

Supplementary Material

Supplemental Text

The cladogram in figure 1 is based on a number of published phylogenetic studies (Andreasen and Bremer 2000; Backlund, Oxelman, and Bremer 2000; Bremer and Manen 2000; Richardson et al. 2000; Anderberg, Rydin, and Kallersjo 2002; Kress, Prince, and Williams 2002; Ronsted et al. 2002; Bremer et al. 2003; Tam et al. 2004; Williams, Kress, and Manos 2004; Albach, Meudt, and Oxelman 2005; Qiu et al. 2005; Schonenberger, Anderberg, and Sytsma 2005; Soltis et al. 2005; Qiu et al. 2006; Tokuoka and Tobe 2006; Davis et al. 2007a; Davis et al. 2007b; Livshultz et al. 2007; Tokuoka 2007).

*Families with multiple gains of the *cox1* intron*

Synopses for four of the most complex families for which multiple, within-family intron acquisitions are inferred were provided in the main text. The organismal trees shown in figure 2 are based on the following studies: A. Rhamnaceae (Richardson et al. 2000); B. Apocynaceae (Livshultz et al. 2007); C. Rubiaceae (Andreasen and Bremer 2000; Bremer and Manen 2000; Davis et al. 2007a); D. Plantaginaceae (Ronsted et al. 2002; Albach, Meudt, and Oxelman 2005). Synopses for the remaining five families for which multiple transfers are inferred are provided below; for the first two of these families, we do not invoke any within-family transfers, whereas for the last three we do. Following treatment of these five families, we also fully consider the case of *Hippuris*,

which was briefly treated in the main text within the context of its family, the Plantaginaceae.

Boraginaceae: Based on current sampling, this is the simplest to interpret of the nine families with multiple inferred intron acquisitions. Two of the four sampled Boraginaceae taxa, *Ehretia* and *Heliotropium*, have the intron. The two introns are well-separated in the intron phylogeny (fig. 5) and have different length CCTs (fig. 1), making it clear that they were acquired independently and, most likely, from distantly related donors.

Euphorbiaceae: We infer five separate transfers to account for the intron's presence in all six Euphorbiaceae examined. The introns from *Croton* and *Codiaeum* clearly trace back to the same transfer event (fig. 5). However, this intron clade and the other four Euphorbiaceae introns are relatively widely separated from one another in the intron phylogeny (fig. 5) and therefore each probably results from a separate transfer, from relatively distantly related donors. Consistent with this hypothesis, three different CCT lengths are found within the family (figs. 1 and 5). *Hevea* and *Euphorbia* are the most likely candidates for having acquired their intron by the same transfer, as they share the same, rare CCT (CCT=5) and are not well separated in the intron phylogeny (fig. 5). However, because *Hura*, the strongly supported sister to *Euphorbia* (Tokuoka 2007), acquired its intron by a clearly independent transfer (fig. 5), it seems more likely that all three plants acquired their introns by separate events. The limited data available for this

species-rich family do not allow us to assess the recency of these events or whether within-family transfers have taken place between closely related species.

Araceae: An earlier study (Cho and Palmer 1999) invoked 5 separate intron acquisitions, all but the first from a closely related set of Araceae-like donors, to account for the intron's presence in 6 of 15 Araceae taxa sampled (also see figs. 1 and 5). Although there has been no further sampling of the family (but see Addendum), this inference is strengthened by subsequent phylogenetic study (Tam et al. 2004). In particular, *Zamioculcas* and *Philodendron*, thought previously to be sister taxa (in which case the only evidence for their having acquired the intron independently was their possession of different length CCTs), now appear to be phylogenetically separated by intron- and CCT-lacking taxa (fig. 1).

Marantaceae: The six *cox1* introns examined from the monocot family Marantaceae form a well-supported (95% BS) clade of closely related sequences (fig. 5). Relationships within this intron clade are largely unresolved and do not conflict with organismal phylogeny (figs. 1 and 5). Based on intron phylogeny alone, one would assume that these six introns arose by a single, shared transfer event. However, *Monotagma* is separated from the other intron-bearing Marantaceae by no fewer than six intermediate clades that lack both the intron and the corresponding CCT (fig. 1). This pattern strongly supports the hypothesis that *Monotagma* acquired its intron separately from the *Maranta/Ctenanthe/Saranthe* clade. The main text describes at length four

alternative hypotheses to account for the two CCT lengths found within the *Maranta/Ctenanthe/Sarantia* clade.

