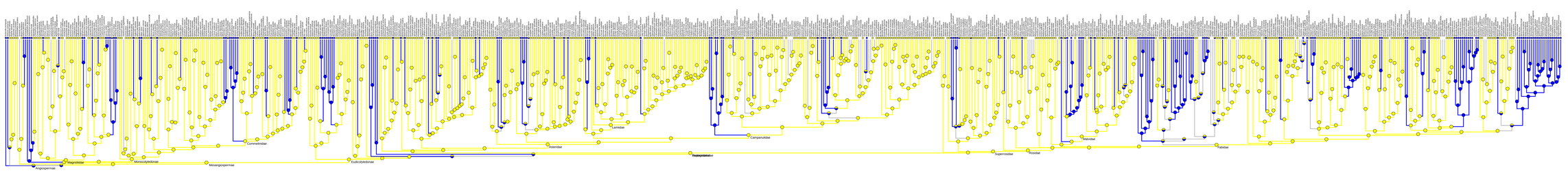
MP ancestral state reconstruction using ancestral pars
(R phangorn)
100_A. Functional sex of flowers (02d), 97 steps

bisexual
unisexual

Node	MP state(s)
Angiospermae	bisexual / unisexual
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

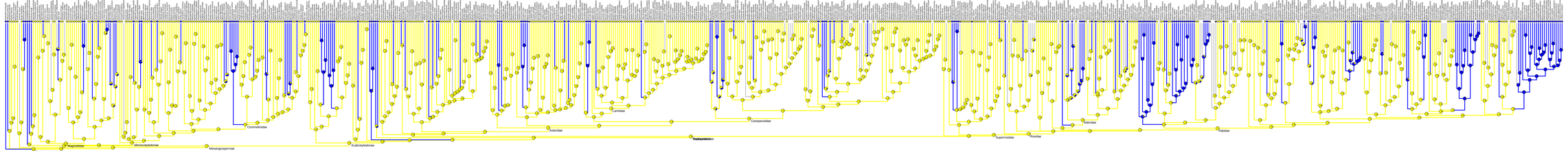


ML ancestral state reconstruction using rayDISC (R:corHMM) 100_A. Functional sex of flowers (02d), ARDeq model

bisexual
unisexual

Node	ML state	Prob
Angiospermae	bisexual	1
Mesangiospermae	bisexual	1
Magnoliidae	bisexual	1
Monocotyledonae	bisexual	1
Eudicotyledonae	bisexual	1
Commelinidae	bisexual	0.9999
Ranunculidae	bisexual	1
Superasteridae	bisexual	1
Asteridae	bisexual	1
Lamidae	bisexual	1
Campanulidae	bisexual	0.9996
Caryophyllidae	bisexual	1
Rosidae	bisexual	1
Malvidae	bisexual	0.9997
Fabidae	bisexual	1

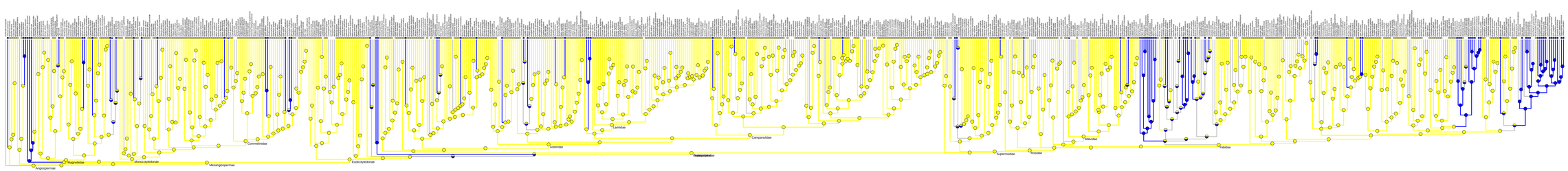
Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	-313.25	2	630.5	630.52	1.38	0.23	0.003	7e−04
ARDeq*	-312.56	2	629.12	629.14	0	0.46	0.003	7e−04
ER	-316.07	1	634.13	634.14	5	0.04	0.0029	0.0029
UNI01	-314.06	1	630.12	630.12	0.99	0.28	0.003	
UNI10	-354.64	1	711.27	711.28	82.14	0		0.0118



MP ancestral state reconstruction using ancestral pars
(R phangorn)
100_B. Structural sex of flowers (D2d), 56 steps

bisexual
unisexual

Node	MP state(s)
Angiospermae	bisexual
Mesangiospermae	bisexual
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

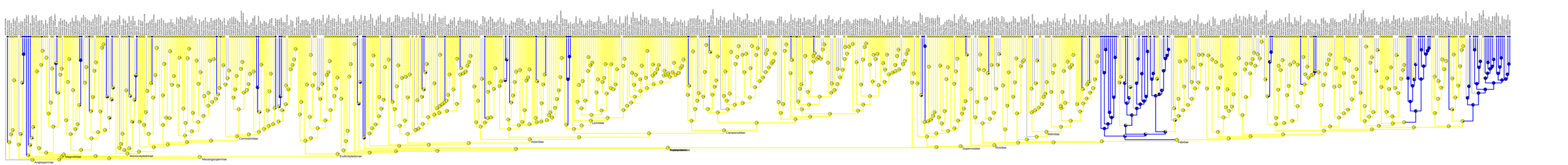


ML ancestral state reconstruction using rayDISC (R:corHMM) 100_B. Structural sex of flowers (D2d), ARDeq model

bisexual
unisexual

Node	ML state	Prob
Angiospermae	bisexual	1
Mesangiospermae	bisexual	1
Magnoliidae	bisexual	1
Monocotyledonae	bisexual	1
Eudicotyledonae	bisexual	1
Commelinidae	bisexual	1
Gentianidae	bisexual	1
Superasteridae	bisexual	1
Asteridae	bisexual	1
Lamidae	bisexual	0.9999
Campanulidae	bisexual	1
Asteridae	bisexual	1
Rosidae	bisexual	1
Malvidae	bisexual	1
Fabidae	bisexual	0.9975

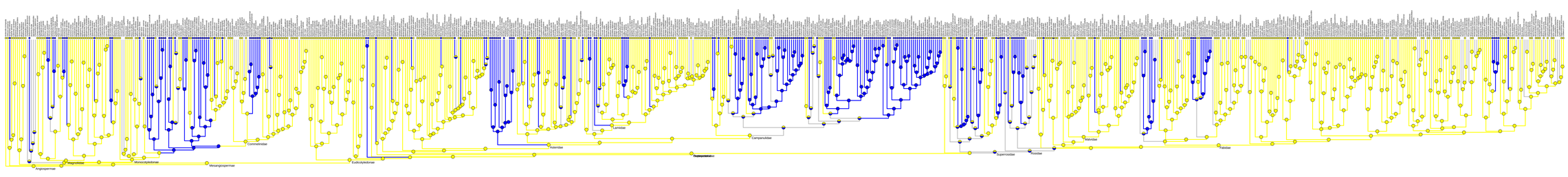
Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	−209.05	2	422.1	422.11	1.36	0.28	0.0015	0.004
ARDeq**	−208.37	2	420.74	420.75	0	0.56	0.0015	0.004
ER	−210.62	1	423.23	423.24	2.48	0.16	0.0016	0.0016
UN01	−223.81	1	449.61	449.62	28.87	0	0.0017	
UN10	−230.41	1	462.81	462.82	42.06	0	0	0.0165



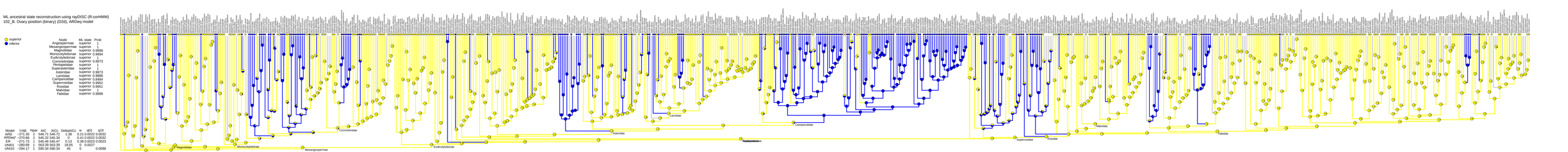
MP ancestral state reconstruction using ancestral.pars
(R phangorn)
102_B. Ovary position (binary) (0/d), 78 steps

superior
inferior

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



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



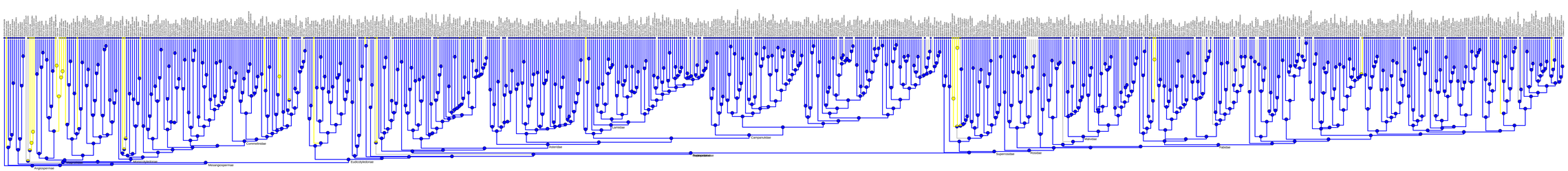
Node	ML state	Prob
Angiospermae	superior	1
Mesangiospermae	superior	1
Magnoliidae	superior	0.9999
Monocotyledonae	superior	0.9994
Eudicotyledonae	superior	1
Gunneridae	superior	0.8973
Pentapetalae	superior	1
Superasteridae	superior	1
Asteridae	superior	0.9873
Lamidae	superior	0.9898
Campanulidae	superior	0.8484
Superrosidae	superior	0.9953
Rosidae	superior	0.9953
Malvidae	superior	1
Fabidae	superior	0.9999

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	−271.35	2	546.71	546.72	1.38	0.21	0.0032	0.0032
ARDeq*	−270.66	2	545.32	545.34	0	0.41	0.0032	0.0032
ER	−271.73	1	545.46	545.47	0.13	0.38	0.0023	0.0023
UNI01	−280.89	1	563.78	563.79	18.05	0	0.0027	
UNI10	−294.17	1	590.34	590.34	45	0		0.0098

MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
201_A. Perianth presence (D2c), 21 steps

absent
present

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

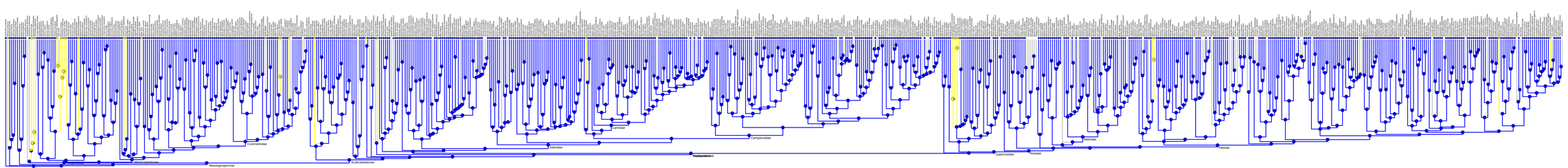


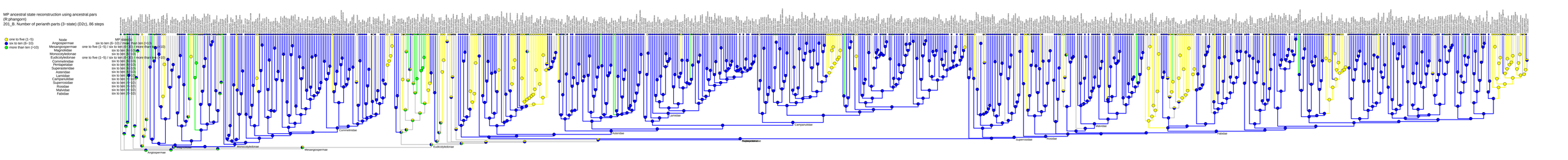
ML ancestral state reconstruction using rayDISC (R:corHMM)
201_A. Perianth presence (D2c), UNI10 model

absent
present

Node	ML state	Prob
Angiospermae	present	1
Mesangiospermae	present	1
Magnoliidae	present	1
Monocotyledonae	present	1
Eudicotyledonae	present	1
Commelinidae	present	1
Gunneridae	present	1
Superasteridae	present	1
Asteridae	present	1
Lamidae	present	1
Campanulidae	present	1
Superrosidae	present	1
Rosidae	present	1
Malvidae	present	1
Fabidae	present	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	−97.4	2	198.81	198.82	2.01	0.13	0	5e−04
ARDeq	−96.71	2	197.42	197.44	0.62	0.25	0	5e−04
ER	−97.65	1	197.3	197.31	0.5	0.27	5e−04	5e−04
UNI01	−109.2	1	220.4	220.41	23.59	0	0.0221	
UNI10*	−97.4	1	196.81	196.81	0	0.35		5e−04



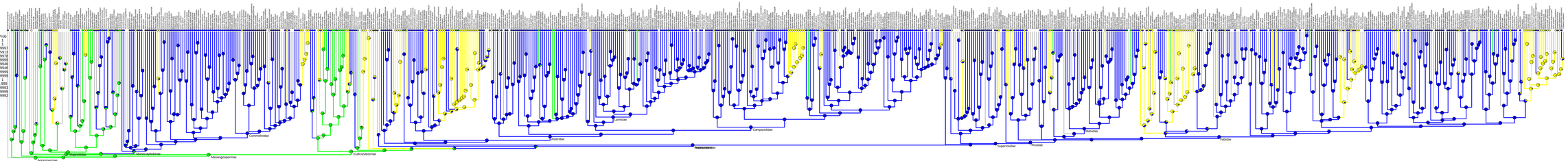

MP ancestral state reconstruction using ancestral.pars
(R phangorn)
201_B. Number of perianth parts (3–state) (D2c), 86 steps
one to five (1–5)
six to ten (6–10)
more than ten (>10)
Node
Angiospermae
Mesangiospermae
Magnoliidae
Monocotyledonae
Eudicotyledonae
Commelinidae
Ranunculidae
Superasteridae
Asteridae
Lamiidae
Campanulidae
Santalanae
Rosidae
Malvidae
Fabidae
MP-state(s)
six to ten (6–10) / more than ten (>10)
one to five (1–5) / six to ten (6–10) / more than ten (>10)
six to ten (6–10)
six to ten (6–10)
one to five (1–5) / six to ten (6–10)
six to ten (6–10)
six to ten (6–10)
six to ten (6–10)
six to ten (6–10)
six to ten (6–10)
six to ten (6–10)
six to ten (6–10)
six to ten (6–10)
six to ten (6–10)
Angiospermae
Magnoliidae
Monocotyledonae
Commelinidae
Mesangiospermae
Eudicotyledonae
Ranunculidae
Superasteridae
Asteridae
Lamiidae
Campanulidae
Santalanae
Rosidae
Malvidae
Fabidae

ML ancestral state reconstruction using rayDISC (RcorHMM)
201_B. Number of perianth parts (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)	1
Magnoliidae	more than ten (>10)	0.9997
Monocotyledoneae	six to ten (6–10)	0.5913
Eudicotyledoneae	more than ten (>10)	0.9978
Commelinidae	six to ten (6–10)	0.9999
Pentapetalae	six to ten (6–10)	0.9946
Superasteridae	six to ten (6–10)	0.9946
Asteridae	six to ten (6–10)	0.9999
Lamidae	six to ten (6–10)	0.9999
Campanulidae	six to ten (6–10)	1
Superrosidae	six to ten (6–10)	0.999
Rosidae	six to ten (6–10)	0.9993
Malvidae	six to ten (6–10)	0.9999
Fabidae	six to ten (6–10)	0.9992

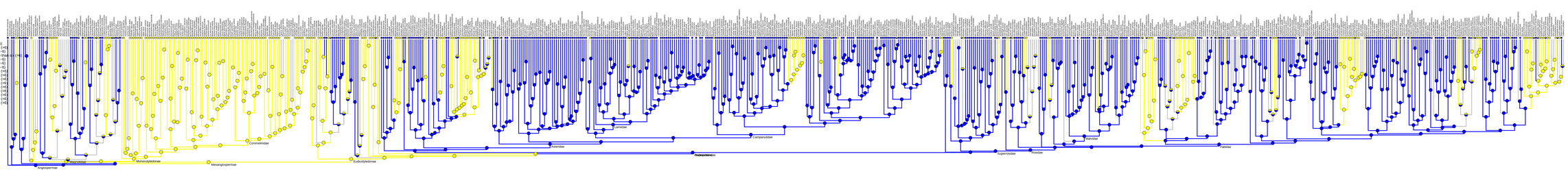
Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	---
ARD	−325.6	6	663.19	663.3	2.2	0.25	0.004	---
ARDeq*	−324.5	6	661	661.1	0	0.74	0.004	---
ER	−350.6	1	703.21	703.21	42.11	0	0.0033	---
SYM	−339.65	3	685.3	685.33	24.23	0	0.002	---
SYMeq	−338.58	3	683.16	683.19	22.08	0	0.002	---
ORD	−331.92	4	671.85	671.9	10.8	0	0.0041	---
ORDeq	−330.83	4	669.65	669.71	8.6	0.01	0.0041	---
ORDSYM	−342.6	2	689.2	689.22	28.11	0	0.0021	---
ORDSYMeq	−341.54	2	687.08	687.1	25.99	0	0.0021	---
ORDER	−351.99	1	705.98	705.98	44.88	0	0.0014	---



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)
Superrosidae	more than six (>6)
Rosidae	more than six (>6)
Malvidae	more than six (>6)
Fabidae	more than six (>6)

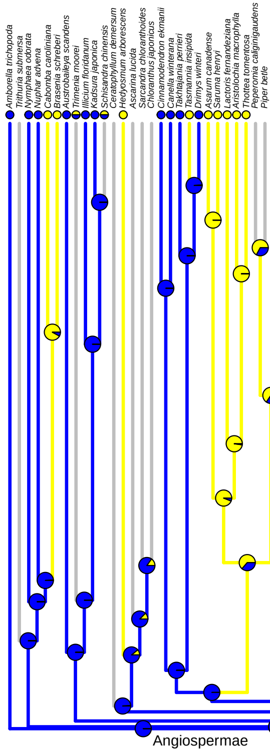


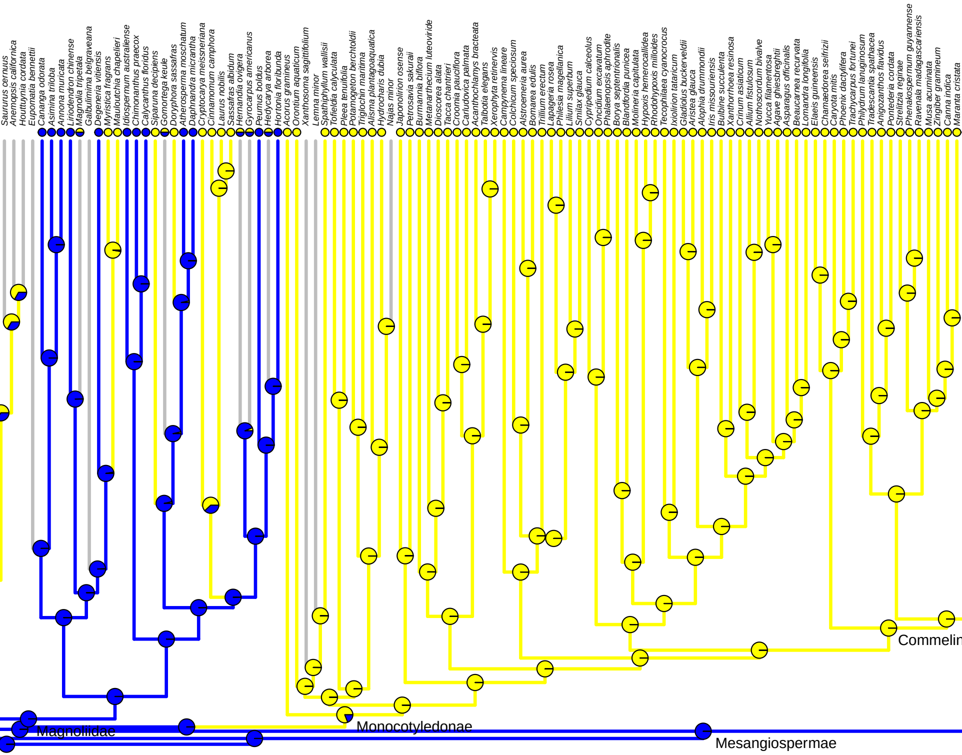
ML ancestral state reconstruction using rayDISC (R:corHMM)
201_C. Number of perianth parts (binary) (D2c), ARDeq model

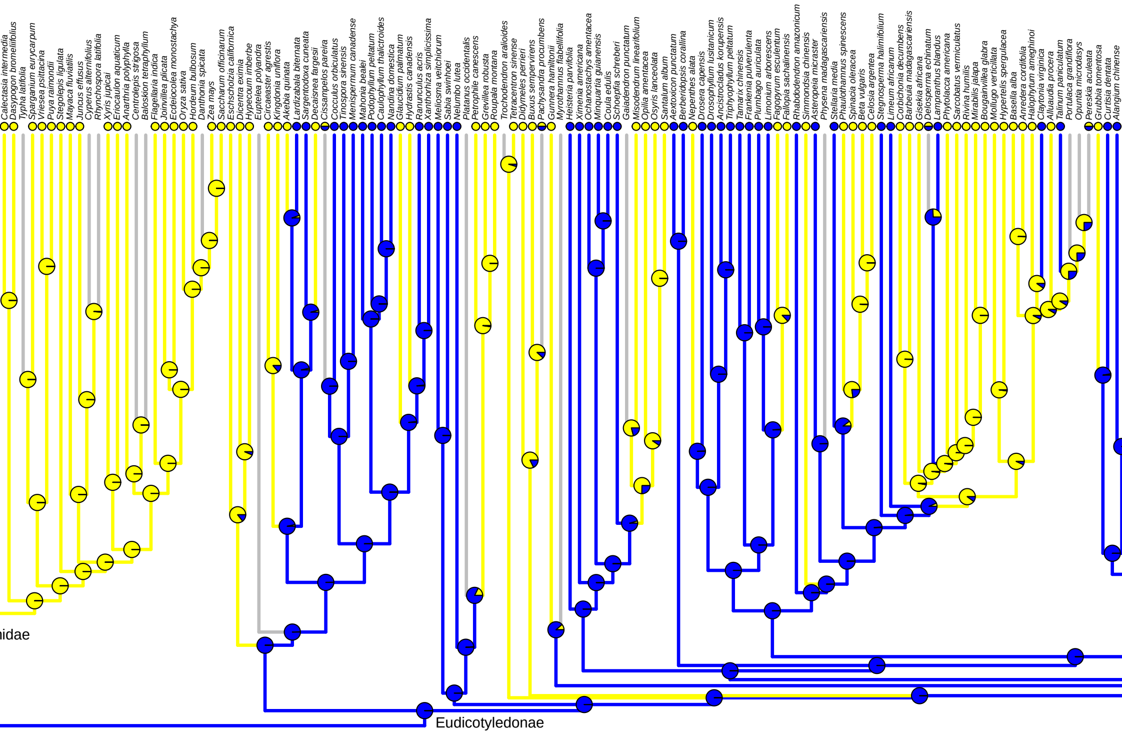
🟡 one to six (1−6)
🔵 more than six (>6)

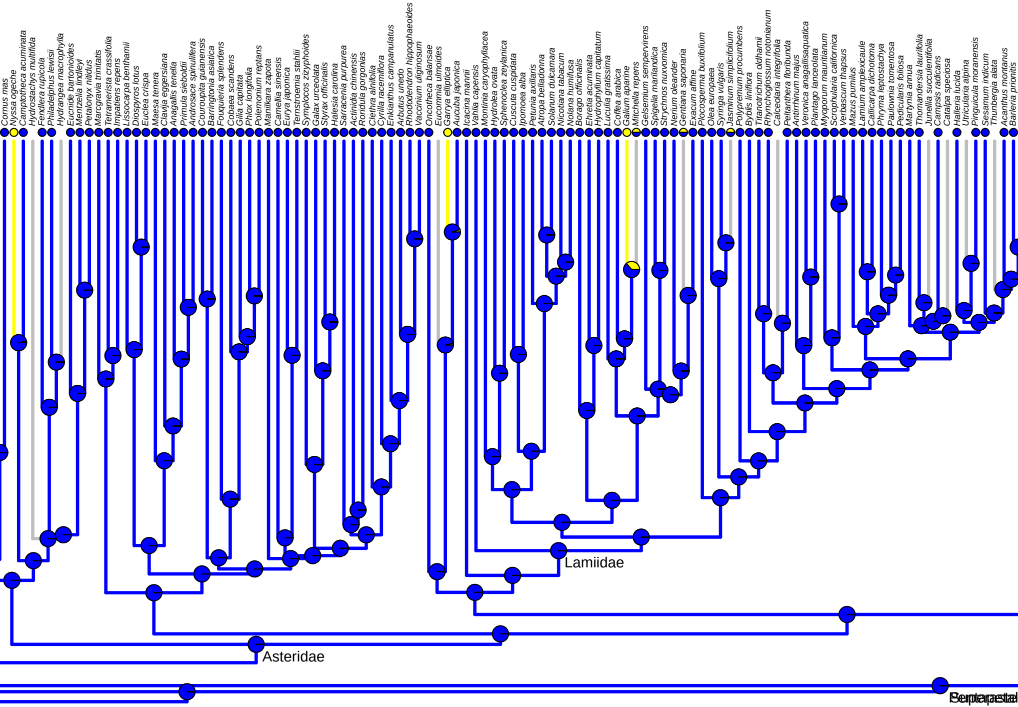
Node	ML state	Prob
Angiospermae	more than six (>6)	1
Mesangiospermae	more than six (>6)	1
Magnoliidae	more than six (>6)	0.9999
Monocotyledonae	one to six (1−6)	0.8097
Eudicotyledonae	more than six (>6)	1
Commelinidae	one to six (1−6)	1
Pentapetalae	more than six (>6)	1
Superasteridae	more than six (>6)	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

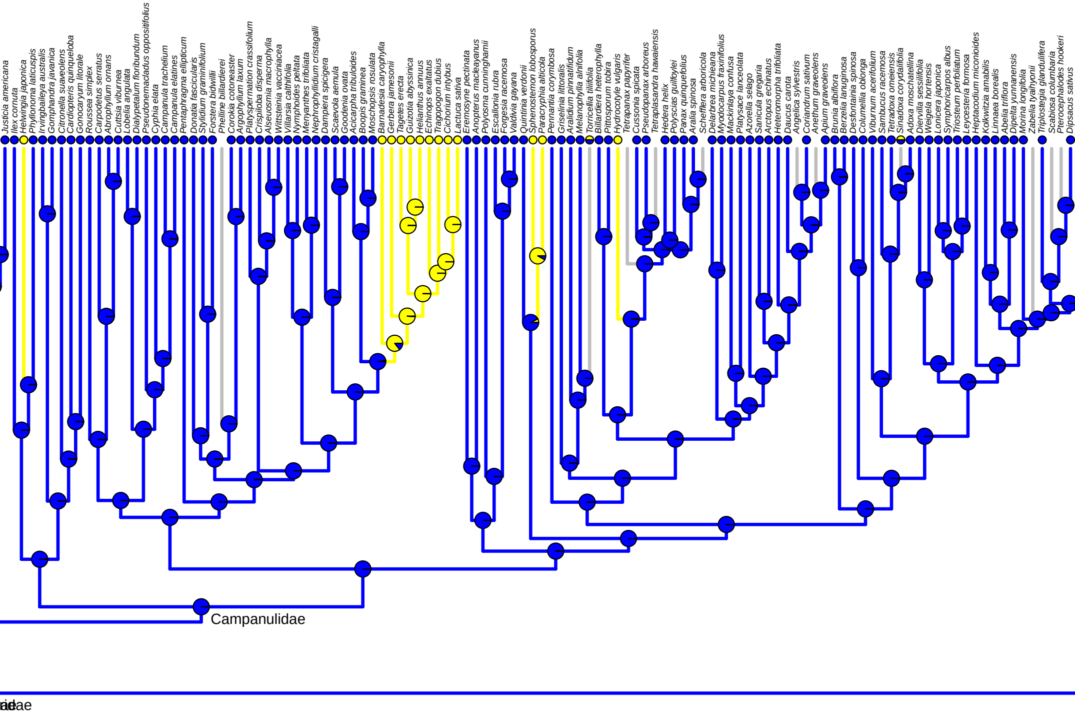
Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	−248.39	2	500.79	500.8	1.39	0.33	6e−04	0.0026
ARDeq**	−247.7	2	499.4	499.42	0	0.65	6e−04	0.0026
ER	−254.88	1	511.75	511.76	12.34	0	0.0022	0.0022
UNI01	−322.49	1	646.98	646.98	147.57	0	0.0081	
UNI10	−252.26	1	506.52	506.52	7.1	0.02		0.0029


Amborella trichopoda
Trithuria submersa
Nymphaea odorata
Nuphar advena
Cabomba caroliniana
Brasenia schreberi
Austrobaileya scandens
Trimenia moorei
Illicium floridanum
Kadsura japonica
Schisandra chinensis
Ceratophyllum demersum
Hedyosmum arborescens
Ascarina lucida
Sarcandra chloranthoides
Chloranthus japonicus
Cinnamodendron ekmanii
Canella winterana
Takhtajania perrieri
Tasmannia insipida
Drimys winteri
Asarum canadense
Saruma henryi
Lactoris fernandeziana
Aristolochia macrophylla
Thottea tomentosa
Peperomia caliginigaudens
Piper betle
Angiospermae


Saururus cernuus
Anemopsis californica
Houttuynia cordata
Eupomatia bennettii
Cananga odorata
Asimina triloba
Annona muricata
Liriodendron chinense
Magnolia tripetala
Galbulimima belgraveana
Degeneria vitiensis
Myristica fragrans
Mauloutchia chapelieri
Idiospermum australiense
Chimonanthus praecox
Calycanthus floridus
Siparuna decipiens
Gomortega keule
Doryphora sassafras
Atherosperma moschatum
Daphnandra micrantha
Cryptocarya meissneriana
Cinnamomum camphora
Laurus nobilis
Sassafras albidum
Hernandia ovigera
Gyrocarpus americanus
Peumus boldus
Hedycarya arborea
Hortonia floribunda
Acorus gramineus
Orontium aquaticum
Xanthosoma sagittifolium
Lemna minor
Spathiphyllum wallisii
Tofieldia calyculata
Pleea tenuifolia
Potamogeton berchtoldii
Triglochin maritima
Alisma plantagoaquatica
Hydrocharis dubia
Najas minor
Japonolirion osense
Petrosavia sakuraii
Burmannia biflora
Metanarthecium luteoviride
Dioscorea alata
Tacca chantrieri
Croomia pauciflora
Carludovica palmata
Acanthochlamys bracteata
Talbotia elegans
Xerophyta retinervis
Campynema lineare
Colchicum speciosum
Alstroemeria aurea
Bomarea edulis
Trillium erectum
Lapageria rosea
Philesia magellanica
Lilium superbum
Smilax glauca
Cypripedium calceolus
Oncidium excavatum
Phalaenopsis aphrodite
Borya septentrionalis
Blandfordia punicea
Molineria capitulata
Hypoxis hemerocallidea
Rhodohypoxis milloides
Tecophilaea cyanocrocus
Ixiolirion tataricum
Gladiolus buckerveldii
Aristea glauca
Alophia drummondii
Iris missouriensis
Bulbine succulenta
Xanthorrhoea resinosa
Crinum asiaticum
Allium fistulosum
Nothoscordum bivalve
Yucca filamentosa
Agave ghiesbreghtii
Asparagus officinalis
Beaucarnea recurvata
Lomandra longifolia
Elaeis guineensis
Chamaedorea seifrizii
Caryota mitis
Phoenix dactylifera
Trachycarpus fortunei
Philydrum lanuginosum
Tradescantia spathacea
Anigozanthos flavidus
Pontederia cordata
Strelitzia reginae
Phenakospermum guyannense
Ravenala madagascariensis
Musa acuminata
Zingiber gramineum
Canna indica
Maranta cristata
Commelin
Magnoliidae
Monocotyledonae
Mesangiospermae


Calectasia intermedia
Dasypogon bromeliifolius
Typha latifolia
Sparganium eurycarpum
Vriesea psittacina
Puya raimondii
Stegolepis ligulata
Mayaca fluviatilis
Juncus effusus
Cyperus alternifolius
Rhynchospora latifolia
Xyris jupicai
Eriocaulon aquaticum
Anarthria polyphylla
Centrolepis strigosa
Baloskion tetraphyllum
Flagellaria indica
Joinvillea plicata
Ecdeiocolea monostachya
Oryza sativa
Hordeum bulbosum
Danthonia spicata
Zea mays
Saccharum officinarum
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
Meliosma veitchiorum
Sabia swinhoei
Nelumbo lutea
Platanus occidentalis
Petrophile canescens
Grevillea robusta
Roupala montana
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
Nepenthes alata
Drosera capensis
Drosophyllum lusitanicum
Ancistrocladus korupensis
Triphyophyllum peltatum
Tamarix chinensis
Frankenia pulverulenta
Plumbago auriculata
Limonium arborescens
Fagopyrum esculentum
Fallopia sachalinensis
Rhabdodendron amazonicum
Simmondsia chinensis
Asteropeia micraster
Physena madagascariensis
Stellaria media
Phaulothamnus spinescens
Spinacia oleracea
Beta vulgaris
Celosia argentea
Stegnosperma halimifolium
Limeum africanum
Corbichonia decumbens
Barbeuia madagascariensis
Gisekia africana
Delosperma echinatum
Lampranthus blandus
Phytolacca americana
Sarcobatus vermiculatus
Rivina humilis
Mirabilis jalapa
Bougainvillea glabra
Mollugo verticillata
Hypertelis spergulacea
Basella alba
Anredera cordifolia
Halophytum ameghinoi
Claytonia virginica
Alluaudia procera
Talinum paniculatum
Portulaca grandiflora
Opuntia microdasys
Pereskia aculeata
Grubbia tomentosa
Curtisia dentata
Alangium chinense
idae
Eudicotyledonae


