Supporting Information Figs S1-S10, Table S1 and Methods S1-S4

Fig. S1

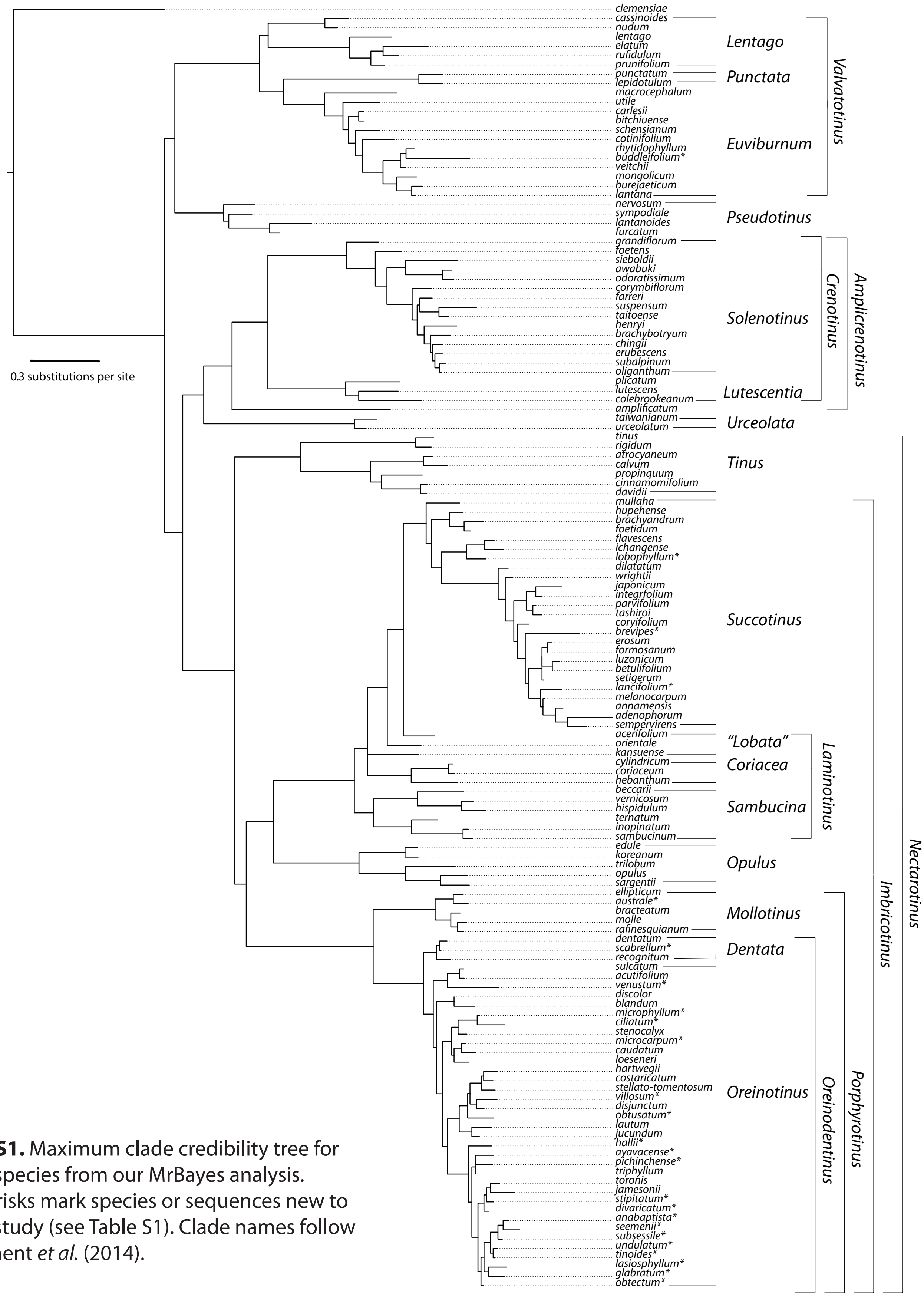


Fig. S1. Maximum clade credibility tree for 138 species from our MrBayes analysis. Asterisks mark species or sequences new to this study (see Table S1). Clade names follow Clement *et al.* (2014).

Fig. S2

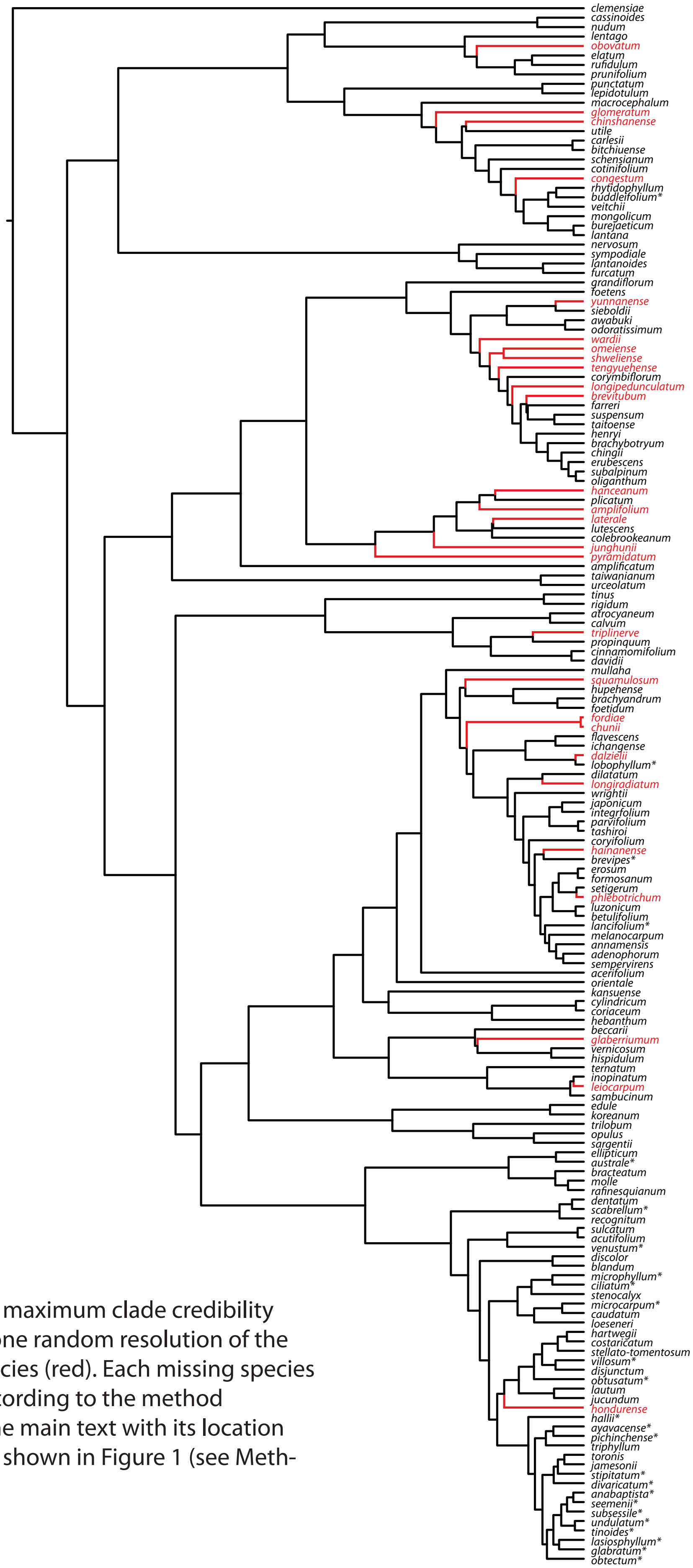
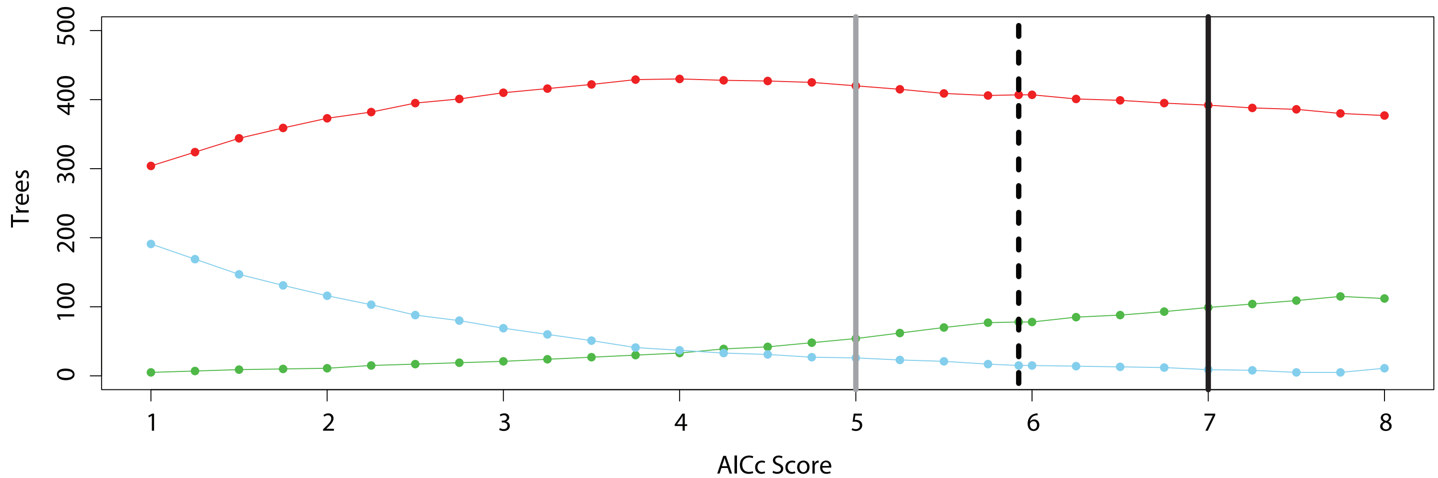


Fig. S2. BEAST maximum clade credibility tree showing one random resolution of the 27 missing species (red). Each missing species was placed according to the method described in the main text with its location constrained as shown in Figure 1 (see Methods S2).

Fig. S3

(**a**) TurboMEDUSA results for trees with λ=3.0



(**b**) TurboMEDUSA results for trees with λ=4.0

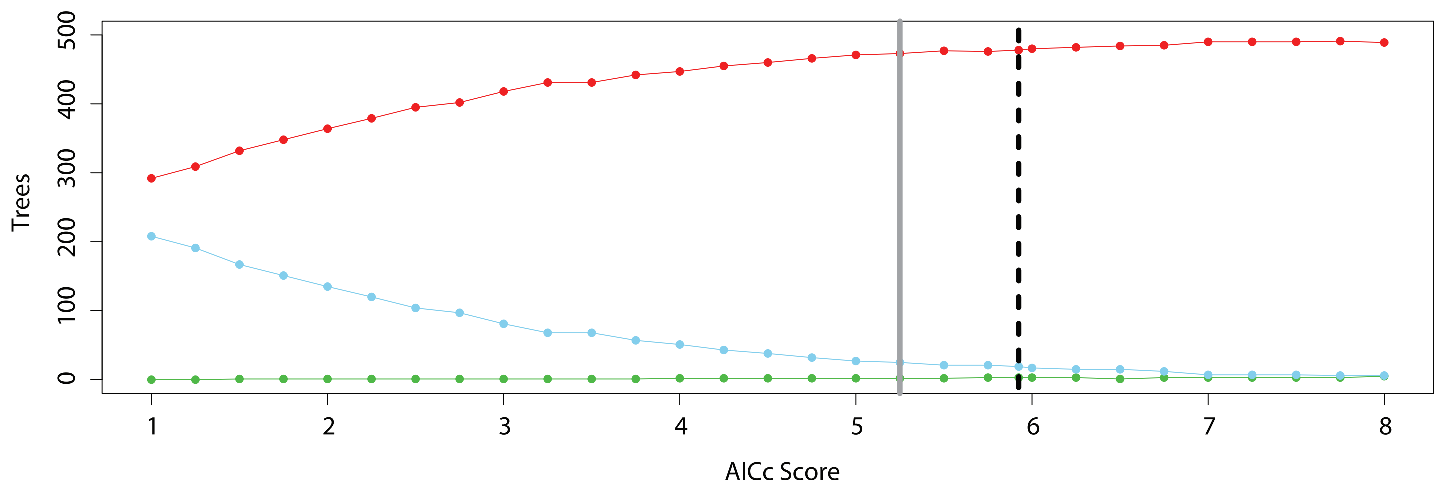
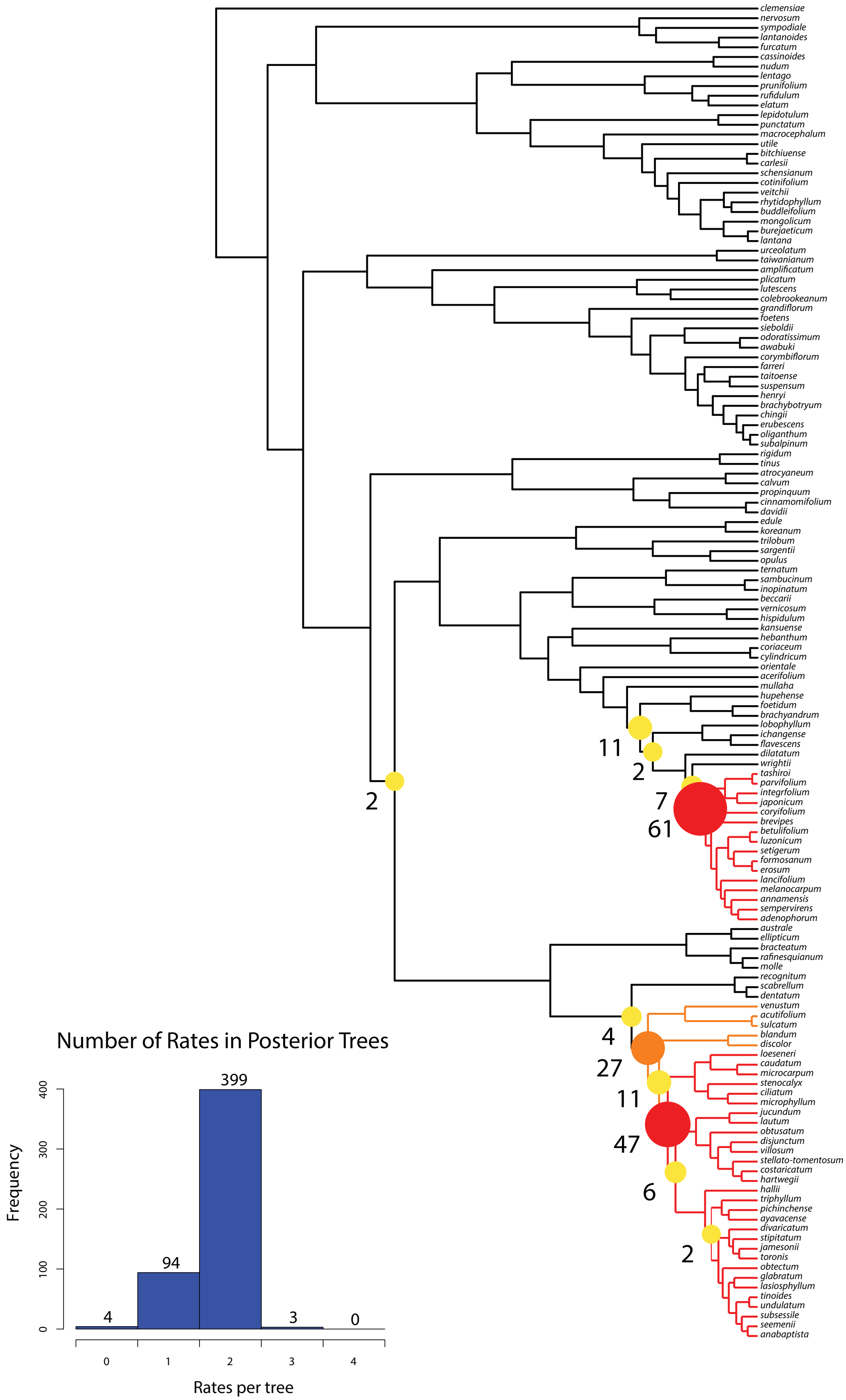


