.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>heterophylla</i>	25.17	15.75	60.00	11.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>kroemeri</i>	25.58	11.50	59.17	5.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>micrantha</i>	26.77	82.33	84.54	60.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>nicoliana</i>	72.00	77.33	41.08	25.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>pearcei</i>	117.74	235.67	36.26	59.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>penduliflora</i>	15.36	44.50	71.75	56.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>petiolata</i>	17.29	14.75	65.89	16.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>robertreadii</i>	28.29	41.33	59.27	28.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>rojasii</i>	41.18	20.25	37.43	25.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>rusbyi</i>	31.86	84.85	59.58	22.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>schidosperma</i>	42.11	78.58	57.14	43.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>vasquezii</i>	13.50	1.00	67.54	1.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>villosula</i>	55.72	86.08	55.30	12.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>weberbaueri</i>	47.44	93.67	55.28	30.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>weddelliana</i>	27.94	79.75	63.60	25.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>windischii</i>	15.63	10.75	67.69	7.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Fosterella</i>	<i>yuvinkae</i>	36.07	79.60	51.30	3.75
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>alborosea</i>	31.48	28.92	50.97	45.17
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>columbiana</i>	53.09	69.75	49.47	46.00
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>danielii</i>	56.12	97.50	38.14	18.00
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>kessleri</i>	11.92	3.25	73.11	8.00
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>leymebambana</i>	28.38	22.75	55.29	26.00
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>mulfordii</i>	58.19	152.58	31.65	38.00
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>nubigena</i>	27.82	43.25	53.85	52.25
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>oaxacana</i>	43.41	35.00	73.61	29.75
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>rohweri</i>	14.72	21.08	80.53	19.83
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>sanctae-martae</i>	39.92	8.50	51.61	33.00
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>sodiroana</i>	75.84	269.67	31.29	22.75
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>sphacelata</i>	39.48	68.85	69.14	44.40
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>stenolepis</i>	31.65	38.83	47.93	39.00
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>steyermarkii</i>	61.88	101.25	53.58	51.00
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>sylvicola</i>	59.30	132.75	54.76	55.25
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>van-hyningii</i>	31.22	36.75	75.21	19.00
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>vilcabambae</i>	32.88	33.50	50.88	14.25
C ₃ succulent terrestrial	Bromelioideae	<i>Greigia</i>	<i>vulcanica</i>	75.05	193.75	31.27	60.08
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>bracteata</i>	10.19	29.00	76.46	10.75
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>caudata</i>	3.39	5.50	108.46	14.25

CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>confusa</i>	8.33	10.00	86.58	10.00
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>conzattiana</i>	5.94	13.17	94.21	13.33
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>fragilis</i>	8.85	9.92	91.67	8.33
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>galeottii</i>	6.17	10.25	93.30	11.92
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>glabra</i>	22.35	25.25	85.15	20.50
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>glomerata</i>	12.17	20.25	79.65	43.00
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>guatemalensis</i>	9.24	21.83	82.89	38.25
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>jaliscana</i>	3.60	4.75	109.45	17.50
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>laevis</i>	1.60	1.00	108.90	1.50
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>liebmannii</i>	3.85	2.75	92.10	9.50
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>lundelliorum</i>	33.96	37.45	80.18	20.40
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>lyman-smithii</i>	3.20	2.75	96.15	1.50
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>montana</i>	2.92	8.75	102.24	60.50
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>pedicellata</i>	4.88	0.50	111.31	1.25
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>podantha</i>	4.99	17.83	91.59	36.35
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>pringlei</i>	4.62	4.00	93.76	8.58
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>purpusii</i>	29.17	36.25	75.42	4.00
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>rosea</i>	3.24	6.33	106.88	20.33
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>schottii</i>	21.15	32.25	74.02	36.25
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>sphaeroblasta</i>	4.58	2.00	96.42	11.00
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>stenopetala</i>	25.01	40.75	82.37	26.25
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>subalata</i>	2.58	4.00	111.25	11.75
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>texensis</i>	8.44	17.33	72.95	24.00
CAM terrestrial	Hechtioideae	<i>Hechtia</i>	<i>tillandsioides</i>	31.20	37.00	80.75	17.50
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>arachnoidea</i>	94.20	97.75	47.24	44.50
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>brachyphylla</i>	54.19	23.58	55.28	5.83
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>cylindrostachya</i>	42.25	42.25	64.08	22.00
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>geniculata</i>	35.60	34.25	65.39	30.50
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>guianensis</i>	84.00	48.33	45.52	6.33
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>holstii</i>	48.75	7.00	58.21	1.17
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>marahuacae</i>	104.43	7.25	43.06	3.33
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>navioides</i>	40.74	48.50	65.43	33.00
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>nubigena</i>	163.75	96.25	31.75	18.75
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>serrulata</i>	66.98	91.25	53.93	23.50
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>steyermarkii</i>	48.56	7.33	57.33	7.00
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>subsimplex</i>	44.59	50.92	60.62	34.00
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>thyrsoides</i>	30.25	4.42	70.33	2.33
C ₃ mesic terrestrial	Lindmanioideae	<i>Lindmania</i>	<i>wurdackii</i>	73.47	58.67	50.36	17.17

C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>acaulis</i>	62.57	108.75	40.10	36.75
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>affinis</i>	168.94	80.08	30.36	16.75
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>aliciae</i>	79.50	87.92	51.75	42.50
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>angustifolia</i>	104.15	59.75	35.50	10.08
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>caulescens</i>	114.19	179.75	32.68	41.25
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>connata</i>	108.38	32.75	39.13	5.50
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>crispa</i>	80.42	145.25	50.31	49.25
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>duidae</i>	98.09	169.42	44.58	50.83
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>jauana</i>	72.48	9.75	50.15	4.00
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>linearis</i>	104.31	1.75	42.86	1.42
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>luzuloides</i>	70.90	13.50	50.90	5.25
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>maguirei</i>	46.70	8.15	51.57	5.75
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>nubicola</i>	130.52	109.00	36.20	23.00
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>octopoides</i>	88.72	16.50	46.00	4.50
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>ovoidea</i>	36.17	5.00	69.58	2.00
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>pauciflora</i>	105.64	15.25	43.31	3.17
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>pulvinata</i>	99.50	12.50	43.63	2.25
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>scirpiflora</i>	71.56	9.17	50.53	3.75
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>subpetiolata</i>	64.00	4.50	53.92	2.75
C ₃ mesic terrestrial	Navioideae	<i>Navia</i>	<i>terramarae</i>	163.53	1.25	26.58	1.00
CAM terrestrial	Bromelioideae	<i>Neoglaziovia</i>	<i>variegata</i>	10.31	74.75	72.19	75.42
C ₃ succulent terrestrial	Bromelioideae	<i>Ochagavia</i>	<i>carnea</i>	16.79	24.00	84.50	28.00
C ₃ succulent terrestrial	Bromelioideae	<i>Ochagavia</i>	<i>litoralis</i>	16.67	62.25	93.60	54.00
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>albopictum</i>	21.22	7.90	57.50	12.17
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>amoenum</i>	18.92	12.25	56.27	23.75
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>boudetianum</i>	31.28	11.75	58.08	8.25
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>burle-marxii</i>	20.02	9.17	56.57	14.58
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>compactum</i>	24.15	28.25	64.98	36.25
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>diamantinense</i>	7.65	5.50	87.46	6.75
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>disjunctum</i>	12.87	23.75	62.56	43.67
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>foliosum</i>	28.70	26.75	59.33	46.00
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>harleyi</i>	3.04	4.00	87.17	6.25
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>hatschbachii</i>	19.56	21.83	63.91	30.17
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>horridum</i>	10.64	16.75	80.14	24.75
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>jabrense</i>	8.16	16.93	95.27	55.08
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>lemei</i>	14.33	13.50	65.94	20.50
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>leprosum</i>	14.00	19.75	72.70	33.25
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>magalhaesii</i>	29.78	8.75	58.82	14.00

CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>maracasense</i>	16.78	21.08	52.26	54.50
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>mello-barretoii</i>	8.79	6.50	85.25	7.50
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>navioides</i>	21.24	11.33	53.97	24.67
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>ophiuroides</i>	22.08	3.25	52.86	1.33
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>piranianum</i>	5.28	1.17	90.41	0.50
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>pseudovagans</i>	27.86	1.00	60.95	2.17
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>riocontense</i>	17.56	20.75	67.15	30.50
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>rubiginosum</i>	30.10	1.58	57.96	2.00
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>saxicola</i>	21.37	72.25	52.55	65.25
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>schulzianum</i>	7.42	3.50	86.54	2.50
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>triumfense</i>	13.97	3.25	75.22	8.67
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>ulei</i>	20.58	0.25	58.67	0.25
CAM terrestrial	Bromelioideae	<i>Orthophytum</i>	<i>zanonii</i>	26.42	0.50	63.67	0.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>abyssicola</i>	29.06	2.00	58.08	9.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>aequatorialis</i>	43.75	243.08	58.35	67.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>alata</i>	87.64	128.00	32.28	21.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>albiflos</i>	54.75	0.75	35.92	0.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>alborubra</i>	100.42	29.50	38.92	4.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>alexanderi</i>	162.32	44.58	18.60	9.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>amblyosperma</i>	48.19	62.67	68.02	11.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>amboroensis</i>	35.78	14.25	52.32	14.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>angustifolia</i>	78.27	129.00	37.32	33.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>aphelandriflora</i>	103.20	248.25	38.20	58.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>archeri</i>	211.38	386.83	23.90	25.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>arcuata</i>	104.29	278.50	42.41	61.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>arenaria</i>	58.50	39.75	29.44	20.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>arida</i>	88.06	88.50	34.75	13.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>armata</i>	26.84	100.00	72.66	48.42
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>atrorubens</i>	72.05	439.25	52.16	67.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>azouryi</i>	22.73	25.25	62.01	33.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>bakeri</i>	167.54	241.33	23.58	43.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>barbatostigma</i>	28.04	4.75	60.95	6.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>barrigae</i>	98.93	118.67	35.30	52.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>basincurva</i>	77.92	12.00	42.52	2.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>bella</i>	109.02	176.50	34.88	25.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>bergii</i>	7.58	1.25	77.17	7.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>bicolor</i>	164.50	351.17	27.52	26.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>biflora</i>	134.34	98.58	22.82	26.00

C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>billbergioides</i>	14.13	48.00	90.79	100.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>brachysperma</i>	88.20	144.80	37.52	31.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>brackeana</i>	47.75	80.33	49.02	13.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>bradei</i>	5.39	3.50	87.92	14.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>breedlovei</i>	6.65	12.25	95.27	17.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>brevicalycina</i>	33.66	57.33	50.98	41.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>brittoniana</i>	86.51	241.42	46.15	60.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>bromeliifolia</i>	45.50	22.25	46.00	23.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>brongniartiana</i>	99.98	169.25	32.88	56.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>brunnescens</i>	88.95	140.75	30.73	47.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>bulbosa</i>	92.31	206.50	47.81	60.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>calvicola</i>	2.77	4.67	88.68	13.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>calderonii</i>	17.82	29.33	77.06	24.58
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>cardenasii</i>	8.75	7.75	77.33	30.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>caricifolia</i>	64.86	203.75	48.07	67.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>carinata</i>	34.63	66.50	56.89	61.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>chiapensis</i>	22.67	42.75	74.83	55.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>chiquitana</i>	22.58	0.75	51.17	1.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>chiriquensis</i>	34.92	39.25	63.29	10.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>clarkii</i>	33.11	1.67	77.58	1.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>commixta</i>	54.77	152.58	49.60	53.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>compostelae</i>	2.73	1.75	106.35	15.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>condorensis</i>	151.04	1.42	14.00	0.10
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>corallina</i>	136.24	141.00	22.36	30.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>costata</i>	108.67	106.50	24.58	7.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>cremersii</i>	64.14	13.75	45.42	4.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>crinita</i>	90.25	0.75	47.67	0.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>ctenophylla</i>	41.86	87.50	66.73	36.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>cubensis</i>	69.89	97.25	43.06	42.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>curvidens</i>	13.94	13.75	79.94	10.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>cuzcoensis</i>	44.33	93.00	55.38	71.17
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>cylindrostachya</i>	3.84	2.75	109.15	13.35
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>decidua</i>	31.06	29.00	58.94	29.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>dendroidea</i>	50.90	71.67	43.39	56.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>deroosei</i>	47.42	31.50	37.77	9.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>diffusa</i>	91.38	228.00	32.95	69.17
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>dodsonii</i>	130.02	204.50	24.28	16.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>domingensis</i>	78.30	81.07	32.22	32.13

C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>echinata</i>	120.97	252.75	30.81	43.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>elizabethae</i>	33.06	4.25	62.44	7.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>elongata</i>	58.53	263.33	59.18	86.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>elvirae</i>	186.86	256.75	23.70	35.08
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>encholirioides</i>	26.77	11.00	61.97	15.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>ensifolia</i>	3.89	5.25	81.25	7.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>ferrell-ingramiae</i>	117.43	138.92	29.37	59.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>filispina</i>	37.08	33.25	67.08	17.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>flammea</i>	42.84	104.10	53.21	70.17
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>flexuosa</i>	6.08	28.25	94.41	52.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>fluvialis</i>	97.17	11.50	40.86	4.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>fruticosa</i>	91.58	18.33	33.94	4.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>fuertesii</i>	48.01	62.00	44.03	30.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>funkiae</i>	73.92	105.50	51.42	29.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>fusca</i>	34.02	138.17	55.47	63.17
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>geyskesii</i>	40.45	34.92	59.20	31.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>glaziovii</i>	31.99	39.75	61.53	20.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>goudae</i>	191.56	194.25	22.04	14.92
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>guzmanioides</i>	50.77	153.75	68.24	88.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>halophila</i>	33.61	92.33	65.82	44.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>harlingii</i>	239.12	243.00	18.36	8.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>harrylutheri</i>	160.18	49.00	20.69	15.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>heterophylla</i>	24.31	155.25	74.99	91.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>hintoniana</i>	4.25	5.75	104.85	16.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>hirtzii</i>	145.24	100.50	21.22	11.58
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>hooveri</i>	50.40	143.50	34.56	26.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>imbricata</i>	37.19	163.67	68.34	77.17
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>integrifolia</i>	45.21	105.92	51.65	58.83
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>irwiniana</i>	6.86	12.00	78.14	15.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>juncoides</i>	76.40	154.25	52.24	59.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>kalbreyeri</i>	100.14	295.00	40.12	50.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>karwinskyana</i>	5.90	17.50	101.02	44.58
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>kniphofioides</i>	65.75	19.75	35.17	3.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>kressii</i>	110.83	78.75	37.01	23.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>lanuginosa</i>	28.53	133.67	64.04	67.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>lehmannii</i>	114.16	234.33	33.77	49.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>leprosa</i>	2.47	4.25	108.33	9.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>lignosa</i>	43.81	127.42	53.85	63.08

C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>longipes</i>	165.53	274.75	37.00	28.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>longissimiflora</i>	21.92	24.25	55.92	2.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>luteyniorum</i>	60.57	135.67	33.83	25.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>lymansmithiana</i>	112.22	62.75	38.84	4.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>macarenensis</i>	79.65	143.50	37.63	43.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>macranthera</i>	152.25	499.33	42.62	73.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>maidifolia</i>	62.63	254.92	50.32	80.83
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>marinii</i>	160.39	0.67	20.94	1.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>megasepala</i>	51.87	103.00	54.40	40.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>melanopoda</i>	66.56	7.15	25.04	7.42
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>meridensis</i>	47.15	69.58	50.58	44.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>melchiana</i>	1.85	2.50	108.15	5.95
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>minicorallina</i>	152.33	51.33	17.11	7.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>mituensis</i>	200.08	52.25	22.75	4.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>modesta</i>	2.58	1.75	109.08	5.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>mucida</i>	143.39	138.50	28.92	13.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>multiflora</i>	32.98	108.25	60.58	58.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>multiramosa</i>	22.21	91.60	84.44	45.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>neillii</i>	147.61	75.58	20.14	6.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>nigra</i>	53.19	242.50	53.56	76.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>nobilis</i>	81.17	28.17	22.36	2.08
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>nubigena</i>	21.63	18.25	57.31	40.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>nuda</i>	48.81	104.75	60.61	44.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>oaxacana</i>	2.84	5.83	107.33	18.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>oblongifolia</i>	7.36	1.25	79.92	8.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>occidentalis</i>	96.64	128.75	40.72	28.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>palmeri</i>	6.67	7.83	105.28	42.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>palmoides</i>	114.85	243.00	40.88	103.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>paniculata</i>	37.30	158.42	55.10	73.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>paraguayensis</i>	44.25	3.75	33.67	1.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>patentiflora</i>	101.80	206.92	39.32	55.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>pavonii</i>	21.29	55.00	62.38	153.58
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>peruana</i>	59.75	6.00	27.83	11.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>petraea</i>	41.81	8.92	40.69	8.17
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>pomacochae</i>	56.53	147.00	40.33	43.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>poortmanii</i>	116.66	159.75	22.68	32.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>prolifera</i>	3.39	1.50	107.53	11.17
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>pruinosa</i>	38.40	129.58	66.85	47.00

C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>puberula</i>	16.08	46.17	79.73	51.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>pulverulenta</i>	37.07	71.42	51.65	25.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>pungens</i>	29.35	164.33	52.83	133.92
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>punicea</i>	75.79	92.50	56.00	26.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>quesnelioides</i>	45.43	10.80	62.78	1.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>recurvata</i>	48.83	81.42	66.44	47.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>reflexiflora</i>	61.18	151.33	47.49	72.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>ringens</i>	28.44	46.42	79.56	35.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>riparia</i>	114.55	255.83	29.28	85.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>roseana</i>	2.18	2.50	106.13	8.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>rubiginosa</i>	140.24	213.92	30.52	31.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>rundelliana</i>	62.14	110.50	50.65	33.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>samuelssonii</i>	21.44	4.67	58.94	6.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>sastrei</i>	55.08	35.25	51.07	14.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>saxicola</i>	25.77	25.75	69.20	24.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>scandens</i>	68.50	114.75	29.29	36.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>sceptriformis</i>	167.35	192.75	25.78	49.17
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>sceptrigera</i>	45.73	189.25	74.85	98.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>schultzei</i>	22.65	60.25	58.54	29.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>semaphora</i>	95.38	53.67	39.22	18.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>simulans</i>	77.92	151.50	38.72	61.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>sodiroi</i>	37.93	157.25	52.87	60.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>spectabilis</i>	108.18	274.50	28.46	36.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>sprucei</i>	138.68	154.25	25.68	42.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>squarrosa</i>	99.04	146.08	34.50	36.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>staminea</i>	47.83	16.67	40.61	23.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>stenophylla</i>	76.19	43.00	30.23	20.92
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>stevensonii</i>	54.17	88.50	73.07	30.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>suaveolens</i>	39.17	10.33	58.24	9.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>susannae</i>	126.39	31.50	27.78	4.67
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>tarapotensis</i>	51.91	63.00	37.86	34.17
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>tillandsioides</i>	3.67	2.00	106.25	4.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>tillii</i>	156.06	36.00	24.83	3.33
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>torresiana</i>	9.63	18.50	71.13	17.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i> trianae</i>	73.44	181.92	35.31	64.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>truncata</i>	50.16	72.50	44.29	68.00
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>turbinella</i>	103.85	194.50	36.43	30.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>uaupensis</i>	138.32	194.50	29.87	46.33

C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>ulei</i>	5.23	7.75	78.51	22.42
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>undulata</i>	89.56	55.00	53.08	17.75
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>unilateralis</i>	3.42	10.25	111.50	21.50
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>valerioi</i>	65.44	174.75	51.77	55.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>vallisoletana</i>	7.25	1.50	98.42	3.25
C ₃ mesic terrestrial	Pitcairnioideae	<i>Pitcairnia</i>	<i>wendlandii</i>	82.85	187.33	47.15	73.25
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>aequatorialis</i>	24.19	62.75	47.40	75.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>alpestris</i>	8.02	27.75	96.50	50.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>angelensis</i>	35.36	9.83	32.67	8.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>angulonis</i>	22.72	35.50	53.72	59.75
C ₃ —CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>angusta</i>	14.15	47.33	65.07	27.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>argentea</i>	71.10	151.58	54.32	59.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>aristeguietae</i>	19.31	13.25	58.89	2.08
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>atra</i>	4.38	13.50	95.42	59.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>berteroana</i>	10.61	4.42	72.60	8.58
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>berteroniana</i>	7.86	17.00	96.41	31.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>bicolor</i>	43.54	49.42	45.08	13.00
C ₃ —CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>boliviensis</i>	16.24	114.00	83.40	97.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>brackeana</i>	56.63	19.50	19.79	2.08
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>brittoniana</i>	10.95	9.00	71.63	15.67
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>cajasensis</i>	34.79	43.50	38.24	34.75
C ₃ —CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>cardenasii</i>	35.95	95.10	77.67	46.50
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>castellanosii</i>	0.10	0.10	117.17	3.50
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>chilensis</i>	7.86	17.00	96.41	31.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>claudiae</i>	9.92	2.50	75.83	0.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>clava-herculis</i>	59.50	55.58	23.70	36.67
C ₃ —CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>coerulea</i>	5.41	14.65	94.98	35.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>cryptantha</i>	52.32	104.92	38.51	27.75
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>ctenorrhyncha</i>	7.06	3.25	78.96	12.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>cuevae</i>	43.42	21.92	42.90	23.17
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>cylindrica</i>	27.25	54.75	77.17	92.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>dasyliroides</i>	49.80	44.50	57.91	18.00
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>densiflora</i>	7.92	5.25	75.25	3.25
C ₃ —CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>dyckiioides</i>	2.16	7.20	100.80	32.10
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>entre-riosensis</i>	2.33	1.25	91.00	1.75
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>eryngioides</i>	49.24	62.75	38.88	56.42
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>exigua</i>	66.93	138.33	28.85	22.67
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>ferreyrae</i>	40.65	90.25	61.53	35.08

C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>ferruginea</i>	28.33	174.33	62.97	103.25
C ₃ —CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>floccosa</i>	42.64	106.50	55.59	46.83
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>fulgens</i>	98.27	128.42	25.83	29.00
C ₃ —CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>glandulosa</i>	21.42	53.00	67.25	50.25
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>glaucovirens</i>	85.25	144.75	34.25	37.75
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>glomerifera</i>	34.20	60.00	39.18	64.33
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>goudotiana</i>	20.20	92.60	73.41	34.60
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>harmsii</i>	2.39	6.50	98.25	21.25
C ₃ —CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>herrerae</i>	17.77	51.75	64.01	36.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>herzogii</i>	26.49	90.35	67.35	38.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>hirtzii</i>	25.06	22.67	41.36	4.42
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>hofstenii</i>	37.20	97.60	70.42	60.00
C ₃ —CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>humilis</i>	29.50	109.75	81.41	52.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>hutchisonii</i>	52.56	34.00	37.07	20.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>joergensenii</i>	26.10	4.42	47.98	4.75
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>killipii</i>	24.15	12.75	45.78	6.33
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>kuntzeana</i>	30.04	87.00	64.48	33.50
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>lanata</i>	27.85	35.75	50.13	19.67
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>lasiopoda</i>	26.36	30.83	63.47	19.33
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>leptostachya</i>	16.10	19.83	68.56	28.25
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>lilloi</i>	4.97	21.75	93.29	54.25
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>lineata</i>	39.27	25.25	42.55	27.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>longispina</i>	54.83	18.67	24.75	6.67
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>maculata</i>	56.17	150.33	35.96	42.25
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>micrantha</i>	20.79	114.00	89.83	53.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>mirabilis</i>	9.29	97.60	94.35	63.20
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>mollis</i>	20.20	92.60	73.41	34.60
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>nana</i>	10.62	11.50	75.24	10.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>navarroana</i>	71.75	104.25	19.68	9.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>nitida</i>	41.62	57.25	37.93	28.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>novarae</i>	0.10	0.10	108.38	3.25
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>nutans</i>	31.88	33.50	35.86	28.92
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>obconica</i>	61.06	135.67	40.31	28.33
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>ochroleuca</i>	98.58	12.00	29.92	1.00
C ₃ —CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>olivacea</i>	23.57	91.10	73.44	35.25
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>parviflora</i>	42.25	8.00	42.19	4.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>pattersoniae</i>	34.18	23.75	31.83	25.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>pearcei</i>	20.31	19.67	64.63	17.00

C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>pichincae</i>	20.17	3.08	58.78	43.75
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>pygmaea</i>	41.72	156.00	35.84	34.33
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>raimondii</i>	7.19	54.33	86.41	64.75
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>reducta</i>	39.03	122.08	59.53	53.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>retrorsa</i>	33.57	20.50	31.02	9.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>robin-fosteri</i>	38.72	81.50	53.84	25.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>roldanii</i>	69.56	34.50	36.79	0.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>roseana</i>	22.61	2.50	51.53	6.42
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>rusbyi</i>	37.79	81.35	55.36	24.75
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>sanctae-crucis</i>	12.56	6.75	64.77	25.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>sanctae-martae</i>	39.92	8.50	51.61	33.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>santosii</i>	34.38	25.25	44.25	23.00
C ₃ —CAM succulent terrestrial	Puyoideae	<i>Puya</i>	<i>smithii</i>	2.51	4.70	97.79	14.10
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>sodiroana</i>	19.50	0.10	49.75	0.10
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>spathacea</i>	8.21	23.00	74.52	55.50
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>stenothyrsa</i>	17.61	37.30	71.70	46.80
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>thomasiana</i>	25.14	42.17	59.61	55.58
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>tillii</i>	56.83	91.00	45.25	47.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i> trianae</i>	48.32	93.00	36.66	24.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>tuberosa</i>	9.88	18.25	74.60	31.75
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>tunarensis</i>	6.55	10.50	89.04	23.42
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>venusta</i>	1.70	17.00	104.37	28.50
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>vestita</i>	18.53	3.92	50.64	5.08
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>volcanensis</i>	0.50	1.25	108.12	9.08
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>weberbaueri</i>	37.19	85.75	56.53	39.33
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>weberiana</i>	1.67	7.75	104.01	40.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>weddelliana</i>	37.37	95.85	66.67	28.50
CAM terrestrial	Puyoideae	<i>Puya</i>	<i>wrightii</i>	33.25	33.50	43.67	15.00
C ₃ succulent terrestrial	Puyoideae	<i>Puya</i>	<i>yakespala</i>	1.08	3.25	85.10	66.00
C ₃ mesic terrestrial	Navioideae	<i>Sequencia</i>	<i>serrata</i>	106.67	74.33	31.87	15.00
C ₃ mesic terrestrial	Navioideae	<i>Steyerbromelia</i>	<i>deflexa</i>	96.00	21.67	44.81	3.33
C ₃ mesic terrestrial	Navioideae	<i>Steyerbromelia</i>	<i>discolor</i>	100.40	12.75	43.90	3.75
C ₃ mesic terrestrial	Navioideae	<i>Steyerbromelia</i>	<i>ramosa</i>	110.00	93.50	41.23	23.00

Appendix 2.2

A2.2.1 Taxonomic and geographic coverage

Estimates of hydrological bioclimatic habitat position and range were generated for a total of 564 species. The number of species represented in each terrestrial bromeliad genus, and the proportion of species in each of these genera represented, is displayed in Table A2.2.1. There was no discernible taxonomic bias in terms of percentage genus coverage at the subfamilial level (AOV: $F = 0.365$, $p = 0.892$).

Group	Genus	Species sampled/Total species	Percentage genus coverage (%)
Pitcairnioideae	<i>Deuterochonia</i>	10/18	55.6
	<i>Dyckia</i>	51/150	34.7
	<i>Encholirium</i>	18/26	69.2
	<i>Fosterella</i>	25/31	80.6
	<i>Pitcairnia</i>	183/395	46.3
Hechtioideae	<i>Hechtia</i>	26/67	38.8
Bromelioideae	<i>Ananas</i>	5/6	83.3
	<i>Bromelia</i>	23/61	37.7
	<i>Cryptanthus</i>	16/67	23.9
	<i>Deinacanthos</i>	1/1	100.0
	<i>Disteganthus</i>	3/3	100.0
	<i>Fascicularia</i>	1/1	100.0
	<i>Fernseea</i>	½	50.0
	<i>Greigia</i>	18/35	51.4
	<i>Neoglaziovia</i>	1/3	33.3
	<i>Ochagavia</i>	2/4	50.0
	<i>Orthophytum</i>	28/68	41.2
Puyoideae	<i>Puya</i>	99/227	43.6
Lindmanioideae	<i>Connellia</i>	3/6	50.0
	<i>Lindmania</i>	14/38	36.8
Navioideae	<i>Brewcaria</i>	3/6	50.0
	<i>Cottendorfia</i>	1/1	100.0
	<i>Navia</i>	20/91	22.0
	<i>Sequencia</i>	1/1	100.0
	<i>Steyerbromelia</i>	3/6	50.0
Brocchinioideae	<i>Brocchinia</i>	8/21	38.1
Terrestrial Bromeliaceae		564/1335	42.0

Table A2.2.1. Extent of taxon sampling by genus and subfamily.



Fig. A2.2.1. Geographic distribution of presence data for 564 species analysed in this investigation, plotted by taxonomic group.

The geographic coverage of the data analysed in this investigation is displayed in Fig. A2.2.1. Even when assessed at a very coarse scale, there was wide variation in the density of presence data between different geographical regions, with notably low densities in parts of Amazonia, the Caribbean islands, and the Central Andes.

A2.2.2 Relationships between univariate habitat ranges and number of presence points per species

The effect of the number of presence points on univariate habitat ranges was assessed across the entire dataset. Table A2.2.2 shows that across all species there were statistically significant positive correlations between the number of available presence points and the range of values observed for each bioclimatic variable, implying that species with few presence points tended to show narrower habitat ranges. Assuming this is not the result of under-recording, this might suggest that rarity is associated with narrow habitat ranges.

Bioclimatic variable range	Correlation with <i>n</i>		
	Slope	r^2	<i>p</i>
Mean annual precipitation, MAP	0.75	28.68	< 0.001
Precipitation seasonality, P_{seas}	0.76	34.37	< 0.001
Precipitation of driest month, P_{dry}	0.85	26.54	< 0.001
Aridity index, AI	0.72	29.31	< 0.001
Ratio of actual to potential evapotranspiration, AET/PET	0.61	20.79	< 0.001

Table A2.2.2. Relationships between sample size and calculated ranges for bioclimatic variables across all species ($n = 564$).

A2.2.3 Relationships between bioclimatic variables

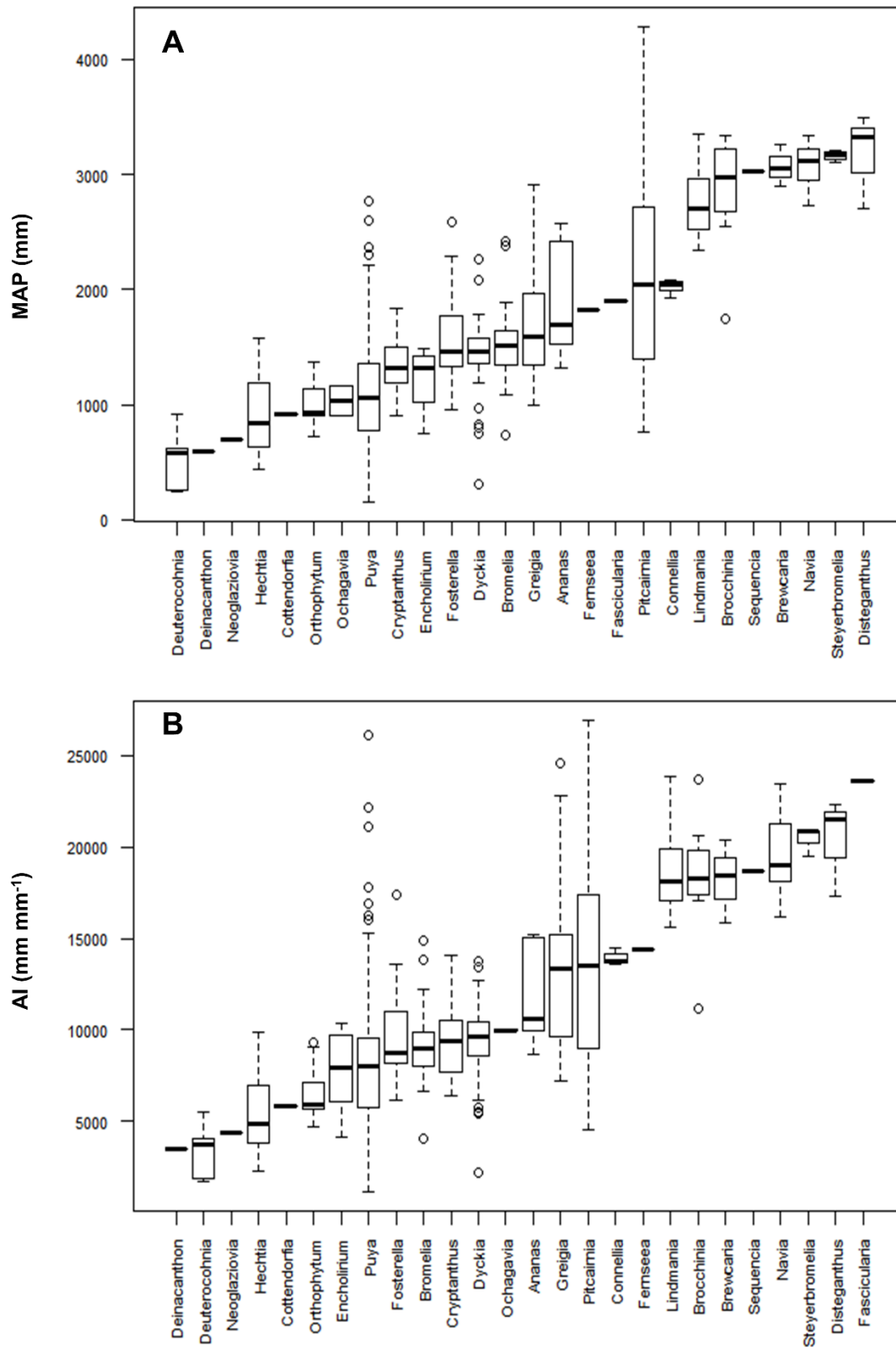
Pairwise linear regression was performed between mean univariate habitat position scores for all genera to assess the degree of collinearity. All pairs showed strong, statistically significant correlations, summarised in Table 2.3.3. Of all the variables, P_{seas} was the most weakly coordinated with other variables, as was borne out in PCA-based estimation of multivariate hydrological habitat position and range. This suggests that variation in overall moisture requirement could be partly decoupled from variation in tolerance of environmental seasonality.

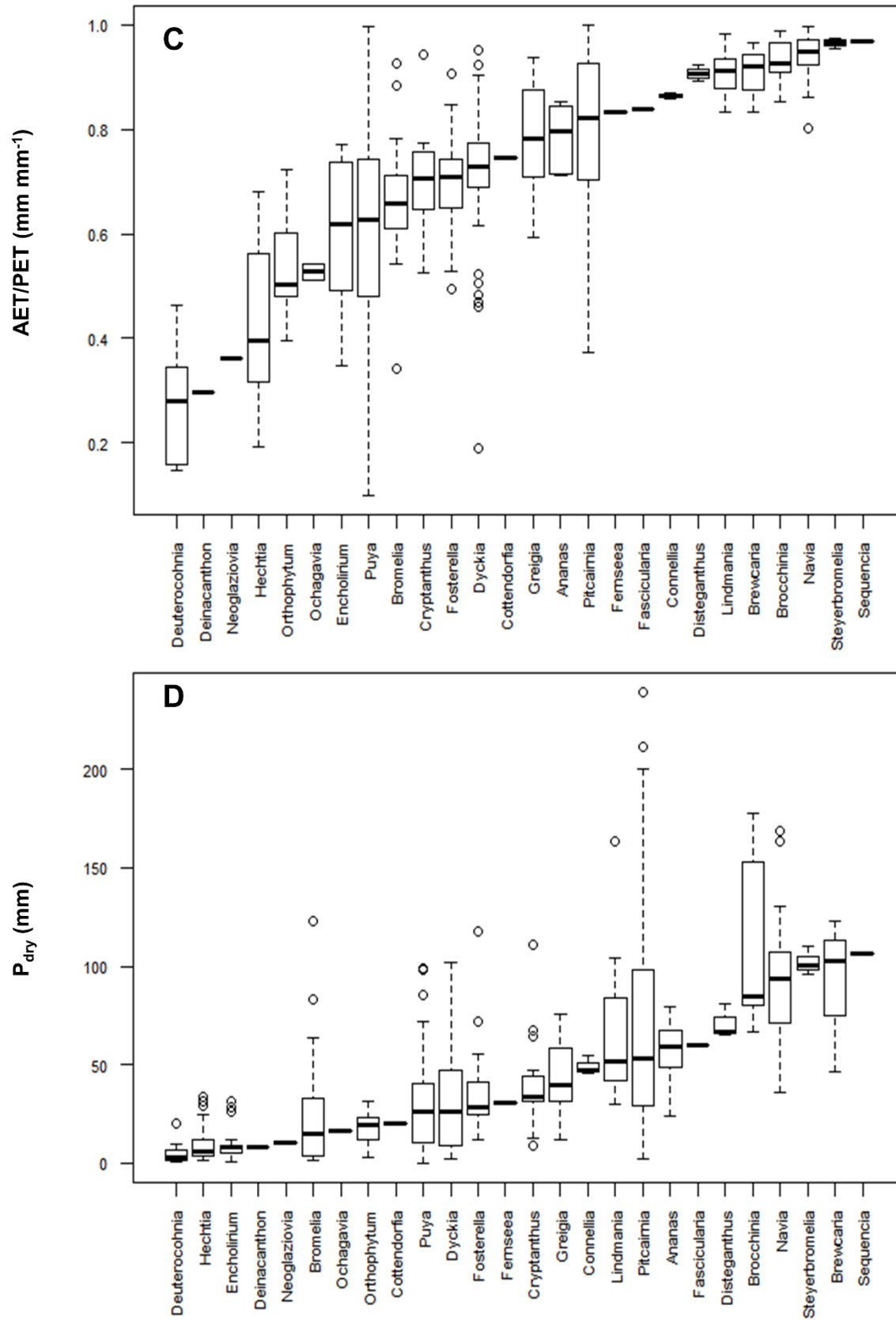
	AI	MAP	P_{dry}	P_{seas}
AET/PET	+, $r^2 = 77.19$, $p < 0.001$	+, $r^2 = 79.81$, $p < 0.001$	+, $r^2 = 71.54$, $p < 0.001$	-, $r^2 = 69.08$, $p < 0.001$
AI		+, $r^2 = 82.89$, $p < 0.001$	+, $r^2 = 74.89$, $p < 0.001$	-, $r^2 = 48.54$, $p < 0.001$
MAP			+, $r^2 = 88.83$, $p < 0.001$	-, $r^2 = 61.21$, $p < 0.001$
P_{dry}				-, $r^2 = 71.58$, $p < 0.001$

Table A2.2.3. Pairwise correlations between genus-mean scores for bioclimatic indices (aridity index, AI; mean annual precipitation, MAP; precipitation of driest month, P_{dry} ; precipitation seasonality, P_{seas}).

Appendix 2.3

A2.3.1 Variation in hydrological habitat position and range by genus





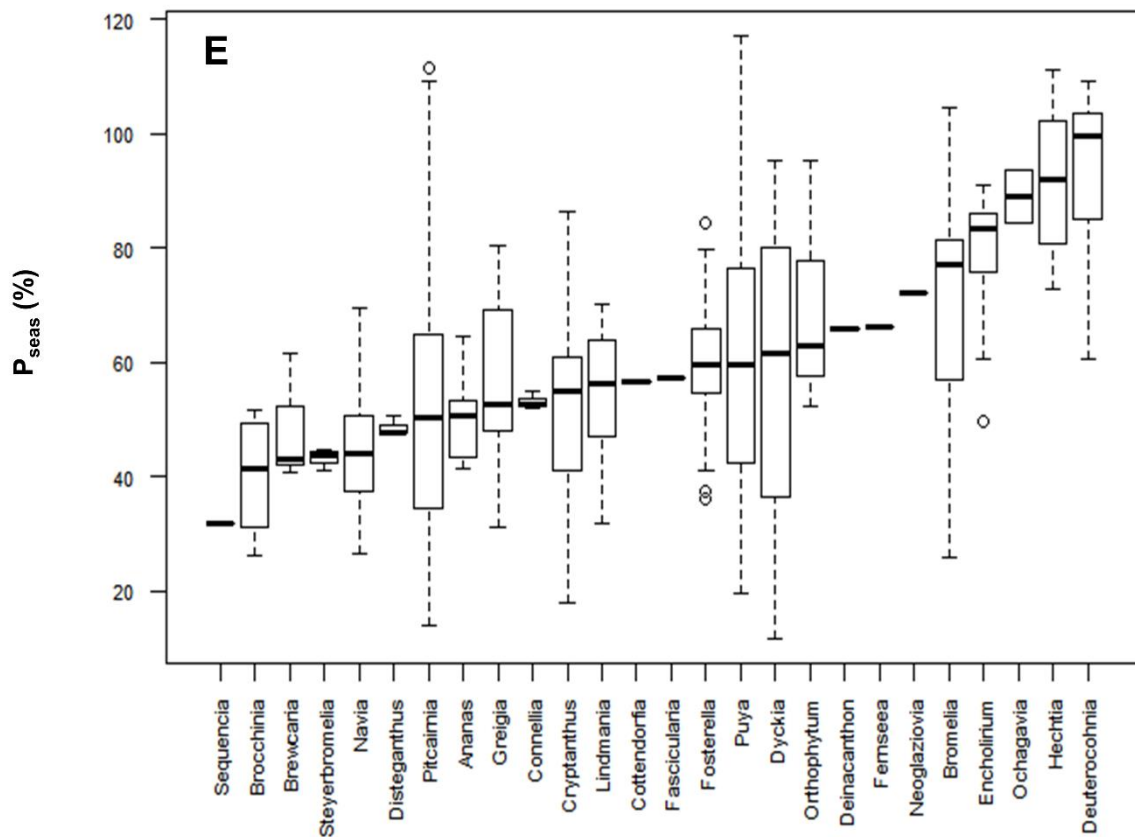
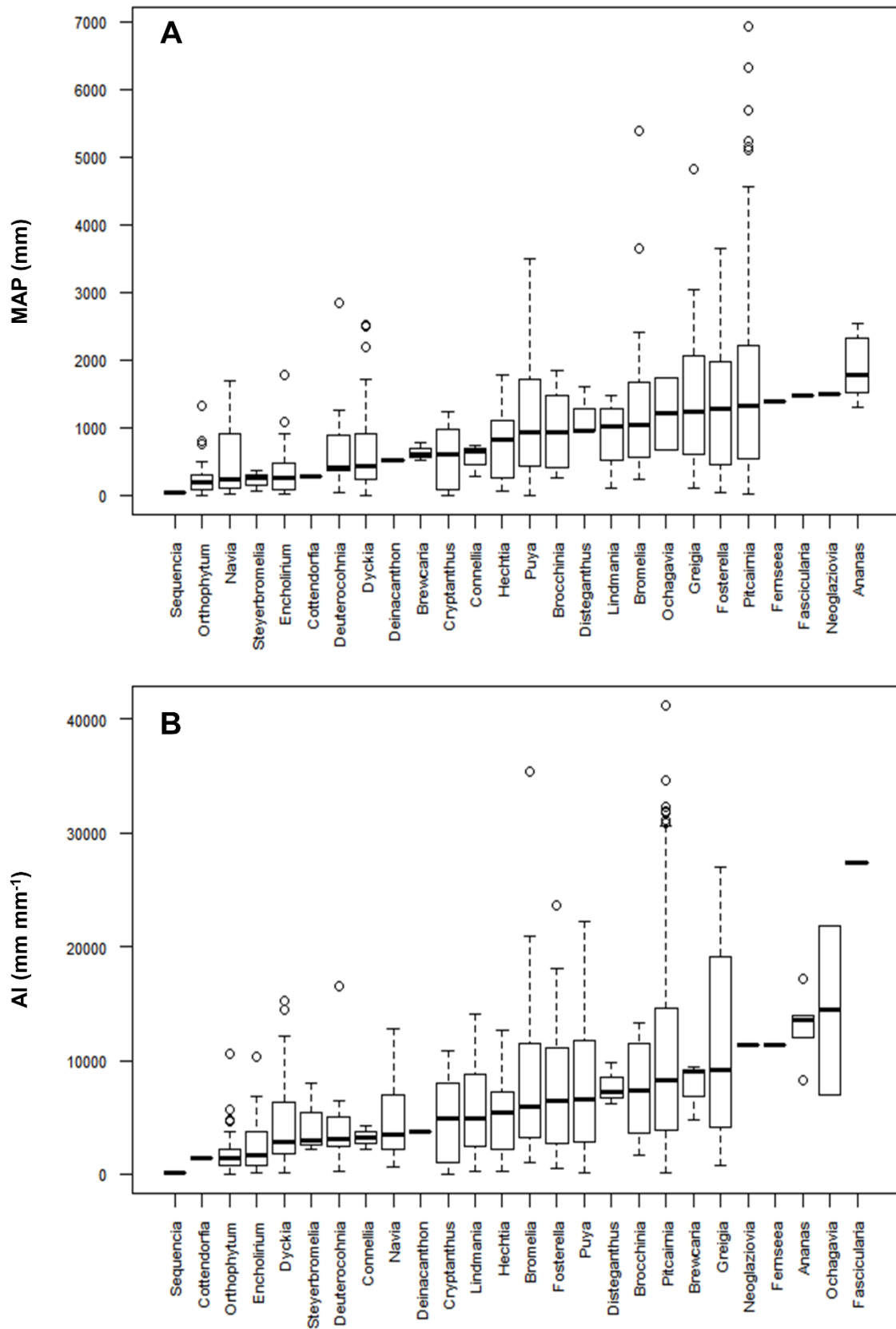
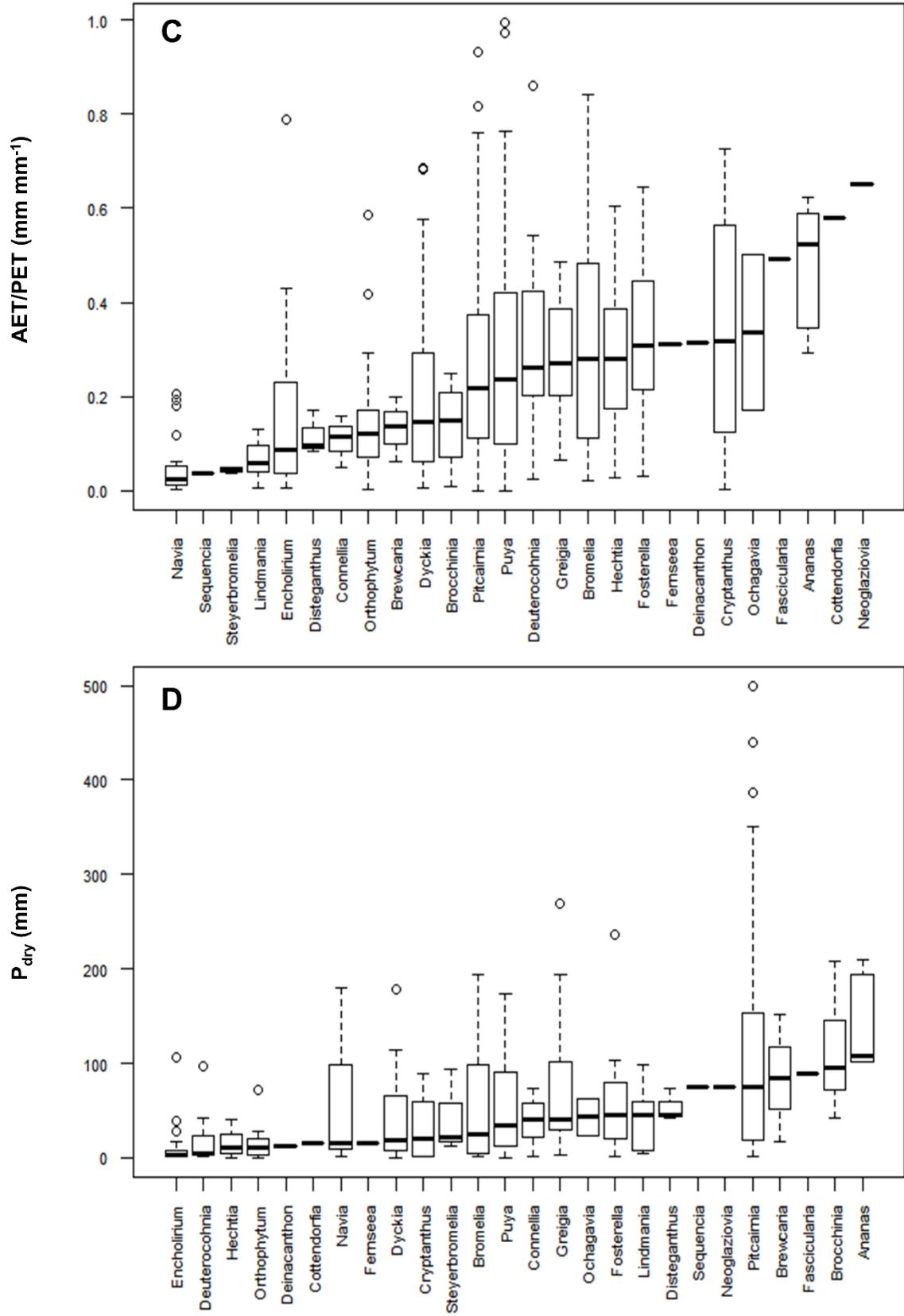


Figure A2.3.1. Terrestrial bromeliad genera ranked by median score for species' mean values for five bioclimatic variables: b) MAP; B) AI; c) AET/PET; d) P_{dry} ; e) P_{seas} . Boxes show median values and interquartile range (IQR), with whiskers of length (1.5 x IQR) and outliers plotted as individual points.

Variation in mean scores for habitat position is shown by genus median in Fig. A2.3.1. Median MAP score was lowest in *Deuterocohnia*, followed by *Deinacanthus*, *Neoglaziovia* and *Hechtia*. The same four genera occupied these positions in terms of both median scores for AI and AET/PET.

Deuterocohnia, *Deinacanthus*, *Neoglaziovia* and *Encholirium* were the four genera with lowest median scores for species' mean scores for P_{dry} . *Deuterocohnia* and *Hechtia* showed the highest median scores for P_{seas} , followed by *Ochagavia* and *Encholirium*. At the other end of the spectrum, the highest median scores for AET/PET occurred in *Sequencia*, *Steyerbromelia*, *Navia* and *Brocchinia*. The same genera showed the four lowest median scores for P_{seas} and the highest for P_{dry} . By contrast, the four highest-scoring genera for AI were *Fascicularia*, *Steyerbromelia*, *Disteganthus* and *Navia*, and the highest median scores for MAP occurred in *Disteganthus*, *Steyerbromelia*, *Navia* and *Brewcaria*.





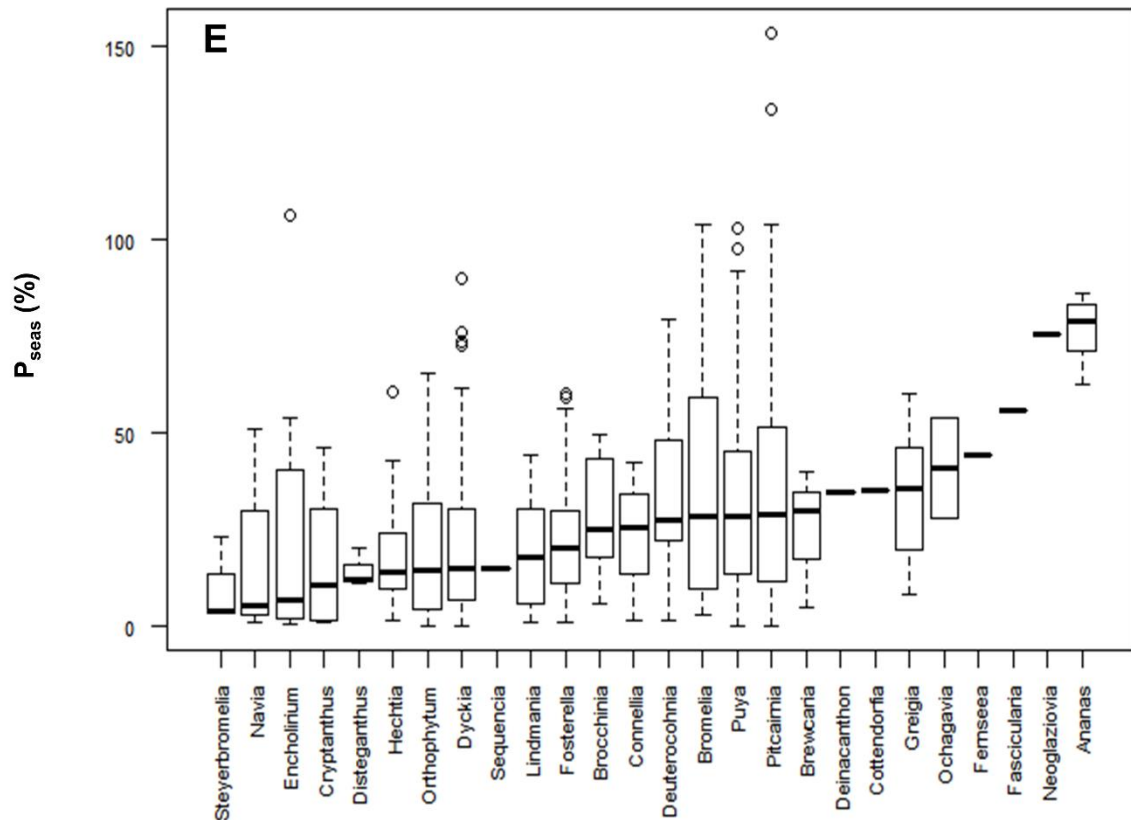


Figure A2.3.2. Terrestrial bromeliad genera ranked by median score for species' ranges of values for five bioclimatic variables: a) MAP; b) AI; c) AET/PET; d) P_{dry} ; e) P_{seas} . Boxes show median values and interquartile range (IQR), with whiskers of length (1.5 x IQR) and outliers plotted as individual points.

Fig. A2.3.2 shows variation in habitat range by genus median. In terms of MAP, the narrowest ranges occurred in *Sequencia*, *Orthophytum* and *Navia*, while the widest occurred in *Ananas*, *Neoglaziovia* and *Fascicularia*. This pattern was broadly consistent with the results for AI, in which the monospecific *Cottendorfia* displayed a notably narrow range. However, this contrasted with the broad range shown by *Cottendorfia* in terms of AET/PET. Otherwise, rankings for AET/PET were again rather similar. The narrowest ranges in terms of P_{dry} occurred in strongly xeromorphic CAM terrestrial genera including *Encholirium*, *Deuterocohnia* and *Hechtia*, while the genera *Brocchinia* and *Brewcaria* ranked surprisingly highly, alongside *Ananas* and *Fascicularia*. The pattern for P_{seas} was similar to that observed for MAP.

Appendix 2.4

A2.4.1 Variation in hydrological habitat and position within taxonomic groups

PCA was performed separately on data for species within each major taxonomic group in order to identify more detailed, lineage-specific trends in variation in hydrological habitat mean and range.

Brocchinioideae and Lindmanioideae

Among the *Brocchinioideae* and *Lindmanioideae*, the overall moisture vs. seasonality distinction was maintained, and the most distinctive hydrological habitat means occurred in *Connellia* (*Lindmanioideae*), which clustered tightly in the area of the PC1-PC2 climate space characterised by lower overall moisture and moderate seasonality (Fig. A2.4.1). Scores for *Brocchinia* (*Brocchinioideae*) and *Lindmania* (*Lindmanioideae*) species covered wider habitat ranges, with the centre of the range for *Lindmania* spp. being located further towards the high-seasonality end of the climate space than for *Brocchinia* spp. The *Lindmania* species whose hydrological habitat mean was associated with the highest level of seasonality was *L. thyrsoides* L.B.Sm., while *L. nubigena* (L.B.Sm.) L.B.Sm. occupied the other end of this spectrum. In *Brocchinia*, a shorter gradient existed between *B. reducta* Baker and *B. delicatula* L.B.Sm., the latter being associated with the lowest levels of seasonality. Meanwhile the habitat mean of *B. rupestris* (Gleason) Holst was associated with considerably lower overall moisture than any other species in the genus or in *Lindmanioideae*.

PCA on hydrological habitat range data for *Brocchinioideae* and *Lindmanioideae* identified two axes of variation corresponding to overall environmental moisture (MAP, AI, AET/PET) and seasonality (P_{dry} , P_{seas} ; Fig. A2.4.2). In *Brocchinia*, the broadest habitat ranges occurred in *B. hechtoides* Mez and *B. tatei* L.B.Sm., two tank-forming species. *B. delicatula* showed narrow habitat range with respect to seasonality but not total moisture, while the reverse was true for *B. rupestris*. Among *Lindmania* species, broad habitat range occurred in species such as the strongly morphologically-reduced *L. subsimplex* L.B.Sm.. Narrow habitat range in terms of seasonality but not total moisture occurred in *L. thyrsoides*, with the reverse being true for *L. nubigena*. Most *Connellia* species showed relatively broad habitat ranges, the exception being *C. caricifolia* L.B.Sm., which appeared to be strongly restricted by seasonality.

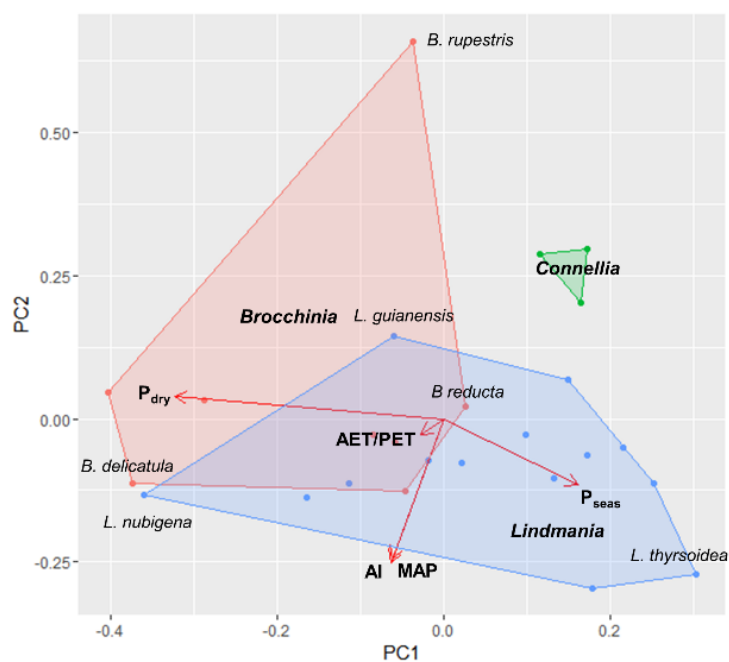


Figure A2.4.1. PC1-PC2 biplot based on PCA of mean values of bioclimatic variables (MAP, AI, AET/PET, P_{dry} , P_{seas}) for Brocchinioideae and Lindmanioideae ($n = 35$). Species scores are plotted and grouped by genus, with separate convex hulls covering all species belonging to each genus. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

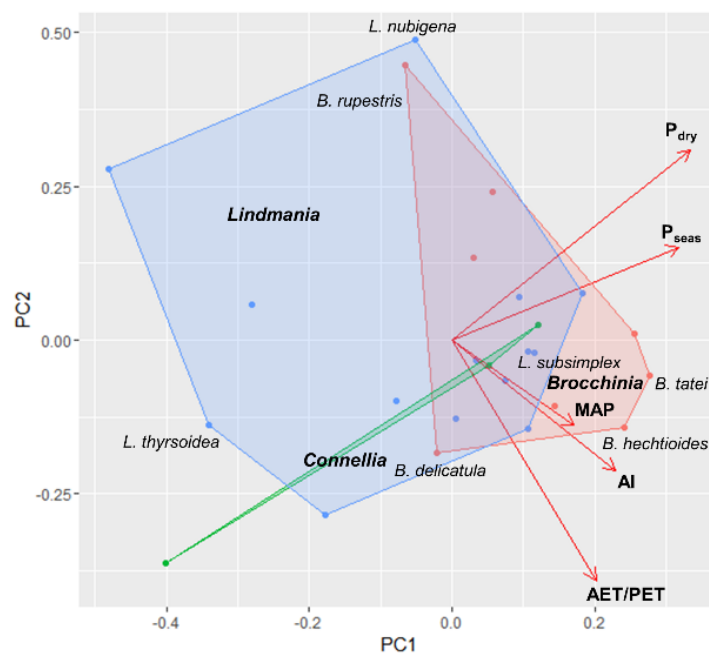


Figure A2.4.2. PC1-PC2 biplot based on PCA of ranges of bioclimatic variables (MAP, AI, AET/PET, P_{dry} , P_{seas}) for Brocchinioideae and Lindmanioideae ($n = 35$). Species scores are plotted and grouped by genus, with separate convex hulls covering all species belonging to each genus. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

Hechtia (Hechtioideae)

In the Central-North American succulent CAM genus *Hechtia* (Hechtioideae) there was approximately equal variation across total moisture and seasonality axes (Fig. A2.4.3). Species such as *H. texensis* S.Watson occupied the area of climate space characterised by moderate seasonality and low overall moisture, while strongly seasonal environments with high overall moisture were associated with species including *H. laevis* L.B.Sm. The two species whose habitat means were located in the region of climate space characterised by the highest moisture and lowest seasonality were *H. lundelliorum* L.B.Sm. and *H. tillandsioides* (André) L.B.Sm., both of which are relatively thin-leaved and lack prominent spines.

PCA of habitat range data for *Hechtia* identified two axes of variation corresponding to overall moisture (including P_{dry}) and P_{seas} (Fig. A2.4.4). The broadest overall habitat range occurred in *H. glomerata* Zucc., while *H. stenopetala* Klotzsch showed higher habitat range in terms of overall moisture but not seasonality. *H. lyman-smithii* Burt-Utley & Utley appeared to be limited by seasonality more than by overall moisture, while the reverse was true of *H. liebmännii* Mez. *H. pedicellata* S.Watson appeared to be equally restricted by both factors.

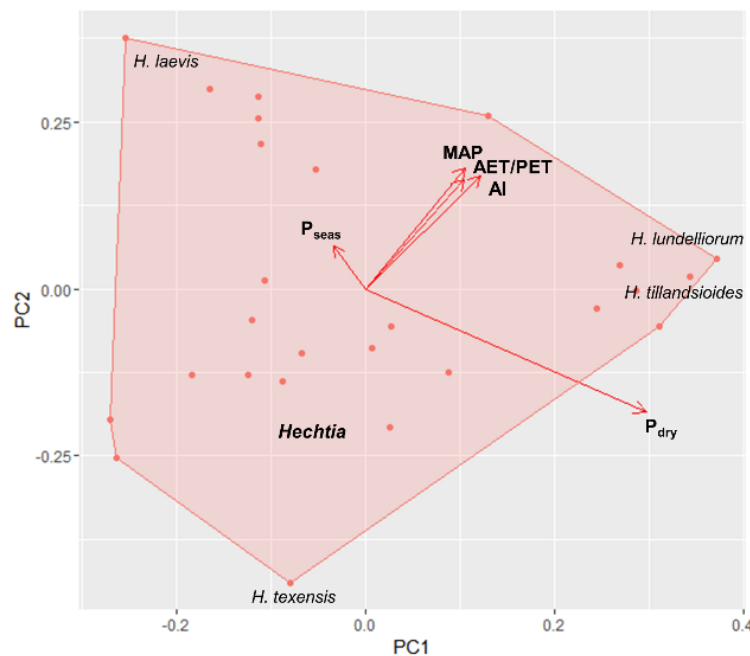


Figure A2.4.3. PC1-PC2 biplot based on PCA of mean values of bioclimatic variables (MAP, AI, AET/PET, P_{dry} , P_{seas}) for Hechtioideae ($n = 26$). Convex hull covers all species. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

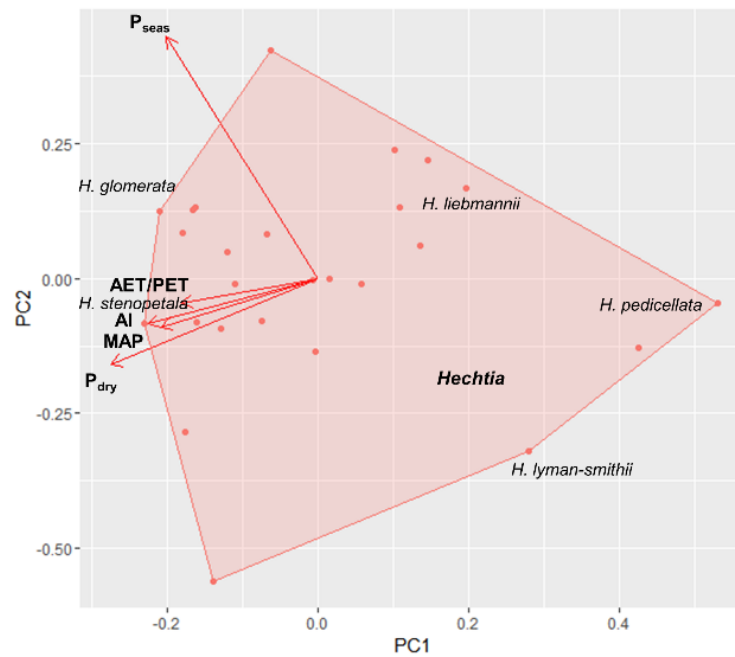


Figure A2.4.4. PC1-PC2 biplot based on PCA of ranges of bioclimatic variables (MAP, AI, AET/PET, P_{dry} , P_{seas}) for Hechtioideae ($n = 26$). Convex hull covers all species. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

Navioideae

The results of PCA on hydrological habitat mean data for the Navioideae were consistent with the overall moisture vs. seasonality distinction. In terms of variation in species' scores, the strongest contrast was between the monospecific genus *Cottendorfia* and the remainder of the subfamily (Fig. A2.4.5). *C. florida* was located in the corner of the PC1-PC2 climate space associated with the lowest overall moisture and moderate seasonality. *Navia* spp. showed the widest range of habitat means, and this variation was primarily parallel to the PC loading for seasonality, suggesting that overall moisture demand is relatively strongly conserved across the genus. Species associated with the highest levels of seasonality included *N. ovoidea* L.B.Sm., Steyerm. & H.Rob., while species such as *N. terramarae* L.B.Sm. & Steyerm. occupying the other end of the spectrum. The area of climate space occupied by *Brewcaria* spp. fell towards the centre of that occupied by *Navia* spp., and variation in habitat mean in *Brewcaria* was again confined to the seasonality axis. While data were available for only three *Steyerbromelia* species, these seemed to conform to the same pattern, and their habitat means were also located towards the centre of the range occupied by *Navia* spp. *Sequencia serrata* (L.B.Sm.) Givnish, the sole representative of its genus, was located towards the low-seasonality end of the area of climate space occupied by *Navia* spp. Overall, it appears that moisture requirement is

relatively strongly conserved across the Navioideae, with the exception of *C. florida*, while there has been some degree of adaptation to different temporal distribution of precipitation.

When PCA was performed on habitat range data for Navioideae species, bioclimatic variable loadings fell onto three axes: 1) MAP and AI; 2) P_{dry} and P_{seas} ; 3) AET/PET (Fig. A2.4.6). The first and second of these axes were orthogonal, with the third lying approximately midway between. The broadest habitat ranges occurred in *Navia* spp., notably the diminutive *N. duidae* L.B.Sm. Narrow habitat range with respect to total moisture but not seasonality occurred in *N. luzuloides* L.B.Sm., Steyer. & H.Rob., whereas the converse arrangement was true for *N. terramarae*. Habitat ranges of *Brewcaria*, *Cottendorfia* and *Steyerbromelia* species fell within the range of habitat ranges occupied by *Navia* spp., whereas *Sequencia serrata* displayed exceptional specificity with respect to overall moisture.

