Supporting Information

Article title: Australian continental-island biogeography – insight from the starflowers (*Calytrix*: Myrtaceae)

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Supplementary Methods

Southwest Western Australia subset analysis

We further focused on the southwestern Australian region specifically by dividing it into subregions for analysis of biogeographic patterns within the hotspot, given that the majority of *Calytrix* species are endemic to the region. Six subregions were delineated according to the Interim Biogeographic Regionalisation for Australia (IBRA7) bioregional classification scheme: http://www.environment.gov.au/topics/land/national-reserve-system/science-maps-and-data/australias-bioregions-ibra): northern Geraldton Sandplains (N), Swan Coastal Plain (P), mesic forests (J; includes Jarrah Forest and Warren IBRA regions), wheatbelt (W; includes Avon Wheatbelt and Mallee IBRA regions), Esperance (E), south coast (S; Albany and Stirling regions– includes a portion of the Mallee and Esperance IBRA regions), and semi-arid regions surrounding SWA (A; includes Coolgardie, Yalgoo, Murchison IBRA regions). *Calytrix retrorsifolia* and *C. acutifolia* (Nge et al., 2017) were classified under the Swan Coastal Plain as they are found on the edge of the Darling Scarp and are not in the adjacent Jarrah Forest biome.

In our SWA subset analysis, non-SWA taxa apart from the semi-arid taxa adjacent to SWA were pruned from the dated tree. No scenarios on climatic changes (aridification) across the biome through time were included in this subset as our understanding on how aridification has affect these regional biomes within SWA are currently lacking.

Supplementary Results and Discussion

The DEC+*j* model was the best fit model for our SWA subset analysis, having the lowest AIC scores out of the six models tested (Table S6). Western central Australia was estimated to be the most probable ancestral range for Clade A (P = 0.85), whereas the wheatbelt, western central Australia, and both areas combined were estimated as the most probable ancestral ranges for Clade

B (P = 0.29, 0.30, 0.36 respectively) (Fig. S5). Clade C was inferred to have the northern sandplains as its most probable ancestral range (P = 0.53). Unlike the continent-wide analysis (see main text), dispersal (61%) was the most common biogeographic event, followed by within-area speciation (34%), and vicariance (5%) within SWA (Table S7a). Range expansion account for over half (53%) of the total events within SWA.

The SWA is an important diversification center for *Calytrix,* accounting for the majority (76.7%) of within-area speciation events in our continent-wide BSM analysis (see main text). Of the subregions, the Northern Sandplains is shown to be an important area of diversification for *Calytrix,* with two clades diversifying predominantly within that area of SWA. The diversification history of the largest clade (B) showed that initial diversification in SWA was concentrated in the Wheatbelt region from the late Oligocene to early Miocene, following the split with *C. verruculosa* at the base of the clade. A subsequent radiation coinciding with the aridification of the continent was noted in the mid-Miocene (*c.* 15 Ma), when a lineage migrated into the Northern Sandplains and diversified (Figs. S5–7). This radiation is significant as it accounts for almost half of the present diversity within *Calytrix*, and is the source of four out of the five independent dispersal events noted from SWA into the adjacent arid zone. The Northern Sandplains was also estimated as the ancestral area for Clade C. This clade has an older origin and diversification history (early Oligocene) than the nested radiation of Clade B in the Northern Sandplains. This area has been identified repeatedly as one of the hotspots for plant species richness and endemism within SWA (Hopper and Gioia, 2004; Rosauer et al., 2009; González-Orozco et al., 2011; Gioia and Hopper, 2017). It is also the most prominent source area within SWA, accounting for about a third of all dispersal events with movements to all other subregions recorded except for Esperance. Further studies are warranted to investigate for mechanisms that led to this area being conducive for increased diversification of many plant groups compared with other subregions within SWA.

The Swan Coastal Plain is another notable biogeographic subregion for *Calytrix* as it has the highest species to area-size ratio out of all SWA subregions, despite being of recent origin compared to the rest of SWA. A similar pattern is shown in other studies, with this region being another hotspot for plant species richness in SWA (Hopper and Gioia, 2004; Phillips et al., 2009). The region originated in the Quaternary from the build up of coastal carbonate deposits that comprise Quindalup and Spearwood dunes, and eroded deposits from the Yilgarn Block making up the older Bassendean dunes (*c.* 800 kya). In contrast, the rest of SWA has been tectonically quiet for 300 million years and sits on the Yilgarn Craton which assembled *c.* 2–3 billion ya. The formation of the Swan Coastal Plain in the Quaternary would have provided new niches for colonisation from other areas of SWA, resulting in it being the largest sink area in our BSM analyses. Due to its recent age, all dispersal events recorded into this subregion are range expansion events (i.e. no endemic species–within-area speciation). Surprisingly, it is also an important source area for other subregions, being recorded as having the third highest number of disperal events to other areas. However, this might be explained by its proximity to the Northern Sandplains and Wheatbelt, which are the two major centers of diversification for *Calytrix* in SWA. Indeed, a link between the number of species, frequency of dispersal events, and geographic distance between areas is noted in this study, supporting the distance decay of similarity effect (Nekola and White, 1999). A similar effect is noted in our continent-wide analysis, where biogeographic events are largely limited to within-area speciation events, and dispersal events limited to adjacent areas. Geographic distance of dispersal events might be determined by the biology of this group. Many species of *Calytrix* display seed characters indicative of wind or animal dispersal, with the presence of calyx awns, increased length of the hypanthium, and presence of hairs on the propagules (Craven, 1987). However, this link has never been been formally documented or tested. Additional studies are also warranted to look at why other subregions such as the Jarrah Forest and southern regions (South Coast and Esperance) play a smaller role in the diversification of *Calytrix* in SWA, despite these areas being adjacent to the Wheatbelt – one of the major diversification centers.

Southwest Western Australia extinction buffer

Extinctions in other parts of Australia could also be inferred from our dataset based on the respective stem and crown ages of each lineage. *Ochrosperma* display a broom-and-handle or comb-like signature (with a stem age of *c.* 43.7 Ma and crown age of *c.* 19.1 Ma), indicative of extinction and subsequent diversification (Crisp and Cook, 2009). The genus is sister to *Calytrix* and *Homalocalyx* and is confined largely to mesic rainforest areas of eastern Australia. The most common recent ancestor (MRCA) of these genera in Chamelaucieae could have a much wider distribution across Australia similar to *Calytrix* during the Eocene as the climate was warmer and wetter then (Crisp and Cook, 2013). These lineages then retreated to mesic fringes (SWA and eastern Australia) of the continent as it became progressively more arid since the mid-Miocene in concordance with the peripheral-vicariance hypothesis (Byrne et al., 2011). Higher diversifiation rates or earlier differentiation in SWA compared to other regions of Australia around the E–O boundary was inferred from our dataset, with the origins of SWA clades (B and C) at or immediately after the E–O boundary event. In contrast, the northern and eastern Australian clades arose after the E–O boundary during the late Oligocene (26 Ma, 95% CI: 20–31 Ma). This pattern of higher diversification rates in SWA compared with eastern Australia around the E–O boundary is congruent with the broader diversification history of Chamelaucieae as is shown in differences in its genera diversification rates across the two regions (Nge et al., 2020).

Supplementary Tables and Figures

Table S1a. Samples of outgroups used in this study, with the relevant gene regions and associated GenBank accesion number.

