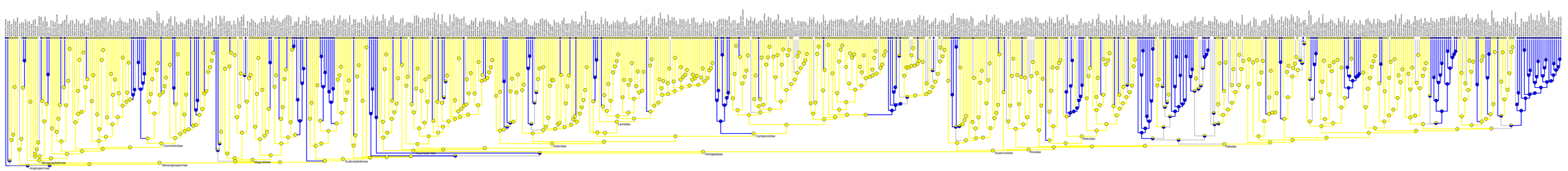
MP ancestral state reconstruction using ancestral.pars
(R phangorn)
100_A. Functional sex of flowers (D2d), 98 steps

bisexual
unisexual

Node	MP state(s)
Angiospermae	bisexual
Mesangiospermae	bisexual / unisexual
Magnoliidae	bisexual
Monocotyledonae	bisexual
Eudicotyledonae	bisexual
Commelinidae	bisexual
Ceratophyllidae	bisexual
Superasteridae	bisexual
Asteridae	bisexual
Lamiidae	bisexual
Campanulidae	bisexual
Superrosidae	bisexual
Rosidae	bisexual
Malvidae	bisexual
Fabidae	bisexual

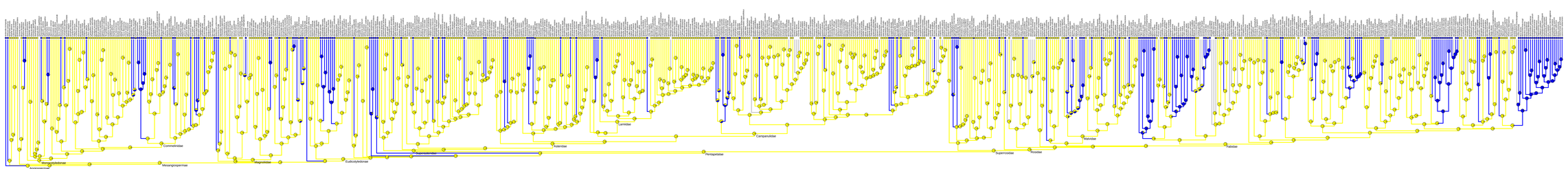


ML ancestral state reconstruction using rayDISC (R:corHMM) 100_A. Functional sex of flowers (0/2d), ARDeq model

bisexual
unisexual

Node	ML state	Prob
Angiospermae	bisexual	1
Mesangiospermae	bisexual	1
Magnoliidae	bisexual	1
Monocotyledonae	bisexual	1
Eudicotyledonae	bisexual	1
Commelinidae	bisexual	1
Ceratophyllum	bisexual	1
Superasteridae	bisexual	1
Asteridae	bisexual	1
Lamidae	bisexual	1
Campanulidae	bisexual	0.9992
Pentapetalae	bisexual	1
Rosidae	bisexual	1
Malvidae	bisexual	0.9997
Fabidae	bisexual	1

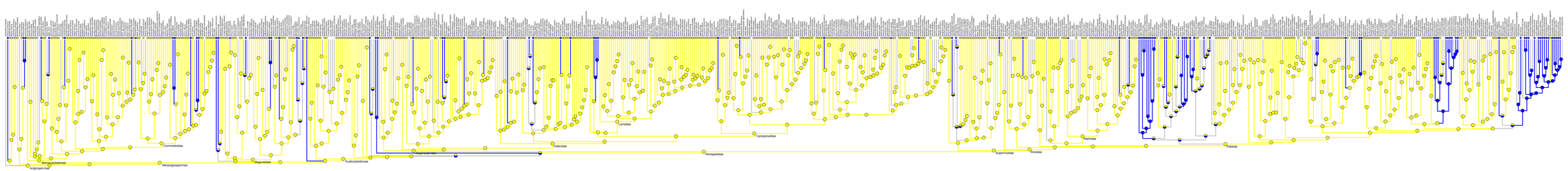
Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	-313.49	2	630.98	630.99	1.38	0.24	0.003	0.001
ARDeq*	-312.8	2	629.59	629.61	0	0.48	0.003	0.001
ER	-315.41	1	632.82	632.83	3.22	0.1	0.0029	0.0029
UN01	-314.77	1	631.55	631.55	1.94	0.18	0.003	
UN10	-352.85	1	707.7	707.71	78.1	0		0.012



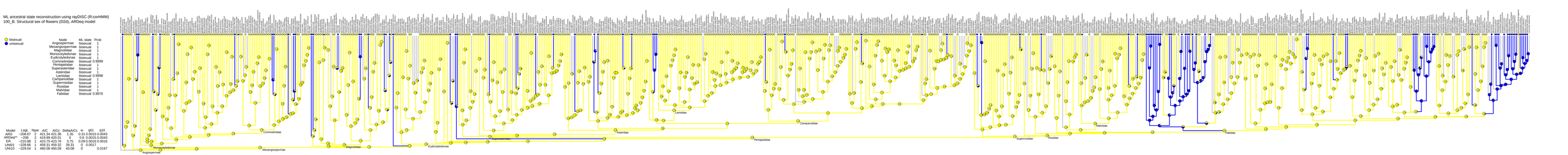
MP ancestral state reconstruction using ancestral.pars (R phangorn)
100_B. Structural sex of flowers (D2d), 57 steps

bisexual
unisexual

Node	MP state(s)
Angiospermae	bisexual
Mesangiospermae	bisexual
Magnoliidae	bisexual
Monocotyledonae	bisexual
Eudicotyledonae	bisexual
Commelinidae	bisexual
Ranunculidae	bisexual
Superasteridae	bisexual
Asteridae	bisexual
Lamiidae	bisexual
Campanulidae	bisexual
Superrosidae	bisexual
Rosidae	bisexual
Malvidae	bisexual
Fabidae	bisexual



ML ancestral state reconstruction using rayDISC (R corHMM)
100_B. Structural sex of flowers (D2d), ARDeq model



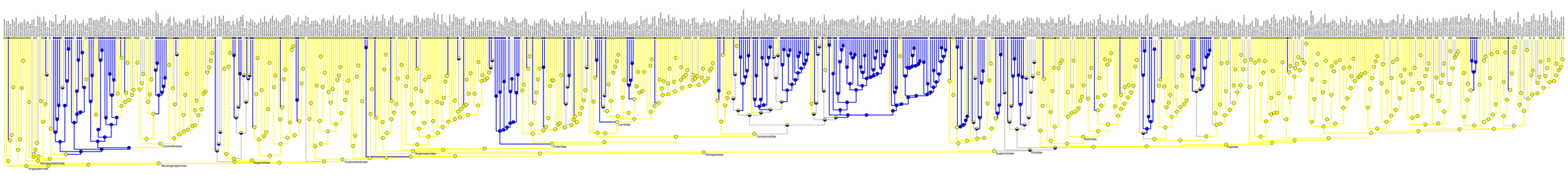
Node	ML state	Prob
Angiospermae	bisexual	1
Mesangiospermae	bisexual	1
Magnoliidae	bisexual	1
Monocotyledonae	bisexual	1
Eudicotyledonae	bisexual	1
Commelinidae	bisexual	0.9999
Ceratophyllidae	bisexual	1
Superasteridae	bisexual	1
Asteridae	bisexual	1
Lamidae	bisexual	0.9998
Campanulidae	bisexual	1
Caryophyllidae	bisexual	1
Rosidae	bisexual	1
Malvidae	bisexual	1
Fabidae	bisexual	0.9976

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	−208.67	2	421.34	421.36	1.35	0.31	0.0015	0.0043
ARDeq**	−208	2	419.99	420.01	0	0.6	0.0015	0.0043
ER	−210.88	1	423.75	423.76	3.75	0.09	0.0016	0.0016
UN01	−229.66	1	459.31	459.32	39.31	0	0.0017	
UN10	−229.04	1	460.08	460.09	40.08	0		0.0167

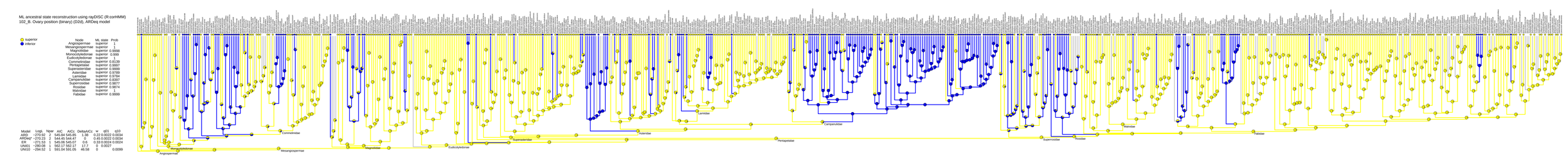
MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
102_B. Ovary position (binary) (0/d), 79 steps

superior
inferior

Node	MP state(s)
Angiospermae	superior
Mesangiospermae	superior
Magnoliidae	superior
Monocotyledonae	superior
Eudicotyledonae	superior
Commelinidae	superior
Ceratophyllum	superior
Superasteridae	superior
Asteridae	superior
Lamiidae	superior
Campanulidae	superior
Pentapetalae	superior
Rosidae	superior / inferior
Malvidae	superior
Fabidae	superior



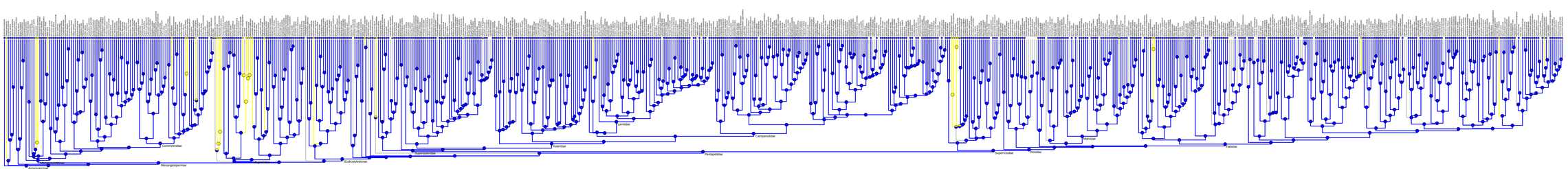
ML ancestral state reconstruction using rayDISC (R:corHMM)
102_B. Ovary position (binary) (D2d), ARDeq model



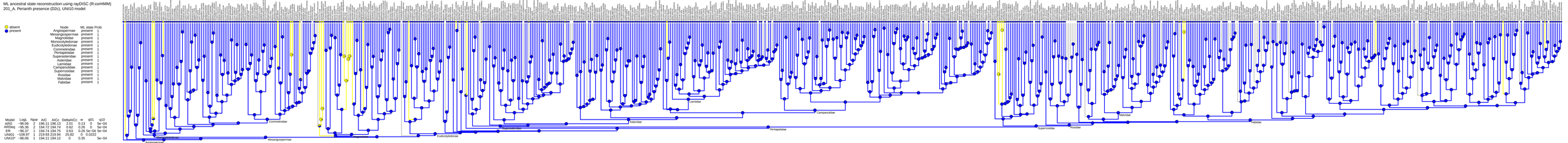
MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
201_A. Perianth presence (D2c), 20 steps

absent
present

Node	MP state(s)
Angiospermae	present
Mesangiospermae	present
Magnoliidae	present
Monocotyledoneae	present
Eudicotyledoneae	present
Commelinidae	present
Ceratophyllum	present
Superasteridae	present
Asteridae	present
Lamiidae	present
Campanulidae	present
Santalales	present
Rosidae	present
Malvidae	present
Fabidae	present

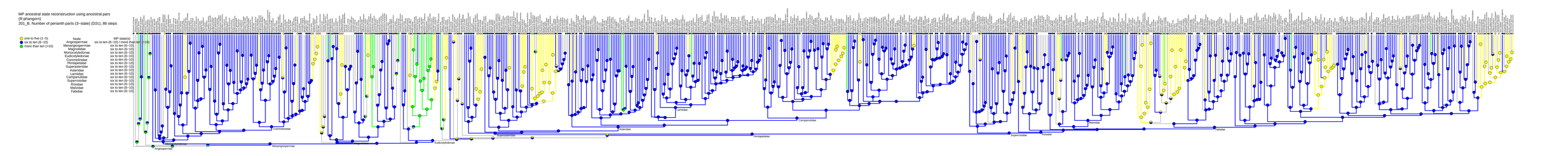


ML ancestral state reconstruction using rayDISC (R:corHMM)
201_A. Perianth presence (D2c), UNI10 model

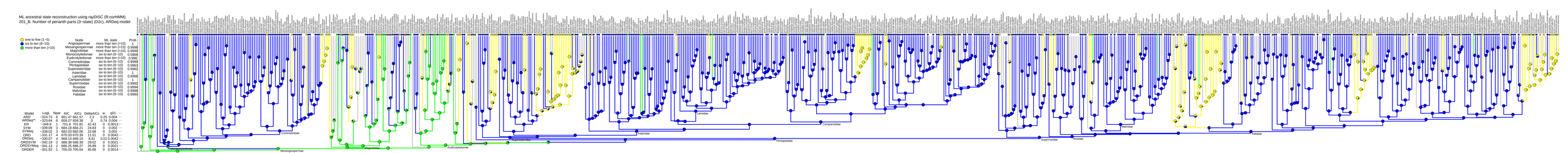


Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	−96.06	2	196.11	196.13	2.01	0.13	0	5e−04
ARDeq	−96.36	2	194.72	194.74	0.62	0.26	0	5e−04
ER	−96.37	1	194.74	194.75	0.63	0.26	5e−04	5e−04
UNI01	−108.97	1	219.93	219.94	25.82	0	0.0222	
UNI10*	−96.06	1	194.11	194.12	0	0.35		5e−04

MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
201_B. Number of perianth parts (3–state) (D2c), 86 steps



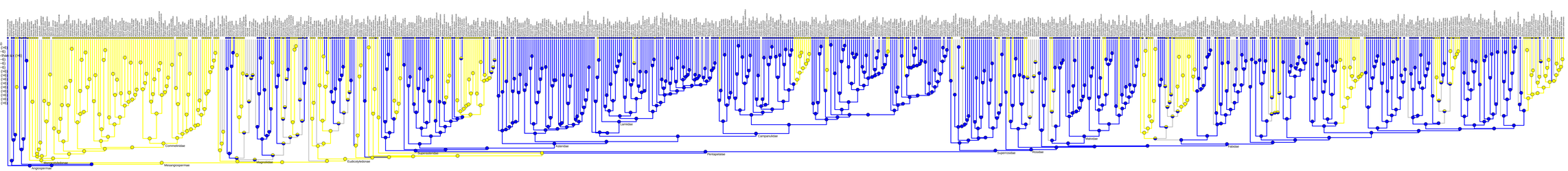
ML ancestral state reconstruction using ray|DISC (R:corHMM)
201_B. Number of perianth parts (3–state) (D2c), ARDeq model



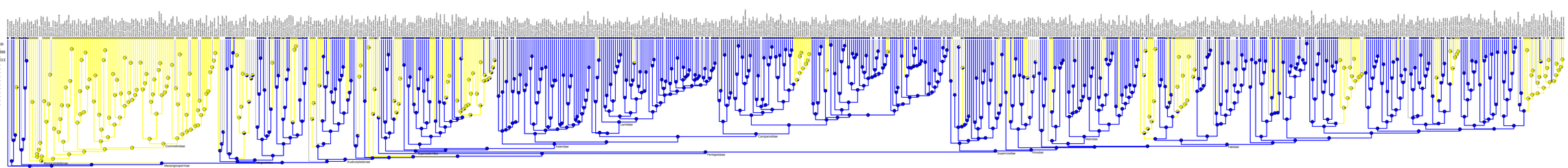
MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
201_C. Number of perianth parts (binary) (D2c), 69 steps

one to six (1–6)
more than six (>6)

Node	MP state(s)
Angiospermae	more than six (>6)
Mesangiospermae	one to six (1–6)
Magnoliidae	one to six (1–6) / more than six (>6)
Monocotyledonae	one to six (1–6)
Eudicotyledonae	one to six (1–6)
Commelinidae	one to six (1–6)
Ceratophyllidae	more than six (>6)
Superasteridae	more than six (>6)
Asteridae	more than six (>6)
Lamiidae	more than six (>6)
Campanulidae	more than six (>6)
Berberidaceae	more than six (>6)
Rosidae	more than six (>6)
Malvidae	more than six (>6)
Fabidae	more than six (>6)



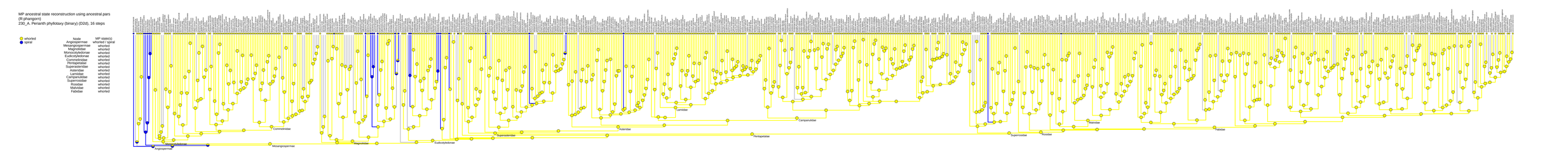
ML ancestral state reconstruction using ray[DISC (R:corHMM)
201_C. Number of perianth parts (binary) (D2c), ARDeq model



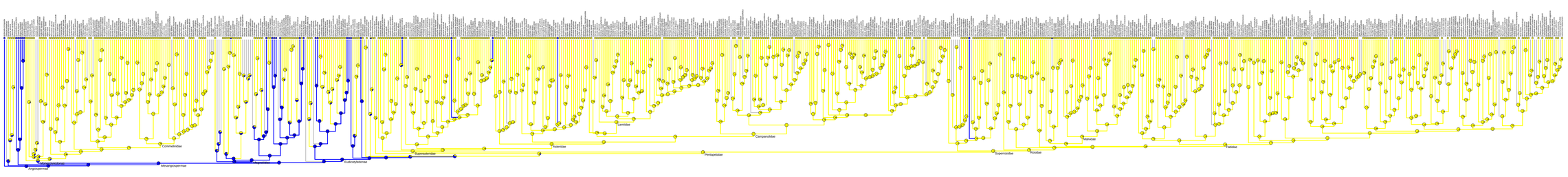
Node	ML state	Prob
Angiospermae	more than six (>6)	1
Mesangiospermae	more than six (>6)	0.9999
Magnoliidae	more than six (>6)	1
Monocotyledonae	one to six (1–6)	0.8013
Eudicotyledonae	more than six (>6)	1
Commelinidae	one to six (1–6)	1
Gunneridae	more than six (>6)	1
Superasteridae	more than six (>6)	1
Asteridae	more than six (>6)	1
Lamiidae	more than six (>6)	1
Campanulidae	more than six (>6)	1
Superrosidae	more than six (>6)	1
Rosidae	more than six (>6)	1
Malvidae	more than six (>6)	1
Fabidae	more than six (>6)	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	−247.89	2	499.77	499.79	1.39	0.32	6e−04	0.0026
ARDeq**	−247.19	2	498.39	498.4	0	0.65	6e−04	0.0026
ER	−254.48	1	510.95	510.96	12.56	0	0.0022	0.0022
UN01	−323.21	1	648.42	648.43	150.03	0	0.0081	
UN10	−251.44	1	504.87	504.88	6.48	0.03		0.0029

MP ancestral state reconstruction using ancestral.pars (ff::phangorn)
230_A. Perianth phyllotaxy (binary) (D2d), 16 steps



ML ancestral state reconstruction using ray/DISC (R:corHMM)
230_A. Perianth phyllotaxy (binary) (D2d), ARD model



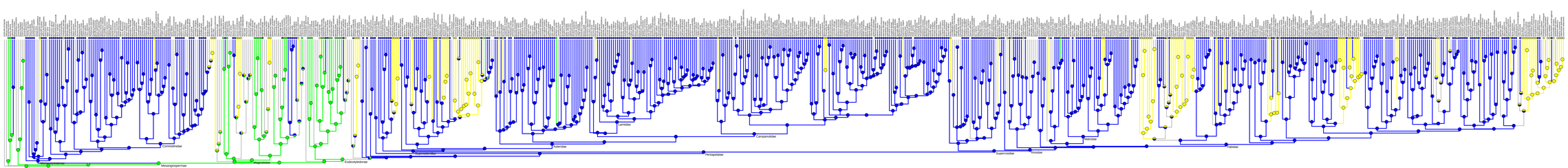
Node	ML state	Prob
Angiospermae	spiral	1
Mesangiospermae	spiral	0.9999
Magnoliidae	spiral	0.9998
Monocotyledonae	spiral	0.5013
Eudicotyledonae	spiral	0.9997
Commelinidae	whorled	0.9999
Asteridae	whorled	0.9996
Superasteridae	whorled	0.9956
Asteridae	whorled	0.9995
Lamiidae	whorled	0.9999
Campanulidae	whorled	1
Pentapetalae	whorled	0.9987
Rosidae	whorled	0.9926
Malvidae	whorled	1
Fabidae	whorled	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD**	-70.65	2	145.29	145.31	0	0.99	2e-04	0.0113
ARDeq	-77.56	2	159.12	159.14	13.83	0	4e-04	8e-04
ER	-78.28	1	158.56	158.57	13.26	0	4e-04	4e-04
UN01	-78.7	1	159.39	159.4	14.09	0	4e-04	
UN10	-76.92	1	155.84	155.84	10.53	0.01		0.0185

MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
231_A. Number of perianth whorls (D2c), 73 steps

- one (1)
- two (2)
- more than two (>2)

Node	MP state(s)
Angiospermae	more than two (>2)
Mesangiospermae	more than two (>2)
Magnoliidae	more than two (>2)
Monocotyledonae	two (2)
Eudicotyledonae	more than two (>2)
Commelinidae	two (2)
Ranunculidae	two (2)
Superasteridae	two (2)
Asteridae	two (2)
Lamiidae	two (2)
Campanulidae	two (2)
Superrosidae	two (2)
Rosidae	two (2)
Malvidae	two (2)
Fabidae	two (2)

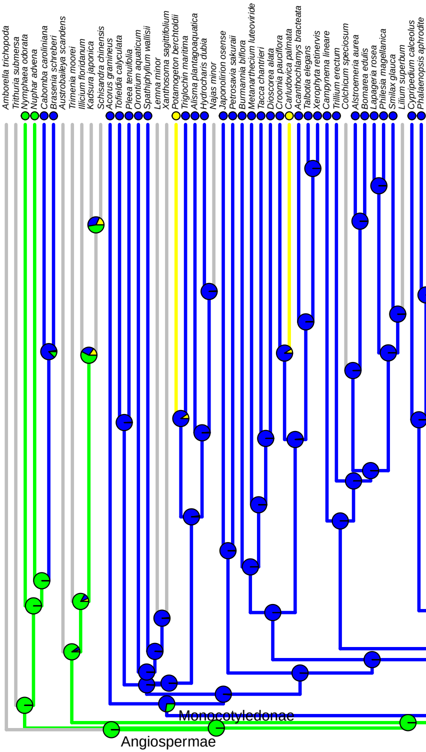


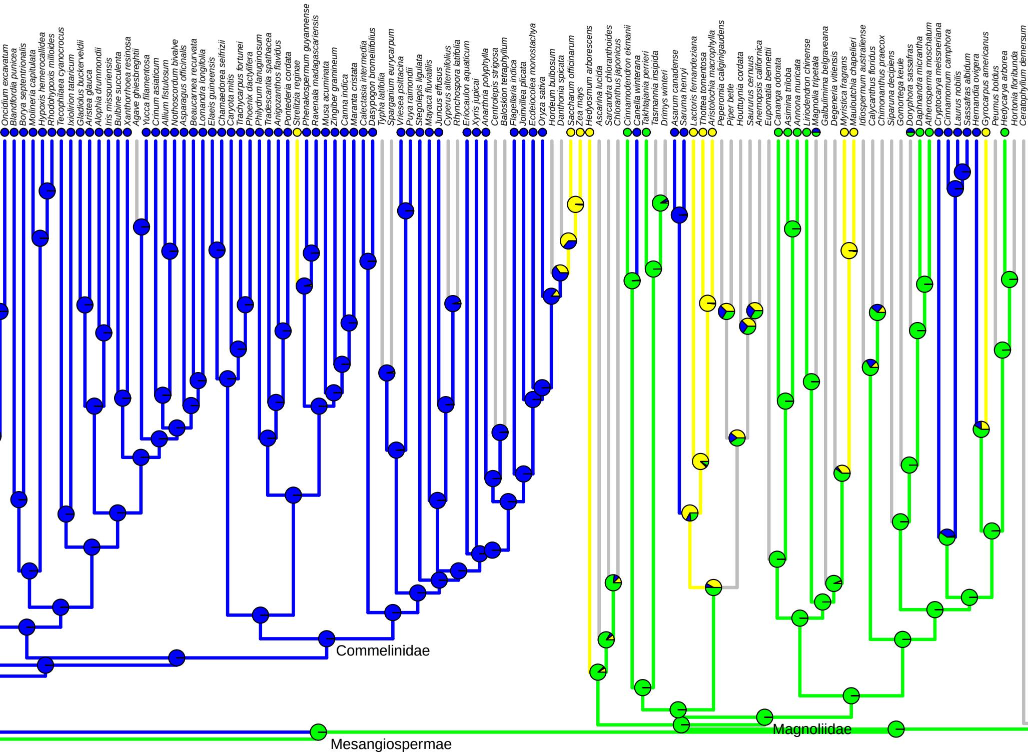
ML ancestral state reconstruction using rayDISC (R:corHMM)
231_A. Number of perianth whorls (D2c), ARDeq model

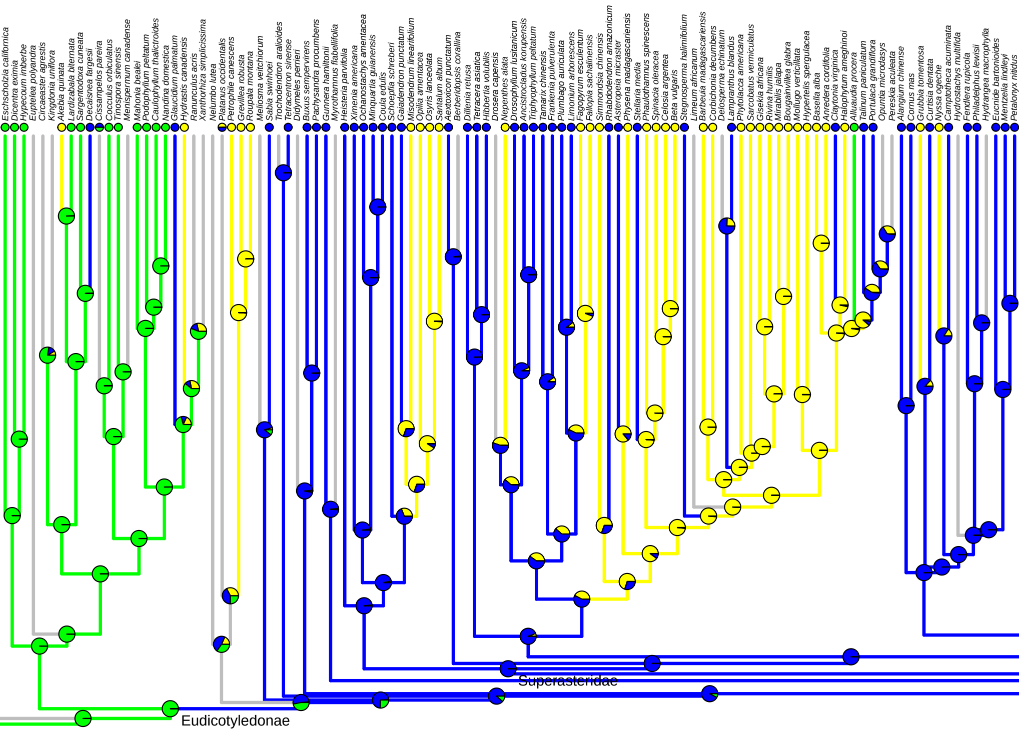
- 🟡 one (1)
- 🔵 two (2)
- 🟢 more than two (>2)

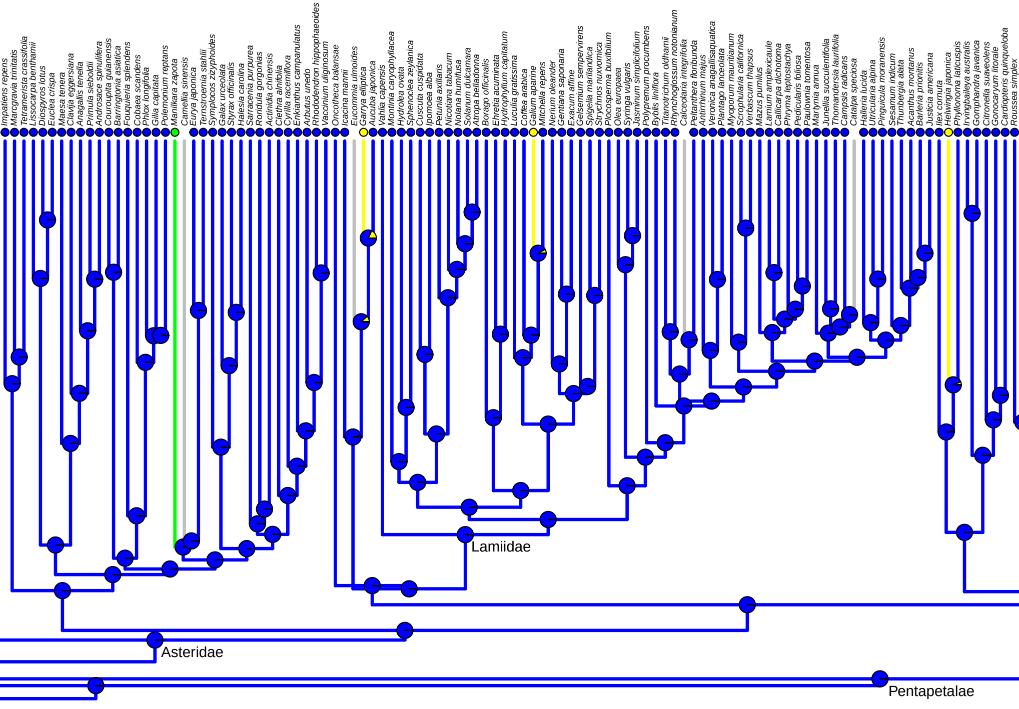
Node	ML state	Prob
Angiospermae	more than two (>2)	1
Mesangiospermae	more than two (>2)	0.9999
Magnoliidae	more than two (>2)	1
Monocotyledonae	two (2)	0.724
Eudicotyledonae	more than two (>2)	0.9984
Commelinidae	two (2)	1
Pentapetalae	two (2)	0.9998
Superasteridae	two (2)	0.9998
Asteridae	two (2)	0.9999
Lamiidae	two (2)	0.9999
Campanulidae	two (2)	1
Superrosidae	two (2)	1
Rosidae	two (2)	1
Malvidae	two (2)	0.9999
Fabidae	two (2)	0.9976

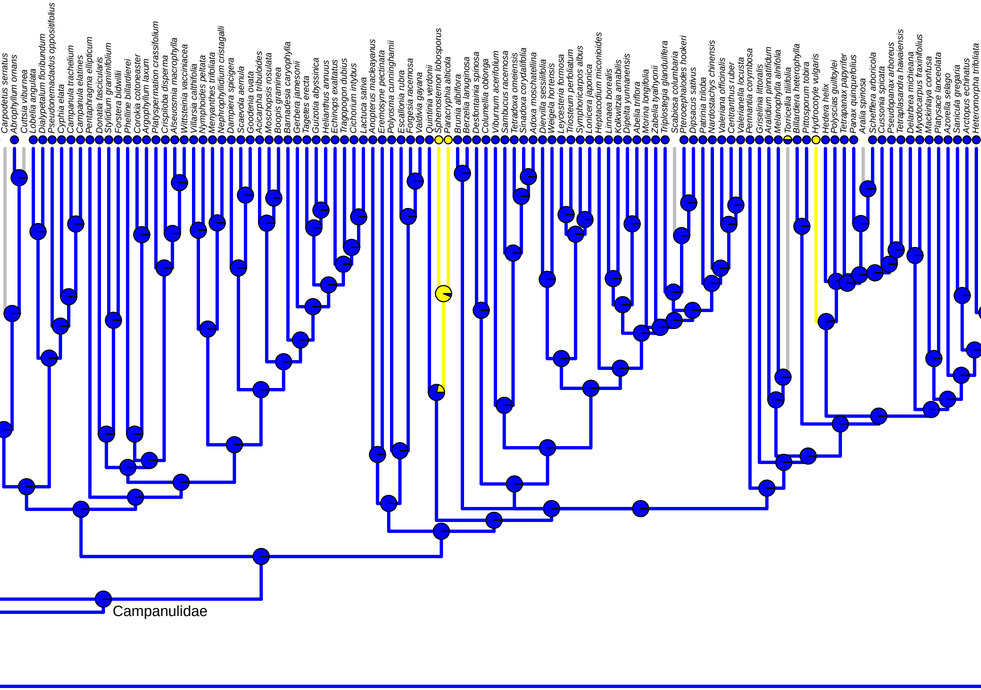
Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	···
ARD	−269.2	6	550.41	550.51	2.2	0.25	0.0048	···
ARDeq**	−268.1	6	548.21	548.32	0	0.75	0.0048	···
ER	−311.61	1	625.22	625.23	76.91	0	0.001	···
SYM	−293.84	3	593.67	593.7	45.39	0	0.0019	···
SYMeq	−292.85	3	591.69	591.72	43.4	0	0.0019	···
ORD	−277.03	4	562.06	562.11	13.79	0	0.0047	···
ORDeq	−275.93	4	559.86	559.91	11.59	0	0.0047	···
ORDSYM	−299.35	2	602.7	602.71	54.4	0	0.0019	···
ORDSYMeq	−298.28	2	600.56	600.58	52.26	0	0.0019	···
ORDER	−314.24	1	630.48	630.49	82.17	0	0.0012	···




Oncidium excavatum
Blandfordia punicea
Borya septentrionalis
Molineria capitulata
Hypoxis hemerocallidea
Rhodohypoxis milloides
Tecophilaea cyanocrocus
Ixiolirion tataricum
Gladiolus buckerveldii
Aristea glauca
Alophia drummondii
Iris missouriensis
Bulbine succulenta
Xanthorrhoea resinosa
Agave ghiesbreghtii
Yucca filamentosa
Crinum asiaticum
Allium fistulosum
Nothoscordum bivalve
Asparagus officinalis
Beaucarnea recurvata
Lomandra longifolia
Elaeis guineensis
Chamaedorea seifrizii
Caryota mitis
Trachycarpus fortunei
Phoenix dactylifera
Philydrum lanuginosum
Tradescantia spathacea
Anigozanthos flavidus
Pontederia cordata
Strelitzia reginae
Phenakospermum guyannense
Ravenala madagascariensis
Musa acuminata
Zingiber gramineum
Canna indica
Maranta cristata
Calectasia intermedia
Dasypogon bromeliifolius
Typha latifolia
Sparganium eurycarpum
Vriesea psittacina
Puya raimondii
Stegolepis ligulata
Mayaca fluviatilis
Juncus effusus
Cyperus alternifolius
Rhynchospora latifolia
Eriocaulon aquaticum
Xyris jupicai
Anarthria polyphylla
Centrolepis strigosa
Baloskion tetraphyllum
Flagellaria indica
Joinvillea plicata
Ecdeiocolea monostachya
Oryza sativa
Hordeum bulbosum
Danthonia spicata
Saccharum officinarum
Zea mays
Hedyosmum arborescens
Ascarina lucida
Sarcandra chloranthoides
Chloranthus japonicus
Cinnamodendron ekmanii
Canella winterana
Takhtajania perrieri
Tasmannia insipida
Drimys winteri
Asarum canadense
Saruma henryi
Lactoris fernandeziana
Thottea tomentosa
Aristolochia macrophylla
Peperomia caliginigaudens
Piper betle
Houttuynia cordata
Saururus cernuus
Anemopsis californica
Eupomatia bennettii
Cananga odorata
Asimina triloba
Annona muricata
Liriodendron chinense
Magnolia tripetala
Galbulimima belgraveana
Degeneria vitiensis
Myristica fragrans
Mauloutchia chapelieri
Idiospermum australiense
Calycanthus floridus
Chimonanthus praecox
Siparuna decipiens
Gomortega keule
Doryphora sassafras
Daphnandra micrantha
Atherosperma moschatum
Cryptocarya meissneriana
Cinnamomum camphora
Laurus nobilis
Sassafras albidum
Hernandia ovigera
Gyrocarpus americanus
Peumus boldus
Hedycarya arborea
Hortonia floribunda
Ceratophyllum demersum
Commelinidae
Magnoliidae
Mesangiospermae


Eschscholzia californica
Dicentra eximia
Hypecoum imberbe
Euptelea polyandra
Circaeaster agrestis
Kingdonia uniflora
Akebia quinata
Lardizabala biternata
Sargentodoxa cuneata
Decaisnea fargesii
Cissampelos pareira
Cocculus orbiculatus
Tinospora sinensis
Menispermum canadense
Mahonia bealei
Podophyllum peltatum
Caulophyllum thalictroides
Nandina domestica
Glaucidium palmatum
Hydrastis canadensis
Ranunculus acris
Xanthorhiza simplicissima
Nelumbo lutea
Platanus occidentalis
Petrophile canescens
Grevillea robusta
Roupala montana
Meliosma veitchiorum
Sabia swinhoei
Trochodendron aralioides
Tetracentron sinense
Didymeles perrieri
Buxus sempervirens
Pachysandra procumbens
Gunnera hamiltonii
Myrothamnus flabellifolia
Heisteria parvifolia
Ximenia americana
Ochanostachys amentacea
Minquartia guianensis
Coula edulis
Schoepfia schreberi
Gaiadendron punctatum
Misodendrum linearifolium
Opilia amentacea
Osyris lanceolata
Santalum album
Aextoxicon punctatum
Berberidopsis corallina
Dillenia retusa
Tetracera asiatica
Hibbertia volubilis
Drosera capensis
Nepenthes alata
Drosophyllum lusitanicum
Ancistrocladus korupensis
Triphyophyllum peltatum
Tamarix chinensis
Frankenia pulverulenta
Plumbago auriculata
Limonium arborescens
Fagopyrum esculentum
Fallopia sachalinensis
Simmondsia chinensis
Rhabdodendron amazonicum
Asteropeia micraster
Physena madagascariensis
Stellaria media
Phaulothamnus spinescens
Spinacia oleracea
Celosia argentea
Beta vulgaris
Stegnosperma halimifolium
Limeum africanum
Barbeuia madagascariensis
Corbichonia decumbens
Delosperma echinatum
Lampranthus blandus
Phytolacca americana
Sarcobatus vermiculatus
Gisekia africana
Rivina humilis
Mirabilis jalapa
Bougainvillea glabra
Mollugo verticillata
Hypertelis spergulacea
Basella alba
Anredera cordifolia
Claytonia virginica
Halophytum ameghinoi
Alluaudia procera
Talinum paniculatum
Portulaca grandiflora
Opuntia microdasys
Pereskia aculeata
Alangium chinense
Cornus mas
Grubbia tomentosa
Curtisia dentata
Nyssa ogeche
Camptotheca acuminata
Hydrostachys multifida
Fendlera rupicola
Philadelphus lewisii
Hydrangea macrophylla
Eucnide bartonioides
Mentzelia lindleyi
Petalonyx nitidus
Superasteridae
Eudicotyledonae


Impatiens repens
Marcgravia trinitatis
Tetramerista crassifolia
Lissocarpa benthamii
Diospyros lotus
Euclea crispa
Maesa tenera
Clavija eggersiana
Anagallis tenella
Primula sieboldii
Androsace spinulifera
Couroupita guianensis
Barringtonia asiatica
Fouquieria splendens
Cobaea scandens
Phlox longifolia
Gilia capitata
Polemonium reptans
Manilkara zapota
Camellia sinensis
Eurya japonica
Ternstroemia stahlii
Symplocos zizyphoides
Galax urceolata
Styrax officinalis
Halesia carolina
Sarracenia purpurea
Roridula gorgonias
Actinidia chinensis
Clethra alnifolia
Cyrilla racemiflora
Enkianthus campanulatus
Arbutus unedo
Rhododendron hippophaeoides
Vaccinium uliginosum
Oncotheca balansae
Icacina mannii
Eucommia ulmoides
Garrya elliptica
Aucuba japonica
Vahlia capensis
Montinia caryophyllacea
Hydrolea ovata
Sphenoclea zeylanica
Cuscuta cuspidata
Ipomoea alba
Petunia axillaris
Nicotiana tabacum
Nolana humifusa
Solanum dulcamara
Atropa belladonna
Borago officinalis
Ehretia acuminata
Hydrophyllum capitatum
Luculia gratissima
Coffea arabica
Galium aparine
Mitchella repens
Nerium oleander
Gentiana saponaria
Exacum affine
Gelsemium sempervirens
Spigelia marilandica
Strychnos nuxvomica
Plocosperma buxifolium
Olea europaea
Syringa vulgaris
Jasminum simplicifolium
Polypremum procumbens
Byblis liniflora
Titanotrichum oldhamii
Rhynchoglossum notonianum
Calceolaria integrifolia
Peltanthera floribunda
Antirrhinum majus
Veronica anagallisaquatica
Plantago lanceolata
Myoporum mauritianum
Scrophularia californica
Verbascum thapsus
Mazus pumilus
Lamium amplexicaule
Callicarpa dichotoma
Phryma leptostachya
Pedicularis foliosa
Paulownia tomentosa
Martynia annua
Junellia succulentifolia
Thomandersia laurifolia
Campsis radicans
Catalpa speciosa
Halleria lucida
Utricularia alpina
Pinguicula moranensis
Sesamum indicum
Thunbergia alata
Acanthus montanus
Barleria prionitis
Justicia americana
Ilex cornuta
Helwingia japonica
Phyllonoma laticuspis
Irvingbaileya australis
Gomphandra javanica
Citronella suaveolens
Gonocaryum litorale
Cardiopteris quinqueloba
Roussea simplex
Lamiidae
Asteridae
Pentapetalae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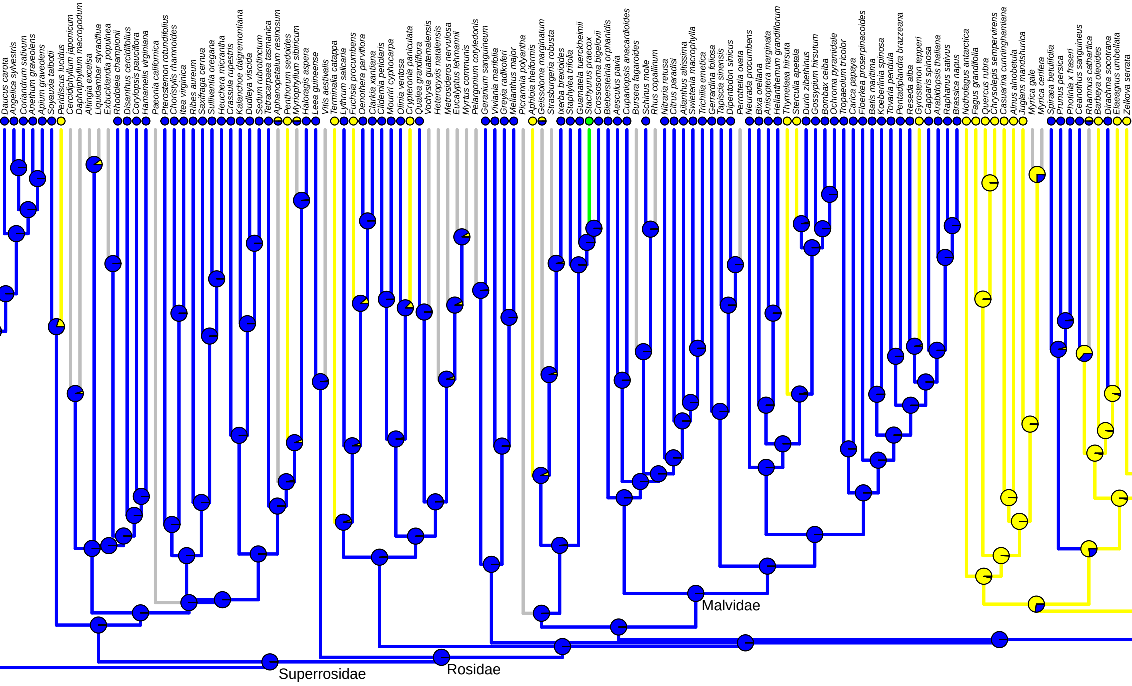
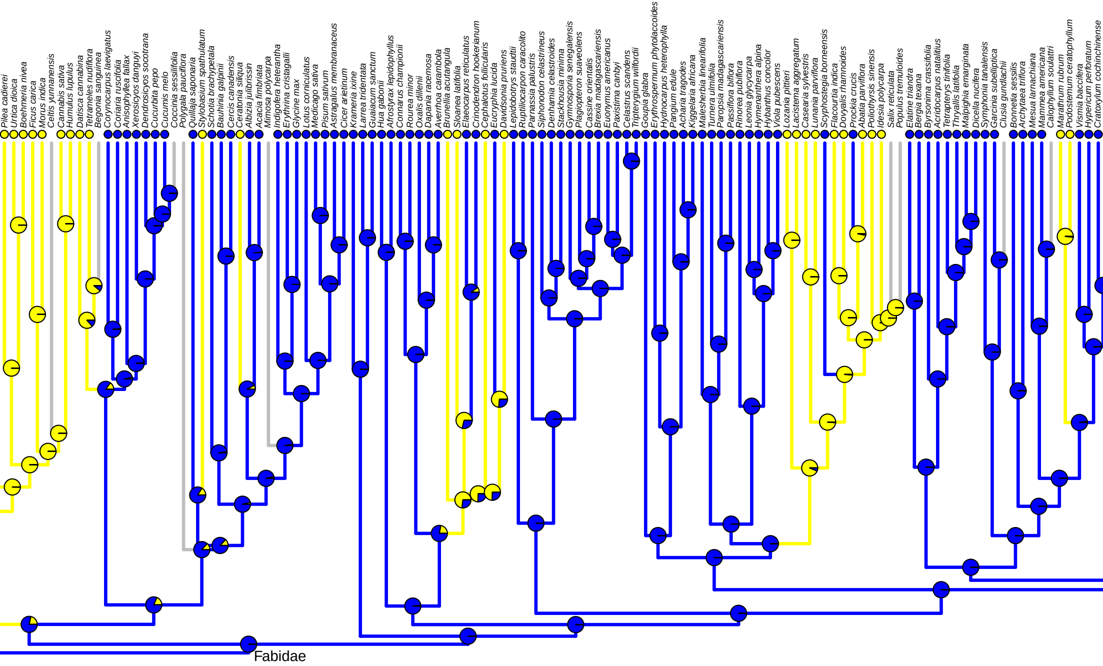
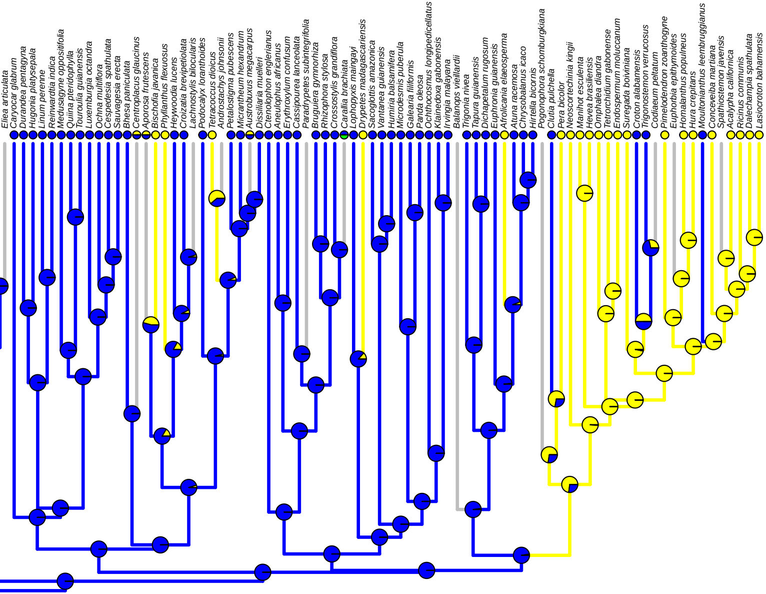
Abrophyllum ornans
Cuttsia viburnea
Lobelia angulata
Dialypetalum floribundum
Pseudonemacladus oppositifolius
Cyphia elata
Campanula trachelium
Campanula elatines
Pentaphragma ellipticum
Donatia fascicularis
Stylidium graminifolium
Forstera bidwillii
Phelline billardierei
Corokia cotoneaster
Argophyllum laxum
Platyspermation crassifolium
Crispiloba disperma
Alseuosmia macrophylla
Wittsteinia vacciniacea
Villarsia calthifolia
Nymphoides peltata
Menyanthes trifoliata
Nephrophyllidium cristagalli
Dampiera spicigera
Scaevola aemula
Goodenia ovata
Acicarpha tribuloides
Moschopsis rosulata
Boopis graminea
Barnadesia caryophylla
Gerbera jamesonii
Tagetes erecta
Guizotia abyssinica
Helianthus annuus
Echinops exaltatus
Tragopogon dubius
Cichorium intybus
Lactuca sativa
Anopterus macleayanus
Eremosyne pectinata
Polyosma cunninghamii
Escallonia rubra
Forgesia racemosa
Valdivia gayana
Quintinia verdonii
Sphenostemon lobosporus
Paracryphia alticola
Brunia albiflora
Berzelia lanuginosa
Desfontainia spinosa
Columellia oblonga
Viburnum acerifolium
Sambucus racemosa
Tetradoxa omeiensis
Sinadoxa corydalifolia
Adoxa moschatellina
Diervilla sessilifolia
Weigela hortensis
Leycesteria formosa
Triosteum perfoliatum
Symphoricarpos albus
Lonicera japonica
Heptacodium miconioides
Linnaea borealis
Kolkwitzia amabilis
Dipelta yunnanensis
Abelia triflora
Morina longifolia
Zabelia tyaihyonii
Triplostegia glandulifera
Scabiosa columbaria
Pterocephalodes hookeri
Dipsacus sativus
Patrinia triloba
Nardostachys chinensis
Valeriana officinalis
Centranthus ruber
Valerianella locusta
Pennantia corymbosa
Griselinia littoralis
Aralidium pinnatifidum
Melanophylla alnifolia
Torricellia tiliifolia
Billardiera heterophylla
Pittosporum tobira
Hydrocotyle vulgaris
Hedera helix
Polyscias guilfoylei
Tetrapanax papyrifer
Panax quinquefolius
Aralia spinosa
Schefflera arboricola
Cussonia spicata
Pseudopanax arboreus
Tetraplasandra hawaiensis
Delarbrea michieana
Myodocarpus fraxinifolius
Mackinlaya confusa
Platysace lanceolata
Azorella selago
Sanicula gregaria
Arctopus echinatus
Heteromorpha trifoliata
Campanulidae