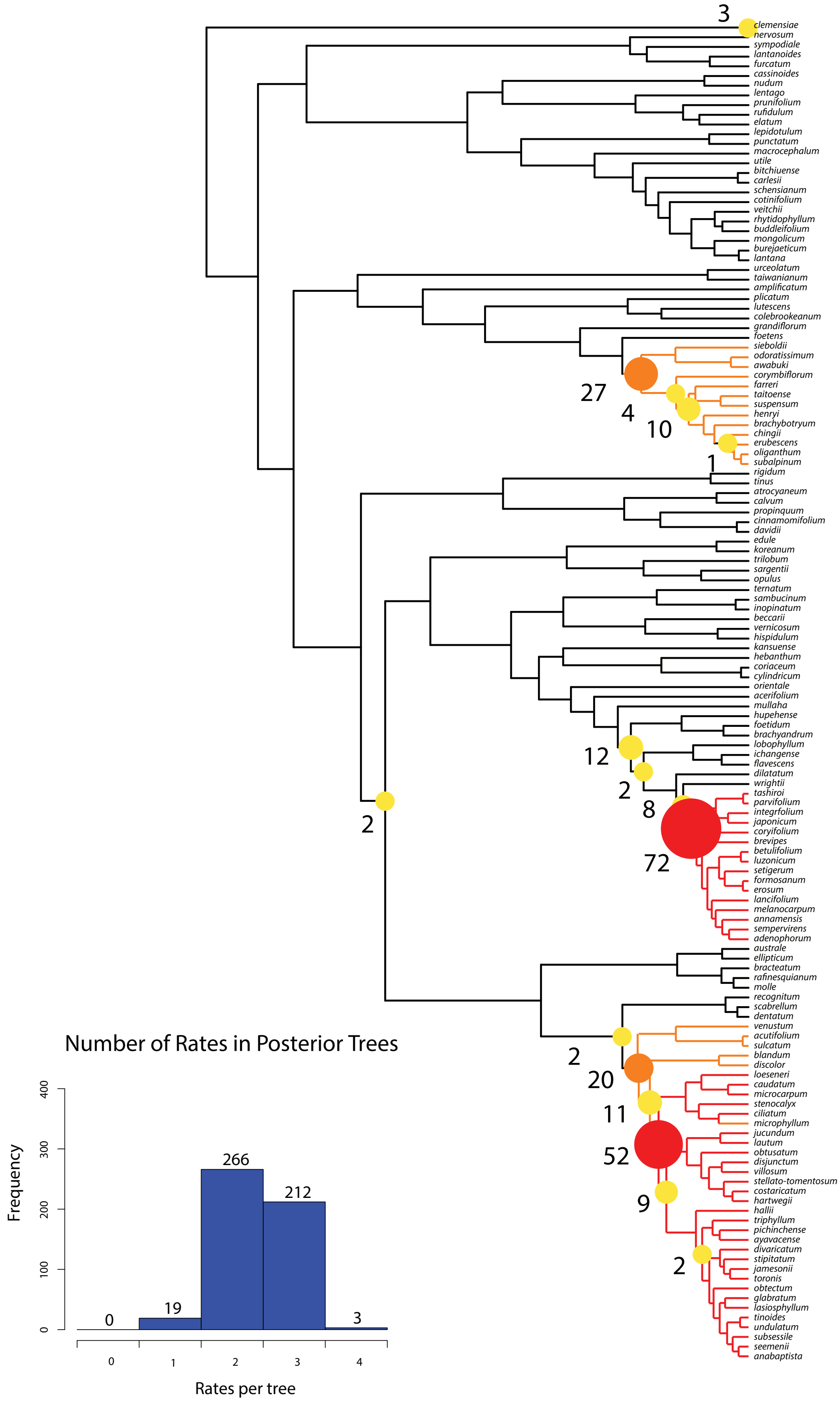
Fig S3. Number of shifts identified with turobMEDUSA in 500 simulated trees each with one rate shift (two rates). Number of trees identified to have one rate in green, two rates in red, and three or more rates in blue. Dotted line indicates the standard AICc (Akaike information criterion) cutoff for 165 tips. Bold grey line indicates the threshold below which more than 5% of the trees are identified to have at least three shifts. Bold black line indicates the threshold above which at least 20% of the trees are found to have a single rate (no shift). (a) trees simulated with the shift λ=3; (b) trees simulated with the shift λ=4.

Fig. S4 (**a**)



clemensiae
nervosum
sympodiale
lantanoides
furcatum
cassinoides
nudum
lentago
prunifolium
rufidulum
elatum
lepidotulum
punctatum
macrocephalum
utile
bitchiuense
carlesii
schensianum
cotinifolium
veitchii
rhytidophyllum
buddleifolium
mongolicum
burejaeticum
lantana
urceolatum
taiwanianum
amplificatum
plicatum
lutescens
colebrookeanum
grandiflorum
foetens
sieboldii
odoratissimum
awabuki
corymbiflorum
farreri
taitoense
suspensum
henryi
brachybotryum
chingii
erubescens
oliganthum
subalpinum
rigidum
tinus
atrocyaneum
calvum
propinquum
cinnamomifolium
davidii
edule
koreanum
trilobum
sargentii
opulus
ternatum
sambucinum
inopinatum
beccarii
vernicosum
hispidulum
kansuense
hebanthum
coriaceum
cylindricum
orientale
acerifolium
mullaha
hupehense
foetidum
brachyandrum
lobophyllum
ichangense
flavescens
dilatatum
wrightii
tashiroi
parvifolium
integrfolium
japonicum
coryifolium
brevipes
betulifolium
luzonicum
setigerum
formosanum
erosum
lancifolium
melanocarpum
annamensis
sempervirens
adenophorum
australe
ellipticum
bracteatum
rafinesquianum
molle
recognitum
scabrellum
dentatum
venustum
acutifolium
sulcatum
blandum
discolor
loeseneri
caudatum
microcarpum
stenocalyx
ciliatum
microphyllum
jucundum
lautum
obtusatum
disjunctum
villosum
stellato-tomentosum
costaricatum
hartwegii
hallii
triphyllum
pichinchense
ayavacense
divaricatum
stipitatum
jamesonii
toronis
obtectum
glabratum
lasiosphyllum
tinoides
undulatum
subsessile
seemenii
anabaptista
11
2
7
61
2
4
27
11
47
6
2
Number of Rates in Posterior Trees
Frequency
Rates per tree
0
100
200
300
400
0
1
2
3
4
4
94
399
3
0

Fig. S4 (**b**)



3
clemensiae
nervosum
sympodiale
lantanoides
furcatum
cassinoides
nudum
lentago
prunifolium
rufidulum
elatum
lepidotulum
punctatum
macrocephalum
utile
bitchiuense
carlesii
schensianum
cotinifolium
veitchii
rhytidophyllum
buddleifolium
mongolicum
burejaeticum
lantana
urceolatum
taiwanianum
amplificatum
plicatum
lutescens
colebrookeanum
grandiflorum
foetens
sieboldii
odoratissimum
awabuki
corymbiflorum
farreri
taitoense
suspensum
henryi
brachybotryum
chingii
erubescens
oliganthum
subalpinum
27
4
10
1
rigidum
tinus
atrocyaneum
calvum
propinquum
cinnamomifolium
davidii
edule
koreanum
trilobum
sargentii
opulus
ternatum
sambucinum
inopinatum
beccarii
vernicosum
hispidulum
kansuense
hebanthum
coriaceum
cylindricum
orientale
acerifolium
mullaha
hupehense
foetidum
brachyandrum
lobophyllum
ichangense
flavescens
dilatatum
wrightii
tashiroi
parvifolium
integrfolium
japonicum
coryifolium
brevipes
betulifolium
luzonicum
setigerum
formosanum
erosum
lancifolium
melanocarpum
annamensis
sempervirens
adenophorum
12
2
8
72
2
australe
ellipticum
bracteatum
rafinesquianum
molle
recognitum
scabrellum
dentatum
venustum
acutifolium
sulcatum
blandum
discolor
loeseneri
caudatum
microcarpum
stenocalyx
ciliatum
microphyllum
jucundum
lautum
obtusatum
disjunctum
villosum
stellato-tomentosum
costaricatum
hartwegii
hallii
triphyllum
pichinchense
ayavacense
divaricatum
stipitatum
jamesonii
toronis
obtectum
glabratum
lasiosphyllum
tinoides
undulatum
subsessile
seemenii
anabaptista
2
20
11
52
9
2
Number of Rates in Posterior Trees
Frequency
0
100
200
300
400
0
19
266
212
3
0
1
2
3
4
Rates per tree

Fig. S4 (**c**)

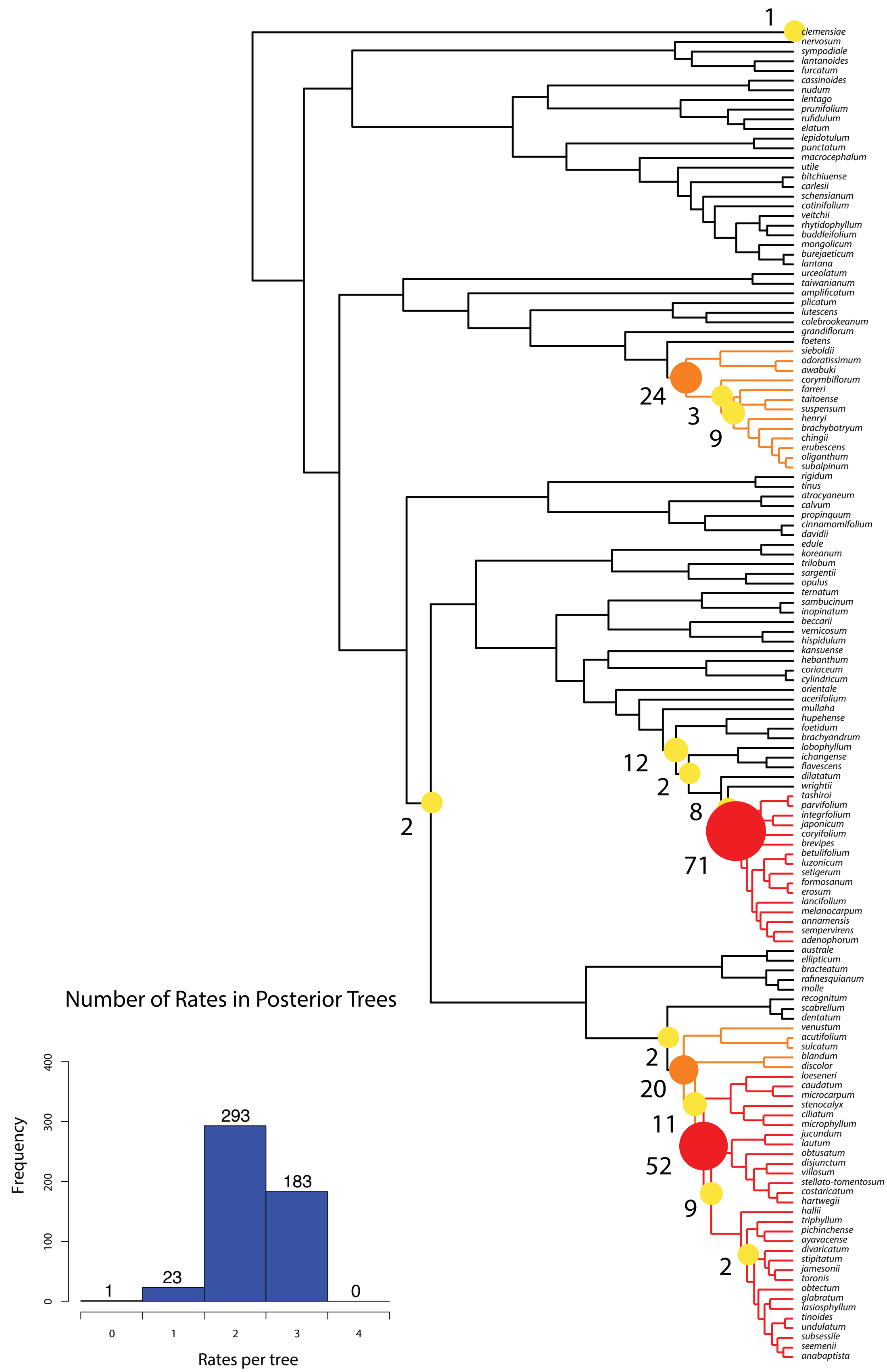
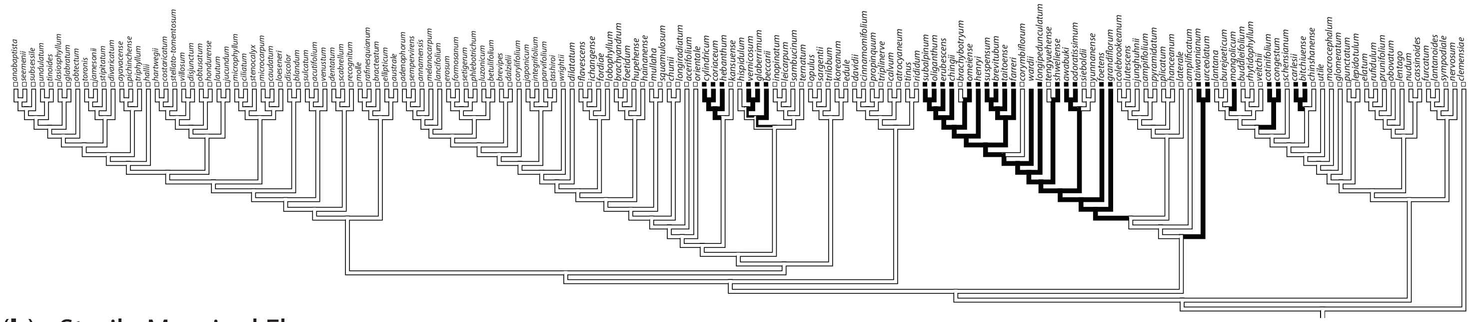


