Extended Data Table 1. The copy number of guard cell toolkit genes

		Seagrasses				Freshwater species			Mangrove		Moconots					Eudicots										
Orthogroup	Gene name	**CN**	**PO**	**TT**	**ZM**	**PA**	SP	WA	AM	RA	OS	BD	AC	EG	AO	BV	UG	SL	CC	VV	PT	AT	TC	ATR	average non seagrasses	average in seagresses	enrichment in seagrasses
OG0007504	*KAT1/2*	0	0	0	0	0	0	0	1	1	3	3	2	2	3	2	0	2	1	1	1	2	1	1	1.4	0	-1.4
OG0007602	*CHX20*	0	0	0	0	1	1	1	0	1	1	1	1	3	2	1	2	1	2	2	1	1	3	1	1.4	0	-1.4
OG0008443	*SPCH*	0	0	0	0	0	0	2	4	1	2	2	1	1	1	1	2	1	1	1	2	1	1	1	1.4	0	-1.4
OG0010600	*FAMA*	0	0	0	0	1	0	1	1	2	1	1	1	1	1	2	1	2	1	1	2	1	1	1	1.2	0	-1.2
OG0010778	*MUTE*	0	0	0	0	0	1	2	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1.2	0	-1.2
OG0011023	*EPF2*	0	0	0	0	0	1	1	1	0	2	2	2	0	3	1	0	1	0	1	1	2	1	1	1.1	0	-1.1
OG0011265	*EPFL9*	0	0	0	0	0	1	0	3	1	2	1	1	2	1	1	0	1	0	1	1	1	1	1	1.1	0	-1.1
OG0011287	*EPF1*	0	0	0	0	1	1	0	1	1	0	0	1	1	1	1	1	1	1	2	3	1	1	1	1	0	-1
OG0011459	*BLUS1*	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	3	1	1	1	1	0	-1
OG0012246	*TMM*	0	0	0	0	0	1	1	1	1	1	1	1	0	1	0	0	1	1	0	1	1	1	1	0.8	0	-0.8
OG0013441	*BASL*	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	4	1	1	0	1	1	0	0	0.6	0	-0.6
OG0000002	*MYB60*	28	25	25	12	25	21	12	19	2	26	28	27	2	27	18	21	30	24	37	44	27	32	14	22.8	22.5	-0.3
OG0000010	*ABCG3*	7	14	8	10	14	18	13	0	18	24	15	14	16	21	11	14	25	23	31	24	15	25	15	17.9	9.8	-8.1
OG0000040	*STP*	3	7	5	6	10	4	3	11	1	14	14	14	13	9	10	8	12	10	9	24	11	14	7	10.4	5.3	-5.2
OG0000102	*SnRK2.6*	8	5	5	4	6	6	5	11	8	11	10	7	2	7	5	1	8	11	8	13	10	7	4	7.4	5.5	-1.9
OG0000274	*CNGC14*	4	4	2	2	5	4	2	7	5	5	6	4	7	2	7	0	6	6	6	5	5	6	2	4.7	3	-1.7
OG0000293	*CPK*	5	4	4	4	6	4	2	6	2	4	4	3	1	3	4	4	6	4	4	6	8	5	3	4.1	4.3	0.2
OG0000927	*ABI1*	2	2	1	1	2	3	2	7	3	3	3	3	4	2	1	2	4	3	3	3	4	3	1	3	1.5	-1.5
OG0001440	*SCRM*	1	2	3	1	1	2	1	5	2	2	2	2	4	3	2	4	2	2	3	2	2	2	3	2.5	1.8	-0.8
OG0001443	*PHOT1/2*	3	3	2	2	4	2	2	2	2	3	2	2	2	2	2	2	2	2	2	3	2	2	2	2.1	2.5	0.4
OG0001444	*ER/ERL1/ERL2*	2	2	2	3	1	2	5	3	4	3	2	2	0	2	1	0	2	3	2	3	3	2	2	2.3	2.3	0
OG0001734	*SKOR/GORK*	1	1	1	1	1	1	1	3	2	2	3	2	2	4	2	3	3	2	5	3	2	2	2	2.4	1	-1.4
OG0002166	*YODA*	2	2	1	2	2	1	1	5	3	2	2	1	1	2	1	1	3	1	3	4	1	2	1	1.9	1.8	-0.2
OG0002436	*GRP7*	1	2	1	1	2	2	3	3	1	2	2	3	1	2	1	2	3	2	1	2	2	1	2	1.9	1.3	-0.7
OG0004112	*MYB88*	0	1	1	1	1	2	1	3	2	1	1	2	2	2	1	2	2	1	1	2	2	1	1	1.6	0.8	-0.9
OG0004841	*POLAR*	1	1	2	1	1	1	0	1	0	3	4	2	2	2	1	0	1	1	0	2	2	1	2	1.4	1.3	-0.1
OG0005143	*TPK1*	1	1	1	1	2	1	1	1	1	3	3	1	1	1	1	1	1	1	1	2	2	1	1	1.3	1	-0.3
OG0006635	*MPR5*	1	1	1	1	1	1	0	3	1	1	1	2	2	1	1	1	1	1	1	2	1	1	1	1.2	1	-0.2
OG0010592	*HT1*	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	2	1	0	2	1	1	1	0.9	1	0.1
OG0010864	*SLAC1*	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0.9	0.5	-0.4

Species sequenced in this work are in bold. Full list of abbreviation of the species names used in the figure: CN *Cymodocea nodosa*; PO *Posidonia oceanica*; TT *Thalassia testudinum*; ZM *Zostera marina*; PA *Potamogeton acutifolius*; SP *Spirodela polyrhiza*; WA *Wolffia australiana*; AM *Avicennia marina*; RA *Rhizophora apiculata*; OS *Oryza sativa*; BD *Brachypodium distachyon*; AC *Ananas comosus*; EG *Elaeis guineensis*; AO *Asparagus officinalis*; BV *Beta vulgaris*; UG *Utricularia gibba*; SL *Solanum lycopersicum*; CC *Coffea canephora*; VV *Vitis vinifera*; PT *Populus trichocarpa*; AT *Arabidopsis thaliana*; TC *Theobroma cacao*; ATR *Amborella trichopoda*.

Extended Data Table 2. The copy number of genes involved in triterpenes, JA, MeJA/MeSA and ethylene biosynthesis and signaling pathways