Zingiberaceae: An intron-and CCT-lacking group of two genera (*Curcuma* and *Smithatris*) is nested within a clade of gingers (Zingiberaceae) that otherwise all contain the intron (fig. 1), and whose introns form a strongly supported monophyletic group (fig. 5). Either the intron was acquired once, in the common ancestor of this clade, and then it and its CCT were lost (in the *Curcuma* and *Smithatris* clade), or, as depicted in fig. 1, there were *at least* two separate intron gains and no losses. We emphasize the “at least” here, because, depending on the resolution of the current polytomy for this part of Zingiberaceae phylogeny, more than two transfers might have to be invoked to account for the intron distribution. In addition, *Siphonochilus*, the basal-most member of the Zingiberaceae, contains an intron that almost certainly was acquired independently and from an unrelated donor, as it has a different length CCT (fig. 1), is unrelated in intron phylogeny (fig. 5), and is separated in Zingiberaceae phylogeny by two intron-lacking clades (fig. 1).

Hippuris (Plantaginaceae): *Hippuris* not only lacks the *cox1* intron (as do the two *Plantago* clades inferred to have lost it; see main text) but *entirely* lacks the CCT. At least three scenarios could account for this pattern. First, *Hippuris* ancestrally contained the intron and the CCT, but lost them by five independent events, namely, a standard retroprocessing event leading to intron loss and precise substitutional reversion at all four CCT sites. The *Hippuris cox1* coding sequence is not notably divergent (figs. 2 and 4),

and therefore we regard the coincident occurrence of all five events as extremely unlikely. Second, *Hippuris* ancestrally contained the intron and CCT and lost them in a concerted manner via horizontal uptake of an intronless *coxI* gene from *outside* the Plantaginaceae, followed by either loss of the native, intron-containing *coxI* gene or its effective erasure by gene conversion with the foreign intronless-copy. The *coxI* exon phylogeny (fig. 4), though poorly resolved in the relevant portion of the tree, does not provide support for this hypothesis. Third, *Hippuris* never possessed the intron and therefore rather than a single gain of the intron in the family, three separate gains must be invoked – in *Sibthorpia*, in *Callitriche*, and in a large clade comprising most of the rest of the family (fig. 3). Incongruence at the base of the Plantaginaceae between the intron and organismal phylogenies is consistent with this third scenario, i.e., the *Sibthorpia* and *Callitriche* introns are not sisters; rather, *Sibthorpia* nests three steps away, as sister to the *Aragoa* + *Plantago* clade (figs. 3 and 5). If correct, this would suggest that two of the three intron acquisitions in the family occurred via intrafamilial transfer. Although scenario 3 invokes two extra HGTs versus one extra for scenario 2, it is nonetheless more plausible because the probability of transfer of this homing group I intron is far greater than for other elements of the genome (including the *coxI* gene itself), and because the *Sibthorpia* intron is anomalously placed within Plantaginaceae phylogeny.

Coconversion tract length and selection vis-à-vis RNA editing

Nucleotide position 20 downstream of the *coxI* intron shows an intriguingly complex pattern of variation. This site has been determined experimentally or predicted computationally (Mower, 2006; our unpublished data) to be a site of C→U RNA editing

in numerous angiosperms. This edit changes the corresponding amino acid from proline to leucine. The ancestral and common condition at this site in angiosperm *coxI* genes is clearly C (editing necessary), with most examined plants possessing a T (editing unnecessary) also possessing the *coxI* intron.

All introns with CCT=6 have T at this position. This is as expected under two assumptions, the first of which is that upon its initial arrival in angiosperms the *coxI* intron had T at this position. This could be because the fungal donor supplied the T (many fungi have T at this position) and/or because the initial recipient happened to be one of those relatively rare intronless angiosperms with a T at this position. The second assumption is that each subsequent, within-angiosperm transfer that maintained the CCT=6 state also brought with it nucleotides 19 and 20.

Those introns with CCT=0–3 all have the pre-edited C (fig. 2 and data not shown). This is also as expected, if an occasional transfer is accompanied by an aberrantly short 3' co-conversion event, if all 3' co-conversions have a strict 5'→3' polarity, and if the recipient genes in these rare transfers all had the ancestral C at position 20. Consistent with the last hypothesis is the observation that for all five inferred transfers for which CCT reductions from 6 to 0–3 are inferred, the most closely related intronless plants to those with CCT=0–3 have C at position 20 (data not shown).

