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Supplementary Materials for

Landscape burning facilitated Aboriginal migration into Lutruwita/Tasmania 41,600 years ago

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Supplementary Text

Chronology considerations

Reworked or redistributed alluvial and aeolian sands are largely features of arid phases in the Furneaux Group during the Quaternary (*1*), including the last glacial maximum (LGM) (*2*). Bedrock sand characterized the base of laymina paywuta and likely marks the end of the arid Marine Isotope Stage (MIS)-4 and the onset of wetter conditions suitable for lagoon formation at the beginning of MIS-3. Thus, the bottom depth (394 cm) of laymina paywuta is taken as the start of MIS-3 (~57 ka) in the age-depth model, when moisture conditions were suitable for organic preservation at the site. The relatively arid MIS-4 (*3*, *4*) would likely have supported cold adapted herbaceous plant communities as the case later during the LGM. This reflects in the greater abundance of herbaceous pollen in the bottom 9 cm of Emerald Swamp (later referred to as 'Emerald') and is taken to indicate MIS-4, with the depth (280 cm) of major herbaceous community decline marking the boundary of MIS-4/MIS-3 in the age-depth model (Fig. 2). Out of the 24 radiocarbon dates obtained for laymina paywuta, six dates were suspected to be contaminated/mixed due to age reversals and 18 were used in building the age-depth model. There are no limestones around either of the coring sites and there is less likelihood of reservoir effects on the radiocarbon dates. Similarly, the age reversals in Emerald, especially at 185 and 255 cm, are also likely due to sediment mixing or contamination. However, no significant difference was observed after fitting the age-depth model with and without the reversed dates for Emerald, hence we present the former (Fig. 2). All radiocarbon date results are presented in Table S1 in supplementary information. The palaeoecological results presented here are focused on pre-LGM and LGM periods (~60–17 ka).