Daucus carota
Angelica sylvestris
Coriandrum sativum
Anethum graveolens
Apium graveolens
Soyauxia talbotii
Peridiscus lucidus
Cercidiphyllum japonicum
Daphniphyllum macropodum
Altingia excelsa
Liquidambar styraciflua
Exbucklandia populnea
Rhodoleia championii
Disanthus cercidifolius
Corylopsis pauciflora
Hamamelis virginiana
Paeonia californica
Pterostemon rotundifolius
Choristylis rhamnoides
Itea virginica
Ribes aureum
Saxifraga cernua
Sullivantia oregana
Heuchera micrantha
Crassula rupestris
Kalanchoe daigremontiana
Dudleya viscida
Sedum rubrotinctum
Tetracarpaea tasmanica
Aphanopetalum resinosum
Penthorum sedoides
Myriophyllum sibiricum
Haloragis aspera
Leea guineense
Vitis aestivalis
Terminalia catappa
Lythrum salicaria
Fuchsia procumbens
Oenothera parviflora
Clarkia xantiana
Clidemia petiolaris
Mouriri cyphocarpa
Olinia ventosa
Crypteronia paniculata
Qualea grandiflora
Vochysia guatemalensis
Heteropyxis natalensis
Metrosideros nervulosa
Eucalyptus lehmannii
Myrtus communis
Pelargonium cotyledonis
Geranium sanguineum
Viviania marifolia
Greyia radlkoferi
Melianthus major
Picramnia polyantha
Aphloia theiformis
Geissoloma marginatum
Strasburgeria robusta
Ixerba brexioides
Staphylea trifolia
Guamatela tuerckheimii
Stachyurus praecox
Crossosoma bigelovii
Biebersteinia orphanidis
Aesculus pavia
Cupaniopsis anacardioides
Bursera fagaroides
Schinus molle
Rhus copallinum
Nitraria retusa
Citrus paradisi
Ailanthus altissima
Swietenia macrophylla
Trichilia emetica
Gerrardina foliosa
Tapiscia sinensis
Dipentodon sinicus
Perrottetia ovata
Neurada procumbens
Bixa orellana
Anisoptera marginata
Helianthemum grandiflorum
Thymelaea hirsuta
Sterculia apetala
Durio zibethinus
Gossypium hirsutum
Bombax ceiba
Ochroma pyramidale
Tropaeolum tricolor
Carica papaya
Floerkea proserpinacoides
Batis maritima
Koeberlinia spinosa
Tovaria pendula
Pentadiplandra brazzeana
Reseda alba
Gyrostemon tepperi
Capparis spinosa
Arabidopsis thaliana
Raphanus sativus
Brassica napus
Nothofagus antarctica
Fagus grandifolia
Quercus rubra
Chrysolepis sempervirens
Casuarina cunninghamiana
Alnus alnobetula
Juglans mandshurica
Myrica gale
Myrica cerifera
Spiraea betulifolia
Prunus persica
Photinia x fraseri
Ceanothus sanguineus
Rhamnus cathartica
Barbeya oleoides
Dirachma socotrana
Elaeagnus umbellata
Zelkova serrata
Malvidae
Superrosidae
Rosidae

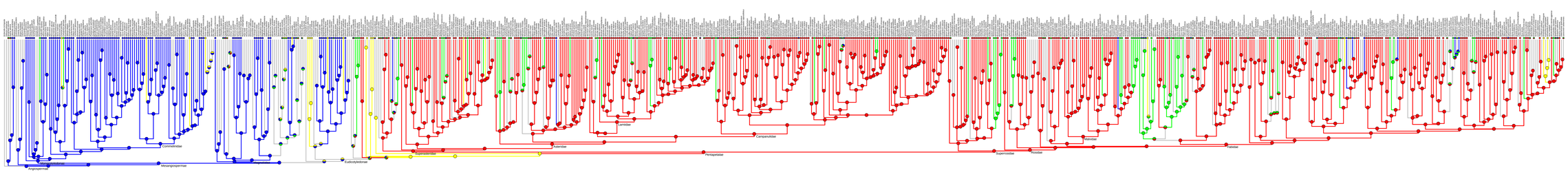

Pilea cadierei
Urtica dioica
Boehmeria nivea
Ficus carica
Morus indica
Celtis yunnanensis
Cannabis sativa
Humulus lupulus
Datisca cannabina
Tetrameles nudiflora
Begonia sanguinea
Corynocarpus laevigatus
Coriaria ruscifolia
Anisophyllea fallax
Xerosicyos danguyi
Dendrosicyos socotrana
Cucurbita pepo
Cucumis melo
Coccinia sessilifolia
Polygala pauciflora
Quillaja saponaria
Stylobasium spathulatum
Schotia brachypetala
Bauhinia galpinii
Cercis canadensis
Ceratonia siliqua
Albizia julibrissin
Acacia fimbriata
Mimosa polycarpa
Indigofera heterantha
Erythrina cristagalli
Glycine max
Lotus corniculatus
Medicago sativa
Pisum sativum
Astragalus membranaceus
Cicer arietinum
Krameria ixine
Larrea tridentata
Guaiacum sanctum
Hua gabonii
Afrostyrax lepidophyllus
Connarus championii
Rourea minor
Oxalis dillenii
Dapania racemosa
Averrhoa carambola
Brunellia acutangula
Sloanea latifolia
Elaeocarpus reticulatus
Crinodendron hookerianum
Cephalotus follicularis
Eucryphia lucida
Davidsonia pruriens
Lepidobotrys staudtii
Ruptiliocarpon caracolito
Parnassia palustris
Siphonodon celastrineus
Denhamia celastroides
Stackhousia minima
Gymnosporia senegalensis
Plagiopteron suaveolens
Cassine orientalis
Brexia madagascariensis
Euonymus americanus
Paxistima canbyi
Celastrus scandens
Tripterygium wilfordii
Goupia glabra
Erythrospermum phytolaccoides
Hydnocarpus heterophylla
Pangium edule
Acharia tragodes
Kiggelaria africana
Malesherbia linearifolia
Turnera ulmifolia
Paropsia madagascariensis
Passiflora biflora
Rinorea pubiflora
Leonia glycycarpa
Hymenanthera alpina
Hybanthus concolor
Viola pubescens
Lozania pittieri
Lacistema aggregatum
Casearia sylvestris
Lunania parviflora
Scyphostegia borneensis
Flacourtia indica
Dovyalis rhamnoides
Prockia crucis
Abatia parviflora
Poliothyrsis sinensis
Idesia polycarpa
Salix reticulata
Populus tremuloides
Elatine triandra
Bergia texana
Byrsonima crassifolia
Acridocarpus natalitius
Tetrapterys tinifolia
Thryallis latifolia
Malpighia emarginata
Dicella nucifera
Symphonia tanalensis
Garcinia subelliptica
Clusia gundlachii
Bonnetia sessilis
Archytaea triflora
Mesua larnachiana
Mammea americana
Calophyllum soulattri
Marathrum rubrum
Podostemum ceratophyllum
Vismia baccifera
Hypericum perforatum
Cratoxylum cochinchinense
Fabidae


Eliea articulata
Caryocar glabrum
Durandea pentagyna
Hugonia platysepala
Linum perenne
Reinwardtia indica
Medusagyne oppositifolia
Quiina pteridophylla
Touroulia guianensis
Luxemburgia octandra
Ochna multiflora
Cespedesia spathulata
Sauvagesia erecta
Bhesa paniculata
Centroplacus glaucinus
Aporosa frutescens
Bischofia javanica
Phyllanthus flexuosus
Heywoodia lucens
Croizatia brevipetiolata
Lachnostylis bilocularis
Podocalyx loranthoides
Tetracoccus dioicus
Androstachys johnsonii
Petalostigma pubescens
Micrantheum hexandrum
Austrobuxus megacarpus
Dissiliaria muelleri
Ctenolophon englerianus
Aneulophus africanus
Erythroxylum confusum
Cassipourea lanceolata
Paradrypetes subintegrifolia
Bruguiera gymnorhiza
Rhizophora stylosa
Crossostylis grandiflora
Carallia brachiata
Lophopyxis maingayi
Drypetes madagascariensis
Sacoglottis amazonica
Vantanea guianensis
Humiria balsamifera
Microdesmis puberula
Galearia filiformis
Panda oleosa
Ochthocosmus longipedicellatus
Klainedoxa gabonensis
Irvingia malayana
Balanops vieillardii
Trigonia nivea
Tapura guianensis
Dichapetalum rugosum
Euphronia guianensis
Afrolicania elaeosperma
Atuna racemosa
Chrysobalanus icaco
Hirtella bicornis
Pogonophora schomburgkiana
Clutia pulchella
Pera bicolor
Neoscortechinia kingii
Manihot esculenta
Hevea brasiliensis
Omphalea diandra
Tetrorchidium gabonense
Endospermum moluccanum
Suregada boiviniana
Croton alabamensis
Trigonostemon verrucosus
Codiaeum peltatum
Pimelodendron zoanthogyne
Euphorbia epithymoides
Homalanthus populneus
Hura crepitans
Moultonianthus leembruggianus
Conceveiba martiana
Spathiostemon javensis
Acalypha californica
Ricinus communis
Dalechampia spathulata
Lasiocroton bahamensis

MP ancestral state reconstruction using ancestral.pars
(ff:phangorn)
232_A. Perianth merism (4–state) (D2c), 84 steps

- dimerous
- trimerous
- tetramerous
- pentamerous

Node	MP state(s)
Angiospermae	trimerous
Mesangiospermae	trimerous
Magnoliidae	trimerous
Monocotyledonae	trimerous
Eudicotyledonae	dimerous / trimerous
Commelinidae	trimerous
Gunneridae	pentamerous
Superasteridae	pentamerous
Asteridae	pentamerous
Lamiidae	pentamerous
Campanulidae	pentamerous
Superrosidae	pentamerous
Rosidae	pentamerous
Malvidae	pentamerous
Fabidae	pentamerous

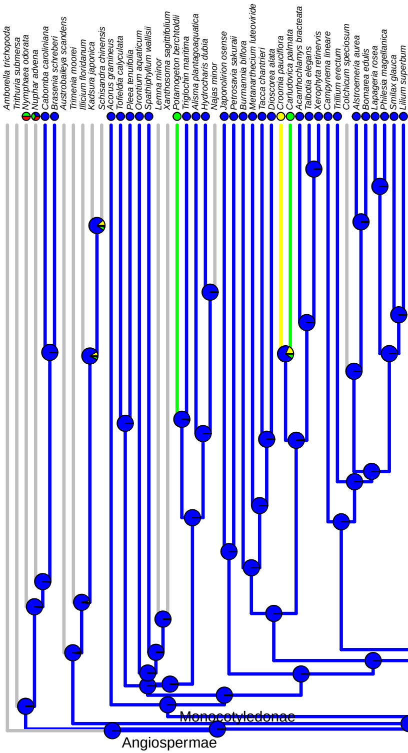


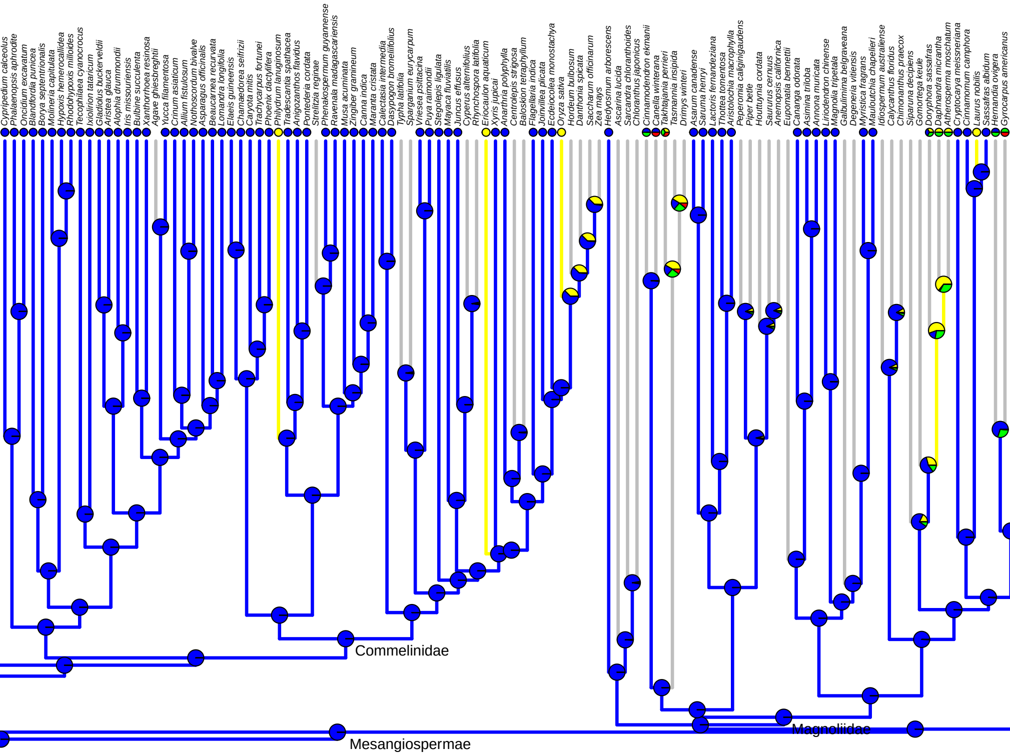
ML ancestral state reconstruction using rayDISC (R:corHMM)
232_A. Perianth merism (4−state) (D2c), SYMeq model

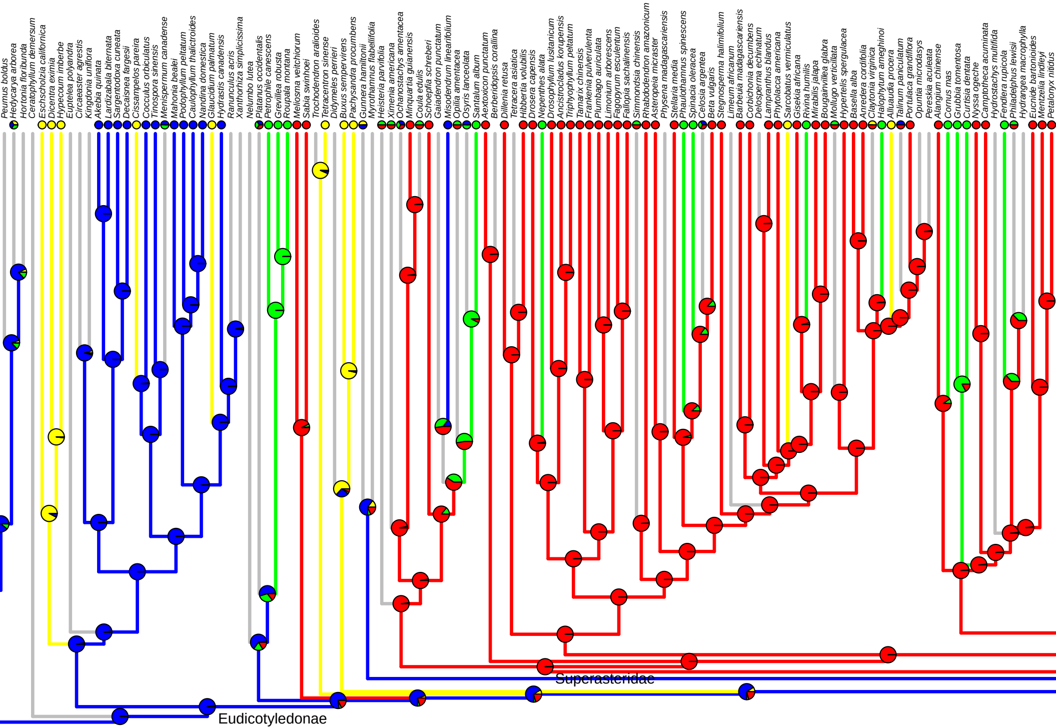
- ● dimerous
- ● trimerous
- ● tetramerous
- ● pentamerous

Node	ML state	Prob
Angiospermae	trimerous	1
Mesangiospermae	trimerous	1
Magnoliidae	trimerous	1
Monocotyledonae	trimerous	1
Eudicotyledonae	trimerous	0.9775
Commelinidae	trimerous	1
Pentapetalae	pentamerous	0.9997
Superasteridae	pentamerous	0.9999
Asteridae	pentamerous	1
Lamiidae	pentamerous	0.9999
Campanulidae	pentamerous	1
Superrosidae	pentamerous	1
Rosidae	pentamerous	1
Malvidae	pentamerous	1
Fabidae	pentamerous	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	···
ARD	−324.05	12	672.09	672.49	10.26	0	0	···
ARDeq	−322.68	12	669.36	669.76	7.53	0.02	0	···
ER	−360.93	1	723.86	723.87	61.64	0	8e−04	···
SYM	−326.44	6	664.89	664.99	2.76	0.2	0.0013	···
SYMeq**	−325.06	6	662.12	662.23	0	0.78	0.0013	···
ORD	−337.09	6	686.19	686.29	24.06	0	0	···
ORDeq	−335.78	6	683.56	683.66	21.43	0	0	···
ORDSYM	−345.25	3	696.5	696.53	34.3	0	0.002	···
ORDSYMeq	−343.88	3	693.75	693.78	31.55	0	0.002	···
ORDER	−346.93	1	695.87	695.87	33.64	0	0.0025	···




Cypripedium calceolus
Phalaenopsis aphrodite
Oncidium excavatum
Blandfordia punicea
Borya septentrionalis
Molineria capitulata
Hypoxis hemerocallidea
Rhodohypoxis milloides
Tecophilaea cyanocrocus
Ixiolirion tataricum
Gladiolus buckerveldii
Aristea glauca
Alophia drummondii
Iris missouriensis
Bulbine succulenta
Xanthorrhoea resinosa
Agave ghiesbreghtii
Yucca filamentosa
Crinum asiaticum
Allium fistulosum
Nothoscordum bivalve
Asparagus officinalis
Beaucarnea recurvata
Lomandra longifolia
Elaeis guineensis
Chamaedorea seifrizii
Caryota mitis
Trachycarpus fortunei
Phoenix dactylifera
Philydrum lanuginosum
Tradescantia spathacea
Anigozanthos flavidus
Pontederia cordata
Strelitzia reginae
Phenakospermum guyannense
Ravenala madagascariensis
Musa acuminata
Zingiber gramineum
Canna indica
Maranta cristata
Calectasia intermedia
Dasypogon bromeliifolius
Typha latifolia
Sparganium eurycarpum
Vriesea psittacina
Puya raimondii
Stegolepis ligulata
Mayaca fluviatilis
Juncus effusus
Cyperus alternifolius
Rhynchospora latifolia
Eriocaulon aquaticum
Xyris jupicai
Anarthria polyphylla
Centrolepis strigosa
Baloskion tetraphyllum
Flagellaria indica
Joinvillea plicata
Ecdeiocolea monostachya
Oryza sativa
Hordeum bulbosum
Danthonia spicata
Saccharum officinarum
Zea mays
Hedyosmum arborescens
Ascarina lucida
Sarcandra chloranthoides
Chloranthus japonicus
Cinnamodendron ekmanii
Canella winterana
Takhtajania perrieri
Tasmannia insipida
Drimys winteri
Asarum canadense
Saruma henryi
Lactoris fernandeziana
Thottea tomentosa
Aristolochia macrophylla
Peperomia caliginigaudens
Piper betle
Houttuynia cordata
Saururus cernuus
Anemopsis californica
Eupomatia bennettii
Cananga odorata
Asimina triloba
Annona muricata
Liriodendron chinense
Magnolia tripetala
Galbulimima belgraveana
Degeneria vitiensis
Myristica fragrans
Mauloutchia chapelieri
Idiospermum australiense
Calycanthus floridus
Chimonanthus praecox
Siparuna decipiens
Gomortega keule
Doryphora sassafras
Daphnandra micrantha
Atherosperma moschatum
Cryptocarya meissneriana
Cinnamomum camphora
Laurus nobilis
Sassafras albidum
Hernandia ovigera
Gyrocarpus americanus
Commelinidae
Magnoliidae
Mesangiospermae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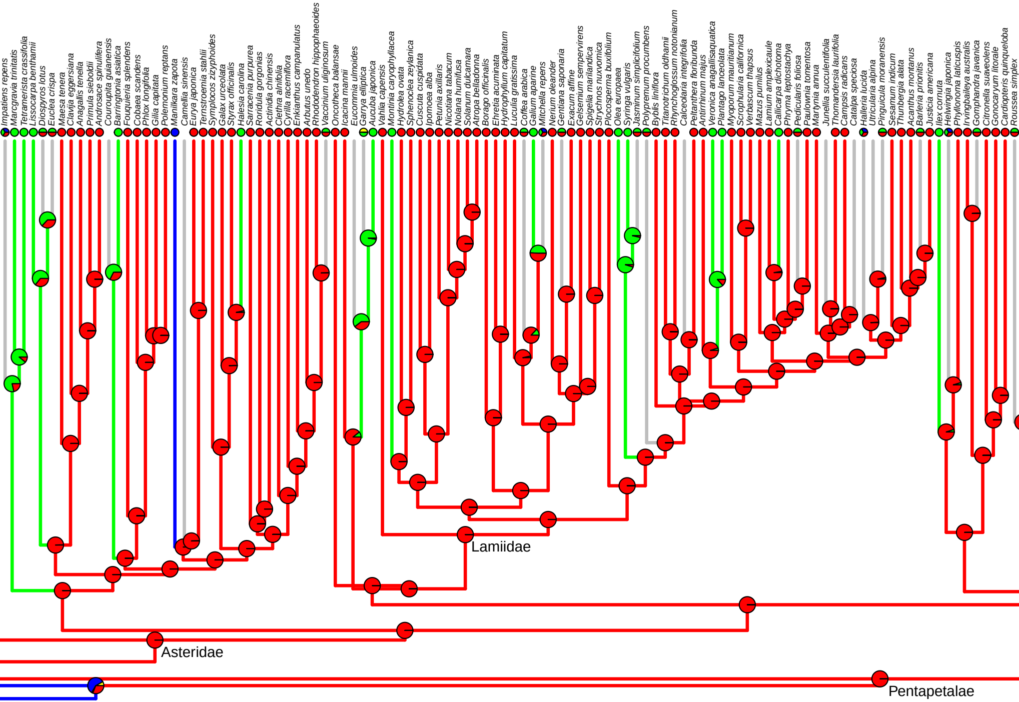
Hedycarya arborea
Hortonia floribunda
Ceratophyllum demersum
Eschscholzia californica
Dicentra eximia
Hypecoum imberbe
Euptelea polyandra
Circaeaster agrestis
Kingdonia uniflora
Akebia quinata
Lardizabala biternata
Sargentodoxa cuneata
Decaisnea fargesii
Cissampelos pareira
Cocculus orbiculatus
Tinospora sinensis
Menispermum canadense
Mahonia bealei
Podophyllum peltatum
Caulophyllum thalictroides
Nandina domestica
Glaucidium palmatum
Hydrastis canadensis
Ranunculus acris
Xanthorhiza simplicissima
Nelumbo lutea
Platanus occidentalis
Petrophile canescens
Grevillea robusta
Roupala montana
Meliosma veitchiorum
Sabia swinhoei
Trochodendron aralioides
Tetracentron sinense
Didymeles perrieri
Buxus sempervirens
Pachysandra procumbens
Gunnera hamiltonii
Myrothamnus flabellifolia
Heisteria parvifolia
Ximenia americana
Ochanostachys amentacea
Minquartia guianensis
Coula edulis
Schoepfia schreberi
Gaiadendron punctatum
Misodendrum linearifolium
Opilia amentacea
Osyris lanceolata
Santalum album
Aextoxicon punctatum
Berberidopsis corallina
Dillenia retusa
Tetracera asiatica
Hibbertia volubilis
Drosera capensis
Nepenthes alata
Drosophyllum lusitanicum
Ancistrocladus korupensis
Triphyophyllum peltatum
Tamarix chinensis
Frankenia pulverulenta
Plumbago auriculata
Limonium arborescens
Fagopyrum esculentum
Fallopia sachalinensis
Simmondsia chinensis
Rhabdodendron amazonicum
Asteropeia micraster
Physena madagascariensis
Stellaria media
Phaulothamnus spinescens
Spinacia oleracea
Celosia argentea
Beta vulgaris
Stegnosperma halimifolium
Limeum africanum
Barbeuia madagascariensis
Corbichonia decumbens
Delosperma echinatum
Lampranthus blandus
Phytolacca americana
Sarcobatus vermiculatus
Gisekia africana
Rivina humilis
Mirabilis jalapa
Bougainvillea glabra
Mollugo verticillata
Hypertelis spergulacea
Basella alba
Anredera cordifolia
Claytonia virginica
Halophytum ameghinoi
Alluaudia procera
Talinum paniculatum
Portulaca grandiflora
Opuntia microdasys
Pereskia aculeata
Alangium chinense
Cornus mas
Grubbia tomentosa
Curtisia dentata
Nyssa ogeche
Camptotheca acuminata
Hydrostachys multifida
Fendlera rupicola
Philadelphus lewisii
Hydrangea macrophylla
Eucnide bartonioides
Mentzelia lindleyi
Petalonyx nitidus
Superasteridae
Eudicotyledonae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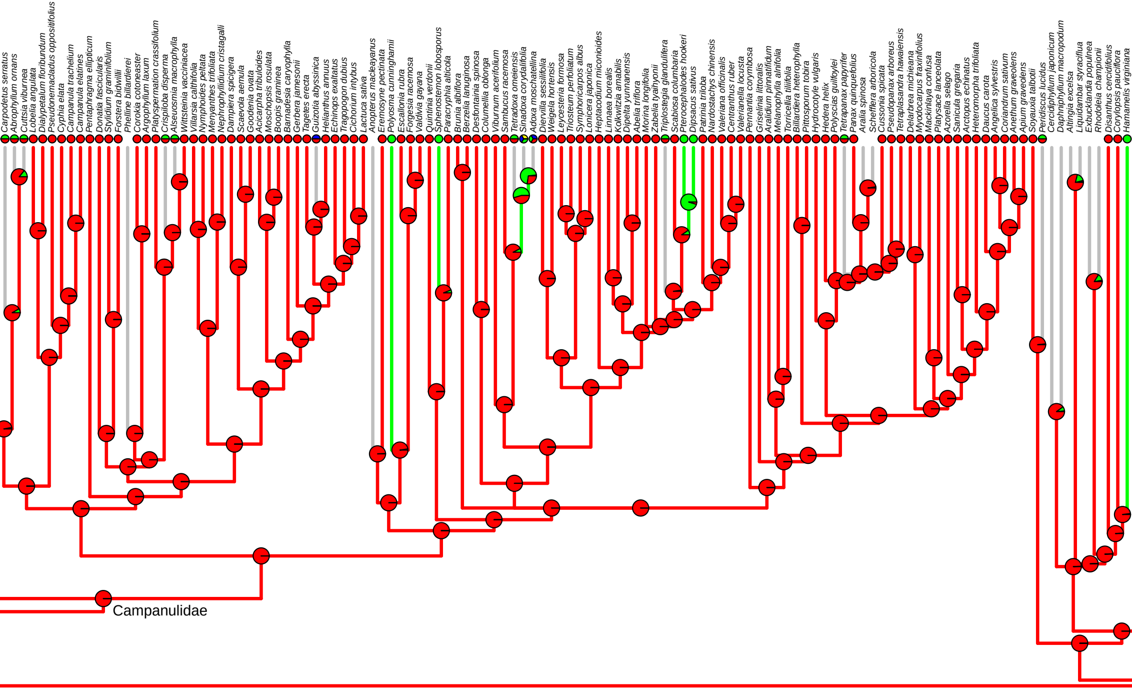
Marcgravia trinitatis
Tetramerista crassifolia
Lissocarpa benthamii
Diospyros lotus
Euclea crispa
Maesa tenera
Clavija eggersiana
Anagallis tenella
Primula sieboldii
Androsace spinulifera
Couroupita guianensis
Barringtonia asiatica
Fouquieria splendens
Cobaea scandens
Phlox longifolia
Gilia capitata
Polemonium reptans
Manilkara zapota
Camellia sinensis
Eurya japonica
Ternstroemia stahlii
Symplocos zizyphoides
Galax urceolata
Styrax officinalis
Halesia carolina
Sarracenia purpurea
Roridula gorgonias
Actinidia chinensis
Clethra alnifolia
Cyrilla racemiflora
Enkianthus campanulatus
Arbutus unedo
Rhododendron hippophaeoides
Vaccinium uliginosum
Oncotheca balansae
Icacina mannii
Eucommia ulmoides
Garrya elliptica
Aucuba japonica
Vahlia capensis
Montinia caryophyllacea
Hydrolea ovata
Sphenoclea zeylanica
Cuscuta cuspidata
Ipomoea alba
Petunia axillaris
Nicotiana tabacum
Nolana humifusa
Solanum dulcamara
Atropa belladonna
Borago officinalis
Ehretia acuminata
Hydrophyllum capitatum
Luculia gratissima
Coffea arabica
Galium aparine
Mitchella repens
Nerium oleander
Gentiana saponaria
Exacum affine
Gelsemium sempervirens
Spigelia marilandica
Strychnos nuxvomica
Plocosperma buxifolium
Olea europaea
Syringa vulgaris
Jasminum simplicifolium
Polypremum procumbens
Byblis liniflora
Titanotrichum oldhamii
Rhynchoglossum notonianum
Calceolaria integrifolia
Peltanthera floribunda
Antirrhinum majus
Veronica anagallisaquatica
Plantago lanceolata
Myoporum mauritianum
Scrophularia californica
Verbascum thapsus
Mazus pumilus
Lamium amplexicaule
Callicarpa dichotoma
Phryma leptostachya
Pedicularis foliosa
Paulownia tomentosa
Martynia annua
Junellia succulentifolia
Thomandersia laurifolia
Campsis radicans
Catalpa speciosa
Halleria lucida
Utricularia alpina
Pinguicula moranensis
Sesamum indicum
Thunbergia alata
Acanthus montanus
Barleria prionitis
Justicia americana
Ilex cornuta
Helwingia japonica
Phyllonoma laticuspis
Irvingbaileya australis
Gomphandra javanica
Citronella suaveolens
Gonocaryum litorale
Cardiopteris quinqueloba
Roussea simplex
Lamiidae
Asteridae
Pentapetalae


Carpodetus serratus
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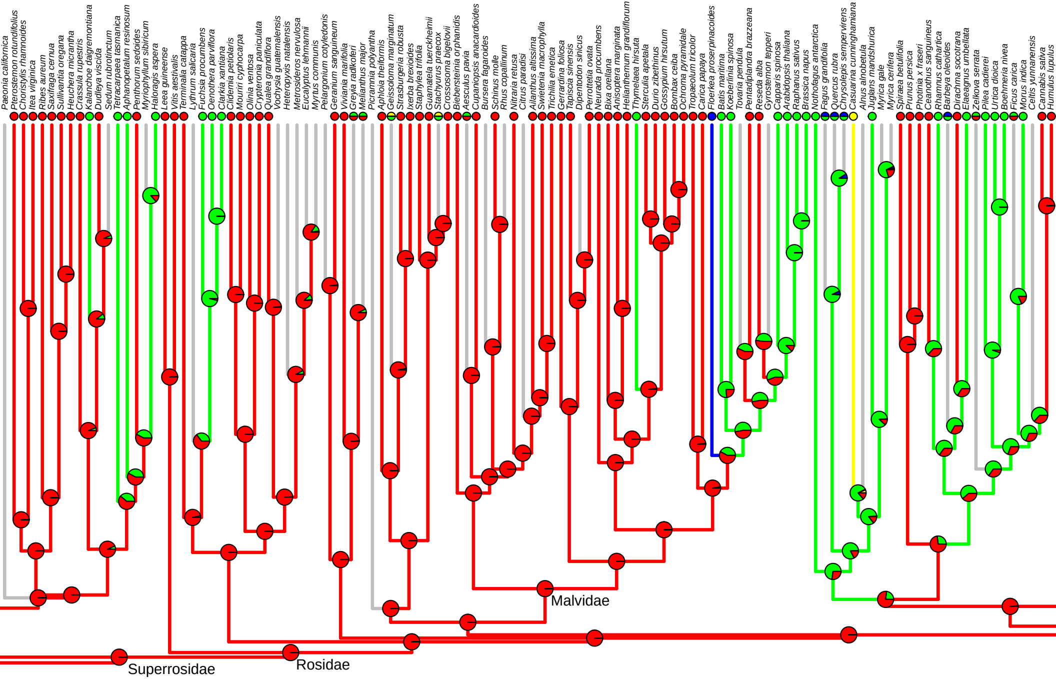
Cuttsia viburnea
Lobelia angulata
Dialypetalum floribundum
Pseudonemacladus oppositifolius
Cyphia elata
Campanula trachelium
Campanula elatines
Pentaphragma ellipticum
Donatia fascicularis
Stylidium graminifolium
Forstera bidwillii
Phelline billardierei
Corokia cotoneaster
Argophyllum laxum
Platyspermation crassifolium
Crispiloba disperma
Alseuosmia macrophylla
Wittsteinia vacciniacea
Villarsia calthifolia
Nymphoides peltata
Menyanthes trifoliata
Nephrophyllidium cristagalli
Dampiera spicigera
Scaevola aemula
Goodenia ovata
Acicarpha tribuloides
Moschopsis rosulata
Boopis graminea
Barnadesia caryophylla
Gerbera jamesonii
Tagetes erecta
Guizotia abyssinica
Helianthus annuus
Echinops exaltatus
Tragopogon dubius
Cichorium intybus
Lactuca sativa
Anopterus macleayanus
Eremosyne pectinata
Polyosma cunninghamii
Escallonia rubra
Forgesia racemosa
Valdivia gayana
Quintinia verdonii
Sphenostemon lobosporus
Paracryphia alticola
Brunia albiflora
Berzelia lanuginosa
Desfontainia spinosa
Columellia oblonga
Viburnum acerifolium
Sambucus racemosa
Tetradoxa omeiensis
Sinadoxa corydalifolia
Adoxa moschatellina
Diervilla sessilifolia
Weigela hortensis
Leycesteria formosa
Triosteum perfoliatum
Symphoricarpos albus
Lonicera japonica
Heptacodium miconioides
Linnaea borealis
Kolkwitzia amabilis
Dipelta yunnanensis
Abelia triflora
Morina longifolia
Zabelia tyaihyonii
Triplostegia glandulifera
Scabiosa columbaria
Pterocephalodes hookeri
Dipsacus sativus
Patrinia triloba
Nardostachys chinensis
Valeriana officinalis
Centranthus ruber
Valerianella locusta
Pennantia corymbosa
Griselinia littoralis
Aralidium pinnatifidum
Melanophylla alnifolia
Torricellia tiliifolia
Billardiera heterophylla
Pittosporum tobira
Hydrocotyle vulgaris
Hedera helix
Polyscias guilfoylei
Tetrapanax papyrifer
Panax quinquefolius
Aralia spinosa
Schefflera arboricola
Cussonia spicata
Pseudopanax arboreus
Tetraplasandra hawaiensis
Delarbrea michieana
Myodocarpus fraxinifolius
Mackinlaya confusa
Platysace lanceolata
Azorella selago
Sanicula gregaria
Arctopus echinatus
Heteromorpha trifoliata
Daucus carota
Angelica sylvestris
Coriandrum sativum
Anethum graveolens
Apium graveolens
Soyauxia talbotii
Peridiscus lucidus
Cercidiphyllum japonicum
Daphniphyllum macropodum
Altingia excelsa
Liquidambar styraciflua
Exbucklandia populnea
Rhodoleia championii
Disanthus cercidifolius
Corylopsis pauciflora
Hamamelis virginiana
Campanulidae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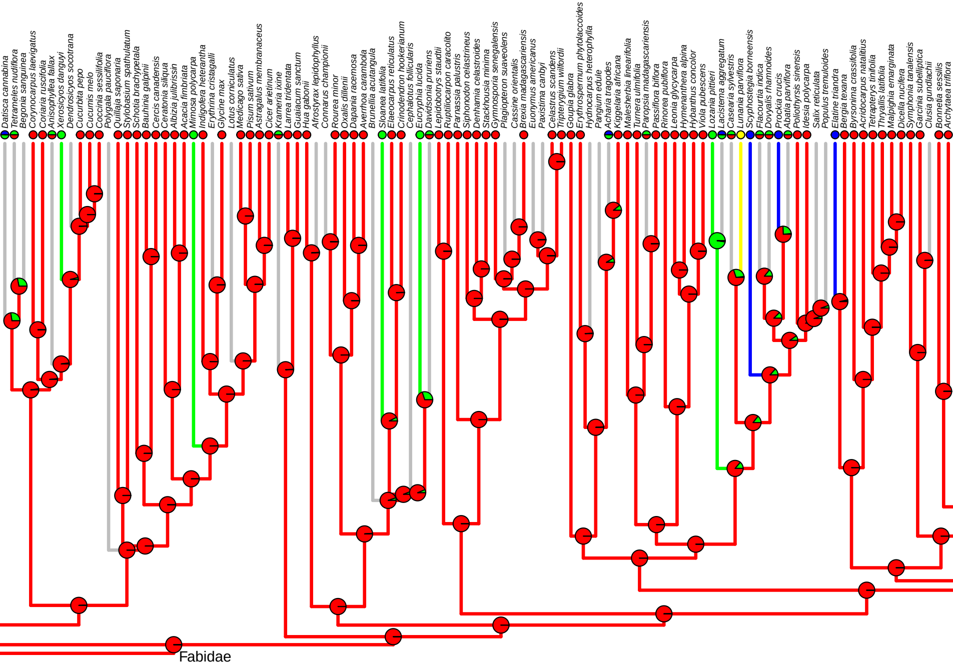
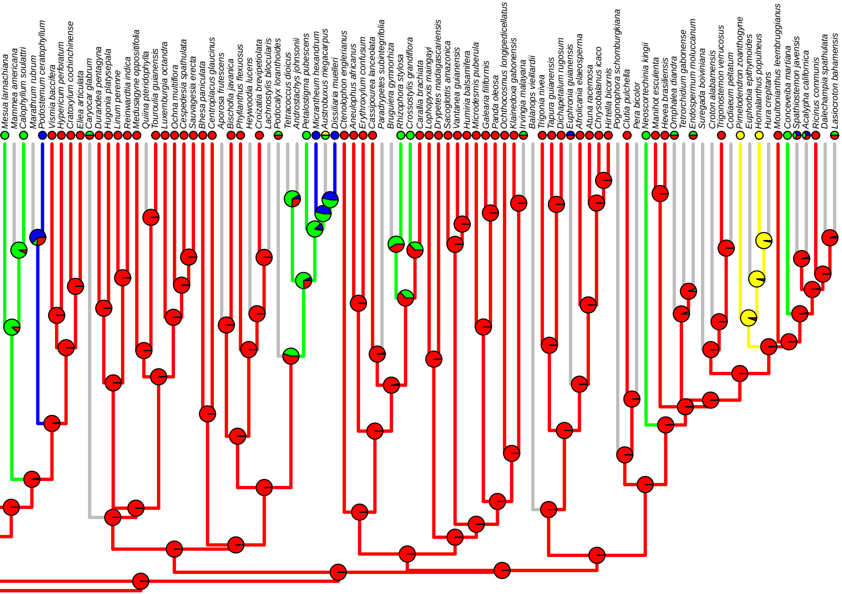
Pterostemon rotundifolius
Choristylis rhamnoides
Itea virginica
Ribes aureum
Saxifraga cernua
Sullivantia oregana
Heuchera micrantha
Crassula rupestris
Kalanchoe daigremontiana
Dudleya viscida
Sedum rubrotinctum
Tetracarpaea tasmanica
Aphanopetalum resinosum
Penthorum sedoides
Myriophyllum sibiricum
Haloragis aspera
Leea guineense
Vitis aestivalis
Terminalia catappa
Lythrum salicaria
Fuchsia procumbens
Oenothera parviflora
Clarkia xantiana
Clidemia petiolaris
Mouriri cyphocarpa
Olinia ventosa
Crypteronia paniculata
Qualea grandiflora
Vochysia guatemalensis
Heteropyxis natalensis
Metrosideros nervulosa
Eucalyptus lehmannii
Myrtus communis
Pelargonium cotyledonis
Geranium sanguineum
Viviania marifolia
Greyia radlkoferi
Melianthus major
Picramnia polyantha
Aphloia theiformis
Geissoloma marginatum
Strasburgeria robusta
Ixerba brexioides
Staphylea trifolia
Guamatela tuerckheimii
Stachyurus praecox
Crossosoma bigelovii
Biebersteinia orphanidis
Aesculus pavia
Cupaniopsis anacardioides
Bursera fagaroides
Schinus molle
Rhus copallinum
Nitraria retusa
Citrus paradisi
Ailanthus altissima
Swietenia macrophylla
Trichilia emetica
Gerrardina foliosa
Tapiscia sinensis
Dipentodon sinicus
Perrottetia ovata
Neurada procumbens
Bixa orellana
Anisoptera marginata
Helianthemum grandiflorum
Thymelaea hirsuta
Sterculia apetala
Durio zibethinus
Gossypium hirsutum
Bombax ceiba
Ochroma pyramidale
Tropaeolum tricolor
Carica papaya
Floerkea proserpinacoides
Batis maritima
Koeberlinia spinosa
Tovaria pendula
Pentadiplandra brazzeana
Reseda alba
Gyrostemon tepperi
Capparis spinosa
Arabidopsis thaliana
Raphanus sativus
Brassica napus
Nothofagus antarctica
Fagus grandifolia
Quercus rubra
Chrysolepis sempervirens
Casuarina cunninghamiana
Alnus alnobetula
Juglans mandshurica
Myrica gale
Myrica cerifera
Spiraea betulifolia
Prunus persica
Photinia x fraseri
Ceanothus sanguineus
Rhamnus cathartica
Barbeya oleoides
Dirachma socotrana
Elaeagnus umbellata
Zelkova serrata
Pilea cadierei
Urtica dioica
Boehmeria nivea
Ficus carica
Morus indica
Celtis yunnanensis
Cannabis sativa
Humulus lupulus
Malvidae
Superrosidae
Rosidae