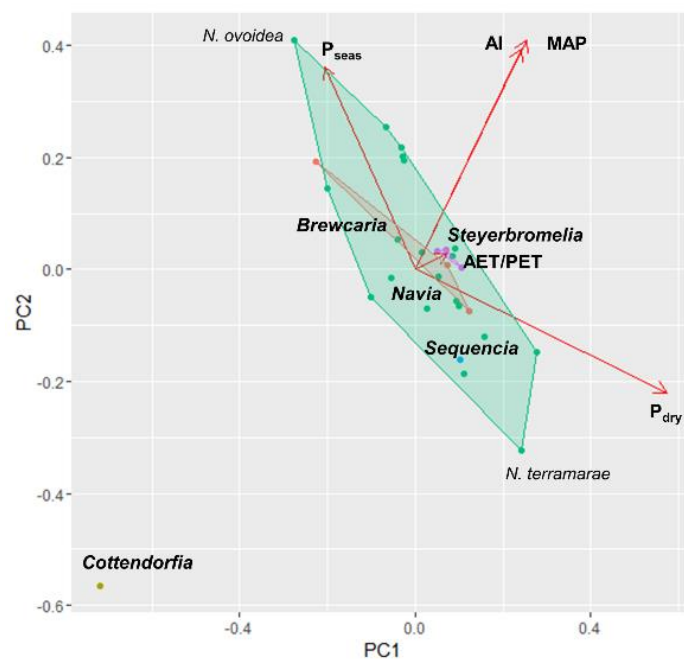


Figure A2.4.5. PC1-PC2 biplot based on PCA of mean values of bioclimatic variables (MAP, AI, AET/PET, P_{dry} , P_{seas}) for Navioideae ($n = 28$). Species scores are plotted and grouped by genus, with separate convex hulls covering all species belonging to each genus. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

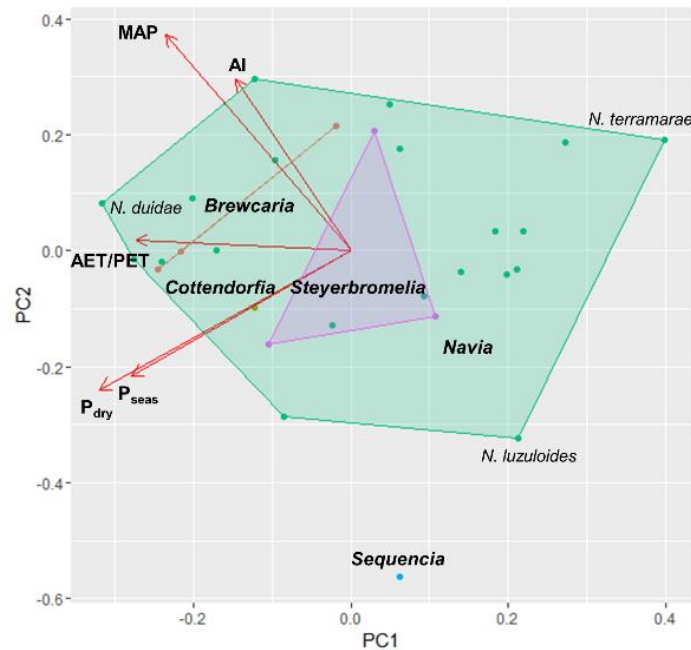


Figure A2.4.6. PC1-PC2 biplot based on PCA of ranges of bioclimatic variables (MAP, AI, AET/PET, P_{dry} , P_{seas}) for Navioideae ($n = 28$). Species scores are plotted and grouped by genus, with separate convex hulls covering all species belonging to each genus. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

Pitcairnia and *Fosterella*

Hydrological habitat means in the large genus *Pitcairnia* varied widely across the PC1-PC2 climate space, where the total moisture vs. precipitation seasonality distinction was supported (Fig. A2.4.7). Aseasonal, high-moisture environments were associated with broad-leaved, often petiolate species such as *P. archeri* L.B.Sm., while strongly seasonal environments with high overall moisture hosted species such as the largely coastal *P. calcicola* J.R.Grant & J.F.Morales. Seasonal low-moisture environments were associated with species with morphologically-reduced leaves, such as *P. micheliana* Andrews, while aseasonal low-moisture environments were occupied by species such as *P. nobilis* Mez & Sodiro. The range of habitat means of *Fosterella* spp. fell within the core of the range occupied by *Pitcairnia* spp. *Fosterella* spp. showed slightly more dispersion along the overall moisture axis than the seasonality axis. The habitat mean of the narrow-leaved South American lithophyte *F. albicans* (Griseb.) L.B.Sm. was located in the lowest-moisture and most seasonal corner of the climate space occupied by *Fosterella* spp. Seasonal, high-moisture environments were associated with the broad-leaved Central American species *F. micrantha* (Lindl.) L.B.Sm., while

aseasonal, high-moisture environments were occupied by the lowland Amazonian species *F. pearcei* (Baker) L.B.Sm.

When PCA was performed on habitat range data for *Pitcairnia* and *Fosterella*, the bioclimatic variable loadings fell into four groupings: 1) AET/PET; 2) P_{seas} ; 3) MAP and AI; 4) P_{dry} (Fig. A2.4.8). *Pitcairnia* spp. such as *P. heterophylla* (Lindl.) Beer and *P. macranthera* André showed some of the broadest habitat ranges, while other species appeared to be differentially sensitive to different bioclimatic variables. *P. mituensis* L.B.Sm. displayed a particularly narrow habitat range with respect to AET/PET, whereas *P. condorensis* Manzan. & W.Till. appeared to be most strongly limited by P_{seas} and *P. prolifera* Rauh by P_{dry} . Among *Fosterella* spp., the broadest habitat ranges occurred in species such as *F. pearcei*, while *F. caulescens* Rauh appeared to be limited by AET/PET and P_{seas} , and *F. vasquezii* E.Gross & Ibisch by MAP/AI and P_{dry} .

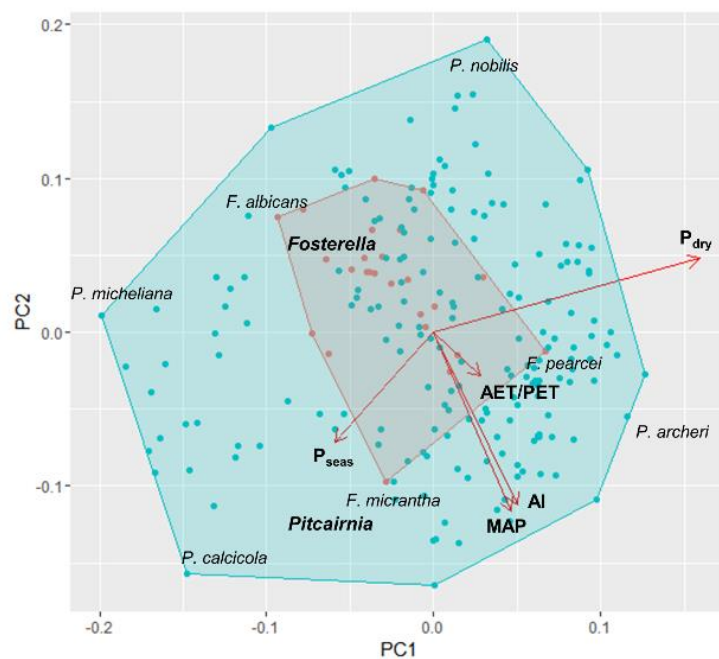


Figure A2.4.7. PC1-PC2 biplot based on PCA of mean values of bioclimatic variables (MAP, AI, AET/PET, P_{dry} , P_{seas}) for *Pitcairnia* and *Fosterella* ($n = 208$). Species scores are plotted and grouped by genus, with separate convex hulls covering all species belonging to each genus. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

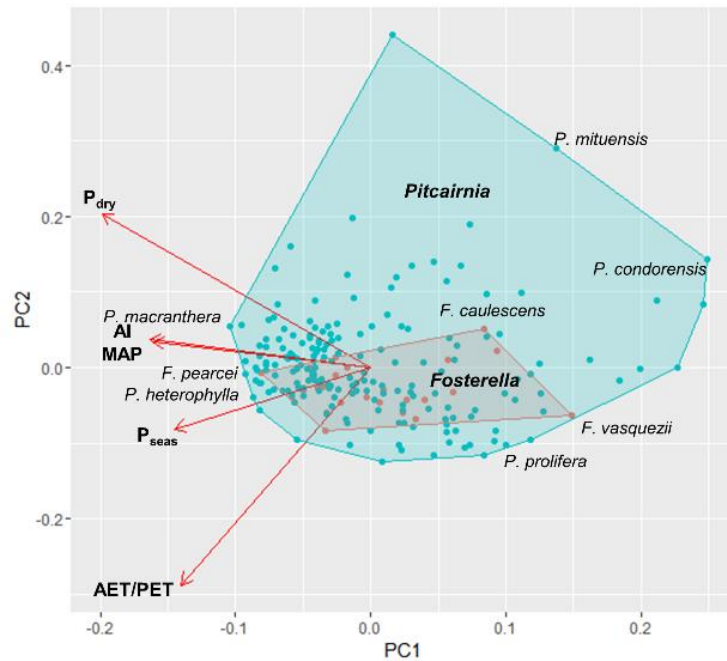


Figure A2.4.8. PC1-PC2 biplot based on PCA of ranges of bioclimatic variables (MAP, AI, AET/PET, P_{dry} , P_{seas}) for *Pitcairnia* and *Fosterella* ($n = 208$). Species scores are plotted and grouped by genus, with separate convex hulls covering all species belonging to each genus. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

Xeric Clade Pitcairnioideae

For the Xeric Clade Pitcairnioideae, the total moisture vs. precipitation seasonality distinction in bioclimatic variable loadings held true (Fig. A2.4.9). Species' scores for the three genera overlapped towards the centre of the PC1-PC2 climate space, but each genus also occupied more distinctive regions of the space. *Deuterocohnia* spp. occurred in the lowest moisture environments with moderate levels of seasonality. Species associated with the very driest regions included the miniaturised *De. haumanii* A.Cast. and *De. lorentziana* (Mez.) M.A.Spencer & L.B.Sm. Species with habitat means located in slightly higher-moisture and less seasonal areas of the climate space included *De. meiziana* Kuntze ex Mez. *Dyckia* is the largest of the Xeric Clade genera and showed the widest range of hydrological habitat means. Two major loose clusters were identifiable: both towards the high-moisture end of the climate space, but towards opposite ends of the seasonality spectrum, reflecting the geographical distribution of *Dyckia* diversity in central and southern Brazil. From the first of these groups, the relatively large and broad-leaved *Dy. maritima* Baker was associated with the lowest levels of seasonality, while from the second group the highly spinose species *Dy. dawsonii* L.B.Sm. occurred in environments with the highest seasonality and highest

overall moisture. One exceptional *Dyckia* species, *Dy. velascana* Mez, occurred in an area of habitat space comparable to those occupied by *Deuterocohnia* spp. Finally, in the genus *Encholirium* most variation was along the seasonality axis, with a lesser amount of variation in overall moisture. The species *E. spectabile* Mart. ex Schult. & Schult.f. was associated with the driest and most aseasonal environments, while *E. longiflorum* Leme occupied the area of habitat space characterised by the most extreme seasonality but somewhat higher overall moisture.

Three groupings of bioclimatic variable loadings were identified when PCA was performed on habitat range data for Xeric Clade species: 1) MAP, AI and AET/PET; 2) P_{dry} ; 3) P_{seas} (Fig. A2.4.10). The first and second of these axes were orthogonal, with the third lying approximately midway between. There was extensive overlap in habitat ranges between species of each of the three Xeric Clade genera. In *Deuterocohnia*, the broadest habitat range occurred in the miniaturised *De. strobilifera* Mez. *De. brevifolia* (Griseb.) M.A.Spencer & L.B.Sm. appeared to be sensitive to P_{dry} but not overall moisture or P_{seas} , whereas the opposite was true for *De. seramisiana* R.Vásquez, Ibisch & E.Gross. The range of hydrological habitat range scores for *Dyckia* species was higher than for the other two genera, and the broadest habitat ranges occurred in species such as *Dy. pulquinensis* Wittm. *Dy. dawsonii* was strongly restricted by P_{dry} but not overall moisture or P_{seas} , while the reverse held for species such as *Dy. exserta* L.B.Sm. In *Encholirium*, the broadest habitat range occurred in *E. spectabile*. P_{dry} appeared to be more restrictive than either overall moisture or P_{seas} for *E. ctenophyllum* Forzza & Zappi, whereas the opposite was true for *E. biflorum* Mez (Forzza).

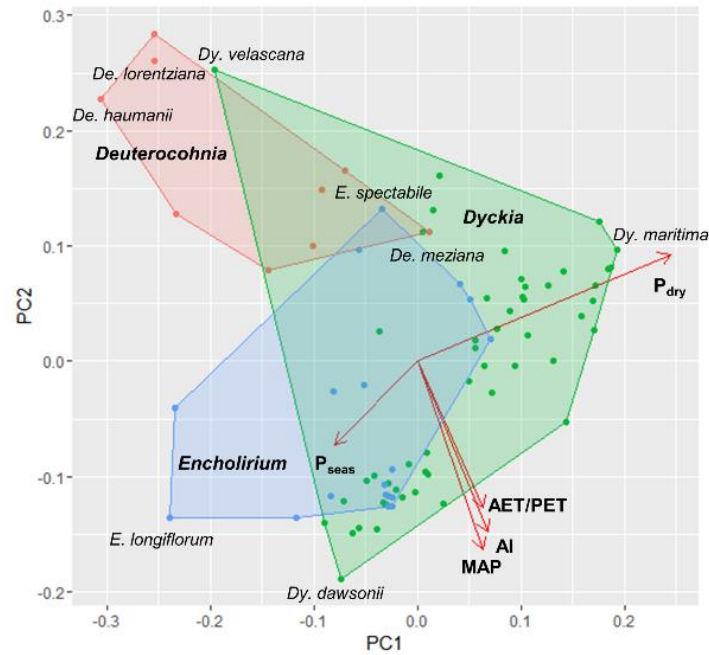


Figure A2.4.9. PC1-PC2 biplot based on PCA of mean values of bioclimatic variables (MAP, AI, AET/PET, P_{dry} , P_{seas}) for Xeric Clade Pitcairnioideae ($n = 79$). Species scores are plotted and grouped by genus, with separate convex hulls covering all species belonging to each genus. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

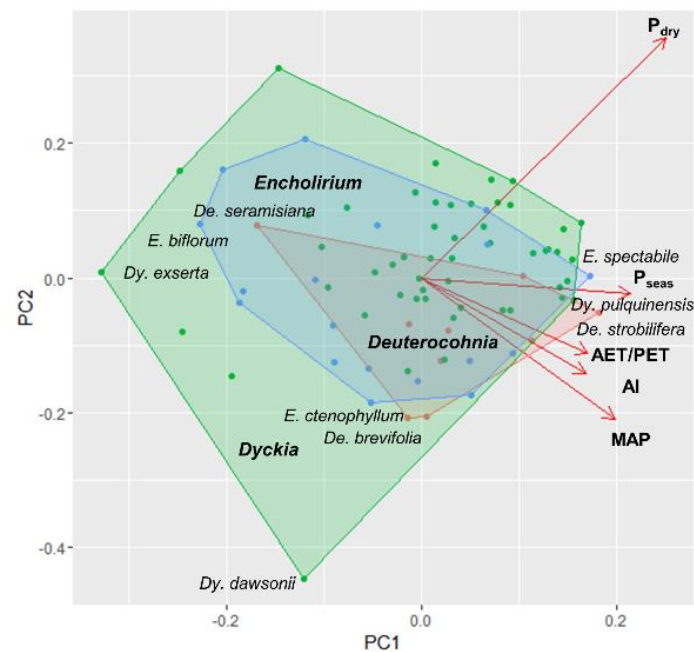


Figure A2.4.10. PC1-PC2 biplot based on PCA of ranges of bioclimatic variables (MAP, AI, AET/PET, P_{dry} , P_{seas}) for Xeric Clade Pitcairnioideae ($n = 79$). Species scores are plotted and grouped by genus, with separate convex hulls covering all species belonging to each genus. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

Puya (Puyoideae)

PCA performed on habitat mean data for *Puya* revealed a different association between bioclimatic variables from that which was observed in all other taxonomic groups (Fig. A2.4.11). MAP, AI, and P_{dry} were all approximately aligned along one axis (corresponding to PC1), with P_{seas} also aligned in the opposite direction, while AET/PET alone formed an orthogonal axis (PC2). Most *Puya* spp. clustered relatively tightly in PC1-PC2 climate space, but some species occupied more extreme regions. The most aseasonal, high-moisture environments were occupied by *P. fulgens* L.B.Sm. from the Peruvian Amazon. The Colombian montane forest species *P. roldanii* Betancur & Callejas scored lowly on PC1, suggesting its association with high-moisture environments, but highly on PC2, indicative of low AET/PET. Meanwhile the Argentinian *P. harmsii* (A.Cast.) A.Cast. occurred in the most seasonal, low-moisture environments, and *P. volcanensis* A.Cast., from the same geographical region, showed a similar habitat mean except that it displayed a higher AET/PET score.

When habitat range data for *Puya* was subjected to PCA, two axes of variation were revealed, one corresponding to AET/PET and the other to all remaining bioclimatic variables (Fig. A2.4.12). One species showing particularly broad habitat range was *P. boliviensis* Baker. The Peruvian species *P. angusta* L.B.Sm. was more strongly restricted by AET/PET than by other factors, while the opposite was true of the Ecuadorean *P. sodiroana* Mez.

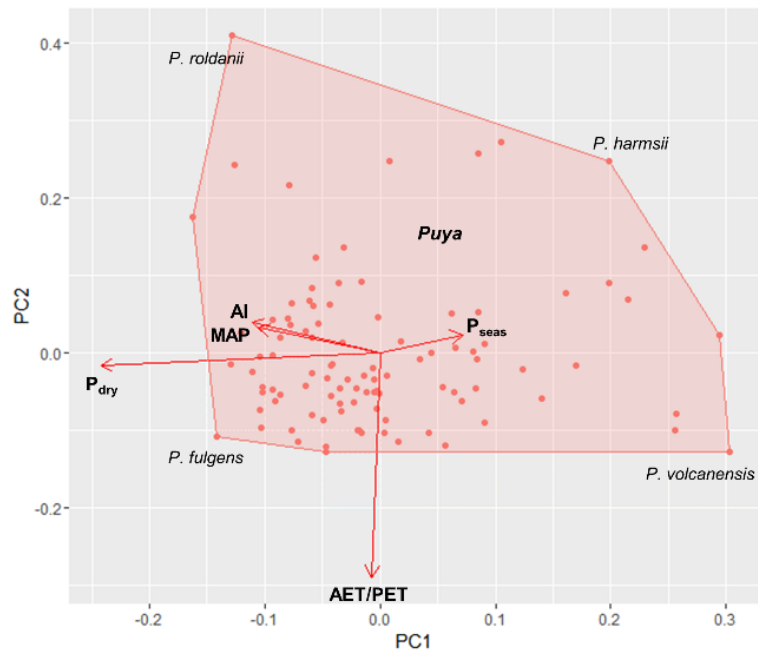


Figure A2.4.11. PC1-PC2 biplot based on PCA of mean values of bioclimatic variables (MAP, AI, AET/PET, P_{dry} , P_{seas}) for Puyoideae ($n = 99$). Convex hull covers all species. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

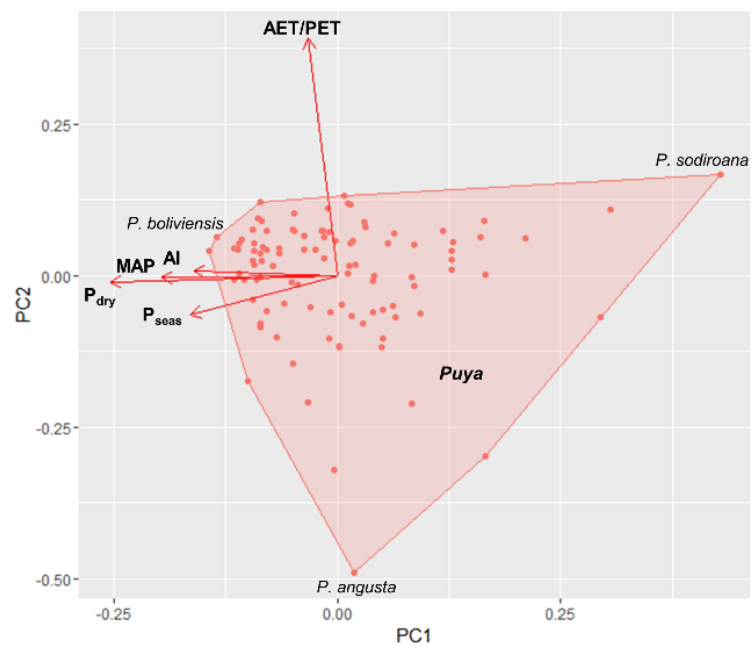


Figure A2.4.12. PC1-PC2 biplot based on PCA of ranges of bioclimatic variables (MAP, AI, AET/PET, P_{dry} , P_{seas}) for Puyoideae ($n = 99$). Convex hull covers all species. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

C₃ early-diverging Bromelioideae

PCA for habitat mean data for the four strictly *C₃* genera of early-diverging Bromelioideae (*Fascicularia*, *Fernseea*, *Greigia* and *Ochagavia*) were broadly consistent with the overall moisture vs. seasonality distinction (Fig. A2.4.13). The largest of the four genera is *Greigia*. *Greigia* spp. hydrological habitat means varied roughly equally along the total moisture and seasonality axes. Andean species such as *G. sodiroana* Mez occupied the least seasonal but lowest overall moisture environments, while *G. kessleri* H.E.Luther occurred in more seasonal, low-moisture environments. Higher-moisture, seasonal environments were occupied by Central American species such as *G. rohweri* L.B.Sm., while the species associated with the highest levels of overall moisture and moderate seasonality was *G. sylvicola* Standl. Habitat means of species of all other genera fell within the range occupied by *Greigia* spp. The monospecific Chilean genus *Fascicularia* was located in the high-moisture and moderately seasonal region of the climate space, while the single *Fernseea* species analysed was also associated with relatively high levels of moisture but stronger seasonality. Both Chilean *Ochagavia* species were associated with lower total moisture and strong seasonality.

PCA of habitat range data for *C₃* early-diverging bromelioid genera identified two groups of aligned bioclimatic variable loadings corresponding to overall moisture and seasonality (Fig. A2.4.14). The broadest hydrological habitat ranges occurred in the Ecuadorean *Greigia sodiroana*. The Bolivian *G. kessleri* was more sensitive to seasonality than total moisture, with the opposite being true for the Venezuelan *G. alborosea* (Griseb.) Mez. Both *Fascicularia bicolor* (Ruiz & Pav.) Mez and *Ochagavia litoralis* (Phil.) Zizka, Trumpler & Zöllner showed relatively broad habitat ranges, while that of *O. carnea* (Beer) L.B.Sm. & Looser was slightly narrower with respect to both overall moisture and seasonality. *Fernseea itatiaeae* (Wawra) Baker appeared to be considerably more sensitive to seasonality than to overall moisture.

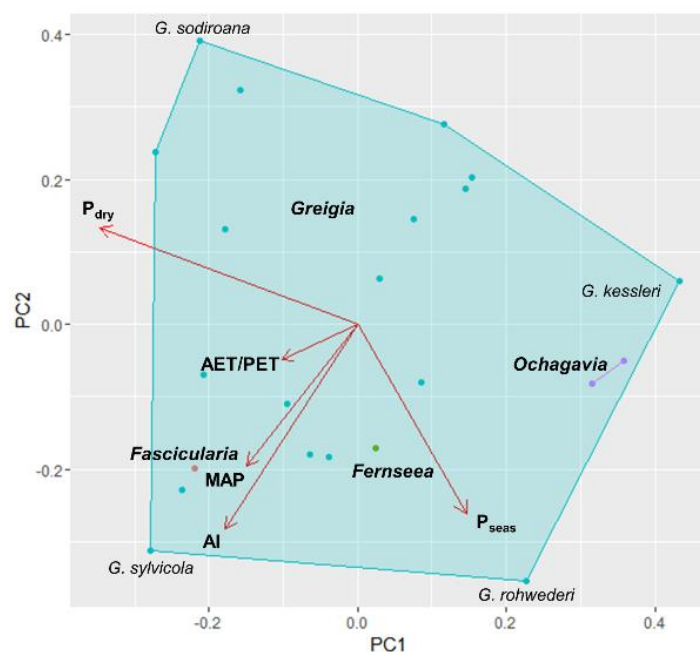


Figure A2.4.13. PC1-PC2 biplot based on PCA of mean values of bioclimatic variables (MAP , AI , AET/PET , P_{dry} , P_{seas}) for C₃ early-diverging Bromelioideae ($n = 22$). Species scores are plotted and grouped by genus, with separate convex hulls covering all species belonging to each genus. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

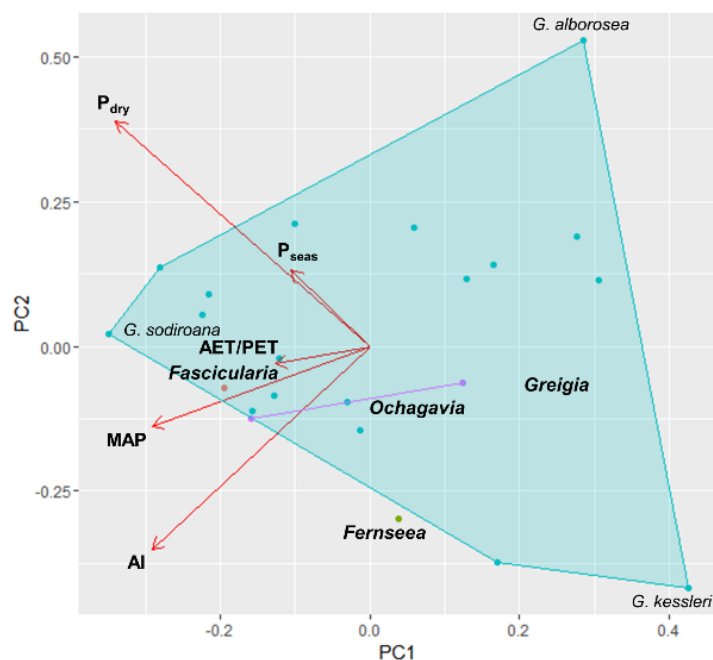


Figure A2.4.14. PC1-PC2 biplot based on PCA of ranges of bioclimatic variables (MAP , AI , AET/PET , P_{dry} , P_{seas}) for C₃ early-diverging Bromelioideae ($n = 22$). Species scores are plotted and grouped by genus, with separate convex hulls covering all species belonging to each genus. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

CAM early-diverging Bromelioideae

There was a clear overall moisture vs. seasonality distinction when PCA was performed on hydrological habitat means for the CAM genera in the early-diverging Bromelioideae (Fig. A2.4.15). Among the CAM genera in the early-diverging Bromelioideae, the most distinctive genus was *Disteganthus*. All three species represented in the dataset clustered closely in the area of the PC1-PC2 climate space corresponding to high moisture and low seasonality. At the opposite end of the spectrum, the genera *Deinacanthon* and *Neoglaziovia* were associated with some of the driest and most seasonal environments. The genus with the broadest range of habitat means was *Bromelia*. Species such as *B. tubulosa* L.B.Sm. were associated with less seasonal, high-moisture habitats, and indeed this species co-occurs with *Disteganthus* spp. in northern Amazonia. Among *Bromelia* spp. associated with high seasonality, there was a distinction between species such as *B. irwinii* L.B.Sm. which inhabit regions with higher overall moisture, and species like *B. arenaria* Ule which are restricted to drier regions. In *Cryptanthus*, the only species with a high-moisture, aseasonal habitat was *C. pseudopetiolatus* Philcox. As its name suggests, this species again displays pseudopetiolate leaves. In more seasonal but relatively high-moisture environments occurred species such as *C. schwackeanus* Mez, which displays a C₃ $\delta^{13}\text{C}$ signature (Crayn et al., 2015). Finally, the range of habitat means in the genus *Orthophytum* was centred furthest towards the drier, more seasonal corner of the PC1-PC2 climate space, but was still extensive. Species associated with the lowest overall moisture levels and moderate degrees of seasonality included the strongly xeromorphic, acaulescent rosette species *O. saxicola* (Ule) L.B.Sm., while caulescent species like *O. schulzianum* Leme & M.Machado were associated with more seasonal environments with higher overall moisture.

In terms of habitat range (Fig. A2.4.16), the greatest variation occurred among *Orthophytum* spp., followed by two other larger genera, *Cryptanthus* and *Bromelia*. Where some *Orthophytum* species (e.g. *O. saxicola*) showed relatively wide ranges in terms of overall moisture and seasonality, other species appeared to be constrained either by overall moisture or seasonality. The same was true for both *Cryptanthus* and *Bromelia*. *Ananas*, *Deinacanthon*, and *Disteganthus* species all showed moderately high wide ranges for both overall moisture and seasonality, with *Disteganthus* being the most strongly limited by seasonality among these smaller genera.

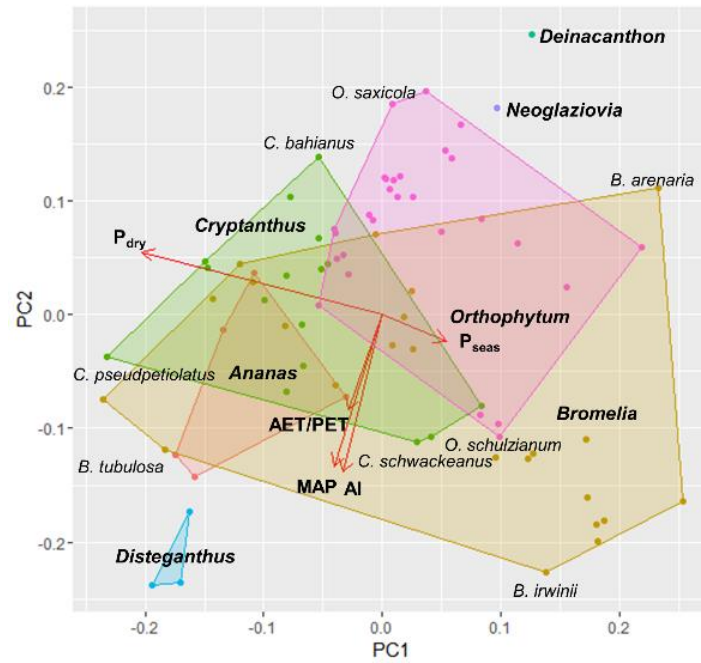


Figure A2.4.15. PC1-PC2 biplot based on PCA of mean values of bioclimatic variables (MAP, AI, AET/PET, P_{dry}, P_{seas}) for CAM early-diverging Bromelioideae ($n = 77$). Species scores are plotted and grouped by genus, with separate convex hulls covering all species belonging to each genus. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

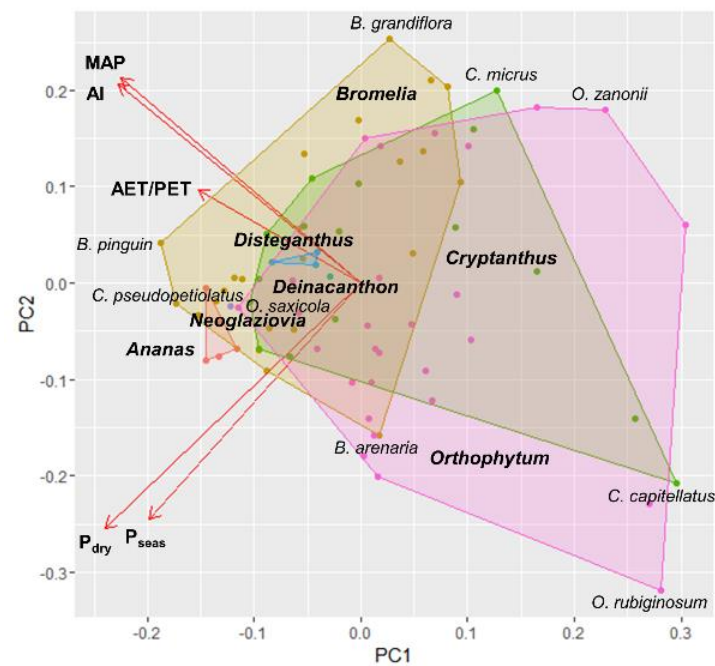


Figure A2.4.16. PC1-PC2 biplot based on PCA of ranges of bioclimatic variables (MAP, AI, AET/PET, P_{dry}, P_{seas}) for CAM early-diverging Bromelioideae ($n = 77$). Species scores are plotted and grouped by genus, with separate convex hulls covering all species belonging to each genus. PC1-PC2 scores for selected species are highlighted and arrows show bioclimatic variable loadings.

Appendix 3.1

A3.1.1 Species used in leaf economic and hydraulic and drought resistance trait surveys

Functional type	LES?	Species	Subfamily	Source
C₃ terrestrials	Y	<i>Fascicularia bicolor</i> (Ruiz & Pav.) Mez	Bromelioideae	CUBG
	N	<i>Fernseea bocainensis</i> Pereira & Moutinho	Bromelioideae	MSBG
	N	<i>Fosterella albicans</i> (Griseb.) L.B.Sm.	Pitcairnioideae	RBGK
	N	<i>Fosterella caulescens</i> Rauh	Pitcairnioideae	RBGK
	N	<i>Fosterella micrantha</i> (Lindl.) L.B.Sm.	Pitcairnioideae	RBGK
	N	<i>Fosterella penduliflora</i> (C.H.Wright) L.B.Sm.	Pitcairnioideae	RBGK
	N	<i>Fosterella petiolata</i> (Mez) L.B.Sm.	Pitcairnioideae	RBGK
	N	<i>Fosterella rusbyi</i> (Mez) L.B.Sm.	Pitcairnioideae	RBGK
	N	<i>Fosterella schidosperma</i> (Baker) L.B.Sm.	Pitcairnioideae	RBGK
	N	<i>Fosterella spectabilis</i> H.Luther	Pitcairnioideae	RBGK
	N	<i>Navia arida</i> L.B.Sm. & Steyerf.	Navioideae	MSBG
	N	<i>Navia lactea</i> L.B.Sm., Steyerf. & H.Rob.	Navioideae	MSBG
	Y	<i>Ochagavia elegans</i> Phil.	Bromelioideae	CUBG
	N	<i>Ochagavia litoralis</i> (Phil.) Zizka	Bromelioideae	CUBG
	N	<i>Pitcairnia andreana</i> Linden	Pitcairnioideae	MSBG
	N	<i>Pitcairnia angustifolia</i> Aiton	Pitcairnioideae	RBGK
	N	<i>Pitcairnia atrorubens</i> (Beer) Baker	Pitcairnioideae	RBGE
	N	<i>Pitcairnia bergii</i> H.Luther	Pitcairnioideae	MSBG
	N	<i>Pitcairnia beycalema</i> Beer	Pitcairnioideae	MSBG
	N	<i>Pitcairnia breedlovei</i> L.B.Sm.	Pitcairnioideae	RBGK
	N	<i>Pitcairnia caricifolia</i> Mart. ex Schult. & Schult.f.	Pitcairnioideae	RBGK
	N	<i>Pitcairnia cuzcoensis</i> L.B.Sm.	Pitcairnioideae	RBGK
	N	<i>Pitcairnia flammea</i> Lindl.	Pitcairnioideae	RBGE
	N	<i>Pitcairnia funkiae</i> M.A.Spencer & L.B.Sm.	Pitcairnioideae	RBGK
	N	<i>Pitcairnia grafii</i> Rauh	Pitcairnioideae	RBGK
	Y	<i>Pitcairnia imbricata</i> (Brongn.) Regel	Pitcairnioideae	CUBG
	Y	<i>Pitcairnia integrifolia</i> Ker Gawl.	Pitcairnioideae	CUBG
	N	<i>Pitcairnia jareckii</i> Proctor & Cedeno-Mald.	Pitcairnioideae	RBGK
	N	<i>Pitcairnia neglecta</i> (H. Luther) D.C. Taylor & H.Rob.	Pitcairnioideae	MSBG
	N	<i>Pitcairnia palmoides</i> Mez & Sodiro	Pitcairnioideae	MSBG
	N	<i>Pitcairnia poortmanii</i> André	Pitcairnioideae	RBGK
	N	<i>Pitcairnia recurvata</i> (Scheidweiler) C.Koch	Pitcairnioideae	RBGK
	N	<i>Pitcairnia riparia</i> Mez	Pitcairnioideae	MSBG
	N	<i>Pitcairnia sprucei</i> Baker	Pitcairnioideae	RBGK
	N	<i>Pitcairnia staminea</i> Lodd.	Pitcairnioideae	RBGK
	N	<i>Pitcairnia stevensonii</i> H.Luther & Whitten	Pitcairnioideae	MSBG
	N	<i>Pitcairnia undulata</i> Scheidw.	Pitcairnioideae	MSBG
	Y	<i>Pitcairnia xanthocalyx</i> Mart.	Pitcairnioideae	CUBG
	Y	<i>Puya alpestris</i> (Poepp.) Gay	Puyoideae	CUBG
	Y	[‡] <i>Puya x berteroniana</i> Mez	Puyoideae	CUBG
	Y	[†] <i>Puya chilensis</i> Molina	Puyoideae	CUBG
	N	<i>Puya coerulea</i> Lindley	Puyoideae	MSBG
	N	[†] <i>Puya ferruginea</i> (Ruiz & Pav.) L.B.Sm.	Puyoideae	MSBG
	N	[†] <i>Puya floccosa</i> (Linden) E.Morren ex Mez	Puyoideae	RBGE
	N	[†] <i>Puya humilis</i> Mez	Puyoideae	MSBG
	N	[‡] <i>Puya laxa</i> L.B.Sm.	Puyoideae	MSBG
	Y	<i>Puya mirabilis</i> (Mez) L.B.Sm.	Puyoideae	CUBG
	N	[‡] <i>Puya stenothyrsa</i> (Baker) Mez	Puyoideae	MSBG
	Y	[‡] <i>Puya venusta</i> (Baker) Phil.	Puyoideae	CUBG

C ₃ tank-epiphytes	N	<i>Alcantarea nevaesii</i> Leme	Tillandsioideae	MSBG
	N	<i>Alcantarea imperialis</i> (Carrière) Harms	Tillandsioideae	MSBG
	N	<i>Alcantarea odorata</i> (Leme) J.R. Grant	Tillandsioideae	MSBG
	N	<i>Alcantarea regina</i> (Vell.) Harms	Tillandsioideae	MSBG
	N	<i>Alcantarea simplicisticha</i> Leme & A.P. Fontana	Tillandsioideae	MSBG
	N	<i>Alcantarea trepida</i> Versieux & Wand.	Tillandsioideae	MSBG
	N	<i>Brocchinia acuminata</i> L.B.Sm.	Brocchinioideae	MSBG
	N	<i>Brocchinia melanacra</i> L.B.Sm.	Brocchinioideae	MSBG
	N	<i>Brocchinia micrantha</i> (Baker) Mez	Brocchinioideae	MSBG
	N	<i>Brocchinia steyermarkii</i> L.B.Sm.	Brocchinioideae	MSBG
	N	<i>Brocchinia tatei</i> L.B.Sm.	Brocchinioideae	MSBG
	Y	<i>Catopsis berteroniana</i> (Schult. & Schult. f.) Mez	Tillandsioideae	CUBG
	Y	<i>Catopsis floribunda</i> L.B.Sm.	Tillandsioideae	CUBG
	N	<i>Catopsis juncifolia</i> Mez & Wercklé	Tillandsioideae	RBGK
	Y	<i>Catopsis morreniana</i> Mez	Tillandsioideae	CUBG
	N	<i>Catopsis nutans</i> (Sw.) Griseb.	Tillandsioideae	RBGK
	N	<i>Catopsis paniculata</i> E.Morren	Tillandsioideae	RBGK
	N	<i>Catopsis sessiliflora</i> (Ruiz & Pav.) Mez	Tillandsioideae	RBGK
	N	<i>Catopsis subulata</i> L.B.Sm.	Tillandsioideae	RBGK
	N	<i>Goudaea ospinae</i> (H. Luther) W. Till & Barfuss	Tillandsioideae	MSBG
	N	<i>Guzmania acorifolia</i> (Griseb.) Mez	Tillandsioideae	MSBG
	N	<i>Guzmania conifera</i> (André) André ex Mez	Tillandsioideae	MSBG
	N	<i>Guzmania lindenii</i> (André) Mez	Tillandsioideae	MSBG
	Y	<i>Guzmania lingulata</i> (L.) Mez	Tillandsioideae	CUBG
	Y	[†] <i>Guzmania monostachia</i> (L.) Rusby ex Mez	Tillandsioideae	CUBG
	N	<i>Guzmania musaica</i> (Linden & André) Mez	Tillandsioideae	MSG
	N	<i>Guzmania regalis</i> H.Luther	Tillandsioideae	MSBG
	N	<i>Guzmania wittmackii</i> (André) André ex Mez	Tillandsioideae	RBGE
	N	<i>Lemeltonia cornuta</i> (Mez & Sodiro) Barfuss & W. Till	Tillandsioideae	MSBG
	N	<i>Lutheria bi-beatricis</i> (Morillo) Barfuss & W. Till	Tillandsioideae	MSBG
	Y	<i>Lutheria glutinosa</i> Lindl.	Tillandsioideae	CUBG
	Y	<i>Lutheria splendens</i> (Brongn.) Barfuss & W. Till	Tillandsioideae	CUBG
	N	<i>Mezobromelia pleiosticha</i> (Grisebach) Utleý & H.Luther	Tillandsioideae	RBGK
	N	<i>Pseudalcantarea viridiflora</i> (Beer) Pinzón & Barfuss	Tillandsioideae	RBGE
	Y	<i>Racinaea dyeriana</i> (André) Barfuss & W. Till	Tillandsioideae	CUBG
	N	<i>Racinaea multiflora</i> (Benth.) M.A.Spencer & L.B.Sm.	Tillandsioideae	RBGK
	N	<i>Racinaea spiculosa</i> (Griseb.) M.A.Spencer & L.B.Sm.	Tillandsioideae	CUBG
	N	<i>Tillandsia amicorum</i> I.Ramírez & Bevilacqua	Tillandsioideae	RBGK
	N	<i>Tillandsia australis</i> Mez	Tillandsioideae	MSBG
	N	<i>Tillandsia complanata</i> Benth.	Tillandsioideae	RBGK
	Y	<i>Tillandsia leiboldiana</i> Schltdl.	Tillandsioideae	CUBG
	N	<i>Tillandsia rauhii</i> L.B.Sm.	Tillandsioideae	MSBG
	N	<i>Tillandsia reversa</i> L. B. Smith	Tillandsioideae	MSBG
	N	<i>Vriesea erythrodactylon</i> (E.Morren) E.Morren ex Mez	Tillandsioideae	RBGE
	Y	<i>Vriesea fenestralis</i> Linden & André	Tillandsioideae	CUBG
	Y	<i>Vriesea fosteriana</i> L.B.Sm.	Tillandsioideae	CUBG
	N	<i>Vriesea friburgensis</i> Mez	Tillandsioideae	MSBG
	Y	<i>Vriesea gigantea</i> Gaudich.	Tillandsioideae	CUBG
	Y	<i>Vriesea guttata</i> Linden & André	Tillandsioideae	CUBG
	N	<i>Vriesea incurvata</i> Gaudich.	Tillandsioideae	RBGE
	N	<i>Vriesea lubbersii</i> (Baker) E.Morren ex Mez	Tillandsioideae	RBGE
	N	<i>Vriesea platynema</i> Gaudich.	Tillandsioideae	RBGK
	N	<i>Vriesea psittacina</i> (Hook.) Lindl.	Tillandsioideae	RBGE
	N	<i>Vriesea rubyae</i> E.Pereira	Tillandsioideae	RBGE
	N	<i>Vriesea saundersii</i> (Carrière) E.Morren ex Mez	Tillandsioideae	MSBG
	N	<i>Wallisia lindeniana</i> (Regel) E.Morren	Tillandsioideae	MSBG

	N	<i>Werauhia gladioliflora</i> (H.Wendland) J.R.Grant	Tillandsioideae	RBGE
	N	<i>Werauhia marnier-lapostollei</i> (L.B.Sm.) J.R.Grant	Tillandsioideae	RBGE
	N	<i>Werauhia ringens</i> (Grisebach) J.R.Grant	Tillandsioideae	RBGE
	Y	<i>Werauhia sanguinolenta</i> (Linden ex Cogniaux & Marchal) J.R.Grant	Tillandsioideae	CUBG
	N	<i>Werauhia viridiflora</i> (Regel) J.R.Grant	Tillandsioideae	RBGE
CAM terrestrials	N	<i>Ananas ananassoides</i> (Baker) L.B.Sm.	Bromelioideae	MSBG
	N	<i>Ananas ananassoides</i> var. <i>nanus</i> L.B.Sm.	Bromelioideae	MSBG
	N	<i>Ananas sagenaria</i> (Arruda) Schult. & Schult.f.	Bromelioideae	MSBG
	Y	<i>Ananas comosus</i> (L.) Merr.	Bromelioideae	CUBG
	N	<i>Ananas lucidus</i> Mill.	Bromelioideae	RBGE
	N	<i>Ananas paraguayensis</i> Camargo & L.B.Sm.	Bromelioideae	MSBG
	N	<i>Bromelia balansae</i> Mez	Bromelioideae	MSBG
	N	<i>Bromelia epiphytica</i> L.B.Sm.	Bromelioideae	MSBG
	N	<i>Bromelia flemingii</i> I.Ramírez & Carnevali	Bromelioideae	MSBG
	N	<i>Bromelia goyazensis</i> Mez	Bromelioideae	MSBG
	Y	<i>Bromelia humilis</i> Jacq.	Bromelioideae	CUBG
	N	<i>Bromelia macedoi</i> L.B.Sm.	Bromelioideae	RBGE
	N	<i>Bromelia scarlatina</i> (Linden) E.Morren	Bromelioideae	MSBG
	Y	<i>Cryptanthus acaulis</i> (Lindl.) Beer	Bromelioideae	RBGK
	N	<i>Cryptanthus beuckeri</i> E.Morren	Bromelioideae	CUBG
	Y	<i>Cryptanthus bivittatus</i> (Hook.) Regel	Bromelioideae	CUBG
	N	<i>Cryptanthus brevifolius</i> Leme	Bromelioideae	RBGK
	N	<i>Cryptanthus bromelioides</i> Otto & A.Dietr.	Bromelioideae	RBGK
	N	<i>Cryptanthus capitatus</i> Leme	Bromelioideae	MSBG
	N	<i>Cryptanthus colnagoi</i> Rauh & Leme	Bromelioideae	RBGK
	N	<i>Cryptanthus diana</i> Leme	Bromelioideae	MSBG
	N	* <i>Cryptanthus fernseeoides</i> Leme	Bromelioideae	MSBG
	N	<i>Cryptanthus grazielae</i> H.Luther	Bromelioideae	MSBG
	N	<i>Cryptanthus incrassatus</i> L.B.Sm.	Bromelioideae	MSBG
	N	<i>Cryptanthus lyman-smithii</i> Leme	Bromelioideae	MSBG
	N	<i>Cryptanthus maritimus</i> L.B.Sm.	Bromelioideae	MSBG
	N	<i>Cryptanthus osiris</i> W.Weber	Bromelioideae	MSBG
	N	<i>Cryptanthus pickelii</i> L.B.Sm.	Bromelioideae	RBGK
	N	* <i>Cryptanthus pseudoscaposus</i> L.B.Sm.	Bromelioideae	MSBG
	N	<i>Cryptanthus whitmanii</i> Leme	Bromelioideae	RBGK
	Y	<i>Deuterocohnia brevifolia</i> (Griseb.) M.A.Spencer & L.B.Sm.	Pitcairnioideae	CUBG
	N	<i>Deuterocohnia brevispicata</i> Rauh & L.Hrom.	Pitcairnioideae	MSBG
	Y	<i>Deuterocohnia lorentziana</i> (Mez) M.A.Spencer & L.B.Sm.	Pitcairnioideae	CUBG
	N	<i>Deuterocohnia meziana</i> Kuntze ex Mez	Pitcairnioideae	RBGE
	N	<i>Deuterocohnia schreiteri</i> A.Cast.	Pitcairnioideae	MSBG
	N	<i>Deuterocohnia seramisiana</i> R. Vasquez, Ibisch & E. Gross	Pitcairnioideae	MSBG
	N	<i>Disteganthus lateralis</i> (L.B.Sm.) Gouda	Bromelioideae	MSBG
	N	<i>Dyckia choristaminea</i> Mez	Pitcairnioideae	RBGE
	N	<i>Dyckia encholirioides</i> (Gaudich.) Mez	Pitcairnioideae	MSBG
	N	<i>Dyckia frigida</i> Hook.f.	Pitcairnioideae	MSBG
	N	<i>Dyckia hebdingii</i> L.B.Sm.	Pitcairnioideae	MSBG
	N	<i>Dyckia jonesiana</i> T.Strehl	Pitcairnioideae	MSBG
	N	<i>Dyckia microcalyx</i> Baker	Pitcairnioideae	MSBG
	N	<i>Dyckia milagrensis</i> Leme	Pitcairnioideae	MSBG
	N	<i>Dyckia pseudococcinea</i> L.B.Sm.	Pitcairnioideae	MSBG
	N	<i>Dyckia rariflora</i> Schult. & Schult.f.	Pitcairnioideae	CUBG
	Y	<i>Dyckia remotiflora</i> A.Dietr.	Pitcairnioideae	CUBG
	N	<i>Dyckia saxatilis</i> Mez	Pitcairnioideae	MSBG

	N	<i>Encholirium magalhaesii</i> L.B.Sm.	Pitcairnioideae	MSBG
	N	<i>Encholirium spectabile</i> Mart. ex Schult. & Schult.f.	Pitcairnioideae	RBGE
	N	<i>Hechtia argentea</i> (B.S.Williams) Baker	Hechtioideae	MSBG
	N	<i>Hechtia carlsoniae</i> Burt-Utley & Utley	Hechtioideae	MSBG
	N	<i>Hechtia dichroantha</i> Donn.Sm.	Hechtioideae	MSBG
	N	<i>Hechtia epigyna</i> Harms	Hechtioideae	MSBG
	N	<i>Hechtia fragilis</i> Burt-Utley & Utley	Hechtioideae	MSBG
	N	<i>Hechtia glomerata</i> Zuccharini	Hechtioideae	MSBG
	N	<i>Hechtia lundelliorum</i> L.B.Sm.	Hechtioideae	MSBG
	N	<i>Hechtia malvernii</i> Gilmartin	Hechtioideae	MSBG
	N	<i>Hechtia marnier-lapostollei</i> L.B.Sm.	Hechtioideae	MSBG
	N	<i>Hechtia montana</i> Brandegees	Hechtioideae	MSBG
	N	<i>Hechtia mooreana</i> L.B.Sm.	Hechtioideae	MSBG
	N	<i>Hechtia pumila</i> Burt-Utley & Utley	Hechtioideae	MSBG
	N	<i>Hechtia purpusii</i> Brandegees	Hechtioideae	MSBG
	N	<i>Hechtia rosea</i> E.Morren ex Baker	Hechtioideae	MSBG
	N	<i>Hechtia tillandsioides</i> (André) L.B.Sm.	Hechtioideae	MSBG
	N	<i>Neoglaziovia variegata</i> (Arruda) Mez	Bromelioideae	RBGK
	N	<i>Orthophytum alvimii</i> W.Weber	Bromelioideae	MSBG
	N	<i>Orthophytum benzingii</i> Leme & H.Luther	Bromelioideae	MSBG
	N	<i>Orthophytum disjunctum</i> L.B.Sm.	Bromelioideae	MSBG
	N	<i>Orthophytum duartei</i> L.B.Sm.	Bromelioideae	MSBG
	N	<i>Orthophytum foliosum</i> L.B.Sm.	Bromelioideae	MSBG
	N	<i>Orthophytum gurkenii</i> Hutchison	Bromelioideae	MSBG
	N	<i>Orthophytum rubrum</i> L.B.Sm.	Bromelioideae	MSBG
	N	<i>Orthophytum saxicola</i> (Ule) L.B.Sm.	Bromelioideae	MSBG
	N	<i>Orthophytum sucrei</i> H. Luther	Bromelioideae	MSBG
CAM tank- epiphytes	N	<i>*Acanthostachys pitcairnioides</i> (Mez) Rauh & Barthlott	Bromelioideae	RBGK
	N	<i>Acanthostachys strobilacea</i> (Schult.f.) Klotsch	Bromelioideae	RBGK
	N	<i>Aechmea aciculosa</i> Mez & Sodiro	Bromelioideae	MSBG
	N	<i>Aechmea alba</i> Mez	Bromelioideae	MSBG
	N	<i>Aechmea allenii</i> L.B.Sm.	Bromelioideae	MSBG
	Y	<i>Aechmea aquilega</i> (Salisb.) Griseb.	Bromelioideae	CUBG
	N	<i>Aechmea blumenavii</i> Reitz	Bromelioideae	MSBG
	N	<i>Aechmea bromeliifolia</i> (Rudge) Baker	Bromelioideae	RBGK
	N	<i>Aechmea calyculata</i> (E.Morren) Baker	Bromelioideae	MSBG
	N	<i>Aechmea chantinii</i> (Carriere) Baker	Bromelioideae	RBGK
	N	<i>Aechmea coelestis</i> (K. Koch) E.Morren	Bromelioideae	RBGK
	N	<i>Aechmea disjuncta</i> (L B Smith) Leme & J A Siqueira	Bromelioideae	MSBG
	N	<i>Aechmea distichantha</i> Lem.	Bromelioideae	RBGK
	N	<i>Aechmea drakeana</i> André	Bromelioideae	RBGK
	Y	<i>Aechmea fasciata</i> (Lindl.) Baker	Bromelioideae	CUBG
	Y	<i>Aechmea fendleri</i> André ex Mez	Bromelioideae	CUBG
	Y	<i>Aechmea filicaulis</i> (Griseb.) Mez	Bromelioideae	CUBG
	Y	<i>Aechmea gamosepala</i> Wittm.	Bromelioideae	CUBG
	N	<i>Aechmea lamarchei</i> (Morr.) Mez	Bromelioideae	RBGK
	N	<i>Aechmea longifolia</i> (Rudge) L.B.Sm. & M.A.Spencer	Bromelioideae	RBGK
	N	<i>Aechmea lueddemanniana</i> (K.Koch) Mez	Bromelioideae	MSBG
	N	<i>Aechmea marauensis</i> Leme	Bromelioideae	MSBG
	N	<i>Aechmea miniata</i> (Beer) hort. ex Baker	Bromelioideae	RBGK
	Y	<i>Aechmea nudicaulis</i> (L.) Griseb.	Bromelioideae	CUBG
	N	<i>Aechmea orlandiana</i> L.B.Sm.	Bromelioideae	RBGK
	N	<i>Aechmea pineliana</i> (Brongn. ex Planch.) Baker	Bromelioideae	RBGK
	N	<i>Aechmea ramosa</i> Mart. ex Schult. & Schult.f.	Bromelioideae	MSBG
	N	<i>Aechmea recurvata</i> (Klotzsch) L.B.Sm.	Bromelioideae	RBGK
	N	<i>Aechmea subintegerrima</i> (Philcox) Leme	Bromelioideae	MSBG
	N	<i>Aechmea tayoensis</i> Gilmartin	Bromelioideae	MSBG

N	<i>Aechmea turbinocalyx</i> Mez	Bromelioideae	MSBG
N	<i>Aechmea victoriana</i> L.B.Sm.	Bromelioideae	CUBG
N	<i>Aechmea warasii</i> E.Pereira	Bromelioideae	MSBG
N	<i>Aechmea winkleri</i> Reitz	Bromelioideae	MSBG
N	<i>Androlepis skinneri</i> Brongniart ex Houillet	Bromelioideae	MSBG
N	<i>Araeococcus flagellifolius</i> Harms	Bromelioideae	RBGK
N	<i>Araeococcus goeldianus</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Araeococcus micranthus</i> Brongn.	Bromelioideae	RBGK
N	<i>Araeococcus nigropurpureus</i> Leme & J.A.Siqueira	Bromelioideae	MSBG
N	<i>Billbergia amoena</i> (Loddiges) Lindley	Bromelioideae	MSBG
N	<i>Billbergia decora</i> Poepp. & Endl.	Bromelioideae	MSBG
N	<i>Billbergia euphemiae</i> E.Morren	Bromelioideae	CUBG
N	<i>Billbergia laxiflora</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Billbergia leptopoda</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Billbergia macrolepis</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Billbergia manarae</i> Steyerl.	Bromelioideae	MSBG
N	<i>Billbergia oxysepala</i> Mez	Bromelioideae	MSBG
N	<i>Billbergia pallidiflora</i> Liebm.	Bromelioideae	MSBG
N	<i>Billbergia robert-readii</i> E.Gross & Rauh	Bromelioideae	MSBG
N	<i>Billbergia sanderiana</i> E.Morren	Bromelioideae	MSBG
N	<i>Billbergia speciosa</i> Thunb.	Bromelioideae	MSBG
N	<i>Billbergia stenopetala</i> Harms	Bromelioideae	MSBG
N	<i>Billbergia tessmannii</i> Harms	Bromelioideae	MSBG
N	<i>Billbergia viridiflora</i> H.Wendl	Bromelioideae	MSBG
N	<i>Billbergia vittata</i> Brongn. ex Morel	Bromelioideae	MSBG
N	<i>Canistropsis exigua</i> (E.Pereira & Leme) Leme	Bromelioideae	MSBG
N	<i>Canistropsis marceloi</i> (E.Pereira & Moutinho) Leme	Bromelioideae	MSBG
N	<i>Canistropsis microps</i> (E.Morren ex Mez) Leme	Bromelioideae	MSBG
N	<i>Hohenbergia augusta</i> (Vell.) E.Morren	Bromelioideae	MSBG
N	<i>Hohenbergia belemii</i> L.B.Sm. & Read	Bromelioideae	MSBG
N	<i>Hohenbergia brachycephala</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Hohenbergia catingae</i> Ule	Bromelioideae	MSBG
N	<i>Hohenbergia edmundoi</i> L.B.Sm. & Read	Bromelioideae	MSBG
N	<i>Hohenbergia inermis</i> Mez	Bromelioideae	MSBG
N	<i>Hohenbergia negrilensis</i> Britton ex L.B.Sm.	Bromelioideae	MSBG
N	<i>Hohenbergia portoricensis</i> Mez	Bromelioideae	MSBG
N	<i>Hohenbergia proctorii</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Hohenbergia undulatifolia</i> Leme & H.Luther	Bromelioideae	MSBG
N	<i>Hohenbergia urbaniana</i> Mez	Bromelioideae	MSBG
N	<i>Hohenbergia utriculosa</i> Ule	Bromelioideae	MSBG
N	<i>Lymania alvimii</i> (L.B.Sm. & Read) Read	Bromelioideae	MSBG
N	<i>Lymania azurea</i> Leme	Bromelioideae	RBGK
N	<i>Lymania smithii</i> Read	Bromelioideae	MSBG
N	<i>Lymania spiculata</i> Leme & Forzza	Bromelioideae	MSBG
N	<i>Neoregelia amandae</i> W.Weber	Bromelioideae	MSBG
N	<i>Neoregelia ampullacea</i> (E.Morren) L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia bahiana</i> (Ule) L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia carolinae</i> (Beer) L.B.Sm.	Bromelioideae	RBGE
N	<i>Neoregelia chlorosticta</i> (hort. Saunders ex W.Marshall) L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia compacta</i> (Mez) L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia crispata</i> Leme	Bromelioideae	MSBG
N	<i>Neoregelia eleutheropetala</i> (Ule) L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia gavionensis</i> Martinelli & Leme	Bromelioideae	MSBG
N	<i>Neoregelia hoehneana</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia indecora</i> (Mez) L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia johnsoniae</i> H.Luther	Bromelioideae	MSBG

N	<i>Neoregelia laevis</i> (Mez) L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia lilliputiana</i> E.Pereira	Bromelioideae	MSBG
N	<i>Neoregelia longipedicellata</i> Leme	Bromelioideae	MSBG
N	<i>Neoregelia macrosepala</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia magdalenae</i> L.B.Sm. & Reitz	Bromelioideae	MSBG
N	<i>Neoregelia marmorata</i> (Baker) L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia mooreana</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia mucugensis</i> Leme	Bromelioideae	MSBG
N	<i>Neoregelia myrmecophila</i> (Ule) L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia nivea</i> Leme	Bromelioideae	MSBG
N	<i>Neoregelia olens</i> (Hook.f.) L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia pauciflora</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia paulistana</i> E.Pereira	Bromelioideae	MSBG
N	<i>Neoregelia pendula</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia pernambucana</i> Leme & J.A.Siqueira	Bromelioideae	MSBG
N	<i>Neoregelia roethii</i> W.Weber	Bromelioideae	MSBG
N	<i>Neoregelia rosea</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia rothinessa</i> Leme, H. Luther & W. Till	Bromelioideae	MSBG
N	<i>Neoregelia rubrovittata</i> Leme	Bromelioideae	MSBG
N	<i>Neoregelia ruschii</i> Leme & B.R. Silva	Bromelioideae	MSBG
N	<i>Neoregelia sapiatibensis</i> Pereira & I.A.Penna	Bromelioideae	MSBG
N	<i>Neoregelia sarmentosa</i> (Regel) L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia simulans</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia tarapotoensis</i> Rauh	Bromelioideae	MSBG
N	<i>Neoregelia tigrina</i> (Ruschi) Ruschi	Bromelioideae	MSBG
N	<i>Neoregelia wilsoniana</i> M.B.Foster	Bromelioideae	MSBG
N	<i>Neoregelia wurdackii</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Neoregelia zonata</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Nidularium albiflorum</i> (L.B.Sm.) Leme	Bromelioideae	MSBG
N	<i>*Nidularium amazonicum</i> (Baker) Linden & E.Morren ex Lindman	Bromelioideae	MSBG
N	<i>Nidularium amorimii</i> Leme	Bromelioideae	MSBG
N	<i>Nidularium angustifolium</i> Ule	Bromelioideae	MSBG
N	<i>*Nidularium apiculatum</i> L.B.Sm.	Bromelioideae	MSBG
Y	<i>Nidularium billbergioides</i> (Schult. & Schult. f.) L.B.Sm.	Bromelioideae	CUBG
N	<i>Nidularium campo-alegrensis</i> Leme	Bromelioideae	MSBG
N	<i>*Nidularium campos-portoi</i> (L.B.Sm.) Wanderley & B.A.Moreira	Bromelioideae	MSBG
N	<i>Nidularium espiritosantense</i> Leme	Bromelioideae	MSBG
N	<i>*Nidularium ferdinando-coburgii</i> Wawra	Bromelioideae	MSBG
N	<i>Nidularium fradense</i> Leme	Bromelioideae	MSBG
N	<i>Nidularium fulgens</i> Lem.	Bromelioideae	MSBG
Y	<i>*Nidularium innocentii</i> Lem.	Bromelioideae	CUBG
N	<i>Nidularium krisgreeniae</i> Leme	Bromelioideae	MSBG
N	<i>Nidularium linehamii</i> Leme	Bromelioideae	MSBG
N	<i>*Nidularium picinguabensis</i> Leme	Bromelioideae	MSBG
N	<i>Nidularium procerum</i> Lindm.	Bromelioideae	MSBG
N	<i>Nidularium rosulatum</i> Ule	Bromelioideae	MSBG
N	<i>*Nidularium rubens</i> Mez	Bromelioideae	MSBG
N	<i>Nidularium serratum</i> Leme	Bromelioideae	MSBG
N	<i>Nidularium viridipetalum</i> Leme	Bromelioideae	MSBG
N	<i>Portea grandiflora</i> Philcox	Bromelioideae	MSBG
N	<i>Quesnelia augusto-coburgi</i> Wawra	Bromelioideae	RBGE
N	<i>Quesnelia edmundoi</i> L.B.Sm.	Bromelioideae	MSBG
N	<i>Quesnelia kautskyi</i> C.Vieira	Bromelioideae	MSBG
N	<i>Quesnelia lateralis</i> Wawra	Bromelioideae	MSBG
N	<i>Quesnelia liboniana</i> (De Jonghe) Mez	Bromelioideae	MSBG

	N	<i>Quesnelia marmorata</i> (Lem.) Read	Bromelioideae	MSBG
	N	<i>Quesnelia strobilispica</i> Wawra	Bromelioideae	MSBG
	N	<i>Ronnbergia silvana</i> Leme	Bromelioideae	MSBG
	Y	<i>Tillandsia fasciculata</i> Sw.	Tillandsioideae	CUBG
	Y	<i>Tillandsia utriculata</i> L.	Tillandsioideae	CUBG
	N	<i>Ursulaea tuitensis</i> (Magaña & E.J.Lott) Read & H.U.Baensch	Bromelioideae	MSBG
	N	* <i>Wittrockia cyathiformis</i> (Vellozo) Leme	Bromelioideae	RBGK
	N	<i>Wittrockia gigantea</i>	Bromelioideae	RBGK
	N	<i>Wittrockia superba</i>	Bromelioideae	RBGK
CAM atmospheric epiphytes	N	<i>Tillandsia arequita</i> (André) André ex Mez	Tillandsioideae	RBGK
	N	<i>Tillandsia arhiza</i> Mez	Tillandsioideae	MSBG
	N	<i>Tillandsia balsasensis</i> Rauh	Tillandsioideae	RBGK
	N	<i>Tillandsia belloensis</i> W.Weber	Tillandsioideae	RBGK
	Y	<i>Tillandsia brachycaulos</i> Schltdl.	Tillandsioideae	CUBG
	Y	<i>Tillandsia bulbosa</i> Hook.	Tillandsioideae	CUBG
	Y	<i>Tillandsia butzii</i> Mez	Tillandsioideae	CUBG
	N	<i>Tillandsia cacticola</i> L.B.Sm.	Tillandsioideae	RBGE
	Y	<i>Tillandsia caput-medusae</i> E.Morren	Tillandsioideae	CUBG
	N	<i>Tillandsia chlorophylla</i> L.B.Sm.	Tillandsioideae	MSBG
	N	<i>Tillandsia copanensis</i> Rauh & Rutschmann	Tillandsioideae	MSBG
	N	<i>Tillandsia crocata</i> (E.Morren) N.E.Br.	Tillandsioideae	RBGK
	N	<i>Tillandsia dura</i> Baker	Tillandsioideae	MSBG
	N	<i>Tillandsia duratii</i> Vis.	Tillandsioideae	RBGK
	N	<i>Tillandsia edithae</i> Rauh	Tillandsioideae	MSBG
	N	<i>Tillandsia funckiana</i> Baker	Tillandsioideae	MSBG
	N	<i>Tillandsia guenther-nolleri</i> Ehlers	Tillandsioideae	MSBG
	N	<i>Tillandsia harrisii</i> R Ehlers	Tillandsioideae	RBGK
	Y	<i>Tillandsia ionantha</i> Planch.	Tillandsioideae	CUBG
	Y	<i>Tillandsia juncea</i> (Ruiz & Pav.) Poir.	Tillandsioideae	CUBG
	N	<i>Tillandsia krukoffiana</i> L.B.Sm.	Tillandsioideae	MSBG
	N	<i>Tillandsia latifolia</i> Meyen	Tillandsioideae	MSBG
	N	<i>Tillandsia leucolepis</i> L.B.Sm.	Tillandsioideae	MSBG
	N	<i>Tillandsia lithophila</i> L. Hrom.	Tillandsioideae	RBGE
	N	<i>Tillandsia lymanii</i> Rauh	Tillandsioideae	MSBG
	N	<i>Tillandsia marnier-lapostollei</i> Rauh	Tillandsioideae	MSBG
	N	<i>Tillandsia mima</i> L.B.Sm.	Tillandsioideae	MSBG
	N	<i>Tillandsia mollis</i> H.Hrom. & W.Till	Tillandsioideae	RBGK
	N	<i>Tillandsia neglecta</i> E.Pereira	Tillandsioideae	MSBG
	N	<i>Tillandsia paleacea</i> C.Presl	Tillandsioideae	RBGK
	Y	<i>Tillandsia paucifolia</i> Baker	Tillandsioideae	CUBG
	N	<i>Tillandsia peiranoi</i> A.Cast.	Tillandsioideae	RBGK
	Y	<i>Tillandsia polystachia</i> (L.) L.	Tillandsioideae	CUBG
	N	<i>Tillandsia pruinosa</i> Sw.	Tillandsioideae	MSBG
	N	<i>Tillandsia pseudobaileyi</i> Gardner	Tillandsioideae	RBGK
	N	<i>Tillandsia rhodocephala</i> Ehlers & Koide	Tillandsioideae	MSBG
	N	<i>Tillandsia streptophylla</i> Scheidw. ex C. Morren	Tillandsioideae	MSBG
	Y	<i>Tillandsia stricta</i> Sol. ex Ker Gawl.	Tillandsioideae	CUBG
	N	<i>Tillandsia tenuifolia</i> L.	Tillandsioideae	RBGK
	N	<i>Tillandsia xerographica</i> Rohweder	Tillandsioideae	RBGE
	N	<i>Tillandsia xiphioides</i> Ker Gawl.	Tillandsioideae	MSBG

Table A3.1.1. Species used for drought resistance trait survey. Y/N in 'LES' column indicates whether species was included in the leaf economic trait survey. [‡]CAM $\delta^{13}\text{C}$ value in Crayn et al. (2015); [†]C₃-CAM; *C₃ $\delta^{13}\text{C}$ value in Crayn et al. (2015). Key to living collection sources: CUBG = Cambridge University Botanic Garden; MSBG = Marie Selby Botanical Gardens; RBGE = Royal Botanic Garden Edinburgh; RBGK = Royal Botanic Garden Kew.

Appendix 3.2

A3.2.1 Comparison of bench drying and overpressure methods for vulnerability curve construction

A comparison of bench drying and overpressure methods for vulnerability curve construction was made using four species of different functional types (*Pitcairnia integrifolia*, *Bromelia humilis*, *Vriesea fenestralis*, and *Aechmea aquilega*). Five replicate curves using each method were measured for each species. The results are shown plotted together in the following figure.

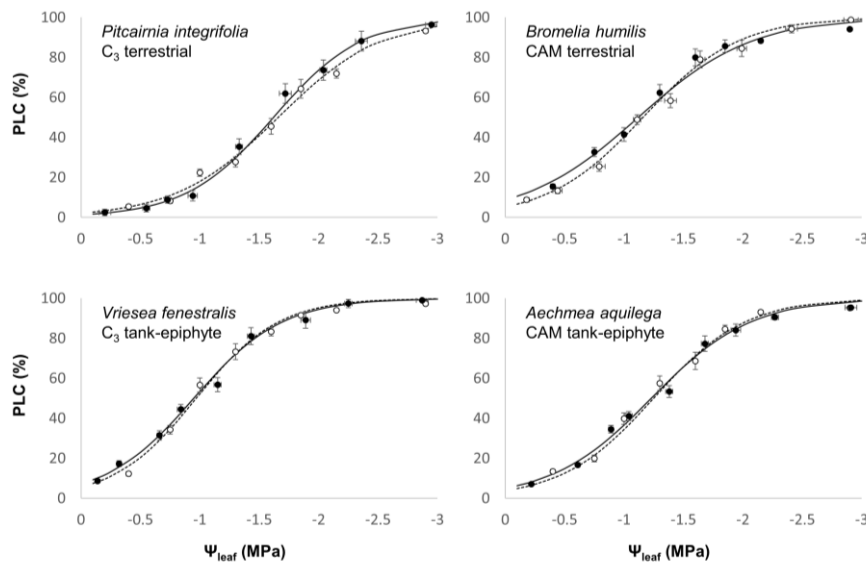


Figure A3.2.1. Comparison of leaf hydraulic vulnerability curves produced using overpressure and bench drying methods. Closed circles show mean data from the overpressure method, and open circles show mean data from bench drying method. Solid lines show sigmoidal response of percentage loss conductance (PLC) to leaf water potential (Ψ_{leaf}) fitted using overpressure method, and dashed lines show sigmoidal response of PLC to Ψ_{leaf} fitted using bench drying method. Error bars show $\pm$ standard error of mean.