Number	Taxa	*matK*	*atpB*	*ndhF*	ITS
1	*Agonis_*	AF184715.1	AF184676.2	AY498762.1	EU850627.1
2	*Angophora_costata_*	HQ287612.1			
3	*Angophora_leiocarpa_*	HQ287613.1			
4	*Arillastrum_gummiferum_*	HQ287614.1			
5	*Calothamnus_*	AF184704.2	AF184667	AY498774.1	EF041511.1
6	*Corymbia_calophylla_*	HQ287615.1			
7	*Corymbia_intermedia_*	HQ287616.1			
8	*Corymbia_maculata_*	HQ287617.1			
9	*Eucalyptopsis_papuana_*	AF368205.2			AF190354.1
10	*Eucalyptus_baileyana_*	HQ287618.1			
11	*Eucalyptus_bicostata_*	HQ287619.1			
12	*Eucalyptus_brachyandra_*	HQ287620.1			
13	*Eucalyptus_curtisii_*	HQ287621.1			
14	*Eucalyptus_deglupta_*	HQ287622.1			
15	*Eucalyptus_diversicolor_*	HQ287623.1			
16	*Eucalyptus_globulus_*	HQ287627.1			
17	*Eucalyptus_guilfoylei_*	HQ287628.1			
18	*Eucalyptus_howittiana_*	HQ287629.1			
19	*Eucalyptus_imlayensis_*	HQ287630.1			
20	*Eucalyptus_jacksonii_*	HQ287631.1			
21	*Eucalyptus_kitsoniana_*	HQ287633.1			
22	*Eucalyptus_microcorys_*	HQ287634.1			
23	*Eucalyptus_raveretiana_*	HQ287635.1			
24	*Eucalyptus_stoatei_*	HQ287636.1			
25	*Eucalyptus_tenuipes_*	HQ287637.1			
26	*Homalocalyx_aureus_*	AF489398.1		AY498785.1	HM160106.1
27	*Homalospermum_firmum_*	AF184720.1	AF184682.2		EU850632.1
28	*Kunzea_baxteri_*	AF184722.1	AF184684	AY498789.1	KM064868.1
29	*Kunzea_*EAST_Au	AF184724.1	AF184686.2	AY498790.1	EU833174.1
30	*Leptospermum_*EAST_Au	AF184732.1	AF184697.2	AY498791.1	EU850643.1
31	*Leptospermum_spinescens_*	AF184734.1	AF184696.2		
32	*Lindsayomyrtus_racemoides_*	AF184706.3	AF184668.2	AY498793.1	HM160111.1
33	*Lophostemon_*	AY525134.1	HQ287610.1	AY525134.1	KM065037.1
34	*Ochrosperma_citriodorum_*	AF489383.1	AF489327.1		
35	*Ochrosperma_lineare_*	AF489384.2	AF489328.2		
36	*Ochrosperma_oligomerum_*	AF489385.2	AF489329.2		
37	*Osbornia_octodonta_*	AF368213.2		AY498805.1	EF041844.1
38	*Stockwellia_quadrifida_*	HQ287639.1			
39	*Syncarpia_*	AY525139.1		AY498813.1	KM065007.1
40	*Xanthostemon_*	AY525144.1		AY498823.1	EF041515.1

Table S1b. Newly sequenced *Calytrix* and *Homalocalyx* outgroup samples used in this study, sourced from herbarium specimens.

Collector's no.	Taxa	Voucher	Date collected
FN 640	*Calytrix amethystina*	PERTH 08628920	24/9/12
FN 641	*Calytrix birdii*	PERTH 06764929	29/10/00
FN 642	*Calytrix creswellii*	PERTH 08930155	9/11/16
FN 643	*Calytrix decandra*	PERTH 08930155	17/1/17
FN 644	*Calytrix desolata*	PERTH 08754896	14/9/10
FN 645	*Calytrix divergens*	PERTH 08193096	11/12/08
FN 646	*Calytrix eriosipetala*	PERTH 07557280	8/9/06
FN 647	*Calytrix uncinata*	PERTH 08762740	21/11/10
FN 648	*Calytrix verruculosa*	PERTH 07379226	15/5/06
FN 649	*Calytrix viscida*	PERTH 08612382	3/10/12
FN 650	*Calytrix watsonii*	PERTH 07739303	18/9/05
FN 651	*Calytrix* sp. Paynes Find	PERTH 08200378	12/10/08
FN 652	*Calytrix truncatifolia*	PERTH 07498918	12/10/05
FN 653	*Calytrix breviseta* subsp. *stipulosa*	PERTH 08996903	11/10/13
FN 654	*Calytrix drummondii*	PERTH 06482732	7/12/02
FN 655	*Calytrix ecalycata* subsp. *pubescens*	PERTH 08576815	28/9/07
FN 656	*Calytrix habrantha*	PERTH 06390901	12/11/01
FN 657	*Calytrix hirta*	PERTH 08929769	25/11/16
FN 658	*Calytrix duplistipulata*	PERTH 06419720	5/6/00
FN 659	*Calytrix merreliana*	PERTH 08701997	21/10/13
FN 660	*Calytrix megaphylla*	PERTH 08050767	2/4/07
FN 661	*Calytrix nematoclada*	PERTh 05563119	3/5/99
FN 662	*Calytrix oldfieldii*	PERTH 05878993	15/8/00
FN 663	*Calytrix parvivallis*	PERTH 07729561	4/10/06
FN 664	*Calytrix patrickiae*	PERTH 06233961	3/10/00
FN 665	*Calytrix paucicostata*	PERTH 05312957	5/11/98
FN 666	*Calytrix plumulosa*	PERTH 08097348	26/10/07
FN 667	*Calytrix sagei*	PERTH 06836844	28/10/02
FN 668	*Calytrix simplex* subsp. *suboppositifolia*	PERTH 07577745	9/12/06
FN 669	*Calytrix simplex* subsp. *simplex*	PERTH 08471436	10/1/13
FN 670	*Calytrix superba*	PERTH 07400977	23/6/00
FN 672	*Calytrix variabilis*	PERTH 07781458	29/9/07
FN 673	*Calytrix achaeta*	PERTH 08662436	29/5/08
FN 674	*Calytrix brownii*	PERTH 08364419	9/6/11
FN 675	*Calytrix exstipulata*	PERTH 08257779	6/7/10
FN 676	*Calytrix gomphrenoides*	PERTH 07994001	23/1/07
FN 677	*Homalocalyx aureus*	PERTH 08894914	16/9/16

Table Sc. Newly sequenced *Calytrix* samples used in this study, from freshly collected material, to be vouchered in AD.

Collector's no.	Taxa	Date collected	Latitude	Longitude
FN 380	*Calytrix tetragona*	00/09/2017	-37.2679	149.6753
FN 400	*Calytrix aurea*	00/09/2017	-32.025	115.9819
FN 401	*Calytrix fraseri*	00/09/2017	-32.0187	115.9806
FN 550	*Calytrix sylvana*	2/10/18	-31.4751	115.9707
FN 554	*Calytrix strigosa*	2/10/18	-31.1799	115.8259
FN 567	*Calytrix chrysantha*	2/10/18	-29.9052	115.25361
FN 572	*Calytrix sapphirina*	3/10/18	-29.6388	115.2171
FN 583	*Calytrix depressa*	3/10/18	-28.01716	114.3304
FN 584	*Calytrix brevifolia*	4/10/18	-27.6921	114.2124
FN 585	*Calytrix formosa*	4/10/18	-27.6121	114.4097
FN 586	*Calytrix harvestiana*	4/10/18	-27.6495	114.4551
FN 592	*Calytrix strigosa*	4/10/18	-27.7014	114.2925
FN 594	*Calytrix gracilis*	4/10/18	-27.8526	114.48098
FN 595	*Calytrix purpurea*	4/10/18	-27.8526	114.48098
FN 597	*Calytrix pimeleoides*	4/10/18	-28.2347	114.6457
FN 601	*Calytrix ecalycata* subsp. *ecalycata*	5/10/18	-29.2685	115.8685
FN 602	*Calytrix ecalycata* subsp. *brevis*	5/10/18	-30.03580556	115.7390556
FN 607	*Calytrix platycheiridia*	5/10/18	-30.02077778	115.8688611
FN 610	*Calytrix cravenii* 'typical form'	5/10/18	-30.1112	115.9785
FN 611	*Calytrix leschenaultii*	5/10/18	-30.1112	115.9785
FN 612	*Calytrix violacea*	6/10/18	-30.862286	116.72096
FN 614	*Calytrix gracilis*	6/10/18	-30.862286	116.72096
FN 617	*Calytrix sapphirina*	6/10/18	-30.8545	116.6865
FN 619	*Calytrix cravenii* 'Calingiri'	6/10/18	-31.03638	116.5344
FN 623	*Calytrix cravenii* 'Calingiri'	6/10/18	-31.1618	116.4895
FN 625	*Calytrix oncophylla*	6/10/18	-31.497301	116.576933
FN 626	*Calytrix leschenaultii*	6/10/18	-31.497301	116.576933
FN 628	*Calytrix sylvana*	6/10/18	-31.6784	116.3276
FN 633	*Calytrix breviseta* subsp. *breviseta*	7/10/18	-32.0198	115.98589
FN 634	*Calytrix acutifolia*	7/10/18	-31.9952	116.0319
FN 635	*Calytrix glutinosa*	7/10/18	-31.9942	116.0316
FN 639	*Calytrix tetragona*	9/10/18	-33.5845	117.2260833
FN 680	*Calytrix leschenaultii*	9/10/18	-33.5845	117.2260833
FN 685	*Calytrix tetragona*	10/10/18	-34.3424	117.8001
FN 688	*Calytrix leschenaultii*	10/10/18	-34.4901	118.6096
FN 690	*Calytrix tetragona*	10/10/18	-34.409	118.7295
FN 691	*Calytrix tetragona*	10/10/18	-33.7131	118.6825
FN 692	*Calytrix leschenaultii*	10/10/18	-33.7131	118.6825
FN 306	*Calytrix retrorsifolia*	00/09/2017	-33.701069	115.541297
FN 394	*Calytrix tetragona*	00/02/2018	-36.3108	146.2084
FN 251	*Calytrix tetragona*	18/10/17	-32.725607	138.081843
FN 402	*Calytrix flavescens*	00/04/2018	-32.1074	115.9309

Table S2. Summary statistics and AIC scores for all 20 models in this study across the different scenarios for the continent-wide analysis. AIC scores from BAYAREA models were excluded from model selection as these models do not account for vicariance. The model with the lowest score is highlighted in red.