Cornus mas
Nyssa ogeche
Camptotheca acuminata
Hydrostachys multifida
Fendlera rupicola
Philadelphus lewisii
Hydrangea macrophylla
Eucnide bartonioides
Mentzelia lindleyi
Petalonyx nitidus
Marcgravia trinitatis
Tetramerista crassifolia
Impatiens repens
Lissocarpa benthamii
Diospyros lotus
Euclea crispa
Maesa tenera
Clavija eggersiana
Anagallis tenella
Primula sieboldii
Androsace spinulifera
Couroupita guianensis
Barringtonia asiatica
Fouquieria splendens
Cobaea scandens
Gilia capitata
Phlox longifolia
Polemonium reptans
Manilkara zapota
Camellia sinensis
Eurya japonica
Ternstroemia stahlii
Symplocos zizyphoides
Galax urceolata
Styrax officinalis
Halesia carolina
Sarracenia purpurea
Actinidia chinensis
Roridula gorgonias
Clethra alnifolia
Cyrilla racemiflora
Enkianthus campanulatus
Arbutus unedo
Rhododendron hippophaeoides
Vaccinium uliginosum
Oncotheca balansae
Eucommia ulmoides
Garrya elliptica
Aucuba japonica
Icacina mannii
Vahlia capensis
Montinia caryophyllacea
Hydrolea ovata
Sphenoclea zeylanica
Cuscuta cuspidata
Ipomoea alba
Petunia axillaris
Atropa belladonna
Solanum dulcamara
Nicotiana tabacum
Nolana humifusa
Borago officinalis
Ehretia acuminata
Hydrophyllum capitatum
Luculia gratissima
Coffea arabica
Galium aparine
Mitchella repens
Gelsemium sempervirens
Spigelia marilandica
Strychnos nuxvomica
Nerium oleander
Gentiana saponaria
Exacum affine
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
Paulownia tomentosa
Pedicularis foliosa
Martynia annua
Thomandersia laurifolia
Junellia succulentifolia
Campsis radicans
Catalpa speciosa
Halleria lucida
Utricularia alpina
Pinguicula moranensis
Sesamum indicum
Thunbergia alata
Acanthus montanus
Barleria prionitis
Lamiidae
Asteridae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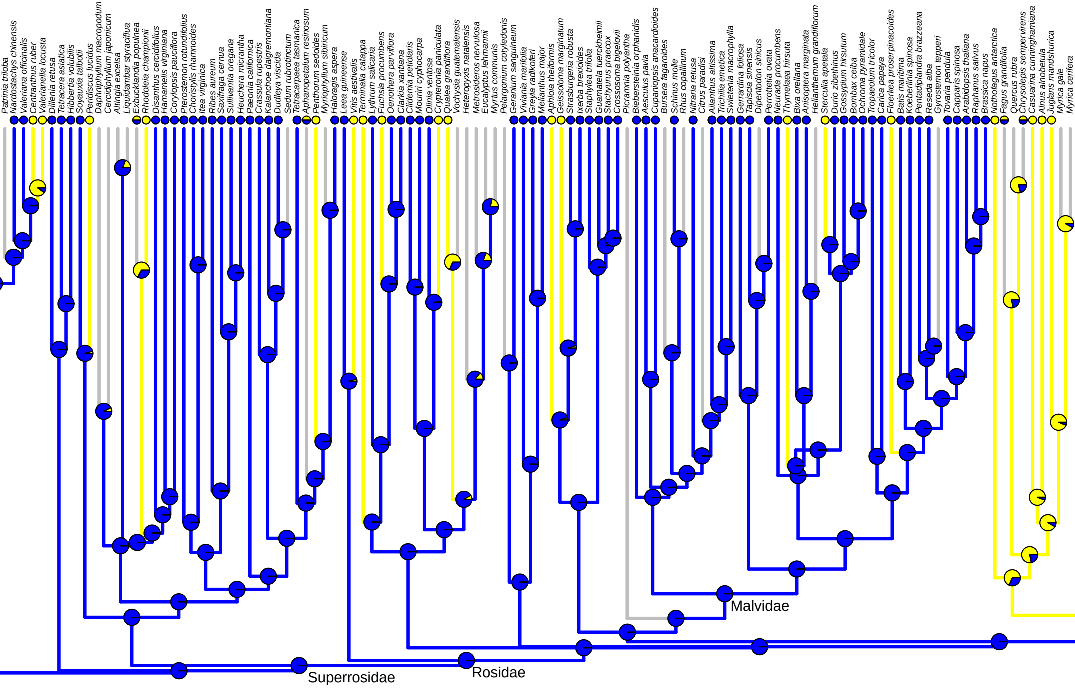
Ilex cornuta
Helwingia japonica
Phyllonoma laticuspis
Irvingbaileya australis
Gomphandra javanica
Citronella suaveolens
Cardiopteris quinqueloba
Gonocaryum litorale
Roussea simplex
Carpodetus serratus
Abrophyllum ornans
Cuttsia viburnea
Lobelia angulata
Dialypetalum floribundum
Pseudonemacladus oppositifolius
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
Boopis graminea
Moschopsis rosulata
Barnadesia caryophylla
Gerbera jamesonii
Tagetes erecta
Guizotia abyssinica
Helianthus annuus
Echinops exaltatus
Tragopogon dubius
Cichorium intybus
Lactuca sativa
Eremosyne pectinata
Anopterus macleayanus
Polyosma cunninghamii
Escallonia rubra
Forgesia racemosa
Valdivia gayana
Quintinia verdonii
Sphenostemon lobosporus
Paracryphia alticola
Pennantia corymbosa
Griselinia littoralis
Aralidium pinnatifidum
Melanophylla alnifolia
Torricellia tiliifolia
Billardiera heterophylla
Pittosporum tobira
Hydrocotyle vulgaris
Tetrapanax papyrifer
Cussonia spicata
Pseudopanax arboreus
Tetraplasandra hawaiensis
Hedera helix
Polyscias guilfoylei
Panax quinquefolius
Aralia spinosa
Schefflera arboricola
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
Brunia albiflora
Berzelia lanuginosa
Desfontainia spinosa
Columellia oblonga
Viburnum acerifolium
Sambucus racemosa
Tetradoxa omeiensis
Sinadoxa corydalifolia
Adoxa moschatellina
Diervilla sessilifolia
Weigela hortensis
Lonicera japonica
Symphoricarpos albus
Triosteum perfoliatum
Leycesteria formosa
Heptacodium miconioides
Kolkwitzia amabilis
Linnaea borealis
Abelia triflora
Dipelta yunnanensis
Morina longifolia
Zabelia tyaihyonii
Triplostegia glandulifera
Scabiosa columbaria
Pterocephalodes hookeri
Dipsacus sativus
Campanulidae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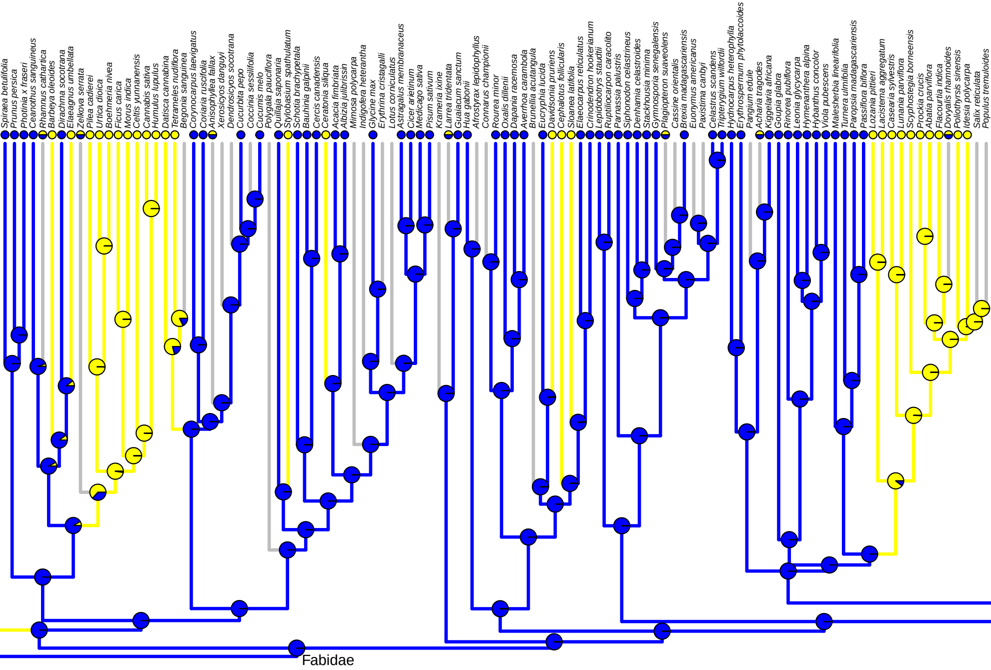
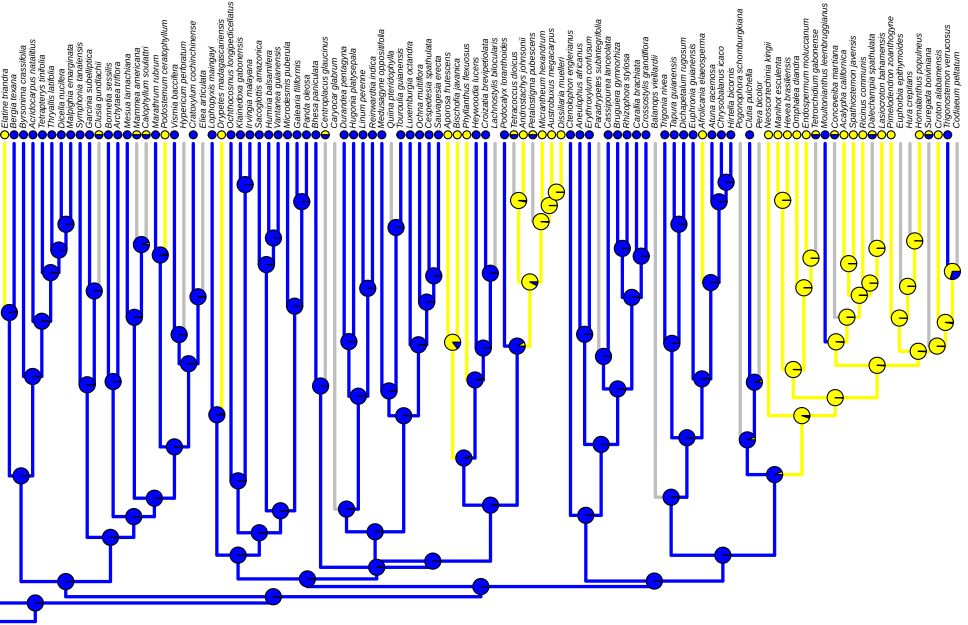
Centranthus ruber
Valerianella locusta
Dillenia retusa
Tetracera asiatica
Hibbertia volubilis
Soyauxia talbotii
Peridiscus lucidus
Daphniphyllum macropodum
Cercidiphyllum japonicum
Altingia excelsa
Liquidambar styraciflua
Exbucklandia populnea
Rhodoleia championii
Disanthus cercidifolius
Hamamelis virginiana
Corylopsis pauciflora
Pterostemon rotundifolius
Choristylis rhamnoides
Itea virginica
Ribes aureum
Saxifraga cernua
Sullivantia oregana
Heuchera micrantha
Paeonia californica
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
Aphloia theiformis
Geissoloma marginatum
Strasburgeria robusta
Ixerba brexioides
Staphylea trifolia
Guamatela tuerckheimii
Stachyurus praecox
Crossosoma bigelovii
Picramnia polyantha
Biebersteinia orphanidis
Aesculus pavia
Cupaniopsis anacardioides
Bursera fagaroides
Schinus molle
Rhus copallinum
Nitraria retusa
Citrus paradisi
Ailanthus altissima
Trichilia emetica
Swietenia macrophylla
Gerrardina foliosa
Tapiscia sinensis
Dipentodon sinicus
Perrottetia ovata
Neurada procumbens
Thymelaea hirsuta
Bixa orellana
Anisoptera marginata
Helianthemum grandiflorum
Sterculia apetala
Durio zibethinus
Gossypium hirsutum
Bombax ceiba
Ochroma pyramidale
Tropaeolum tricolor
Carica papaya
Floerkea proserpinacoides
Batis maritima
Koeberlinia spinosa
Pentadiplandra brazzeana
Reseda alba
Gyrostemon tepperi
Tovaria pendula
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
Malvidae
Superrosidae
Rosidae

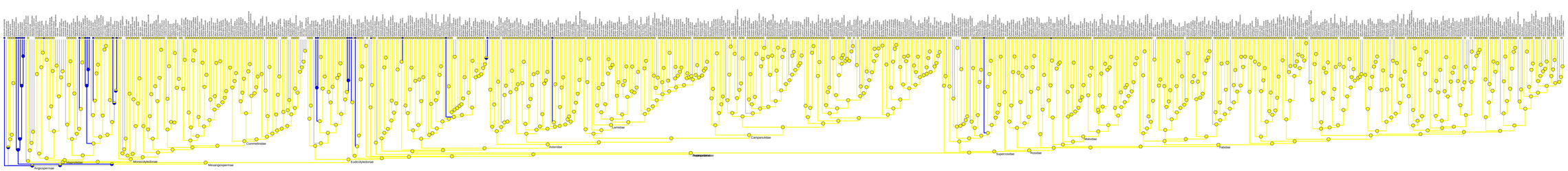

Spiraea betulifolia
Prunus persica
Photinia x fraseri
Ceanothus sanguineus
Rhamnus cathartica
Barbeya oleoides
Dirachma socotrana
Elaeagnus umbellata
Zelkova serrata
Pilea cadierei
Urtica dioica
Boehmeria nivea
Ficus carica
Morus indica
Celtis yunnanensis
Cannabis sativa
Humulus lupulus
Datisca cannabina
Tetrameles nudiflora
Begonia sanguinea
Corynocarpus laevigatus
Coriaria ruscifolia
Anisophyllea fallax
Xerosicyos danguyi
Dendrosicyos socotrana
Cucurbita pepo
Coccinia sessilifolia
Cucumis melo
Polygala pauciflora
Quillaja saponaria
Stylobasium spathulatum
Schotia brachypetala
Bauhinia galpinii
Cercis canadensis
Ceratonia siliqua
Acacia fimbriata
Albizia julibrissin
Mimosa polycarpa
Indigofera heterantha
Glycine max
Erythrina cristagalli
Lotus corniculatus
Astragalus membranaceus
Cicer arietinum
Medicago sativa
Pisum sativum
Krameria ixine
Larrea tridentata
Guaiacum sanctum
Hua gabonii
Afrostyrax lepidophyllus
Connarus championii
Rourea minor
Oxalis dillenii
Dapania racemosa
Averrhoa carambola
Brunellia acutangula
Eucryphia lucida
Davidsonia pruriens
Cephalotus follicularis
Sloanea latifolia
Elaeocarpus reticulatus
Crinodendron hookerianum
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
Hydnocarpus heterophylla
Erythrospermum phytolaccoides
Pangium edule
Acharia tragodes
Kiggelaria africana
Goupia glabra
Rinorea pubiflora
Leonia glycycarpa
Hymenanthera alpina
Hybanthus concolor
Viola pubescens
Malesherbia linearifolia
Turnera ulmifolia
Paropsia madagascariensis
Passiflora biflora
Lozania pittieri
Lacistema aggregatum
Casearia sylvestris
Lunania parviflora
Scyphostegia borneensis
Prockia crucis
Abatia parviflora
Flacourtia indica
Dovyalis rhamnoides
Poliothyrsis sinensis
Idesia polycarpa
Salix reticulata
Populus tremuloides
Fabidae


Elatine triandra
Bergia texana
Byrsonima crassifolia
Acridocarpus natalitius
Tetrapterys tinifolia
Thryallis latifolia
Dicella nucifera
Malpighia emarginata
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
Lophopyxis maingayi
Drypetes madagascariensis
Ochthocosmus longipedicellatus
Klainedoxa gabonensis
Irvingia malayana
Sacoglottis amazonica
Humiria balsamifera
Vantanea guianensis
Microdesmis puberula
Galearia filiformis
Panda oleosa
Bhesa paniculata
Centroplacus glaucinus
Caryocar glabrum
Durandea pentagyna
Hugonia platysepala
Linum perenne
Reinwardtia indica
Medusagyne oppositifolia
Quiina pteridophylla
Touroulia guianensis
Luxemburgia octandra
Ochna multiflora
Cespedesia spathulata
Sauvagesia erecta
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
Paradrypetes subintegrifolia
Cassipourea lanceolata
Bruguiera gymnorhiza
Rhizophora stylosa
Carallia brachiata
Crossostylis grandiflora
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
Endospermum moluccanum
Tetrorchidium gabonense
Moultonianthus leembruggianus
Conceveiba martiana
Acalypha californica
Spathiostemon javensis
Ricinus communis
Dalechampia spathulata
Lasiocroton bahamensis
Pimelodendron zoanthogyne
Euphorbia epithymoides
Hura crepitans
Homalanthus populneus
Suregada boiviniana
Croton alabamensis
Trigonostemon verrucosus
Codiaeum peltatum

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

alt verticillate
spiral

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

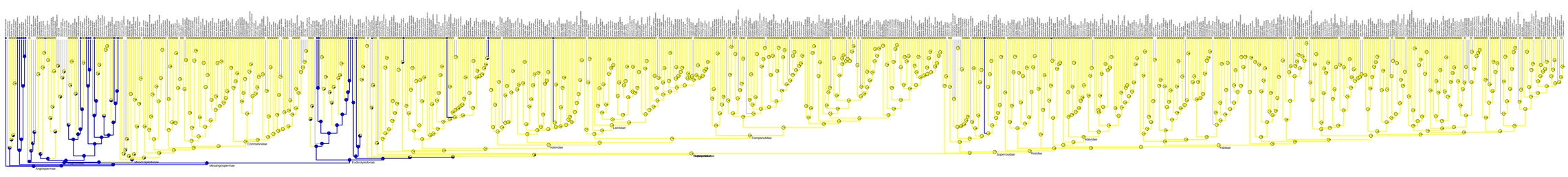


ML ancestral state reconstruction using rayDISC (R:corHMM)
230_A. Perianth phyllotaxy (binary) (D2d), ARD model

whorled
spiral

Node	ML state	Prob
Angiospermae	spiral	1
Mesangiospermae	spiral	1
Magnoliidae	spiral	0.9985
Monocotyledonae	whorled	0.5128
Eudicotyledonae	spiral	0.9998
Commelinidae	whorled	0.9997
Ceratophyta	whorled	0.9999
Superasteridae	whorled	0.9777
Asteridae	whorled	0.9995
Lamidae	whorled	1
Campanulidae	whorled	1
Superrosidae	whorled	0.9916
Rosidae	whorled	0.9545
Malvidae	whorled	1
Fabidae	whorled	1

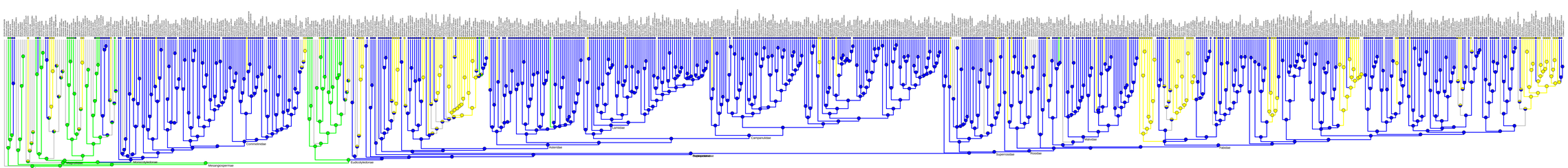
Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD***	-70.5	2	145	145.01	0	0.99	2e-04	0.0111
ARDeq	-77.64	2	159.29	159.3	14.29	0	4e-04	2e-04
ER	-78.3	1	158.6	158.61	13.6	0	4e-04	4e-04
UN01	-78.36	1	158.72	158.73	13.71	0	4e-04	
UN10	-77.59	1	157.18	157.18	12.17	0		0.0185



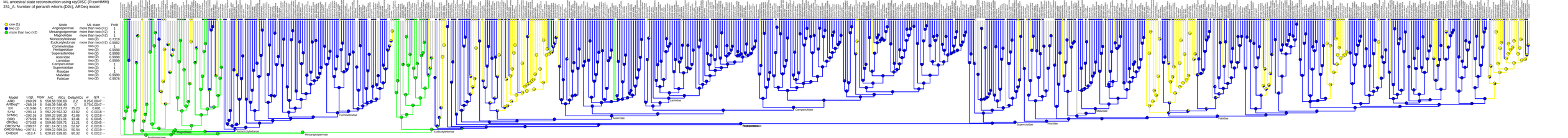
MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
231_A. Number of perianth whorls (D2c), 73 steps

- 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)
Monocotyledoneae	two (2)
Eudicotyledoneae	more than two (>2)
Commelinidae	two (2)
Ranunculidae	two (2)
Superasteridae	two (2)
Asteridae	two (2)
Lamidae	two (2)
Campanulidae	two (2)
Superrosidae	two (2)
Rosidae	two (2)
Malvidae	two (2)
Fabidae	two (2)



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



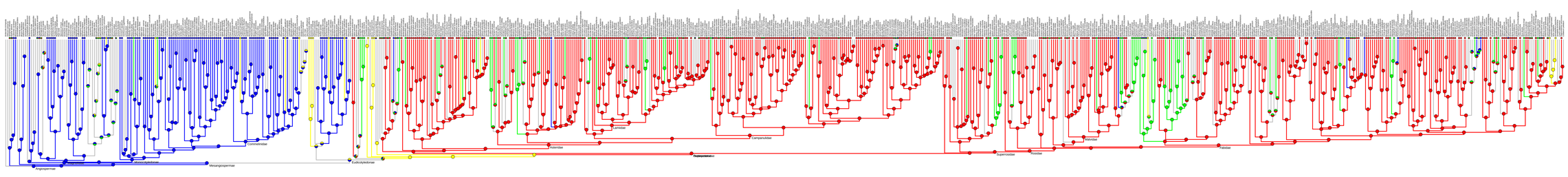
Node	ML state	Prob
Angiospermae	more than two (>2)	1
Mesangiospermae	more than two (>2)	1
Magnoliidae	more than two (>2)	1
Monocotyledonae	two (2)	0.7319
Eudicotyledonae	more than two (>2)	0.9982
Gunneridae	two (2)	1
Pentapetalae	two (2)	0.9998
Superasteridae	two (2)	0.9998
Asteridae	two (2)	0.9998
Lamidae	two (2)	0.9999
Campanulidae	two (2)	1
Lamiidae	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	-269.29	6	550.58	550.69	2.2	0.25	0.0047	--
ARDeq**	-268.19	6	548.39	548.49	0	0.75	0.0047	--
ER	-310.86	1	623.72	623.73	75.23	0	0.001	--
SYM	-292.14	3	590.28	590.35	41.86	0	0.0018	--
SYMeq	-292.14	3	590.28	590.35	41.86	0	0.0018	--
ORD	-276.93	4	561.85	561.91	13.41	0	0.0045	--
ORDeq	-275.83	4	559.65	559.71	11.21	0	0.0045	--
ORDSYM	-298.57	2	601.14	601.16	52.67	0	0.0019	--
ORDSYMeq	-297.51	2	599.02	599.04	50.54	0	0.0019	--
ORDER	-313.4	1	628.81	628.81	80.32	0	0.0012	--

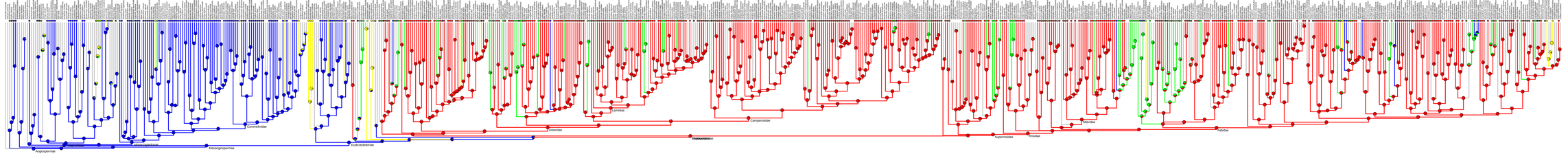
MP ancestral state reconstruction using ancestral pars
(R:phangorn)
232_A. Perianth merism (4–state) (D2c), 84 steps

- dimerous
- trimerous
- tetramerous
- pentamerous

Node	MP state(s)
Angiospermae	trimerous
Mesangiospermae	trimerous
Magnoliidae	trimerous
Monocotyledonae	trimerous
Eudicotyledonae	dimerous / trimerous
Commelinidae	trimerous
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)
232_A. Perianth merism (4–state) (D2c), SYMeq model



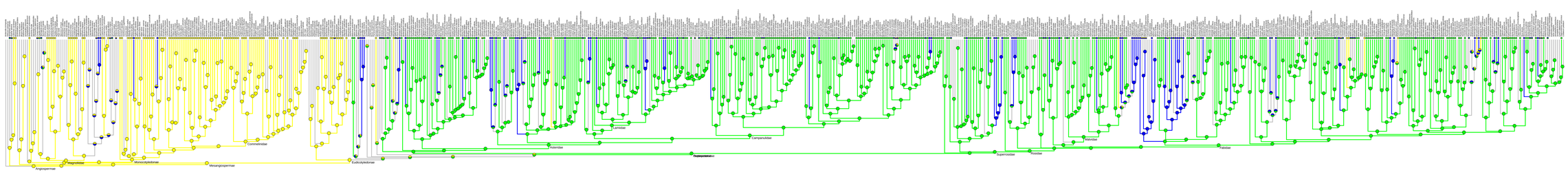
Node	ML state	Prob
Angiospermae	trimerous	1
Mesangiospermae	trimerous	1
Magnoliidae	trimerous	1
Monocotyledoneae	trimerous	1
Eudicotyledoneae	trimerous	0.9742
Commelinidae	trimerous	1
Superasteridae	pentamerous	0.9998
Superasteridae	pentamerous	0.9998
Asteridae	pentamerous	1
Lamidae	pentamerous	1
Campanulidae	pentamerous	1
Superrosidae	pentamerous	1
Rosidae	pentamerous	1
Malvidae	pentamerous	1
Fabidae	pentamerous	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	--
ARD	-321.85	12	667.7	668.1	7.62	0.02	6e−04	--
ARDeq	-326.5	12	665	665.4	4.92	0.09	5e−04	--
ER	-360.15	1	722.29	722.3	61.81	0	8e−04	--
SYM	-324.19	6	660.38	660.49	2.9	0.19	0.0013	--
SYMeq**	-324.19	6	660.38	660.49	2.9	0.19	0.0013	--
ORD	-336.7	6	685.4	685.51	25.02	0	0	--
ORDeq	-336.17	6	684.33	684.44	23.95	0	0	--
ORDSYM	-344.42	3	694.85	694.88	34.39	0	0.002	--
ORDSYMeq	-343.05	3	692.1	692.14	31.65	0	0.002	--
ORDER	-345.93	1	693.86	693.86	33.38	0	0.0025	--

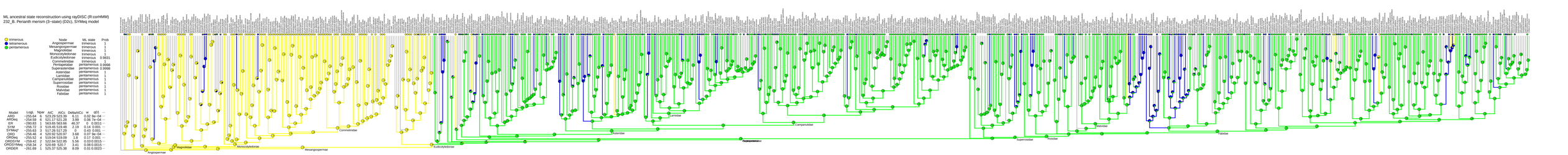
MP ancestral state reconstruction using ancestral pars (R:phangorn)
232_B. Perianth merism (3–state) (D2c), 70 steps

trimerous
tetramerous
pentamerous

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

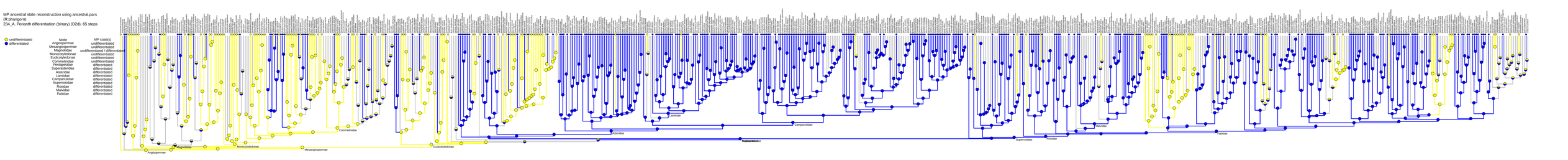


ML ancestral state reconstruction using rayDISC (R:corHMM)
232_B. Perianth merism (3–state) (D2c), SYMeq model



Node	ML state	Prob
Angiospermae	trimerous	1
Mesangiospermae	trimerous	1
Magnoliidae	trimerous	1
Monocotyledoneae	trimerous	1
Eudicotyledoneae	trimerous	0.9831
Commelinidae	trimerous	1
Gunneridae	pentamerous	0.9998
Superasteridae	pentamerous	0.998
Asteridae	pentamerous	1
Lamiidae	pentamerous	1
Campanulidae	pentamerous	1
Superrosidae	pentamerous	1
Rosidae	pentamerous	1
Malvidae	pentamerous	1
Fabidae	pentamerous	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	…
ARD	-255.64	6	523.29	523.39	6.11	0.02	8e−04	…
ARDeq	-254.59	4	521.17	521.28	3.99	0.06	7e−04	…
ER	-260.83	1	563.65	563.66	46.37	0	0.0013	…
SYM	-255.63	3	517.25	517.29	2.19	0.19	0.001	…
SYMeq	-255.63	3	517.25	517.29	2.19	0.43	0.001	…
ORD	-256.46	4	520.92	520.97	3.68	0.07	9e−04	…
ORDeq	-255.52	4	519.04	519.09	1.8	0.17	0.001	…
ORDSYM	-259.42	2	522.84	522.85	5.56	0.03	0.0015	…
ORDSYMeq	-258.34	2	520.69	520.7	3.41	0.08	0.0015	…
ORDER	-261.69	1	525.37	525.38	8.09	0.01	0.0023	…

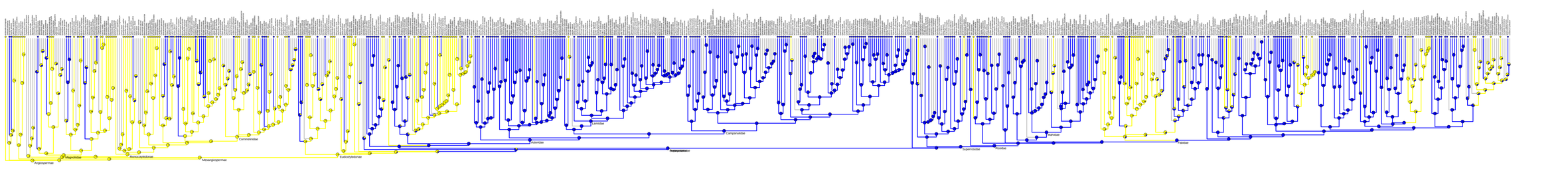

MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
234_A. Periamth differentiation (binary) (D2d), 65 steps
undifferentiated
differentiated
Node
MP state(s)
Angiospermae
undifferentiated
Mesangiospermae
undifferentiated
Magnoliidae
undifferentiated / differentiated
Monocotyledonae
undifferentiated
Eudicotyledonae
undifferentiated
Commelinidae
undifferentiated
Ceratophyllidae
differentiated
Superasteridae
differentiated
Asteridae
differentiated
Lamiidae
differentiated
Campanulidae
differentiated
Superrosidae
differentiated
Rosidae
differentiated
Malvidae
differentiated
Fabidae
differentiated
Angiospermae
Magnoliidae
Monocotyledonae
Mesangiospermae
Eudicotyledonae
Commelinidae
Ceratophyllidae
Superasteridae
Asteridae
Lamiidae
Campanulidae
Superrosidae
Rosidae
Malvidae
Fabidae

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	1
Monocotyledonae	undifferentiated	1
Eudicotyledonae	undifferentiated	0.9915
Commelinidae	undifferentiated	0.9999
Ceratophyllidae	undifferentiated	0.9429
Superasteridae	differentiated	0.9429
Asteridae	differentiated	0.9977
Lamidae	differentiated	0.9999
Campanulidae	differentiated	1
Gentianidae	differentiated	0.9913
Rosidae	differentiated	0.9985
Malvidae	differentiated	0.9988
Fabidae	differentiated	0.9985