The shape of leaf hydraulic vulnerability curves and the location of the fitted inflexion point at P_{50L} were very similar using either the overpressure or bench drying method for all four species tested (Fig. A3.2.1). While acknowledging the artefacts that the overpressure method could introduce into the data if it affects the structure of the mesophyll, on the basis of the high degree of consistency in vulnerability curves constructed using both approaches in these four species it was decided to use the overpressure method for the remaining species because of the much faster measurement cycle (ca. 8 hours compared with several days or more). The use of the overpressure method in other plant groups is not necessarily advocated, particularly those with less mechanically reinforced leaves, where it is likely to produce results considerably less consistent with more 'natural' dehydration.

Appendix 3.3

A3.3.3 Mean values and standard errors for leaf economic and hydraulic traits for 50 bromeliad species

Functional type	Species	$A_{\max}$ ($\mu\text{mol m}^{-2}$ s^{-1})	N_{leaf} (%)	PNUE ($A_{\max}/$ N_{leaf})	LMA (g m^{-2})	g_{smax} (mmol m^{-2} s^{-1})	iWUE ($A_{\max}/$ g_s)	P_{leaf} (%)	C: N	R_L ($\mu\text{mol m}^{-2}$ s^{-1})	R_D ($\mu\text{mol m}^{-2}$ s^{-1})	$\delta^{13}\text{C}$ (‰)
C₃ mesic terrestrial	<i>Pitcairnia imbricata</i>	6.32 ± 0.51	1.31 ± 0.03	4.38	110.1 ± 5.29	0.136 ± 0.002	46.5	0.017 ± 0.002	24.08 ± 0.12	0.43 ± 0.05	0.71 ± 0.05	-28.0 ± 0.3
	<i>Pitcairnia integrifolia</i>	6.08 ± 0.45	1.71 ± 0.02	3.09	114.9 ± 4.33	0.136 ± 0.005	44.7	0.019 ± 0.002	23.50 ± 0.33	0.45 ± 0.05	0.69 ± 0.06	-26.5 ± 0.3
	<i>Pitcairnia xanthocalyx</i>	6.81 ± 0.47	1.49 ± 0.02	8.63	53.0 ± 3.11	0.147 ± 0.009	46.2	0.022 ± 0.002	28.83 ± 0.15	0.42 ± 0.06	0.68 ± 0.05	-30.8 ± 0.4
	<i>Fascicularia bicolor</i>	4.53 ± 0.21	0.88 ± 0.01	1.80	286.7 ± 5.66	0.091 ± 0.003	50.1	0.020 ± 0.002	50.07 ± 1.41	0.44 ± 0.08	0.61 ± 0.05	-25.2 ± 0.3
	<i>Ochagavia elegans</i>	4.26 ± 0.23	0.82 ± 0.02	1.82	285.6 ± 7.98	0.098 ± 0.002	43.3	0.019 ± 0.001	18.33 ± 0.52	0.45 ± 0.06	0.64 ± 0.04	-23.6 ± 0.2
	<i>Puya alpestris</i>	4.50 ± 0.22	1.11 ± 0.02	1.23	316.5 ± 9.74	0.238 ± 0.011	18.9	0.024 ± 0.001	39.88 ± 1.03	0.40 ± 0.04	0.67 ± 0.04	-23.8 ± 0.3
C₃ succulent terrestrial	<i>Puya berteroniana</i>	3.43 ± 0.13	1.26 ± 0.01	0.92	295.2 ± 6.45	0.226 ± 0.012	15.2	0.023 ± 0.001	32.03 ± 1.22	0.38 ± 0.03	0.63 ± 0.05	-28.7 ± 0.4
	<i>Puya chilensis</i>	4.19 ± 0.20	1.20 ± 0.02	1.08	323.6 ± 6.76	0.221 ± 0.012	19.0	0.022 ± 0.001	36.51 ± 1.05	0.42 ± 0.04	0.65 ± 0.05	-23.1 ± 0.3
	<i>Puya mirabilis</i>	4.13 ± 0.21	0.88 ± 0.02	1.83	256.4 ± 4.55	0.212 ± 0.015	19.5	0.020 ± 0.002	43.61 ± 2.04	0.37 ± 0.04	0.66 ± 0.04	-25.5 ± 0.4
	<i>Puya venusta</i>	4.12 ± 0.22	0.71 ± 0.01	1.81	321.4 ± 3.55	0.243 ± 0.014	17.0	0.019 ± 0.002	55.44 ± 0.89	0.46 ± 0.03	0.62 ± 0.04	-26.1 ± 0.2
	<i>Catopsis berteroniana</i>	3.20 ± 0.17	0.90 ± 0.02	5.06	70.2 ± 2.05	0.075 ± 0.006	42.7	0.008 ± 0.001	49.56 ± 0.76	0.28 ± 0.02	0.33 ± 0.02	-26.1 ± 0.3
	<i>Catopsis floribunda</i>	3.43 ± 0.14	0.52 ± 0.01	11.11	59.4 ± 2.21	0.075 ± 0.008	46.1	0.007 ± 0.001	77.50 ± 1.45	0.25 ± 0.03	0.31 ± 0.02	-25.6 ± 0.3
C₃ tank-epiphyte	<i>Catopsis morreniana</i>	3.90 ± 0.14	1.04 ± 0.01	9.07	41.4 ± 1.89	0.077 ± 0.006	50.5	0.007 ± 0.001	48.66 ± 0.04	0.28 ± 0.02	0.36 ± 0.03	-25.0 ± 0.4
	<i>Guzmania lingulata</i>	4.01 ± 0.16	1.06 ± 0.01	7.09	53.4 ± 2.05	0.110 ± 0.009	36.5	0.009 ± 0.001	38.89 ± 0.76	0.31 ± 0.02	0.51 ± 0.03	-23.7 ± 0.4
	<i>Guzmania monostachia</i>	4.67 ± 0.19	1.11 ± 0.01	11.00	38.3 ± 1.37	0.101 ± 0.008	46.3	0.010 ± 0.002	39.31 ± 1.21	0.29 ± 0.03	0.52 ± 0.02	-26.6 ± 0.3

	<i>Lutheria glutinosa</i>	3.34 ± 0.14	0.82 ± 0.01	9.74	41.8 ± 1.54	0.118 ± 0.006	28.4	0.012 ± 0.001	52.91 ± 1.17	0.27 ± 0.01	0.42 ± 0.03	-28.4 ± 0.3
	<i>Lutheria splendens</i>	3.28 ± 0.19	0.74 ± 0.01	3.99	111.2 ± 4.08	0.079 ± 0.006	41.4	0.012 ± 0.002	57.08 ± 2.13	0.29 ± 0.02	0.41 ± 0.04	-27.1 ± 0.4
	<i>Nidularium innocentii</i>	1.81 ± 0.12	0.85 ± 0.01	1.49	143.1 ± 5.01	0.023 ± 0.002	80.0	0.008 ± 0.002	49.64 ± 1.98	0.18 ± 0.01	0.28 ± 0.03	-28.6 ± 0.2
	<i>Racinaea dyeriana</i>	3.80 ± 0.16	1.55 ± 0.02	5.86	41.9 ± 1.11	0.082 ± 0.004	46.2	0.014 ± 0.001	26.51 ± 1.77	0.33 ± 0.02	0.51 ± 0.03	-23.9 ± 0.4
	<i>Tillandsia leiboldiana</i>	3.40 ± 0.15	1.44 ± 0.02	2.64	89.5 ± 1.68	0.101 ± 0.007	33.7	0.013 ± 0.001	27.79 ± 1.03	0.29 ± 0.01	0.48 ± 0.03	-25.6 ± 0.4
	<i>Vriesea fenestralis</i>	4.01 ± 0.16	1.32 ± 0.03	3.25	93.5 ± 1.98	0.136 ± 0.006	29.5	0.012 ± 0.003	37.69 ± 0.54	0.35 ± 0.02	0.45 ± 0.04	-24.8 ± 0.3
	<i>Vriesea fosteriana</i>	4.10 ± 0.15	1.44 ± 0.02	2.76	103.3 ± 2.21	0.122 ± 0.007	33.6	0.013 ± 0.002	32.68 ± 0.79	0.33 ± 0.02	0.49 ± 0.02	-24.7 ± 0.3
	<i>Vriesea gigantea</i>	4.00 ± 0.17	1.58 ± 0.04	3.05	82.9 ± 2.14	0.119 ± 0.008	33.6	0.014 ± 0.002	31.57 ± 1.00	0.26 ± 0.02	0.41 ± 0.02	-23.9 ± 0.2
	<i>Vriesea guttata</i>	4.06 ± 0.13	1.48 ± 0.03	2.64	103.9 ± 5.17	0.130 ± 0.007	31.2	0.013 ± 0.002	31.72 ± 1.13	0.25 ± 0.02	0.40 ± 0.04	-24.7 ± 0.3
	<i>Werauhia sanguinolenta</i>	4.57 ± 0.24	0.72 ± 0.02	9.90	64.1 ± 3.06	0.136 ± 0.006	33.6	0.010 ± 0.001	59.43 ± 0.05	0.28 ± 0.02	0.36 ± 0.03	-25.6 ± 0.2
CAM terrestrial	<i>Ananas comosus</i>	2.92 ± 0.15	1.03 ± 0.01	0.83	283.4 ±4.89	0.018 ± 0.001	134.0	0.016 ± 0.003	39.59 ± 0.65	0.35 ± 0.03	0.46 ± 0.02	-15.1 ± 0.3
	<i>Bromelia humilis</i>	2.25 ± 0.13	0.85 ± 0.01	0.85	265.0 ± 7.68	0.010 ± 0.001	192.0	0.015 ± 0.004	47.16 ± 0.48	0.27 ± 0.03	0.33 ± 0.03	-17.8 ± 0.3
	<i>Cryptanthus acaulis</i>	1.20 ± 0.10	0.88 ± 0.01	0.56	245.2 ± 6.56	0.021 ± 0.002	57.2	0.013 ± 0.002	44.31 ± 1.13	0.25 ± 0.01	0.36 ± 0.03	-16.2 ± 0.2
	<i>Cryptanthus bivittatus</i>	1.23 ± 0.09	0.75 ± 0.01	0.65	251.6 ± 5.76	0.024 ± 0.003	51.4	0.012 ± 0.002	55.09 ± 1.04	0.22 ± 0.01	0.32 ± 0.02	-14.8 ± 0.3
	<i>Deuterocohnia brevifolia</i>	0.81 ± 0.05	0.74 ± 0.01	0.30	366.2 ±6.72	0.014 ± 0.001	58.1	0.011 ± 0.001	64.77 ± 2.13	0.20 ± 0.02	0.33 ± 0.03	-13.4 ± 0.2
	<i>Deuterocohnia lorentziana</i>	0.95 ± 0.07	0.45 ± 0.01	0.64	329.3 ± 8.89	0.017 ± 0.001	55.6	0.010 ± 0.002	96.53 ± 1.98	0.21 ± 0.01	0.36 ± 0.02	-14.0 ± 0.1
	<i>Dyckia remotiflora</i>	0.90 ± 0.06	0.93 ± 0.02	0.26	380.0 ±6.87	0.019 ± 0.002	47.5	0.010 ± 0.001	46.51 ± 0.54	0.23 ± 0.02	0.29 ± 0.02	-14.2 ± 0.3
CAM tank- epiphyte	<i>Aechmea aquilega</i>	2.63 ± 0.13	1.48 ± 0.03	1.95	171.0 ± 5.76	0.017 ± 0.001	155.0	0.013 ± 0.002	26.26 ± 1.32	0.19 ± 0.01	0.33 ± 0.03	-13.8 ± 0.2
	<i>Aechmea fasciata</i>	2.86 ± 0.16	0.82 ± 0.02	3.73	155.3 ± 4.33	0.010 ± 0.001	286.0	0.014 ± 0.001	49.13 ± 1.04	0.22 ± 0.01	0.35 ± 0.03	-20.4 ± 0.2
	<i>Aechmea fendleri</i>	2.81 ± 0.18	0.60 ± 0.03	5.23	189.7 ± 6.91	0.011 ± 0.001	256.0	0.010 ± 0.001	72.07 ± 0.43	0.29 ± 0.02	0.31 ± 0.02	-14.7 ± 0.1

	<i>Aechmea filicaulis</i>	2.94 ± 0.16	0.56 ± 0.02	10.05	52.2 ± 2.05	0.011 ± 0.001	267.0	0.011 ± 0.002	70.29 ± 2.12	0.41 ± 0.03	0.44 ± 0.04	-19.9 ± 0.3
	<i>Aechmea gamosepala</i>	2.95 ± 0.19	0.94 ± 0.01	5.81	54.0 ± 3.01	0.009 ± 0.001	328.0	0.012 ± 0.001	45.86 ± 1.46	0.28 ± 0.02	0.39 ± 0.04	-14.5 ± 0.1
	<i>Aechmea nudicaulis</i>	2.26 ± 0.18	0.92 ± 0.02	1.17	209.5 ± 5.99	0.013 ± 0.001	174.0	0.011 ± 0.002	48.54 ± 1.76	0.22 ± 0.02	0.36 ± 0.02	-15.3 ± 0.1
	<i>Nidularium billbergioides</i>	1.32 ± 0.14	0.69 ± 0.02	1.40	191.3 ±4.33	0.012 ± 0.002	154.0	0.011 ± 0.001	62.01 ± 1.03	0.38 ± 0.03	0.46 ± 0.03	-16.4 ± 0.3
	<i>Tillandsia fasciculata</i>	0.94 ± 0.09	0.94 ± 0.01	0.69	145.4 ± 5.01	0.013 ± 0.002	72.6	0.003 ± 0.001	44.93 ± 0.86	0.27 ± 0.02	0.34 ± 0.03	-15.7 ± 0.2
	<i>Tillandsia utriculata</i>	0.98 ± 0.07	0.49 ± 0.02	1.03	195.3 ± 4.21	0.009 ± 0.001	109.0	0.008 ± 0.001	89.51 ± 1.58	0.25 ± 0.02	0.36 ± 0.02	-15.0 ± 0.1
CAM atmospheric epiphyte	<i>Tillandsia brachycaulos</i>	0.91 ± 0.05	0.91 ± 0.01	0.71	140.7 ± 5.04	0.005 ± 0.001	182.0	0.006 ± 0.001	48.93 ± 0.41	0.24 ± 0.02	0.28 ± 0.02	-15.2 ± 0.2
	<i>Tillandsia bulbosa</i>	0.71 ± 0.07	0.82 ± 0.01	0.51	167.8 ± 4.41	0.006 ± 0.001	118.0	0.004 ± 0.001	53.40 ± 0.03	0.27 ± 0.01	0.25 ± 0.02	-14.9 ± 0.1
	<i>Tillandsia butzii</i>	0.88 ± 0.08	0.94 ± 0.01	0.52	177.6 ±5.16	0.005 ± 0.001	175.0	0.005 ± 0.001	42.21 ± 1.32	0.25 ± 0.02	0.32 ± 0.03	-14.8 ± 0.1
	<i>Tillandsia caput-medusae</i>	0.82 ± 0.06	0.56 ± 0.01	0.61	239.5 ± 6.26	0.006 ± 0.001	137.0	0.002 ± 0.001	73.38 ± 1.33	0.22 ± 0.02	0.35 ± 0.03	-13.6 ± 0.1
	<i>Tillandsia ionantha</i>	0.78 ± 0.04	0.84 ± 0.02	0.89	131.4 ± 4.38	0.008 ± 0.001	123.0	0.002 ± 0.001	53.44 ± 1.01	0.18 ± 0.01	0.28 ± 0.02	-16.1 ± 0.1
	<i>Tillandsia juncea</i>	0.70 ± 0.05	0.97 ± 0.01	0.47	152.9 ± 3.02	0.009 ± 0.001	78.2	0.004 ± 0.001	46.51 ± 0.86	0.19 ± 0.01	0.25 ± 0.02	-16.0 ± 0.2
	<i>Tillandsia paucifolia</i>	0.76 ± 0.05	0.67 ± 0.01	0.60	189.2 ± 4.11	0.008 ± 0.001	94.9	0.004 ± 0.001	72.61 ± 0.05	0.23 ± 0.02	0.33 ± 0.03	-14.6 ± 0.1
	<i>Tillandsia polystachia</i>	1.13 ± 0.09	0.89 ± 0.01	0.68	186.1 ± 5.00	0.010 ± 0.001	113.0	0.007 ± 0.001	40.64 ± 0.02	0.33 ± 0.02	0.37 ± 0.02	-16.1 ± 0.1
	<i>Tillandsia stricta</i>	1.09 ± 0.07	0.88 ± 0.01	0.71	173.6 ± 3.39	0.007 ± 0.001	156.0	0.005 ± 0.001	51.73 ± 0.31	0.27 ± 0.02	0.35 ± 0.02	-15.3 ± 0.1

Functional type	Species	VED (μm)	IVD (μm)	K_{leafmax} ($\text{mmol m}^{-2} \text{s}^{-1}$ MPa^{-1})	Ψ_{tlp} (MPa)	ϵ (MPa)	C_{FT} (mol m^{-2} MPa^{-1})	P_{505} (MPa)	P_{50L} (MPa)	SD (mm^{-2})	IAS (%)
C₃ mesic terrestrial	<i>Pitcairnia imbricata</i>	165.0 $\pm$ 5.6	272.5 $\pm$ 4.3	4.67 $\pm$ 0.16	-1.57 $\pm$ 0.11	17.70 $\pm$ 0.45	6.45 $\pm$ 0.43	-0.45 $\pm$ 0.02	-1.74 $\pm$ 0.05	415.6 $\pm$ 7.86	15.33 $\pm$ 1.00
		155.0 $\pm$ 6.2	248.0 $\pm$ 3.2	4.74 $\pm$ 0.07	-1.56 $\pm$ 0.05	19.96 $\pm$ 0.91	3.56 $\pm$ 0.12	-0.42 $\pm$ 0.03	-1.64 $\pm$ 0.04	412.97 $\pm$ 6.56	16.30 $\pm$ 0.87
	<i>Pitcairnia xanthocalyx</i>	182.5 $\pm$ 5.6	286.7 $\pm$ 3.7	5.48 $\pm$ 0.1	-1.57 $\pm$ 0.07	21.91 $\pm$ 1.06	3.63 $\pm$ 0.20	-0.50 $\pm$ 0.02	-1.72 $\pm$ 0.07	438.48 $\pm$ 7.12	15.81 $\pm$ 1.03
		425.0 $\pm$ 7.8	386.7 $\pm$ 5.5	5.12 $\pm$ 0.13	-1.54 $\pm$ 0.03	13.45 $\pm$ 2.11	7.97 $\pm$ 1.11	-0.46 $\pm$ 0.03	-1.51 $\pm$ 0.08	19.22 $\pm$ 1.34	5.91 $\pm$ 0.12
	<i>Ochagavia elegans</i>	495.0 $\pm$ 9.2	426.7 $\pm$ 5.9	3.79 $\pm$ 0.1	-1.52 $\pm$ 0.14	12.86 $\pm$ 1.01	10.00 $\pm$ 1.04	-0.45 $\pm$ 0.03	-1.47 $\pm$ 0.06	16.28 $\pm$ 1.22	5.00 $\pm$ 0.06
		287.5 $\pm$ 9.2	303.3 $\pm$ 4.3	1.79 $\pm$ 0.06	-1.39 $\pm$ 0.06	8.25 $\pm$ 0.23	12.17 $\pm$ 1.55	-0.45 $\pm$ 0.04	-1.37 $\pm$ 0.06	79.08 $\pm$ 3.03	4.16 $\pm$ 0.09
C₃ succulent terrestrial	<i>Puya alpestris</i>	280.0 $\pm$ 8.8	296.7 $\pm$ 3.9	2.60 $\pm$ 0.07	-1.31 $\pm$ 0.09	8.22 $\pm$ 0.34	10.12 $\pm$ 1.32	-0.52 $\pm$ 0.05	-1.38 $\pm$ 0.04	72.80 $\pm$ 4.01	3.88 $\pm$ 0.03
		275.0 $\pm$ 5.8	266.7 $\pm$ 6.6	1.68 $\pm$ 0.06	-1.40 $\pm$ 0.04	8.79 $\pm$ 0.41	9.19 $\pm$ 1.40	-0.48 $\pm$ 0.03	-1.38 $\pm$ 0.05	61.22 $\pm$ 3.27	5.84 $\pm$ 0.11
	<i>Puya berteroniana</i>	293.3 $\pm$ 8.7	313.3 $\pm$ 2.2	4.52 $\pm$ 0.11	-1.45 $\pm$ 0.10	14.05 $\pm$ 0.58	2.83 $\pm$ 0.16	-0.50 $\pm$ 0.02	-1.35 $\pm$ 0.08	75.40 $\pm$ 2.99	7.87 $\pm$ 0.08
		332.5 $\pm$ 5.5	310.0 $\pm$ 3.9	1.98 $\pm$ 0.09	-1.42 $\pm$ 0.08	9.32 $\pm$ 0.37	7.32 $\pm$ 0.92	-0.49 $\pm$ 0.04	-1.34 $\pm$ 0.07	66.32 $\pm$ 2.76	4.55 $\pm$ 0.07
	<i>Puya chilensis</i>	200.0 $\pm$ 4.6	343.3 $\pm$ 4.1	1.01 $\pm$ 0.06	-1.02 $\pm$ 0.04	8.64 $\pm$ 0.61	2.38 $\pm$ 0.08	-0.45 $\pm$ 0.04	-1.03 $\pm$ 0.07	44.22 $\pm$ 2.81	12.39 $\pm$ 0.15
		166.7 $\pm$ 7.1	311.0 $\pm$ 3.0	1.38 $\pm$ 0.06	-1.05 $\pm$ 0.03	8.01 $\pm$ 0.50	2.91 $\pm$ 0.07	-0.42 $\pm$ 0.03	-1.13 $\pm$ 0.06	39.17 $\pm$ 1.57	15.00 $\pm$ 0.21
	<i>Puya mirabilis</i>	117.5 $\pm$ 3.3	290.0 $\pm$ 3.3	1.05 $\pm$ 0.06	-1.01 $\pm$ 0.06	8.79 $\pm$ 0.44	3.40 $\pm$ 0.08	-0.44 $\pm$ 0.05	-0.97 $\pm$ 0.05	38.37 $\pm$ 1.49	14.22 $\pm$ 0.17
		120.0 $\pm$ 3.8	222.0 $\pm$ 3.9	0.89 $\pm$ 0.06	-1.09 $\pm$ 0.02	5.65 $\pm$ 0.31	2.95 $\pm$ 0.09	-0.31 $\pm$ 0.02	-0.98 $\pm$ 0.08	48.15 $\pm$ 1.05	19.42 $\pm$ 1.06
	<i>Puya venusta</i>	132.5 $\pm$ 4.5	242.0 $\pm$ 3.8	0.80 $\pm$ 0.07	-1.15 $\pm$ 0.05	4.87 $\pm$ 0.12	4.20 $\pm$ 0.05	-0.38 $\pm$ 0.01	-1.06 $\pm$ 0.07	37.12 $\pm$ 1.16	18.02 $\pm$ 0.94
		156.7 $\pm$ 2.8	193.3 $\pm$ 2.8	1.34 $\pm$ 0.13	-0.92 $\pm$ 0.04	4.44 $\pm$ 0.07	6.33 $\pm$ 0.08	-0.35 $\pm$ 0.04	-0.88 $\pm$ 0.06	21.45 $\pm$ 0.68	12.12 $\pm$ 0.71
C₃ tank-epiphyte	<i>Catopsis berteroniana</i>	212.5 $\pm$ 5.7	266.7 $\pm$ 3.9	0.49 $\pm$ 0.03	-0.81 $\pm$ 0.02	5.24 $\pm$ 0.11	5.45 $\pm$ 0.06	-0.27 $\pm$ 0.02	-0.79 $\pm$ 0.07	26.32 $\pm$ 0.91	8.29 $\pm$ 0.13
		156.7 $\pm$ 2.8	193.3 $\pm$ 2.8	1.34 $\pm$ 0.13	-0.92 $\pm$ 0.04	4.44 $\pm$ 0.07	6.33 $\pm$ 0.08	-0.35 $\pm$ 0.04	-0.88 $\pm$ 0.06	21.45 $\pm$ 0.68	12.12 $\pm$ 0.71
	<i>Catopsis floribunda</i>	156.7 $\pm$ 2.8	193.3 $\pm$ 2.8	1.34 $\pm$ 0.13	-0.92 $\pm$ 0.04	4.44 $\pm$ 0.07	6.33 $\pm$ 0.08	-0.35 $\pm$ 0.04	-0.88 $\pm$ 0.06	21.45 $\pm$ 0.68	12.12 $\pm$ 0.71
		156.7 $\pm$ 2.8	193.3 $\pm$ 2.8	1.34 $\pm$ 0.13	-0.92 $\pm$ 0.04	4.44 $\pm$ 0.07	6.33 $\pm$ 0.08	-0.35 $\pm$ 0.04	-0.88 $\pm$ 0.06	21.45 $\pm$ 0.68	12.12 $\pm$ 0.71
	<i>Catopsis morreniana</i>	156.7 $\pm$ 2.8	193.3 $\pm$ 2.8	1.34 $\pm$ 0.13	-0.92 $\pm$ 0.04	4.44 $\pm$ 0.07	6.33 $\pm$ 0.08	-0.35 $\pm$ 0.04	-0.88 $\pm$ 0.06	21.45 $\pm$ 0.68	12.12 $\pm$ 0.71
		156.7 $\pm$ 2.8	193.3 $\pm$ 2.8	1.34 $\pm$ 0.13	-0.92 $\pm$ 0.04	4.44 $\pm$ 0.07	6.33 $\pm$ 0.08	-0.35 $\pm$ 0.04	-0.88 $\pm$ 0.06	21.45 $\pm$ 0.68	12.12 $\pm$ 0.71

	<i>Nidularium innocentii</i>	255.0 ± 2.7	250.0 ± 3.6	0.54 ± 0.02	-1.38 ± 0.04	9.22 ± 0.14	3.61 ± 0.07	-0.33 ± 0.02	-1.19 ± 0.06	15.61 ± 0.16	8.90 ± 0.08
	<i>Racinaea dyeriana</i>	112.5 ± 3.1	213.3 ± 3.4	0.49 ± 0.01	-0.96 ± 0.03	5.54 ± 0.11	2.94 ± 0.03	-0.31 ± 0.03	-0.91 ± 0.06	29.9 ± 0.48	11.93 ± 0.86
	<i>Tillandsia leiboldiana</i>	90.0 ± 2.8	190.0 ± 2.9	1.21 ± 0.06	-1.05 ± 0.02	1.93 ± 0.02	3.42 ± 0.02	-0.34 ± 0.02	-0.95 ± 0.07	31.22 ± 0.61	10.53 ± 0.77
	<i>Vriesea fenestralis</i>	152.5 ± 2.8	240.0 ± 3.2	1.08 ± 0.06	-0.92 ± 0.05	5.91 ± 0.14	5.31 ± 0.02	-0.36 ± 0.03	-0.96 ± 0.07	22.16 ± 0.27	13.68 ± 0.91
	<i>Vriesea fosteriana</i>	136.0 ± 3.1	248.0 ± 3.3	0.88 ± 0.07	-0.91 ± 0.04	5.16 ± 0.20	5.70 ± 0.05	-0.33 ± 0.03	-0.87 ± 0.07	24.71 ± 0.55	15.86 ± 1.13
	<i>Vriesea gigantea</i>	176.7 ± 3.2	266.7 ± 3.9	0.81 ± 0.06	-0.92 ± 0.03	5.01 ± 0.10	5.30 ± 0.09	-0.39 ± 0.02	-0.90 ± 0.08	23.80 ± 0.68	12.42 ± 0.97
	<i>Vriesea guttata</i>	152.5 ± 2.6	273.3 ± 3.5	0.91 ± 0.06	-0.99 ± 0.05	5.10 ± 0.09	5.53 ± 0.12	-0.38 ± 0.03	-0.93 ± 0.07	21.01 ± 0.71	9.36 ± 0.81
	<i>Werauhia sanguinolenta</i>	140.0 ± 5.1	246.7 ± 3.6	1.84 ± 0.16	-1.02 ± 0.06	11.67 ± 0.55	5.02 ± 0.15	-0.35 ± 0.02	-1.11 ± 0.06	28.99 ± 0.80	14.01 ± 0.91
CAM terrestrial	<i>Ananas comosus</i>	457.5 ± 4.8	416.7 ± 4.4	0.14 ± 0.01	-1.16 ± 0.05	3.87 ± 0.03	8.63 ± 0.81	-0.54 ± 0.04	-1.17 ± 0.09	15.81 ± 0.15	6.21 ± 0.11
	<i>Bromelia humilis</i>	355.0 ± 7.6	323.3 ± 3.4	0.05 ± <0.01	-1.21 ± 0.08	4.03 ± 0.06	6.75 ± 0.56	-0.48 ± 0.05	-1.22 ± 0.08	16.57 ± 1.12	6.44 ± 0.10
	<i>Cryptanthus acaulis</i>	420.0 ± 8.8	380.0 ± 4.1	0.06 ± <0.01	-1.22 ± 0.09	2.54 ± 0.03	10.65 ± 0.99	-0.43 ± 0.04	-1.23 ± 0.10	10.22 ± 1.06	6.83 ± 0.11
	<i>Cryptanthus bivittatus</i>	435.0 ± 7.9	366.0 ± 4.4	0.04 ± <0.01	-1.22 ± 0.10	2.32 ± 0.04	11.93 ± 1.14	-0.39 ± 0.03	-1.22 ± 0.11	9.91 ± 0.87	6.01 ± 0.06
	<i>Deuterocohnia brevifolia</i>	362.0 ± 8.2	263.3 ± 4.2	0.02 ± <0.01	-0.92 ± 0.05	1.94 ± 0.02	13.92 ± 1.57	-0.45 ± 0.05	-0.95 ± 0.07	8.88 ± 0.76	7.18 ± 0.05
	<i>Deuterocohnia lorentziana</i>	370.0 ± 6.6	256.7 ± 3.9	0.03 ± <0.01	-0.95 ± 0.07	1.84 ± 0.02	13.63 ± 2.01	-0.48 ± 0.04	-0.92 ± 0.09	10.13 ± 1.03	5.11 ± 0.12
	<i>Dyckia remotiflora</i>	430.0 ± 7.3	240.0 ± 3.2	0.04 ± <0.01	-0.83 ± 0.04	3.47 ± 0.04	8.02 ± 0.76	-0.53 ± 0.04	-0.80 ± 0.10	7.15 ± 0.25	4.43 ± 0.14
CAM tank-epiphyte	<i>Aechmea aquilega</i>	350.0 ± 5.8	336.7 ± 3.5	0.22 ± 0.02	-1.22 ± 0.07	6.86 ± 0.05	5.79 ± 0.44	-0.55 ± 0.05	-1.27 ± 0.07	29.44 ± 1.31	11.58 ± 0.34
	<i>Aechmea fasciata</i>	357.5 ± 6.3	331.0 ± 5.5	0.28 ± 0.02	-1.14 ± 0.08	5.60 ± 0.10	5.13 ± 0.32	-0.62 ± 0.05	-1.24 ± 0.08	31.33 ± 1.21	9.01 ± 0.22
	<i>Aechmea fendleri</i>	327.5 ± 7.7	313.3 ± 3.8	0.16 ± 0.02	-1.18 ± 0.11	6.50 ± 0.12	6.11 ± 0.11	-0.52 ± 0.04	-1.20 ± 0.08	35.62 ± 1.22	10.26 ± 0.86
	<i>Aechmea filicaulis</i>	340.0 ± 8.2	343.3 ± 3.3	0.17 ± 0.04	-1.29 ± 0.12	6.62 ± 0.13	3.50 ± 0.12	-0.54 ± 0.03	-1.29 ± 0.06	37.29 ± 2.81	9.23 ± 0.54

CAM atmospheric epiphyte	<i>Aechmea gamosepala</i>	325.0 ± 6.8	330.0 ± 3.3	0.14 ± 0.01	-1.24 ± 0.09	7.39 ± 0.14	3.44 ± 0.08	-0.56 ± 0.04	-1.18 ± 0.07	31.01 ± 1.89	9.50 ± 0.41
	<i>Aechmea nudicaulis</i>	392.5 ± 5.8	320.0 ± 3.9	0.23 ± 0.02	-1.21 ± 0.10	4.82 ± 0.06	5.86 ± 0.34	-0.62 ± 0.06	-1.23 ± 0.08	26.43 ± 1.99	8.32 ± 0.38
	<i>Nidularium billbergioides</i>	262.5 ± 6.2	256.7 ± 2.9	0.26 ± 0.02	-1.05 ± 0.05	7.74 ± 0.21	3.56 ± 0.22	-0.34 ± 0.02	-1.14 ± 0.09	9.67 ± 0.32	9.10 ± 0.62
	<i>Tillandsia fasciculata</i>	465.0 ± 8.9	336.7 ± 3.8	0.08 ± 0.01	-0.66 ± 0.02	4.10 ± 0.08	6.15 ± 0.58	-0.30 ± 0.03	-0.73 ± 0.10	4.99 ± 0.10	6.15 ± 0.48
	<i>Tillandsia utriculata</i>	442.5 ± 9.1	336.7 ± 3.7	0.05 ± <0.01	-0.63 ± 0.06	4.00 ± 0.07	6.25 ± 0.19	-0.38 ± 0.04	-0.60 ± 0.04	4.85 ± 0.21	4.50 ± 0.11
	<i>Tillandsia brachycaulos</i>	402.5 ± 6.7	356.7 ± 3.5	0.03 ± <0.01	-1.12 ± 0.04	3.58 ± 0.05	9.22 ± 0.74	-0.37 ± 0.02	-1.18 ± 0.07	4.15 ± 0.15	7.93 ± 0.21
	<i>Tillandsia bulbosa</i>	475.0 ± 7.3	339.7 ± 4.4	0.03 ± <0.01	-0.81 ± 0.06	5.44 ± 0.04	7.31 ± 0.45	-0.39 ± 0.03	-0.90 ± 0.06	3.92 ± 0.24	6.01 ± 0.09
	<i>Tillandsia butzii</i>	397.5 ± 6.6	353.3 ± 4.2	0.01 ± <0.01	-0.81 ± 0.03	3.48 ± 0.02	11.42 ± 1.22	-0.37 ± 0.04	-0.82 ± 0.05	3.37 ± 0.26	5.16 ± 0.19
	<i>Tillandsia caput-medusae</i>	457.5 ± 5.8	330.0 ± 3.8	0.02 ± <0.01	-0.82 ± 0.04	1.60 ± 0.01	13.16 ± 1.07	-0.35 ± 0.03	-0.76 ± 0.07	4.05 ± 0.10	5.14 ± 0.21
	<i>Tillandsia ionantha</i>	430.0 ± 3.7	326.7 ± 3.3	0.01 ± <0.01	-0.90 ± 0.03	1.63 ± 0.02	12.70 ± 1.31	-0.37 ± 0.03	-0.85 ± 0.05	3.10 ± 0.13	6.20 ± 0.22
	<i>Tillandsia juncea</i>	327.5 ± 4.8	293.3 ± 4.5	0.03 ± <0.01	-0.98 ± 0.02	10.45 ± 0.76	4.00 ± 0.37	-0.33 ± 0.03	-1.02 ± 0.06	2.98 ± 0.14	4.71 ± 0.17
	<i>Tillandsia paucifolia</i>	487.5 ± 8.7	350.0 ± 4.7	0.01 ± <0.01	-0.75 ± 0.03	2.66 ± 0.06	14.05 ± 0.14	-0.39 ± 0.02	-0.72 ± 0.08	3.86 ± 0.12	5.75 ± 0.23
	<i>Tillandsia polystachia</i>	420.0 ± 6.7	335.0 ± 4.2	0.02 ± <0.01	-0.70 ± 0.03	4.27 ± 0.04	12.99 ± 1.18	-0.37 ± 0.01	-0.71 ± 0.07	4.12 ± 0.11	6.29 ± 0.19
	<i>Tillandsia stricta</i>	395.0 ± 6.5	345.0 ± 4.3	0.03 ± <0.01	-0.82 ± 0.03	1.60 ± 0.02	13.26 ± 1.09	-0.35 ± 0.03	-0.86 ± 0.07	4.24 ± 0.10	7.01 ± 0.21

Table A3.3.1. Mean values ($\pm$ SE) for leaf economic and hydraulic traits in 50 bromeliad species. Trait key: $A_{\max}$ = maximum photosynthetic capacity; N_{leaf} = leaf nitrogen content; PNUE = photosynthetic nitrogen-use efficiency; LMA = leaf mass per unit area; g_{smax} = maximal stomatal conductance; iWUE = intrinsic water-use efficiency; P_{leaf} = leaf phosphorus content; C: N = ratio of leaf carbon to nitrogen content; R_L = respiration in the light; R_D = dark respiration; $\delta^{13}\text{C}$ = carbon isotope ratio; VED = vein-epidermis distance; IVD = interveinal distance; K_{leafmax} = maximal leaf hydraulic conductance; Ψ_{tlp} = leaf water potential at turgor loss point; ϵ = leaf bulk elastic modulus; C_{FT} = leaf capacitance at full turgor; $P_{50\text{S}}$ = leaf water potential at 50% stomatal closure; $P_{50\text{L}}$ = leaf water potential at 50% loss hydraulic conductance; SD = stomatal density; IAS = internal air space fraction.

A3.3.2 Mean values for drought resistance and bioclimatic traits for 376 bromeliad species

Functional type	Species	Subfamily	π_o (MPa)	LMA (g m ⁻²)	SWC	WMA (g m ⁻²)	P _{seas} (%)	AI (mm mm ⁻¹)
C₃ mesic terrestrial	<i>Fosterella albicans</i>	Pitcairnioideae	-0.60	116.73	5.35	624.51	79.97	6129.65
	<i>Fosterella caulescens</i>	Pitcairnioideae	-0.65	100.65	5.54	557.60	54.17	11389.15
	<i>Fosterella micrantha</i>	Pitcairnioideae	-0.64	169.07	4.82	814.92	84.54	13612.43
	<i>Fosterella penduliflora</i>	Pitcairnioideae	-0.57	143.37	4.24	607.89	71.75	6349.54
	<i>Fosterella petiolata</i>	Pitcairnioideae	-0.67	129.06	4.11	530.44	65.89	7841.75
	<i>Fosterella rusbyi</i>	Pitcairnioideae	-0.62	201.53	5.04	1015.71	59.58	9475.25
	<i>Fosterella schidosperma</i>	Pitcairnioideae	-0.58	143.88	4.02	578.40	57.14	11021.53
	<i>Fosterella spectabilis</i>	Pitcairnioideae	-0.66	117.25	5.22	612.05	98.00	6118.14
	<i>Navia arida</i>	Navioideae	-0.51	152.61	3.88	592.13	58.50	13283.62
	<i>Navia lactea</i>	Navioideae	-0.50	105.50	2.99	315.45	61.67	18785.72
	<i>Pitcairnia andreana</i>	Pitcairnioideae	-0.64	97.27	3.83	372.54	NA	NA
	<i>Pitcairnia angustifolia</i>	Pitcairnioideae	-0.63	130.10	3.76	489.18	37.32	14063.30
	<i>Pitcairnia atrorubens</i>	Pitcairnioideae	-0.52	109.09	4.60	501.81	52.16	21299.50
	<i>Pitcairnia bergii</i>	Pitcairnioideae	-0.78	106.70	4.26	454.54	77.17	6772.64
	<i>Pitcairnia beycalema</i>	Pitcairnioideae	-0.70	91.84	3.89	357.26	47.63	12036.46
	<i>Pitcairnia breedlovei</i>	Pitcairnioideae	-0.81	88.32	4.03	355.93	95.27	6248.47
	<i>Pitcairnia caricifolia</i>	Pitcairnioideae	-0.57	156.67	3.00	470.01	47.88	15751.84
	<i>Pitcairnia cuzcoensis</i>	Pitcairnioideae	-0.73	81.63	3.88	316.72	55.38	8170.20
	<i>Pitcairnia flammea</i>	Pitcairnioideae	-0.72	85.71	3.09	264.84	53.21	10662.09
	<i>Pitcairnia funkiae</i>	Pitcairnioideae	-0.47	143.84	4.13	594.06	49.83	22363.31
	<i>Pitcairnia grafii</i>	Pitcairnioideae	-0.68	105.57	4.11	433.89	NA	NA
	<i>Pitcairnia imbricata</i>	Pitcairnioideae	-0.69	110.14	5.49	604.67	68.11	15156.65
	<i>Pitcairnia integrifolia</i>	Pitcairnioideae	-0.79	114.91	5.50	632.01	51.65	12712.34
	<i>Pitcairnia jareckii</i>	Pitcairnioideae	-0.69	173.47	4.18	725.10	NA	NA
	<i>Pitcairnia neglecta</i>	Pitcairnioideae	-0.73	111.17	4.67	519.16	NA	NA
	<i>Pitcairnia palmoides</i>	Pitcairnioideae	-0.66	98.90	3.94	389.67	40.88	17007.36

	<i>Pitcairnia paniculata</i>	Pitcairnioideae	-0.68	92.21	3.79	349.48	55.10	8606.94
	<i>Pitcairnia poortmanii</i>	Pitcairnioideae	-0.69	102.55	4.93	505.57	22.68	13038.07
	<i>Pitcairnia recurvata</i>	Pitcairnioideae	-0.71	136.02	2.90	394.46	66.44	15141.49
	<i>Pitcairnia riparia</i>	Pitcairnioideae	-0.70	95.56	4.24	405.17	29.73	14384.55
	<i>Pitcairnia sprucei</i>	Pitcairnioideae	-0.50	152.72	3.17	484.12	25.68	16915.59
	<i>Pitcairnia staminea</i>	Pitcairnioideae	-0.73	132.65	4.67	619.48	40.61	9425.30
	<i>Pitcairnia stevensonii</i>	Pitcairnioideae	-0.65	116.67	4.23	493.51	70.97	16708.01
	<i>Pitcairnia undulata</i>	Pitcairnioideae	-0.76	235.60	4.24	998.94	53.08	20102.51
	<i>Pitcairnia xanthocalyx</i>	Pitcairnioideae	-0.78	52.96	4.00	211.84	72.75	2089.17
C₃ succulent terrestrial	<i>Fascicularia bicolor</i>	Bromelioideae	-0.75	286.73	5.68	1628.63	57.46	9683.10
	<i>Fernseea bocainensis</i>	Bromelioideae	-0.52	112.80	3.10	349.68	NA	NA
	<i>Ochagavia elegans</i>	Bromelioideae	-0.76	285.62	7.57	2162.14	62.83	8978.06
	<i>Ochagavia litoralis</i>	Bromelioideae	-0.82	260.67	7.52	1960.24	88.39	9981.86
	<i>Puya alpestris</i>	Puyoideae	-0.77	316.50	10.45	3307.43	96.59	6372.49
	<i>Puya berteroniana</i>	Puyoideae	-0.70	295.24	10.90	3218.12	86.81	8041.39
	<i>Puya chilensis</i>	Puyoideae	-0.76	323.61	10.99	3556.47	103.37	3512.44
	<i>Puya coerulea</i>	Puyoideae	-0.71	273.33	9.18	2509.17	94.98	5961.03
	<i>Puya ferruginea</i>	Puyoideae	-0.66	325.65	11.88	3868.72	61.84	7464.67
	<i>Puya floccosa</i>	Puyoideae	-0.63	326.53	10.61	3464.48	55.59	16011.79
	<i>Puya humilis</i>	Puyoideae	-0.68	344.72	11.98	4129.75	91.35	5162.63
	<i>Puya laxa</i>	Puyoideae	-0.69	332.60	10.15	3375.89	70.88	4827.70
	<i>Puya mirabilis</i>	Puyoideae	-0.64	256.37	7.38	1892.01	96.73	15156.65
	<i>Puya stenothyrsa</i>	Puyoideae	-0.67	306.79	10.16	3116.99	68.44	8894.20
	<i>Puya venusta</i>	Puyoideae	-0.71	321.41	10.96	3522.65	106.52	2358.62
CAM terrestrial	<i>Ananas ananassoides</i>	Bromelioideae	-0.72	280.52	5.34	1497.98	64.60	9944.85
	<i>Ananas ananassoides</i> var. <i>nanus</i>	Bromelioideae	-0.73	267.55	6.12	1637.41	61.58	11943.49
	<i>Ananas comosus</i>	Bromelioideae	-0.69	283.36	6.17	1748.33	55.06	13834.30
	<i>Ananas lucidus</i>	Bromelioideae	-0.70	236.25	4.68	1105.65	50.88	15190.39
	<i>Ananas parguazensis</i>	Bromelioideae	-0.65	271.30	4.52	1226.28	53.49	15027.37
	<i>Ananas saganaria</i>	Bromelioideae	-0.71	277.79	6.19	1719.52	43.41	10600.67

<i>Bromelia balansae</i>	Bromelioideae	-0.63	299.48	5.75	1722.01	NA	9184.74
<i>Bromelia epiphytica</i>	Bromelioideae	-0.47	268.35	4.55	1220.99	NA	NA
<i>Bromelia flemingii</i>	Bromelioideae	-0.52	294.95	6.67	1967.32	NA	NA
<i>Bromelia goyazensis</i>	Bromelioideae	-0.51	253.00	6.81	1722.93	77.86	9011.29
<i>Bromelia humilis</i>	Bromelioideae	-0.59	265.05	7.69	2038.23	51.45	6650.49
<i>Bromelia macedoi</i>	Bromelioideae	-0.68	285.11	6.99	1992.92	82.73	9603.97
<i>Bromelia scarlatina</i>	Bromelioideae	-0.44	169.70	4.44	753.47	17.75	16902.00
<i>Cryptanthus acaulis</i>	Bromelioideae	-0.72	245.18	6.68	1637.80	29.57	7191.60
<i>Cryptanthus beuckeri</i>	Bromelioideae	-0.74	246.02	5.54	1362.95	40.10	9442.64
<i>Cryptanthus bivittatus</i>	Bromelioideae	-0.72	251.61	6.56	1650.56	NA	NA
<i>Cryptanthus brevifolius</i>	Bromelioideae	-0.71	276.02	6.37	1758.25	NA	NA
<i>Cryptanthus bromelioides</i>	Bromelioideae	-0.65	242.50	7.32	1775.10	63.00	13005.61
<i>Cryptanthus capitatus</i>	Bromelioideae	-0.74	281.75	6.13	1727.13	NA	NA
<i>Cryptanthus colnagoi</i>	Bromelioideae	-0.67	209.18	7.15	1495.64	NA	NA
<i>Cryptanthus diana</i>	Bromelioideae	-0.67	236.67	5.46	1292.22	61.08	10902.51
<i>Cryptanthus fernseeoides</i>	Bromelioideae	-0.65	269.17	6.12	1647.32	NA	NA
<i>Cryptanthus graziae</i>	Bromelioideae	-0.65	305.67	7.04	2151.92	NA	NA
<i>Cryptanthus incrassatus</i>	Bromelioideae	-0.65	206.75	6.18	1277.72	NA	NA
<i>Cryptanthus lyman-smithii</i>	Bromelioideae	-0.66	144.50	6.45	932.03	36.67	13367.33
<i>Cryptanthus maritimus</i>	Bromelioideae	-0.65	260.17	3.99	1038.08	32.79	9381.80
<i>Cryptanthus osiris</i>	Bromelioideae	-0.66	246.20	6.01	1479.66	NA	NA
<i>Cryptanthus pickelii</i>	Bromelioideae	-0.64	215.82	5.32	1148.16	60.99	12019.93
<i>Cryptanthus pseudoscaposus</i>	Bromelioideae	-0.70	133.28	6.11	814.34	43.00	8235.61
<i>Cryptanthus whitmanii</i>	Bromelioideae	-0.68	267.86	9.27	2483.06	NA	NA
<i>Deuterocohnia brevifolia</i>	Pitcairnioideae	-0.74	366.22	8.28	3032.30	104.92	2652.65
<i>Deuterocohnia brevispicata</i>	Pitcairnioideae	-0.61	321.65	8.83	2840.17	85.85	5072.87
<i>Deuterocohnia lorentziana</i>	Pitcairnioideae	-0.75	329.34	8.84	2911.37	103.73	1706.36
<i>Deuterocohnia meziana</i>	Pitcairnioideae	-0.62	367.53	10.36	3807.61	60.75	5479.17
<i>Deuterocohnia schreiteri</i>	Pitcairnioideae	-0.77	319.20	10.62	3389.90	103.20	1724.98
<i>Deuterocohnia seramisiana</i>	Pitcairnioideae	-0.60	360.20	11.66	4199.93	92.75	4061.36

<i>Disteganthus lateralis</i>	Bromelioideae	-0.68	157.47	4.02	633.03	47.48	17294.38
<i>Dyckia choristaminea</i>	Pitcairnioideae	-0.68	344.38	10.32	3554.00	10.28	11682.30
<i>Dyckia encholirioides</i>	Pitcairnioideae	-0.64	337.01	10.35	3488.05	39.19	11982.22
<i>Dyckia frigida</i>	Pitcairnioideae	-0.67	306.12	10.13	3101.00	25.25	10413.62
<i>Dyckia hebdingii</i>	Pitcairnioideae	-0.62	337.84	9.24	3121.64	NA	NA
<i>Dyckia jonesiana</i>	Pitcairnioideae	-0.64	324.48	9.01	2923.56	NA	NA
<i>Dyckia microcalyx</i>	Pitcairnioideae	-0.67	393.55	8.61	3388.47	26.23	9371.02
<i>Dyckia milagrensis</i>	Pitcairnioideae	-0.66	327.47	9.11	2983.25	NA	NA
<i>Dyckia pseudococcinea</i>	Pitcairnioideae	-0.69	312.25	8.76	2735.31	42.81	9237.23
<i>Dyckia rariflora</i>	Pitcairnioideae	-0.71	310.00	9.18	2845.80	84.33	9513.85
<i>Dyckia remotiflora</i>	Pitcairnioideae	-0.66	379.98	8.48	3222.23	21.28	9683.10
<i>Dyckia saxatilis</i>	Pitcairnioideae	-0.69	392.11	8.54	3348.62	80.60	9668.62
<i>Encholirium magalhaesii</i>	Pitcairnioideae	-0.62	333.71	8.91	2973.36	85.81	10248.54
<i>Encholirium spectabile</i>	Pitcairnioideae	-0.66	319.28	9.88	3154.49	70.25	4640.60
<i>Hechtia argentea</i>	Hechtioideae	-0.68	366.00	9.54	3491.64	78.25	2544.03
<i>Hechtia carlsoniae</i>	Hechtioideae	-0.65	352.50	7.03	2478.08	105.50	6977.88
<i>Hechtia dichroantha</i>	Hechtioideae	-0.59	373.98	11.39	4259.63	73.50	8207.61
<i>Hechtia epigyna</i>	Hechtioideae	-0.59	425.56	11.01	4685.42	NA	NA
<i>Hechtia fragilis</i>	Hechtioideae	-0.64	437.82	10.66	4667.16	91.67	4789.97
<i>Hechtia glomerata</i>	Hechtioideae	-0.64	443.23	10.88	4822.34	79.65	4937.11
<i>Hechtia lundelliorum</i>	Hechtioideae	-0.65	393.78	8.04	3165.99	80.18	9846.29
<i>Hechtia malvernii</i>	Hechtioideae	-0.70	361.72	6.22	2249.90	NA	NA
<i>Hechtia marnier-lapostollei</i>	Hechtioideae	-0.62	438.78	9.26	4063.10	NA	NA
<i>Hechtia montana</i>	Hechtioideae	-0.68	415.97	11.22	4667.18	102.24	2517.03
<i>Hechtia mooreana</i>	Hechtioideae	-0.66	384.50	7.21	2772.25	106.75	6597.71
<i>Hechtia pumila</i>	Hechtioideae	-0.63	405.00	9.68	3920.40	NA	NA
<i>Hechtia purpusii</i>	Hechtioideae	-0.58	356.73	6.93	2472.14	76.75	11305.58
<i>Hechtia rosea</i>	Hechtioideae	-0.67	398.72	8.82	3516.71	106.33	5738.96
<i>Hechtia tillandsioides</i>	Hechtioideae	-0.64	411.49	11.1	4567.54	80.75	8975.30
<i>Neoglaziovia variegata</i>	Bromelioideae	-0.63	446.94	8.72	3897.32	72.19	4391.50

	<i>Orthophytum alvimii</i>	Bromelioideae	-0.65	289.99	7.12	2064.73	66.00	6553.21
	<i>Orthophytum benzingii</i>	Bromelioideae	-0.65	322.50	6.98	2251.05	68.70	6478.34
	<i>Orthophytum disjunctum</i>	Bromelioideae	-0.80	375.43	6.01	2256.33	62.56	4887.09
	<i>Orthophytum duartei</i>	Bromelioideae	-0.63	296.50	7.80	2312.70	58.33	7711.46
	<i>Orthophytum foliosum</i>	Bromelioideae	-0.73	341.22	5.87	2002.96	28.70	7460.55
	<i>Orthophytum gurkenii</i>	Bromelioideae	-0.65	356.74	7.51	2679.12	65.00	7305.85
	<i>Orthophytum rubrum</i>	Bromelioideae	-0.66	392.33	7.22	2832.62	NA	NA
	<i>Orthophytum saxicola</i>	Bromelioideae	-0.78	384.98	6.88	2648.66	52.55	5112.07
	<i>Orthophytum sucrei</i>	Bromelioideae	-0.67	312.10	6.43	2006.80	62.75	7735.01
C₃ tank-epiphyte	<i>Alcantarea imperialis</i>	Tillandsioideae	-0.56	211.04	2.86	603.57	32.79	11989.75
	<i>Alcantarea nevaesii</i>	Tillandsioideae	-0.45	198.37	4.08	809.35	NA	NA
	<i>Alcantarea odorata</i>	Tillandsioideae	-0.47	149.85	3.22	482.52	65.85	9420.13
	<i>Alcantarea regina</i>	Tillandsioideae	-0.61	155.61	3.79	589.76	55.92	11119.64
	<i>Alcantarea simplicisticha</i>	Tillandsioideae	-0.44	155.50	4.00	622.00	60.67	7252.81
	<i>Alcantarea trepida</i>	Tillandsioideae	-0.46	162.00	3.89	630.18	60.81	7404.07
	<i>Brocchinia acuminata</i>	Brocchinioideae	-0.32	137.72	3.01	414.54	49.07	18937.34
	<i>Brocchinia melanacra</i>	Brocchinioideae	-0.34	147.72	3.00	443.16	52.38	19972.49
	<i>Brocchinia micrantha</i>	Brocchinioideae	-0.42	155.97	3.15	491.31	46.15	17720.89
	<i>Brocchinia steyermarkii</i>	Brocchinioideae	-0.41	137.00	2.91	398.67	54.98	14417.64
	<i>Brocchinia tatei</i>	Brocchinioideae	-0.38	142.86	3.06	437.15	50.56	17438.31
	<i>Catopsis berteroniana</i>	Tillandsioideae	-0.36	70.22	3.21	225.41	52.44	14033.08
	<i>Catopsis floribunda</i>	Tillandsioideae	-0.48	59.43	3.54	210.38	50.09	13131.48
	<i>Catopsis juncifolia</i>	Tillandsioideae	-0.34	68.37	3.55	242.71	50.81	18454.16
	<i>Catopsis morreniana</i>	Tillandsioideae	-0.39	41.36	3.43	141.86	61.74	15026.53
	<i>Catopsis nutans</i>	Tillandsioideae	-0.49	60.33	3.01	181.59	68.54	14157.45
	<i>Catopsis paniculata</i>	Tillandsioideae	-0.51	62.34	3.33	207.59	69.79	11947.23
	<i>Catopsis sessiliflora</i>	Tillandsioideae	-0.39	58.11	3.46	201.06	59.27	16497.47
	<i>Catopsis subulata</i>	Tillandsioideae	-0.54	48.20	3.01	145.08	84.11	8155.92
	<i>Goudaea ospinae</i>	Tillandsioideae	-0.31	127.16	3.15	400.55	55.70	25542.58
	<i>Guzmania acorifolia</i>	Tillandsioideae	-0.56	41.06	3.12	128.11	32.88	21311.10

<i>Guzmania conifera</i>	Tillandsioideae	-0.52	55.55	3.42	189.98	22.63	15936.29
<i>Guzmania lindenii</i>	Tillandsioideae	-0.46	102.00	3.91	398.82	25.25	6355.97
<i>Guzmania lingulata</i>	Tillandsioideae	-0.47	53.36	3.23	172.35	45.35	18225.50
<i>Guzmania monostachia</i>	Tillandsioideae	-0.54	38.28	3.07	117.52	56.07	15638.30
<i>Guzmania musaica</i>	Tillandsioideae	-0.38	74.05	3.13	231.78	54.98	26448.04
<i>Guzmania regalis</i>	Tillandsioideae	-0.51	93.01	2.56	238.11	33.90	19313.45
<i>Guzmania wittmackii</i>	Tillandsioideae	-0.49	94.81	2.84	269.26	59.78	12807.15
<i>Lemeltonia cornuta</i>	Tillandsioideae	-0.38	122.22	3.45	421.66	53.89	17245.52
<i>Lutheria bi-beatricis</i>	Tillandsioideae	-0.45	122.80	3.50	429.80	64.69	13940.75
<i>Lutheria glutinosa</i>	Tillandsioideae	-0.36	41.84	3.90	163.18	NA	NA
<i>Lutheria splendens</i>	Tillandsioideae	-0.39	111.23	4.73	526.12	43.90	17848.96
<i>Mezobromelia pleiosticha</i>	Tillandsioideae	-0.41	166.33	3.22	535.58	36.06	18940.83
<i>Pseudalcantarea viridiflora</i>	Tillandsioideae	-0.56	92.33	3.01	277.91	72.16	11818.74
<i>Racinaea dyeriana</i>	Tillandsioideae	-0.46	41.87	3.25	136.08	84.75	17208.78
<i>Racinaea multiflora</i>	Tillandsioideae	-0.52	68.99	3.10	213.87	91.72	6620.37
<i>Racinaea spiculosa</i>	Tillandsioideae	-0.34	68.89	3.44	236.98	45.08	16892.50
<i>Tillandsia amicornum</i>	Tillandsioideae	-0.57	86.99	3.00	260.97	NA	NA
<i>Tillandsia australis</i>	Tillandsioideae	-0.59	122.35	3.12	381.73	75.74	5954.43
<i>Tillandsia complanata</i>	Tillandsioideae	-0.55	96.88	3.04	294.52	44.68	11998.68
<i>Tillandsia leiboldiana</i>	Tillandsioideae	-0.44	89.46	4.78	427.62	57.43	18067.36
<i>Tillandsia rauhii</i>	Tillandsioideae	-0.45	128.65	3.09	397.53	NA	NA
<i>Tillandsia reversa</i>	Tillandsioideae	-0.47	153.06	4.08	624.48	41.45	12309.27
<i>Vriesea erythrodactylon</i>	Tillandsioideae	-0.47	72.73	2.75	200.01	34.19	13745.76
<i>Vriesea fenestralis</i>	Tillandsioideae	-0.51	93.55	3.74	349.88	44.25	9583.88
<i>Vriesea fosteriana</i>	Tillandsioideae	-0.49	103.34	3.16	326.55	56.15	8850.14
<i>Vriesea friburgensis</i>	Tillandsioideae	-0.51	86.66	4.00	346.64	40.63	10361.79
<i>Vriesea gigantea</i>	Tillandsioideae	-0.48	82.94	3.16	262.09	29.40	12688.60
<i>Vriesea guttata</i>	Tillandsioideae	-0.49	103.92	3.80	394.90	39.78	12227.48
<i>Vriesea incurvata</i>	Tillandsioideae	-0.43	111.13	3.07	341.17	31.74	13216.26
<i>Vriesea lubbersii</i>	Tillandsioideae	-0.49	140.31	3.36	471.44	53.33	9579.53

	<i>Vriesea platynema</i>	Tillandsioideae	-0.62	150.51	2.83	425.94	25.82	12728.06
	<i>Vriesea psittacina</i>	Tillandsioideae	-0.52	97.16	3.10	301.20	28.99	11334.28
	<i>Vriesea rubyae</i>	Tillandsioideae	-0.44	91.43	3.25	297.15	NA	NA
	<i>Vriesea saundersii</i>	Tillandsioideae	-0.52	143.20	3.34	478.29	74.25	11039.85
	<i>Wallisia lindeniana</i>	Tillandsioideae	-0.48	156.80	3.15	493.92	79.50	7388.37
	<i>Werauhia gladioliflora</i>	Tillandsioideae	-0.37	147.96	2.40	355.10	48.32	21120.35
	<i>Werauhia marnier-lapostollei</i>	Tillandsioideae	-0.42	112.86	5.82	656.85	62.89	18813.70
	<i>Werauhia ringens</i>	Tillandsioideae	-0.46	134.65	4.02	541.29	32.16	18484.63
	<i>Werauhia sanguinolenta</i>	Tillandsioideae	-0.52	64.12	4.68	300.08	63.56	17179.06
	<i>Werauhia viridiflora</i>	Tillandsioideae	-0.36	137.66	3.28	451.52	58.65	20420.19
CAM tank-epiphyte	<i>Acanthostachys pitcairnioides</i>	Bromelioideae	-0.62	118.75	4.29	509.44	79.00	7392.40
	<i>Acanthostachys strobilacea</i>	Bromelioideae	-0.57	297.55	8.57	2550.00	52.89	8824.76
	<i>Aechmea aciculosa</i>	Bromelioideae	-0.33	85.16	3.33	283.58	57.05	17307.30
	<i>Aechmea alba</i>	Bromelioideae	-0.65	142.86	3.39	484.30	30.03	9383.38
	<i>Aechmea allenii</i>	Bromelioideae	-0.31	94.88	3.33	315.95	62.93	18575.47
	<i>Aechmea aquilega</i>	Bromelioideae	-0.59	90.97	5.28	480.32	48.09	13673.52
	<i>Aechmea blumenavii</i>	Bromelioideae	-0.41	71.11	3.00	213.33	25.42	12960.04
	<i>Aechmea bromeliifolia</i>	Bromelioideae	-0.57	162.34	5.00	811.70	56.48	10435.26
	<i>Aechmea calyculata</i>	Bromelioideae	-0.44	77.06	3.10	238.89	19.33	12113.47
	<i>Aechmea chantinii</i>	Bromelioideae	-0.43	137.76	3.80	523.49	25.39	17147.98
	<i>Aechmea coelestis</i>	Bromelioideae	-0.45	84.75	3.59	304.25	48.05	11006.65
	<i>Aechmea disjuncta</i>	Bromelioideae	-0.52	175.76	3.22	565.95	37.10	7475.94
	<i>Aechmea distichantha</i>	Bromelioideae	-0.46	219.69	4.06	891.94	42.14	10019.96
	<i>Aechmea drakeana</i>	Bromelioideae	-0.45	83.46	2.90	242.03	19.48	14850.54
	<i>Aechmea fasciata</i>	Bromelioideae	-0.44	93.32	3.88	362.08	56.84	10628.65
	<i>Aechmea fendleri</i>	Bromelioideae	-0.47	89.68	4.43	397.28	NA	NA
	<i>Aechmea filicaulis</i>	Bromelioideae	-0.61	52.18	3.78	197.24	NA	NA
	<i>Aechmea gamosepala</i>	Bromelioideae	-0.55	54.03	3.30	178.30	44.49	12848.74
	<i>Aechmea lamarchei</i>	Bromelioideae	-0.48	109.69	4.26	467.28	41.01	8672.00
	<i>Aechmea longifolia</i>	Bromelioideae	-0.43	229.08	4.39	1005.66	32.40	17873.70

<i>Aechmea lueddemanniana</i>	Bromelioideae	-0.47	140.66	3.12	438.86	63.04	14841.74
<i>Aechmea marauensis</i>	Bromelioideae	-0.51	123.07	3.27	402.44	29.62	12769.95
<i>Aechmea miniata</i>	Bromelioideae	-0.37	165.82	2.72	451.03	20.86	13501.60
<i>Aechmea nudicaulis</i>	Bromelioideae	-0.54	209.47	4.56	955.18	51.44	17747.55
<i>Aechmea orlandiana</i>	Bromelioideae	-0.54	144.16	4.02	579.52	55.94	6776.80
<i>Aechmea pineliana</i>	Bromelioideae	-0.55	101.30	4.17	422.42	50.25	8417.28
<i>Aechmea ramosa</i>	Bromelioideae	-0.62	141.22	2.90	409.54	56.08	7883.87
<i>Aechmea recurvata</i>	Bromelioideae	-0.48	217.55	4.68	1018.13	18.47	11973.40
<i>Aechmea subintegerrima</i>	Bromelioideae	-0.54	94.36	3.45	325.54	14.50	11464.91
<i>Aechmea tayoensis</i>	Bromelioideae	-0.34	97.61	3.16	308.45	18.67	15675.75
<i>Aechmea turbinocalyx</i>	Bromelioideae	-0.48	93.27	3.07	286.34	22.30	10771.28
<i>Aechmea victoriana</i>	Bromelioideae	-0.48	96.94	3.13	303.42	51.59	8632.82
<i>Aechmea warasii</i>	Bromelioideae	-0.48	137.62	2.76	379.83	51.55	9065.86
<i>Aechmea winkleri</i>	Bromelioideae	-0.43	153.06	3.03	463.77	27.13	10767.11
<i>Androlepis skinneri</i>	Bromelioideae	-0.55	144.67	3.24	468.73	57.50	17144.21
<i>Araeococcus flagellifolius</i>	Bromelioideae	-0.58	276.53	4.93	1363.29	54.90	14287.75
<i>Araeococcus goeldianus</i>	Bromelioideae	-0.50	227.95	4.32	984.74	61.00	18163.66
<i>Araeococcus micranthus</i>	Bromelioideae	-0.46	216.25	4.91	1061.79	51.40	15468.46
<i>Araeococcus nigropurpureus</i>	Bromelioideae	-0.49	231.75	4.42	1024.34	17.57	14564.09
<i>Billbergia amoena</i>	Bromelioideae	-0.60	162.34	4.48	727.28	46.12	9834.09
<i>Billbergia decora</i>	Bromelioideae	-0.40	194.11	3.49	677.44	43.78	15880.91
<i>Billbergia euphemiae</i>	Bromelioideae	-0.59	237.24	3.04	721.21	47.23	9065.80
<i>Billbergia laxiflora</i>	Bromelioideae	-0.64	217.33	3.39	736.75	51.67	8324.69
<i>Billbergia leptopoda</i>	Bromelioideae	-0.63	144.45	3.23	466.57	53.40	8639.10
<i>Billbergia macrolepis</i>	Bromelioideae	-0.43	281.72	4.52	1273.37	61.20	15994.08
<i>Billbergia manarae</i>	Bromelioideae	-0.45	230.66	3.66	844.22	NA	NA
<i>Billbergia oxysepala</i>	Bromelioideae	-0.47	195.61	3.16	618.13	23	17698.40
<i>Billbergia pallidiflora</i>	Bromelioideae	-0.71	293.78	4.78	1404.27	101.59	5729.77
<i>Billbergia robert-readii</i>	Bromelioideae	-0.48	223.39	4.09	913.67	49.19	13604.01
<i>Billbergia sanderiana</i>	Bromelioideae	-0.66	188.33	3.73	702.47	63.63	9217.62

<i>Billbergia speciosa</i>	Bromelioideae	-0.58	176.11	3.2	563.55	83.23	10485.52
<i>Billbergia stenopetala</i>	Bromelioideae	-0.41	261.16	3.79	989.80	32.53	16294.34
<i>Billbergia tessmannii</i>	Bromelioideae	-0.46	222.06	3.31	735.02	17.12	16246.78
<i>Billbergia viridiflora</i>	Bromelioideae	-0.54	170.50	3.20	545.60	60.11	15303.84
<i>Billbergia vittata</i>	Bromelioideae	-0.62	245.68	4.40	1080.99	73.72	9477.82
<i>Canistropsis exigua</i>	Bromelioideae	-0.41	107.25	3.14	336.77	40.25	11343.18
<i>Canistropsis marceloi</i>	Bromelioideae	-0.46	93.84	3.00	281.52	71.77	13426.50
<i>Canistropsis microps</i>	Bromelioideae	-0.46	102.04	3.48	355.10	38.65	12262.11
<i>Hohenbergia augusta</i>	Bromelioideae	-0.47	204.08	4.32	881.63	40.10	11182.96
<i>Hohenbergia belemii</i>	Bromelioideae	-0.45	153.25	3.02	462.82	20.90	12820.97
<i>Hohenbergia brachycephala</i>	Bromelioideae	-0.44	168.89	3.16	533.69	26.13	12522.41
<i>Hohenbergia catingae</i>	Bromelioideae	-0.51	174.33	3.22	561.34	56.69	5807.26
<i>Hohenbergia edmundoi</i>	Bromelioideae	-0.47	161.20	3.00	483.60	58.25	5870.72
<i>Hohenbergia inermis</i>	Bromelioideae	-0.38	156.75	2.99	468.68	49.08	16402.36
<i>Hohenbergia negrilensis</i>	Bromelioideae	-0.48	140.50	2.96	415.88	NA	NA
<i>Hohenbergia portoricensis</i>	Bromelioideae	-0.46	154.40	3.11	480.18	32.66	15578.67
<i>Hohenbergia proctorii</i>	Bromelioideae	-0.43	138.25	2.89	399.54	NA	NA
<i>Hohenbergia undulatifolia</i>	Bromelioideae	-0.46	170.67	3.12	532.49	NA	NA
<i>Hohenbergia urbaniana</i>	Bromelioideae	-0.44	144.00	3.11	447.84	65.51	3559.21
<i>Hohenbergia utriculosa</i>	Bromelioideae	-0.50	162.78	3.00	488.34	54.04	6381.66
<i>Lymania alvimii</i>	Bromelioideae	-0.44	110.61	3.28	362.80	14.73	11309.35
<i>Lymania azurea</i>	Bromelioideae	-0.43	112.14	3.13	351.00	14.90	11243.74
<i>Lymania smithii</i>	Bromelioideae	-0.43	95.56	2.94	280.95	19.13	12291.38
<i>Lymania spiculata</i>	Bromelioideae	-0.42	96.52	2.88	277.98	NA	NA
<i>Neoregelia amandae</i>	Bromelioideae	-0.40	120.71	3.91	471.98	NA	NA
<i>Neoregelia ampullacea</i>	Bromelioideae	-0.57	136.12	3.83	521.34	48.95	8348.26
<i>Neoregelia bahiana</i>	Bromelioideae	-0.55	99.96	3.38	337.86	64.85	7238.60
<i>Neoregelia carolinae</i>	Bromelioideae	-0.52	138.79	3.50	485.77	55.14	11209.11
<i>Neoregelia chlorosticta</i>	Bromelioideae	-0.57	244.00	4.10	1000.40	24.37	9124.62
<i>Neoregelia compacta</i>	Bromelioideae	-0.50	138.96	3.15	437.72	NA	NA