			Seagrasses				freshwater specie			Mangrove		Moconots					Eudicots										
	Orthogroup	Gene name	*CN*	*PO*	*TT*	*ZM*	*PA*	*SP*	*WA*	*AM*	*RA*	*OS*	*BD*	*AC*	*EG*	*AO*	*BV*	*UG*	*SL*	*CC*	*VV*	*PT*	*AT*	*TC*	*ATR*	average non seagrasses	average in seagresses	enrichmentin seagrasses
TPS	OG0000073	**Terpene synthase - TPS-**	0	0	0	0	0	0	0	11	0	30	13	4	9	1	8	0	14	17	30	13	22	18	2	10.7	0	-10.7
	OG0000414	**TPS-CIN1**	1	1	1	0	1	4	0	3	0	0	3	1	1	4	3	1	12	14	4	11	6	8	9	4.7	0.8	-3.9
	OG0001267	**SQE**	1	2	3	1	1	1	1	7	2	2	1	1	2	2	2	1	2	4	5	4	3	7	1	2.7	1.8	-0.9
	OG0003488	**TPS14**	0	0	0	0	0	0	0	2	4	2	2	3	0	1	3	0	2	1	6	2	1	4	4	2.1	0	-2.1
	OG0003932	**squalene synthase**	1	1	3	1	1	1	1	2	1	2	2	1	2	1	2	0	4	1	1	2	2	1	1	1.5	1.5	0
	OG0004390	**TPS31/GA1**	1	1	1	1	1	2	1	2	2	3	1	2	1	1	1	1	1	2	2	2	1	1	1	1.5	1	-0.5
	OG0008991	**CYP705A5**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	1.4	0	-1.4
	OG0011463	**TPS04**	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	1	2	4	1	1	3	2	1	0	-1
	OG0014737	**CYP708A2**	0	0	0	0	0	0	0	0	1	3	1	0	0	0	0	0	0	0	0	1	1	0	0	0.4	0	-0.4
MeSA	OG0000086	***JMT, BSTM1***	4	6	3	2	2	3	0	6	2	20	6	11	4	6	16	1	10	13	17	10	9	14	10	8.8	3.8	-5
	OG0000120	***CHL1***	5	6	4	4	3	4	4	8	5	14	12	7	2	8	6	6	15	5	6	5	7	6	10	7.2	4.8	-2.5
	OG0000199	***LOX3***	3	4	2	2	5	7	9	1	4	8	5	6	1	5	7	2	6	4	8	9	4	10	6	5.7	2.8	-2.9
	OG0000306	***NPF***	4	3	4	3	4	2	1	8	6	6	4	3	2	3	3	5	5	7	3	5	6	5	3	4.3	3.5	-0.8
	OG0000394	***ABCG1/2/6/20***	4	6	3	6	4	3	1	5	2	5	5	4	3	1	3	2	4	2	2	5	8	5	1	3.4	4.8	1.4
	OG0000542	***JAZ1***	3	2	4	2	4	2	2	2	5	4	5	3	4	6	2	8	3	2	2	3	4	2	1	3.3	2.8	-0.6
	OG0000649	***AOX2***	3	4	3	3	4	3	4	1	2	3	4	1	1	4	4	3	4	3	3	4	5	2	2	2.9	3.3	0.3
	OG0000886	***NPF1.2***	0	0	0	0	0	0	0	4	0	1	1	0	0	1	6	1	17	12	3	11	2	4	1	3.6	0	-3.6
	OG0001204	***CYP94C1***	2	3	1	2	4	3	1	6	4	4	4	1	4	0	2	0	2	2	3	4	1	3	0	2.4	2	-0.4
	OG0001236	***NPF8.1***	1	1	1	9	2	1	1	2	2	2	2	2	0	3	1	3	4	2	1	5	1	4	2	2.1	3	0.9
	OG0001254	***JOX1***	2	4	2	2	2	0	1	5	1	4	4	5	0	2	1	1	3	2	2	5	4	2	1	2.4	2.5	0.1
	OG0001476	***JAR1***	2	4	3	2	3	3	1	3	2	2	2	2	3	2	1	2	8	1	1	2	1	1	1	2.1	2.8	0.6
	OG0001843	***JAM1***	2	1	1	3	1	2	6	4	2	2	2	2	2	1	1	2	2	1	1	2	2	1	3	2.1	1.8	-0.4
	OG0001871	***JAZ3,4,9***	2	1	3	0	2	1	1	6	3	2	1	1	2	1	2	4	3	2	2	4	3	2	1	2.3	1.5	-0.8
	OG0002013	***NPF3.1***	1	1	1	1	1	1	5	2	2	4	4	2	0	0	2	2	2	3	2	4	1	3	2	2.3	1	-1.3
	OG0002236	***CYP94B1***	1	4	2	5	1	1	2	0	3	2	1	1	1	0	1	2	4	1	1	2	3	1	1	1.5	3	1.5
	OG0002251	***NPF2.7/NAXT***	0	0	0	0	1	3	0	0	0	1	1	1	2	2	4	0	8	6	2	1	7	5	1	2.4	0	-2.4
	OG0002270	***MYC2***	1	2	4	3	2	1	1	2	2	1	1	1	4	0	2	3	2	1	1	2	4	1	1	1.7	2.5	0.8
	OG0002613	***JAZ7***	0	0	2	0	0	2	2	3	3	1	1	4	2	1	1	1	4	2	5	2	3	1	2	2.2	0.5	-1.7
	OG0003233	***OPR3***	1	3	1	4	1	1	2	1	1	1	1	1	1	1	3	1	1	1	1	3	1	1	2	1.3	2.3	0.9
	OG0003391	***NPF5.7***	1	1	2	1	1	0	0	3	3	1	1	1	0	2	4	1	3	2	1	3	2	2	1	1.7	1.3	-0.4
	OG0003582	***JAZ11***	4	2	3	1	3	2	2	0	2	1	1	1	2	1	0	0	1	1	1	2	2	2	1	1.2	2.5	1.3
	OG0004210	***NINJA***	1	1	1	6	1	1	1	1	2	1	1	1	2	2	1	1	1	1	1	2	1	1	1	1.2	2.3	1
	OG0004293	***JASSY***	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	9	1	1	1.4	1.3	-0.2
	OG0004420	***JAZ10***	3	2	2	1	3	3	0	2	2	1	1	1	3	0	1	0	0	0	1	2	1	1	1	1.1	2	0.9
	OG0004530	***COS1***	1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	1	2	5	1	2	1	1	1	1.5	1	-0.5
	OG0004860	***CTS***	2	2	1	1	1	1	1	1	2	2	2	1	4	1	1	1	1	1	0	2	1	1	1	1.3	1.5	0.2
	OG0009426	***GH3.10***	1	1	1	1	1	1	1	1	1	0	0	1	2	1	0	0	3	1	1	2	1	1	1	1	1	0
	OG0011832	***NPF5.1***	0	0	0	0	1	0	0	2	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	0.8	0	-0.8
	OG0014068	***NPF4.1***	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	2	1	1	0.4	0.3	-0.1
ethylene	OG0000276	***EIN3/EIL2***	2	4	4	4	5	3	5	6	4	7	6	4	2	6	4	0	9	4	3	7	6	3	2	4.5	3.5	-1
	OG0000281	***ENAP1***	5	5	3	3	5	4	5	7	4	4	4	2	8	3	4	5	5	4	2	7	5	3	3	4.4	4	-0.4
	OG0000296	***LTH1,2***	4	3	6	3	4	1	1	15	5	3	5	4	2	2	2	4	4	4	8	5	7	4	1	4.3	4	-0.3
	OG0000357	***SAM1/MAT1, 2, 3,4***	4	3	4	2	3	3	2	6	7	5	3	4	6	2	2	8	4	3	4	6	4	4	2	4.2	3.3	-0.9
	OG0000744	***ETR2, ERS2, EIN4***	1	3	2	0	2	3	4	4	3	4	4	2	4	4	2	3	8	3	3	4	3	2	1	3.4	1.5	-1.9
	OG0001476	***JAR1***	2	4	3	2	3	3	1	3	2	2	2	2	3	2	1	2	8	1	1	2	1	1	1	2.1	2.8	0.6
	OG0001646	***EBF1,2***	0	2	3	0	3	3	3	3	3	2	2	2	2	2	2	3	4	2	2	4	2	2	1	2.4	1.3	-1.2
	OG0001697	***ARD1,2,3,4***	2	1	2	1	2	2	2	5	1	3	3	2	2	2	2	2	2	2	2	2	4	2	2	2.3	1.5	-0.8
	OG0002343	***type-1 ACO2,3,4***	0	1	1	0	1	1	1	2	3	3	2	1	0	1	2	1	5	6	2	4	3	2	2	2.3	0.5	-1.8
	OG0002836	***Type-2 ACS ACS4,5,8,9,11***	0	1	1	0	3	1	1	3	3	1	1	2	2	1	1	1	3	2	3	3	5	2	1	2	0.5	-1.5
	OG0002976	***ETR1, ERS1***	0	1	1	0	2	1	1	2	3	2	3	3	3	1	2	1	3	1	2	3	2	2	1	2	0.5	-1.5
	OG0003168	***EIN2***	0	1	1	0	1	1	0	3	2	4	3	2	3	4	1	1	3	1	2	2	1	1	1	1.9	0.5	-1.4
	OG0003464	***Type-1 ACS ACS1,2,6***	0	0	0	0	0	0	0	5	4	1	1	1	2	1	2	1	5	3	2	3	3	2	1	2.1	0	-2.1
	OG0003520	***ACS10,12***	2	1	1	1	2	1	1	2	2	1	1	1	2	1	2	2	2	2	2	2	2	2	1	1.6	1.3	-0.4
	OG0003634	***ETO1, EOL1***	1	1	2	1	1	2	0	1	4	1	1	1	1	0	1	2	2	2	2	4	2	2	1	1.6	1.3	-0.4
	OG0005343	***MTN1,2***	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	2	1	1	1	2	2	1	2	1.3	1	-0.3
	OG0005488	***MTK***	1	1	1	1	1	1	0	2	1	2	1	1	2	1	1	1	1	1	2	2	1	2	2	1.3	1	-0.3
	OG0005504	***ETO1-like2 (EOL2)***	1	1	1	1	1	1	1	2	1	2	2	2	1	2	1	1	1	1	1	2	1	1	1	1.3	1	-0.3
	OG0005606	***RAN1***	2	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	2	1	1	1	1.3	1.3	0
	OG0005645	***CTR1 (Raf1)***	0	1	1	0	1	1	1	1	2	2	2	1	1	1	1	0	3	1	2	4	1	2	1	1.5	0.5	-1
	OG0006193	***GGT1***	2	1	1	1	3	1	0	1	2	1	1	1	0	1	1	1	2	1	1	2	2	1	1	1.1	1.3	0.1
	OG0009047	***Type-3 ACS7***	0	2	0	0	1	0	0	1	1	3	1	0	2	1	1	0	2	1	2	2	1	1	2	1.2	0.5	-0.7
	OG0010403	***Type-3 ACO5***	0	1	0	0	0	0	0	0	1	3	3	1	1	2	1	0	1	2	1	2	1	1	1	1.2	0.3	-0.9
	OG0010451	***RTE1***	0	0	0	0	0	1	1	2	1	2	1	1	1	1	1	0	2	1	1	2	1	1	2	1.2	0	-1.2
	OG0011542	***type-2 ACO1***	0	1	0	0	0	0	0	2	1	1	1	1	2	0	1	0	1	2	1	1	1	2	0	0.9	0.3	-0.7