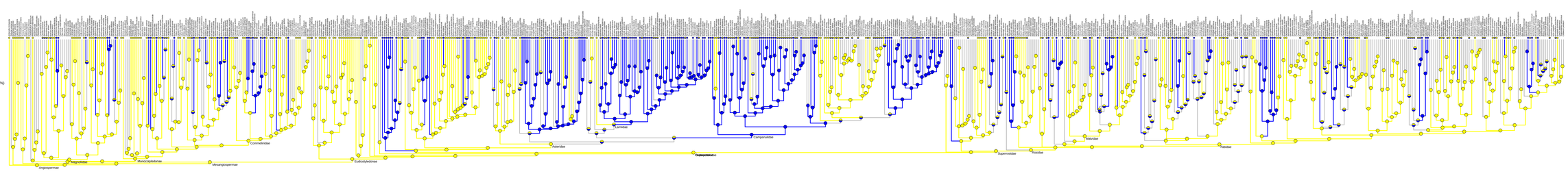
Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	-199.82	2	403.64	403.66	1.38	0.33	0.0046	0.0015
ARDeq**	-199.13	2	402.26	402.27	0	0.67	0.0046	0.0015
ER	-209.24	1	420.48	420.48	18.21	0	0.0025	0.0025
UN01	-229.29	1	458.58	458.59	56.32	0	0.0089	
UN10	-233.78	1	469.55	469.56	67.28	0		0.0034



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%)
Ranunculidae	free (<5%)
Superasteridae	free (<5%)
Asteridae	free (<5%)
Lamidae	free (<5%) / fused (>5%)
Campanulidae	fused (>5%)
Rosanae	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

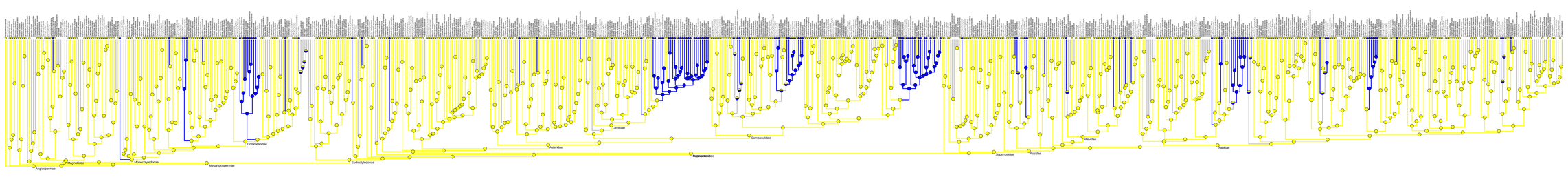
Node	ML state	Prob
Angiospermae	free (<5%)	1
Mesangiospermae	free (<5%)	1
Magnoliidae	free (<5%)	0.9999
Monocotyledoneae	free (<5%)	1
Eudicotyledoneae	free (<5%)	1
Commelinidae	free (<5%)	0.9991
Gunneridae	free (<5%)	0.9994
Superasteridae	free (<5%)	0.9994
Asteridae	free (<5%)	0.8583
Lamiidae	fused (>5%)	0.9506
Campanulidae	fused (>5%)	0.9276
Superrosidae	free (<5%)	0.9994
Rosidae	free (<5%)	0.9994
Malvidae	free (<5%)	0.9983
Fabidae	free (<5%)	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	-224.54	2	453.08	453.1	1.38	0.21	0.0044	0.0035
ARDeq*	-223.85	2	451.7	451.71	0	0.42	0.0044	0.0035
ER	-225.01	1	452.01	452.02	0.3	0.36	0.0042	0.0042
UN01	-236.28	1	474.56	474.57	22.85	0	0.0049	
UN10	-236.29	1	474.58	474.59	22.87	0		0.008

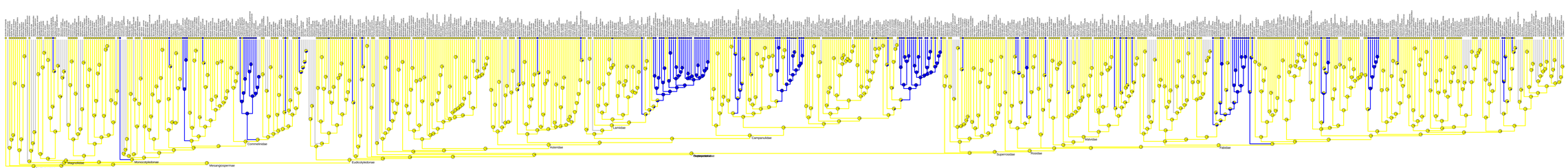
MP ancestral state reconstruction using ancestral.pars (R:phangorn)
207_A. Symmetry of perianth (binary) (D2d), 55 steps

actinomorphic
zygomorphic

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



ML ancestral state reconstruction using rayDISC (R corHMM)
207_A. Symmetry of perianth (binary) (02d), ARDeq model



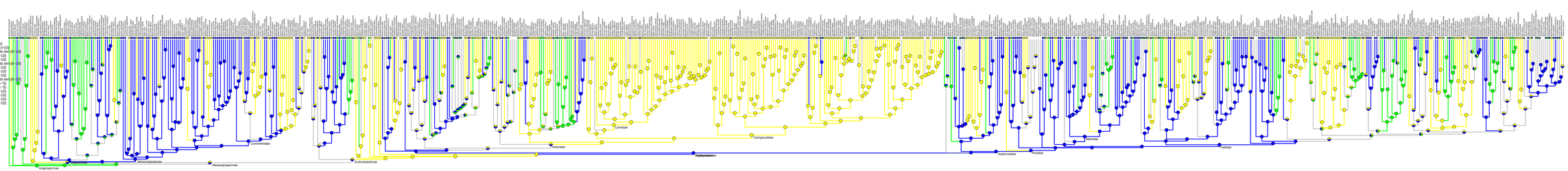
Node	ML state	Prob
Angiospermae	actinomorphic	1
Mesangiospermae	actinomorphic	1
Magnoliidae	actinomorphic	1
Monocotyledonae	actinomorphic	0.9997
Eudicotyledonae	actinomorphic	1
Commelinidae	actinomorphic	0.9978
Gunneridae	actinomorphic	1
Superasteridae	actinomorphic	1
Asteridae	actinomorphic	1
Lamiidae	actinomorphic	0.9998
Campanulidae	actinomorphic	1
Superrosidae	actinomorphic	1
Rosidae	actinomorphic	1
Malvidae	actinomorphic	0.9998
Fabidae	actinomorphic	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	−209.77	2	423.55	423.56	1.37	0.33	0.0014	0.0059
ARDeq**	−209.99	2	422.17	422.19	0	0.66	0.0014	0.0059
ER	−217.62	1	437.24	437.24	15.06	0	0.0015	0.0015
UN01	−258.94	1	519.88	519.88	97.7	0	0.0018	0
UN10	−216.82	1	435.64	435.64	13.45	0	0	0.0167

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)

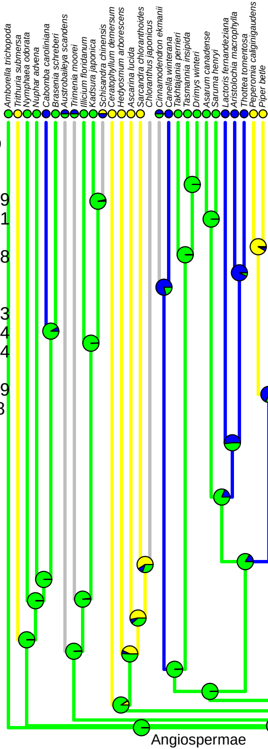
Node	MP state(s)
Angiospermae	more than ten (>10)
Mesangiospermae	one to five (1–5) / six to ten (6–10)
Magnoliidae	six to ten (6–10)
Monocotyledonae	six to ten (6–10)
Eudicotyledonae	one to five (1–5) / six to ten (6–10)
Commelinidae	six to ten (6–10)
Ceratophyllum	six to ten (6–10)
Superasteridae	six 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)



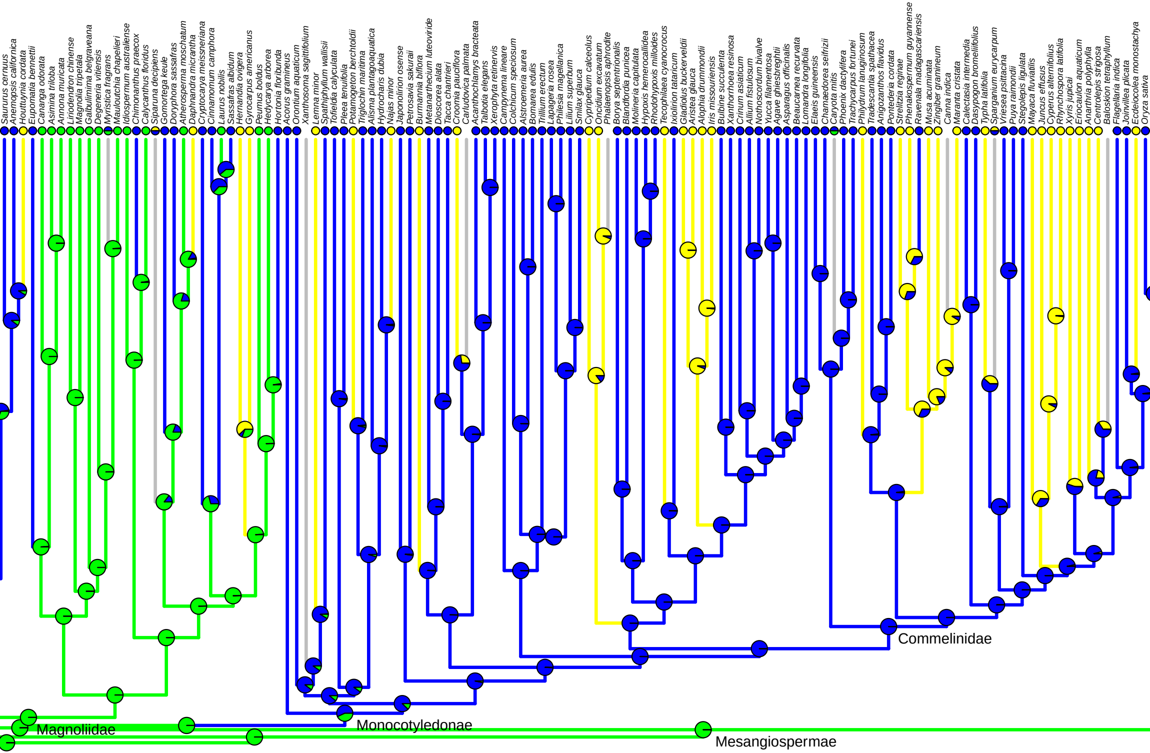
ML ancestral state reconstruction using rayDISC (R:corHMM)
301_B. Number of fertile stamens (3−state) (D2c), ARDeq model

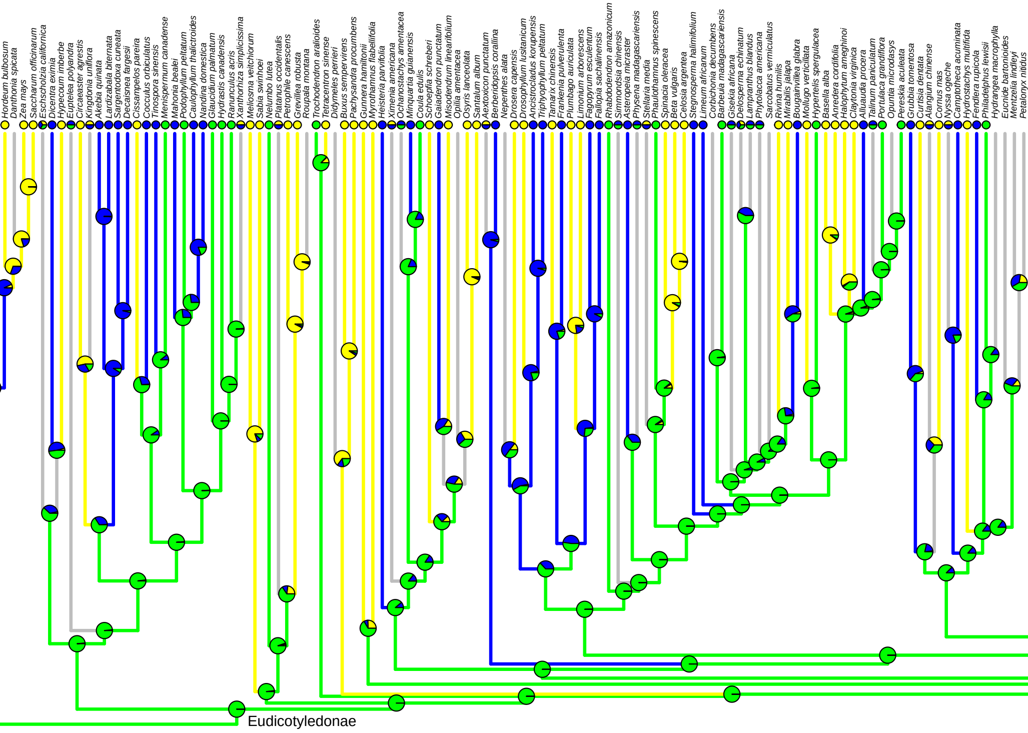
🟡 one to five (1−5)
🔵 six to ten (6−10)
🟢 more than ten (>10)

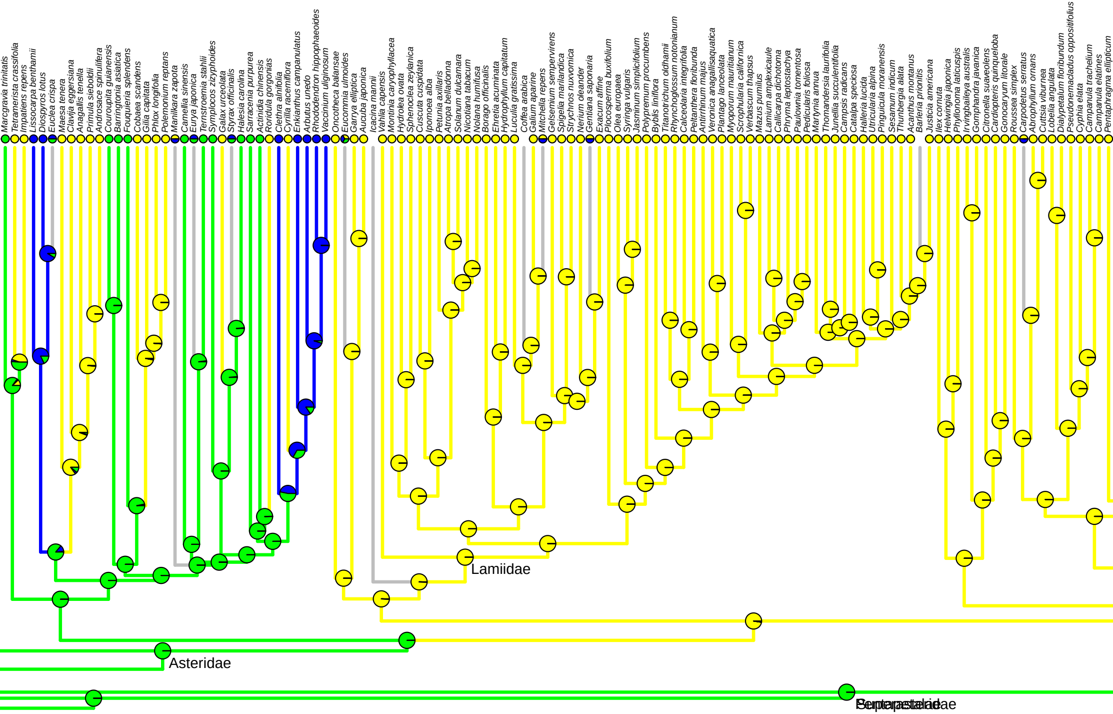
Node	ML state	Prob
Angiospermae	more than ten (>10)	1
Mesangiospermae	more than ten (>10)	1
Magnoliidae	more than ten (>10)	0.9999
Monocotyledonae	six to ten (6−10)	0.5681
Eudicotyledonae	more than ten (>10)	1
Commelinidae	six to ten (6−10)	0.9998
Pentapetalae	more than ten (>10)	1
Superasteridae	more than ten (>10)	1
Asteridae	more than ten (>10)	0.9993
Lamiidae	one to five (1−5)	0.9994
Campanulidae	one to five (1−5)	0.9964
Superrosidae	more than ten (>10)	1
Rosidae	more than ten (>10)	0.9999
Malvidae	more than ten (>10)	0.928
Fabidae	more than ten (>10)	1

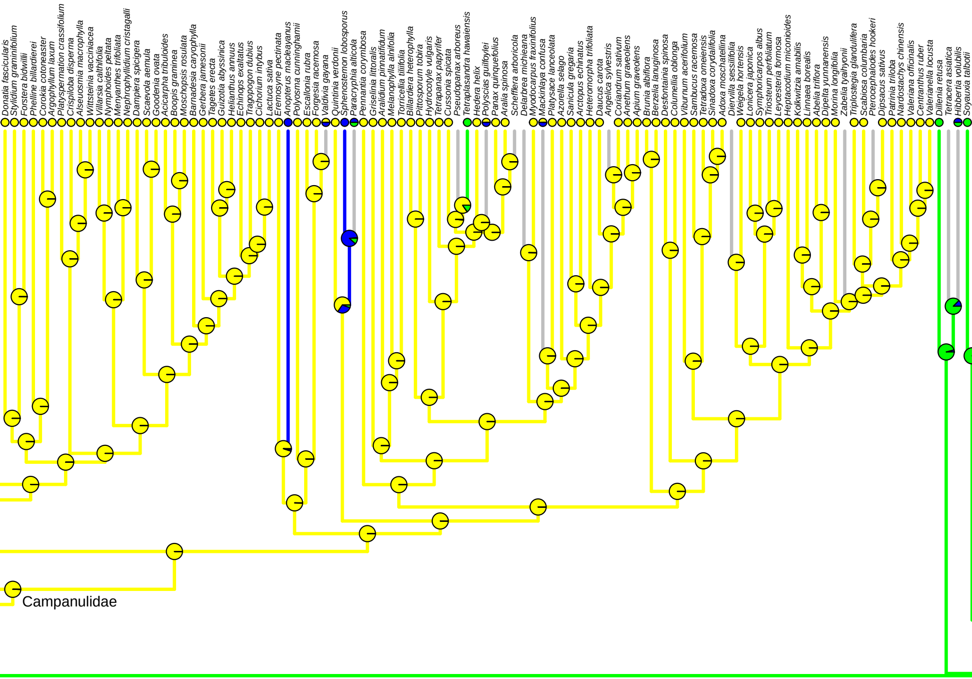

Amborella trichopoda
Trithuria submersa
Nymphaea odorata
Nuphar advena
Cabomba caroliniana
Brasenia schreberi
Austrobaileya scandens
Trimenia moorei
Illicium floridanum
Kadsura japonica
Schisandra chinensis
Ceratophyllum demersum
Hedyosmum arborescens
Ascarina lucida
Sarcandra chloranthoides
Chloranthus japonicus
Cinnamodendron ekmanii
Canella winterana
Takhtajania perrieri
Tasmannia insipida
Drimys winteri
Asarum canadense
Saruma henryi
Lactoris fernandeziana
Aristolochia macrophylla
Thottea tomentosa
Peperomia caliginigaudens
Piper betle
Angiospermae

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	⋯
ARD	−495.22	6	1002.44	1002.54	2.2	0.25	4e−04	⋯
ARDeq**	−494.12	6	1000.24	1000.35	0	0.75	4e−04	⋯
ER	−538	1	1077.99	1078	77.65	0	0.0027	⋯
SYM	−531.78	3	1069.56	1069.59	69.24	0	0.0038	⋯
SYMeq	−530.98	3	1067.97	1068	67.65	0	0.0038	⋯
ORD	−511.87	4	1031.74	1031.79	31.45	0	8e−04	⋯
ORDeq	−511.35	4	1030.69	1030.74	30.4	0	8e−04	⋯
ORDSYM	−536.28	2	1076.56	1076.58	76.23	0	0.0043	⋯
ORDSYMeq	−535.41	2	1074.81	1074.83	74.48	0	0.0043	⋯
ORDER	−536.3	1	1074.61	1074.61	74.26	0	0.0044	⋯


Saururus cernuus
Anemopsis californica
Houttuynia cordata
Eupomatia bennettii
Cananga odorata
Asimina triloba
Annona muricata
Liriodendron chinense
Magnolia tripetala
Galbulimima belgraveana
Degeneria vitiensis
Myristica fragrans
Mauloutchia chapelieri
Idiospermum australiense
Chimonanthus praecox
Calycanthus floridus
Siparuna decipiens
Gomortega keule
Doryphora sassafras
Atherosperma moschatum
Daphnandra micrantha
Cryptocarya meissneriana
Cinnamomum camphora
Laurus nobilis
Sassafras albidum
Hernandia ovigera
Gyrocarpus americanus
Peumus boldus
Hedycarya arborea
Hortonia floribunda
Acorus gramineus
Orontium aquaticum
Xanthosoma sagittifolium
Lemna minor
Spathiphyllum wallisii
Tofieldia calyculata
Pleea tenuifolia
Potamogeton berchtoldii
Triglochin maritima
Alisma plantagoaquatica
Hydrocharis dubia
Najas minor
Japonolirion osense
Petrosavia sakuraii
Burmannia biflora
Metanarthecium luteoviride
Dioscorea alata
Tacca chantrieri
Croomia pauciflora
Carludovica palmata
Acanthochlamys bracteata
Talbotia elegans
Xerophyta retinervis
Campynema lineare
Colchicum speciosum
Alstroemeria aurea
Bomarea edulis
Trillium erectum
Lapageria rosea
Philesia magellanica
Lilium superbum
Smilax glauca
Cypripedium calceolus
Oncidium excavatum
Phalaenopsis aphrodite
Borya septentrionalis
Blandfordia punicea
Molineria capitulata
Hypoxis hemerocallidea
Rhodohypoxis milloides
Tecophilaea cyanocrocus
Ixiolirion tataricum
Gladiolus buckerveldii
Aristea glauca
Alophia drummondii
Iris missouriensis
Bulbine succulenta
Xanthorrhoea resinosa
Crinum asiaticum
Allium fistulosum
Nothoscordum bivalve
Yucca filamentosa
Agave ghiesbreghtii
Asparagus officinalis
Beaucarnea recurvata
Lomandra longifolia
Elaeis guineensis
Chamaedorea seifrizii
Caryota mitis
Phoenix dactylifera
Trachycarpus fortunei
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
Xyris jupicai
Eriocaulon aquaticum
Anarthria polyphylla
Centrolepis strigosa
Baloskion tetraphyllum
Flagellaria indica
Joinvillea plicata
Ecdeiocolea monostachya
Oryza sativa
Commelinidae
Magnoliidae
Monocotyledonae
Mesangiospermae


Hordeum bulbosum
Danthonia spicata
Zea mays
Saccharum officinarum
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
Meliosma veitchiorum
Sabia swinhoei
Nelumbo lutea
Platanus occidentalis
Petrophile canescens
Grevillea robusta
Roupala montana
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
Nepenthes alata
Drosera capensis
Drosophyllum lusitanicum
Ancistrocladus korupensis
Triphyophyllum peltatum
Tamarix chinensis
Frankenia pulverulenta
Plumbago auriculata
Limonium arborescens
Fagopyrum esculentum
Fallopia sachalinensis
Rhabdodendron amazonicum
Simmondsia chinensis
Asteropeia micraster
Physena madagascariensis
Stellaria media
Phaulothamnus spinescens
Spinacia oleracea
Beta vulgaris
Celosia argentea
Stegnosperma halimifolium
Limeum africanum
Corbichonia decumbens
Barbeuia madagascariensis
Gisekia africana
Delosperma echinatum
Lampranthus blandus
Phytolacca americana
Sarcobatus vermiculatus
Rivina humilis
Mirabilis jalapa
Bougainvillea glabra
Mollugo verticillata
Hypertelis spergulacea
Basella alba
Anredera cordifolia
Halophytum ameghinoi
Claytonia virginica
Alluaudia procera
Talinum paniculatum
Portulaca grandiflora
Opuntia microdasys
Pereskia aculeata
Grubbia tomentosa
Curtisia dentata
Alangium chinense
Cornus mas
Nyssa ogeche
Camptotheca acuminata
Hydrostachys multifida
Fendlera rupicola
Philadelphus lewisii
Hydrangea macrophylla
Eucnide bartonioides
Mentzelia lindleyi
Petalonyx nitidus
Eudicotyledonae


Marcgravia trinitatis
Tetramerista crassifolia
Impatiens repens
Lissocarpa benthamii
Diospyros lotus
Euclea crispa
Maesa tenera
Clavija eggersiana
Anagallis tenella
Primula sieboldii
Androsace spinulifera
Couroupita guianensis
Barringtonia asiatica
Fouquieria splendens
Cobaea scandens
Gilia capitata
Phlox longifolia
Polemonium reptans
Manilkara zapota
Camellia sinensis
Eurya japonica
Ternstroemia stahlii
Symplocos zizyphoides
Galax urceolata
Styrax officinalis
Halesia carolina
Sarracenia purpurea
Actinidia chinensis
Roridula gorgonias
Clethra alnifolia
Cyrilla racemiflora
Enkianthus campanulatus
Arbutus unedo
Rhododendron hippophaeoides
Vaccinium uliginosum
Oncotheca balansae
Eucommia ulmoides
Garrya elliptica
Aucuba japonica
Icacina mannii
Vahlia capensis
Montinia caryophyllacea
Hydrolea ovata
Sphenoclea zeylanica
Cuscuta cuspidata
Ipomoea alba
Petunia axillaris
Atropa belladonna
Solanum dulcamara
Nicotiana tabacum
Nolana humifusa
Borago officinalis
Ehretia acuminata
Hydrophyllum capitatum
Luculia gratissima
Coffea arabica
Galium aparine
Mitchella repens
Gelsemium sempervirens
Spigelia marilandica
Strychnos nuxvomica
Nerium oleander
Gentiana saponaria
Exacum affine
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
Paulownia tomentosa
Pedicularis foliosa
Martynia annua
Thomandersia laurifolia
Junellia succulentifolia
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
Cardiopteris quinqueloba
Gonocaryum litorale
Roussea simplex
Carpodetus serratus
Abrophyllum ornans
Cuttsia viburnea
Lobelia angulata
Dialypetalum floribundum
Pseudonemacladus oppositifolius
Cyphia elata
Campanula trachelium
Campanula elatines
Pentaphragma ellipticum
Lamiidae
Asteridae
Superasteridae
Pentapetalidae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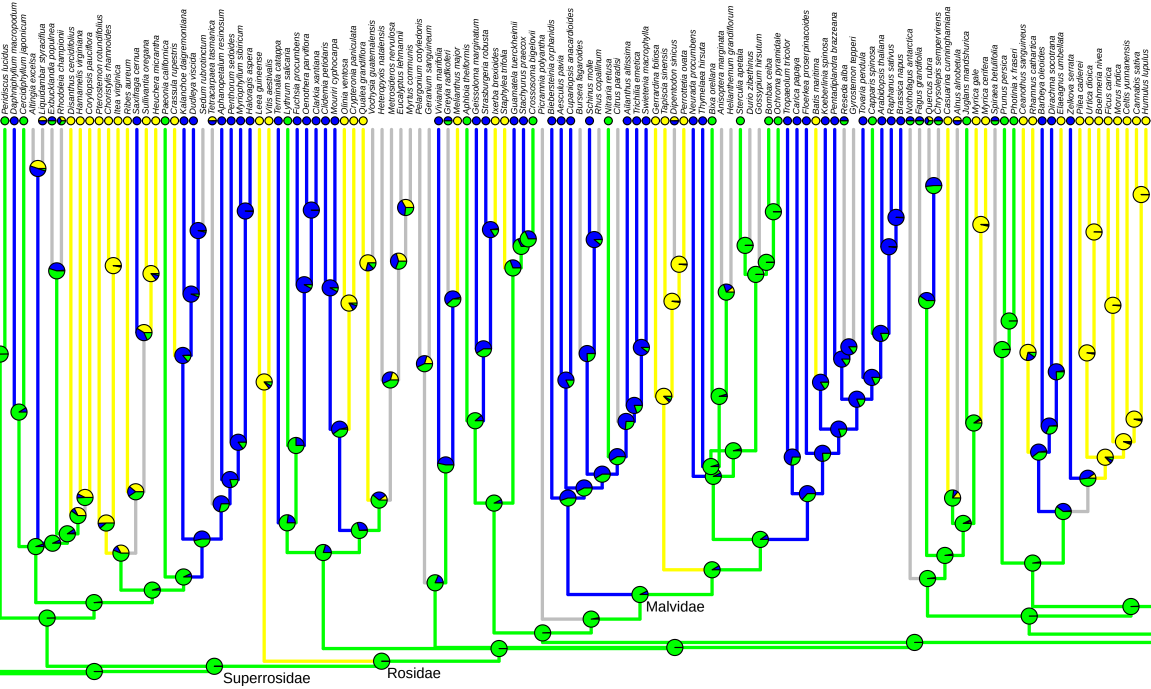
Phelline billardierei
Corokia cotoneaster
Argophyllum laxum
Platyspermation crassifolium
Crispiloba disperma
Alseuosmia macrophylla
Wittsteinia vacciniacea
Villarsia calthifolia
Nymphoides peltata
Menyanthes trifoliata
Nephrophyllidium cristagalli
Dampiera spicigera
Scaevola aemula
Goodenia ovata
Acicarpha tribuloides
Boopis graminea
Moschopsis rosulata
Barnadesia caryophylla
Gerbera jamesonii
Tagetes erecta
Guizotia abyssinica
Helianthus annuus
Echinops exaltatus
Tragopogon dubius
Cichorium intybus
Lactuca sativa
Eremosyne pectinata
Anopterus macleayanus
Polyosma cunninghamii
Escallonia rubra
Forgesia racemosa
Valdivia gayana
Quintinia verdonii
Sphenostemon lobosporus
Paracryphia alticola
Pennantia corymbosa
Griselinia littoralis
Aralidium pinnatifidum
Melanophylla alnifolia
Torricellia tiliifolia
Billardiera heterophylla
Pittosporum tobira
Hydrocotyle vulgaris
Tetrapanax papyrifer
Cussonia spicata
Pseudopanax arboreus
Tetraplasandra hawaiensis
Hedera helix
Polyscias guilfoylei
Panax quinquefolius
Aralia spinosa
Schefflera arboricola
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
Brunia albiflora
Berzelia lanuginosa
Desfontainia spinosa
Columellia oblonga
Viburnum acerifolium
Sambucus racemosa
Tetradoxa omeiensis
Sinadoxa corydalifolia
Adoxa moschatellina
Diervilla sessilifolia
Weigela hortensis
Lonicera japonica
Symphoricarpos albus
Triosteum perfoliatum
Leycesteria formosa
Heptacodium miconioides
Kolkwitzia amabilis
Linnaea borealis
Abelia triflora
Dipelta yunnanensis
Morina longifolia
Zabelia tyaihyonii
Triplostegia glandulifera
Scabiosa columbaria
Pterocephalodes hookeri
Dipsacus sativus
Patrinia triloba
Nardostachys chinensis
Valeriana officinalis
Centranthus ruber
Valerianella locusta
Dillenia retusa
Tetracera asiatica
Hibbertia volubilis
Soyauxia talbotii
Campanulidae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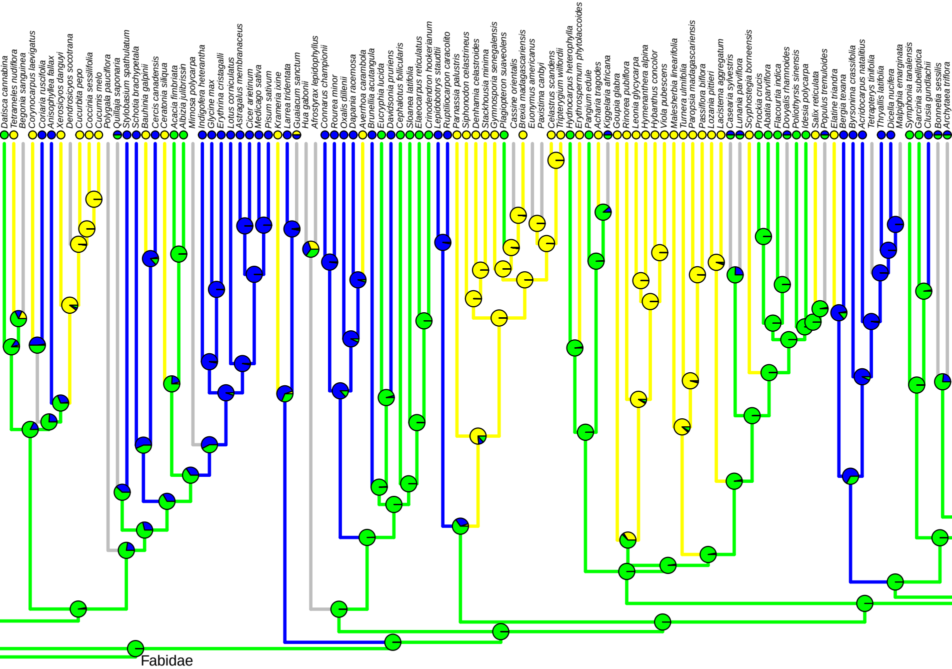
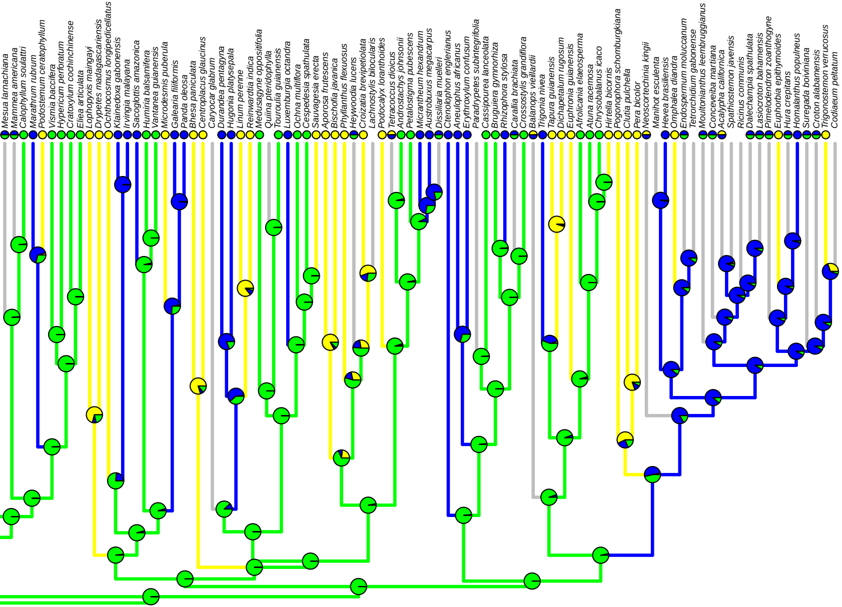
Daphniphyllum macropodum
Cercidiphyllum japonicum
Altingia excelsa
Liquidambar styraciflua
Exbucklandia populnea
Rhodoleia championii
Disanthus cercidifolius
Hamamelis virginiana
Corylopsis pauciflora
Pterostemon rotundifolius
Choristylis rhamnoides
Itea virginica
Ribes aureum
Saxifraga cernua
Sullivantia oregana
Heuchera micrantha
Paeonia californica
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
Aphloia theiformis
Geissoloma marginatum
Strasburgeria robusta
Ixerba brexioides
Staphylea trifolia
Guamatela tuerckheimii
Stachyurus praecox
Crossosoma bigelovii
Picramnia polyantha
Biebersteinia orphanidis
Aesculus pavia
Cupaniopsis anacardioides
Bursera fagaroides
Schinus molle
Rhus copallinum
Nitraria retusa
Citrus paradisi
Ailanthus altissima
Trichilia emetica
Swietenia macrophylla
Gerrardina foliosa
Tapiscia sinensis
Dipentodon sinicus
Perrottetia ovata
Neurada procumbens
Thymelaea hirsuta
Bixa orellana
Anisoptera marginata
Helianthemum grandiflorum
Sterculia apetala
Durio zibethinus
Gossypium hirsutum
Bombax ceiba
Ochroma pyramidale
Tropaeolum tricolor
Carica papaya
Floerkea proserpinacoides
Batis maritima
Koeberlinia spinosa
Pentadiplandra brazzeana
Reseda alba
Gyrostemon tepperi
Tovaria pendula
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
Coccinia sessilifolia
Cucumis melo
Polygala pauciflora
Quillaja saponaria
Stylobasium spathulatum
Schotia brachypetala
Bauhinia galpinii
Cercis canadensis
Ceratonia siliqua
Acacia fimbriata
Albizia julibrissin
Mimosa polycarpa
Indigofera heterantha
Glycine max
Erythrina cristagalli
Lotus corniculatus
Astragalus membranaceus
Cicer arietinum
Medicago sativa
Pisum sativum
Krameria ixine
Larrea tridentata
Guaiacum sanctum
Hua gabonii
Afrostyrax lepidophyllus
Connarus championii
Rourea minor
Oxalis dillenii
Dapania racemosa
Averrhoa carambola
Brunellia acutangula
Eucryphia lucida
Davidsonia pruriens
Cephalotus follicularis
Sloanea latifolia
Elaeocarpus reticulatus
Crinodendron hookerianum
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
Hydnocarpus heterophylla
Erythrospermum phytolaccoides
Pangium edule
Acharia tragodes
Kiggelaria africana
Goupia glabra
Rinorea pubiflora
Leonia glycycarpa
Hymenanthera alpina
Hybanthus concolor
Viola pubescens
Malesherbia linearifolia
Turnera ulmifolia
Paropsia madagascariensis
Passiflora biflora
Lozania pittieri
Lacistema aggregatum
Casearia sylvestris
Lunania parviflora
Scyphostegia borneensis
Prockia crucis
Abatia parviflora
Flacourtia indica
Dovyalis rhamnoides
Poliothyrsis sinensis
Idesia polycarpa
Salix reticulata
Populus tremuloides
Elatine triandra
Bergia texana
Byrsonima crassifolia
Acridocarpus natalitius
Tetrapterys tinifolia
Thryallis latifolia
Dicella nucifera
Malpighia emarginata
Symphonia tanalensis
Garcinia subelliptica
Clusia gundlachii
Bonnetia sessilis
Archytaea triflora
Fabidae