<i>Neoregelia crispata</i>	Bromelioideae	-0.52	121.50	3.11	377.87	18.25	9767.83
<i>Neoregelia eleutheropetala</i>	Bromelioideae	-0.43	206.63	5.67	1171.59	24.78	18092.57
<i>Neoregelia gavionensis</i>	Bromelioideae	-0.42	136.20	4.11	559.78	NA	NA
<i>Neoregelia hoehneana</i>	Bromelioideae	-0.48	122.50	2.89	354.03	NA	NA
<i>Neoregelia indecora</i>	Bromelioideae	-0.44	148.05	4.19	620.33	NA	NA
<i>Neoregelia johnsoniae</i>	Bromelioideae	-0.46	132.25	3.69	488.00	NA	NA
<i>Neoregelia laevis</i>	Bromelioideae	-0.54	158.16	3.81	602.59	38.92	13481.97
<i>Neoregelia lilliputiana</i>	Bromelioideae	-0.42	122.21	3.12	381.30	NA	NA
<i>Neoregelia longipedicellata</i>	Bromelioideae	-0.49	137.50	3.22	442.75	59.50	14284.40
<i>Neoregelia macrosepala</i>	Bromelioideae	-0.54	145.01	4.56	661.25	51.30	8651.18
<i>Neoregelia magdalenae</i>	Bromelioideae	-0.56	136.71	3.90	533.17	NA	NA
<i>Neoregelia marmorata</i>	Bromelioideae	-0.45	129.58	4.05	524.80	41.33	18103.28
<i>Neoregelia mooreana</i>	Bromelioideae	-0.41	144.97	4.56	661.06	20.67	23098.94
<i>Neoregelia mucugensis</i>	Bromelioideae	-0.52	130.58	3.54	462.25	NA	NA
<i>Neoregelia myrmecophila</i>	Bromelioideae	-0.47	150.56	4.13	621.81	27.04	17899.62
<i>Neoregelia nivea</i>	Bromelioideae	-0.49	140.13	3.51	491.86	NA	NA
<i>Neoregelia olens</i>	Bromelioideae	-0.41	135.44	4.24	574.27	NA	NA
<i>Neoregelia pauciflora</i>	Bromelioideae	-0.51	139.47	4.20	585.77	47.06	9169.18
<i>Neoregelia paulistana</i>	Bromelioideae	-0.51	140.50	3.31	465.06	21	9543.85
<i>Neoregelia pendula</i>	Bromelioideae	-0.49	108.79	3.25	353.57	15.25	16548.86
<i>Neoregelia pernambucana</i>	Bromelioideae	-0.49	133.00	3.15	418.95	58.75	8431.90
<i>Neoregelia roethii</i>	Bromelioideae	-0.51	127.24	3.78	480.97	NA	NA
<i>Neoregelia rosea</i>	Bromelioideae	-0.41	144.50	2.99	432.06	12.50	14980.25
<i>Neoregelia rothinessa</i>	Bromelioideae	-0.49	148.90	3.80	565.82	NA	NA
<i>Neoregelia rubrovittata</i>	Bromelioideae	-0.48	130.64	3.50	457.24	NA	NA
<i>Neoregelia ruschii</i>	Bromelioideae	-0.52	129.83	3.90	506.34	56.96	9993.54
<i>Neoregelia sapiatibensis</i>	Bromelioideae	-0.54	158.27	4.23	669.48	NA	NA
<i>Neoregelia sarmentosa</i>	Bromelioideae	-0.58	155.09	5.32	825.08	37.47	10121.30
<i>Neoregelia simulans</i>	Bromelioideae	-0.58	151.74	3.92	594.82	55.88	8411.41
<i>Neoregelia tarapotoensis</i>	Bromelioideae	-0.52	112.00	3.65	408.80	15.33	14152.07

<i>Neoregelia tigrina</i>	Bromelioideae	-0.48	164.94	4.14	682.85	50.00	8898.64
<i>Neoregelia wilsoniana</i>	Bromelioideae	-0.43	110.65	3.60	398.34	18.31	10928.08
<i>Neoregelia wurdackii</i>	Bromelioideae	-0.47	121.71	4.10	499.01	18.67	14547.99
<i>Neoregelia zonata</i>	Bromelioideae	-0.49	152.80	3.12	476.74	84.25	10596.40
<i>Nidularium albiflorum</i>	Bromelioideae	-0.46	160.59	3.06	491.41	NA	NA
<i>Nidularium amazonicum</i>	Bromelioideae	-0.54	94.39	3.11	293.55	25.12	13225.03
<i>Nidularium amorimii</i>	Bromelioideae	-0.38	146.47	2.87	420.37	21.13	14547.99
<i>Nidularium angustifolium</i>	Bromelioideae	-0.42	133.50	3.31	441.89	74.25	11039.85
<i>Nidularium apiculatum</i>	Bromelioideae	-0.50	155.00	3.35	519.25	NA	NA
<i>Nidularium billbergioides</i>	Bromelioideae	-0.54	191.33	3.97	759.58	43.97	10263.85
<i>Nidularium campo-alegrensis</i>	Bromelioideae	-0.42	154.67	2.84	439.26	39.63	11427.21
<i>Nidularium campos-portoi</i>	Bromelioideae	-0.45	114.65	3.44	394.40	46.50	12316.53
<i>Nidularium espiritosantense</i>	Bromelioideae	-0.61	141.23	2.97	419.45	54.68	9309.45
<i>Nidularium ferdinando-coburgii</i>	Bromelioideae	-0.54	152.30	2.75	418.83	NA	NA
<i>Nidularium fradense</i>	Bromelioideae	-0.63	122.05	3.54	432.06	63.00	9090.64
<i>Nidularium fulgens</i>	Bromelioideae	-0.55	122.45	3.85	471.43	55.60	NA
<i>Nidularium innocentii</i>	Bromelioideae	-0.51	142.99	3.23	461.86	36.63	12065.63
<i>Nidularium krisgreeniae</i>	Bromelioideae	-0.54	101.99	3.00	305.97	46.01	11230.64
<i>Nidularium linehamii</i>	Bromelioideae	-0.60	72.24	3.72	268.73	NA	NA
<i>Nidularium picinguabensis</i>	Bromelioideae	-0.52	114.43	3.22	368.46	NA	NA
<i>Nidularium procerum</i>	Bromelioideae	-0.43	131.79	2.99	394.05	41.20	11127.20
<i>Nidularium rosulatum</i>	Bromelioideae	-0.63	97.50	3.21	312.98	58.50	10386.82
<i>Nidularium rubens</i>	Bromelioideae	-0.53	100.55	3.56	357.96	74.25	11039.85
<i>Nidularium serratum</i>	Bromelioideae	-0.49	143.77	3.60	517.57	NA	NA
<i>Nidularium viridipetalum</i>	Bromelioideae	-0.52	92.25	3.80	350.55	NA	NA
<i>Portea grandiflora</i>	Bromelioideae	-0.53	133.45	3.13	417.70	19.07	14290.92
<i>Quesnelia augusto-coburgi</i>	Bromelioideae	-0.51	163.64	4.08	667.65	68.44	13080.24
<i>Quesnelia edmundoi</i>	Bromelioideae	-0.51	173.89	4.16	723.38	52.88	9148.35
<i>Quesnelia kautskyi</i>	Bromelioideae	-0.48	169.06	3.60	608.62	57.92	9870.00
<i>Quesnelia lateralis</i>	Bromelioideae	-0.45	166.23	4.03	669.91	57.67	13085.79

	<i>Quesnelia liboniana</i>	Bromelioideae	-0.51	160.71	3.71	596.23	54.00	12156.17
	<i>Quesnelia marmorata</i>	Bromelioideae	-0.53	158.38	4.16	658.86	44.78	9261.21
	<i>Quesnelia strobilispica</i>	Bromelioideae	-0.54	165.70	4.06	672.74	74.25	11039.85
	<i>Ronnbergia silvana</i>	Bromelioideae	-0.41	160.75	4.04	649.43	22.00	9670.28
	<i>Tillandsia fasciculata</i>	Tillandsioideae	-0.52	105.43	4.02	423.83	69.26	10338.01
	<i>Tillandsia utriculata</i>	Tillandsioideae	-0.56	195.28	5.15	1005.69	55.88	11725.01
	<i>Ursulaea tuitensis</i>	Bromelioideae	-0.59	305.66	9.03	2760.11	103.52	7595.26
	<i>Wittrockia cyathiformis</i>	Bromelioideae	-0.45	104.48	3.27	341.65	53.97	12179.00
	<i>Wittrockia gigantea</i>	Bromelioideae	-0.44	110.67	3.30	365.21	67.00	11101.82
	<i>Wittrockia superba</i>	Bromelioideae	-0.48	128.95	3.11	401.03	25.05	12398.15
CAM atmospheric epiphyte	<i>Tillandsia arequita</i>	Tillandsioideae	-0.44	201.33	3.32	668.42	NA	NA
	<i>Tillandsia arhiza</i>	Tillandsioideae	-0.52	154.44	5.46	843.24	50.63	8062.43
	<i>Tillandsia balsasensis</i>	Tillandsioideae	-0.43	165.00	6.19	1021.35	NA	NA
	<i>Tillandsia belloensis</i>	Tillandsioideae	-0.56	165.40	3.76	621.90	68.00	12950.51
	<i>Tillandsia brachycaulos</i>	Tillandsioideae	-0.44	100.66	5.48	551.62	71.47	11172.14
	<i>Tillandsia butzii</i>	Tillandsioideae	-0.39	177.61	6.05	1074.54	71.89	13088.74
	<i>Tillandsia cacticola</i>	Tillandsioideae	-0.52	240.28	5.62	1350.37	70.00	3216.76
	<i>Tillandsia caput-medusae</i>	Tillandsioideae	-0.44	239.48	6.34	1518.30	90.78	9309.79
	<i>Tillandsia chlorophylla</i>	Tillandsioideae	-0.38	104.78	3.11	325.87	66.08	14508.05
	<i>Tillandsia copanensis</i>	Tillandsioideae	-0.50	147.68	3.57	527.22	NA	NA
	<i>Tillandsia crocata</i>	Tillandsioideae	-0.32	146.25	4.59	671.29	28.50	10834.10
	<i>Tillandsia dura</i>	Tillandsioideae	-0.40	129.64	4.03	522.45	45.02	12118.20
	<i>Tillandsia duratii</i>	Tillandsioideae	-0.59	189.10	3.25	614.58	51.65	6191.87
	<i>Tillandsia edithae</i>	Tillandsioideae	-0.45	225.40	5.54	1248.72	59.96	5850.13
	<i>Tillandsia funckiana</i>	Tillandsioideae	-0.40	105.40	4.24	446.90	68.25	9096.21
	<i>Tillandsia guenther-nolleri</i>	Tillandsioideae	-0.36	188.95	4.33	818.15	NA	NA
	<i>Tillandsia harrisii</i>	Tillandsioideae	-0.44	227.92	4.84	1103.13	78.00	14000.61
	<i>Tillandsia ionantha</i>	Tillandsioideae	-0.49	111.35	5.03	560.09	94.00	7174.55
	<i>Tillandsia juncea</i>	Tillandsioideae	-0.55	152.94	4.05	619.41	69.47	11650.98
	<i>Tillandsia krukoffiana</i>	Tillandsioideae	-0.57	126.78	3.22	408.23	57.58	10904.77

<i>Tillandsia latifolia</i>	Tillandsioideae	-0.68	214.29	4.95	1060.74	79.20	3573.75
<i>Tillandsia leucolepis</i>	Tillandsioideae	-0.47	248.76	4.58	1139.32	NA	NA
<i>Tillandsia lithophila</i>	Tillandsioideae	-0.29	133.33	6.65	886.64	NA	NA
<i>Tillandsia lymanii</i>	Tillandsioideae	-0.59	130.45	3.14	409.61	60.18	5429.52
<i>Tillandsia marnier-lapostollei</i>	Tillandsioideae	-0.40	116.56	3.21	374.16	NA	NA
<i>Tillandsia mima</i>	Tillandsioideae	-0.44	185.67	5.34	991.48	46.92	10269.98
<i>Tillandsia mollis</i>	Tillandsioideae	-0.44	168.75	6.84	1154.25	95.25	3769.17
<i>Tillandsia neglecta</i>	Tillandsioideae	-0.47	213.42	4.21	898.50	NA	NA
<i>Tillandsia paleacea</i>	Tillandsioideae	-0.67	160.33	5.05	809.67	75.93	6587.44
<i>Tillandsia paucifolia</i>	Tillandsioideae	-0.48	189.20	6.21	1174.93	86.62	7843.81
<i>Tillandsia peiranoi</i>	Tillandsioideae	-0.52	181.25	5.80	1051.25	112.60	2140.75
<i>Tillandsia polystachia</i>	Tillandsioideae	-0.52	186.11	4.40	818.88	65.19	11044.30
<i>Tillandsia pruinosa</i>	Tillandsioideae	-0.38	227.28	5.20	1181.86	53.74	12912.27
<i>Tillandsia pseudobaileyi</i>	Tillandsioideae	-0.53	155.55	3.54	550.65	89.22	6548.96
<i>Tillandsia rhodocephala</i>	Tillandsioideae	-0.44	166.56	3.78	629.60	NA	NA
<i>Tillandsia streptophylla</i>	Tillandsioideae	-0.42	211.35	5.22	1103.25	62.29	11162.51
<i>Tillandsia stricta</i>	Tillandsioideae	-0.50	173.64	4.33	751.86	40.19	9440.44
<i>Tillandsia tenuifolia</i>	Tillandsioideae	-0.42	181.63	4.59	833.68	45.57	9727.95
<i>Tillandsia xerographica</i>	Tillandsioideae	-0.52	295.05	5.62	1658.18	102.93	5710.38
<i>Tillandsia xiphioides</i>	Tillandsioideae	-0.68	130.00	3.69	479.70	68.14	4428.28

Table A3.3.2 Mean values of drought resistance and bioclimatic traits for 376 bromeliad species. Trait key: π_o = osmotic potential at full turgor; LMA = leaf mass per unit area; SWC = saturated water content; WMA = water mass per unit area; P_{seas} = precipitation seasonality; AI = aridity index. For π_o and SWC, SE < 0.03 for all species; for LMA and WMA, SE < 10 for all species.

Appendix 3.4

A3.4.1 Non-significant relationships among leaf economic and hydraulic traits specific functional types

Functional type	Variable 1	Variable 2	r^2	p
CAM atmospheric epiphyte	$A_{\max}$	K_{leafmax}	-0.13	0.799
CAM terrestrial	$A_{\max}$	g_{smax}	-0.11	0.561
CAM tank-epiphyte	$A_{\max}$	g_{smax}	-0.14	0.959
CAM atmospheric epiphyte	$A_{\max}$	g_{smax}	-0.11	0.678
CAM terrestrial	$A_{\max}$	IAS	-0.14	0.643
CAM atmospheric epiphyte	$A_{\max}$	IAS	0.15	0.161
CAM terrestrial	g_{smax}	IAS	-0.13	0.608
CAM tank-epiphyte	g_{smax}	IAS	0.08	0.235
CAM atmospheric epiphyte	g_{smax}	IAS	-0.09	0.569

Table A3.4.1 Non-significant relationships between pairs of traits within specific functional types. Trait key:

$A_{\max}$ = maximum photosynthetic capacity; K_{leafmax} = maximal leaf hydraulic conductance; g_{smax} = maximal stomatal conductance; IAS = internal air space fraction.

Appendix 3.5

A3.5.1 Numerical results of PCA for leaf economic and hydraulic traits

Component	Standard deviation	Proportion of variance	Cumulative proportion
PC1	3.11	0.48	0.48
PC2	1.93	0.19	0.67
PC3	1.43	0.10	0.77
PC4	1.12	0.06	0.83
PC5	0.91	0.04	0.88

Table A3.5.1. Results of principal components analysis (PCA) performed on all measured leaf economic and hydraulic traits for 50 bromeliad species.

Appendix 4.1

A4.1.1 Results of survey of vein placement

Functional type	Species	IVD (mm)	± SE	VED (mm)	± SE	IVD: VED	L _{leaf} (mm)	± SE	W _{leaf} (mm)	± SE	W _{leaf} : L _{leaf}	APL (μm)	± SE	t _{rehyd} (min)	± SE	MAP (mm)	Habitat
C ₃ tank-epiphyte	<i>Alcantarea nevaesii</i>	0.23	0.004	0.29	0.004	0.80	882	18	88	3	0.10	NA	NA	NA	NA	NA	TMF
C ₃ tank-epiphyte	<i>Alcantarea simplicisticha</i>	0.12	0.003	0.16	0.004	0.78	534	16	79	4	0.15	NA	NA	NA	NA	1154.67	NA
C ₃ tank-epiphyte	<i>Alcantarea trepida</i>	0.14	0.002	0.18	0.003	0.80	825	22	81	4	0.10	NA	NA	NA	NA	1179.69	NA
C ₃ tank-epiphyte	<i>Brocchinia acuminata</i>	0.28	0.002	0.13	0.003	2.18	317	12	47	2	0.15	NA	NA	NA	NA	2916.69	TMF
C ₃ tank-epiphyte	<i>Brocchinia melanacra</i>	0.14	0.004	0.14	0.003	1.00	399	15	44	3	0.11	NA	NA	NA	NA	2997.56	TMF
C ₃ tank-epiphyte	<i>Brocchinia micrantha</i>	0.18	0.005	0.17	0.002	1.11	1015	27	124	5	0.12	NA	NA	NA	NA	2650.85	TMF
C ₃ tank-epiphyte	<i>Brocchinia steyermarkii</i>	0.06	0.003	0.06	0.004	0.91	415	13	51	2	0.12	NA	NA	NA	NA	2338.03	TMF
C ₃ tank-epiphyte	<i>Brocchinia tatei</i>	0.44	0.010	0.20	0.005	2.18	268	11	94	4	0.35	NA	NA	NA	NA	2738.96	TMF
C ₃ tank-epiphyte	<i>Catopsis berteroniana</i>	0.18	0.005	0.09	0.002	2.00	133	5	53	4	0.40	NA	NA	NA	NA	2034.37	TMF
C ₃ tank-epiphyte	<i>Catopsis floribunda</i>	0.43	0.010	0.10	0.005	4.42	82	3	59	4	0.72	NA	NA	NA	NA	1967.43	TMF
C ₃ tank-epiphyte	<i>Catopsis juncifolia</i>	0.20	0.002	0.18	0.004	1.11	185	7	14	1	0.08	NA	NA	NA	NA	2852.60	TMF
C ₃ tank-epiphyte	<i>Catopsis morreniana</i>	0.33	0.007	0.12	0.005	2.81	99	4	45	2	0.45	NA	NA	NA	NA	2375.67	TMF
C ₃ tank-epiphyte	<i>Catopsis nutans</i>	0.14	0.003	0.12	0.004	1.20	217	6	33	4	0.15	NA	NA	NA	NA	2198.35	TMF
C ₃ tank-epiphyte	<i>Catopsis paniculate</i>	0.21	0.003	0.09	0.003	2.33	181	9	64	4	0.35	NA	NA	NA	NA	1738.59	TMF
C ₃ tank-epiphyte	<i>Catopsis sessiliflora</i>	0.22	0.005	0.11	0.001	2.00	128	3	54	5	0.42	NA	NA	NA	NA	2530.27	TMF
C ₃ tank-epiphyte	<i>Catopsis subulata</i>	0.10	0.002	0.05	0.001	1.85	158	6	52	4	0.33	NA	NA	NA	NA	1313.35	TMF
C ₃ tank-epiphyte	<i>Guzmania acorifolia</i>	0.09	0.003	0.08	0.002	1.23	411	12	44	3	0.11	NA	NA	NA	NA	2844.25	TMF
C ₃ tank-epiphyte	<i>Guzmania conifera</i>	0.18	0.005	0.11	0.002	1.67	396	8	71	5	0.18	NA	NA	NA	NA	2348.22	TMF
C ₃ tank-epiphyte	<i>Guzmania lindenii</i>	0.15	0.003	0.09	0.002	1.63	401	10	68	5	0.17	NA	NA	NA	NA	1207.00	TMF

C ₃ tank-epiphyte	<i>Guzmania lingulata</i>	0.19	0.006	0.12	0.001	1.60	328	10	60	4	0.18	NA	NA	NA	NA	2837.87	TMF
C ₃ tank-epiphyte	<i>Guzmania monostachia</i>	0.29	0.006	0.13	0.001	2.19	197	11	58	5	0.29	NA	NA	NA	NA	2399.08	TMF
C ₃ tank-epiphyte	<i>Guzmania musaica</i>	0.15	0.002	0.11	0.001	1.37	327	6	62	4	0.19	NA	NA	NA	NA	2338.03	TMF
C ₃ tank-epiphyte	<i>Guzmania regalis</i>	0.12	0.002	0.06	0.004	2.10	348	12	83	4	0.24	NA	NA	NA	NA	2720.80	TMF
C ₃ tank-epiphyte	<i>Guzmania wittmackii</i>	0.16	0.004	0.10	0.003	1.62	332	10	55	2	0.17	NA	NA	NA	NA	1828.71	TMF
C ₃ tank-epiphyte	<i>Tillandsia amicornum</i>	0.09	0.001	0.05	0.002	1.88	362	12	59	4	0.16	NA	NA	NA	NA	NA	TMF
C ₃ tank-epiphyte	<i>Tillandsia australis</i>	0.21	0.004	0.11	0.003	1.94	356	9	86	6	0.24	NA	NA	NA	NA	902.66	MFS
C ₃ tank-epiphyte	<i>Tillandsia complanata</i>	0.10	0.001	0.06	0.002	1.70	378	7	56	5	0.15	NA	NA	NA	NA	1579.29	TMF
C ₃ tank-epiphyte	<i>Tillandsia cornuta</i>	0.12	0.004	0.11	0.004	1.17	373	9	34	2	0.09	NA	NA	NA	NA	2436.53	TMF
C ₃ tank-epiphyte	<i>Racinea dyeriana</i>	0.41	0.004	0.11	0.003	3.67	124	3	63	3	0.51	NA	NA	NA	NA	2659.25	TMF
C ₃ tank-epiphyte	<i>Tillandsia leiboldiana</i>	0.19	0.003	0.05	0.001	3.80	87	5	47	3	0.54	NA	NA	NA	NA	2620.59	TMF
C ₃ tank-epiphyte	<i>Racinea multiflora</i>	0.24	0.003	0.20	0.002	1.20	204	9	19	1	0.09	NA	NA	NA	NA	1028.05	TMF
C ₃ tank-epiphyte	<i>Tillandsia rauhii</i>	0.21	0.005	0.16	0.004	1.30	331	13	57	5	0.17	NA	NA	NA	NA	NA	TMF
C ₃ tank-epiphyte	<i>Tillandsia reversa</i>	0.47	0.006	0.32	0.004	1.48	346	12	46	3	0.13	NA	NA	NA	NA	1793.85	TMF
C ₃ tank-epiphyte	<i>Racinea spiculosa</i>	0.16	0.005	0.08	0.002	2.00	118	6	59	3	0.50	NA	NA	NA	NA	2449.01	TMF
C ₃ tank-epiphyte	<i>Tillandsia umbellata</i>	0.15	0.005	0.09	0.001	1.73	197	7	17	1	0.09	NA	NA	NA	NA	1212.00	TMF
C ₃ tank-epiphyte	<i>Pseudalcantarea viridiflora</i>	0.12	0.003	0.08	0.002	1.54	319	10	54	5	0.17	NA	NA	NA	NA	1758.15	TMF
C ₃ tank-epiphyte	<i>Lutheria bi-beatricis</i>	0.14	0.004	0.12	0.003	1.20	326	10	62	4	0.19	NA	NA	NA	NA	2446.39	TMF
C ₃ tank-epiphyte	<i>Vriesea erythrodactylon</i>	0.26	0.004	0.09	0.002	2.82	204	7	82	6	0.40	NA	NA	NA	NA	1708.41	TMF
C ₃ tank-epiphyte	<i>Vriesea fenestralis</i>	0.27	0.003	0.11	0.003	2.54	253	7	80	4	0.32	NA	NA	NA	NA	1312.63	TMF
C ₃ tank-epiphyte	<i>Vriesea fosteriana</i>	0.38	0.006	0.14	0.005	2.79	195	5	89	5	0.46	NA	NA	NA	NA	1276.81	TMF
C ₃ tank-epiphyte	<i>Vriesea friburgensis</i>	0.16	0.004	0.12	0.004	1.40	309	9	44	5	0.14	NA	NA	NA	NA	1399.37	TDF
C ₃ tank-epiphyte	<i>Vriesea gigantea</i>	0.27	0.006	0.13	0.003	2.08	216	5	64	3	0.30	NA	NA	NA	NA	1579.23	TMF
C ₃ tank-epiphyte	<i>Werauhia gladioliflora</i>	0.29	0.005	0.29	0.007	1.00	375	6	64	4	0.17	NA	NA	NA	NA	3311.36	TMF
C ₃ tank-epiphyte	<i>Lutheria glutinosa</i>	0.19	0.003	0.16	0.002	1.18	355	10	44	1	0.12	NA	NA	NA	NA	NA	TMF
C ₃ tank-epiphyte	<i>Vriesea guttata</i>	0.29	0.003	0.10	0.001	2.86	155	5	74	6	0.48	NA	NA	NA	NA	1541.03	TMF
C ₃ tank-epiphyte	<i>Alcantarea imperialis</i>	0.24	0.003	0.20	0.006	1.20	502	16	81	4	0.16	NA	NA	NA	NA	1296.58	TMF

C ₃ tank-epiphyte	<i>Vriesea incurvata</i>	0.21	0.004	0.08	0.002	2.71	298	13	79	4	0.27	NA	NA	NA	NA	1660.88	TMF
C ₃ tank-epiphyte	<i>Vriesea lubbersii</i>	0.21	0.005	0.19	0.003	1.09	324	12	47	6	0.15	NA	NA	NA	NA	1337.04	TMF
C ₃ tank-epiphyte	<i>Werauhia marnier-lapostollei</i>	0.19	0.004	0.12	0.003	1.57	208	10	58	5	0.28	NA	NA	NA	NA	3022.52	TMF
C ₃ tank-epiphyte	<i>Alcantarea odorata</i>	0.17	0.002	0.20	0.005	0.83	933	21	73	7	0.08	NA	NA	NA	NA	1352.40	TMF
C ₃ tank-epiphyte	<i>Tillandsia ospinae</i>	0.14	0.005	0.13	0.005	1.05	348	13	68	4	0.20	NA	NA	NA	NA	4083.13	TMF
C ₃ tank-epiphyte	<i>Vriesea platynema</i>	0.37	0.004	0.22	0.004	1.69	354	11	77	4	0.22	NA	NA	NA	NA	1608.51	TMF
C ₃ tank-epiphyte	<i>Mezobromelia pleiosticha</i>	0.14	0.006	0.18	0.004	0.78	588	15	78	2	0.13	NA	NA	NA	NA	2846.49	TMF
C ₃ tank-epiphyte	<i>Vriesea psittacina</i>	0.13	0.001	0.10	0.005	1.29	339	12	52	4	0.15	NA	NA	NA	NA	1489.69	TMF
C ₃ tank-epiphyte	<i>Alcantarea regina</i>	0.30	0.004	0.36	0.004	0.84	912	18	93	6	0.10	NA	NA	NA	NA	1575.67	TMF
C ₃ tank-epiphyte	<i>Werauhia ringens</i>	0.13	0.002	0.10	0.001	1.29	328	11	56	3	0.17	NA	NA	NA	NA	2755.03	TMF
C ₃ tank-epiphyte	<i>Vriesea rubyae</i>	0.12	0.005	0.11	0.001	1.12	233	9	44	2	0.19	NA	NA	NA	NA	NA	TMF
C ₃ tank-epiphyte	<i>Werauhia sanguinolenta</i>	0.35	0.006	0.14	0.005	2.48	149	6	59	6	0.40	NA	NA	NA	NA	3009.77	TMF
C ₃ tank-epiphyte	<i>Vriesea saundersii</i>	0.15	0.003	0.15	0.006	0.96	358	8	69	1	0.19	NA	NA	NA	NA	2156.25	TMF
C ₃ tank-epiphyte	<i>Lutheria splendens</i>	0.27	0.005	0.28	0.004	0.94	339	8	70	5	0.21	NA	NA	NA	NA	2698.79	TMF
C ₃ tank-epiphyte	<i>Werauhia viridiflora</i>	0.25	0.004	0.13	0.003	1.98	235	8	71	1	0.30	NA	NA	NA	NA	3014.50	TMF
CAM atmospheric	<i>Tillandsia arequibae</i>	0.20	0.005	0.38	0.005	0.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	MFS
CAM atmospheric	<i>Tillandsia arhiza</i>	0.21	0.003	0.23	0.003	0.92	NA	NA	NA	NA	NA	NA	NA	NA	NA	1204.90	TDF
CAM atmospheric	<i>Tillandsia balsasensis</i>	0.23	0.004	0.23	0.003	0.99	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM atmospheric	<i>Tillandsia belloensis</i>	0.12	0.006	0.11	0.005	1.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	2071.75	TMF
CAM atmospheric	<i>Tillandsia brachycaulos</i>	0.28	0.004	0.20	0.002	1.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	1794.50	TMF
CAM atmospheric	<i>Tillandsia butzii</i>	0.39	0.008	0.36	0.004	1.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	1835.87	TMF
CAM atmospheric	<i>Tillandsia cacticola</i>	0.35	0.004	0.54	0.002	0.65	NA	NA	NA	NA	NA	NA	NA	NA	NA	491.00	DXS
CAM atmospheric	<i>Tillandsia caput-medusae</i>	0.33	0.009	0.66	0.012	0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	1552.10	TDF

CAM atmospheric	<i>Tillandsia chlorophylla</i>	0.15	0.001	0.16	0.002	0.89	NA	NA	NA	NA	NA	NA	NA	NA	NA	2373.63	TMF
CAM atmospheric	<i>Tillandsia copanensis</i>	0.19	0.005	0.21	0.006	0.91	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM atmospheric	<i>Tillandsia crocata</i>	0.28	0.004	0.54	0.009	0.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	1491.30	MFS
CAM atmospheric	<i>Tillandsia dura</i>	0.08	0.002	0.11	0.001	0.78	NA	NA	NA	NA	NA	NA	NA	NA	NA	1556.97	TMF
CAM atmospheric	<i>Tillandsia duratii</i>	0.18	0.002	0.22	0.002	0.81	NA	NA	NA	NA	NA	NA	NA	NA	NA	1003.58	MFS
CAM atmospheric	<i>Tillandsia edithae</i>	0.13	0.004	0.21	0.003	0.63	NA	NA	NA	NA	NA	NA	NA	NA	NA	955.42	MFS
CAM atmospheric	<i>Tillandsia funckiana</i>	0.10	0.002	0.08	0.001	1.31	NA	NA	NA	NA	NA	NA	NA	NA	NA	1432.88	TMF
CAM atmospheric	<i>Tillandsia guenther-nolleri</i>	0.28	0.005	0.29	0.003	0.96	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TDF
CAM atmospheric	<i>Tillandsia harrisii</i>	0.39	0.009	0.54	0.008	0.73	NA	NA	NA	NA	NA	NA	NA	NA	NA	1899.78	TMF
CAM atmospheric	<i>Tillandsia ionantha</i>	0.43	0.006	0.49	0.007	0.87	NA	NA	NA	NA	NA	NA	NA	NA	NA	1211.38	TDF
CAM atmospheric	<i>Tillandsia juncea</i>	0.25	0.004	0.25	0.006	1.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	1677.18	TMF
CAM atmospheric	<i>Tillandsia krukoffiana</i>	0.16	0.004	0.14	0.004	1.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	1664.62	TMF
CAM atmospheric	<i>Tillandsia latifolia</i>	0.23	0.007	0.45	0.008	0.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	520.52	TMF
CAM atmospheric	<i>Tillandsia leucolepis</i>	0.15	0.002	0.34	0.004	0.46	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TDF
CAM atmospheric	<i>Tillandsia lithophila</i>	0.38	0.006	0.48	0.012	0.79	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM atmospheric	<i>Tillandsia lymanii</i>	0.14	0.002	0.12	0.003	1.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	739.28	TMF
CAM atmospheric	<i>Tillandsia marnier-lapostollei</i>	0.25	0.006	0.18	0.003	1.43	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM atmospheric	<i>Tillandsia mima</i>	0.20	0.004	0.25	0.004	0.79	NA	NA	NA	NA	NA	NA	NA	NA	NA	1714.86	TMF
CAM atmospheric	<i>Tillandsia mollis</i>	0.22	0.004	0.45	0.007	0.48	NA	NA	NA	NA	NA	NA	NA	NA	NA	587.25	TDF
CAM atmospheric	<i>Tillandsia neglecta</i>	0.15	0.003	0.22	0.007	0.66	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM atmospheric	<i>Tillandsia paleacea</i>	0.12	0.001	0.21	0.007	0.60	NA	NA	NA	NA	NA	NA	NA	NA	NA	873.67	TDF
CAM atmospheric	<i>Tillandsia paucifolia</i>	0.35	0.009	0.69	0.015	0.51	NA	NA	NA	NA	NA	NA	NA	NA	NA	1303.40	TMF
CAM atmospheric	<i>Tillandsia peiranoi</i>	0.45	0.010	0.45	0.007	0.99	NA	NA	NA	NA	NA	NA	NA	NA	NA	303.95	MFS
CAM atmospheric	<i>Tillandsia polystachia</i>	0.34	0.005	0.52	0.013	0.64	NA	NA	NA	NA	NA	NA	NA	NA	NA	1731.08	TDF
CAM atmospheric	<i>Tillandsia pruinosa</i>	0.12	0.001	0.24	0.004	0.49	NA	NA	NA	NA	NA	NA	NA	NA	NA	2034.50	TMF
CAM atmospheric	<i>Tillandsia pseudobaileyi</i>	0.09	0.002	0.10	0.004	0.91	NA	NA	NA	NA	NA	NA	NA	NA	NA	1094.67	TMF
CAM atmospheric	<i>Tillandsia rhodocephala</i>	0.15	0.004	0.15	0.005	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TDF

CAM atmospheric	<i>Tillandsia streptophylla</i>	0.29	0.005	0.35	0.005	0.82	NA	NA	NA	NA	NA	NA	NA	NA	NA	1749.46	TDF
CAM atmospheric	<i>Tillandsia stricta</i>	0.35	0.003	0.18	0.005	1.94	NA	NA	NA	NA	NA	NA	NA	NA	NA	1406.73	TMF
CAM atmospheric	<i>Tillandsia tenuifolia</i>	0.23	0.003	0.64	0.010	0.36	NA	NA	NA	NA	NA	NA	NA	NA	NA	1361.27	TMF
CAM atmospheric	<i>Tillandsia xerographica</i>	0.35	0.007	0.95	0.016	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	1030.75	TDF
CAM atmospheric	<i>Tillandsia xiphioides</i>	0.19	0.004	0.20	0.003	0.97	NA	NA	NA	NA	NA	NA	NA	NA	NA	566.38	MFS
CAM tank-epiphyte	<i>Acanthostachys pitcairnioides</i>	0.30	0.005	0.66	0.011	0.46	NA	NA	NA	NA	NA	NA	NA	NA	NA	1387.75	TMF
CAM tank-epiphyte	<i>Acanthostachys strobilacea</i>	0.37	0.008	0.73	0.060	0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	1347.65	TDF
CAM tank-epiphyte	<i>Aechmea aciculosa</i>	0.19	0.003	0.12	0.003	1.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	2536.18	TMF
CAM tank-epiphyte	<i>Aechmea alba</i>	0.27	0.005	0.28	0.003	0.98	NA	NA	NA	NA	NA	NA	NA	NA	NA	1341.69	TDF
CAM tank-epiphyte	<i>Aechmea allenii</i>	0.24	0.005	0.15	0.004	1.60	NA	NA	NA	NA	NA	NA	NA	NA	NA	2670.29	TMF
CAM tank-epiphyte	<i>Aechmea aquilega</i>	0.37	0.006	0.30	0.005	1.22	NA	NA	NA	NA	NA	NA	NA	NA	NA	2125.81	TMF
CAM tank-epiphyte	<i>Aechmea blumenavii</i>	0.15	0.003	0.09	0.004	1.56	NA	NA	NA	NA	NA	NA	NA	NA	NA	1598.01	MFS
CAM tank-epiphyte	<i>Aechmea bromeliifolia</i>	0.38	0.005	0.44	0.011	0.87	NA	NA	NA	NA	NA	NA	NA	NA	NA	1658.70	TMF
CAM tank-epiphyte	<i>Aechmea calyculata</i>	0.19	0.004	0.09	0.002	2.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	1621.48	MFS
CAM tank-epiphyte	<i>Aechmea chantinii</i>	0.23	0.004	0.29	0.003	0.77	NA	NA	NA	NA	NA	NA	NA	NA	NA	2815.27	TMF
CAM tank-epiphyte	<i>Aechmea coelestis</i>	0.21	0.004	0.19	0.003	1.09	NA	NA	NA	NA	NA	NA	NA	NA	NA	1497.11	TMF
CAM tank-epiphyte	<i>Aechmea disjuncta</i>	0.06	0.001	0.19	0.006	0.34	NA	NA	NA	NA	NA	NA	NA	NA	NA	1049.80	TMF
CAM tank-epiphyte	<i>Aechmea distichantha</i>	0.36	0.007	0.42	0.009	0.85	NA	NA	NA	NA	NA	NA	NA	NA	NA	1460.04	MFS
CAM tank-epiphyte	<i>Aechmea drakeana</i>	0.17	0.004	0.10	0.003	1.71	NA	NA	NA	NA	NA	NA	NA	NA	NA	2342.69	TMF
CAM tank-epiphyte	<i>Aechmea fasciata</i>	0.41	0.008	0.36	0.005	1.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	1548.75	TMF
CAM tank-epiphyte	<i>Aechmea fendleri</i>	0.31	0.005	0.24	0.005	1.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Aechmea filicaulis</i>	0.68	0.009	0.18	0.002	3.80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TDF
CAM tank-epiphyte	<i>Aechmea gamosepala</i>	0.33	0.007	0.19	0.001	1.74	NA	NA	NA	NA	NA	NA	NA	NA	NA	1638.04	TDF
CAM tank-epiphyte	<i>Aechmea lamarchei</i>	0.33	0.006	0.33	0.008	1.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	1203.85	TDF
CAM tank-epiphyte	<i>Aechmea longifolia</i>	0.29	0.006	0.44	0.008	0.66	NA	NA	NA	NA	NA	NA	NA	NA	NA	2934.33	TMF
CAM tank-epiphyte	<i>Aechmea lueddemanniana</i>	0.18	0.003	0.24	0.006	0.75	NA	NA	NA	NA	NA	NA	NA	NA	NA	2260.94	TMF

CAM tank-epiphyte	<i>Aechmea marauensis</i>	0.15	0.004	0.16	0.004	0.93	NA	NA	NA	NA	NA	NA	NA	NA	NA	1682.34	TMF
CAM tank-epiphyte	<i>Aechmea miniata</i>	0.34	0.005	0.25	0.004	1.36	NA	NA	NA	NA	NA	NA	NA	NA	NA	1733.47	TMF
CAM tank-epiphyte	<i>Aechmea nudicaulis</i>	0.32	0.005	0.49	0.011	0.65	NA	NA	NA	NA	NA	NA	NA	NA	NA	2234.74	TDF
CAM tank-epiphyte	<i>Aechmea orlandiana</i>	0.44	0.007	0.38	0.004	1.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	1078.81	TMF
CAM tank-epiphyte	<i>Aechmea pineliana</i>	0.38	0.006	0.46	0.006	0.82	NA	NA	NA	NA	NA	NA	NA	NA	NA	1197.23	TMF
CAM tank-epiphyte	<i>Aechmea ramosa</i>	0.14	0.003	0.15	0.003	0.96	NA	NA	NA	NA	NA	NA	NA	NA	NA	1183.24	TMF
CAM tank-epiphyte	<i>Aechmea recurvata</i>	0.25	0.005	0.55	0.009	0.45	NA	NA	NA	NA	NA	NA	NA	NA	NA	1641.22	MFS
CAM tank-epiphyte	<i>Aechmea subintegerrima</i>	0.09	0.002	0.09	0.002	1.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	1498.40	TMF
CAM tank-epiphyte	<i>Aechmea tayoensis</i>	0.41	0.007	0.25	0.005	1.64	NA	NA	NA	NA	NA	NA	NA	NA	NA	2536.54	TMF
CAM tank-epiphyte	<i>Ursulaea tuitensis</i>	0.09	0.002	0.18	0.002	0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	1275.97	TDF
CAM tank-epiphyte	<i>Aechmea turbinocalyx</i>	0.13	0.002	0.09	0.002	1.38	NA	NA	NA	NA	NA	NA	NA	NA	NA	1414.25	TMF
CAM tank-epiphyte	<i>Aechmea victoriana</i>	0.37	0.006	0.18	0.004	2.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	1245.29	TMF
CAM tank-epiphyte	<i>Aechmea warasii</i>	0.12	0.003	0.14	0.001	0.83	NA	NA	NA	NA	NA	NA	NA	NA	NA	1285.03	TMF
CAM tank-epiphyte	<i>Aechmea winkleri</i>	0.24	0.004	0.26	0.007	0.95	NA	NA	NA	NA	NA	NA	NA	NA	NA	1413.50	TMF
CAM tank-epiphyte	<i>Androlepis skinneri</i>	0.41	0.010	0.32	0.005	1.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	2684.61	TMF
CAM tank-epiphyte	<i>Araeococcus flagellifolius</i>	0.28	0.005	0.65	0.011	0.42	NA	NA	NA	NA	NA	NA	NA	NA	NA	2574.76	TMF
CAM tank-epiphyte	<i>Araeococcus goeldianus</i>	0.12	0.002	0.16	0.001	0.78	NA	NA	NA	NA	NA	NA	NA	NA	NA	2983.83	TMF
CAM tank-epiphyte	<i>Araeococcus micranthus</i>	0.29	0.006	0.41	0.005	0.71	NA	NA	NA	NA	NA	NA	NA	NA	NA	2492.29	TMF
CAM tank-epiphyte	<i>Araeococcus nigropurpureus</i>	0.09	0.002	0.09	0.001	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	1860.32	TMF
CAM tank-epiphyte	<i>Billbergia amoena</i>	0.30	0.007	0.27	0.004	1.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	1331.49	TMF
CAM tank-epiphyte	<i>Billbergia chlorostica</i>	0.22	0.006	0.21	0.004	1.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	1209.98	TDF
CAM tank-epiphyte	<i>Billbergia decora</i>	0.26	0.003	0.23	0.005	1.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	2651.43	TDF
CAM tank-epiphyte	<i>Billbergia elegans</i>	0.22	0.003	0.15	0.006	1.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	1516.38	TMF
CAM tank-epiphyte	<i>Billbergia euphemiae</i>	0.29	0.003	0.14	0.002	2.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	1281.23	TMF
CAM tank-epiphyte	<i>Billbergia laxiflora</i>	0.15	0.005	0.12	0.001	1.30	NA	NA	NA	NA	NA	NA	NA	NA	NA	1216.49	TMF
CAM tank-epiphyte	<i>Billbergia leptopoda</i>	0.31	0.007	0.18	0.003	1.73	NA	NA	NA	NA	NA	NA	NA	NA	NA	1262.81	TMF
CAM tank-epiphyte	<i>Billbergia macrolepis</i>	0.10	0.002	0.26	0.004	0.39	NA	NA	NA	NA	NA	NA	NA	NA	NA	2568.66	TMF

CAM tank-epiphyte	<i>Billbergia manarae</i>	0.18	0.004	0.16	0.003	1.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Billbergia oxysepala</i>	0.29	0.004	0.22	0.005	1.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	2931.25	TMF
CAM tank-epiphyte	<i>Billbergia pallidiflora</i>	0.14	0.004	0.39	0.005	0.36	NA	NA	NA	NA	NA	NA	NA	NA	NA	986.10	TDF
CAM tank-epiphyte	<i>Billbergia robert-readii</i>	0.23	0.006	0.28	0.006	0.81	NA	NA	NA	NA	NA	NA	NA	NA	NA	2293.88	TMF
CAM tank-epiphyte	<i>Billbergia sanderiana</i>	0.18	0.005	0.15	0.007	1.20	NA	NA	NA	NA	NA	NA	NA	NA	NA	1363.46	TMF
CAM tank-epiphyte	<i>Billbergia stenopetala</i>	0.29	0.005	0.29	0.009	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	2722.15	TMF
CAM tank-epiphyte	<i>Billbergia tessmannii</i>	0.24	0.004	0.16	0.002	1.48	NA	NA	NA	NA	NA	NA	NA	NA	NA	2741.95	TMF
CAM tank-epiphyte	<i>Billbergia viridiflora</i>	0.24	0.005	0.14	0.005	1.71	NA	NA	NA	NA	NA	NA	NA	NA	NA	2320.55	TMF
CAM tank-epiphyte	<i>Billbergia vittata</i>	0.11	0.001	0.17	0.003	0.67	NA	NA	NA	NA	NA	NA	NA	NA	NA	1390.73	TMF
CAM tank-epiphyte	<i>Canistropsis marceloi</i>	0.33	0.007	0.16	0.001	2.06	NA	NA	NA	NA	NA	NA	NA	NA	NA	1806.29	TMF
CAM tank-epiphyte	<i>Wittrockia cyathiformis</i>	0.21	0.003	0.14	0.001	1.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	1648.17	TMF
CAM tank-epiphyte	<i>Canistrum fragrans</i>	0.37	0.008	0.49	0.010	0.75	NA	NA	NA	NA	NA	NA	NA	NA	NA	1454.92	TMF
CAM tank-epiphyte	<i>Wittrockia gigantea</i>	0.16	0.004	0.13	0.004	1.27	NA	NA	NA	NA	NA	NA	NA	NA	NA	1601.59	TMF
CAM tank-epiphyte	<i>Wittrockia superba</i>	0.20	0.005	0.21	0.004	0.97	NA	NA	NA	NA	NA	NA	NA	NA	NA	1522.66	TMF
CAM tank-epiphyte	<i>Hohenbergia belemii</i>	0.15	0.005	0.15	0.004	1.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	1671.45	TMF
CAM tank-epiphyte	<i>Hohenbergia brachycephala</i>	0.22	0.004	0.37	0.004	0.61	NA	NA	NA	NA	NA	NA	NA	NA	NA	1639.00	TMF
CAM tank-epiphyte	<i>Hohenbergia catingae</i>	0.06	0.002	0.22	0.002	0.29	NA	NA	NA	NA	NA	NA	NA	NA	NA	869.82	TMF
CAM tank-epiphyte	<i>Hohenbergia edmundoi</i>	0.13	0.002	0.22	0.003	0.58	NA	NA	NA	NA	NA	NA	NA	NA	NA	917.25	TDF
CAM tank-epiphyte	<i>Hohenbergia inermis</i>	0.14	0.003	0.14	0.005	1.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	2107.67	TMF
CAM tank-epiphyte	<i>Hohenbergia negrilensis</i>	0.16	0.004	0.13	0.006	1.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Hohenbergia portoricensis</i>	0.18	0.005	0.18	0.002	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	2275.75	TMF
CAM tank-epiphyte	<i>Hohenbergia proctorii</i>	0.14	0.003	0.08	0.002	1.67	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Hohenbergia undulatifolia</i>	0.09	0.001	0.21	0.002	0.43	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TDF
CAM tank-epiphyte	<i>Hohenbergia urbaniana</i>	0.15	0.003	0.14	0.001	1.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	605.70	TMF

CAM tank-epiphyte	<i>Hohenbergia utriculosa</i>	0.12	0.002	0.12	0.005	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	974.90	TDF
CAM tank-epiphyte	<i>Lymania alvimii</i>	0.11	0.003	0.12	0.002	0.95	NA	NA	NA	NA	NA	NA	NA	NA	NA	1469.44	TMF
CAM tank-epiphyte	<i>Lymania azurea</i>	0.48	0.007	0.30	0.007	1.62	NA	NA	NA	NA	NA	NA	NA	NA	NA	1467.72	TMF
CAM tank-epiphyte	<i>Lymania smithii</i>	0.16	0.005	0.06	0.004	2.55	NA	NA	NA	NA	NA	NA	NA	NA	NA	1619.55	TMF
CAM tank-epiphyte	<i>Lymania spiculata</i>	0.35	0.005	0.15	0.007	2.31	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Neoregelia amandae</i>	0.10	0.003	0.11	0.001	0.89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Neoregelia ampullacea</i>	0.15	0.005	0.21	0.001	0.71	NA	NA	NA	NA	NA	NA	NA	NA	NA	1181.67	TMF
CAM tank-epiphyte	<i>Neoregelia bahiana</i>	0.06	0.001	0.16	0.001	0.41	NA	NA	NA	NA	NA	NA	NA	NA	NA	1081.74	TDF
CAM tank-epiphyte	<i>Neoregelia carolinae</i>	0.18	0.003	0.11	0.005	1.72	NA	NA	NA	NA	NA	NA	NA	NA	NA	1559.14	TMF
CAM tank-epiphyte	<i>Neoregelia compacta</i>	0.25	0.005	0.20	0.005	1.30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Neoregelia crispata</i>	0.08	0.002	0.08	0.003	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	1248.25	TMF
CAM tank-epiphyte	<i>Neoregelia eleutheropetala</i>	0.37	0.008	0.38	0.006	0.99	NA	NA	NA	NA	NA	NA	NA	NA	NA	3036.68	TMF
CAM tank-epiphyte	<i>Neoregelia gavionensis</i>	0.18	0.003	0.12	0.006	1.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Neoregelia hoehneana</i>	0.09	0.002	0.08	0.002	1.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Neoregelia indecora</i>	0.28	0.004	0.35	0.009	0.79	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Neoregelia johnsoniae</i>	0.15	0.004	0.14	0.003	1.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Neoregelia laevis</i>	0.25	0.004	0.24	0.003	1.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	1779.37	TMF
CAM tank-epiphyte	<i>Neoregelia lilliputiana</i>	0.08	0.001	0.24	0.002	0.35	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Neoregelia longipedicellata</i>	0.16	0.003	0.19	0.005	0.88	NA	NA	NA	NA	NA	NA	NA	NA	NA	1795.00	TMF
CAM tank-epiphyte	<i>Neoregelia macrosepala</i>	0.17	0.003	0.17	0.006	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	1229.28	TMF
CAM tank-epiphyte	<i>Neoregelia magdalenae</i>	0.16	0.003	0.09	0.001	1.87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Neoregelia marmorata</i>	0.13	0.005	0.13	0.005	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	2494.30	TMF
CAM tank-epiphyte	<i>Neoregelia mooreana</i>	0.18	0.005	0.21	0.004	0.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	3668.88	TMF
CAM tank-epiphyte	<i>Neoregelia mucugensis</i>	0.09	0.002	0.11	0.002	0.83	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TDF

CAM tank-epiphyte	<i>Neoregelia myrmecophila</i>	0.18	0.001	0.15	0.007	1.24	NA	NA	NA	NA	NA	NA	NA	NA	NA	2944.06	TMF
CAM tank-epiphyte	<i>Neoregelia nivea</i>	0.16	0.001	0.11	0.004	1.42	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Neoregelia olens</i>	0.20	0.005	0.12	0.003	1.70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Neoregelia pauciflora</i>	0.15	0.003	0.11	0.003	1.39	NA	NA	NA	NA	NA	NA	NA	NA	NA	1289.35	TMF
CAM tank-epiphyte	<i>Neoregelia paulistana</i>	0.07	0.001	0.07	0.002	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	1255.00	TMF
CAM tank-epiphyte	<i>Neoregelia pendula</i>	0.09	0.001	0.24	0.004	0.38	NA	NA	NA	NA	NA	NA	NA	NA	NA	2752.24	TMF
CAM tank-epiphyte	<i>Neoregelia pernambucana</i>	0.29	0.006	0.16	0.006	1.81	NA	NA	NA	NA	NA	NA	NA	NA	NA	1188.50	TMF
CAM tank-epiphyte	<i>Neoregelia roethii</i>	0.12	0.003	0.15	0.003	0.81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Neoregelia rosea</i>	0.12	0.002	0.25	0.004	0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	2531.75	TMF
CAM tank-epiphyte	<i>Neoregelia rothinessa</i>	0.23	0.004	0.15	0.004	1.56	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Neoregelia rubrovittata</i>	0.14	0.003	0.16	0.001	0.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Neoregelia ruschii</i>	0.14	0.002	0.08	0.001	1.77	NA	NA	NA	NA	NA	NA	NA	NA	NA	1390.65	TMF
CAM tank-epiphyte	<i>Neoregelia sapiatibensis</i>	0.26	0.004	0.15	0.002	1.73	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Neoregelia sarmentosa</i>	0.20	0.004	0.12	0.002	1.62	NA	NA	NA	NA	NA	NA	NA	NA	NA	1352.86	TMF
CAM tank-epiphyte	<i>Neoregelia simulans</i>	0.15	0.002	0.14	0.006	1.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	1225.82	TMF
CAM tank-epiphyte	<i>Neoregelia tarapotoensis</i>	0.21	0.004	0.18	0.005	1.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	2299.44	TMF
CAM tank-epiphyte	<i>Neoregelia tigrina</i>	0.31	0.005	0.24	0.004	1.31	NA	NA	NA	NA	NA	NA	NA	NA	NA	1258.63	TMF
CAM tank-epiphyte	<i>Neoregelia wilsoniana</i>	0.06	0.001	0.09	0.005	0.70	NA	NA	NA	NA	NA	NA	NA	NA	NA	1456.52	TMF
CAM tank-epiphyte	<i>Neoregelia wurdackii</i>	0.10	0.001	0.09	0.003	1.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	2478.81	TMF
CAM tank-epiphyte	<i>Neoregelia zonata</i>	0.12	0.001	0.15	0.006	0.84	NA	NA	NA	NA	NA	NA	NA	NA	NA	1488.75	TMF
CAM tank-epiphyte	<i>Nidularium albiflorum</i>	0.15	0.006	0.11	0.007	1.44	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Nidularium amazonicum</i>	0.21	0.003	0.24	0.003	0.90	NA	NA	NA	NA	NA	NA	NA	NA	NA	1616.34	TMF
CAM tank-epiphyte	<i>Nidularium amorimii</i>	0.15	0.002	0.11	0.004	1.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	1238.26	TMF
CAM tank-epiphyte	<i>Nidularium angustifolium</i>	0.08	0.002	0.07	0.004	1.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	2156.25	TMF

CAM tank-epiphyte	<i>Nidularium apiculatum</i>	0.15	0.003	0.09	0.002	1.67	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Nidularium billbergioides</i>	0.28	0.006	0.22	0.001	1.31	NA	NA	NA	NA	NA	NA	NA	NA	NA	1565.61	TMF
CAM tank-epiphyte	<i>Nidularium campo-alegrensis</i>	0.14	0.003	0.09	0.004	1.60	NA	NA	NA	NA	NA	NA	NA	NA	NA	1488.15	TMF
CAM tank-epiphyte	<i>Nidularium campos-portoi</i>	0.11	0.001	0.12	0.003	0.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	1772.75	TMF
CAM tank-epiphyte	<i>Nidularium espiritosantense</i>	0.11	0.004	0.08	0.002	1.38	NA	NA	NA	NA	NA	NA	NA	NA	NA	1322.15	TMF
CAM tank-epiphyte	<i>Nidularium exiguum</i>	0.15	0.004	0.08	0.002	2.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	1531.25	TMF
CAM tank-epiphyte	<i>Nidularium ferdinando-coburgii</i>	0.16	0.005	0.11	0.002	1.56	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Nidularium fradense</i>	0.12	0.001	0.11	0.004	1.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	1347.00	TMF
CAM tank-epiphyte	<i>Nidularium fulgens</i>	0.33	0.005	0.21	0.003	1.58	NA	NA	NA	NA	NA	NA	NA	NA	NA	1503.95	TMF
CAM tank-epiphyte	<i>Nidularium innocentii</i>	0.26	0.006	0.26	0.004	0.98	NA	NA	NA	NA	NA	NA	NA	NA	NA	1583.43	TMF
CAM tank-epiphyte	<i>Nidularium krisgreeniae</i>	0.15	0.002	0.15	0.004	1.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	1521.50	TMF
CAM tank-epiphyte	<i>Nidularium linehamii</i>	0.12	0.002	0.17	0.003	0.69	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Canistrospis microps</i>	0.28	0.004	0.24	0.006	1.20	NA	NA	NA	NA	NA	NA	NA	NA	NA	1586.32	TMF
CAM tank-epiphyte	<i>Nidularium picinguabensis</i>	0.21	0.003	0.18	0.007	1.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Nidularium procerum</i>	0.11	0.003	0.07	0.001	1.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	1473.23	TMF
CAM tank-epiphyte	<i>Nidularium rosulatum</i>	0.12	0.003	0.12	0.003	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	1428.50	TMF
CAM tank-epiphyte	<i>Nidularium rubens</i>	0.12	0.006	0.12	0.002	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	2156.25	TMF
CAM tank-epiphyte	<i>Nidularium serratum</i>	0.14	0.006	0.11	0.002	1.33	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Nidularium viridipetalum</i>	0.11	0.002	0.12	0.003	0.90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
CAM tank-epiphyte	<i>Portea grandiflora</i>	0.24	0.006	0.24	0.003	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	1839.11	TMF
CAM tank-epiphyte	<i>Quesnelia augusto-coburgi</i>	0.35	0.007	0.32	0.005	1.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	1789.50	TMF
CAM tank-epiphyte	<i>Quesnelia blanda</i>	0.18	0.003	0.14	0.004	1.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	2156.25	TMF
CAM tank-epiphyte	<i>Quesnelia edmundoi</i>	0.12	0.003	0.18	0.004	0.65	NA	NA	NA	NA	NA	NA	NA	NA	NA	1312.69	TMF
CAM tank-epiphyte	<i>Quesnelia kautskyi</i>	0.17	0.004	0.14	0.003	1.21	NA	NA	NA	NA	NA	NA	NA	NA	NA	1365.72	TMF

CAM tank-epiphyte	<i>Quesnelia lateralis</i>	0.22	0.005	0.26	0.007	0.84	NA	NA	NA	NA	NA	NA	NA	NA	NA	1688.50	TMF
CAM tank-epiphyte	<i>Quesnelia liboniana</i>	0.32	0.003	0.22	0.008	1.44	NA	NA	NA	NA	NA	NA	NA	NA	NA	1624.94	TMF
CAM tank-epiphyte	<i>Quesnelia marmorata</i>	0.49	0.007	0.51	0.009	0.96	NA	NA	NA	NA	NA	NA	NA	NA	NA	1279.24	TMF
CAM tank-epiphyte	<i>Ronnbergia silvana</i>	0.11	0.004	0.07	0.001	1.58	NA	NA	NA	NA	NA	NA	NA	NA	NA	1254.75	TMF
CAM tank-epiphyte	<i>Tillandsia fasciculata</i>	0.67	0.009	0.97	0.023	0.68	NA	NA	NA	NA	NA	NA	NA	NA	NA	1653.99	TMF
CAM tank-epiphyte	<i>Tillandsia utriculata</i>	0.34	0.005	0.64	0.014	0.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	1664.44	TMF
Non-succulent terrestrial	<i>Fosterella albicans</i>	0.28	0.003	0.25	0.004	1.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	957.46	MFS
Non-succulent terrestrial	<i>Fosterella caulescens</i>	0.09	0.002	0.21	0.008	0.43	NA	NA	NA	NA	NA	NA	NA	NA	NA	1618.63	TMF
Non-succulent terrestrial	<i>Fosterella micrantha</i>	0.30	0.007	0.29	0.008	1.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	2287.85	TMF
Non-succulent terrestrial	<i>Fosterella penduliflora</i>	0.32	0.007	0.19	0.002	1.75	NA	NA	NA	NA	NA	NA	NA	NA	NA	1029.77	TMF
Non-succulent terrestrial	<i>Fosterella petiolata</i>	0.25	0.005	0.27	0.006	0.90	NA	NA	NA	NA	NA	NA	NA	NA	NA	1155.98	TMF
Non-succulent terrestrial	<i>Fosterella rusbyi</i>	0.10	0.002	0.20	0.003	0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	1460.73	TMF
Non-succulent terrestrial	<i>Fosterella schidosperma</i>	0.43	0.010	0.50	0.006	0.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	1827.40	TMF
Non-succulent terrestrial	<i>Fosterella spectabilis</i>	0.31	0.003	0.36	0.010	0.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	2625.80	TMF
Non-succulent terrestrial	<i>Navia arida</i>	0.08	0.002	0.28	0.003	0.30	NA	NA	NA	NA	NA	NA	NA	NA	NA	2472.88	TMF
Non-succulent terrestrial	<i>Navia lactea</i>	0.31	0.007	0.23	0.003	1.34	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
Non-succulent terrestrial	<i>Pitcairnia andreana</i>	0.22	0.004	0.19	0.005	1.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	1359.65	TMF
Non-succulent terrestrial	<i>Pitcairnia angustifolia</i>	0.16	0.003	0.16	0.006	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	2048.42	TMF
Non-succulent terrestrial	<i>Pitcairnia atrorubens</i>	0.15	0.003	0.04	0.001	3.57	NA	NA	NA	NA	NA	NA	NA	NA	NA	3120.61	TMF
Non-succulent terrestrial	<i>Pitcairnia bergii</i>	0.20	0.003	0.13	0.001	1.48	NA	NA	NA	NA	NA	NA	NA	NA	NA	979.58	TMF
Non-succulent terrestrial	<i>Pitcairnia breedlovei</i>	0.07	0.001	0.06	0.002	1.20	NA	NA	NA	NA	NA	NA	NA	NA	NA	1069.81	TMF
Non-succulent terrestrial	<i>Pitcairnia caricifolia</i>	0.08	0.002	0.10	0.005	0.82	NA	NA	NA	NA	NA	NA	NA	NA	NA	2630.27	TMF
Non-succulent terrestrial	<i>Pitcairnia corcovadensis</i>	0.29	0.006	0.19	0.004	1.56	NA	NA	NA	NA	NA	NA	NA	NA	NA	1539.38	TMF
Non-succulent terrestrial	<i>Pitcairnia cuzcoensis</i>	0.10	0.003	0.09	0.006	1.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	1374.77	TMF
Non-succulent terrestrial	<i>Pitcairnia flammea</i>	0.38	0.004	0.14	0.001	2.71	NA	NA	NA	NA	NA	NA	NA	NA	NA	1454.80	TMF
Non-succulent terrestrial	<i>Pitcairnia funkiae</i>	0.41	0.003	0.21	0.002	1.93	NA	NA	NA	NA	NA	NA	NA	NA	NA	3457.33	TMF
Non-succulent terrestrial	<i>Pitcairnia grafii</i>	0.22	0.004	0.21	0.004	1.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF

Non-succulent terrestrial	<i>Pitcairnia imbricata</i>	0.26	0.005	0.06	0.005	4.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	2256.33	TMF
Non-succulent terrestrial	<i>Pitcairnia integrifolia</i>	0.28	0.004	0.61	0.010	0.47	NA	NA	NA	NA	NA	NA	NA	NA	NA	1946.19	TMF
Non-succulent terrestrial	<i>Pitcairnia jareckii</i>	0.06	0.004	0.06	0.001	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
Non-succulent terrestrial	<i>Pitcairnia neglecta</i>	0.38	0.004	0.34	0.005	1.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TMF
Non-succulent terrestrial	<i>Pitcairnia palmoides</i>	0.62	0.009	0.30	0.005	2.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	2556.25	TMF
Non-succulent terrestrial	<i>Pitcairnia paniculata</i>	0.29	0.007	0.22	0.005	1.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	1359.65	TMF
Non-succulent terrestrial	<i>Pitcairnia poortmanii</i>	0.09	0.002	0.06	0.001	1.36	NA	NA	NA	NA	NA	NA	NA	NA	NA	2057.52	TMF
Non-succulent terrestrial	<i>Pitcairnia recurvata</i>	0.37	0.005	0.11	0.001	3.55	NA	NA	NA	NA	NA	NA	NA	NA	NA	2302.54	TMF
Non-succulent terrestrial	<i>Pitcairnia riparia</i>	0.18	0.004	0.09	0.002	2.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	2140.96	TMF
Non-succulent terrestrial	<i>Pitcairnia sprucei</i>	0.17	0.002	0.12	0.002	1.49	NA	NA	NA	NA	NA	NA	NA	NA	NA	2804.49	TMF
Non-succulent terrestrial	<i>Pitcairnia staminea</i>	0.06	0.002	0.05	0.001	1.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	1265.20	TMF
Non-succulent terrestrial	<i>Pitcairnia stevensonii</i>	0.20	0.005	0.17	0.005	1.18	NA	NA	NA	NA	NA	NA	NA	NA	NA	2475.45	TMF
Non-succulent terrestrial	<i>Pitcairnia undulata</i>	0.31	0.004	0.20	0.006	1.51	NA	NA	NA	NA	NA	NA	NA	NA	NA	3353.38	TMF
Non-succulent terrestrial	<i>Pitcairnia xanthocalyx</i>	0.10	0.001	0.10	0.001	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TDF
Succulent terrestrial	<i>Ananas ananassoides</i>	0.56	0.011	0.67	0.012	0.84	NA	NA	NA	NA	NA	0.78	0.02	356	8	1697.42	TMF
Succulent terrestrial	<i>Ananas bracteatus</i>	0.32	0.007	0.61	0.015	0.52	NA	NA	NA	NA	NA	0.66	0.01	236	6	1528.67	TDF
Succulent terrestrial	<i>Ananas comosus</i>	0.42	0.009	0.41	0.006	1.02	NA	NA	NA	NA	NA	0.61	0.02	316	6	2153.34	TDF
Succulent terrestrial	<i>Ananas lucidus</i>	0.13	0.003	0.24	0.007	0.54	NA	NA	NA	NA	NA	0.26	0.01	224	6	2415.79	TMF
Succulent terrestrial	<i>Ananas nanus</i>	0.50	0.009	0.61	0.015	0.82	NA	NA	NA	NA	NA	0.71	0.02	322	9	1912.10	TMF
Succulent terrestrial	<i>Ananas parguazensis</i>	0.18	0.002	0.19	0.002	0.94	NA	NA	NA	NA	NA	0.24	0.01	284	5	2568.67	TMF
Succulent terrestrial	<i>Bromelia balansae</i>	0.40	0.005	0.85	0.014	0.48	NA	NA	NA	NA	NA	0.90	0.03	286	5	1510.18	TMF
Succulent terrestrial	<i>Bromelia epiphytica</i>	0.24	0.007	0.12	0.002	2.00	NA	NA	NA	NA	NA	0.17	0.01	339	7	NA	TDF
Succulent terrestrial	<i>Bromelia flemingii</i>	0.08	0.002	0.22	0.005	0.38	NA	NA	NA	NA	NA	0.28	0.01	224	4	NA	TMF
Succulent terrestrial	<i>Bromelia goyazensis</i>	0.07	0.001	0.18	0.002	0.40	NA	NA	NA	NA	NA	0.22	0.01	205	4	1517.83	TDF
Succulent terrestrial	<i>Bromelia humilis</i>	0.23	0.005	0.31	0.004	0.76	NA	NA	NA	NA	NA	0.37	0.02	258	6	1510.18	TDF
Succulent terrestrial	<i>Bromelia macedoi</i>	0.17	0.004	0.22	0.007	0.78	NA	NA	NA	NA	NA	0.26	0.01	289	5	1587.55	TDF
Succulent terrestrial	<i>Bromelia scarlatina</i>	0.53	0.012	0.12	0.005	4.50	NA	NA	NA	NA	NA	0.15	0.01	503	12	2770.75	TMF
Succulent terrestrial	<i>Cryptanthus acaulis</i>	0.50	0.011	0.28	0.006	1.79	NA	NA	NA	NA	NA	0.34	0.01	358	4	843.43	TMF
Succulent terrestrial	<i>Cryptanthus beuckeri</i>	0.66	0.014	0.28	0.007	2.39	NA	NA	NA	NA	NA	0.31	0.01	487	9	1313.98	TMF