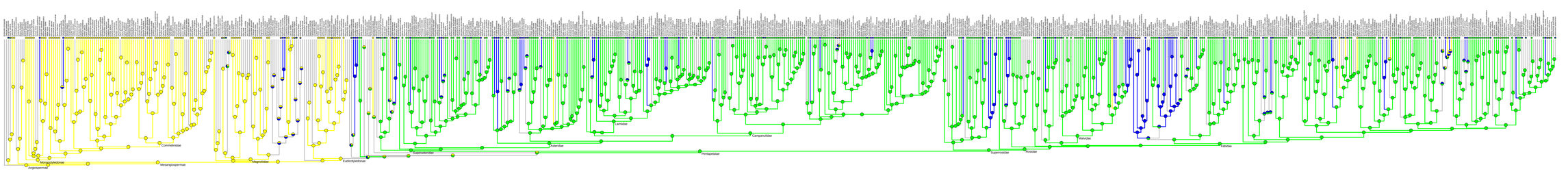

Datisca cannabina
Tetrameles nudiflora
Begonia sanguinea
Corynocarpus laevigatus
Coriaria ruscifolia
Anisophyllea fallax
Xerosicyos danguyi
Dendrosicyos socotrana
Cucurbita pepo
Cucumis melo
Coccinia sessilifolia
Polygala paucifolia
Quillaja saponaria
Stylobasium spathulatum
Schotia brachypetala
Bauhinia galpinii
Cercis canadensis
Ceratonia siliqua
Albizia julibrissin
Acacia fimbriata
Mimosa polycarpa
Indigofera heterantha
Erythrina cristagalli
Glycine max
Lotus corniculatus
Medicago sativa
Pisum sativum
Astragalus membranaceus
Cicer arietinum
Krameria ixine
Larrea tridentata
Guaiacum sanctum
Hua gabonii
Afrostyrax lepidophyllus
Connarus championii
Rourea minor
Oxalis dillenii
Dapania racemosa
Averrhoa carambola
Brunellia acutangula
Sloanea latifolia
Elaeocarpus reticulatus
Crinodendron hookerianum
Cephalotus follicularis
Eucryphia lucida
Davidsonia pruriens
Lepidobotrys staudtii
Ruptiliocarpon caracolito
Parnassia palustris
Siphonodon celastrineus
Denhamia celastroides
Stackhousia minima
Gymnosporia senegalensis
Plagiopteron suaveolens
Cassine orientalis
Brexia madagascariensis
Euonymus americanus
Paxistima canbyi
Celastrus scandens
Tripterygium wilfordii
Goupia glabra
Erythrospermum phytolaccoides
Hydnocarpus heterophylla
Pangium edule
Acharia tragodes
Kiggelaria africana
Malesherbia linearifolia
Turnera ulmifolia
Paropsia madagascariensis
Passiflora biflora
Rinorea pubiflora
Leonia glycycarpa
Hymenanthera alpina
Hybanthus concolor
Viola pubescens
Lozania pittieri
Lacistema aggregatum
Casearia sylvestris
Lunania parviflora
Scyphostegia borneensis
Flacourtia indica
Dovyalis rhamnoides
Prockia crucis
Abatia parviflora
Poliothyrsis sinensis
Idesia polycarpa
Salix reticulata
Populus tremuloides
Elatine triandra
Bergia texana
Byrsonima crassifolia
Acridocarpus natalitius
Tetrapterys tinifolia
Thryallis latifolia
Malpighia emarginata
Dicella nucifera
Symphonia tanalensis
Garcinia subelliptica
Clusia gundlachii
Bonnetia sessilis
Archytaea triflora
Fabidae


Mesua larnachiana
Mammea americana
Calophyllum soulattri
Marathrum rubrum
Podostemum ceratophyllum
Vismia baccifera
Hypericum perforatum
Cratoxylum cochinchinense
Eliea articulata
Caryocar glabrum
Durandea pentagyna
Hugonia platysepala
Linum perenne
Reinwardtia indica
Medusagyne oppositifolia
Quiina pteridophylla
Touroulia guianensis
Luxemburgia octandra
Ochna multiflora
Cespedesia spathulata
Sauvagesia erecta
Bhesa paniculata
Centroplacus glaucinus
Aporosa frutescens
Bischofia javanica
Phyllanthus flexuosus
Heywoodia lucens
Croizatia brevipetiolata
Lachnostylis bilocularis
Podocalyx loranthoides
Tetracoccus dioicus
Androstachys johnsonii
Petalostigma pubescens
Micrantheum hexandrum
Austrobuxus megacarpus
Dissiliaria muelleri
Ctenolophon englerianus
Aneulophus africanus
Erythroxylum confusum
Cassipourea lanceolata
Paradrypetes subintegrifolia
Bruguiera gymnorhiza
Rhizophora stylosa
Crossostylis grandiflora
Carallia brachiata
Lophopyxis maingayi
Drypetes madagascariensis
Sacoglottis amazonica
Vantanea guianensis
Humiria balsamifera
Microdesmis puberula
Galearia filiformis
Panda oleosa
Ochthocosmus longipedicellatus
Klainedoxa gabonensis
Irvingia malayana
Balanops vieillardii
Trigonia nivea
Tapura guianensis
Dichapetalum rugosum
Euphronia guianensis
Afrolicania elaeosperma
Atuna racemosa
Chrysobalanus icaco
Hirtella bicornis
Pogonophora schomburgkiana
Clutia pulchella
Pera bicolor
Neoscortechinia kingii
Manihot esculenta
Hevea brasiliensis
Omphalea diandra
Tetrorchidium gabonense
Endospermum moluccanum
Suregada boiviniana
Croton alabamensis
Trigonostemon verrucosus
Codiaeum peltatum
Pimelodendron zoanthogyne
Euphorbia epithymoides
Homalanthus populneus
Hura crepitans
Moultonianthus leembruggianus
Conceveiba martiana
Spathiostemon javensis
Acalypha californica
Ricinus communis
Dalechampia spathulata
Lasiocroton bahamensis

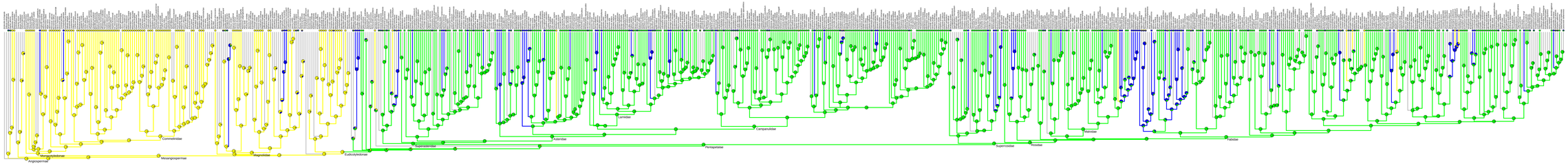
MP ancestral state reconstruction using ancestral pars
(R:phangorn)
232_B. Perianth merism (3–state) (D2c), 70 steps

trimerous
tetramerous
pentamerous

Node	MP state(s)
Angiospermae	trimerous
Mesangiospermae	trimerous
Magnoliidae	trimerous
Monocotyledonae	trimerous
Eudicotyledonae	trimerous
Commelinidae	trimerous
Ranunculidae	trimerous
Superasteridae	pentamerous
Asteridae	pentamerous
Lamiidae	pentamerous
Campanulidae	pentamerous
Superrosidae	pentamerous
Rosidae	pentamerous
Malvidae	pentamerous
Fabidae	pentamerous



ML ancestral state reconstruction using rayDISC (R:corHMM)
232_8. Perianth merism (3–state) (D2c), SYMeq model



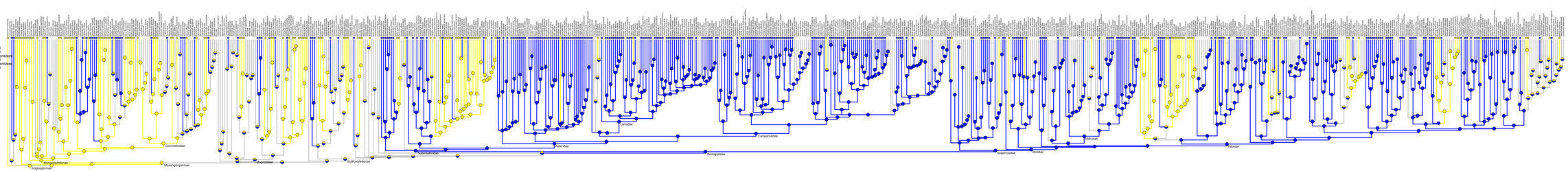
Node	ML state	Prob
Angiospermae	trimerous	1
Mesangiospermae	trimerous	1
Magnoliidae	trimerous	1
Monocotyledonae	trimerous	1
Eudicotyledonae	trimerous	0.9823
Commelinidae	trimerous	1
Pentapetalae	pentamerous	0.9998
Superasteridae	pentamerous	0.9999
Asteridae	pentamerous	1
Lamiidae	pentamerous	0.9999
Campanulidae	pentamerous	1
Superrosidae	pentamerous	1
Rosidae	pentamerous	1
Malvidae	pentamerous	1
Fabidae	pentamerous	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	---
ARD	−256.35	6	524.7	524.8	5.89	0.02	8e−04	---
ARDeq	−255.25	6	522.5	522.61	3.7	0.06	8e−04	---
ER	−281.81	1	565.62	565.63	46.72	0	0.0011	---
SYM	−257.53	3	521.07	521.1	2.19	0.12	0.0001	---
SYMeq*	−256.44	3	518.88	518.91	0	0.37	0.001	---
ORD	−256.92	4	521.85	521.9	2.99	0.08	0.0001	---
ORDeq	−255.85	4	519.69	519.75	0.84	0.24	0.001	---
ORDSYM	−260.14	2	524.28	524.29	5.38	0.03	0.0015	---
ORDSYMeq	−259.04	2	522.09	522.1	3.2	0.07	0.0015	---
ORDER	−262.6	1	527.21	527.21	8.3	0.01	0.0024	---

MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
234_A. Periantn differentiation (binary) (D2d), 65 steps

undifferentiated
differentiated

Node	MP state(s)
Angiospermae	undifferentiated
Mesangiospermae	undifferentiated
Magnoliidae	undifferentiated / differentiated
Monocotyledoneae	undifferentiated
Eudicotyledoneae	undifferentiated / differentiated
Commelinidae	undifferentiated
Ranunculidae	differentiated
Superasteridae	differentiated
Asteridae	differentiated
Lamiidae	differentiated
Campanulidae	differentiated
Superrosidae	differentiated
Rosidae	differentiated
Malvidae	differentiated
Fabidae	differentiated

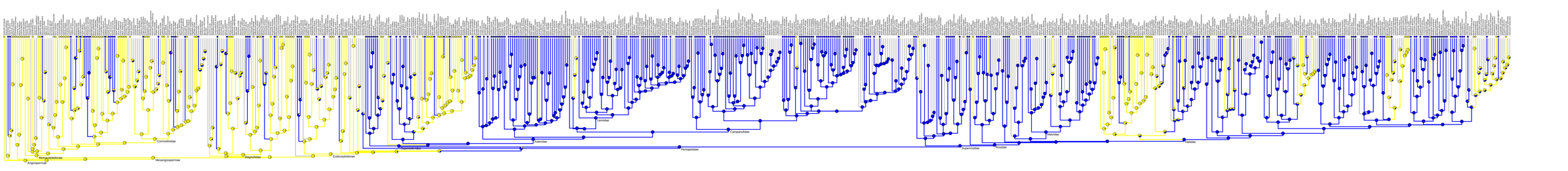


ML ancestral state reconstruction using rayDISC (R:corHMM)
234_A. Perianth differentiation (binary) (D2d), ARDeq model

undifferentiated
differentiated

Node	ML state	Prob
Angiospermae	undifferentiated	1
Mesangiospermae	undifferentiated	1
Magnoliidae	undifferentiated	0.9999
Monocotyledonae	undifferentiated	1
Eudicotyledonae	undifferentiated	0.9914
Commelinidae	undifferentiated	1
Ranunculidae	undifferentiated	0.9564
Superasteridae	differentiated	0.9578
Asteridae	differentiated	0.9986
Lamidae	differentiated	0.9998
Campanulidae	differentiated	1
Caryophyllidae	differentiated	0.9917
Rosidae	differentiated	0.9947
Malvidae	differentiated	0.9989
Fabidae	differentiated	0.987

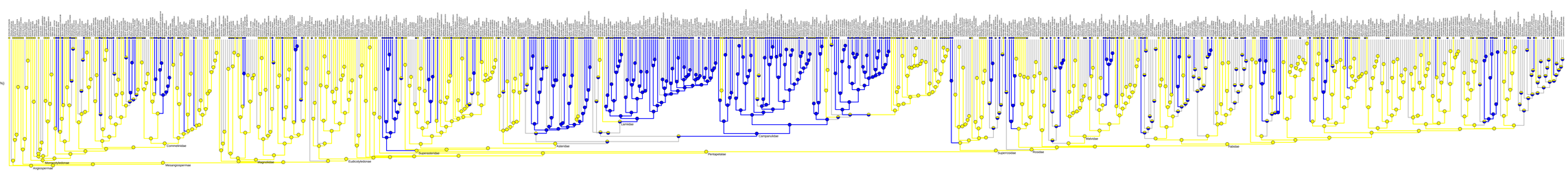
Model	LogL	Notr	AIC	AICc	DeltaAICc	w	q01	q10
ARD	−199.62	2	403.23	403.25	1.38	0.33	0.0046	0.0015
ARDeq**	−199.92	2	401.85	401.86	0	0.67	0.0046	0.0015
ER	−209.01	1	420.03	420.03	18.17	0	0.0025	0.0025
UN01	−228.56	1	459.09	459.1	57.23	0	0.0089	
UN10	−237.12	1	476.25	476.25	74.39	0		0.0035



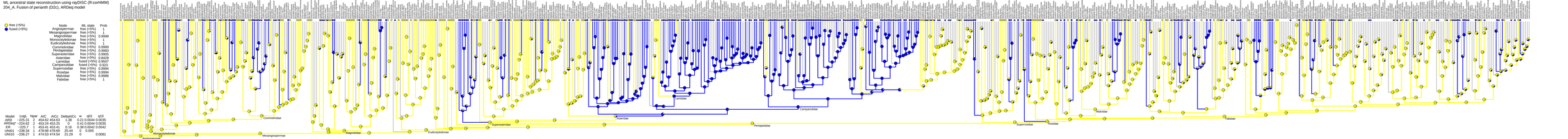
MP ancestral state reconstruction using ancestral pars
(R:phangorn)
204_A. Fusion of perianth (D2c), 77 steps

free (<5%)
fused (>5%)

Node	MP state(s)
Angiospermae	free (<5%)
Mesangiospermae	free (<5%)
Magnoliidae	free (<5%)
Monocotyledonae	free (<5%)
Eudicotyledonae	free (<5%)
Commelinidae	free (<5%)
Ceratophyllum	free (<5%)
Superasteridae	free (<5%)
Asteridae	free (<5%)
Lamiidae	free (<5%) / fused (>5%)
Campanulidae	fused (>5%)
Pentapetalae	free (<5%)
Rosidae	free (<5%)
Malvidae	free (<5%)
Fabidae	free (<5%)



ML ancestral state reconstruction using rayDISC (R:corHMM)
204_A. Fusion of perianth (D2c), ARDeq model



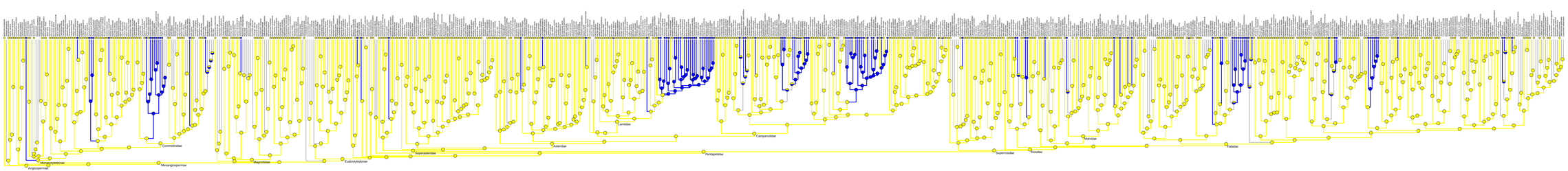
Node	ML state	Prob
Angiospermae	free (<5%)	1
Mesangiospermae	free (<5%)	1
Magnoliidae	free (<5%)	0.9999
Monocotyledonae	free (<5%)	1
Eudicotyledonae	free (<5%)	1
Commelinidae	free (<5%)	0.9999
Magnoliidae	free (<5%)	0.9903
Superasteridae	free (<5%)	0.9905
Asteridae	free (<5%)	0.8428
Lamiidae	fused (>5%)	0.9507
Campanulidae	fused (>5%)	0.923
Pentapetalae	free (<5%)	0.9999
Rosidae	free (<5%)	0.9994
Malvidae	free (<5%)	0.9986
Fabidae	free (<5%)	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	-225.31	2	454.62	454.63	1.38	0.21	0.0044	0.0035
ARDeq*	-224.62	2	453.24	453.25	0	0.41	0.0044	0.0035
ER	-225.7	1	453.41	453.41	0.16	0.38	0.0042	0.0042
UN01	-238.34	1	478.68	478.69	25.44	0	0.005	
UN10	-236.27	1	474.53	474.54	21.29	0		0.0081

MP ancestral state reconstruction using ancestral.pars (R:phangorn)
207_A. Symmetry of perianth (binary) (D2d), 55 steps

actinomorphic
zygomorphic

Node	MP state(s)
Angiospermae	actinomorphic
Mesangiospermae	actinomorphic
Magnoliidae	actinomorphic
Monocotyledonae	actinomorphic
Eudicotyledonae	actinomorphic
Commelinidae	actinomorphic
Ceratophyllum	actinomorphic
Superasteridae	actinomorphic
Asteridae	actinomorphic
Lamiidae	actinomorphic
Campanulidae	actinomorphic
Pentapetalae	actinomorphic
Rosidae	actinomorphic
Malvidae	actinomorphic
Fabidae	actinomorphic



ML ancestral state reconstruction using rayDISC (R:corHMM) 207_A. Symmetry of perianth (binary) (D2d), ARDeq model

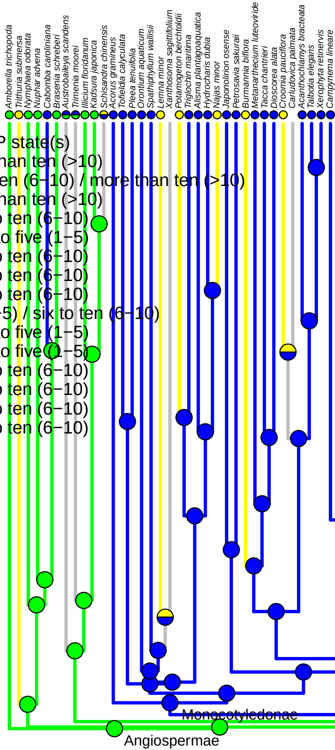
Node	ML state	Prob
Angiospermae	actinomorphic	1
Mesangiospermae	actinomorphic	1
Magnoliidae	actinomorphic	1
Monocotyledonae	actinomorphic	0.9998
Eudicotyledonae	actinomorphic	1
Commelinidae	actinomorphic	0.9967
Ranunculidae	actinomorphic	1
Superasteridae	actinomorphic	1
Asteridae	actinomorphic	1
Lamidae	actinomorphic	0.9955
Campanulidae	actinomorphic	1
Pentapetalae	actinomorphic	1
Rosidae	actinomorphic	1
Malvidae	actinomorphic	0.9997
Fabidae	actinomorphic	0.9999

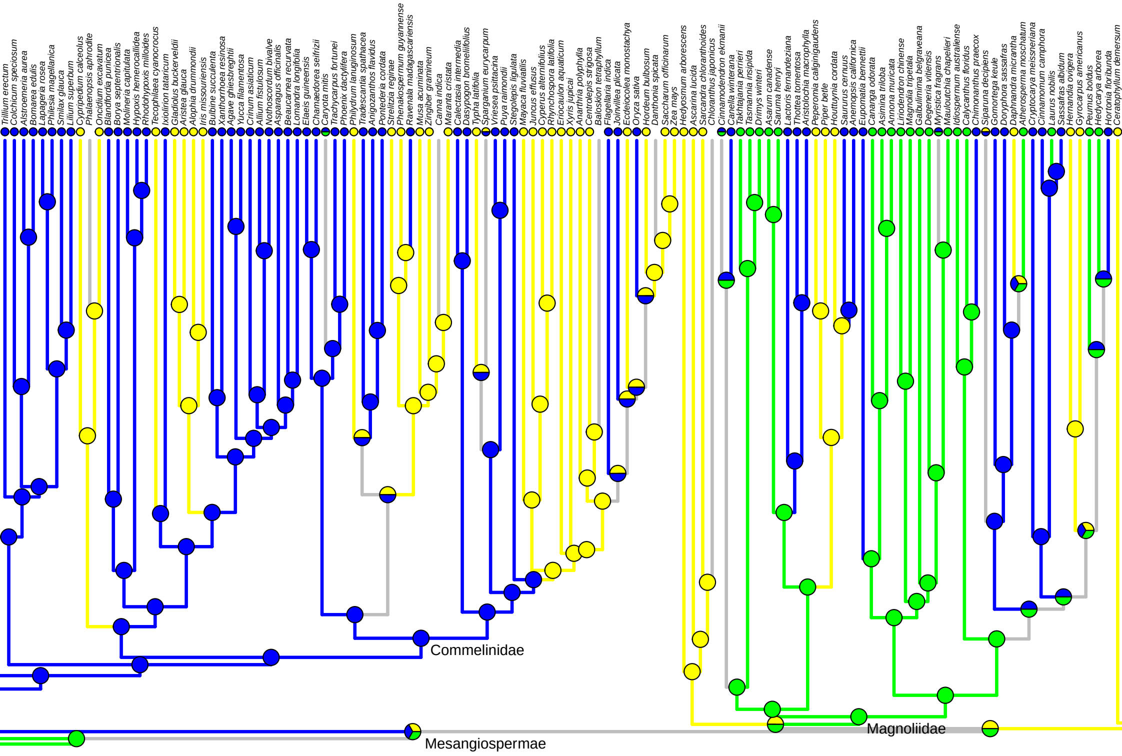
Model	LogL	Nopr	AIC	AICc	DeltaAICc	w	q01	q10
ARD	-210.43	2	424.86	424.88	1.38	0.33	0.0014	0.0059
ARDeq**	-209.74	2	423.48	423.5	0	0.66	0.0014	0.0059
ER	-218.72	1	439.44	439.45	15.95	0	0.0015	0.0015
UN01	-261.41	1	524.82	524.82	101.33	0	0.0018	
UN10	-217.44	1	436.87	436.88	13.38	0		0.0166

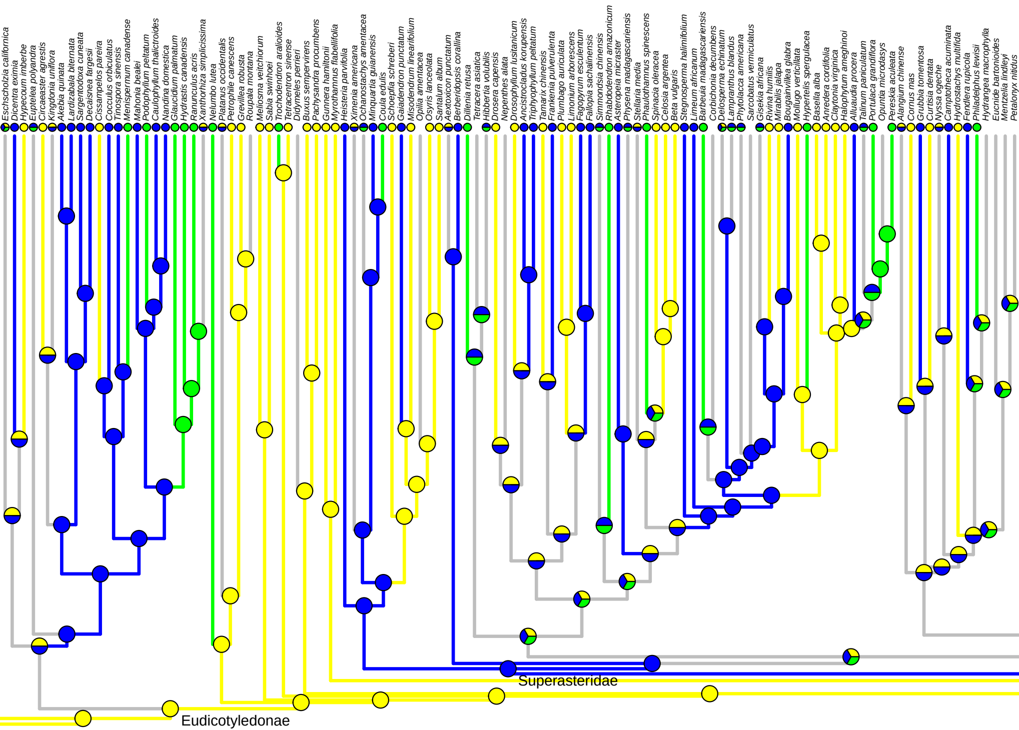
MP ancestral state reconstruction using ancestral.pars (R:phangorn)
301_B. Number of fertile stamens (3−state) (D2c), 157 steps

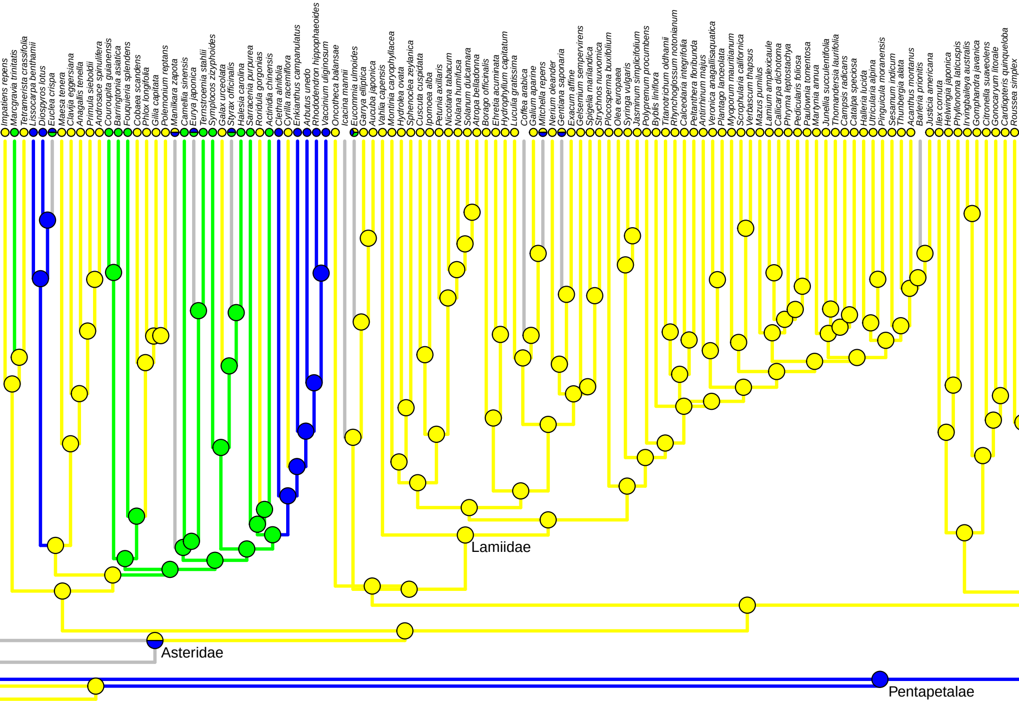
- 🟡 one to five (1−5)
- 🔵 six to ten (6−10)
- 🟢 more than ten (>10)

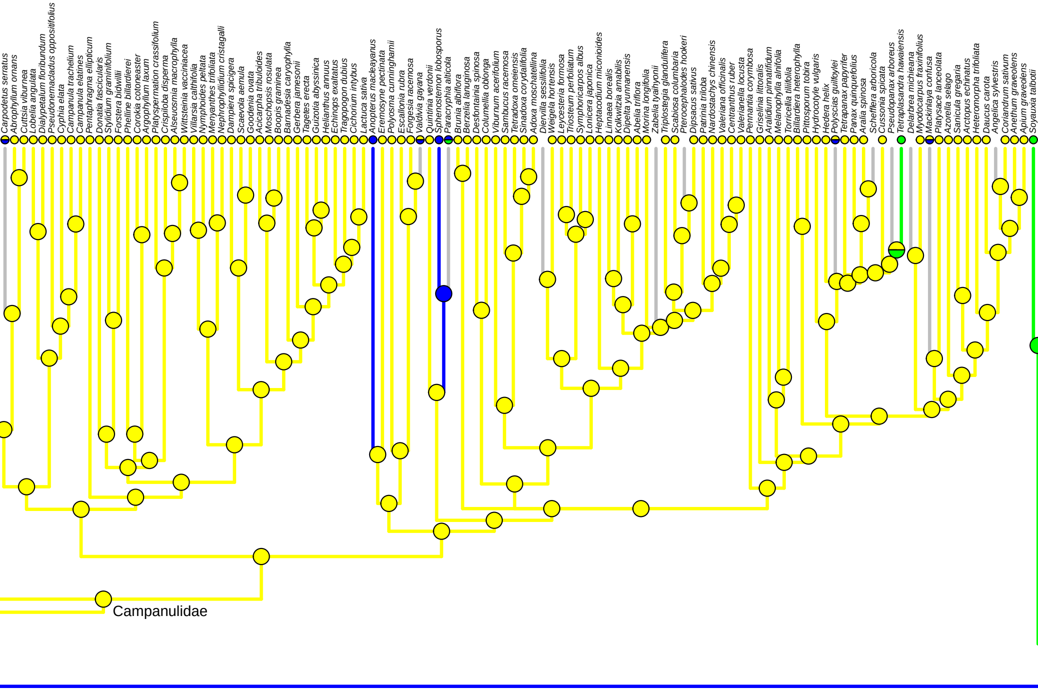
Node	MP state(s)
Angiospermae	more than ten (>10)
Mesangiospermae	one to five (1−5) / six to ten (6−10) / more than ten (>10)
Magnoliidae	more than ten (>10)
Monocotyledonae	six to ten (6−10)
Eudicotyledonae	one to five (1−5)
Commelinidae	six to ten (6−10)
Pentapetalae	six to ten (6−10)
Superasteridae	six to ten (6−10)
Asteridae	one to five (1−5) / six to ten (6−10)
Lamiidae	one to five (1−5)
Campanulidae	one to five (1−5)
Superrosidae	six to ten (6−10)
Rosidae	six to ten (6−10)
Malvidae	six to ten (6−10)
Fabidae	six to ten (6−10)


Amborella trichopoda
Trithuria submersa
Nymphaea odorata
Nuphar advena
Cabomba caroliniana
Brasenia schreberi
Austrobaileya scandens
Trimenia moorei
Illicium floridanum
Kadsura japonica
Schisandra chinensis
Acorus gramineus
Tofieldia calyculata
Pleea tenuifolia
Orontium aquaticum
Spathiphyllum wallisii
Lemna minor
Xanthosoma sagittifolium
Potamogeton berchtoldii
Triglochin maritima
Alisma plantagoaquatica
Hydrocharis dubia
Najas minor
Japonolirion osense
Petrosavia sakuraii
Burmannia biflora
Metanarthecium luteoviride
Tacca chantrieri
Dioscorea alata
Croomia pauciflora
Carludovica palmata
Acanthochlamys bracteata
Talbotia elegans
Xerophyta retinervis
Campynema lineare
Monocotyledonae
Angiospermae


Trillium erectum
Colchicum speciosum
Alstroemeria aurea
Bomarea edulis
Lapageria rosea
Philesia magellanica
Smilax glauca
Lilium superbum
Cypripedium calceolus
Phalaenopsis aphrodite
Oncidium excavatum
Blandfordia punicea
Borya septentrionalis
Molineria capitulata
Hypoxis hemerocallidea
Rhodohypoxis milloides
Tecophilaea cyanocrocus
Ixiolirion tataricum
Gladiolus buckerveldii
Aristea glauca
Alophia drummondii
Iris missouriensis
Bulbine succulenta
Xanthorrhoea resinosa
Agave ghiesbreghtii
Yucca filamentosa
Crinum asiaticum
Allium fistulosum
Nothoscordum bivalve
Asparagus officinalis
Beaucarnea recurvata
Lomandra longifolia
Elaeis guineensis
Chamaedorea seifrizii
Caryota mitis
Trachycarpus fortunei
Phoenix dactylifera
Philydrum lanuginosum
Tradescantia spathacea
Anigozanthos flavidus
Pontederia cordata
Strelitzia reginae
Phenakospermum guyannense
Ravenala madagascariensis
Musa acuminata
Zingiber gramineum
Canna indica
Maranta cristata
Calectasia intermedia
Dasypogon bromeliifolius
Typha latifolia
Sparganium eurycarpum
Vriesea psittacina
Puya raimondii
Stegolepis ligulata
Mayaca fluviatilis
Juncus effusus
Cyperus alternifolius
Rhynchospora latifolia
Eriocaulon aquaticum
Xyris jupicai
Anarthria polyphylla
Centrolepis strigosa
Baloskion tetraphyllum
Flagellaria indica
Joinvillea plicata
Ecdeiocolea monostachya
Oryza sativa
Hordeum bulbosum
Danthonia spicata
Saccharum officinarum
Zea mays
Hedyosmum arborescens
Ascarina lucida
Sarcandra chloranthoides
Chloranthus japonicus
Cinnamodendron ekmanii
Canella winterana
Takhtajania perrieri
Tasmannia insipida
Drimys winteri
Asarum canadense
Saruma henryi
Lactoris fernandeziana
Thottea tomentosa
Aristolochia macrophylla
Peperomia caliginigaudens
Piper betle
Houttuynia cordata
Saururus cernuus
Anemopsis californica
Eupomatia bennettii
Cananga odorata
Asimina triloba
Annona muricata
Liriodendron chinense
Magnolia tripetala
Galbulimima belgraveana
Degeneria vitiensis
Myristica fragrans
Mauloutchia chapelieri
Idiospermum australiense
Calycanthus floridus
Chimonanthus praecox
Siparuna decipiens
Gomortega keule
Doryphora sassafras
Daphnandra micrantha
Atherosperma moschatum
Cryptocarya meissneriana
Cinnamomum camphora
Laurus nobilis
Sassafras albidum
Hernandia ovigera
Gyrocarpus americanus
Peumus boldus
Hedycarya arborea
Hortonia floribunda
Ceratophyllum demersum
Commelinidae
Mesangiospermae
Magnoliidae


Eschscholzia californica
Dicentra eximia
Hypecoum imberbe
Euptelea polyandra
Circaeaster agrestis
Kingdonia uniflora
Akebia quinata
Lardizabala biternata
Sargentodoxa cuneata
Decaisnea fargesii
Cissampelos pareira
Cocculus orbiculatus
Tinospora sinensis
Menispermum canadense
Mahonia bealei
Podophyllum peltatum
Caulophyllum thalictroides
Nandina domestica
Glaucidium palmatum
Hydrastis canadensis
Ranunculus acris
Xanthorhiza simplicissima
Nelumbo lutea
Platanus occidentalis
Petrophile canescens
Grevillea robusta
Roupala montana
Meliosma veitchiorum
Sabia swinhoei
Trochodendron aralioides
Tetracentron sinense
Didymeles perrieri
Buxus sempervirens
Pachysandra procumbens
Gunnera hamiltonii
Myrothamnus flabellifolia
Heisteria parvifolia
Ximenia americana
Ochanostachys amentacea
Minquartia guianensis
Coula edulis
Schoepfia schreberi
Gaiadendron punctatum
Misodendrum linearifolium
Opilia amentacea
Osyris lanceolata
Santalum album
Aextoxicon punctatum
Berberidopsis corallina
Dillenia retusa
Tetracera asiatica
Hibbertia volubilis
Drosera capensis
Nepenthes alata
Drosophyllum lusitanicum
Ancistrocladus korupensis
Triphyophyllum peltatum
Tamarix chinensis
Frankenia pulverulenta
Plumbago auriculata
Limonium arborescens
Fagopyrum esculentum
Fallopia sachalinensis
Simmondsia chinensis
Rhabdodendron amazonicum
Asteropeia micraster
Physena madagascariensis
Stellaria media
Phaulothamnus spinescens
Spinacia oleracea
Celosia argentea
Beta vulgaris
Stegnosperma halimifolium
Limeum africanum
Barbeuia madagascariensis
Corbichonia decumbens
Delosperma echinatum
Lampranthus blandus
Phytolacca americana
Sarcobatus vermiculatus
Gisekia africana
Rivina humilis
Mirabilis jalapa
Bougainvillea glabra
Mollugo verticillata
Hypertelis spergulacea
Basella alba
Anredera cordifolia
Claytonia virginica
Halophytum ameghinoi
Alluaudia procera
Talinum paniculatum
Portulaca grandiflora
Opuntia microdasys
Pereskia aculeata
Alangium chinense
Cornus mas
Grubbia tomentosa
Curtisia dentata
Nyssa ogeche
Camptotheca acuminata
Hydrostachys multifida
Fendlera rupicola
Philadelphus lewisii
Hydrangea macrophylla
Eucnide bartonioides
Mentzelia lindleyi
Petalonyx nitidus
Superasteridae
Eudicotyledonae


Impatiens repens
Marcgravia trinitatis
Tetramerista crassifolia
Lissocarpa benthamii
Diospyros lotus
Euclea crispa
Maesa tenera
Clavija eggersiana
Anagallis tenella
Primula sieboldii
Androsace spinulifera
Couroupita guianensis
Barringtonia asiatica
Fouquieria splendens
Cobaea scandens
Phlox longifolia
Gilia capitata
Polemonium reptans
Manilkara zapota
Camellia sinensis
Eurya japonica
Ternstroemia stahlii
Symplocos zizyphoides
Galax urceolata
Styrax officinalis
Halesia carolina
Sarracenia purpurea
Roridula gorgonias
Actinidia chinensis
Clethra alnifolia
Cyrilla racemiflora
Enkianthus campanulatus
Arbutus unedo
Rhododendron hippophaeoides
Vaccinium uliginosum
Oncotheca balansae
Icacina mannii
Eucommia ulmoides
Garrya elliptica
Aucuba japonica
Vahlia capensis
Montinia caryophyllacea
Hydrolea ovata
Sphenoclea zeylanica
Cuscuta cuspidata
Ipomoea alba
Petunia axillaris
Nicotiana tabacum
Nolana humifusa
Solanum dulcamara
Atropa belladonna
Borago officinalis
Ehretia acuminata
Hydrophyllum capitatum
Luculia gratissima
Coffea arabica
Galium aparine
Mitchella repens
Nerium oleander
Gentiana saponaria
Exacum affine
Gelsemium sempervirens
Spigelia marilandica
Strychnos nuxvomica
Plocosperma buxifolium
Olea europaea
Syringa vulgaris
Jasminum simplicifolium
Polypremum procumbens
Byblis liniflora
Titanotrichum oldhamii
Rhynchoglossum notonianum
Calceolaria integrifolia
Peltanthera floribunda
Antirrhinum majus
Veronica anagallisaquatica
Plantago lanceolata
Myoporum mauritianum
Scrophularia californica
Verbascum thapsus
Mazus pumilus
Lamium amplexicaule
Callicarpa dichotoma
Phryma leptostachya
Pedicularis foliosa
Paulownia tomentosa
Martynia annua
Junellia succulentifolia
Thomandersia laurifolia
Campsis radicans
Catalpa speciosa
Halleria lucida
Utricularia alpina
Pinguicula moranensis
Sesamum indicum
Thunbergia alata
Acanthus montanus
Barleria prionitis
Justicia americana
Ilex cornuta
Helwingia japonica
Phyllonoma laticuspis
Irvingbaileya australis
Gomphandra javanica
Citronella suaveolens
Gonocaryum litorale
Cardiopteris quinqueloba
Roussea simplex
Lamiidae
Asteridae
Pentapetalae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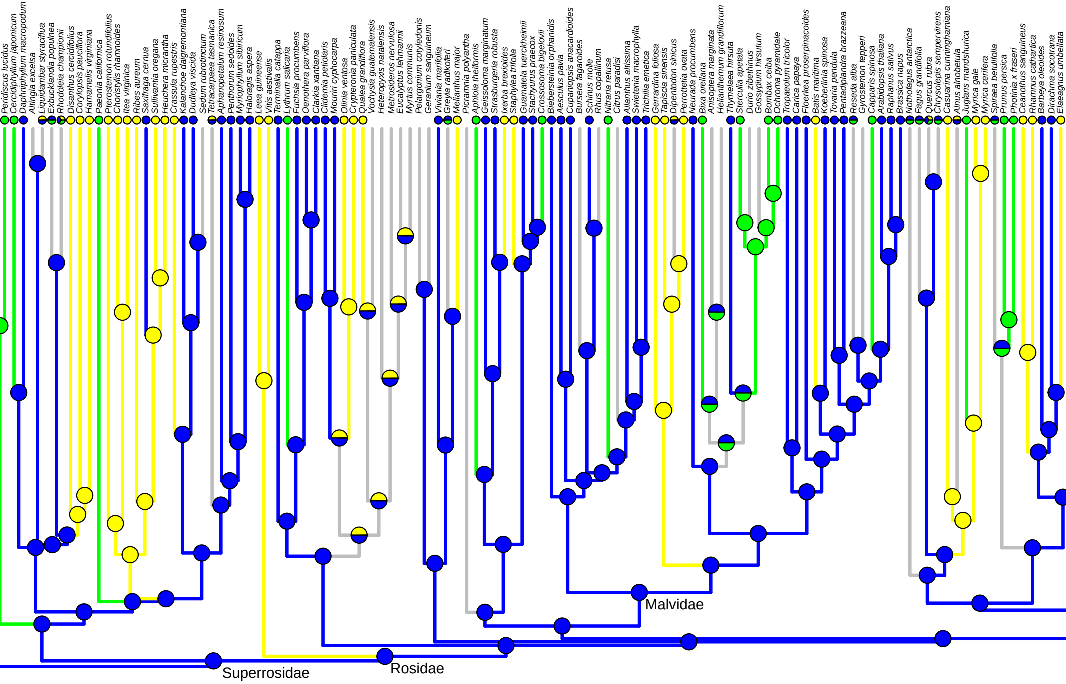
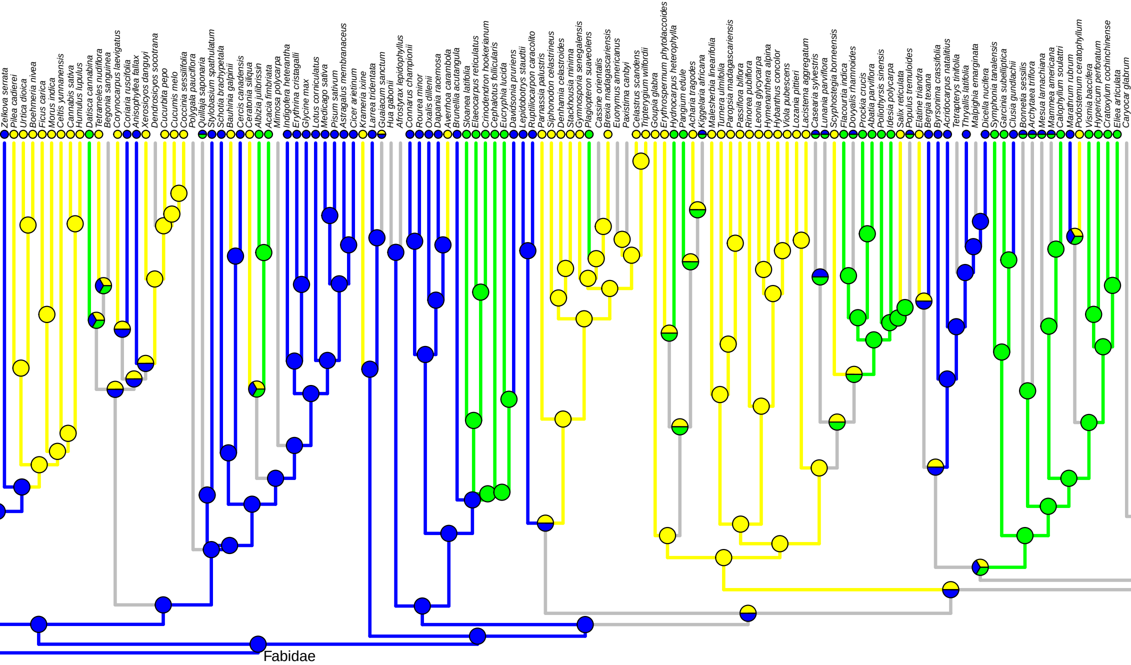
Abrophyllum ornans
Cuttsia viburnea
Lobelia angulata
Dialypetalum floribundum
Pseudonemacladus oppositifolius
Cyphia elata
Campanula trachelium
Campanula elatines
Pentaphragma ellipticum
Donatia fascicularis
Stylidium graminifolium
Forstera bidwillii
Phelline billardierei
Corokia cotoneaster
Argophyllum laxum
Platyspermation crassifolium
Crispiloba disperma
Alseuosmia macrophylla
Wittsteinia vacciniacea
Villarsia calthifolia
Nymphoides peltata
Menyanthes trifoliata
Nephrophyllidium cristagalli
Dampiera spicigera
Scaevola aemula
Goodenia ovata
Acicarpha tribuloides
Moschopsis rosulata
Boopis graminea
Barnadesia caryophylla
Gerbera jamesonii
Tagetes erecta
Guizotia abyssinica
Helianthus annuus
Echinops exaltatus
Tragopogon dubius
Cichorium intybus
Lactuca sativa
Anopterus macleayanus
Eremosyne pectinata
Polyosma cunninghamii
Escallonia rubra
Forgesia racemosa
Valdivia gayana
Quintinia verdonii
Sphenostemon lobosporus
Paracryphia alticola
Brunia albiflora
Berzelia lanuginosa
Desfontainia spinosa
Columellia oblonga
Viburnum acerifolium
Sambucus racemosa
Tetradoxa omeiensis
Sinadoxa corydalifolia
Adoxa moschatellina
Diervilla sessilifolia
Weigela hortensis
Leycesteria formosa
Triosteum perfoliatum
Symphoricarpos albus
Lonicera japonica
Heptacodium miconioides
Linnaea borealis
Kolkwitzia amabilis
Dipelta yunnanensis
Abelia triflora
Morina longifolia
Zabelia tyaihyonii
Triplostegia glandulifera
Scabiosa columbaria
Pterocephalodes hookeri
Dipsacus sativus
Patrinia triloba
Nardostachys chinensis
Valeriana officinalis
Centranthus ruber
Valerianella locusta
Pennantia corymbosa
Griselinia littoralis
Aralidium pinnatifidum
Melanophylla alnifolia
Torricellia tiliifolia
Billardiera heterophylla
Pittosporum tobira
Hydrocotyle vulgaris
Hedera helix
Polyscias guilfoylei
Tetrapanax papyrifer
Panax quinquefolius
Aralia spinosa
Schefflera arboricola
Cussonia spicata
Pseudopanax arboreus
Tetraplasandra hawaiensis
Delarbrea michieana
Myodocarpus fraxinifolius
Mackinlaya confusa
Platysace lanceolata
Azorella selago
Sanicula gregaria
Arctopus echinatus
Heteromorpha trifoliata
Daucus carota
Angelica sylvestris
Coriandrum sativum
Anethum graveolens
Apium graveolens
Soyauxia talbotii
Campanulidae