Species sequenced in this work are in bold. Full list of abbreviation of the species names used in the figure: CN *Cymodocea nodosa*; PO *Posidonia oceanica*; TT *Thalassia testudinum*; ZM *Zostera marina*; PA *Potamogeton acutifolius*; SP *Spirodela polyrhiza*; WA *Wolffia australiana*; AM *Avicennia marina*; RA *Rhizophora apiculata*; OS *Oryza sativa*; BD *Brachypodium distachyon*; AC *Ananas comosus*; EG *Elaeis guineensis*; AO *Asparagus officinalis*; BV *Beta vulgaris*; UG *Utricularia gibba*; SL *Solanum lycopersicum*; CC *Coffea canephora*; VV *Vitis vinifera*; PT *Populus trichocarpa*; AT *Arabidopsis thaliana*; TC *Theobroma cacao*; ATR *Amborella trichopoda*.

Extended Data Table 3. The copy number of genes involved in vascular development

		Seagrasses				Freshwater species			Mangrove		Moconots					Eudicots											
Orthogroup	Gene name	**CN**	**PO**	**TT**	**ZM**	**PA**	SP	WA	AM	RA	OS	BD	AC	EG	AO	BV	UG	SL	CC	VV	PT	AT	TC	ATR	average non seagrasses	average in seagresses	enrichmentin seagrasses
OG0011664	*WOX4*	0	0	0	0	0	0	0	3	2	1	1	0	1	0	1	0	1	1	1	2	1	1	1	0.9	0	-0.9
OG0000863	*PFA4/6*	1	3	1	1	2	2	1	8	4	3	3	3	4	3	2	3	4	2	2	4	4	2	2	3.1	1.5	-1.6
OG0001432	*PFA2,/3*	2	2	3	1	3	1	0	5	4	3	2	4	4	2	1	1	3	2	2	3	2	2	1	2.3	2	-0.3
OG0002048	*PFB1/2*	0	1	2	0	1	1	1	4	4	2	3	2	3	2	2	1	3	2	3	4	3	2	1	2.4	0.8	-1.6
OG0004244	*LRL1/2*	2	2	1	2	1	1	0	3	2	2	2	0	2	1	1	1	2	1	1	2	2	1	1	1.4	1.8	0.4
OG0010761	*PFA5*	1	1	1	0	1	0	0	3	1	1	1	1	2	0	0	0	1	1	1	2	1	1	1	0.9	0.8	-0.2
OG0011216	*PXY*	1	1	1	0	1	1	0	0	1	1	1	0	0	1	1	0	2	1	1	2	1	1	1	0.8	0.8	-0.1
OG0008868	*ARF5/MP*	2	1	1	0	1	1	0	3	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1.1	1	-0.1
OG0000009	*PEAR*	15	13	19	13	22	18	8	35	16	14	16	12	21	2	11	29	20	16	11	18	22	13	12	16.3	15	-1.3
OG0000050	*LOG3/4*	8	10	7	6	11	7	6	19	13	11	9	8	2	10	8	0	9	11	11	17	9	9	7	9.2	7.8	-1.5
OG0000101	*ERF109*	8	5	8	6	8	6	11	4	0	10	7	6	10	3	7	10	12	4	6	10	8	7	5	7	6.8	-0.3
OG0000147	AHK (A-type)	4	4	7	4	8	4	5	13	5	8	7	5	2	7	7	0	7	4	10	10	11	5	4	6.3	4.8	-1.6
OG0000465	*ERF1*	3	3	2	2	4	2	7	2	2	4	4	3	3	2	2	3	7	6	2	8	3	5	1	3.7	2.5	-1.2
OG0000521	*APL1*	3	3	5	3	5	3	3	2	2	4	3	4	2	4	2	2	3	3	4	6	4	4	2	3.2	3.5	0.3
OG0000619	*LBD3/4*	1	2	2	2	3	1	0	3	5	4	2	4	6	3	3	1	5	3	5	8	3	4	2	3.4	1.8	-1.7
OG0000679	*SVP*	6	5	2	1	2	4	2	5	2	3	4	3	1	1	4	0	3	3	5	8	2	3	1	3	3.5	0.5
OG0000743	*CVP2*	2	1	3	3	2	3	2	6	4	5	5	3	3	2	2	3	3	2	2	4	3	2	1	3.1	2.3	-0.8
OG0000789	*PHV, PHB, REV*	2	2	2	1	3	3	2	6	4	4	3	3	3	3	1	4	3	3	3	4	3	2	2	3.1	1.8	-1.4
OG0000913	*PSK1-6*	3	3	3	1	4	1	1	5	2	3	2	4	0	2	2	3	4	3	3	5	5	3	1	2.7	2.5	-0.2
OG0001299	*NEN4*	2	2	2	2	2	2	1	3	3	3	2	3	3	3	2	2	3	2	2	3	4	2	1	2.4	2	-0.4
OG0001663	*SACL1/2*	2	2	2	0	3	1	0	5	4	0	1	0	2	2	3	2	4	2	0	9	3	2	2	2.3	1.5	-0.8
OG0001698	*ERF018*	1	1	1	0	2	1	0	4	3	7	3	1	2	0	2	2	3	2	2	6	3	3	2	2.6	0.8	-1.8
OG0001785	*SHR*	2	2	2	1	2	3	1	4	3	2	1	2	4	1	2	3	2	2	2	3	1	2	2	2.2	1.8	-0.5
OG0001893	*LBD1/11*	2	1	1	0	2	1	0	1	3	1	2	1	4	1	2	5	4	4	7	2	2	2	1	2.4	1	-1.4
OG0002017	*PSKR1/2*	2	2	2	2	2	2	1	1	3	3	3	3	0	3	1	0	2	3	1	4	2	2	2	2	2	0
OG0002065	*BES1/BZR1*	1	1	2	1	1	3	1	4	3	1	1	0	2	1	1	5	3	2	2	4	4	2	1	2.2	1.3	-1
OG0002445	*WOX10/13*	2	4	2	1	2	2	0	2	2	1	2	1	2	2	1	1	1	2	3	3	3	2	1	1.7	2.3	0.5
OG0003527	*LHW*	1	1	1	1	0	1	1	4	2	4	1	1	2	3	1	3	2	1	1	2	1	1	1	1.8	1	-0.8
OG0003906	*KNAT1*	2	1	1	1	1	1	1	2	2	4	2	2	4	1	1	1	1	1	1	1	1	1	1	1.6	1.3	-0.3
OG0004118	*TMO5/T5L1*	2	1	1	1	1	1	1	3	2	1	2	2	2	1	1	1	2	1	1	2	2	1	1	1.5	1.3	-0.3
OG0004211	*ATHB8*	1	1	0	1	1	0	0	2	3	1	1	1	1	2	2	1	3	1	2	4	2	2	1	1.6	0.8	-0.9
OG0004259	*LHW-like1*	1	1	1	2	2	1	1	1	2	1	1	1	2	6	1	0	1	1	1	2	1	1	1	1.4	1.3	-0.1
OG0005806	*T5L2,3*	1	1	1	1	2	2	1	2	1	1	1	1	2	1	1	0	1	1	1	2	2	1	1	1.2	1	-0.2
OG0006199	*SACL3*	1	1	1	1	2	1	1	3	1	3	2	2	3	0	0	1	1	1	0	1	1	1	0	1.2	1	-0.2
OG0006692	*PSK3*	0	0	1	0	0	1	0	2	3	2	0	2	0	1	2	0	4	2	2	2	1	2	1	1.5	0.3	-1.3
OG0010611	*CLE45*	1	1	0	0	0	1	0	4	2	1	0	2	0	2	0	2	1	1	0	2	1	1	0	1.1	0.5	-0.6
OG0011216	*PXY*	1	1	1	0	1	1	0	0	1	1	1	0	0	1	1	0	2	1	1	2	1	1	1	0.8	0.8	-0.1
OG0012266	*AHP6*	0	0	0	0	0	0	0	2	2	0	0	1	0	0	1	0	1	1	1	2	1	1	1	0.8	0	-0.8
OG0012813	*LHW-like2,3*	0	0	0	0	0	0	0	2	1	0	0	0	0	0	1	0	1	1	1	2	2	1	0	0.7	0	-0.7
OG0023514	*CLE41,44-TDIF*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0.1	0	-0.1