Succulent terrestrial	<i>Cryptanthus bivittatus</i>	0.30	0.005	0.44	0.005	0.69	NA	NA	NA	NA	NA	0.52	0.02	255	5	NA	TMF
Succulent terrestrial	<i>Cryptanthus brevifolius</i>	0.45	0.009	0.71	0.013	0.64	NA	NA	NA	NA	NA	0.86	0.03	321	5	NA	TMF
Succulent terrestrial	<i>Cryptanthus bromelioides</i>	0.13	0.002	0.09	0.002	1.40	NA	NA	NA	NA	NA	0.15	0.01	269	4	1893.25	TMF
Succulent terrestrial	<i>Cryptanthus capitatus</i>	0.11	0.003	0.13	0.002	0.86	NA	NA	NA	NA	NA	0.18	0.01	250	5	NA	TMF
Succulent terrestrial	<i>Cryptanthus colnagoi</i>	0.36	0.007	0.44	0.009	0.81	NA	NA	NA	NA	NA	0.49	0.02	265	6	NA	TMF
Succulent terrestrial	<i>Cryptanthus diana</i>	0.15	0.003	0.12	0.003	1.23	NA	NA	NA	NA	NA	0.17	0.01	277	3	1497.70	TMF
Succulent terrestrial	<i>Cryptanthus fernseeoides</i>	0.08	0.002	0.09	0.001	0.93	NA	NA	NA	NA	NA	0.15	0.01	231	4	NA	TMF
Succulent terrestrial	<i>Cryptanthus grazielae</i>	0.12	0.001	0.19	0.005	0.62	NA	NA	NA	NA	NA	0.27	0.02	209	3	NA	TMF
Succulent terrestrial	<i>Cryptanthus incrassatus</i>	0.10	0.002	0.13	0.002	0.79	NA	NA	NA	NA	NA	0.16	0.01	246	6	NA	TMF
Succulent terrestrial	<i>Cryptanthus lyman-smithii</i>	0.13	0.002	0.08	0.004	1.57	NA	NA	NA	NA	NA	0.14	0.01	251	5	1800.67	TMF
Succulent terrestrial	<i>Cryptanthus maritimus</i>	0.09	0.002	0.11	0.002	0.83	NA	NA	NA	NA	NA	0.15	0.01	231	4	1296.58	TMF
Succulent terrestrial	<i>Cryptanthus osiris</i>	0.12	0.003	0.11	0.004	1.08	NA	NA	NA	NA	NA	0.28	0.01	232	4	NA	TMF
Succulent terrestrial	<i>Cryptanthus pickelii</i>	0.28	0.006	0.24	0.003	1.16	NA	NA	NA	NA	NA	0.27	0.01	282	7	1614.81	TMF
Succulent terrestrial	<i>Cryptanthus pseudoscaposus</i>	0.09	0.003	0.13	0.006	0.71	NA	NA	NA	NA	NA	0.17	0.01	221	5	1133.25	TMF
Succulent terrestrial	<i>Cryptanthus whitmanii</i>	0.28	0.004	0.73	0.016	0.38	NA	NA	NA	NA	NA	0.91	0.03	291	8	NA	TMF
Succulent terrestrial	<i>Deuterocohnia brevifolia</i>	0.16	0.004	0.19	0.005	0.88	NA	NA	NA	NA	NA	0.27	0.01	191	4	424.67	MFS
Succulent terrestrial	<i>Deuterocohnia brevispicata</i>	0.17	0.002	0.52	0.012	0.33	NA	NA	NA	NA	NA	0.63	0.02	188	4	764.83	MFS
Succulent terrestrial	<i>Deuterocohnia lorentziana</i>	0.16	0.005	0.23	0.007	0.69	NA	NA	NA	NA	NA	0.29	0.02	202	5	256.80	MFS
Succulent terrestrial	<i>Deuterocohnia meziana</i>	0.23	0.007	1.06	0.018	0.22	NA	NA	NA	NA	NA	1.16	0.04	241	6	924.68	MFS
Succulent terrestrial	<i>Deuterocohnia schreiteri</i>	0.18	0.005	0.85	0.014	0.21	NA	NA	NA	NA	NA	0.89	0.03	205	4	241.03	MFS
Succulent terrestrial	<i>Deuterocohnia seramisiana</i>	0.26	0.005	1.14	0.026	0.23	NA	NA	NA	NA	NA	1.27	0.03	250	7	585.00	MFS

Succulent terrestrial	<i>Disteganthus lateralis</i>	0.39	0.006	0.32	0.005	1.22	NA	NA	NA	NA	NA	0.38	0.01	383	9	2709.89	TMF
Succulent terrestrial	<i>Dyckia choristaminea</i>	0.33	0.004	0.75	0.011	0.44	NA	NA	NA	NA	NA	0.93	0.04	197	5	1448.90	MFS
Succulent terrestrial	<i>Dyckia encholirioides</i>	0.41	0.009	1.04	0.022	0.40	NA	NA	NA	NA	NA	1.24	0.06	223	4	1570.40	TDF
Succulent terrestrial	<i>Dyckia frigida</i>	0.35	0.005	0.93	0.019	0.38	NA	NA	NA	NA	NA	1.00	0.03	239	5	1460.75	TDF
Succulent terrestrial	<i>Dyckia hebdingii</i>	0.09	0.003	0.21	0.006	0.43	NA	NA	NA	NA	NA	0.25	0.02	220	5	NA	TDF
Succulent terrestrial	<i>Dyckia jonesiana</i>	0.14	0.003	0.19	0.005	0.71	NA	NA	NA	NA	NA	0.24	0.01	236	2	NA	TDF
Succulent terrestrial	<i>Dyckia microcalyx</i>	0.09	0.002	0.29	0.003	0.32	NA	NA	NA	NA	NA	0.29	0.02	164	4	1473.13	TDF
Succulent terrestrial	<i>Dyckia milagrensis</i>	0.13	0.001	0.23	0.006	0.56	NA	NA	NA	NA	NA	0.25	0.01	171	3	NA	TDF
Succulent terrestrial	<i>Dyckia pseudococcinea</i>	0.13	0.001	0.32	0.008	0.40	NA	NA	NA	NA	NA	0.41	0.03	181	3	1250.88	TMF
Succulent terrestrial	<i>Dyckia rariflora</i>	0.24	0.005	0.50	0.011	0.48	NA	NA	NA	NA	NA	0.54	0.03	214	5	1411.96	TDF
Succulent terrestrial	<i>Dyckia remotiflora</i>	0.24	0.004	0.53	0.013	0.45	NA	NA	NA	NA	NA	0.68	0.02	200	4	1362.85	MFS
Succulent terrestrial	<i>Dyckia saxatilis</i>	0.13	0.003	0.28	0.004	0.47	NA	NA	NA	NA	NA	0.39	0.03	195	6	1448.66	TDF
Succulent terrestrial	<i>Encholirium magalhaesii</i>	0.10	0.003	0.36	0.004	0.28	NA	NA	NA	NA	NA	0.36	0.02	178	5	1441.50	TDF
Succulent terrestrial	<i>Encholirium spectabile</i>	0.15	0.005	0.51	0.012	0.29	NA	NA	NA	NA	NA	0.52	0.03	201	4	745.91	TDF
Succulent terrestrial	<i>Fascicularia bicolor</i>	0.22	0.003	0.28	0.003	0.78	NA	NA	NA	NA	NA	0.45	0.02	255	6	663.13	MFS
Succulent terrestrial	<i>Fernseea bocainensis</i>	0.35	0.005	0.22	0.003	1.61	NA	NA	NA	NA	NA	0.37	0.01	289	7	1777.00	TMF
Succulent terrestrial	<i>Hechtia argentea</i>	0.42	0.007	1.95	0.036	0.22	NA	NA	NA	NA	NA	2.11	0.06	293	7	471.25	TDF
Succulent terrestrial	<i>Hechtia carlsoniae</i>	0.24	0.005	0.62	0.015	0.38	NA	NA	NA	NA	NA	0.79	0.03	240	4	1149.25	TDF
Succulent terrestrial	<i>Hechtia dichroantha</i>	0.33	0.003	0.99	0.022	0.34	NA	NA	NA	NA	NA	1.20	0.03	210	6	1192.33	MFS
Succulent terrestrial	<i>Hechtia epigyna</i>	0.30	0.003	1.00	0.024	0.30	NA	NA	NA	NA	NA	1.03	0.04	236	6	NA	DXS
Succulent terrestrial	<i>Hechtia fragilis</i>	0.28	0.006	0.75	0.017	0.37	NA	NA	NA	NA	NA	0.93	0.03	288	8	817.63	TDF
Succulent terrestrial	<i>Hechtia glomerata</i>	0.26	0.007	0.80	0.018	0.32	NA	NA	NA	NA	NA	0.82	0.03	201	6	813.11	TDF
Succulent terrestrial	<i>Hechtia lundelliorum</i>	0.11	0.003	0.17	0.005	0.67	NA	NA	NA	NA	NA	0.21	0.01	238	6	1574.52	TDF
Succulent terrestrial	<i>Hechtia malvernii</i>	0.14	0.001	0.16	0.006	0.87	NA	NA	NA	NA	NA	0.22	0.01	247	6	NA	MFS
Succulent terrestrial	<i>Hechtia marnier-lapostollei</i>	0.41	0.009	0.63	0.011	0.64	NA	NA	NA	NA	NA	0.77	0.03	307	4	NA	TDF
Succulent terrestrial	<i>Hechtia montana</i>	0.38	0.005	1.29	0.022	0.29	NA	NA	NA	NA	NA	1.31	0.03	225	7	435.15	DXS
Succulent terrestrial	<i>Hechtia mooreana</i>	0.41	0.005	1.62	0.036	0.25	NA	NA	NA	NA	NA	1.80	0.05	248	5	1160.75	TDF

Succulent terrestrial	<i>Hechtia pumila</i>	0.15	0.003	0.24	0.006	0.63	NA	NA	NA	NA	NA	0.27	0.01	238	6	NA	TDF
Succulent terrestrial	<i>Hechtia purpusii</i>	0.46	0.010	2.88	0.053	0.16	NA	NA	NA	NA	NA	3.22	0.09	266	4	1656.50	TDF
Succulent terrestrial	<i>Hechtia rosea</i>	0.15	0.002	0.30	0.004	0.50	NA	NA	NA	NA	NA	0.33	0.02	229	4	979.11	TDF
Succulent terrestrial	<i>Hechtia tillandsioides</i>	0.37	0.006	1.48	0.031	0.25	NA	NA	NA	NA	NA	1.50	0.06	231	6	1428.10	TDF
Succulent terrestrial	<i>Neoglaziovia variegata</i>	0.47	0.011	1.31	0.022	0.36	NA	NA	NA	NA	NA	1.61	0.05	331	9	702.09	TDF
Succulent terrestrial	<i>Ochagavia elegans</i>	0.29	0.003	0.12	0.002	2.34	NA	NA	NA	NA	NA	0.18	0.01	237	6	NA	MFS
Succulent terrestrial	<i>Ochagavia litoralis</i>	0.09	0.003	0.19	0.007	0.48	NA	NA	NA	NA	NA	0.25	0.01	256	6	908.35	MFS
Succulent terrestrial	<i>Orthophytum alvimii</i>	0.20	0.001	0.24	0.001	0.85	NA	NA	NA	NA	NA	0.34	0.02	244	4	1086.67	TMF
Succulent terrestrial	<i>Orthophytum benzingii</i>	0.12	0.004	0.15	0.001	0.81	NA	NA	NA	NA	NA	0.18	0.01	190	5	1088.70	TMF
Succulent terrestrial	<i>Orthophytum disjunctum</i>	0.09	0.003	0.11	0.001	0.83	NA	NA	NA	NA	NA	0.17	0.01	181	5	725.80	TMF
Succulent terrestrial	<i>Orthophytum duartei</i>	0.14	0.002	0.12	0.002	1.15	NA	NA	NA	NA	NA	0.19	0.01	206	3	1198.00	TMF
Succulent terrestrial	<i>Orthophytum foliosum</i>	0.18	0.003	0.18	0.001	1.00	NA	NA	NA	NA	NA	0.28	0.02	226	6	1158.27	TMF
Succulent terrestrial	<i>Orthophytum gurkenii</i>	0.10	0.005	0.16	0.002	0.65	NA	NA	NA	NA	NA	0.19	0.01	226	5	1205.00	TMF
Succulent terrestrial	<i>Orthophytum rubrum</i>	0.06	0.003	0.18	0.003	0.35	NA	NA	NA	NA	NA	0.24	0.02	176	4	NA	TMF
Succulent terrestrial	<i>Orthophytum saxicola</i>	0.07	0.002	0.18	0.004	0.42	NA	NA	NA	NA	NA	0.23	0.01	166	6	762.78	TMF
Succulent terrestrial	<i>Orthophytum sucrei</i>	0.09	0.004	0.11	0.002	0.83	NA	NA	NA	NA	NA	0.15	0.01	164	5	1212.00	TMF
Succulent terrestrial	<i>Puya alpestris</i>	0.09	0.001	0.08	0.002	1.15	NA	NA	NA	NA	NA	0.12	0.01	175	4	663.71	TMX
Succulent terrestrial	<i>Puya berteroniana</i>	0.22	0.002	0.16	0.002	1.42	NA	NA	NA	NA	NA	0.19	0.01	226	6	662.28	MFS
Succulent terrestrial	<i>Puya chilensis</i>	0.15	0.003	0.09	0.002	1.67	NA	NA	NA	NA	NA	0.12	0.01	239	7	662.28	MFS
Succulent terrestrial	<i>Puya coerulea</i>	0.14	0.003	0.06	0.004	2.40	NA	NA	NA	NA	NA	0.09	0.01	176	5	663.13	MFS
Succulent terrestrial	<i>Puya ferruginea</i>	0.14	0.002	0.14	0.001	1.00	NA	NA	NA	NA	NA	0.15	0.02	168	4	1050.05	MFS
Succulent terrestrial	<i>Puya floccosa</i>	0.09	0.001	0.09	0.001	1.07	NA	NA	NA	NA	NA	0.12	0.01	162	5	2373.79	TMF
Succulent terrestrial	<i>Puya humilis</i>	0.09	0.002	0.08	0.005	1.14	NA	NA	NA	NA	NA	0.12	0.01	199	5	1370.29	TRA
Succulent terrestrial	<i>Puya laxa</i>	0.06	0.001	0.04	0.007	1.43	NA	NA	NA	NA	NA	0.07	0.01	158	4	716.25	DXS
Succulent terrestrial	<i>Puya mirabilis</i>	0.34	0.005	0.20	0.002	1.70	NA	NA	NA	NA	NA	0.25	0.02	228	6	769.16	MFS
Succulent terrestrial	<i>Puya stenothyrsa</i>	0.19	0.005	0.09	0.002	2.00	NA	NA	NA	NA	NA	0.13	0.01	215	6	1055.63	MFS
Succulent terrestrial	<i>Puya venusta</i>	0.26	0.007	0.07	0.002	3.75	NA	NA	NA	NA	NA	0.10	0.01	238	4	341.16	MFS

Table A4.1.1 (overleaf). Mean values of anatomical and bioclimatic characters quantified in vein placement survey for 376 bromeliad species. Trait key: IVD = interveinal distance; VED = vein-epidermis distance; L_{leaf} = leaf length; W_{leaf} = leaf width; APL = apoplastic hydraulic path length; t_{rehyd} = time for controlled rehydration; MAP = mean annual precipitation. Habitat key: DXS = desert and xeric shrubland; MFS = Mediterranean forest and scrub; TDF = tropical dry forest; TMF = tropical moist forest; TRA = Andean alpine tundra. For additional bioclimatic data and details of provenance of living material, see appendices to Chapter 3.

A4.1.2 Results of survey of venation architecture, vascular anatomy, and components of hydraulic conductance

Functional type	Species	Venation pattern	Leaf xylem vessels	$ P_{50x} $ (MPa)	$\pm$ SE	1° vein 1° conduit d (μm)	$\pm$ SE	1° vein 2° conduit d (μm)	$\pm$ SE	2° vein 1° conduit d (μm)	$\pm$ SE
CAM tank-epiphyte	<i>Aechmea aquilega</i>	1	0	2.77	0.18	7.8	0.20	4.5	0.13	5.3	0.03
CAM tank-epiphyte	<i>Aechmea fasciata</i>	1	0	2.86	0.12	8.8	0.21	4.2	0.11	5.8	0.02
CAM tank-epiphyte	<i>Aechmea fendleri</i>	1	0	2.99	0.10	7.9	0.22	5.0	0.10	5.4	0.03
CAM tank-epiphyte	<i>Aechmea filicaulis</i>	1	0	2.63	0.05	8.2	0.25	4.8	0.12	5.1	0.07
CAM tank-epiphyte	<i>Aechmea gamosepala</i>	1	0	2.71	0.03	8.8	0.21	4.6	0.11	5.2	0.04
CAM tank-epiphyte	<i>Aechmea nudicaulis</i>	1	0	2.88	0.09	6.8	0.23	4.0	0.14	5.0	0.05
CAM terrestrial	<i>Ananas comosus</i>	1	0	2.56	0.11	15.2	0.36	7.6	0.10	7.5	0.03
CAM terrestrial	<i>Bromelia humilis</i>	2	1	2.48	0.10	13.6	0.31	7.0	0.09	8.9	0.02
C ₃ tank-epiphyte	<i>Catopsis berteroniana</i>	3	1	2.48	0.13	10.2	0.32	7.0	0.08	7.7	0.06
C ₃ tank-epiphyte	<i>Catopsis floribunda</i>	3	1	2.37	0.08	9.5	0.33	7.2	0.10	7.2	0.06
C ₃ tank-epiphyte	<i>Catopsis morreniana</i>	3	1	2.52	0.09	9.1	0.27	7.4	0.13	7.4	0.04
CAM terrestrial	<i>Cryptanthus acaulis</i>	1	1	2.34	0.11	13.7	0.22	8.2	0.12	7.8	0.02
CAM terrestrial	<i>Cryptanthus bivittatus</i>	1	1	2.26	0.13	14.5	0.34	8.5	0.16	8.1	0.03
CAM terrestrial	<i>Deuterocohnia brevifolia</i>	2	0	2.82	0.07	13.6	0.30	5.2	0.14	5.0	0.04
CAM terrestrial	<i>Deuterocohnia lorentziana</i>	2	0	2.71	0.02	12.4	0.31	5.5	0.12	5.2	0.05
CAM terrestrial	<i>Dyckia remotiflora</i>	2	0	2.60	0.07	11.0	0.29	6.1	0.14	5.0	0.03
C ₃ succulent terrestrial	<i>Fascicularia bicolor</i>	4	0	2.21	0.04	15.3	0.31	9.8	0.14	9.4	0.03

C ₃ tank-epiphyte	<i>Guzmania lingulata</i>	3	0	2.85	0.09	8.1	0.23	6.4	0.11	7.1	0.02
C ₃ tank-epiphyte	<i>Guzmania monostachia</i>	3	0	2.97	0.03	7.7	0.21	6.1	0.10	6.8	0.05
CAM tank-epiphyte	<i>Nidularium billbergioides</i>	1	0	3.13	0.14	6.8	0.20	NA	NA	6.8	0.03
C ₃ tank-epiphyte	<i>Nidularium innocentii</i>	1	0	3.05	0.12	7.3	0.24	NA	NA	6.5	0.05
C ₃ succulent terrestrial	<i>Ochagavia elegans</i>	4	0	2.29	0.05	14.8	0.30	9.5	0.04	9.2	0.02
C ₃ mesic terrestrial	<i>Pitcairnia imbricata</i>	5	1	1.79	0.11	51.8	0.65	8.6	0.11	25.5	0.01
C ₃ mesic terrestrial	<i>Pitcairnia integrifolia</i>	5	1	1.88	0.02	44.5	0.60	8.2	0.07	26.1	0.02
C ₃ mesic terrestrial	<i>Pitcairnia xanthocalyx</i>	5	1	1.95	0.08	40.8	0.49	8.0	0.12	23.4	0.04
C ₃ succulent terrestrial	<i>Puya alpestris</i>	3	1	2.45	0.10	16.85	0.32	8.2	0.11	8.2	0.02
C ₃ succulent terrestrial	<i>Puya berteroniana</i>	3	1	2.27	0.07	16.4	0.39	8.5	0.13	7.9	0.05
C ₃ succulent terrestrial	<i>Puya chilensis</i>	3	1	2.21	0.04	17.1	0.21	8.8	0.09	8.4	0.04
C ₃ succulent terrestrial	<i>Puya mirabilis</i>	3	1	2.36	0.06	13.4	0.26	7.2	0.04	7.2	0.03
C ₃ succulent terrestrial	<i>Puya venusta</i>	3	1	2.31	0.03	15.8	0.34	7.9	0.06	8.1	0.02
CAM atmospheric epiphyte	<i>Tillandsia brachycaulos</i>	1	0	3.08	0.02	8.8	0.21	5.3	0.13	5.3	0.04
CAM atmospheric epiphyte	<i>Tillandsia bulbosa</i>	1	0	3.03	0.10	7.1	0.22	5.1	0.12	5.4	0.03
CAM atmospheric epiphyte	<i>Tillandsia butzii</i>	1	0	2.95	0.11	6.6	0.25	4.8	0.03	4.7	0.01
CAM atmospheric epiphyte	<i>Tillandsia caput-medusae</i>	1	0	3.12	0.03	6.9	0.26	5.1	0.05	4.9	0.03
C ₃ tank-epiphyte	<i>Racinaea dyeriana</i>	1	0	2.55	0.10	8.8	0.23	6.2	0.06	5.9	0.02
CAM tank-epiphyte	<i>Tillandsia fasciculata</i>	1	0	2.94	0.06	8.2	0.28	6.6	0.09	5.7	0.05
CAM atmospheric epiphyte	<i>Tillandsia ionantha</i>	1	0	3.08	0.06	6.5	0.22	4.8	0.11	4.6	0.04
CAM atmospheric epiphyte	<i>Tillandsia juncea</i>	1	0	2.98	0.09	5.8	0.22	4.5	0.07	4.8	0.03
C ₃ tank-epiphyte	<i>Tillandsia leiboldiana</i>	1	0	2.61	0.11	7.9	0.24	6.1	0.08	5.7	0.02
CAM atmospheric epiphyte	<i>Tillandsia paucifolia</i>	1	0	3.11	0.04	6.6	0.19	4.7	0.09	4.9	0.04
CAM atmospheric epiphyte	<i>Tillandsia polystachia</i>	1	0	2.94	0.09	7.2	0.28	5.5	0.04	5.2	0.03
CAM atmospheric epiphyte	<i>Tillandsia stricta</i>	1	0	3.09	0.03	7.8	0.31	5.7	0.10	5.4	0.02
CAM tank-epiphyte	<i>Tillandsia utriculata</i>	1	0	3.00	0.08	8.4	0.24	5.9	0.09	5.6	0.01
C ₃ tank-epiphyte	<i>Vriesea fenestralis</i>	3	1	2.54	0.11	10.8	0.22	8.0	0.04	8.0	0.01
C ₃ tank-epiphyte	<i>Vriesea fosteriana</i>	3	1	2.43	0.10	10.4	0.25	7.5	0.08	7.6	0.03
C ₃ tank-epiphyte	<i>Vriesea gigantea</i>	3	1	2.44	0.09	11.9	0.25	7.8	0.10	7.8	0.02
C ₃ tank-epiphyte	<i>Lutheria glutinosa</i>	3	1	2.49	0.04	12.4	0.24	7.9	0.11	8.2	0.01

C ₃ tank-epiphyte	<i>Vriesea guttata</i>	3	1	2.63	0.06	11	0.25	7.3	0.07	7.5	0.03
C ₃ tank-epiphyte	<i>Werauhia sanguinolenta</i>	3	1	2.41	0.09	10.5	0.27	7.6	0.09	7.2	0.05
C ₃ tank-epiphyte	<i>Lutheria splendens</i>	3	1	2.33	0.05	11.7	0.31	8.2	0.10	8.1	0.02

Functional type	Species	IVD ₁	± SE	IVD ₂	± SE	IVD ₃	± SE	Leaf width (µm)	± SE	<i>t/b</i> ²	± SE
CAM tank-epiphyte	<i>Aechmea aquilega</i>	673.4	5.7	673.4	5.7	NA	NA	44600	288	9.88 x 10 ⁻⁷	1.01 x 10 ⁻⁸
CAM tank-epiphyte	<i>Aechmea fasciata</i>	662.0	4.6	662.0	4.6	NA	NA	67900	310	9.42 x 10 ⁻⁷	1.36 x 10 ⁻⁸
CAM tank-epiphyte	<i>Aechmea fendleri</i>	626.6	3.8	626.6	3.8	NA	NA	46100	295	1.14 x 10 ⁻⁶	3.26 x 10 ⁻⁷
CAM tank-epiphyte	<i>Aechmea filicaulis</i>	686.7	6.6	686.7	6.6	NA	NA	34200	241	8.22 x 10 ⁻⁷	1.04 x 10 ⁻⁸
CAM tank-epiphyte	<i>Aechmea gamosepala</i>	660.0	6.2	660.0	6.2	NA	NA	32200	284	9.34 x 10 ⁻⁷	4.51 x 10 ⁻⁸
CAM tank-epiphyte	<i>Aechmea nudicaulis</i>	640.0	4.7	640.0	4.7	NA	NA	41800	300	8.71 x 10 ⁻⁷	3.60 x 10 ⁻⁸
CAM terrestrial	<i>Ananas comosus</i>	833.4	8.1	833.4	8.1	NA	NA	25600	187	2.64 x 10 ⁻⁷	5.08 x 10 ⁻⁸
CAM terrestrial	<i>Bromelia humilis</i>	969.9	8.8	485.0	4.5	NA	NA	25000	214	1.50 x 10 ⁻⁷	3.36 x 10 ⁻⁸
C ₃ tank-epiphyte	<i>Catopsis berteroniana</i>	1373.3	10.2	457.8	6.7	NA	NA	28900	203	7.33 x 10 ⁻⁸	2.11 x 10 ⁻⁹
C ₃ tank-epiphyte	<i>Catopsis floribunda</i>	1244.0	11.1	414.7	9.2	NA	NA	26400	211	8.58 x 10 ⁻⁸	5.15 x 10 ⁻⁹
C ₃ tank-epiphyte	<i>Catopsis morreniana</i>	1160.0	4.7	386.7	3.6	NA	NA	22400	267	7.15 x 10 ⁻⁸	4.07 x 10 ⁻⁹
CAM terrestrial	<i>Cryptanthus acaulis</i>	760.0	6.7	760.0	6.7	NA	NA	33300	309	5.14 x 10 ⁻⁷	1.19 x 10 ⁻⁸
CAM terrestrial	<i>Cryptanthus bivittatus</i>	732.0	5.3	732.0	5.3	NA	NA	29700	204	5.48 x 10 ⁻⁷	3.66 x 10 ⁻⁸
CAM terrestrial	<i>Deuterocohnia brevifolia</i>	789.9	6.7	395.0	5.9	NA	NA	12200	131	1.42 x 10 ⁻⁷	8.21 x 10 ⁻⁸
CAM terrestrial	<i>Deuterocohnia lorentziana</i>	770.1	7.2	385.1	4.8	NA	NA	11900	186	1.55 x 10 ⁻⁷	3.40 x 10 ⁻⁸
CAM terrestrial	<i>Dyckia remotiflora</i>	720.0	6.8	360.0	6.2	NA	NA	26700	210	1.63 x 10 ⁻⁷	2.26 x 10 ⁻⁸
C ₃ succulent terrestrial	<i>Fascicularia bicolor</i>	1546.8	9.9	1546.8	9.9	773.4	4.6	29900	304	7.51 x 10 ⁻⁹	4.54 x 10 ⁻⁹
C ₃ tank-epiphyte	<i>Guzmania lingulata</i>	888.0	7.6	296.0	3.8	NA	NA	31500	322	9.02 x 10 ⁻⁸	2.90 x 10 ⁻⁹
C ₃ tank-epiphyte	<i>Guzmania monostachia</i>	968.0	8.3	322.7	8.5	NA	NA	30300	273	7.99 x 10 ⁻⁸	3.16 x 10 ⁻⁹
CAM tank-epiphyte	<i>Nidularium billbergioides</i>	513.4	7.2	513.4	7.2	NA	NA	31700	291	8.10 x 10 ⁻⁷	4.11 x 10 ⁻⁸
C ₃ tank-epiphyte	<i>Nidularium innocentii</i>	500.0	6.8	500.0	6.8	NA	NA	34100	240	1.34 x 10 ⁻⁷	1.27 x 10 ⁻⁸
C ₃ succulent terrestrial	<i>Ochagavia elegans</i>	1706.8	6.1	1706.8	6.1	853.4	5.9	28600	211	1.07 x 10 ⁻⁸	2.09 x 10 ⁻⁹

C ₃ mesic terrestrial	<i>Pitcairnia imbricata</i>	1090.0	9.2	1090.0	9.2	545.0	8.2	26600	208	1.90 x 10 ⁻⁸	3.04 x 10 ⁻⁹
C ₃ mesic terrestrial	<i>Pitcairnia integrifolia</i>	992.0	7.2	992.0	7.2	496.0	5.5	25100	222	1.59 x 10 ⁻⁸	2.26 x 10 ⁻⁹
C ₃ mesic terrestrial	<i>Pitcairnia xanthocalyx</i>	1146.8	7.3	1146.8	7.3	573.4	4.7	27300	213	1.72 x 10 ⁻⁸	3.11 x 10 ⁻⁹
C ₃ succulent terrestrial	<i>Puya alpestris</i>	1213.2	6.7	404.4	5.8	NA	NA	31200	185	3.30 x 10 ⁻⁸	4.14 x 10 ⁻⁹
C ₃ succulent terrestrial	<i>Puya berteroniana</i>	1186.8	9.0	395.6	8.8	NA	NA	33800	310	2.78 x 10 ⁻⁸	6.02 x 10 ⁻⁹
C ₃ succulent terrestrial	<i>Puya chilensis</i>	1066.7	7.2	355.6	6.4	NA	NA	31500	324	2.54 x 10 ⁻⁸	2.00 x 10 ⁻⁹
C ₃ succulent terrestrial	<i>Puya mirabilis</i>	1253.2	11.2	417.7	10.5	NA	NA	17600	254	2.40 x 10 ⁻⁸	4.15 x 10 ⁻⁹
C ₃ succulent terrestrial	<i>Puya venusta</i>	1240.0	13.1	413.3	12.1	NA	NA	32900	249	3.37 x 10 ⁻⁸	2.02 x 10 ⁻⁹
CAM atmospheric epiphyte	<i>Tillandsia brachycaulos</i>	713.4	8.5	713.4	8.5	NA	NA	10100	153	4.60 x 10 ⁻⁶	5.18 x 10 ⁻⁷
CAM atmospheric epiphyte	<i>Tillandsia bulbosa</i>	679.3	7.2	679.3	7.2	NA	NA	9100	106	5.76 x 10 ⁻⁶	3.36 x 10 ⁻⁷
CAM atmospheric epiphyte	<i>Tillandsia butzii</i>	706.6	8.3	706.6	8.3	NA	NA	4800	113	6.08 x 10 ⁻⁶	4.15 x 10 ⁻⁷
CAM atmospheric epiphyte	<i>Tillandsia caput-medusae</i>	660.0	9.4	660.0	9.4	NA	NA	6800	152	6.08 x 10 ⁻⁶	5.12 x 10 ⁻⁷
C ₃ tank-epiphyte	<i>Racinaea dyeriana</i>	426.6	4.5	426.6	4.5	NA	NA	22300	271	4.77 x 10 ⁻⁸	6.09 x 10 ⁻⁹
CAM tank-epiphyte	<i>Tillandsia fasciculata</i>	673.3	5.6	673.3	5.6	NA	NA	24500	239	1.18 x 10 ⁻⁶	3.14 x 10 ⁻⁷
CAM atmospheric epiphyte	<i>Tillandsia ionantha</i>	653.4	5.5	653.4	5.5	NA	NA	3600	132	5.14 x 10 ⁻⁶	2.26 x 10 ⁻⁷
CAM atmospheric epiphyte	<i>Tillandsia juncea</i>	586.6	3.9	586.6	3.9	NA	NA	3400	126	4.55 x 10 ⁻⁶	1.28 x 10 ⁻⁷
C ₃ tank-epiphyte	<i>Tillandsia leiboldiana</i>	380.0	4.5	380.0	4.5	NA	NA	21100	254	5.48 x 10 ⁻⁸	3.72 x 10 ⁻⁹
CAM atmospheric epiphyte	<i>Tillandsia paucifolia</i>	700.0	3.2	700.0	3.2	NA	NA	5300	138	5.92 x 10 ⁻⁶	2.11 x 10 ⁻⁷
CAM atmospheric epiphyte	<i>Tillandsia polystachia</i>	670.0	5.0	670.0	5.0	NA	NA	29500	201	1.14 x 10 ⁻⁶	1.04 x 10 ⁻⁷
CAM atmospheric epiphyte	<i>Tillandsia stricta</i>	690.0	6.1	690.0	6.1	NA	NA	9500	143	4.84 x 10 ⁻⁶	3.89 x 10 ⁻⁷
CAM tank-epiphyte	<i>Tillandsia utriculata</i>	673.4	3.4	673.4	3.4	NA	NA	19900	218	1.31 x 10 ⁻⁶	1.56 x 10 ⁻⁷
C ₃ tank-epiphyte	<i>Vriesea fenestralis</i>	960.0	5.9	320.0	4.6	NA	NA	42200	339	1.05 x 10 ⁻⁷	2.34 x 10 ⁻⁸
C ₃ tank-epiphyte	<i>Vriesea fosteriana</i>	992.0	7.2	330.7	3.8	NA	NA	41800	342	9.21 x 10 ⁻⁸	8.65 x 10 ⁻⁹
C ₃ tank-epiphyte	<i>Vriesea gigantea</i>	1066.8	9.3	355.6	8.2	NA	NA	44400	303	1.34 x 10 ⁻⁷	2.43 x 10 ⁻⁸
C ₃ tank-epiphyte	<i>Lutheria glutinosa</i>	773.3	8.8	257.8	6.2	NA	NA	31600	276	1.68 x 10 ⁻⁷	3.01 x 10 ⁻⁸
C ₃ tank-epiphyte	<i>Vriesea guttata</i>	1093.3	7.2	364.4	5.5	NA	NA	32200	295	1.07 x 10 ⁻⁷	1.15 x 10 ⁻⁸
C ₃ tank-epiphyte	<i>Werauhia sanguinolenta</i>	986.8	5.5	328.9	4.1	NA	NA	28900	301	9.28 x 10 ⁻⁸	6.76 x 10 ⁻⁹
C ₃ tank-epiphyte	<i>Lutheria splendens</i>	1066.7	9.2	355.6	7.0	NA	NA	66100	391	2.55 x 10 ⁻⁷	3.01 x 10 ⁻⁸

Functional type	Species	1° vein ΣK^*	2° vein ΣK^*	3° vein ΣK^*	p 1°
CAM tank-epiphyte	<i>Aechmea aquilega</i>	11012813	920280.6	NA	92.3
CAM tank-epiphyte	<i>Aechmea fasciata</i>	11544865	1678239	NA	87.3
CAM tank-epiphyte	<i>Aechmea fendleri</i>	15457914	1065797	NA	93.5
CAM tank-epiphyte	<i>Aechmea filicaulis</i>	12153727	773792.7	NA	94.0
CAM tank-epiphyte	<i>Aechmea gamosepala</i>	13796558	870080.3	NA	94.1
CAM tank-epiphyte	<i>Aechmea nudicaulis</i>	5765482	958738	NA	85.7
CAM terrestrial	<i>Ananas comosus</i>	56593071	2177322	NA	96.3
CAM terrestrial	<i>Bromelia humilis</i>	45928303	10161386	NA	81.9
C ₃ tank-epiphyte	<i>Catopsis berteroniana</i>	21992470	16585584	NA	57.0
C ₃ tank-epiphyte	<i>Catopsis floribunda</i>	23858180	16542613	NA	59.1
C ₃ tank-epiphyte	<i>Catopsis morreniana</i>	23498027	19795359	NA	54.3
CAM terrestrial	<i>Cryptanthus acaulis</i>	45749413	3825205	NA	92.3
CAM terrestrial	<i>Cryptanthus bivittatus</i>	58631462	4618691	NA	92.7
CAM terrestrial	<i>Deuterocohnia brevifolia</i>	54294319	932157	NA	98.3
CAM terrestrial	<i>Deuterocohnia lorentziana</i>	40367271	1118529	NA	97.3
CAM terrestrial	<i>Dyckia remotiflora</i>	19907462	1022654	NA	95.1
C ₃ succulent terrestrial	<i>Fascicularia bicolor</i>	93115334	5946458	49780.19	94.0
C ₃ tank-epiphyte	<i>Guzmania lingulata</i>	19485584	13485329	NA	59.1
C ₃ tank-epiphyte	<i>Guzmania monostachia</i>	14691555	9107716	NA	61.7
CAM tank-epiphyte	<i>Nidularium billbergioides</i>	35980099	17990049	NA	66.7
C ₃ tank-epiphyte	<i>Nidularium innocentii</i>	40147067	18926795	NA	68.0
C ₃ succulent terrestrial	<i>Ochagavia elegans</i>	74139573	4120677	39254.75	94.7
C ₃ mesic terrestrial	<i>Pitcairnia imbricata</i>	31238840108	1.59E+08	89908.26	99.5
C ₃ mesic terrestrial	<i>Pitcairnia integrifolia</i>	18656777184	1.89E+08	101814.5	99.0

C ₃ mesic terrestrial	<i>Pitcairnia xanthocalyx</i>	11409042437	1.07E+08	82839.2	99.1
C ₃ succulent terrestrial	<i>Puya alpestris</i>	116080478	8780801	NA	93.0
C ₃ succulent terrestrial	<i>Puya berteroniana</i>	109563450	7732892	NA	93.4
C ₃ succulent terrestrial	<i>Puya chilensis</i>	147992564	10997641	NA	93.1
C ₃ succulent terrestrial	<i>Puya mirabilis</i>	47149666	3789501	NA	92.6
C ₃ succulent terrestrial	<i>Puya venusta</i>	91280558	8179552	NA	91.8
CAM atmospheric epiphyte	<i>Tillandsia brachycaulos</i>	9208224	1085851	NA	89.5
CAM atmospheric epiphyte	<i>Tillandsia bulbosa</i>	5284360	1228831	NA	81.1
CAM atmospheric epiphyte	<i>Tillandsia butzii</i>	3584174	542385	NA	86.9
CAM atmospheric epiphyte	<i>Tillandsia caput-medusae</i>	5112552	857512.1	NA	85.6
C ₃ tank-epiphyte	<i>Racinaea dyeriana</i>	20562245	3904048	NA	84.0
CAM tank-epiphyte	<i>Tillandsia fasciculata</i>	11913524	1539108	NA	88.6
CAM atmospheric epiphyte	<i>Tillandsia ionantha</i>	3421838	538198	NA	86.4
CAM atmospheric epiphyte	<i>Tillandsia juncea</i>	2613229	710743.3	NA	78.6
C ₃ tank-epiphyte	<i>Tillandsia leiboldiana</i>	16635478	3272630	NA	83.6
CAM atmospheric epiphyte	<i>Tillandsia paucifolia</i>	3497708	646809.2	NA	84.4
CAM atmospheric epiphyte	<i>Tillandsia polystachia</i>	5831923	1071367	NA	84.5
CAM atmospheric epiphyte	<i>Tillandsia stricta</i>	7217133	967867.3	NA	88.2
CAM tank-epiphyte	<i>Tillandsia utriculata</i>	9339933	1433768	NA	86.7
C ₃ tank-epiphyte	<i>Vriesea fenestralis</i>	55771270	37699112	NA	59.7
C ₃ tank-epiphyte	<i>Vriesea fosteriana</i>	41070096	25753555	NA	61.5
C ₃ tank-epiphyte	<i>Vriesea gigantea</i>	54053427	28613737	NA	65.4
C ₃ tank-epiphyte	<i>Lutheria glutinosa</i>	87579705	44769596	NA	66.2
C ₃ tank-epiphyte	<i>Vriesea guttata</i>	37354729	20456195	NA	64.6
C ₃ tank-epiphyte	<i>Vriesea sanguinolenta</i>	43246311	20854287	NA	67.5
C ₃ tank-epiphyte	<i>Lutheria splendens</i>	60884718	33280137	NA	64.7

Functional type	Species	K_x (mmol m ⁻² s ⁻¹ MPa ⁻¹)	± SE	K_{ox} (mmol m ⁻² s ⁻¹ MPa ⁻¹)	K_{leaf} (mmol m ⁻² s ⁻¹ MPa ⁻¹)	± SE
CAM tank-epiphyte	<i>Aechmea aquilega</i>	0.52	0.02	0.37	0.22	0.03
CAM tank-epiphyte	<i>Aechmea fasciata</i>	0.73	0.03	0.45	0.28	0.02
CAM tank-epiphyte	<i>Aechmea fendleri</i>	0.35	0.02	0.29	0.16	0.01
CAM tank-epiphyte	<i>Aechmea filicaulis</i>	0.46	0.01	0.28	0.17	0.01
CAM tank-epiphyte	<i>Aechmea gamosepala</i>	0.34	0.02	0.24	0.14	0.01
CAM tank-epiphyte	<i>Aechmea nudicaulis</i>	0.58	0.02	0.39	0.23	0.02
CAM terrestrial	<i>Ananas comosus</i>	0.34	0.03	0.24	0.14	0.01
CAM terrestrial	<i>Bromelia humilis</i>	0.13	<0.01	0.08	0.05	<0.01
C ₃ tank-epiphyte	<i>Catopsis berteroniana</i>	2.23	0.01	1.83	1.01	0.01
C ₃ tank-epiphyte	<i>Catopsis floribunda</i>	2.95	0.02	2.61	1.38	0.01
C ₃ tank-epiphyte	<i>Catopsis morreniana</i>	2.34	0.03	1.90	1.05	0.01
CAM terrestrial	<i>Cryptanthus acaulis</i>	0.14	0.01	0.09	0.06	<0.01
CAM terrestrial	<i>Cryptanthus bivittatus</i>	0.16	0.01	0.09	0.06	<0.01
CAM terrestrial	<i>Deuterocohnia brevifolia</i>	0.05	<0.01	0.03	0.02	<0.01
CAM terrestrial	<i>Deuterocohnia lorentziana</i>	0.08	<0.01	0.04	0.03	<0.01
CAM terrestrial	<i>Dyckia remotiflora</i>	0.10	0.01	0.06	0.04	<0.01
C ₃ succulent terrestrial	<i>Fascicularia bicolor</i>	6.83	0.03	5.04	2.90	0.02
C ₃ tank-epiphyte	<i>Guzmania lingulata</i>	4.36	0.04	1.12	0.89	<0.01
C ₃ tank-epiphyte	<i>Guzmania monostachia</i>	1.98	0.01	1.34	0.80	0.01
CAM tank-epiphyte	<i>Nidularium billbergioides</i>	0.63	<0.01	0.45	0.26	<0.01
C ₃ tank-epiphyte	<i>Nidularium innocentii</i>	1.22	0.01	0.98	0.54	0.01
C ₃ succulent terrestrial	<i>Ochagavia elegans</i>	5.41	0.04	5.33	2.68	0.02
C ₃ mesic terrestrial	<i>Pitcairnia imbricata</i>	11.17	0.07	8.00	4.67	0.03
C ₃ mesic terrestrial	<i>Pitcairnia integrifolia</i>	11.06	0.04	8.33	4.74	0.03
C ₃ mesic terrestrial	<i>Pitcairnia xanthocalyx</i>	12.56	0.06	9.72	5.48	0.04
C ₃ succulent terrestrial	<i>Puya alpestris</i>	5.72	0.06	2.60	1.79	0.01
C ₃ succulent terrestrial	<i>Puya berteroniana</i>	8.61	0.04	3.72	2.60	0.02
C ₃ succulent terrestrial	<i>Puya chilensis</i>	5.61	0.07	2.39	1.68	0.02

C ₃ succulent terrestrial	<i>Puya mirabilis</i>	12.28	0.03	7.17	4.52	0.01
C ₃ succulent terrestrial	<i>Puya venusta</i>	5.78	0.04	3.01	1.98	0.02
CAM atmospheric epiphyte	<i>Tillandsia brachycaulos</i>	0.07	<0.01	0.04	0.03	<0.01
CAM atmospheric epiphyte	<i>Tillandsia bulbosa</i>	0.08	<0.01	0.05	0.03	<0.01
CAM atmospheric epiphyte	<i>Tillandsia butzii</i>	0.04	<0.01	0.02	0.01	<0.01
CAM atmospheric epiphyte	<i>Tillandsia caput-medusae</i>	0.05	<0.01	0.03	0.02	<0.01
C ₃ tank-epiphyte	<i>Racinaea dyeriana</i>	1.19	0.02	0.84	0.49	<0.01
CAM tank-epiphyte	<i>Tillandsia fasciculata</i>	0.22	<0.01	0.12	0.08	<0.01
CAM atmospheric epiphyte	<i>Tillandsia ionantha</i>	0.04	<0.01	0.02	0.01	<0.01
CAM atmospheric epiphyte	<i>Tillandsia juncea</i>	0.10	<0.01	0.05	0.03	<0.01
C ₃ tank-epiphyte	<i>Tillandsia leiboldiana</i>	2.92	0.01	2.06	1.21	0.01
CAM atmospheric epiphyte	<i>Tillandsia paucifolia</i>	0.05	<0.01	0.02	0.01	<0.01
CAM atmospheric epiphyte	<i>Tillandsia polystachia</i>	0.05	<0.01	0.05	0.02	<0.01
CAM atmospheric epiphyte	<i>Tillandsia stricta</i>	0.05	<0.01	0.05	0.03	<0.01
CAM tank-epiphyte	<i>Tillandsia utriculata</i>	0.30	<0.01	0.15	0.05	<0.01
C ₃ tank-epiphyte	<i>Vriesea fenestralis</i>	2.57	0.02	1.86	1.08	0.01
C ₃ tank-epiphyte	<i>Vriesea fosteriana</i>	2.08	0.02	1.53	0.88	0.01
C ₃ tank-epiphyte	<i>Vriesea gigantea</i>	1.84	0.02	1.43	0.81	0.01
C ₃ tank-epiphyte	<i>Lutheria glutinosa</i>	3.32	0.01	2.26	1.34	0.01
C ₃ tank-epiphyte	<i>Vriesea guttata</i>	2.17	0.02	1.57	0.91	0.01
C ₃ tank-epiphyte	<i>Werauhia sanguinolenta</i>	4.38	0.02	3.17	1.84	0.01
C ₃ tank-epiphyte	<i>Lutheria splendens</i>	12.78	0.04	0.81	0.49	<0.01

Table A4.1.2. Mean values of venation structural-functional traits for 50 bromeliad species. Trait key: P_{50x} = leaf water potential at 50% loss xylem hydraulic conductance; $1^\circ/2^\circ$ vein $1^\circ/2^\circ$ conduit d = diameter of primary/secondary conduits in primary/secondary veins; IVD_i = order-specific interveinal distance; t/b^2 = thickness-to-span ratio of primary xylem conduits in primary veins; $1^\circ/2^\circ/3^\circ \Sigma K^*$ = vein-specific hydraulic conductance estimated from anatomical characters; $p\ 1^\circ$ = proportion of total anatomically-estimated xylem hydraulic conductance contributed by 1° veins; K_x = measured xylem hydraulic conductance; K_{ox} = calculated extra-xylary hydraulic conductance; K_{leaf} = measured whole-leaf hydraulic conductance.

A4.1.3 Extra-xylary anatomical characterisation

Functional type	Species	LA	Epidermis fraction	Spongy fraction	Palisade fraction	Vein fraction	BSE fraction	Hydrenchyma fraction	
CAM tank-epiphyte	<i>Aechmea aquilega</i>	1	0.06	0.45	0.14	0.06	0.00	0.29	SE < 0.02 for all trait/species combinations
CAM tank-epiphyte	<i>Aechmea fasciata</i>	1	0.05	0.46	0.09	0.05	0.00	0.35	
CAM tank-epiphyte	<i>Aechmea fendleri</i>	1	0.06	0.55	0.05	0.06	0.00	0.28	
CAM tank-epiphyte	<i>Aechmea filicaulis</i>	1	0.06	0.46	0.08	0.05	0.00	0.35	
CAM tank-epiphyte	<i>Aechmea gamosepala</i>	1	0.05	0.41	0.13	0.05	0.00	0.36	
CAM tank-epiphyte	<i>Aechmea nudicaulis</i>	1	0.07	0.26	0.19	0.06	0.00	0.42	
CAM terrestrial	<i>Ananas comosus</i>	1	0.05	0.36	0.14	0.07	0.00	0.38	
CAM terrestrial	<i>Bromelia humilis</i>	1	0.05	0.38	0.25	0.06	0.06	0.20	
C ₃ tank-epiphyte	<i>Catopsis berteroniana</i>	2	0.08	0.35	0.12	0.06	0.00	0.39	
C ₃ tank-epiphyte	<i>Catopsis floribunda</i>	2	0.09	0.45	0.10	0.05	0.00	0.31	
C ₃ tank-epiphyte	<i>Catopsis morreniana</i>	2	0.08	0.39	0.11	0.06	0.00	0.36	
CAM terrestrial	<i>Cryptanthus acaulis</i>	1	0.05	0.45	0.13	0.07	0.00	0.30	
CAM terrestrial	<i>Cryptanthus bivittatus</i>	1	0.06	0.42	0.14	0.07	0.00	0.31	
CAM terrestrial	<i>Deuterocohnia brevifolia</i>	3	0.04	0.32	0.12	0.06	0.00	0.46	
CAM terrestrial	<i>Deuterocohnia lorentziana</i>	3	0.04	0.33	0.10	0.06	0.00	0.47	
CAM terrestrial	<i>Dyckia remotiflora</i>	3	0.03	0.25	0.13	0.07	0.00	0.52	
C ₃ succulent terrestrial	<i>Fascicularia bicolor</i>	1	0.05	0.33	0.05	0.05	0.00	0.52	
C ₃ tank-epiphyte	<i>Guzmania lingulata</i>	2	0.10	0.42	0.15	0.06	0.00	0.27	
C ₃ tank-epiphyte	<i>Guzmania monostachia</i>	2	0.10	0.42	0.19	0.06	0.00	0.23	
CAM tank-epiphyte	<i>Nidularium billbergioides</i>	1	0.07	0.39	0.12	0.06	0.00	0.36	
C ₃ tank-epiphyte	<i>Nidularium innocentii</i>	1	0.08	0.42	0.05	0.06	0.00	0.39	
C ₃ succulent terrestrial	<i>Ochagavia elegans</i>	1	0.05	0.33	0.04	0.05	0.00	0.53	
C ₃ mesic terrestrial	<i>Pitcairnia imbricata</i>	4	0.06	0.34	0.14	0.10	0.05	0.31	
C ₃ mesic terrestrial	<i>Pitcairnia integrifolia</i>	4	0.07	0.18	0.18	0.11	0.06	0.40	
C ₃ mesic terrestrial	<i>Pitcairnia xanthocalyx</i>	4	0.07	0.21	0.20	0.11	0.06	0.35	

C ₃ succulent terrestrial	<i>Puya alpestris</i>	5	0.04	0.17	0.11	0.08	0.07	0.53
C ₃ succulent terrestrial	<i>Puya berteroniana</i>	5	0.04	0.18	0.10	0.07	0.06	0.55
C ₃ succulent terrestrial	<i>Puya chilensis</i>	5	0.05	0.11	0.10	0.07	0.07	0.60
C ₃ succulent terrestrial	<i>Puya mirabilis</i>	5	0.07	0.18	0.08	0.08	0.06	0.53
C ₃ succulent terrestrial	<i>Puya venusta</i>	5	0.04	0.25	0.10	0.07	0.06	0.48
CAM atmospheric epiphyte	<i>Tillandsia brachycaulos</i>	6	0.04	0.34	0.03	0.04	0.00	0.55
CAM atmospheric epiphyte	<i>Tillandsia bulbosa</i>	6	0.05	0.24	0.02	0.05	0.00	0.64
CAM atmospheric epiphyte	<i>Tillandsia butzii</i>	6	0.04	0.24	0.02	0.04	0.00	0.66
CAM atmospheric epiphyte	<i>Tillandsia caput-medusae</i>	6	0.05	0.58	0.03	0.04	0.00	0.30
C ₃ tank-epiphyte	<i>Racinaea dyeriana</i>	2	0.06	0.06	0.11	0.07	0.00	0.70
CAM tank-epiphyte	<i>Tillandsia fasciculata</i>	6	0.05	0.40	0.14	0.06	0.00	0.35
CAM atmospheric epiphyte	<i>Tillandsia ionantha</i>	6	0.04	0.38	0.04	0.05	0.00	0.49
CAM atmospheric epiphyte	<i>Tillandsia juncea</i>	6	0.04	0.48	0.02	0.04	0.00	0.42
C ₃ tank-epiphyte	<i>Tillandsia leiboldiana</i>	2	0.06	0.05	0.15	0.07	0.00	0.67
CAM atmospheric epiphyte	<i>Tillandsia paucifolia</i>	6	0.05	0.13	0.04	0.05	0.00	0.73
CAM atmospheric epiphyte	<i>Tillandsia polystachia</i>	6	0.05	0.45	0.09	0.05	0.00	0.36
CAM atmospheric epiphyte	<i>Tillandsia stricta</i>	6	0.05	0.40	0.04	0.04	0.00	0.47
CAM tank-epiphyte	<i>Tillandsia utriculata</i>	6	0.06	0.45	0.12	0.06	0.00	0.31
C ₃ tank-epiphyte	<i>Vriesea fenestralis</i>	2	0.06	0.40	0.12	0.07	0.00	0.35
C ₃ tank-epiphyte	<i>Vriesea fosteriana</i>	2	0.06	0.40	0.10	0.07	0.00	0.37
C ₃ tank-epiphyte	<i>Vriesea gigantea</i>	2	0.06	0.39	0.10	0.07	0.00	0.38
C ₃ tank-epiphyte	<i>Lutheria glutinosa</i>	2	0.07	0.47	0.06	0.06	0.00	0.34
C ₃ tank-epiphyte	<i>Vriesea guttata</i>	2	0.06	0.44	0.14	0.06	0.00	0.30
C ₃ tank-epiphyte	<i>Werauhia sanguinolenta</i>	2	0.06	0.49	0.08	0.07	0.00	0.30
C ₃ tank-epiphyte	<i>Lutheria splendens</i>	2	0.07	0.47	0.06	0.07	0.00	0.33

Table A4.1.3. Mean values of proportion of leaf cross-section occupied by different extra-xylary compartments for 50 bromeliad species. LA = leaf anatomical design, as described in text; BSE = bundle sheath extension.

Appendix 4.2

A4.2.1 Heuristic model of vein placement physiology- Methods

An heuristic model of physiological fitness was designed, based on multiplicative fitness components (w_i). For the purposes of this model, ‘fitness’ is defined simply as a relative measure of physiological adaptation to a particular environmental context. The first step in model construction was to define the relationships (‘linker functions’) between IVD and VED and a set of internal variables. All internal variables and linker functions are displayed in Table A4.2.1. The internal variables included LMA, leaf hydraulic capacitance at full turgor (C_{FT}) and leaf area, as well as relative indices of leaf hydraulic vulnerability (V_H) and leaf construction cost (CC). The method of DeBoer et al. (2016) was used to compare the ability of an observed leaf anatomical arrangement (i.e. a specific combination of LT, IVD and VED values) to provide hydraulic support for gas exchange with the ability of the ‘optimal’ arrangement (IVD = VED) to achieve the same. This approach assumes a key role for vein placement in driving variation in hydraulic conductance, a hypothesis which received moderate support in the context of the bromeliads in the analyses presented in **Chapter 3** and for which empirical equations could be parameterised. Another comparative index was constructed, defined by the balance between the potential rate of hydraulic recharge with the observed anatomical arrangement and the equivalent potential of a similar leaf with the ‘optimal’ arrangement. The rate of recharge was assumed to be linearly related to the quotient of leaf hydraulic capacitance and conductance.

Internal variable	Linker function	Normalisation	Explanation
Leaf mass per unit area, LMA (g m ⁻²)	$LMA = 10^{(0.5294 \times \log VED + 1.2978)}$	$LMA_{rel} = \frac{LMA}{LMA_{max}}$ where LMA_{max} is the upper bound for LMA observed in the species set (800 g m ⁻²)	Empirical relationship derived from anatomical measurements
Leaf hydraulic capacitance at full turgor, C_{FT} (mmol MPa ⁻¹ m ⁻²)	$C_{FT} = 1000 \times 10^{(0.6932 \times \log VED - 0.8932)}$	$C_{FT,rel} = \frac{C_{FT}}{C_{FT,max}}$ where $C_{FT,max}$ is the upper bound for C_{FT} observed in the species set (33,000 mmol MPa ⁻¹ m ⁻²)	Empirical relationship derived from anatomical measurements
Hydraulic vulnerability, V_H (relative)	$V_H = \frac{1}{1 + e^{(-2 \times (IVD/VED - 1))}}$	n/a	Heuristic relationship based on logic proposed by Zwieniecki and Boyce (2014)
Adaptation for hydraulic recharge, dt_{hyd} (%)	$dt_{hyd} = 100 \times \frac{t_{hyd,opt} - t_{hyd}}{t_{hyd}}$	$dt_{hyd,rel} = \frac{dt_{hyd}}{dt_{hyd,max}}$ where $dt_{hyd,max}$ is the upper bound for dt_{hyd}	Hydraulic recharge rate assumed to be controlled by leaf

	$t_{hyd} = \frac{C_{FT}}{K_{leaf}}$ $t_{hyd_opt} = \frac{C_{FT}}{K_{leaf_opt}}$	observed in the species set (50%)	hydraulic conductance
Leaf area (mm ²)	$Area = l_{leaf} \times w_{leaf}$ $l_{leaf} = 10^{(-0.232 \times (IVD/VED) + 2.86)}$ $w_{leaf} = 10^{(0.253 \times \log(l_{leaf}) + 1.139)}$	$Area_{rel} = \frac{Area}{Area_{max}}$ where $Area_{max}$ is the upper bound for leaf area observed in the species set (47,500 mm²)	Empirical relationships derived from anatomical measurements
1- leaf construction cost, CC (relative)	$CC = 1 - \left(\frac{1}{1 + e^{-(IVD/VED-1)}} \right)$	n/a	Heuristic relationship assuming construction cost inversely related to IVD/VED. N.B. Higher values indicate lower leaf construction cost.
Adaptation for productivity, δA (%)	$\delta A = 100 \times \frac{A_{int} - A_{int_opt}}{A_{int}}$ $A_{int} = \left(1 - \frac{\Gamma^*}{C_{i,int}} \right) \times \left(\frac{v_{cmax} \times C_{i,int}}{C_{i,int} + k_c \left(1 + \frac{O}{k_o} \right)} \right) - R_d$ $C_{i,int} = C_a \times \frac{\Delta_{leaf} - a}{b}$ where for C₃ species $a = 4.4$ and $b = 22.6$ (Farquhar et al., 1982); for CAM species $a = -8.6$, $b = 23.9$. $\Delta_{leaf} = 1000 \times \frac{\delta_{air} - \delta_{leaf}}{1 + \delta_{leaf}}$ (Farquhar et al., 1989) $A_{int_opt} = g_{sc_opt} \times (C_a - C_{i_opt})$ $g_{sc_opt} = \frac{g_{sw_opt}}{1.6}$ $g_{sw_opt} = \frac{E_{opt}}{VPD}$ $E_{opt} = K_{leaf_opt} \times \Delta\Psi_{leaf}$ $K_{leaf_opt} = \frac{6707}{((LT^2/4) + 0.078 \times (IVD_{0.5}/VED_{0.5})^2 \times LT^2)^{1.4}}$ $IVD_{0.5} = VED_{0.5} = \frac{IVD + VED}{2}$ $\Delta\Psi_{leaf} = \frac{E_{int}}{K_{leaf}}$	$\delta A_{rel} = \frac{\delta A}{\delta A_{max}}$ where δA_{max} is the upper bound for δA observed in the species set (20%)	Semi-empirical system of equations based on De Boer et al. (2017). Compares theoretical integrated carbon gain achievable with actual anatomical arrangement with carbon gain achievable with 'optimal' arrangement (IVD = VED). Re-parameterised using anatomical and physiological measurements. Assumes photosynthesis is principally limited by carboxylation.

$$E_{int} = 1.6 \times g_{sc,int} \times VPD$$

$$g_{sc,int} = \frac{A_{int}}{C_a - C_{i,int}}$$

$$K_{leaf} = \frac{6707}{((LT^2/4) + 0.078 \times (IVD/VED)^2 \times LT^2)^{1.4}}$$

Table A4.2.1. Model internal variables and linker functions connecting internal variables to IVD and VED.

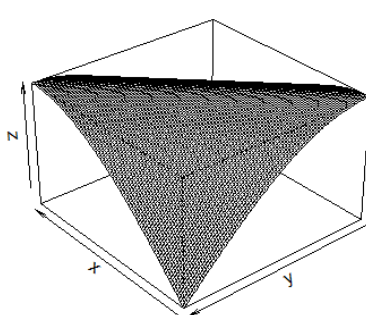
Table A4.2.2 shows the methods and values used for photosynthetic parameters in modelling fitness component w_9 (see below). Several key parameters were derived from coupled gas exchange and chlorophyll fluorescence measurements performed according to the protocol of Bellasio et al. (2016). These measurements were performed for a small set of representative C_3 and CAM species (the latter during Phase IV RuBisCO-mediated CO_2 fixation), and mean values of fitted parameters were then used for all C_3 and CAM species respectively. Further details are provided in **Appendix 4.1**. This approach assumes that variation in photosynthetic parameters among species of the same photosynthetic pathway is relatively insignificant. This assumption is recognised as a potential limitation, although variation in fitted parameters among those species which were characterised by gas exchange and chlorophyll fluorescence measurements was relatively low.

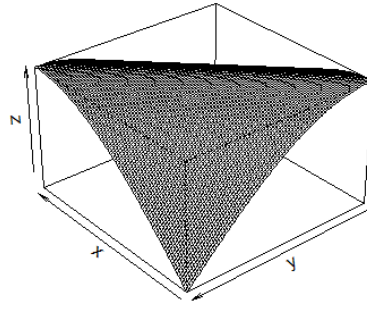
Parameter	Definition	Value	Method of estimation
Γ^*	Respiration-adjusted CO_2 compensation point (ppm)	48 (C_3) 10 (CAM)	Gas exchange measurements (Bellasio et al., 2016)- see Appendix 4.1
V_{cmax}	Maximum carboxylation rate ($\mu mol\ m^{-2}\ s^{-1}$)	55 (C_3) 65 (CAM)	Gas exchange and chlorophyll fluorescence measurements (Bellasio et al., 2016)- see Appendix 4.1
$k_c(1+(O/k_o))$	Apparent $k_m(CO_2)$ of RuBisCO (μM)	550 (C_3) 320 (CAM)	Gas exchange and chlorophyll fluorescence measurements (Bellasio et al., 2016)- see Appendix 4.1
R_D	Dark respiration rate ($\mu mol\ m^{-2}\ s^{-1}$)	0.69 (C_3 mesic terrestrial) 0.64 (C_3 succulent terrestrial) 0.35 (CAM terrestrial)	Mean values calculated by functional type from data reported in Chapter 3
δ_{air}	$\delta^{13}C$ air (‰)	-8.10	Arbitrary selection from within range of values reported in Affek et al. (2007)
δ_{leaf}	$\delta^{13}C$ leaf (‰)	Species-specific	Retrieved from Crayn et al. (2015)
C_a	Atmospheric CO_2 concentration (ppm)	400	Based on recent trends reported in Scripps CO_2 measurements (Scripps CO_2 Program 2016)
VPD	Leaf-air vapour pressure deficit (kPa)	Species-specific	Representative reliable presence-point near centre of species' geographical range selected manually from GBIF data and used to retrieve mean

2011-2015 absolute atmospheric vapour pressure (AVP, kPa) from a rasterised version of the CRU TS v3.24.01 dataset (Climate Research Unit, University of East Anglia). Water vapour in internal leaf air spaces was assumed to be saturating, leaf temperature was standardised to 28 °C for calculation of saturated vapour pressure (SVP, kPa), and VPD was calculated as AVP-SVP

Table 4.2.2. Parameters used for modelling of fitness component w_9 .

The second step in model construction was to define the relationships between internal variables, environmental variables, and the values of a series of relative fitness components. These semi-quantitative, heuristic relationships are outlined and justified in Table A4.2.3. Two environmental variables were selected as representative of the major axes of variation in bromeliad hydrological habitat space (see **Chapter 2**): the aridity index (AI, mm mm⁻¹) and precipitation seasonality (P_{seas} , %). Relative fitness components w_8 and w_9 were simply set as equal to CC and δA_{rel} respectively, as it was assumed that higher values of these traits would be advantageous under all environments.

Fitness component	Internal variable	Environmental variable	Relationship and description	Rationale
w_1	LMA_{rel}	AI_{rel}	$z = \cos(1.5x - 1.5y)$ 	Less tough, shorter-lived leaves favoured under more mesic conditions, and tougher, longer-lived leaves favoured under more arid conditions (Chapter 3)
Fitness maximised when LMA_{rel} and AI_{rel} equal				
w_2	$\text{C}_{\text{FT,rel}}$	AI_{rel}	$z = \cos(1.5x - 1.5y)$	Advantage of water storage rises under increasingly arid conditions (Chapter 3)

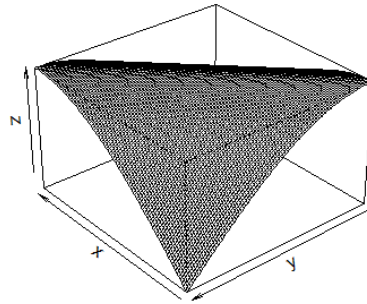


Fitness maximised when $C_{FT,rel}$ and Al_{rel} equal

w_3 $C_{FT,rel}$ $P_{seas,rel}$

$$z = \cos(1.5x - 1.5y)$$

Advantage of water storage rises as water availability is concentrated in increasingly seasonal precipitation events (Ellenberg, 1981)

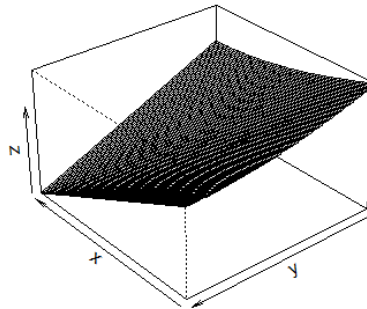


Fitness maximised when $C_{FT,rel}$ and $P_{seas,rel}$ equal

w_4 V_H Al_{rel}

$$z = \sqrt{(x-1)^2 + (y-1)^2}$$

Hydraulic vulnerability less strongly selected against in more humid environments (Zwieniecki and Boyce, 2014), while high hydraulic vulnerability in arid environments could lead to catastrophic physiological dysfunction

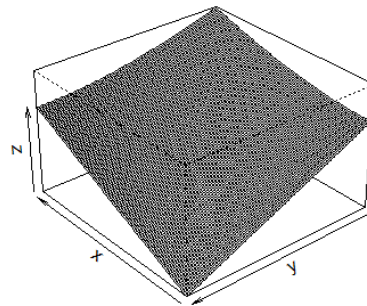


Fitness maximised when V_H and Al_{rel} both low, and minimised when V_H and Al_{rel} both high

w_5 $\delta t_{hyd,rel}$ Al_{rel}

$$z = \sqrt{x^2 + (y-1)^2}$$

Efficient hydraulic recharge assumed to be crucial in arid environments (Griffiths, 2013), but could also be beneficial for species occupying more mesic sites



Fitness maximised when Al_{rel} low and $dt_{hyd,rel}$ high, and minimised when Al_{rel} high and $dt_{hyd,rel}$ low

w_6 $\delta t_{hyd,rel}$ $P_{seas,rel}$

$$z = \sqrt{x^2 + (y-1)^2}$$

Efficient hydraulic recharge assumed to be crucial under episodic

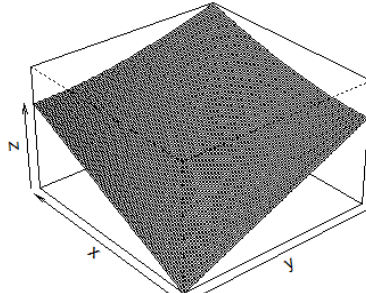
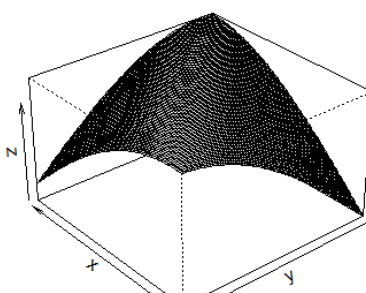
				 precipitation regimes (Ellenberg, 1981), but could also be beneficial for species occupying less seasonal sites Fitness maximised when $P_{seas,rel}$ low and $\delta t_{hyd,rel}$ high, and minimised when $P_{seas,rel}$ high and $\delta t_{hyd,rel}$ low
w_7	$Area_{rel}$	AI_{rel}	$z = \sin(1.5x + 1.5y)$	 High leaf area assumed to be advantageous in more mesic environments due to competitive interactions, and less advantageous in more arid environments due to increased for water loss Fitness maximised when $Area_{rel} = -AI + 1$
w_8	CC	n/a	n/a	Low leaf construction costs <i>per se</i> assumed to be advantageous in any environment
w_9	δA_{rel}	n/a	n/a	Maximisation of potential carbon gain assumed to be advantageous in any environment

Table A4.2.3. Relationships between normalised internal variables and fitness components (w_i).

For a set of 31 representative terrestrial species native to contrasting areas of hydrological habitat space and of different functional types, the model was parameterised with anatomical traits (leaf thickness, LT; IVD; VED), mean AI and P_{seas} scores retrieved from **Chapter 2**, and carbon isotope values from the Crayn et al. (2015) dataset. Anatomical traits were measured by light microscopy using leaf material sourced and sampled as described in **Chapter 3**. At least ten replicate leaves were sampled per species. Species-specific traits are summarised in Table A4.2.4.