Peridiscus lucidus
Cercidiphyllum japonicum
Daphniphyllum macropodum
Altingia excelsa
Liquidambar styraciflua
Exbucklandia populnea
Rhodoleia championii
Disanthus cercidifolius
Corylopsis pauciflora
Hamamelis virginiana
Paeonia californica
Pterostemon rotundifolius
Choristylis rhamnoides
Itea virginica
Ribes aureum
Saxifraga cernua
Sullivantia oregana
Heuchera micrantha
Crassula rupestris
Kalanchoe daigremontiana
Dudleya viscida
Sedum rubrotinctum
Tetracarpaea tasmanica
Aphanopetalum resinosum
Penthorum sedoides
Myriophyllum sibiricum
Haloragis aspera
Leea guineense
Vitis aestivalis
Terminalia catappa
Lythrum salicaria
Fuchsia procumbens
Oenothera parviflora
Clarkia xantiana
Clidemia petiolaris
Mouriri cyphocarpa
Olinia ventosa
Crypteronia paniculata
Qualea grandiflora
Vochysia guatemalensis
Heteropyxis natalensis
Metrosideros nervulosa
Eucalyptus lehmannii
Myrtus communis
Pelargonium cotyledonis
Geranium sanguineum
Viviania marifolia
Greyia radlkoferi
Melianthus major
Picramnia polyantha
Aphloia theiformis
Geissoloma marginatum
Strasburgeria robusta
Ixerba brexioides
Staphylea trifolia
Guamatela tuerckheimii
Stachyurus praecox
Crossosoma bigelovii
Biebersteinia orphanidis
Aesculus pavia
Cupaniopsis anacardioides
Bursera fagaroides
Schinus molle
Rhus copallinum
Nitraria retusa
Citrus paradisi
Ailanthus altissima
Swietenia macrophylla
Trichilia emetica
Gerrardina foliosa
Tapiscia sinensis
Dipentodon sinicus
Perrottetia ovata
Neurada procumbens
Bixa orellana
Anisoptera marginata
Helianthemum grandiflorum
Thymelaea hirsuta
Sterculia apetala
Durio zibethinus
Gossypium hirsutum
Bombax ceiba
Ochroma pyramidale
Tropaeolum tricolor
Carica papaya
Floerkea proserpinacoides
Batis maritima
Koeberlinia spinosa
Tovaria pendula
Pentadiplandra brazzeana
Reseda alba
Gyrostemon tepperi
Capparis spinosa
Arabidopsis thaliana
Raphanus sativus
Brassica napus
Nothofagus antarctica
Fagus grandifolia
Quercus rubra
Chrysolepis sempervirens
Casuarina cunninghamiana
Alnus alnobetula
Juglans mandshurica
Myrica gale
Myrica cerifera
Spiraea betulifolia
Prunus persica
Photinia x fraseri
Ceanothus sanguineus
Rhamnus cathartica
Barbeya oleoides
Dirachma socotrana
Elaeagnus umbellata
Malvidae
Superrosidae
Rosidae


Zelkova serrata
Pilea cadierei
Urtica dioica
Boehmeria nivea
Ficus carica
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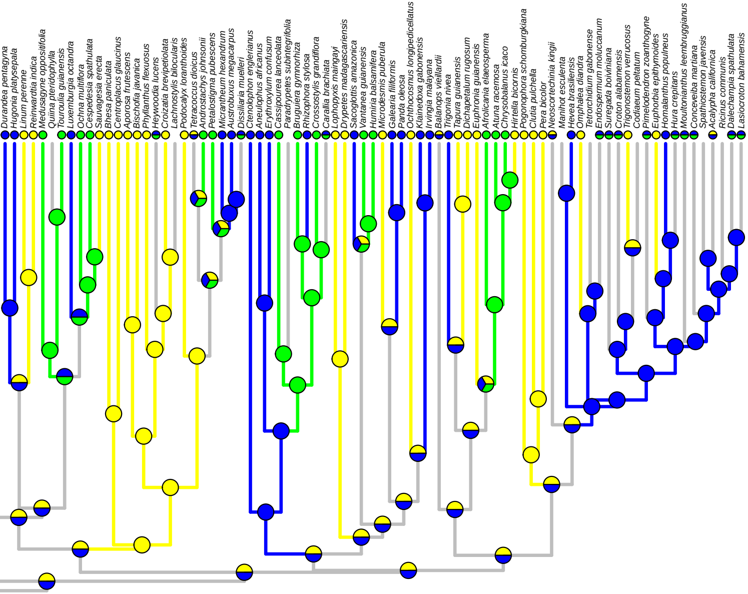
Celtis yunnanensis
Cannabis sativa
Humulus lupulus
Datisca cannabina
Tetrameles nudiflora
Begonia sanguinea
Corynocarpus laevigatus
Coriaria ruscifolia
Anisophyllea fallax
Xerosicyos danguyi
Dendrosicyos socotrana
Cucurbita pepo
Cucumis melo
Coccinia sessilifolia
Polygala pauciflora
Quillaja saponaria
Stylobasium spathulatum
Schotia brachypetala
Bauhinia galpinii
Cercis canadensis
Ceratonia siliqua
Albizia julibrissin
Acacia fimbriata
Mimosa polycarpa
Indigofera heterantha
Erythrina cristagalli
Glycine max
Lotus corniculatus
Medicago sativa
Pisum sativum
Astragalus membranaceus
Cicer arietinum
Krameria ixine
Larrea tridentata
Guaiacum sanctum
Hua gabonii
Afrostyrax lepidophyllus
Connarus championii
Rourea minor
Oxalis dillenii
Dapania racemosa
Averrhoa carambola
Brunellia acutangula
Sloanea latifolia
Elaeocarpus reticulatus
Crinodendron hookerianum
Cephalotus follicularis
Eucryphia lucida
Davidsonia pruriens
Lepidobotrys staudtii
Ruptiliocarpon caracolito
Parnassia palustris
Siphonodon celastrineus
Denhamia celastroides
Stackhousia minima
Gymnosporia senegalensis
Plagiopteron suaveolens
Cassine orientalis
Brexia madagascariensis
Euonymus americanus
Paxistima canbyi
Celastrus scandens
Tripterygium wilfordii
Goupia glabra
Erythrospermum phytolaccoides
Hydnocarpus heterophylla
Pangium edule
Acharia tragodes
Kiggelaria africana
Malesherbia linearifolia
Turnera ulmifolia
Paropsia madagascariensis
Passiflora biflora
Rinorea pubiflora
Leonia glycycarpa
Hymenanthera alpina
Hybanthus concolor
Viola pubescens
Lozania pittieri
Lacistema aggregatum
Casearia sylvestris
Lunania parviflora
Scyphostegia borneensis
Flacourtia indica
Dovyalis rhamnoides
Prockia crucis
Abatia parviflora
Poliothyrsis sinensis
Idesia polycarpa
Salix reticulata
Populus tremuloides
Elatine triandra
Bergia texana
Byrsonima crassifolia
Acridocarpus natalitius
Tetrapterys tinifolia
Thryallis latifolia
Malpighia emarginata
Dicella nucifera
Symphonia tanalensis
Garcinia subelliptica
Clusia gundlachii
Bonnetia sessilis
Archytaea triflora
Mesua larnachiana
Mammea americana
Calophyllum soulattri
Marathrum rubrum
Podostemum ceratophyllum
Vismia baccifera
Hypericum perforatum
Cratoxylum cochinchinense
Eliea articulata
Caryocar glabrum
Fabidae

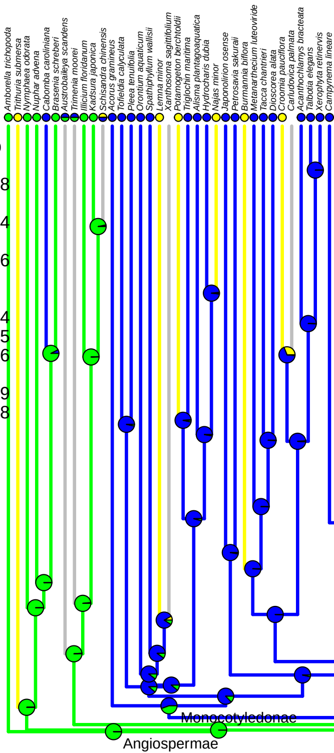

Durandea pentagyna
Hugonia platysepala
Linum perenne
Reinwardtia indica
Medusagyne oppositifolia
Quiina pteridophylla
Touroulia guianensis
Luxemburgia octandra
Ochna multiflora
Cespedesia spathulata
Sauvagesia erecta
Bhesa paniculata
Centroplacus glaucinus
Aporosa frutescens
Bischofia javanica
Phyllanthus flexuosus
Heywoodia lucens
Croizatia brevipetiolata
Lachnostylis bilocularis
Podocalyx loranthoides
Tetracoccus dioicus
Androstachys johnsonii
Petalostigma pubescens
Micrantheum hexandrum
Austrobuxus megacarpus
Dissiliaria muelleri
Ctenolophon englerianus
Aneulophus africanus
Erythroxylum confusum
Cassipourea lanceolata
Paradrypetes subintegrifolia
Bruguiera gymnorhiza
Rhizophora stylosa
Crossostylis grandiflora
Carallia brachiata
Lophopyxis maingayi
Drypetes madagascariensis
Sacoglottis amazonica
Vantanea guianensis
Humiria balsamifera
Microdesmis puberula
Galearia filiformis
Panda oleosa
Ochthocosmus longipedicellatus
Klainedoxa gabonensis
Irvingia malayana
Balanops vieillardii
Trigonia nivea
Tapura guianensis
Dichapetalum rugosum
Euphronia guianensis
Afrolicania elaeosperma
Atuna racemosa
Chrysobalanus icaco
Hirtella bicornis
Pogonophora schomburgkiana
Clutia pulchella
Pera bicolor
Neoscortechinia kingii
Manihot esculenta
Hevea brasiliensis
Omphalea diandra
Tetrorchidium gabonense
Endospermum moluccanum
Suregada boiviniana
Croton alabamensis
Trigonostemon verrucosus
Codiaeum peltatum
Pimelodendron zoanthogyne
Euphorbia epithymoides
Homalanthus populneus
Hura crepitans
Moultonianthus leembruggianus
Conceveiba martiana
Spathiostemon javensis
Acalypha californica
Ricinus communis
Dalechampia spathulata
Lasiocroton bahamensis

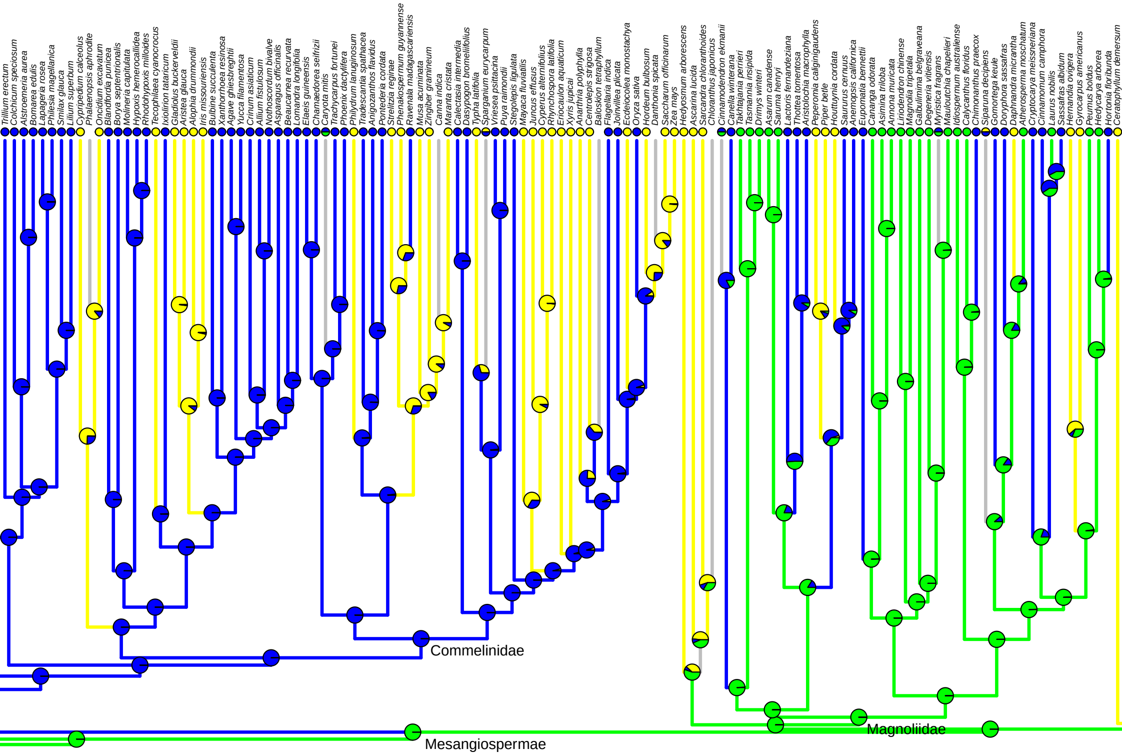
ML ancestral state reconstruction using rayDISC (R:corHMM)
301_B. Number of fertile stamens (3−state) (D2c), ARDeq model

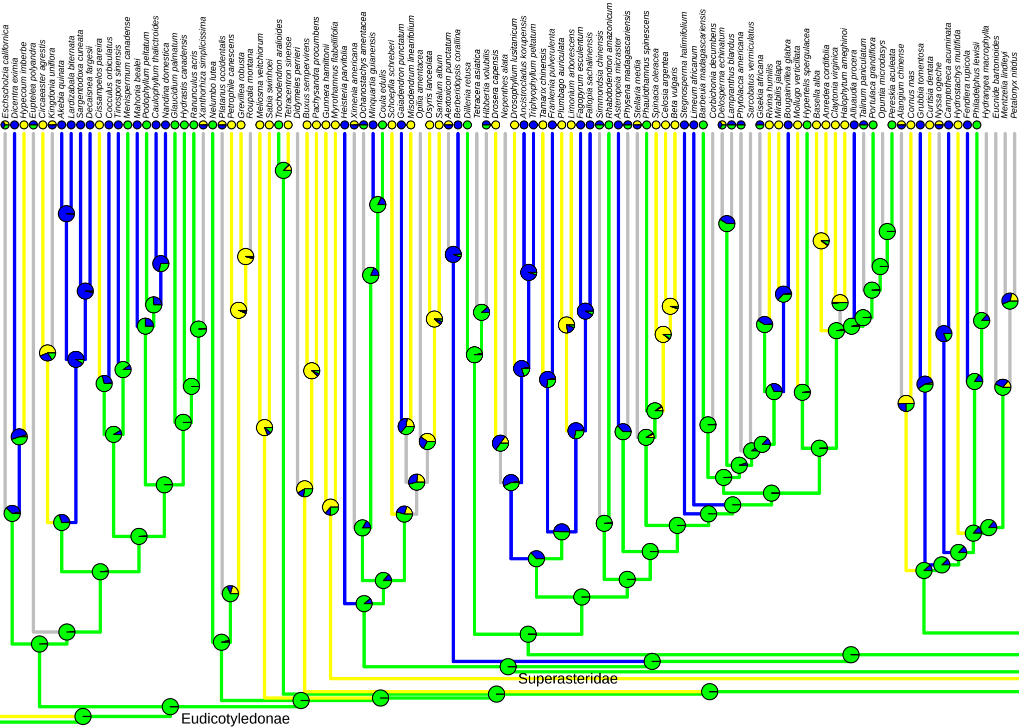
🟡 one to five (1−5)
🔵 six to ten (6−10)
🟢 more than ten (>10)

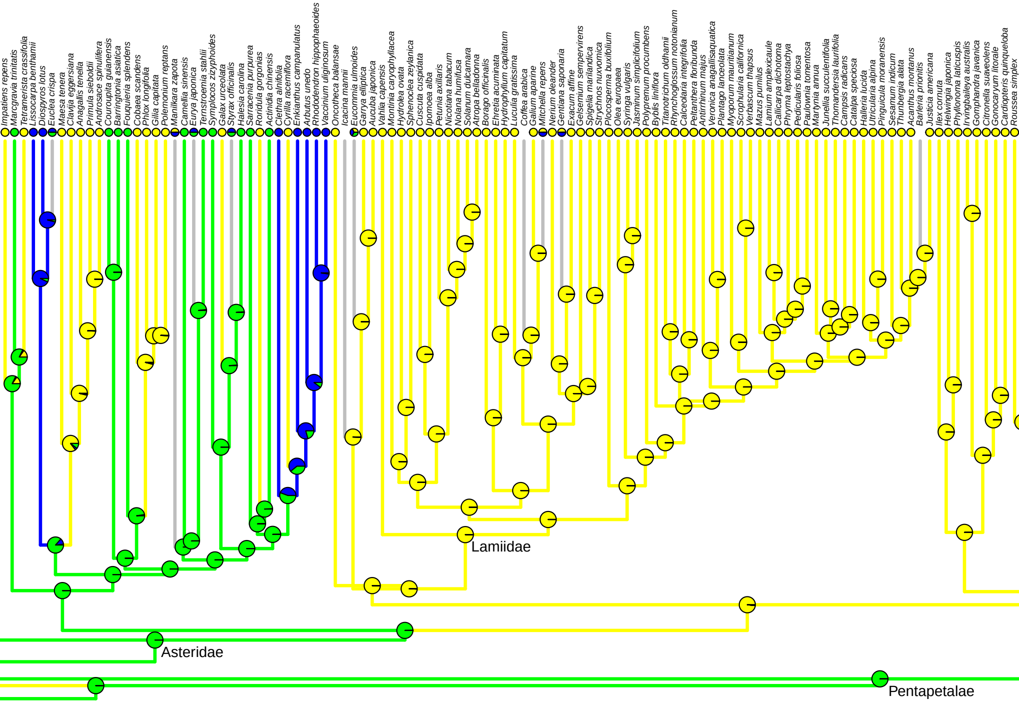
Node	ML state	Prob
Angiospermae	more than ten (>10)	1
Mesangiospermae	more than ten (>10)	0.9998
Magnoliidae	more than ten (>10)	1
Monocotyledonae	six to ten (6−10)	0.5554
Eudicotyledonae	more than ten (>10)	1
Commelinidae	six to ten (6−10)	0.9996
Pentapetalae	more than ten (>10)	1
Superasteridae	more than ten (>10)	1
Asteridae	more than ten (>10)	0.9994
Lamiidae	one to five (1−5)	0.9995
Campanulidae	one to five (1−5)	0.9966
Superrosidae	more than ten (>10)	1
Rosidae	more than ten (>10)	0.9999
Malvidae	more than ten (>10)	0.9418
Fabidae	more than ten (>10)	1

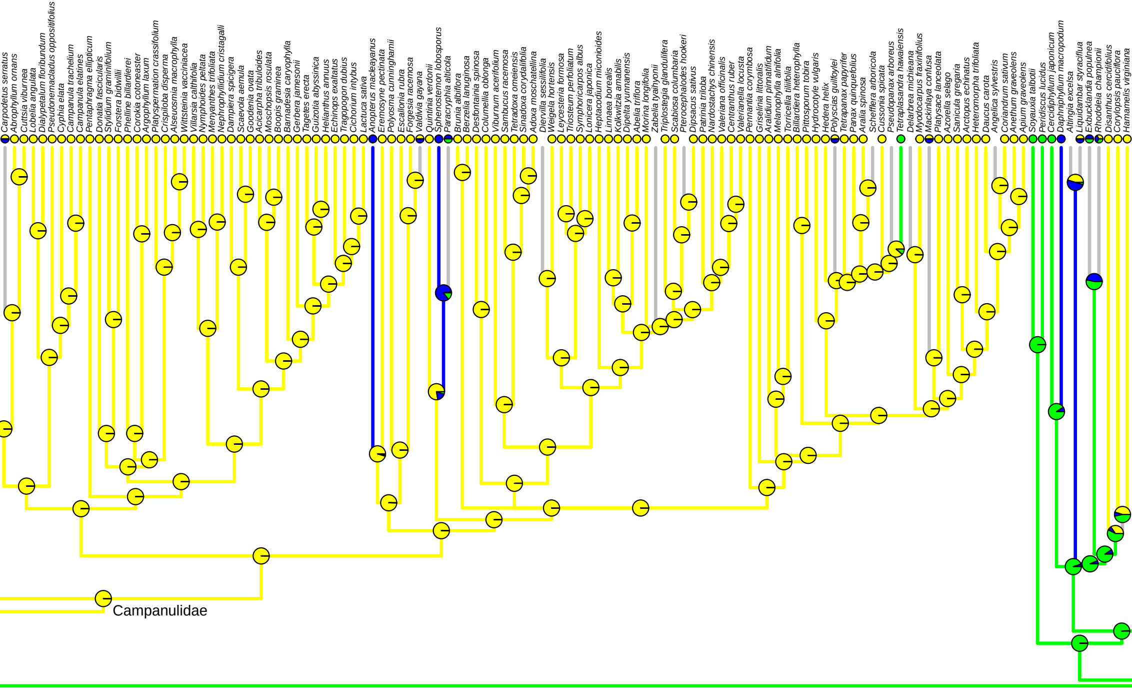
Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	···
ARD	−493.28	6	998.56	998.66	2.2	0.25	4e−04	···
ARDeq**	−492.18	6	996.36	996.47	0	0.75	4e−04	···
ER	−538.35	1	1078.69	1078.7	82.23	0	0.0027	···
SYM	−530.98	3	1067.96	1067.99	71.52	0	0.0039	···
SYMeq	−530.13	3	1066.25	1066.28	69.82	0	0.0039	···
ORD	−509.98	4	1027.96	1028.01	31.54	0	8e−04	···
ORDeq	−509.41	4	1026.82	1026.87	30.4	0	8e−04	···
ORDSYM	−534.65	2	1073.29	1073.31	76.84	0	0.0044	···
ORDSYMeq	−533.73	2	1071.47	1071.49	75.02	0	0.0044	···
ORDER	−534.68	1	1071.36	1071.37	74.9	0	0.0044	···


Amborella trichopoda
Trithuria submersa
Nymphaea odorata
Nuphar advena
Cabomba caroliniana
Brasenia schreberi
Austrobaileya scandens
Trimenia moorei
Illicium floridanum
Kadsura japonica
Schisandra chinensis
Acorus gramineus
Tofieldia calyculata
Pleea tenuifolia
Orontium aquaticum
Spathiphyllum wallisii
Lemna minor
Xanthosoma sagittifolium
Potamogeton berchtoldii
Triglochin maritima
Alisma plantagoaquatica
Hydrocharis dubia
Najas minor
Japonolirion osense
Petrosavia sakuraii
Burmannia biflora
Metanarthecium luteoviride
Tacca chantrieri
Dioscorea alata
Croomia pauciflora
Carludovica palmata
Acanthochlamys bracteata
Talbotia elegans
Xerophyta retinervis
Campynema lineare
Monocotyledonae
Angiospermae


Trillium erectum
Colchicum speciosum
Alstroemeria aurea
Bomarea edulis
Lapageria rosea
Philesia magellanica
Smilax glauca
Lilium superbum
Cypripedium calceolus
Phalaenopsis aphrodite
Oncidium excavatum
Blandfordia punicea
Borya septentrionalis
Molineria capitulata
Hypoxis hemerocallidea
Rhodohypoxis milloides
Tecophilaea cyanocrocus
Ixiolirion tataricum
Gladiolus buckerveldii
Aristea glauca
Alophia drummondii
Iris missouriensis
Bulbine succulenta
Xanthorrhoea resinosa
Agave ghiesbreghtii
Yucca filamentosa
Crinum asiaticum
Allium fistulosum
Nothoscordum bivalve
Asparagus officinalis
Beaucarnea recurvata
Lomandra longifolia
Elaeis guineensis
Chamaedorea seifrizii
Caryota mitis
Trachycarpus fortunei
Phoenix dactylifera
Philydrum lanuginosum
Tradescantia spathacea
Anigozanthos flavidus
Pontederia cordata
Strelitzia reginae
Phenakospermum guyannense
Ravenala madagascariensis
Musa acuminata
Zingiber gramineum
Canna indica
Maranta cristata
Calectasia intermedia
Dasypogon bromeliifolius
Typha latifolia
Sparganium eurycarpum
Vriesea psittacina
Puya raimondii
Stegolepis ligulata
Mayaca fluviatilis
Juncus effusus
Cyperus alternifolius
Rhynchospora latifolia
Eriocaulon aquaticum
Xyris jupicai
Anarthria polyphylla
Centrolepis strigosa
Baloskion tetraphyllum
Flagellaria indica
Joinvillea plicata
Ecdeiocolea monostachya
Oryza sativa
Hordeum bulbosum
Danthonia spicata
Saccharum officinarum
Zea mays
Hedyosmum arborescens
Ascarina lucida
Sarcandra chloranthoides
Chloranthus japonicus
Cinnamodendron ekmanii
Canella winterana
Takhtajania perrieri
Tasmannia insipida
Drimys winteri
Asarum canadense
Saruma henryi
Lactoris fernandeziana
Thottea tomentosa
Aristolochia macrophylla
Peperomia caliginigaudens
Piper betle
Houttuynia cordata
Saururus cernuus
Anemopsis californica
Eupomatia bennettii
Cananga odorata
Asimina triloba
Annona muricata
Liriodendron chinense
Magnolia tripetala
Galbulimima belgraveana
Degeneria vitiensis
Myristica fragrans
Mauloutchia chapelieri
Idiospermum australiense
Calycanthus floridus
Chimonanthus praecox
Siparuna decipiens
Gomortega keule
Doryphora sassafras
Daphnandra micrantha
Atherosperma moschatum
Cryptocarya meissneriana
Cinnamomum camphora
Laurus nobilis
Sassafras albidum
Hernandia ovigera
Gyrocarpus americanus
Peumus boldus
Hedycarya arborea
Hortonia floribunda
Ceratophyllum demersum
Commelinidae
Magnoliidae
Mesangiospermae


Eschscholzia californica
Dicentra eximia
Hypecoum imberbe
Euptelea polyandra
Circaeaster agrestis
Kingdonia uniflora
Akebia quinata
Lardizabala biternata
Sargentodoxa cuneata
Decaisnea fargesii
Cissampelos pareira
Cocculus orbiculatus
Tinospora sinensis
Menispermum canadense
Mahonia bealei
Podophyllum peltatum
Caulophyllum thalictroides
Nandina domestica
Glaucidium palmatum
Hydrastis canadensis
Ranunculus acris
Xanthorhiza simplicissima
Nelumbo lutea
Platanus occidentalis
Petrophile canescens
Grevillea robusta
Roupala montana
Meliosma veitchiorum
Sabia swinhoei
Trochodendron aralioides
Tetracentron sinense
Didymeles perrieri
Buxus sempervirens
Pachysandra procumbens
Gunnera hamiltonii
Myrothamnus flabellifolia
Heisteria parvifolia
Ximenia americana
Ochanostachys amentacea
Minquartia guianensis
Coula edulis
Schoepfia schreberi
Gaiadendron punctatum
Misodendrum linearifolium
Opilia amentacea
Osyris lanceolata
Santalum album
Aextoxicon punctatum
Berberidopsis corallina
Dillenia retusa
Tetracera asiatica
Hibbertia volubilis
Drosera capensis
Nepenthes alata
Drosophyllum lusitanicum
Ancistrocladus korupensis
Triphyophyllum peltatum
Tamarix chinensis
Frankenia pulverulenta
Plumbago auriculata
Limonium arborescens
Fagopyrum esculentum
Fallopia sachalinensis
Simmondsia chinensis
Rhabdodendron amazonicum
Asteropeia micraster
Physena madagascariensis
Stellaria media
Phaulothamnus spinescens
Spinacia oleracea
Celosia argentea
Beta vulgaris
Stegnosperma halimifolium
Limeum africanum
Barbeuia madagascariensis
Corbichonia decumbens
Delosperma echinatum
Lampranthus blandus
Phytolacca americana
Sarcobatus vermiculatus
Gisekia africana
Rivina humilis
Mirabilis jalapa
Bougainvillea glabra
Mollugo verticillata
Hypertelis spergulacea
Basella alba
Anredera cordifolia
Claytonia virginica
Halophytum ameghinoi
Alluaudia procera
Talinum paniculatum
Portulaca grandiflora
Opuntia microdasys
Pereskia aculeata
Alangium chinense
Cornus mas
Grubbia tomentosa
Curtisia dentata
Nyssa ogeche
Camptotheca acuminata
Hydrostachys multifida
Fendlera rupicola
Philadelphus lewisii
Hydrangea macrophylla
Eucnide bartonioides
Mentzelia lindleyi
Petalonyx nitidus
Superasteridae
Eudicotyledonae


Impatiens repens
Marcgravia trinitatis
Tetramerista crassifolia
Lissocarpa benthamii
Diospyros lotus
Euclea crispa
Maesa tenera
Clavija eggersiana
Anagallis tenella
Primula sieboldii
Androsace spinulifera
Couroupita guianensis
Barringtonia asiatica
Fouquieria splendens
Cobaea scandens
Phlox longifolia
Gilia capitata
Polemonium reptans
Manilkara zapota
Camellia sinensis
Eurya japonica
Ternstroemia stahlii
Symplocos zizyphoides
Galax urceolata
Styrax officinalis
Halesia carolina
Sarracenia purpurea
Roridula gorgonias
Actinidia chinensis
Clethra alnifolia
Cyrilla racemiflora
Enkianthus campanulatus
Arbutus unedo
Rhododendron hippophaeoides
Vaccinium uliginosum
Oncotheca balansae
Icacina mannii
Eucommia ulmoides
Garrya elliptica
Aucuba japonica
Vahlia capensis
Montinia caryophyllacea
Hydrolea ovata
Sphenoclea zeylanica
Cuscuta cuspidata
Ipomoea alba
Petunia axillaris
Nicotiana tabacum
Nolana humifusa
Solanum dulcamara
Atropa belladonna
Borago officinalis
Ehretia acuminata
Hydrophyllum capitatum
Luculia gratissima
Coffea arabica
Galium aparine
Mitchella repens
Nerium oleander
Gentiana saponaria
Exacum affine
Gelsemium sempervirens
Spigelia marilandica
Strychnos nuxvomica
Plocosperma buxifolium
Olea europaea
Syringa vulgaris
Jasminum simplicifolium
Polypremum procumbens
Byblis liniflora
Titanotrichum oldhamii
Rhynchoglossum notonianum
Calceolaria integrifolia
Peltanthera floribunda
Antirrhinum majus
Veronica anagallisaquatica
Plantago lanceolata
Myoporum mauritianum
Scrophularia californica
Verbascum thapsus
Mazus pumilus
Lamium amplexicaule
Callicarpa dichotoma
Phryma leptostachya
Pedicularis foliosa
Paulownia tomentosa
Martynia annua
Junellia succulentifolia
Thomandersia laurifolia
Campsis radicans
Catalpa speciosa
Halleria lucida
Utricularia alpina
Pinguicula moranensis
Sesamum indicum
Thunbergia alata
Acanthus montanus
Barleria prionitis
Justicia americana
Ilex cornuta
Helwingia japonica
Phyllonoma laticuspis
Irvingbaileya australis
Gomphandra javanica
Citronella suaveolens
Gonocaryum litorale
Cardiopteris quinqueloba
Roussea simplex
Lamiidae
Asteridae
Pentapetalae


Carpodetus serratus
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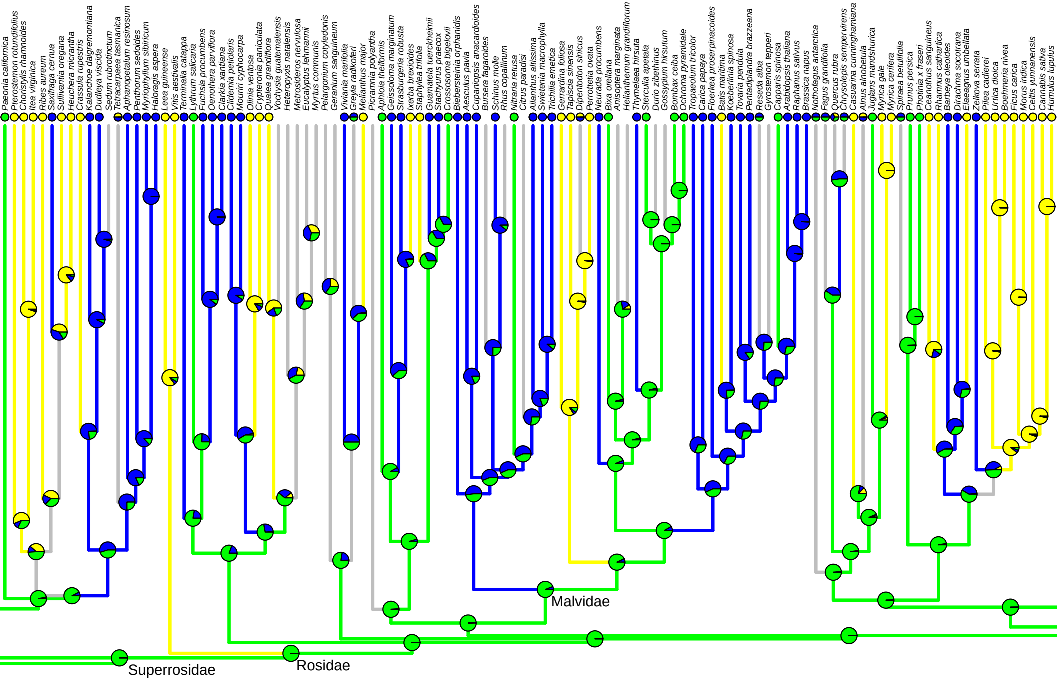
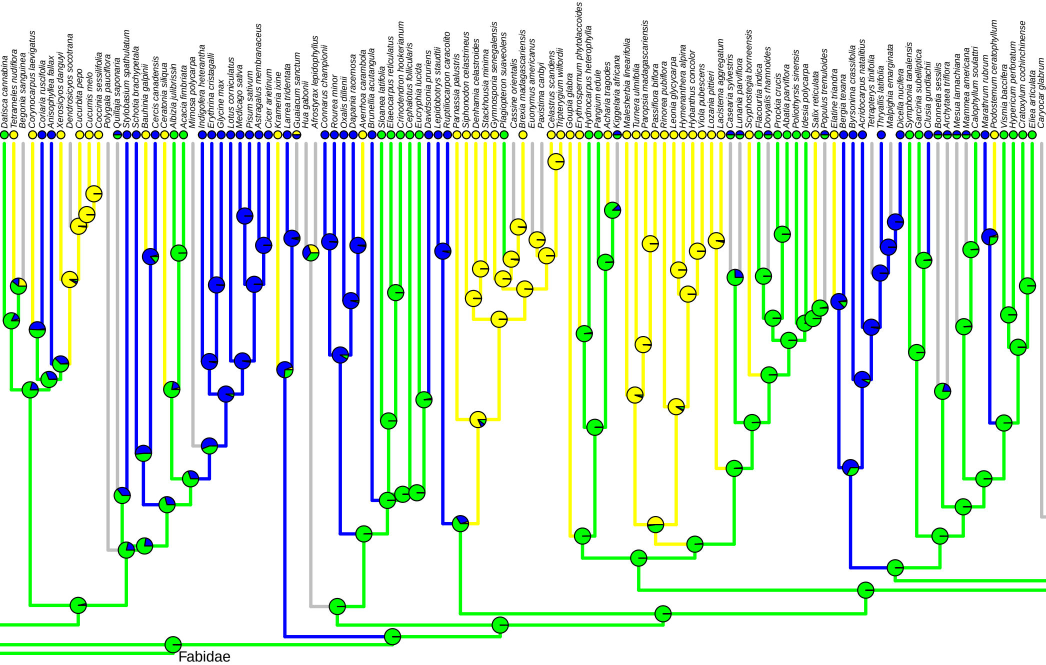
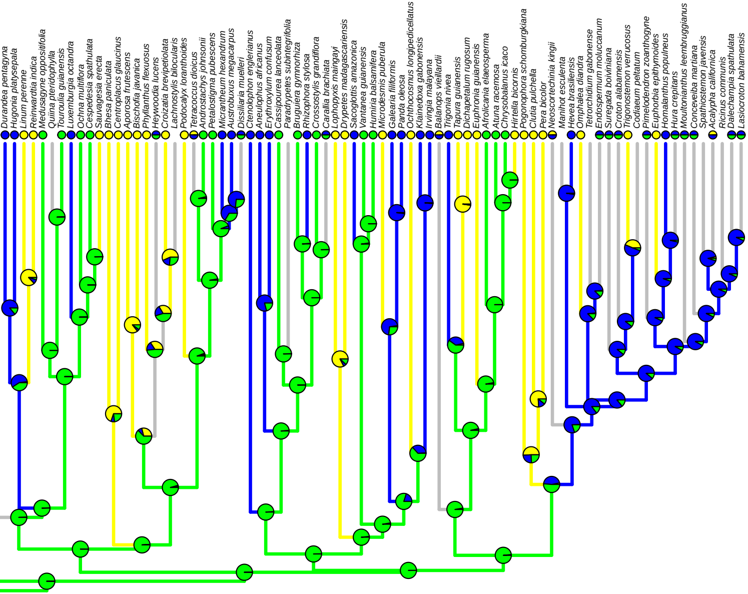
Cuttsia viburnea
Lobelia angulata
Dialypetalum floribundum
Pseudonemacladus oppositifolius
Cyphia elata
Campanula trachelium
Campanula elatines
Pentaphragma ellipticum
Donatia fascicularis
Stylidium graminifolium
Forstera bidwillii
Phelline billardierei
Corokia cotoneaster
Argophyllum laxum
Platyspermation crassifolium
Crispiloba disperma
Alseuosmia macrophylla
Wittsteinia vacciniacea
Villarsia calthifolia
Nymphoides peltata
Menyanthes trifoliata
Nephrophyllidium cristagalli
Dampiera spicigera
Scaevola aemula
Goodenia ovata
Acicarpha tribuloides
Moschopsis rosulata
Boopis graminea
Barnadesia caryophylla
Gerbera jamesonii
Tagetes erecta
Guizotia abyssinica
Helianthus annuus
Echinops exaltatus
Tragopogon dubius
Cichorium intybus
Lactuca sativa
Anopterus macleayanus
Eremosyne pectinata
Polyosma cunninghamii
Escallonia rubra
Forgesia racemosa
Valdivia gayana
Quintinia verdonii
Sphenostemon lobosporus
Paracryphia alticola
Brunia albiflora
Berzelia lanuginosa
Desfontainia spinosa
Columellia oblonga
Viburnum acerifolium
Sambucus racemosa
Tetradoxa omeiensis
Sinadoxa corydalifolia
Adoxa moschatellina
Diervilla sessilifolia
Weigela hortensis
Leycesteria formosa
Triosteum perfoliatum
Symphoricarpos albus
Lonicera japonica
Heptacodium miconioides
Linnaea borealis
Kolkwitzia amabilis
Dipelta yunnanensis
Abelia triflora
Morina longifolia
Zabelia tyaihyonii
Triplostegia glandulifera
Scabiosa columbaria
Pterocephalodes hookeri
Dipsacus sativus
Patrinia triloba
Nardostachys chinensis
Valeriana officinalis
Centranthus ruber
Valerianella locusta
Pennantia corymbosa
Griselinia littoralis
Aralidium pinnatifidum
Melanophylla alnifolia
Torricellia tiliifolia
Billardiera heterophylla
Pittosporum tobira
Hydrocotyle vulgaris
Hedera helix
Polyscias guilfoylei
Tetrapanax papyrifer
Panax quinquefolius
Aralia spinosa
Schefflera arboricola
Cussonia spicata
Pseudopanax arboreus
Tetraplasandra hawaiensis
Delarbrea michieana
Myodocarpus fraxinifolius
Mackinlaya confusa
Platysace lanceolata
Azorella selago
Sanicula gregaria
Arctopus echinatus
Heteromorpha trifoliata
Daucus carota
Angelica sylvestris
Coriandrum sativum
Anethum graveolens
Apium graveolens
Soyauxia talbotii
Peridiscus lucidus
Cercidiphyllum japonicum
Daphniphyllum macropodum
Altingia excelsa
Liquidambar styraciflua
Exbucklandia populnea
Rhodoleia championii
Disanthus cercidifolius
Corylopsis pauciflora
Hamamelis virginiana
Campanulidae


Paeonia californica
Pterostemon rotundifolius
Choristylis rhamnoides
Itea virginica
Ribes aureum
Saxifraga cernua
Sullivantia oregana
Heuchera micrantha
Crassula rupestris
Kalanchoe daigremontiana
Dudleya viscida
Sedum rubrotinctum
Tetracarpaea tasmanica
Aphanopetalum resinosum
Penthorum sedoides
Myriophyllum sibiricum
Haloragis aspera
Leea guineense
Vitis aestivalis
Terminalia catappa
Lythrum salicaria
Fuchsia procumbens
Oenothera parviflora
Clarkia xantiana
Clidemia petiolaris
Mouriri cyphocarpa
Olinia ventosa
Crypteronia paniculata
Qualea grandiflora
Vochysia guatemalensis
Heteropyxis natalensis
Metrosideros nervulosa
Eucalyptus lehmannii
Myrtus communis
Pelargonium cotyledonis
Geranium sanguineum
Viviania marifolia
Greyia radlkoferi
Melianthus major
Picramnia polyantha
Aphloia theiformis
Geissoloma marginatum
Strasburgeria robusta
Ixerba brexioides
Staphylea trifolia
Guamatela tuerckheimii
Stachyurus praecox
Crossosoma bigelovii
Biebersteinia orphanidis
Aesculus pavia
Cupaniopsis anacardioides
Bursera fagaroides
Schinus molle
Rhus copallinum
Nitraria retusa
Citrus paradisi
Ailanthus altissima
Swietenia macrophylla
Trichilia emetica
Gerrardina foliosa
Tapiscia sinensis
Dipentodon sinicus
Perrottetia ovata
Neurada procumbens
Bixa orellana
Anisoptera marginata
Helianthemum grandiflorum
Thymelaea hirsuta
Sterculia apetala
Durio zibethinus
Gossypium hirsutum
Bombax ceiba
Ochroma pyramidale
Tropaeolum tricolor
Carica papaya
Floerkea proserpinacoides
Batis maritima
Koeberlinia spinosa
Tovaria pendula
Pentadiplandra brazzeana
Reseda alba
Gyrostemon tepperi
Capparis spinosa
Arabidopsis thaliana
Raphanus sativus
Brassica napus
Nothofagus antarctica
Fagus grandifolia
Quercus rubra
Chrysolepis sempervirens
Casuarina cunninghamiana
Alnus alnobetula
Juglans mandshurica
Myrica gale
Myrica cerifera
Spiraea betulifolia
Prunus persica
Photinia x fraseri
Ceanothus sanguineus
Rhamnus cathartica
Barbeya oleoides
Dirachma socotrana
Elaeagnus umbellata
Zelkova serrata
Pilea cadierei
Urtica dioica
Boehmeria nivea
Ficus carica
Morus indica
Celtis yunnanensis
Cannabis sativa
Humulus lupulus
Malvidae
Superrosidae
Rosidae