	LnL	numparams	d	e	j	x	AIC	AIC_wt
Default parameters with no time stratification and distance metric								
DEC	-84.1	2	0.0031	1.00E-12	0	n/a	172.2	4.70E-08
DEC+J	-66.27	3	0.0005	1.00E-12	0.037	n/a	138.5	0.97
DIVALIKE	-87.78	2	0.0048	1.00E-12	0	n/a	179.6	1.20E-09
DIVALIKE+J	-69.84	3	0.0014	1.00E-12	0.036	n/a	145.7	0.027
BAYAREALIKE	-107	2	0.0012	0.027	0	n/a	217.9	5.60E-18
BAYAREALIKE+J	-72.35	3	0.0011	1.00E-07	0.04	n/a	150.7	0.0022
Scenario 1: addition of current relative distance between regions with no time stratification								
DEC	-67.19	3	0.031	0.0004	0	-0.75	140.4	2.00E-08
DEC+J	-48.57	4	0.0099	1.00E-12	0.62	-1.07	105.1	0.92
DIVALIKE	-68.46	3	0.056	1.00E-12	0	-0.86	142.9	5.70E-09
DIVALIKE+J	-51.24	4	0.02	1.00E-12	0.52	-1.04	110.5	0.063
BAYAREALIKE	-90.45	3	0.071	0.019	0	-0.99	186.9	1.60E-18
BAYAREALIKE+J	-52.4	4	0.017	1.00E-07	0.48	-1.1	112.8	0.02
Scenario 2: gradual retreat of W, E, N and expansion of the arid interior (A) from 40 Ma stratified at 10 Ma time intervals								
DEC	-57.57	3	0.69	1.00E-12	0	-2.5	121.1	9.90E-06
DEC+J	-45.11	4	0.29	1.00E-12	2.25	-2.5	98.21	0.95
DIVALIKE	-61.06	3	0.5	1.00E-12	0	-2.1	128.1	3.00E-07
DIVALIKE+J	-48.28	4	0.099	1.00E-12	1.08	-1.84	104.6	0.04
BAYAREALIKE	-87.15	3	0.58	0.026	0	-2.48	180.3	1.40E-18
BAYAREALIKE+J	-49.48	4	0.034	1.00E-07	0.63	-1.61	107	0.012
Scenario 3: abrupt retreat of W, E, N and expansion of the arid interior (A) commencing at 20 Ma								
DEC	-61.49	3	0.12	5.70E-05	0	-1.87	129	1.10E-06
DEC+J	-46.91	4	0.0075	1.00E-12	0.34	-1.06	101.8	0.86
DIVALIKE	-63.95	3	0.059	1.00E-12	0	-1.13	133.9	9.30E-08
DIVALIKE+J	-49.01	4	0.014	1.00E-12	0.3	-1.06	106	0.1
BAYAREALIKE	-84.7	3	0.23	0.025	0	-2.49	175.4	9.00E-17
BAYAREALIKE+J	-50.04	4	0.0094	1.00E-07	0.3	-1.08	108.1	0.037
Scenario 4: similar to scenario 3 but with additional increase in dispersal distance between W and E at c. 14 Ma (simulate Nullarbor uplift)								
DEC	-61.43	3	0.11	1.00E-12	0	-1.83	128.9	2.40E-06
DEC+J	-47.52	4	0.0087	1.00E-12	0.38	-1.09	103	0.95
DIVALIKE	-65.87	3	0.037	1.00E-12	0	-0.83	137.7	2.80E-08
DIVALIKE+J	-50.79	4	0.0083	1.00E-12	0.19	-0.76	109.6	0.036
BAYAREALIKE	-84.62	3	0.25	0.025	0	-2.5	175.2	2.00E-16
BAYAREALIKE+J	-51.87	4	0.006	1.00E-07	0.21	-0.8	111.7	0.012

Table S3a. Average number and directionality of range-expansion events estimated for *Calytrix* over 50 biogeographical stochastic mapping (BSM) events of continent-wide analysis. Number includes total number of dispersal events (from found and range expansion events). Colour indicates frequency of events (red–green, highest–lowest). Area names in first row indicate source areas (where lineages dispersed from) and names in first column indicate sink areas (where lineages dispersed to). Area names are southwest Australia (W), eastern Australia (E), western central arid zone (A), and northern Australia (N).

	W	E	A	N	total	% source
W	0	0.2	0.08	0	0.28	21
E	0.84	0	0.02	0.06	0.92	68
A	0.06	0.04	0	0.02	0.12	9
N	0	0.04	0	0	0.04	3
total	0.9	0.28	0.1	0.08	1.36	100
% sink	66	21	7	6	100	

Table S3b. Average number and directionality of founder events estimated for *Calytrix* over 50 biogeographical stochastic mapping (BSM) events of continent-wide analysis. Number includes total number of dispersal events (from found and range expansion events). Colour indicates frequency of events (red–green, highest–lowest). Area names in first row indicate source areas (where lineages dispersed from) and names in first column indicate sink areas (where lineages dispersed to). Area names are southwest Australia (W), eastern Australia (E), western central arid zone (A), and northern Australia (N).

	W	E	A	N	total	% source
W	0	0.1	5.54	0.22	5.86	58
E	0.08	0	0	0.4	0.48	5
A	2.52	0.34	0	0.36	3.22	32
N	0.02	0.46	0.04	0	0.52	5
total	2.62	0.9	5.58	0.98	10.08	100
% sink	26	9	55	10	100	

Table S4. Vicariance scenarios and how often they are witnessed out of the 50 BSMs.

Vicariance	no. out of 50 BSMs
AN->A,N	2
EAN->A,EN	1
WA->A,W	26
WAN->A,WN	3
WAN->N,WA	1
WE->E,W	1
WEA->A,WE	5
WEA->W,EA	2
WEAN->A,WEN	37
WEAN->N,WEA	2
WEAN->W,EAN	2
WEN->N,WE	43

Table S5. Sympatric speciation out of the 50 BSMs within each region.

BSM	A->A,A	E->E,E	N->N,N	W->W,W
1	5	1	4	39
2	7	3	4	37
3	6	3	4	39
4	7	3	4	38
5	5	3	4	39
6	6	3	4	39
7	6	2	4	39
8	6	2	4	39
9	5	1	4	40
10	6	0	4	36
11	5	2	4	39
12	5	1	4	39
13	6	2	4	39
14	7	1	4	36
15	7	2	4	38
16	6	3	4	39
17	7	3	4	38
18	5	2	4	40
19	6	2	4	38
20	7	3	4	38
21	5	0	4	40
22	6	3	4	39
23	5	0	4	41
24	5	2	4	39
25	5	2	4	40
26	5	0	4	40
27	6	3	4	39
28	6	3	4	39
29	7	2	4	38
30	6	3	4	39
31	5	0	4	39
32	6	1	4	39
33	6	2	4	39
34	7	2	4	38
35	5	0	4	41
36	6	2	4	38
37	5	2	4	40
38	7	3	4	37
39	5	3	4	40
40	5	1	4	40
41	6	3	4	39
42	7	2	4	38
43	6	3	4	39
44	6	3	4	39
45	5	0	4	41
46	6	1	4	39
47	6	3	4	39
48	6	2	4	39

Table S5. Continued.

BSM	A->A,A	E->E,E	N->N,N	W->W,W
49	6	2	4	39
50	7	1	4	38

	A->A,A	E->E,E	N->N,N	W->W,W
average	5.88	1.92	4	38.88
%	11.6	3.8	7.9	76.7

Table S6. . Summary statistics and AIC scores for all four models in this study across the different scenarios for the SWA subset. AIC scores from BAYAREA models were excluded from model selection as these models do not account for vicariance. The model with the lowest score is highlighted in red.

