Table S1. Taxon sampling and gene coverage as indicated by GenBank voucher numbers for phylogenetic analyses, including biogeographic range coding for ancestral state reconstruction in BioGeoBears. See Fig. 2 for which area the coded character represents.

Genus	Subgenus	species	voucher #	locality data	Biogeo region	COI	COII	28S	12S	AK	H3
Aulono-gyrus	Afrogyrus	altern-atus	MB525	see Miller & Bergsten, 2012	A		MH029 976	MH029 949	JX4780 08.1	MH030 003	JX4779 27.1
Aulono-gyrus	Afrogyrus	ater	GTG20	Kenya: Meru Co., Mt. Kenya Nat'l Prk., Sirimon gate, 00.00568°S, 37.24656°E, 2613m, 17.vi.2013, leg. SM Baca, KB Miller, ex. forest stream, SMB170613-A.	A	MH029 957	MH029 984	MH029 939	MH029 925		MH029 992
Aulono-gyrus	Afrogyrus	bedeli	MB493	see Miller & Bergsten, 2012	A	JX4780 69.1	JX4781 57.1	MH029 953	JX4779 80.1	MH030 000	JX4779 00.1
Aulono-gyrus	Afrogyrus	caffer	GTG35	Tanzania: Kagera Reg. ca. 5km E of Bhiaramulo, 02°38.159'S, 31°20.789'E, 1427m, 26.vii.2010, leg. R.W.Sites & A.Mbogho. L-1154.	A	JX4781 01.1	MH029 985	MH029 948	JX4780 131.1	MH030 001	MH029 991
Aulono-gyrus	Afrogyrus	capen-sis	GTG8	South Africa: Western Cape Prov. trib. strm. to Keurboom River crossing R339, 33.8612°S, 23.1729°E, 250m, 13.xii.2015, leg. J.Bergsten, A.Desamore, K.B.Miller, RSA15-21.	A	MH029 965	MH029 982	MH029 940	MH029 914	MH030 004	
Aulono-gyrus	Afrogyrus	Conspi-cuus	GTG18	Kenya: Meru Co., Mt. Kenya Nat'l Prk., Sirimon gate, 00.00568°S, 37.24656°E, 2613m, 17.vi.2013, leg. SM Baca, KB Miller, ex. forest stream, SMB170613-A.	A	MH029 958	MH029 975	MH029 942	MH029 920	MH030 002	MH029 993
Aulono-gyrus	Afrogyrus	depres-sus	GTG12	South Africa: Western Cape Prov. Du Toit River under bridge road R45, 33.9482°S, 19.1689°E, 301m, 20.xii.2015, leg. J.Bergsten, A.Desamore, K.B.Miller, RSA15-48.	A	MH029 966	MH029 983	MH029 941	MH029 915	MH030 005	
Aulono-gyrus	Afrogyrus	flavi-pes	GTG14	Tanzania: Kagera Reg. ca. 5km E of Bhiaramulo, 02°38.159'S, 31°20.789'E, 1427m, 26.vii.2010, leg. R.W.Sites & A.Mbogho. L-1154.	A	MH029 955		MH029 943		MH029 999	
Aulono-gyrus	Afrogyrus	graueri	GTG39	Kenya: Nyeri Co., SE Mt. Kenya, 00.37492°S, 37.15634°E, 2040m, 19.vi.2013, leg. SM Baca, KB Miller, ex. mountain stream, SMB190613-A.	A	MH029 960	MH029 977	MH029 945	MH029 921	MH030 009	MH029 994
Aulono-gyrus	Afrogyrus	hypox-anthus	GTG41	Kenya: Nyeri Co., SE Mt. Kenya, 00.37492°S, 37.15634°E, 2040m, 19.vi.2013, leg. SM Baca, KB Miller, ex. mountain stream, SMB190613-A.	A	MH029 962	MH029 979	MH029 952	MH029 922	MH030 011	
Aulono-gyrus	Afrogyrus	knysna-nus	GTG10	South Africa: Western Cape Prov. Jonkershoek Nat. Res. side of Jonkershoek trail, strm trib. To Eerste river, 33.9816°S, 18.9455°E, 291m, 20.xii.2015, leg. J.Bergsten, A.Desamore, K.B.Miller, RSA15-44.	A	MH029 959		MH029 944	MH029 919	MH030 007	
Aulono-gyrus	Afrogyrus	margin-atus	MB523	see Miller & Bergsten, 2012	A	JX4780 95.1	MH029 972	MH029 936	JX4780 06.1		JX4779 25.1
Aulono-gyrus	Afrogyrus	navi-culus	GTG4	South Africa: Western Cape Prov. Groot river, bridge, R102 by Nat. Val. Restcamp, 33.9687°S, 23.5595°E, 10m, 9.xii.2015, leg. J.Bergsten, A.Desamore, K.B.Miller, ex. forest river, RSA15-03.	A	MH029 963	MH029 980	MH029 947	MH029 916	MH030 008	
Aulono-gyrus	Afrogyrus	seydeli	GTG37	Kenya: Narok Co., Kilgoris-Lolgorian Rd., Migor River, 01.17307°S, 34.83674°E, 1581m, 13.vi.2013, leg. SM Baca, KB Miller, ex. shallow rocky stream, SMB130613-C.	A	MH029 961	MH029 978	MH029 951	MH029 923	MH030 010	MH029 990