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Extended Data Table 4. The copy number of genes involved in lignin biosynthesis

		Seagrasses				Freshwater species			Mangrove		Moconots					Eudicots										
Orthogroup	Gene name	CN	PO	TT	ZM	PA	SP	WA	AM	RA	OS	BD	AC	EG	AO	BV	UG	SL	CC	VV	PT	AT	TC	ATR	average non seagrasses	average in seagresses	enrichment in seagrasses
OG0000443	PAL	2	2	2	2	2	2	3	4	3	8	8	5	3	4	1	3	10	4	1	5	4	3	2	4.1	2	-2.1
OG0000764	C4H	5	5	5	3	3	3	1	4	3	4	3	4	0	1	2	3	1	3	3	3	1	3	2	2.4	4.5	2.1
OG0000371	4CL	3	4	3	6	3	4	2	9	5	5	5	2	4	2	2	2	5	2	3	5	4	3	2	3.7	4	0.3
OG0000655	HCT	1	1	1	2	1	5	1	0	11	2	2	3	1	1	6	4	2	2	2	6	2	12	2	3.6	1.3	-2.3
OG0000651	CCoAOMT	2	4	3	2	2	0	3	4	3	3	5	5	4	1	2	2	8	2	5	3	2	4	2	3.2	2.8	-0.5
OG0001245	COMT	3	1	4	1	3	5	2	3	3	1	4	1	2	4	3	2	1	1	4	3	1	3	1	2.4	2.3	-0.2
OG0001242	F5H	2	1	2	2	2	1	12	2	3	3	3	2	0	1	2	3	1	2	3	3	2	2	1	2.6	1.8	-0.8
OG0001314	CCR	1	1	4	1	1	1	1	1	2	2	2	1	1	4	2	0	2	12	5	2	7	1	1	2.6	1.8	-0.9
OG0005436	CAD	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	3	1	2	2	1	1.3	1	-0.3
OG0001038	PER	1	1	2	1	6	1	3	0	2	4	3	3	0	3	3	0	4	4	3	10	4	1	1	2.7	1.3	-1.5
OG0001082	PER	2	1	0	8	1	2	1	1	1	7	9	2	0	1	1	0	10	2	0	3	3	1	1	2.5	2.8	0.3
OG0002652	PER	1	2	0	1	1	0	0	2	2	1	1	1	0	1	4	0	6	4	5	3	2	3	2	2.1	1	-1.1
OG0000015	LAC	6	6	3	3	9	7	3	1	14	25	18	16	21	12	14	1	24	22	34	44	15	23	11	16.9	4.5	-12.4
OG0014186	LAC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4	1	1	0	0.4	0	-0.4
OG0012253	LAC	0	0	0	0	0	0	0	0	1	0	0	1	2	2	1	0	1	1	1	1	1	1	1	0.8	0	-0.8

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Extended Data Table 5. The copy number of resistance (NRL) genes and heat shock factors (HSF)