Fig. S4. Histograms show the number of trees found to have 1-5 distinct diversification rates with turboMEDUSA. Results are displayed on the 138-species maximum clade credibility tree. Dots indicate the placement of the shifts that occur in at least 1% (5) of trees and dot size is proportional to the frequency of the shift. Numbers next to each node indicate the percentage of trees with a shift in that location. (a) Results for 500 138-species trees with the default AICc cutoff. (b) Results for 500 165-species trees using an AICc cutoff of 4.5. (c) Same as (b) but with an AICc threshold of 5.

Fig. S5

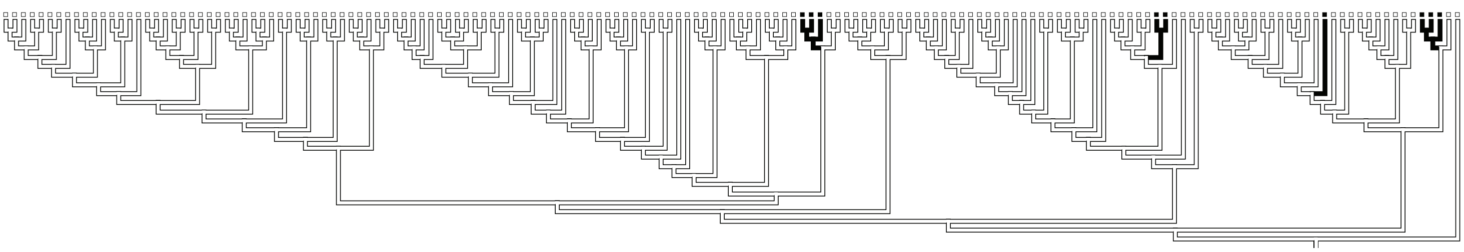
(**a**) Tubular corolla

■ Tubular corolla
□ Rotate corolla



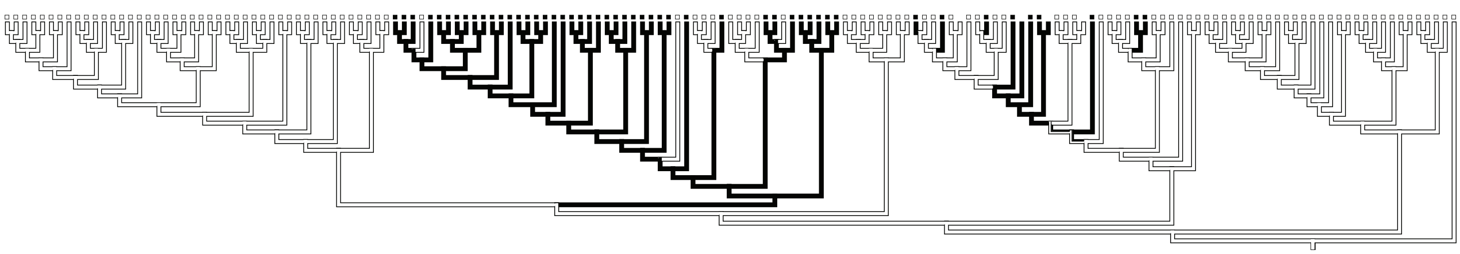
(**b**) Sterile Marginal Flowers

■ Sterile marginal flowers
□ Only fertile flowers



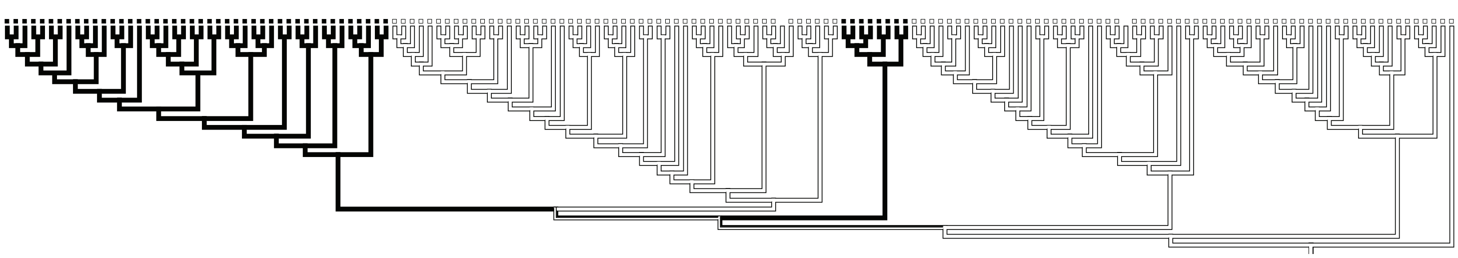
(**c**) Red juicy fruits

■ Red juicy fruit
□ Other



(**a**) Purple mealy fruits

■ Purple fruit
□ Other



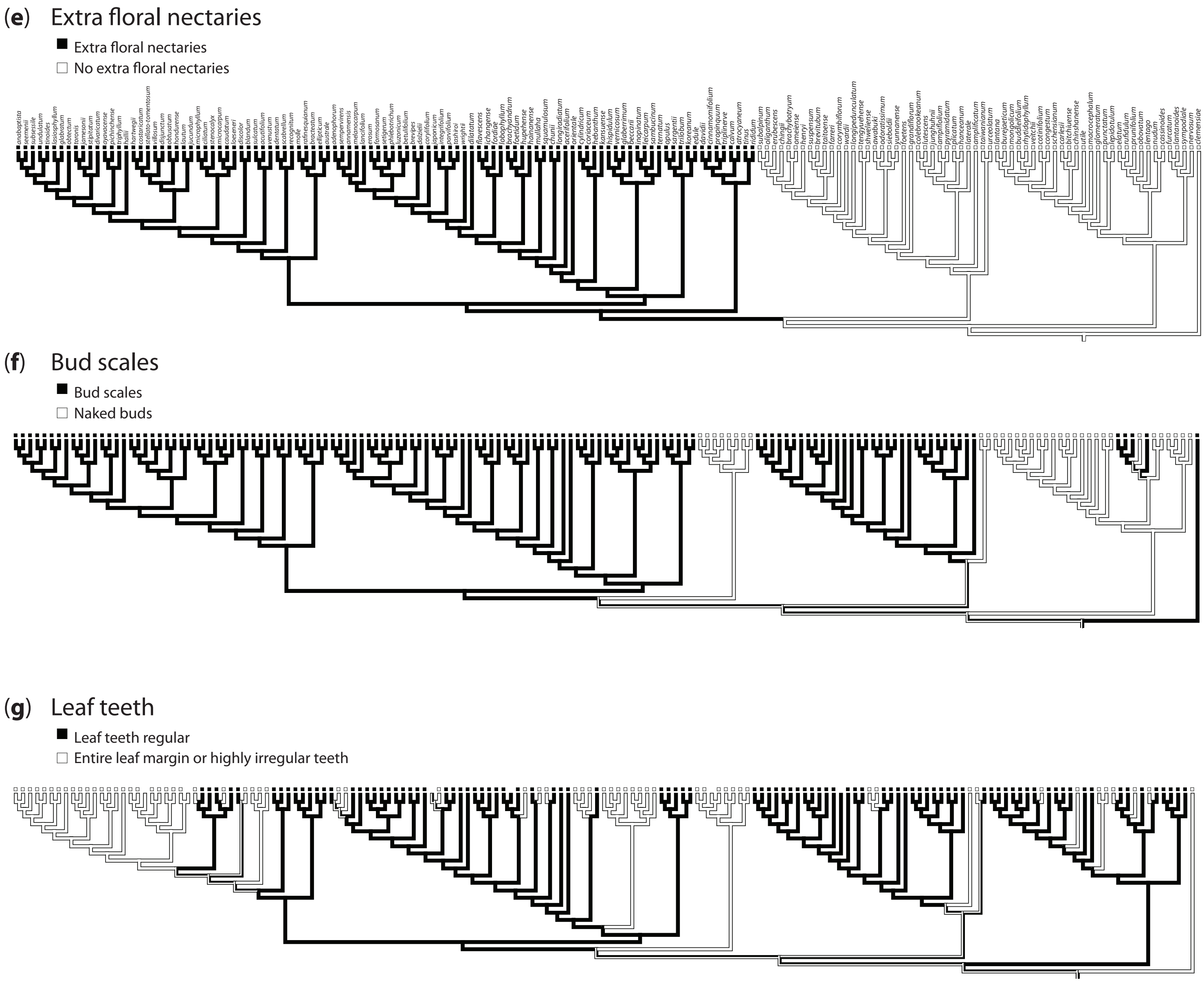


Fig. S5. Characters used in the BiSSE analyses. Each tree shows the distribution of one character and an ancestral state reconstruction using parsimony in Mesquite (Maddison & Maddison, 2011). In each case, black and white represent the two states as indicated. Unknown or ambiguous characters are indicated by the absence of a box next to the species name. (a) tubular corollas, (b) sterile marginal flowers, (c) red juicy fruits, (d) purple mealy fruits (ovary transitioning rapidly from green color, without an intervening red phase), (e) extra floral nectaries, (f) bud scales, and (g) leaf teeth. We note that in the case of red juicy fruits (c) and leaf teeth (g), the placement of *V. kansuense* (of "Lobata") as sister to the Coriacea clade significantly affects the optimization; we doubt this placement because it was not supported in our MrBayes analysis. Morphological characters (e.g. trilobed leaves) instead support the placement of *V. kansuense* with *V. orientale* and *V. acerifolium*.