Aulono-gyrus	Afrogyrus	sp.	MB569	see Miller & Bergsten, 2012	A	JX4781 06.1	JX4781 93.1	MH029 950	JX4780 18.1		
Aulono-gyrus	Afrogyrus	varians	GTG2	South Africa: Western Cape Prov. Du Toit River under bridge road R45, 33.9482°S, 19.1689°E, 301m, 20.xii.2015, leg. J.Bergsten, A.Desamore, K.B.Miller, RSA15-48.	A	MH029 964	MH029 981	MH029 946	MH029 913	MH030 006	
Aulono-gyrus	Aulono-gyrus	anti-podum	GTG65	New Caledonia: River Carénage, 22°16.529'S, 166°49.382'E, 191m, 18.i.2017, leg. N.Charpin, NC-011	O	MH029 970		MH029 934	MH029 924	MH029 995	
Aulono-gyrus	Aulono-gyrus	striatus	MB469	see Miller & Bergsten, 2012	P	JX4780 56.1	JX4781 44.1		JX4779 67.1	KX7755 22.1	JX4778 89.1
Aulono-gyrus	Aulono-gyrus	strigo-sus	MB687	see Miller & Bergsten, 2012	O	JX4781 43.1	JX4782 23.1	MH029 935	JX4780 54.1		
Aulono-gyrus	Lopho-gyrus	carini-pennis	MB604	see Miller & Bergsten, 2012	M	JX4781 15.1	JX4782 02.1		JX4780 27.1		MH029 988
Aulono-gyrus	Lopho-gyrus	crista-tus	MB519	see Miller & Bergsten, 2012	M	JX4780 91.1	JX4781 79.1	MH029 937	JX4780 02.1	MH029 998	JX4779 21.1
Aulono-gyrus	Paragyrus	goudoti	MB529	see Miller & Bergsten, 2012	M	JX4780 99.1	JX4781 86.1		JX4780 11.1		JX4779 30.1
Aulono-gyrus	Ptery-gyrus	elegant-issi-mus	GTG6	Madagascar, Fianarantsoa, stream E Ranomofana, 21º16.532'S, 47º29.977'E, 13 Nov 2008, K.B. Miller, leg. KBM13110801	M	MH029 954	MH029 986	MH029 938	MH029 917	MH029 997	MH029 989
Dineu-tus	Cyclous	sublin-eatus	GenBa nk	see Miller & Bergsten, 2012	-	JX4780 85.1	JX4781 73.1	EU677 683.1	JX4779 96.1	KX7755 36.1	JX4779 15.1
Gyrinus	Gyrinus	maculi-ventris	MB839	see Gustafson & Miller, 2017	-	KX775 621.1	KX7756 72.1	MH029 927	KX7755 13.1	KX7755 72.1	
Gyrinus	Gyrinus	plicifer	MB495	see Miller & Bergsten, 2012	-	JX4780 70.1	JX4781 58.1		JX4779 81.1		JX4779 01.1
Gyrinus	Oreo-gyrinus	dimor-phus	MB839	see Gustafson & Miller, 2017	-	KX775 622.1	KX7756 73.1	MH029 933	KX7755 14.1	KX7755 73.1	KX7757 19.1
Gyrinus	Neo-gyrinus	chaly-baeus	GTG25	Brazil: Mina Gerais, Serra do Caraça, 20.11615°S, 43.47670°W, 1260m, 31.i.2015 leg. M.V.P. Simões & C. Assis.	-	MH029 968	MH029 973	MH029 932	MH029 926	MH030 014	
Gyrinus	Neo-gyrinus	rozei	GTG29	Venezuela: Bolivar, Gran Sabana, S. Rio Sakaika, Rt 10, 5.57495°S, 61.31205°W, 1100m, 2.viii.2008, leg. A.E.Z.Short, roadside pond. AS-08-067.	-	MH029 969	MH029 974	MH029 930	MH029 912	MH030 012	
Gyrinus	Neo-gyrinus	ovatus	MB492	see Miller & Bergsten, 2012	-	JX4780 68.1	JX4781 56.1	MH029 931	JX4779 79.1	MH030 013	
Gyrinus	Gyrinulus	minu-tus	MB526	see Miller & Bergsten, 2012	-	JX4780 97.1	JX4781 84.1		JX4780 09.1		JX4779 28.1
Macro-gyrus	Macro-gyrus	oblong-gus	Gen-Bank	see Gustafson & Miller, 2017	-	KX775 600.1	KX7756 52.1	EU677 682.1	KX7754 92.1	KX7755 53.1	KX7757 00.1
Meta-gyrinus		sinen-sis	JLKB1	see Miller & Bergsten, 2012	S	JX4781 39.1	JX4782 19.1				
Orecto-chilus		dauri-cus	GTG62	Mongolia: Hovsgol Aimag, Mörön Soum, Tunamal Nuur, 5 km W of Arbulag, 49.89999°N, 99.39450°E, 1871m, 06.vii.2006, leg. P.J.Torres. SRP06070603.	-	MH029 971	MH029 971	MH029 928	MH029 911		MH02 9987
Porro-rhynchus		landaisi	Gen-Bank	see Gustafson & Miller, 2017	-	KX775 618.1	KX7756 69.1		KX7755 10.1	KX77556 9.1	KX775 717.1
Patrus		produc-tus	Gen-Bank	see Miller & Bergsten, 2012	-	JX4780 78.1	JX4781 66.1		JX4779 90.1	KX77557 6.1	JX477 909.1

Table S2. Primers used for amplification and sequencing.

Gene	Forward primer (5'-3')	Reverse primer (5'-3')	Reference
COI	Jerry, CAACATTTATTTTGATTTTTTGG	Pat, TCCAATGCACTAATCTGCCATATTA	SIMON et al. (1994)
COII	F-leu, TCTAATATGGCAGATTAGTGC	R-lys, GAGACCAGTACTTGCTTTCAGTCATC	WHITING (2002)
12S	12Sai, AAACTACGATTAGATACCCTATTAT	12Sbi, AAGAGCGACGGGCGATGTGT	SVENSON & WHITING (2004)
28S	NLF184-21, ACCCGTGAAYTTAAGCATAT	LS1041R, TACGGACRTCCATCAGGGTTTCCCCTGATTC	WILD & MADDISON (2008)
H3	HexAF, ATGGCTCGTACCAAGCAGACGGC	HexAR,, ATATCCTTGGGCATGATGGTGAC	COLGAN et al. (1998)
AK	AK183F, GATTCTGGAGTCGGNATYTAYGCNCCYGAYGC	AK939R, GCCNCCYTCRGCYTCRGTGTGYTC	WILD & MADDISON (2008)
AK	GyrAKF1, CAAGAAGACTGACAAGCATCC	GyrAKR1, CACCTGCAAGTTGAACTT	This study

Internal primers were designed for AK183F and AK939R, these are GyrAKF1 and GyrAKR1. Nested PCR was performed using these primers to amplify Arginine kinase in difficult specimens.

References

COLGAN D.J., MCLAUCHLAN A., WILSON G.D.F., LIVINGSTON S.P., EDGECOMBE G.D., MACARANAS J., ET AL. 1998. Histone H3 and U2 snRNA DNA sequences and arthropod molecular evolution. – Australian Journal of Zoology 46: 419–437.

SIMON C., FRATI F., BECKENBACH A., CRESPI B., LIU H., FLOOK P. 1994. Evolution, weighting, and phylogenetic utility of mitochondrial gene sequences and a compilation of conserved polymerase chain reaction primers. – Annals of the Entomological Society of America 87: 651– 701.

SVENSON G.J., WHITING M.F. 2004. Phylogeny of Mantodea based on molecular data: Evolution of a charismatic predator. – Systematic Entomology 29: 359– 370.

WHITING M.F. 2002. Mecoptera is paraphyletic: multiple genes and phylogeny of Mecoptera and Siphonaptera. – Zoologica Scripta 31: 93– 104.

WILD A.L., MADDISON D.R. 2008. Evaluating nuclear protein-coding genes for phylogenetic utility in beetles. – Molecular Phylogenetics and Evolution 48: 877– 891.

Table S3. Dispersal rate multipliers used in BioGeoBEARS ancestral range reconstruction.

A	M	P	S	O
1.00	0.50	0.75	0.25	0.10
0.50	1.00	0.10	0.10	0.10
0.75	0.10	1.00	0.75	0.25
0.10	0.10	0.75	1.00	0.75
0.10	0.10	0.25	0.75	1.00

A	M	P	S	O
1.00	0.50	0.50	0.10	0.10
0.50	1.00	0.10	0.10	0.10
0.50	0.10	1.00	0.75	0.10
0.10	0.10	0.75	1.00	0.10
0.10	0.10	0.10	0.10	1.00

A	M	P	S	O
1.00	0.50	0.25	0.10	0.10
0.50	1.00	0.10	0.75	0.25
0.25	0.10	1.00	0.50	0.10
0.10	0.75	0.50	1.00	0.10
0.10	0.25	0.10	0.10	1.00