			Seagrasses				Freshwater species			Mangrove		Moconots					Eudicots										
	Orthogroup	Gene name	***CN***	***PO***	***TT***	***ZM***	***PA***	*SP*	*WA*	*AM*	*RA*	*OS*	*BD*	*AC*	*EG*	*AO*	*BV*	*UG*	*SL*	*CC*	*VV*	*PT*	*AT*	*TC*	*ATR*	average non seagrasses	average in seagresses	enrichment in seagrasses
Resistance (NRL) genes	Muti OGs	CC-NBS (CN)	2	0	0	0	2	3	0	0	0	72	37	7	41	3	26	0	35	0	26	19	7	46	15	17	0.5	-16.5
	Muti OGs	CC-NBS-LRR (CNL)	59	58	27	21	71	30	0	83	66	42	55	39	143	29	32	11	123	460	200	119	43	82	14	86	41	-45
	Muti OGs	NBS-LRR (NL)	26	37	27	23	40	41	1	18	9	118	6	109	59	9	47	18	48	93	12	71	11	104	40	44	28	-16
	Muti OGs	NBS (N)	0	0	0	0	2	11	0	0	0	260	15	17	17	4	0	0	57	0	n/a	n/a	0	53	39	28	0	-28
	Muti OGs	TIR-NBS (TN)	0	0	0	0	0	4	0	0	0	1	0	5	0	0	0	0	9	0	14	32	15	4	4	4.6	0	-4.6
	Muti OGs	TIR-NBS-LRR (TNL)	0	0	0	0	0	0	0	2	6	0	0	0	0	0	1	0	21	8	90	91	83	8	14	17	0	-17
		TOTAL	87	95	54	44	115	89	1	103	81	493	113	177	260	45	106	29	293	561	342	332	159	297	126	196	70	-126
Heat shock factots (HSF)	**Class A**	A1	2	1	2	1	5	2	2	3	2	1	2	5	7	2	3	1	4	0	0	5	6	3	2	2.89	1.5	-1.39
		A2	1	2	1	3	4	2	1	3	1	7	9	2	5	2	1	2	1	2	1	3	1	4	1	2.74	1.75	-0.99
		A3	0	0	0	0	0	0	0	4	1	2	1	1	2	2	1	2	1	1	1	1	1	1	1	1.21	0	-1.21
		A4	1	1	1	1	1	2	1	1	3	2	6	1	2	2	1	4	3	1	1	3	2	2	0	2.00	1	-1.00
		A5	1	1	1	1	1	1	1	0	3	1	1	1	5	1	1	3	1	1	2	2	1	1	1	1.47	1	-0.47
		A6	1	1	1	1	2	1	1	5	2	3	5	2	1	2	1	0	3	2	3	7	2	9	1	2.74	1	-1.74
		A7	0	0	0	0	0	0	0	0	0	3	2	1	0	1	0	0	0	0	0	0	2	0	0	0.47	0	-0.47
		A8	0	0	0	0	0	0	0	2	1	3	1	0	0	0	0	1	1	1	1	5	1	1	0	0.95	0	-0.95
		A9	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	2	3	3	1	1	2	1	0	0.84	0	-0.84
	Class B	B1	1	1	1	0	1	1	0	2	1	1	1	3	2	0	1	1	1	1	1	2	1	1	1	1.16	0.75	-0.41
		B2	2	2	2	2	2	2	1	4	3	5	3	4	4	1	3	4	2	1	2	7	2	1	1	2.74	2	-0.74
		B3	0	0	0	0	0	0	0	2	2	0	0	0	0	0	1	0	2	1	1	2	1	1	0	0.68	0	-0.68
		B4	3	2	4	2	4	2	3	5	2	4	5	3	3	3	2	1	2	1	2	5	1	2	2	2.74	2.75	0.01
		B5	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	2	0	1	1	0.42	0	-0.42
	Class C	C1	0	0	0	0	0	0	0	3	2	3	3	1	2	1	0	0	1	1	1	2	1	1	0	1.16	0	-1.16
		C2	0	0	0	0	0	0	0	0	0	2	3	1	2	1	0	0	0	0	0	0	0	0	0	0.47	0	-0.47
		TOTAL	12	11	13	11	20	13	10	37	23	37	42	25	35	18	16	21	26	17	18	47	24	29	11	24.68	11.75	-12.93

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Extended Data Table 6. The copy number of genes involved in flavonoid biosynthesis

		Seagrasses				Freshwater species			Mangrove		Moconots					Eudicots										
Orthogroup	Gene name	*CN*	*PO*	*TT*	*ZM*	*PA*	*SP*	*WA*	*AM*	*RA*	*OS*	*BD*	*AC*	*EG*	*AO*	*BV*	*UG*	*SL*	*CC*	*VV*	*PT*	*AT*	*TC*	*ATR*	average non seagrasses	average in seagresses	enrichment in seagrasses
OG0000079	***CHS***	4	32	31	12	9	1	1	5	4	7	2	1	14	3	8	1	4	2	13	9	1	5	3	4.7	19.8	15.1
OG0005602	***CHI***	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	2	1	3	1.3	1.3	0
OG0001878	***F3H***	1	3	3	7	2	1	3	1	2	1	1	1	0	1	4	1	1	1	2	2	1	2	4	1.6	3.5	1.9
OG0000110	***F3'H***	5	7	14	3	2	7	8	6	10	10	11	6	0	4	2	1	9	24	7	11	1	4	4	6.9	7.3	0.4
OG0000578	***FNS***	1	2	1	2	3	2	1	10	2	4	3	3	1	4	3	0	2	2	5	14	3	3	2	3.6	1.5	-2.1
OG0003398	***FLS***	1	3	0	0	1	0	0	3	3	1	1	1	0	1	2	1	1	1	3	4	5	3	2	1.8	1	-0.8
OG0002592	***DFR***	1	1	6	2	1	2	1	0	3	2	1	1	1	1	1	0	1	1	4	2	1	3	4	1.6	2.5	0.9
Muti-OGs	***GT1***	46	76	74	56	94	73	42	146	92	227	177	73	137	83	103	78	184	239	126	215	121	168	143	132.7	63	-69.7
Muti-OGs	***GH1***	6	7	7	5	7	8	7	17	24	27	26	16	15	20	11	9	18	32	21	42	38	24	21	20.2	6.25	-13.95
OG0000016	***SOT12***	13	6	18	7	2	0	0	18	14	31	19	1	13	3	34	0	26	25	17	28	17	25	7	2 in freashwater species	11	9
OG0000669	***RT***	1	2	2	2	4	2	0	2	4	10	6	4	6	1	2	1	2	4	3	2	4	5	1	3.3	1.8	-1.5

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Extended Data Table 7. The copy number of genes involved in salt stress