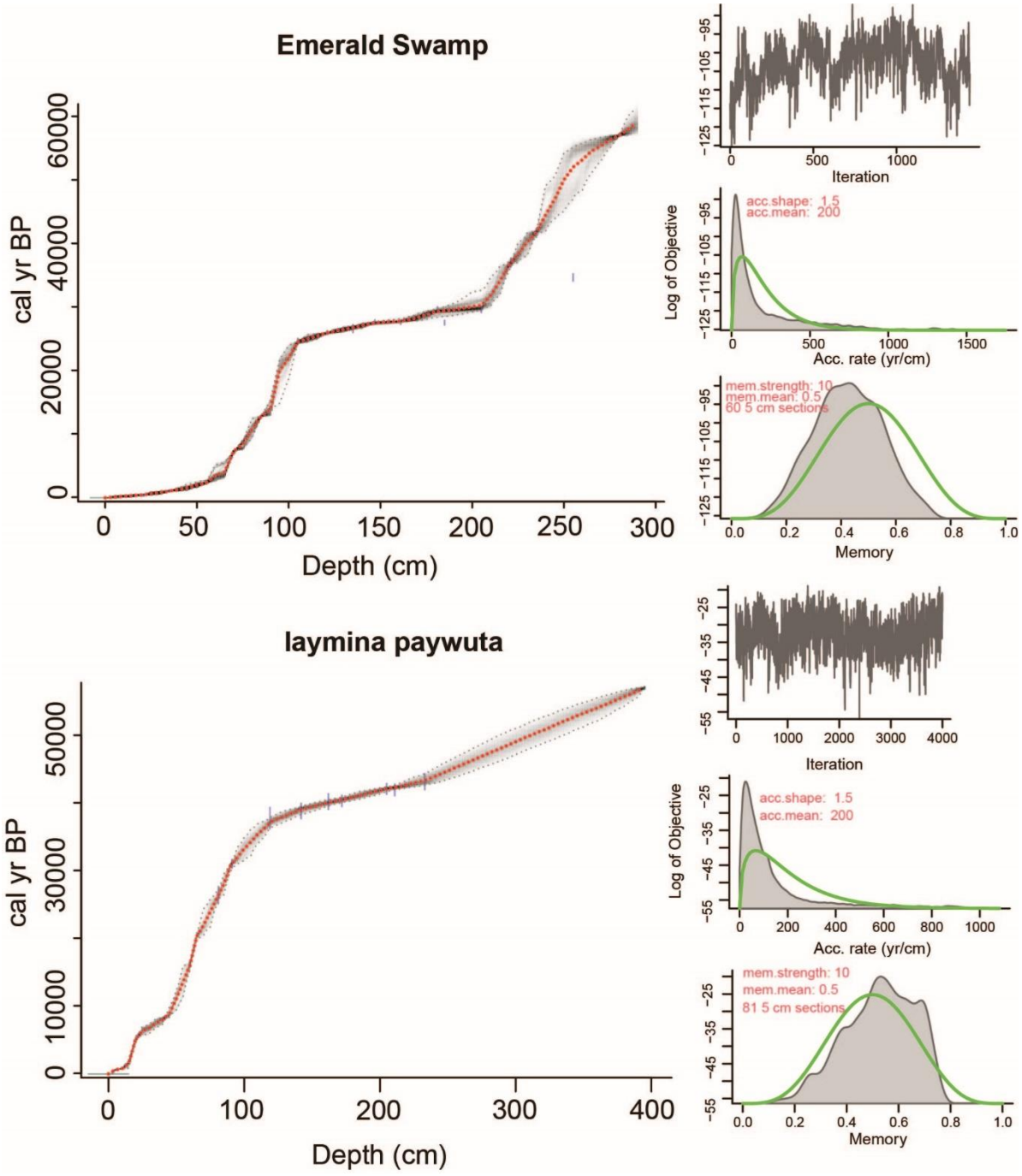

Figure S1: Bacon age-depth model out put for core sites showing calibrated ^{14}C dates (purple), age-depth model (dark grey), 95% confidence intervals of calibrated range (light grey), single model based on the weighted mean age for each depth (red curve).