Fig. S6

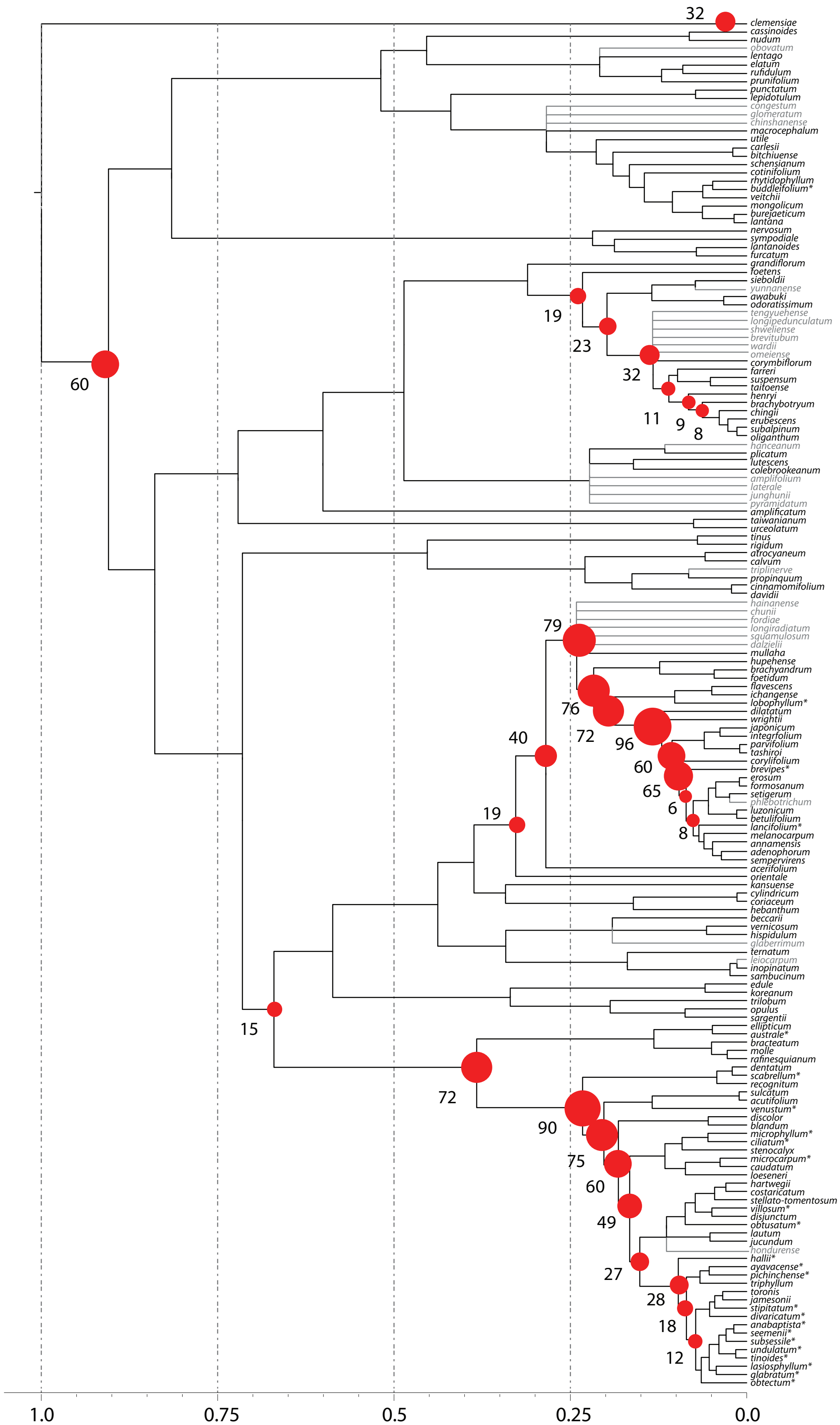
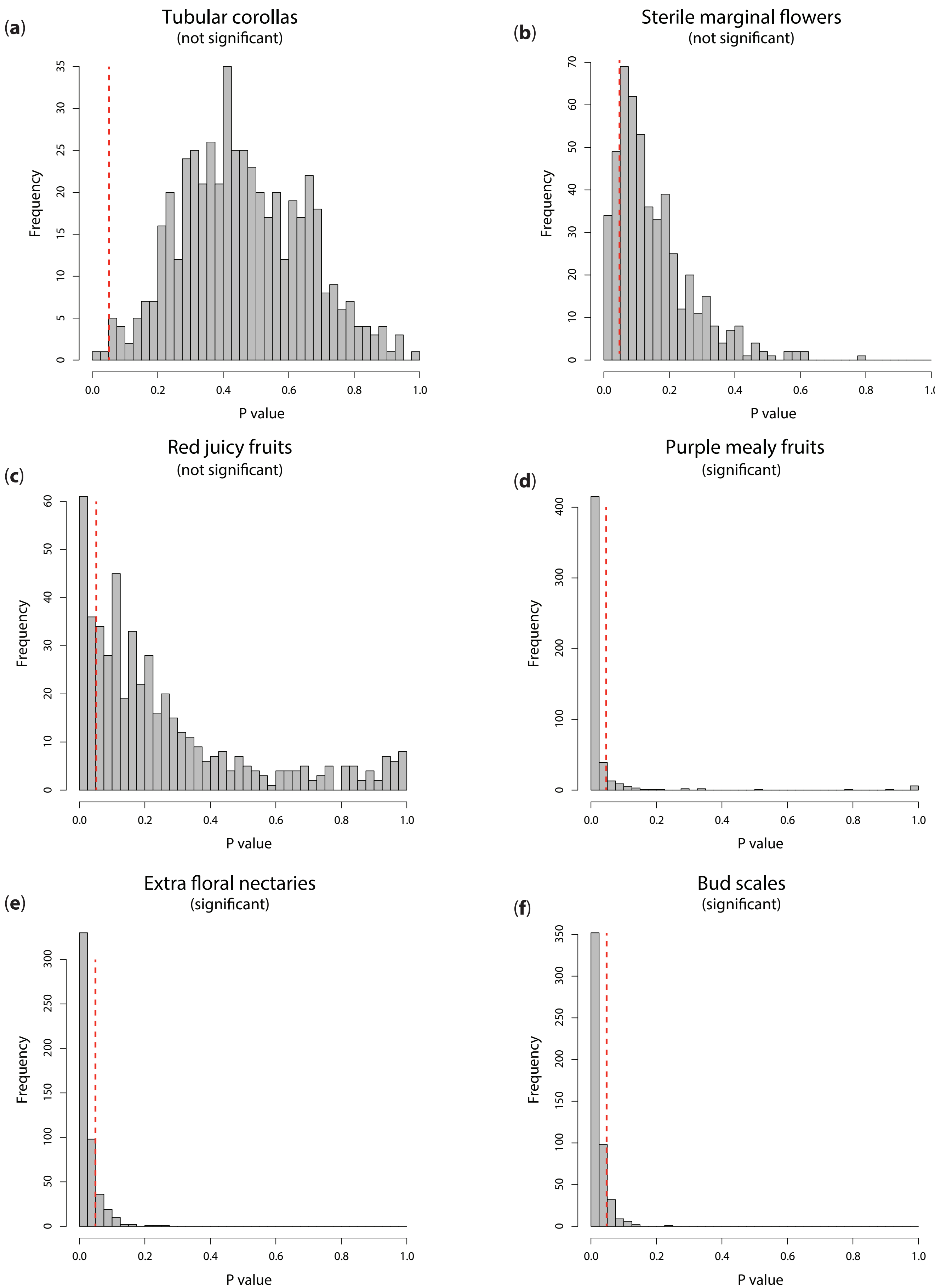


Fig. S6. BAMM results based on 100 'complete' trees (165 species). Red dots indicate the nodes that were identified as significant with a Bayes Factor ≥ 10 and were present in the 95% credible set of shift configurations for at least 5 different trees. Number of trees that found evidence for a shift at each node are indicated.

Fig. S7



(a)
Tubular corollas
(not significant)
Frequency
0 5 10 15 20 25 30 35
0.0 0.2 0.4 0.6 0.8 1.0
P value
(b)
Sterile marginal flowers
(not significant)
Frequency
0 10 20 30 40 50 60 70
0.0 0.2 0.4 0.6 0.8 1.0
P value
(c)
Red juicy fruits
(not significant)
Frequency
0 10 20 30 40 50 60
0.0 0.2 0.4 0.6 0.8 1.0
P value
(d)
Purple mealy fruits
(significant)
Frequency
0 100 200 300 400
0.0 0.2 0.4 0.6 0.8 1.0
P value
(e)
Extra floral nectaries
(significant)
Frequency
0 50 100 150 200 250 300
0.0 0.2 0.4 0.6 0.8 1.0
P value
(f)
Bud scales
(significant)
Frequency
0 50 100 150 200 250 300 350
0.0 0.2 0.4 0.6 0.8 1.0
P value

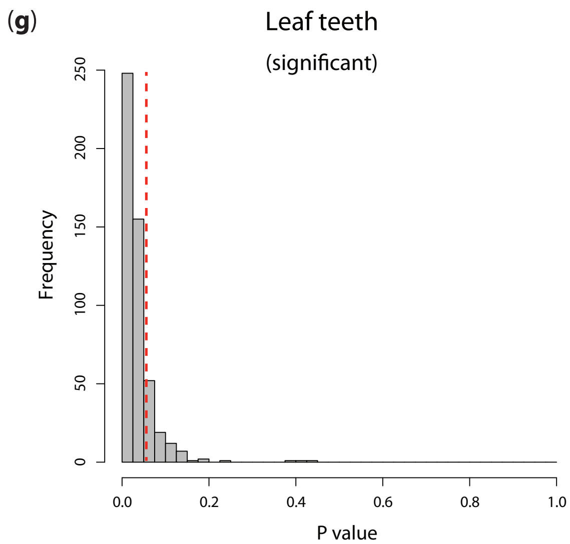
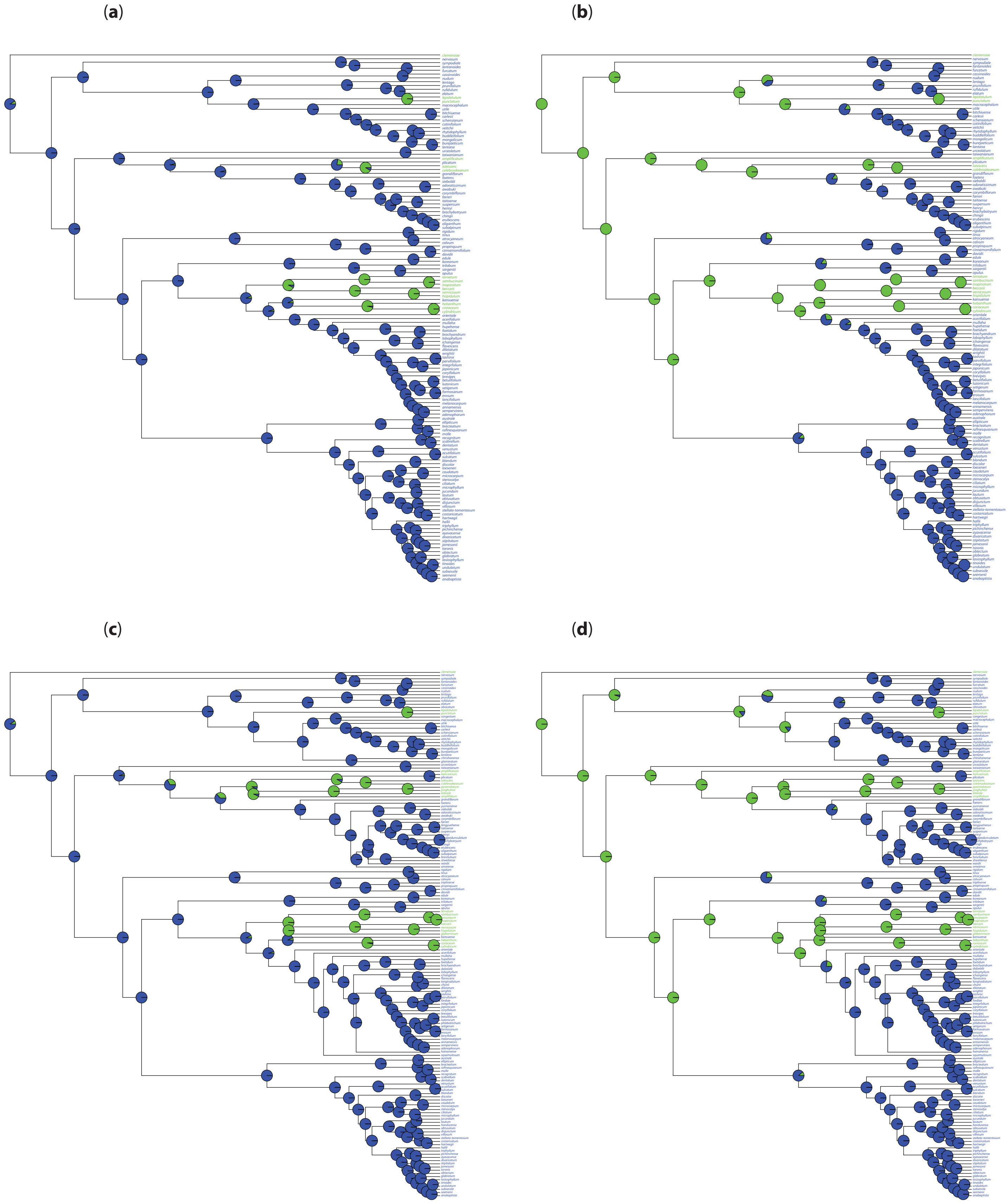


Fig. S7. BiSSE results for a set of morphological characters (see Fig. S5) run over 500 trees from the BEAST poster distribution, each with the missing taxa added. Each tree had the same initial 138-species topology but a unique set of branch lengths. Each also contains a random resolution of the missing taxa. Histograms show the number of trees found to have each significance level. The 0.05 significance cutoff is represented by a dotted red line.