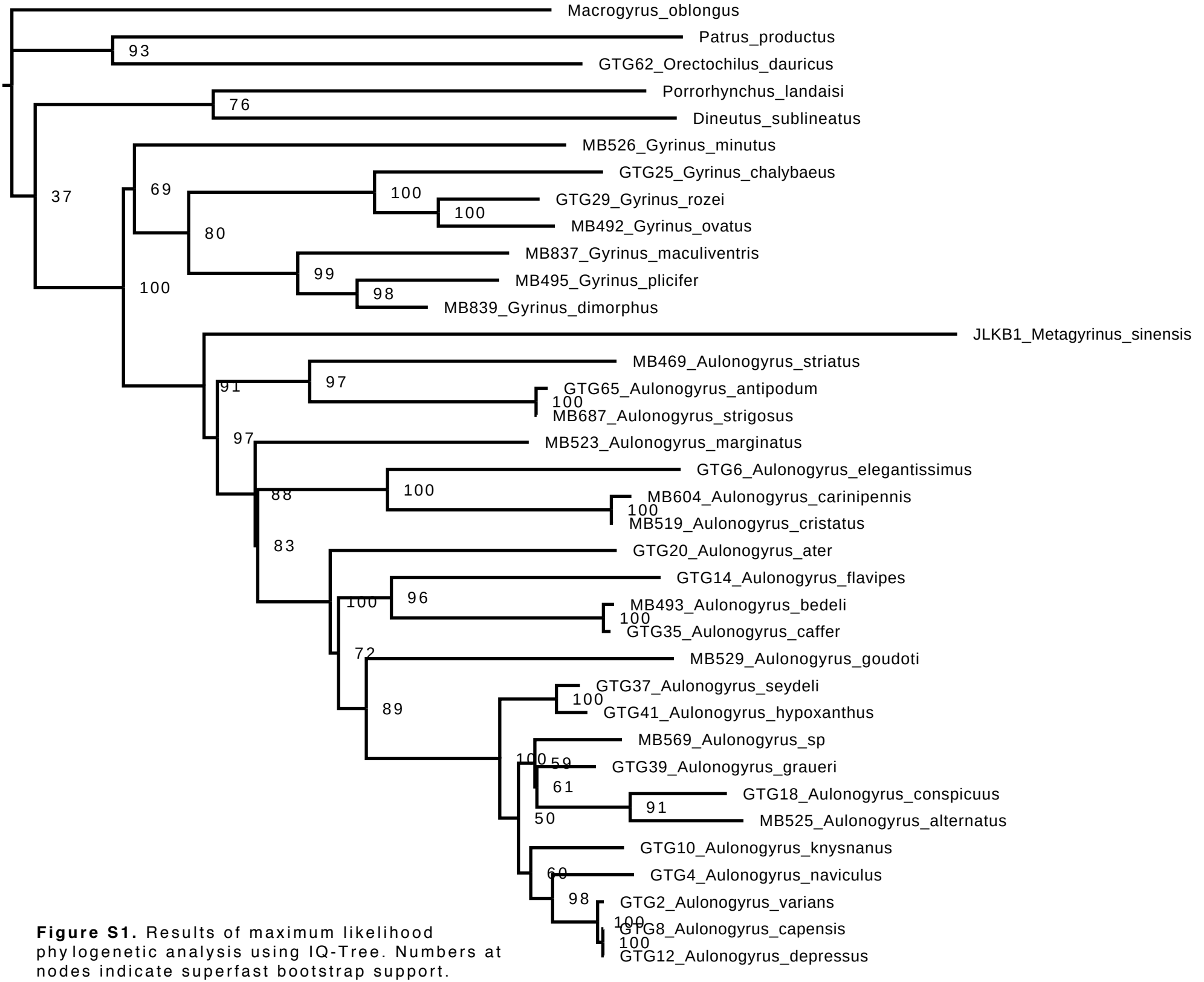

Figure S1. Results of maximum likelihood phylogenetic analysis using IQ-Tree. Numbers at nodes indicate superfast bootstrap support.

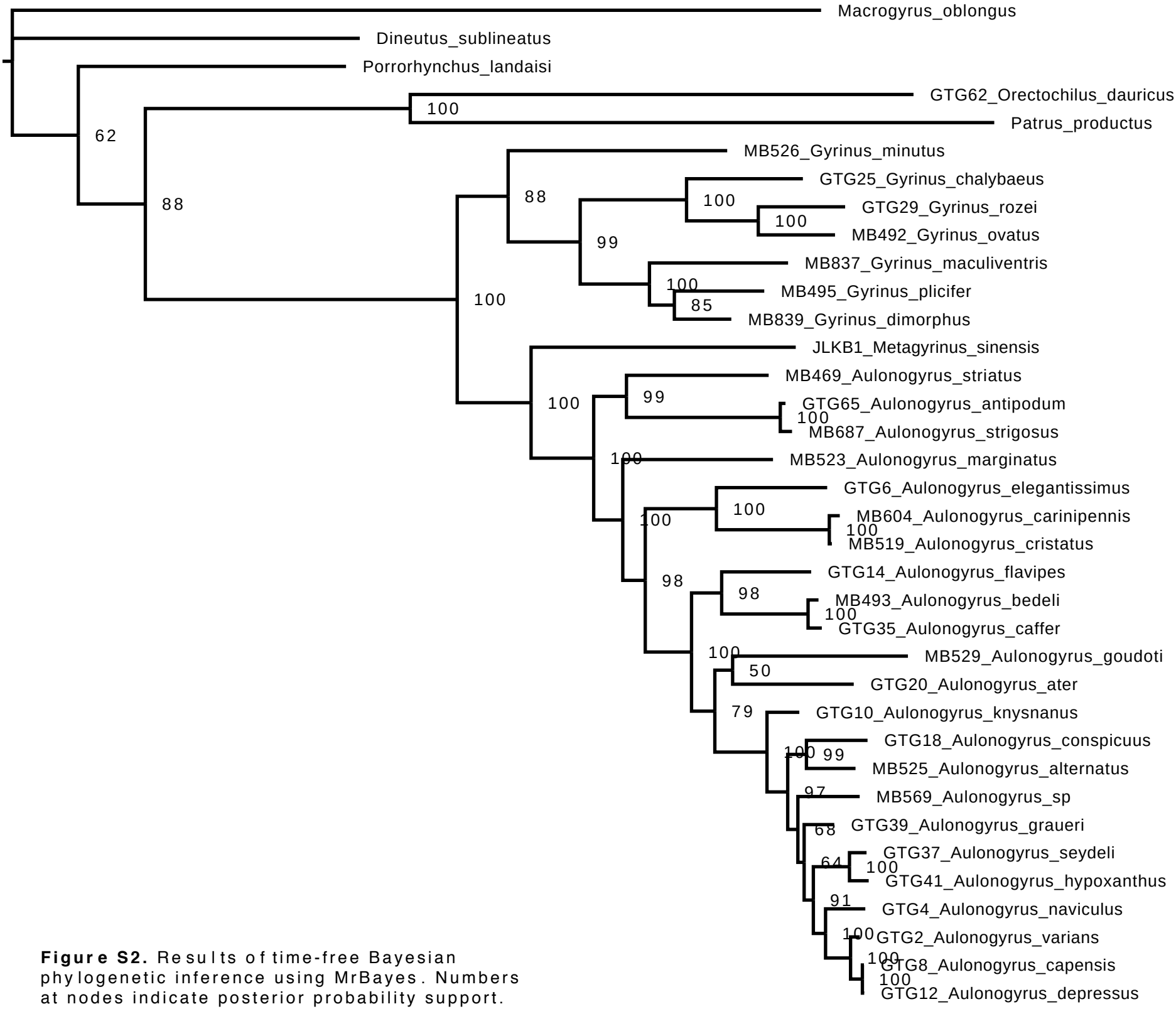

Figure S2. Results of time-free Bayesian phylogenetic inference using MrBayes. Numbers at nodes indicate posterior probability support.