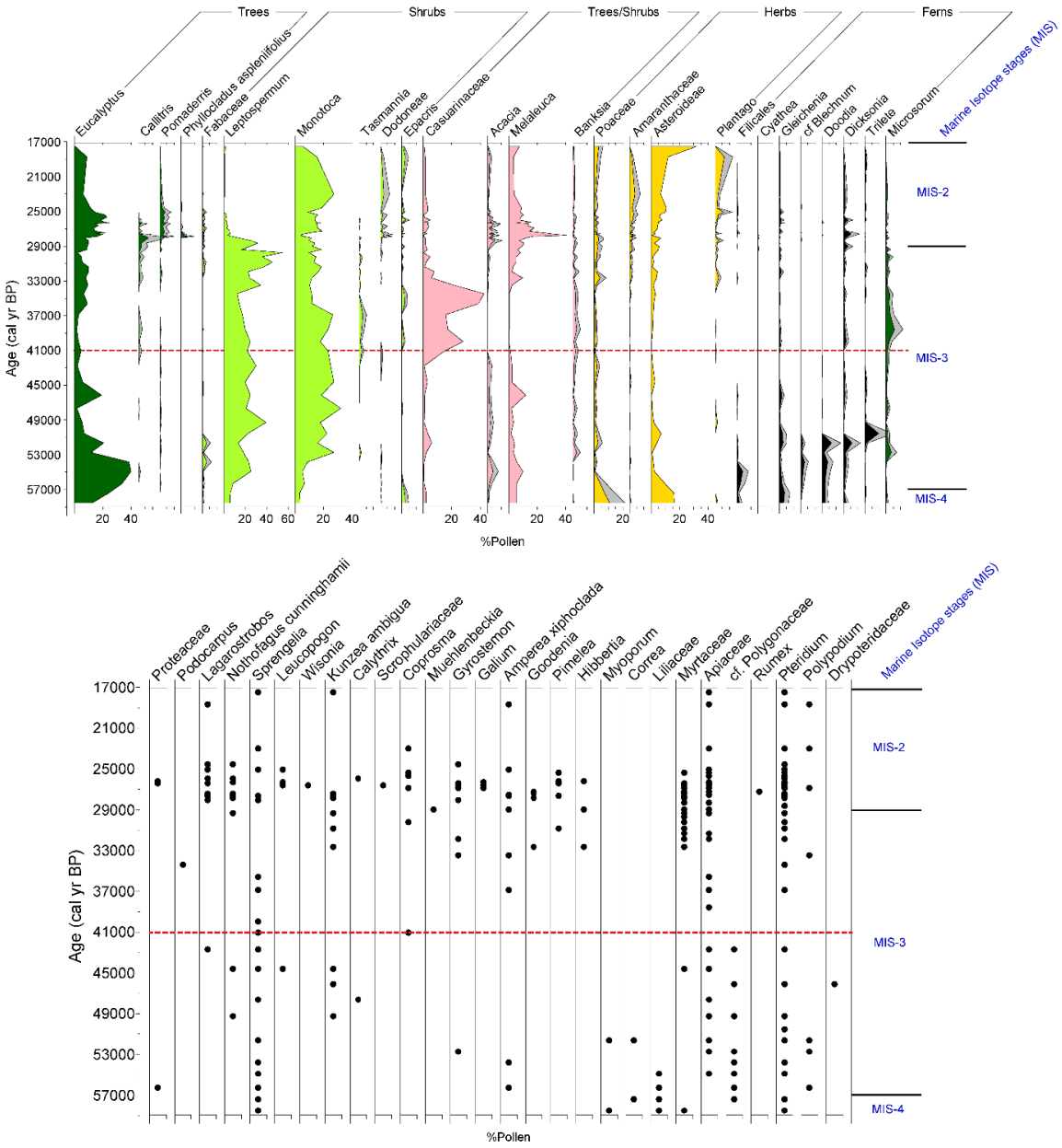

Figure S2: Full terrestrial pollen record for Emerald Swamp, western Bass Strait. Solid black circle indicates taxa occurrence in one sample or at <2% across the record. Grey-shades are ×4 exaggeration to enhance visibility. Red-shaded zone is the timing of human arrival in Tasmania/Lutruwita at ~41.6 ka as identified in main text.

At Emerald Swamp, the MIS-4 – 3 transition is charactered by the replacement of herbs by *Eucalyptus*. *Eucalyptus* soon declines by ~53 ka with the expansion of *Leptospermum* and *Monotoca* largely characterizing MIS-3. However, human arrival at ~41.6 ka was accompanied by a major expansion of Casuarinaceae from ~41 to 33 ka. *Eucalyptus* peaked briefly again between ~28 and 25 ka. *Leptospermum* dropped out at this time with *Monotoc*a and herbaceous taxa, especially Asterioideae dominating.

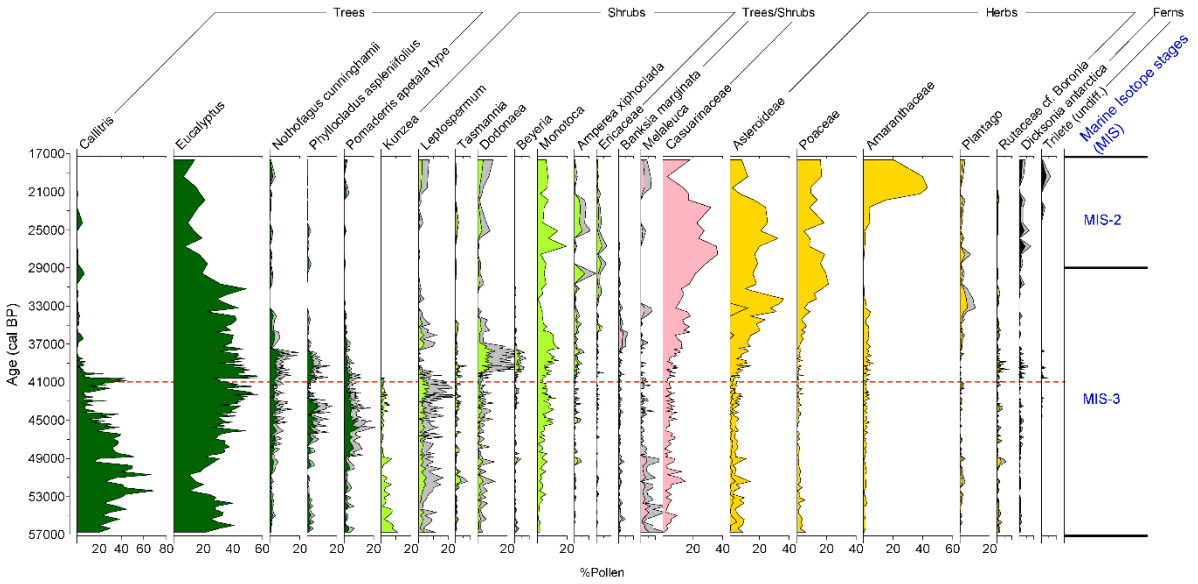

Figure S3: Full terrestrial pollen record of taxa >2% for laymina paywuta, eastern Bass Strait. Grey-shades are ×4 exaggeration to enhance visibility. Red-dotted line is the timing of human arrival on the eastern Bassin Land Bridge at ~41.6 ka as identified in main text.