What is intriguing, however, is that unlike the CCT=0–3 introns, all introns with CCT=4 or 5 still have the post-edited T at position 20 [fig. 2; note that there are probably only 1-2 transfers each that shortened the CCT from 6 to either 4 or 5 (fig. 5)]. This pattern may reflect selection for efficient RNA editing at position 20. Most of the sequence determinants for proper editing site recognition in plant mitochondria appear to

be located within the 5–20 nt immediately upstream of a particular editing site (Choury and Araya 2006; Mulligan, Chang, and Chou 2007). We posit that the most critical editing site determinants for the site in question are located within the first 10 nt upstream of the site, such that any strictly polar CCT truncations that result in CCT=4 or 5 in a recipient gene bearing the ancestral pre-edited C at position 20 would be sufficiently deleterious to be lost by purifying selection. According to this hypothesis, the only viable CCT=4 or 5 truncations would, most likely, be those cases in which the recipients already have or soon acquire the post-edited T at position 20. Relevant data (i.e., from appropriately related intronless plants) are unavailable for any of the CCT=5 plants. Although the large clade of CCT=4 introns (fig. 5) may have had C present ancestrally at position 20, the small clade composed of five members of the Zingiberaceae probably had T present (data not shown).

Literature Cited

- Albach, D., H. Meudt, and B. Oxelman. 2005. Piecing together the "new" Plantaginaceae. *Am. J. Bot.* **92**:297-315.
- Anderberg, A. A., C. Rydin, and M. Kallersjo. 2002. Phylogenetic relationships in the order Ericales s.l.: analyses of molecular data from five genes from the plastid and mitochondrial genomes. *Am. J. Bot.* **89**:677-687.
- Andreasen, K., and B. Bremer. 2000. Combined phylogenetic analysis in the Rubiaceae-Ixoroideae: morphology, nuclear and chloroplast DNA data. *Am. J. Bot.* **87**:1731-1748.

- Backlund, M., B. Oxelman, and B. Bremer. 2000. Phylogenetic relationships within the Gentianales based on *ndhF* and *rbcL* sequences, with particular reference to the Loganiaceae. *Am. J. Bot.* **87**:1029-1043.
- Bremer, B., K. Bremer, M. W. Chase et al. 2003. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. *Bot. J. Linnean Soc.* **141**:399-436.
- Bremer, B., and J. F. Manen. 2000. Phylogeny and classification of the subfamily Rubioideae (Rubiaceae). *Plant Syst. Evol.* **225**.
- Cho, Y., Y. L. Qiu, P. Kuhlman, and J. D. Palmer. 1998. Explosive invasion of plant mitochondria by a group I intron. *Proc. Natl. Acad. Sci. USA* **95**:14244-14249.
- Cho, Y. R., and J. D. Palmer. 1999. Multiple acquisitions via horizontal transfer of a group I intron in the mitochondrial *cox1* gene during evolution of the Araceae family. *Mol. Biol. Evol.* **16**:1155-1165.
- Choury, D., and A. Araya. 2006. RNA editing site recognition in heterologous plant mitochondria. *Curr Genet* **50**:405-416.
- Davis, A., M. Chester, O. Maurin, and M. F. Fay. 2007a. Searching for the relatives of *Coffea* (Rubiaceae, Ixoroideae): the circumscription and phylogeny of *Coffeae* based plastid sequence data and morphology. *Am. J. Bot.* **94**:313-329.
- Davis, C. C., M. Latvis, D. L. Nickrent, K. J. Wurdack, and D. Baum. 2007b. Florar gigantism in *Rafflesiaceae*. *Science* **315**:1812.
- Kress, W., L. Prince, and K. Williams. 2002. The phylogeny and a new classification of the gingers (*Zingiberaceae*): evidence from molecular data. *Am. J. Bot.* **89**:1682-1696.