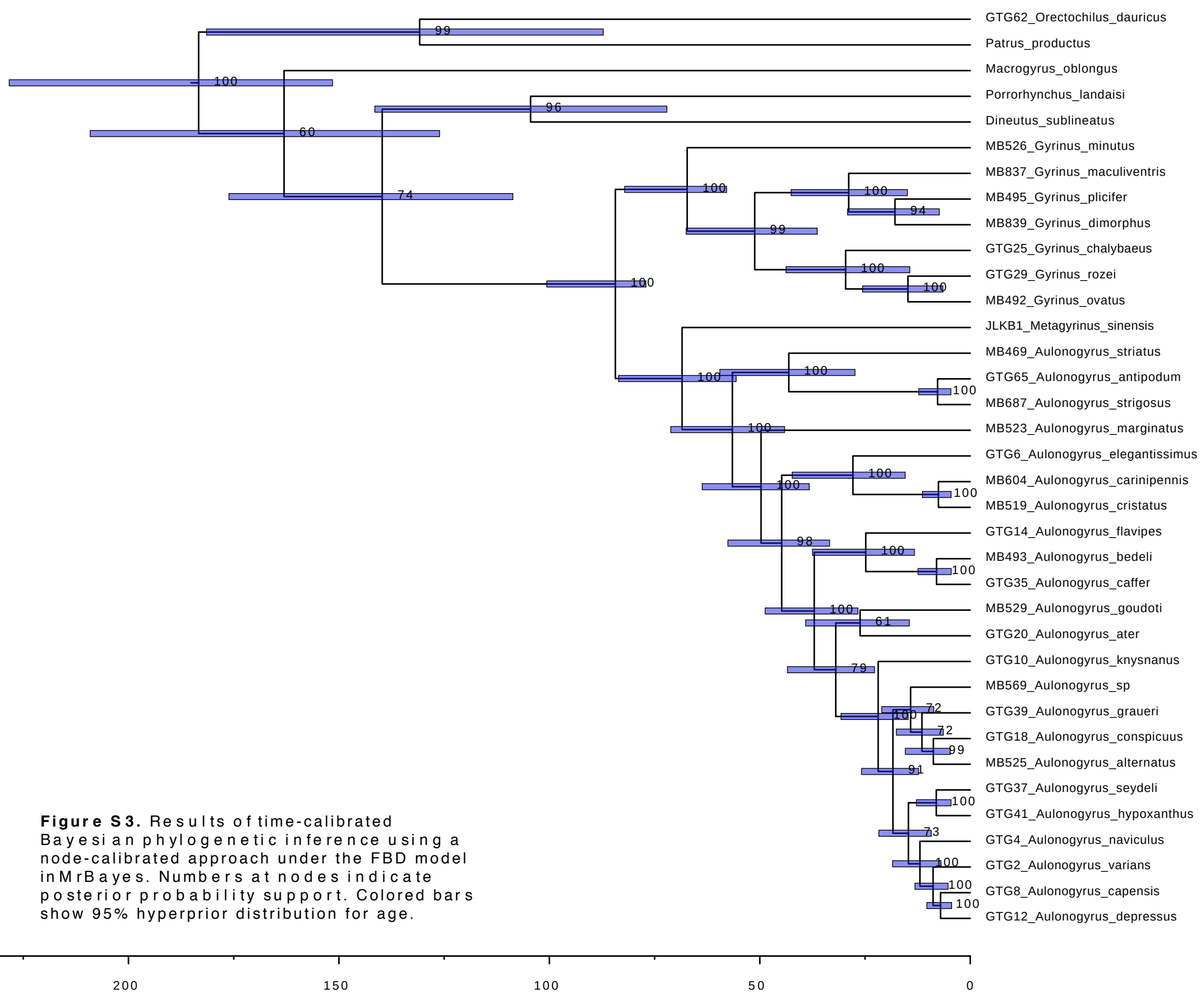

Figure S3. Results of time-calibrated Bayesian phylogenetic inference using a node-calibrated approach under the FBD model in MrBayes. Numbers at nodes indicate posterior probability support. Colored bars show 95% hyperprior distribution for age.

Figure S4.

BioGeoBEARS DEC on Aulonogyrus M0_unconstrained
ancstates: global optim, 3 areas max. d=0.0111; e=0.1657; j=0; LnL=−15.69

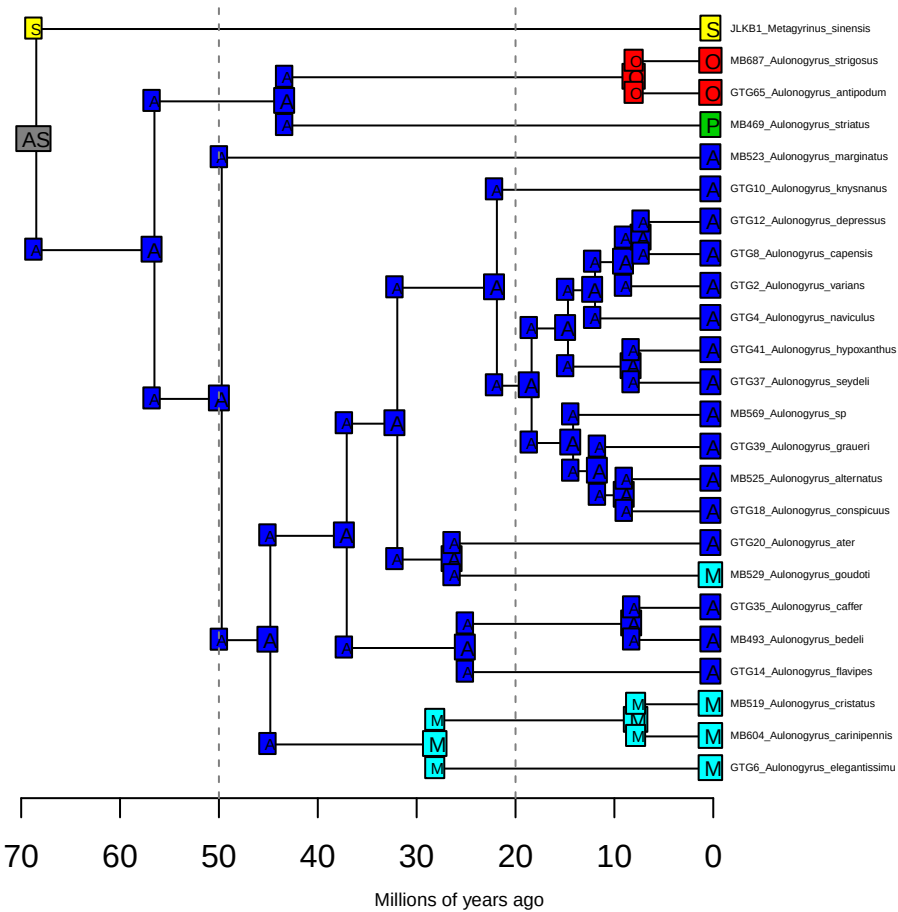

Figure S5.