Fig. S8



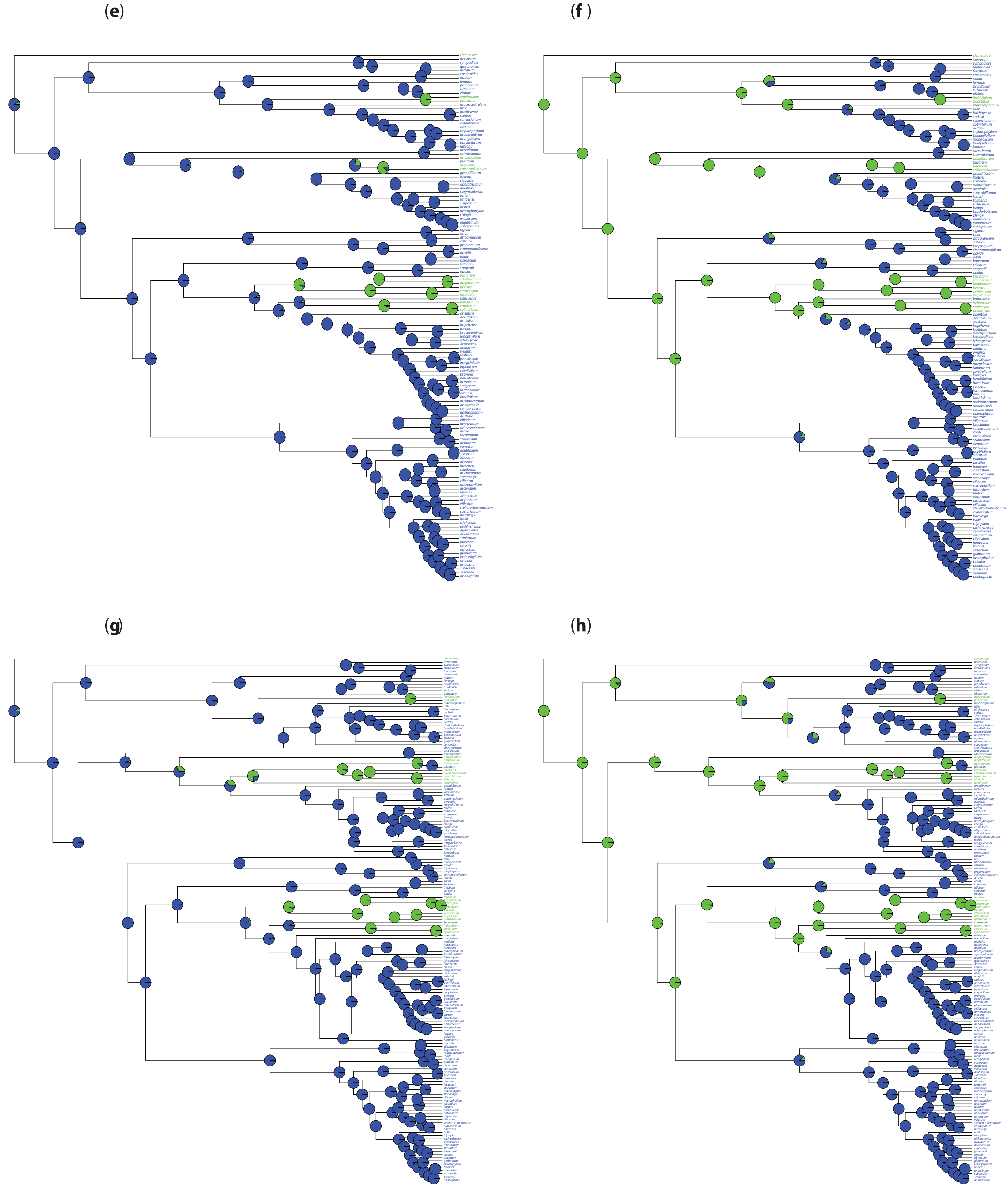


Fig. S8. Maximum likelihood ancestral state reconstructions done in corHMM (Beaulieu et al., 2013) based on the transition rates estimated with GEIGER (Harmon et al., 2008). Green=tropical; blue=temperate or cloud forest. (a), (b) 138-species tree dated using fossil pollen. (c), (d) An example 165-species tree dated with fossil pollen. This tree is identical to that in (a), (b), but contains the 27 unsequenced species. (e),(f) 138-species tree dated with fossil leaves. (g),(h) An example 165-species tree dated with fossil leaves. This tree is identical to that in (e),(f), but contains the 27 unsequenced species. (a), (c), (e), and (g) were constrained to have symmetrical transition rates between the two states, i.e. the rate from temperate to tropical must be the same as the rate from tropical to temperate. (b), (d), (f), and (h) allowed asymmetrical transition rates.

Fig. S9

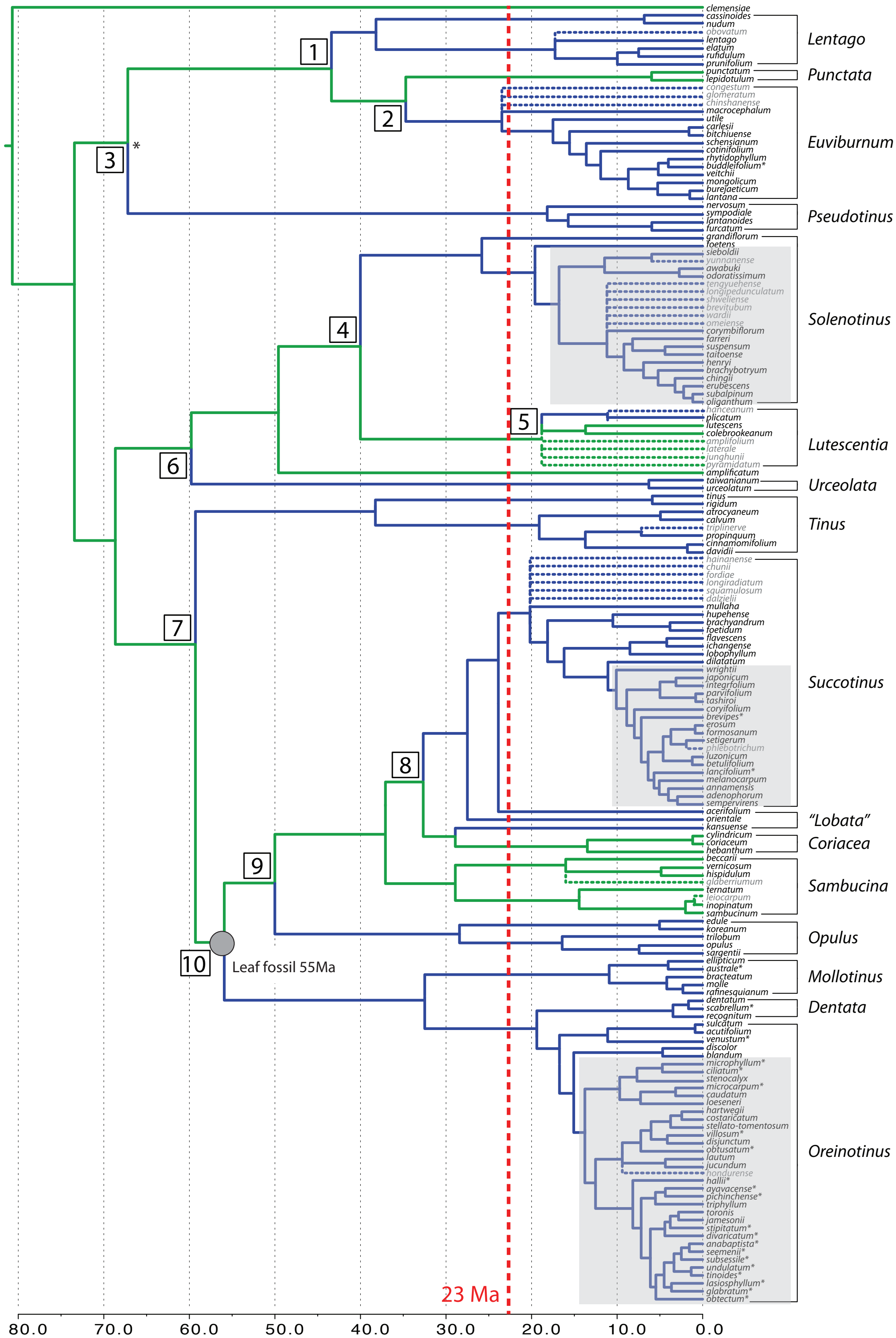


Fig. S9. The 138-species time tree calibrated with leaf fossils. The 27 added taxa are shown as polytomies with dotted lines. Branch colors show the ML character reconstruction with asymmetrical transition rates (green=lowland tropical; blue= temperate or cloud forest). Ten shifts to the temperate state are numbered; an additional shift, involving *V. kansuense*, is not numbered as it is not confidently resolved. Grey boxes indicate regions of the tree identified as having significantly higher rates of diversification in turboMEDUSA analyses (see Fig. 2). A grey circle marks the location of the leaf fossils; an asterisk marks the node where the fossil pollen constraint is placed in the alternative dating analysis shown in Fig. 4. A red dotted line indicates the position of the 23 Ma time slice tested with time-dependent BiSSE models (see Fig. S10a).

Fig. S10

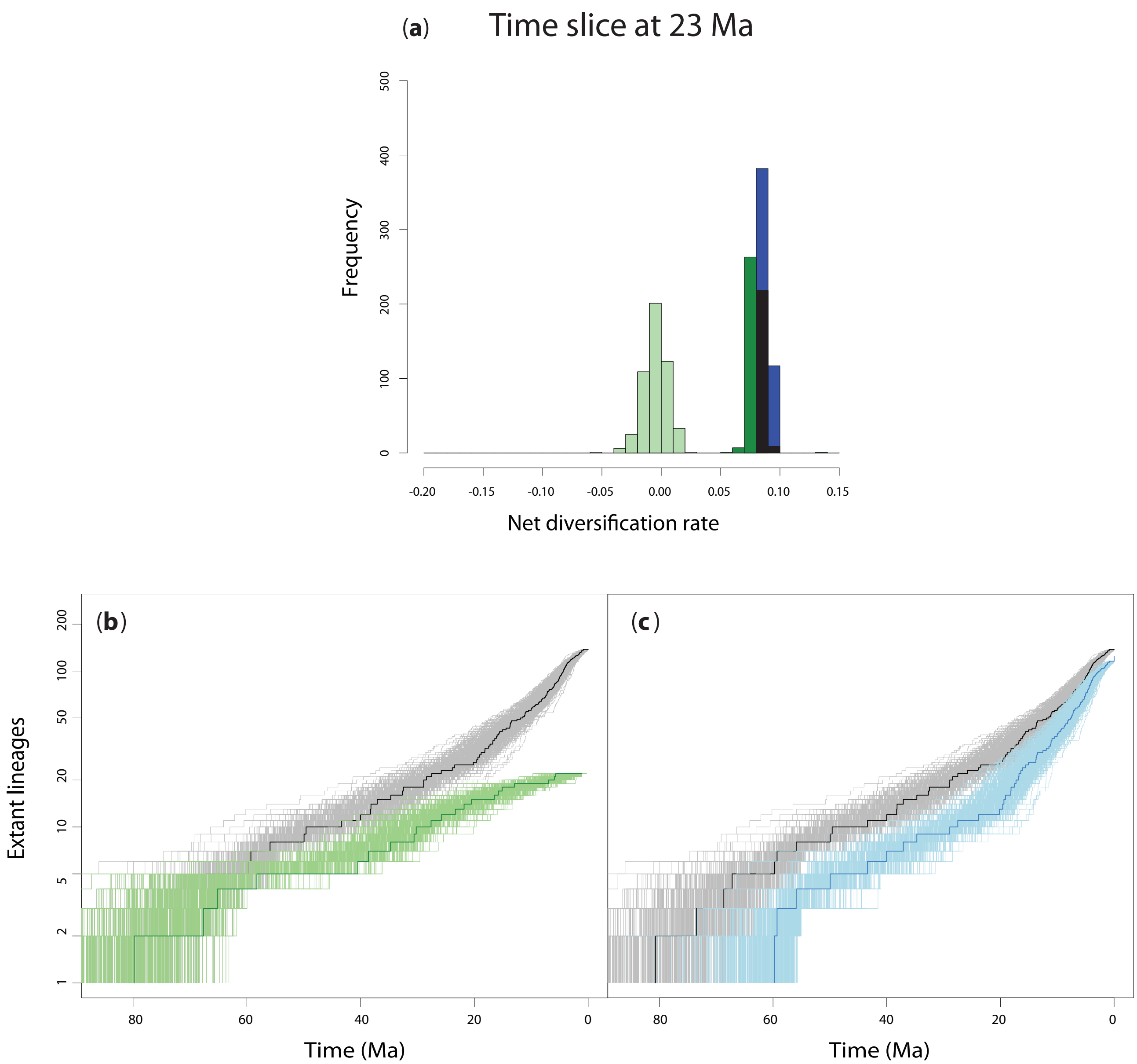


Fig. S10. (a) The distribution of net diversification rates found in 500 trees each dated using leaf fossils with different placements of missing taxa. Dark green indicates tropical diversification rates before the time slice, light green indicates tropical rates after the time slice, and blue indicates temperate diversification rates after the time slice. (a) Rates based on a time slice at 23 Ma. (b) Lineage through time (LTT) plot based on the fossil leaf calibration. The bold black line indicates the log (number of lineages) over time for all Viburnum based on the maximum clade credibility BEAST tree. Grey lines show results for 500 posterior distribution trees. Bold dark green line represents LTT for tropical lineages in the maximum clade credibility tree; light green lines show results for tropical lineages from 500 posterior trees. (c) Bold dark blue represents LTT for temperate lineages in the maximum clade credibility tree; light blue lines show results for temperate lineages for 500 posterior trees. Grey and black lines as in (b).

Supplemental Information

Temperate radiations and dying embers of a tropical past: the diversification of *Viburnum*

Spriggs EL, Clement WL, Sweeney PW, Madriñán S, Edwards EJ, and Donoghue MJ

New Phytologist 2015, **Vol (no):** pp–pp.

Methods S1

Fossil calibrations

In a first approach to calibrating the *Viburnum* phylogeny, we used fossil leaves. Many leaves from the Paleocene of western North America have been described as *Viburnum* species. However, in a series of papers by Manchester and colleagues (Manchester *et al.*, 1999, 2002; Manchester 2002; Manchester & Hickey, 2007), 21 *Viburnum* species names were synonymized with species of *Celtis* (Celtidaceae) and of *Davidia*, *Beringiaphyllum,* and *Browniea* (Cornales). Their identifications were especially convincing based on the presence of corresponding fossil fruits in the same strata. *Viburnum* was discounted as a possibility based primarily on petiole length — many of the fossils have long petioles whereas modern *Viburnum* species were assumed by these authors to have shorter petioles. The absence of accompanying *Viburnum* endocarps (which have been preserved in some more recent sediments) also argued against *Viburnum*. However, we note that petioles as long as those found in the fossils are a regular feature of a number of *Viburnum* species (including several whose leaf blades correspond well in shape and venation to some of the fossils; e.g., *V. molle* of the *Mollotinus* clade), and the fossilization of *Viburnum* endocarps appears to have been highly sporadic.

Although almost all of the so-called *Viburnum* leaf fossils from the Paleocene can immediately be dismissed as mis-identifications, this is not universally the case. We (MJD) examined hundreds of these leaves in several major collections (USNM PAL; WTU), and, based on the detailed similarity of several of these fossil leaves to modern *Viburnum* species, we believe that it is premature to entirely dismiss the existence of *Viburnum* in the Paleocene. In addition, although they too are questionable, we note that fossil pollen grains of Paleocene age have been assigned to *Viburnum* (McIver & Basinger 1999; Kalkreuth *et al.,* 1993). Thus, to provide an older bound on clade ages, we carried out an analysis in which we assumed the existence of *Viburnum* by the end of the Paleocene.