Callitris and *Eucalyptus* generally dominated the first half of MIS-3 at laymina paywuta, and human arrival at ~41.6 ka features a collapse in *Callitris* abundance in favour of *Eucalyptus* in the area by ~41 ka. *Eucalyptus* declines in MIS-2, with the expansion of herbs and Casuarinaceae.

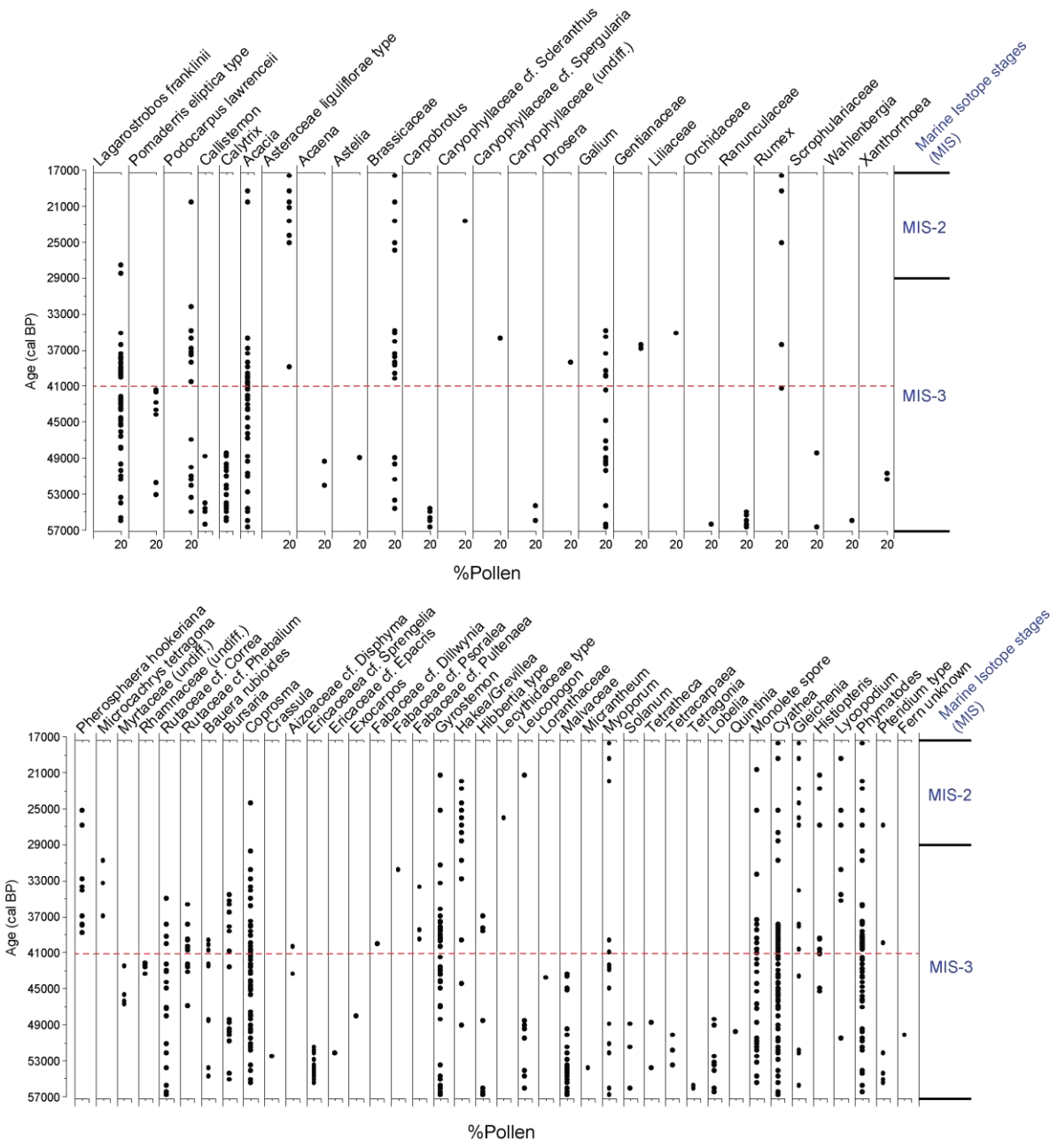

Figure S4: Terrestrial pollen record of taxa occurrence in one sample or at <2% in laymina paywuta record. Red-dotted line is the timing of human arrival on the eastern Bassin Land Bridge at ~41.6 ka as identified in main text.