Mesua larnachiana
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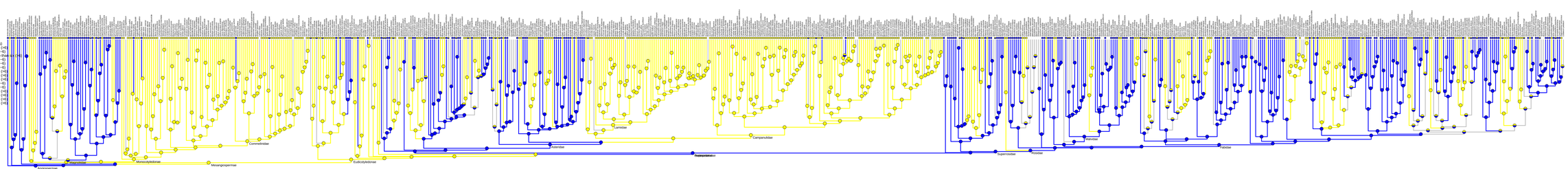
Calophyllum soulattri
Marathrum rubrum
Podostemum ceratophyllum
Vismia baccifera
Hypericum perforatum
Cratoxylum cochinchinense
Eliea articulata
Lophopyxis maingayi
Drypetes madagascariensis
Ochthocosmus longipedicellatus
Klainedoxa gabonensis
Irvingia malayana
Sacoglottis amazonica
Humiria balsamifera
Vantanea guianensis
Microdesmis puberula
Galearia filiformis
Panda oleosa
Bhesa paniculata
Centroplacus glaucinus
Caryocar glabrum
Durandea pentagyna
Hugonia platysepala
Linum perenne
Reinwardtia indica
Medusagyne oppositifolia
Quiina pteridophylla
Touroulia guianensis
Luxemburgia octandra
Ochna multiflora
Cespedesia spathulata
Sauvagesia erecta
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
Paradrypetes subintegrifolia
Cassipourea lanceolata
Bruguiera gymnorhiza
Rhizophora stylosa
Carallia brachiata
Crossostylis grandiflora
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
Endospermum moluccanum
Tetrorchidium gabonense
Moultonianthus leembruggianus
Conceveiba martiana
Acalypha californica
Spathiostemon javensis
Ricinus communis
Dalechampia spathulata
Lasiocroton bahamensis
Pimelodendron zoanthogyne
Euphorbia epithymoides
Hura crepitans
Homalanthus populneus
Suregada boiviniana
Croton alabamensis
Trigonostemon verrucosus
Codiaeum peltatum

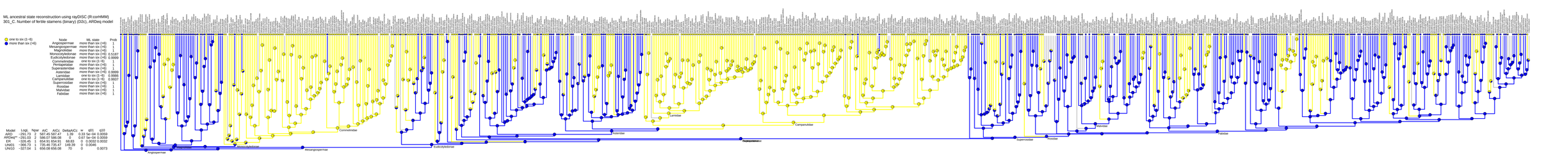
MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
301_C. Number of fertile stamens (binary) (02c), 93 steps

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	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



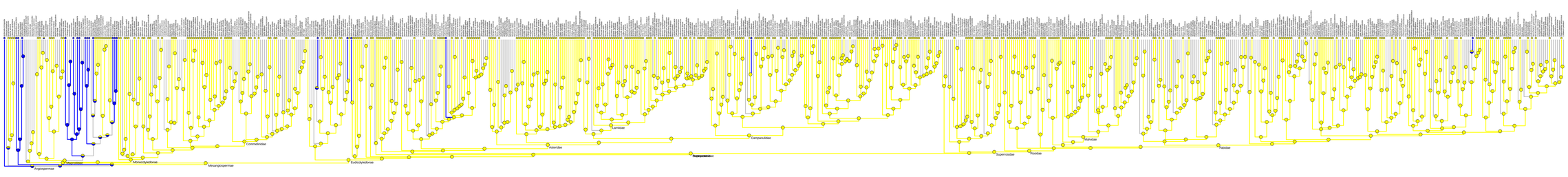
Node	ML state	Prob
Angiospermae	more than six (>6)	1
Mesangiospermae	more than six (>6)	1
Magnoliidae	more than six (>6)	1
Monocotyledonae	more than six (>6)	0.5187
Eudicotyledonae	more than six (>6)	0.9999
Commelinidae	one to six (1–6)	1
Gunneridae	more than six (>6)	1
Superasteridae	more than six (>6)	1
Asteridae	more than six (>6)	0.9999
Lamiidae	one to six (1–6)	0.9996
Campanulidae	one to six (1–6)	0.9937
Caryophyllidae	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	−291.73	2	587.45	587.47	1.39	0.33	5e−04	0.0059
ARDeq**	−291.03	2	586.07	586.08	0	0.67	5e−04	0.0059
ER	−326.45	1	654.91	654.91	68.83	0	0.0032	0.0032
UN01	−365.73	1	735.46	735.47	149.39	0	0.0046	
UN10	−327.04	1	656.08	656.08	70	0		0.0073

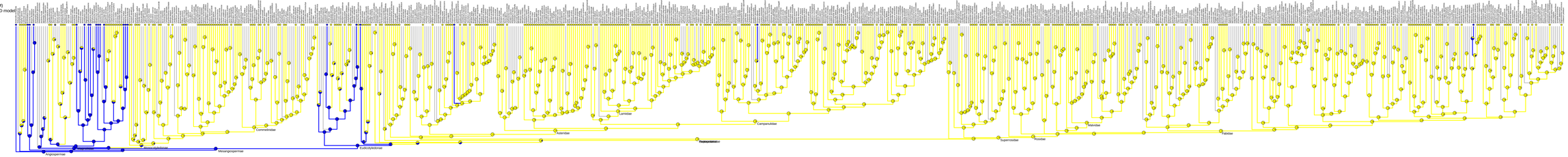
MP ancestral state reconstruction using ancestral pars
(R:phangorn)
330_A. Androecium structural phyllotaxy (binary) (D2d), 12 steps

whorled
spiral

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



ML ancestral state reconstruction using rayDISC (R:corHMM)
330_A. Androecium structural phylotaxy (binary) (D2z), ARD model



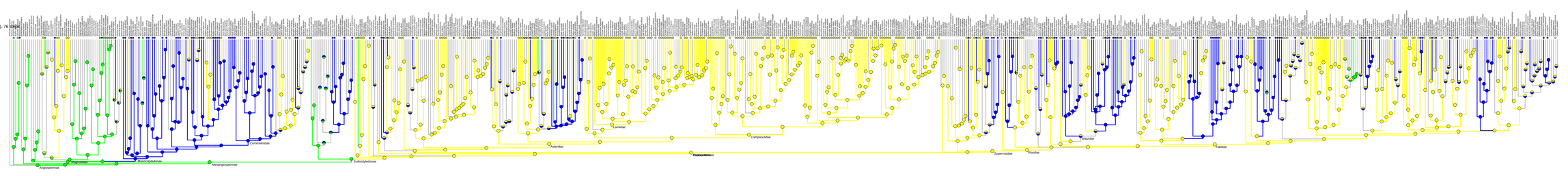
Node	ML state	Prob
Angiospermae	spiral	1
Mesangiospermae	spiral	0.9992
Magnoliidae	spiral	0.9982
Monocotyledonae	whorled	0.5792
Eudicotyledonae	spiral	0.9844
Commelinidae	whorled	0.9997
Gunneridae	whorled	0.9975
Superasteridae	whorled	0.9975
Asteridae	whorled	1
Lamiidae	whorled	1
Campanulidae	whorled	1
Superasteridae	whorled	0.9996
Rosidae	whorled	0.9997
Malvidae	whorled	1
Fabidae	whorled	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD***	-55.27	2	114.54	114.65	0	0.97	1e-04	0.0087
ARDeq	-59.88	2	123.77	123.78	9.23	0.01	4e-04	0
ER	-60.81	1	123.62	123.62	9.07	0.01	4e-04	4e-04
UN01	-60.58	1	123.16	123.16	8.61	0.01	4e-04	
UN10	-76.52	1	155.04	155.04	40.49	0		0.0211

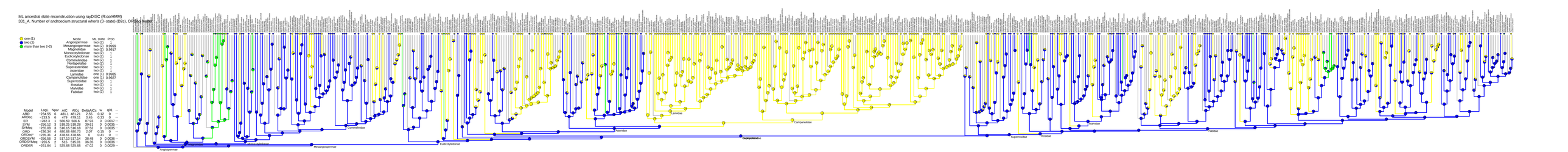
MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
331_A. Number of androecium structural whorls (3–state) (D2c), 76 taxa

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

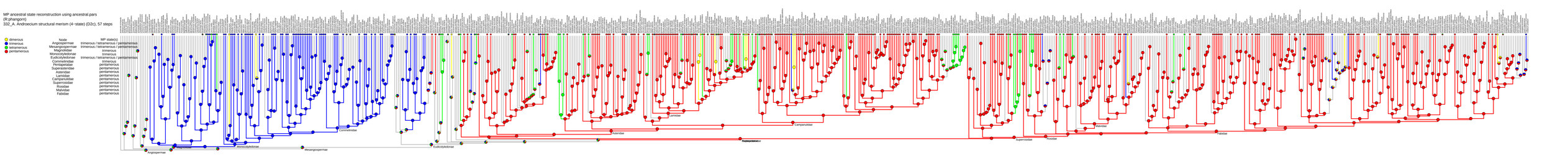
Node	MP state(s)
Angiospermae	more than two (>2)
Mesangiospermae	more than two (>2)
Magnoliidae	more than two (>2)
Monocotyledonae	two (2)
Eudicotyledonae	more than two (>2)
Commelinidae	two (2)
Ceratophyllum	two (2)
Superasteridae	one (1)
Asteridae	one (1)
Lamiidae	one (1)
Campanulidae	one (1)
Superrosidae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



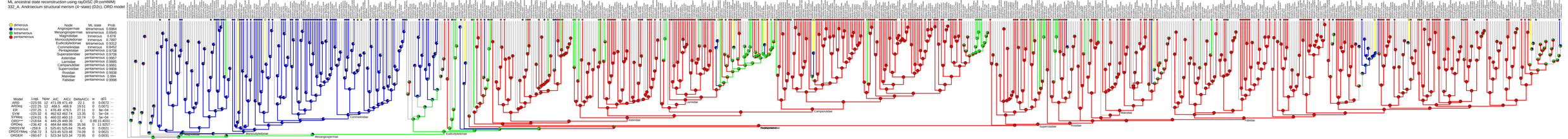
ML ancestral state reconstruction using rayDISC (R:corHMM)
331_A. Number of androecium structural whorls (3–state) (D2c), OR0deg model



Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	...
ARD	-234.55	6	481.1	481.21	2.55	0.12	0	...
ARDeq	-233.5	6	479	479.11	0.45	0.32	0	...
ER	-282.3	1	566.59	566.6	87.93	0	0.0017	...
SYM	-256.08	3	518.15	518.28	37.52	0	0.0035	...
SYMeq	-256.08	3	518.15	518.28	37.52	0	0.0035	...
ORD	-236.34	4	480.68	480.73	2.07	0.11	0	...
ORDeq*	-236.31	4	478.61	478.66	0	0.41	0	...
ORDSYM	-256.56	2	517.13	517.14	38.48	0	0.0036	...
ORDSYMeq	-255.5	2	515	515.01	36.35	0	0.0036	...
ORDER	-261.84	1	525.68	525.68	47.02	0	0.0029	...


MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
332_A. Androecium structural merism (4–state) (D2c), 57 steps
dimerous
trimerous
tetramerous
pentamerous
Node
Angiospermae
Mesangiospermae
Magnoliidae
Monocotyledoniae
Eudicotyledoniae
Commelinidae
Ranunculidae
Superasteridae
Asteridae
Lamiidae
Campanulidae
Santalanae
Rosidae
Malvidae
Fabidae
MP state(s)
trimerous / tetramerous / pentamerous
trimerous / tetramerous / pentamerous
trimerous
trimerous
trimerous / tetramerous / pentamerous
trimerous
pentamerous
pentamerous
pentamerous
pentamerous
pentamerous
pentamerous
pentamerous
pentamerous
Angiospermae
Magnoliidae
Monocotyledoniae
Commelinidae
Mesangiospermae
Eudicotyledoniae
Asteridae
Lamiidae
Campanulidae
Superasteridae
Rosidae
Malvidae
Fabidae

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



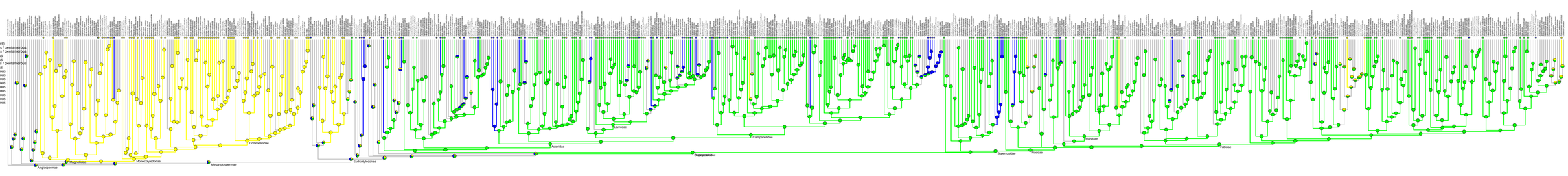
Node	ML state	Prob
Angiospermae	tetramerous	0.6854
Mesangiospermae	tetramerous	0.6945
Magnoliidae	trimerous	0.678
Monocotyledoneae	trimerous	0.7897
Eudicotyledoneae	tetramerous	0.9312
Commelinidae	trimerous	0.8452
Gunneridae	pentamerous	0.9708
Superasteridae	pentamerous	0.9728
Asteridae	pentamerous	0.9957
Lamiidae	pentamerous	0.9985
Campanulidae	pentamerous	0.9991
Superrosidae	pentamerous	0.9938
Rosidae	pentamerous	0.9938
Malvidae	pentamerous	0.994
Fabidae	pentamerous	0.9998

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	--
ARD	-223.55	12	471.09	471.49	22.1	0	0.0072	--
ARDeq	-222.25	12	468.5	468.9	19.51	0	0.0071	--
ER	-237.35	1	476.69	476.7	27.11	0	8e-04	--
SYM	-224.01	6	460.02	460.33	10.74	0	5e-04	--
SYMeq	-224.01	6	460.02	460.13	10.74	0	5e-04	--
ORD**	-218.64	6	449.28	449.39	0	0.99	15.4031	--
ORDeq	-236.42	6	484.84	484.95	35.56	0	11.9257	--
ORDSYM	-259.8	3	525.81	525.84	76.45	0	0.0021	--
ORDSYMeq	-258.72	3	523.45	523.48	74.09	0	0.0021	--
ORDER	-260.67	1	523.34	523.34	73.95	0	0.0031	--

MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
332_B. Androecium structural merism (3–state) (D2c), 48 steps

trimerous
tetramerous
pentamerous

Node	MP state(s)
Angiospermae	trimerous / tetramerous / pentamerous
Mesangiospermae	trimerous / tetramerous / pentamerous
Magnoliidae	trimerous
Monocotyledoneae	trimerous
Eudicotyledoneae	trimerous / tetramerous / pentamerous
Commelinidae	trimerous
Gunneridae	pentamerous
Superasteridae	pentamerous
Asteridae	pentamerous
Lamiidae	pentamerous
Campanulidae	pentamerous
Superrosidae	pentamerous
Rosidae	pentamerous
Malvidae	pentamerous
Fabidae	pentamerous

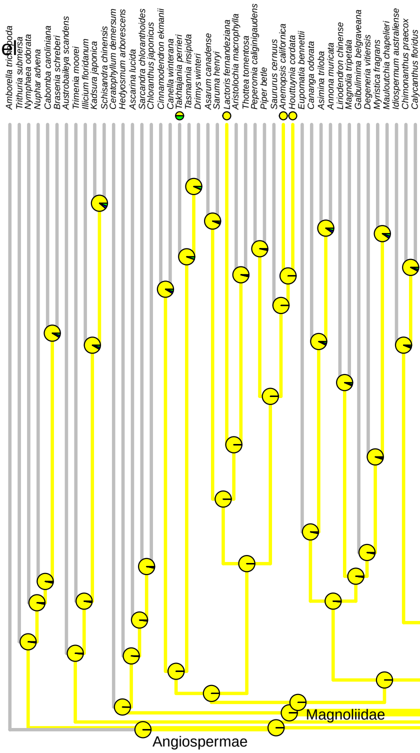


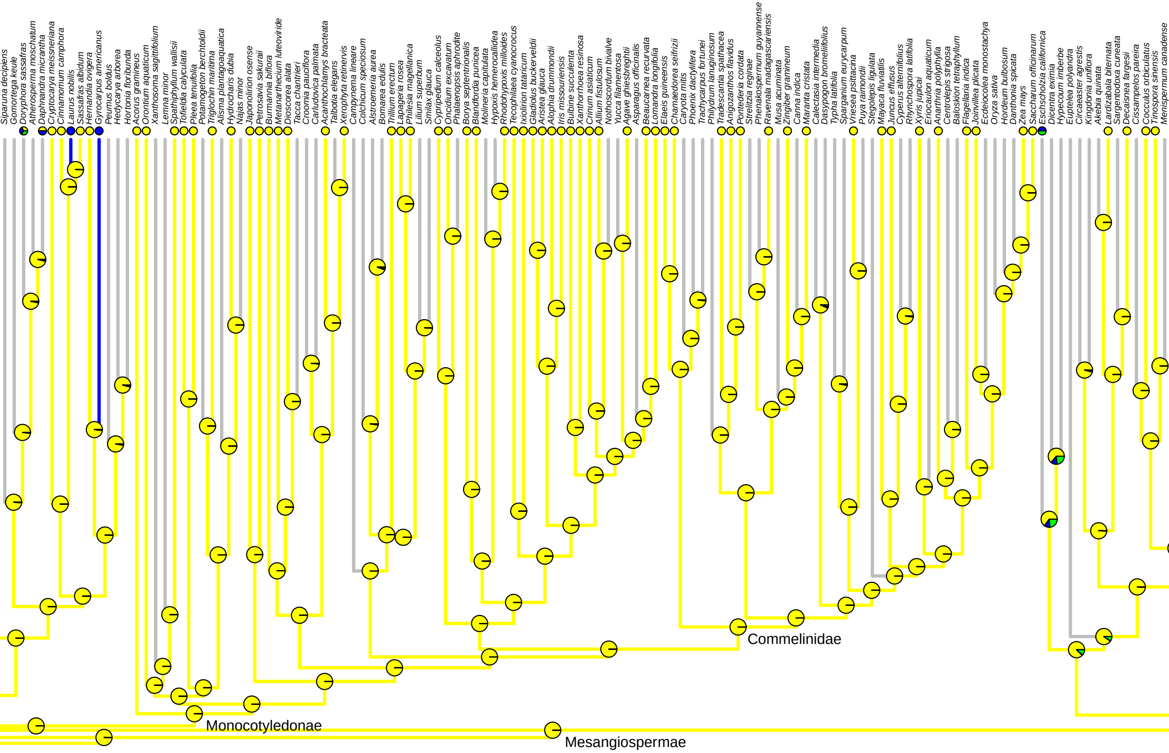
ML ancestral state reconstruction using rayDISC (R:corHMM)
332_B. Androecium structural merism (3−state) (D2c), SYMeq model

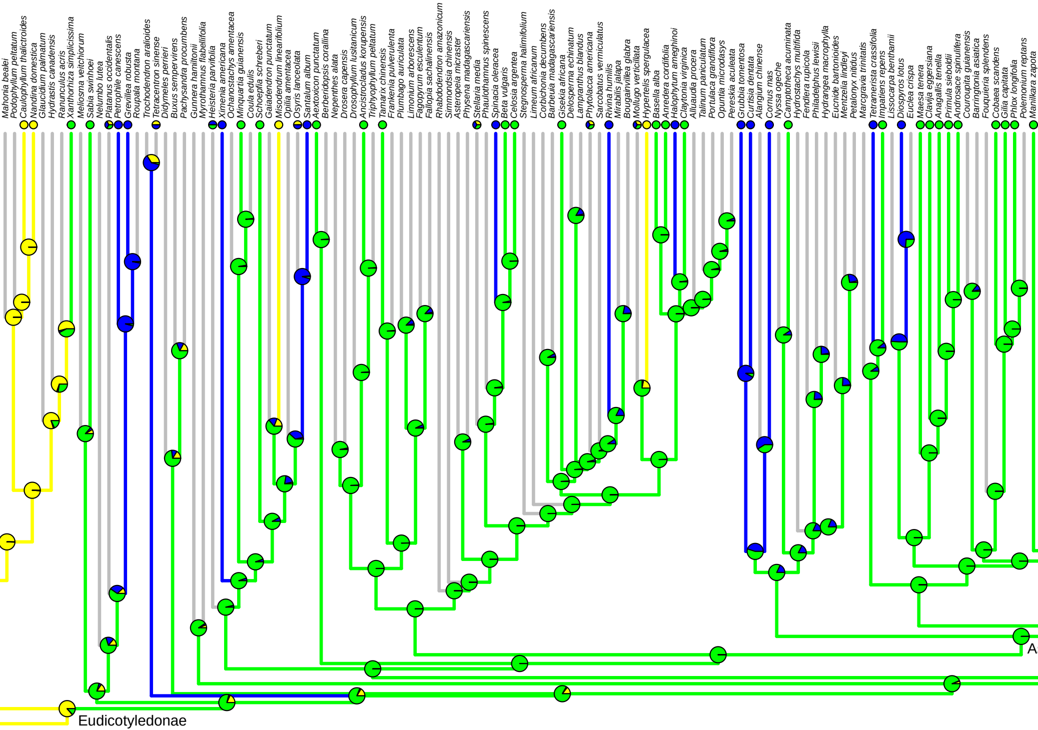
🟡	trimerous
🔵	tetramerous
🟢	pentamerous

Node	ML state	Prob
Angiospermae	trimerous	0.9999
Mesangiospermae	trimerous	0.9985
Magnoliidae	trimerous	1
Monocotyledonae	trimerous	1
Eudicotyledonae	trimerous	0.8633
Commelinidae	trimerous	1
Pentapetalae	pentamerous	0.9999
Superasteridae	pentamerous	0.9999
Asteridae	pentamerous	0.9997
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	−176.92	6	365.85	365.96	7.74	0.01	5e−04	⋯
ARDeq	−175.95	6	363.89	364	5.78	0.03	5e−04	⋯
ER	−185.99	1	373.98	373.98	15.77	0	0.0011	⋯
SYM	−177.11	3	360.22	360.25	2.04	0.22	5e−04	⋯
SYMeq**	−176.09	3	358.19	358.22	0	0.62	5e−04	⋯
ORD	−178.11	4	364.22	364.27	6.05	0.03	5e−04	⋯
ORDeq	−177.21	4	362.42	362.47	4.25	0.07	3e−04	⋯
ORDSYM	−186.25	2	376.49	376.51	18.29	0	0.002	⋯
ORDSYMeq	−185.32	2	374.64	374.66	16.44	0	0.002	⋯
ORDER	−186.96	1	375.91	375.92	17.7	0	0.0027	⋯