If we assume that some of the Paleocene fossil leaves are indeed viburnums, they can then be placed on the stem subtending the *Porphyrotinus* clade. This placement is supported by the broadly ovate shapes of the leaf blades of the fossils, with usually broadly rounded apices; by craspedodromous secondary venation with a tendency for the midrib and four major secondary veins to be clustered near the intersection with the petiole; by numerous prominent agrophic veins extending from the basal secondaries into the marginal teeth, and by the regular presence of shallow to more deeply toothed margins, each ending in an evident tip. *Viburnum molle* of the *Porphyrotinus* clade compares especially closely to the *Davidia antiqua*-type leaves pictured in Manchester (2002). However, because these same general features are found also in some species of the *Oreinodentinus* clades, especially several *Oreinotinus* species in eastern Mexico (e.g., *V. microcarpum*), we place these fossils on the stem of *Porphyrotinus*, implying that this lineage had come into existence by ca. 55 million years before present (Ma). Regarding the discussion in the text of the ancestral geographic area and habitat for *Viburnum*, we note that these fossil leaves have temperate, not tropical, characteristics (Schmerler *et al.*, 2012), and that modern members of the *Porphyrotinus* clade are not present in Asia but instead occupy temperate forests in North America and cloud forest habitats in the mountains of the Neotropics.

In a second approach to dating, we ignored the questionable Paleocene fossil leaves and pollen grains, and instead focused on fossil pollen grains from the mid-Eocene. Specifically, we accepted the photographic evidence presented by Gruas-Cavagnetto (1978) and McIntyre (1991) for the presence of *Viburnum* at ca. 45 Ma in both the Paris Basin and the Northwest Territory in the Canadian arctic. The reticulate exine of these grains appears to be loosely connected and the muri appear to be scabrate (bumpy), both of which are characters of the *Valvatotinus* clade (Donoghue, 1985; Clement *et al.*, 2014). Gruas-Cavagnetto (1978) compared his grains to *V. puncatum*, which belongs (along with *V. lepidotulum*) to the lowland tropical sister group of the

Euviburnum clade, and McIntyre (1991) labeled his grains "cf. *V. cassinoides*" of the *Lentago* clade. These specific assignments are unjustified, but we accept that these grains do mark the existence of at least the stem lineage of *Valvatotinus*, which today contains both tropical and temperate species and is present in both the Old and New Worlds. Consistent with this interpretation, Leopold & Clay-Poole (2001) described a similar grain from the Florissant of Colorado at ca. 34 Ma, which they labeled "cf. *lentago*."

Finally, we note that several additional fossil pollen grains have recently come to light from Eocene deposits in Western North America. Bouchal (2013) described and figured several credible *Viburnum* pollen grains from the Latest Eocene (ca. 35 Ma) Florissant flora of Colorado, and an exceptionally well-preserved and convincing *Viburnum* grain is soon to be described from the early Middle Eocene (ca. 45-48 Ma) Princeton Chert of British Colombia (R. Zetter, F. Grímsson, and S. Manchester, unpublished data). Although these grains are difficult to assign with certainty to extant clades, they do providing convincing evidence for the presence of *Viburnum* in these locations in the mid-Eocene, and, therefore, general support for our dating analyses.

Methods S2

Placement of un-sequenced species

The placement of the 27 *Viburnum* species that we recognize, but that have not yet been sequenced, was based on morphological data obtained from recent regional taxonomic treatments (e.g., Yang & Malécot, 2011) and on our own extensive field, herbarium, and anatomical studies. In three cases, missing species were placed as sister to an individual sequenced species based on an apomorphic trait (e.g., nodding inflorescences unite the Japanese *V. phlebotrichum* with the Chinese *V. setigerum*; asymmetrical sterile marginal flowers unite the Chinese *V. hanceanum* with the Japanese and Chinese *V. plicatum*; leaf margins, paniculate inflorescences, and the sesame-like smell of the crushed leaves unite the Chinese *V. yunnanense* with the Japanese *V. sieboldii*). In two other cases, sister-species assignments were based on the recognition by some authors of a segregate entity (sometimes at the level of variety) from the more widespread species that we have already sequenced (*V. leiocarpum* with *V. inopinatum*; *V. triplinerve* with *V. propinquum*).

In all other cases one or more species were added deeper in the tree, linked to clades with which they share one or more probable apomorphies. Within the *Valvatotinus* clade, *V. obovatum* is placed with the subclade within *Lentago* with sessile inflorescences; and *V. congest*um, *V. glomeratum*, and *V. chinshanense* were linked with *Euviburnum* based on a combination of branching architecture, naked buds, densely stellate leaf blades, and large, shallowly grooved endocarps. Within the entirely Asian *Crenotinus* clade (Clement *et al.*, 2014), *V. amplifolium*, *V. laterale*, *V. junghunii*, and *V. pyramidatum* were linked with the *Lutescentia* clade based on branching architecture (monopodial plagiotropic axes). *Viburnum tengyuehense*, *V. longipedunculatum*, *V. schweilense*, *V. brevitubum*, *V. wardii*, and *V. omeiense* were placed with somewhat less certainty with a clade within *Solenotinus* based on a combination of characters including paniculate infloresences, corolla tube, and stamen attachment. We note that these species are very similar to the core species within this *Solenotinus* subclade and have previously been synonymized with them. They also lack distinguishing features found in other *Solenotinus* species (e.g., flowers produced with the leaves in *V. grandiflorum* and *V. foetens*). Within the *Sambucina* clade, *V. glaberrimum* of the Phillippines was linked with the Malaysian *V. becarrii*, *V. hispidulum*, and *V. vernicosum* based on large, pit-like extrafloral nectaries and prominent bracts surrounding the flowers in young inflorescences. *Viburnum hainanense, V. chunii, V. fordiae, V. longiradiatum, V. squalmulosum,* and *V. dalzielli* were added at the base of the *Succotinus* clade based on red juicy fruits, small grooved endocarps, and characteristic leaf teeth. Finally, within the *Oreinotinus* clade, *V. hondurense* was placed at the base of an unresolved largely Central American species complex that probably includes its closest relatives (e.g., *V. disjunctum*) judging by the distribution of stellate trichomes.

Each added species was placed randomly within its specified clade and, divergence times were randomly selected from a uniform distribution bounded by 0 and the stem age of the sister taxon. In the case of the missing species connected directly to an individual species (e.g., *V. phlebotrichum* with *V. setigerum*), a time along the branch of the sequenced species was randomly selected and the missing species was attached at that point. In the case of the missing species embedded within a larger clade, a given branch in the clade that was inferred to have existed at the chosen time was randomly selected and the missing species was attached to it (SI Fig. 2). By repeating this process, we generated a distribution of “complete” *Viburnum* trees, each one containing a random resolution of the missing taxa. This taxon placement strategy was coded in R using the ape and phytools packages (Paradis *et al.*, 2004, Revell, 2012; R scripts available from ELS upon request).

Methods S3

A limited set of simulations performed with this study confirmed previous results that the default AICc thresholds in turboMEDUSA may in some cases be too stringent (Koenen *et al.,* 2013). Our simulations were designed to identify an appropriate AICc cutoff that balanced the potential for turboMEDUSA to miss shifts that were present in a simulated tree (false negatives) with the potential to identify too many shifts in the same tree (false positives). The tree size and diversification rates were designed to be similar to our *Viburnum* dataset. Specifically, we evolved 500 trees in the R package TreeSim (Stadler 2013), each with 165 taxa, and with one of two alternative sets of rates. The first set entailed a background rate with λ=1.5 and μ=0.5, and a shift rate of λ=3.0 and μ=0.5; a second set was identical except with a shift rate of λ=4.0. We ran turboMEDUSA on each set and evaluated the frequency with which rate shifts were identified.

With the default AICc cutoff, turboMEDUSA failed to identify a shift in the two-rate trees up to 16% of the time (Fig. S3). Higher AICc cutoffs led to lower Type-1 error rates, but higher probabilities that the method would fail to identify true shifts. With a lowered AICc threshold, the shift was identified more often, but three rates were also recovered at a higher frequency. Lowering the AICc score when using turboMEDUSA on the *Viburnum* tree did not lead to shifts in new parts of the phylogeny, but did cause the already existing shifts to be identified at a higher frequency (Fig. S4).

Methods S4

BiSSE character simulations

To evaluate type I error rates and to asses more generally how BiSSE behaves on the *Viburnum* phylogeny, we conducted a limited series of simulations. Binary characters were evolved at rates of 0.01, 0.001, and 0.005 across our BEAST maximum clade credibility tree using GEIGER (Harmon *et al.,* 2008). We then selected 100 trees that had at least 15 tips in each state, and ran BiSSE on each one. The 15-tip threshold was arbitrary, but chosen to select trees with a reasonable number of taxa in each state, comparable to the characters tested in our study.

Our random character simulations found that BiSSE behaves reliably on our dataset. That is, results were significant when a simulated character state occurred primarily in the vicinity the clades that turboMEDUSA identified as significant radiations within *Viburnum*. When the transition rates were the lowest (0.001), 37 of the 100 random characters were significant at the 0.05 level, but only 8 at the 0.001 level. At higher transition rates, 0.005 or 0.01, there were slightly fewer trees significant at the 0.05 level (28 at rates of 0.005, and 35 at rates of 0.01). Fewer still were significant at the 0.001 level (1 tree at transition rates of 0.005 and 3 trees with transition rates of 0.01). In each case, the simulated characters that appeared significant were ones in which one of the states marked a clade that contained some or all of the radiations identified by turboMEDUSA analyses. For instance, if a simulated character evolved at or near the base of both *Oreinotinus* and *Succotinus*, then the results were highly significant.

We also ran BiSSE on simulated trees to evaluate type I error rates in a constant-diversification background. For this analysis, we simulated 500 trees with 165 tips each with a speciation rate of 2 and an extinction rate of 1. Traits were then simulated in GEIGER across each tree at rates of 0.005, 0.01, 0.02, and 0.03 multiple times if necessary to ensure that each tree ultimately had 15 tips in each character state. At all rates of trait evolution, the proportion of trees identified as significant was ≤0.062 at a 0.05 significance cutoff, ≤0.01 at a 0.01 cutoff, and ≤0.002 at a 0.005 cutoff. Therefore, it seems that type I error rates on trees that contain a constant diversification rate occur at almost exactly at the expected frequency.

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Table S1

Voucher information and GenBank accession information for 138 species of *Viburnum* included in this study. Each species name is followed by the voucher specimen, herbarium, and GenBank accession numbers for each of 10 genes in the following order: *trn*H-*psb*A, *rpl*32-*trn*L$^{(UAG)}$, ITS, *trn*K, *mat*K, *rbc*L, *ndh*F, *trn*C-*ycf*6, *trn*S-*trn*G, *pet*B-*pet*D. Species are grouped by their least inclusive clade following the phylogenetic nomenclature of Clement *et al.* (2014). Most data are from Clement & Donoghue (2011, 2012), Chatelet *et al.* (2013), and Clement *et al.* (2014). GenBank accession numbers for new sequences acquired since these studies are indicated in bold. Species that are new to the *Viburnum* phylogeny are underlined. Herbarium abbreviations are as follows: ANDES = Universidad de los Andes Herbarium, A = Arnold Arboretum; Harvard University Herbaria; GH = Grey Herbarium, Harvard University; K = Kew Royal Botanic Gardens; MO = Missouri Botanical Garden; NY = New York Botanical Garden; QCNE = Museo Ecuatoriano de Ciencias Naturales; WTU = University of Washington Herbarium; YU = Yale University Herbarium. A hyphen (-) in the list of GenBank accession numbers indicates sequences that we were unable to obtain.

Amplicrenotinus

Viburnum amplificatum J. Kern; P.W. Sweeney *et al.* PWS2149; YU; KF019850; KF019871; KJ795806; KF019939; KF019753; KF019795; KF019773; KF019894; KF019918; KF019830.

Coriacea

Viburnum beccarii Gamble; P.W. Sweeney *et al.* PWS2106; YU; KF019842; KF019863; KF019808; KF019931; KF019743; KF019786; KF019766; KF019884; KF019907; KF019822. ***Viburnum coriaceum*** Bl.; P.W. Sweeney *et al.* PWS2088; YU; KP281845; KP281854; KP281840; KP281893; KP281810; KP281818; KP281828;

KP281876; KP281902; KP281864. ***Viburnum cylindricum*** Buch.-Ham. ex D. Don; M.J. Donoghue WC268; YU; KP281846; KP281855; -; KP281894; KP281811; KP281819; -; KP281877; KP281903; KP281865. ***Viburnum hebanthum*** Wight and Arn.; J. Klackenberg 32; NY; HQ592076; HQ591895; -; HQ591795; HQ591587; HQ591729; HQ591660; HQ592138; HQ591833; HQ592012.

Corisuccotinus

Viburnum acerifolium L.; M.J. Donoghue and R.C. Winkworth 27; YU; AY627384; HQ591863; AY265114; AY265160; HQ591557; HQ591701; HQ591641; HQ592108; HQ591819; HQ591987. ***Viburnum kansuense*** Batalin; Boufford *et al.* 27416; A; AY627403; HQ591901; AY265133; AY265179; HQ591594; HQ591735; HQ591666; HQ592144; EF490276; HQ592018. ***Viburnum orientale*** Pall.; Merello *et al.* 2291; MO; HQ592089; HQ591919; EF462986; EF490249; HQ591612; HQ591753; HQ591680; HQ592160; EF490284; HQ592031.

Dentata

Viburnum dentatum L.; M.J. Donoghue and R.C. Winkworth 33; YU; AY627391; HQ591884; AY265121; AY265167; HQ591574; HQ591718; HQ591651; HQ592128; HQ591827; HQ592002. ***Viburnum recognitum*** Fernald; Arnold Arboretum 1471-83B, 00192902; A; JQ805337; JQ805507; JQ805189; JQ805585; JQ805261; JQ805387; JX049465; JX049490; JX049504; KF019824.