Functional type	Species	IVD (μm)	VED (μm)	LT (μm)	δ _{leaf} (‰)	VPD (kPa)	AI (mm mm ⁻¹)	P _{seas} (%)
CAM terrestrial	<i>Bromelia balansae</i> Mez	400	850	1542	-15.40	1.63	9185	51.45
CAM terrestrial	<i>Cryptanthus beuckeri</i> E.Morren	660	280	524	-17.30	1.24	9443	31.22
CAM terrestrial	<i>Deuterocohnia brevifolia</i> (Griseb.) M.A.Spencer & L.B.Sm.	160	190	248	-10.60	3.25	2744	105.25
CAM terrestrial	<i>Deuterocohnia lorentziana</i> (Mez) M.A.Spencer & L.B.Sm.	160	230	472	-12.20	2.80	1837	103.73
CAM terrestrial	<i>Deuterocohnia meziana</i> Kuntze ex Mez	230	1060	2304	-12.70	1.77	5479	60.75
CAM terrestrial	<i>Deuterocohnia schreiteri</i> A.Cast.	180	850	1791	-11.40	2.57	1725	103.2
CAM terrestrial	<i>Disteganthus lateralis</i> (L.B.Sm.) Gouda	390	320	616	-14.00	0.68	17294	47.48
CAM terrestrial	<i>Dyckia remotiflora</i> A.Dietr.	240	530	1271	-13.40	1.86	10170	13.67
CAM terrestrial	<i>Encholirium spectabile</i> Mart. Ex Schult. & Schult.f.	150	510	1092	-12.50	1.63	4641	70.25
C ₃ succulent terrestrial	<i>Fascicularia bicolor</i> (Ruiz & Pav.) Mez	220	280	596	-23.80	2.73	23607	57.46
C ₃ mesic terrestrial	<i>Fosterella caulescens</i> Rauh	90	210	407	-24.80	2.40	11389	51.47
C ₃ mesic terrestrial	<i>Fosterella micrantha</i> (Lindl.) L.B.Sm.	300	290	582	-30.60	1.34	13612	84.54
C ₃ mesic terrestrial	<i>Fosterella penduliflora</i> (C.H.Wright) L.B.Sm.	320	190	382	-30.50	1.84	6350	71.75
C ₃ mesic terrestrial	<i>Fosterella rusbyi</i> (Mez) L.B.Sm.	100	200	367	-30.60	2.67	9475	59.58
CAM terrestrial	<i>Hechtia montana</i> Brandegee	380	1290	2676	-13.10	2.09	2517	102.24
CAM terrestrial	<i>Hechtia purpusii</i> Brandegee	460	2880	7041	-12.80	1.64	8233	75.4
CAM terrestrial	<i>Hechtia rosea</i> E.Morren ex Baker	150	300	688	-11.30	1.20	5523	106.88
C ₃ succulent terrestrial	<i>Ochagavia litoralis</i> (Phil.) Zizka, Trumpler & Zöllner	90	190	475	-27.40	2.48	9982	93.60
CAM terrestrial	<i>Orthophytum foliosum</i> L.B.Sm.	180	180	354	-13.90	1.20	7461	59.33
CAM terrestrial	<i>Orthophytum saxicola</i> (Ule) L.B.Sm.	70	180	403	-14.30	1.36	5112	52.55
C ₃ mesic terrestrial	<i>Pitcairnia breedlovei</i> L.B.Sm.	70	60	148	-26.60	1.54	6248	95.27
C ₃ mesic terrestrial	<i>Pitcairnia flammea</i> Lindl.	380	140	307	-26.80	1.40	10662	53.21
C ₃ mesic terrestrial	<i>Pitcairnia imbricate</i> (Brongn.) Regel	260	60	144	-31.60	1.74	15026	68.34
C ₃ mesic terrestrial	<i>Pitcairnia palmoides</i> Mez & Sodiro	620	300	622	-29.60	1.22	17007	40.88
C ₃ mesic terrestrial	<i>Pitcairnia recurvata</i> (Scheidw.) K.Koch	370	110	241	-26.80	1.35	15141	66.44
C ₃ mesic terrestrial	<i>Pitcairnia undulata</i> Scheidw.	310	200	439	-28.70	1.29	20103	53.08
C ₃ succulent terrestrial	<i>Puya alpestris</i> (Poepp.) Gay	90	80	192	-25.70	2.57	5766	96.50
CAM terrestrial	<i>Puya chilensis</i> Molina	150	90	229	-18.60	2.61	5527	96.41
C ₃ succulent terrestrial	<i>Puya coerulea</i> Lindl.	140	60	155	-23.30	3.19	5961	94.98
C ₃ succulent terrestrial	<i>Puya mirabilis</i> (Mez) L.B.Sm.	340	200	447	-23.60	2.38	4967	94.35

CAM terrestrial	<i>Puya venusta</i> (Baker) Phil.	260	70	259	-17.30	2.61	2764	104.37
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Table A4.2.4. Anatomical parameters, carbon isotope ratios from Crayn et al. (2015), and bioclimatic scores for all species used in IVD: VED modelling.

The model was fitted for each species and the output (fitness components) retrieved, including the product of all fitness components (w_{tot}). The model was then solved for the optimal combination of IVD and VED for maximum w_{tot} (w_{fit}), holding all other parameters constant. The model was constrained to find solutions for which $50 \mu\text{m} \leq \text{IVD} \leq 1000 \mu\text{m}$, $50 \mu\text{m} \leq \text{VED} \leq 3000 \mu\text{m}$ and $\text{VED} \leq (\text{LT}/2)$. These constraints were based on the lower and upper bounds on IVD and VED observed during anatomical characterisation, and the tendency for the vascular plane never to fall closer to the adaxial than to the abaxial epidermis. The results of model optimisation were compared with the results obtained with the observed anatomical parameters by calculating $w_{\text{fit}} - w_{\text{tot}}$ and $100 \times (w_{\text{tot}}/w_{\text{fit}})$, and the ratios between the observed and fitted values of IVD, VED, and IVD: VED.

In addition to the analyses described above, the optimal combination of IVD and VED for maximum w_{tot} was modelled across AI- P_{seas} climate space for three hypothetical trait combinations designed to represent the three focal functional types (C_3 mesic terrestrial, C_3 succulent terrestrial, and CAM terrestrial). The relevant traits are outlined in Table A4.2.5.

Functional type	δ_{leaf} (‰)	VPD (kPa)	LT (μm)
C_3 mesic terrestrial	-28.00	1.20	200
C_3 succulent terrestrial	-23.00	1.80	900
CAM terrestrial	-12.00	2.40	2000

Table A4.2.5. Hypothetical trait combinations used to represent idealised examples of bromeliads of different terrestrial functional types for solving for optimal IVD and VED.

The same model constraints were used as in species-specific optimisation outlined above. For each functional type, model runs were performed using different combinations of AI and P_{seas} . AI was varied between 2,000 and 23,000 mm mm^{-1} at 3,000 mm mm^{-1} intervals, while P_{seas} was varied between 20 and 120% at 25% intervals. The resulting IVD: VED values were then transferred to R, and the 'loess' function was used to perform localised second-degree polynomial regression fitting, with the smoothing parameter (α) set to 0.25. Surface plots of the optimal IVD: VED ratio as a function of AI and P_{seas} were produced using the 'wireframe' function of the 'lattice' package (Sarkar, 2008).

A4.2.2 Heuristic structure-function modelling- Results

Fitness component scores (w_i) for all species are displayed by functional type in Table A4.2.6. Mean values differed significantly between functional types only for w_7 ($F = 3.58$, $p = 0.041$) and w_9 ($F = 4.56$, $p = 0.019$). In the case of w_7 , which links leaf area with AI, the highest scores occurred in C_3 succulent terrestrials and the lowest in CAM terrestrials. For w_9 , which reflects the ability of hydraulic supply to meet demand, the highest scores occurred in CAM terrestrials and the lowest in C_3 mesic terrestrials. Although differences between functional types in mean scores for other fitness components were not statistically significant, scores for w_3 , w_4 , w_5 and w_6 tended to be higher in CAM terrestrials and lower in C_3 succulent terrestrials, while scores for w_1 and w_2 tended to be higher in C_3 mesic terrestrials and lower in C_3 succulent terrestrials and w_8 was generally higher in C_3 mesic terrestrials and lower in CAM terrestrials. When all fitness components were multiplied to provide species-specific scores of w_{tot} , these values did not differ significantly between functional types, but tended to be higher in C_3 mesic terrestrials and lower in C_3 succulent terrestrials.

Functional type	Species	IVD: VED	w_1	w_2	w_3	w_4	w_5	w_6	w_7	w_8	w_9	w_{tot}
CAM terrestrial	<i>Bromelia balansae</i>	0.47	0.974	0.934	1.000	0.817	0.743	0.873	0.805	0.371	0.590	0.142
CAM terrestrial	<i>Cryptanthus beuckeri</i>	2.36	0.773	0.774	0.995	0.355	0.411	0.771	0.969	0.795	0.349	0.045
CAM terrestrial	<i>Deuterocohnia brevifolia</i>	0.84	0.445	0.43	0.459	0.587	0.562	0.566	0.748	0.461	0.554	0.007
CAM terrestrial	<i>Deuterocohnia lorentziana</i>	0.70	0.757	0.751	0.704	0.708	0.676	0.654	0.925	0.443	0.590	0.048
CAM terrestrial	<i>Deuterocohnia meziana</i>	0.22	0.972	0.893	1.000	0.852	0.733	0.860	0.483	0.314	0.662	0.132
CAM terrestrial	<i>Deuterocohnia schreiteri</i>	0.21	0.800	0.712	0.687	0.718	0.707	0.718	0.287	0.313	0.687	0.057
CAM terrestrial	<i>Disteganthus lateralis</i>	0.85	0.975	0.976	0.962	0.751	0.771	0.741	0.957	0.555	0.452	0.128
CAM terrestrial	<i>Dyckia remotiflora</i>	0.45	0.893	0.885	0.961	0.839	0.764	1.000	0.828	0.367	0.62	0.145
CAM terrestrial	<i>Encholirium spectabile</i>	0.29	0.703	0.694	0.905	0.822	0.715	0.808	0.506	0.331	0.659	0.064

C ₃ succulent terrestrial	<i>Fascicularia bicolor</i>	0.79	0.995	0.995	0.909	1.000	1.000	0.773	0.922	0.447	0.583	0.181
C ₃ mesic terrestrial	<i>Fosterella caulescens</i>	0.43	0.815	0.808	0.905	0.868	0.791	0.865	0.854	0.361	0.665	0.107
C ₃ mesic terrestrial	<i>Fosterella micrantha</i>	1.03	0.901	0.902	0.725	0.698	0.702	0.571	1.000	0.509	0.51	0.061
C ₃ mesic terrestrial	<i>Fosterella penduliflora</i>	0.32	0.615	0.601	0.78	0.311	0.39	0.508	0.993	0.665	0.335	0.013
C ₃ mesic terrestrial	<i>Fosterella rusbyi</i>	0.50	0.745	0.736	0.87	0.811	0.741	0.825	0.828	0.378	0.561	0.068
CAM terrestrial	<i>Hechtia montana</i>	0.29	0.976	0.865	0.903	0.809	0.7	0.709	0.401	0.331	0.647	0.094
CAM terrestrial	<i>Hechtia purpusii</i>	0.16	0.901	0.916	0.871	0.896	0.772	0.801	0.565	0.301	0.666	0.103
CAM terrestrial	<i>Hechtia rosea</i>	0.48	0.627	0.63	0.513	0.759	0.684	0.662	0.686	0.378	0.645	0.025
C ₃ succulent terrestrial	<i>Ochagavia litoralis</i>	0.47	0.76	0.749	0.583	0.828	0.756	0.695	0.832	0.371	0.613	0.044
CAM terrestrial	<i>Orthophytum foliosum</i>	1.00	0.43	0.411	0.485	0.509	0.509	0.521	0.8	0.378	0.505	0.004
CAM terrestrial	<i>Orthophytum saxicola</i>	0.39	0.555	0.538	0.903	0.795	0.703	0.88	0.598	0.352	0.617	0.041
C ₃ mesic terrestrial	<i>Pitcairnia breedlovei</i>	1.17	0.562	0.495	0.461	0.477	0.502	0.491	0.941	0.542	0.451	0.007
C ₃ mesic terrestrial	<i>Pitcairnia flammea</i>	2.71	0.769	0.746	0.884	0.396	0.438	0.588	0.924	0.847	0.188	0.019
C ₃ mesic terrestrial	<i>Pitcairnia imbricata</i>	4.33	0.884	0.844	0.728	0.557	0.574	0.453	0.687	0.966	0.441	0.058
C ₃ mesic terrestrial	<i>Pitcairnia palmoides</i>	2.07	0.968	0.969	0.979	0.638	0.677	0.705	0.827	0.744	0.352	0.108
C ₃ mesic terrestrial	<i>Pitcairnia recurvata</i>	3.36	0.897	0.874	0.778	0.561	0.584	0.475	0.741	0.914	0.171	0.025
C ₃ mesic terrestrial	<i>Pitcairnia undulata</i>	1.55	0.99	0.988	0.907	0.785	0.819	0.653	0.827	0.634	0.401	0.116
C ₃ succulent terrestrial	<i>Puya alpestris</i>	1.13	0.547	0.49	0.467	0.487	0.506	0.499	0.923	0.531	0.458	0.007
CAM terrestrial	<i>Puya chilensis</i>	1.67	0.539	0.488	0.477	0.292	0.375	0.371	0.986	0.661	0.447	0.004
C ₃ succulent terrestrial	<i>Puya coerulea</i>	2.33	0.549	0.481	0.464	0.23	0.311	0.302	0.999	0.791	0.084	0.0006
C ₃ succulent terrestrial	<i>Puya mirabilis</i>	1.70	0.557	0.545	0.582	0.27	0.359	0.375	0.982	0.668	0.218	0.003
CAM terrestrial	<i>Puya venusta</i>	3.71	0.396	0.329	0.368	0.102	0.183	0.2	0.996	0.938	0.333	0.0003

Table A4.2.6. Observed IVD: VED ratios and modelled fitness components (w_i) for 31 bromeliad species of contrasting functional type.

The relationships between observed IVD: VED and calculated individual fitness components (w_i) and w_{tot} are displayed in Fig. A4.2.1. These relationships are reflective of the model structure, and highlight how the model generated a spectrum of values for each fitness component.

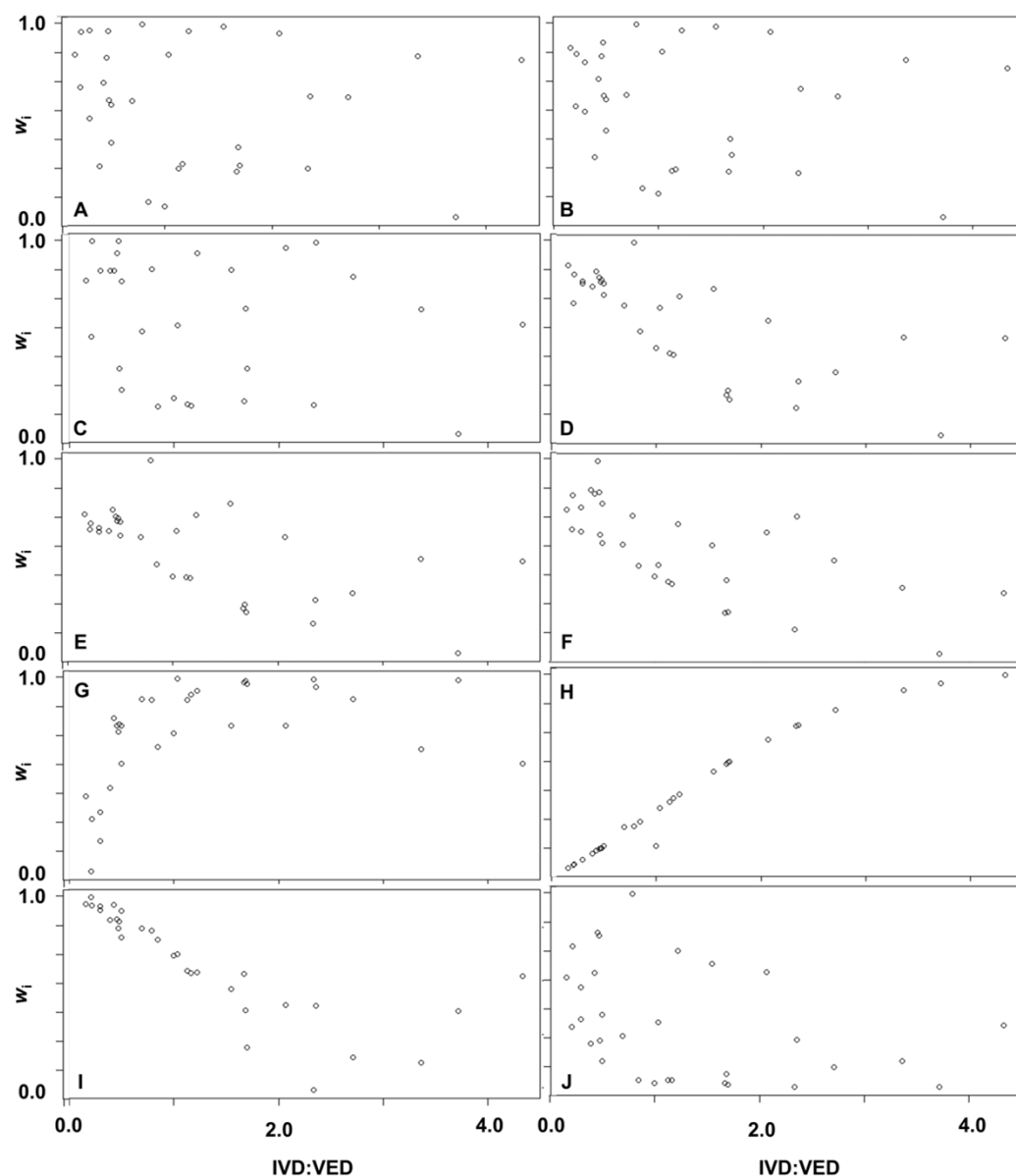


Figure A4.2.1. Relationships between fitness components (w_i) and observed IVD: VED for 31 bromeliad species. a) w_1 ; b) w_2 ; c) w_3 ; d) w_4 ; e) w_5 ; f) w_6 ; g) w_7 ; h) w_8 ; i) w_9 ; j) w_{tot} .

The optimal values of IVD and VED were next calculated for each species by maximising w_{tot} subject to the constraints described in A4.2.1.3. The maximised value of w_{tot} was termed w_{fit} . The results are displayed in Table A4.2.7.

The squared residuals between actual values of IVD, VED, and IVD: VED and the fitted optimal values displayed broad variation. Although there were no significant differences between functional types in terms of the values of squared residuals (IVD: $F = 0.72$, $p = 0.497$; VED: $F = 0.47$, $p = 0.631$), lower values tended to occur in succulent CAM terrestrials, while the median value and range were substantially higher for C_3 mesic terrestrials in particular. The relationship between observed IVD: VED and $IVD_{fit}: VED_{fit}$ is displayed in Fig. A4.2.2a. There was a relatively strong positive correlation between the observed and modelled ratios ($r^2 = 0.48$, $p < 0.001$), with the modelled optimal ratio tending to be approximately 25% of the observed ratio. Fig. A4.2.2b shows the strong positive correlation between w_{tot} and w_{fit} ($r^2 = 0.53$, $p < 0.001$). Functional type was a significant factor for the absolute difference between w_{fit} and w_{tot} ($F = 4.99$, $p = 0.014$), with slightly lower values in most CAM terrestrials than in C_3 succulent terrestrials, and substantially higher values occurring among many C_3 mesic terrestrials. Although the difference in $100 \times (w_{tot}/w_{fit})$ for functional types was not statistically significant ($F = 2.10$, $p = 0.141$), values tended to be somewhat lower among CAM terrestrials than in the other two functional types. Overall, these results are consistent with the conclusion that the observed vein placement of CAM terrestrials is closest to the theoretical optimum predicted by the simple heuristic model presented here. The stronger departure of observed vein placement from predicted optima in species of other functional types is consistent with alternative physiological or developmental factors being more important determinants of vein placement in these groups.

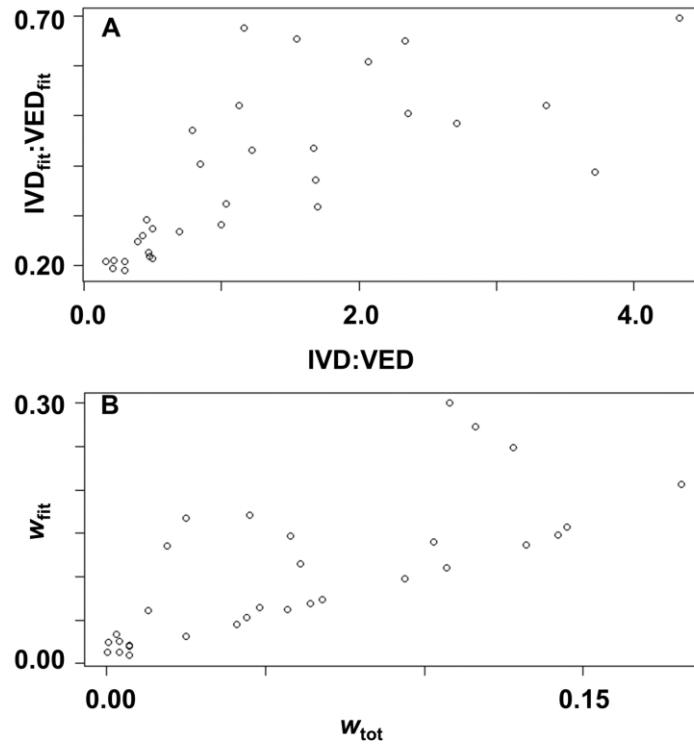


Figure A4.2.2. a) Relationship between observed IVD: VED and modelled optimal $IVD_{fit}: VED_{fit}$. b) Relationship between w_{tot} calculated from observed vein placement and w_{fit} based on modelled optimal vein placement.

The relationships between IVD: VED and w_{fit} , $w_{fit}-w_{tot}$, and the ratio of w_{tot} to w_{fit} are displayed in Fig. A4.2.3. While there was no correlation between the observed value of IVD: VED and w_{fit} (Fig. A4.2.3a), there was a positive correlation between IVD: VED and $w_{fit}-w_{tot}$ ($r^2 = 0.30$, $p < 0.001$; Fig. A4.2.3b). There was an even stronger positive correlation between IVD: VED and the ratio of w_{fit} to w_{tot} ($r^2 = 0.61$, $p < 0.001$; Fig. A4.2.3c). These results are again consistent with any adaptive advantage of apparent ‘overinvestment’ in veins ($IVD: VED \gg 1$) being based on other (perhaps non-hydraulic) aspects of species’ ecophysiology not represented in the model structure.

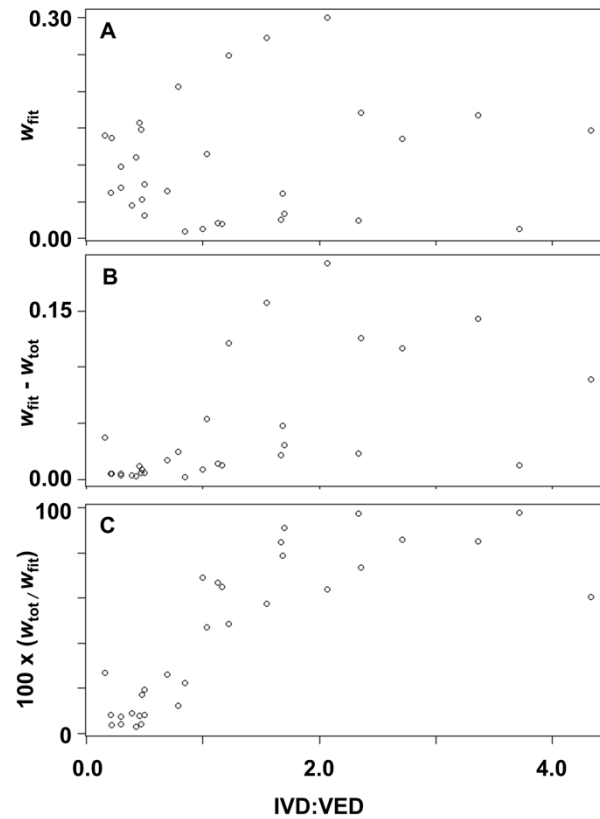


Figure A4.2.3. Relationships between IVD: VED and measures of optimisation modelling output for 31 bromeliad species: a) w_{fit} ; b) $w_{fit} - w_{tot}$; c) $100 \times (w_{tot}/w_{fit})$.

There was a strong positive correlation between w_{fit} and species mean AI score ($r^2 = 0.64$, $p < 0.001$; Fig. A4.2.4a), and a negative correlation between w_{fit} and species mean P_{seas} score ($r^2 = 0.45$, $p < 0.001$; Fig. A4.2.4b). Thus the model was able to find higher w_{fit} for species from more mesic, aseasonal habitats, which is consistent with the possibility that it is perhaps easier to balance competing physiological demands in such environments.

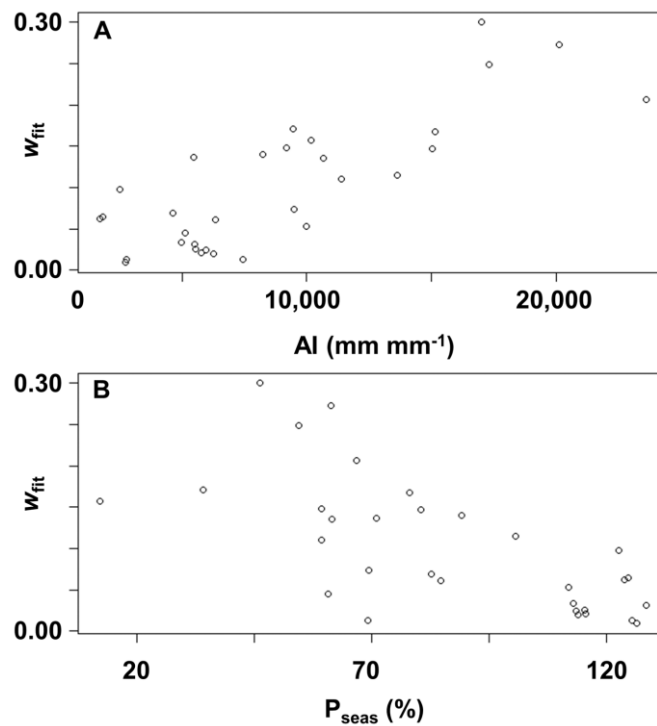


Figure A4.2.4. Relationships between bioclimatic factors and modelled optimised fitness (w_{fit}) for 31 bromeliad species. a) w_{fit} vs. AI; b) w_{fit} vs. P_{seas} .

In addition to the species-specific optimisation runs described above, optimal IVD: VED was also solved for across the AI- P_{seas} climate space for idealised representatives of three focal functional types (C_3 mesic terrestrials, C_3 succulent terrestrials and CAM terrestrials). The results are displayed as surfaces in Fig. A4.2.5. Consistent with the poor model performance for individual C_3 mesic terrestrial species, the surface of optimal IVD: VED values for the idealised C_3 mesic terrestrial was equal to 0.5 across the entire climate space (Fig. A4.2.5a), which was driven by constrained maximisation of VED and minimisation of IVD. By contrast, for both the idealised C_3 succulent terrestrial (Fig. A4.2.5b) and CAM terrestrial (Fig. A4.2.5c), the surface showed complex, similar topology. At higher values of AI, the optimal value of IVD: VED increased steeply, reaching a global maximum where high AI was combined with low P_{seas} (i.e. the most mesic and aseasonal environments). Conversely, the lowest optimal values of IVD: VED occurred at low AI and high P_{seas} (i.e. the most xeric and seasonal environments). This pattern was consistent with the observed relationships between vein placement and habitat association across bromeliad species.

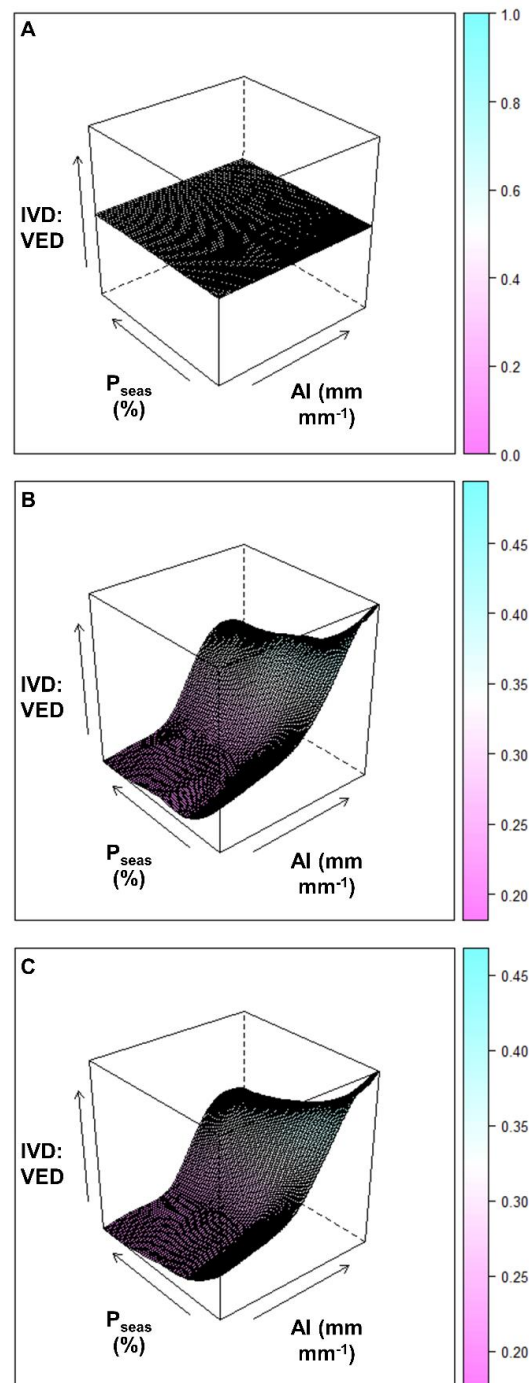


Figure A4.2.5. Optimal solutions for IVD: VED across P_{seas} -AI climate space for idealised representatives of three bromeliad functional types: a) C_3 mesic terrestrial; b) C_3 succulent terrestrial; c) CAM terrestrial.

A.4.2.3 Heuristic structure-function modelling- Discussion

Alongside the extensive empirical survey of vein placement and analysis of correlations with functional type and habitat occupancy, further insights into the functional significance of variation in vein placement were gained through the implementation of a simple model linking relevant anatomical parameters with heuristic fitness components. The structure of the model was based on

a combination of empirically-defined trait correlations and theoretical mechanistic relationships between relative trait values and probability of plant success in different areas of hydrological habitat space defined by the aridity index (AI) and precipitation seasonality (P_{seas}). The model was not intended to be fully quantitative, and ignored some physiological mechanisms that could link vein placement with plant fitness. However, it succeeded in generating several interesting insights regarding the possible relative importance of vein placement for ecophysiological adaptation and differentiation among terrestrial bromeliads of different functional types. Because the model was to a large extent based on hydraulic physiological factors, the fact that the observed values of IVD: VED were closer to the fitted optimal values of IVD: VED in succulent species than in non-succulent species suggests that hydraulic optimisation of vein placement could be more important in the ecophysiology of succulent terrestrial bromeliads. This is consistent with the hypothesis that the efficiency of vein-mediated water distribution is a key component of the process of recharge in succulents. The model also demonstrated how low IVD could support the relatively high rates of gas exchange observed in some C_3 succulent terrestrials (e.g. *Puya* spp., see **Chapter 3**). Because of the use of photosynthetic parameters fitted to data relating to Phase IV CO_2 fixation, the model probably underestimated the benefit of disproportionately high VED in succulent CAM species. From observations made during anatomical characterisation it was clear that in these plants high VED was associated with an increased number of chlorenchyma cell layers, and with larger cells. This provides a large capacity for PEPC-mediated CO_2 fixation during Phase I and storage of organic acids in chlorenchyma cell vacuoles. Organic acid storage capacity is a key limiting factor for nocturnal carbon assimilation in CAM plants (Steudle et al., 1980; Silvera et al., 2010). Selection for high VED as a correlate of photosynthetic capacity in CAM bromeliads could therefore complement selection for low IVD as a correlate of hydraulic recharge capacity in driving low IVD: VED ratios in these species.

By contrast, the greater disparity between observed and modelled optimal IVD: VED ratios in non-succulent C_3 mesic terrestrials suggests that other physiological factors could be more important determinants of the fitness of contrasting vein placement phenotypes. For instance, wider leaves may be selected for in shade-adapted species, but the achievement of high leaf width may be developmentally contingent on high IVD (as suggested by the data for C_3 tank-epiphytes presented above). In such environments, the hydraulic disadvantages of effective underinvestment in veins may be of limited consequence for plant water-use.

Functional type	Species	IVD (μm)	VED (μm)	IVD: VED	IVD _{fit} (μm)	VED _{fit} (μm)	IVD _{fit} : VED _{fit}	(IVD-IVD _{fit}) ²	(VED-VED _{fit}) ²	(IVD: VED-IVD _{fit} : VED _{fit}) ²	w _{tot}	w _{fit}	w _{fit} -w _{tot}	100* w _{fit} - w _{tot} / w _{fit}
CAM	<i>Bromelia balansae</i>	400	850	0.47	175	771	0.23	50625	6241	0.06	0.142	0.148	0.006	4.05
terrestrial	<i>Cryptanthus beuckeri</i>	660	280	2.36	132	262	0.50	278784	324	3.43	0.045	0.171	0.126	73.68
CAM	<i>Deuterocohnia brevifolia</i>	160	190	0.84	50	124	0.40	12100	4356	0.19	0.007	0.009	0.002	22.22
terrestrial	<i>Deuterocohnia lorentziana</i>	160	230	0.70	53	197	0.27	11449	1089	0.18	0.048	0.065	0.017	26.15
CAM	<i>Deuterocohnia meziana</i>	230	1060	0.22	242	1152	0.21	144	8464	<0.01	0.132	0.137	0.005	3.65
terrestrial	<i>Deuterocohnia schreiteri</i>	180	850	0.21	174	895	0.19	36	2025	<0.01	0.057	0.062	0.005	8.06
CAM	<i>Disteganthus lateralis</i>	390	320	0.85	133	308	0.43	66049	144	0.62	0.128	0.249	0.121	48.59
terrestrial	<i>Dyckia remotiflora</i>	240	530	0.45	185	635	0.29	3025	11025	0.03	0.145	0.157	0.012	7.64
CAM	<i>Encholirium spectabile</i>	150	510	0.29	114	546	0.21	1296	1296	0.01	0.064	0.069	0.005	7.25
terrestrial	<i>Fascicularia bicolor</i>	220	280	0.79	140	298	0.47	6400	324	0.10	0.181	0.206	0.025	12.14
C ₃ succulent	<i>Fosterella caulescens</i>	90	210	0.43	53	203	0.26	1369	49	0.03	0.107	0.110	0.003	2.73
terrestrial	<i>Fosterella micrantha</i>	300	290	1.03	94	291	0.32	42436	1	0.51	0.061	0.115	0.054	47.00
C ₃ mesic	<i>Fosterella penduliflora</i>	320	190	0.32	71	191	0.37	62001	1	1.72	0.013	0.061	0.048	78.69
terrestrial	<i>Fosterella rusbyi</i>	100	200	0.50	50	183	0.27	2500	289	0.05	0.068	0.074	0.006	8.11
C ₃ mesic	<i>Hechtia montana</i>	380	1290	0.29	254	1338	0.19	15876	2304	0.01	0.094	0.098	0.004	4.08
terrestrial	<i>Hechtia purpusii</i>	460	2880	0.16	291	1390	0.21	28561	2220	<0.01	0.103	0.140	0.037	26.64
CAM	<i>Hechtia rosea</i>	150	300	0.48	74	344	0.22	5776	1936	0.08	0.025	0.031	0.006	19.35
terrestrial														

C ₃ succulent terrestrial	<i>Ochagavia litoralis</i>	90	190	0.47	52	238	0.22	1444	2304	0.07	0.044	0.053	0.009	16.98
CAM terrestrial	<i>Orthophytum foliosum</i>	180	180	1.00	50	177	0.28	16900	9	0.51	0.004	0.013	0.009	69.23
CAM terrestrial	<i>Orthophytum saxicola</i>	70	180	0.39	50	201	0.25	400	441	0.02	0.041	0.045	0.004	8.89
C ₃ mesic terrestrial	<i>Pitcairnia breedlovei</i>	70	60	1.17	50	74	0.68	400	196	0.24	0.007	0.020	0.013	65.00
C ₃ mesic terrestrial	<i>Pitcairnia flammea</i>	380	140	2.71	74	153	0.48	93636	169	4.98	0.019	0.136	0.117	86.03
C ₃ mesic terrestrial	<i>Pitcairnia imbricata</i>	260	60	4.33	50	72	0.69	44100	144	13.24	0.058	0.147	0.089	60.54
C ₃ mesic terrestrial	<i>Pitcairnia palmoides</i>	620	300	2.07	189	311	0.61	185761	121	2.13	0.108	0.300	0.192	64.00
C ₃ mesic terrestrial	<i>Pitcairnia recurvata</i>	370	110	3.36	63	121	0.52	94249	121	8.08	0.025	0.168	0.143	85.12
C ₃ mesic terrestrial	<i>Pitcairnia undulata</i>	310	200	1.55	143	219	0.65	27889	361	0.80	0.116	0.273	0.157	57.51
C ₃ succulent terrestrial	<i>Puya alpestris</i>	90	80	1.13	50	96	0.52	1600	256	0.37	0.007	0.021	0.014	66.67
CAM terrestrial	<i>Puya chilensis</i>	150	90	1.67	50	115	0.44	10000	625	1.52	0.004	0.026	0.022	84.62
C ₃ succulent terrestrial	<i>Puya coerulea</i>	140	60	2.33	50	77	0.65	8100	289	2.84	<0.001	0.024	0.023	97.50
C ₃ succulent terrestrial	<i>Puya mirabilis</i>	340	200	1.70	71	224	0.32	72361	576	1.91	0.003	0.034	0.031	91.18
CAM terrestrial	<i>Puya venusta</i>	260	70	3.71	50	129	0.39	44100	3481	11.07	<0.001	0.013	0.012	97.69

Table A4.2.7. Results of heuristic modelling of optimal IVD and VED. Key: IVD = measured interveinal distance; VED = measured vein-epidermis distance; IVD_{fit} = fitted optimal interveinal distance; VED_{fit} = fitted optimal vein-epidermis distance; w_{tot} = product of fitness components based on empirical data; w_{fit} = product of fitness components based on fitted optimal parameters.

Appendix 5.1

A5.1.1 Stomatal responses to VPD and stomatal structural traits

Functional type	Species	VPD (kPa)	g_{sw} (mol m ⁻² s ⁻¹)	± SE	E (mol m ⁻² s ⁻¹)	A (μmol m ⁻² s ⁻¹)	± SE	WUE (μmol mol ⁻¹)
CAM tank-epiphyte	<i>Acanthostachys pitcairnioides</i>	0.02	0.084	0.002	0.002	2.72	0.12	32.38
		0.25	0.039	0.002	0.010	1.44	0.10	36.92
		0.50	0.028	0.001	0.014	1.09	0.09	38.93
		0.75	0.021	0.002	0.016	0.88	0.06	41.90
		1.00	0.016	0.001	0.016	0.71	0.04	44.38
		1.25	0.013	0.002	0.016	0.62	0.02	47.69
		1.50	0.009	<0.001	0.014	0.54	0.04	60.00
		1.75	0.006	<0.001	0.011	0.46	0.04	76.67
CAM tank-epiphyte	<i>Acanthostachys strobilacea</i>	2.00	0.003	<0.001	0.006	0.40	0.03	133.33
		0.02	0.094	0.003	0.002	2.51	0.17	26.70
		0.25	0.044	0.002	0.011	1.41	0.13	32.05
		0.50	0.031	0.002	0.016	1.12	0.10	36.13
		0.75	0.023	0.002	0.017	0.93	0.07	40.43
		1.00	0.017	0.001	0.017	0.79	0.03	46.47
		1.25	0.012	0.001	0.015	0.70	0.05	58.33
		1.50	0.008	<0.001	0.012	0.60	0.04	75.00
CAM tank-epiphyte	<i>Aechmea aquilega</i>	1.75	0.005	<0.001	0.009	0.53	0.03	106.00
		2.00	0.002	<0.001	0.004	0.48	0.03	240.00
		0.02	0.065	0.002	0.001	2.65	0.14	40.77
		0.25	0.028	0.002	0.007	1.24	0.10	44.29
		0.50	0.017	0.002	0.009	0.87	0.05	51.18
		0.75	0.012	0.001	0.009	0.60	0.03	50.00
		1.00	0.008	0.001	0.008	0.39	0.02	48.75
		1.25	0.004	<0.001	0.005	0.26	0.01	65.00
CAM tank-epiphyte	<i>Aechmea fendleri</i>	1.50	0.002	<0.001	0.003	0.12	0.01	60.00
		1.75	0.000	<0.001	0.000	0.00	0.00	0.00
		2.00	0.000	<0.001	0.000	0.00	0.00	0.00
		0.02	0.076	0.003	0.002	3.12	0.19	41.05
		0.25	0.034	0.003	0.009	1.38	0.11	40.59
		0.50	0.024	0.002	0.012	0.81	0.05	33.75
		0.75	0.015	0.002	0.011	0.55	0.03	36.67
		1.00	0.008	0.001	0.008	0.32	0.02	40.00
CAM tank-epiphyte	<i>Aechmea nudicaulis</i>	1.25	0.004	<0.001	0.005	0.11	0.01	27.50
		1.50	0.000	<0.001	0.000	0.00	0.00	0.00
		1.75	0.000	<0.001	0.000	0.00	0.00	0.00
		2.00	0.000	<0.001	0.000	0.00	0.00	0.00
		0.02	0.078	0.004	0.002	2.88	0.16	36.92
		0.25	0.035	0.002	0.009	1.40	0.11	40.00
		0.50	0.023	0.002	0.012	0.96	0.05	41.74
		0.75	0.016	0.001	0.012	0.69	0.05	43.13
CAM tank-epiphyte	<i>Aechmea fasciata</i>	1.00	0.011	0.001	0.011	0.49	0.03	44.55
		1.25	0.007	<0.001	0.009	0.33	0.02	47.14
		1.50	0.004	<0.001	0.006	0.21	0.01	52.50
		1.75	0.002	<0.001	0.004	0.10	0.01	50.00
		2.00	0.000	<0.001	0.000	0.00	0.00	0.00
		0.02	0.084	0.002	0.002	3.35	0.17	39.88
		0.25	0.051	0.003	0.013	1.85	0.14	36.27
		0.50	0.038	0.002	0.019	1.43	0.12	37.63
CAM tank-epiphyte	<i>Aechmea fasciata</i>	0.75	0.033	0.002	0.025	1.18	0.10	35.76
		1.00	0.026	0.002	0.026	0.99	0.07	38.08
		1.25	0.023	0.001	0.029	0.82	0.05	35.65
		1.50	0.018	0.002	0.027	0.71	0.04	39.44
		1.75	0.015	0.001	0.026	0.63	0.03	42.00
		2.00	0.012	0.001	0.024	0.57	0.02	47.50

CAM tank- epiphyte	<i>Aechmea filicaulis</i>	0.02	0.068	0.002	0.001	2.56	0.15	37.65
		0.25	0.028	0.002	0.007	1.21	0.10	43.21
		0.50	0.021	0.003	0.011	0.85	0.08	40.48
		0.75	0.015	0.001	0.011	0.62	0.04	41.33
		1.00	0.012	0.001	0.012	0.45	0.02	37.50
		1.25	0.010	0.001	0.013	0.30	0.02	30.00
		1.50	0.006	<0.001	0.009	0.20	0.01	33.33
		1.75	0.002	<0.001	0.004	0.09	<0.01	45.00
		2.00	0.000	<0.001	0.000	0.00	0.00	0.00
CAM tank- epiphyte	<i>Aechmea gamosepala</i>	0.02	0.071	0.002	0.001	2.91	0.18	40.99
		0.25	0.030	0.003	0.008	1.28	0.11	42.67
		0.50	0.019	0.002	0.010	0.93	0.05	48.95
		0.75	0.012	0.001	0.009	0.66	0.04	55.00
		1.00	0.008	<0.001	0.008	0.50	0.03	62.50
		1.25	0.005	<0.001	0.006	0.32	0.02	64.00
		1.50	0.002	<0.001	0.003	0.25	0.02	125.00
		1.75	0.001	<0.001	0.002	0.12	0.01	120.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
CAM terrestrial	<i>Ananas comosus</i>	0.02	0.123	0.004	0.002	3.95	0.20	32.11
		0.25	0.088	0.003	0.022	3.12	0.17	35.45
		0.50	0.075	0.003	0.038	2.87	0.18	38.27
		0.75	0.063	0.003	0.047	2.71	0.18	43.02
		1.00	0.055	0.002	0.055	2.61	0.15	47.45
		1.25	0.049	0.003	0.061	2.53	0.13	51.63
		1.50	0.043	0.002	0.065	2.44	0.12	56.74
		1.75	0.038	0.002	0.067	2.36	0.11	62.11
		2.00	0.035	0.002	0.070	2.30	0.11	65.71
CAM terrestrial	<i>Ananas bracteatus</i>	0.02	0.097	0.004	0.002	3.42	0.19	35.26
		0.25	0.066	0.005	0.017	2.78	0.15	42.12
		0.50	0.052	0.002	0.026	2.56	0.14	49.23
		0.75	0.046	0.003	0.035	2.41	0.13	52.39
		1.00	0.042	0.003	0.042	2.30	0.13	54.76
		1.25	0.039	0.002	0.049	2.22	0.14	56.92
		1.50	0.037	0.003	0.056	2.16	0.12	58.38
		1.75	0.034	0.002	0.060	2.12	0.13	62.35
		2.00	0.030	0.002	0.060	2.07	0.10	69.00
CAM tank- epiphyte	<i>Araeococcus micranthus</i>	0.02	0.083	0.002	0.002	3.37	0.15	40.60
		0.25	0.048	0.003	0.012	1.64	0.13	34.17
		0.50	0.035	0.003	0.018	1.20	0.10	34.29
		0.75	0.028	0.002	0.021	0.91	0.06	32.50
		1.00	0.021	0.002	0.021	0.74	0.03	35.24
		1.25	0.014	0.001	0.018	0.57	0.03	40.71
		1.50	0.010	0.001	0.015	0.41	0.03	41.00
		1.75	0.005	<0.001	0.009	0.30	0.02	60.00
		2.00	0.002	<0.001	0.004	0.15	0.01	75.00
CAM tank- epiphyte	<i>Billbergia nutans</i>	0.02	0.080	0.004	0.002	3.02	0.16	37.75
		0.25	0.047	0.003	0.012	1.55	0.13	32.98
		0.50	0.036	0.003	0.018	1.14	0.09	31.67
		0.75	0.028	0.001	0.021	0.82	0.06	29.29
		1.00	0.022	0.002	0.022	0.70	0.06	31.82
		1.25	0.017	0.001	0.021	0.53	0.03	31.18
		1.50	0.014	<0.001	0.021	0.43	0.03	30.71
		1.75	0.010	0.001	0.018	0.34	0.02	34.00
		2.00	0.008	0.001	0.016	0.24	0.01	30.00
CAM tank- epiphyte	<i>Billbergia amoena</i>	0.02	0.090	0.003	0.002	2.88	0.15	32.00
		0.25	0.052	0.003	0.013	1.46	0.11	28.08
		0.50	0.039	0.002	0.020	1.02	0.05	26.15
		0.75	0.030	0.002	0.023	0.77	0.04	25.67
		1.00	0.023	0.002	0.023	0.62	0.04	26.96
		1.25	0.016	0.001	0.020	0.50	0.04	31.25
		1.50	0.015	0.002	0.023	0.40	0.03	26.67
		1.75	0.012	0.001	0.021	0.29	0.02	24.17
		2.00	0.009	0.001	0.018	0.20	0.01	22.22

CAM tank-epiphyte	<i>Billbergia euphemiae</i>	0.02	0.079	0.004	0.002	2.94	0.16	37.22
		0.25	0.047	0.003	0.012	1.41	0.13	30.00
		0.50	0.035	0.004	0.018	0.97	0.07	27.71
		0.75	0.027	0.002	0.020	0.73	0.05	27.04
		1.00	0.020	0.001	0.020	0.57	0.04	28.50
		1.25	0.014	0.001	0.018	0.46	0.03	32.86
		1.50	0.012	0.001	0.018	0.36	0.02	30.00
		1.75	0.008	0.001	0.014	0.26	0.01	32.50
		2.00	0.006	<0.001	0.012	0.17	0.01	28.33
C ₃ mesic terrestrial	<i>Brocchinia reducta</i>	0.02	0.114	0.002	0.002	3.66	0.19	32.11
		0.25	0.072	0.004	0.018	2.41	0.17	33.47
		0.50	0.058	0.003	0.029	2.08	0.16	35.86
		0.75	0.052	0.003	0.039	1.83	0.16	35.19
		1.00	0.043	0.003	0.043	1.71	0.14	39.77
		1.25	0.037	0.002	0.046	1.62	0.14	43.78
		1.50	0.032	0.002	0.048	1.51	0.12	47.19
		1.75	0.027	0.003	0.047	1.40	0.12	51.85
		2.00	0.023	0.002	0.046	1.33	0.12	57.83
C ₃ mesic terrestrial	<i>Brocchinia tatei</i>	0.02	0.122	0.005	0.002	3.55	0.15	29.10
		0.25	0.079	0.004	0.020	2.09	0.13	26.46
		0.50	0.061	0.004	0.031	1.85	0.13	30.33
		0.75	0.055	0.003	0.041	1.66	0.14	30.18
		1.00	0.045	0.004	0.045	1.50	0.11	33.33
		1.25	0.040	0.004	0.050	1.42	0.10	35.50
		1.50	0.035	0.003	0.053	1.30	0.09	37.14
		1.75	0.030	0.002	0.053	1.22	0.09	40.67
		2.00	0.024	0.002	0.048	1.15	0.08	47.92
CAM terrestrial	<i>Bromelia humilis</i>	0.02	0.081	0.005	0.002	2.61	0.12	32.22
		0.25	0.045	0.003	0.011	1.81	0.13	40.22
		0.50	0.035	0.003	0.018	1.53	0.12	43.71
		0.75	0.029	0.002	0.022	1.36	0.10	46.90
		1.00	0.024	0.002	0.024	1.26	0.09	52.50
		1.25	0.021	0.001	0.026	1.17	0.07	55.71
		1.50	0.018	0.001	0.027	1.10	0.07	61.11
		1.75	0.016	0.001	0.028	1.07	0.08	66.88
		2.00	0.015	0.001	0.030	1.04	0.07	69.33
CAM terrestrial	<i>Bromelia karatas</i>	0.02	0.087	0.005	0.002	3.12	0.20	35.86
		0.25	0.049	0.003	0.012	1.95	0.14	39.80
		0.50	0.039	0.004	0.020	1.66	0.12	42.56
		0.75	0.032	0.003	0.024	1.51	0.11	47.19
		1.00	0.027	0.002	0.027	1.40	0.10	51.85
		1.25	0.024	0.001	0.030	1.32	0.11	55.00
		1.50	0.021	0.002	0.032	1.24	0.10	59.05
		1.75	0.019	0.002	0.033	1.16	0.10	61.05
		2.00	0.017	0.001	0.034	1.11	0.09	65.29
CAM terrestrial	<i>Bromelia balansae</i>	0.02	0.069	0.006	0.001	2.83	0.12	41.01
		0.25	0.039	0.003	0.010	1.77	0.11	45.38
		0.50	0.032	0.002	0.016	1.52	0.12	47.50
		0.75	0.027	0.003	0.020	1.40	0.12	51.85
		1.00	0.024	0.001	0.024	1.31	0.10	54.58
		1.25	0.021	0.002	0.026	1.22	0.09	58.10
		1.50	0.019	0.002	0.029	1.14	0.08	60.00
		1.75	0.017	0.001	0.030	1.10	0.08	64.71
		2.00	0.015	0.001	0.030	1.05	0.05	70.00
CAM tank-epiphyte	<i>Canistrum cyathiforme</i>	0.02	0.089	0.004	0.002	2.70	0.16	30.34
		0.25	0.035	0.002	0.009	1.22	0.10	34.86
		0.50	0.026	0.003	0.013	0.83	0.05	31.92
		0.75	0.021	0.002	0.016	0.55	0.03	26.19
		1.00	0.016	0.002	0.016	0.44	0.03	27.50
		1.25	0.011	0.001	0.014	0.29	0.02	26.36
		1.50	0.003	<0.001	0.005	0.15	0.01	50.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00

C ₃ tank-epiphyte	<i>Catopsis morreniana</i>	0.02	0.124	0.005	0.002	2.90	0.19	23.48
		0.25	0.043	0.002	0.011	1.41	0.12	32.79
		0.50	0.024	0.002	0.012	0.97	0.05	40.42
		0.75	0.017	0.001	0.013	0.69	0.03	40.59
		1.00	0.012	0.001	0.012	0.54	0.03	45.00
		1.25	0.007	<0.001	0.009	0.40	0.02	57.14
		1.50	0.002	<0.001	0.003	0.26	0.02	130.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
C ₃ tank-epiphyte	<i>Catopsis berteroniana</i>	0.02	0.120	0.005	0.002	2.20	0.14	18.33
		0.25	0.045	0.003	0.011	1.05	0.05	23.33
		0.50	0.023	0.002	0.012	0.72	0.04	31.30
		0.75	0.014	0.001	0.011	0.51	0.03	36.43
		1.00	0.010	<0.001	0.010	0.39	0.03	39.00
		1.25	0.008	<0.001	0.010	0.25	0.02	31.25
		1.50	0.003	<0.001	0.005	0.17	0.01	56.67
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
C ₃ tank-epiphyte	<i>Catopsis floribunda</i>	0.02	0.119	0.006	0.002	2.43	0.14	20.40
		0.25	0.047	0.003	0.012	1.24	0.10	26.38
		0.50	0.025	0.002	0.013	0.85	0.05	34.00
		0.75	0.016	0.001	0.012	0.66	0.03	41.25
		1.00	0.013	<0.001	0.013	0.48	0.03	36.92
		1.25	0.010	<0.001	0.013	0.34	0.02	34.00
		1.50	0.004	<0.001	0.006	0.28	0.02	70.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
CAM terrestrial	<i>Cryptanthus whitmanii</i>	0.02	0.082	0.003	0.002	2.88	0.15	35.12
		0.25	0.051	0.003	0.013	2.17	0.13	42.55
		0.50	0.043	0.002	0.022	1.98	0.13	46.05
		0.75	0.036	0.002	0.027	1.85	0.14	51.39
		1.00	0.030	0.003	0.030	1.79	0.12	59.67
		1.25	0.026	0.002	0.033	1.72	0.13	66.15
		1.50	0.023	0.001	0.035	1.64	0.12	71.30
		1.75	0.020	0.002	0.035	1.60	0.12	80.00
		2.00	0.017	0.001	0.034	1.58	0.13	92.94
CAM terrestrial	<i>Cryptanthus colnagoi</i>	0.02	0.092	0.005	0.002	2.43	0.15	26.41
		0.25	0.058	0.003	0.015	1.94	0.14	33.45
		0.50	0.047	0.004	0.024	1.75	0.13	37.23
		0.75	0.040	0.003	0.030	1.62	0.12	40.50
		1.00	0.035	0.003	0.035	1.54	0.12	44.00
		1.25	0.030	0.002	0.038	1.44	0.14	48.00
		1.50	0.026	0.002	0.039	1.38	0.12	53.08
		1.75	0.024	0.002	0.042	1.34	0.11	55.83
		2.00	0.020	0.001	0.040	1.30	0.12	65.00
CAM terrestrial	<i>Cryptanthus bivittatus</i>	0.02	0.081	0.004	0.002	2.55	0.15	31.48
		0.25	0.051	0.004	0.013	2.02	0.14	39.61
		0.50	0.042	0.003	0.021	1.84	0.13	43.81
		0.75	0.036	0.002	0.027	1.73	0.14	48.06
		1.00	0.031	0.003	0.031	1.62	0.12	52.26
		1.25	0.025	0.002	0.031	1.59	0.14	63.60
		1.50	0.022	0.001	0.033	1.52	0.14	69.09
		1.75	0.019	0.002	0.033	1.48	0.13	77.89
		2.00	0.016	0.001	0.032	1.46	0.12	91.25
CAM terrestrial	<i>Cryptanthus acaulis</i>	0.02	0.084	0.005	0.002	2.71	0.17	32.26
		0.25	0.053	0.005	0.013	1.91	0.14	36.04
		0.50	0.045	0.004	0.023	1.72	0.14	38.22
		0.75	0.039	0.004	0.029	1.60	0.12	41.03
		1.00	0.033	0.002	0.033	1.53	0.12	46.36
		1.25	0.026	0.002	0.033	1.49	0.11	57.31
		1.50	0.022	0.001	0.033	1.44	0.13	65.45
		1.75	0.020	0.001	0.035	1.40	0.12	70.00
		2.00	0.018	0.001	0.036	1.37	0.12	76.11

CAM terrestrial	<i>Cryptanthus beuckeri</i>	0.02	0.080	0.004	0.002	2.53	0.16	31.63
		0.25	0.050	0.005	0.013	1.95	0.14	39.00
		0.50	0.042	0.003	0.021	1.77	0.12	42.14
		0.75	0.036	0.003	0.027	1.65	0.12	45.83
		1.00	0.030	0.002	0.030	1.58	0.13	52.67
		1.25	0.025	0.003	0.031	1.52	0.12	60.80
		1.50	0.020	0.002	0.030	1.48	0.11	74.00
		1.75	0.017	0.001	0.030	1.45	0.12	85.29
		2.00	0.015	0.001	0.030	1.42	0.11	94.67
CAM terrestrial	<i>Cryptanthus bromelioides</i>	0.02	0.076	0.004	0.002	2.37	0.15	31.18
		0.25	0.048	0.003	0.012	1.85	0.13	38.54
		0.50	0.039	0.002	0.020	1.68	0.12	43.08
		0.75	0.033	0.002	0.025	1.55	0.10	46.97
		1.00	0.028	0.002	0.028	1.47	0.13	52.50
		1.25	0.022	0.001	0.028	1.40	0.12	63.64
		1.50	0.018	0.001	0.027	1.36	0.11	75.56
		1.75	0.015	0.001	0.026	1.34	0.12	89.33
		2.00	0.013	0.001	0.026	1.32	0.11	101.54
CAM terrestrial	<i>Cryptanthus maritimus</i>	0.02	0.070	0.004	0.001	2.82	0.14	40.29
		0.25	0.052	0.003	0.013	1.99	0.12	38.27
		0.50	0.042	0.003	0.021	1.84	0.14	43.81
		0.75	0.036	0.002	0.027	1.74	0.13	48.33
		1.00	0.031	0.002	0.031	1.65	0.12	53.23
		1.25	0.024	0.001	0.030	1.59	0.12	66.25
		1.50	0.021	0.002	0.032	1.54	0.11	73.33
		1.75	0.017	<0.001	0.030	1.52	0.12	89.41
		2.00	0.014	0.001	0.028	1.49	0.13	106.43
C ₃ succulent terrestrial	<i>Cryptanthus microglaziovii</i>	0.02	0.101	0.006	0.002	2.99	0.17	29.60
		0.25	0.051	0.003	0.013	2.08	0.15	40.78
		0.50	0.041	0.002	0.021	1.90	0.15	46.34
		0.75	0.034	0.002	0.026	1.71	0.14	50.29
		1.00	0.028	0.003	0.028	1.62	0.12	57.86
		1.25	0.024	0.002	0.030	1.55	0.13	64.58
		1.50	0.022	0.002	0.033	1.50	0.12	68.18
		1.75	0.019	0.001	0.033	1.46	0.11	76.84
		2.00	0.017	0.001	0.034	1.38	0.11	81.18
C ₃ succulent terrestrial	<i>Cryptanthus pseudoscaposus</i>	0.02	0.095	0.004	0.002	3.12	0.17	32.84
		0.25	0.048	0.004	0.012	2.21	0.14	46.04
		0.50	0.043	0.003	0.022	1.96	0.15	45.58
		0.75	0.036	0.002	0.027	1.81	0.14	50.28
		1.00	0.032	0.002	0.032	1.69	0.14	52.81
		1.25	0.027	0.002	0.034	1.62	0.13	60.00
		1.50	0.025	0.003	0.038	1.58	0.13	63.20
		1.75	0.021	0.001	0.037	1.54	0.14	73.33
		2.00	0.019	0.001	0.038	1.51	0.12	79.47
CAM terrestrial	<i>Deuterocohnia brevifolia</i>	0.02	0.055	0.004	0.001	0.81	0.04	14.79
		0.25	0.030	0.002	0.008	0.48	0.03	16.00
		0.50	0.023	0.001	0.012	0.37	0.02	16.09
		0.75	0.017	0.001	0.013	0.32	0.02	18.82
		1.00	0.013	0.001	0.013	0.26	0.02	20.00
		1.25	0.010	0.001	0.013	0.23	0.02	23.00
		1.50	0.008	<0.001	0.012	0.20	0.01	25.00
		1.75	0.006	<0.001	0.011	0.17	0.01	28.33
		2.00	0.004	<0.001	0.008	0.15	0.01	37.50
CAM terrestrial	<i>Deuterocohnia lorentziana</i>	0.02	0.067	0.004	0.001	0.95	0.04	14.10
		0.25	0.035	0.002	0.009	0.55	0.03	15.71
		0.50	0.026	0.002	0.013	0.42	0.02	16.15
		0.75	0.018	0.001	0.014	0.36	0.02	20.00
		1.00	0.015	0.001	0.015	0.32	0.02	21.33
		1.25	0.012	<0.001	0.015	0.29	0.01	24.17
		1.50	0.010	<0.001	0.015	0.26	0.01	26.00
		1.75	0.008	<0.001	0.014	0.24	0.01	30.00
		2.00	0.005	<0.001	0.010	0.22	0.01	44.00

CAM terrestrial	<i>Disteganthus basilateralis</i>	0.02	0.090	0.004	0.002	3.01	0.18	33.44
		0.25	0.044	0.005	0.011	1.41	0.14	32.05
		0.50	0.029	0.003	0.015	1.03	0.07	35.52
		0.75	0.021	0.002	0.016	0.84	0.05	40.00
		1.00	0.015	0.001	0.015	0.63	0.04	42.00
		1.25	0.011	0.001	0.014	0.52	0.04	46.85
		1.50	0.007	<0.001	0.011	0.46	0.03	65.71
		1.75	0.003	<0.001	0.005	0.38	0.03	126.67
		2.00	0.001	<0.001	0.002	0.27	0.02	270.00
CAM terrestrial	<i>Dyckia remotiflora</i>	0.02	0.071	0.004	0.001	1.22	0.11	17.18
		0.25	0.037	0.003	0.009	0.77	0.06	20.81
		0.50	0.028	0.003	0.014	0.59	0.04	21.07
		0.75	0.024	0.001	0.018	0.48	0.04	20.00
		1.00	0.020	0.003	0.020	0.41	0.03	20.50
		1.25	0.017	0.002	0.021	0.39	0.03	22.94
		1.50	0.013	0.001	0.020	0.36	0.03	27.69
		1.75	0.011	0.001	0.019	0.33	0.02	30.00
		2.00	0.007	<0.001	0.014	0.30	0.01	42.86
CAM terrestrial	<i>Dyckia brevifolia</i>	0.02	0.068	0.004	0.001	1.04	0.10	15.29
		0.25	0.035	0.002	0.009	0.56	0.06	16.00
		0.50	0.029	0.001	0.015	0.47	0.03	16.21
		0.75	0.022	0.002	0.017	0.39	0.02	17.73
		1.00	0.018	0.001	0.018	0.35	0.02	19.44
		1.25	0.016	0.001	0.020	0.31	0.01	19.38
		1.50	0.011	0.001	0.017	0.28	0.01	25.45
		1.75	0.010	<0.001	0.018	0.26	0.02	26.00
		2.00	0.008	<0.001	0.016	0.25	0.02	31.25
C ₃ succulent terrestrial	<i>Fascicularia bicolor</i>	0.02	0.199	0.006	0.004	4.53	0.21	22.78
		0.25	0.122	0.004	0.031	3.28	0.20	26.89
		0.50	0.101	0.005	0.051	2.84	0.17	28.12
		0.75	0.094	0.005	0.071	2.47	0.16	26.28
		1.00	0.082	0.004	0.082	2.32	0.18	28.29
		1.25	0.073	0.005	0.091	2.18	0.17	29.86
		1.50	0.066	0.005	0.099	2.03	0.16	30.76
		1.75	0.061	0.004	0.107	1.94	0.15	31.80
		2.00	0.055	0.003	0.110	1.81	0.14	32.91
C ₃ mesic terrestrial	<i>Fosterella penduliflora</i>	0.02	0.101	0.005	0.002	5.01	0.22	49.60
		0.25	0.057	0.004	0.014	3.45	0.20	60.53
		0.50	0.045	0.003	0.023	2.97	0.21	66.00
		0.75	0.036	0.003	0.027	2.66	0.22	73.89
		1.00	0.029	0.003	0.029	2.41	0.21	83.10
		1.25	0.025	0.002	0.031	2.28	0.20	91.20
		1.50	0.021	0.002	0.032	2.14	0.20	101.90
		1.75	0.016	0.001	0.028	2.05	0.16	128.13
		2.00	0.013	0.001	0.026	1.98	0.17	152.31
C ₃ mesic terrestrial	<i>Fosterella rusbyi</i>	0.02	0.120	0.004	0.002	4.86	0.22	40.50
		0.25	0.066	0.005	0.017	3.22	0.20	48.79
		0.50	0.052	0.004	0.026	2.74	0.19	52.69
		0.75	0.041	0.004	0.031	2.39	0.19	58.29
		1.00	0.035	0.004	0.035	2.24	0.20	64.00
		1.25	0.031	0.002	0.039	2.11	0.18	68.06
		1.50	0.026	0.002	0.039	1.99	0.15	76.54
		1.75	0.021	0.001	0.037	1.83	0.14	87.14
		2.00	0.017	0.001	0.034	1.74	0.15	102.35
C ₃ mesic terrestrial	<i>Fosterella villosula</i>	0.02	0.117	0.006	0.002	4.72	0.24	40.34
		0.25	0.065	0.003	0.016	3.08	0.20	47.38
		0.50	0.053	0.004	0.027	2.56	0.22	48.30
		0.75	0.040	0.004	0.030	2.33	0.18	58.25
		1.00	0.036	0.002	0.036	2.14	0.16	59.44
		1.25	0.033	0.002	0.041	2.01	0.15	60.91
		1.50	0.027	0.002	0.041	1.88	0.16	69.63
		1.75	0.022	0.001	0.039	1.84	0.14	83.64
		2.00	0.018	0.002	0.036	1.77	0.13	98.33

C ₃ succulent terrestrial	<i>Greigia sphacelata</i>	0.02	0.159	0.005	0.003	4.44	0.20	27.92
		0.25	0.095	0.004	0.024	3.02	0.22	31.79
		0.50	0.076	0.004	0.038	2.68	0.21	35.26
		0.75	0.063	0.005	0.047	2.49	0.18	39.52
		1.00	0.058	0.004	0.058	2.31	0.17	39.83
		1.25	0.053	0.004	0.066	2.17	0.15	40.94
		1.50	0.047	0.003	0.071	2.06	0.16	43.83
		1.75	0.042	0.004	0.074	2.01	0.17	47.86
		2.00	0.038	0.003	0.076	1.95	0.15	51.32
C ₃ tank- epiphyte	<i>Guzmania lingulata</i>	0.02	0.176	0.004	0.004	3.22	0.20	18.30
		0.25	0.088	0.004	0.022	2.03	0.18	23.07
		0.50	0.068	0.005	0.034	1.64	0.15	24.12
		0.75	0.052	0.005	0.039	1.42	0.12	27.31
		1.00	0.041	0.004	0.041	1.28	0.11	31.22
		1.25	0.035	0.002	0.044	1.14	0.10	32.57
		1.50	0.029	0.002	0.044	1.06	0.07	36.55
		1.75	0.021	0.002	0.037	0.99	0.06	47.14
		2.00	0.016	0.001	0.032	0.93	0.07	58.13
C ₃ tank- epiphyte	<i>Guzmania wittmackii</i>	0.02	0.149	0.004	0.003	3.99	0.19	26.78
		0.25	0.082	0.004	0.021	2.15	0.16	26.22
		0.50	0.061	0.004	0.031	1.68	0.15	27.54
		0.75	0.048	0.003	0.036	1.38	0.012	28.75
		1.00	0.036	0.002	0.036	1.22	0.10	33.89
		1.25	0.031	0.002	0.039	1.03	0.08	33.23
		1.50	0.026	0.001	0.039	0.94	0.08	36.15
		1.75	0.019	0.001	0.033	0.84	0.07	44.21
		2.00	0.016	0.001	0.032	0.78	0.07	48.75
C ₃ tank- epiphyte	<i>Guzmania berteroniana</i>	0.02	0.140	0.006	0.003	3.19	0.21	22.79
		0.25	0.075	0.004	0.019	2.01	0.17	26.80
		0.50	0.058	0.005	0.029	1.61	0.15	27.76
		0.75	0.045	0.003	0.034	1.42	0.09	31.56
		1.00	0.037	0.0003	0.037	1.26	0.09	34.05
		1.25	0.028	0.002	0.035	1.15	0.08	41.07
		1.50	0.025	0.001	0.038	1.07	0.09	42.80
		1.75	0.020	0.002	0.035	1.01	0.07	50.50
		2.00	0.015	0.001	0.030	0.96	0.07	64.00
CAM terrestrial	<i>Hechtia montana</i>	0.02	0.055	0.005	0.001	2.55	0.19	46.36
		0.25	0.028	0.002	0.007	1.76	0.14	62.86
		0.50	0.021	0.002	0.011	1.54	0.12	73.33
		0.75	0.017	0.001	0.013	1.44	0.12	84.71
		1.00	0.014	0.001	0.014	1.33	0.10	95.00
		1.25	0.011	0.001	0.014	1.28	0.09	116.36
		1.50	0.009	<0.001	0.014	1.22	0.10	135.56
		1.75	0.007	<0.001	0.012	1.17	0.09	167.14
		2.00	0.005	<0.001	0.010	1.14	0.09	228.00
CAM terrestrial	<i>Hechtia podantha</i>	0.02	0.065	0.004	0.001	2.77	0.18	42.62
		0.25	0.032	0.002	0.008	1.89	0.16	59.06
		0.50	0.022	0.002	0.011	1.66	0.15	75.45
		0.75	0.015	0.001	0.011	1.54	0.14	102.67
		1.00	0.011	0.001	0.011	1.46	0.14	132.73
		1.25	0.008	<0.001	0.010	1.41	0.11	176.25
		1.50	0.006	<0.001	0.009	1.38	0.12	230.00
		1.75	0.004	<0.001	0.007	1.35	0.10	337.50
		2.00	0.002	<0.001	0.004	1.31	0.11	655.00
CAM tank- epiphyte	<i>Hohenbergia catingae</i>	0.02	0.079	0.004	0.002	2.82	0.20	35.70
		0.25	0.031	0.002	0.008	1.21	0.10	39.03
		0.50	0.021	0.002	0.011	0.85	0.07	40.48
		0.75	0.014	0.001	0.011	0.62	0.05	44.29
		1.00	0.009	<0.001	0.009	0.44	0.03	48.89
		1.25	0.006	<0.001	0.008	0.35	0.02	58.33
		1.50	0.003	<0.001	0.005	0.26	0.01	86.67
		1.75	0.001	<0.001	0.002	0.19	0.01	190.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00