	LnL	numparams	d	e	j	AIC	AICc	AIC_wt
DEC	-217.3	2	0.0077	0.0006	0	438.6	438.8	0.92
DEC+*J*	-219.8	3	0.0076	1.00E-12	0.026	445.7	446.1	0.027
DIVALIKE	-231.5	2	0.01	0.01	0	466.9	467.1	6.50E-07
DIVALIKE+*J*	-219.8	3	0.0076	1.00E-12	0.026	445.7	446.1	0.027
BAYAREALIKE	-234.3	2	0.0056	0.053	0	472.6	472.7	3.90E-08
BAYAREALIKE+J	-220	3	0.004	0.023	0.025	445.9	446.3	0.023

Table S7a Summary of 50 biogeographical stochastic mapping (BSM) counts of SWA subset analysis for *Calytrix* using the DEC + *j* model.

Mode	**Type**	**Mean**	**%**
Within-area speciation	Sympatric speciation	25	23.5
	Speciation–subset	11.36	10.7
Dispersal	Founder events (j)	11.28	10.6
	Range expansions (d)	53.22	50.1
	Range contractions (e)	0	0.0
Vicariance	Vicariance	5.36	5.0
Total		**115.5**	100.0

Table S7b Average number and directionality of all dispersal events (founder & range expansion) estimated for *Calytrix* over 50 biogeographical stochastic mapping (BSM) events of SWA subset analysis. Number includes total number of dispersal events (from found and range expansion events). Colour indicates frequency of events (red–green, highest–lowest). Area names in first row indicate source areas (where lineages dispersed from) and names in first column indicate sink areas (where lineages dispersed to). Area names are Geraldton Sandplains (N), Swan Coastal Plain (P), Wheatbelt (W), South Coast (S), Esperance (E), arid areas adjacent to SWA (A), and Jarrah Forest (J).

	N	P	W	S	E	A	J	total	% source
N	0	5.04	6.78	1.66	0.64	3.34	3.28	20.74	32.2
P	1.6	0	2.26	1.92	1.02	0	2.48	9.28	14.4
W	4.52	4.38	0	0.82	2.04	1.86	4.36	17.98	27.9
S	0.34	0.96	0.48	0	0.8	0.02	0.44	3.04	4.7
E	0.12	0.68	0.34	0.66	0	0.12	0.58	2.5	3.9
A	1.18	0.54	1.36	0	0.92	0	0.56	4.56	7.1
J	1.18	2.44	1.44	0.8	0.48	0.06	0	6.4	9.9
TOTAL	8.94	14.04	12.66	5.86	5.9	5.4	11.7	64.5	
% sink	13.9	21.8	19.6	9.1	9.1	8.4	18.1		

Table S7c Average number and directionality of range expansion events estimated for *Calytrix* over 50 biogeographical stochastic mapping (BSM) events of SWA subset analysis. Number includes total number of dispersal events (from found and range expansion events). Colour indicates frequency of events (red–green, highest–lowest). Area names in first row indicate source areas (where lineages dispersed from) and names in first column indicate sink areas (where lineages dispersed to). Area names are Geraldton Sandplains (N), Swan Coastal Plain (P), Wheatbelt (W), South Coast (S), Esperance (E), arid areas adjacent to SWA (A), and Jarrah Forset (J).

	N	P	W	S	E	A	J	total	%
N	0	3.9	5.7	1.4	0.6	0.4	3.16	15.16	28
P	1.4	0	2.2	1.7	0.74	0	2.48	8.52	16
W	3.4	4.18	0	0.8	1.94	1.12	4.22	15.66	29
S	0.32	0.82	0.48	0	0.8	0	0.44	2.86	5
E	0.1	0.6	0.34	0.66	0	0.1	0.56	2.36	4
A	0.52	0.5	0.54	0	0.26	0	0.46	2.28	4
J	1.16	2.44	1.44	0.8	0.48	0.06	0	6.38	12
total	6.9	12.44	10.7	5.36	4.82	1.68	11.32	53.22	100
%	13	23	20	10	9	3	21	100	

Table S7d Average number and directionality of founder events estimated for *Calytrix* over 50 biogeographical stochastic mapping (BSM) events of SWA subset analysis. Number includes total number of dispersal events (from found and range expansion events). Colour indicates frequency of events (red–green, highest–lowest). Area names in first row indicate source areas (where lineages dispersed from) and names in first column indicate sink areas (where lineages dispersed to). Area names are Geraldton Sandplains (N), Swan Coastal Plain (P), Wheatbelt (W), South Coast (S), Esperance (E), arid areas adjacent to SWA (A), and Jarrah Forest (J).

	N	P	W	S	E	A	J	total	% source
N	0	1.14	1.08	0.26	0.04	2.94	0.12	5.58	49
P	0.2	0	0.06	0.22	0.28	0	0	0.76	7
W	1.12	0.2	0	0.02	0.1	0.74	0.14	2.32	21
S	0.02	0.14	0	0	0	0.02	0	0.18	2
E	0.02	0.08	0	0	0	0.02	0.02	0.14	1
A	0.66	0.04	0.82	0	0.66	0	0.1	2.28	20
J	0.02	0	0	0	0	0	0	0.02	0
total	2.04	1.6	1.96	0.5	1.08	3.72	0.38	11.28	100
% sink	18	14	17	4	10	33	3	100	

Fig. S1a. Maximum likelihood (RAxML) topology of *Calytrix* based on our NGS nuclear dataset with 28 nuclear loci. The three clades are highlighted, and support value denoting the crown of *Calytrix* is circled in purple. Support values are bootstrap support.

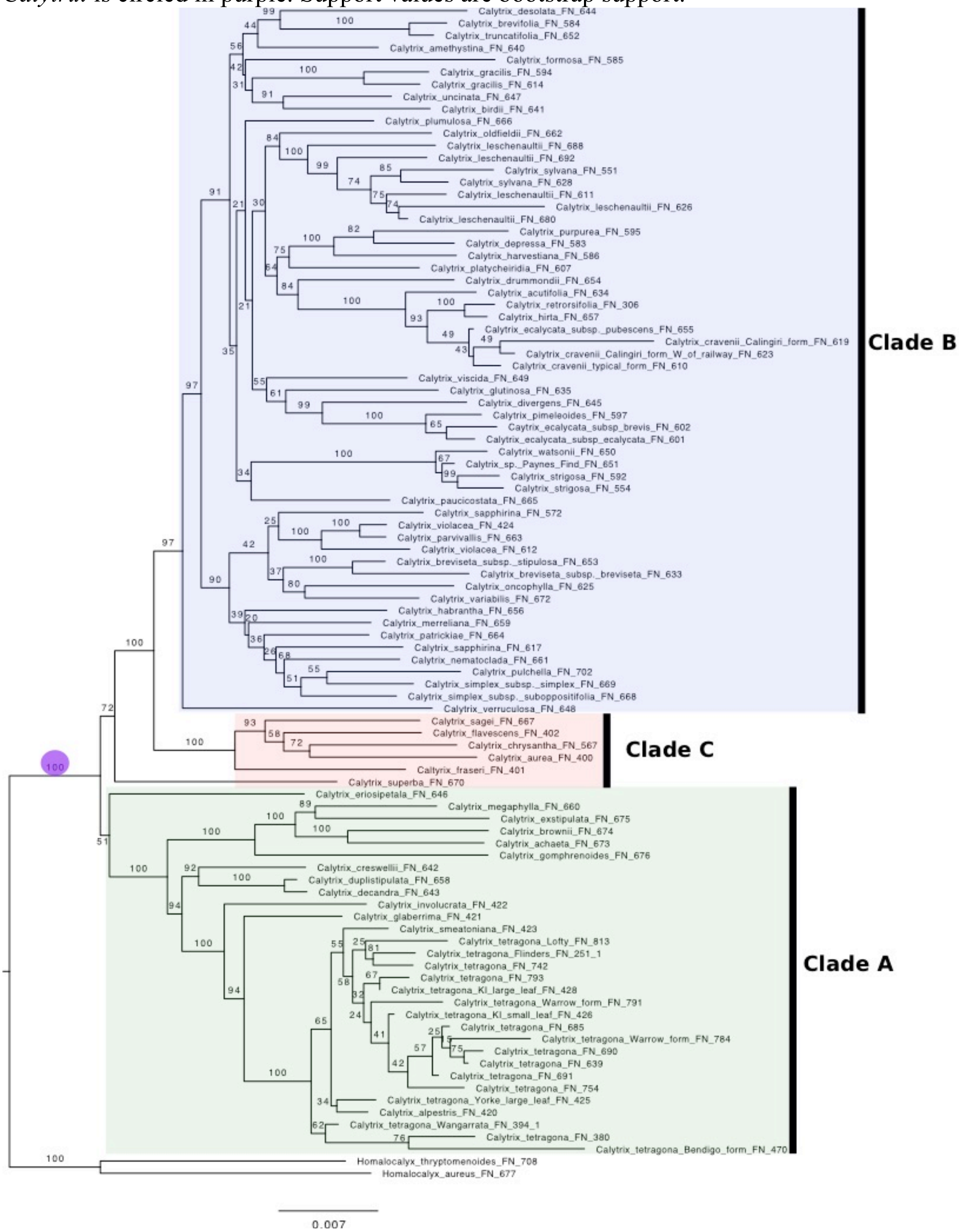


Fig. S1b. Maximum likelihood (RAxML) topology of *Calytrix* based on our NGS plastid dataset with 19 plastid loci. The three clades are highlighted, and support values indicate bootstrap support.