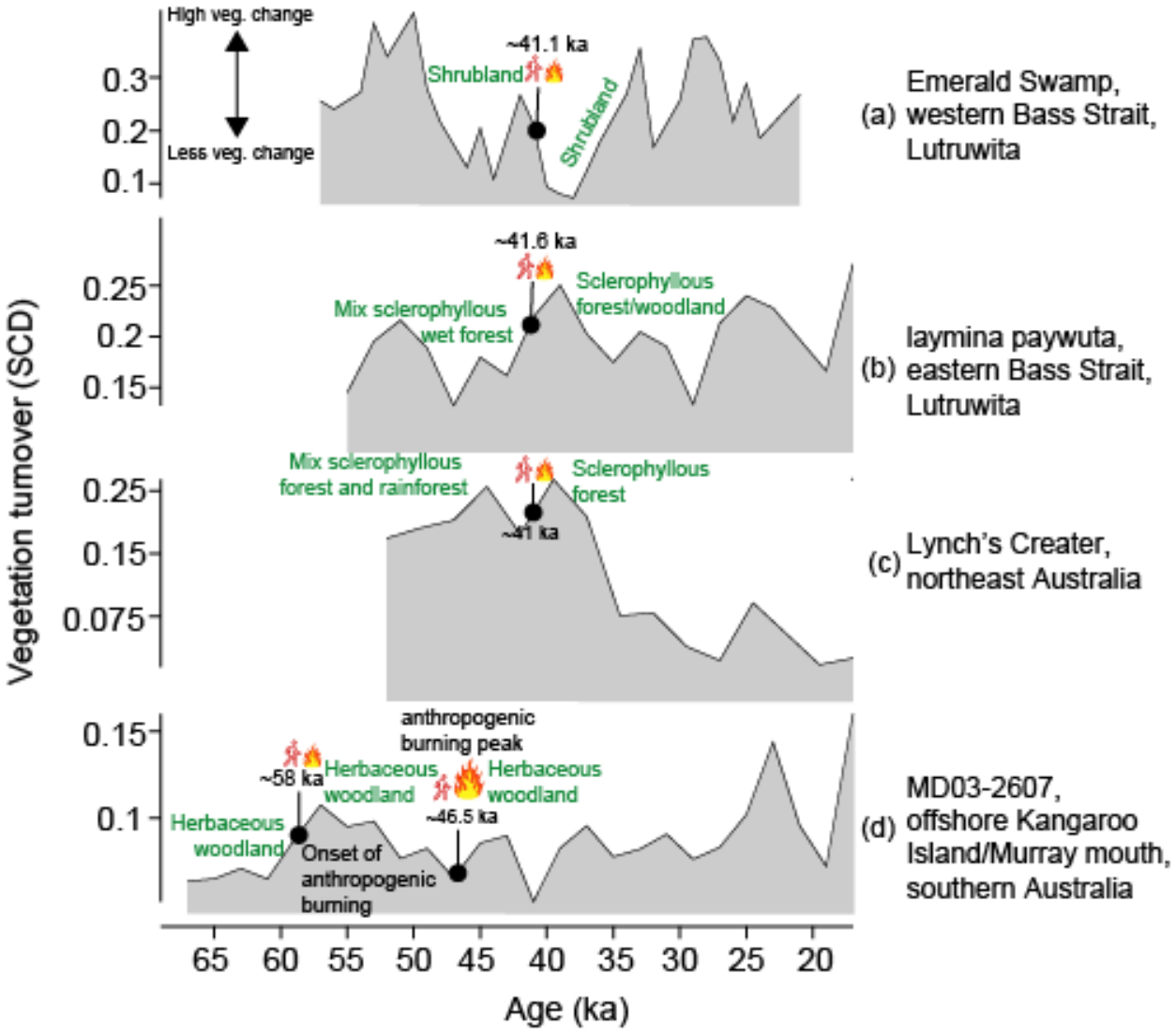

Figure S5: Vegetation turnover in Tasmanian/Lutruwitan sites compared to that of the Australian mainland (*5*, *6*).