BioGeoBEARS DEC on Aulonogyrus M0_unconstrained
ancstates: global optim, 3 areas max. d=0.0111; e=0.1657; j=0; LnL=−15.69

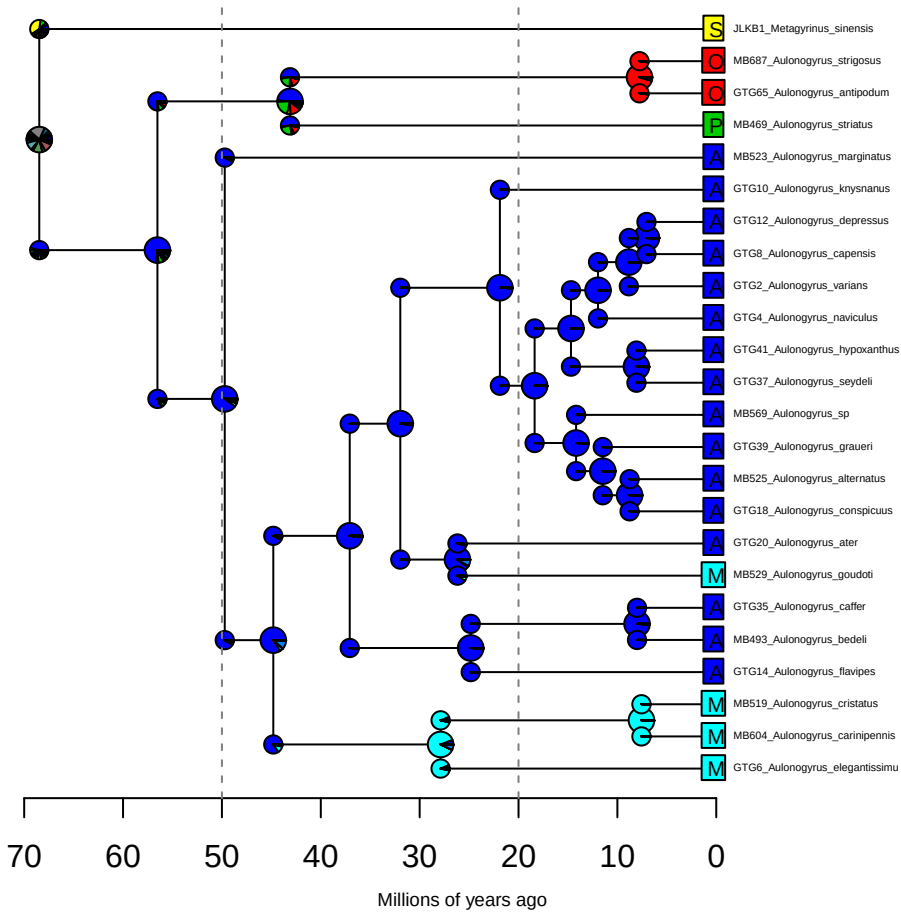

Figure S6.

BioGeoBEARS DEC+J on Aulonogyrus M0_unconstrained
ancstates: global optim, 3 areas max. d=0.0123; e=0.4895; j=0; LnL=−15.01

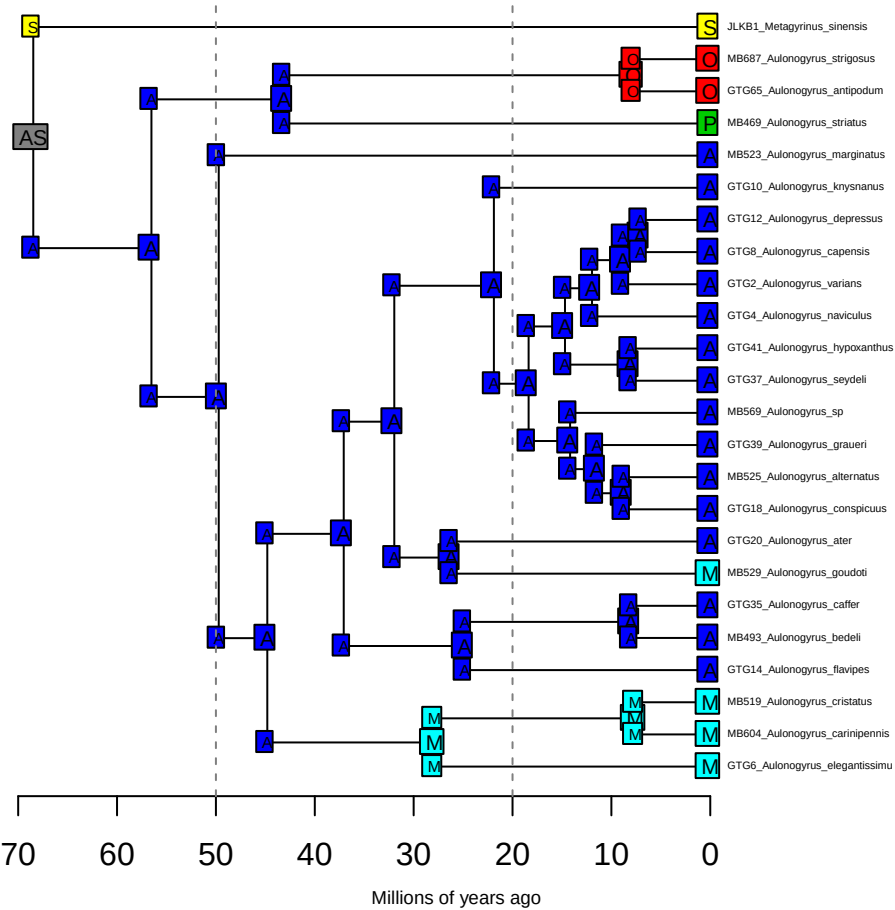

Figure S7.

BioGeoBEARS DEC+J on Aulonogyrus M0_unconstrained
ancstates: global optim, 3 areas max. d=0.0123; e=0.4895; j=0; LnL=−15.01