			Seagrasses				Freshwater species			Mangrove		Moconots					Eudicots										
	Orthogroup	Gene name	***CN***	***PO***	***TT***	***ZM***	***PA***	*SP*	*WA*	*AM*	*RA*	*OS*	*BD*	*AC*	*EG*	*AO*	*BV*	*UG*	*SL*	*CC*	*VV*	*PT*	*AT*	*TC*	*ATR*	average non seagrasses	average in seagresses	enrichment in seagrasses
Na+/H+ antiporters	OG0000616	NHX1/2/4	4	2	2	3	2	2	3	5	5	3	3	3	3	3	1	2	3	4	4	5	3	4	2	3.2	2.8	-0.5
	OG0002900	NHX5/6	2	2	1	1	1	1	1	1	2	2	2	4	2	4	1	1	1	2	2	1	2	1	2	1.8	1.5	-0.3
	OG0011282	NHX3	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	2	1	0	-1
	OG0005894	SOS1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	2	2	1	1	1.2	1.3	0
		Total NHXs	8	5	4	5	5	5	6	8	10	7	7	9	7	9	4	6	6	8	8	8	8	7	7	7.1	5.5	-1.6
	OG0001686	SOS3	0	1	1	2	5	1	1	1	3	4	1	2	2	2	2	4	5	2	2	3	2	2	1	2.2	1	-1.2
	OG0009717	SOS2	1	1	1	1	1	1	1	2	1	1	1	1	0	0	1	1	1	1	1	2	1	1	1	1	1	0
H+-PPases	OG0000466	*AVP1*	3	4	5	5	4	2	1	4	3	6	4	5	5	3	2	1	5	3	3	4	1	3	2	3.2	4.25	1.05
	OG0017043	*AVP1-like*	0	3	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1	0.8	0.7
	OG0022475	*AVP1-like*	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.1	0.3	0.2
	OG0026704	*AVP1-like*	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1	0.3	0.2
	OG0028988	*AVP1-like*	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
CYCLIC NUCLEOTIDE GATED CATION CHANNELs	OG0000274	*CNGC14/15/16/17*	4	4	2	2	5	4	2	7	5	5	6	4	7	2	7	0	6	6	6	5	5	6	2	4.7	3	-1.7
	OG0001012	*CNGC2/4*	2	1	3	0	2	4	0	4	5	3	3	2	6	4	2	1	3	3	2	3	2	3	3	2.9	1.5	-1.4
	OG0001185	*CNGC1/3/10/12/13*	1	1	1	1	2	1	2	5	2	1	3	2	3	1	7	0	5	2	2	4	6	2	2	2.8	1	-1.8
	OG0001985	*CNGC5/6/7/9*	1	1	2	2	2	1	1	3	3	3	2	2	2	1	2	0	3	2	2	3	5	2	1	2.1	1.5	-0.6
	OG0003668	*CNGC19/20*	0	1	0	1	4	4	0	4	1	2	2	1	1	1	1	0	1	2	2	3	2	1	1	1.6	0.5	-1.1
	OG0013989	*CNGC20-like*	0	0	0	0	1	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	-0.4
	OG0015248	*CNGC14-like*	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0.2	0.3	0.1
	OG0015675	*CNGC14-like*	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	1	0	0	0	0	0.3	0.3	0
	OG0021657	*CNGC1-like*	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0.2	0	-0.2
	OG0028477	*CNGC14-like*	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
	OG0030129	*CNGC17-like*	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
		CNGCs in total	8	8	10	8	17	14	13	23	16	16	16	11	19	10	22	1	20	16	15	18	20	14	10	15.3	8.5	-6.8
K+ channels and transporters	OG0007504	*KAT1/2*	0	0	0	0	0	0	0	1	1	3	3	2	2	3	2	0	2	1	1	1	2	1	1	1.4	0	-1.4
	OG0001734	*GORK*	1	1	1	1	1	1	1	3	2	2	3	2	2	4	2	3	3	2	5	3	2	2	2	2.4	1	-1.4
	OG0027252	*KOR1-like*	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5
	OG0001335	*AKT1/6*	2	2	6	2	1	2	1	5	2	2	2	1	2	3	3	1	2	3	2	4	3	2	1	2.3	3	0.7
	OG0022411	*AKT1-like*	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5
	OG0029548	*AKT1-like*	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
	OG0008929	*AKT2/3*	1	1	0	2	1	1	1	1	1	1	1	1	2	1	1	0	2	1	1	1	1	1	1	1.1	1	-0.1
	OG0019063	*AKT2/3-like*	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.1	0.5	0.4
	OG0008967	*KAT3*	1	1	1	1	1	1	1	1	1	3	1	1	0	0	0	1	2	1	1	3	1	1	0	1.1	1	-0.1
	OG0010757	*HAK5*	0	0	0	0	3	1	1	0	0	1	2	1	0	1	0	0	2	2	1	3	1	1	1	1	0	-1
	OG0017639	*HAK5-like*	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0.2	0	-0.2
	OG0009315	*HAK5-like*	0	1	0	0	2	0	0	2	2	0	0	0	3	0	8	0	0	1	1	0	0	0	4	1.2	0.3	-0.9
	OG0027392	*HAK5-like*	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.1	0	-0.1
	OG0000055	*KUP/HAK*	4	4	5	7	6	8	5	9	13	17	17	12	1	10	8	1	13	8	10	13	7	10	13	9.7	5	-4.7
	OG0000529	*KUP/HAK*	3	3	2	4	4	2	2	9	5	5	5	2	0	2	3	1	3	3	3	4	3	3	3	3.2	3	-0.2
	OG0003652	*KUP/HAK*	2	1	2	1	1	1	0	0	2	3	3	1	0	1	2	0	3	1	2	3	2	2	2	1.6	1.5	-0.1
	OG0014464	*KUP/HAK*	0	1	3	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0.2	1	0.8
Cl- transporter /channel	OG0000508	*CLC-C,G*	4	5	2	3	4	2	2	2	4	5	5	4	4	6	3	2	3	2	3	6	2	2	2	3.3	3.5	0.2
	OG0004143	*CLC-F*	2	2	2	2	2	1	1	1	1	2	2	2	2	1	0	1	2	1	1	1	1	1	1	1.2	2	0.8
	OG0008344	*CLC-D*	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	1	-0.1
	OG0011016	*CLC-A/B*	0	0	0	0	0	1	1	2	0	1	1	1	1	1	2	0	2	1	1	1	2	1	1	1.1	0	-1.1
	OG0011443	*CLC-E*	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	0	-0.9
	OG0002251	*NPF2.7/NAXT*	0	0	0	0	1	3	0	0	0	1	1	1	2	2	4	0	8	6	2	1	7	5	1	2.4	0	-2.4
	OG0009029	*ALMT12/QUAC1*	0	0	0	0	0	0	0	1	2	1	1	1	1	5	1	1	2	1	1	1	3	1	1	1.3	0	-1.3

Species sequenced in this work are in bold. Full list of abbreviation of the species names used in the figure: CN *Cymodocea nodosa*; PO *Posidonia oceanica*; TT *Thalassia testudinum*; ZM *Zostera marina*; PA *Potamogeton acutifolius*; SP *Spirodela polyrhiza*; WA *Wolffia australiana*; AM *Avicennia marina*; RA *Rhizophora apiculata*; OS *Oryza sativa*; BD *Brachypodium distachyon*; AC *Ananas comosus*; EG *Elaeis guineensis*; AO *Asparagus officinalis*; BV *Beta vulgaris*; UG *Utricularia gibba*; SL *Solanum lycopersicum*; CC *Coffea canephora*; VV *Vitis vinifera*; PT *Populus trichocarpa*; AT *Arabidopsis thaliana*; TC *Theobroma cacao*; ATR *Amborella trichopoda*.

Extended Data Table 8. The copy number of genes involved in hypoxia tolerance

			Seagrasses				Freshwater species			Mangrove		Moconots					Eudicots										
	Orthogroup	Gene name	*CN*	*PO*	*TT*	*ZM*	*PA*	*SP*	*WA*	*AM*	*RA*	*OS*	*BD*	*AC*	*EG*	*AO*	*BV*	*UG*	*SL*	*CC*	*VV*	*PT*	*AT*	*TC*	*ATR*	average non seagrasses	average in seagresses	enrichment in seagrasses
PCO genes	OG0001645	*PCO1,2*	2	2	4	2	3	2	1	4	2	2	2	3	4	2	1	1	3	2	2	2	2	1	1	2.1	2.5	0.4
	OG0004744	*PCO4*	0	2	0	0	1	1	0	2	2	2	1	2	3	1	1	2	2	1	2	2	2	2	1	1.6	0.5	-1.1
	OG0008626	*PCO3*	1	1	1	1	1	1	0	0	1	3	1	1	1	1	1	1	1	1	1	2	1	1	1	1.1	1	-0.1
	OG0009770	*PCO-like*	1	3	2	0	1	1	1	1	1	1	1	1	1	1	1	2	0	1	1	2	0	1	0	0.9	1.5	0.6
	OG0011709	*PCO-like*	1	3	2	1	1	0	0	0	1	1	0	2	2	0	0	0	0	0	1	0	0	1	0	0.4	1.8	1.3
	OG0018699	*PCO*	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5
	OG0028813	*PCO-like*	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
		*PCO*s in total	6	11	9	6	8	5	2	7	7	9	5	9	11	5	4	6	6	5	7	8	5	6	3	5.5	8	2.5
ERF-VII genes	OG0000298	*RAP2.3*	7	4	10	7	10	6	5	3	2	4	2	1	5	0	2	4	2	2	2	4	3	4	3	3	7	4
	OG0001149	*RAP2.2, RAP2.12*	4	3	5	2	6	2	1	3	2	3	3	4	2	1	1	3	3	2	0	2	2	1	1	2	3.5	1.5
	OG0021466	*ERF*	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5
	OG0021512		1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0.8
	OG0026423		1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5
	OG0029099		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
	OG0001132	*ZPR2, ZPR3*	2	1	1	1	2	3	1	5	3	5	3	3	2	4	1	4	3	2	3	4	2	2	2	2.9	1.3	-1.6
	OG0022570		0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5
	OG0030094		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
		*ERF-VII*s in total	16	12	16	14	19	11	7	11	7	12	8	8	9	5	4	11	8	6	5	10	7	7	6	6	14.5	8.5
LDH genes	OG0002170		3	1	5	3	2	1	2	1	2	2	1	2	2	1	1	2	2	2	2	3	1	1	1	1.6	3	1.4
	OG0007502		1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1.1	1	-0.1
	OG0017976	*LDH*	0	2	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.1	0.5	0.4
	OG0018984		0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0.8
	OG0029967		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
		*LDH*s in total	4	5	8	5	3	2	4	2	3	3	2	3	3	4	2	3	4	3	3	4	2	2	2	2.8	5.5	2.7

Species sequenced in this work are in bold. Full list of abbreviation of the species names used in the figure: CN *Cymodocea nodosa*; PO *Posidonia oceanica*; TT *Thalassia testudinum*; ZM *Zostera marina*; PA *Potamogeton acutifolius*; SP *Spirodela polyrhiza*; WA *Wolffia australiana*; AM *Avicennia marina*; RA *Rhizophora apiculata*; OS *Oryza sativa*; BD *Brachypodium distachyon*; AC *Ananas comosus*; EG *Elaeis guineensis*; AO *Asparagus officinalis*; BV *Beta vulgaris*; UG *Utricularia gibba*; SL *Solanum lycopersicum*; CC *Coffea canephora*; VV *Vitis vinifera*; PT *Populus trichocarpa*; AT *Arabidopsis thaliana*; TC *Theobroma cacao*; ATR *Amborella trichopoda*.