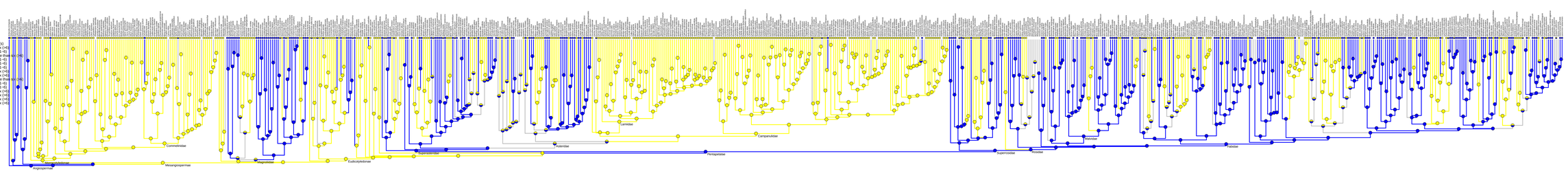

Datisca cannabina
Tetrameles nudiflora
Begonia sanguinea
Corynocarpus laevigatus
Coriaria ruscifolia
Anisophyllea fallax
Xerosicyos danguyi
Dendrosicyos socotrana
Cucurbita pepo
Cucumis melo
Coccinia sessilifolia
Polygala pauciflora
Quillaja saponaria
Stylobasium spathulatum
Schotia brachypetala
Bauhinia galpinii
Cercis canadensis
Ceratonia siliqua
Albizia julibrissin
Acacia fimbriata
Mimosa polycarpa
Indigofera heterantha
Erythrina cristagalli
Glycine max
Lotus corniculatus
Medicago sativa
Pisum sativum
Astragalus membranaceus
Cicer arietinum
Krameria ixine
Larrea tridentata
Guaiacum sanctum
Hua gabonii
Afrostyrax lepidophyllus
Connarus championii
Rourea minor
Oxalis dillenii
Dapania racemosa
Averrhoa carambola
Brunellia acutangula
Sloanea latifolia
Elaeocarpus reticulatus
Crinodendron hookerianum
Cephalotus follicularis
Eucryphia lucida
Davidsonia pruriens
Lepidobotrys staudtii
Ruptiliocarpon caracolito
Parnassia palustris
Siphonodon celastrineus
Denhamia celastroides
Stackhousia minima
Gymnosporia senegalensis
Plagiopteron suaveolens
Cassine orientalis
Brexia madagascariensis
Euonymus americanus
Paxistima canbyi
Celastrus scandens
Tripterygium wilfordii
Goupia glabra
Erythrospermum phytolaccoides
Hydnocarpus heterophylla
Pangium edule
Acharia tragodes
Kiggelaria africana
Malesherbia linearifolia
Turnera ulmifolia
Paropsia madagascariensis
Passiflora biflora
Rinorea pubiflora
Leonia glycycarpa
Hymenanthera alpina
Hybanthus concolor
Viola pubescens
Lozania pittieri
Lacistema aggregatum
Casearia sylvestris
Lunania parviflora
Scyphostegia borneensis
Flacourtia indica
Dovyalis rhamnoides
Prockia crucis
Abatia parviflora
Poliothyrsis sinensis
Idesia polycarpa
Salix reticulata
Populus tremuloides
Elatine triandra
Bergia texana
Byrsonima crassifolia
Acridocarpus natalitius
Tetrapterys tinifolia
Thryallis latifolia
Malpighia emarginata
Dicella nucifera
Symphonia tanalensis
Garcinia subelliptica
Clusia gundlachii
Bonnetia sessilis
Archytaea triflora
Mesua larnachiana
Mammea americana
Calophyllum soulattri
Marathrum rubrum
Podostemum ceratophyllum
Vismia baccifera
Hypericum perforatum
Cratoxylum cochinchinense
Eliea articulata
Caryocar glabrum
Fabidae


Durandea pentagyna
Hugonia platysepala
Linum perenne
Reinwardtia indica
Medusagyne oppositifolia
Quiina pteridophylla
Touroulia guianensis
Luxemburgia octandra
Ochna multiflora
Cespedesia spathulata
Sauvagesia erecta
Bhesa paniculata
Centroplacus glaucinus
Aporosa frutescens
Bischofia javanica
Phyllanthus flexuosus
Heywoodia lucens
Croizatia brevipetiolata
Lachnostylis bilocularis
Podocalyx loranthoides
Tetracoccus dioicus
Androstachys johnsonii
Petalostigma pubescens
Micrantheum hexandrum
Austrobuxus megacarpus
Dissiliaria muelleri
Ctenolophon englerianus
Aneulophus africanus
Erythroxylum confusum
Cassipourea lanceolata
Paradrypetes subintegrifolia
Bruguiera gymnorhiza
Rhizophora stylosa
Crossostylis grandiflora
Carallia brachiata
Lophopyxis maingayi
Drypetes madagascariensis
Sacoglottis amazonica
Vantanea guianensis
Humiria balsamifera
Microdesmis puberula
Galearia filiformis
Panda oleosa
Ochthocosmus longipedicellatus
Klainedoxa gabonensis
Irvingia malayana
Balanops vieillardii
Trigonia nivea
Tapura guianensis
Dichapetalum rugosum
Euphronia guianensis
Afrolicania elaeosperma
Atuna racemosa
Chrysobalanus icaco
Hirtella bicornis
Pogonophora schomburgkiana
Clutia pulchella
Pera bicolor
Neoscortechinia kingii
Manihot esculenta
Hevea brasiliensis
Omphalea diandra
Tetrorchidium gabonense
Endospermum moluccanum
Suregada boiviniana
Croton alabamensis
Trigonostemon verrucosus
Codiaeum peltatum
Pimelodendron zoanthogyne
Euphorbia epithymoides
Homalanthus populneus
Hura crepitans
Moultonianthus leembruggianus
Conceveiba martiana
Spathiostemon javensis
Acalypha californica
Ricinus communis
Dalechampia spathulata
Lasiocroton bahamensis

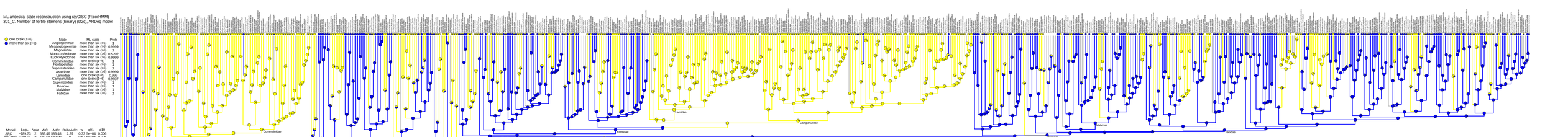
MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
301_C. Number of fertile stamens (binary) (02c), 95 steps

one to six (1–6)
more than six (>6)

Node	MP state(s)
Angiospermae	more than six (>6)
Mesangiospermae	one to six (1–6)
Magnoliidae	one to six (1–6) | more than six (>6)
Monocotyledonae	one to six (1–6)
Eudicotyledonae	one to six (1–6)
Commelinidae	one to six (1–6)
Ceratophyllidae	more than six (>6)
Superasteridae	more than six (>6)
Asteridae	one to six (1–6) | more than six (>6)
Lamiidae	one to six (1–6)
Campanulidae	one to six (1–6)
Superrosidae	more than six (>6)
Rosidae	more than six (>6)
Malvidae	more than six (>6)
Fabidae	more than six (>6)



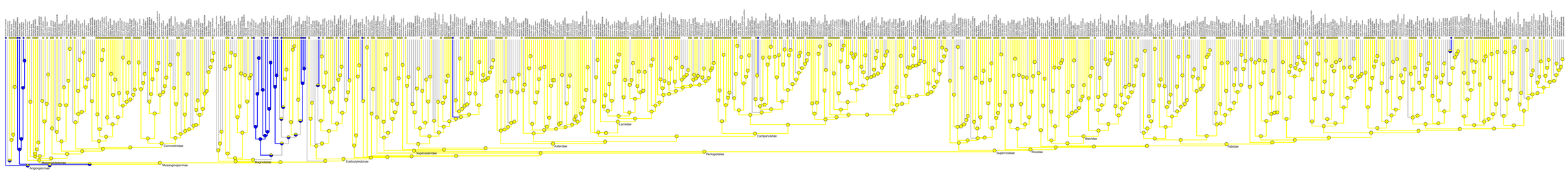
ML ancestral state reconstruction using rayDISC (R:corHMM)
301_C. Number of fertile stamens (binary) (02c), ARDeq model



Node	ML state	Prob
Angiospermae	more than six (>6)	1
Mesangiospermae	more than six (>6)	0.9999
Magnoliidae	more than six (>6)	1
Monocotyledonae	more than six (>6)	0.5222
Eudicotyledonae	more than six (>6)	0.9999
Commelinidae	one to six (1–6)	1
Rosidae	more than six (>6)	1
Superasteridae	more than six (>6)	1
Asteridae	more than six (>6)	0.9999
Lamiidae	one to six (1–6)	0.999
Campanulidae	one to six (1–6)	0.9937
Caryophyllales	more than six (>6)	1
Rosidae	more than six (>6)	1
Malvidae	more than six (>6)	1
Fabidae	more than six (>6)	1

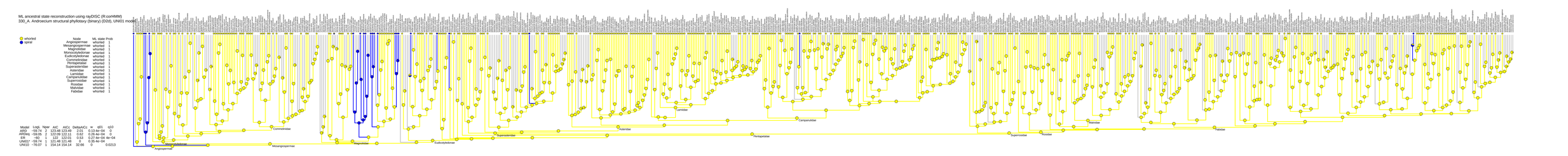
Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	−289.73	2	583.46	583.48	1.39	0.33	5e−04	0.006
ARDeq**	−289.04	1	582.08	582.09	0	0.67	5e−04	0.006
ER	−325.04	1	652.09	652.09	70	0	0.0032	0.0032
UN01	−365.16	1	732.31	732.32	150.23	0	0.0046	
UN10	−326.26	1	654.51	654.52	72.43	0		0.0075

MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
330_A. Androecium structural phyllotaxy (binary) (D2d), 12 steps



node	MP state(s)
Angiospermae	whorled / spiral
Mesangiospermae	whorled
Magnoliidae	whorled
Monocotyledonae	whorled
Eudicotyledonae	whorled
Commelinidae	whorled
Ceratophyllidae	whorled
Superasteridae	whorled
Asteridae	whorled
Lamiidae	whorled
Campanulidae	whorled
Pentapetalae	whorled
Rosidae	whorled
Malvidae	whorled
Fabidae	whorled

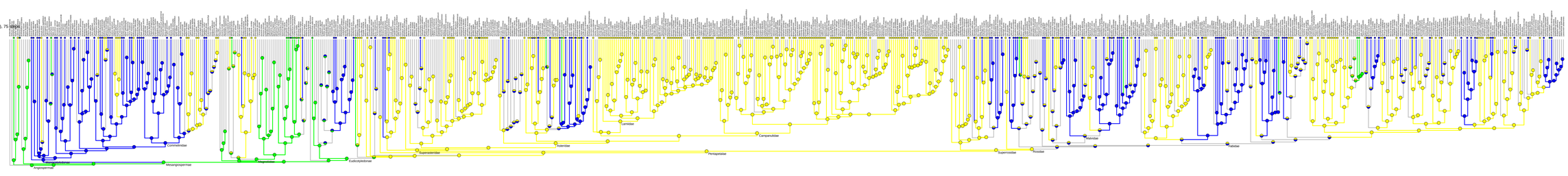
whorled
spiral


ML ancestral state reconstruction using rayDISC (R:corHMM)
330_A. Androecium structural phyllotaxy (binary) (D2d), UNI01 model
whorled
spiral
Node ML state Prob
Angiospermae whorled 1
Mesangiospermae whorled 1
Magnoliidae whorled 1
Monocotyledonae whorled 1
Eudicotyledonae whorled 1
Commelinidae whorled 1
Gunneridae whorled 1
Superasteridae whorled 1
Asteridae whorled 1
Lamidae whorled 1
Campanulidae whorled 1
Asterales whorled 1
Rosidae whorled 1
Malvidae whorled 1
Fabidae whorled 1
Model LogL Npar AIC AICc DeltaAICc w q01 q10
ARD −59.74 2 123.48 123.49 2.01 0.13 4e-04 0
ARDeq −59.05 2 122.09 122.11 0.62 0.26 4e-04 0
ER −60 1 122 122.01 0.53 0.27 4e-04 4e-04
UNI01* −59.74 1 121.48 121.48 0 0.35 4e-04
UNI10 −76.07 1 154.14 154.14 32.66 0 0.0213
Angiospermae
Mesangiospermae
Magnoliidae
Monocotyledonae
Eudicotyledonae
Commelinidae
Gunneridae
Superasteridae
Asteridae
Lamidae
Campanulidae
Asterales
Pentapetalae
Rosidae
Malvidae
Fabidae

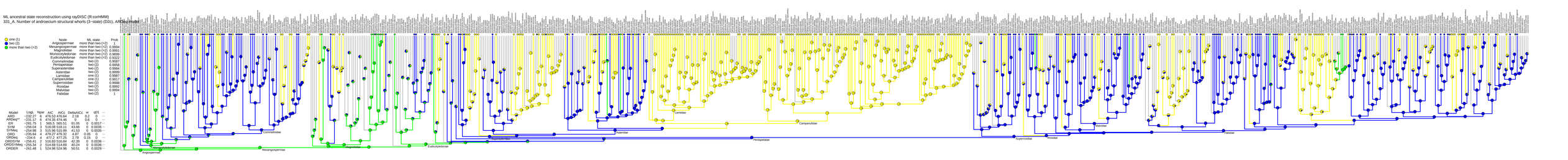
MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
331_A. Number of androecium structural whorls (3–state) (D2c), 75 taxa

one (1)
two (2)
more than two (>2)

Node	MP state(s)
Angiospermae	more than two (>2)
Mesangiospermae	more than two (>2)
Magnoliidae	more than two (>2)
Monocotyledonae	two (2)
Eudicotyledonae	more than two (>2)
Commelinidae	two (2)
Ceratophyllum	two (2)
Superasteridae	one (1)
Asteridae	one (1)
Lamiidae	one (1)
Campanulidae	one (1)
Pentapetalae	one (1)
Rosidae	one (1)
Malvidae	one (1) / two (2)
Fabidae	one (1) / two (2)



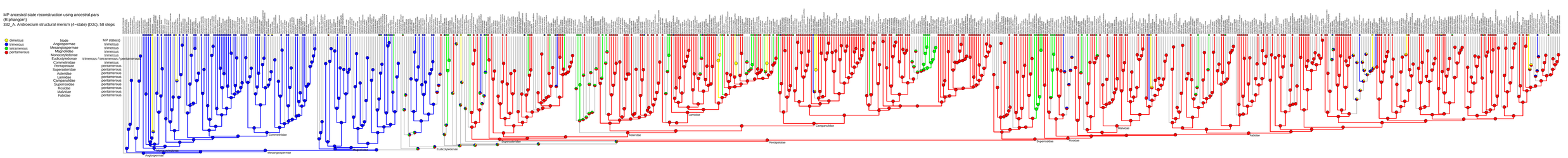
ML ancestral state reconstruction using ray|DISC (R corHMM)
331_A. Number of androecium structural whorls (3–state) (D2c), AR3eq model



Node	ML state	Prob
Angiospermae	more than two (>2)	1
Mesangiospermae	more than two (>2)	0.9994
Magnoliidae	more than two (>2)	0.9991
Monocotyledoneae	more than two (>2)	0.9699
Eudicotyledoneae	more than two (>2)	0.9322
Commelinidae	two (2)	0.9087
Gunneridae	two (2)	0.9994
Superasteridae	two (2)	0.9994
Asteridae	two (2)	0.9999
Lamidae	one (1)	0.5997
Campanulidae	one (1)	0.9917
Caryophyllales	one (1)	0.9982
Rosidae	two (2)	0.9982
Malvidae	two (2)	0.9994
Fabidae	two (2)	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	---
ARD	-232.27	6	476.53	476.64	2.18	0.2	0	---
ARDeq**	-231.17	6	474.35	474.46	0	0.6	0	---
ER	-291.75	1	585.5	585.51	91.05	0	0.0017	---
SYM	-254.98	3	515.96	516.04	41.58	0	0.0035	---
SYMeq	-254.98	3	515.96	516.04	41.53	0	0.0035	---
ORD	-235.64	4	479.27	479.32	4.87	0.05	0	---
ORDeq	-234.6	4	477.2	477.25	2.79	0.15	0	---
ORDSYM	-256.41	2	516.83	516.84	42.28	0	0.0036	---
ORDSYMeq	-255.34	2	514.68	514.69	40.24	0	0.0036	---
ORDER	-261.48	1	524.96	524.96	50.51	0	0.0029	---

MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
332_A. Androecium structural merism (4–state) (D2c), 58 steps

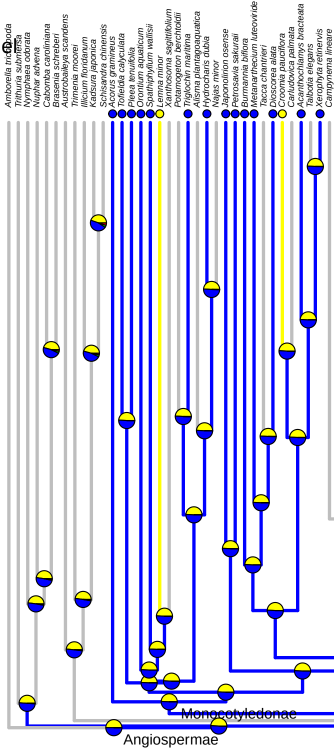


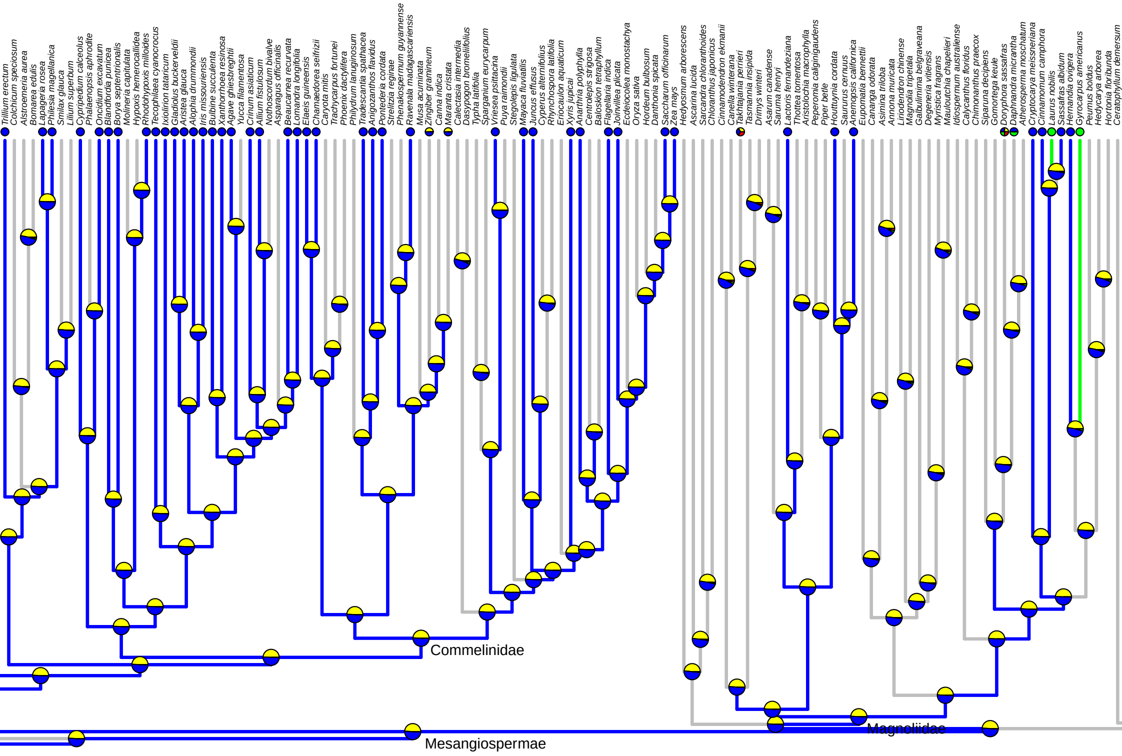
ML ancestral state reconstruction using rayDISC (R:corHMM)
332_A. Androecium structural merism (4−state) (D2c), ORDeq model

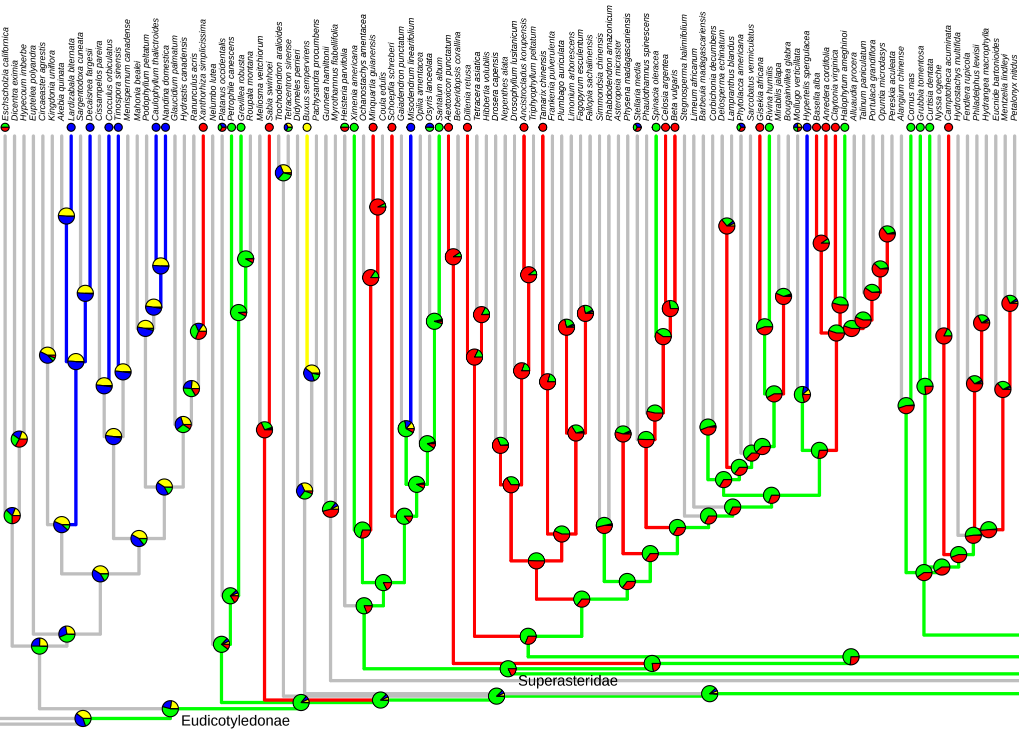
🟡 dimerous
🔵 trimerous
🟢 tetramerous
🔴 pentamerous

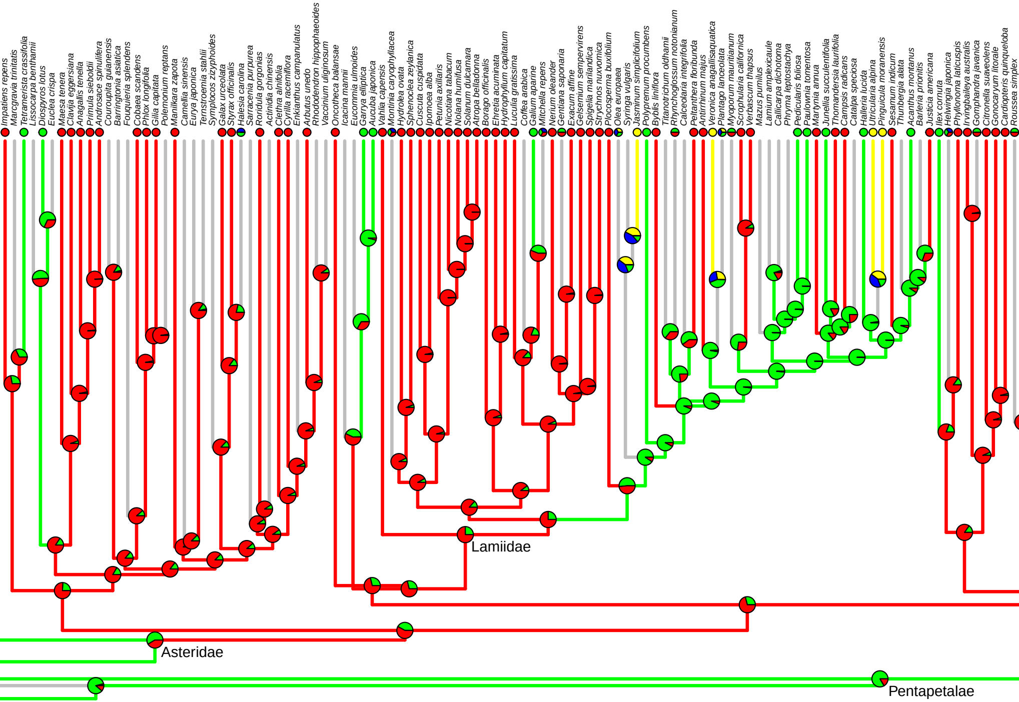
Node	ML state	Prob
Angiospermae	dimerous	0.4999
Mesangiospermae	trimerous	0.5059
Magnoliidae	trimerous	0.5057
Monocotyledonae	trimerous	0.5069
Eudicotyledonae	tetramerous	0.541
Commelinidae	trimerous	0.5071
Pentapetalae	tetramerous	0.8355
Superasteridae	tetramerous	0.8229
Asteridae	tetramerous	0.5847
Lamiidae	pentamerous	0.7485
Campanulidae	pentamerous	0.792
Superrosidae	tetramerous	0.7825
Rosidae	tetramerous	0.7451
Malvidae	pentamerous	0.542
Fabidae	pentamerous	0.5618

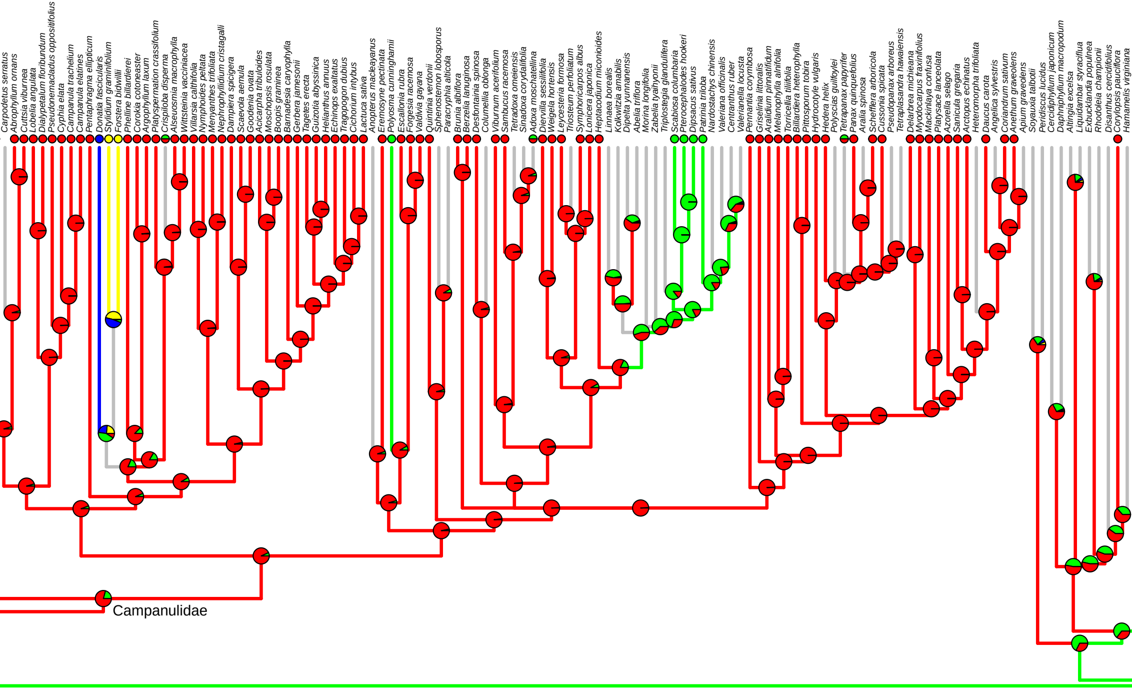
Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	···
ARD	−223.41	12	470.82	471.22	231.43	0	0.007	···
ARDeq	−222.07	12	468.14	468.54	228.75	0	0.0068	···
ER	−237.58	1	477.17	477.17	237.38	0	9e−04	···
SYM	−225.35	6	462.71	462.81	223.02	0	5e−04	···
SYMeq	−223.98	6	459.95	460.06	220.27	0	5e−04	···
ORD	−160.64	6	333.28	333.38	93.59	0	100	···
ORDeq***	−113.84	6	239.68	239.79	0	1	99.997	···
ORDSYM	−259.14	3	524.29	524.32	284.53	0	0.0021	···
ORDSYMeq	−257.81	3	521.61	521.64	281.85	0	0.0021	···
ORDER	−260	1	521.99	522	282.21	0	0.0031	···


Amborella trichopoda
Trithuria submersa
Nymphaea odorata
Nuphar advena
Cabomba caroliniana
Brasenia schreberi
Austrobaileya scandens
Trimenia moorei
Illicium floridanum
Kadsura japonica
Schisandra chinensis
Acorus gramineus
Tofieldia calyculata
Pleea tenuifolia
Orontium aquaticum
Spathiphyllum wallisii
Lemna minor
Xanthosoma sagittifolium
Potamogeton berchtoldii
Triglochin maritima
Alisma plantagoaquatica
Hydrocharis dubia
Najas minor
Japonolirion osense
Petrosavia sakuraii
Burmannia biflora
Metanarthecium luteoviride
Tacca chantrieri
Dioscorea alata
Croomia pauciflora
Carludovica palmata
Acanthochlamys bracteata
Talbotia elegans
Xerophyta retinervis
Campynema lineare
Monocotyledonae
Angiospermae

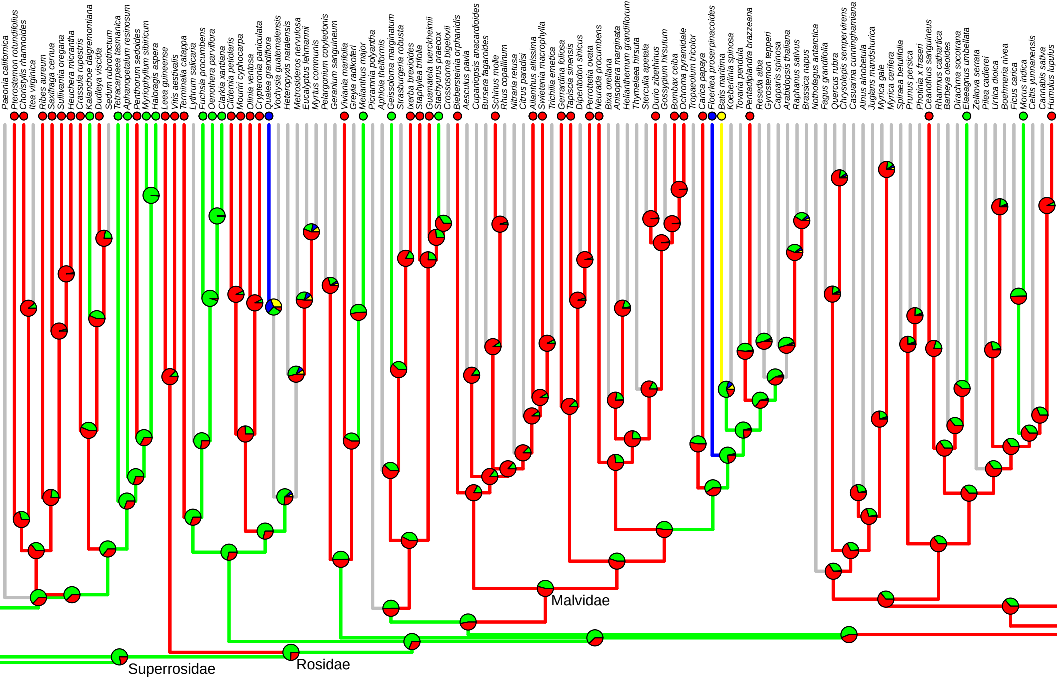

Trillium erectum
Colchicum speciosum
Alstroemeria aurea
Bomarea edulis
Lapageria rosea
Philesia magellanica
Smilax glauca
Lilium superbum
Cypripedium calceolus
Phalaenopsis aphrodite
Oncidium excavatum
Blandfordia punicea
Borya septentrionalis
Molineria capitulata
Hypoxis hemerocallidea
Rhodohypoxis milloides
Tecophilaea cyanocrocus
Ixiolirion tataricum
Gladiolus buckerveldii
Aristea glauca
Alophia drummondii
Iris missouriensis
Bulbine succulenta
Xanthorrhoea resinosa
Agave ghiesbreghtii
Yucca filamentosa
Crinum asiaticum
Allium fistulosum
Nothoscordum bivalve
Asparagus officinalis
Beaucarnea recurvata
Lomandra longifolia
Elaeis guineensis
Chamaedorea seifrizii
Caryota mitis
Trachycarpus fortunei
Phoenix dactylifera
Philydrum lanuginosum
Tradescantia spathacea
Anigozanthos flavidus
Pontederia cordata
Strelitzia reginae
Phenakospermum guyannense
Ravenala madagascariensis
Musa acuminata
Zingiber gramineum
Canna indica
Maranta cristata
Calectasia intermedia
Dasypogon bromeliifolius
Typha latifolia
Sparganium eurycarpum
Vriesea psittacina
Puya raimondii
Stegolepis ligulata
Mayaca fluviatilis
Juncus effusus
Cyperus alternifolius
Rhynchospora latifolia
Eriocaulon aquaticum
Xyris jupicai
Anarthria polyphylla
Centrolepis strigosa
Baloskion tetraphyllum
Flagellaria indica
Joinvillea plicata
Ecdeiocolea monostachya
Oryza sativa
Hordeum bulbosum
Danthonia spicata
Saccharum officinarum
Zea mays
Hedyosmum arborescens
Ascarina lucida
Sarcandra chloranthoides
Chloranthus japonicus
Cinnamodendron ekmanii
Canella winterana
Takhtajania perrieri
Tasmannia insipida
Drimys winteri
Asarum canadense
Saruma henryi
Lactoris fernandeziana
Thottea tomentosa
Aristolochia macrophylla
Peperomia caliginigaudens
Piper betle
Houttuynia cordata
Saururus cernuus
Anemopsis californica
Eupomatia bennettii
Cananga odorata
Asimina triloba
Annona muricata
Liriodendron chinense
Magnolia tripetala
Galbulimima belgraveana
Degeneria vitiensis
Myristica fragrans
Mauloutchia chapelieri
Idiospermum australiense
Calycanthus floridus
Chimonanthus praecox
Siparuna decipiens
Gomortega keule
Doryphora sassafras
Daphnandra micrantha
Atherosperma moschatum
Cryptocarya meissneriana
Cinnamomum camphora
Laurus nobilis
Sassafras albidum
Hernandia ovigera
Gyrocarpus americanus
Peumus boldus
Hedycarya arborea
Hortonia floribunda
Ceratophyllum demersum
Commelinidae
Magnoliidae
Mesangiospermae


Eschscholzia californica
Dicentra eximia
Hypecoum imberbe
Euptelea polyandra
Circaeaster agrestis
Kingdonia uniflora
Akebia quinata
Lardizabala biternata
Sargentodoxa cuneata
Decaisnea fargesii
Cissampelos pareira
Cocculus orbiculatus
Tinospora sinensis
Menispermum canadense
Mahonia bealei
Podophyllum peltatum
Caulophyllum thalictroides
Nandina domestica
Glaucidium palmatum
Hydrastis canadensis
Ranunculus acris
Xanthorhiza simplicissima
Nelumbo lutea
Platanus occidentalis
Petrophile canescens
Grevillea robusta
Roupala montana
Meliosma veitchiorum
Sabia swinhoei
Trochodendron aralioides
Tetracentron sinense
Didymeles perrieri
Buxus sempervirens
Pachysandra procumbens
Gunnera hamiltonii
Myrothamnus flabellifolia
Heisteria parvifolia
Ximenia americana
Ochanostachys amentacea
Minquartia guianensis
Coula edulis
Schoepfia schreberi
Gaiadendron punctatum
Misodendrum linearifolium
Opilia amentacea
Osyris lanceolata
Santalum album
Aextoxicon punctatum
Berberidopsis corallina
Dillenia retusa
Tetracera asiatica
Hibbertia volubilis
Drosera capensis
Nepenthes alata
Drosophyllum lusitanicum
Ancistrocladus korupensis
Triphyophyllum peltatum
Tamarix chinensis
Frankenia pulverulenta
Plumbago auriculata
Limonium arborescens
Fagopyrum esculentum
Fallopia sachalinensis
Simmondsia chinensis
Rhabdodendron amazonicum
Asteropeia micraster
Physena madagascariensis
Stellaria media
Phaulothamnus spinescens
Spinacia oleracea
Celosia argentea
Beta vulgaris
Stegnosperma halimifolium
Limeum africanum
Barbeuia madagascariensis
Corbichonia decumbens
Delosperma echinatum
Lampranthus blandus
Phytolacca americana
Sarcobatus vermiculatus
Gisekia africana
Rivina humilis
Mirabilis jalapa
Bougainvillea glabra
Mollugo verticillata
Hypertelis spergulacea
Basella alba
Anredera cordifolia
Claytonia virginica
Halophytum ameghinoi
Alluaudia procera
Talinum paniculatum
Portulaca grandiflora
Opuntia microdasys
Pereskia aculeata
Alangium chinense
Cornus mas
Grubbia tomentosa
Curtisia dentata
Nyssa ogeche
Camptotheca acuminata
Hydrostachys multifida
Fendlera rupicola
Philadelphus lewisii
Hydrangea macrophylla
Eucnide bartonioides
Mentzelia lindleyi
Petalonyx nitidus
Superasteridae
Eudicotyledonae


Impatiens repens
Marcgravia trinitatis
Tetramerista crassifolia
Lissocarpa benthamii
Diospyros lotus
Euclea crispa
Maesa tenera
Clavija eggersiana
Anagallis tenella
Primula sieboldii
Androsace spinulifera
Couroupita guianensis
Barringtonia asiatica
Fouquieria splendens
Cobaea scandens
Phlox longifolia
Gilia capitata
Polemonium reptans
Manilkara zapota
Camellia sinensis
Eurya japonica
Ternstroemia stahlii
Symplocos zizyphoides
Galax urceolata
Styrax officinalis
Halesia carolina
Sarracenia purpurea
Roridula gorgonias
Actinidia chinensis
Clethra alnifolia
Cyrilla racemiflora
Enkianthus campanulatus
Arbutus unedo
Rhododendron hippophaeoides
Vaccinium uliginosum
Oncotheca balansae
Icacina mannii
Eucommia ulmoides
Garrya elliptica
Aucuba japonica
Vahlia capensis
Montinia caryophyllacea
Hydrolea ovata
Sphenoclea zeylanica
Cuscuta cuspidata
Ipomoea alba
Petunia axillaris
Nicotiana tabacum
Nolana humifusa
Solanum dulcamara
Atropa belladonna
Borago officinalis
Ehretia acuminata
Hydrophyllum capitatum
Luculia gratissima
Coffea arabica
Galium aparine
Mitchella repens
Nerium oleander
Gentiana saponaria
Exacum affine
Gelsemium sempervirens
Spigelia marilandica
Strychnos nuxvomica
Plocosperma buxifolium
Olea europaea
Syringa vulgaris
Jasminum simplicifolium
Polypremum procumbens
Byblis liniflora
Titanotrichum oldhamii
Rhynchoglossum notonianum
Calceolaria integrifolia
Peltanthera floribunda
Antirrhinum majus
Veronica anagallisaquatica
Plantago lanceolata
Myoporum mauritianum
Scrophularia californica
Verbascum thapsus
Mazus pumilus
Lamium amplexicaule
Callicarpa dichotoma
Phryma leptostachya
Pedicularis foliosa
Paulownia tomentosa
Martynia annua
Junellia succulentifolia
Thomandersia laurifolia
Campsis radicans
Catalpa speciosa
Halleria lucida
Utricularia alpina
Pinguicula moranensis
Sesamum indicum
Thunbergia alata
Acanthus montanus
Barleria prionitis
Justicia americana
Ilex cornuta
Helwingia japonica
Phyllonoma laticuspis
Irvingbaileya australis
Gomphandra javanica
Citronella suaveolens
Gonocaryum litorale
Cardiopteris quinqueloba
Roussea simplex
Lamiidae
Asteridae
Pentapetalae



Carpodetus serratus
Abrophyllum ornans
Cuttsia viburnea
Lobelia angulata
Dialypetalum floribundum
Pseudonemacladus oppositifolius
Cyphia elata
Campanula trachelium
Campanula elatines
Pentaphragma ellipticum
Donatia fascicularis
Stylidium graminifolium
Forstera bidwillii
Phelline billardierei
Corokia cotoneaster
Argophyllum laxum
Platyspermation crassifolium
Crispiloba disperma
Alseuosmia macrophylla
Wittsteinia vacciniacea
Villarsia calthifolia
Nymphoides peltata
Menyanthes trifoliata
Nephrophyllidium cristagalli
Dampiera spicigera
Scaevola aemula
Goodenia ovata
Acicarpha tribuloides
Moschopsis rosulata
Boopis graminea
Barnadesia caryophylla
Gerbera jamesonii
Tagetes erecta
Guizotia abyssinica
Helianthus annuus
Echinops exaltatus
Tragopogon dubius
Cichorium intybus
Lactuca sativa
Anopterus macleayanus
Eremosyne pectinata
Polyosma cunninghamii
Escallonia rubra
Forgesia racemosa
Valdivia gayana
Quintinia verdonii
Sphenostemon lobosporus
Paracryphia alticola
Brunia albiflora
Berzelia lanuginosa
Desfontainia spinosa
Columellia oblonga
Viburnum acerifolium
Sambucus racemosa
Tetradoxa omeiensis
Sinadoxa corydalifolia
Adoxa moschatellina
Diervilla sessilifolia
Weigela hortensis
Leycesteria formosa
Triosteum perfoliatum
Symphoricarpos albus
Lonicera japonica
Heptacodium miconioides
Linnaea borealis
Kolkwitzia amabilis
Dipelta yunnanensis
Abelia triflora
Morina longifolia
Zabelia tyaihyonii
Triplostegia glandulifera
Scabiosa columbaria
Pterocephalodes hookeri
Dipsacus sativus
Patrinia triloba
Nardostachys chinensis
Valeriana officinalis
Centranthus ruber
Valerianella locusta
Pennantia corymbosa
Griselinia littoralis
Aralidium pinnatifidum
Melanophylla alnifolia
Torricellia tiliifolia
Billardiera heterophylla
Pittosporum tobira
Hydrocotyle vulgaris
Hedera helix
Polyscias guilfoylei
Tetrapanax papyrifer
Panax quinquefolius
Aralia spinosa
Schefflera arboricola
Cussonia spicata
Pseudopanax arboreus
Tetraplasandra hawaiensis
Delarbrea michieana
Myodocarpus fraxinifolius
Mackinlaya confusa
Platysace lanceolata
Azorella selago
Sanicula gregaria
Arctopus echinatus
Heteromorpha trifoliata
Daucus carota
Angelica sylvestris
Coriandrum sativum
Anethum graveolens
Apium graveolens
Soyauxia talbotii
Peridiscus lucidus
Cercidiphyllum japonicum
Daphniphyllum macropodum
Altingia excelsa
Liquidambar styraciflua
Exbucklandia populnea
Rhodoleia championii
Disanthus cercidifolius
Corylopsis pauciflora
Hamamelis virginiana
Campanulidae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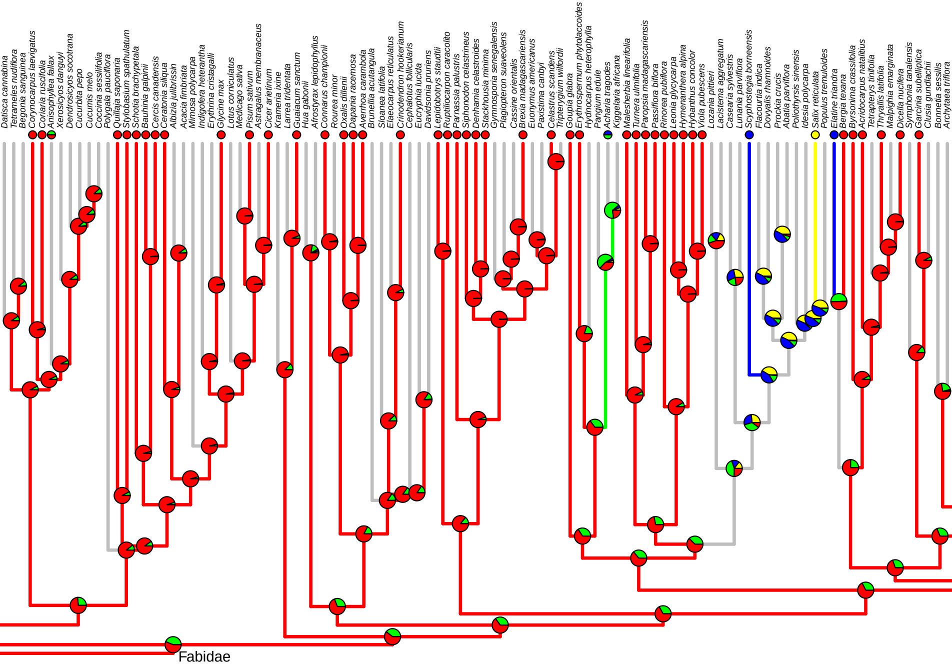
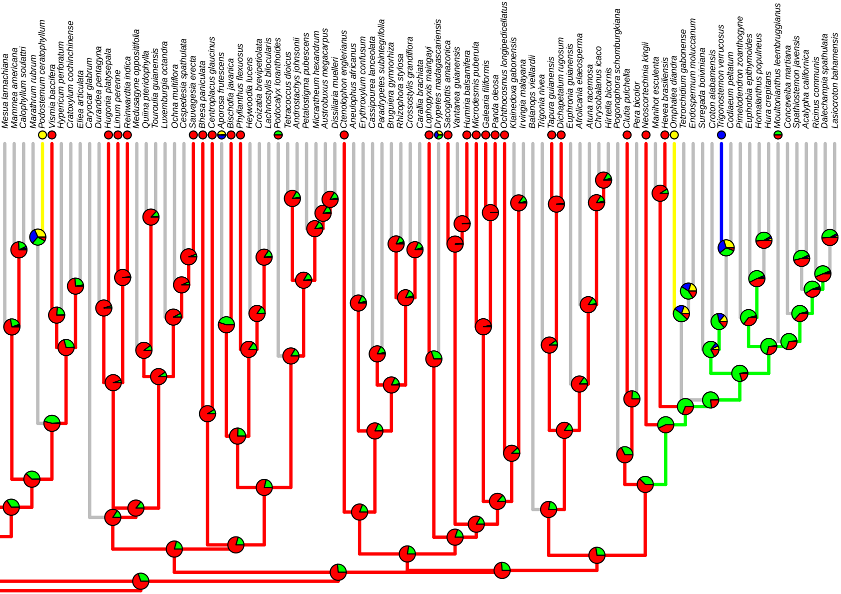
Pterostemon rotundifolius
Choristylis rhamnoides
Itea virginica
Ribes aureum
Saxifraga cernua
Sullivantia oregana
Heuchera micrantha
Crassula rupestris
Kalanchoe daigremontiana
Dudleya viscida
Sedum rubrotinctum
Tetracarpaea tasmanica
Aphanopetalum resinosum
Penthorum sedoides
Myriophyllum sibiricum
Haloragis aspera
Leea guineense
Vitis aestivalis
Terminalia catappa
Lythrum salicaria
Fuchsia procumbens
Oenothera parviflora
Clarkia xantiana
Clidemia petiolaris
Mouriri cyphocarpa
Olinia ventosa
Crypteronia paniculata
Qualea grandiflora
Vochysia guatemalensis
Heteropyxis natalensis
Metrosideros nervulosa
Eucalyptus lehmannii
Myrtus communis
Pelargonium cotyledonis
Geranium sanguineum
Viviania marifolia
Greyia radlkoferi
Melianthus major
Picramnia polyantha
Aphloia theiformis
Geissoloma marginatum
Strasburgeria robusta
Ixerba brexioides
Staphylea trifolia
Guamatela tuerckheimii
Stachyurus praecox
Crossosoma bigelovii
Biebersteinia orphanidis
Aesculus pavia
Cupaniopsis anacardioides
Bursera fagaroides
Schinus molle
Rhus copallinum
Nitraria retusa
Citrus paradisi
Ailanthus altissima
Swietenia macrophylla
Trichilia emetica
Gerrardina foliosa
Tapiscia sinensis
Dipentodon sinicus
Perrottetia ovata
Neurada procumbens
Bixa orellana
Anisoptera marginata
Helianthemum grandiflorum
Thymelaea hirsuta
Sterculia apetala
Durio zibethinus
Gossypium hirsutum
Bombax ceiba
Ochroma pyramidale
Tropaeolum tricolor
Carica papaya
Floerkea proserpinacoides
Batis maritima
Koeberlinia spinosa
Tovaria pendula
Pentadiplandra brazzeana
Reseda alba
Gyrostemon tepperi
Capparis spinosa
Arabidopsis thaliana
Raphanus sativus
Brassica napus
Nothofagus antarctica
Fagus grandifolia
Quercus rubra
Chrysolepis sempervirens
Casuarina cunninghamiana
Alnus alnobetula
Juglans mandshurica
Myrica gale
Myrica cerifera
Spiraea betulifolia
Prunus persica
Photinia x fraseri
Ceanothus sanguineus
Rhamnus cathartica
Barbeya oleoides
Dirachma socotrana
Elaeagnus umbellata
Zelkova serrata
Pilea cadierei
Urtica dioica
Boehmeria nivea
Ficus carica
Morus indica
Celtis yunnanensis
Cannabis sativa
Humulus lupulus
Malvidae
Rosidae
Superrosidae