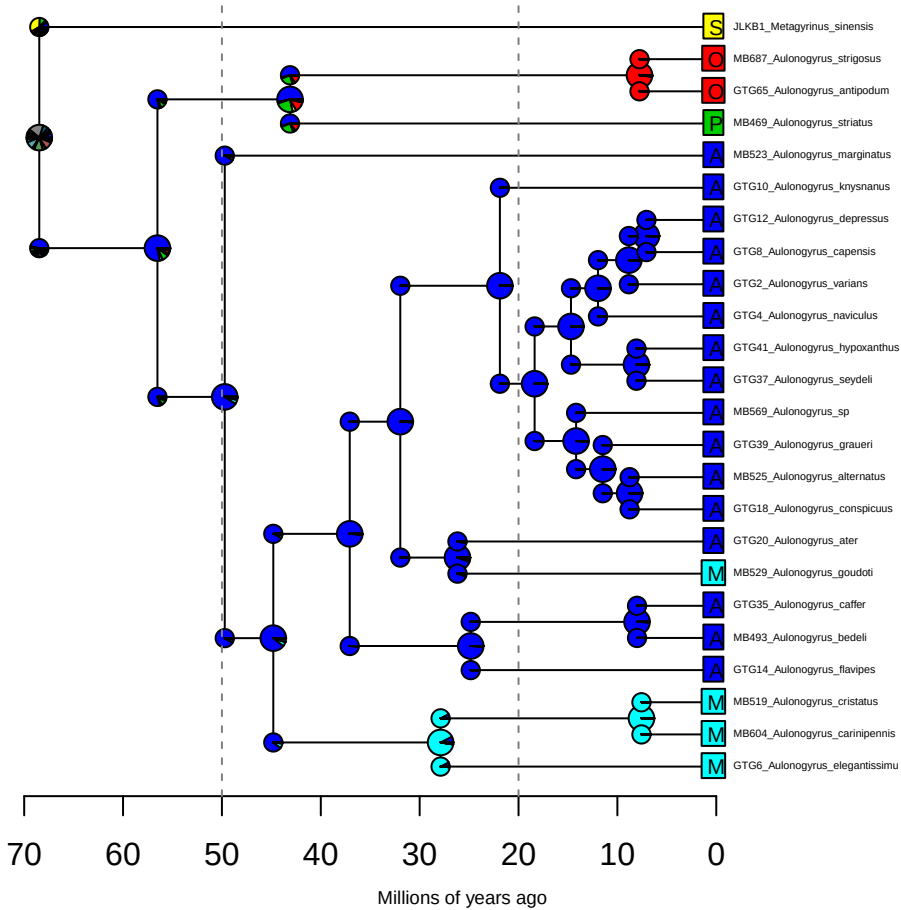

Figure S8.

BioGeoBEARS DIVALIKE on Aulonogyrus M0_unconstrained
ancstates: global optim, 3 areas max. d=1e−04; e=1e−04; j=0.0648; lnL=−16.47

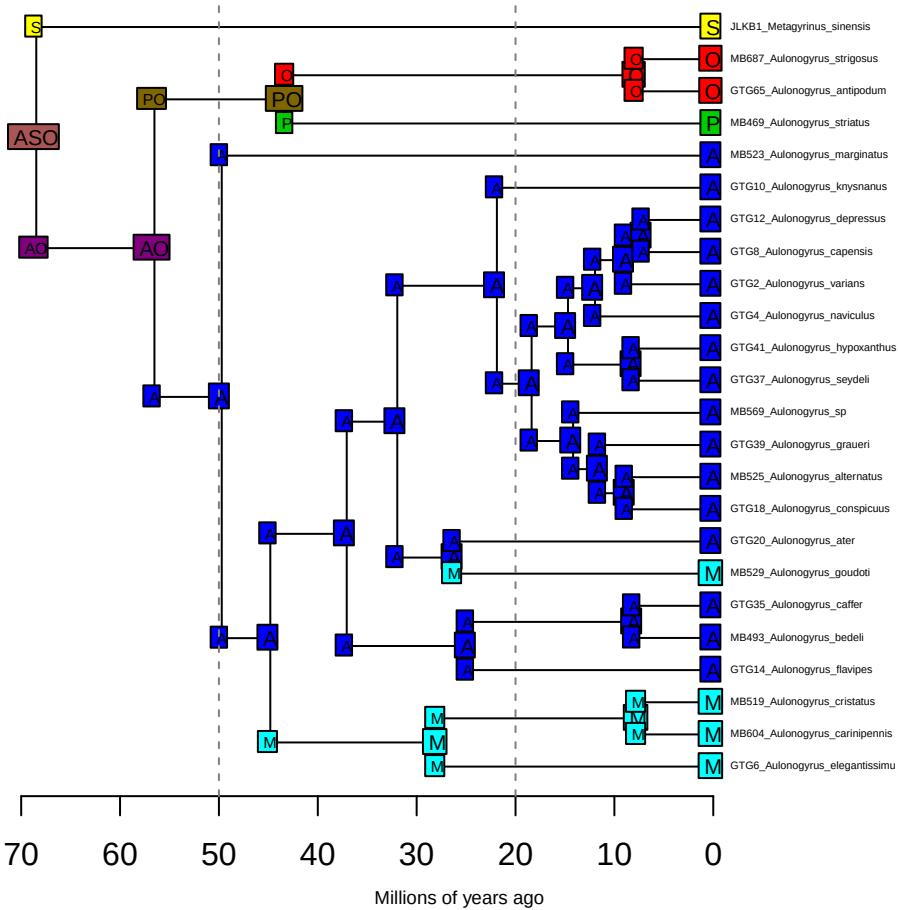

Figure S9.

BioGeoBEARS DIVALIKE on Aulonogyrus M0_unconstrained
ancstates: global optim, 3 areas max. d=1e−04; e=1e−04; j=0.0648; LnL=−16.47

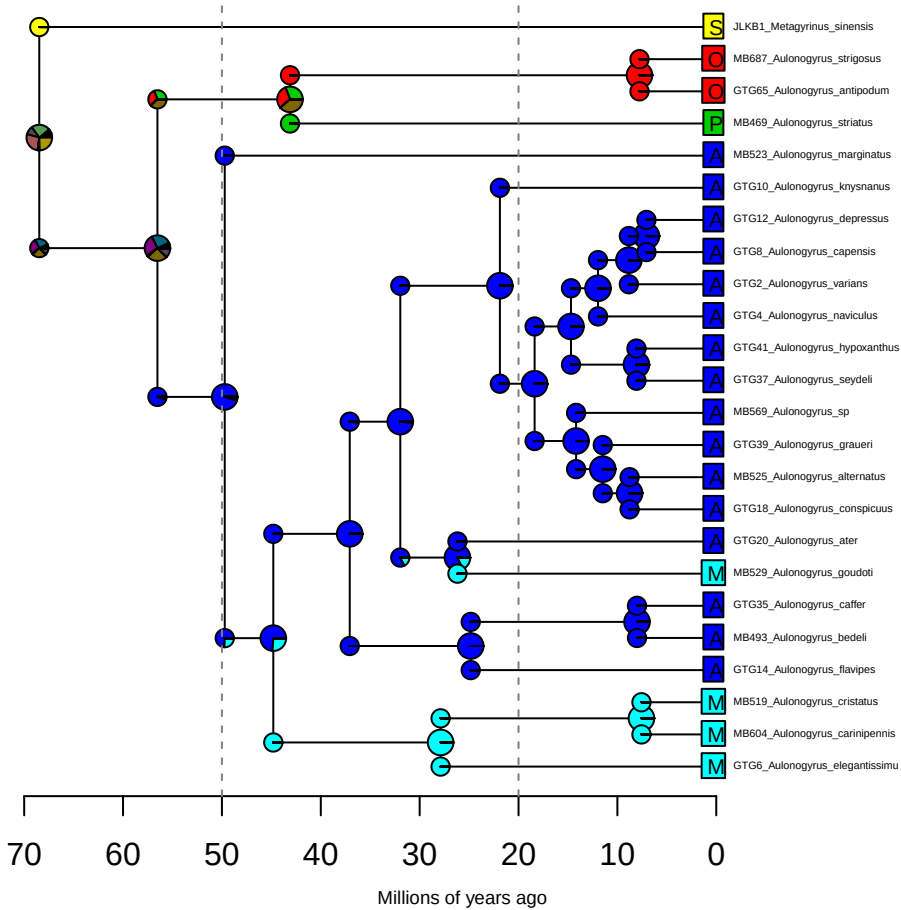

Figure S10.