Extended Data Table 9. The copy number of CO2-concentrating mechanisms (CCM)-related genes (Carbonic anhydrases, Boron transporters and proton pumps, C4-metabolism, Rubisco activase)

			Seagrasses				Freshwater species			Mangrove		Moconots					Eudicots										
	Orthogroup	Gene name	CN	PO	TT	ZM	PA	SP	WA	AM	RA	OS	BD	AC	EG	AO	BV	UG	SL	CC	VV	PT	AT	TC	ATR	average non seagrasse	average in seagresses	enrichment in seagrasses
Carbonic anhydrases (CA)	OG0000299	*ACA5/7*	6	4	6	4	3	0	0	8	5	5	2	1	4	2	3	3	7	5	4	6	6	6	5	3.95	5	1.05
	OG0002316	*ACA1*	1	1	3	0	2	1	9	2	1	4	4	2	2	2	2	1	1	1	1	2	1	1	1	2.11	1.25	-0.86
	OG0013954	*ACA*	1	2	0	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.16	1.25	1.09
	OG0014553	ACA	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	5	0.32	0	-0.32
	OG0019431	ACA	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0.16	0	-0.16
	OG0028785	*ACA8*	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.25	0.25
		Alpha CA in total	8	7	9	7	8	1	9	10	6	11	6	3	6	4	6	4	8	6	5	8	7	7	12	6.68	7.75	1.07
	OG0001190	*BCA1/2/3*	2	2	2	1	4	1	0	4	2	1	2	2	3	1	2	5	3	2	4	5	4	4	1	2.63	1.75	-0.88
	OG0005111	*BCA5*	1	1	1	1	2	1	2	1	1	1	1	1	2	1	1	1	1	1	2	3	1	2	1	1.37	1	-0.37
		Beta CA in total	3	3	3	2	6	2	2	5	3	2	3	3	5	2	3	6	4	3	6	8	5	6	2	4.00	2.75	-1.25
	OG0002131	*GAMMACA1*	1	1	1	3	1	2	2	2	2	3	2	2	2	2	1	1	3	2	2	3	3	2	1	2.00	1.5	-0.50
	OG0006442	*GAMMACA-like 1/2*	2	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	0	2	2	1	1	1.11	1.5	0.39
		Gamma CA in total	3	3	2	4	2	3	3	3	3	4	3	3	4	3	2	2	4	3	2	5	5	3	2	3.11	3	-0.11
Boron/HCO3-transporters and proton pumps	OG0001707	*Boron transporter 4/5*	2	1	1	1	1	1	3	4	2	2	2	1	2	4	3	1	2	1	3	5	4	3	1	2.37	1.25	-1.12
	OG0001954	*Boron transporter 1/2*	1	2	2	1	1	2	1	2	3	1	1	1	2	2	3	2	3	1	3	5	3	3	2	2.16	1.5	-0.66
	OG0012730		0	0	0	0	0	0	0	0	1	0	0	0	2	0	1	0	1	1	1	2	1	1	1	0.63	0	-0.63
	OG0004171	Boric acid channel	0	1	3	2	1	2	2	2	1	1	1	1	2	1	2	2	1	2	1	2	1	1	1	1.42	1.5	0.08
		Boron/HCO3-transporter family in total	3	4	6	4	3	5	6	8	7	4	4	3	8	7	9	5	7	5	8	14	9	8	5	6.58	4.25	-2.33
	OG0000088	ATPase 8/1/4/6	8	6	6	8	6	5	6	2	9	9	9	8	4	9	7	0	7	9	8	14	12	9	5	7.26	7	-0.26
	OG0010781	ATPase	1	0	0	0	0	0	0	10	0	0	0	2	4	0	0	1	1	0	0	0	0	0	2	1.05	0.25	-0.80
	OG0001162	Calcium-transporting ATPase 5/6	3	2	3	2	3	2	2	3	2	4	3	2	4	2	1	1	2	2	2	5	3	2	1	2.42	2.5	0.08
		H+-ATPase (pm) in total	12	8	9	10	9	7	8	15	11	13	12	12	12	11	8	2	10	11	10	19	15	11	8	10.74	9.75	-0.99
C4-photosynthesis pathways	OG0000943	*PEPC 2/3*	2	2	1	4	3	2	1	2	3	5	5	2	4	2	2	2	4	2	2	3	3	2	1	2.63	2.25	-0.38
	OG0006429	*PEPC*	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	0	2	2	2	1	1.21	1	-0.21
	OG0007219	*PEPC*	1	1	1	1	1	1	1	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1.16	1	-0.16
	OG0008463	*PEPC4*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1.05	1	-0.05
	OG0017899	*PEPC2*	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0.16	0.25	0.09
	OG0008097	*PEPC*	1	1	4	0	1	4	2	2	0	1	0	0	1	0	4	0	0	0	0	1	2	1	1	1.05	1.5	0.45
	OG0001051	*PEPCK 1/2*	1	1	6	1	6	2	1	3	2	2	1	0	2	1	1	2	2	2	2	2	2	2	15	2.63	2.25	-0.38
	OG0008566	*PEPCK*	1	1	1	2	1	1	1	0	1	1	1	1	3	3	1	0	0	0	1	1	0	1	1	0.95	1.25	0.30
	OG0001738	*PEPCK 1/2*	2	3	1	2	2	1	3	3	2	2	3	2	0	2	2	0	5	2	2	4	2	2	1	2.11	2	-0.11
	OG0003685	*PPDK*	1	1	1	2	1	1	1	5	1	2	1	1	1	2	1	3	1	1	2	1	1	2	1	1.53	1.25	-0.28
	OG0004857	*PPDK* regulatory protein	1	1	2	2	2	1	1	2	1	1	1	1	2	1	1	2	1	1	1	1	2	1	1	1.26	1.5	0.24
	OG0000557	NADP-dependent malic enzyme	3	3	3	3	3	2	1	6	5	4	4	2	3	4	3	2	5	3	3	5	4	3	1	3.32	3	-0.32
	OG0015507	NADP-dependent malic enzyme	0	0	2	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0.16	0.5	0.34
	OG0005961	NAD-dependent malic enzyme	1	1	1	1	2	1	4	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1.26	1	-0.26
	OG0008588	NAD-dependent malic enzyme	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1.05	1	-0.05
	OG0007502	Malate dehydrogenase 1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1.11	1	-0.11
	OG0002210	*ALAAT1/2*	3	1	2	4	4	1	1	0	1	5	4	1	0	2	1	2	3	1	1	2	2	1	0	1.68	2.5	0.82
	OG0006193	GGT2	2	1	1	1	3	1	0	1	2	1	1	1	0	1	1	1	2	1	1	2	2	1	1	1.21	1.25	0.04
	OG0023713	*AtAlaAT2*	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.05	0.25	0.20
	OG0024911	*GGT2*	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.11	0	-0.11
	OG0002885	*Asp4/3*	2	1	1	2	1	1	1	2	2	1	1	1	1	2	2	2	2	2	2	3	3	2	1	1.68	1.5	-0.18
	OG0004376	*ASPARTATE AMINOTRANSFERASE 1*	1	1	1	2	1	1	1	2	2	2	2	1	1	0	1	2	1	1	2	2	1	2	1	1.37	1.25	-0.12
	OG0007063	Asportate aminotransferase	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	2	1	1	1	1.16	1	-0.16
		C4-metabolism in total	27	24	35	32	37	25	24	36	29	36	33	20	26	32	28	27	34	24	26	39	32	28	32	29.89	29.5	-0.39
Rubisco activase	OG0005372	*RuBisCO activase*	1	2	1	3	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1.11	1.75	0.64
	OG0008417	*RuBisCO activase*	1	1	1	1	1	1	1	0	1	1	1	1	1	2	1	0	1	1	1	2	1	2	1	1.05	1	-0.05
	OG0020352	*RuBisCO activase*	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0.11	0.25	0.14
	OG0002125	*RuBisCO activase*	1	1	1	2	3	2	1	2	3	1	2	3	2	1	1	4	2	2	3	3	1	2	1	2.05	1.25	-0.80
		Rubisco activase in total	3	5	3	6	5	4	3	3	5	3	4	5	4	5	3	6	5	4	5	7	3	5	3	4.32	4.25	-0.07