Euviburnum

Viburnum bitchiuense Makino; D. Chatelet 1097-77A; A-living collection; JX049467; JX049477; JX049448; JX049491; JX049451; JX049471; JX049459; JX049481; JX049495; JX049509. ***Viburnum buddleifolium*** C.H. Wright; K. Schmandt 7533B, 00161917; A; JQ805295; JQ805471; -; JQ805551; JX049458; JX049472; JX049462; JX049485; JX049499; -. ***Viburnum burejaeticum*** Regel et Herder; K. Schmandt 375-95A, 00223095; A; JQ805297; JQ805472; -; JQ805552; JQ805231; JX049463, JX049473; JX049463; JX049486; JX049500; JX049513. ***Viburnum carlesii*** Hemsl. Ex Forb. and Hemsl.; M.J. Donoghue and R.C. Winkworth 24; YU; AY627385; HQ591873;

AY265115; AY265161; HQ591566; HQ591710; HQ591645; HQ592117; HQ591823; HQ591996. ***Viburnum cotinifolium*** D. Don; M.J. Donoghue WC267; YU; KF019843; KF019864; KF019809; KF019932; KF019744; KF019787; KF019767; -; KF019908; KF019823. ***Viburnum lantana*** L.; M.J. Donoghue and R.C. Winkworth 26; YU; AY627404; HQ591902; AY265134; AY265180; HQ591595; HQ591736; HQ591667; HQ592145; EF490278; HQ592019. ***Viburnum macrocephalum*** Fortune; M.J. Donoghue 101; YU; HQ592086; HQ591911; EF462984; EF490247; HQ591604; HQ591745; HQ591673; HQ592153; HQ591842; HQ592027. ***Viburnum mongolicum*** Rehder; M.J. Donoghue s.n.; YU; HQ592087; HQ591914; EF462985; EF490248; HQ591607; HQ591748; HQ591676; HQ592155; HQ591844; HQ592029. ***Viburnum rhytidophyllum*** Hemsl. Ex Forb. and Hemsl.; M.J. Donoghue and R.C. Winkworth 8; YU; HQ592092; HQ591925; AY265146; AY265192; HQ591618; HQ591759; HQ591685; HQ592166; HQ591850; HQ592036. ***Viburnum schensianum*** Maxim.; Boufford *et al.* 26082; A; HQ592094; HQ591929; HQ591975; HQ591808; HQ591622; HQ591763; HQ591689; HQ592169; HQ591851; HQ592040. ***Viburnum utile*** Hemsl.; Egolf 2336-E; cultivated plant; AY627424; HQ591945; AY265156; AY265202; HQ591638; HQ591778; HQ591698; HQ592184; EF490291; HQ592054. ***Viburnum veitchii*** C.H. Wright; Bouffourd *et al.* 27597; A; HQ592106; HQ591946; HQ591985; HQ591817; HQ591639; HQ591779; HQ591699; -; HQ591861; HQ592055.

Lentago

Viburnum cassinoides L.; Arnold Arboretum 874-85A, 0182773; A; HQ592067; HQ591874; HQ591956; HQ591789; HQ591567; HQ591711; HQ591646; HQ592118; HQ591824; HQ591997. ***Viburnum elatum*** Benth.; M.J. Donoghue 472; YU; AY627394; HQ591887; AY265124; AY265170; HQ591578; HQ591721; -; -; EF490272; HQ592003. ***Viburnum lentago*** L.; M.J. Donoghue and R.C. Winkworth 21; YU; AY627406; HQ591905; AY265136; AY265182; HQ591598; HQ591739; HQ591670; HQ592148; EF490280; HQ592022. ***Viburnum nudum*** L.; M.J. Donoghue -; -; AY627410; HQ591915; AY265140; AY265186; HQ591608; HQ591749; HQ591677; HQ592156; EF490282; HQ592030. ***Viburnum prunifolium*** L.; M.J. Donoghue and R.C. Winkworth 13; YU; AY627413; HQ591922; AY265144; AY265190; HQ591615; HQ591756;

HQ591683; HQ592163; EF490286; HQ592033. ***Viburnum rufidulum*** Raf.; M.J. Donoghue and R.C. Winkworth 14; YU; AY627415 ; HQ591927; AY265147; AY265193; HQ591620; HQ591761; HQ591687; HQ592167; EF490287; HQ592038.

<u>Lutescentia</u>

Viburnum colebrookeanum Wall.; Parker 3220; A; HQ592070; HQ591879; HQ591959; HQ591791; HQ591570; HQ591715; -; HQ592123; -; HQ592000. ***Viburnum lutescens*** Blume; Wu *et al.* WP531; A; -; HQ591909; HQ591969; HQ591802; HQ591602; HQ591743; HQ591672; HQ592151; HQ591841; HQ592025.

<u>Mollotinus</u>

Viburnum bracteatum Rehder; Arnold Arboretum 1067-87A, 0227564; A; HQ592065; HQ591871; -; KF019933; HQ591564; HQ591708; HQ591643; HQ592115; HQ591822; HQ591994. ***Viburnum ellipticum*** Hook.; M.J. Donoghue -; -; AY627395; -; AY265125; AY265171; HQ591579; HQ591722; HQ591653; HQ592131; HQ591830; HQ592004. ***Viburnum molle*** Michx.; M.J. Donoghue and R.C. Winkworth 5; YU; AY627409 ; HQ591913; AY265139; AY265185; HQ591606; HQ591747; HQ591675; HQ592154; EF490281; -. ***Viburnum rafinesquianum*** Schult.; M.J. Donoghue and R.C. Winkworth 4; YU; AY627414; HQ591924; AY265145; AY265191; HQ591617; HQ591758; HQ591684; HQ592165; HQ591849; HQ592035.

<u>Opulus</u>

Viburnum edule (Michaux) Raf.; NVI -; -; AY627393; -; AY265123; AY265169; HQ591577; HQ591720; -; -; EF490271; -. ***Viburnum koreanum*** Nakai; H. Yamaji 5170; MO; HQ592081; -; EF462983; EF490246; -; -; -; -; EF490277; -. ***Viburnum opulus*** L.; W.L. Clement 250; YU; -; HQ591918; HQ591972; HQ591805; HQ591611; HQ591752; HQ591679; HQ592159; HQ591847; -. ***Viburnum sargentii*** Koehne; M.J. Donoghue and R.C. Winkworth 17; YU; AY627416; HQ591928; AY265148; AY265194; HQ591621; HQ591762; HQ591688; HQ592168; EF490288; HQ592039. ***Viburnum trilobum*** Marshall; Arnold Arboretum 22900A, 0174487; AA; HQ592104; HQ591942;

HQ591983; HQ591815; HQ591635; HQ591775; HQ591695; HQ592182; EF490290; HQ592051.

Oreinotinus

Viburnum acutifolium Benth.; M.J. Donoghue 96; YU; JQ805307; -; JQ805160; -; JQ805237; JQ805397; -; KF019885; -; -. ***Viburnum anabaptista*** Graebn.; P.W. Sweeney *et al.* 2160; YU, ANDES; KP281847; KP281856; -; KP281895; KP281812; KP281820; KP281829; KP281878; KP281904; KP281866. ***Viburnum australe*** Morton; MA Carranza *et al.* 2064; MO; JQ805304; -; JQ805157; KP281896; JQ805235; JQ805393; -; KP281879; -; -. ***Viburnum ayavacense*** Kunth; E. Fernandez et al 1930; MO; JQ805309; KP281857; JQ805162; JQ805561; JQ805238; JQ805399; KP281830; KP281880; -; -. ***Viburnum blandum*** C.V. Morton; M.J. Donoghue 464; YU; HQ592062; HQ591869; HQ591952; HQ591785; HQ591562; HQ591706; -; HQ592113; -; HQ591992. ***Viburnum caudatum*** Greenm.; M.J. Donoghue 64; YU; HQ592068; HQ591875; HQ591957; HQ591790; -; -; -; HQ592119; HQ591825; -. ***Viburnum ciliatum*** Greenm.; MG Zol Baez 287; F; JQ805310; JQ805481; JQ805163; JQ805562; JQ805239; JQ805400; -; KP281881; -; -. ***Viburnum costaricanum*** (Oerst.) Hemsl.; M.J. Donoghue 85; YU; -; JQ805482; JQ805164; JQ805564; -; -; KP281831; -; KF019909; -. ***Viburnum discolor*** Benth.; M.J. Donoghue 507; YU; HQ592073; HQ591886; -; HQ591793; HQ591576; -; -; HQ592130; HQ591829; -. ***Viburnum disjunctum*** C.V. Morton; M.J. Donoghue MJD700; YU; KF019844; -; KF019810; -; KF019745; KF019788; -; KF019887; KF019910; -. ***Viburnum divaricatum*** Benth.; P.W. Sweeney *et al.* PWS1773; YU, QCNE; JQ805317; JQ805487; JQ805167; JQ805567; JQ805242; JQ805404; KP281832; KP281882; KP281905; KP281867. ***Viburnum glabratum*** Kunth.; P.W. Sweeney *et al.* 2152; YU, ANDES; KP281848; KP281858; KP281841; KP281897; KP281813; KP281821; KP281833; KP281883; KP281906; KP281868. ***Viburnum hallii*** (Oersted) Killip and A.C. Smith; P.W. Sweeney *et al.* PWS1626; YU, QCNE; JQ805322; JQ805492; JQ805173; JQ805572; JQ805248; JQ805410; -; -; -; -. ***Viburnum hartwegii*** Benth.; M.J. Donoghue 40; YU; AY627400; HQ591894; AY265130; AY265176; HQ591586; -; HQ591659; HQ592137; HQ591832; HQ592011. ***Viburnum jamesonii*** (Oersted) Killip and A.C. Smith; P.W. Sweeney *et al.* 1636; YU; HQ592080; HQ591898;

HQ591966; HQ591798; HQ591591; HQ591732; HQ591663; HQ592142; HQ591836; HQ592015. ***Viburnum jucundum*** C.V. Morton; M.J. Donoghue 244; YU; AY627402; HQ591900; AY265132; AY265178; HQ591593; HQ591734; HQ591665; -; HQ591838; HQ592017. ***Viburnum lasiophyllum*** Benth.; P.W. Sweeney *et al.* 2174; YU, ANDES; KP281849; KP281859; -; -; KP281814; KP281822; KP281834; KP281884; KP281907; KP281869. ***Viburnum lautum*** C.V. Morton; M.J. Donoghue 72; YU; HQ592082; HQ591904; HQ591967; HQ591799; HQ591597; HQ591738; HQ591669; HQ592147; HQ591839; HQ592021. ***Viburnum loeseneri*** Graebn.; M.J. Donoghue 2547; YU; HQ592084; HQ591908; HQ591968; HQ591801; HQ591601; HQ591742; -; HQ592150; -; HQ592024. ***Viburnum microcarpum*** Schlecht. and Cham.; F. Ventura A. 819; NY; JQ805327; JQ805496; JQ805178; KP281898; -; JQ805414; -; -; -; -. ***Viburnum microphyllum*** (Oerst.) Hemsl.; M.J. Donoghue MJD2492; YU; KP281850; KP281860; -; -; -; KP281823; -; KP281885; KP281908; -. ***Viburnum obtectum*** ; P.W. Sweeney *et al.* PWS1701; YU, QCNE; JQ805328; JQ805497; JQ805179; JQ805576; JQ805252; JQ805415; -; -; -; -. ***Viburnum obtusatum*** D.N. Gibson; M.J. Donoghue 242; YU; JQ805331; JQ805501; JQ805183; JQ805579; JQ805256; JQ805419; -; -; KP281909; -. ***Viburnum pichinchense*** Benth.; P.W. Sweeney *et al.* PWS1669; YU, QCNE; JQ805332; JQ805502; JQ805184; JQ805580; JQ805257; JQ805420; KP281835; KP281886; -; KP281870. ***Viburnum scabrellum*** (T.andG.) Chapman; M.J. Donoghue 82; YU; JQ805338; JQ805508; JQ805190; JQ805586; JQ805262; KP281824; KP281836; KP281887; KP281910; KP281871. ***Viburnum seemenii*** Graebn.; Lewis 37409; GH; JQ805340; JQ805509; JQ805193; JQ805587; JQ805263; JQ805426; -; -; -; -. ***Viburnum stellato-tomentosum*** (Oerst.) Hemsl.; M.J. Donoghue MJD640; YU; KF019845; KF019865; -; -; KF019747; KF019789; -; KF019888; KF019911; -. ***Viburnum stenocalyx*** Hemsl.; M.J. Donoghue 60; YU; HQ592097; HQ591933; HQ591978; HQ591810; HQ591626; HQ591767; -; HQ592173; KF019912; HQ592043. ***Viburnum stipitatum*** ; P.W. Sweeney *et al.* PWS1708; YU, QCNE; JQ805343; JQ805512; JQ805195; JQ805589; JQ805265; JQ805428; -; -; -; -. ***Viburnum subsessile*** Killip and A.C. Smith; P.W. Sweeney *et al.* 2172; YU, ANDES; KP281851; KP281861; KP281842; -; KP281815; KP281825; KP281837; KP281888; KP281911; KP281872. ***Viburnum sulcatum*** Hemsl.; M.J. Donoghue 207; YU; HQ592099; HQ591935; HQ591980;

HQ591812; HQ591628; -; -; HQ592175; -; -. ***Viburnum tinoides*** L.f.; P.W. Sweeney *et al.* 2167; YU, ANDES; KP281852; KP281862; KP281843; KP281899; KP281816; KP281826; KP281838; KP281889; KP281912; KP281873. ***Viburnum toronis*** Killip and A.C. Smith; P.W. Sweeney *et al.* PWS1799; YU, QCNE; HQ592103; HQ591941; HQ591982; HQ591814; HQ591634; HQ591774; HQ591694; HQ592181; HQ591858; HQ592050. ***Viburnum triphyllum*** Benth.; P.W. Sweeney *et al.* PWS1783; YU, QCNE; HQ592105; HQ591943; HQ591984; HQ591816; HQ591636; HQ591776; HQ591696; HQ592183; HQ591859; HQ592052. ***Viburnum undulatum*** (Oersted) Killip and A.C. Smith; P.W. Sweeney *et al.* 2164; YU, ANDES; KP281853; KP281863; KP281844; KP281900; KP281817; KP281827; KP281839; KP281890; KP281913; KP281874. ***Viburnum venustum*** Morton; W. Haber 11072; MO; JQ805355; JQ805525; JQ805206; KP281901; JQ805278; JQ805441; -; KP281891; KP281914; -. ***Viburnum villosum*** Sw.; M.J. Donoghue 628; YU; JQ805357; JQ805527; -; JQ805600; JQ805280; JQ805443; -; KP281892; -; KP281875.