Table S1: AMS radiocarbon dates of bulk sediment for laymina paywuta and Emerald Swamp, Bass Strait, Tasmania/Lutruwita, measured at Direct AMS, Washington and Australian Nuclear Science and Technology Organization (ANSTO). Dates in italics are those excluded when building laymina paywuta age-depth model. Note: 'Depth' is lower boundary and thickness is 1 cm, so '0 cm' is '0-1 cm' and so on.

Site	LabID	Lab	^{14}C yr bp	Error (1 σ)	Depth (cm)	Calendar age range
laymina paywuta	Core top		-66	1	0	-
laymina paywuta	D-AMS 028548	DirectAMS	236	22	2.5	147 - 297
laymina paywuta	D-AMS 028549	DirectAMS	383	24	4	323 - 489
laymina paywuta	D-AMS 028550	DirectAMS	552	25	5.5	505 - 549
laymina paywuta	D-AMS 028551	DirectAMS	854	24	10	676 - 765
laymina paywuta	D-AMS 028552	DirectAMS	1242	23	12	1058 - 1177
laymina paywuta	*OZY557*	*ANSTO*	*6155*	*45*	*8*	*6855 - 7161*
laymina paywuta	OZT383	ANSTO	4890	45	22	5472 - 5714
laymina paywuta	OZY558	ANSTO	10590	100	33	12093 - 12736
laymina paywuta	OZT384	ANSTO	7600	30	42	8218 - 8424
laymina paywuta	OZT385	ANSTO	13465	45	60	16000 - 16333
laymina paywuta	OZY559	ANSTO	15440	60	63	18361 - 18848
laymina paywuta	*OZT386*	*ANSTO*	*12800*	*45*	*72*	*15053 - 15419*
laymina paywuta	OZY560	ANSTO	22060	270	81	25845 - 26980
laymina paywuta	OZY561	ANSTO	26940	130	91	30929 - 31206
laymina paywuta	*OZT387*	*ANSTO*	*27310*	*90*	*110*	*31111 - 31536*
laymina paywuta	OZY562	ANSTO	33000	230	119	36747 - 38511
laymina paywuta	*OZY563*	*ANSTO*	*39060*	*290*	*132*	*42394 - 42897*
laymina paywuta	OZT388	ANSTO	34040	140	142	38748 - 39556

laymina paywuta	OZY564	ANSTO	35070	270	162	39602 - 40766
laymina paywuta	OZT389	ANSTO	35220	150	172	39908 - 40720
laymina paywuta	*OZY565*	*ANSTO*	*32570*	*200*	*189*	*36350 - 37374*
laymina paywuta	OZY566	ANSTO	37910	330	205	41943 - 42471
laymina paywuta	OZY567	ANSTO	37650	350	211	41746 - 42418
laymina paywuta	OZY568	ANSTO	39150	410	233	42339 - 43055
Emerald	Core top		-72	1	0	-
Emerald	D-AMS 047842	DirectAMS	359	26	21	307 - 464
Emerald	D-AMS 047306	DirectAMS	1116	24	35	928 - 1053
Emerald	D-AMS 047843	DirectAMS	2329	26	55	2150 - 2351
Emerald	D-AMS 047844	DirectAMS	6655	23	71	7431 - 7569
Emerald	D-AMS 047307	DirectAMS	10902	34	85	12740 - 12889
Emerald	D-AMS 047845	DirectAMS	20467	49	105	24263 - 24780
Emerald	D-AMS 047846	DirectAMS	21623	53	121	25792 - 25984
Emerald	D-AMS 047308	DirectAMS	22369	78	135	26386 - 26940
Emerald	D-AMS 047847	DirectAMS	23530	61	147	27481 - 27822
Emerald	D-AMS 047848	DirectAMS	23429	59	161	27397 - 27763
Emerald	D-AMS 047849	DirectAMS	25310	64	181	29247 - 29848
Emerald	D-AMS 047309	DirectAMS	23250	84	185	27289 - 27681
Emerald	D-AMS 047850	DirectAMS	25258	63	205	29216 - 29798
Emerald	D-AMS 047851	DirectAMS	32670	113	221	36563 - 37322
Emerald	D-AMS 047310	DirectAMS	37082	244	235	41438 - 42143
Emerald	D-AMS 047852	DirectAMS	30092	92	255	34286 - 34662