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Extended Data Table 10. The copy number of gene families involved in nitrogen metabolism

		Seagrasses				Freshwater species			Mangrove		Moconots					Eudicots										
Orthogroup	Gene name	CN	PO	TT	ZM	PA	SP	WA	AM	RA	OS	BD	AC	EG	AO	BV	UG	SL	CC	VV	PT	AT	TC	ATR	average non seagrasses	average in seagresses	enrichment in seagrasses
OG0000120	Nitrate/Nitrite Transporter (NRT)	5	6	4	4	3	4	4	8	5	14	12	7	2	8	6	6	15	5	6	5	7	6	10	7.2	4.8	-2.5
OG0000306		4	3	4	3	4	2	1	8	6	6	4	3	2	3	3	5	5	7	3	5	6	5	3	4.3	3.5	-0.8
OG0000367		3	3	2	3	2	7	1	1	3	12	10	3	1	6	2	3	4	4	6	3	3	3	4	4.2	2.8	-1.5
OG0000480		1	1	1	1	2	2	2	5	2	3	6	2	3	2	10	2	6	5	3	7	6	6	2	4.1	1	-3.1
OG0000886		0	0	0	0	0	0	0	4	0	1	1	0	0	1	6	1	17	12	3	11	2	4	1	3.6	0	-3.6
OG0000925		1	1	1	3	3	2	3	4	3	3	2	1	0	3	5	1	5	3	2	5	3	3	3	2.8	1.5	-1.3
OG0002990		2	1	1	1	2	1	0	4	2	2	2	2	1	2	1	1	2	2	2	3	2	2	1	1.8	1.3	-0.5
OG0003549		0	1	2	1	1	2	0	4	2	1	1	3	0	1	2	0	4	2	2	2	3	2	1	1.8	1	-0.8
OG0003600		1	1	1	1	1	1	2	2	1	2	2	1	1	2	1	1	1	2	1	3	2	1	4	1.7	1	-0.7
OG0008152		1	1	1	2	1	0	0	0	0	6	6	1	3	1	0	0	0	0	0	0	0	0	1	1	1.3	0.3
OG0010200		1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	0.1
OG0013783		0	0	0	0	0	0	0	2	0	0	0	0	0	0	4	1	0	1	0	0	1	0	0	0.5	0	-0.5
OG0016342		0	0	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0.1	0.3	0.1
OG0016485		0	1	1	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.2	0.5	0.3
OG0017868		0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0.2	0	-0.2
OG0023822		1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.1	0.3	0.2
	Total NRT	20	20	19	21	21	23	14	42	27	51	47	25	14	34	41	22	60	44	30	45	37	33	31	**33.7**	**20**	**-13.7**
OG0000251	Amino acid Transporter	4	3	7	8	6	4	3	5	8	3	2	2	5	0	5	6	3	4	2	7	5	5	3	4	5.5	1.5
OG0000740		4	4	5	4	6	1	0	3	2	6	5	2	3	0	1	2	1	2	3	6	1	2	2	2.3	4.3	1.9
OG0002047		0	2	1	0	0	0	0	4	3	3	1	3	3	5	0	1	4	3	3	6	0	3	2	2.4	0.8	-1.7
OG0002121		0	1	1	0	1	4	1	6	2	2	2	2	2	2	1	0	3	2	3	4	3	2	2	2.4	0.5	-1.9
OG0006860		1	2	1	1	1	1	1	0	1	1	1	1	2	1	1	1	1	2	1	2	1	1	1	1.1	1.3	0.1
OG0014275		0	0	2	0	0	0	0	1	0	1	0	0	1	1	0	1	0	0	1	0	0	0	0	0.3	0.5	0.2
OG0022012		0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
OG0027980		0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5
OG0008862	Urea transporter	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1.1	1	-0.1
OG0005068	Nitrate Reductase (NR)	1	1	1	1	7	1	2	0	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1.1	1	-0.1
OG0005078		1	1	1	1	1	1	7	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1.4	1	-0.4
OG0005129		1	0	1	1	1	1	1	2	1	3	2	2	1	1	1	1	1	2	1	2	2	1	1	1.4	0.8	-0.7
OG0005957	Ferredoxin-Nitrite Reductase (NiR)	1	1	1	1	1	2	1	2	1	1	1	1	2	2	1	1	1	1	1	2	1	1	1	1.3	1	-0.3
OG0009014		1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	2	1	1	1	1	1	1	1	1	0
OG0001530	Glutamate Synthase (GOGAT)	1	1	1	1	16	11	1	1	1	1	1	1	2	2	1	1	1	1	1	2	2	1	1	1.8	1	-0.8
OG0001582		3	3	2	2	2	2	2	1	2	2	2	2	2	2	2	3	2	2	2	4	3	1	2	2.1	2.5	0.4
OG0003012		1	3	2	3	0	0	1	1	3	0	0	2	0	0	6	2	7	4	0	2	1	0	0	1.6	2.3	0.6
OG0003672		2	2	2	2	2	1	1	2	2	2	2	1	2	1	1	1	1	1	1	2	1	1	1	1.3	2	0.7
OG0008964		2	2	2	1	1	1	1	3	1	2	1	2	1	2	1	1	2	1	1	2	2	1	1	1.4	1.8	0.3
OG0017196		0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
OG0027329		0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
OG0029155		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
OG0003672		2	2	2	2	2	1	1	2	2	2	2	1	2	1	1	1	1	1	1	2	1	1	1	1.3	2	0.7
OG0000244	Glutamine Synthetase (GS)	3	2	3	8	4	4	2	5	5	4	4	6	7	4	2	5	5	3	5	8	6	4	4	4.6	4	-0.6
OG0018028		0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.1	0.5	0.4
OG0029514		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
OG0000842	Asparagine synthetase	2	3	4	3	3	2	4	3	2	2	3	4	4	3	3	1	2	2	1	3	3	2	2	2.6	3	0.4
OG0007556		1	1	1	1	1	1	2	1	0	1	1	1	2	1	1	1	1	2	1	1	1	1	1	1.1	1	-0.1
OG0001180	Glutamate Dehydrogenase (GDH)	1	2	3	2	2	3	1	3	5	2	2	2	2	2	1	3	4	2	3	4	3	2	2	2.6	2	-0.6
OG0008777		1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1.1	1	-0.1
OG0027340		0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
OG0028925		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
OG0029894		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3
OG0030253		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3

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