- Livshultz, T., D. Middleton, M. Endress, and J. Williams. 2007. Phylogeny of Apocynoideae and the APSA clade (Apocynaceae s.l.). *Ann. Missouri Bot. Gard.* **94**:324-359.
- Mulligan, R., K. Chang, and C. Chou. 2007. Computational analysis of RNA editing sites in plant mitochondrial genomes reveals similar information content and a sporadic distribution of editing sites. *Mol. Biol. Evol.* **24**.
- Qiu, Y. L., O. Dombrovskaya, J. Lee et al. 2005. Phylogenetic analyses of basal angiosperms based on nine plastid, mitochondrial, and nuclear genes. *Int. J. Plant Sci.* **166**:815-842.
- Qiu, Y. L., L. Li, B. Wang et al. 2006. The deepest divergences in land plants inferred from phylogenomic evidence. *Proc. Nat. Acad. Sci.* **103**:15511-15516.
- Richardson, J. E., M. F. Fay, Q. C. B. Cronk, D. Bowman, and M. W. Chase. 2000. A phylogenetic analysis of Rhamnaceae using *rbcL* and *trnL-F* plastid DNA sequences. *Am. J. Bot.* **87**:1309-1324.
- Ronsted, N., M. W. Chase, D. Albach, and M. Bello. 2002. Phylogenetic relationships within *Plantago* (Plantaginaceae): evidence from nuclear ribosomal ITS and plastid *trnL-F* sequence data. *Bot. J. Linnean Soc.* **139**:323-338.
- Schonenberger, J., A. A. Anderberg, and K. J. Sytsma. 2005. Molecular phylogenetics and patterns of floral evolution in the Ericales. *Int. J. Plant Sci.* **166**:265-288.
- Soltis, D. E., P. S. Soltis, P. Endress, and M. W. Chase. 2005. Phylogeny and evolution of angiosperms. Sinauer Associates, Inc, Sunderland, MA.

- Tam, S., P. Boyce, T. Upson, D. Barabe, A. Bruneau, F. Forest, and J. Parker. 2004. Intergeneric and infrafamilial phylogeny of subfamily Monosteroideae (Araceae) revealed by chloroplast *trnL-F* sequences. *Am. J. Bot.* **91**:490-498.
- Tokuoka, T. 2007. Molecular phylogenetic analysis of Euphorbiaceae sensu stricto based on plastid and nuclear DNA sequences and ovule and seed character evolution. *J. Plant Res* **120**:511-522.
- Tokuoka, T., and H. Tobe. 2006. Phylogenetic analyses of Malpighiales using plastid and nuclear DNA sequences, with particular reference to the embryology of Euphorbiaceae sens. str. . *J. Plant Res.* **119**:599-616.
- Williams, K., W. Kress, and P. Manos. 2004. The phylogeny, evolution, and classification of the genus *Globba* and tribe Globbeae (Singiberaceae): appendages do matter. *Am. J. Bot.* **91**:100-114.

Legends:

Table S1. Taxonomic information for all 640 angiosperms for which *coxI* intron presence/absence has been determined. GenBank accession numbers are given for those taxa for which *coxI* sequences are available. “S” and “P” indicate that *coxI* intron presence/absence data come from Southern blots (Cho et al. 1998) and PCR surveys, respectively. New sequences are shown in bold. Asterisks indicate *coxI* intron presence.

Figure S1. Diagram summarizing the process of group I intron homing. Horizontal transfer of an intron-bearing *coxI* gene initiates the process. The intron-encoded site-specific endonuclease recognizes and cleaves its target site in the native, intronless *coxI* gene. Exonucleolytic degradation activates the double-strand-break-repair system of the cell, with the foreign copy of *coxI* used as a template to repair the native one, resulting in a chimeric intron-bearing *coxI* gene.

Figure S2. Nucleotide alignment of the exonic regions flanking the *coxI* intron insertion site (42 nt from 3' end of exon 1 and 48 nt from 5' end of exon 2) from virtually all sequenced angiosperm *coxI* genes.

Figure S3. Cladogram of angiosperm relationships depicted in Figure 1, including character state for intron presence (character 1) and CCT (co-conversion tract) presence (character 2; CCT=1-6 coded as present).

Table S1. Taxonomic information for all 640 angiosperms for which cox1 intron presence/absence has been determined