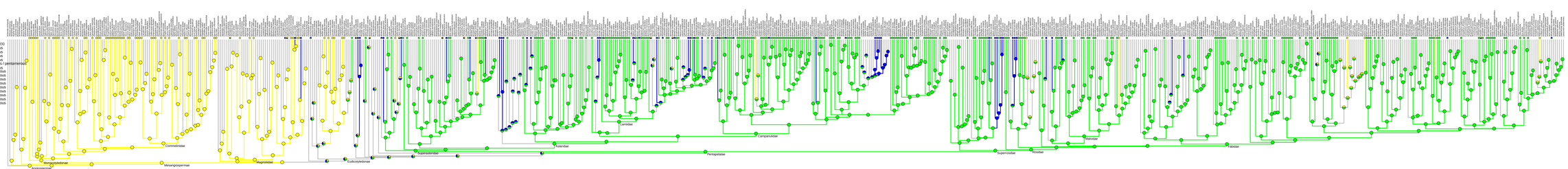

Datisca cannabina
Tetrameles nudiflora
Begonia sanguinea
Corynocarpus laevigatus
Coriaria ruscifolia
Anisophyllea fallax
Xerosicyos danguyi
Dendrosicyos socotrana
Cucurbita pepo
Cucumis melo
Coccinia sessilifolia
Polygala pauciflora
Quillaja saponaria
Stylobasium spathulatum
Schotia brachypetala
Bauhinia galpinii
Cercis canadensis
Ceratonia siliqua
Albizia julibrissin
Acacia fimbriata
Mimosa polycarpa
Indigofera heterantha
Erythrina cristagalli
Glycine max
Lotus corniculatus
Medicago sativa
Pisum sativum
Astragalus membranaceus
Cicer arietinum
Krameria ixine
Larrea tridentata
Guaiacum sanctum
Hua gabonii
Afrostyrax lepidophyllus
Connarus championii
Rourea minor
Oxalis dillenii
Dapania racemosa
Averrhoa carambola
Brunellia acutangula
Sloanea latifolia
Elaeocarpus reticulatus
Crinodendron hookerianum
Cephalotus follicularis
Eucryphia lucida
Davidsonia pruriens
Lepidobotrys staudtii
Ruptiliocarpon caracolito
Parnassia palustris
Siphonodon celastrineus
Denhamia celastroides
Stackhousia minima
Gymnosporia senegalensis
Plagiopteron suaveolens
Cassine orientalis
Brexia madagascariensis
Euonymus americanus
Paxistima canbyi
Celastrus scandens
Tripterygium wilfordii
Goupia glabra
Erythrospermum phytolaccoides
Hydnocarpus heterophylla
Pangium edule
Acharia tragodes
Kiggelaria africana
Malesherbia linearifolia
Turnera ulmifolia
Paropsia madagascariensis
Passiflora biflora
Rinorea pubiflora
Leonia glycycarpa
Hymenanthera alpina
Hybanthus concolor
Viola pubescens
Lozania pittieri
Lacistema aggregatum
Casearia sylvestris
Lunania parviflora
Scyphostegia borneensis
Flacourtia indica
Dovyalis rhamnoides
Prockia crucis
Abatia parviflora
Poliothyrsis sinensis
Idesia polycarpa
Salix reticulata
Populus tremuloides
Elatine triandra
Bergia texana
Byrsonima crassifolia
Acridocarpus natalitius
Tetrapterys tinifolia
Thryallis latifolia
Malpighia emarginata
Dicella nucifera
Symphonia tanalensis
Garcinia subelliptica
Clusia gundlachii
Bonnetia sessilis
Archytaea triflora
Fabidae


Mesua larnachiana
Mammea americana
Calophyllum soulattri
Marathrum rubrum
Podostemum ceratophyllum
Vismia baccifera
Hypericum perforatum
Cratoxylum cochinchinense
Eliea articulata
Caryocar glabrum
Durandea pentagyna
Hugonia platysepala
Linum perenne
Reinwardtia indica
Medusagyne oppositifolia
Quiina pteridophylla
Touroulia guianensis
Luxemburgia octandra
Ochna multiflora
Cespedesia spathulata
Sauvagesia erecta
Bhesa paniculata
Centroplacus glaucinus
Aporosa frutescens
Bischofia javanica
Phyllanthus flexuosus
Heywoodia lucens
Croizatia brevipetiolata
Lachnostylis bilocularis
Podocalyx loranthoides
Tetracoccus dioicus
Androstachys johnsonii
Petalostigma pubescens
Micrantheum hexandrum
Austrobuxus megacarpus
Dissiliaria muelleri
Ctenolophon englerianus
Aneulophus africanus
Erythroxylum confusum
Cassipourea lanceolata
Paradrypetes subintegrifolia
Bruguiera gymnorhiza
Rhizophora stylosa
Crossostylis grandiflora
Carallia brachiata
Lophopyxis maingayi
Drypetes madagascariensis
Sacoglottis amazonica
Vantanea guianensis
Humiria balsamifera
Microdesmis puberula
Galearia filiformis
Panda oleosa
Ochthocosmus longipedicellatus
Klainedoxa gabonensis
Irvingia malayana
Balanops vieillardii
Trigonia nivea
Tapura guianensis
Dichapetalum rugosum
Euphronia guianensis
Afrolicania elaeosperma
Atuna racemosa
Chrysobalanus icaco
Hirtella bicornis
Pogonophora schomburgkiana
Clutia pulchella
Pera bicolor
Neoscortechinia kingii
Manihot esculenta
Hevea brasiliensis
Omphalea diandra
Tetrorchidium gabonense
Endospermum moluccanum
Suregada boiviniana
Croton alabamensis
Trigonostemon verrucosus
Codiaeum peltatum
Pimelodendron zoanthogyne
Euphorbia epithymoides
Homalanthus populneus
Hura crepitans
Moultonianthus leembruggianus
Conceveiba martiana
Spathiostemon javensis
Acalypha californica
Ricinus communis
Dalechampia spathulata
Lasiocroton bahamensis

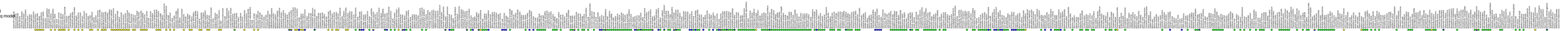
MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
332_B. Androecium structural merism (3–state) (D2c), 49 steps

trimerous
tetramerous
pentamerous

Node	MP state(s)
Angiospermae	trimerous
Mesangiospermae	trimerous
Magnoliidae	trimerous
Monocotyledonae	trimerous
Eudicotyledonae	trimerous / tetramerous / pentamerous
Commelinidae	trimerous
Ranunculidae	pentamerous
Superasteridae	pentamerous
Asteridae	pentamerous
Lamiidae	pentamerous
Campanulidae	pentamerous
Superrosidae	pentamerous
Rosidae	pentamerous
Malvidae	pentamerous
Fabidae	pentamerous



ML ancestral state reconstruction using rayDISC (R:corHMM)
332_B. Androecium structural merism (3–state) (D2c), ARDeq model



- trimerous
- tetramerous
- pentamerous

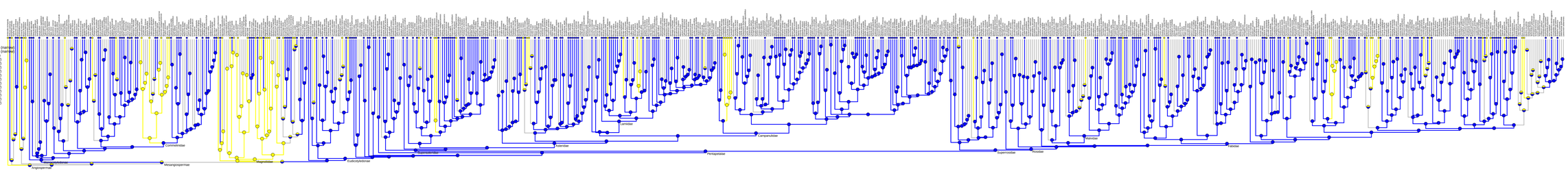
Node	ML state	Prob
Angiospermae	trimerous	1
Mesangiospermae	trimerous	1
Magnoliidae	trimerous	1
Monocotyledonae	trimerous	1
Eudicotyledonae	trimerous	0.9174
Commelinidae	trimerous	1
Pentapetalae	tetramerous	1
Superasteridae	tetramerous	1
Asteridae	tetramerous	1
Lamidae	tetramerous	0.981
Campanulidae	tetramerous	0.9402
Superrosidae	tetramerous	1
Rosidae	tetramerous	0.999
Malvidae	pentamerous	0.5079
Fabidae	tetramerous	0.9427

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	...
ARD	−171.5	6	355	355.11	2.19	0.23	9e−04	...
ARDeq*	−170.41	6	352.81	352.92	0	0.7	9e−04	...
ER	−186.49	1	374.98	374.99	22.07	0	0.0011	...
SYM	−177.31	3	360.63	360.66	7.74	0.01	5e−04	...
SYMeq	−176.22	3	358.44	358.47	5.55	0.04	5e−04	...
ORD	−178.47	4	364.95	365	12.08	0	0	...
ORDeq	−177.4	4	362.79	362.84	9.92	0	0	...
ORDSYM	−186.31	2	376.62	376.64	23.72	0	0.002	...
ORDSYMeq	−185.23	2	374.46	374.47	21.55	0	0.002	...
ORDER	−187.15	1	376.29	376.3	23.38	0	0.0027	...

MP ancestral state reconstruction using ancestral pars
(R:phangorn)
305_A. Filament (binary) (D2d), 53 steps

laminar (wide)
typical (narrow)

Node	MP state(s)
Angiospermae	laminar (wide) / typical (narrow)
Mesangiospermae	laminar (wide) / typical (narrow)
Magnoliidae	laminar (wide)
Monocotyledonae	typical (narrow)
Eudicotyledonae	typical (narrow)
Commelinidae	typical (narrow)
Gunneridae	typical (narrow)
Superasteridae	typical (narrow)
Asteridae	typical (narrow)
Lamiidae	typical (narrow)
Campanulidae	typical (narrow)
Superrosidae	typical (narrow)
Rosidae	typical (narrow)
Malvidae	typical (narrow)
Fabidae	typical (narrow)

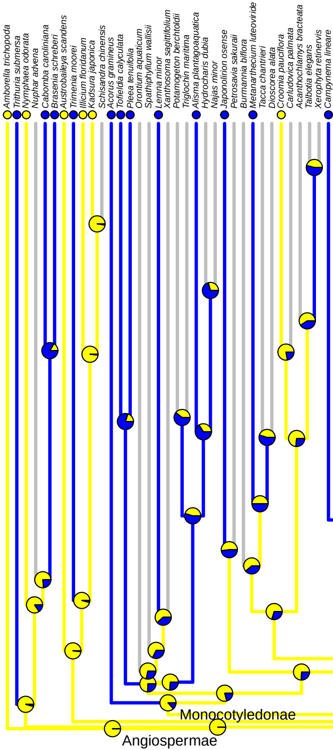


ML ancestral state reconstruction using rayDISC (R:corHMM)
305_A. Filament (binary) (D2d), ARDeq model

○ laminar (wide)
● typical (narrow)

Node	ML state	Prob
Angiospermae	laminar (wide)	1
Mesangiospermae	laminar (wide)	0.9926
Magnoliidae	laminar (wide)	0.9985
Monocotyledonae	laminar (wide)	0.867
Eudicotyledonae	typical (narrow)	0.5676
Commelinidae	laminar (wide)	0.684
Pentapetalae	typical (narrow)	0.999
Superasteridae	typical (narrow)	0.9995
Asteridae	typical (narrow)	0.9997
Lamiidae	typical (narrow)	0.997
Campanulidae	typical (narrow)	0.9961
Superrosidae	typical (narrow)	0.9995
Rosidae	typical (narrow)	0.9996
Malvidae	typical (narrow)	0.9974
Fabidae	typical (narrow)	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	−172.23	2	348.47	348.48	1.28	0.34	0.0089	0.0021
ARDeq**	−171.59	2	347.18	347.2	0	0.65	0.009	0.0021
ER	−177.9	1	357.8	357.81	10.61	0	0.0024	0.0024
UNI01	−183.93	1	369.86	369.87	22.67	0	0.0147	
UNI10	−187.81	1	377.61	377.62	30.42	0		0.0023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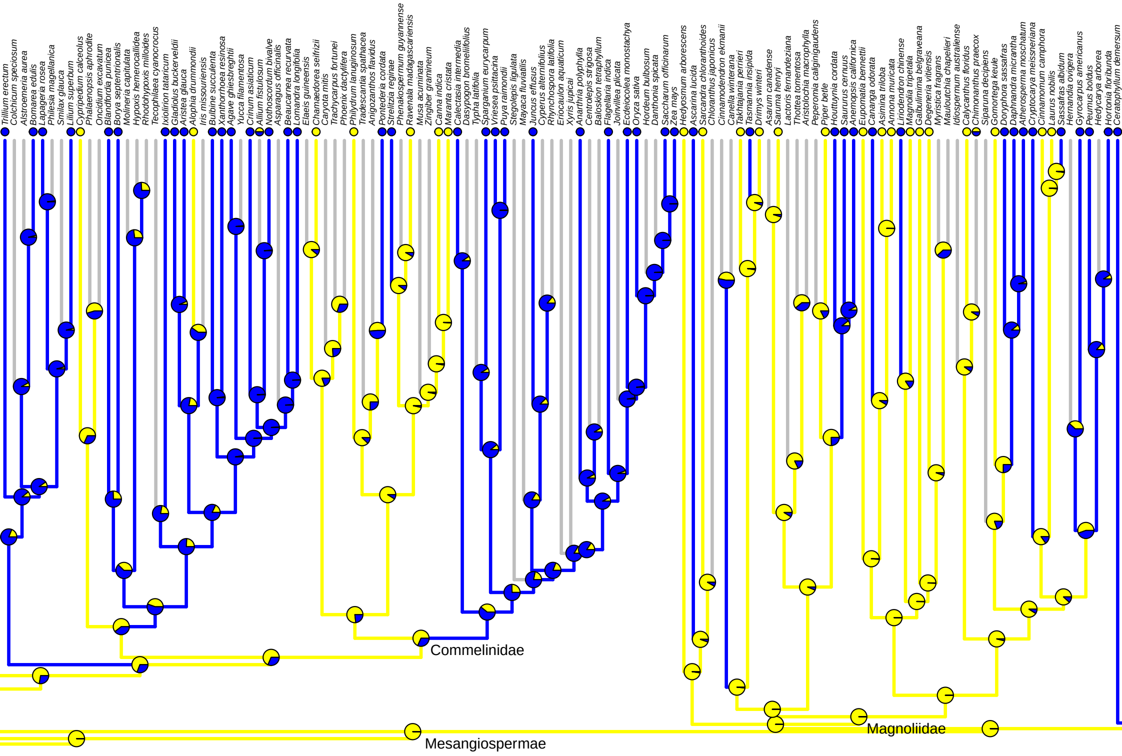
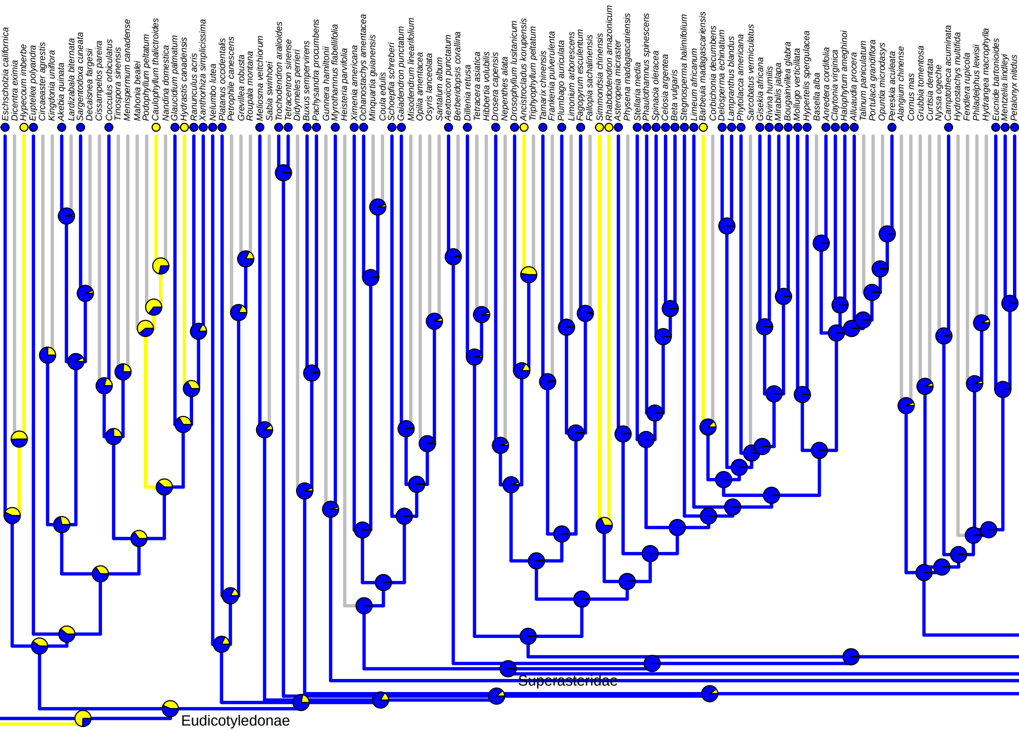
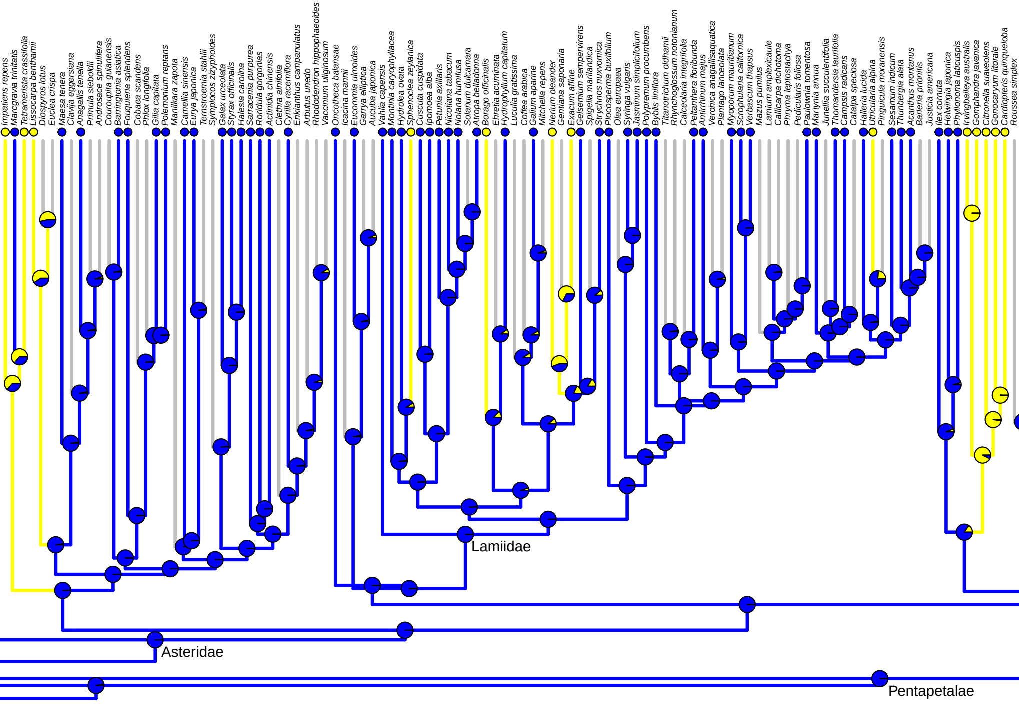
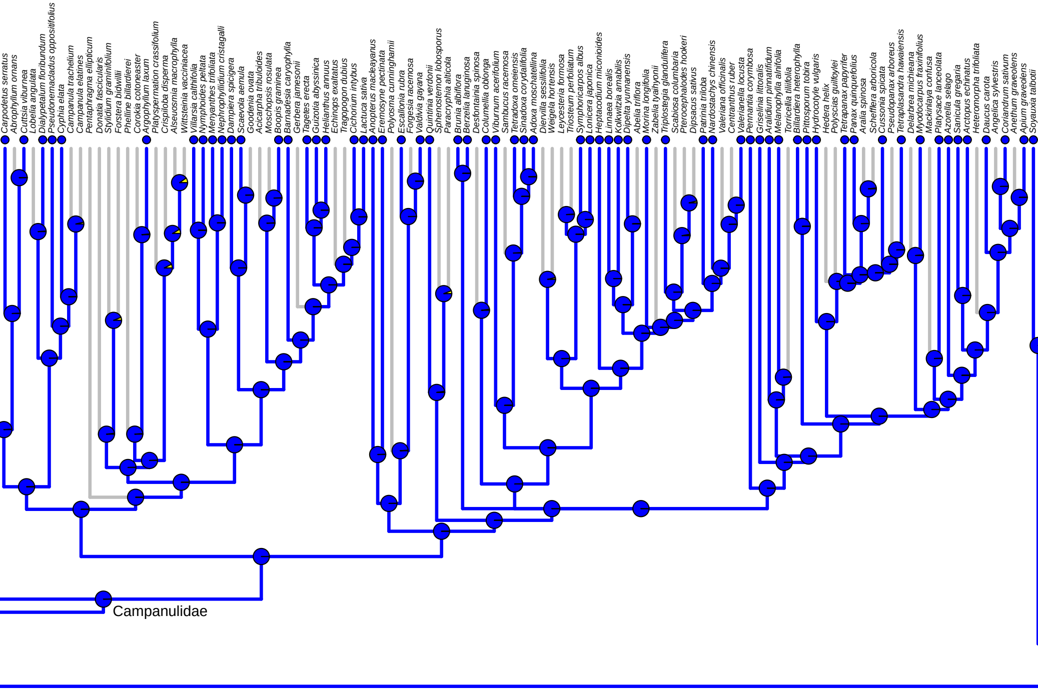
Trithuria submersa
Nymphaea odorata
Nuphar advena
Cabomba caroliniana
Brasenia schreberi
Austrobaileya scandens
Trimenia moorei
Illicium floridanum
Kadsura japonica
Schisandra chinensis
Acorus gramineus
Tofieldia calyculata
Pleea tenuifolia
Orontium aquaticum
Spathiphyllum wallisii
Lemna minor
Xanthosoma sagittifolium
Potamogeton berchtoldii
Triglochin maritima
Alisma plantagoaquatica
Hydrocharis dubia
Najas minor
Japonolirion osense
Petrosavia sakuraii
Burmannia biflora
Metanarthecium luteoviride
Tacca chantrieri
Dioscorea alata
Croomia pauciflora
Carludovica palmata
Acanthochlamys bracteata
Talbotia elegans
Xerophyta retinervis
Campynema lineare
Monocotyledonae
Angiospermae


Trillium erectum
Colchicum speciosum
Alstroemeria aurea
Bomarea edulis
Lapageria rosea
Philesia magellanica
Smilax glauca
Lilium superbum
Cypripedium calceolus
Phalaenopsis aphrodite
Oncidium excavatum
Blandfordia punicea
Borya septentrionalis
Molineria capitulata
Hypoxis hemerocallidea
Rhodohypoxis milloides
Tecophilaea cyanocrocus
Ixiolirion tataricum
Gladiolus buckerveldii
Aristea glauca
Alophia drummondii
Iris missouriensis
Bulbine succulenta
Xanthorrhoea resinosa
Agave ghiesbreghtii
Yucca filamentosa
Crinum asiaticum
Allium fistulosum
Nothoscordum bivalve
Asparagus officinalis
Beaucarnea recurvata
Lomandra longifolia
Elaeis guineensis
Chamaedorea seifrizii
Caryota mitis
Trachycarpus fortunei
Phoenix dactylifera
Philydrum lanuginosum
Tradescantia spathacea
Anigozanthos flavidus
Pontederia cordata
Strelitzia reginae
Phenakospermum guyannense
Ravenala madagascariensis
Musa acuminata
Zingiber gramineum
Canna indica
Maranta cristata
Calectasia intermedia
Dasypogon bromeliifolius
Typha latifolia
Sparganium eurycarpum
Vriesea psittacina
Puya raimondii
Stegolepis ligulata
Mayaca fluviatilis
Juncus effusus
Cyperus alternifolius
Rhynchospora latifolia
Eriocaulon aquaticum
Xyris jupicai
Anarthria polyphylla
Centrolepis strigosa
Baloskion tetraphyllum
Flagellaria indica
Joinvillea plicata
Ecdeiocolea monostachya
Oryza sativa
Hordeum bulbosum
Danthonia spicata
Saccharum officinarum
Zea mays
Hedyosmum arborescens
Ascarina lucida
Sarcandra chloranthoides
Chloranthus japonicus
Cinnamodendron ekmanii
Canella winterana
Takhtajania perrieri
Tasmannia insipida
Drimys winteri
Asarum canadense
Saruma henryi
Lactoris fernandeziana
Thottea tomentosa
Aristolochia macrophylla
Peperomia caliginigaudens
Piper betle
Houttuynia cordata
Saururus cernuus
Anemopsis californica
Eupomatia bennettii
Cananga odorata
Asimina triloba
Annona muricata
Liriodendron chinense
Magnolia tripetala
Galbulimima belgraveana
Degeneria vitiensis
Myristica fragrans
Mauloutchia chapelieri
Idiospermum australiense
Calycanthus floridus
Chimonanthus praecox
Siparuna decipiens
Gomortega keule
Doryphora sassafras
Daphnandra micrantha
Atherosperma moschatum
Cryptocarya meissneriana
Cinnamomum camphora
Laurus nobilis
Sassafras albidum
Hernandia ovigera
Gyrocarpus americanus
Peumus boldus
Hedycarya arborea
Hortonia floribunda
Ceratophyllum demersum
Commelinidae
Magnoliidae
Mesangiospermae




Impatiens repens
Marcgravia trinitatis
Tetramerista crassifolia
Lissocarpa benthamii
Diospyros lotus
Euclea crispa
Maesa tenera
Clavija eggersiana
Anagallis tenella
Primula sieboldii
Androsace spinulifera
Couroupita guianensis
Barringtonia asiatica
Fouquieria splendens
Cobaea scandens
Phlox longifolia
Gilia capitata
Polemonium reptans
Manilkara zapota
Camellia sinensis
Eurya japonica
Ternstroemia stahlii
Symplocos zizyphoides
Galax urceolata
Styrax officinalis
Halesia carolina
Sarracenia purpurea
Roridula gorgonias
Actinidia chinensis
Clethra alnifolia
Cyrilla racemiflora
Enkianthus campanulatus
Arbutus unedo
Rhododendron hippophaeoides
Vaccinium uliginosum
Oncotheca balansae
Icacina mannii
Eucommia ulmoides
Garrya elliptica
Aucuba japonica
Vahlia capensis
Montinia caryophyllacea
Hydrolea ovata
Sphenoclea zeylanica
Cuscuta cuspidata
Ipomoea alba
Petunia axillaris
Nicotiana tabacum
Nolana humifusa
Solanum dulcamara
Atropa belladonna
Borago officinalis
Ehretia acuminata
Hydrophyllum capitatum
Luculia gratissima
Coffea arabica
Galium aparine
Mitchella repens
Nerium oleander
Gentiana saponaria
Exacum affine
Gelsemium sempervirens
Spigelia marilandica
Strychnos nuxvomica
Plocosperma buxifolium
Olea europaea
Syringa vulgaris
Jasminum simplicifolium
Polypremum procumbens
Byblis liniflora
Titanotrichum oldhamii
Rhynchoglossum notonianum
Calceolaria integrifolia
Peltanthera floribunda
Antirrhinum majus
Veronica anagallisaquatica
Plantago lanceolata
Myoporum mauritianum
Scrophularia californica
Verbascum thapsus
Mazus pumilus
Lamium amplexicaule
Callicarpa dichotoma
Phryma leptostachya
Pedicularis foliosa
Paulownia tomentosa
Martynia annua
Junellia succulentifolia
Thomandersia laurifolia
Campsis radicans
Catalpa speciosa
Halleria lucida
Utricularia alpina
Pinguicula moranensis
Sesamum indicum
Thunbergia alata
Acanthus montanus
Barleria prionitis
Justicia americana
Ilex cornuta
Helwingia japonica
Phyllonoma laticuspis
Irvingbaileya australis
Gomphandra javanica
Citronella suaveolens
Gonocaryum litorale
Cardiopteris quinqueloba
Roussea simplex
Lamiidae
Asteridae
Pentapetalae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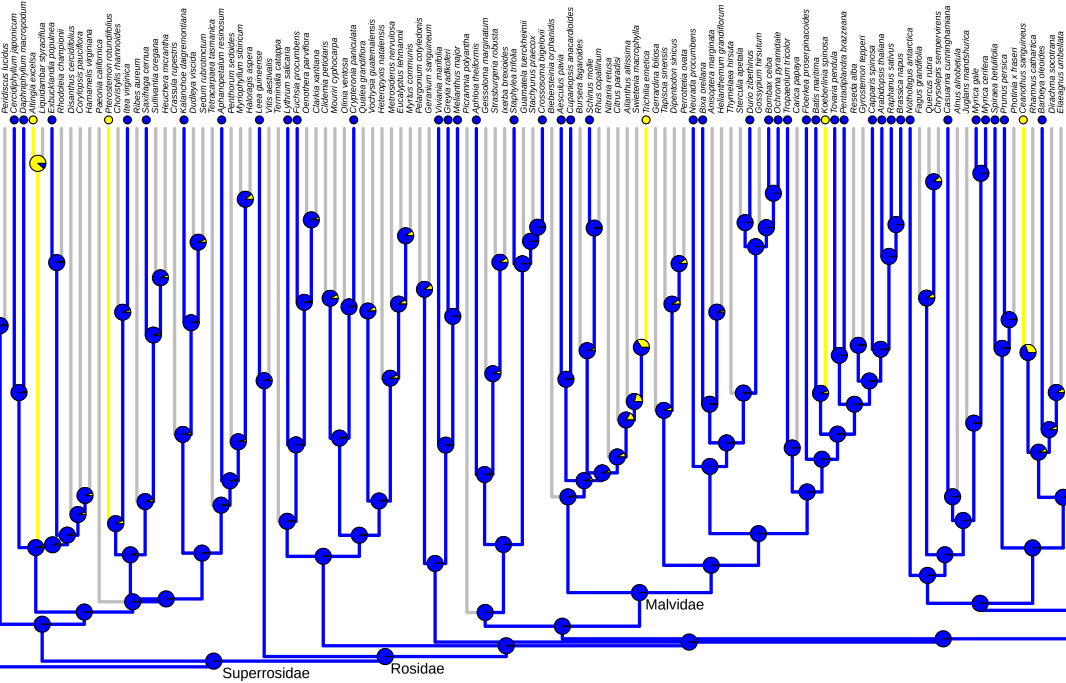
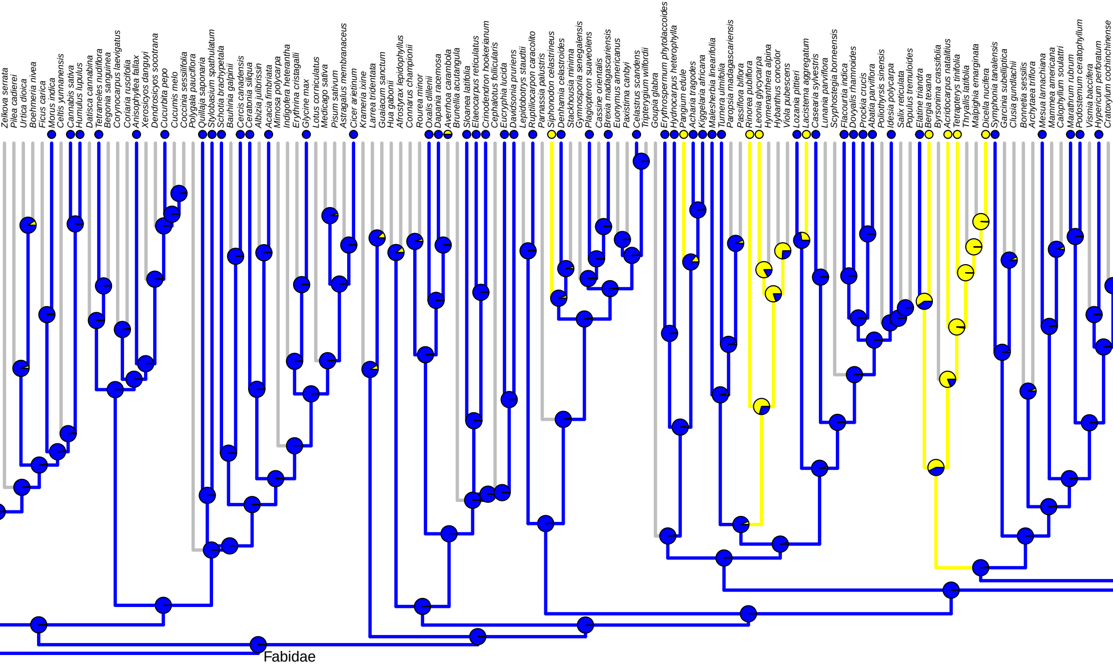
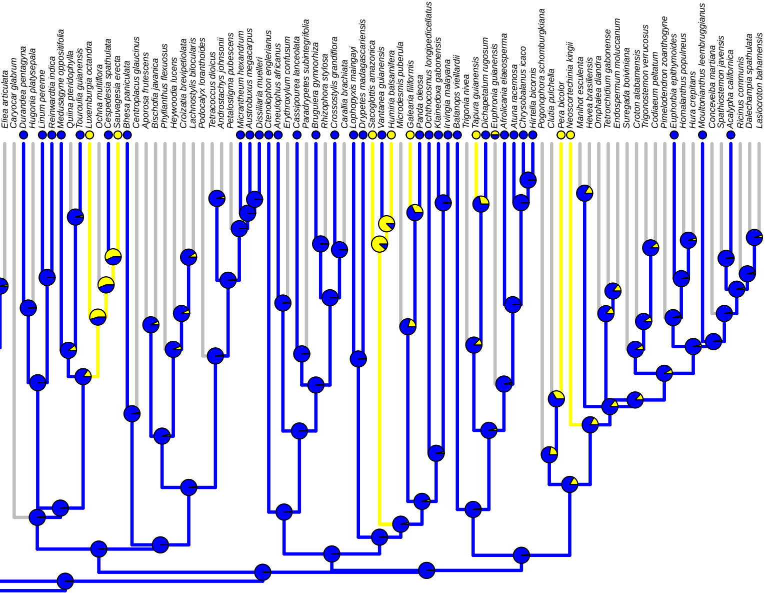
Cuttsia viburnea
Lobelia angulata
Dialypetalum floribundum
Pseudonemacladus oppositifolius
Cyphia elata
Campanula trachelium
Campanula elatines
Pentaphragma ellipticum
Donatia fascicularis
Stylidium graminifolium
Forstera bidwillii
Phelline billardierei
Corokia cotoneaster
Argophyllum laxum
Platyspermation crassifolium
Crispiloba disperma
Alseuosmia macrophylla
Wittsteinia vacciniacea
Villarsia calthifolia
Nymphoides peltata
Menyanthes trifoliata
Nephrophyllidium cristagalli
Dampiera spicigera
Scaevola aemula
Goodenia ovata
Acicarpha tribuloides
Moschopsis rosulata
Boopis graminea
Barnadesia caryophylla
Gerbera jamesonii
Tagetes erecta
Guizotia abyssinica
Helianthus annuus
Echinops exaltatus
Tragopogon dubius
Cichorium intybus
Lactuca sativa
Anopterus macleayanus
Eremosyne pectinata
Polyosma cunninghamii
Escallonia rubra
Forgesia racemosa
Valdivia gayana
Quintinia verdonii
Sphenostemon lobosporus
Paracryphia alticola
Brunia albiflora
Berzelia lanuginosa
Desfontainia spinosa
Columellia oblonga
Viburnum acerifolium
Sambucus racemosa
Tetradoxa omeiensis
Sinadoxa corydalifolia
Adoxa moschatellina
Diervilla sessilifolia
Weigela hortensis
Leycesteria formosa
Triosteum perfoliatum
Symphoricarpos albus
Lonicera japonica
Heptacodium miconioides
Linnaea borealis
Kolkwitzia amabilis
Dipelta yunnanensis
Abelia triflora
Morina longifolia
Zabelia tyaihyonii
Triplostegia glandulifera
Scabiosa columbaria
Pterocephalodes hookeri
Dipsacus sativus
Patrinia triloba
Nardostachys chinensis
Valeriana officinalis
Centranthus ruber
Valerianella locusta
Pennantia corymbosa
Griselinia littoralis
Aralidium pinnatifidum
Melanophylla alnifolia
Torricellia tiliifolia
Billardiera heterophylla
Pittosporum tobira
Hydrocotyle vulgaris
Hedera helix
Polyscias guilfoylei
Tetrapanax papyrifer
Panax quinquefolius
Aralia spinosa
Schefflera arboricola
Cussonia spicata
Pseudopanax arboreus
Tetraplasandra hawaiensis
Delarbrea michieana
Myodocarpus fraxinifolius
Mackinlaya confusa
Platysace lanceolata
Azorella selago
Sanicula gregaria
Arctopus echinatus
Heteromorpha trifoliata
Daucus carota
Angelica sylvestris
Coriandrum sativum
Anethum graveolens
Apium graveolens
Soyauxia talbotii
Campanulidae


Peridiscus lucidus
Cercidiphyllum japonicum
Daphniphyllum macropodum
Altingia excelsa
Liquidambar styraciflua
Exbucklandia populnea
Rhodoleia championii
Disanthus cercidifolius
Corylopsis pauciflora
Hamamelis virginiana
Paeonia californica
Pterostemon rotundifolius
Choristylis rhamnoides
Itea virginica
Ribes aureum
Saxifraga cernua
Sullivantia oregana
Heuchera micrantha
Crassula rupestris
Kalanchoe daigremontiana
Dudleya viscida
Sedum rubrotinctum
Tetracarpaea tasmanica
Aphanopetalum resinosum
Penthorum sedoides
Myriophyllum sibiricum
Haloragis aspera
Leea guineense
Vitis aestivalis
Terminalia catappa
Lythrum salicaria
Fuchsia procumbens
Oenothera parviflora
Clarkia xantiana
Clidemia petiolaris
Mouriri cyphocarpa
Olinia ventosa
Crypteronia paniculata
Qualea grandiflora
Vochysia guatemalensis
Heteropyxis natalensis
Metrosideros nervulosa
Eucalyptus lehmannii
Myrtus communis
Pelargonium cotyledonis
Geranium sanguineum
Viviania marifolia
Greyia radlkoferi
Melianthus major
Picramnia polyantha
Aphloia theiformis
Geissoloma marginatum
Strasburgeria robusta
Ixerba brexioides
Staphylea trifolia
Guamatela tuerckheimii
Stachyurus praecox
Crossosoma bigelovii
Biebersteinia orphanidis
Aesculus pavia
Cupaniopsis anacardioides
Bursera fagaroides
Schinus molle
Rhus copallinum
Nitraria retusa
Citrus paradisi
Ailanthus altissima
Swietenia macrophylla
Trichilia emetica
Gerrardina foliosa
Tapiscia sinensis
Dipentodon sinicus
Perrottetia ovata
Neurada procumbens
Bixa orellana
Anisoptera marginata
Helianthemum grandiflorum
Thymelaea hirsuta
Sterculia apetala
Durio zibethinus
Gossypium hirsutum
Bombax ceiba
Ochroma pyramidale
Tropaeolum tricolor
Carica papaya
Floerkea proserpinacoides
Batis maritima
Koeberlinia spinosa
Tovaria pendula
Pentadiplandra brazzeana
Reseda alba
Gyrostemon tepperi
Capparis spinosa
Arabidopsis thaliana
Raphanus sativus
Brassica napus
Nothofagus antarctica
Fagus grandifolia
Quercus rubra
Chrysolepis sempervirens
Casuarina cunninghamiana
Alnus alnobetula
Juglans mandshurica
Myrica gale
Myrica cerifera
Spiraea betulifolia
Prunus persica
Photinia x fraseri
Ceanothus sanguineus
Rhamnus cathartica
Barbeya oleoides
Dirachma socotrana
Elaeagnus umbellata
Malvidae
Superrosidae
Rosidae

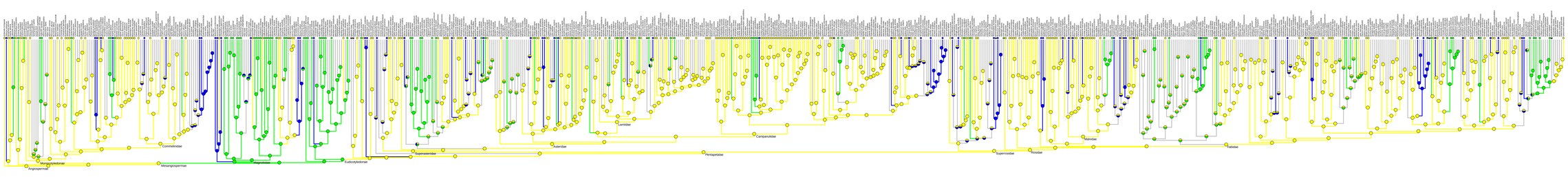

Zelkova serrata
Pilea cadierei
Urtica dioica
Boehmeria nivea
Ficus carica
Morus indica
Celtis yunnanensis
Cannabis sativa
Humulus lupulus
Datisca cannabina
Tetrameles nudiflora
Begonia sanguinea
Corynocarpus laevigatus
Coriaria ruscifolia
Anisophyllea fallax
Xerosicyos danguyi
Dendrosicyos socotrana
Cucurbita pepo
Cucumis melo
Coccinia sessilifolia
Polygala pauciflora
Quillaja saponaria
Stylobasium spathulatum
Schotia brachypetala
Bauhinia galpinii
Cercis canadensis
Ceratonia siliqua
Albizia julibrissin
Acacia fimbriata
Mimosa polycarpa
Indigofera heterantha
Erythrina cristagalli
Glycine max
Lotus corniculatus
Medicago sativa
Pisum sativum
Astragalus membranaceus
Cicer arietinum
Krameria ixine
Larrea tridentata
Guaiacum sanctum
Hua gabonii
Afrostyrax lepidophyllus
Connarus championii
Rourea minor
Oxalis dillenii
Dapania racemosa
Averrhoa carambola
Brunellia acutangula
Sloanea latifolia
Elaeocarpus reticulatus
Crinodendron hookerianum
Cephalotus follicularis
Eucryphia lucida
Davidsonia pruriens
Lepidobotrys staudtii
Ruptiliocarpon caracolito
Parnassia palustris
Siphonodon celastrineus
Denhamia celastroides
Stackhousia minima
Gymnosporia senegalensis
Plagiopteron suaveolens
Cassine orientalis
Brexia madagascariensis
Euonymus americanus
Paxistima canbyi
Celastrus scandens
Tripterygium wilfordii
Goupia glabra
Erythrospermum phytolaccoides
Hydnocarpus heterophylla
Pangium edule
Acharia tragodes
Kiggelaria africana
Malesherbia linearifolia
Turnera ulmifolia
Paropsia madagascariensis
Passiflora biflora
Rinorea pubiflora
Leonia glycycarpa
Hymenanthera alpina
Hybanthus concolor
Viola pubescens
Lozania pittieri
Lacistema aggregatum
Casearia sylvestris
Lunania parviflora
Scyphostegia borneensis
Flacourtia indica
Dovyalis rhamnoides
Prockia crucis
Abatia parviflora
Poliothyrsis sinensis
Idesia polycarpa
Salix reticulata
Populus tremuloides
Elatine triandra
Bergia texana
Byrsonima crassifolia
Acridocarpus natalitius
Tetrapterys tinifolia
Thryallis latifolia
Malpighia emarginata
Dicella nucifera
Symphonia tanalensis
Garcinia subelliptica
Clusia gundlachii
Bonnetia sessilis
Archytaea triflora
Mesua larnachiana
Mammea americana
Calophyllum soulattri
Marathrum rubrum
Podostemum ceratophyllum
Vismia baccifera
Hypericum perforatum
Cratoxylum cochinchinense
Fabidae