BioGeoBEARS DIVALIKE+J on Aulonogyrus M0_unconstrained
ancstates: global optim, 3 areas max. d=0.001; e=1e−04; j=0.0275; LnL=−17.53

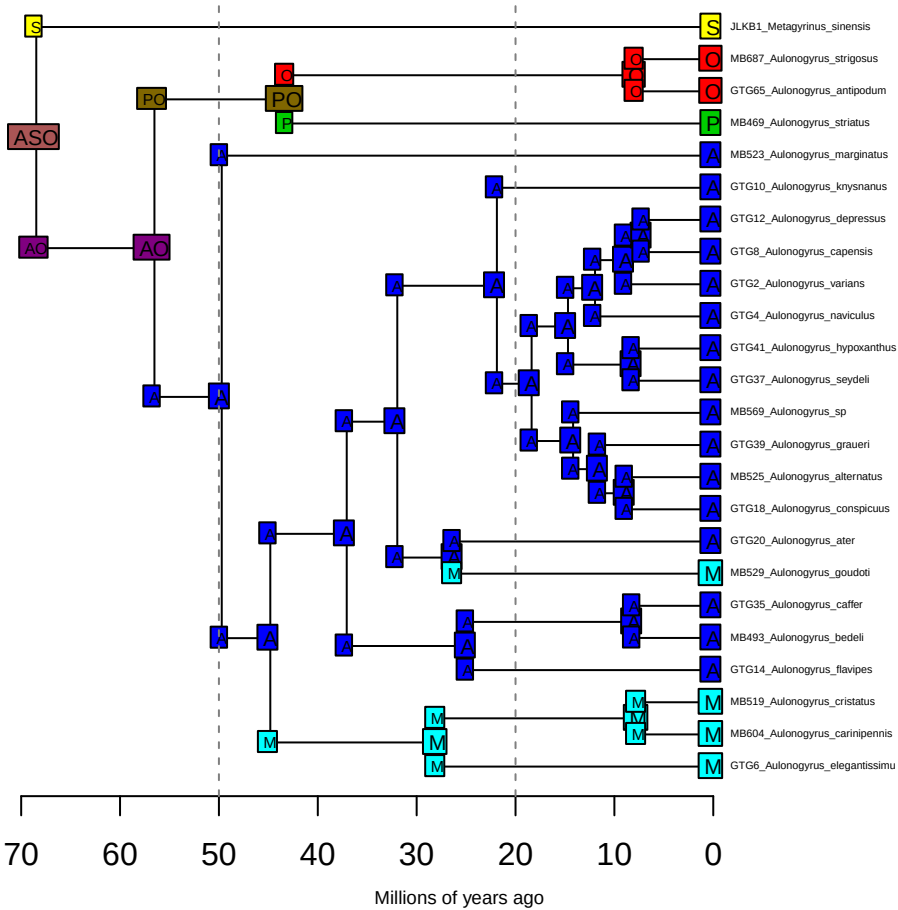

Figure S11.

BioGeoBEARS DIVALIKE+J on Aulonogyrus M0_unconstrained
ancstates: global optim, 3 areas max. d=0.001; e=1e−04; j=0.0275; LnL=−17.53

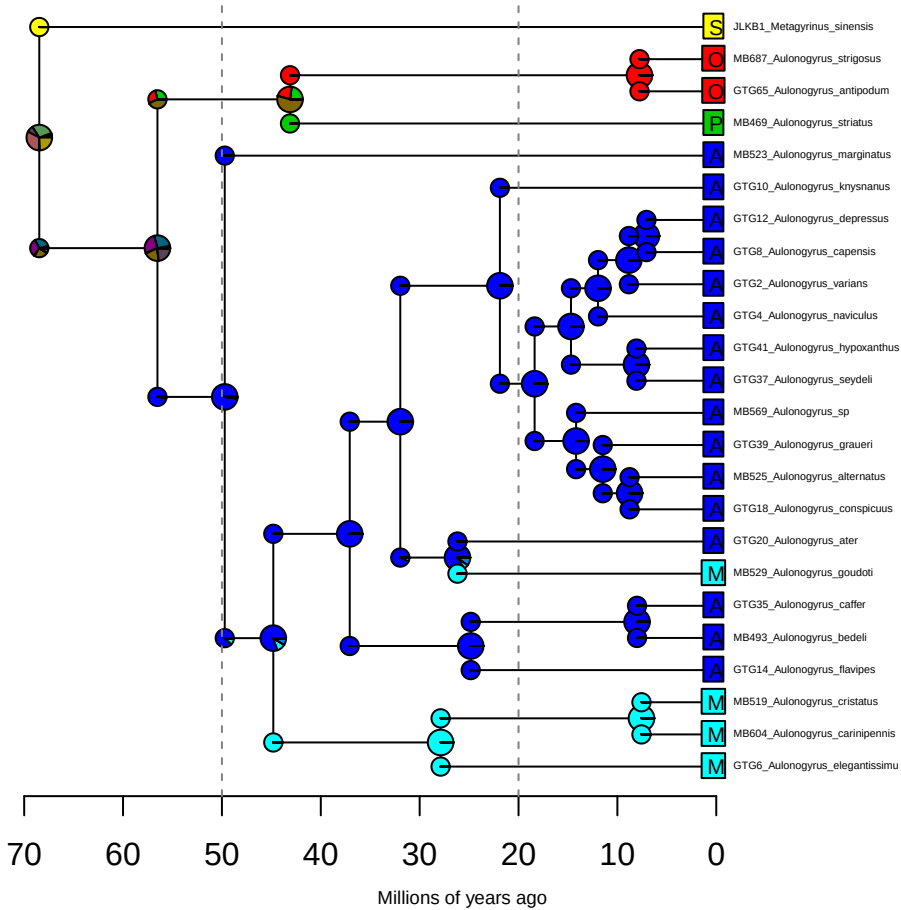

Figure S12.

BioGeoBEARS BAYAREALIKE on Aulonogyrus M0_unconstrained
ancstates: global optim, 3 areas max. d=0.0049; e=0.0149; j=1e−04; LnL=−29.20