Pseudotinus

Viburnum furcatum Blume ex Hook.f. and Thomson; Tsugaru and Takashi 19958; MO; AY627399 ; HQ591893; AY265129; AY265175; HQ591585; HQ591728; HQ591658; HQ592136; EF490275; HQ592010. ***Viburnum lantanoides*** Michx.; M.J. Donoghue and R.C. Winkworth 2; YU; AY627405; HQ591903; AY265135; AY265181; HQ591596; HQ591737; HQ591668; HQ592146; EF490279; HQ592020. ***Viburnum nervosum*** D. Don; Boufford *et al.* 27388; A; AY627388; HQ591880; AY265118; AY265164; HQ591571; HQ591716; HQ591649; HQ592124; EF490268; -. ***Viburnum sympodiale*** Graebn.; Lai and Shan 4529; MO; HQ592100; HQ591937; EF462988; EF490252; HQ591630; HQ591770; -; HQ592177; EF490289; HQ592046.

Punctata

Viburnum punctatum Buch.-Ham. Ex D. Don; P.W. Sweeney *et al.* PWS2097; YU; -; KF019866; KJ795805; KF019934; KF019748; KF019790; KF019768; KF019889; KF019913; KF019825. ***Viburnum lepidotulum*** Merr. and Chun; Lau 27991; A; HQ592083; HQ591906; -; HQ591800; HQ591599; HQ591740; -; -; -; -.

Sambucina

Viburnum hispidulum J. Kern; P.W. Sweeney *et al.* PWS2136; YU; KF019846; KF019867; -; KF019935; KF019749; KF019791; KF019769; KF019890; KF019914; KF019826. ***Viburnum inopinatum*** Craib.; P.W. Sweeney *et al.* PWS2091; YU; KF019847; KF019868; KJ795808; KF019936; KF019750; KF019792; KF019770; KF019891; KF019915; KF019827. ***Viburnum sambucinum*** Reinw. Ex Blume; P.W. Sweeney *et al.* PWS2100; YU; KF019848; KF019869; KF019811; KF019937; KF019751; KF019793; KF019771; KF019892; KF019916; KF019828. ***Viburnum ternatum*** Rehder; Bartholomew *et al.* 2268; A; HQ592102; HQ591939; HQ591981; HQ591813; HQ591632; HQ591772; -; HQ592179; HQ591856; HQ592048. ***Viburnum vernicosum*** Gibbs; P.W. Sweeney *et al.* PWS2123; YU; KF019849; KF019870; KF019812; KF019938; KF019752; KF019794; KF019772; KF019893; KF019917; KF019829.

Solenotinus

Viburnum awabuki Hort.Berol. Ex K. Koch; Liu 141; A; HQ592060; HQ591867; HQ591951; HQ591783; HQ591560; HQ591704; -; HQ592111; -; HQ591990. ***Viburnum brachybotryum*** Hemsl. Ex Forb. and Hemsl.; NVI -; -; HQ592064; -; HQ591954; HQ591787; -; -; -; -; -; -. ***Viburnum chingii*** P.S. Hsu; Bartholomew *et al.* 973; A; HQ592069; HQ591876; HQ591958; -; -; HQ591712; -; HQ592120; -; -. ***Viburnum corymbiflorum*** P.S. Hsu and S.C. Hsu; Gao 1706; A; HQ592072; HQ591882; HQ591961; -; HQ591573; -; -; HQ592126; -; -. ***Viburnum erubescens*** Wall.; Boufford *et al.* 27190; A; AY627397; HQ591889; AY265127; AY265173; HQ591581; HQ591724; HQ591655; HQ592133; HQ591831; HQ592006. ***Viburnum farreri*** Stearn; M.J. Donoghue and R.C. Winkworth 18; YU; AY627398; HQ591890; AY265128; AY265174; HQ591582; HQ591725; HQ591656; HQ592134; EF490274; HQ502007. ***Viburnum foetens*** Decne.; M.J. Donoghue WC270; YU, WU; KF019851; KF019872; KF019813; KF019940; KF019754; KF019796; KF019774; KF019895; KF019919; KF019831. ***Viburnum grandiflorum*** Wall. Ex DC; M.J. Donoghue WC271; YU; KF019852; KF019873; KF019814; KF019941; KF019755; KF019797; KF019775;

KF019896; KF019920; KF019832. ***Viburnum henryi*** Hemsl.; M.J. Donoghue WC272; YU; KF019853; KF019874; KF019815; KF019942; KF019756; KF019798; KF019776; KF019897; KF019921; -. ***Viburnum odoratissimum*** Ker-Gawl.; R. Olmstead 118; WTU; AY627411; HQ591916; AY265141; AY265187; HQ591609; HQ591750; HQ591678; HQ592157; HQ591845; -. ***Viburnum oliganthum*** Batalin; Bouffourd *et al.* 27175; A; HQ592088; HQ591917; HQ591971; HQ591804; HQ591610; HQ591751; -; HQ592158; HQ591846; -. ***Viburnum sieboldii*** Miq.; M.J. Donoghue and R.C. Winkworth 3; YU; AY627417; HQ591932; AY265149; AY265195; HQ591625; HQ591766; HQ591691; HQ592172; HQ591853; HQ592042. ***Viburnum subalpinum*** Hand.-Mazz.; Heng 11878; GH; HQ592098; HQ591934; HQ591979; HQ591811; HQ591627; HQ591768; -; HQ592174; -; HQ592044. ***Viburnum suspensum*** Lindl.; M.J. Donoghue and R.C. Winkworth 36; YU; AY627419; HQ591936; AY265151; AY265197; HQ591629; HQ591769; HQ591692; HQ592176; HQ591854; HQ592045. ***Viburnum taitoense*** Hayata; M.J. Donoghue and K.-F. Chung KFC1941; YU; KF019854; KF019875; KF019816; KF019943; KF019757; KF019799; KF019777; KF019898; KF019922; KF019833.

<u>Succotinus</u>

Viburnum adenophorum W.W. Smith; Boufford and Barholomew 24402; A; HQ592057; HQ591864; HQ591948; HQ591781; HQ591558; HQ591702; -; HQ592109; yes; HQ591988. ***Viburnum annamensis*** Fukuoka; P.W. Sweeney *et al.* 2094; YU; KF019855; KF019876; KJ795807; KF019944; KF019758; KF019800; KF019778; KF019899; KF019923; KF019834. ***Viburnum betulifolium*** Batalin; Boufford *et al.* 29335; A; HQ592061; HQ591868; -; HQ591784; HQ591561; HQ591705; -; HQ592112; -; HQ591991. ***Viburnum brachyandrum*** Nakai; Mizushima 568; A; HQ592063; HQ591870; HQ591953; HQ591786; HQ591563; HQ591707; -; HQ592114; HQ591821; HQ591993. ***Viburnum brevipes*** Rehder; Zhu Dahai et al 110; MO; JQ805366; JQ805535; -; JQ805608; JQ805283; JQ805454; -; -; -; -. ***Viburnum cf. corylifolium*** Hook.f. and Thomson; D. Chatelet 103-99A; A; JX049469; JX049479; KF019817; JX049493; JX049453; JX049475; JX049460; JX049483; JX049497; JX049511. ***Viburnum dilatatum*** Thunberg; M.J. Donoghue and R.C. Winkworth 19; YU;

AY627392; HQ591885; AY265122; AY265168; HQ591575; HQ591719; HQ591652; HQ592129; HQ591828; -. ***Viburnum erosum*** Thunberg; M.J. Donoghue and R.C. Winkworth 16; YU; AY627396; HQ591888; AY265126; AY165172; HQ591580; HQ591723; HQ591654; HQ592132; EF490273; HQ592005. ***Viburnum flavescens*** W.W. Smith; Boufford *et al.* 32758; A; HQ592074; HQ591891; HQ591962; HQ591794; HQ591583; HQ591726; HQ591657; -; JX049505; HQ592008. ***Viburnum foetidum*** Wall.; C.-H. Lin 563; MO; HQ592075; HQ591892; HQ591963; EF490245; HQ591584; HQ591727; -; HQ592135; JX049506; HQ592009. ***Viburnum formosanum*** Hayata; M.J. Donoghue, JM Hu J-M Hu 2007; YU; KF019857; KF019878; -; KF019946; KF019760; KF019802; KF019780; KF019901; KF019925; KF019836. ***Viburnum hupehense*** Rehder; Bartholomew *et al.* 1286; A; HQ592077; HQ591896; HQ591964; HQ591796; HQ591588; HQ591730; HQ591661; HQ592139; HQ591834; HQ592013. ***Viburnum ichangense*** Rehder; Bartholomew *et al.* 1889; A; HQ592078; HQ591897; HQ591965; HQ591797; HQ591589; HQ591731; HQ591662; HQ592140; HQ591835; HQ592014. ***Viburnum integrifolium*** Hayata; M.J. Donoghue and K.-F. Chung KFC1946; YU; KF019858; KF019879; -; KF019947; KF019761; KF019803; KF019781; KF019902; KF019926; KF019837. ***Viburnum japonicum*** Spreng; NVI -; -; AY627401; HQ591899; AY265131; AY265177; HQ591592; HQ591733; HQ591664; HQ592143; HQ591837; HQ592016. ***Viburnum lancifolium*** Hsu; Zou Huanning s.n.; MO; JQ805373; JQ805540; -; JQ805612; -; JQ805460; -; -; -; -. ***Viburnum lobophyllum*** Graebn.; M.J. Donoghue and R.C. Winkworth 25; YU; AY627407; HQ591907; AY265137; AY265183; HQ591600; HQ591741; HQ591671; HQ592149; HQ591840; HQ592023. ***Viburnum luzonicum*** Rolfe; Shen 673; A; HQ592085; HQ591910; HQ591970; HQ591803; HQ591603; HQ591744; JX049466; HQ592152; JX049507; HQ592026. ***Viburnum melanocarpum*** P.S. Hsu; M.J. Donoghue and R.C. Winkworth 12; YU; AY627408 ; HQ591912; AY265138; AY265184; HQ591605; HQ591746; HQ591674; -; HQ591843; HQ502028. ***Viburnum mullaha*** Buch.-Ham. Ex D.Don; M.J. Donoghue WC274; YU; KF019859; KF019880; KF019819; KF019948; KF019762; KF019804; KF019782; KF019903; KF019927; KF019838. ***Viburnum parvifolium*** Hayata; M.J. Donoghue and K.-F. Chung KFC1953; YU; KF019860; KF019881; KF019820; KF019949; KF019763; KF019805; KF019783; KF019904; KF019928; KF019839. ***Viburnum sempervirens*** K. Koch; Hu and But 21891; A; HQ592095; HQ591930; HQ591976; HQ591809; HQ591623; HQ591764; -; HQ592170; -; -. ***Viburnum setigerum*** Hance; M.J. Donoghue 102; YU; HQ592096; HQ591931; HQ591977; EF490251; HQ591624; HQ591765; HQ591690; HQ592171; HQ591852; HQ592041. ***Viburnum tashiroi*** Nakai; M.J. Donoghue s.n.; YU; KF019861; KF019882; -; KF019950; KF019764; KF019806; KF019784; KF019905; KF019929; KF019840. ***Viburnum wrightii*** Miquel; Yonekura 1362; A; HQ592107; HQ591947; HQ591986; HQ591818; HQ591640; HQ591780; HQ591700; HQ592185; HQ591862; HQ592056.

Tinus

Viburnum atrocyaneum C.B. Clarke; Boufford *et al.* 34956; A; HQ592059; HQ591866; HQ591950; HQ591782; HQ591559; HQ591703; HQ591642; HQ592110; HQ591820; HQ591989. ***Viburnum calvum*** Rehder; Li and Soukup 934; A; HQ592066; HQ591872; HQ591955; HQ591788; HQ591565; HQ591709; HQ591644; HQ592116; JX049508; HQ591995. ***Viburnum cinnamomifolium*** Rehder; R. Olmstead 120; WTU; AY627386 ; HQ591877; AY265116; AY265162; HQ591568; HQ591713; HQ591647; HQ592121; HQ591826; HQ591998. ***Viburnum davidii*** Franchet; M.J. Donoghue WC269; YU; KF019862; KF019883; KF019821; KF019951; KF019765; KF019807; KF019785; KF019906; KF019930; KF019841. ***Viburnum propinquum*** Hemsl.; M.J. Donoghue 100; YU; HQ592090; HQ591921; EF462987; EF490250; HQ591614; HQ591755; HQ591682; HQ592162; -; -. ***Viburnum rigidum*** Ventenat; Stearn 1116; A; HQ592093; HQ591926; HQ591974; HQ591807; HQ591619; HQ591760; HQ591686; -; -; HQ592037. ***Viburnum tinus*** L.; M.J. Donoghue and R.C. Winkworth 35; YU; AY627420; HQ591940; AY265152; AY265198; HQ591633; HQ591773; HQ591693; HQ592180; HQ591857; HQ592049.

Tomentosa

Viburnum plicatum Thunberg; M.J. Donoghue and R.C. Winkworth 10; YU; AY627412; HQ591920; AY265143; AY265189; HQ591613; HQ591754; HQ591681; HQ592161; EF490285; HQ592032.

Urceolata

Viburnum taiwanianum Hayata; W.-H. Hu *et al.* 2186; MO; HQ592101; HQ591938; EF462989; EF490253; HQ591631; HQ591771; -; HQ592178; HQ591855; HQ592047.

Viburnum urceolatum S. and Z.; M.J. Donoghue -; -; AY627423; HQ591944; AY265155; AY265201; HQ591637; HQ591777; HQ591697; -; HQ591860; HQ592053.

Viburnum

Viburnum clemensiae Kern; J. Beaman 11781; K; AY627387; HQ591878; AY265117; AY265163; HQ591569; HQ591714; HQ591648; HQ592122; EF490267; HQ591999.