Siparuna decipiens
Gomortega keule
Doryphora sassafras
Atherosperma moschatum
Daphnandra micrantha
Cryptocarya meissneriana
Cinnamomum camphora
Laurus nobilis
Sassafras albidum
Hernandia ovigera
Gyrocarpus americanus
Peumus boldus
Hedycarya arborea
Hortonia floribunda
Acorus gramineus
Orontium aquaticum
Xanthosoma sagittifolium
Lemna minor
Spathiphyllum wallisii
Tofieldia calyculata
Pleea tenuifolia
Potamogeton berchtoldii
Triglochin maritima
Alisma plantagoaquatica
Hydrocharis dubia
Najas minor
Japonolirion osense
Petrosavia sakuraii
Burmannia biflora
Metanarthecium luteoviride
Dioscorea alata
Tacca chantrieri
Croomia pauciflora
Carludovica palmata
Acanthochlamys bracteata
Talbotia elegans
Xerophyta retinervis
Campynema lineare
Colchicum speciosum
Alstroemeria aurea
Bomarea edulis
Trillium erectum
Lapageria rosea
Philesia magellanica
Lilium superbum
Smilax glauca
Cypripedium calceolus
Oncidium excavatum
Phalaenopsis aphrodite
Borya septentrionalis
Blandfordia punicea
Molineria capitulata
Hypoxis hemerocallidea
Rhodohypoxis milloides
Tecophilaea cyanocrocus
Ixiolirion tataricum
Gladiolus buckerveldii
Aristea glauca
Alophia drummondii
Iris missouriensis
Bulbine succulenta
Xanthorrhoea resinosa
Crinum asiaticum
Allium fistulosum
Nothoscordum bivalve
Yucca filamentosa
Agave ghiesbreghtii
Asparagus officinalis
Beaucarnea recurvata
Lomandra longifolia
Elaeis guineensis
Chamaedorea seifrizii
Caryota mitis
Phoenix dactylifera
Trachycarpus fortunei
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
Xyris jupicai
Eriocaulon aquaticum
Anarthria polyphylla
Centrolepis strigosa
Baloskion tetraphyllum
Flagellaria indica
Joinvillea plicata
Ecdeiocolea monostachya
Oryza sativa
Hordeum bulbosum
Danthonia spicata
Zea mays
Saccharum officinarum
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
Commelinidae
Monocotyledonae
Mesangiospermae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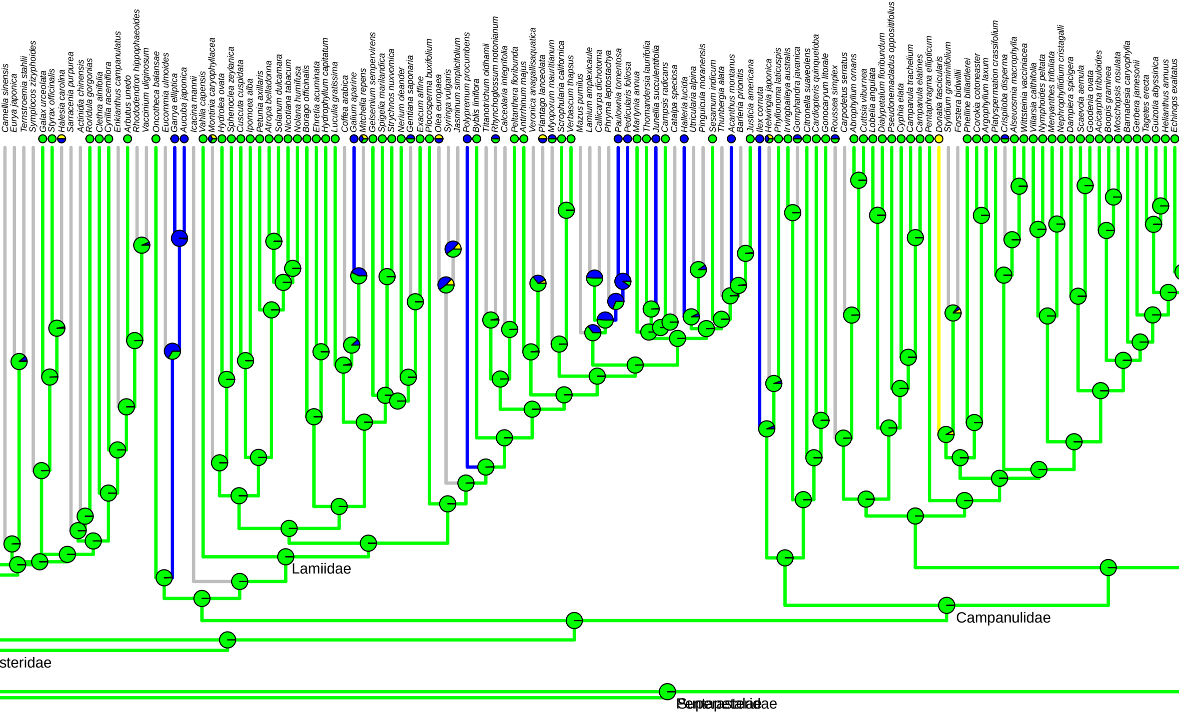
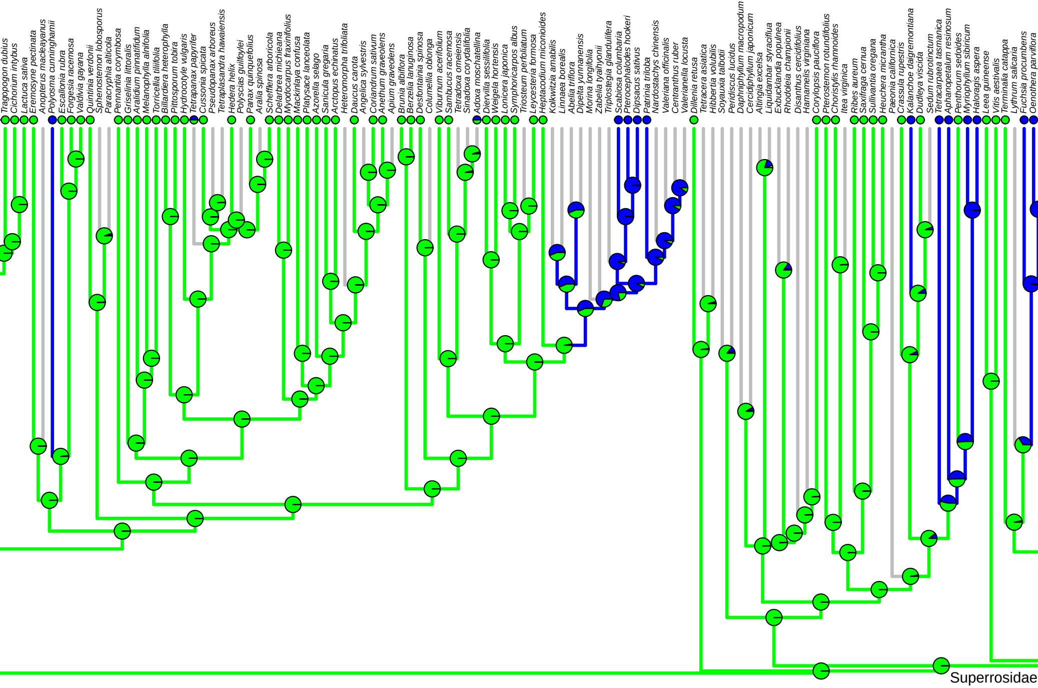
Caulophyllum thalictroides
Nandina domestica
Glaucidium palmatum
Hydrastis canadensis
Ranunculus acris
Xanthorhiza simplicissima
Meliosma veitchiorum
Sabia swinhoei
Nelumbo lutea
Platanus occidentalis
Petrophile canescens
Grevillea robusta
Roupala montana
Trochodendron aralioides
Tetracentron sinense
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
Nepenthes alata
Drosera capensis
Drosophyllum lusitanicum
Ancistrocladus korupensis
Triphyophyllum peltatum
Tamarix chinensis
Frankenia pulverulenta
Plumbago auriculata
Limonium arborescens
Fagopyrum esculentum
Fallopia sachalinensis
Rhabdodendron amazonicum
Simmondsia chinensis
Asteropeia micraster
Physena madagascariensis
Stellaria media
Phaulothamnus spinescens
Spinacia oleracea
Beta vulgaris
Celosia argentea
Stegnosperma halimifolium
Limeum africanum
Corbichonia decumbens
Barbeuia madagascariensis
Gisekia africana
Delosperma echinatum
Lampranthus blandus
Phytolacca americana
Sarcobatus vermiculatus
Rivina humilis
Mirabilis jalapa
Bougainvillea glabra
Mollugo verticillata
Hypertelis spergulacea
Basella alba
Anredera cordifolia
Halophytum ameghinoi
Claytonia virginica
Alluaudia procera
Talinum paniculatum
Portulaca grandiflora
Opuntia microdasys
Pereskia aculeata
Grubbia tomentosa
Curtisia dentata
Alangium chinense
Cornus mas
Nyssa ogeche
Camptotheca acuminata
Hydrostachys multifida
Fendlera rupicola
Philadelphus lewisii
Hydrangea macrophylla
Eucnide bartonioides
Mentzelia lindleyi
Petalonyx nitidus
Marcgravia trinitatis
Tetramerista crassifolia
Impatiens repens
Lissocarpa benthamii
Diospyros lotus
Euclea crispa
Maesa tenera
Clavija eggersiana
Anagallis tenella
Primula sieboldii
Androsace spinulifera
Couroupita guianensis
Barringtonia asiatica
Fouquieria splendens
Cobaea scandens
Gilia capitata
Phlox longifolia
Polemonium reptans
Manilkara zapota
A
Eudicotyledonae


Camellia sinensis
Eurya japonica
Ternstroemia stahlii
Symplocos zizyphoides
Galax urceolata
Styrax officinalis
Halesia carolina
Sarracenia purpurea
Actinidia chinensis
Roridula gorgonias
Clethra alnifolia
Cyrilla racemiflora
Enkianthus campanulatus
Arbutus unedo
Rhododendron hippophaeoides
Vaccinium uliginosum
Oncotheca balansae
Eucommia ulmoides
Garrya elliptica
Aucuba japonica
Icacina mannii
Vahlia capensis
Montinia caryophyllacea
Hydrolea ovata
Sphenoclea zeylanica
Cuscuta cuspidata
Ipomoea alba
Petunia axillaris
Atropa belladonna
Solanum dulcamara
Nicotiana tabacum
Nolana humifusa
Borago officinalis
Ehretia acuminata
Hydrophyllum capitatum
Luculia gratissima
Coffea arabica
Galium aparine
Mitchella repens
Gelsemium sempervirens
Spigelia marilandica
Strychnos nuxvomica
Nerium oleander
Gentiana saponaria
Exacum affine
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
Paulownia tomentosa
Pedicularis foliosa
Martynia annua
Thomandersia laurifolia
Junellia succulentifolia
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
Cardiopteris quinqueloba
Gonocaryum litorale
Roussea simplex
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
Boopis graminea
Moschopsis rosulata
Barnadesia caryophylla
Gerbera jamesonii
Tagetes erecta
Guizotia abyssinica
Helianthus annuus
Echinops exaltatus
Lamiidae
Campanulidae
steridae
Superasteridae
Pentapetalae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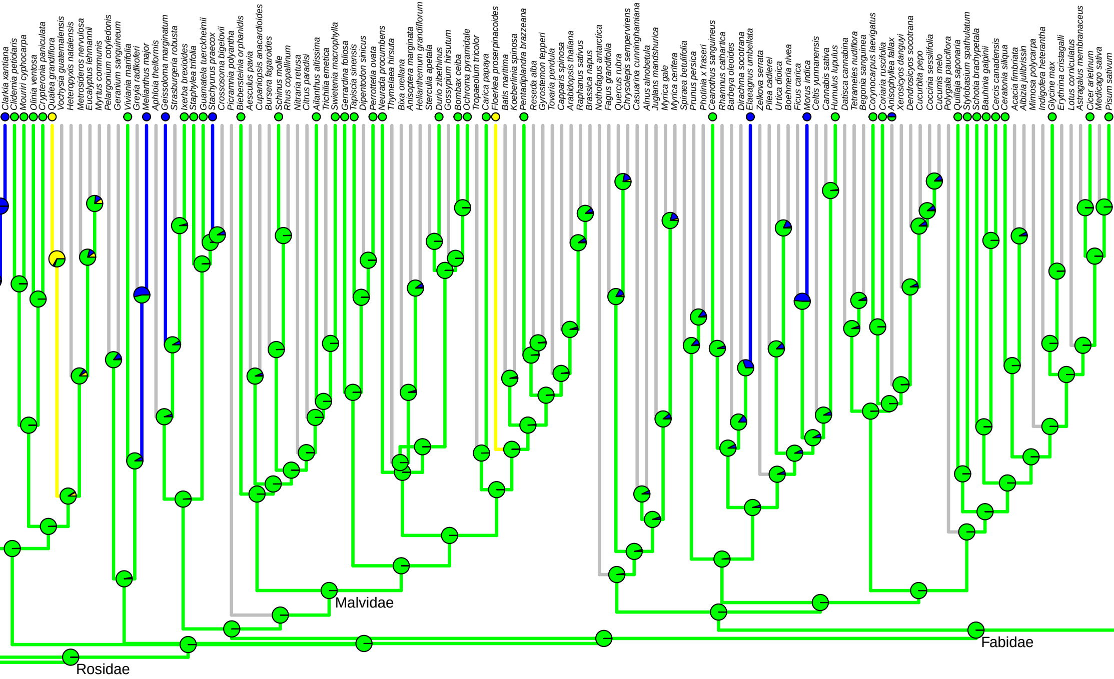
Cichorium intybus
Lactuca sativa
Eremosyne pectinata
Anopterus macleayanus
Polyosma cunninghamii
Escallonia rubra
Forgesia racemosa
Valdivia gayana
Quintinia verdonii
Sphenostemon lobosporus
Paracryphia alticola
Pennantia corymbosa
Griselinia littoralis
Aralidium pinnatifidum
Melanophylla alnifolia
Torricellia tiliifolia
Billardiera heterophylla
Pittosporum tobira
Hydrocotyle vulgaris
Tetrapanax papyrifer
Cussonia spicata
Pseudopanax arboreus
Tetraplasandra hawaiensis
Hedera helix
Polyscias guilfoylei
Panax quinquefolius
Aralia spinosa
Schefflera arboricola
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
Brunia albiflora
Berzelia lanuginosa
Desfontainia spinosa
Columellia oblonga
Viburnum acerifolium
Sambucus racemosa
Tetradoxa omeiensis
Sinadoxa corydalifolia
Adoxa moschatellina
Diervilla sessilifolia
Weigela hortensis
Lonicera japonica
Symphoricarpos albus
Triosteum perfoliatum
Leycesteria formosa
Heptacodium miconioides
Kolkwitzia amabilis
Linnaea borealis
Abelia triflora
Dipelta yunnanensis
Morina longifolia
Zabelia tyaihyonii
Triplostegia glandulifera
Scabiosa columbaria
Pterocephalodes hookeri
Dipsacus sativus
Patrinia triloba
Nardostachys chinensis
Valeriana officinalis
Centranthus ruber
Valerianella locusta
Dillenia retusa
Tetracera asiatica
Hibbertia volubilis
Soyauxia talbotii
Peridiscus lucidus
Daphniphyllum macropodum
Cercidiphyllum japonicum
Altingia excelsa
Liquidambar styraciflua
Exbucklandia populnea
Rhodoleia championii
Disanthus cercidifolius
Hamamelis virginiana
Corylopsis pauciflora
Pterostemon rotundifolius
Choristylis rhamnoides
Itea virginica
Ribes aureum
Saxifraga cernua
Sullivantia oregana
Heuchera micrantha
Paeonia californica
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
Superrosidae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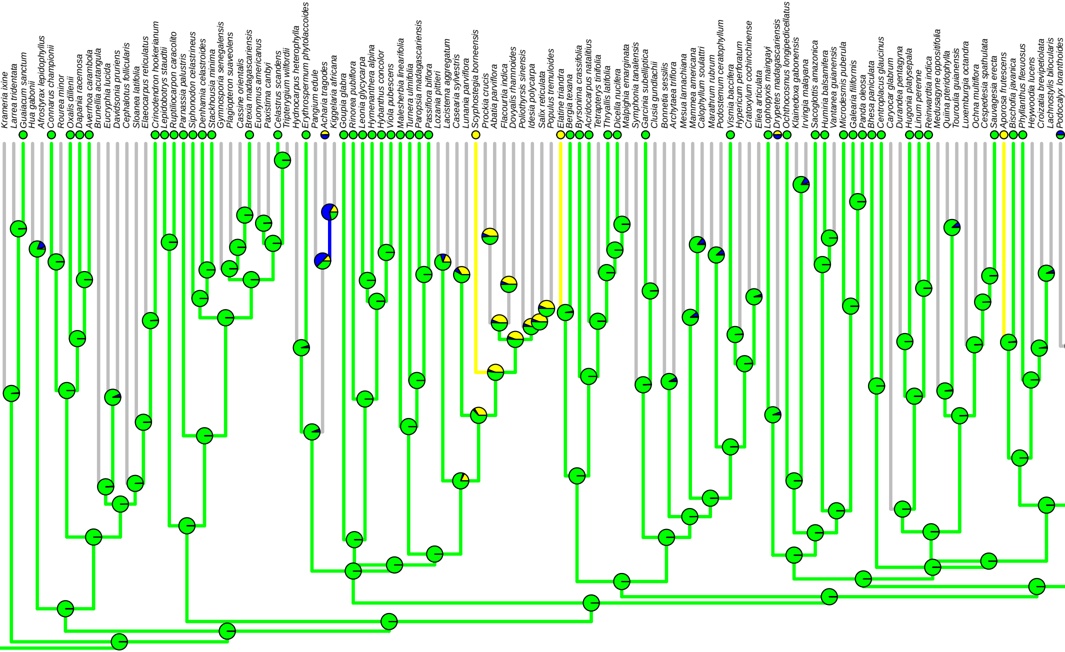
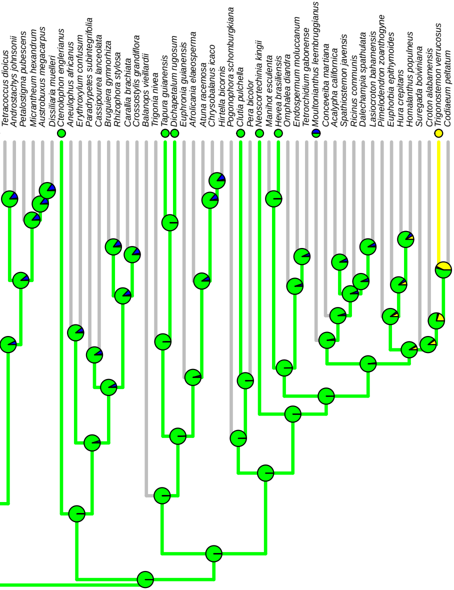
Clidemia petiolaris
Mouriri cyphocarpa
Olinia ventosa
Crypteronia paniculata
Qualea grandiflora
Vochysia guatemalensis
Heteropyxis natalensis
Metrosideros nervulosa
Eucalyptus lehmannii
Myrtus communis
Pelargonium cotyledonis
Geranium sanguineum
Viviania marifolia
Greyia radlkoferi
Melianthus major
Aphloia theiformis
Geissoloma marginatum
Strasburgeria robusta
Ixerba brexioides
Staphylea trifolia
Guamatela tuerckheimii
Stachyurus praecox
Crossosoma bigelovii
Picramnia polyantha
Biebersteinia orphanidis
Aesculus pavia
Cupaniopsis anacardioides
Bursera fagaroides
Schinus molle
Rhus copallinum
Nitraria retusa
Citrus paradisi
Ailanthus altissima
Trichilia emetica
Swietenia macrophylla
Gerrardina foliosa
Tapiscia sinensis
Dipentodon sinicus
Perrottetia ovata
Neurada procumbens
Thymelaea hirsuta
Bixa orellana
Anisoptera marginata
Helianthemum grandiflorum
Sterculia apetala
Durio zibethinus
Gossypium hirsutum
Bombax ceiba
Ochroma pyramidale
Tropaeolum tricolor
Carica papaya
Floerkea proserpinacoides
Batis maritima
Koeberlinia spinosa
Pentadiplandra brazzeana
Reseda alba
Gyrostemon tepperi
Tovaria pendula
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
Datisca cannabina
Tetrameles nudiflora
Begonia sanguinea
Corynocarpus laevigatus
Coriaria ruscifolia
Anisophyllea fallax
Xerosicyos danguyi
Dendrosicyos socotrana
Cucurbita pepo
Coccinia sessilifolia
Cucumis melo
Polygala pauciflora
Quillaja saponaria
Stylobasium spathulatum
Schotia brachypetala
Bauhinia galpinii
Cercis canadensis
Ceratonia siliqua
Acacia fimbriata
Albizia julibrissin
Mimosa polycarpa
Indigofera heterantha
Glycine max
Erythrina cristagalli
Lotus corniculatus
Astragalus membranaceus
Cicer arietinum
Medicago sativa
Pisum sativum
Malvidae
Fabidae
Rosidae

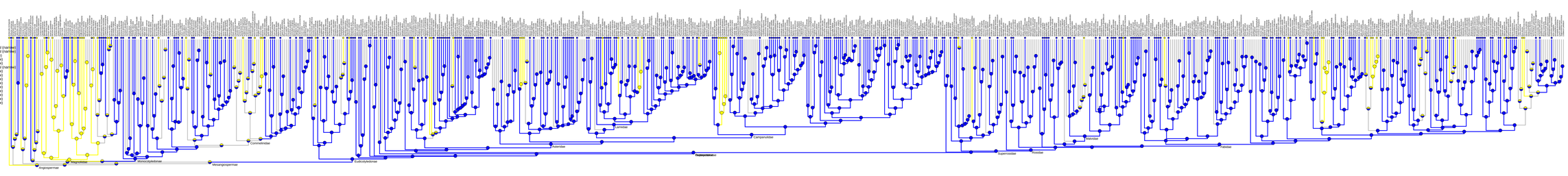

Krameria ixine
Larrea tridentata
Guaiacum sanctum
Hua gabonii
Afrostyrax lepidophyllus
Connarus championii
Rourea minor
Oxalis dillenii
Dapania racemosa
Averrhoa carambola
Brunellia acutangula
Eucryphia lucida
Davidsonia pruriens
Cephalotus follicularis
Sloanea latifolia
Elaeocarpus reticulatus
Crinodendron hookerianum
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
Hydnocarpus heterophylla
Erythrospermum phytolaccoides
Pangium edule
Acharia tragodes
Kiggelaria africana
Goupia glabra
Rinorea pubiflora
Leonia glycycarpa
Hymenanthera alpina
Hybanthus concolor
Viola pubescens
Malesherbia linearifolia
Turnera ulmifolia
Paropsia madagascariensis
Passiflora biflora
Lozania pittieri
Lacistema aggregatum
Casearia sylvestris
Lunania parviflora
Scyphostegia borneensis
Prockia crucis
Abatia parviflora
Flacourtia indica
Dovyalis rhamnoides
Poliothyrsis sinensis
Idesia polycarpa
Salix reticulata
Populus tremuloides
Elatine triandra
Bergia texana
Byrsonima crassifolia
Acridocarpus natalitius
Tetrapterys tinifolia
Thryallis latifolia
Dicella nucifera
Malpighia emarginata
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
Lophopyxis maingayi
Drypetes madagascariensis
Ochthocosmus longipedicellatus
Klainedoxa gabonensis
Irvingia malayana
Sacoglottis amazonica
Humiria balsamifera
Vantanea guianensis
Microdesmis puberula
Galearia filiformis
Panda oleosa
Bhesa paniculata
Centroplacus glaucinus
Caryocar glabrum
Durandea pentagyna
Hugonia platysepala
Linum perenne
Reinwardtia indica
Medusagyne oppositifolia
Quiina pteridophylla
Touroulia guianensis
Luxemburgia octandra
Ochna multiflora
Cespedesia spathulata
Sauvagesia erecta
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
Paradrypetes subintegrifolia
Cassipourea lanceolata
Bruguiera gymnorhiza
Rhizophora stylosa
Carallia brachiata
Crossostylis grandiflora
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
Endospermum moluccanum
Tetrorchidium gabonense
Moultonianthus leembruggianus
Conceveiba martiana
Acalypha californica
Spathiostemon javensis
Ricinus communis
Dalechampia spathulata
Lasiocroton bahamensis
Pimelodendron zoanthogyne
Euphorbia epithymoides
Hura crepitans
Homalanthus populneus
Suregada boiviniana
Croton alabamensis
Trigonostemon verrucosus
Codiaeum peltatum

MP ancestral state reconstruction using ancestral pars
(R:phangorn)
305_A. Filament (binary) (D2d), 55 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	laminar (wide) / typical (narrow)
Ranunculidae	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)

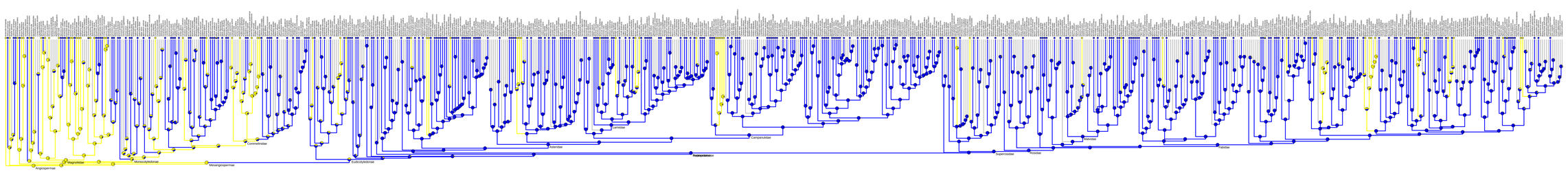


ML ancestral state reconstruction using rayDISC (R:corHMM)
305_A. Filament (binary) (D2d), ARDeq model

laminar (wide)
typical (narrow)

Node	ML state	Prob
Angiospermae	laminar (wide)	1
Mesangiospermae	laminar (wide)	0.9953
Magnoliidae	laminar (wide)	0.5978
Monocotyledonae	laminar (wide)	0.851
Eudicotyledonae	typical (narrow)	0.5337
Commelinidae	laminar (wide)	0.6355
Ceratophyllum	laminar (wide)	0.9981
Superasteridae	typical (narrow)	0.9981
Asteridae	typical (narrow)	0.9995
Lamidae	typical (narrow)	0.9971
Campanulidae	typical (narrow)	0.9945
Superrosidae	typical (narrow)	0.9993
Rosidae	typical (narrow)	0.9993
Malvidae	typical (narrow)	0.997
Fabidae	typical (narrow)	1

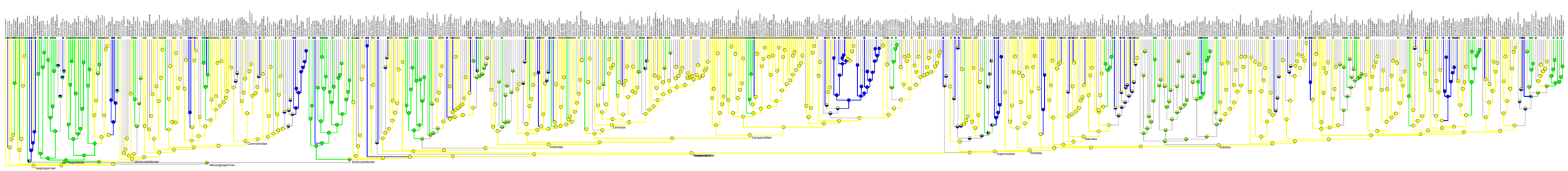
Model	LogL	Nopr	AIC	AICc	DeltaAICc	w	q01	q10
ARD	−173.1	2	350.21	350.22	1.32	0.34	0.0092	0.0022
ARDeq**	−172.45	2	348.89	348.91	0	0.66	0.0093	0.0021
ER	−176.67	1	359.33	359.34	10.43	0	0.0024	0.0024
UN01	−184.89	1	371.78	371.78	22.88	0	0.0147	
UN10	−187.98	1	377.95	377.96	29.05	0		0.0023



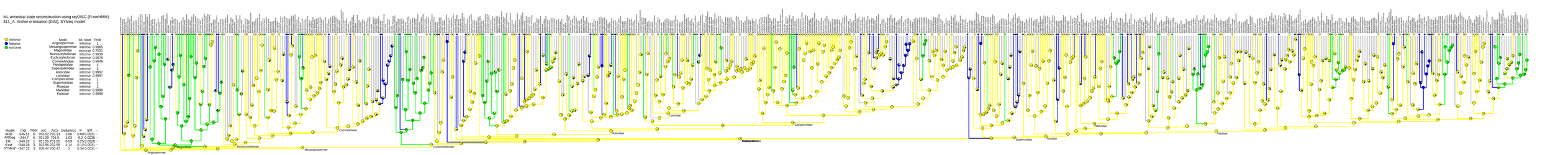
MP ancestral state reconstruction using ancestral.pars (R:phangorn)
311_A. Anther orientation (D2d), 110 steps

- introrse
- latrorse
- extrorse

Node	MP state(s)
Angiospermae	introrse
Mesangiospermae	introrse / extrorse
Magnoliidae	extrorse
Monocotyledoneae	introrse
Eudicotyledoneae	introrse / 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 ray/DISC (R:corHMM)
311_A. Anther orientation (D2d), SYMeq model

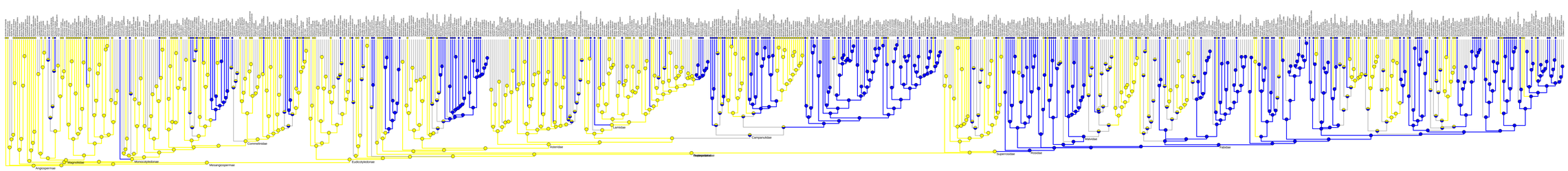


Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	--
ARD	-345.51	6	703.02	703.13	2.66	0.09	0.0031	---
ARDeq	-344.7	4	701.39	701.5	1.03	0.2	0.0038	---
ER	-349.52	1	701.05	701.05	0.59	0.25	0.0028	---
SYM	-348.28	3	702.56	702.59	2.12	0.12	0.0031	---
SYMeq*	-347.22	3	700.44	700.47	0	0.34	0.0031	---

MP ancestral state reconstruction using ancestral pars
(R:phangorn)
312_A. Anther attachment (binary) (D2d), 96 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
Superrosidae	dorsifixed
Rosidae	dorsifixed
Malvidae	dorsifixed
Fabidae	dorsifixed

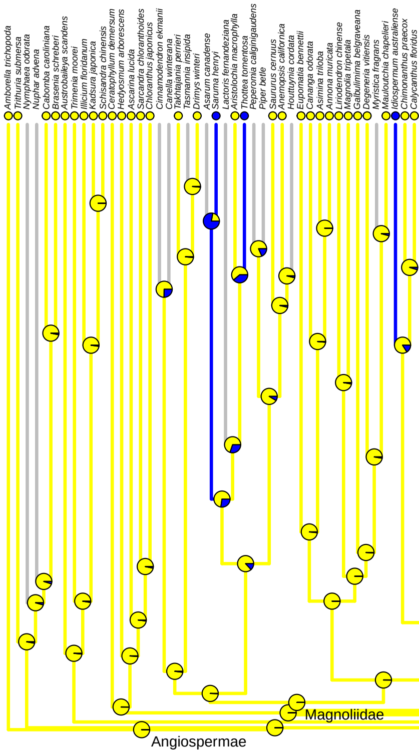


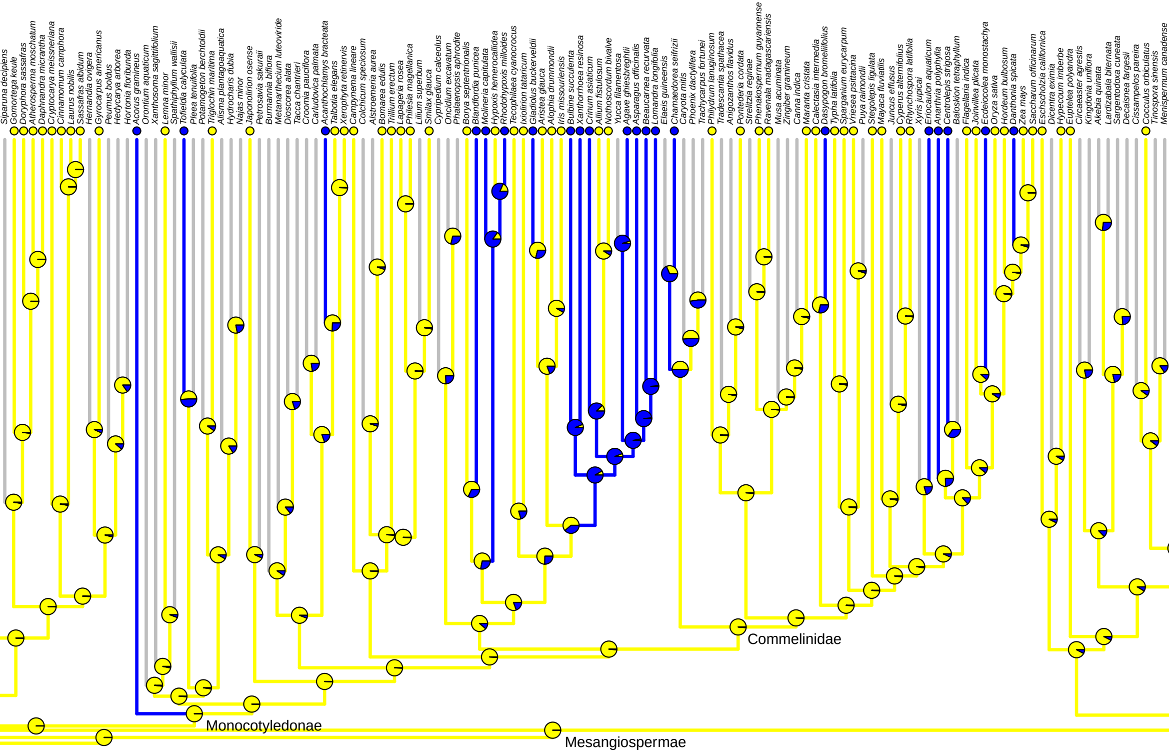
ML ancestral state reconstruction using rayDISC (R:corHMM)
312_A. Anther attachment (binary) (D2d), ARDeq model

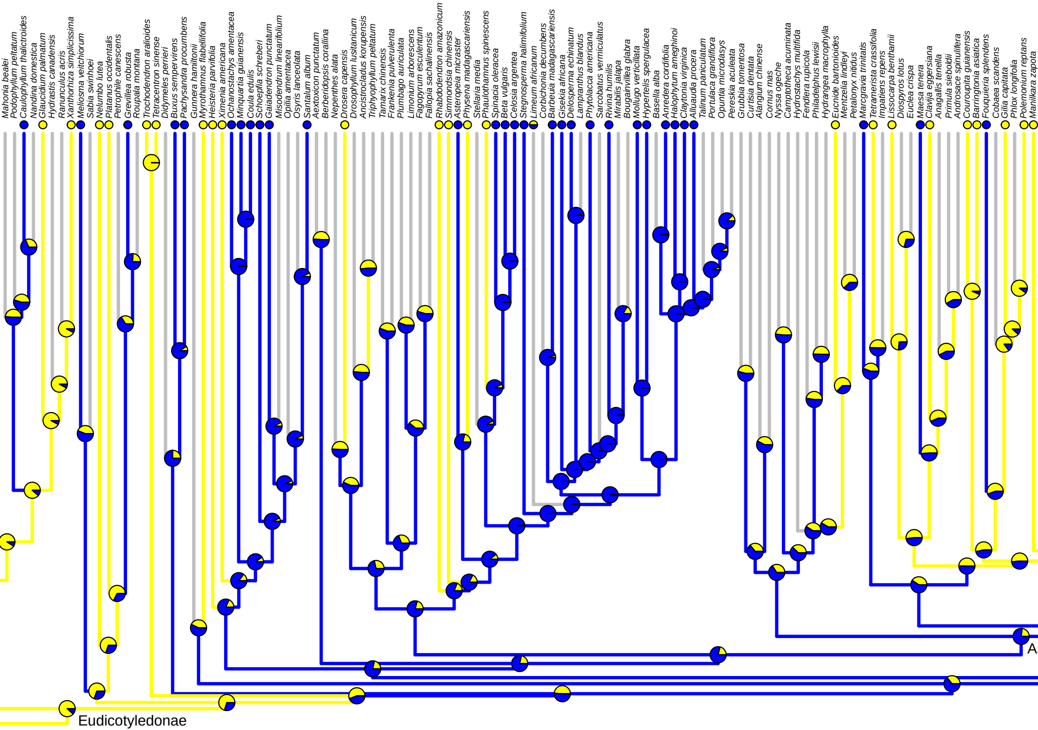
🟡 basifixed
🔵 dorsifixed

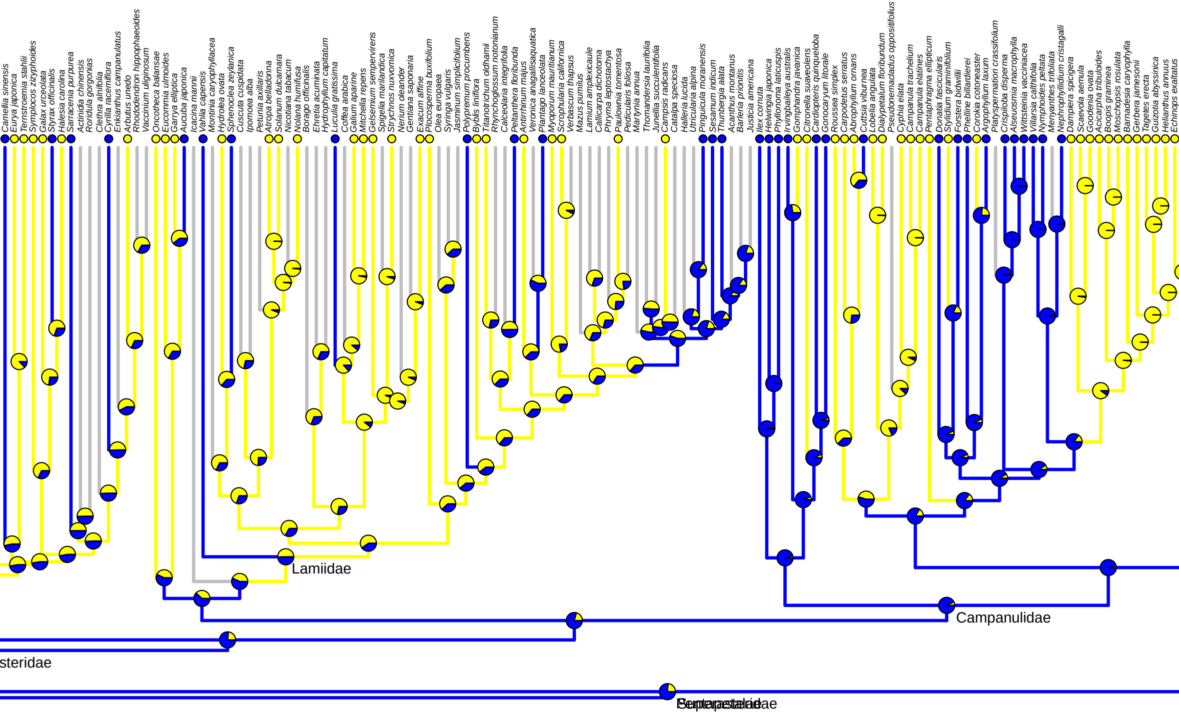
Node	ML state	Prob
Angiospermae	basifixed	1
Mesangiospermae	basifixed	0.9994
Magnoliidae	basifixed	0.9993
Monocotyledonae	basifixed	0.9964
Eudicotyledonae	basifixed	0.8849
Commelinidae	basifixed	0.9857
Pentapetalae	dorsifixed	0.7638
Superasteridae	dorsifixed	0.7638
Asteridae	dorsifixed	0.7705
Lamiidae	basifixed	0.5045
Campanulidae	dorsifixed	0.9267
Superrosidae	dorsifixed	0.7834
Rosidae	dorsifixed	0.8723
Malvidae	dorsifixed	0.9743
Fabidae	dorsifixed	0.9994