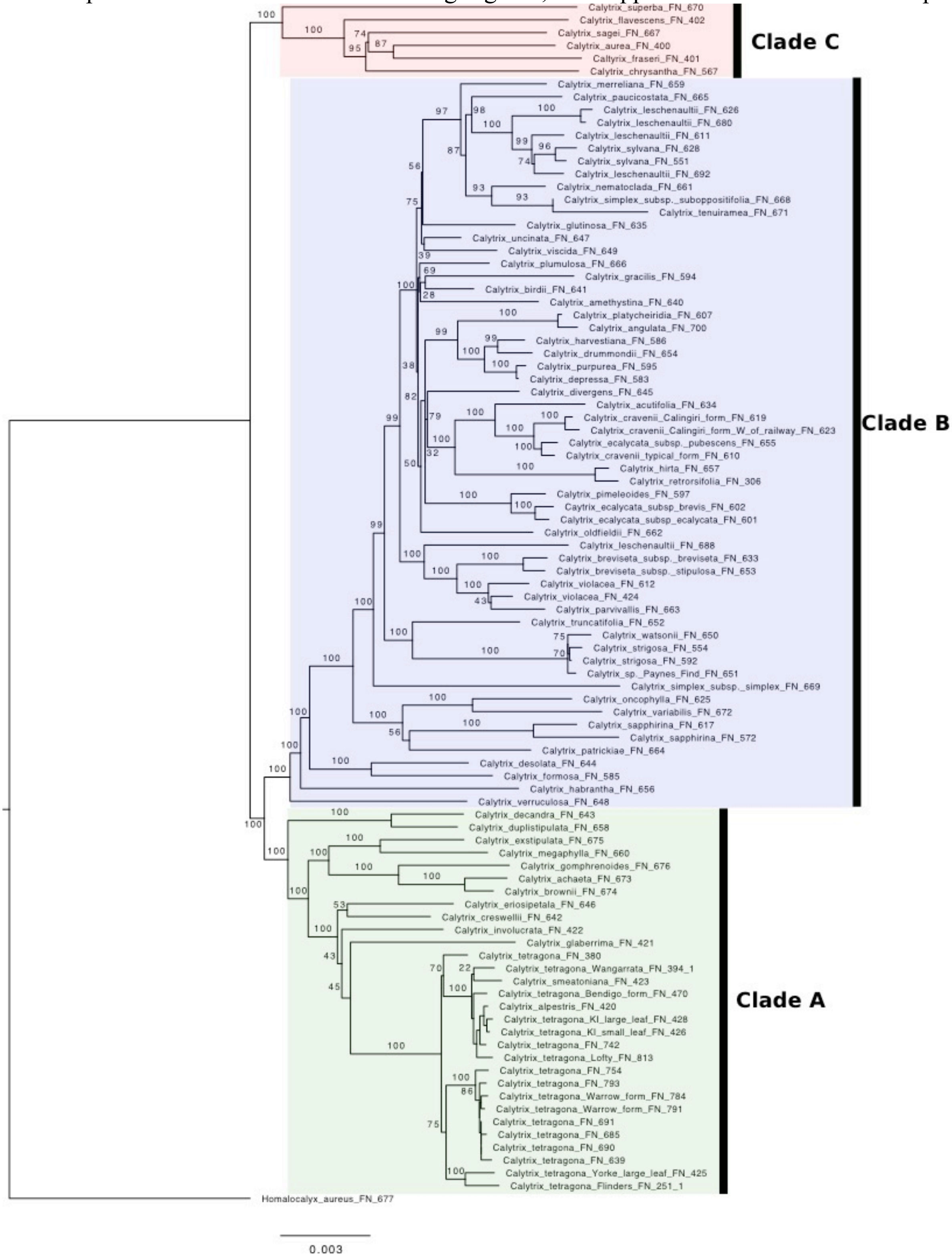
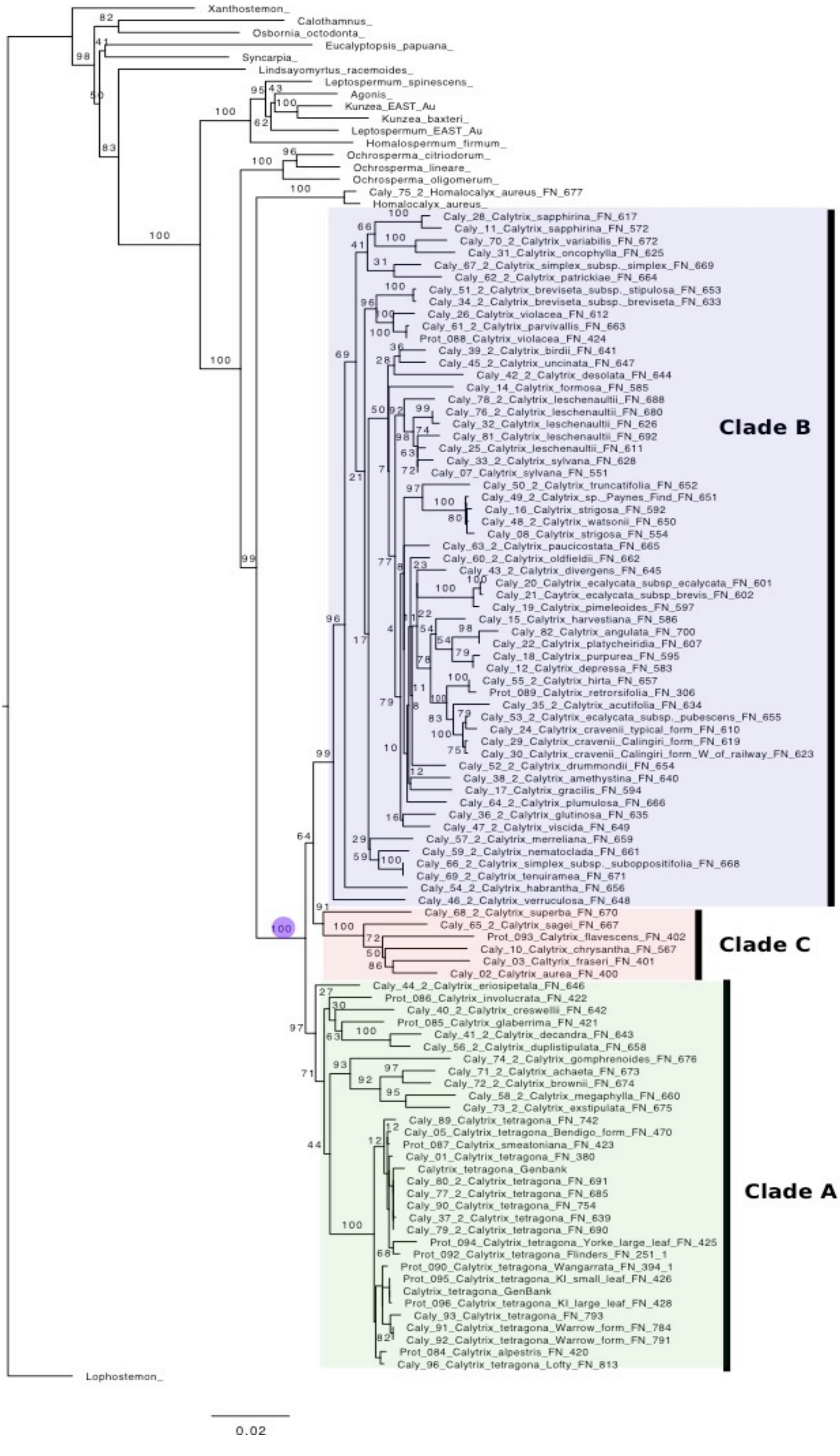


Fig. S2. Maximum likelihood topology of *Calytrix* and outgroups based on ITS and 3 chl markers.