Eliea articulata
Caryocar glabrum
Durandea pentagyna
Hugonia platysepala
Linum perenne
Reinwardtia indica
Medusagyne oppositifolia
Quiina pteridophylla
Touroulia guianensis
Luxemburgia octandra
Ochna multiflora
Cespedesia spathulata
Sauvagesia erecta
Bhesa paniculata
Centroplacus glaucinus
Aporosa frutescens
Bischofia javanica
Phyllanthus flexuosus
Heywoodia lucens
Croizatia brevipetiolata
Lachnostylis bilocularis
Podocalyx loranthoides
Tetracoccus dioicus
Androstachys johnsonii
Petalostigma pubescens
Micrantheum hexandrum
Austrobuxus megacarpus
Dissiliaria muelleri
Ctenolophon englerianus
Aneulophus africanus
Erythroxylum confusum
Cassipourea lanceolata
Paradrypetes subintegrifolia
Bruguiera gymnorhiza
Rhizophora stylosa
Crossostylis grandiflora
Carallia brachiata
Lophopyxis maingayi
Drypetes madagascariensis
Sacoglottis amazonica
Vantanea guianensis
Humiria balsamifera
Microdesmis puberula
Galearia filiformis
Panda oleosa
Ochthocosmus longipedicellatus
Klainedoxa gabonensis
Irvingia malayana
Balanops vieillardii
Trigonia nivea
Tapura guianensis
Dichapetalum rugosum
Euphronia guianensis
Afrolicania elaeosperma
Atuna racemosa
Chrysobalanus icaco
Hirtella bicornis
Pogonophora schomburgkiana
Clutia pulchella
Pera bicolor
Neoscortechinia kingii
Manihot esculenta
Hevea brasiliensis
Omphalea diandra
Tetrorchidium gabonense
Endospermum moluccanum
Suregada boiviniana
Croton alabamensis
Trigonostemon verrucosus
Codiaeum peltatum
Pimelodendron zoanthogyne
Euphorbia epithymoides
Homalanthus populneus
Hura crepitans
Moultonianthus leembruggianus
Conceveiba martiana
Spathiostemon javensis
Acalypha californica
Ricinus communis
Dalechampia spathulata
Lasiocroton bahamensis

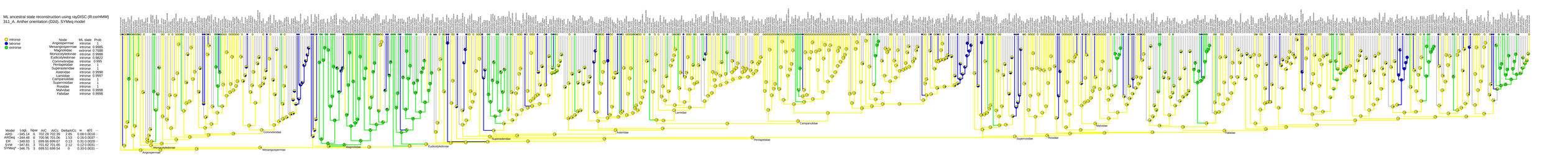
MP ancestral state reconstruction using ancestral.pars (R:phangorn)
311_A. Anther orientation (D2d), 109 steps

introrse
latrorse
extrorse

Node	MP state(s)
Angiospermae	introrse
Mesangiospermae	introrse
Magnoliidae	extrorse
Monocotyledoneae	introrse
Eudicotyledoneae	extrorse
Commelinidae	introrse
Ranunculidae	introrse
Superasteridae	introrse
Asteridae	introrse
Lamiidae	introrse
Campanulidae	introrse
Superrosidae	introrse
Rosidae	introrse
Malvidae	introrse
Fabidae	introrse



ML ancestral state reconstruction using rayDISC (R:corHMM)
311_A. Anther orientation (D2d), SYMeq model



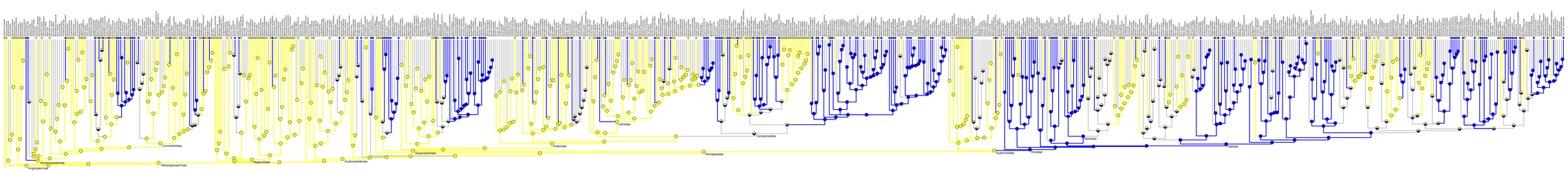
Node	ML state	Prob
Angiospermae	introrse	1
Mesangiospermae	introrse	0.9985
Magnoliidae	extrorse	0.7688
Monocotyledonae	introrse	0.9988
Eudicotyledonae	introrse	0.9822
Commelinidae	introrse	0.995
Ceratophyllum	latrorse	1
Superasteridae	introrse	1
Asteridae	introrse	0.9998
Lamidae	introrse	0.9997
Campanulidae	introrse	1
Gentianidae	introrse	1
Rosidae	introrse	1
Malvidae	introrse	0.9998
Fabidae	introrse	0.9998

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	--
ARD	-345.14	6	702.28	702.39	2.85	0.08	0.0018	---
ARDeq	-344.46	6	700.96	701.06	1.53	0.16	0.0037	---
ER	-348.83	1	699.66	699.67	0.13	0.31	0.0028	---
SYM	-347.81	3	701.62	701.65	2.12	0.12	0.0031	---
SYMeq*	-346.75	3	699.51	699.54	0	0.33	0.0031	---

MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
312_A. Anther attachment (binary) (D2d), 97 steps

basifixed
dorsifixed

Node	MP state(s)
Angiospermae	basifixed
Mesangiospermae	basifixed
Magnoliidae	basifixed
Monocotyledonae	basifixed
Eudicotyledonae	basifixed
Commelinidae	basifixed
Ceratophyllidae	basifixed
Superasteridae	basifixed
Asteridae	basifixed
Lamiidae	basifixed
Campanulidae	basifixed / dorsifixed
Pentapetalae	dorsifixed
Rosidae	dorsifixed
Malvidae	dorsifixed
Fabidae	dorsifixed

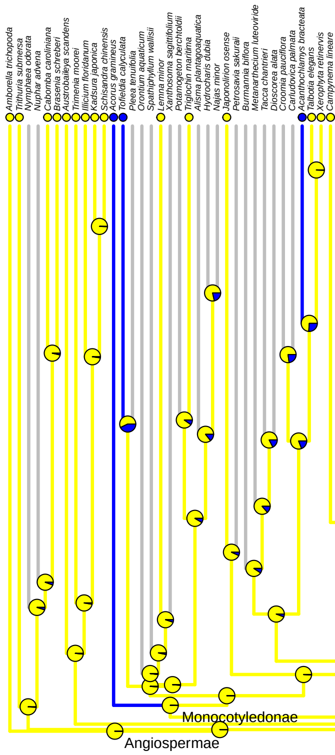


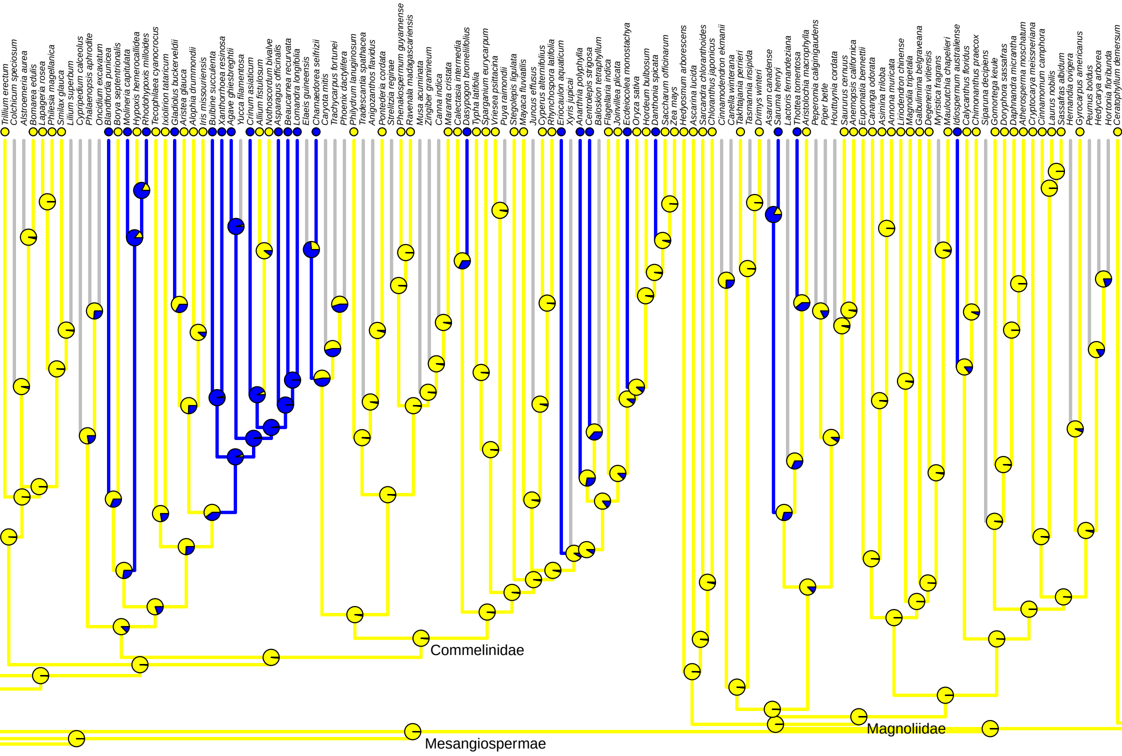
ML ancestral state reconstruction using rayDISC (R:corHMM)
312_A. Anther attachment (binary) (D2d), ARDeq model

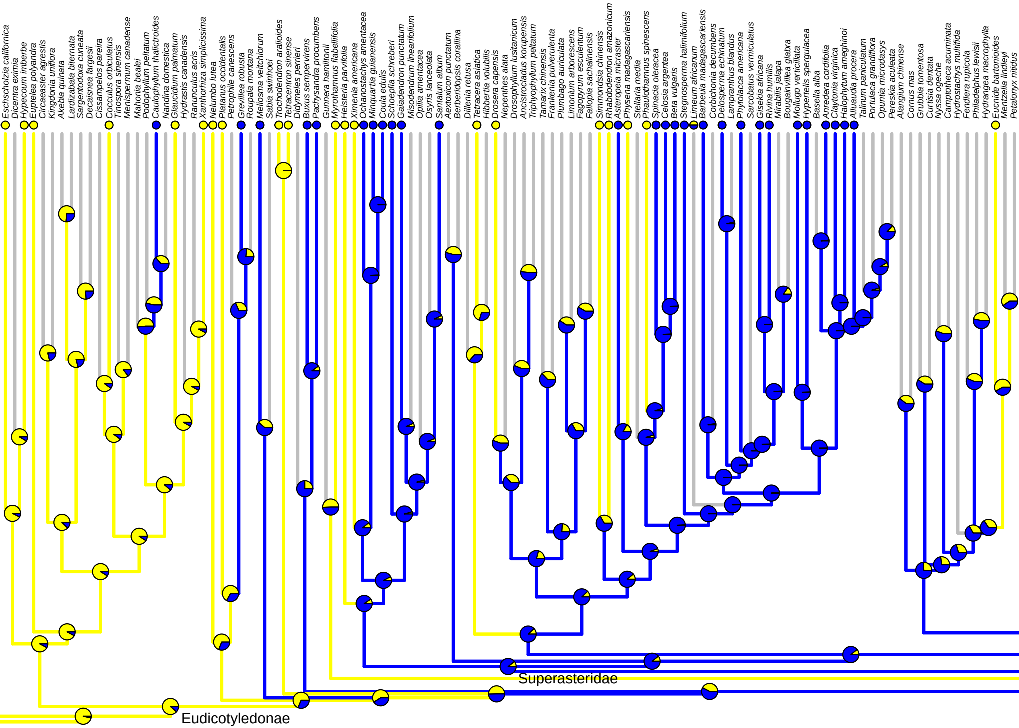
🟡 basifixed
🔵 dorsifixed

Node	ML state	Prob
Angiospermae	basifixed	1
Mesangiospermae	basifixed	0.9995
Magnoliidae	basifixed	0.999
Monocotyledonae	basifixed	0.9958
Eudicotyledonae	basifixed	0.8848
Commelinidae	basifixed	0.9837
Pentapetalae	dorsifixed	0.8862
Superasteridae	dorsifixed	0.8927
Asteridae	dorsifixed	0.874
Lamiidae	dorsifixed	0.5707
Campanulidae	dorsifixed	0.9576
Superrosidae	dorsifixed	0.895
Rosidae	dorsifixed	0.9396
Malvidae	dorsifixed	0.9775
Fabidae	dorsifixed	0.9997

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	−265.1	2	534.19	534.21	1.34	0.28	0.0043	0.0075
ARDeq**	−264.43	2	532.85	532.87	0	0.55	0.0043	0.0074
ER	−266.63	1	535.26	535.26	2.39	0.17	0.0055	0.0055
UNI01	−293.34	1	588.69	588.69	55.82	0	0.0062	
UNI10	−276.78	1	555.56	555.57	22.7	0		0.0081




Trillium erectum
Colchicum speciosum
Alstroemeria aurea
Bomarea edulis
Lapageria rosea
Philesia magellanica
Smilax glauca
Lilium superbum
Cypripedium calceolus
Phalaenopsis aphrodite
Oncidium excavatum
Blandfordia punicea
Borya septentrionalis
Molineria capitulata
Hypoxis hemerocallidea
Rhodohypoxis milloides
Tecophilaea cyanocrocus
Ixiolirion tataricum
Gladiolus buckerveldii
Aristea glauca
Alophia drummondii
Iris missouriensis
Bulbine succulenta
Xanthorrhoea resinosa
Agave ghiesbreghtii
Yucca filamentosa
Crinum asiaticum
Allium fistulosum
Nothoscordum bivalve
Asparagus officinalis
Beaucarnea recurvata
Lomandra longifolia
Elaeis guineensis
Chamaedorea seifrizii
Caryota mitis
Trachycarpus fortunei
Phoenix dactylifera
Philydrum lanuginosum
Tradescantia spathacea
Anigozanthos flavidus
Pontederia cordata
Strelitzia reginae
Phenakospermum guyannense
Ravenala madagascariensis
Musa acuminata
Zingiber gramineum
Canna indica
Maranta cristata
Calectasia intermedia
Dasypogon bromeliifolius
Typha latifolia
Sparganium eurycarpum
Vriesea psittacina
Puya raimondii
Stegolepis ligulata
Mayaca fluviatilis
Juncus effusus
Cyperus alternifolius
Rhynchospora latifolia
Eriocaulon aquaticum
Xyris jupicai
Anarthria polyphylla
Centrolepis strigosa
Baloskion tetraphyllum
Flagellaria indica
Joinvillea plicata
Ecdeiocolea monostachya
Oryza sativa
Hordeum bulbosum
Danthonia spicata
Saccharum officinarum
Zea mays
Hedyosmum arborescens
Ascarina lucida
Sarcandra chloranthoides
Chloranthus japonicus
Cinnamodendron ekmanii
Canella winterana
Takhtajania perrieri
Tasmannia insipida
Drimys winteri
Asarum canadense
Saruma henryi
Lactoris fernandeziana
Thottea tomentosa
Aristolochia macrophylla
Peperomia caliginigaudens
Piper betle
Houttuynia cordata
Saururus cernuus
Anemopsis californica
Eupomatia bennettii
Cananga odorata
Asimina triloba
Annona muricata
Liriodendron chinense
Magnolia tripetala
Galbulimima belgraveana
Degeneria vitiensis
Myristica fragrans
Mauloutchia chapelieri
Idiospermum australiense
Calycanthus floridus
Chimonanthus praecox
Siparuna decipiens
Gomortega keule
Doryphora sassafras
Daphnandra micrantha
Atherosperma moschatum
Cryptocarya meissneriana
Cinnamomum camphora
Laurus nobilis
Sassafras albidum
Hernandia ovigera
Gyrocarpus americanus
Peumus boldus
Hedycarya arborea
Hortonia floribunda
Ceratophyllum demersum
Commelinidae
Magnoliidae
Mesangiospermae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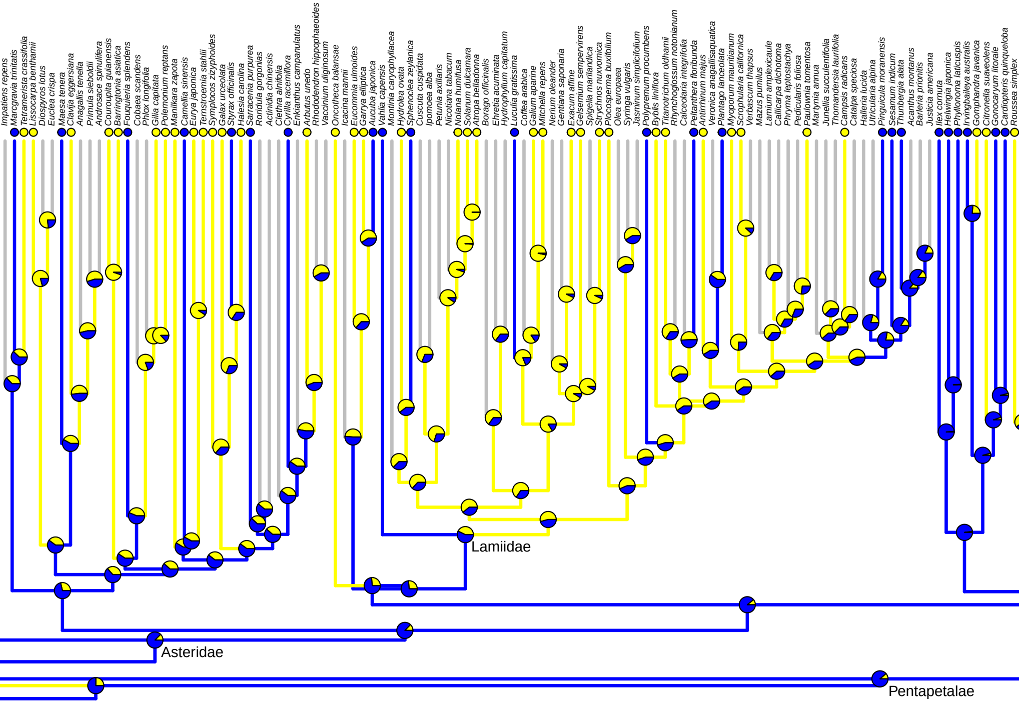
Sargentodoxa cuneata
Decaisnea fargesii
Cissampelos pareira
Cocculus orbiculatus
Tinospora sinensis
Menispermum canadense
Mahonia bealei
Podophyllum peltatum
Caulophyllum thalictroides
Nandina domestica
Glaucidium palmatum
Hydrastis canadensis
Ranunculus acris
Xanthorhiza simplicissima
Nelumbo lutea
Platanus occidentalis
Petrophile canescens
Grevillea robusta
Roupala montana
Meliosma veitchiorum
Sabia swinhoei
Trochodendron aralioides
Tetracentron sinense
Didymeles perrieri
Buxus sempervirens
Pachysandra procumbens
Gunnera hamiltonii
Myrothamnus flabellifolia
Heisteria parvifolia
Ximenia americana
Ochanostachys amentacea
Minquartia guianensis
Coula edulis
Schoepfia schreberi
Gaiadendron punctatum
Misodendrum linearifolium
Opilia amentacea
Osyris lanceolata
Santalum album
Aextoxicon punctatum
Berberidopsis corallina
Dillenia retusa
Tetracera asiatica
Hibbertia volubilis
Drosera capensis
Nepenthes alata
Drosophyllum lusitanicum
Ancistrocladus korupensis
Triphyophyllum peltatum
Tamarix chinensis
Frankenia pulverulenta
Plumbago auriculata
Limonium arborescens
Fagopyrum esculentum
Fallopia sachalinensis
Simmondsia chinensis
Rhabdodendron amazonicum
Asteropeia micraster
Physena madagascariensis
Stellaria media
Phaulothamnus spinescens
Spinacia oleracea
Celosia argentea
Beta vulgaris
Stegnosperma halimifolium
Limeum africanum
Barbeuia madagascariensis
Corbichonia decumbens
Delosperma echinatum
Lampranthus blandus
Phytolacca americana
Sarcobatus vermiculatus
Gisekia africana
Rivina humilis
Mirabilis jalapa
Bougainvillea glabra
Mollugo verticillata
Hypertelis spergulacea
Basella alba
Anredera cordifolia
Claytonia virginica
Halophytum ameghinoi
Alluaudia procera
Talinum paniculatum
Portulaca grandiflora
Opuntia microdasys
Pereskia aculeata
Alangium chinense
Cornus mas
Grubbia tomentosa
Curtisia dentata
Nyssa ogeche
Camptotheca acuminata
Hydrostachys multifida
Fendlera rupicola
Philadelphus lewisii
Hydrangea macrophylla
Eucnide bartonioides
Mentzelia lindleyi
Petalonyx nitidus
Superasteridae
Eudicotyledonae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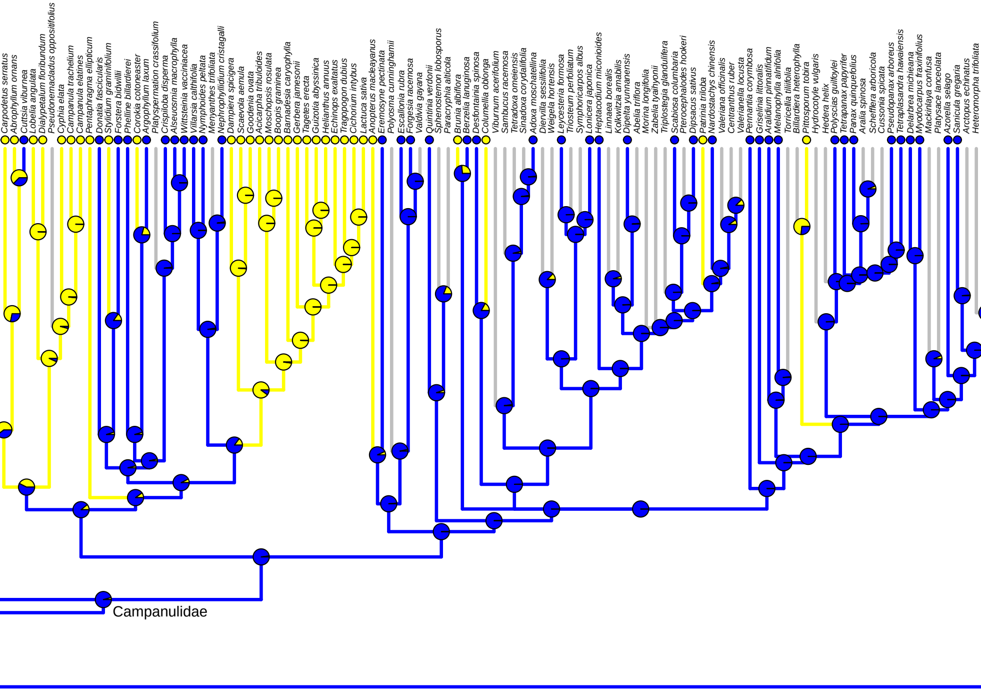
Anagallis tenella
Primula sieboldii
Androsace spinulifera
Couroupita guianensis
Barringtonia asiatica
Fouquieria splendens
Cobaea scandens
Phlox longifolia
Gilia capitata
Polemonium reptans
Manilkara zapota
Camellia sinensis
Eurya japonica
Ternstroemia stahlii
Symplocos zizyphoides
Galax urceolata
Styrax officinalis
Halesia carolina
Sarracenia purpurea
Roridula gorgonias
Actinidia chinensis
Clethra alnifolia
Cyrilla racemiflora
Enkianthus campanulatus
Arbutus unedo
Rhododendron hippophaeoides
Vaccinium uliginosum
Oncotheca balansae
Icacina mannii
Eucommia ulmoides
Garrya elliptica
Aucuba japonica
Vahlia capensis
Montinia caryophyllacea
Hydrolea ovata
Sphenoclea zeylanica
Cuscuta cuspidata
Ipomoea alba
Petunia axillaris
Nicotiana tabacum
Nolana humifusa
Solanum dulcamara
Atropa belladonna
Borago officinalis
Ehretia acuminata
Hydrophyllum capitatum
Luculia gratissima
Coffea arabica
Galium aparine
Mitchella repens
Nerium oleander
Gentiana saponaria
Exacum affine
Gelsemium sempervirens
Spigelia marilandica
Strychnos nuxvomica
Plocosperma buxifolium
Olea europaea
Syringa vulgaris
Jasminum simplicifolium
Polypremum procumbens
Byblis liniflora
Titanotrichum oldhamii
Rhynchoglossum notonianum
Calceolaria integrifolia
Peltanthera floribunda
Antirrhinum majus
Veronica anagallisaquatica
Plantago lanceolata
Myoporum mauritianum
Scrophularia californica
Verbascum thapsus
Mazus pumilus
Lamium amplexicaule
Callicarpa dichotoma
Phryma leptostachya
Pedicularis foliosa
Paulownia tomentosa
Martynia annua
Junellia succulentifolia
Thomandersia laurifolia
Campsis radicans
Catalpa speciosa
Halleria lucida
Utricularia alpina
Pinguicula moranensis
Sesamum indicum
Thunbergia alata
Acanthus montanus
Barleria prionitis
Justicia americana
Ilex cornuta
Helwingia japonica
Phyllonoma laticuspis
Irvingbaileya australis
Gomphandra javanica
Citronella suaveolens
Gonocaryum litorale
Cardiopteris quinqueloba
Roussea simplex
Lamiidae
Asteridae
Pentapetalae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Cuttsia viburnea
Lobelia angulata
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Cyphia elata
Campanula trachelium
Campanula elatines
Pentaphragma ellipticum
Donatia fascicularis
Stylidium graminifolium
Forstera bidwillii
Phelline billardierei
Corokia cotoneaster
Argophyllum laxum
Platyspermation crassifolium
Crispiloba disperma
Alseuosmia macrophylla
Wittsteinia vacciniacea
Villarsia calthifolia
Nymphoides peltata
Menyanthes trifoliata
Nephrophyllidium cristagalli
Dampiera spicigera
Scaevola aemula
Goodenia ovata
Acicarpha tribuloides
Moschopsis rosulata
Boopis graminea
Barnadesia caryophylla
Gerbera jamesonii
Tagetes erecta
Guizotia abyssinica
Helianthus annuus
Echinops exaltatus
Tragopogon dubius
Cichorium intybus
Lactuca sativa
Anopterus macleayanus
Eremosyne pectinata
Polyosma cunninghamii
Escallonia rubra
Forgesia racemosa
Valdivia gayana
Quintinia verdonii
Sphenostemon lobosporus
Paracryphia alticola
Brunia albiflora
Berzelia lanuginosa
Desfontainia spinosa
Columellia oblonga
Viburnum acerifolium
Sambucus racemosa
Tetradoxa omeiensis
Sinadoxa corydalifolia
Adoxa moschatellina
Diervilla sessilifolia
Weigela hortensis
Leycesteria formosa
Triosteum perfoliatum
Symphoricarpos albus
Lonicera japonica
Heptacodium miconioides
Linnaea borealis
Kolkwitzia amabilis
Dipelta yunnanensis
Abelia triflora
Morina longifolia
Zabelia tyaihyonii
Triplostegia glandulifera
Scabiosa columbaria
Pterocephalodes hookeri
Dipsacus sativus
Patrinia triloba
Nardostachys chinensis
Valeriana officinalis
Centranthus ruber
Valerianella locusta
Pennantia corymbosa
Griselinia littoralis
Aralidium pinnatifidum
Melanophylla alnifolia
Torricellia tiliifolia
Billardiera heterophylla
Pittosporum tobira
Hydrocotyle vulgaris
Hedera helix
Polyscias guilfoylei
Tetrapanax papyrifer
Panax quinquefolius
Aralia spinosa
Schefflera arboricola
Cussonia spicata
Pseudopanax arboreus
Tetraplasandra hawaiensis
Delarbrea michieana
Myodocarpus fraxinifolius
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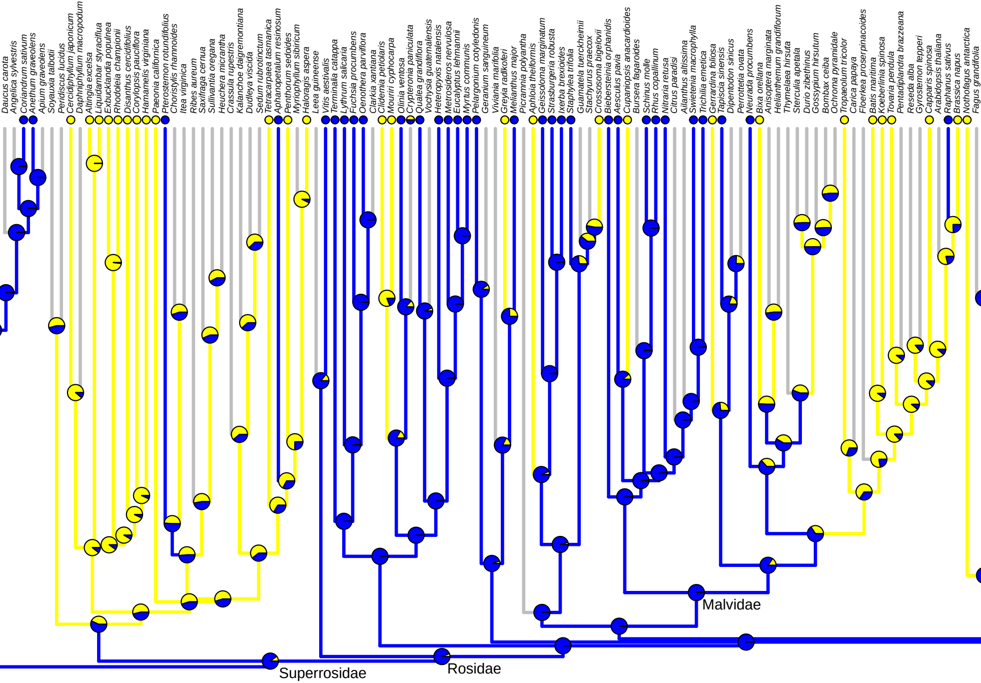
Heteromorpha trifoliata
Campanulidae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Anethum graveolens
Apium graveolens
Soyauxia talbotii
Peridiscus lucidus
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Daphniphyllum macropodum
Altingia excelsa
Liquidambar styraciflua
Exbucklandia populnea
Rhodoleia championii
Disanthus cercidifolius
Corylopsis pauciflora
Hamamelis virginiana
Paeonia californica
Pterostemon rotundifolius
Choristylis rhamnoides
Itea virginica
Ribes aureum
Saxifraga cernua
Sullivantia oregana
Heuchera micrantha
Crassula rupestris
Kalanchoe daigremontiana
Dudleya viscida
Sedum rubrotinctum
Tetracarpaea tasmanica
Aphanopetalum resinosum
Penthorum sedoides
Myriophyllum sibiricum
Haloragis aspera
Leea guineense
Vitis aestivalis
Terminalia catappa
Lythrum salicaria
Fuchsia procumbens
Oenothera parviflora
Clarkia xantiana
Clidemia petiolaris
Mouriri cyphocarpa
Olinia ventosa
Crypteronia paniculata
Qualea grandiflora
Vochysia guatemalensis
Heteropyxis natalensis
Metrosideros nervulosa
Eucalyptus lehmannii
Myrtus communis
Pelargonium cotyledonis
Geranium sanguineum
Viviania marifolia
Greyia radlkoferi
Melianthus major
Picramnia polyantha
Aphloia theiformis
Geissoloma marginatum
Strasburgeria robusta
Ixerba brexioides
Staphylea trifolia
Guamatela tuerckheimii
Stachyurus praecox
Crossosoma bigelovii
Biebersteinia orphanidis
Aesculus pavia
Cupaniopsis anacardioides
Bursera fagaroides
Schinus molle
Rhus copallinum
Nitraria retusa
Citrus paradisi
Ailanthus altissima
Swietenia macrophylla
Trichilia emetica
Gerrardina foliosa
Tapiscia sinensis
Dipentodon sinicus
Perrottetia ovata
Neurada procumbens
Bixa orellana
Anisoptera marginata
Helianthemum grandiflorum
Thymelaea hirsuta
Sterculia apetala
Durio zibethinus
Gossypium hirsutum
Bombax ceiba
Ochroma pyramidale
Tropaeolum tricolor
Carica papaya
Floerkea proserpinacoides
Batis maritima
Koeberlinia spinosa
Tovaria pendula
Pentadiplandra brazzeana
Reseda alba
Gyrostemon tepperi
Capparis spinosa
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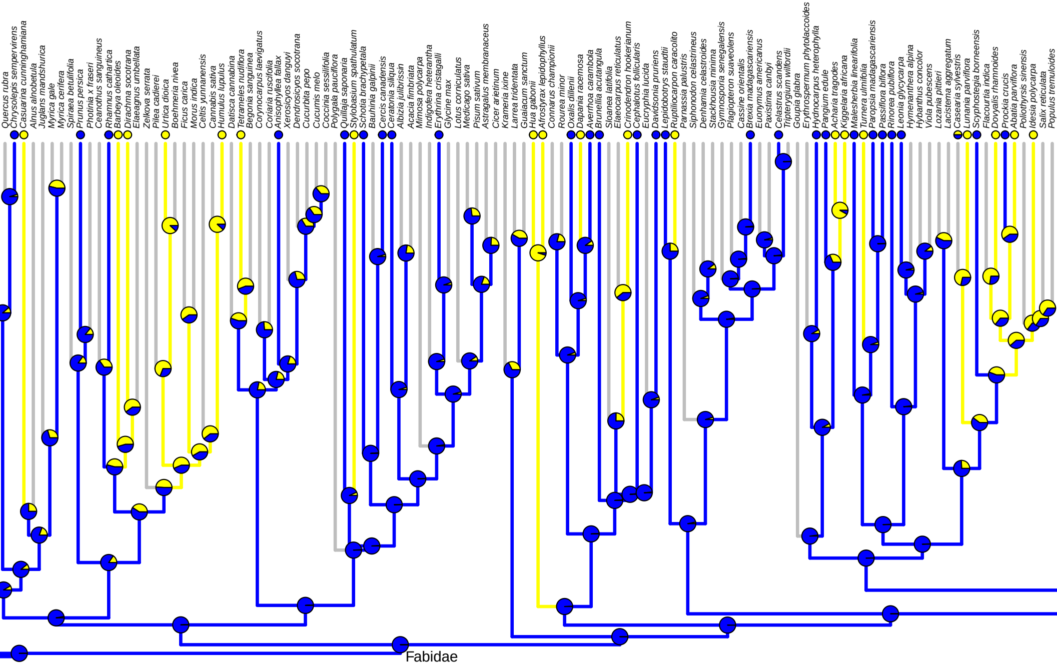
Raphanus sativus
Brassica napus
Nothofagus antarctica
Fagus grandifolia
Malvidae
Superrosidae
Rosidae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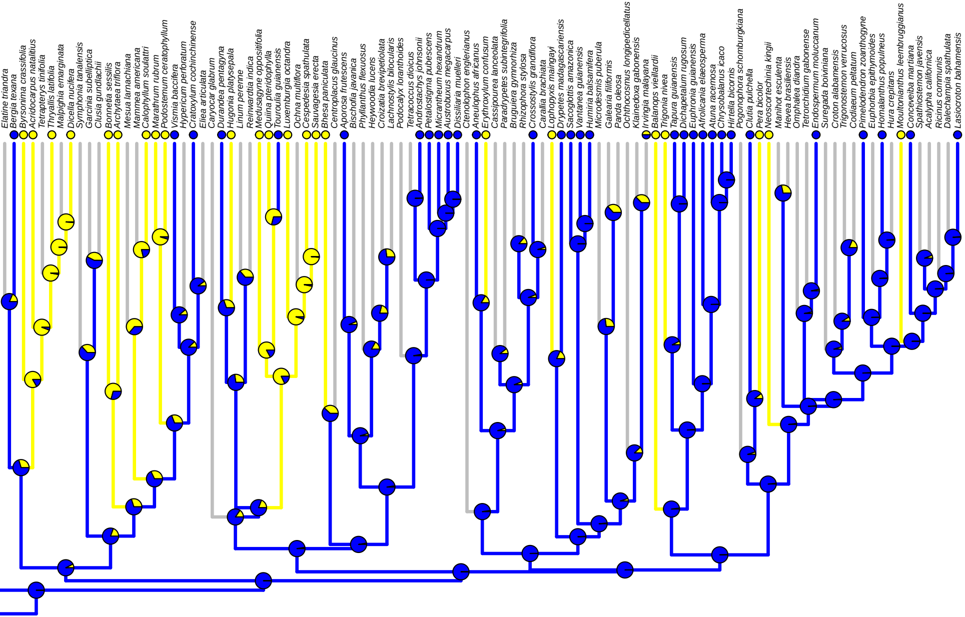
Prunus persica
Photinia x fraseri
Ceanothus sanguineus
Rhamnus cathartica
Barbeya oleoides
Dirachma socotrana
Elaeagnus umbellata
Zelkova serrata
Pilea cadierei
Urtica dioica
Boehmeria nivea
Ficus carica
Morus indica
Celtis yunnanensis
Cannabis sativa
Humulus lupulus
Datisca cannabina
Tetrameles nudiflora
Begonia sanguinea
Corynocarpus laevigatus
Coriaria ruscifolia
Anisophyllea fallax
Xerosicyos danguyi
Dendrosicyos socotrana
Cucurbita pepo
Cucumis melo
Coccinia sessilifolia
Polygala pauciflora
Quillaja saponaria
Stylobasium spathulatum
Schotia brachypetala
Bauhinia galpinii
Cercis canadensis
Ceratonia siliqua
Albizia julibrissin
Acacia fimbriata
Mimosa polycarpa
Indigofera heterantha
Erythrina cristagalli
Glycine max
Lotus corniculatus
Medicago sativa
Pisum sativum
Astragalus membranaceus
Cicer arietinum
Krameria ixine
Larrea tridentata
Guaiacum sanctum
Hua gabonii
Afrostyrax lepidophyllus
Connarus championii
Rourea minor
Oxalis dillenii
Dapania racemosa
Averrhoa carambola
Brunellia acutangula
Sloanea latifolia
Elaeocarpus reticulatus
Crinodendron hookerianum
Cephalotus follicularis
Eucryphia lucida
Davidsonia pruriens
Lepidobotrys staudtii
Ruptiliocarpon caracolito
Parnassia palustris
Siphonodon celastrineus
Denhamia celastroides
Stackhousia minima
Gymnosporia senegalensis
Plagiopteron suaveolens
Cassine orientalis
Brexia madagascariensis
Euonymus americanus
Paxistima canbyi
Celastrus scandens
Tripterygium wilfordii
Goupia glabra
Erythrospermum phytolaccoides
Hydnocarpus heterophylla
Pangium edule
Acharia tragodes
Kiggelaria africana
Malesherbia linearifolia
Turnera ulmifolia
Paropsia madagascariensis
Passiflora biflora
Rinorea pubiflora
Hymenanthera alpina
Leonia glycycarpa
Hybanthus concolor
Viola pubescens
Lozania pittieri
Lacistema aggregatum
Casearia sylvestris
Lunania parviflora
Scyphostegia borneensis
Flacourtia indica
Dovyalis rhamnoides
Prockia crucis
Abatia parviflora
Poliothyrsis sinensis
Idesia polycarpa
Salix reticulata
Populus tremuloides
Fabidae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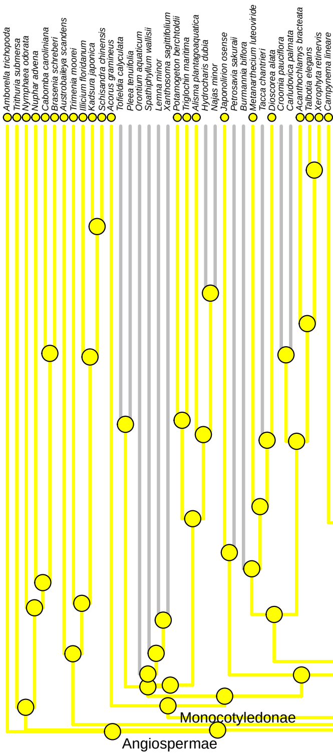
Symphonia tanalensis
Garcinia subelliptica
Clusia gundlachii
Bonnetia sessilis
Archytaea triflora
Mesua larnachiana
Mammea americana
Calophyllum soulattri
Marathrum rubrum
Podostemum ceratophyllum
Vismia baccifera
Hypericum perforatum
Cratoxylum cochinchinense
Eliea articulata
Caryocar glabrum
Durandea pentagyna
Hugonia platysepala
Linum perenne
Reinwardtia indica
Medusagyne oppositifolia
Quiina pteridophylla
Touroulia guianensis
Luxemburgia octandra
Ochna multiflora
Cespedesia spathulata
Sauvagesia erecta
Bhesa paniculata
Centroplacus glaucinus
Aporosa frutescens
Bischofia javanica
Phyllanthus flexuosus
Heywoodia lucens
Croizatia brevipetiolata
Lachnostylis bilocularis
Podocalyx loranthoides
Tetracoccus dioicus
Androstachys johnsonii
Petalostigma pubescens
Micrantheum hexandrum
Austrobuxus megacarpus
Dissiliaria muelleri
Ctenolophon englerianus
Aneulophus africanus
Erythroxylum confusum
Cassipourea lanceolata
Paradrypetes subintegrifolia
Bruguiera gymnorhiza
Rhizophora stylosa
Crossostylis grandiflora
Carallia brachiata
Lophopyxis maingayi
Drypetes madagascariensis
Sacoglottis amazonica
Vantanea guianensis
Humiria balsamifera
Microdesmis puberula
Galearia filiformis
Panda oleosa
Ochthocosmus longipedicellatus
Klainedoxa gabonensis
Irvingia malayana
Balanops vieillardii
Trigonia nivea
Tapura guianensis
Dichapetalum rugosum
Euphronia guianensis
Afrolicania elaeosperma
Atuna racemosa
Chrysobalanus icaco
Hirtella bicornis
Pogonophora schomburgkiana
Clutia pulchella
Pera bicolor
Neoscortechinia kingii
Manihot esculenta
Hevea brasiliensis
Omphalea diandra
Tetrorchidium gabonense
Endospermum moluccanum
Suregada boiviniana
Croton alabamensis
Trigonostemon verrucosus
Codiaeum peltatum
Pimelodendron zoanthogyne
Euphorbia epithymoides
Homalanthus populneus
Hura crepitans
Moultonianthus leembruggianus
Conceveiba martiana
Spathiostemon javensis
Acalypha californica
Ricinus communis
Dalechampia spathulata
Lasiocroton bahamensis

MP ancestral state reconstruction using ancestral.pars (R:phangorn)
313_A. Anther dehiscence (3−state) (D2d), 10 steps