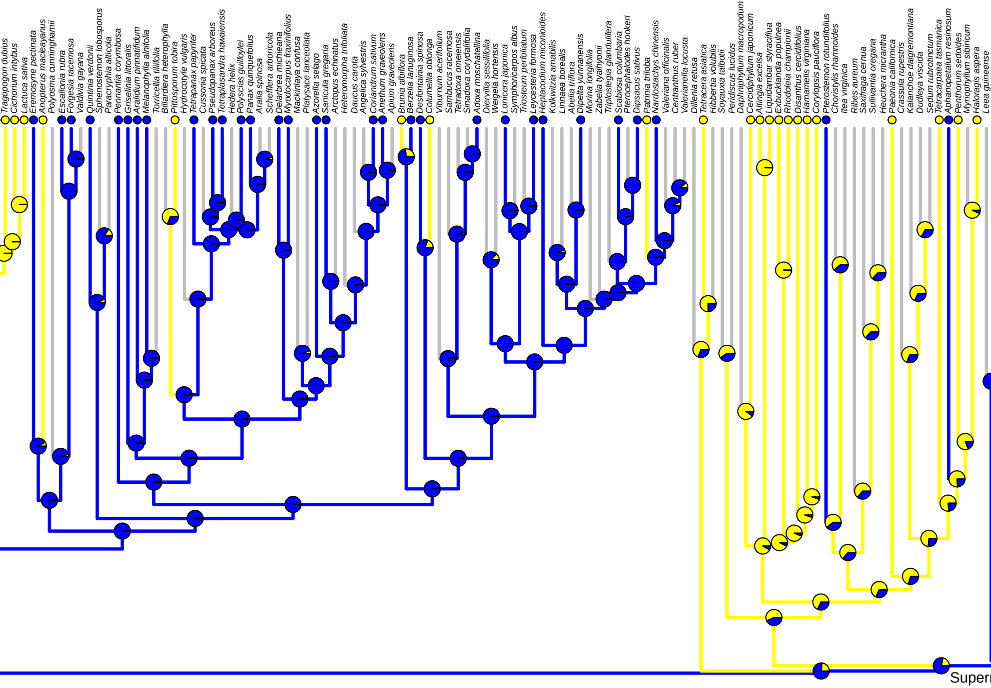
Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	−265.7	2	535.4	535.41	1.34	0.27	0.0045	0.0073
ARDeq**	−265.03	2	534.06	534.08	0	0.53	0.0045	0.0073
ER	−266.99	1	535.98	535.99	1.91	0.2	0.0055	0.0055
UNI01	−292.69	1	587.37	587.38	53.3	0	0.0061	
UNI10	−277.87	1	557.73	557.74	23.66	0		0.008

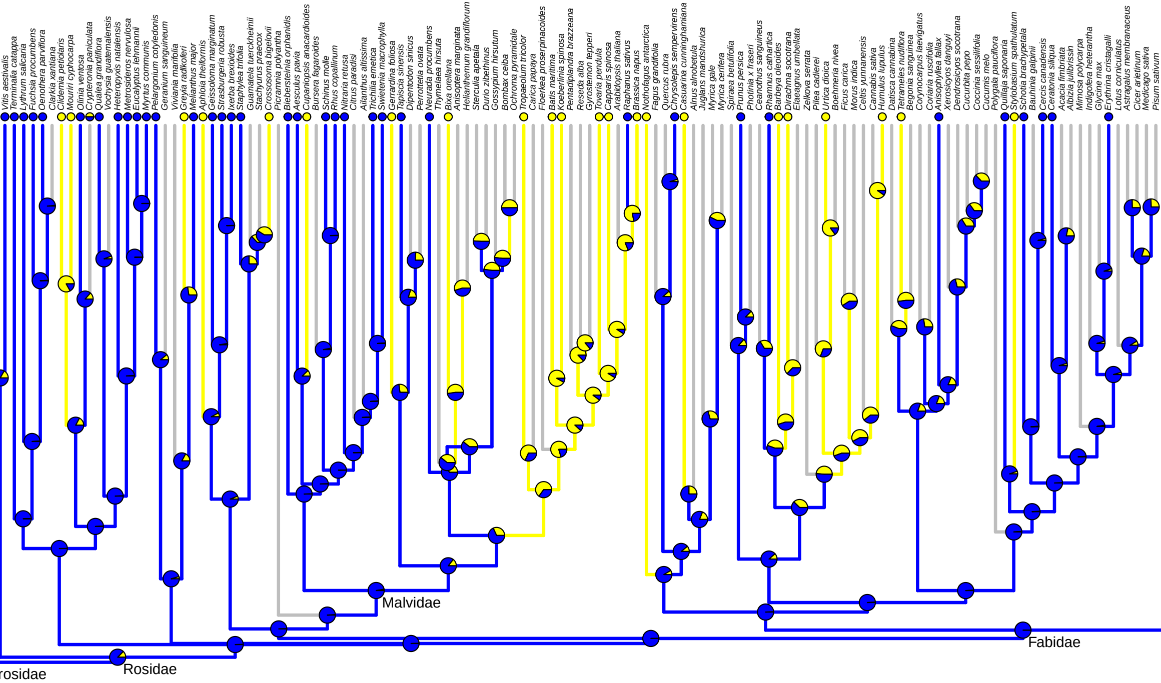



Siparuna decipiens
Gomortega keule
Doryphora sassafras
Atherosperma moschatum
Daphnandra micrantha
Cryptocarya meissneriana
Cinnamomum camphora
Laurus nobilis
Sassafras albidum
Hernandia ovigera
Gyrocarpus americanus
Peumus boldus
Hedycarya arborea
Hortonia floribunda
Acorus gramineus
Orontium aquaticum
Xanthosoma sagittifolium
Lemna minor
Spathiphyllum wallisii
Tofieldia calyculata
Pleea tenuifolia
Potamogeton berchtoldii
Triglochin maritima
Alisma plantagoaquatica
Hydrocharis dubia
Najas minor
Japonolirion osense
Petrosavia sakuraii
Burmannia biflora
Metanarthecium luteoviride
Dioscorea alata
Tacca chantrieri
Croomia pauciflora
Carludovica palmata
Acanthochlamys bracteata
Talbotia elegans
Xerophyta retinervis
Campynema lineare
Colchicum speciosum
Alstroemeria aurea
Bomarea edulis
Trillium erectum
Lapageria rosea
Philesia magellanica
Lilium superbum
Smilax glauca
Cypripedium calceolus
Oncidium excavatum
Phalaenopsis aphrodite
Borya septentrionalis
Blandfordia punicea
Molineria capitulata
Hypoxis hemerocallidea
Rhodohypoxis milloides
Tecophilaea cyanocrocus
Ixiolirion tataricum
Gladiolus buckerveldii
Aristea glauca
Alophia drummondii
Iris missouriensis
Bulbine succulenta
Xanthorrhoea resinosa
Crinum asiaticum
Allium fistulosum
Nothoscordum bivalve
Yucca filamentosa
Agave ghiesbreghtii
Asparagus officinalis
Beaucarnea recurvata
Lomandra longifolia
Elaeis guineensis
Chamaedorea seifrizii
Caryota mitis
Phoenix dactylifera
Trachycarpus fortunei
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
Xyris jupicai
Eriocaulon aquaticum
Anarthria polyphylla
Centrolepis strigosa
Baloskion tetraphyllum
Flagellaria indica
Joinvillea plicata
Ecdeiocolea monostachya
Oryza sativa
Hordeum bulbosum
Danthonia spicata
Zea mays
Saccharum officinarum
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
Commelinidae
Monocotyledonae
Mesangiospermae


Mahonia bealei
Podophyllum peltatum
Caulophyllum thalictroides
Nandina domestica
Glaucidium palmatum
Hydrastis canadensis
Ranunculus acris
Xanthorhiza simplicissima
Meliosma veitchiorum
Sabia swinhoei
Nelumbo lutea
Platanus occidentalis
Petrophile canescens
Grevillea robusta
Roupala montana
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
Nepenthes alata
Drosera capensis
Drosophyllum lusitanicum
Ancistrocladus korupensis
Triphyophyllum peltatum
Tamarix chinensis
Frankenia pulverulenta
Plumbago auriculata
Limonium arborescens
Fagopyrum esculentum
Fallopia sachalinensis
Rhabdodendron amazonicum
Simmondsia chinensis
Asteropeia micraster
Physena madagascariensis
Stellaria media
Phaulothamnus spinescens
Spinacia oleracea
Beta vulgaris
Celosia argentea
Stegnosperma halimifolium
Limeum africanum
Corbichonia decumbens
Barbeuia madagascariensis
Gisekia africana
Delosperma echinatum
Lampranthus blandus
Phytolacca americana
Sarcobatus vermiculatus
Rivina humilis
Mirabilis jalapa
Bougainvillea glabra
Mollugo verticillata
Hypertelis spergulacea
Basella alba
Anredera cordifolia
Halophytum ameghinoi
Claytonia virginica
Alluaudia procera
Talinum paniculatum
Portulaca grandiflora
Opuntia microdasys
Pereskia aculeata
Grubbia tomentosa
Curtisia dentata
Alangium chinense
Cornus mas
Nyssa ogeche
Camptotheca acuminata
Hydrostachys multifida
Fendlera rupicola
Philadelphus lewisii
Hydrangea macrophylla
Eucnide bartonioides
Mentzelia lindleyi
Petalonyx nitidus
Marcgravia trinitatis
Tetramerista crassifolia
Impatiens repens
Lissocarpa benthamii
Diospyros lotus
Euclea crispa
Maesa tenera
Clavija eggersiana
Anagallis tenella
Primula sieboldii
Androsace spinulifera
Couroupita guianensis
Barringtonia asiatica
Fouquieria splendens
Cobaea scandens
Gilia capitata
Phlox longifolia
Polemonium reptans
Manilkara zapota
A
Eudicotyledonae


Camellia sinensis
Eurya japonica
Ternstroemia stahlii
Symplocos zizyphoides
Galax urceolata
Styrax officinalis
Halesia carolina
Sarracenia purpurea
Actinidia chinensis
Roridula gorgonias
Clethra alnifolia
Cyrilla racemiflora
Enkianthus campanulatus
Arbutus unedo
Rhododendron hippophaeoides
Vaccinium uliginosum
Oncotheca balansae
Eucommia ulmoides
Garrya elliptica
Aucuba japonica
Icacina mannii
Vahlia capensis
Montinia caryophyllacea
Hydrolea ovata
Sphenoclea zeylanica
Cuscuta cuspidata
Ipomoea alba
Petunia axillaris
Atropa belladonna
Solanum dulcamara
Nicotiana tabacum
Nolana humifusa
Borago officinalis
Ehretia acuminata
Hydrophyllum capitatum
Luculia gratissima
Coffea arabica
Galium aparine
Mitchella repens
Gelsemium sempervirens
Spigelia marilandica
Strychnos nuxvomica
Nerium oleander
Gentiana saponaria
Exacum affine
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
Paulownia tomentosa
Pedicularis foliosa
Martynia annua
Thomandersia laurifolia
Junellia succulentifolia
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
Cardiopteris quinqueloba
Gonocaryum litorale
Roussea simplex
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
Boopis graminea
Moschopsis rosulata
Barnadesia caryophylla
Gerbera jamesonii
Tagetes erecta
Guizotia abyssinica
Helianthus annuus
Echinops exaltatus
Lamiidae
Campanulidae
steridae
Superasteridae
Pentapetalae


Tragopogon dubius
Cichorium intybus
Lactuca sativa
Eremosyne pectinata
Anopterus macleayanus
Polyosma cunninghamii
Escallonia rubra
Forgesia racemosa
Valdivia gayana
Quintinia verdonii
Sphenostemon lobosporus
Paracryphia alticola
Pennantia corymbosa
Griselinia littoralis
Aralidium pinnatifidum
Melanophylla alnifolia
Torricellia tiliifolia
Billardiera heterophylla
Pittosporum tobira
Hydrocotyle vulgaris
Tetrapanax papyrifer
Cussonia spicata
Pseudopanax arboreus
Tetraplasandra hawaiensis
Hedera helix
Polyscias guilfoylei
Panax quinquefolius
Aralia spinosa
Schefflera arboricola
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
Brunia albiflora
Berzelia lanuginosa
Desfontainia spinosa
Columellia oblonga
Viburnum acerifolium
Sambucus racemosa
Tetradoxa omeiensis
Sinadoxa corydalifolia
Adoxa moschatellina
Diervilla sessilifolia
Weigela hortensis
Lonicera japonica
Symphoricarpos albus
Triosteum perfoliatum
Leycesteria formosa
Heptacodium miconioides
Kolkwitzia amabilis
Linnaea borealis
Abelia triflora
Dipelta yunnanensis
Morina longifolia
Zabelia tyaihyonii
Triplostegia glandulifera
Scabiosa columbaria
Pterocephalodes hookeri
Dipsacus sativus
Patrinia triloba
Nardostachys chinensis
Valeriana officinalis
Centranthus ruber
Valerianella locusta
Dillenia retusa
Tetracera asiatica
Hibbertia volubilis
Soyauxia talbotii
Peridiscus lucidus
Daphniphyllum macropodum
Cercidiphyllum japonicum
Altingia excelsa
Liquidambar styraciflua
Exbucklandia populnea
Rhodoleia championii
Disanthus cercidifolius
Hamamelis virginiana
Corylopsis pauciflora
Pterostemon rotundifolius
Choristylis rhamnoides
Itea virginica
Ribes aureum
Saxifraga cernua
Sullivantia oregana
Heuchera micrantha
Paeonia californica
Crassula rupestris
Kalanchoe daigremontiana
Dudleya viscida
Sedum rubrotinctum
Tetracarpaea tasmanica
Aphanopetalum resinosum
Penthorum sedoides
Myriophyllum sibiricum
Haloragis aspera
Leea guineense
Super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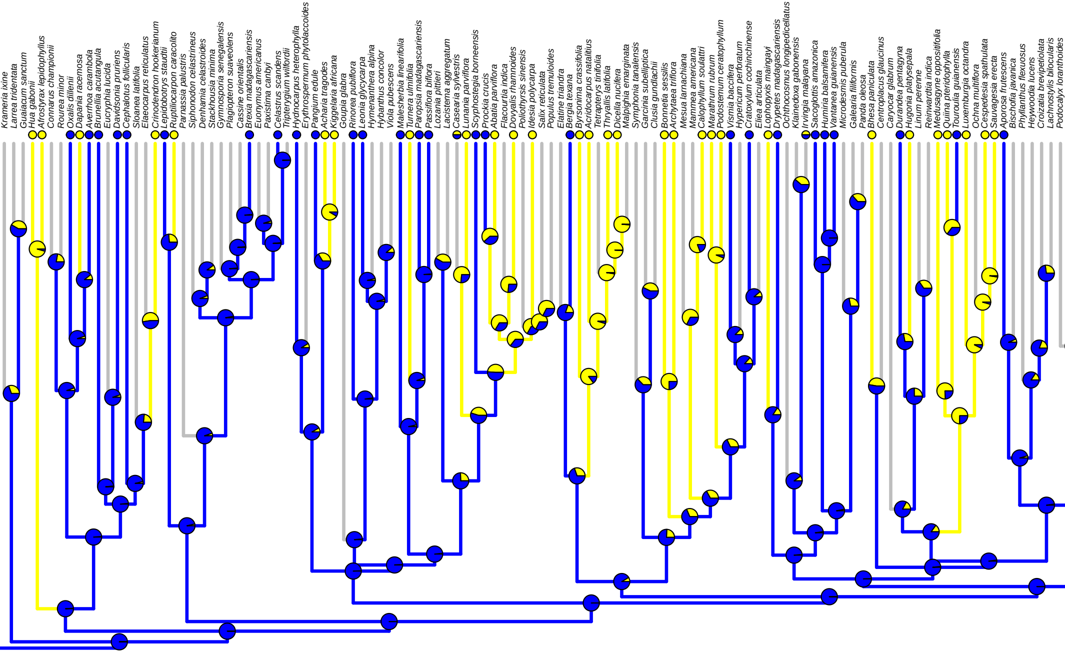
Lythrum salicaria
Fuchsia procumbens
Oenothera parviflora
Clarkia xantiana
Clidemia petiolaris
Mouriri cyphocarpa
Olinia ventosa
Crypteronia paniculata
Qualea grandiflora
Vochysia guatemalensis
Heteropyxis natalensis
Metrosideros nervulosa
Eucalyptus lehmannii
Myrtus communis
Pelargonium cotyledonis
Geranium sanguineum
Viviania marifolia
Greyia radlkoferi
Melianthus major
Aphloia theiformis
Geissoloma marginatum
Strasburgeria robusta
Ixerba brexioides
Staphylea trifolia
Guamatela tuerckheimii
Stachyurus praecox
Crossosoma bigelovii
Picramnia polyantha
Biebersteinia orphanidis
Aesculus pavia
Cupaniopsis anacardioides
Bursera fagaroides
Schinus molle
Rhus copallinum
Nitraria retusa
Citrus paradisi
Ailanthus altissima
Trichilia emetica
Swietenia macrophylla
Gerrardina foliosa
Tapiscia sinensis
Dipentodon sinicus
Perrottetia ovata
Neurada procumbens
Thymelaea hirsuta
Bixa orellana
Anisoptera marginata
Helianthemum grandiflorum
Sterculia apetala
Durio zibethinus
Gossypium hirsutum
Bombax ceiba
Ochroma pyramidale
Tropaeolum tricolor
Carica papaya
Floerkea proserpinacoides
Batis maritima
Koeberlinia spinosa
Pentadiplandra brazzeana
Reseda alba
Gyrostemon tepperi
Tovaria pendula
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
Datisca cannabina
Tetrameles nudiflora
Begonia sanguinea
Corynocarpus laevigatus
Coriaria ruscifolia
Anisophyllea fallax
Xerosicyos danguyi
Dendrosicyos socotrana
Cucurbita pepo
Coccinia sessilifolia
Cucumis melo
Polygala pauciflora
Quillaja saponaria
Stylobasium spathulatum
Schotia brachypetala
Bauhinia galpinii
Cercis canadensis
Ceratonia siliqua
Acacia fimbriata
Albizia julibrissin
Mimosa polycarpa
Indigofera heterantha
Glycine max
Erythrina cristagalli
Lotus corniculatus
Astragalus membranaceus
Cicer arietinum
Medicago sativa
Pisum sativum
Malvidae
Fabidae
Rosidae
rosidae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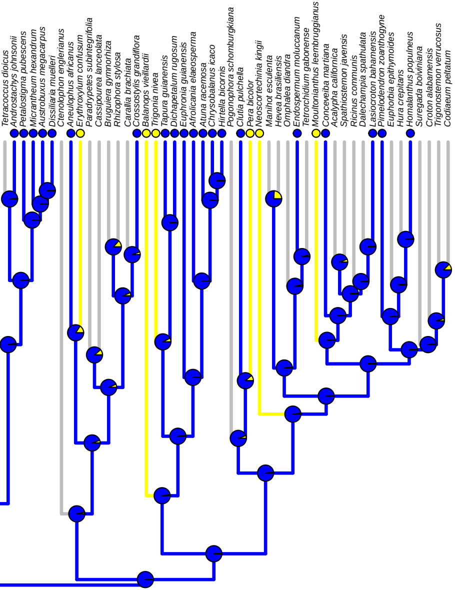
Larrea tridentata
Guaiacum sanctum
Hua gabonii
Afrostyrax lepidophyllus
Connarus championii
Rourea minor
Oxalis dillenii
Dapania racemosa
Averrhoa carambola
Brunellia acutangula
Eucryphia lucida
Davidsonia pruriens
Cephalotus follicularis
Sloanea latifolia
Elaeocarpus reticulatus
Crinodendron hookerianum
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
Hydnocarpus heterophylla
Erythrospermum phytolaccoides
Pangium edule
Acharia tragodes
Kiggelaria africana
Goupia glabra
Rinorea pubiflora
Leonia glycycarpa
Hymenanthera alpina
Hybanthus concolor
Viola pubescens
Malesherbia linearifolia
Turnera ulmifolia
Paropsia madagascariensis
Passiflora biflora
Lozania pittieri
Lacistema aggregatum
Casearia sylvestris
Lunania parviflora
Scyphostegia borneensis
Prockia crucis
Abatia parviflora
Flacourtia indica
Dovyalis rhamnoides
Poliothyrsis sinensis
Idesia polycarpa
Salix reticulata
Populus tremuloides
Elatine triandra
Bergia texana
Byrsonima crassifolia
Acridocarpus natalitius
Tetrapterys tinifolia
Thryallis latifolia
Dicella nucifera
Malpighia emarginata
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
Lophopyxis maingayi
Drypetes madagascariensis
Ochthocosmus longipedicellatus
Klainedoxa gabonensis
Irvingia malayana
Sacoglottis amazonica
Humiria balsamifera
Vantanea guianensis
Microdesmis puberula
Galearia filiformis
Panda oleosa
Bhesa paniculata
Centroplacus glaucinus
Caryocar glabrum
Durandea pentagyna
Hugonia platysepala
Linum perenne
Reinwardtia indica
Medusagyne oppositifolia
Quiina pteridophylla
Touroulia guianensis
Luxemburgia octandra
Ochna multiflora
Cespedesia spathulata
Sauvagesia erecta
Aporosa frutescens
Bischofia javanica
Phyllanthus flexuosus
Heywoodia lucens
Croizatia brevipetiolata
Lachnostylis bilocularis
Podocalyx loranthoides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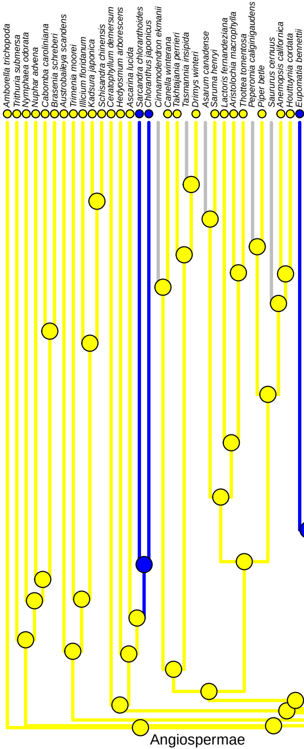
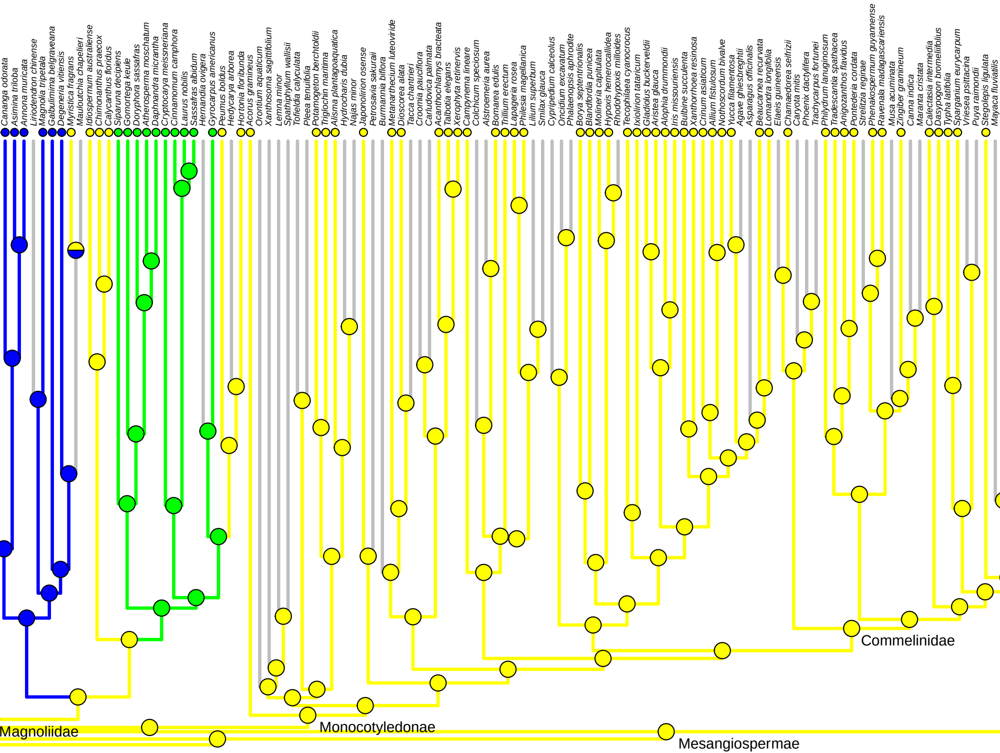
Androstachys johnsonii
Petalostigma pubescens
Micrantheum hexandrum
Austrobuxus megacarpus
Dissiliaria muelleri
Ctenolophon englerianus
Aneulophus africanus
Erythroxylum confusum
Paradrypetes subintegrifolia
Cassipourea lanceolata
Bruguiera gymnorhiza
Rhizophora stylosa
Carallia brachiata
Crossostylis grandiflora
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
Endospermum moluccanum
Tetrorchidium gabonense
Moultonianthus leembruggianus
Conceveiba martiana
Acalypha californica
Spathiostemon javensis
Ricinus communis
Dalechampia spathulata
Lasiocroton bahamensis
Pimelodendron zoanthogyne
Euphorbia epithymoides
Hura crepitans
Homalanthus populneus
Suregada boiviniana
Croton alabamensis
Trigonostemon verrucosus
Codiaeum peltatum

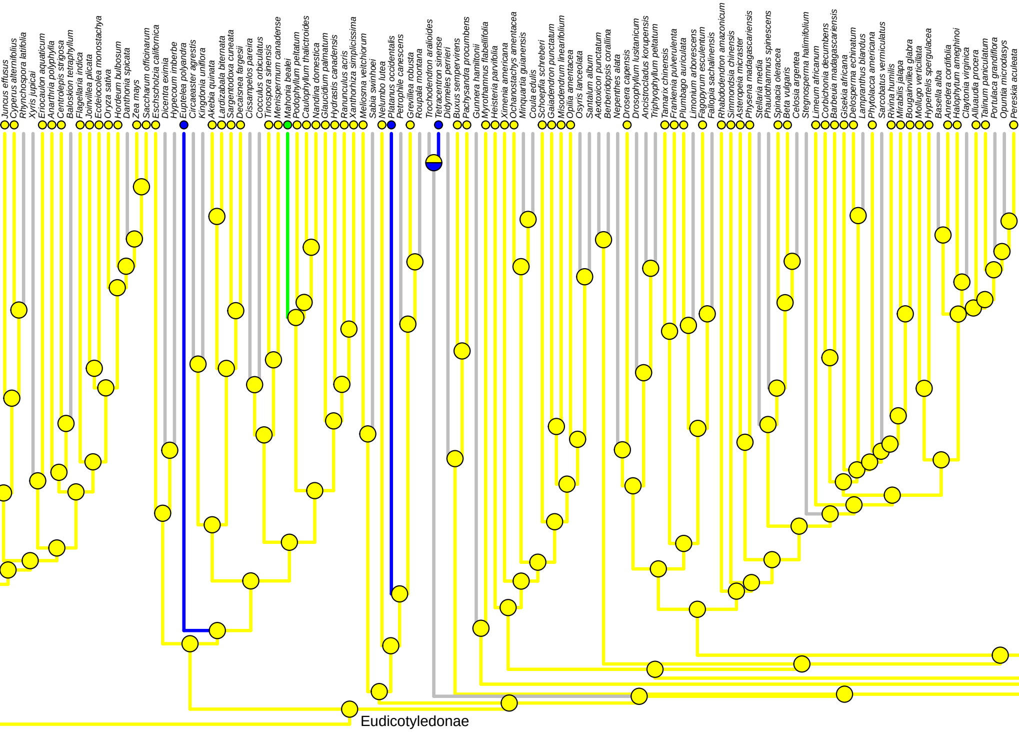
MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
313_A. Anther dehiscence (3−state) (D2d), 10 steps