Xanthostemon_
Calothamnus_
Osbornia_octodonta_
Eucalyptopsis_papuana_
Syncarpia_
Lindsayomyrtus_racemoides_
Leptospermum_spinescens_
Agonis_
Kunzea_EAST_Au
Kunzea_baxteri_
Leptospermum_EAST_Au
Homalospermum_firmum_
Ochrosperma_citriodorum_
Ochrosperma_lineare_
Ochrosperma_oligomerum_
Caly_75_2_Homalocalyx_aureus_FN_677
Homalocalyx_aureus_
Caly_28_Calytrix_sapphirina_FN_617
Caly_11_Calytrix_sapphirina_FN_572
Caly_70_2_Calytrix_variabilis_FN_672
Caly_31_Calytrix_oncophylla_FN_625
Caly_67_2_Calytrix_simplex_subsp._simplex_FN_669
Caly_62_2_Calytrix_patrickiae_FN_664
Caly_51_2_Calytrix_breviseta_subsp._stipulosa_FN_653
Caly_34_2_Calytrix_breviseta_subsp._breviseta_FN_633
Caly_26_Calytrix_violacea_FN_612
Caly_61_2_Calytrix_parvivallis_FN_663
Prot_088_Calytrix_violacea_FN_424
Caly_39_2_Calytrix_birdii_FN_641
Caly_45_2_Calytrix_uncinata_FN_647
Caly_42_2_Calytrix_desolata_FN_644
Caly_14_Calytrix_formosa_FN_585
Caly_78_2_Calytrix_leschenaultii_FN_688
Caly_76_2_Calytrix_leschenaultii_FN_680
Caly_32_Calytrix_leschenaultii_FN_626
Caly_81_Calytrix_leschenaultii_FN_692
Caly_25_Calytrix_leschenaultii_FN_611
Caly_33_2_Calytrix_sylvana_FN_628
Caly_07_Calytrix_sylvana_FN_551
Caly_50_2_Calytrix_truncatifolia_FN_652
Caly_49_2_Calytrix_sp._Paynes_Find_FN_651
Caly_16_Calytrix_strigosa_FN_592
Caly_48_2_Calytrix_watsonii_FN_650
Caly_08_Calytrix_strigosa_FN_554
Caly_63_2_Calytrix_paucicostata_FN_665
Caly_60_2_Calytrix_oldfieldii_FN_662
Caly_43_2_Calytrix_divergens_FN_645
Caly_20_Calytrix_ecalycata_subsp_ecalycata_FN_601
Caly_21_Calytrix_ecalycata_subsp_brevis_FN_602
Caly_19_Calytrix_pimeleoides_FN_597
Caly_15_Calytrix_harvestiana_FN_586
Caly_82_Calytrix_angulata_FN_700
Caly_22_Calytrix_platycheiridia_FN_607
Caly_18_Calytrix_purpurea_FN_595
Caly_12_Calytrix_depressa_FN_583
Caly_55_2_Calytrix_hirta_FN_657
Prot_089_Calytrix_retrorsifolia_FN_306
Caly_35_2_Calytrix_acutifolia_FN_634
Caly_53_2_Calytrix_ecalycata_subsp._pubescens_FN_655
Caly_24_Calytrix_cravenii_typical_form_FN_610
Caly_29_Calytrix_cravenii_Calingiri_form_FN_619
Caly_30_Calytrix_cravenii_Calingiri_form_W_of_railway_FN_623
Caly_52_2_Calytrix_drummondii_FN_654
Caly_38_2_Calytrix_amethystina_FN_640
Caly_17_Calytrix_gracilis_FN_594
Caly_64_2_Calytrix_plumulosa_FN_666
Caly_36_2_Calytrix_glutinosa_FN_635
Caly_47_2_Calytrix_viscida_FN_649
Caly_57_2_Calytrix_merreliana_FN_659
Caly_59_2_Calytrix_nematoclada_FN_661
Caly_66_2_Calytrix_simplex_subsp._suboppositifolia_FN_668
Caly_69_2_Calytrix_tenuiramea_FN_671
Caly_54_2_Calytrix_habrantha_FN_656
Caly_46_2_Calytrix_verruculosa_FN_648
Clade B
Caly_68_2_Calytrix_superba_FN_670
Caly_65_2_Calytrix_sagei_FN_667
Prot_093_Calytrix_flavescens_FN_402
Caly_10_Calytrix_chrysantha_FN_567
Caly_03_Caltyrix_fraseri_FN_401
Caly_02_Calytrix_aurea_FN_400
Clade C
Caly_44_2_Calytrix_eriosipetala_FN_646
Prot_086_Calytrix_involucrata_FN_422
Caly_40_2_Calytrix_creswellii_FN_642
Prot_085_Calytrix_glaberrima_FN_421
Caly_41_2_Calytrix_decandra_FN_643
Caly_56_2_Calytrix_duplistipulata_FN_658
Caly_74_2_Calytrix_gomphrenoides_FN_676
Caly_71_2_Calytrix_achaeta_FN_673
Caly_72_2_Calytrix_brownii_FN_674
Caly_58_2_Calytrix_megaphylla_FN_660
Caly_73_2_Calytrix_exstipulata_FN_675
Caly_89_Calytrix_tetragona_FN_742
Caly_05_Calytrix_tetragona_Bendigo_form_FN_470
Prot_087_Calytrix_smeatoniana_FN_423
Caly_01_Calytrix_tetragona_FN_380
Calytrix_tetragona_Genbank
Caly_80_2_Calytrix_tetragona_FN_691
Caly_77_2_Calytrix_tetragona_FN_685
Caly_90_Calytrix_tetragona_FN_754
Caly_37_2_Calytrix_tetragona_FN_639
Caly_79_2_Calytrix_tetragona_FN_690
Prot_094_Calytrix_tetragona_Yorke_large_leaf_FN_425
Prot_092_Calytrix_tetragona_Flinders_FN_251_1
Prot_090_Calytrix_tetragona_Wangarrata_FN_394_1
Prot_095_Calytrix_tetragona_KI_small_leaf_FN_426
Calytrix_tetragona_GenBank
Prot_096_Calytrix_tetragona_KI_large_leaf_FN_428
Caly_93_Calytrix_tetragona_FN_793
Caly_91_Calytrix_tetragona_Warrow_form_FN_784
Caly_92_Calytrix_tetragona_Warrow_form_FN_791
Prot_084_Calytrix_alpestris_FN_420
Caly_96_Calytrix_tetragona_Lofty_FN_813
Clade A
Lophostemon_
0.02

Fig. S3. Calibrated BEAST chronogram of *Calytrix* inferred from one nuclear (ITS) and three chloroplast (*mat*K, *atp*B, *ndh*F) loci – using the *Eucalyptus* macrofossil calibration only. Node labels indicate divergence age estimates (Ma)