- 🟡 longitudinal slit
- 🔵 H−valvate
- 🟢 flap−valvate

Node	MP state(s)
Angiospermae	longitudinal slit
Mesangiospermae	longitudinal slit
Magnoliidae	longitudinal slit
Monocotyledonae	longitudinal slit
Eudicotyledonae	longitudinal slit
Commelinidae	longitudinal slit
Pentapetalae	longitudinal slit
Superasteridae	longitudinal slit
Asteridae	longitudinal slit
Lamiidae	longitudinal slit
Campanulidae	longitudinal slit
Superrosidae	longitudinal slit
Rosidae	longitudinal slit
Malvidae	longitudinal slit
Fabidae	longitudinal slit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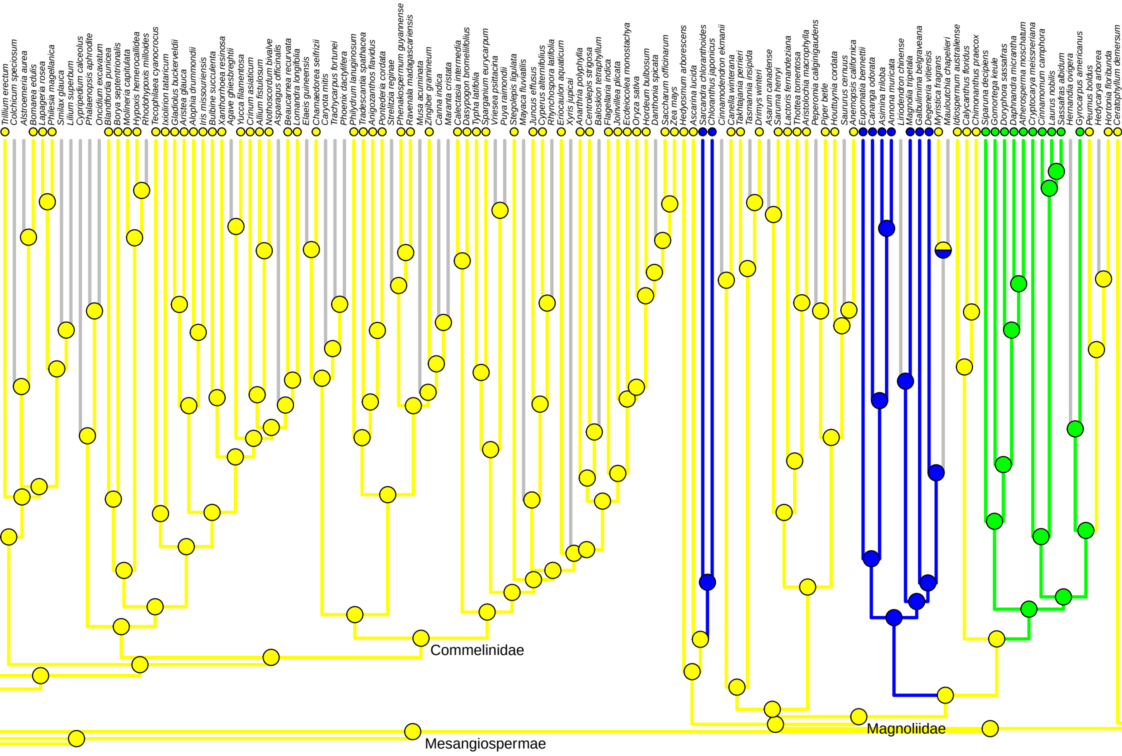
Trithuria submersa
Nymphaea odorata
Nuphar advena
Cabomba caroliniana
Brasenia schreberi
Austrobaileya scandens
Trimenia moorei
Illicium floridanum
Kadsura japonica
Schisandra chinensis
Acorus gramineus
Tofieldia calyculata
Pleea tenuifolia
Orontium aquaticum
Spathiphyllum wallisii
Lemna minor
Xanthosoma sagittifolium
Potamogeton berchtoldii
Triglochin maritima
Alisma plantagoaquatica
Hydrocharis dubia
Najas minor
Japonolirion osense
Petrosavia sakuraii
Burmannia biflora
Metanarthecium luteoviride
Tacca chantrieri
Dioscorea alata
Croomia pauciflora
Carludovica palmata
Acanthochlamys bracteata
Talbotia elegans
Xerophyta retinervis
Campynema lineare
Monocotyledonae
Angiospermae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Bomarea edulis
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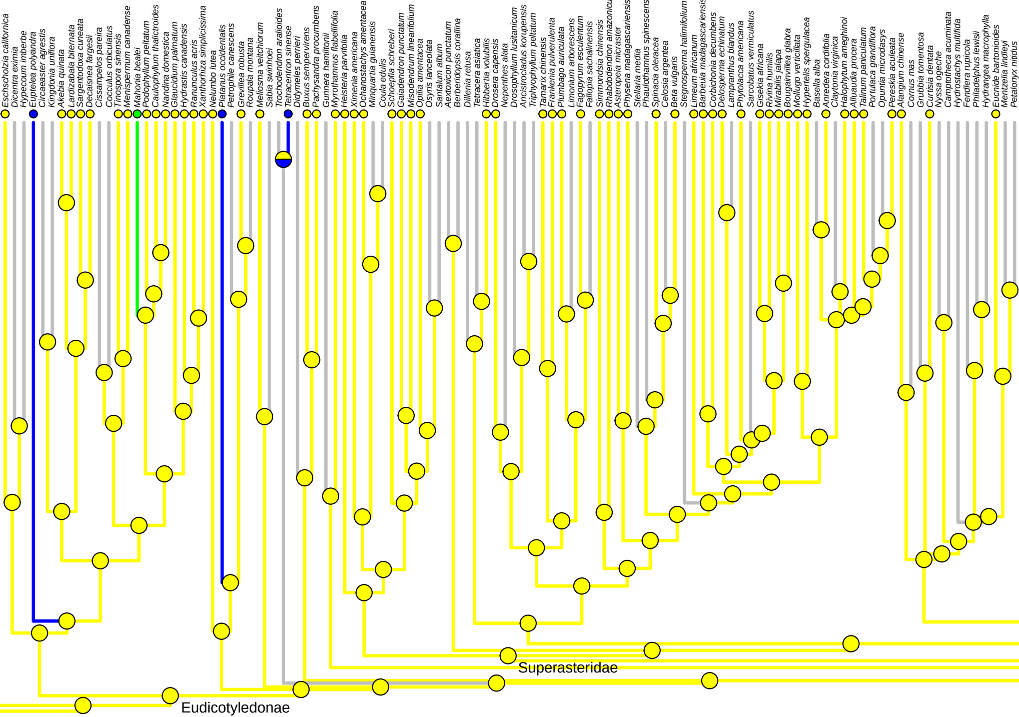
Philesia magellanica
Smilax glauca
Lilium superbum
Cypripedium calceolus
Phalaenopsis aphrodite
Oncidium excavatum
Blandfordia punicea
Borya septentrionalis
Molineria capitulata
Hypoxis hemerocallidea
Rhodohypoxis milloides
Tecophilaea cyanocrocus
Ixiolirion tataricum
Gladiolus buckerveldii
Aristea glauca
Alophia drummondii
Iris missouriensis
Bulbine succulenta
Xanthorrhoea resinosa
Agave ghiesbreghtii
Yucca filamentosa
Crinum asiaticum
Allium fistulosum
Nothoscordum bivalve
Asparagus officinalis
Beaucarnea recurvata
Lomandra longifolia
Elaeis guineensis
Chamaedorea seifrizii
Caryota mitis
Trachycarpus fortunei
Phoenix dactylifera
Philydrum lanuginosum
Tradescantia spathacea
Anigozanthos flavidus
Pontederia cordata
Strelitzia reginae
Phenakospermum guyannense
Ravenala madagascariensis
Musa acuminata
Zingiber gramineum
Canna indica
Maranta cristata
Calectasia intermedia
Dasypogon bromeliifolius
Typha latifolia
Sparganium eurycarpum
Vriesea psittacina
Puya raimondii
Stegolepis ligulata
Mayaca fluviatilis
Juncus effusus
Cyperus alternifolius
Rhynchospora latifolia
Eriocaulon aquaticum
Xyris jupicai
Anarthria polyphylla
Centrolepis strigosa
Baloskion tetraphyllum
Flagellaria indica
Joinvillea plicata
Ecdeiocolea monostachya
Oryza sativa
Hordeum bulbosum
Danthonia spicata
Saccharum officinarum
Zea mays
Hedyosmum arborescens
Ascarina lucida
Sarcandra chloranthoides
Chloranthus japonicus
Cinnamodendron ekmanii
Canella winterana
Takhtajania perrieri
Tasmannia insipida
Drimys winteri
Asarum canadense
Saruma henryi
Lactoris fernandeziana
Thottea tomentosa
Aristolochia macrophylla
Peperomia caliginigaudens
Piper betle
Houttuynia cordata
Saururus cernuus
Anemopsis californica
Eupomatia bennettii
Cananga odorata
Asimina triloba
Annona muricata
Liriodendron chinense
Magnolia tripetala
Galbulimima belgraveana
Degeneria vitiensis
Myristica fragrans
Mauloutchia chapelieri
Idiospermum australiense
Calycanthus floridus
Chimonanthus praecox
Siparuna decipiens
Gomortega keule
Doryphora sassafras
Daphnandra micrantha
Atherosperma moschatum
Cryptocarya meissneriana
Cinnamomum camphora
Laurus nobilis
Sassafras albidum
Hernandia ovigera
Gyrocarpus americanus
Peumus boldus
Hedycarya arborea
Hortonia floribunda
Ceratophyllum demersum
Commelinidae
Magnoliidae
Mesangiospermae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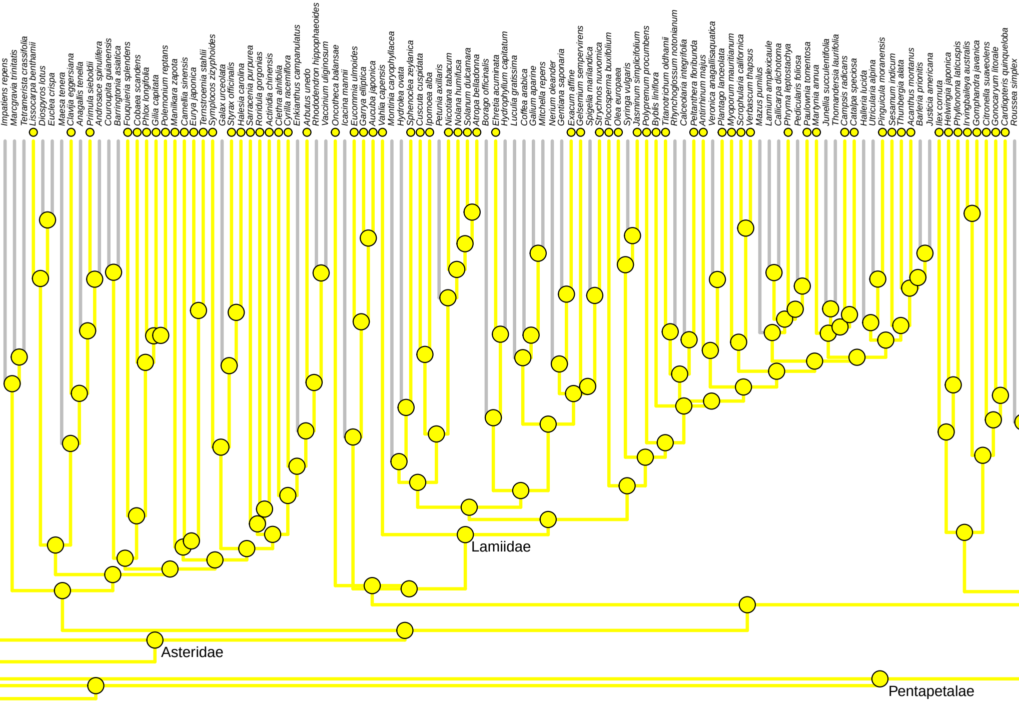
Lardizabala biternata
Sargentodoxa cuneata
Decaisnea fargesii
Cissampelos pareira
Cocculus orbiculatus
Tinospora sinensis
Menispermum canadense
Mahonia bealei
Podophyllum peltatum
Caulophyllum thalictroides
Nandina domestica
Glaucidium palmatum
Hydrastis canadensis
Ranunculus acris
Xanthorhiza simplicissima
Nelumbo lutea
Platanus occidentalis
Petrophile canescens
Grevillea robusta
Roupala montana
Meliosma veitchiorum
Sabia swinhoei
Trochodendron aralioides
Tetracentron sinense
Didymeles perrieri
Buxus sempervirens
Pachysandra procumbens
Gunnera hamiltonii
Myrothamnus flabellifolia
Heisteria parvifolia
Ximenia americana
Ochanostachys amentacea
Minquartia guianensis
Coula edulis
Schoepfia schreberi
Gaiadendron punctatum
Misodendrum linearifolium
Opilia amentacea
Osyris lanceolata
Santalum album
Aextoxicon punctatum
Berberidopsis corallina
Dillenia retusa
Tetracera asiatica
Hibbertia volubilis
Drosera capensis
Nepenthes alata
Drosophyllum lusitanicum
Ancistrocladus korupensis
Triphyophyllum peltatum
Tamarix chinensis
Frankenia pulverulenta
Plumbago auriculata
Limonium arborescens
Fagopyrum esculentum
Fallopia sachalinensis
Simmondsia chinensis
Rhabdodendron amazonicum
Asteropeia micraster
Physena madagascariensis
Stellaria media
Phaulothamnus spinescens
Spinacia oleracea
Celosia argentea
Beta vulgaris
Stegnosperma halimifolium
Limeum africanum
Barbeuia madagascariensis
Corbichonia decumbens
Delosperma echinatum
Lampranthus blandus
Phytolacca americana
Sarcobatus vermiculatus
Gisekia africana
Rivina humilis
Mirabilis jalapa
Bougainvillea glabra
Mollugo verticillata
Hypertelis spergulacea
Basella alba
Anredera cordifolia
Claytonia virginica
Halophytum ameghinoi
Alluaudia procera
Talinum paniculatum
Portulaca grandiflora
Opuntia microdasys
Pereskia aculeata
Alangium chinense
Cornus mas
Grubbia tomentosa
Curtisia dentata
Nyssa ogeche
Camptotheca acuminata
Hydrostachys multifida
Fendlera rupicola
Philadelphus lewisii
Hydrangea macrophylla
Eucnide bartonioides
Mentzelia lindleyi
Petalonyx nitidus
Superasteridae
Eudicotyledonae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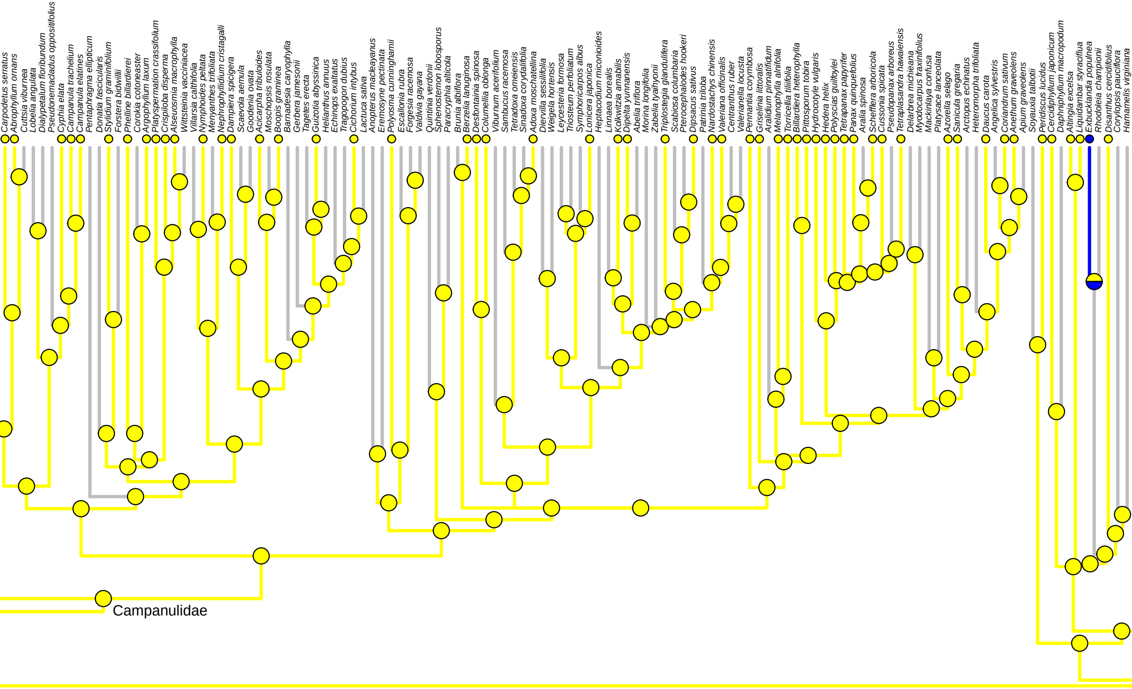
Anagallis tenella
Primula sieboldii
Androsace spinulifera
Couroupita guianensis
Barringtonia asiatica
Fouquieria splendens
Cobaea scandens
Phlox longifolia
Gilia capitata
Polemonium reptans
Manilkara zapota
Camellia sinensis
Eurya japonica
Ternstroemia stahlii
Symplocos zizyphoides
Galax urceolata
Styrax officinalis
Halesia carolina
Sarracenia purpurea
Roridula gorgonias
Actinidia chinensis
Clethra alnifolia
Cyrilla racemiflora
Enkianthus campanulatus
Arbutus unedo
Rhododendron hippophaeoides
Vaccinium uliginosum
Oncotheca balansae
Icacina mannii
Eucommia ulmoides
Garrya elliptica
Aucuba japonica
Vahlia capensis
Montinia caryophyllacea
Hydrolea ovata
Sphenoclea zeylanica
Cuscuta cuspidata
Ipomoea alba
Petunia axillaris
Nicotiana tabacum
Nolana humifusa
Solanum dulcamara
Atropa belladonna
Borago officinalis
Ehretia acuminata
Hydrophyllum capitatum
Luculia gratissima
Coffea arabica
Galium aparine
Mitchella repens
Nerium oleander
Gentiana saponaria
Exacum affine
Gelsemium sempervirens
Spigelia marilandica
Strychnos nuxvomica
Plocosperma buxifolium
Olea europaea
Syringa vulgaris
Jasminum simplicifolium
Polypremum procumbens
Byblis liniflora
Titanotrichum oldhamii
Rhynchoglossum notonianum
Calceolaria integrifolia
Peltanthera floribunda
Antirrhinum majus
Veronica anagallisaquatica
Plantago lanceolata
Myoporum mauritianum
Scrophularia californica
Verbascum thapsus
Mazus pumilus
Lamium amplexicaule
Callicarpa dichotoma
Phryma leptostachya
Pedicularis foliosa
Paulownia tomentosa
Martynia annua
Junellia succulentifolia
Thomandersia laurifolia
Campsis radicans
Catalpa speciosa
Halleria lucida
Utricularia alpina
Pinguicula moranensis
Sesamum indicum
Thunbergia alata
Acanthus montanus
Barleria prionitis
Justicia americana
Ilex cornuta
Helwingia japonica
Phyllonoma laticuspis
Irvingbaileya australis
Gomphandra javanica
Citronella suaveolens
Gonocaryum litorale
Cardiopteris quinqueloba
Roussea simplex
Lamiidae
Asteridae
Pentapetalae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Dialypetalum floribundum
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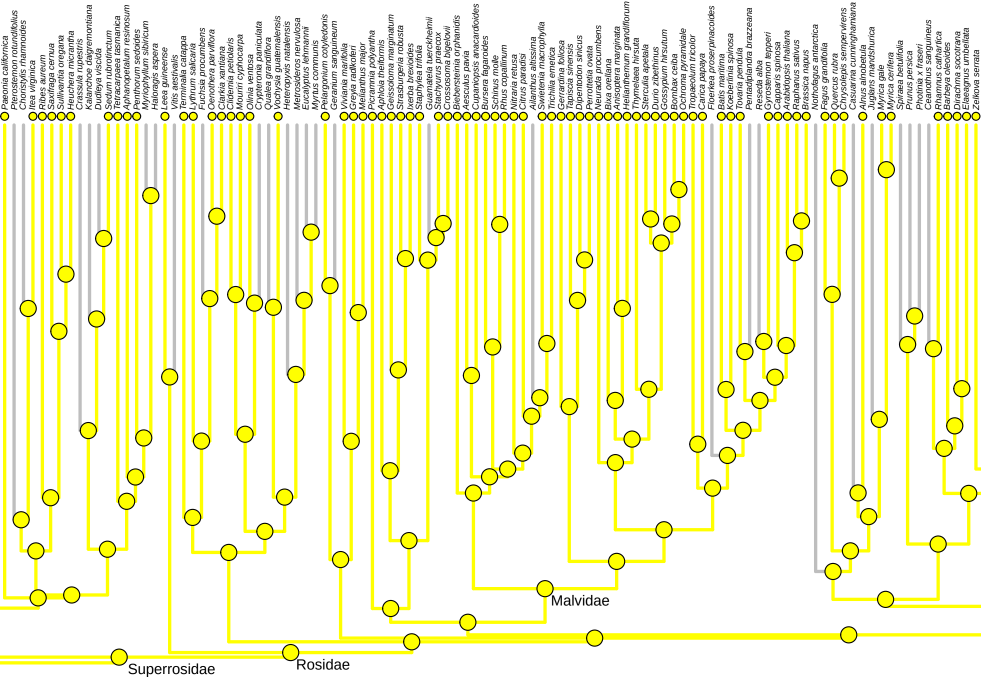
Cyphia elata
Campanula trachelium
Campanula elatines
Pentaphragma ellipticum
Donatia fascicularis
Stylidium graminifolium
Forstera bidwillii
Phelline billardierei
Corokia cotoneaster
Argophyllum laxum
Platyspermation crassifolium
Crispiloba disperma
Alseuosmia macrophylla
Wittsteinia vacciniacea
Villarsia calthifolia
Nymphoides peltata
Menyanthes trifoliata
Nephrophyllidium cristagalli
Dampiera spicigera
Scaevola aemula
Goodenia ovata
Acicarpha tribuloides
Moschopsis rosulata
Boopis graminea
Barnadesia caryophylla
Gerbera jamesonii
Tagetes erecta
Guizotia abyssinica
Helianthus annuus
Echinops exaltatus
Tragopogon dubius
Cichorium intybus
Lactuca sativa
Anopterus macleayanus
Eremosyne pectinata
Polyosma cunninghamii
Escallonia rubra
Forgesia racemosa
Valdivia gayana
Quintinia verdonii
Sphenostemon lobosporus
Paracryphia alticola
Brunia albiflora
Berzelia lanuginosa
Desfontainia spinosa
Columellia oblonga
Viburnum acerifolium
Sambucus racemosa
Tetradoxa omeiensis
Sinadoxa corydalifolia
Adoxa moschatellina
Diervilla sessilifolia
Weigela hortensis
Leycesteria formosa
Triosteum perfoliatum
Symphoricarpos albus
Lonicera japonica
Heptacodium miconioides
Linnaea borealis
Kolkwitzia amabilis
Dipelta yunnanensis
Abelia triflora
Morina longifolia
Zabelia tyaihyonii
Triplostegia glandulifera
Scabiosa columbaria
Pterocephalodes hookeri
Dipsacus sativus
Patrinia triloba
Nardostachys chinensis
Valeriana officinalis
Centranthus ruber
Valerianella locusta
Pennantia corymbosa
Griselinia littoralis
Aralidium pinnatifidum
Melanophylla alnifolia
Torricellia tiliifolia
Billardiera heterophylla
Pittosporum tobira
Hydrocotyle vulgaris
Hedera helix
Polyscias guilfoylei
Tetrapanax papyrifer
Panax quinquefolius
Aralia spinosa
Schefflera arboricola
Cussonia spicata
Pseudopanax arboreus
Tetraplasandra hawaiensis
Delarbrea michieana
Myodocarpus fraxinifolius
Mackinlaya confusa
Platysace lanceolata
Azorella selago
Sanicula gregaria
Arctopus echinatus
Heteromorpha trifoliata
Daucus carota
Angelica sylvestris
Coriandrum sativum
Anethum graveolens
Apium graveolens
Soyauxia talbotii
Peridiscus lucidus
Cercidiphyllum japonicum
Daphniphyllum macropodum
Altingia excelsa
Liquidambar styraciflua
Exbucklandia populnea
Rhodoleia championii
Disanthus cercidifolius
Corylopsis pauciflora
Hamamelis virginiana
Campanulidae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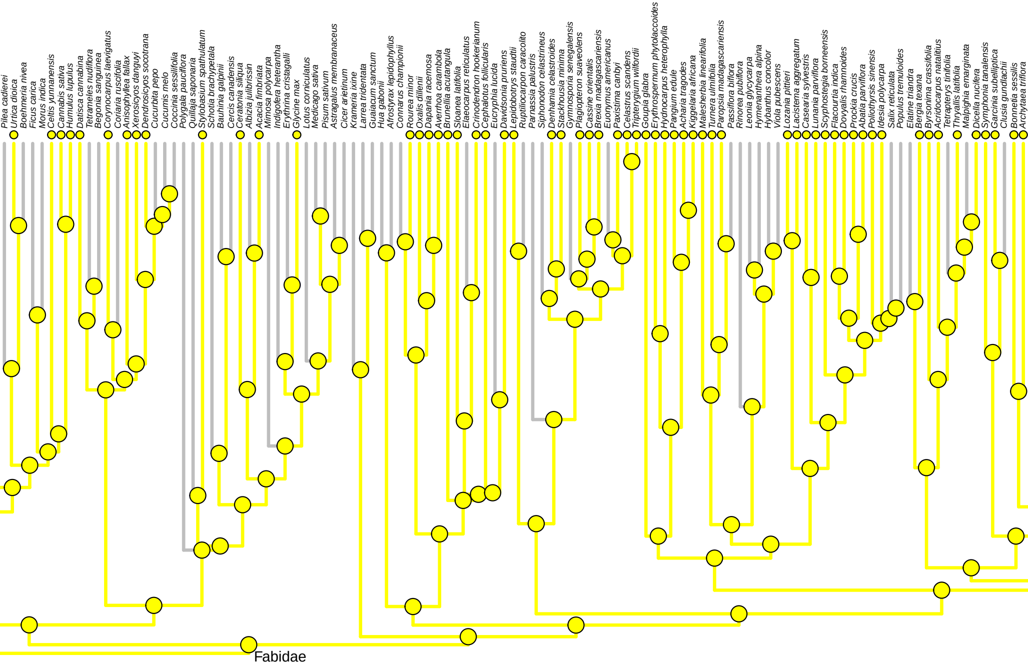
Saxifraga cernua
Sullivantia oregana
Heuchera micrantha
Crassula rupestris
Kalanchoe daigremontiana
Dudleya viscida
Sedum rubrotinctum
Tetracarpaea tasmanica
Aphanopetalum resinosum
Penthorum sedoides
Myriophyllum sibiricum
Haloragis aspera
Leea guineense
Vitis aestivalis
Terminalia catappa
Lythrum salicaria
Fuchsia procumbens
Oenothera parviflora
Clarkia xantiana
Clidemia petiolaris
Mouriri cyphocarpa
Olinia ventosa
Crypteronia paniculata
Qualea grandiflora
Vochysia guatemalensis
Heteropyxis natalensis
Metrosideros nervulosa
Eucalyptus lehmannii
Myrtus communis
Pelargonium cotyledonis
Geranium sanguineum
Viviania marifolia
Greyia radlkoferi
Melianthus major
Picramnia polyantha
Aphloia theiformis
Geissoloma marginatum
Strasburgeria robusta
Ixerba brexioides
Staphylea trifolia
Guamatela tuerckheimii
Stachyurus praecox
Crossosoma bigelovii
Biebersteinia orphanidis
Aesculus pavia
Cupaniopsis anacardioides
Bursera fagaroides
Schinus molle
Rhus copallinum
Nitraria retusa
Citrus paradisi
Ailanthus altissima
Swietenia macrophylla
Trichilia emetica
Gerrardina foliosa
Tapiscia sinensis
Dipentodon sinicus
Perrottetia ovata
Neurada procumbens
Bixa orellana
Anisoptera marginata
Helianthemum grandiflorum
Thymelaea hirsuta
Sterculia apetala
Durio zibethinus
Gossypium hirsutum
Bombax ceiba
Ochroma pyramidale
Tropaeolum tricolor
Carica papaya
Floerkea proserpinacoides
Batis maritima
Koeberlinia spinosa
Tovaria pendula
Pentadiplandra brazzeana
Reseda alba
Gyrostemon tepperi
Capparis spinosa
Arabidopsis thaliana
Raphanus sativus
Brassica napus
Nothofagus antarctica
Fagus grandifolia
Quercus rubra
Chrysolepis sempervirens
Casuarina cunninghamiana
Alnus alnobetula
Juglans mandshurica
Myrica gale
Myrica cerifera
Spiraea betulifolia
Prunus persica
Photinia x fraseri
Ceanothus sanguineus
Rhamnus cathartica
Barbeya oleoides
Dirachma socotrana
Elaeagnus umbellata
Zelkova serrata
Malvidae
Superrosidae
Rosidae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Datisca cannabina
Tetrameles nudiflora
Begonia sanguinea
Corynocarpus laevigatus
Coriaria ruscifolia
Anisophyllea fallax
Xerosicyos danguyi
Dendrosicyos socotrana
Cucurbita pepo
Cucumis melo
Coccinia sessilifolia
Polygala paucifolia
Quillaja saponaria
Stylobasium spathulatum
Schotia brachypetala
Bauhinia galpinii
Cercis canadensis
Ceratonia siliqua
Albizia julibrissin
Acacia fimbriata
Mimosa polycarpa
Indigofera heterantha
Erythrina cristagalli
Glycine max
Lotus corniculatus
Medicago sativa
Pisum sativum
Astragalus membranaceus
Cicer arietinum
Krameria ixine
Larrea tridentata
Guaiacum sanctum
Hua gabonii
Afrostyrax lepidophyllus
Connarus championii
Rourea minor
Oxalis dillenii
Dapania racemosa
Averrhoa carambola
Brunellia acutangula
Sloanea latifolia
Elaeocarpus reticulatus
Crinodendron hookerianum
Cephalotus follicularis
Eucryphia lucida
Davidsonia pruriens
Lepidobotrys staudtii
Ruptiliocarpon caracolito
Parnassia palustris
Siphonodon celastrineus
Denhamia celastroides
Stackhousia minima
Gymnosporia senegalensis
Plagiopteron suaveolens
Cassine orientalis
Brexia madagascariensis
Euonymus americanus
Paxistima canbyi
Celastrus scandens
Tripterygium wilfordii
Goupia glabra
Erythrospermum phytolaccoides
Hydnocarpus heterophylla
Pangium edule
Acharia tragodes
Kiggelaria africana
Malesherbia linearifolia
Turnera ulmifolia
Paropsia madagascariensis
Passiflora biflora
Rinorea pubiflora
Leonia glycycarpa
Hymenanthera alpina
Hybanthus concolor
Viola pubescens
Lozania pittieri
Lacistema aggregatum
Casearia sylvestris
Lunania parviflora
Scyphostegia borneensis
Flacourtia indica
Dovyalis rhamnoides
Prockia crucis
Abatia parviflora
Poliothyrsis sinensis
Idesia polycarpa
Salix reticulata
Populus tremuloides
Elatine triandra
Bergia texana
Byrsonima crassifolia
Acridocarpus natalitius
Tetrapterys tinifolia
Thryallis latifolia
Malpighia emarginata
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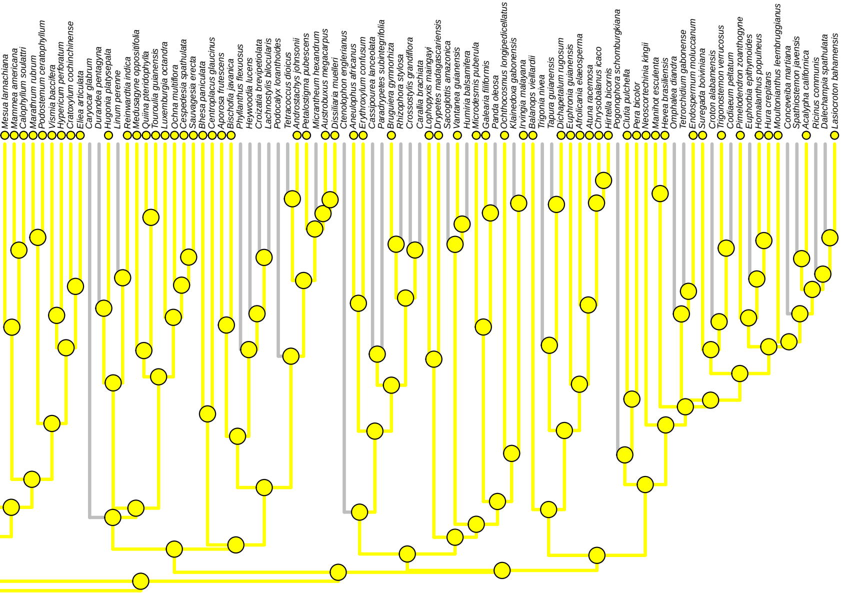
Fabidae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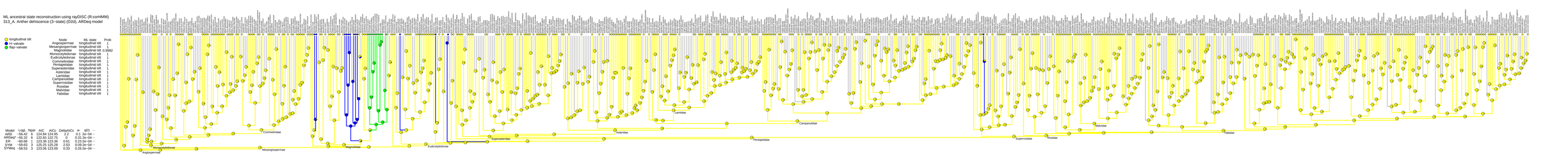
Eliea articulata
Caryocar glabrum
Durandea pentagyna
Hugonia platysepala
Linum perenne
Reinwardtia indica
Medusagyne oppositifolia
Quiina pteridophylla
Touroulia guianensis
Luxemburgia octandra
Ochna multiflora
Cespedesia spathulata
Sauvagesia erecta
Bhesa paniculata
Centroplacus glaucinus
Aporosa frutescens
Bischofia javanica
Phyllanthus flexuosus
Heywoodia lucens
Croizatia brevipetiolata
Lachnostylis bilocularis
Podocalyx loranthoides
Tetracoccus dioicus
Androstachys johnsonii
Petalostigma pubescens
Micrantheum hexandrum
Austrobuxus megacarpus
Dissiliaria muelleri
Ctenolophon englerianus
Aneulophus africanus
Erythroxylum confusum
Cassipourea lanceolata
Paradrypetes subintegrifolia
Bruguiera gymnorhiza
Rhizophora stylosa
Crossostylis grandiflora
Carallia brachiata
Lophopyxis maingayi
Drypetes madagascariensis
Sacoglottis amazonica
Vantanea guianensis
Humiria balsamifera
Microdesmis puberula
Galearia filiformis
Panda oleosa
Ochthocosmus longipedicellatus
Klainedoxa gabonensis
Irvingia malayana
Balanops vieillardii
Trigonia nivea
Tapura guianensis
Dichapetalum rugosum
Euphronia guianensis
Afrolicania elaeosperma
Atuna racemosa
Chrysobalanus icaco
Hirtella bicornis
Pogonophora schomburgkiana
Clutia pulchella
Pera bicolor
Neoscortechinia kingii
Manihot esculenta
Hevea brasiliensis
Omphalea diandra
Tetrorchidium gabonense
Endospermum moluccanum
Suregada boiviniana
Croton alabamensis
Trigonostemon verrucosus
Codiaeum peltatum
Pimelodendron zoanthogyne
Euphorbia epithymoides
Homalanthus populneus
Hura crepitans
Moultonianthus leembruggianus
Conceveiba martiana
Spathiostemon javensis
Acalypha californica
Ricinus communis
Dalechampia spathulata
Lasiocroton bahamensis

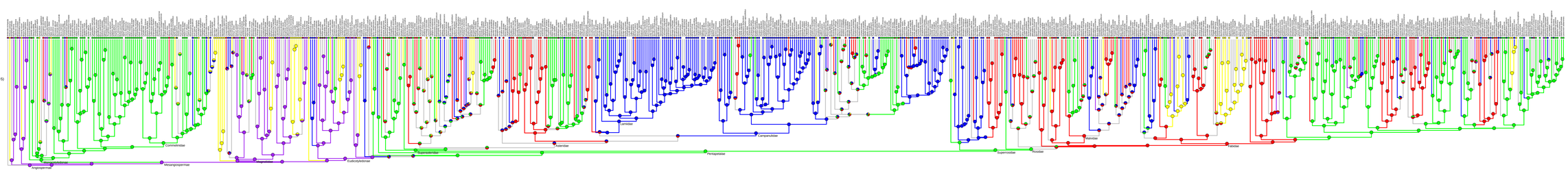
ML ancestral state reconstruction using ratDISC (R corHMM)
313_A. Anther dehiscence (3–state) (D2d), ARDeq model



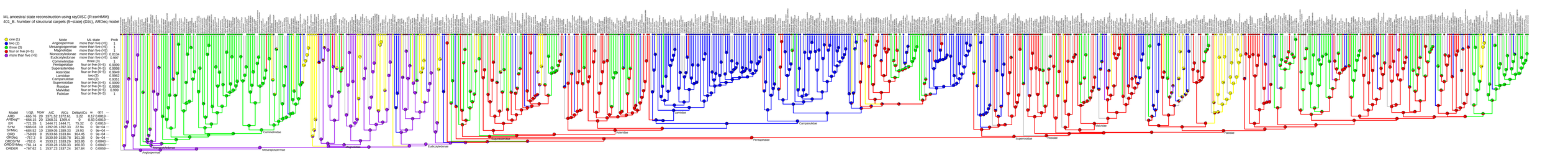
MP ancestral state reconstruction using ancestral pars
(R phangorn)
401_B. Number of structural carpels (5~state) (D2c), 190 steps

- one (1)
- two (2)
- three (3)
- four or five (4~5)
- more than five (>5)

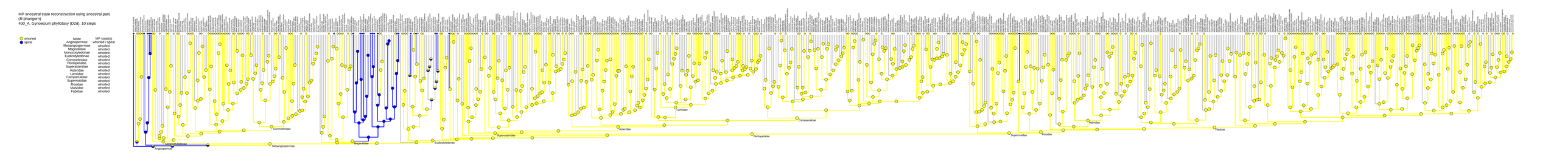
Node	MP state(s)
Angiospermae	more than five (>5)
Mesangiospermae	more than five (>5)
Magnoliidae	more than five (>5)
Monocotyledoneae	three (3)
Eudicotyledoneae	more than five (>5)
Commelinidae	three (3)
Ranunculidae	three (3)
Superasteridae	three (3)
Asteridae	two (2) / four or five (4~5)
Lamiidae	two (2)
Campanulidae	two (2)
Pentapetalae	three (3)
Rosidae	three (3)
Malvidae	four or five (4~5)
Fabidae	four or five (4~5)



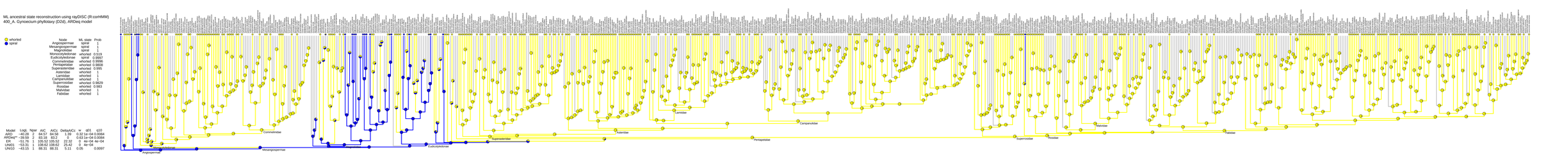
ML ancestral state reconstruction using rayDISC (R:corHMM)
401_B. Number of structural carpels (5-state) (D2c), ARDeq model



MP ancestral state reconstruction using ancestral pars (R phangorn)
400_A. Gynoecium phyllotaxy (D2d), 10 steps



ML ancestral state reconstruction using rayDISC (R:corHMM)
400_A. Gynoecium phyllotaxy (D2d), ARDeq model



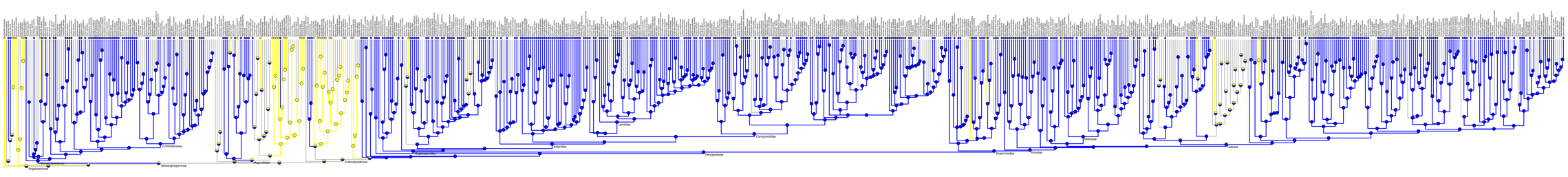
Node	ML state	Prob
Angiospermae	spiral	1
Mesangiospermae	spiral	1
Magnoliidae	spiral	1
Monocotyledonae	whorled	0.519
Eudicotyledonae	spiral	0.9997
Commelinidae	whorled	0.9996
Superasteridae	whorled	0.9995
Superasteridae	whorled	0.995
Asteridae	whorled	1
Lamiidae	whorled	1
Campanulidae	whorled	1
Pentapetalae	whorled	0.9829
Rosidae	whorled	0.983
Malvidae	whorled	1
Fabidae	whorled	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	d01	d10
ARD	-40.28	2	84.57	84.58	1.39	0.32	1e-04	0.0084
ARDeq**	-39.59	2	83.18	83.2	0	0.63	1e-04	0.0084
ER	-51.76	1	105.52	105.52	22.32	0	4e-04	4e-04
UN01	-53.31	1	108.62	108.62	25.42	0	4e-04	
UN10	-43.15	1	88.31	88.31	5.11	0.05		0.0097

MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
403_A. Fusion of ovaries (binary) (D2c), 24 steps

free (<5%)
fused (>5%)

Node	MP state(s)
Angiospermae	free (<5%) / fused (>5%)
Mesangiospermae	free (<5%) / fused (>5%)
Magnoliidae	free (<5%) / fused (>5%)
Monocotyledoneae	fused (>5%)
Eudicotyledoneae	free (<5%) / fused (>5%)
Commelinidae	fused (>5%)
Ceratophyllum	fused (>5%)
Superasteridae	fused (>5%)
Asteridae	fused (>5%)
Lamiidae	fused (>5%)
Campanulidae	fused (>5%)
Superrosidae	fused (>5%)
Rosidae	fused (>5%)
Malvidae	fused (>5%)
Fabidae	fused (>5%)

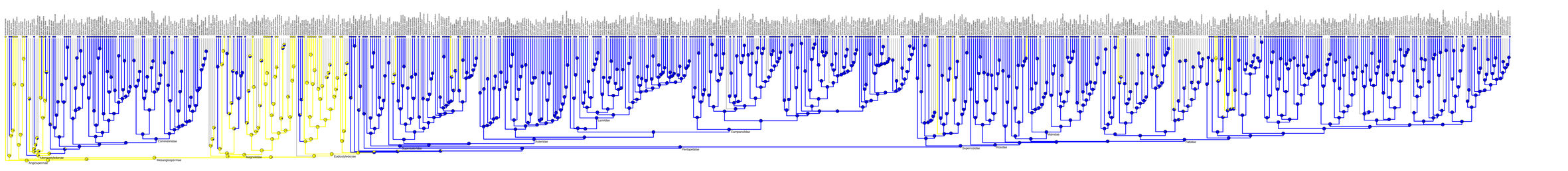


ML ancestral state reconstruction using rayDISC (R:corHMM)
403_A. Fusion of ovaries (binary) (D2c), ARDeq model

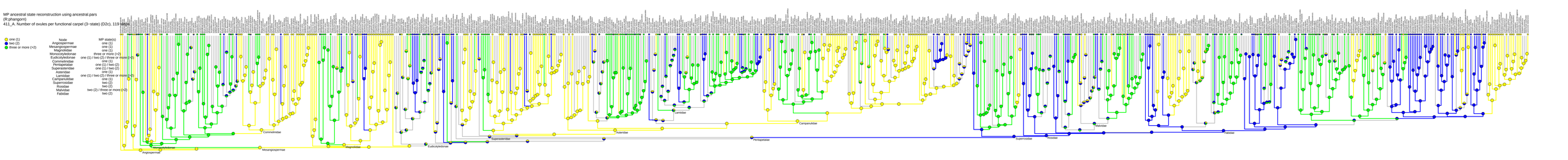
free (+5%)
fused (+5%)

Node	ML state	Prob
Angiospermae	free (+5%)	1
Mesangiospermae	free (+5%)	1
Magnoliidae	free (+5%)	0.9999
Monocotyledonae	free (+5%)	0.928
Eudicotyledonae	free (+5%)	0.9994
Commelinidae	fused (+5%)	0.9999
Magnoliidae	fused (+5%)	0.9999
Superasteridae	fused (+5%)	0.9999
Asteridae	fused (+5%)	1
Lamiidae	fused (+5%)	1
Campanulidae	fused (+5%)	1
Superrosidae	fused (+5%)	1
Rosidae	fused (+5%)	1
Malvidae	fused (+5%)	1
Fabidae	fused (+5%)	0.9998

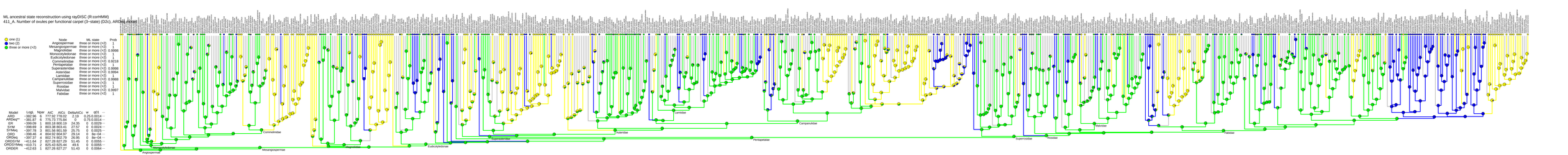
Model	LogL	Nopr	AIC	AICc	DeltaAICc	w	q01	q10
ARD	−94.56	2	193.13	193.14	1.39	0.33	0.0052	5e−04
ARDeq**	−91.87	2	191.74	191.76	0	0.66	0.0052	5e−04
ER	−102.62	1	207.24	207.25	15.49	0	8e−04	8e−04
UN01	−98.62	1	199.23	199.24	7.48	0.02	0.0115	
UN10	−106.61	1	215.22	215.22	23.47	0		8e−04



MP ancestral state reconstruction using ancestral.pars
(R phangorn)
411_A. Number of ovules per functional carpel (3–state) (D2c), 119 taxa



ML ancestral state reconstruction using rayDISC (R:corHMM)
411_A. Number of ovules per functional carpel (3–state) (D2c), ARD model, equal



Node	ML state	Prob
Angiospermae	three or more (>2)	1
Mesangiospermae	three or more (>2)	1
Magnoliidae	three or more (>2)	0.9998
Monocotyledonae	three or more (>2)	1
Eudicotyledonae	three or more (>2)	1
Commelinidae	three or more (>2)	0.9218
Gunneridae	three or more (>2)	1
Superasteridae	three or more (>2)	0.9998
Asteridae	three or more (>2)	0.9994
Lamiidae	three or more (>2)	1
Campanulidae	three or more (>2)	0.9988
Pentapetalae	three or more (>2)	1
Rosidae	three or more (>2)	1
Malvidae	three or more (>2)	0.9997
Fabidae	three or more (>2)	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	--
ARD	-382.96	6	777.92	778.02	2.19	0.25	0.0014	--
ARDeq**	-381.87	6	775.73	775.84	0	0.75	0.0014	--
ER	-399.09	1	800.18	800.19	24.35	0	0.0029	--
SYM	-397.78	3	801.56	801.63	25.79	0	0.0025	--
SYMeq	-397.78	3	801.56	801.63	25.79	0	0.0025	--
ORD	-396.46	4	804.92	804.97	29.14	0	Be-04	--
ORDeq	-397.37	4	802.74	802.79	26.95	0	Be-04	--
ORDSYM	-411.64	2	827.28	827.29	51.45	0	0.0055	--
ORDSYMeq	-410.71	2	825.43	825.44	49.6	0	0.0055	--
ORDER	-412.63	1	827.26	827.27	51.43	0	0.0064	--