🟡 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




Cananga odorata
Asimina triloba
Annona muricata
Liriodendron chinense
Magnolia tripetala
Galbulimima belgraveana
Degeneria vitiensis
Myristica fragrans
Mauloutchia chapelieri
Idiospermum australiense
Chimonanthus praecox
Calycanthus floridus
Siparuna decipiens
Gomortega keule
Doryphora sassafras
Atherosperma moschatum
Daphnandra micrantha
Cryptocarya meissneriana
Cinnamomum camphora
Laurus nobilis
Sassafras albidum
Hernandia ovigera
Gyrocarpus americanus
Peumus boldus
Hedycarya arborea
Hortonia floribunda
Acorus gramineus
Orontium aquaticum
Xanthosoma sagittifolium
Lemna minor
Spathiphyllum wallisii
Tofieldia calyculata
Pleea tenuifolia
Potamogeton berchtoldii
Triglochin maritima
Alisma plantagoaquatica
Hydrocharis dubia
Najas minor
Japonolirion osense
Petrosavia sakuraii
Burmannia biflora
Metanarthecium luteoviride
Dioscorea alata
Tacca chantrieri
Croomia pauciflora
Carludovica palmata
Acanthochlamys bracteata
Talbotia elegans
Xerophyta retinervis
Campynema lineare
Colchicum speciosum
Alstroemeria aurea
Bomarea edulis
Trillium erectum
Lapageria rosea
Philesia magellanica
Lilium superbum
Smilax glauca
Cypripedium calceolus
Oncidium excavatum
Phalaenopsis aphrodite
Borya septentrionalis
Blandfordia punicea
Molineria capitulata
Hypoxis hemerocallidea
Rhodohypoxis milloides
Tecophilaea cyanocrocus
Ixiolirion tataricum
Gladiolus buckerveldii
Aristea glauca
Alophia drummondii
Iris missouriensis
Bulbine succulenta
Xanthorrhoea resinosa
Crinum asiaticum
Allium fistulosum
Nothoscordum bivalve
Yucca filamentosa
Agave ghiesbreghtii
Asparagus officinalis
Beaucarnea recurvata
Lomandra longifolia
Elaeis guineensis
Chamaedorea seifrizii
Caryota mitis
Phoenix dactylifera
Trachycarpus fortunei
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
Commelinidae
Magnoliidae
Monocotyledonae
Mesangiospermae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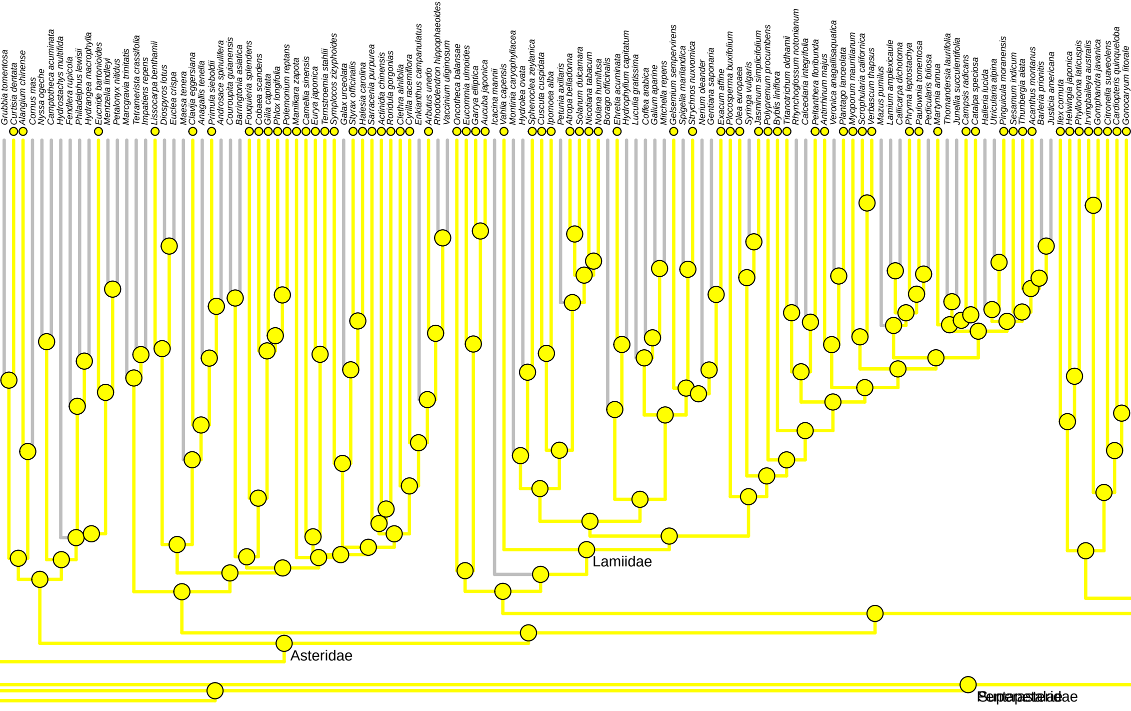
Rhynchospora latifolia
Xyris jupicai
Eriocaulon aquaticum
Anarthria polyphylla
Centrolepis strigosa
Baloskion tetraphyllum
Flagellaria indica
Joinvillea plicata
Ecdeiocolea monostachya
Oryza sativa
Hordeum bulbosum
Danthonia spicata
Zea mays
Saccharum officinarum
Eschscholzia californica
Dicentra eximia
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
Meliosma veitchiorum
Sabia swinhoei
Nelumbo lutea
Platanus occidentalis
Petrophile canescens
Grevillea robusta
Roupala montana
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
Nepenthes alata
Drosera capensis
Drosophyllum lusitanicum
Ancistrocladus korupensis
Triphyophyllum peltatum
Tamarix chinensis
Frankenia pulverulenta
Plumbago auriculata
Limonium arborescens
Fagopyrum esculentum
Fallopia sachalinensis
Rhabdodendron amazonicum
Simmondsia chinensis
Asteropeia micraster
Physena madagascariensis
Stellaria media
Phaulothamnus spinescens
Spinacia oleracea
Beta vulgaris
Celosia argentea
Stegnosperma halimifolium
Limeum africanum
Corbichonia decumbens
Barbeuia madagascariensis
Gisekia africana
Delosperma echinatum
Lampranthus blandus
Phytolacca americana
Sarcobatus vermiculatus
Rivina humilis
Mirabilis jalapa
Bougainvillea glabra
Mollugo verticillata
Hypertelis spergulacea
Basella alba
Anredera cordifolia
Halophytum ameghinoi
Claytonia virginica
Alluaudia procera
Talinum paniculatum
Portulaca grandiflora
Opuntia microdasys
Pereskia aculeata
Eudicotyledonae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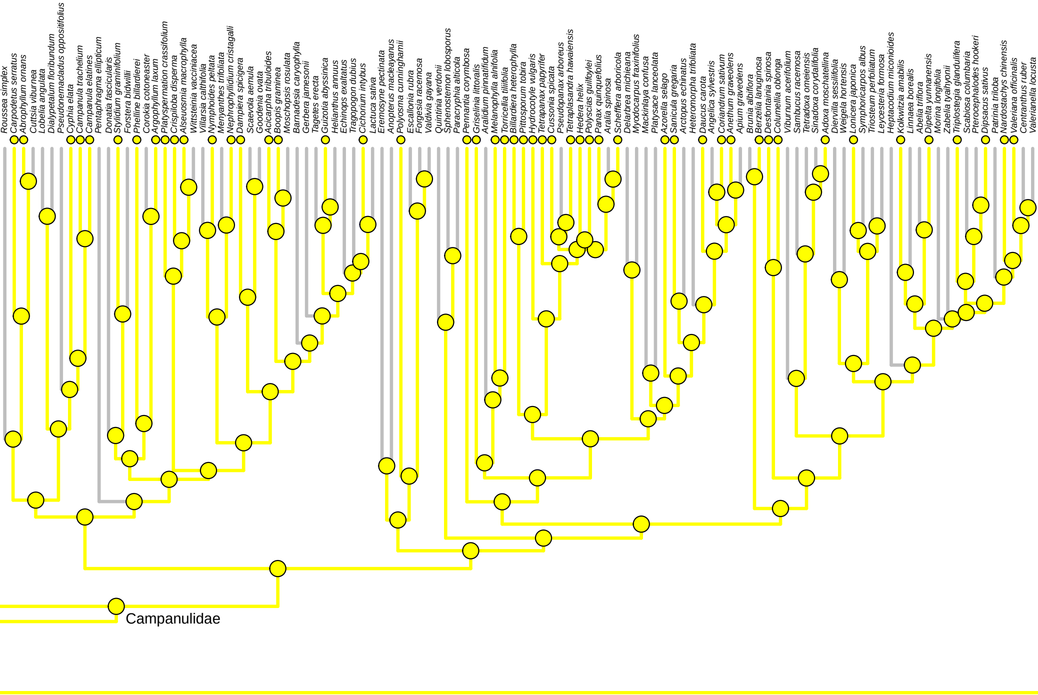
Nyssa ogeche
Camptotheca acuminata
Hydrostachys multifida
Fendlera rupicola
Philadelphus lewisii
Hydrangea macrophylla
Eucnide bartonioides
Mentzelia lindleyi
Petalonyx nitidus
Marcgravia trinitatis
Tetramerista crassifolia
Impatiens repens
Lissocarpa benthamii
Diospyros lotus
Euclea crispa
Maesa tenera
Clavija eggersiana
Anagallis tenella
Primula sieboldii
Androsace spinulifera
Couroupita guianensis
Barringtonia asiatica
Fouquieria splendens
Cobaea scandens
Gilia capitata
Phlox longifolia
Polemonium reptans
Manilkara zapota
Camellia sinensis
Eurya japonica
Ternstroemia stahlii
Symplocos zizyphoides
Galax urceolata
Styrax officinalis
Halesia carolina
Sarracenia purpurea
Actinidia chinensis
Roridula gorgonias
Clethra alnifolia
Cyrilla racemiflora
Enkianthus campanulatus
Arbutus unedo
Rhododendron hippophaeoides
Vaccinium uliginosum
Oncotheca balansae
Eucommia ulmoides
Garrya elliptica
Aucuba japonica
Icacina mannii
Vahlia capensis
Montinia caryophyllacea
Hydrolea ovata
Sphenoclea zeylanica
Cuscuta cuspidata
Ipomoea alba
Petunia axillaris
Atropa belladonna
Solanum dulcamara
Nicotiana tabacum
Nolana humifusa
Borago officinalis
Ehretia acuminata
Hydrophyllum capitatum
Luculia gratissima
Coffea arabica
Galium aparine
Mitchella repens
Gelsemium sempervirens
Spigelia marilandica
Strychnos nuxvomica
Nerium oleander
Gentiana saponaria
Exacum affine
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
Paulownia tomentosa
Pedicularis foliosa
Martynia annua
Thomandersia laurifolia
Junellia succulentifolia
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
Cardiopteris quinqueloba
Gonocaryum litorale
Lamiidae
Asteridae
Superasteridae
Pentapetalae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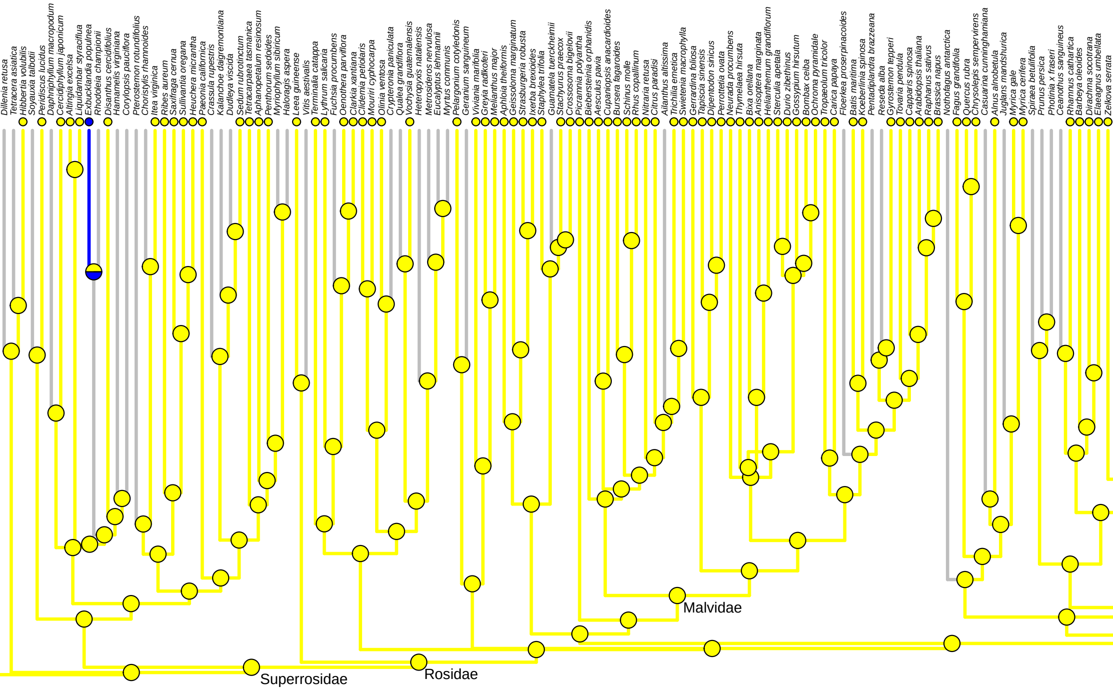
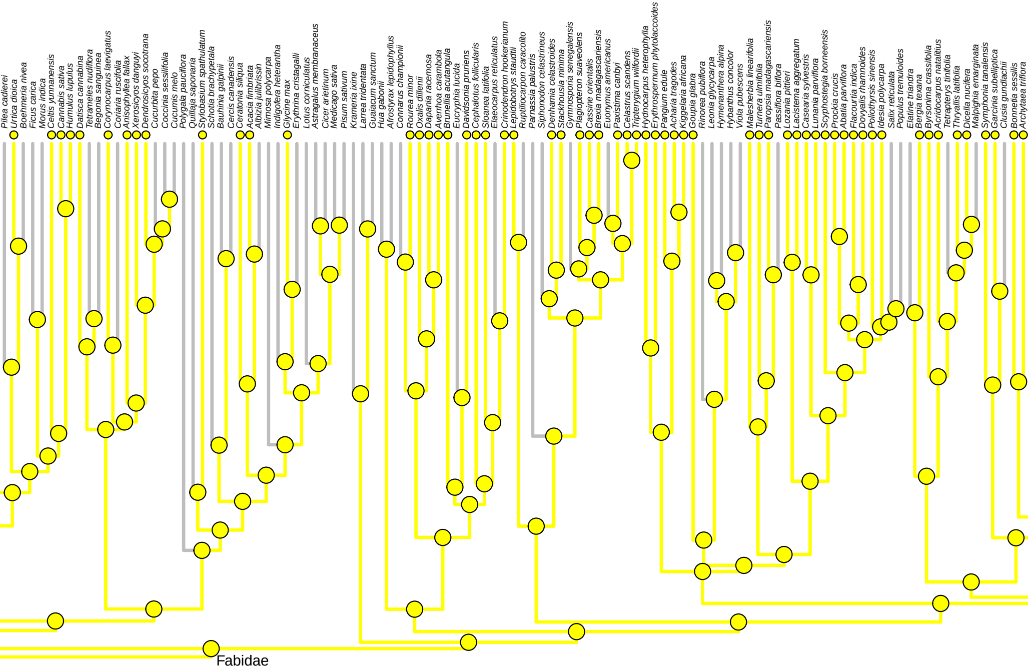
Abrophyllum ornans
Cuttsia viburnea
Lobelia angulata
Dialypetalum floribundum
Pseudonemacladus oppositifolius
Cyphia elata
Campanula trachelium
Campanula elatines
Pentaphragma ellipticum
Donatia fascicularis
Stylidium graminifolium
Forstera bidwillii
Phelline billardierei
Corokia cotoneaster
Argophyllum 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
Boopis graminea
Moschopsis rosulata
Barnadesia caryophylla
Gerbera jamesonii
Tagetes erecta
Guizotia abyssinica
Helianthus annuus
Echinops exaltatus
Tragopogon dubius
Cichorium intybus
Lactuca sativa
Eremosyne pectinata
Anopterus macleayanus
Polyosma cunninghamii
Escallonia rubra
Forgesia racemosa
Valdivia gayana
Quintinia verdonii
Sphenostemon lobosporus
Paracryphia alticola
Pennantia corymbosa
Griselinia littoralis
Aralidium pinnatifidum
Melanophylla alnifolia
Torricellia tiliifolia
Billardiera heterophylla
Pittosporum tobira
Hydrocotyle vulgaris
Tetrapanax papyrifer
Cussonia spicata
Pseudopanax arboreus
Tetraplasandra hawaiensis
Hedera helix
Polyscias guilfoylei
Panax quinquefolius
Aralia spinosa
Schefflera arboricola
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
Brunia albiflora
Berzelia lanuginosa
Desfontainia spinosa
Columellia oblonga
Viburnum acerifolium
Sambucus racemosa
Tetradoxa omeiensis
Sinadoxa corydalifolia
Adoxa moschatellina
Diervilla sessilifolia
Weigela hortensis
Lonicera japonica
Symphoricarpos albus
Triosteum perfoliatum
Leycesteria formosa
Heptacodium miconioides
Kolkwitzia amabilis
Linnaea borealis
Abelia triflora
Dipelta yunnanensis
Morina longifolia
Zabelia tyaihyonii
Triplostegia glandulifera
Scabiosa columbaria
Pterocephalodes hookeri
Dipsacus sativus
Patrinia triloba
Nardostachys chinensis
Valeriana officinalis
Centranthus ruber
Valerianella locusta
Campanulidae


Dillenia retusa
Tetracera asiatica
Hibbertia volubilis
Soyauxia talbotii
Peridiscus lucidus
Daphniphyllum macropodum
Cercidiphyllum japonicum
Altingia excelsa
Liquidambar styraciflua
Exbucklandia populnea
Rhodoleia championii
Disanthus cercidifolius
Hamamelis virginiana
Corylopsis pauciflora
Pterostemon rotundifolius
Choristylis rhamnoides
Itea virginica
Ribes aureum
Saxifraga cernua
Sullivantia oregana
Heuchera micrantha
Paeonia californica
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
Aphloia theiformis
Geissoloma marginatum
Strasburgeria robusta
Ixerba brexioides
Staphylea trifolia
Guamatela tuerckheimii
Stachyurus praecox
Crossosoma bigelovii
Picramnia polyantha
Biebersteinia orphanidis
Aesculus pavia
Cupaniopsis anacardioides
Bursera fagaroides
Schinus molle
Rhus copallinum
Nitraria retusa
Citrus paradisi
Ailanthus altissima
Trichilia emetica
Swietenia macrophylla
Gerrardina foliosa
Tapiscia sinensis
Dipentodon sinicus
Perrottetia ovata
Neurada procumbens
Thymelaea hirsuta
Bixa orellana
Anisoptera marginata
Helianthemum grandiflorum
Sterculia apetala
Durio zibethinus
Gossypium hirsutum
Bombax ceiba
Ochroma pyramidale
Tropaeolum tricolor
Carica papaya
Floerkea proserpinacoides
Batis maritima
Koeberlinia spinosa
Pentadiplandra brazzeana
Reseda alba
Gyrostemon tepperi
Tovaria pendula
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
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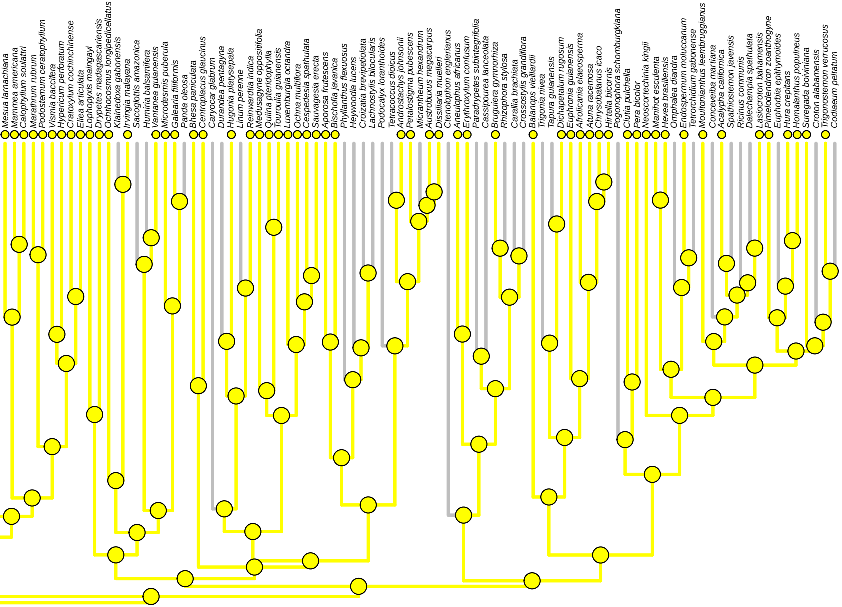
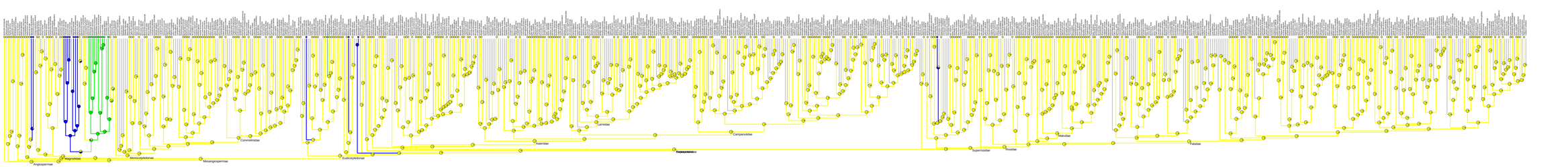
Boehmeria nivea
Ficus carica
Morus indica
Celtis yunnanensis
Cannabis sativa
Humulus lupulus
Datisca cannabina
Tetrameles nudiflora
Begonia sanguinea
Corynocarpus laevigatus
Coriaria ruscifolia
Anisophyllea fallax
Xerosicyos danguyi
Dendrosicyos socotrana
Cucurbita pepo
Coccinia sessilifolia
Cucumis melo
Polygala paucifolia
Quillaja saponaria
Stylobasium spathulatum
Schotia brachypetala
Bauhinia galpinii
Cercis canadensis
Ceratonia siliqua
Acacia fimbriata
Albizia julibrissin
Mimosa polycarpa
Indigofera heterantha
Glycine max
Erythrina cristagalli
Lotus corniculatus
Astragalus membranaceus
Cicer arietinum
Medicago sativa
Pisum sativum
Krameria ixine
Larrea tridentata
Guaiacum sanctum
Hua gabonii
Afrostyrax lepidophyllus
Connarus championii
Rourea minor
Oxalis dillenii
Dapania racemosa
Averrhoa carambola
Brunellia acutangula
Eucryphia lucida
Davidsonia pruriens
Cephalotus follicularis
Sloanea latifolia
Elaeocarpus reticulatus
Crinodendron hookerianum
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
Hydnocarpus heterophylla
Erythrospermum phytolaccoides
Pangium edule
Acharia tragodes
Kiggelaria africana
Goupia glabra
Rinorea pubiflora
Leonia glycycarpa
Hymenanthera alpina
Hybanthus concolor
Viola pubescens
Malesherbia linearifolia
Turnera ulmifolia
Paropsia madagascariensis
Passiflora biflora
Lozania pittieri
Lacistema aggregatum
Casearia sylvestris
Lunania parviflora
Scyphostegia borneensis
Prockia crucis
Abatia parviflora
Flacourtia indica
Dovyalis rhamnoides
Poliothyrsis sinensis
Idesia polycarpa
Salix reticulata
Populus tremuloides
Elatine triandra
Bergia texana
Byrsonima crassifolia
Acridocarpus natalitius
Tetrapterys tinifolia
Thryallis latifolia
Dicella nucifera
Malpighia emarginata
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
Lophopyxis maingayi
Drypetes madagascariensis
Ochthocosmus longipedicellatus
Klainedoxa gabonensis
Irvingia malayana
Sacoglottis amazonica
Humiria balsamifera
Vantanea guianensis
Microdesmis puberula
Galearia filiformis
Panda oleosa
Bhesa paniculata
Centroplacus glaucinus
Caryocar glabrum
Durandea pentagyna
Hugonia platysepala
Linum perenne
Reinwardtia indica
Medusagyne oppositifolia
Quiina pteridophylla
Touroulia guianensis
Luxemburgia octandra
Ochna multiflora
Cespedesia spathulata
Sauvagesia erecta
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
Paradrypetes subintegrifolia
Cassipourea lanceolata
Bruguiera gymnorhiza
Rhizophora stylosa
Carallia brachiata
Crossostylis grandiflora
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
Endospermum moluccanum
Tetrorchidium gabonense
Moultonianthus leembruggianus
Conceveiba martiana
Acalypha californica
Spathiostemon javensis
Ricinus communis
Dalechampia spathulata
Lasiocroton bahamensis
Pimelodendron zoanthogyne
Euphorbia epithymoides
Hura crepitans
Homalanthus populneus
Suregada boiviniana
Croton alabamensis
Trigonostemon verrucosus
Codiaeum peltatum

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

Node	ML state	Prob
Angiospermae	longitudinal slit	1
Mesangiospermae	longitudinal slit	1
Magnoliidae	longitudinal slit	0.9994
Monocotyledonae	longitudinal slit	1
Eudicotyledonae	longitudinal slit	1
Commelinidae	longitudinal slit	1
Ranunculidae	longitudinal slit	1
Superasteridae	longitudinal slit	1
Asteridae	longitudinal slit	1
Lamiidae	longitudinal slit	1
Campanulidae	longitudinal slit	1
Superrosidae	longitudinal slit	1
Rosidae	longitudinal slit	1
Malvidae	longitudinal slit	1
Fabidae	longitudinal slit	1

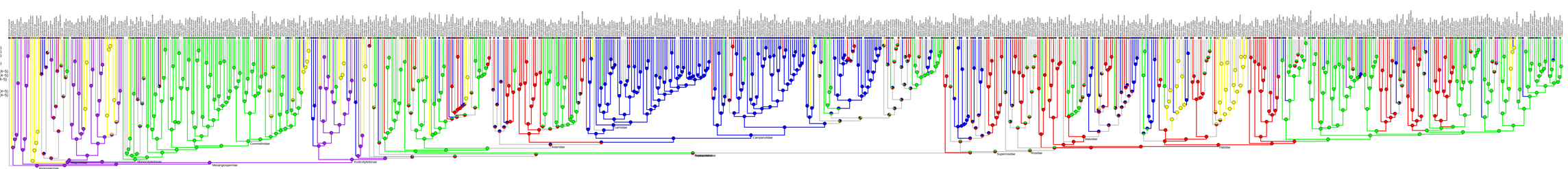
Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	···
ARD	−56.78	6	125.55	125.66	2.19	0.13	2e−04	···
ARDeq*	−55.68	6	123.36	123.47	0	0.38	2e−04	···
ER	−61.41	1	124.81	124.82	1.35	0.2	2e−04	···
SYM	−60.38	3	126.77	126.8	3.33	0.07	2e−04	···
SYMeq	−59.29	3	124.57	124.6	1.14	0.22	2e−04	···



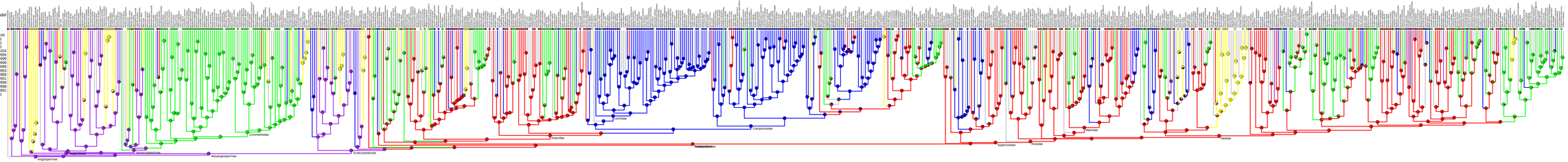
MP ancestral state reconstruction using ancestral pars
(R phangorn)
401_B. Number of structural carpels (5−state) (D2c), 187 steps

- 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)
Ceratophyllidae	three (3) / four or five (4–5)
Superasteridae	three (3) / four or five (4–5)
Asteridae	two (2) / four or five (4–5)
Lamidae	two (2)
Campanulidae	two (2)
Superrosidae	three (3) / four or five (4–5)
Rosidae	three (3) / four or five (4–5)
Malvidae	four or five (4–5)
Fabidae	four or five (4–5)



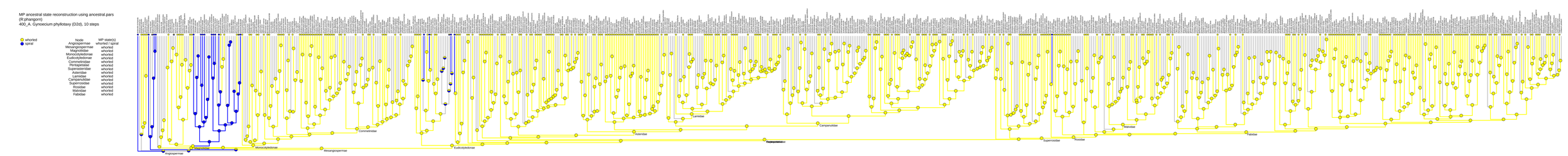
ML ancestral state reconstruction using rayDISC (R:corHMM)
401_B. Number of structural carpels (5-state) (D2c), ARDeq model



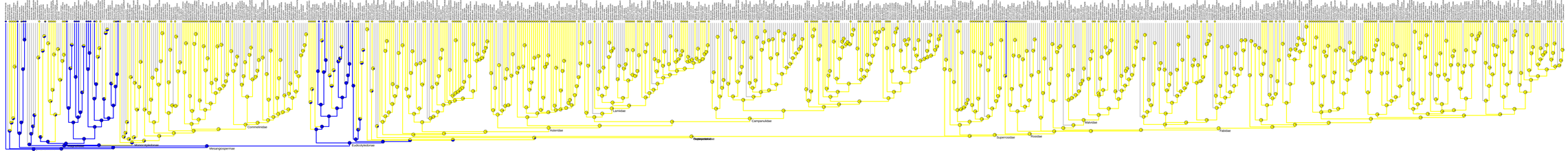
Node	ML state	Prob
Angiospermae	more than five (>5)	1
Mesangiospermae	more than five (>5)	1
Magnoliidae	more than five (>5)	1
Monocotyledoneae	more than five (>5)	0.8204
Eudicotyledoneae	more than five (>5)	0.9956
Commelinidae	three (3)	0.9999
Pentapetalae	four or five (4-5)	0.9999
Superasteridae	four or five (4-5)	0.9999
Asteridae	four or five (4-5)	0.9953
Lamiidae	two (2)	0.9968
Campanulidae	two (2)	0.9951
Superrosidae	four or five (4-5)	0.9999
Rosidae	four or five (4-5)	0.9998
Malvidae	four or five (4-5)	0.9991
Fabidae	four or five (4-5)	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	...
ARD	−665.28	20	1370.55	1371.64	3.22	0.17	0.0017	...
ARDeq*	−663.67	20	1367.33	1368.42	0	0.83	0.0017	...
ER	−720.04	1	1442.09	1442.09	73.67	0	0.0016	...
SYM	−686.43	10	1392.85	1393.13	24.71	0	8e−04	...
SYMeq	−684.89	10	1389.77	1390.05	21.63	0	8e−04	...
ORD	−760.36	8	1536.72	1536.9	168.48	0	0.001	...
ORDeq	−758.84	8	1533.69	1533.87	165.45	0	0.001	...
ORDSYM	−764.3	4	1536.59	1536.64	168.22	0	0.0042	...
ORDSYMeq	−762.85	4	1533.7	1533.75	165.33	0	0.0042	...
ORDER	−769.83	1	1541.66	1541.67	173.25	0	0.0058	...