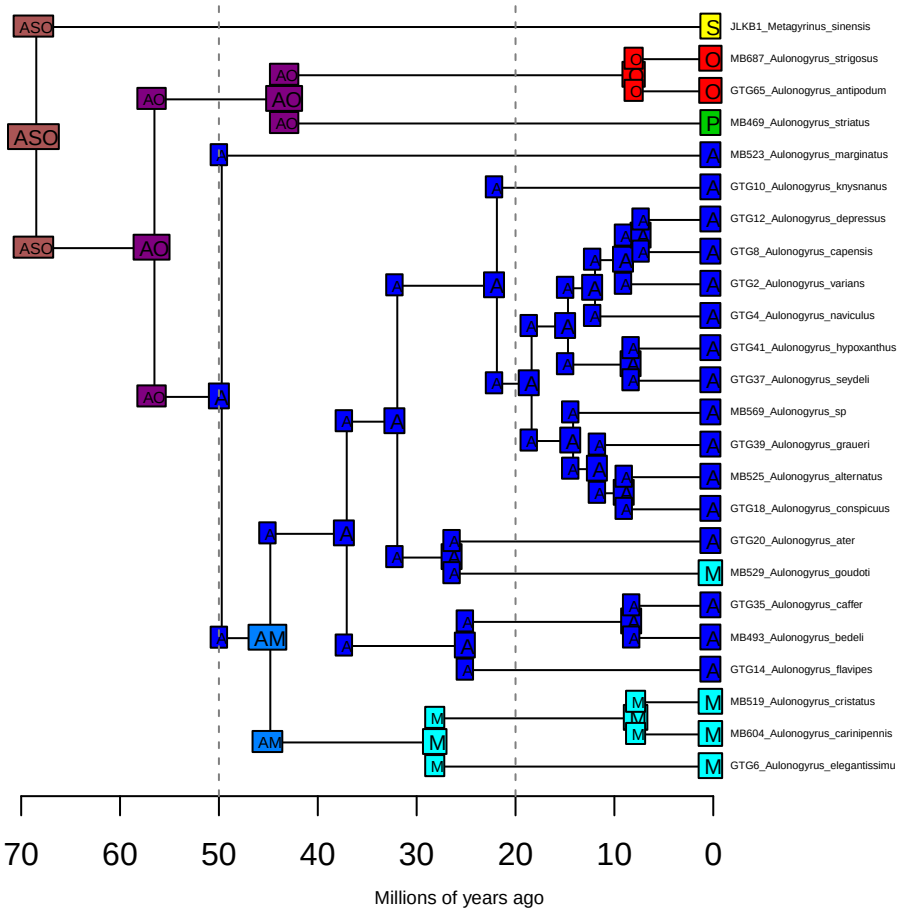

Figure S13.

BioGeoBEARS BAYAREALIKE on Aulonogyrus M0_unconstrained
ancstates: global optim, 3 areas max. d=0.0049; e=0.0149; j=1e−04; LnL=−29.20

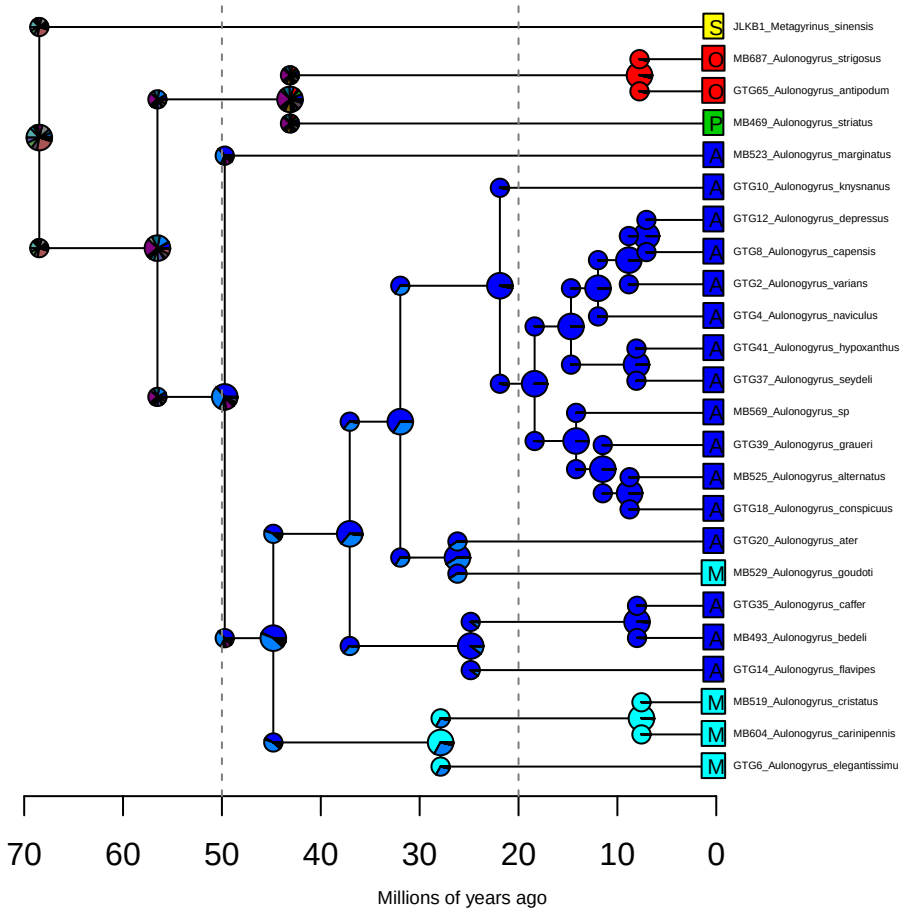

Figure S14.

BioGeoBEARS BAYAREALIKE+J on Aulonogyrus M0_unconstrained
ancstates: global optim, 3 areas max. d=0; e=0; j=0.1013; LnL=−21.45

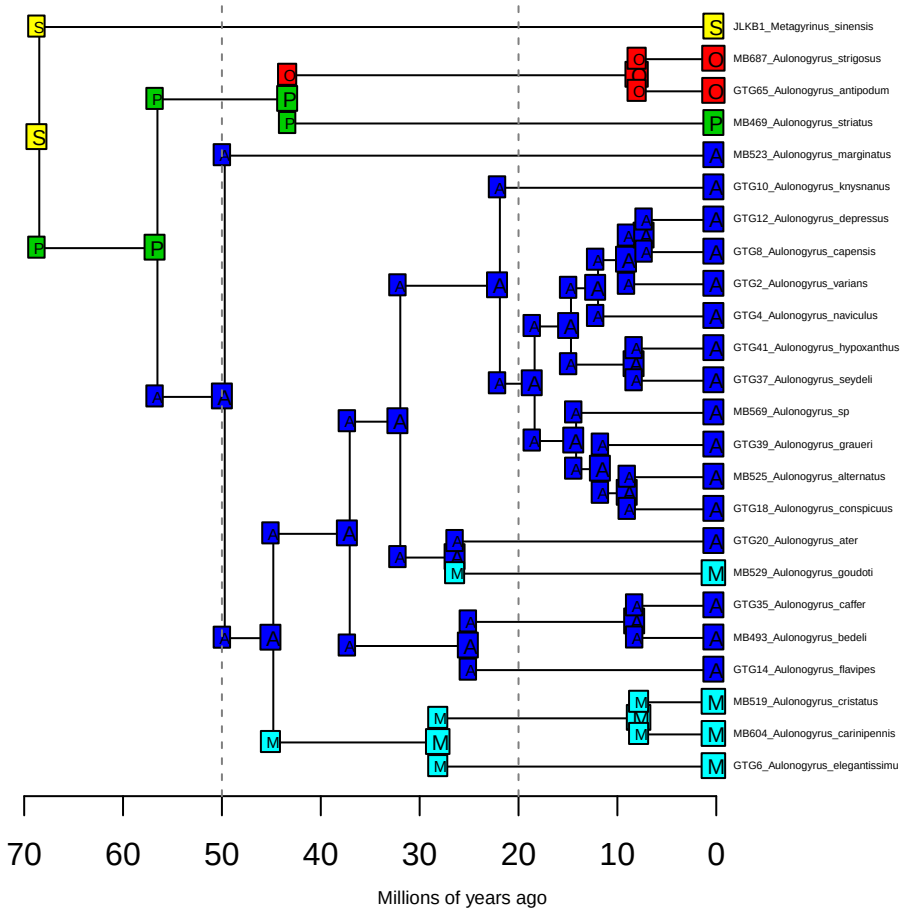

Figure S15.

BioGeoBEARS BAYAREALIKE+J on Aulonogyrus M0_unconstrained
ancstates: global optim, 3 areas max. d=0; e=0; j=0.1013; LnL=−21.45