Intron?	Order	Family	Species Name	GenBank Accession	Number ^a
Asterids					
	Apiales	Apiaceae	Daucus carota	AY820131	
	Apiales	Araliaceae	Hedera helix		S
*	Apiales	Araliaceae	Hydrocotyle rotundifolia	AJ223424	
	Apiales	Araliaceae	Polyscias sp.		P
	Apiales	Araliaceae	Schefflera actinophylla		S
	Apiales	Myodocarpaceae	Delabrea harmsi		P
	Apiales	Myodocarpaceae	Myodocarpus pinnatus		P
	Apiales	Pittosporaceae	Pittosporum tobira		S
*	Aquifoliales	Aquifoliaceae	Ilex sp. Qiu 94038	AJ223429	
	Aquifoliales	Cardiopteridaceae	Citronella sarmentosa		P
	Asterales	Asteraceae	Helianthus annuus		S
	Asterales	Asteraceae	Lactuca sativa		S
	Asterales	Calyceraceae	Calycera sympaganthera		S
	Asterales	Campanulaceae	Lobelia laxifolia		S
	Asterales	Campanulaceae	Platycodon grandiflora		S
	Asterales	Campanulaceae	Prismatocarpus fruticosus		S
	Asterales	Campanulaceae	Trachelium cesuleum		S
	Asterales	Goodeniaceae	Goodenia ovata	AY053575	
	Asterales	Menyanthaceae	Menyanthes trifoliata		S
	Cornales	Cornaceae	Alangium platanifolium		S
	Cornales	Cornaceae	Cornus foemina		S
	Cornales	Cornaceae	Davidia involucrata		S
	Cornales	Hydrangeaceae	Deutzia gracilia		S
	Cornales	Hydrangeaceae	Hydrangea arborescens		S
	Cornales	Loasaceae	Eucnide hirta		S
	Cornales	Nyssaceae	Camptotheca acuminata		S
	Dipsacales	Adoxaceae	Sambucus canadensis	AF193965	
	Dipsacales	Adoxaceae	Viburnum sp.		S
	Dipsacales	Caprifoliaceae	Lonicera sp.		S
	Dipsacales	Dipsacaceae	Dipsacus sp.		S
	Ericales	Balsaminaceae	Impatiens pallida		S
	Ericales	Clethraceae	Clethra barbineivis		S
	Ericales	Cyrillaceae	Cyrilla racemiflora		S
*	Ericales	Ebenaceae	Diospyros virginiana	AJ223417	
	Ericales	Ericaceae	Andromeda glaucophylla	EU156501	S
	Ericales	Ericaceae	Chamaedaphne calyculata	EU156502	S
*	Ericales	Ericaceae	Pyrola secunda	AJ247582	
*	Ericales	Ericaceae	Pyrola rotundifolia		S
	Ericales	Fouquieriaceae	Idria columnaris		S
*	Ericales	Lecythidaceae	Barringtonia asiatica	AJ247581	
	Ericales	Myrsinaceae	Ardisia sp.		S
	Ericales	Myrsinaceae	Rapanea citrifolia		P
	Ericales	Myrsinaceae	Tapeinosperma viellardii		P
	Ericales	Polemoniaceae	Phlox paniculata	AY053576	
	Ericales	Primulaceae	Primula vulgaris		S
	Ericales	Sapotaceae	Achras zapota		S
	Ericales	Sapotaceae	Planchonella rufocostata		P
	Ericales	Sarraceniaceae	Heliamphora heterodoxa	AY600113	
	Ericales	Sarraceniaceae	Sarracenia flava		S
	Ericales	Styracaceae	Halesia carolina		S
*	Ericales	Symplocaceae	Symplocos paniculata	AJ223435	
	Ericales	Theaceae	Camellia sinensis		S