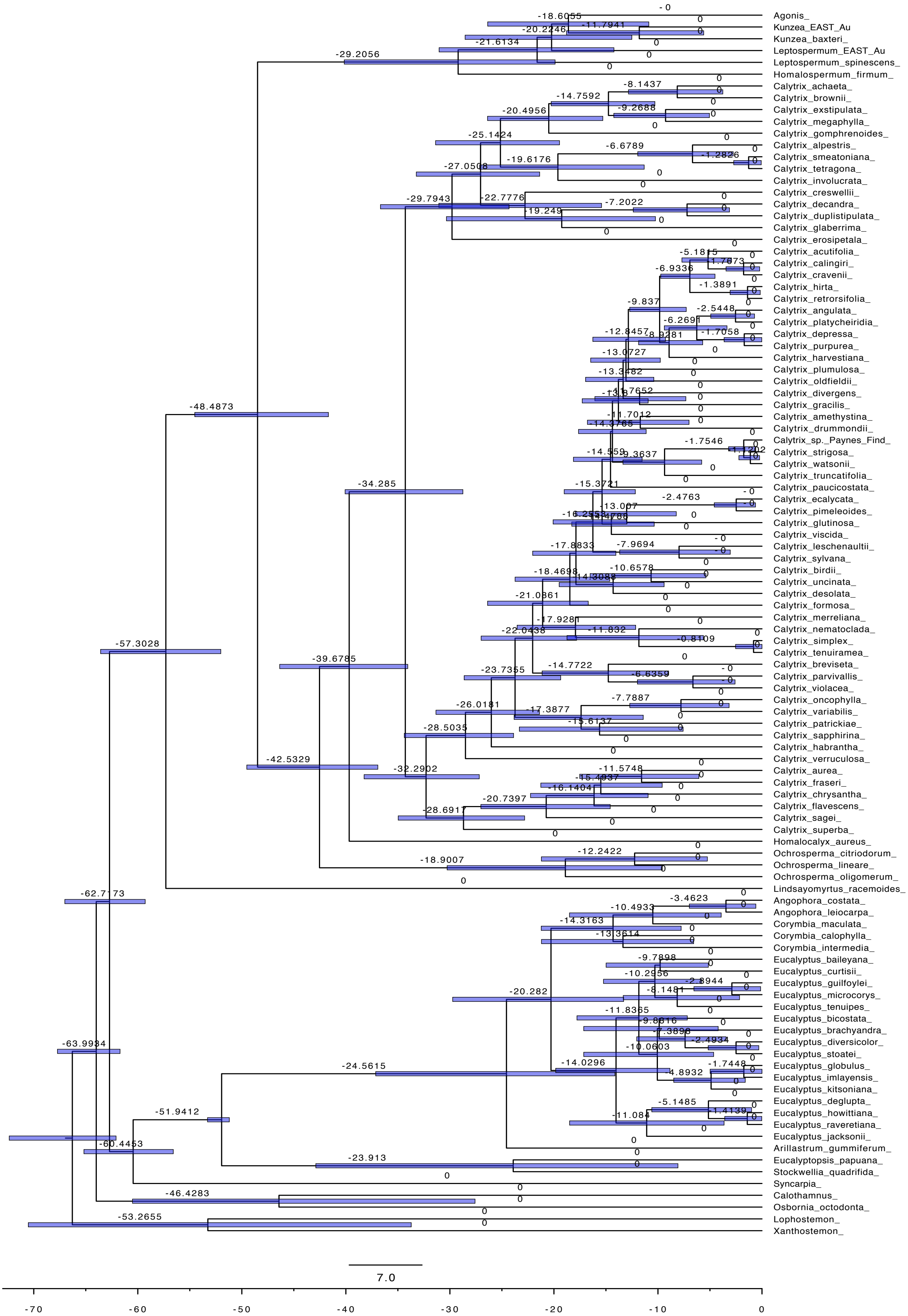


Fig. S4. Maximum-likelihood ancestral-range reconstruction in *Calytrix* based on the default biogeographical model (DEC+*j*) with no time stratification and distance parameters. Pie diagrams depict the relative probabilities of ancestral ranges. *Calytrix* nodes with no pie diagrams shown correspond to the preceding pie. Coloured nodes at the tips correspond to their respective scored current distributions. Area names are southwest Australia (W), eastern Australia (E), western central arid zone (A), and northern Australia (N). Map insert shows area delineation.

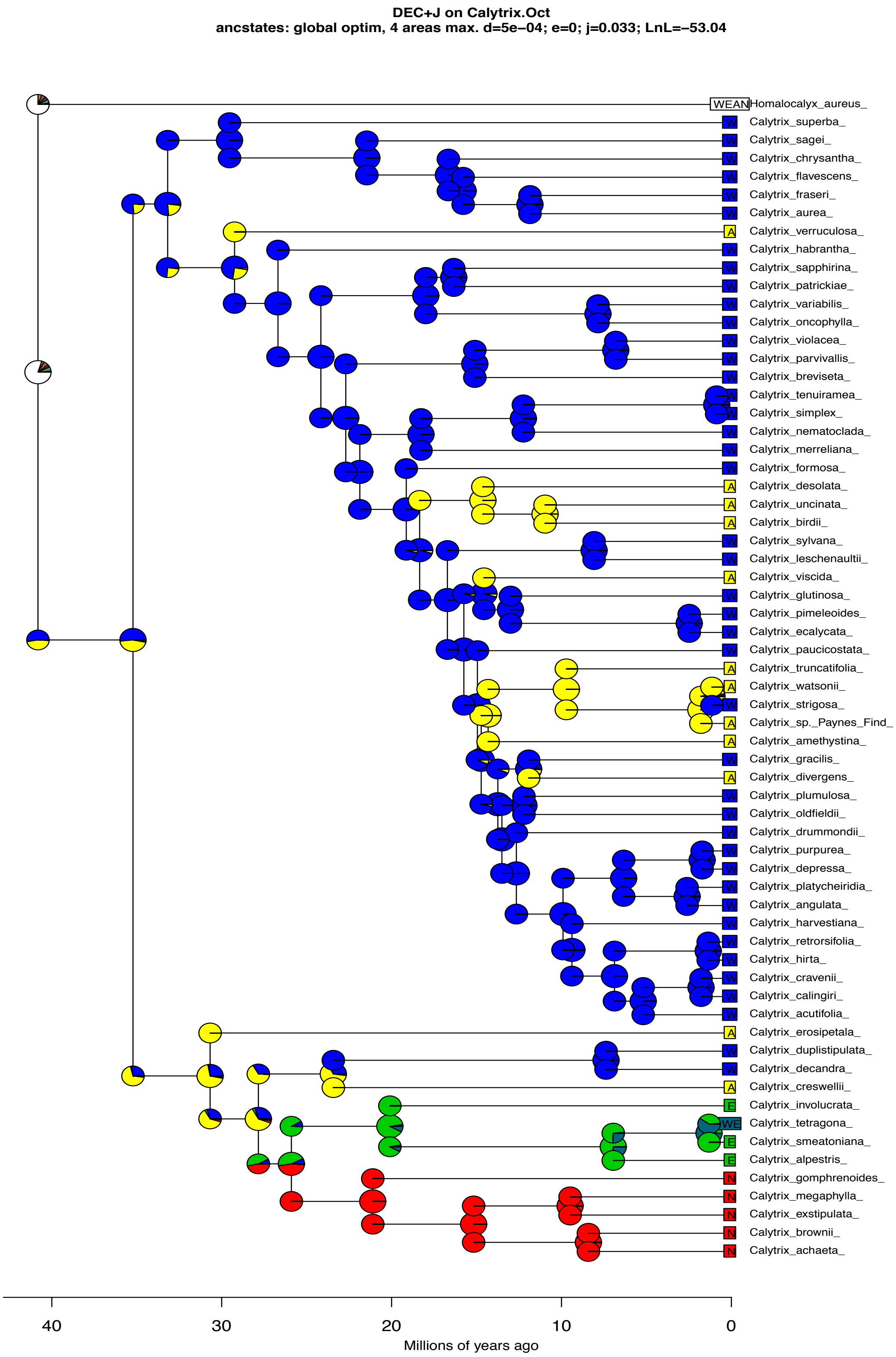


Fig. S5. Maximum-likelihood ancestral-range reconstruction in *Calytrix* based on the default biogeographical model (DEC+*j*) with no time stratification and distance parameters for the SWA subset. Pie diagrams depict the relative probabilities of ancestral ranges. *Calytrix* nodes with no pie diagrams shown correspond to the preceding pie. Coloured nodes at the tips correspond to their respective scored current distributions. Area names are Geraldton Sandplains (N), Swan Coastal Plain (P), Wheatbelt (W), South Coast (S), Esperance (E), arid areas adjacent to SWA (A), and Jarrah Forest (J).