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



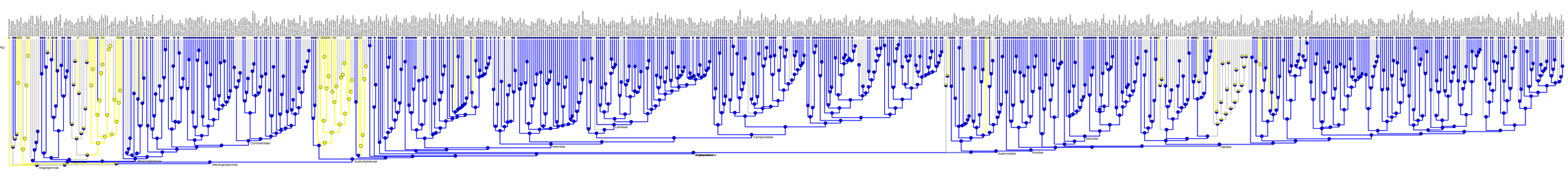
Node	ML state	Prob
Angiospermae	spiral	1
Mesangiospermae	spiral	1
Magnoliidae	spiral	0.9997
Monocotyledonae	whorled	0.5317
Eudicotyledonae	spiral	0.9997
Gunneridae	whorled	0.9997
Pentapetalae	whorled	0.9997
Superasteridae	whorled	0.9746
Asteridae	whorled	1
Lamidae	whorled	1
Campanulidae	whorled	1
Superrosidae	whorled	0.9775
Rosidae	whorled	0.9777
Malvidae	whorled	1
Fabidae	whorled	1

Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD	-39.73	2	83.46	83.48	1.39	0.31	1e-04	0.0083
ARDeq**	-39.04	2	82.07	82.09	0	0.62	1e-04	0.0083
ER	-51.33	1	104.66	104.66	22.57	0	4e-04	4e-04
UN01	-52.95	1	107.89	107.9	25.81	0	4e-04	
UN10	-42.27	1	86.55	86.55	4.46	0.07		0.0098

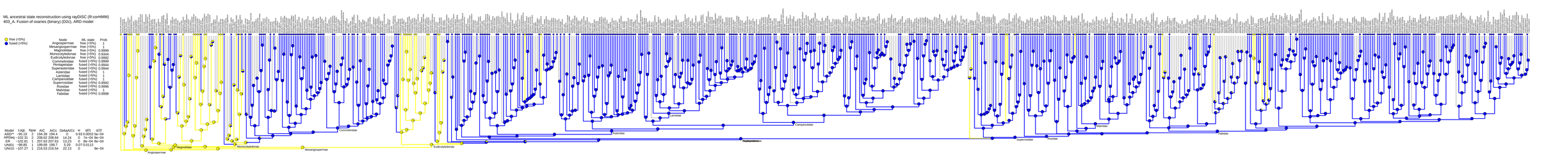
MP ancestral state reconstruction using ancestral.pars
(R:phangorn)
403_A. Fusion of ovaries (binary) (D2c), 24 steps

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

Node	MP state(s)
Angiospermae	free (<5%) / fused (>5%)
Mesangiospermae	fused (>5%)
Magnoliidae	fused (>5%)
Monocotyledonae	fused (>5%)
Eudicotyledonae	fused (>5%)
Commelinidae	fused (>5%)
Ranunculidae	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 ray[DISC (R:corHMM)
403_A. Fusion of ovaries (binary) (D2c), ARD model

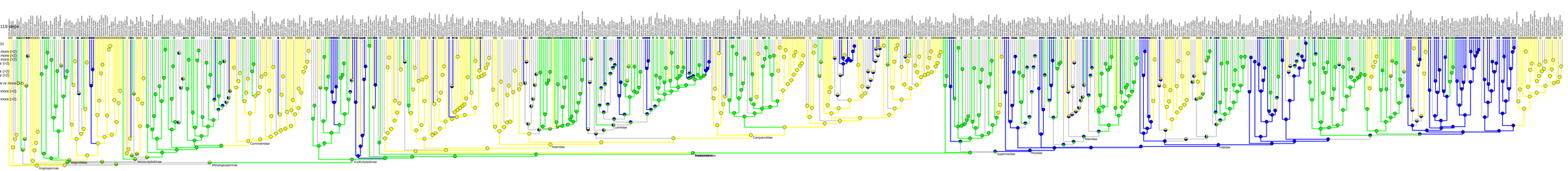


Model	LogL	Npar	AIC	AICc	DeltaAICc	w	q01	q10
ARD**	-95.19	2	194.39	194.4	0	0.93	0.0053	5e−04
ARDeq	-102.31	2	208.62	208.64	14.24	0	7e−04	8e−04
ER	-102.81	1	207.63	207.63	13.23	0	8e−04	8e−04
UN01	-98.85	1	199.69	199.7	5.29	0.07	0.0113	
UN10	-107.27	1	216.53	216.54	22.13	0		9e−04

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

one (1)
two (2)
three or more (>2)

Node	MP state(s)
Angiospermae	one (1)
Mesangiospermae	one (1) / three or more (>2)
Magnoliidae	one (1) / three or more (>2)
Monocotyledonae	one (1) / three or more (>2)
Eudicotyledonae	three or more (>2)
Commelinidae	one (1)
Ceratophyllidae	three or more (>2)
Superasteridae	three or more (>2)
Asteridae	one (1)
Lamiidae	one (1) / two (2) / three or more (>2)
Campanulidae	one (1)
Superrosidae	two (2) / three or more (>2)
Rosidae	two (2)
Malvidae	two (2) / three or more (>2)
Fabidae	two (2)

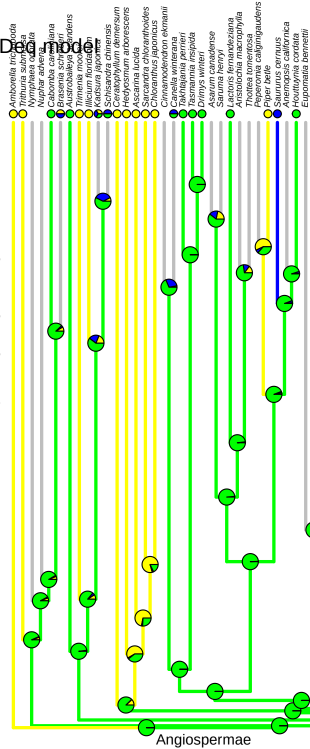


ML ancestral state reconstruction using rayDISC (R:corHMM)
411_A. Number of ovules per functional carpel (3−state) (D2c), ARDeq model

🟡	one (1)
🔵	two (2)
🟢	three or more (>2)

Node	ML state	Prob
Angiospermae	three or more (>2)	1
Mesangiospermae	three or more (>2)	1
Magnoliidae	three or more (>2)	1
Monocotyledonae	three or more (>2)	1
Eudicotyledonae	three or more (>2)	1
Commelinidae	three or more (>2)	0.8553
Pentapetalae	three or more (>2)	1
Superasteridae	three or more (>2)	1
Asteridae	three or more (>2)	0.9948
Lamiidae	three or more (>2)	1
Campanulidae	three or more (>2)	0.9983
Superrosidae	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	−383.3	6	778.6	778.7	2.18	0.25	0.0013	···
ARDeq**	−382.21	6	776.41	776.52	0	0.75	0.0013	···
ER	−398.81	1	799.62	799.63	23.11	0	0.0028	···
SYM	−398.31	3	802.61	802.65	26.13	0	0.0023	···
SYMeq	−397.45	3	800.89	800.92	24.4	0	0.0024	···
ORD	−399.24	4	806.47	806.53	30.01	0	0.0019	···
ORDeq	−398.16	4	804.31	804.36	27.84	0	0.0019	···
ORDSYM	−412.3	2	828.6	828.61	52.09	0	0.0054	···
ORDSYMeq	−411.4	2	826.79	826.81	50.29	0	0.0054	···
ORDER	−413.37	1	828.74	828.74	52.22	0	0.0063	···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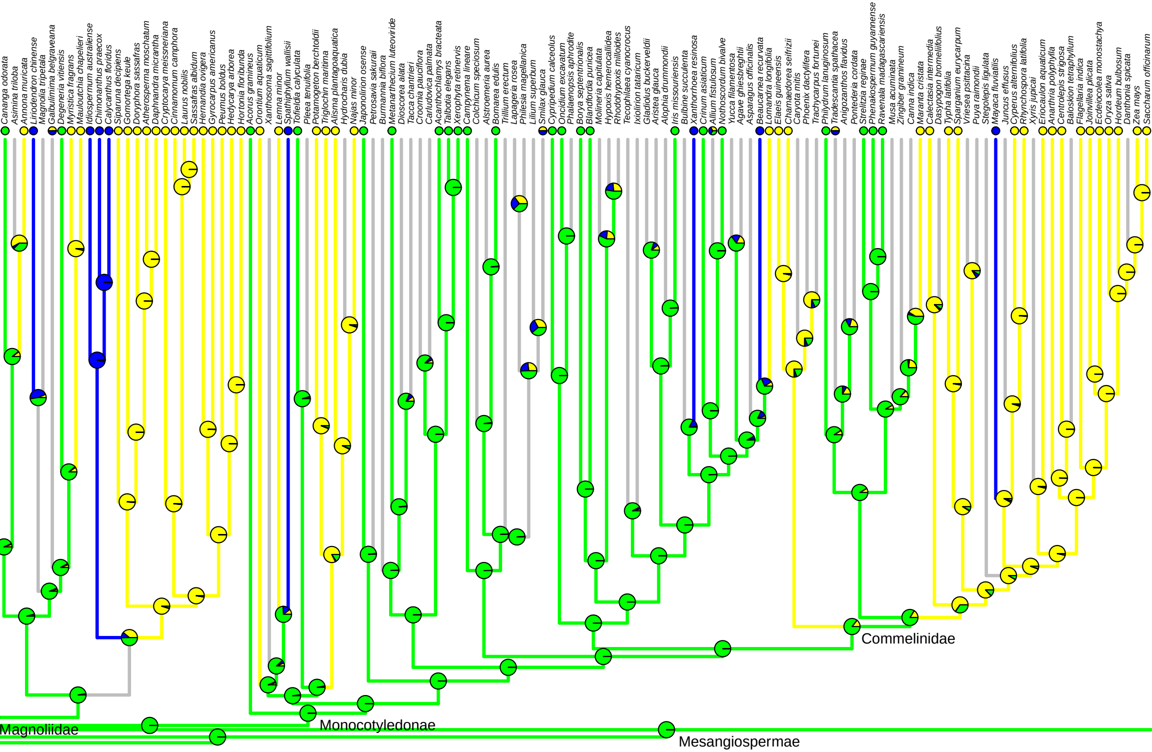
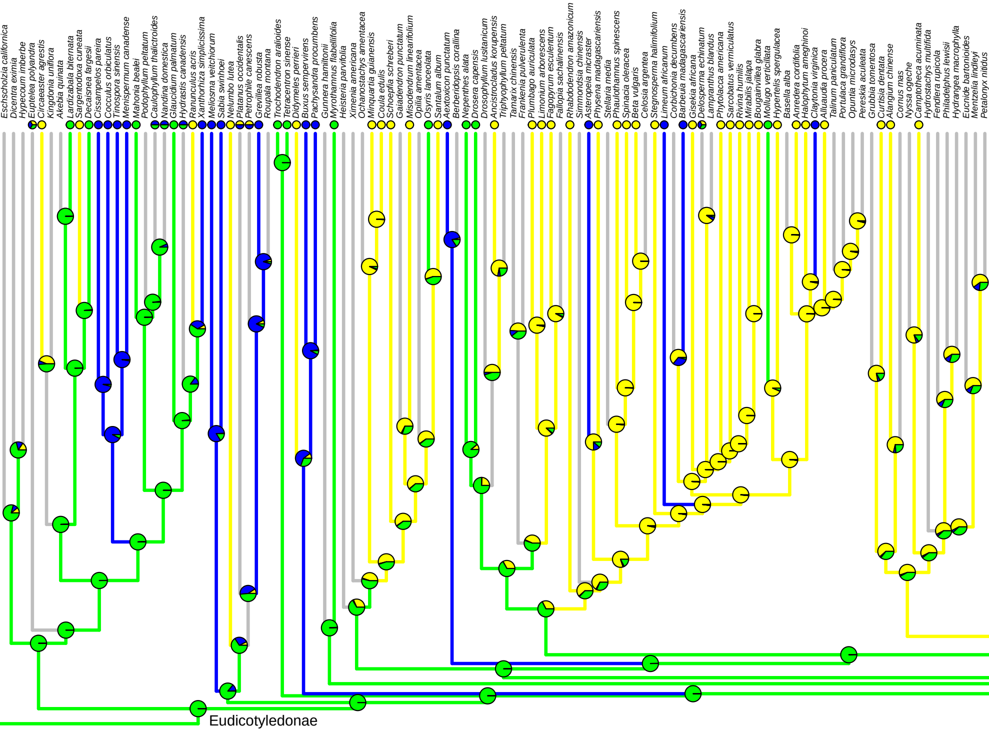
Trithuria submersa
Nymphaea odorata
Nuphar advena
Cabomba caroliniana
Brasenia schreberi
Austrobaileya scandens
Trimenia moorei
Illicium floridanum
Kadsura japonica
Schisandra chinensis
Ceratophyllum demersum
Hedyosmum arborescens
Ascarina lucida
Sarcandra chloranthoides
Chloranthus japonicus
Cinnamodendron ekmanii
Canella winterana
Takhtajania perrieri
Tasmannia insipida
Drimys winteri
Asarum canadense
Saruma henryi
Lactoris fernandeziana
Aristolochia macrophylla
Thottea tomentosa
Peperomia caliginigaudens
Piper betle
Saururus cernuus
Anemopsis californica
Houttuynia cordata
Eupomatia bennettii
Angiospermae


Cananga odorata
Asimina triloba
Annona muricata
Liriodendron chinense
Magnolia tripetala
Galbulimima belgraveana
Degeneria vitiensis
Myristica fragrans
Mauloutchia chapelieri
Idiospermum australiense
Chimonanthus praecox
Calycanthus floridus
Siparuna decipiens
Gomortega keule
Doryphora sassafras
Atherosperma moschatum
Daphnandra micrantha
Cryptocarya meissneriana
Cinnamomum camphora
Laurus nobilis
Sassafras albidum
Hernandia ovigera
Gyrocarpus americanus
Peumus boldus
Hedycarya arborea
Hortonia floribunda
Acorus gramineus
Orontium aquaticum
Xanthosoma sagittifolium
Lemna minor
Spathiphyllum wallisii
Tofieldia calyculata
Pleea tenuifolia
Potamogeton berchtoldii
Triglochin maritima
Alisma plantagoaquatica
Hydrocharis dubia
Najas minor
Japonolirion osense
Petrosavia sakuraii
Burmannia biflora
Metanarthecium luteoviride
Dioscorea alata
Tacca chantrieri
Croomia pauciflora
Carludovica palmata
Acanthochlamys bracteata
Talbotia elegans
Xerophyta retinervis
Campynema lineare
Colchicum speciosum
Alstroemeria aurea
Bomarea edulis
Trillium erectum
Lapageria rosea
Philesia magellanica
Lilium superbum
Smilax glauca
Cypripedium calceolus
Oncidium excavatum
Phalaenopsis aphrodite
Borya septentrionalis
Blandfordia punicea
Molineria capitulata
Hypoxis hemerocallidea
Rhodohypoxis milloides
Tecophilaea cyanocrocus
Ixiolirion tataricum
Gladiolus buckerveldii
Aristea glauca
Alophia drummondii
Iris missouriensis
Bulbine succulenta
Xanthorrhoea resinosa
Crinum asiaticum
Allium fistulosum
Nothoscordum bivalve
Yucca filamentosa
Agave ghiesbreghtii
Asparagus officinalis
Beaucarnea recurvata
Lomandra longifolia
Elaeis guineensis
Chamaedorea seifrizii
Caryota mitis
Phoenix dactylifera
Trachycarpus fortunei
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
Xyris jupicai
Eriocaulon aquaticum
Anarthria polyphylla
Centrolepis strigosa
Baloskion tetraphyllum
Flagellaria indica
Joinvillea plicata
Ecdeiocolea monostachya
Oryza sativa
Hordeum bulbosum
Danthonia spicata
Zea mays
Saccharum officinarum
Commelinidae
Monocotyledonae
Magnoliidae
Mesangiospermae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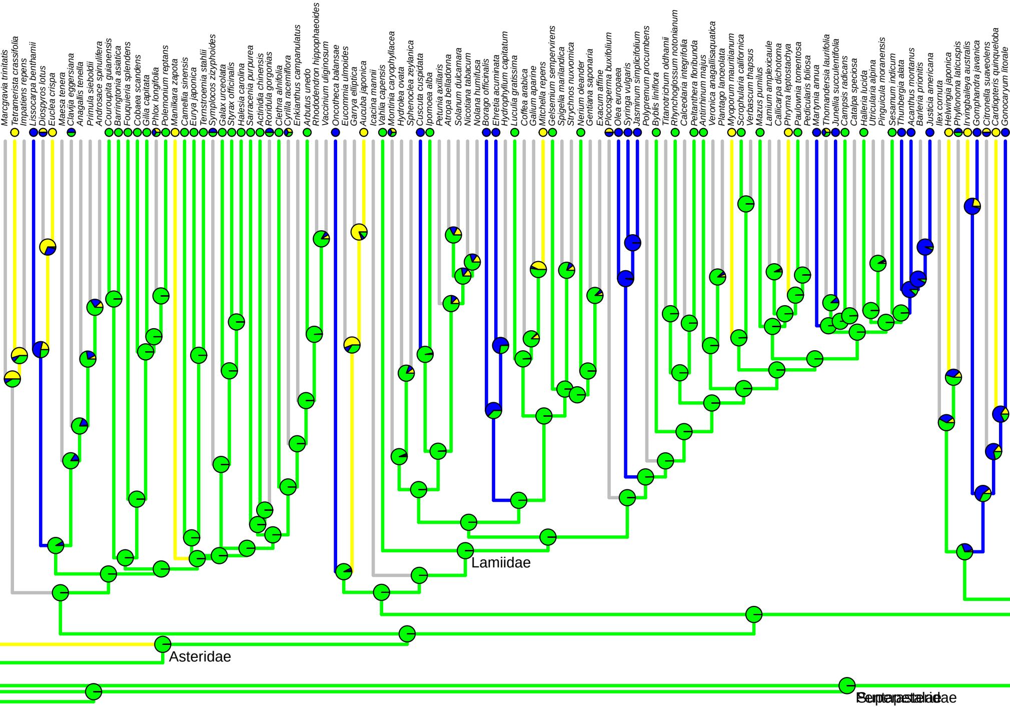
Circaeaster agrestis
Kingdonia uniflora
Akebia quinata
Lardizabala biternata
Sargentodoxa cuneata
Decaisnea fargesii
Cissampelos pareira
Cocculus orbiculatus
Tinospora sinensis
Menispermum canadense
Mahonia bealei
Podophyllum peltatum
Caulophyllum thalictroides
Nandina domestica
Glaucidium palmatum
Hydrastis canadensis
Ranunculus acris
Xanthorhiza simplicissima
Meliosma veitchiorum
Sabia swinhoei
Nelumbo lutea
Platanus occidentalis
Petrophile canescens
Grevillea robusta
Roupala montana
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
Nepenthes alata
Drosera capensis
Drosophyllum lusitanicum
Ancistrocladus korupensis
Triphyophyllum peltatum
Tamarix chinensis
Frankenia pulverulenta
Plumbago auriculata
Limonium arborescens
Fagopyrum esculentum
Fallopia sachalinensis
Rhabdodendron amazonicum
Simmondsia chinensis
Asteropeia micraster
Physena madagascariensis
Stellaria media
Phaulothamnus spinescens
Spinacia oleracea
Beta vulgaris
Celosia argentea
Stegnosperma halimifolium
Limeum africanum
Corbichonia decumbens
Barbeuia madagascariensis
Gisekia africana
Delosperma echinatum
Lampranthus blandus
Phytolacca americana
Sarcobatus vermiculatus
Rivina humilis
Mirabilis jalapa
Bougainvillea glabra
Mollugo verticillata
Hypertelis spergulacea
Basella alba
Anredera cordifolia
Halophytum ameghinoi
Claytonia virginica
Alluaudia procera
Talinum paniculatum
Portulaca grandiflora
Opuntia microdasys
Pereskia aculeata
Grubbia tomentosa
Curtisia dentata
Alangium chinense
Cornus mas
Nyssa ogeche
Camptotheca acuminata
Hydrostachys multifida
Fendlera rupicola
Philadelphus lewisii
Hydrangea macrophylla
Eucnide bartonioides
Mentzelia lindleyi
Petalonyx nitidus
Eudicotyledonae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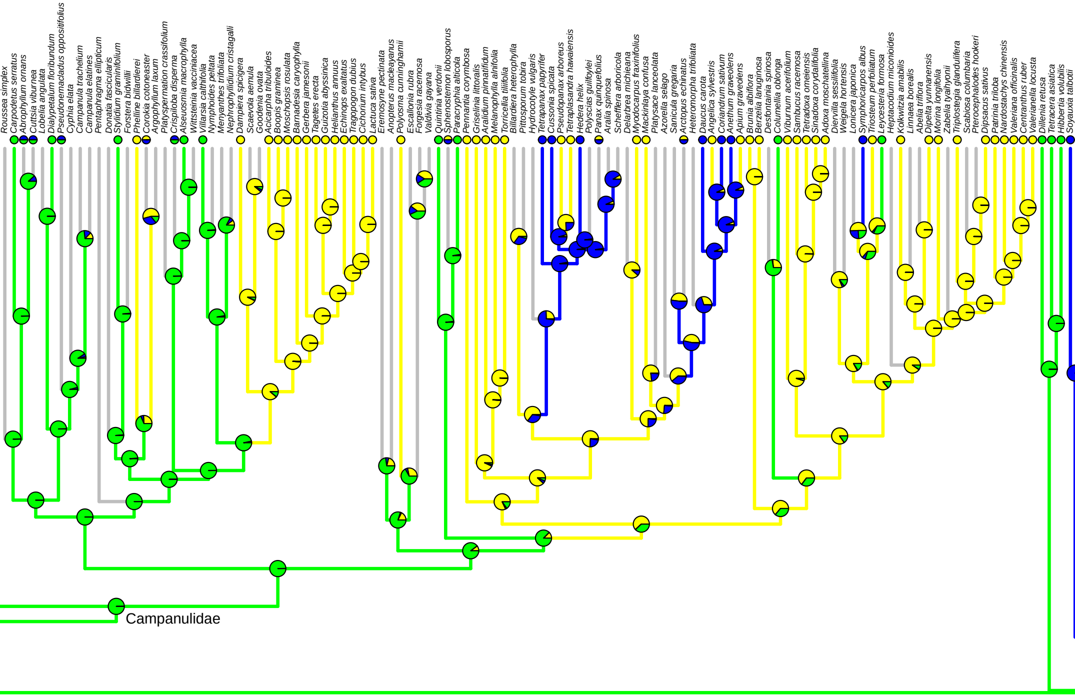
Euclea crispa
Maesa tenera
Clavija eggersiana
Anagallis tenella
Primula sieboldii
Androsace spinulifera
Couroupita guianensis
Barringtonia asiatica
Fouquieria splendens
Cobaea scandens
Gilia capitata
Phlox longifolia
Polemonium reptans
Manilkara zapota
Camellia sinensis
Eurya japonica
Ternstroemia stahlii
Symplocos zizyphoides
Galax urceolata
Styrax officinalis
Halesia carolina
Sarracenia purpurea
Actinidia chinensis
Roridula gorgonias
Clethra alnifolia
Cyrilla racemiflora
Enkianthus campanulatus
Arbutus unedo
Rhododendron hippophaeoides
Vaccinium uliginosum
Oncotheca balansae
Eucommia ulmoides
Garrya elliptica
Aucuba japonica
Icacina mannii
Vahlia capensis
Montinia caryophyllacea
Hydrolea ovata
Sphenoclea zeylanica
Cuscuta cuspidata
Ipomoea alba
Petunia axillaris
Atropa belladonna
Solanum dulcamara
Nicotiana tabacum
Nolana humifusa
Borago officinalis
Ehretia acuminata
Hydrophyllum capitatum
Luculia gratissima
Coffea arabica
Galium aparine
Mitchella repens
Gelsemium sempervirens
Spigelia marilandica
Strychnos nuxvomica
Nerium oleander
Gentiana saponaria
Exacum affine
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
Paulownia tomentosa
Pedicularis foliosa
Martynia annua
Thomandersia laurifolia
Junellia succulentifolia
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
Cardiopteris quinqueloba
Gonocaryum litorale
Lamiidae
Asteridae
Pentapetalae
Superasteridae


Roussea simplex
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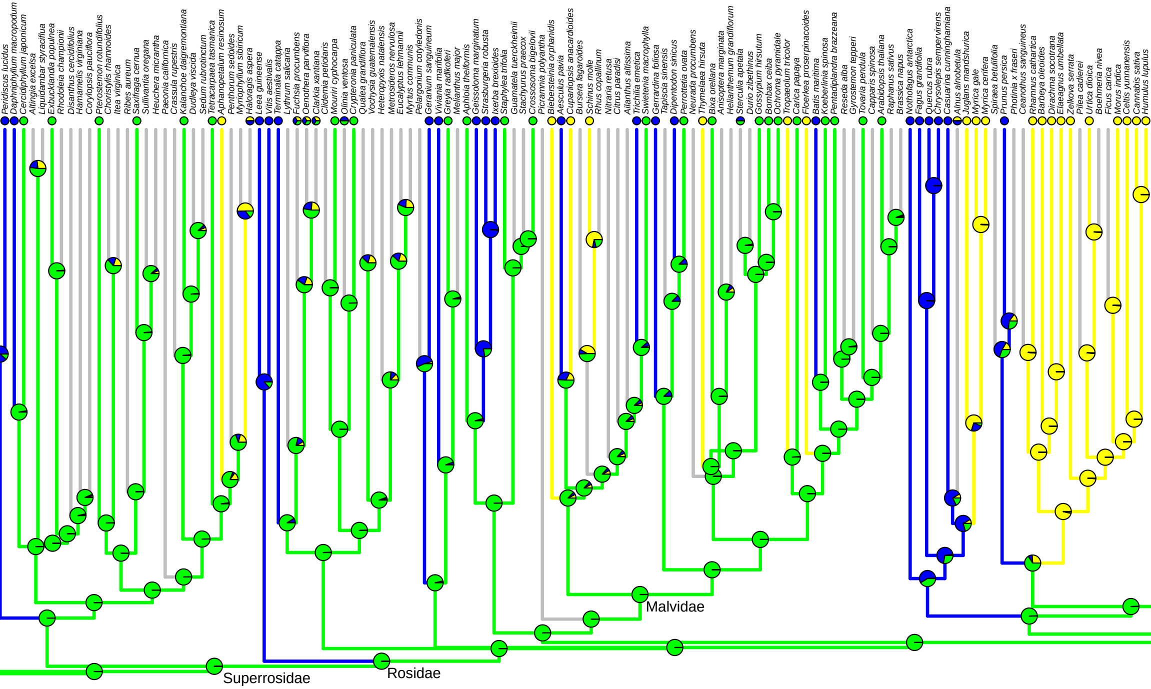
Abrophyllum ornans
Cuttsia viburnea
Lobelia angulata
Dialypetalum floribundum
Pseudonemacladus oppositifolius
Cyphia elata
Campanula trachelium
Campanula elatines
Pentaphragma ellipticum
Donatia fascicularis
Stylidium graminifolium
Forstera bidwillii
Phelline billardierei
Corokia cotoneaster
Argophyllum 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
Boopis graminea
Moschopsis rosulata
Barnadesia caryophylla
Gerbera jamesonii
Tagetes erecta
Guizotia abyssinica
Helianthus annuus
Echinops exaltatus
Tragopogon dubius
Cichorium intybus
Lactuca sativa
Eremosyne pectinata
Anopterus macleayanus
Polyosma cunninghamii
Escallonia rubra
Forgesia racemosa
Valdivia gayana
Quintinia verdonii
Sphenostemon lobosporus
Paracryphia alticola
Pennantia corymbosa
Griselinia littoralis
Aralidium pinnatifidum
Melanophylla alnifolia
Torricellia tiliifolia
Billardiera heterophylla
Pittosporum tobira
Hydrocotyle vulgaris
Tetrapanax papyrifer
Cussonia spicata
Pseudopanax arboreus
Tetraplasandra hawaiensis
Hedera helix
Polyscias guilfoylei
Panax quinquefolius
Aralia spinosa
Schefflera arboricola
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
Brunia albiflora
Berzelia lanuginosa
Desfontainia spinosa
Columellia oblonga
Viburnum acerifolium
Sambucus racemosa
Tetradoxa omeiensis
Sinadoxa corydalifolia
Adoxa moschatellina
Diervilla sessilifolia
Weigela hortensis
Lonicera japonica
Symphoricarpos albus
Triosteum perfoliatum
Leycesteria formosa
Heptacodium miconioides
Kolkwitzia amabilis
Linnaea borealis
Abelia triflora
Dipelta yunnanensis
Morina longifolia
Zabelia tyaihyonii
Triplostegia glandulifera
Scabiosa columbaria
Pterocephalodes hookeri
Dipsacus sativus
Patrinia triloba
Nardostachys chinensis
Valeriana officinalis
Centranthus ruber
Valerianella locusta
Dillenia retusa
Tetracera asiatica
Hibbertia volubilis
Soyauxia talbotii
Campanulidae


Peridiscus lucidus
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Cercidiphyllum japonicum
Altingia excelsa
Liquidambar styraciflua
Exbucklandia populnea
Rhodoleia championii
Disanthus cercidifolius
Hamamelis virginiana
Corylopsis pauciflora
Pterostemon rotundifolius
Choristylis rhamnoides
Itea virginica
Ribes aureum
Saxifraga cernua
Sullivantia oregana
Heuchera micrantha
Paeonia californica
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
Aphloia theiformis
Geissoloma marginatum
Strasburgeria robusta
Ixerba brexioides
Staphylea trifolia
Guamatela tuerckheimii
Stachyurus praecox
Crossosoma bigelovii
Picramnia polyantha
Biebersteinia orphanidis
Aesculus pavia
Cupaniopsis anacardioides
Bursera fagaroides
Schinus molle
Rhus copallinum
Nitraria retusa
Citrus paradisi
Ailanthus altissima
Trichilia emetica
Swietenia macrophylla
Gerrardina foliosa
Tapiscia sinensis
Dipentodon sinicus
Perrottetia ovata
Neurada procumbens
Thymelaea hirsuta
Bixa orellana
Anisoptera marginata
Helianthemum grandiflorum
Sterculia apetala
Durio zibethinus
Gossypium hirsutum
Bombax ceiba
Ochroma pyramidale
Tropaeolum tricolor
Carica papaya
Floerkea proserpinacoides
Batis maritima
Koeberlinia spinosa
Pentadiplandra brazzeana
Reseda alba
Gyrostemon tepperi
Tovaria pendula
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
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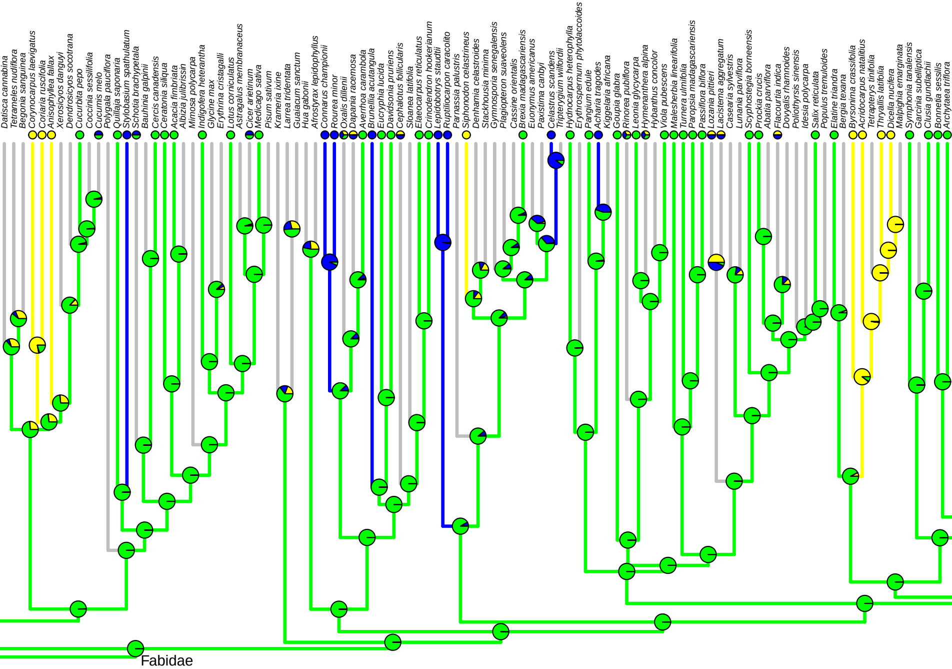
Malvidae
Superrosidae
Rosidae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Dendrosicyos socotrana
Cucurbita pepo
Coccinia sessilifolia
Cucumis melo
Polygala pauciflora
Quillaja saponaria
Stylobasium spathulatum
Schotia brachypetala
Bauhinia galpinii
Cercis canadensis
Ceratonia siliqua
Acacia fimbriata
Albizia julibrissin
Mimosa polycarpa
Indigofera heterantha
Glycine max
Erythrina cristagalli
Lotus corniculatus
Astragalus membranaceus
Cicer arietinum
Medicago sativa
Pisum sativum
Krameria ixine
Larrea tridentata
Guaiacum sanctum
Hua gabonii
Afrostyrax lepidophyllus
Connarus championii
Rourea minor
Oxalis dillenii
Dapania racemosa
Averrhoa carambola
Brunellia acutangula
Eucryphia lucida
Davidsonia pruriens
Cephalotus follicularis
Sloanea latifolia
Elaeocarpus reticulatus
Crinodendron hookerianum
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
Hydnocarpus heterophylla
Erythrospermum phytolaccoides
Pangium edule
Acharia tragodes
Kiggelaria africana
Goupia glabra
Rinorea pubiflora
Leonia glycycarpa
Hymenanthera alpina
Hybanthus concolor
Viola pubescens
Malesherbia linearifolia
Turnera ulmifolia
Paropsia madagascariensis
Passiflora biflora
Lozania pittieri
Lacistema aggregatum
Casearia sylvestris
Lunania parviflora
Scyphostegia borneensis
Prockia crucis
Abatia parviflora
Flacourtia indica
Dovyalis rhamnoides
Poliothyrsis sinensis
Idesia polycarpa
Salix reticulata
Populus tremuloides
Elatine triandra
Bergia texana
Byrsonima crassifolia
Acridocarpus natalitius
Tetrapterys tinifolia
Thryallis latifolia
Dicella nucifera
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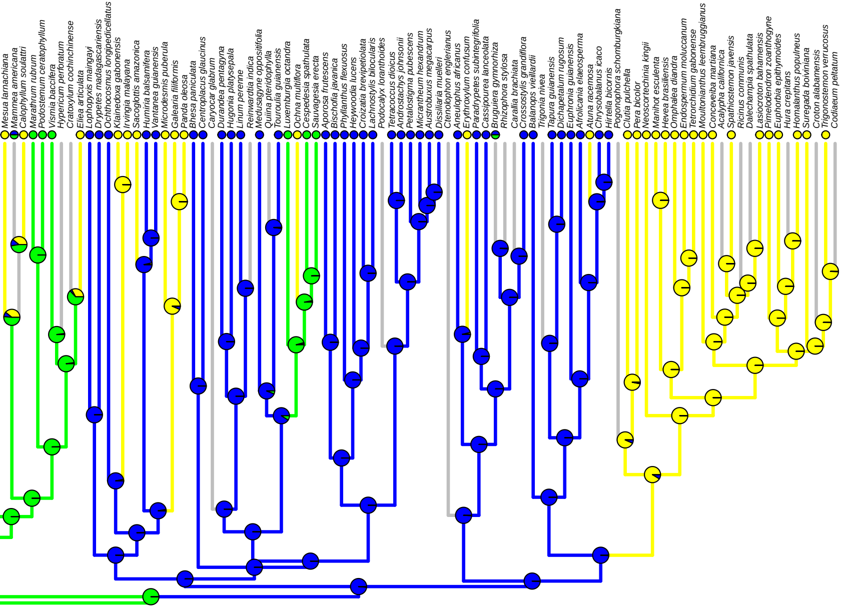
Bonnetia sessilis
Archytaea triflora
Fabidae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Eliea articulata
Lophopyxis maingayi
Drypetes madagascariensis
Ochthocosmus longipedicellatus
Klainedoxa gabonensis
Irvingia malayana
Sacoglottis amazonica
Humiria balsamifera
Vantanea guianensis
Microdesmis puberula
Galearia filiformis
Panda oleosa
Bhesa paniculata
Centroplacus glaucinus
Caryocar glabrum
Durandea pentagyna
Hugonia platysepala
Linum perenne
Reinwardtia indica
Medusagyne oppositifolia
Quiina pteridophylla
Touroulia guianensis
Luxemburgia octandra
Ochna multiflora
Cespedesia spathulata
Sauvagesia erecta
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
Paradrypetes subintegrifolia
Cassipourea lanceolata
Bruguiera gymnorhiza
Rhizophora stylosa
Carallia brachiata
Crossostylis grandiflora
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
Endospermum moluccanum
Tetrorchidium gabonense
Moultonianthus leembruggianus
Conceveiba martiana
Acalypha californica
Spathiostemon javensis
Ricinus communis
Dalechampia spathulata
Lasiocroton bahamensis
Pimelodendron zoanthogyne
Euphorbia epithymoides
Hura crepitans
Homalanthus populneus
Suregada boiviniana
Croton alabamensis
Trigonostemon verrucosus
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