CAM tank- epiphyte	<i>Lymania alvimii</i>	0.02	0.096	0.004	0.002	3.23	0.21	33.65
		0.25	0.040	0.004	0.010	1.44	0.11	36.00
		0.50	0.024	0.002	0.012	0.96	0.06	40.00
		0.75	0.017	0.001	0.013	0.74	0.04	43.53
		1.00	0.011	0.001	0.011	0.52	0.04	47.27
		1.25	0.007	<0.001	0.009	0.39	0.02	55.71
		1.50	0.004	<0.001	0.006	0.24	0.02	60.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
CAM tank- epiphyte	<i>Neoregelia carolinae</i>	0.02	0.074	0.003	0.001	2.99	0.18	40.41
		0.25	0.029	0.003	0.007	1.45	0.11	50.00
		0.50	0.020	0.001	0.010	0.96	0.08	48.00
		0.75	0.014	0.001	0.011	0.71	0.06	50.71
		1.00	0.009	0.001	0.009	0.49	0.03	54.44
		1.25	0.005	<0.001	0.006	0.38	0.03	76.00
		1.50	0.001	<0.001	0.002	0.21	0.02	210.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
CAM tank- epiphyte	<i>Neoregelia ampullacea</i>	0.02	0.085	0.005	0.002	3.23	0.22	38.00
		0.25	0.031	0.002	0.008	1.22	0.10	39.35
		0.50	0.019	0.002	0.010	0.76	0.06	40.00
		0.75	0.013	0.001	0.010	0.52	0.04	40.00
		1.00	0.009	0.001	0.009	0.33	0.02	36.67
		1.25	0.004	<0.001	0.005	0.17	0.01	42.50
		1.50	0.000	0.000	0.000	0.00	0.00	0.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
CAM tank- epiphyte	<i>Neoregelia indecora</i>	0.02	0.074	0.005	0.001	3.01	0.24	40.68
		0.25	0.028	0.002	0.007	1.29	0.11	46.07
		0.50	0.018	0.002	0.009	0.85	0.06	47.22
		0.75	0.011	0.001	0.008	0.63	0.05	57.27
		1.00	0.007	<0.001	0.007	0.42	0.03	60.00
		1.25	0.003	<0.001	0.004	0.28	0.02	93.33
		1.50	0.001	<0.001	0.002	0.18	0.01	180.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
CAM tank- epiphyte	<i>Nidularium billbergioides</i>	0.02	0.055	0.004	0.001	1.88	0.12	34.18
		0.25	0.029	0.002	0.007	0.93	0.06	32.07
		0.50	0.021	0.002	0.011	0.66	0.05	31.43
		0.75	0.015	0.001	0.011	0.51	0.03	34.00
		1.00	0.010	0.001	0.010	0.35	0.03	35.00
		1.25	0.007	<0.001	0.009	0.26	0.02	37.14
		1.50	0.005	<0.001	0.008	0.17	0.01	34.00
		1.75	0.002	<0.001	0.004	0.12	0.01	60.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
C ₃ tank- epiphyte	<i>Nidularium amazonicum</i>	0.02	0.064	0.005	0.001	2.25	0.20	35.16
		0.25	0.031	0.002	0.008	1.08	0.09	34.84
		0.50	0.024	0.001	0.012	0.75	0.04	31.25
		0.75	0.018	0.002	0.014	0.62	0.04	34.44
		1.00	0.012	0.001	0.012	0.44	0.02	36.67
		1.25	0.008	<0.001	0.010	0.32	0.03	40.00
		1.50	0.005	<0.001	0.008	0.24	0.02	48.00
		1.75	0.003	<0.001	0.005	0.19	0.01	63.33
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
C ₃ tank- epiphyte	<i>Nidularium apiculatum</i>	0.02	0.062	0.004	0.001	2.70	0.22	43.55
		0.25	0.030	0.002	0.008	1.17	0.10	39.00
		0.50	0.022	0.002	0.011	0.84	0.05	38.18
		0.75	0.016	0.001	0.012	0.55	0.03	34.38
		1.00	0.011	0.001	0.011	0.37	0.02	33.64
		1.25	0.007	0.001	0.009	0.28	0.02	40.00
		1.50	0.004	<0.001	0.006	0.19	0.01	47.50
		1.75	0.001	<0.001	0.002	0.11	0.01	110.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00

C ₃ tank-epiphyte	<i>Nidularium campos-portoi</i>	0.02	0.071	0.005	0.001	3.01	0.21	42.39
		0.25	0.034	0.002	0.009	1.33	0.11	39.12
		0.50	0.025	0.002	0.013	0.91	0.06	36.40
		0.75	0.018	0.001	0.014	0.64	0.05	35.56
		1.00	0.014	0.001	0.014	0.47	0.03	33.57
		1.25	0.010	0.001	0.013	0.36	0.02	36.00
		1.50	0.007	<0.001	0.011	0.27	0.02	38.57
		1.75	0.005	<0.001	0.009	0.19	0.01	38.00
		2.00	0.002	<0.001	0.004	0.14	0.01	70.00
CAM tank-epiphyte	<i>Nidularium fulgens</i>	0.02	0.054	0.004	0.001	2.96	0.21	54.81
		0.25	0.025	0.002	0.006	1.11	0.10	44.40
		0.50	0.019	0.001	0.010	0.66	0.04	34.74
		0.75	0.013	0.001	0.010	0.43	0.03	33.08
		1.00	0.008	<0.001	0.008	0.25	0.02	31.25
		1.25	0.005	<0.001	0.006	0.14	0.01	28.00
		1.50	0.001	<0.001	0.002	0.11	0.01	110.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
C ₃ tank-epiphyte	<i>Nidularium longiflorum</i>	0.02	0.070	0.005	0.001	2.86	0.21	40.86
		0.25	0.032	0.002	0.008	1.18	0.10	36.88
		0.50	0.021	0.002	0.011	0.73	0.05	34.76
		0.75	0.014	0.001	0.011	0.49	0.03	35.00
		1.00	0.009	0.001	0.009	0.35	0.03	38.89
		1.25	0.005	<0.001	0.006	0.17	0.01	34.00
		1.50	0.002	<0.001	0.003	0.08	<0.01	40.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
CAM tank-epiphyte	<i>Nidularium procerum</i>	0.02	0.049	0.002	0.001	2.88	0.19	58.78
		0.25	0.022	0.002	0.006	1.28	0.11	58.18
		0.50	0.015	0.001	0.008	0.86	0.07	57.33
		0.75	0.011	0.001	0.008	0.55	0.04	50.00
		1.00	0.006	<0.001	0.006	0.41	0.03	68.33
		1.25	0.003	<0.001	0.004	0.24	0.01	80.00
		1.50	0.001	<0.001	0.002	0.15	0.01	150.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
CAM tank-epiphyte	<i>Nidularium purpureum</i>	0.02	0.054	0.004	0.001	2.78	0.18	51.48
		0.25	0.024	0.002	0.006	1.24	0.11	51.67
		0.50	0.017	0.001	0.009	0.73	0.04	42.94
		0.75	0.013	0.001	0.010	0.52	0.04	40.00
		1.00	0.009	0.001	0.009	0.37	0.02	41.11
		1.25	0.006	<0.001	0.008	0.21	0.02	35.00
		1.50	0.004	<0.001	0.006	0.14	0.01	35.00
		1.75	0.002	<0.001	0.004	0.10	0.01	50.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
CAM tank-epiphyte	<i>Nidularium rutilans</i>	0.02	0.061	0.005	0.001	2.66	0.15	43.61
		0.25	0.028	0.003	0.007	1.16	0.09	41.43
		0.50	0.019	0.002	0.010	0.82	0.03	43.16
		0.75	0.014	0.001	0.011	0.55	0.03	39.29
		1.00	0.010	0.001	0.010	0.41	0.03	41.00
		1.25	0.006	<0.001	0.008	0.25	0.01	41.67
		1.50	0.003	<0.001	0.005	0.19	0.01	63.33
		1.75	0.002	<0.001	0.004	0.13	0.01	65.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
C ₃ succulent terrestrial	<i>Ochagavia carnea</i>	0.02	0.210	0.006	0.004	4.08	0.25	19.43
		0.25	0.133	0.006	0.033	3.04	0.22	22.86
		0.50	0.107	0.005	0.054	2.64	0.21	24.67
		0.75	0.092	0.006	0.069	2.41	0.19	26.20
		1.00	0.082	0.005	0.082	2.26	0.20	27.56
		1.25	0.071	0.005	0.089	2.15	0.19	30.28
		1.50	0.064	0.005	0.096	2.07	0.17	32.34
		1.75	0.056	0.004	0.098	1.99	0.15	35.54
		2.00	0.052	0.005	0.104	1.92	0.16	36.92

CAM terrestrial	<i>Orthophytum saxicola</i>	0.02	0.064	0.004	0.001	2.01	0.18	31.41
		0.25	0.034	0.004	0.009	1.21	0.10	35.59
		0.50	0.026	0.002	0.013	0.92	0.05	35.38
		0.75	0.021	0.002	0.016	0.73	0.04	34.76
		1.00	0.018	0.001	0.018	0.64	0.05	35.56
		1.25	0.015	0.001	0.019	0.53	0.03	35.33
		1.50	0.013	0.001	0.020	0.47	0.03	36.15
		1.75	0.011	0.001	0.019	0.39	0.02	35.45
		2.00	0.009	0.001	0.018	0.32	0.03	35.56
CAM terrestrial	<i>Orthophytum horridum</i>	0.02	0.069	0.005	0.001	2.12	0.17	30.72
		0.25	0.036	0.003	0.009	1.03	0.08	28.61
		0.50	0.028	0.003	0.014	0.78	0.04	27.86
		0.75	0.023	0.002	0.017	0.62	0.03	26.96
		1.00	0.019	0.001	0.019	0.51	0.02	26.84
		1.25	0.016	0.001	0.020	0.43	0.03	26.88
		1.50	0.014	0.001	0.021	0.35	0.02	25.00
		1.75	0.011	0.001	0.019	0.30	0.02	27.27
		2.00	0.008	0.001	0.016	0.26	0.01	32.50
C ₃ mesic terrestrial	<i>Pitcairnia imbricata</i>	0.02	0.218	0.006	0.004	6.32	0.26	29.06
		0.25	0.124	0.004	0.031	4.41	0.24	35.56
		0.50	0.101	0.005	0.051	3.92	0.25	38.81
		0.75	0.088	0.005	0.066	3.61	0.22	41.02
		1.00	0.076	0.005	0.076	3.31	0.23	43.55
		1.25	0.068	0.004	0.085	3.02	0.23	44.41
		1.50	0.058	0.005	0.087	2.88	0.24	49.66
		1.75	0.051	0.005	0.089	2.67	0.22	52.35
		2.00	0.045	0.004	0.090	2.56	0.21	56.89
C ₃ mesic terrestrial	<i>Pitcairnia angustifolia</i>	0.02	0.144	0.006	0.003	5.88	0.26	40.83
		0.25	0.084	0.006	0.021	4.02	0.24	47.86
		0.50	0.069	0.005	0.035	3.41	0.24	49.42
		0.75	0.058	0.005	0.044	3.03	0.23	52.24
		1.00	0.053	0.005	0.053	2.88	0.25	54.34
		1.25	0.048	0.004	0.060	2.62	0.22	54.58
		1.50	0.043	0.004	0.065	2.54	0.23	59.07
		1.75	0.039	0.003	0.068	2.40	0.22	61.54
		2.00	0.037	0.003	0.074	2.31	0.20	62.43
C ₃ mesic terrestrial	<i>Pitcairnia cuzcoensis</i>	0.02	0.189	0.006	0.004	6.96	0.24	36.83
		0.25	0.105	0.005	0.026	4.38	0.21	41.71
		0.50	0.083	0.004	0.042	3.82	0.22	46.02
		0.75	0.071	0.005	0.053	3.41	0.24	48.03
		1.00	0.061	0.004	0.061	3.16	0.23	51.80
		1.25	0.054	0.005	0.068	2.98	0.22	55.19
		1.50	0.049	0.004	0.074	2.85	0.22	58.16
		1.75	0.045	0.004	0.079	2.76	0.21	61.33
		2.00	0.040	0.003	0.080	2.68	0.22	67.00
C ₃ mesic terrestrial	<i>Pitcairnia jareckii</i>	0.02	0.155	0.007	0.003	6.44	0.26	41.57
		0.25	0.092	0.005	0.023	4.48	0.25	48.70
		0.50	0.074	0.005	0.037	4.02	0.25	54.32
		0.75	0.064	0.006	0.048	3.66	0.24	57.19
		1.00	0.058	0.004	0.058	3.42	0.25	58.97
		1.25	0.052	0.004	0.065	3.26	0.25	62.69
		1.50	0.046	0.004	0.069	3.13	0.24	68.04
		1.75	0.041	0.003	0.072	2.99	0.22	72.93
		2.00	0.037	0.003	0.074	2.87	0.23	77.57
C ₃ succulent terrestrial	<i>Puya chilensis</i>	0.02	0.354	0.003	0.007	4.19	0.25	11.86
		0.25	0.201	0.006	0.050	3.68	0.26	18.31
		0.50	0.159	0.004	0.080	3.42	0.23	21.51
		0.75	0.141	0.004	0.106	3.31	0.25	23.48
		1.00	0.128	0.005	0.128	3.24	0.23	25.31
		1.25	0.118	0.005	0.148	3.16	0.24	26.78
		1.50	0.109	0.004	0.164	3.08	0.23	28.26
		1.75	0.100	0.004	0.175	3.02	0.22	30.20
		2.00	0.094	0.004	0.188	2.95	0.24	31.38

C ₃ succulent terrestrial	<i>Puya venusta</i>	0.02	0.389	0.005	0.008	4.12	0.25	10.60
		0.25	0.223	0.004	0.056	3.41	0.26	15.29
		0.50	0.177	0.005	0.089	3.22	0.26	18.19
		0.75	0.153	0.004	0.115	3.13	0.24	20.46
		1.00	0.135	0.004	0.135	3.04	0.23	22.52
		1.25	0.124	0.005	0.155	2.96	0.25	23.87
		1.50	0.113	0.004	0.170	2.92	0.23	25.84
		1.75	0.105	0.005	0.184	2.90	0.24	27.62
		2.00	0.099	0.005	0.198	2.88	0.23	29.09
CAM tank- epiphyte	<i>Quesnelia arvensis</i>	0.02	0.080	0.005	0.002	2.88	0.22	36.00
		0.25	0.035	0.004	0.009	1.52	0.11	43.43
		0.50	0.024	0.002	0.012	1.09	0.09	45.42
		0.75	0.018	0.002	0.014	0.78	0.06	43.33
		1.00	0.013	0.001	0.013	0.53	0.04	40.77
		1.25	0.009	0.001	0.011	0.42	0.02	46.67
		1.50	0.006	<0.001	0.009	0.30	0.02	50.00
		1.75	0.004	<0.001	0.007	0.18	0.01	45.00
		2.00	0.001	<0.001	0.002	0.13	0.01	130.00
CAM tank- epiphyte	<i>Quesnelia liboniana</i>	0.02	0.086	0.004	0.002	2.95	0.24	34.30
		0.25	0.033	0.002	0.008	1.46	0.11	44.24
		0.50	0.023	0.002	0.012	0.92	0.07	40.00
		0.75	0.016	0.001	0.012	0.69	0.05	43.13
		1.00	0.012	0.001	0.012	0.50	0.04	41.67
		1.25	0.008	<0.001	0.010	0.38	0.02	47.50
		1.50	0.005	<0.001	0.008	0.27	0.01	54.00
		1.75	0.003	<0.001	0.005	0.15	0.01	50.00
		2.00	0.001	<0.001	0.002	0.11	0.01	110.00
C ₃ tank- epiphyte	<i>Racinaea dyeriana</i>	0.02	0.132	0.004	0.003	2.80	0.22	21.30
		0.25	0.055	0.004	0.014	1.21	0.10	22.00
		0.50	0.032	0.003	0.016	0.78	0.06	24.38
		0.75	0.021	0.002	0.016	0.58	0.04	27.62
		1.00	0.013	0.001	0.013	0.39	0.02	30.00
		1.25	0.009	0.001	0.011	0.22	0.02	24.44
		1.50	0.004	<0.001	0.006	0.13	0.01	32.50
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
C ₃ tank- epiphyte	<i>Tillandsia leiboldiana</i>	0.02	0.162	0.006	0.003	2.40	0.21	14.86
		0.25	0.059	0.004	0.015	1.08	0.06	18.31
		0.50	0.035	0.004	0.018	0.64	0.03	18.29
		0.75	0.022	0.002	0.017	0.44	0.02	20.00
		1.00	0.012	0.001	0.012	0.31	0.02	25.83
		1.25	0.006	<0.001	0.008	0.17	0.01	28.33
		1.50	0.001	<0.001	0.002	0.11	0.01	110.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
CAM atmospheric	<i>Tillandsia caput-medusae</i>	0.02	0.035	0.002	0.001	0.82	0.04	23.52
		0.25	0.010	0.001	0.003	0.35	0.02	35.00
		0.50	0.005	<0.001	0.003	0.21	0.01	42.00
		0.75	0.002	<0.001	0.002	0.08	<0.01	40.00
		1.00	0.000	0.000	0.000	0.00	0.00	0.00
		1.25	0.000	0.000	0.000	0.00	0.00	0.00
		1.50	0.000	0.000	0.000	0.00	0.00	0.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
CAM atmospheric	<i>Tillandsia stricta</i>	0.02	0.039	0.004	0.001	1.09	0.06	27.95
		0.25	0.012	0.001	0.003	0.46	0.02	38.33
		0.50	0.006	<0.001	0.003	0.28	0.02	46.67
		0.75	0.003	<0.001	0.002	0.14	0.01	46.67
		1.00	0.001	<0.001	0.001	0.07	<0.01	70.00
		1.25	0.000	0.000	0.000	0.00	0.00	0.00
		1.50	0.000	0.000	0.000	0.00	0.00	0.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00

CAM atmospheric	<i>Tillandsia paucifolia</i>	0.02	0.029	0.002	0.001	0.76	0.04	26.19
		0.25	0.010	0.001	0.003	0.28	0.02	28.00
		0.50	0.005	<0.001	0.003	0.18	0.01	36.00
		0.75	0.002	<0.001	0.002	0.10	0.01	50.00
		1.00	0.000	0.000	0.000	0.00	0.00	0.00
		1.25	0.000	0.000	0.000	0.00	0.00	0.00
		1.50	0.000	0.000	0.000	0.00	0.00	0.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
CAM tank- epiphyte	<i>Tillandsia utriculata</i>	0.02	0.040	0.003	0.001	0.98	0.03	24.62
		0.25	0.014	0.001	0.004	0.44	0.03	31.43
		0.50	0.007	<0.001	0.004	0.27	0.01	38.57
		0.75	0.004	<0.001	0.003	0.18	0.01	45.00
		1.00	0.001	<0.001	0.001	0.12	0.01	120.00
		1.25	0.000	0.000	0.000	0.00	0.00	0.00
		1.50	0.000	0.000	0.000	0.00	0.00	0.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
CAM tank- epiphyte	<i>Tillandsia fasciculata</i>	0.02	0.045	0.002	0.001	0.94	0.04	20.97
		0.25	0.016	0.001	0.004	0.40	0.03	25.00
		0.50	0.008	0.001	0.004	0.24	0.01	30.00
		0.75	0.004	<0.001	0.003	0.15	0.01	37.50
		1.00	0.001	<0.001	0.001	0.10	0.01	100.00
		1.25	0.000	0.000	0.000	0.00	0.00	0.00
		1.50	0.000	0.000	0.000	0.00	0.00	0.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
CAM atmospheric	<i>Tillandsia ionantha</i>	0.02	0.033	0.002	0.001	0.78	0.03	23.74
		0.25	0.010	0.001	0.003	0.31	0.02	31.00
		0.50	0.004	<0.001	0.002	0.17	0.01	42.50
		0.75	0.001	<0.001	0.001	0.09	<0.01	90.00
		1.00	0.000	0.000	0.000	0.00	0.00	0.00
		1.25	0.000	0.000	0.000	0.00	0.00	0.00
		1.50	0.000	0.000	0.000	0.00	0.00	0.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
C ₃ tank- epiphyte	<i>Vriesea fenestralis</i>	0.02	0.218	0.005	0.004	4.01	0.22	18.44
		0.25	0.092	0.004	0.023	2.21	0.18	24.02
		0.50	0.057	0.005	0.029	1.55	0.13	27.19
		0.75	0.038	0.003	0.029	1.21	0.10	31.84
		1.00	0.024	0.001	0.024	0.92	0.05	38.33
		1.25	0.016	0.001	0.020	0.61	0.03	38.13
		1.50	0.010	0.001	0.015	0.44	0.02	44.00
		1.75	0.005	<0.001	0.009	0.14	0.01	28.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
C ₃ tank- epiphyte	<i>Vriesea fosteriana</i>	0.02	0.195	0.006	0.004	4.10	0.23	21.00
		0.25	0.087	0.006	0.022	2.05	0.15	23.56
		0.50	0.054	0.004	0.027	1.34	0.10	24.81
		0.75	0.040	0.004	0.030	1.01	0.06	25.25
		1.00	0.026	0.002	0.026	0.74	0.06	28.46
		1.25	0.018	0.002	0.023	0.52	0.04	28.89
		1.50	0.011	0.001	0.017	0.38	0.03	34.55
		1.75	0.006	<0.001	0.011	0.17	0.01	28.33
		2.00	0.001	<0.001	0.002	0.08	0.01	80.00
C ₃ tank- epiphyte	<i>Vriesea gigantea</i>	0.02	0.190	0.005	0.004	4.00	0.22	21.00
		0.25	0.084	0.005	0.021	1.73	0.15	20.60
		0.50	0.051	0.004	0.026	1.14	0.11	22.35
		0.75	0.038	0.003	0.029	0.85	0.06	22.37
		1.00	0.024	0.002	0.024	0.52	0.04	21.67
		1.25	0.016	0.002	0.020	0.33	0.02	20.63
		1.50	0.009	0.001	0.014	0.18	0.02	20.00
		1.75	0.004	<0.001	0.007	0.09	0.01	22.50
		2.00	0.000	0.000	0.000	0.00	0.00	0.00

C ₃ tank-epiphyte	<i>Vriesea guttata</i>	0.02	0.208	0.007	0.004	4.06	0.31	19.52
		0.25	0.085	0.006	0.021	1.82	0.11	21.41
		0.50	0.053	0.003	0.027	1.22	0.10	23.02
		0.75	0.040	0.004	0.030	0.93	0.06	23.25
		1.00	0.025	0.001	0.025	0.58	0.02	23.20
		1.25	0.018	0.001	0.023	0.38	0.02	21.11
		1.50	0.010	0.001	0.015	0.25	0.02	25.00
		1.75	0.005	<0.001	0.009	0.11	0.01	22.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
C ₃ tank-epiphyte	<i>Lutheria splendens</i>	0.02	0.127	0.008	0.003	2.28	0.20	17.99
		0.25	0.055	0.005	0.014	1.12	0.09	20.36
		0.50	0.039	0.002	0.020	0.72	0.05	18.46
		0.75	0.029	0.001	0.022	0.53	0.04	18.28
		1.00	0.022	0.001	0.022	0.38	0.02	17.27
		1.25	0.015	0.0001	0.019	0.24	0.02	16.00
		1.50	0.010	<0.001	0.015	0.13	0.01	13.00
		1.75	0.006	<0.001	0.011	0.07	<0.01	11.67
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
C ₃ tank-epiphyte	<i>Guzmania monostachia</i>	0.02	0.111	0.006	0.002	5.62	0.20	50.67
		0.25	0.078	0.004	0.020	4.12	0.22	52.82
		0.50	0.058	0.004	0.029	3.33	0.21	57.41
		0.75	0.047	0.004	0.035	2.97	0.20	63.19
		1.00	0.037	0.002	0.037	2.78	0.20	75.84
		1.25	0.027	0.001	0.033	2.48	0.19	92.89
		1.50	0.017	0.001	0.026	2.13	0.20	125.29
		1.75	0.009	0.001	0.016	1.91	0.17	212.22
		2.00	0.004	<0.001	0.008	1.80	0.15	461.29
C ₃ tank-epiphyte	<i>Nidularium innocentii</i>	0.02	0.108	0.004	0.002	3.10	0.21	28.83
		0.25	0.074	0.004	0.019	1.71	0.14	23.11
		0.50	0.039	0.002	0.020	0.84	0.03	21.54
		0.75	0.023	0.002	0.017	0.52	0.03	22.61
		1.00	0.011	0.001	0.011	0.26	0.02	23.32
		1.25	0.001	<0.001	0.002	0.03	<0.01	26.25
		1.50	0.000	0.000	0.000	0.00	0.00	0.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
C ₃ succulent terrestrial	<i>Ochagavia elegans</i>	0.02	0.219	0.006	0.004	3.62	0.23	16.55
		0.25	0.149	0.005	0.037	1.64	0.15	11.01
		0.50	0.107	0.005	0.054	1.02	0.08	9.53
		0.75	0.082	0.004	0.062	0.65	0.04	7.93
		1.00	0.072	0.005	0.072	0.26	0.01	3.63
		1.25	0.057	0.005	0.071	0.12	0.01	2.12
		1.50	0.048	0.005	0.072	0.03	<0.01	0.63
		1.75	0.040	0.004	0.070	0.00	0.00	0.00
		2.00	0.037	0.003	0.074	0.00	0.00	0.00
C ₃ mesic terrestrial	<i>Pitcairnia xanthocalyx</i>	0.02	0.117	0.005	0.002	6.61	0.24	56.31
		0.25	0.089	0.004	0.022	4.99	0.22	56.07
		0.50	0.072	0.004	0.036	4.12	0.20	57.22
		0.75	0.064	0.004	0.048	3.88	0.22	60.63
		1.00	0.057	0.003	0.057	3.60	0.21	63.60
		1.25	0.047	0.004	0.059	3.20	0.21	67.71
		1.50	0.043	0.004	0.065	3.13	0.20	72.79
		1.75	0.039	0.004	0.068	3.06	0.21	78.46
		2.00	0.035	0.003	0.069	3.04	0.22	87.74
C ₃ mesic terrestrial	<i>Pitcairnia integrifolia</i>	0.02	0.136	0.005	0.003	5.67	0.23	41.75
		0.25	0.112	0.005	0.028	4.78	0.24	42.68
		0.50	0.088	0.004	0.044	4.33	0.21	49.20
		0.75	0.075	0.005	0.056	4.04	0.22	53.87
		1.00	0.068	0.006	0.068	3.90	0.23	57.76
		1.25	0.056	0.005	0.070	3.62	0.22	64.44
		1.50	0.052	0.004	0.078	3.52	0.21	67.69
		1.75	0.048	0.004	0.084	3.31	0.24	68.96
		2.00	0.043	0.004	0.087	3.32	0.22	76.36

C ₃ succulent terrestrial	<i>Puya berteroniana</i>	0.02	0.226	0.005	0.005	4.22	0.21	18.70
		0.25	0.169	0.004	0.042	3.95	0.22	23.37
		0.50	0.121	0.006	0.061	3.83	0.24	31.65
		0.75	0.103	0.004	0.077	3.74	0.22	36.31
		1.00	0.092	0.004	0.092	3.70	0.24	40.38
		1.25	0.073	0.005	0.091	3.67	0.25	50.50
		1.50	0.061	0.004	0.092	3.63	0.22	59.51
		1.75	0.052	0.004	0.091	3.61	0.21	69.42
		2.00	0.047	0.003	0.093	3.59	0.23	77.03
		0.02	0.235	0.004	0.005	7.54	0.24	32.06
C ₃ succulent terrestrial	<i>Puya mirabilis</i>	0.25	0.171	0.003	0.043	5.03	0.22	29.42
		0.50	0.129	0.004	0.065	4.09	0.22	31.71
		0.75	0.109	0.003	0.082	3.67	0.23	33.67
		1.00	0.098	0.004	0.098	3.45	0.21	35.27
		1.25	0.078	0.004	0.098	3.25	0.22	41.50
		1.50	0.071	0.004	0.107	3.16	0.20	44.51
		1.75	0.063	0.004	0.110	3.08	0.19	48.89
		2.00	0.059	0.003	0.118	3.02	0.21	51.29
		0.02	0.098	0.006	0.002	3.90	0.22	39.92
		0.25	0.061	0.005	0.015	2.71	0.21	44.43
C ₃ tank- epiphyte	<i>Lutheria glutinosa</i>	0.50	0.033	0.004	0.017	1.98	0.15	60.00
		0.75	0.020	0.002	0.015	1.49	0.13	74.50
		1.00	0.012	0.001	0.012	0.71	0.04	58.66
		1.25	0.002	<0.001	0.003	0.22	0.01	109.13
		1.50	0.000	0.000	0.000	0.00	0.00	0.00
		1.75	0.000	0.000	0.000	0.00	0.00	0.00
		2.00	0.000	0.000	0.000	0.00	0.00	0.00
		0.02	0.098	0.006	0.002	3.90	0.22	39.92
		0.25	0.061	0.005	0.015	2.71	0.21	44.43
		0.50	0.033	0.004	0.017	1.98	0.15	60.00

Table A5.1.1. Responses of steady-state gas exchange parameters (stomatal conductance to water vapour, g_{sw} ; transpiration rate, E ; assimilation rate, A ; water-use efficiency, WUE) to increasing levels of leaf-air vapour pressure deficit (VPD), based on five replicate curves for each of 93 bromeliad species.

Species	S_s	S_A
<i>Acanthostachys pitcairnioides</i>	0.207	0.186
<i>Acanthostachys strobilacea</i>	0.212	0.176
<i>Aechmea aquilega</i>	0.225	0.219
<i>Aechmea fendleri</i>	0.227	0.231
<i>Aechmea nudicaulis</i>	0.219	0.216
<i>Aechmea fasciata</i>	0.186	0.182
<i>Aechmea filicaulis</i>	0.210	0.216
<i>Aechmea gamosepala</i>	0.224	0.214
<i>Ananas comosus</i>	0.157	0.090
<i>Ananas bracteatus</i>	0.149	0.087
<i>Araeococcus micranthus</i>	0.211	0.204
<i>Billbergia nutans</i>	0.197	0.200
<i>Billbergia amoena</i>	0.199	0.202
<i>Billbergia euphemiae</i>	0.204	0.204
<i>Brocchinia reducta</i>	0.171	0.137
<i>Brocchinia tatei</i>	0.172	0.144
<i>Bromelia humilis</i>	0.179	0.134
<i>Bromelia karatas</i>	0.176	0.139
<i>Bromelia balansae</i>	0.168	0.136
<i>Canistrum cyathiforme</i>	0.213	0.217
<i>Catopsis morreniana</i>	0.227	0.210
<i>Catopsis berteroniana</i>	0.229	0.214
<i>Catopsis floribunda</i>	0.225	0.207
<i>Cryptanthus microglazioui</i>	0.180	0.116
<i>Cryptanthus pseudoscaposus</i>	0.170	0.114
<i>Cryptanthus whitmanii</i>	0.171	0.099
<i>Cryptanthus colnagoi</i>	0.169	0.102
<i>Cryptanthus bivittatus</i>	0.173	0.095

<i>Cryptanthus acaulis</i>	0.172	0.107
<i>Cryptanthus beuckeri</i>	0.176	0.097
<i>Cryptanthus bromelioides</i>	0.180	0.099
<i>Cryptanthus maritimus</i>	0.174	0.102
<i>Deuterocohnia brevifolia</i>	0.202	0.177
<i>Deuterocohnia lorentziana</i>	0.200	0.168
<i>Disteganthus basilateralis</i>	0.216	0.196
<i>Dyckia remotiflora</i>	0.189	0.167
<i>Dyckia brevifolia</i>	0.191	0.166
<i>Fascicularia bicolor</i>	0.155	0.131
<i>Fosterella penduliflora</i>	0.188	0.133
<i>Fosterella rusbyi</i>	0.184	0.139
<i>Fosterella villosula</i>	0.181	0.138
<i>Greigia sphacelata</i>	0.165	0.122
<i>Guzmania monostachia</i>	0.186	0.155
<i>Guzmania lingulata</i>	0.196	0.156
<i>Guzmania wittmackii</i>	0.195	0.176
<i>Guzmania berteroniana</i>	0.193	0.154
<i>Hechtia montana</i>	0.195	0.120
<i>Hechtia podantha</i>	0.212	0.115
<i>Hohenbergia catingae</i>	0.221	0.209
<i>Lymania alvimii</i>	0.224	0.213
<i>Neoregelia carolinae</i>	0.225	0.214
<i>Neoregelia ampullacea</i>	0.230	0.229
<i>Neoregelia indecora</i>	0.230	0.218
<i>Nidularium innocentii</i>	0.215	0.239
<i>Nidularium amazonicum</i>	0.212	0.206
<i>Nidularium apiculatum</i>	0.217	0.216
<i>Nidularium campos-portoi</i>	0.209	0.209
<i>Nidularium longiflorum</i>	0.225	0.226
<i>Nidularium billbergioides</i>	0.215	0.210
<i>Nidularium fulgens</i>	0.221	0.228
<i>Nidularium procerum</i>	0.225	0.221
<i>Nidularium purpureum</i>	0.214	0.220
<i>Nidularium rutilans</i>	0.217	0.215
<i>Ochagavia elegans</i>	0.146	0.236
<i>Ochagavia carnea</i>	0.164	0.117
<i>Orthophytum saxicola</i>	0.185	0.183
<i>Orthophytum horridum</i>	0.188	0.191
<i>Pitcairnia xanthocalyx</i>	0.150	0.131
<i>Pitcairnia integrifolia</i>	0.158	0.084
<i>Pitcairnia imbricata</i>	0.170	0.128
<i>Pitcairnia angustifolia</i>	0.162	0.133
<i>Pitcairnia cuzcoensis</i>	0.171	0.135
<i>Pitcairnia jareckii</i>	0.164	0.120
<i>Puya berteroniana</i>	0.157	0.033
<i>Puya mirabilis</i>	0.157	0.133
<i>Puya chilensis</i>	0.159	0.064
<i>Puya venusta</i>	0.163	0.066
<i>Quesnelia arvensis</i>	0.213	0.211
<i>Quesnelia liboniana</i>	0.213	0.212
<i>Racinaea dyeriana</i>	0.227	0.221
<i>Tillandsia leiboldiana</i>	0.232	0.224
<i>Tillandsia caput-medusae</i>	0.264	0.242
<i>Tillandsia stricta</i>	0.253	0.239
<i>Tillandsia paucifolia</i>	0.257	0.239
<i>Tillandsia utriculata</i>	0.250	0.225
<i>Tillandsia fasciculata</i>	0.251	0.230
<i>Tillandsia ionantha</i>	0.270	0.244
<i>Vriesea fenestralis</i>	0.221	0.211
<i>Vriesea fosteriana</i>	0.217	0.214
<i>Vriesea gigantea</i>	0.221	0.220
<i>Lutheria glutinosa</i>	0.205	0.193

<i>Vriesea guttata</i>	0.219	0.218
<i>Lutheria splendens</i>	0.211	0.218

Table A5.1.2 Mean values of instantaneous stomatal sensitivity to VPD (S_s) and assimilation sensitivity (S_A) to leaf-air vapour pressure deficit for each species calculated from data in Table A5.1.1.

Species	SCM	SD (mm ⁻²)	± SE	Pore length (µm)	± SE
<i>Acanthostachys pitcairnioides</i>	3	22.9	0.14	43	0.60
<i>Acanthostachys strobilacea</i>	3	18.2	0.12	42	0.22
<i>Aechmea aquilega</i>	2	33.7	0.25	35	0.21
<i>Aechmea fendleri</i>	2	35.6	0.22	34	0.22
<i>Aechmea nudicaulis</i>	2	32.1	0.26	30	0.25
<i>Aechmea fasciata</i>	2	32.9	0.91	36	0.31
<i>Aechmea filicaulis</i>	2	38.1	0.42	33	0.40
<i>Aechmea gamosepala</i>	2	30.4	0.30	31	0.22
<i>Ananas comosus</i>	3	24.1	0.22	46	0.31
<i>Ananas bracteatus</i>	3	22.0	0.21	49	0.30
<i>Araeococcus micranthus</i>	2	33.7	0.56	33	0.25
<i>Billbergia nutans</i>	2	35.6	0.50	37	0.20
<i>Billbergia amoena</i>	2	32.0	0.43	35	0.22
<i>Billbergia euphemiae</i>	2	34.4	0.48	35	0.21
<i>Brocchinia reducta</i>	1	38.8	0.41	24	0.21
<i>Brocchinia tatei</i>	1	40.5	0.39	26	0.24
<i>Bromelia humilis</i>	3	16.6	0.21	53	0.21
<i>Bromelia karatas</i>	3	22.2	0.24	46	0.20
<i>Bromelia balansae</i>	3	18.8	0.31	54	0.26
<i>Canistrum cyathiforme</i>	2	37.5	0.20	36	0.30
<i>Catopsis morreniana</i>	2	38.4	0.26	30	0.31
<i>Catopsis berteroniana</i>	2	35.3	0.53	27	0.26
<i>Catopsis floribunda</i>	2	36.5	0.37	31	0.30
<i>Cryptanthus microglazioui</i>	3	24.0	0.71	42	0.33
<i>Cryptanthus pseudoscaposus</i>	3	26.6	0.42	44	0.35
<i>Cryptanthus whitmanii</i>	3	18.4	0.45	45	0.40
<i>Cryptanthus colnagoi</i>	3	19.5	0.21	50	0.38
<i>Cryptanthus bivittatus</i>	3	17.2	0.20	47	0.20
<i>Cryptanthus acaulis</i>	3	18.4	0.15	47	0.21
<i>Cryptanthus beuckeri</i>	3	20.2	0.34	51	0.28
<i>Cryptanthus bromelioides</i>	3	21.7	0.32	49	0.37
<i>Cryptanthus maritimus</i>	3	24.4	0.33	48	0.41
<i>Deuterocohnia brevifolia</i>	3	15.4	0.36	43	0.33
<i>Deuterocohnia lorentziana</i>	3	14.8	0.09	41	0.36
<i>Disteganthus basilateralis</i>	3	22.5	0.22	43	0.31
<i>Dyckia remotiflora</i>	3	19.3	0.21	45	0.32
<i>Dyckia brevifolia</i>	3	21.1	0.43	42	0.35
<i>Fascicularia bicolor</i>	3	23.7	0.33	51	0.25
<i>Fosterella penduliflora</i>	1	296.0	5.64	13	0.26

<i>Fosterella rusbyi</i>	1	322.0	2.34	15	0.22
<i>Fosterella villosula</i>	1	307.0	6.33	12	0.18
<i>Greigia sphacelata</i>	3	26.9	0.52	53	0.29
<i>Guzmania monostachia</i>	2	37.1	0.88	29	0.31
<i>Guzmania lingulata</i>	2	48.2	0.67	32	0.36
<i>Guzmania wittmackii</i>	2	43.7	0.70	30	0.36
<i>Guzmania berteroniana</i>	2	48.4	0.45	30	0.34
<i>Hechtia montana</i>	3	17.2	0.12	62	0.29
<i>Hechtia podantha</i>	3	16.1	0.10	55	0.34
<i>Hohenbergia catingae</i>	2	27.5	0.22	32	0.28
<i>Lymania alvimii</i>	2	36.6	0.34	32	0.26
<i>Neoregelia carolinae</i>	2	30.1	0.36	38	0.22
<i>Neoregelia ampullacea</i>	2	28.3	0.62	36	0.19
<i>Neoregelia indecora</i>	2	26.7	0.45	35	0.29
<i>Nidularium innocentii</i>	2	27.2	0.40	39	0.31
<i>Nidularium amazonicum</i>	2	25.6	0.41	38	0.33
<i>Nidularium apiculatum</i>	2	24.3	0.38	41	0.38
<i>Nidularium campos-portoi</i>	2	28.9	0.53	37	0.32
<i>Nidularium longiflorum</i>	2	30.1	0.32	39	0.22
<i>Nidularium billbergioides</i>	2	20.9	0.21	38	0.26
<i>Nidularium fulgens</i>	2	22.1	0.20	40	0.25
<i>Nidularium procerum</i>	2	24.6	0.31	38	0.40
<i>Nidularium purpureum</i>	2	25.8	0.33	41	0.36
<i>Nidularium rutilans</i>	2	20.2	0.18	36	0.32
<i>Ochagavia elegans</i>	3	16.0	0.19	49	0.41
<i>Ochagavia carnea</i>	3	20.5	0.21	52	0.42
<i>Orthophytum saxicola</i>	3	17.4	0.15	46	0.38
<i>Orthophytum horridum</i>	3	18.3	0.45	49	0.33
<i>Pitcairnia xanthocalyx</i>	1	438.0	8.92	10	0.09
<i>Pitcairnia integrifolia</i>	1	413.0	11.31	11	0.11
<i>Pitcairnia imbricata</i>	1	462.0	7.89	10	0.07
<i>Pitcairnia angustifolia</i>	1	412.0	8.91	9	0.05
<i>Pitcairnia cuzcoensis</i>	1	448.0	4.53	10	0.04
<i>Pitcairnia jareckii</i>	1	417.0	2.24	10	0.08
<i>Puya berteroniana</i>	3	54.0	0.38	54	0.52
<i>Puya mirabilis</i>	3	48.0	0.29	48	0.37
<i>Puya chilensis</i>	3	57.8	0.40	57	0.25
<i>Puya venusta</i>	3	59.2	0.45	52	0.21
<i>Quesnelia arvensis</i>	2	29.4	0.27	37	0.30
<i>Quesnelia liboniana</i>	2	33.1	0.33	39	0.34
<i>Racinaea dyeriana</i>	2	42.1	0.32	37	0.32
<i>Tillandsia leiboldiana</i>	2	40.7	0.46	33	0.28
<i>Tillandsia caput-medusae</i>	3	7.6	0.42	49	0.41
<i>Tillandsia stricta</i>	3	13.4	0.32	52	0.48
<i>Tillandsia paucifolia</i>	3	8.8	0.10	46	0.35
<i>Tillandsia utriculata</i>	3	12.9	0.13	54	0.34

<i>Tillandsia fasciculata</i>	3	13.5	0.22	58	0.36
<i>Tillandsia ionantha</i>	3	5.6	0.25	48	0.32
<i>Vriesea fenestralis</i>	2	49.7	0.21	36	0.29
<i>Vriesea fosteriana</i>	2	42.2	0.22	38	0.33
<i>Vriesea gigantea</i>	2	40.6	0.89	35	0.36
<i>Lutheria glutinosa</i>	2	52.5	0.81	34	0.32
<i>Vriesea guttata</i>	2	38.2	0.43	38	0.31
<i>Lutheria splendens</i>	2	55.3	0.45	32	0.42

Table A5.1.3 Stomatal morphological characters. SCM = stomatal complex morphology (see text for description); SD = stomatal density.

Functional type	Species	VPD (kPa)	α (μm)	$\pm$ SE
C ₃ tank-epiphyte	<i>Guzmania monostachia</i>	0.02	2.89	0.04
		0.25	2.54	0.05
		0.50	2.18	0.03
		0.75	1.84	0.02
		1.00	1.44	0.03
		1.25	1.01	0.01
		1.50	0.57	0.02
		1.75	0.22	0.02
		2.00	0.05	<0.01
C ₃ tank-epiphyte	<i>Nidularium innocentii</i>	0.02	2.66	0.06
		0.25	2.31	0.03
		0.50	2.05	0.04
		0.75	1.68	0.05
		1.00	1.22	0.02
		1.25	0.95	0.01
		1.50	0.62	0.01
		1.75	0.31	0.02
		2.00	0.02	<0.01
C ₃ succulent terrestrial	<i>Ochagavia elegans</i>	0.02	4.94	0.06
		0.25	4.48	0.04
		0.50	4.11	0.05
		0.75	3.78	0.04
		1.00	3.51	0.05
		1.25	3.36	0.02
		1.50	3.05	0.03
		1.75	2.88	0.02
		2.00	2.72	0.03
C ₃ mesic terrestrial	<i>Pitcairnia xanthocalyx</i>	0.02	3.44	0.03
		0.25	3.13	0.04
		0.50	2.94	0.02
		0.75	2.78	0.03
		1.00	2.50	0.01
		1.25	2.31	0.02
		1.50	2.04	0.03
		1.75	1.78	0.02
		2.00	1.34	0.01
C ₃ mesic terrestrial	<i>Pitcairnia integrifolia</i>	0.02	3.80	0.03
		0.25	3.69	0.02
		0.50	3.47	0.03
		0.75	3.33	0.02
		1.00	3.05	0.03
		1.25	2.84	0.03
		1.50	2.51	0.02
		1.75	2.03	0.02

C ₃ succulent terrestrial	<i>Puya berteroniana</i>	2.00	1.76	0.01
		0.02	5.39	0.04
		0.25	5.14	0.05
		0.50	4.86	0.05
		0.75	4.34	0.03
		1.00	3.92	0.04
		1.25	3.41	0.02
		1.50	2.97	0.03
C ₃ succulent terrestrial	<i>Puya mirabilis</i>	1.75	2.50	0.02
		2.00	2.11	0.02
		0.02	4.70	0.04
		0.25	4.31	0.03
		0.50	4.05	0.04
		0.75	3.88	0.03
		1.00	3.55	0.02
		1.25	3.12	0.02
C ₃ tank-epiphyte	<i>Lutheria glutinosa</i>	1.50	2.70	0.03
		1.75	2.41	0.02
		2.00	2.20	0.02
		0.02	2.56	0.03
		0.25	2.07	0.02
		0.50	1.81	0.01
		0.75	1.58	0.01
		1.00	1.25	0.01
		1.25	1.01	0.01
		1.50	0.62	0.02
		1.75	0.14	0.01
		2.00	0.02	<0.01

Table A5.1.4. Response of mean stomatal aperture (α) to leaf-air vapour pressure deficit (VPD) in a subset of eight species.

Functional type	Species	S_{α}
C ₃ tank-epiphyte	<i>Nidularium innocentii</i>	0.61
C ₃ succulent terrestrial	<i>Ochagavia elegans</i>	0.36
C ₃ tank-epiphyte	<i>Guzmania monostachia</i>	0.61
C ₃ tank-epiphyte	<i>Lutheria glutinosa</i>	0.64
C ₃ succulent terrestrial	<i>Puya berteroniana</i>	0.29
C ₃ succulent terrestrial	<i>Puya mirabilis</i>	0.26
C ₃ mesic terrestrial	<i>Pitcairnia integrifolia</i>	0.18
C ₃ mesic terrestrial	<i>Pitcairnia xanthocalyx</i>	0.28

Table A5.1.5 Values of instantaneous stomatal aperture sensitivity (S_{α}) to leaf-air vapour pressure deficit calculated from data presented in Table A5.1.4.

Appendix 6.1

A6.1.1 Description of forest physiognomy and floristics on Trinidad and Tobago

At the very highest elevations on El Cerro del Aripo and El Tucuche, elfin woodland (EW) occurs. This vegetation is characterised by abundant mosses and lichens, short-statured trees (mostly *Clusia intertexta* Britton), and a temperate climate with high evaporative potential but no seasonal drought.

Montane Forest (MF) *sensu* Beard (1946) of the *Richeria grandis* Vahl - *Eschweilera tenax* (Moritz ex O.Berg) Miers association occurs immediately below EW. This formation is best developed on the Aripo massif (around the peaks of El Cerro del Aripo, Morne Bleu and Chaguaramal) and on El Tucuche. MF displays luxuriant herbaceous ground vegetation and epiphytic growth, with tree-ferns and palms making a major contribution to the structure of the understorey. There is occasional evidence of wind damage, particularly on north-facing slopes. According to Beard the temperature range in MF is 15.0 -18.3°C, while Pittendrigh (1948) suggests annual rainfall in MF could be in excess of 6350 mm, and is sufficiently evenly distributed as to prevent the occurrence of seasonal drought.

Lower Montane Forest (LMF) extends across much of the remainder of the Main Ridge and down the north-south ridges between the Santa Cruz Valley and Cumaca. LMF is also found along the St David's Ridge and across much of the lower hills between the St David's Ridge and the Northeast Coastal Hills south and east of Grande Riviere. The typical association of this forest formation is *Byrsonima spicata* (Cav.) Rich. ex Kunth - *Licania ternatensis* Hook.f. ex Duss - *Sterculia pruriens* (Aubl.) K.Schum. More isolated pockets of LMF occur on headlands along the north coast such as on either side of Maracas Bay, and also on St Ann's Peak above Port-of-Spain and on Morne Catherine above Chaguaramas. The woody flora of the LMF is rich, while the ground vegetation is poorly developed and the epiphytic flora impoverished. Pittendrigh estimates an average annual rainfall of ca. 5000 mm in LMF, and Beard describes the climate of LMF as 'sub-tropical' and lacking seasonal drought, with a temperature range of 16.7 - 20°C.

North of the Main Ridge and to the immediate east of Cumaca, LMF transitions to an Evergreen Seasonal Forest (ESF) association, *Aniba panurensis* (Meisn.) Mez/A. *citrifolia* (Meisn.) Mez - *Carapa guianensis* Aubl./*Licania heteromorpha* Benth. This ESF presents a continuous canopy of mesophyllous trees that often show buttressing, and an understorey with many palms. Beard (1946a) suggested that ESF experiences three months of drought per year. In two large areas north of Cumaca and Platanal there is a Seasonal Montane Forest (SMF) formation, comprising the *Inga macrophylla* Willd. - *Guarea guidonia* (L.) Sleumer association. This formation is edaphically

determined, occurring on limestone covered with extremely thin soils. Regular mists provide moisture for luxuriant epiphytic growth and herbaceous ground vegetation in SMF.

At lower elevations in the valleys to the south of the Main Ridge there is a mixed secondary forest including abandoned fruit trees formerly in cultivation. The lowland forests around the Northern Range also include a highly unusual ESF association, *Mora excelsa* Benth. - *Carapa guianensis*/*Pentaclethra macroloba* (Willd.) Kuntze. In these 'mora forests', *M. excelsa* (Fabaceae) dominates to the extent that the upper canopy is virtually monospecific (Beard, 1946). Mora forest occurs throughout the Matura basin and there is also a smaller area north of the St David's Ridge near Paria Bay. Along the fringe of the North Coast and across much of the north-east headland around Toco there is a Deciduous Seasonal Forest (DSF) formation, with *Tabebuia serratifolia* (Vahl) G.Nicholson - *Protium guianense* (Aubl.) Marchand and *Peltogyne floribunda* (Kunth) Pittier/*Tabebuia serratifolia*-*Protium guianense* associations. In the west, particularly on the Chaguaramas peninsula, the DSF is of the *Machaerium biovulatum* Micheli - *Lonchocarpus punctatus* Kunth - *Bursera simaruba* (L.) Sarg. association. In either case, the canopy is low (3-10 m), epiphytes scarce, and seasonal drought lasts for approximately five months.

In the easterly part of the Central Range that includes Tamana and Mount Harris, *Aniba panurensis*/A. *citrifolia* - *Carapa guianensis* - *Eschweilera subglandulosa* (Steud. ex O.Berg) Miers/*Pentaclethra macroloba*/*Attalea maripa* (Aubl.) Mart. ESF occurs. Further south-west this is replaced by another ESF association, *Carapa guianensis* - *Pachira insignis* (Sw.) Savigny - *Eschweilera subglandulosa*/*Pentaclethra macroloba*/*Sabal* spp. These ESF formations are surrounded by a matrix of young secondary forest and teak plantations (*Tectona grandis* L.f.). Pittendrigh (1948) measured the diurnal progression of vertical gradients in temperature and humidity within *Carapa*-*Eschweilera* ESF at Tamana in August 1945. Near the forest floor, relative humidity (RH) was constantly near-saturating, whereas at 65 feet (19.8 m) RH fell from 100% at night to 85% at 3pm. Air temperature also showed a slightly stronger diurnal rhythm higher in the canopy, peaking during the middle of the day.

Beard (1944) noted that the climate of Tobago is reminiscent of that of the Toco district of Trinidad (in the northeast corner of that island). He suggested that a key distinction when compared with the rest of Trinidad is that whereas there the period of maximum rainfall occurs in August, in Toco and Tobago it occurs after the *petit carême*, in November. This could explain the observation that during field surveys conducted in September 2016, extremely few inflorescences or infructescences of any *Aechmea* species were observed outside of the northeast, whereas in the northeast *Ae. aquilega* and especially *Ae. dichlamydea* were in full flower at multiple locations. The period of heaviest rainfall

seems to be coincident with the disintegration of matured infructescences. For the Main Ridge of Tobago, Beard proposes a mean annual rainfall of over 3810 mm. Seasonal drought is more severe in Tobago than in Trinidad, and Beard thought the humidity to be generally lower and the winds more constant, increasing the evaporative demand. Beard identified three types of rain forest on Tobago, two of which are strongly determined by edaphology: Lowland Rain Forest (LRF; *Carapa guianensis* - *Andira inermis* (Wright) DC.), with an upper limit of 250-370 m; Lower Montane Forest (LMF; *Byrsonima spicata* - *Licania biglandulosa*), occurring above LRF on schist; and Xeric Rain Forest (XRF; *Manilkara bidentata* - *Guettarda scabra* (L.) Vent.), occurring above LRF on igneous soils. DSF (*Bursera simaruba*-*Lonchocarpus domingensis* (Pers.) DC.) and littoral and mangrove formations are also present. According to the estimations of land cover based on satellite imagery made by Helmer et al. (2012), approximately 84% forested of Tobago is currently forested, although this includes extensive tracts of invasive bamboo.

Appendix 6.2

A6.2.1 Locations of herbarium/literature-referenced specimens of focal *Aechmea* species

Species	Latitude (approx.; °N)	Longitude (approx., °E)	Locality descriptor	Collection/ reference
<i>Aechmea aquilega</i>	10.691	-61.751	Chacachacare	NHTT
(Salisb.) Griseb.	10.688	-61.550	Four Roads	NHTT
	10.712	-61.152	Oropuche Cave	NHTT
	10.621	-61.137	Aripo Savannah	NHTT
	10.576	-61.133	Cunapo Southern Main Road, Sangre Grande	NHTT
	10.519	-61.420	Chaguanas	NHTT
	10.339	-61.346	Mud Volcano	NHTT
	10.148	-61.035	Guayaguayare	NHTT
<i>Aechmea</i>	10.816	-61.124	Matelot (var. <i>trinitensis</i>)	NHTT
<i>dichlamydea</i> Baker	10.821	-61.027	Montevideo(var. <i>trinitensis</i>)	NHTT
	10.829	-61.000	Sans Souci(var. <i>trinitensis</i>)	NHTT
	11.227	-60.610	Great Dog River (var. <i>dichlamydea</i> , Tobago)	NHTT
	11.268	-60.545	King's Bay (var. <i>dichlamydea</i> , Tobago)	NHTT
	11.298	-60.550	Pigeon Peak (var. <i>dichlamydea</i> , Tobago)	NHTT
	11.220	-60.723	Menna (var. <i>dichlamydea</i> , Tobago)	NHTT
	11.225	-60.712	Easterfield Road (var. <i>dichlamydea</i> , Tobago)	NHTT
	11.275	-60.626	Main Ridge (var. <i>dichlamydea</i> , Tobago)	NHTT
	11.292	-60.544	Speyside (var. <i>dichlamydea</i> , Tobago)	NHTT
	11.284	-60.616	Roxborough-Bloody Bay Road (var. <i>dichlamydea</i> , Tobago)	NHTT
	10.700	-62.617	Las Melenas, Paria Peninsula (var. <i>pariaensis</i> , Venezuela)	
<i>Aechmea fendleri</i>	10.719	-61.237	Heights of Aripo	NHTT
André ex Mez	10.743	-61.403	Tucuche	NHTT
	10.461	-67.269	Prope Coloniam Tovar (Venezuela)	HUH
	11.008	-63.901	Cerro el Copey, Isla Margarita (Venezuela)	Enrech et al., 1998
	10.563	-66.684	Cordillera del Avila (Venezuela)	
	10.682	-62.546	Paria Peninsula (Venezuela)	
	10.124	-65.768	Cerros del Bachiller (Venezuela)	
<i>Aechmea nudicaulis</i>	10.687	-61.401	St Joseph Stock Farm	NHTT
(L.) Griseb.	10.650	-61.396	St Augustine	NHTT
	10.747	-61.324	Arima-Blanchisseuse Road 4.5 milestone	NHTT
	10.685	-61.046	Salybia-Matura Road	NHTT
	10.573	-61.117	1 mile S of Sangre Grande on Manzanilla Road	NHTT
	10.568	-61.135	Cunapo S Road, Sangre Grande	NHTT

10.519	-61.422	Chaguanas	NHTT
10.300	-61.433	Marabella Pasture	NHTT
10.113	-61.286	Moruga Bouffe	NHTT
10.175	-61.049	Lagon Bouffe	NHTT

Table A6.2.1. Herbarium and literature distributional records for *Aechmea* spp. in Trinidad and Tobago

Locations are in Trinidad unless where otherwise stated. Record locations: NHTT = National Herbarium of Trinidad and Tobago; HUH = Harvard University Herbaria. Records for *Ae. aquilega* and *Ae. nudicaulis* outside Trinidad and Tobago not shown.

Appendix 6.3

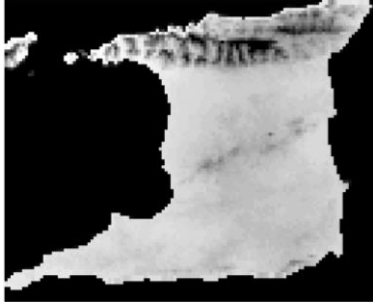
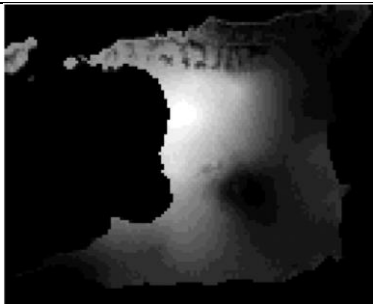
A6.3.1 Subsampling of distributional datasets

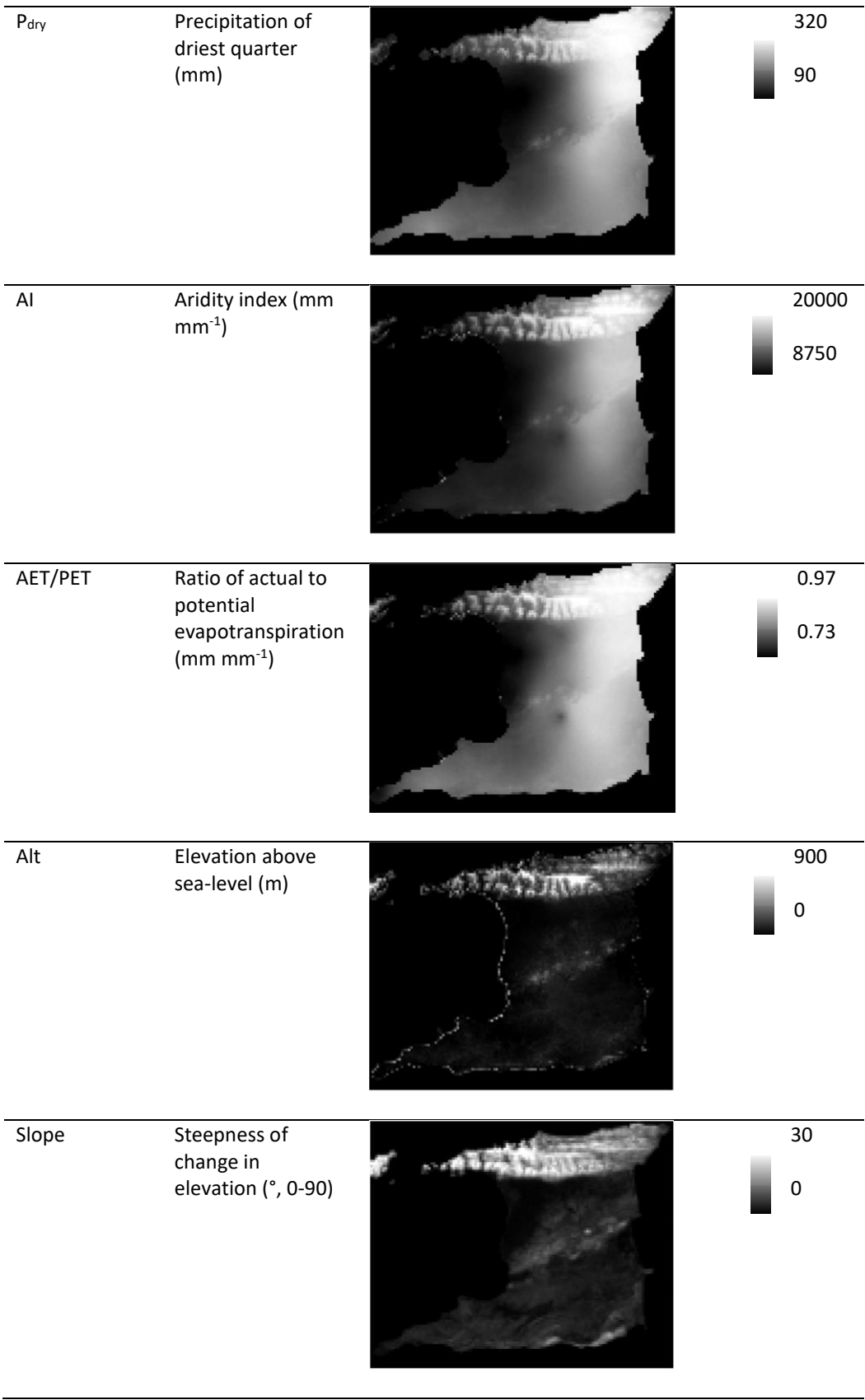
Species	Resolution (°)	<i>n</i>	NNI	Z-score	<i>p</i>
<i>Aechmea aquilega</i>	0.020	45	0.959	-0.524	0.600
<i>Aechmea dichlamydea</i>	0.010	20	0.808	-1.640	0.101
<i>Aechmea fendleri</i>	0.015	46	1.040	0.515	0.607
<i>Aechmea nudicaulis</i>	0.030	104	0.977	-0.451	0.652

Table A6.3.1 Results of NNI subsampling of species presence datasets to remove spatial autocorrelation. NNI = nearest neighbour index.

Appendix 6.4

A6.4.1 Raster images for environmental variables under present-day conditions and future climate scenario

Environmental layer	Definition	Layer map	
MAT	Mean annual temperature (°C)		27.0 21.0
DTR	Mean diurnal temperature range (°C)		9.5 7.5
MAP	Mean annual precipitation (MAP; mm)		2900 1350
P _{seas}	Precipitation seasonality (%)		60 35



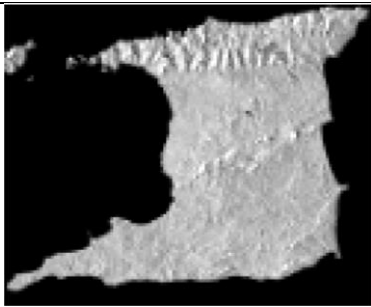
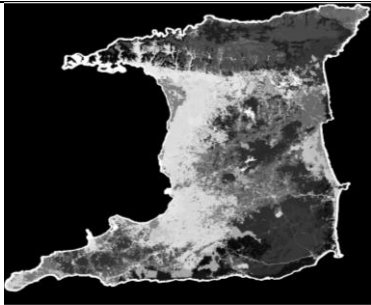
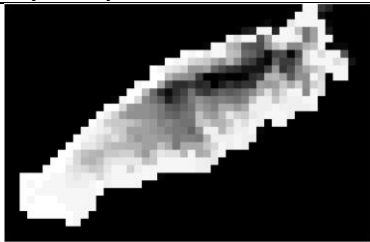
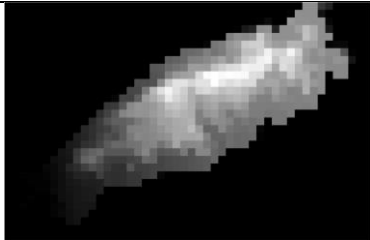
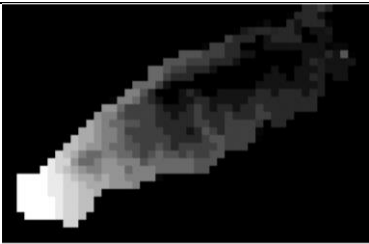
Aspect	Orientation of downward sloping terrain (°, 0-359.9)		280 0
Vegtype	Vegetation/land-cover type as classified in Helmer et al. (2012)		50 0

Table A6.4.1 Environmental layers for Trinidad under present-day climatic conditions.