	Garryales	Aucubaceae	Aucuba japonica var. variegata	S
	Garryales	Eucommiaceae	Eucommia ulmoides	S
*	Gentianales	Apocynaceae	Alstonia plumosa (JM3105)	EU069541 P
*	Gentianales	Apocynaceae	Alyxia loeseneriana (IND-PK429)	EU069542 P
	Gentianales	Apocynaceae	Carissa sp.	EU156496 S
*	Gentianales	Apocynaceae	Hoya lanceolata	AJ247588
*	Gentianales	Apocynaceae	Neisosperma brevituba (IND-JM3240)	EU069543 P
*	Gentianales	Apocynaceae	Nerium oleander	AJ223431
*	Gentianales	Apocynaceae	Ochrosia elliptica (IND-JM3241)	EU069544 P
*	Gentianales	Apocynaceae	Vinca rosea	AJ223423
	Gentianales	Gentianaceae	Nymphoides peltatum	EU156493
	Gentianales	Loganiaceae	Neuburgia neocaledonica	P
*	Gentianales	Loganiaceae	Strychnos spinosa	AJ247596
	Gentianales	Rubiaceae	Asperula sp.	EU156514
	Gentianales	Rubiaceae	Bertiera laxissima (Kew Ref. No. 22347)	EU156533
	Gentianales	Rubiaceae	Calochone redingii (Kew Ref. No. 3355)	EU156534
*	Gentianales	Rubiaceae	Calycosiphonia macrochlamys (Kew Ref. No. 22359)	EU156532
*	Gentianales	Rubiaceae	Coffea arabica	AJ247586
*	Gentianales	Rubiaceae	Coffea magnistipula (Kew Ref. No. 22350)	EU156530
	Gentianales	Rubiaceae	Crucianella sp.	EU156515
	Gentianales	Rubiaceae	Galium sp.	EU156498 S
	Gentianales	Rubiaceae	Gardenia	short sequence P
	Gentianales	Rubiaceae	Hyperacanthus grevei (Kew Ref. No. 22346)	short sequence P
*	Gentianales	Rubiaceae	Ixora sp (Kew Ref. No. 21361)	EU156535
*	Gentianales	Rubiaceae	Ixora sp. Qiu95051	AJ247587
	Gentianales	Rubiaceae	Pentas sp.	EU156516
*	Gentianales	Rubiaceae	Psilanthus melanocarpus (Kew Ref. No. 22353)	EU156531
	Gentianales	Rubiaceae	Psychotria pancheri	P
	Gentianales	Rubiaceae	Scyphiphora hydrophyllaceae (Kew Ref. No. 20032)	short sequence P
*	Lamiales	Acanthaceae	Barleria prionitis	AJ247601
*	Lamiales	Acanthaceae	Justicia americana	AJ247602
*	Lamiales	Acanthaceae	Sanchezia nobilis	AJ223437
*	Lamiales	Acanthaceae	Thunbergia erecta	AJ247603
	Lamiales	Bignoniaceae	Campsis grandiflora	EU156495 S
*	Lamiales	Bignoniaceae	Catalpa fargesii	AJ223411
	Lamiales	Bignoniaceae	Deplanchea speciosa	P
	Lamiales	Bignoniaceae	Pandorea jasminoides	EU156510
	Lamiales	Bignoniaceae	Tecomaria capensis	EU156512
	Lamiales	Byblidaceae	Byblis liniflora	AY600112
*	Lamiales	Calceolariaceae	Calceolaria sp.	AJ247585
	Lamiales	Gesneriaceae	Coronanthera sp.	P
*	Lamiales	Gesneriaceae	Drymonia serrulata	AJ247579
*	Lamiales	Gesneriaceae	Nematanthus hirsutus	AJ247578
	Lamiales	Gesneriaceae	Streptocarpus	EU156506
*	Lamiales	Lamiaceae	Ajuga reptans	AJ247595
	Lamiales	Lamiaceae	Callicarpa sp.	EU156520
*	Lamiales	Lamiaceae	Clerodendrum trichotomum	AJ223414
*	Lamiales	Lamiaceae	Lamium sp. Qiu 95019	AJ223428
*	Lamiales	Lamiaceae	Oxera sp. (JM3229)	EU069545 P
*	Lamiales	Lamiaceae	Physostegia virginiana	AJ247594
*	Lamiales	Lamiaceae	Scutellaria mociniana	AJ247593
*	Lamiales	Lentibulariaceae	Genlisea aurea	AY600088
*	Lamiales	Lentibulariaceae	Genlisea_hispidula	AY600089
*	Lamiales	Lentibulariaceae	Genlisea_violacea	AY600090
*	Lamiales	Lentibulariaceae	Pinguicula ehlersiae	AF482514
*	Lamiales	Lentibulariaceae	Pinguicula_gracilis	AF482515
*	Lamiales	Lentibulariaceae	Pinguicula_grandiflora	AF482516