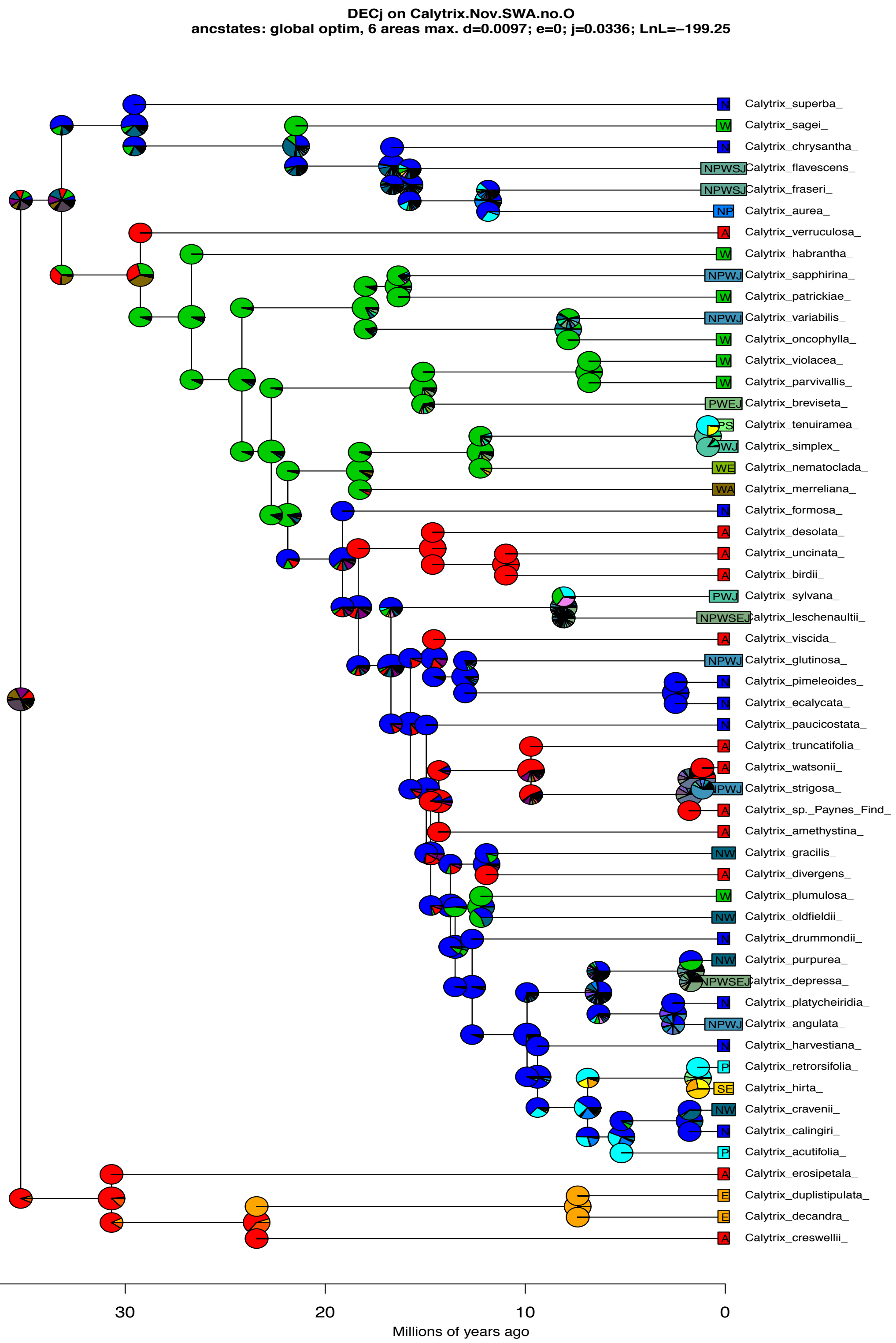


Fig. S6. Area size (ha) and species recorded in each subregion of SWA.

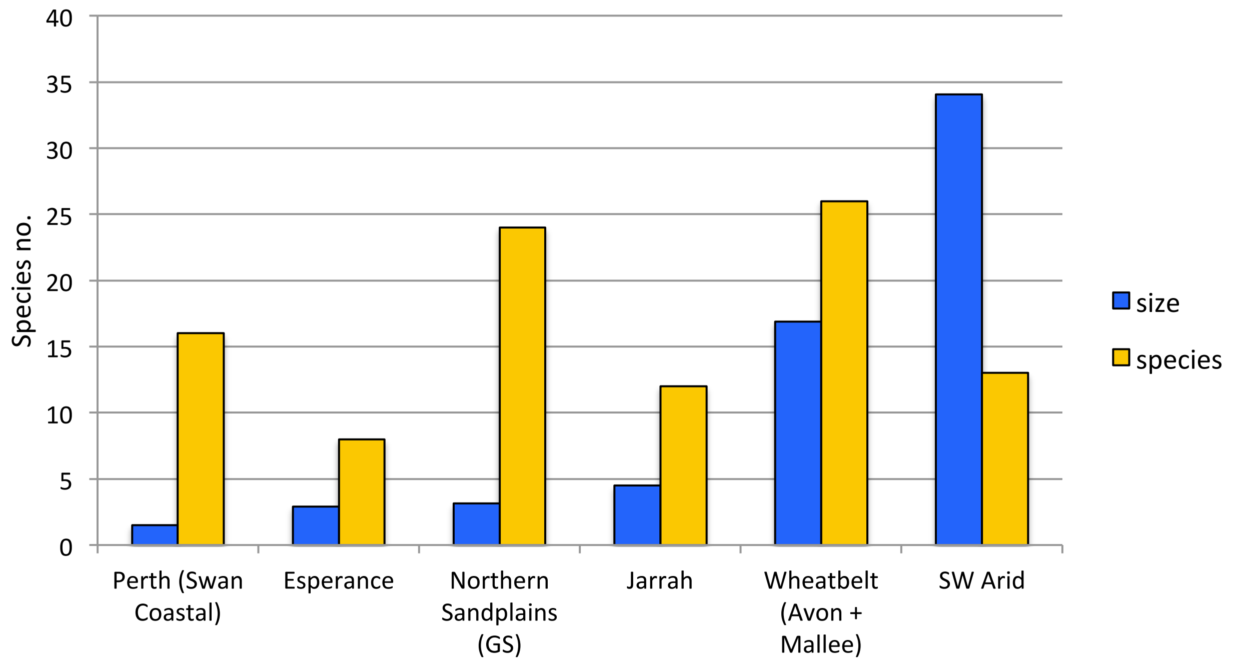
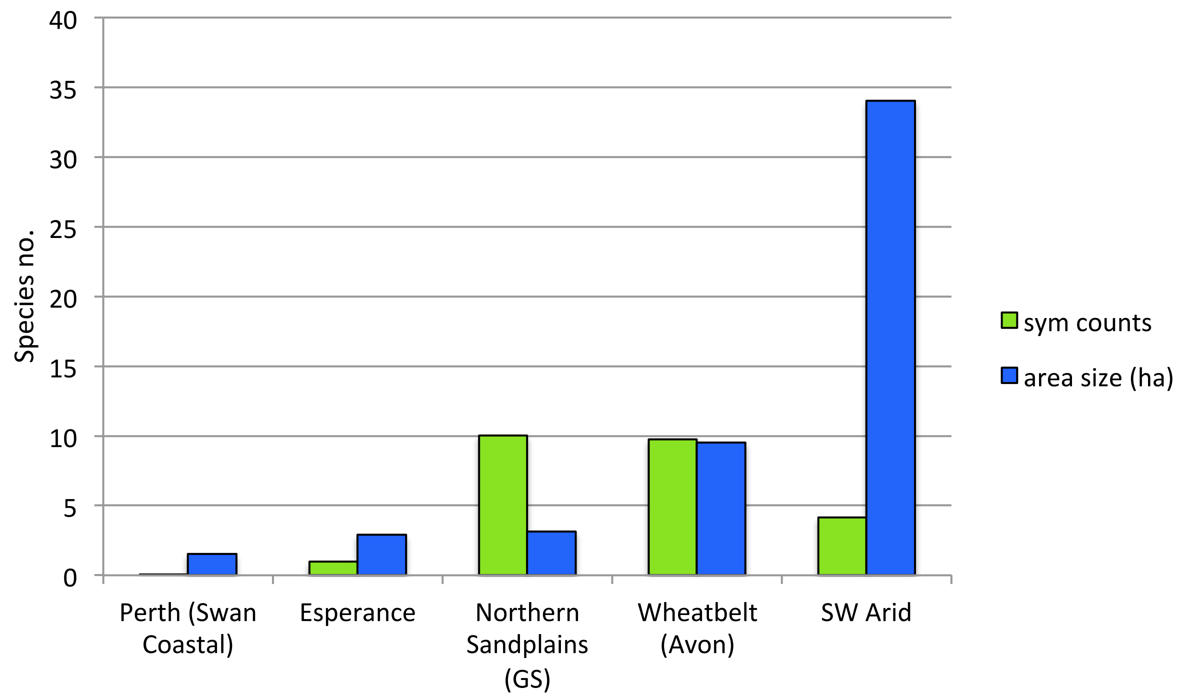


Fig. S7. Area size (ha) and sympatric (within-area) speciation counts in each subregion of SWA.



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