Environmental layer	Layer map	
MAT		27.0 23.0
DTR		8.0 7.0
MAP		2500 1600

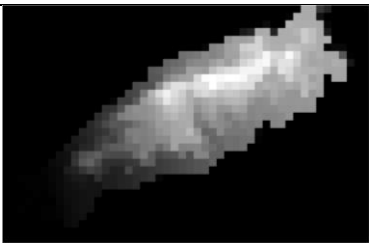
P_{seas}



50

35

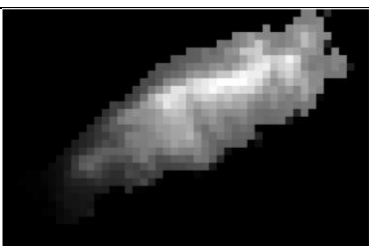
P_{dry}



300

150

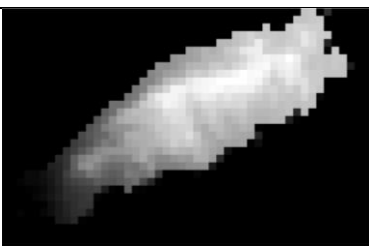
AI



18000

11000

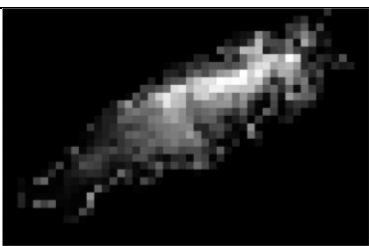
AET/PET



0.96

0.78

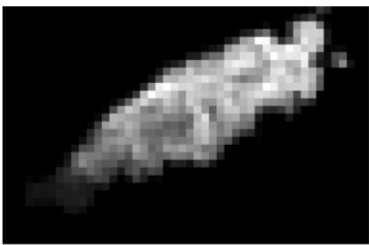
Alt



530

0

Slope



23

0

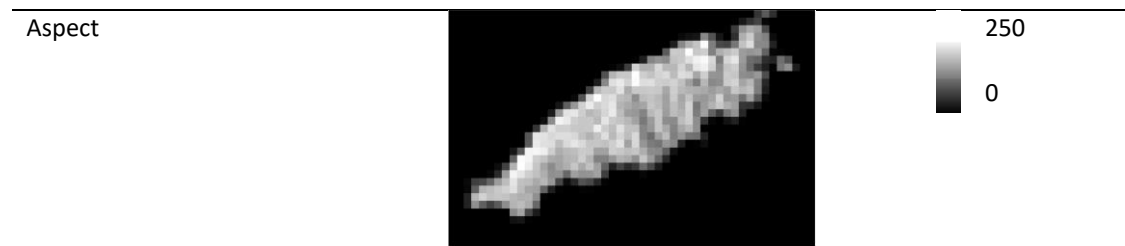
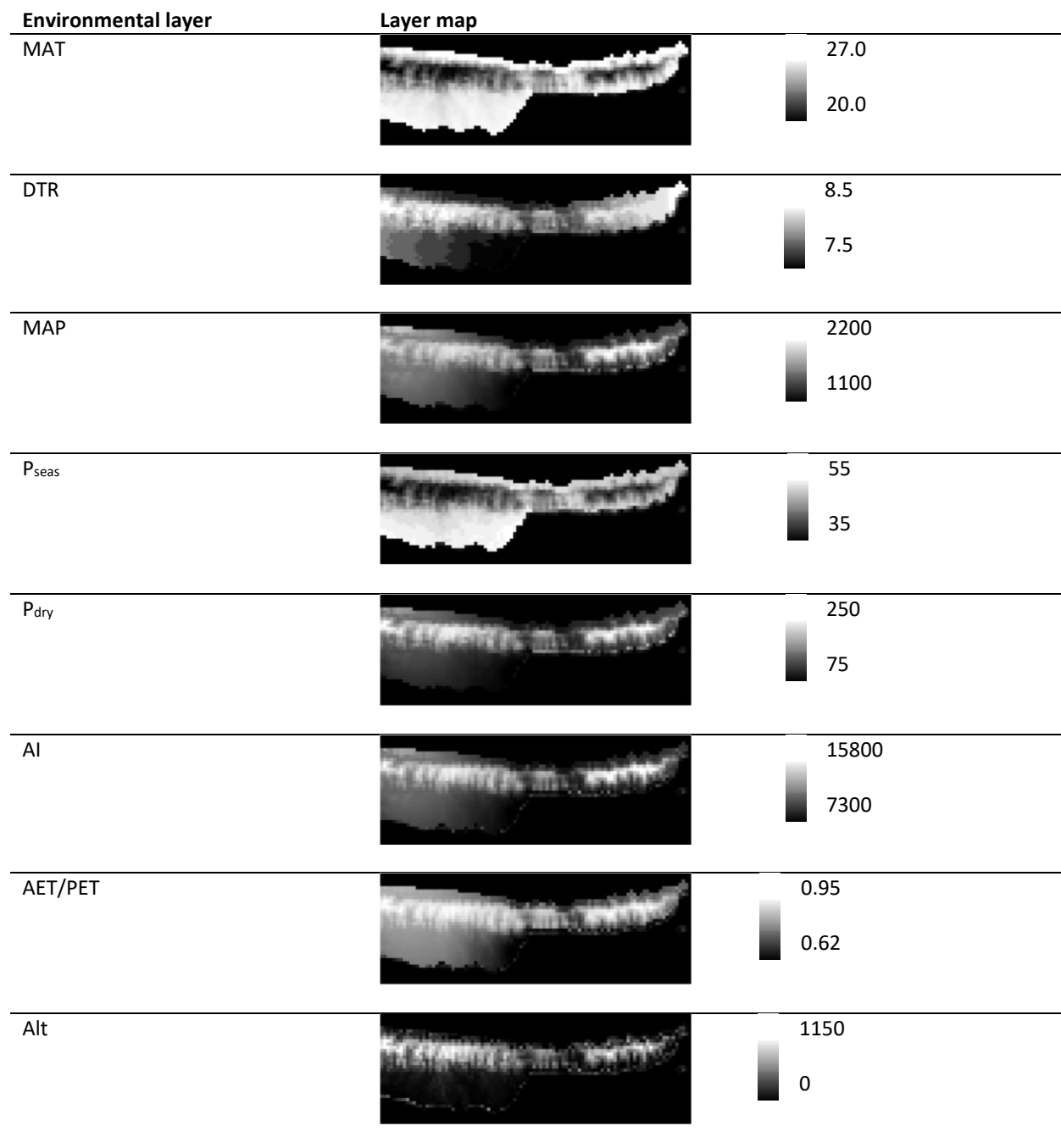
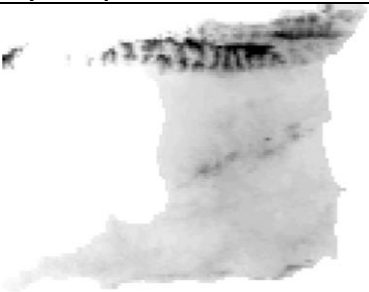


Table A6.4.2 Environmental layers for Tobago under present-day climatic conditions.



Slope		33 0
Aspect		300 0

Table A6.4.3 Environmental layers for the Paria Peninsula under present-day climatic conditions.

Environmental layer	Layer map	
MAT		29.0 23.0
DTR		..95 75
MAP		1620 790

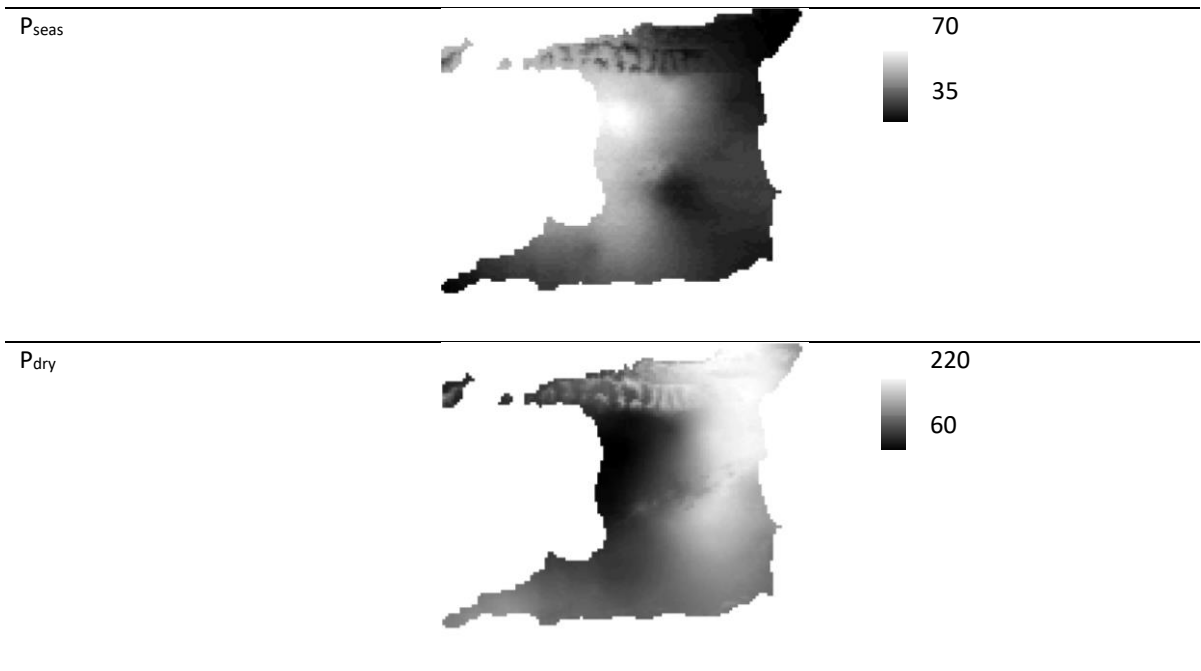
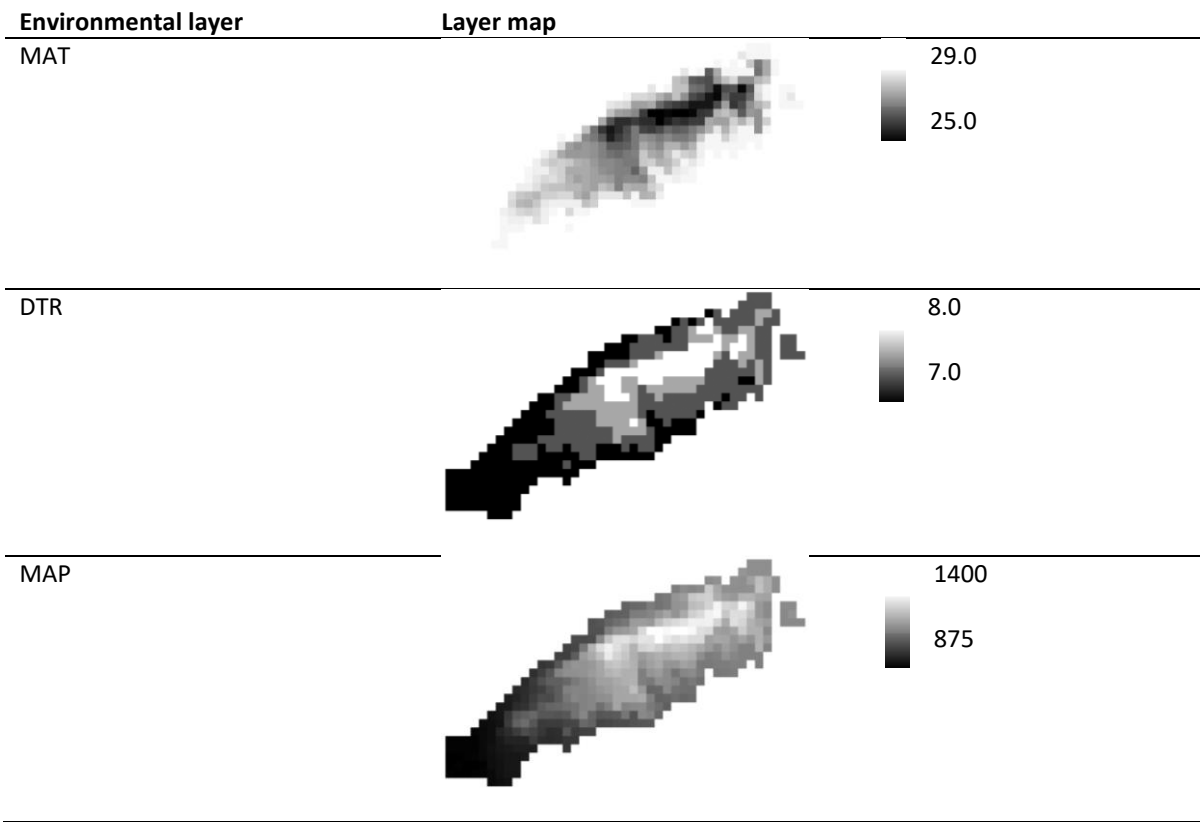


Table A6.4.4 Environmental layers for Trinidad under rcp85 2070 climatic scenario.



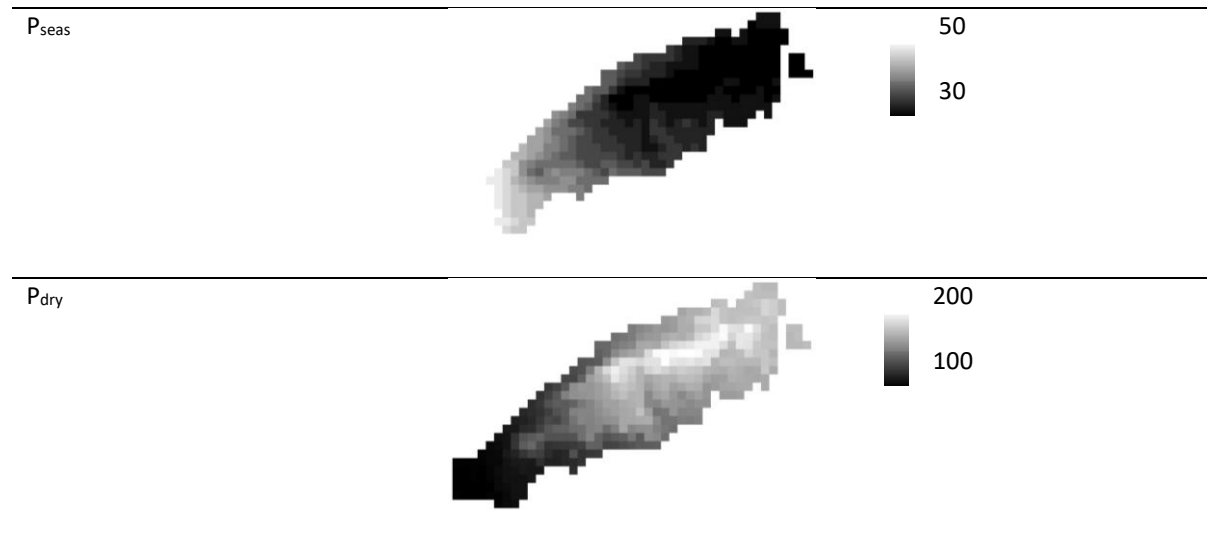


Table A6.4.5 Environmental layers for Tobago under rcp85 2070 climatic scenario.

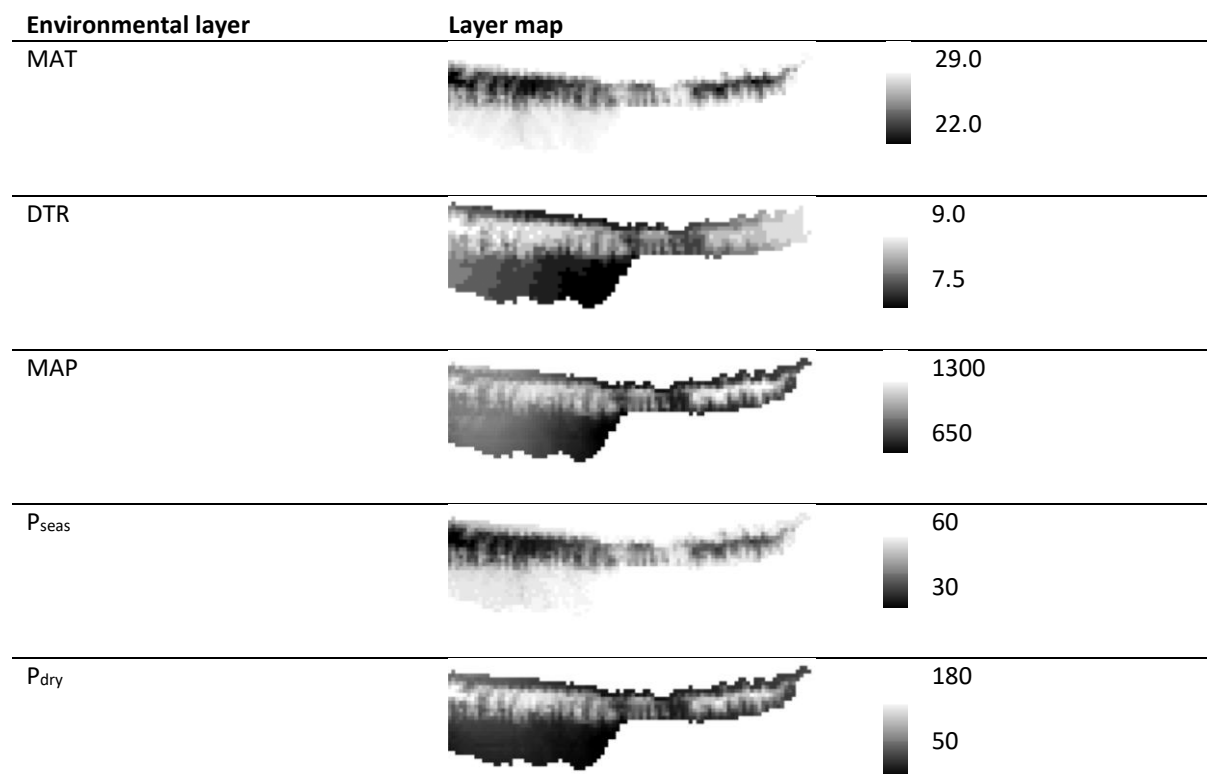


Table A6.4.6 Environmental layers for the Paria Peninsula under rcp85 2070 climatic scenario.

Appendix 6.5

A6.5.1 Vegtype classification of Trinidad vegetation

Vegtype	Helmer et al. (2012) name
1	<i>Coccoloba uvifera</i> (L.) L. – <i>Hippomane mancinella</i> L. DEF
2	<i>Roystonea oleracea</i> (Jacq.) O.F.Cook – <i>Manilkara bidentata</i> (A.DC.) A.Chev. DEF
3	<i>Machaerium biovulatum</i> – <i>Lonchocarpus punctatus</i> – <i>Bursera simaruba</i> DSF
4	<i>Tabebuia serratifolia</i> – <i>Protium guianense</i> and <i>Peltogyne floribunda</i> / <i>Tabebuia serratifolia</i> – <i>Protium guianense</i> DSF
5	<i>Peltogyne floribunda</i> – <i>Mouriri marshallii</i> Burt Davy and Sandwith SESF
6	<i>Trichilia pleeana</i> (A.Juss.) C.DC. – <i>Protium insigne</i> (Triana and Planch.) Engl. – <i>Guarea guidonia</i> SESF
7	<i>Brosimum alicastrum</i> Sw. – <i>Guarea guidonia</i> – <i>Ficus yoponensis</i> Desv. SESF
8	<i>Trichilia pleeana</i> – <i>Protium insigne</i> – <i>Guarea guidonia</i> SESF
9	<i>Aniba panuriensis</i> and <i>Aniba citrifolia</i> – <i>Carapa guianensis</i> / <i>Licania heteromorpha</i> ESF
10	<i>Aniba panuriensis</i> and <i>Aniba citrifolia</i> – <i>Carapa guianensis</i> – <i>Eschweilera subglandulosa</i> / <i>Pentaclethra macroloba</i> / <i>Attalea maripa</i> ESF
11	<i>Carapa guianensis</i> – <i>Pachira insignis</i> – <i>Eschweilera subglandulosa</i> / <i>Pentaclethra macroloba</i> / <i>Sabal</i> sp. ESF
12	<i>Eschweilera subglandulosa</i> – <i>Pachira insignis</i> – <i>Carapa guianensis</i> / <i>Clathrotropis brachypetala</i> (Tul.) Kleinhoonte / <i>Attalea maripa</i> ESF
13	<i>Mora excelsa</i> – <i>Carapa guianensis</i> / <i>Pentaclethra macroloba</i> ESF
14	Transitional Seasonal Evergreen – Lower Montane
15	<i>Byrsonima spicata</i> – <i>Licania ternatensis</i> – <i>Sterculia pruriens</i> LMF
16	<i>Inga macrophylla</i> – <i>Guarea guidonia</i> SMF
17	Transitional Lower Montane-Montane
18	<i>Richeria grandis</i> – <i>Eschweilera tenax</i> MCF
19	Young Secondary Forest
20	Young Secondary Forest and Abandoned or Semi-Active Woody Agriculture
21	<i>Hevea brasiliensis</i> (Willd. ex A.Juss.) Müll.Arg.
22	Secondary Forest- Former Coconut Plantation
23	<i>Bambusa vulgaris</i>
24	Mangrove
25	Palm Swamp- <i>Roystonea oleracea</i> or <i>Mauritia flexuosa</i> L.f.
26	Swamp Forest- <i>Pterocarpus officinalis</i> Jacq.
27	Swamp Forest – Cca Ecotone – <i>Carapa guianensis</i> – <i>Lonchocarpus sericeus</i> (Poir.) DC. – <i>Pterocarpus officinalis</i>
28	Other Woody Wetland
29	Marsh Forest – <i>Manicaria saccifera</i> Gaertn. – <i>Jessenia oligocarpa</i> Griseb. & H.Wendl. – <i>Euterpe precatoria</i> Mart.
30	Marsh Forest – Cco Ecotone
31	<i>Tectona grandis</i> Plantation
32	<i>Pinus caribaea</i> Plantation
33	Other Plantation
34	Wet Savanna, With or Without Shrubs
35	Herbaceous Wetland
36	Seasonally-Flooded Herbaceous Agriculture (Active or Inactive)
37	Active Woody Agriculture
38	Active Woody Agriculture- Coconut
39	Grassy Areas, Herbaceous Agriculture or Pasture (including former sugar cane)
40	Recently Inactive Sugar Cane
41	Low Density Urban
42	High-Medium Density Urban
43	Urban Grass
44	Coastal Sand and Rock
45	Quarry
46	Bare Ground
47	Water- Permanent
48	Pitch Lake
49	Sea

Table A6.5.1 Vegtype classification based on Helmer et al. (2012), with updated taxonomic nomenclature.

Appendix 6.6

A6.6.1 General observations from transects

Some general observations of the relationships between bromeliad distributions and forest structure and composition were made during field surveys. Patches of forest with abundant lianas typically harboured few epiphytic bromeliads, and very few were observed in palm-dominated forests. Only isolated individuals of *Guzmania monostachia* (L.) Rusby ex Mez, and no *Aechmea* bromeliads, were seen growing on bamboo. Epiphytes tended to occur in greater abundance in the vicinity of streams and seepages, where the ambient humidity was higher. This was especially true of the gallery forests south of the St David's Ridge in the Matura Forest area. Epiphytic bromeliad mortality was observed in a few instances of recent ground fire events, including on the north face of Morne Catherine.

Terrestrial individuals of *Ae. aquilega* were frequent in certain localities, being particularly abundant in the vicinity of the Hollis Reservoir. A few terrestrial individuals of *Ae. fendleri* were seen in montane forest, but these were generally much rarer and most appeared to be the result of branch-falls. Individuals of all *Aechmea* species showed a high degree of phenotypic plasticity, particularly with respect to foliar morphology and pigmentation. Shaded individuals tended to display longer, narrower leaves with reduced marginal spines, whereas exposed individuals had shorter, broader leaves with more pronounced spines and higher anthocyanin content. Plasticity was especially marked in *Ae. nudicaulis*, in which the morphology of the rosette varied from a tight tubular structure in exposed individuals to a lax arrangement with a high proportion of horizontal leaf surfaces in the most shaded individuals.

More detailed descriptions of field observations are given below, by area as shown in Fig. A6.6.1.

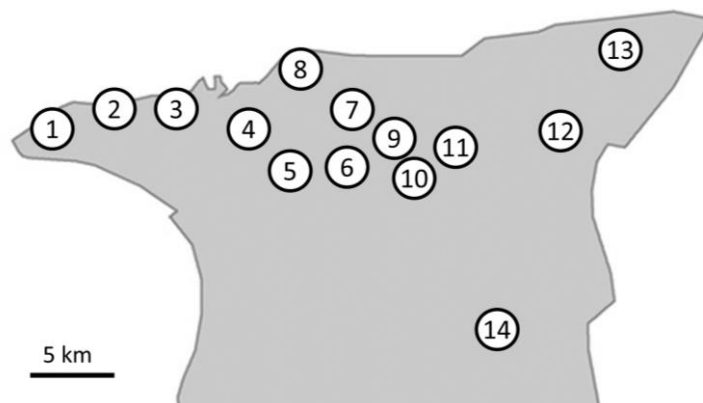


Figure A6.6.1. Distribution of geographical areas discussed in this appendix.

(1) *Chaguaramas Peninsula*

Towards the western end of the Chaguaramas peninsula (see Fig. 6.3.1 for geographical locations discussed throughout this section), *Ae. aquilega* and *Ae. nudicaulis* were common near sea-level in the vicinity of Chaguaramas and Point Gourde, as well as along the floor of the Tucker Valley up to Macqueripe. Although the ESF on the flanks of Morne Catherine (539 m) was generally dry, rich in lianas and poor in epiphytes, several clones of *Ae. aquilega* and *Ae. nudicaulis* were observed in the summit cap of LMF.

(2) *North coast between Chaguaramas Peninsula and Diego Martin*

Between Macqueripe at the head of the Tucker Valley and North Post at the head of the Diego Martin Valley only *Ae. nudicaulis* occurred (at low density) in the dry coastal forest composed of palms and *Ficus* spp. near Corozal Point. Above this, on the ridge of Pierre Knoll (ca. 500 m), no *Aechmea* bromeliads were observed, despite the presence of several high-density populations of *Lutheria splendens* in well-developed LMF. *Ae. aquilega* and *Ae. nudicaulis* occurred through the Diego Martin Valley as well as through the Morne Coco Valley. Only *Ae. nudicaulis* was observed above Port-of-Spain near Fort George, but *Ae. aquilega* occurred with *Ae. nudicaulis* on isolated trees throughout Port-of-Spain and Maraval.

(3) *North coast between Diego Martin and Maracas Bay*

Ae. fendleri was present alongside *Ae. aquilega* and *Ae. nudicaulis* in isolated trees at the top of the Fond Pois Doux Road (ca. 620 m) above St Cite Bay. *Ae. fendleri* was also observed in coastal LMF running down towards Paragrant Bay. Between La Vache Bay and Balata Bay, *Ae. fendleri* occurred on a N-S spur of the Main Ridge, with *Ae. aquilega* occurring around the Maracas Lookout below. Another large population of *Ae. fendleri* was found on the northern side of the col over the Main Ridge between Maracas Bay and the Santa Cruz Valley.

(4) *Saddle Road, Santa Cruz Valley, Maracas Valley and El Tucuche*

Ae. aquilega and *Ae. nudicaulis* were observed throughout the Saddle Valley and Santa Cruz Valley, as well as the La Canoa Valley, which branches off the latter. The same species were abundant in the Maracas Valley. Above Loango, near the head of this valley, *Ae. fendleri* was observed at 440 m and above, as was the case on a separate transect along the Hobal trail to the summit of El Tucuche. *Ae. fendleri* was observed in LMF on the northern side of the col from Loango to Las Cuevas until the trail dropped below 460 m. A second route to El Tucuche along the Old Road from the Bancal Road above Caurita provided numerous observations of *Ae. fendleri* and *Ae. nudicaulis* in LMF and MF

above 480 m. The southern portion of the ridge between the Santa Cruz and Maracas Valleys culminates in a summit of ca. 700 m. While the forest on the eastern (Maracas Valley) side has been largely destroyed, it remains intact on the western (Santa Cruz Valley) side, as well as along the top of the ridge. *Ae. fenderi* was observed above 600 m, while the highest specimen of *Ae. aquilega* observed on the western side occurred at 360 m.

(5) *Mount Tabor, Caura Valley and Lopinot Valley*

On the Mount Tabor/Mount St Benedict massif, only *Ae. nudicaulis* was observed throughout both the dry, palm-dominated secondary forest and the LMF at higher elevations. This was despite the presence of *Lutheria splendens*, a marker of wet LMF and MF generally found to co-occur with *Ae. fenderi* alongside a typical ground flora including *Renealmia thyrsoides* (Ruiz & Pav.) Poepp. & Endl. (Zingiberaceae), *Prestoea pubigera* (Griseb. & H.Wendl.) Hook.f ex Benth. & Hook.f (Arecaceae), and bryophytes such as *Leucobryum* sp. (Dicranaceae). The degree of disturbance at lower elevations may explain the apparent absence of *Ae. aquilega*; much of the vegetation consisted of razor-sedge, bamboo or burnt ground, with only a few scattered mature trees rich in lianas. *Ae. aquilega*, alongside *Ae. nudicaulis*, was nevertheless abundant along the floor of the Caura Valley. At the head of this valley, *Ae. fenderi* was observed below the Main Ridge at 420 m. The bromeliad flora followed roughly the same elevational pattern in the adjacent Lopinot Valley, with *Ae. aquilega* and *Ae. nudicaulis* along the valley floor and *Ae. fenderi* observed at the head of the valley from 500 m upwards. *Ae. fenderi* may have been able to survive slightly lower than this, but there was much clearance for cultivation in the upper Lopinot Valley. The highest point of the southern portion of the ridge between the Lopinot and Caura Valleys was approached from the Lopinot side, with the highest *Ae. aquilega* being observed at 440 m and *Ae. fenderi* above 560 m.

(6) *Arima Valley*

Ae. aquilega and *Ae. nudicaulis* were abundant in the floor of the Arima Valley. A transect over the ridge to the Lopinot Valley found *Ae. fenderi* above 390 m and another transect onto the opposing ridge above the Simla Research Station found *Ae. fenderi* above 410 m. *Ae. fenderi* became abundant on the Arima-Blanchisseuse Road above the Asa Wright Nature Centre at ca. 400 m. *Ae. fenderi* and *Ae. nudicaulis* were observed in the LMF along the Main Ridge at the top of the Lopinot and Arima Valleys, and into the MF on Morne Bleu. They did not, however, occur in the MF near the summit of Morne Bleu (i.e. above 800 m).

(7) *Brasso Seco and Morne La Croix*

On the north face of the Main Ridge beyond the Arima-Blanchisseuse Road col, *Ae. fendleri* transitioned into *Ae. aquilega* along the Paria-Morne Bleu Road at ca. 400 m. *Ae. aquilega* was abundant around Brasso Seco village. One isolated rosette of *Ae. fendleri* was observed along the Paria Bay trail from Brasso Seco. Three transects from Brasso Seco up onto the north face of the Main Ridge identified a transition from *Ae. aquilega* to *Ae. fendleri* between 280 m and 400 m. Along the Madamas Road, which follows a valley directly below the Main Ridge directly eastwards from Brasso Seco, *Ae. aquilega* and *Ae. nudicaulis* were abundant. One *Ae. fendleri* rosette was recorded at 180 m, and two transects along riverbeds leading up towards the Main Ridge identified a transition to *Ae. fendleri* dominance at 250 m. A transect from Morne La Croix up towards the Main Ridge above the head of the Caura Valley located the transition to *Ae. fendleri* in LMF at 340 m. *Ae. aquilega* and *Ae. nudicaulis* both occurred frequently along the Brasso Seco-Paria trail, and in the drier forest on a ridge of 340 m adjacent to this trail, only *Ae. aquilega* was observed.

(8) *Blanchisseuse and Las Cuevas*

Both *Ae. aquilega* and *Ae. nudicaulis* occurred around Blanchisseuse and along the north coast to Las Cuevas. These species were also common in the Rincon Valley south of Las Cuevas Bay and up to the Rincon Waterfall. On the headland between Las Cuevas and Maracas Bay, *Aechmea* bromeliads were absent.

(9) *Heights of Guanapo, La Laja and El Cerro del Aripo*

Both *Ae. aquilega* and *Ae. nudicaulis* occurred along the floor of the Heights of Guanapo. Transects between the bottom of the valley and La Laja (the col on the Main Ridge between Morne Bleu and El Cerro del Aripo) identified the transition from *Ae. aquilega* to *Ae. fendleri* at ca. 300 m. *Ae. fendleri* was abundant and *Ae. nudicaulis* was also observed as El Cerro del Aripo was approached from La Laja. However, in MF above 800 m, neither of these species was recorded. Above 860 m, *Ae. aripensis* was seen, including one rosette on the summit itself (940 m).

(10) *Heights of Aripo and Chaguaramal*

Ae. aquilega and *Ae. nudicaulis* were both common in the floor of the Heights of Aripo. Along the trail to the summit of Chaguaramal, the transition from *Ae. aquilega* to *Ae. fendleri* occurred at ca. 350 m. Above this, *Ae. fendleri* was abundant to the summit (859 m). On the eastern side of the Heights of Aripo, a transect onto the ridge below Morne Poui identified a transition from *Ae. aquilega* to *Ae. fendleri* at ca. 320 m.

(11) *Hollis, Cumaca and Platanal*

Along the road from Valencia to the Hollis Reservoir, *Ae. aquilega* and *Ae. nudicaulis* occurred frequently. At the dam (ca. 200 m), There were several rosettes of *Ae. fendleri* in isolated trees, alongside both *Ae. aquilega* and *Ae. nudicaulis*. Between the reservoir and the Morne Poui ridge, *Ae. fendleri* was common, and isolated rosettes of *Ae. aquilega* occurred up to 260 m. On the Cumaca Road to the east of Hollis, *Ae. aquilega* occurred at elevations up to 400 m, while *Ae. fendleri* was observed up to 440 m. Notably, *Ae. fendleri* occurred down to 115 m near the Oropouche River. *Ae. nudicaulis* was common throughout. At Platanal, below the St David's Ridge, only *Ae. nudicaulis* was recorded, although *Ae. dichlamydea* was observed at two locations on a spur of the St David's Ridge.

(12) *Matura forest region*

Ae. aquilega, *Ae. dichlamydea*, and *Ae. nudicaulis* all occurred around the estuary at Saline Bay, and were observed up to the margins of the monospecific mora forest, after which *Ae. aquilega* was no longer recorded. Along the Rio Seco (a major river in the mora forest), *Ae. nudicaulis* was frequent, and *Ae. dichlamydea* was occasionally observed. Transects between Gray Trace (Salybia) and Fig Walk River and between Mora Trace (Matura) and a ridge at ca. 250 m and 2 km east of Cumaca yielded similar results.

(13) *Redhead-Matelot*

Ae. aquilega and *Ae. nudicaulis* were abundant around the north-east coast between Redhead and Matelot. Several transects inland (Ravin Anglais, Grand Fond from L'Anse Noire, and inland from Sans Souci, Grande Riviere and Matelot) provided further records of these species as well as *Ae. dichlamydea*. *Ae. fendleri* was not observed in this region.

Along a N-S transect starting from the Dass Estate (Grande Riviere), *Ae. nudicaulis* and *Ae. dichlamydea* occurred infrequently, with high-density populations of *L. splendens* in the wetter areas of forest. No epiphytic bromeliads were observed in the dry secondary vegetation around Galera Point, a low-lying area formerly occupied by extensive coconut palm plantations.

(14) *Central Range and South*

In the Central Range, transects across Mount Tamana and Brigand Hill did not produce any observations of *Ae. fendleri*, and *Ae. aquilega* and *Ae. nudicaulis* were abundant from the base to the summit. In South Trinidad, transects along Saunders Trace (Rio Claro-Preau) and Edward Trace (Penal Rock-Guayaguayare) showed *Ae. aquilega* and *Ae. nudicaulis* were abundant through various types of lowland seasonal forest and plantations throughout this region. By contrast, almost no epiphytic bromeliads occurred in the palm-dominated vegetation of the east coast between La Savanne and Manzanilla Bay.

Appendix 6.7

A6.7.1 *Forecasting future potential distributions*

Forecast future potential distributions were projected for each species and geographical region. Forecasting was performed in MaxEnt using the same bioclimatic variables (MAT, DTR, MAP, P_{seas} , P_{dry}) estimated at 30 arc-second resolution for the year 2070 using the CCSM4 General Circulation Model and assuming the representative concentration pathway rcp85. This rcp was selected because it is a 'worst-case scenario' that should highlight the maximal potential effect of anthropogenic emissions on species distributions by the late 21st century. The 2070 bioclimate rasters for each region are displayed in Appendix 6.3. Other climatic layers estimated using comparable methods were not available, and vegtype, altitude, slope and aspect were not included in the model for forecasting because of the possibility that the nature of interactions between bioclimatic layers and these variables could differ significantly under the 2070 scenario.

Under the 2070 climate scenario, the area of suitable environmental space for *Ae. aquilega* is not expected to change considerably on Trinidad (Fig. A6.7.1a). There is a projected increase in P_{occ} at higher elevation in the Northern Range, and a slight diminution in P_{occ} across the lowland areas of the island. On Tobago, the improvement of environmental suitability along the Main Ridge is noticeable (Fig. A6.7.1b), and the same effect is in evidence in the projection for the Paria Peninsula (Fig. A6.7.1c).

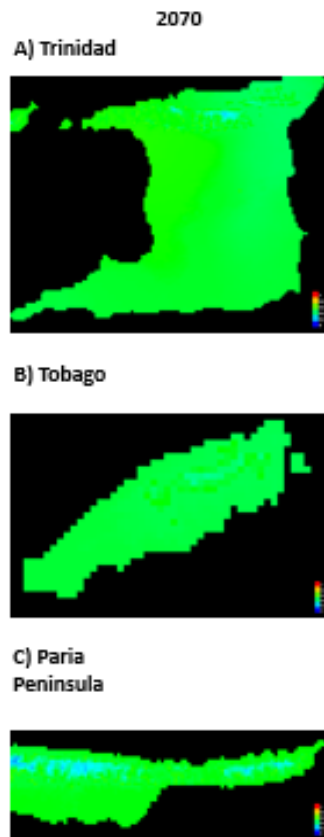


Figure A6.7.1 Projected probability distribution grid maps for *Ae. aquilega* under the rcp85 2070 climate scenario for a) Trinidad, b) Tobago and c) the Paria Peninsula.

There is a slight loss of projected P_{occ} for *Ae. dichlamydea* in northeast Trinidad under the 2070 scenario, but P_{occ} is projected to remain at 0.50 across large parts of this region (Fig. A6.7.2a). A widespread reduction of P_{occ} for *Ae. dichlamydea* is projected to occur across Tobago under the 2070 scenario, although P_{occ} is projected to remain above 0.60 across large areas in central and northern Tobago (Fig. A6.7.2b). P_{occ} is projected to decline substantially across the Paria Peninsula, with suitable environmental space contracting to the highest areas of the mountain chain (Fig. A6.7.2c).

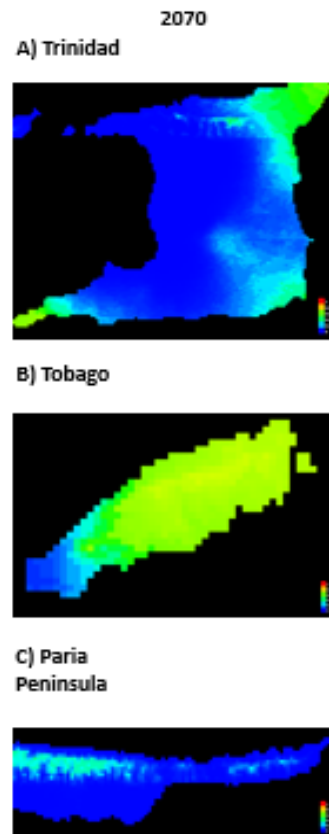


Figure A6.7.2 Projected probability distribution grid maps for *Ae. dichlamydea* under the rcp85 2070 climate scenario for a) Trinidad, b) Tobago and c) the Paria Peninsula.

The projected distribution of P_{occ} for *Ae. fendleri* in 2070 under the rcp85 scenario suggested a considerable reduction in the species' potential range in Trinidad (Fig. A6.7.3a). Only a few small patches of relatively low P_{occ} (~ 0.30) were projected on the Tucuche and Aripo massifs. Projected P_{occ} under the 2070 scenario was effectively zero across the whole of Tobago (A6.7.3b). A few patches with $P_{occ} \sim 0.30$ were projected to remain on the Paria Peninsula (Fig. A6.7.3c).

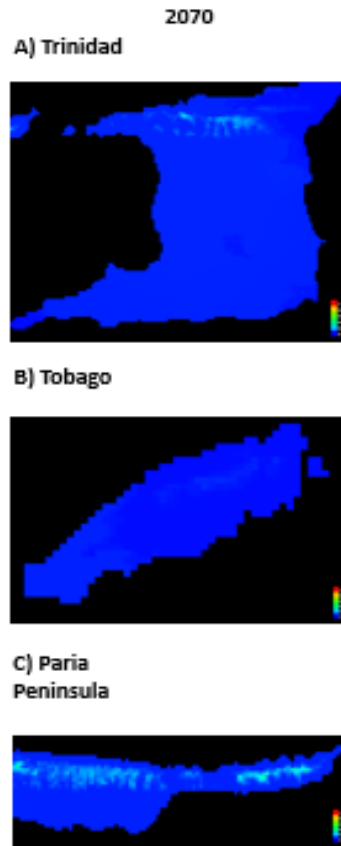


Figure A6.7.3 Projected probability distribution grid maps for *Ae. fenderi* under the rcp85 2070 climate scenario for a) Trinidad, b) Tobago, and c) the Paria Peninsula.

The projected 2070 suitability for *Ae. nudicaulis* of the northeastern and southwestern corners of Trinidad (Fig. A6.7.4a) and the southern plain of the Paria Peninsula (Fig. A6.7.4c) is slightly reduced ($P_{occ} = 0.20-0.40$), whereas in Tobago there is less of an effect (Fig. A6.7.4b).

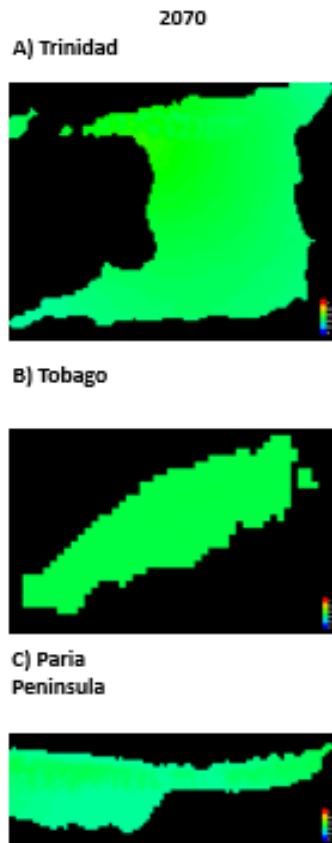


Figure A6.7.4. Projected probability distribution grid maps for *Ae. nudicaulis* under the rcp85 2070 climate scenario for a) Trinidad, b) Tobago and c) the Paria Peninsula.

Projection of bioclimatic envelope migration is contingent upon many assumptions, and should always be interpreted with care (Pearson and Dawson, 2003; Hijmans et al., 2006). However, the attempt to make projections for these species here was spurred on by the observation made during field surveys that *Ae. fendleri* was now absent on Tamana, the highest summit of the Central Range, where it had previously been recorded (Appendix 6.2). When considered alongside anecdotal and published evidence of changing precipitation and temperature regimes in Trinidad (Singh, 1997a, 1997b; Stephenson et al., 2014; Beharry et al., 2015; Jones et al., 2016), this suggests that climate change could already be having an impact on bromeliad species distributions. This would be consistent with the often-discussed potential of vascular epiphytes as climate change indicator species (Lugo and Scatena, 1992; Benzing, 1998; Nadkarni and Solano, 2002; Zotz and Bader, 2009; Hsu et al., 2012). Recent climate modelling studies have projected changes in temperature regime and a potential reduction of May-October precipitation of up to 35% across the Caribbean by 2071-2100 (Campbell et al., 2011; Hall et al., 2013; Taylor et al., 2013), and the impact of climate change on species' ecophysiological performance and the geographical distribution of potential niche space is likely to intensify.

The projections produced using the SDMs elaborated here suggest that, under the assumptions of the rcp85 scenario and CCSM4 GCM, by 2070 there could be a complete loss of suitable climate space for *Ae. fenderi* in both the Northern Range of Trinidad and the Paria Peninsula. Although the species occurs in a few other scattered localities along the Coastal Cordillera of Venezuela, these populations occupy the same bioclimatic envelope and may therefore suffer a similar loss of suitable habitat. In the Trinidadian context, the projections hint at a minimal enhancement of the suitability of some adjacent low-elevation regions by 2070, but since this effect is so small and much of this area is subject to extensive human disturbance, it is unlikely to provide alternative habitat for *Ae. fenderi*. If these projected climatic changes do occur in Trinidad and *Ae. fenderi* cannot show sufficiently rapid acclimation or adaptation, it is therefore highly likely that the species will go locally extinct, with similar outcomes being probable for mainland populations.

Climate change is expected to have a particularly strong impact on tropical montane forest diversity and function (Foster, 2001; Nadkarni and Solano, 2002), and the results of this investigation demonstrate how this could operate the species-level. Trait-mediated physiological sensitivity to climatic factors defines the narrow geographical ranges of species such as *Ae. fenderi*, which may promote niche segregation and species coexistence across topographically and climatically complex landscapes, but increase species' vulnerability to rapid change in the environment. Upslope extinction chains are therefore likely consequences of climate change on tropical mountain ranges (Raxworthy et al., 2008; Jump et al., 2012), especially given the probable migration lag (Corlett and Westcott, 2013). Current protected area networks may be of little use in mitigating this effect (Ponce-Reyes et al., 2012). Unlike in high elevation continental cordilleras such as the Andes, where thoughtful land-use policies could assist upslope migration of forest species as climate change effects advance (Feeley and Silman, 2010), in Trinidad there is no possibility of upslope migration because of the small stature of the Northern Range.

None of the *Aechmea* species discussed here has been assessed for conservation status by the International Union for the Conservation of Nature (IUCN, 2016). The results of species distribution projection for the 2070 rcp85 scenario suggest that the location and extent of bioclimatically suitable areas of Trinidad and Tobago for these species could be subject to extreme change by the end of this century, with *Ae. fenderi* likely to lose as much as 100% of its environmentally suitable habitat on Trinidad. *Ae. dichlamydea* var. *trinitensis*, is also likely to be negatively impacted, which may be of special concern since this taxon is endemic to Trinidad and has already suffered extensive loss of habitat through the conversion of large areas of mora forest around Matura to coniferous forestry plantations. At least in qualitative terms, these projections should be taken into account by policy-makers designing measures for the future conservation of Trinidad's fragile natural heritage.

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Appendix 6.8

A6.8.1 Structural-functional responses to progressive drought

Aechmea aquilega

Day	Fv/Fm	ΔH^+ (mmol m ⁻²)	$A_{\max}$ (μmol m ⁻² s ⁻¹)	Recycling (%)	E (mol m ⁻² s ⁻¹)	Ψ_{leaf} (MPa)	WUE (μmol mol ⁻¹)
0	0.70 ± 0.03	230 ± 4	2.3 ± 0.1	8.7 ± 0.2	0.010 ± 0.002	-0.22 ± 0.01	230 ± 6
4	0.59 ± 0.01	216 ± 5	2.1 ± 0.1	13.0 ± 0.5	0.008 ± 0.001	-0.25 ± 0.02	263 ± 7
8	0.58 ± 0.03	204 ± 6	1.8 ± 0.2	20.6 ± 1.3	0.007 ± 0.001	-0.28 ± 0.02	257 ± 5
12	0.50 ± 0.03	196 ± 5	1.6 ± 0.1	25.5 ± 2.8	0.006 ± 0.001	-0.31 ± 0.03	267 ± 8
16	0.48 ± 0.04	186 ± 3	1.4 ± 0.1	35.5 ± 3.4	0.006 ± <0.001	-0.33 ± 0.01	233 ± 4
20	0.46 ± 0.05	180 ± 7	1.3 ± <0.1	38.9 ± 2.5	0.005 ± <0.001	-0.35 ± 0.02	260 ± 6
24	0.45 ± 0.03	169 ± 2	1.1 ± <0.1	45.6 ± 2.1	0.004 ± <0.001	-0.38 ± 0.02	275 ± 4
28	0.42 ± 0.02	159 ± 6	0.9 ± <0.1	50.9 ± 3.6	0.005 ± <0.001	-0.40 ± 0.01	180 ± 5
32	0.40 ± 0.05	134 ± 4	0.6 ± <0.1	61.2 ± 2.1	0.004 ± <0.001	-0.41 ± 0.02	150 ± 7
36	0.40 ± 0.02	126 ± 4	0.5 ± <0.1	66.7 ± 1.8	0.003 ± <0.001	-0.43 ± 0.02	167 ± 3
40	0.36 ± 0.02	118 ± 7	0.4 ± <0.1	72.9 ± 2.9	0.003 ± <0.001	-0.46 ± 0.01	133 ± 4
44	0.35 ± 0.02	110 ± 4	0.2 ± <0.1	78.2 ± 4.0	0.002 ± <0.001	-0.51 ± 0.03	100 ± 6
48	0.33 ± 0.03	101 ± 7	0.1 ± <0.1	84.2 ± 2.3	0.002 ± <0.001	-0.56 ± 0.02	50 ± 4
52	0.31 ± 0.01	95 ± 3	0	100.0	0.001 ± <0.001	-0.60 ± 0.02	0
56	0.30 ± 0.01	92 ± 2	0	100.0	0	-0.67 ± 0.03	0
60	0.27 ± 0.02	94 ± 2	0	100.0	0	-0.75 ± 0.01	0

Table A6.8.1. Responses of mean (± SE) values of physiological and anatomical quantities to progressive drought in *Ae. aquilega*. Fv/Fm = maximum quantum yield of PSII; ΔH^+ = nocturnal acid accumulation; $A_{\max}$ = maximum photosynthetic capacity; E = transpiration rate; Ψ_{leaf} = leaf water potential; WUE = instantaneous water-use efficiency.

Day	T ₅₀ (°C)	<i>g_s</i> (mol m ⁻² s ⁻¹)	<i>g_m</i> (mol m ⁻² s ⁻¹)	<i>t_{chlor}</i> (μm)	<i>t_{hyd}: t_{chlor}</i>	LER (mm d ⁻¹)	<i>R_D</i> (μmol m ⁻² s ⁻¹)
0	46.3 ± 0.2	0.016 ± 0.001	0.010 ± <0.001	524 ± 5	0.34 ± 0.02	0.42 ± 0.03	0.35 ± 0.02
4	45.4 ± 0.1	0.014 ± 0.001	0.009 ± <0.001	518 ± 4	0.28 ± 0.03	0.40 ± 0.02	0.34 ± 0.02
8	44.6 ± 0.1	0.012 ± 0.001	0.009 ± <0.001	516 ± 7	0.26 ± 0.02	0.38 ± 0.03	0.34 ± 0.02
12	44.1 ± 0.1	0.011 ± 0.001	0.007 ± <0.001	504 ± 9	0.22 ± 0.01	0.37 ± 0.02	0.33 ± 0.03
16	43.7 ± 0.2	0.009 ± 0.001	0.008 ± <0.001	487 ± 5	0.20 ± 0.01	0.35 ± 0.03	0.34 ± 0.03
20	43.0 ± 0.2	0.008 ± <0.001	0.007 ± <0.001	466 ± 3	0.18 ± 0.01	0.32 ± 0.02	0.32 ± 0.02
24	42.5 ± 0.1	0.007 ± <0.001	0.006 ± <0.001	461 ± 6	0.16 ± <0.01	0.30 ± 0.03	0.31 ± 0.01
28	41.9 ± 0.1	0.005 ± <0.001	0.007 ± <0.001	452 ± 6	0.15 ± <0.01	0.29 ± 0.01	0.31 ± 0.03
32	41.4 ± 0.2	0.003 ± <0.001	0.007 ± <0.001	447 ± 4	0.13 ± <0.01	0.26 ± 0.02	0.30 ± 0.02
36	40.8 ± 0.1	0.002 ± <0.001	0.006 ± <0.001	440 ± 5	0.12 ± <0.01	0.27 ± 0.01	0.31 ± 0.01
40	40.2 ± 0.1	0.002 ± <0.001	0.005 ± <0.001	436 ± 6	0.11 ± <0.01	0.24 ± 0.01	0.29 ± 0.02
44	39.8 ± 0.1	0.001 ± <0.001	0.006 ± <0.001	431 ± 3	0.10 ± <0.01	0.23 ± 0.02	0.30 ± 0.02
48	39.3 ± 0.2	0.001 ± <0.001	0.005 ± <0.001	426 ± 7	0.08 ± <0.01	0.21 ± 0.01	0.29 ± 0.01
52	38.8 ± 0.1	0	-	423 ± 5	0.06 ± <0.01	0.20 ± 0.01	0.28 ± 0.02
56	38.4 ± 0.1	0	-	418 ± 4	0.05 ± <0.01	0.18 ± 0.01	0.27 ± 0.02
60	37.6 ± 0.1	0	-	413 ± 3	0.04 ± <0.01	0.17 ± 0.01	0.28 ± 0.02

Table A6.8.2. Responses of mean (± SE) values of physiological and anatomical quantities to progressive drought in *Ae. aquilega* (cont.). T₅₀ = temperature at 50% loss operating efficiency of PSII; *g_s* = stomatal conductance; *g_m* = mesophyll conductance to CO₂; *t_{chlor}* = thickness of chlorenchyma; *t_{hyd}: t_{chlor}* = ratio of hydrenchyma to chlorenchyma thickness; LER = leaf elongation rate; *R_D* = dark respiration.

Aechmea fendleri

Day	Fv/Fm	ΔH^+ (mmol m ⁻²)	$A_{\max}$ (μmol m ⁻² s ⁻¹)	Recycling (%)	E (mol m ⁻² s ⁻¹)	Ψ_{leaf} (MPa)	WUE (μmol mol ⁻¹)
0	0.76 ± 0.02	258 ± 8	2.6 ± 0.2	5.4 ± 0.2	0.013 ± 0.001	-0.17 ± 0.01	200 ± 9
4	0.62 ± 0.03	244 ± 6	2.3 ± 0.1	14.8 ± 0.3	0.011 ± 0.001	-0.19 ± 0.02	209 ± 7
8	0.54 ± 0.02	231 ± 7	1.9 ± 0.1	23.8 ± 1.4	0.010 ± <0.001	-0.23 ± 0.01	190 ± 5
12	0.51 ± 0.02	216 ± 4	1.6 ± 0.1	32.4 ± 2.2	0.009 ± <0.001	-0.25 ± 0.03	178 ± 6
16	0.47 ± 0.03	201 ± 8	1.4 ± 0.1	38.3 ± 1.7	0.008 ± <0.001	-0.28 ± 0.02	175 ± 8
20	0.41 ± 0.02	188 ± 6	1.2 ± <0.1	44.7 ± 4.6	0.006 ± <0.001	-0.31 ± 0.03	200 ± 4
24	0.39 ± 0.03	176 ± 5	0.8 ± <0.1	53.4 ± 3.7	0.005 ± <0.001	-0.36 ± 0.02	160 ± 6
28	0.36 ± 0.03	154 ± 4	0.6 ± <0.1	61.0 ± 2.9	0.003 ± <0.001	-0.41 ± 0.04	200 ± 7
32	0.32 ± 0.02	132 ± 6	0.4 ± <0.1	68.2 ± 5.1	0.003 ± <0.001	-0.46 ± 0.03	133 ± 4
36	0.30 ± 0.01	117 ± 5	0.3 ± <0.1	77.8 ± 2.2	0.002 ± <0.001	-0.51 ± 0.02	150 ± 8
40	0.28 ± 0.02	103 ± 6	0.1 ± <0.1	92.2 ± 1.4	0.001 ± <0.001	-0.58 ± 0.03	100 ± 4
44	0.25 ± 0.01	88 ± 7	0	100.0	0	-0.69 ± 0.04	0
48	0.22 ± 0.02	72 ± 5	0	100.0	0	-0.78 ± 0.03	0
52	0.20 ± 0.02	64 ± 5	0	100.0	0	-0.89 ± 0.03	0
56	0.18 ± 0.01	61 ± 6	0	100.0	0	-1.00 ± 0.03	0
60	0.16 ± 0.01	56 ± 5	0	100.0	0	-1.17 ± 0.05	0

Table A6.8.3. Responses of mean (± SE) values of physiological and anatomical quantities to progressive drought in *Ae. fendleri*. Fv/Fm = maximum quantum yield of PSII; ΔH^+ = nocturnal acid accumulation; $A_{\max}$ = maximum photosynthetic capacity; E = transpiration rate; Ψ_{leaf} = leaf water potential; WUE = instantaneous water-use efficiency.

Day	T ₅₀ (°C)	<i>g_s</i> (mol m ⁻² s ⁻¹)	<i>g_m</i> (mol m ⁻² s ⁻¹)	<i>t_{chlor}</i> (μm)	<i>t_{hyd}</i> : <i>t_{chlor}</i>	LER (mm d ⁻¹)	<i>R_D</i> (μmol m ⁻² s ⁻¹)
0	41.1 ± 0.1	0.011 ± 0.001	0.014 ± <0.001	472 ± 8	0.26 ± 0.02	0.47 ± 0.03	0.32 ± 0.02
4	40.4 ± 0.2	0.010 ± <0.001	0.012 ± <0.001	451 ± 5	0.23 ± 0.01	0.41 ± 0.1	0.30 ± 0.02
8	39.5 ± 0.2	0.009 ± <0.001	0.010 ± <0.001	440 ± 7	0.20 ± 0.01	0.38 ± 0.01	0.29 ± 0.02
12	39.1 ± 0.2	0.007 ± <0.001	0.009 ± <0.001	428 ± 4	0.16 ± 0.02	0.35 ± 0.02	0.28 ± 0.01
16	38.2 ± 0.1	0.006 ± <0.001	0.008 ± <0.001	419 ± 6	0.12 ± 0.01	0.32 ± 0.02	0.27 ± 0.02
20	37.4 ± 0.2	0.004 ± <0.001	0.008 ± <0.001	411 ± 5	0.09 ± 0.01	0.28 ± 0.01	0.26 ± 0.02
24	36.6 ± 0.2	0.003 ± <0.001	0.007 ± <0.001	400 ± 6	0.07 ± <0.01	0.25 ± 0.02	0.26 ± 0.01
28	36.1 ± 0.1	0.002 ± <0.001	0.006 ± <0.001	392 ± 6	0.05 ± <0.01	0.22 ± 0.01	0.24 ± 0.02
32	35.6 ± 0.1	0.002 ± <0.001	0.006 ± <0.001	385 ± 6	0.04 ± <0.01	0.19 ± 0.01	0.24 ± 0.03
36	35.0 ± 0.2	0.001 ± <0.001	0.005 ± <0.001	374 ± 4	0.03 ± <0.01	0.17 ± 0.01	0.23 ± 0.01
40	34.7 ± 0.3	0.001 ± <0.001	0.005 ± <0.001	369 ± 5	0.03 ± <0.01	0.15 ± 0.01	0.22 ± 0.01
44	34.2 ± 0.1	0	-	363 ± 3	0.02 ± <0.01	0.12 ± <0.01	0.21 ± 0.01
48	33.8 ± 0.1	0	-	358 ± 4	0.02 ± <0.01	0.08 ± <0.01	0.22 ± 0.02
52	33.4 ± 0.1	0	-	352 ± 5	0.02 ± <0.01	0.05 ± <0.01	0.21 ± 0.01
56	33.0 ± 0.2	0	-	347 ± 4	0.02 ± <0.01	0.02 ± <0.01	0.20 ± 0.02
60	32.2 ± 0.1	0	-	341 ± 3	0.02 ± <0.01	0.01 ± <0.01	0.19 ± 0.01

Table A6.8.4. Responses of mean (± SE) values of physiological and anatomical quantities to progressive drought in *Ae. fenderi* (cont.). T₅₀ = temperature at 50% loss operating efficiency of PSII; *g_s* = stomatal conductance; *g_m* = mesophyll conductance to CO₂; *t_{chlor}* = thickness of chlorenchyma; *t_{hyd}*: *t_{chlor}* = ratio of hydrenchyma to chlorenchyma thickness; LER = leaf elongation rate; *R_D* = dark respiration.

Aechmea nudicaulis

Day	Fv/Fm	ΔH^+ (mmol m ⁻²)	$A_{\max}$ (μmol m ⁻² s ⁻¹)	Recycling (%)	E (mol m ⁻² s ⁻¹)	Ψ_{leaf} (MPa)	WUE (μmol mol ⁻¹)
0	0.74 ± 0.03	158 ± 7	2.1 ± 0.1	21.5 ± 1.2	0.008 ± <0.001	-0.10 ± 0.01	263 ± 7
4	0.68 ± 0.02	153 ± 6	2.0 ± 0.1	21.6 ± 0.9	0.007 ± <0.001	-0.24 ± 0.01	286 ± 8
8	0.63 ± 0.04	147 ± 4	1.8 ± 0.1	23.8 ± 1.1	0.007 ± <0.001	-0.33 ± 0.02	257 ± 5
12	0.60 ± 0.03	145 ± 5	1.7 ± 0.1	31.0 ± 2.7	0.006 ± <0.001	-0.40 ± 0.02	283 ± 4
16	0.58 ± 0.05	138 ± 4	1.6 ± 0.2	37.7 ± 3.7	0.006 ± <0.001	-0.42 ± 0.03	267 ± 7
20	0.56 ± 0.03	140 ± 6	1.5 ± 0.1	45.7 ± 4.2	0.005 ± <0.001	-0.46 ± 0.02	300 ± 8
24	0.53 ± 0.02	137 ± 6	1.4 ± 0.1	50.4 ± 3.8	0.005 ± <0.001	-0.50 ± 0.02	280 ± 6
28	0.51 ± 0.05	131 ± 4	1.4 ± <0.1	52.7 ± 2.8	0.005 ± <0.001	-0.53 ± 0.02	280 ± 7
32	0.48 ± 0.04	134 ± 6	1.3 ± <0.1	61.2 ± 3.6	0.004 ± <0.001	-0.58 ± 0.03	325 ± 8
36	0.46 ± 0.02	128 ± 4	1.2 ± <0.1	65.6 ± 4.5	0.004 ± <0.001	-0.60 ± 0.02	300 ± 6
40	0.45 ± 0.03	120 ± 3	1.2 ± <0.1	66.7 ± 4.9	0.003 ± <0.001	-0.62 ± 0.03	400 ± 7
44	0.43 ± 0.04	117 ± 5	1.2 ± <0.1	65.8 ± 3.2	0.003 ± <0.001	-0.64 ± 0.02	400 ± 8
48	0.41 ± 0.02	113 ± 3	1.1 ± <0.1	66.4 ± 2.6	0.002 ± <0.001	-0.65 ± 0.02	550 ± 5
52	0.38 ± 0.03	105 ± 2	1.0 ± <0.1	67.6 ± 4.6	0.002 ± <0.001	-0.67 ± 0.04	500 ± 8
56	0.37 ± 0.02	109 ± 4	0.9 ± <0.1	70.6 ± 1.8	0.002 ± <0.001	-0.69 ± 0.03	450 ± 9
60	0.35 ± 0.02	104 ± 4	0.9 ± <0.1	73.1 ± 2.5	0.002 ± <0.001	-0.72 ± 0.02	450 ± 6

Table A6.8.5. Responses of mean (± SE) values of physiological and anatomical quantities to progressive drought in *Ae. nudicaulis*. Fv/Fm = maximum quantum yield of PSII; ΔH^+ = nocturnal acid accumulation; $A_{\max}$ = maximum photosynthetic capacity; E = transpiration rate; Ψ_{leaf} = leaf water potential; WUE = instantaneous water-use efficiency.

Day	T ₅₀ (°C)	<i>g_s</i> (mol m ⁻² s ⁻¹)	<i>g_m</i> (mol m ⁻² s ⁻¹)	<i>t_{chlor}</i> (μm)	<i>t_{hyd}</i> : <i>t_{chlor}</i>	LER (mm d ⁻¹)	<i>R_D</i> (μmol m ⁻² s ⁻¹)
0	51.2 ± 0.2	0.014 ± <0.001	0.009 ± <0.001	755 ± 7	0.68 ± 0.03	0.33 ± 0.02	0.37 ± 0.02
4	50.7 ± 0.2	0.013 ± <0.001	0.008 ± <0.001	742 ± 6	0.60 ± 0.02	0.32 ± 0.02	0.36 ± 0.03
8	50.2 ± 0.1	0.012 ± <0.001	0.008 ± <0.001	738 ± 8	0.55 ± 0.02	0.30 ± 0.02	0.36 ± 0.02
12	49.7 ± 0.1	0.011 ± <0.001	0.007 ± <0.001	726 ± 5	0.47 ± 0.03	0.29 ± 0.02	0.35 ± 0.01
16	49.4 ± 0.2	0.010 ± <0.001	0.007 ± <0.001	717 ± 6	0.41 ± 0.02	0.29 ± 0.01	0.36 ± 0.02
20	49.1 ± 0.1	0.010 ± <0.001	0.007 ± <0.001	709 ± 3	0.38 ± 0.02	0.28 ± 0.02	0.36 ± 0.03
24	48.7 ± 0.1	0.009 ± <0.001	0.007 ± <0.001	688 ± 6	0.35 ± 0.02	0.26 ± 0.03	0.34 ± 0.02
28	48.3 ± 0.1	0.008 ± <0.001	0.006 ± <0.001	684 ± 5	0.30 ± 0.01	0.26 ± 0.01	0.35 ± 0.02
32	47.8 ± 0.2	0.008 ± <0.001	0.006 ± <0.001	673 ± 7	0.27 ± 0.02	0.24 ± 0.01	0.34 ± 0.01
36	47.4 ± 0.1	0.007 ± <0.001	0.006 ± <0.001	670 ± 4	0.24 ± 0.01	0.25 ± 0.02	0.33 ± 0.03
40	47.2 ± 0.1	0.006 ± <0.001	0.006 ± <0.001	666 ± 6	0.22 ± 0.02	0.24 ± 0.02	0.32 ± 0.02
44	46.8 ± 0.2	0.006 ± <0.001	0.005 ± <0.001	662 ± 7	0.20 ± 0.01	0.23 ± 0.02	0.32 ± 0.02
48	46.5 ± 0.1	0.005 ± <0.001	0.005 ± <0.001	658 ± 6	0.17 ± 0.01	0.22 ± 0.02	0.31 ± 0.03
52	46.3 ± 0.1	0.004 ± <0.001	0.004 ± <0.001	651 ± 8	0.15 ± 0.01	0.21 ± 0.01	0.30 ± 0.02
56	46.2 ± 0.1	0.004 ± <0.001	0.004 ± <0.001	648 ± 6	0.13 ± 0.01	0.21 ± 0.01	0.30 ± 0.03
60	46.2 ± 0.1	0.003 ± <0.001	0.004 ± <0.001	643 ± 7	0.12 ± 0.01	0.20 ± 0.01	0.29 ± 0.02

Table A6.8.6. Responses of mean (± SE) values of physiological and anatomical quantities to progressive drought in *Ae. nudicaulis* (cont.). T₅₀ = temperature at 50% loss operating efficiency of PSII; *g_s* = stomatal conductance; *g_m* = mesophyll conductance to CO₂; *t_{chlor}* = thickness of chlorenchyma; *t_{hyd}*: *t_{chlor}* = ratio of hydrenchyma to chlorenchyma thickness; LER = leaf elongation rate; *R_D* = dark respiration.

Appendix 6.9

A6.9.1 Additional factors possibly involved in *Aechmea* niche differentiation

Implicit in the work presented here is the assumption that physiological factors are major drivers of the distributions of bromeliad species in Trinidad. The clear relationships between the distributions of *Ae. aquilega*, *Ae. dichlamydea* and *Ae. fendleri* and climatic variables demonstrated in our presence data are consistent with this assumption, and the corresponding divergences in environmental tolerances between the species uncovered by physiological characterisation make this case highly compelling. However, it is important to note that alongside these interactions with abiotic factors, biotic considerations could also play a role in shaping regional species distributions. Two key phenomena which could be involved, pollination and dispersal, are briefly discussed here. Only sporadic reports are available from which to piece together a picture of the pollination biology of the Trinidadian bromeliads. Snow and Snow (1972) reported that floral visitors of *Ae. fendleri* include the copper-rumped hummingbird (*Amazilia tobaci* Gmelin) and the rufous-breasted hermit (*Glaucis hirsutus* Gmelin). The same authors observed visits to *Ae. dichlamydea* by the same species, while *Ae. nudicaulis* was frequented by *A. tobaci*, the white-chested emerald (*A. brevirostris* Lesson) and the little hermit (*Phaethornis longuemareus* Lesson). *Ae. aquilega* was visited by the widest range of species: *A. brevirostris*, *A. tobaci*, *G. hirsutus*, *P. longuemareus* and the green hermit (*P. guy* Lesson). In a study conducted in the forest of Cerro Copey on Isla Margarita (Venezuela), de Enrech and Madriz (1994) recorded pollination of *Ae. fendleri* by unspecified birds, and a butterfly of the nymphalid genus *Caligo* Hübner (owl butterflies). *Ae. nudicaulis* was the most generalist bromeliad in terms of pollination in a study by Piacentini and Varassin (2007) in southern Brazil. More generally, prezygotic barriers appear to be very weak between many bromeliad species (Wendt et al., 2008). Although it is far from possible to provide a comprehensive description of the pollination biology of the Trinidadian *Aechmea* species, the observations of relatively relaxed pollination syndromes and the sharing of widely-distributed pollinators suggest that the availability of pollinators is unlikely to be a significant factor in shaping the distributions of these bromeliads in Trinidad.

Seed dispersal is even less well documented than pollination. During the course of the field surveys made during this investigation, observations were made of visits to infructescences of *Ae. fendleri* by the bearded bellbird (*Procnias averano* Hermann). Although feeding was not directly observed, the baccate fruits of *Ae. fendleri* may well represent an attractive nutritional resource. The distinctive call of *P. averano* was often heard in areas of forest where *Ae. fendleri* was present, and never where *Ae. fendleri* was absent. It is possible that *P. averano* and/or other avian dispersers are at

least partly responsible for the distribution pattern of *Ae. fendleri* in the Northern Range. The apparent bioclimatic restriction of *Ae. fendleri* could in fact reflect a strongly-defined thermal niche of an avian disperser engendering biotic dispersal limitation. In a thesis on frugivory and dispersal in Tobagonian rainforest plants, Lefevre (2008) described *Ae. dichlamydea* var. *dichlamydea* as bird-dispersed, without providing any further information. *Ae. nudicaulis* fruits have been reported as eaten by tanagers (Thraupidae) in the Brazilian restinga (Gomes et al., 2008) and by ants in the Atlantic Forest (Pizo and Oliveira, 2000).

An additional autecological consideration that may be of great consequence but could not be included in this investigation is the role of the regeneration niche. Specifically, germination requirements and seedling ecophysiology could differ between species in ways that cannot be predicted from observations of the ecophysiological characteristics of mature plants, as discussed in **Chapter 2**. A recent and extensive survey of thermal niche breadth and optima for germination among bromeliads was carried out by Müller et al. (2016). Six *Aechmea* species were included in their analysis. None of these species occur on Trinidad, but they provide useful context. Thermal optima for germination in these species range from approximately 28°C to 35°C, and while the thermal niche breadth spanned at least 20°C in *Ae. melinonii* (subg. *Aechmea*, alongside *Ae. aquilega* and *Ae. fendleri*), it was less than 5°C in *Ae. racinae* (subg. *Lamprococcus*). Therefore there appears to be considerable interspecific variation in thermal regeneration niche, and no inferences can as yet be drawn regarding the likelihood of thermal regeneration niche being an important factor in the distributions of the Trinidadian species. No specific information is available on germination in *Ae. fendleri* or *Ae. aquilega*. In the field, very dense populations of seedlings of both species are often observed in the thick bryophyte mats that frequently occur on the lateral branches of cocoa trees in abandoned plantations. These bryophyte mats are strongly retentive of moisture, and water limitation could therefore be an important driver of seedling mortality (Winkler et al., 2005). Some studies have looked at germination in *Ae. nudicaulis*. In this species, germination is positively photoblastic (Pinheiro and Borghetti, 2003; Marques et al., 2014), and shows a temperature optimum of approximately 25°C (Pinheiro and Borghetti, 2003). In the coastal restinga vegetation of southeastern Brazil, *Ae. nudicaulis* seedlings are highly susceptible to water and temperature stress (Mantovani and Iglesias, 2008). Overall, it is probable that species-specific requirements for germination and seedling establishment do play a role in environmental filtering and consequently on species distributional patterns, but these processes probably operate at a very fine spatial scale and are unlikely to account for the macro-scale differentiation in environmental distributions seen in the epiphytes. More detailed demographic and *in situ* physiological studies could be pursued over longer time periods to determine the susceptibility of individuals of different growth stages to

environmental stressors and the contribution of mortality at each of these stages to spatial population structure.