*	Lamiales	Lentibulariaceae	Pinguicula_gypsicola	AF482517
*	Lamiales	Lentibulariaceae	Pinguicula_sp._Jobson_240	AY600087
*	Lamiales	Lentibulariaceae	Utricularia_adpressa	AF482518
*	Lamiales	Lentibulariaceae	Utricularia_alpina	AF482519
*	Lamiales	Lentibulariaceae	Utricularia_asplundii	AY600091
*	Lamiales	Lentibulariaceae	Utricularia_biloba	AY600092
*	Lamiales	Lentibulariaceae	Utricularia_caerulea	AY600093
*	Lamiales	Lentibulariaceae	Utricularia_costata	AY600094
*	Lamiales	Lentibulariaceae	Utricularia_dichotoma	AY600095
*	Lamiales	Lentibulariaceae	Utricularia_flaccida	AY600096
*	Lamiales	Lentibulariaceae	Utricularia_geminiscapa	AF482520
*	Lamiales	Lentibulariaceae	Utricularia_gibba	AY600097
*	Lamiales	Lentibulariaceae	Utricularia_longifolia	AY600098
*	Lamiales	Lentibulariaceae	Utricularia_meyeri	AY600099
*	Lamiales	Lentibulariaceae	Utricularia_multifida	AY600100
*	Lamiales	Lentibulariaceae	Utricularia_myriocista	AY600101
*	Lamiales	Lentibulariaceae	Utricularia_neottioidea	AY600102
*	Lamiales	Lentibulariaceae	Utricularia_olivacea	AY600103
*	Lamiales	Lentibulariaceae	Utricularia_pubescens	AY128568
*	Lamiales	Lentibulariaceae	Utricularia_striatula	AY600104
*	Lamiales	Lentibulariaceae	Utricularia_subulata	AY600105
*	Lamiales	Lentibulariaceae	Utricularia_triloba	AF482521
*	Lamiales	Lentibulariaceae	Utricularia_violacea	AY600106
	Lamiales	Oleaceae	Forsythia sp.	S
*	Lamiales	Oleaceae	Jasminum polyanthum	AJ247607
	Lamiales	Oleaceae	Olea europaea	AF288707
	Lamiales	Oleaceae	Syringa sp.	S
*	Lamiales	Paulowniaceae	Paulownia tomentosa	AJ247592
*	Lamiales	Pedaliaceae	Sesamum indicum	AJ247598
	Lamiales	Plantaginaceae	Antirrhinum	short sequence P
*	Lamiales	Plantaginaceae	Aragoa abietina (Kew Ref. No. 12226)	EU069508
*	Lamiales	Plantaginaceae	Aragoa cundinmarcensis (Kew Ref. No. 11177)	EU069509
*	Lamiales	Plantaginaceae	Callitriche heterophylla	AJ247577
*	Lamiales	Plantaginaceae	Callitriche stagnalis (Kew Ref. No. 11052)	short sequence P
	Lamiales	Plantaginaceae	Cymbalaria	EU156509
*	Lamiales	Plantaginaceae	Digitalis purpurea	AJ223415
*	Lamiales	Plantaginaceae	Hebe subalpina	AJ223419
	Lamiales	Plantaginaceae	Hippuris vulgaris (Kew Ref. No. 11538)	EU069539
*	Lamiales	Plantaginaceae	Plantago albicans (Kew Ref. No. 9442)	EU069510
*	Lamiales	Plantaginaceae	Plantago alpina (Kew Ref. No. 9401)	EU069511
*	Lamiales	Plantaginaceae	Plantago amplexicaulis (Kew Ref. No. 9429)	EU069512
*	Lamiales	Plantaginaceae	Plantago arenaria (Kew Ref. No. 9390)	EU069513
	Lamiales	Plantaginaceae	Plantago aristata (Kew Ref. No. 9440)	EU069514
*	Lamiales	Plantaginaceae	Plantago atrata	EU069536
	Lamiales	Plantaginaceae	Plantago australis	AJ389608
	Lamiales	Plantaginaceae	Plantago bellardi (Kew Ref. No. 9633)	EU069515
*	Lamiales	Plantaginaceae	Plantago coronopus	AJ389609
*	Lamiales	Plantaginaceae	Plantago crassifolia (Kew Ref. No. 9393)	EU069516
	Lamiales	Plantaginaceae	Plantago cretica (Kew Ref. No. 9583)	EU069517
	Lamiales	Plantaginaceae	Plantago erecta (Kew Ref. No. 9450)	EU069518
*	Lamiales	Plantaginaceae	Plantago lagopus (Kew Ref. No. 9433)	EU069519
*	Lamiales	Plantaginaceae	Plantago lanceolata	EU069537
*	Lamiales	Plantaginaceae	Plantago macrorhiza (Kew Ref. No. 9614)	EU069520
	Lamiales	Plantaginaceae	Plantago major (Kew Ref. No. 11185)	EU069521
*	Lamiales	Plantaginaceae	Plantago maritima (Kew Ref. No. 9432)	EU069522
	Lamiales	Plantaginaceae	Plantago maxima (Kew Ref. No. 11181)	EU069523
	Lamiales	Plantaginaceae	Plantago media	AJ389605

*	Lamiales	Plantaginaceae	Plantago nivalis (Kew Ref. No. 9422)	short sequence	P
*	Lamiales	Plantaginaceae	Plantago ovata (Kew Ref. No. 9631)	EU069524	
	Lamiales	Plantaginaceae	Plantago palmata (Kew Ref. No. 9396)	EU069525	
	Lamiales	Plantaginaceae	Plantago raoulli (Kew Ref. No. 9428)	EU069526	
	Lamiales	Plantaginaceae	Plantago reniformis (Kew Ref. No. 9446)	EU069527	
	Lamiales	Plantaginaceae	Plantago rigida	AJ389607	
	Lamiales	Plantaginaceae	Plantago rugelii	AJ389606	
*	Lamiales	Plantaginaceae	Plantago sarcophylla (Kew Ref. No. 9444)	EU069528	
*	Lamiales	Plantaginaceae	Plantago sempervirens	EU069538	
	Lamiales	Plantaginaceae	Plantago sericea	AJ389613	
*	Lamiales	Plantaginaceae	Plantago serraria (Kew Ref. No. 9613)	EU069529	
	Lamiales	Plantaginaceae	Plantago spathulata (Kew Ref. No. 9584)	EU069530	
*	Lamiales	Plantaginaceae	Plantago subspatulata (Kew Ref. No. 9431)	EU069531	
	Lamiales	Plantaginaceae	Plantago tenuiflora (Kew Ref. No. 11186)	EU069532	
	Lamiales	Plantaginaceae	Plantago tomentosa (Kew Ref. No. 11182)	EU069533	
	Lamiales	Plantaginaceae	Plantago trinitatis (Kew Ref. No. 9612)	EU069534	
	Lamiales	Plantaginaceae	Plantago uniglumis (Kew Ref. No. 9449)	EU069535	
*	Lamiales	Plantaginaceae	Sibthorpia peregrina (Kew Ref. No. 9180)	EU069540	
*	Lamiales	Plantaginaceae	Veronica catenata	AJ223427	
	Lamiales	Scrophulariaceae	Buddleja lindleyana	EU1565308	S
*	Lamiales	Scrophulariaceae	Celsia arturus	AJ247590	
	Lamiales	Scrophulariaceae	Myoporum parvifolium	EU156511	S
*	Lamiales	Scrophulariaceae	Scrophularia nodosa	AJ247591	
	Lamiales	Scrophulariaceae	Verbascum	EU156513	
*	Lamiales	Unplaced	Rehmannia glutinosa	AJ247589	
	Lamiales	Verbenaceae	Petrea valubilis	EU156503	S
*	Solanales	Convolvulaceae	Ipomoea sp.	EU156517	
	Solanales	Solanaceae	Capsicum annuum		S
	Solanales	Solanaceae	Dubosia myoporoides		P
	Solanales	Solanaceae	Nicotiana tabacum	BA000042	
	Solanales	Solanaceae	Petunia x hybrida		S
	Solanales	Solanaceae	Solanum commersonii	AJ582177	
	Solanales	Solanaceae	Solanum lycopersicum	X54738	
	Solanales	Solanaceae	Solanum tuberosum	X83206	
	Unplaced	Boraginaceae	Borago officinalis	EU156518	
	Unplaced	Boraginaceae	Brunnera macrophylla	EU156519	
*	Unplaced	Boraginaceae	Ehretia anacua	AJ247606	
*	Unplaced	Boraginaceae	Heliotropium arborescens	AJ223425	
Caryophyllids					
	Caryophyllales	Aizoaceae	Oscularia sp.		S
	Caryophyllales	Amaranthaceae	Beta vulgaris subsp. vulgaris	X57693	
	Caryophyllales	Amaranthaceae	Celosia cristata		S
	Caryophyllales	Amaranthaceae	Chenopodium sp.		S
	Caryophyllales	Amaranthaceae	Spinacia sp. CLP-2006	DQ317033	
	Caryophyllales	Cactaceae	Notocactus leninghausii		S
	Caryophyllales	Cactaceae	Pereskia grandifolia		S
	Caryophyllales	Caryophyllaceae	Dianthus deltoides		S
	Caryophyllales	Caryophyllaceae	Gypsophila repens	EF547217	
	Caryophyllales	Caryophyllaceae	Silene acaulis	EF547218	
	Caryophyllales	Caryophyllaceae	Silene latifolia	EF547221	
	Caryophyllales	Caryophyllaceae	Silene noctiflora	EF547222	
	Caryophyllales	Caryophyllaceae	Stellaria sp. Qiu	EF547228	
*	Caryophyllales	Droseraceae	Dionaea muscipula	AY600108	
	Caryophyllales	Molluginaceae	Mollugo verticillata		S
	Caryophyllales	Nyctaginaceae	Bougainvillea sp.		S
	Caryophyllales	Nyctaginaceae	Pisonia sp.		P
	Caryophyllales	Phytolaccaceae	Phytolacca americana		S

	Caryophyllales	Plumbaginaceae	Plumbago sp. CLP-2006	DQ317032	
	Caryophyllales	Polygonaceae	Polygonum sp.		S
	Caryophyllales	Portulacaceae	Portulaca sp.		S
	Caryophyllales	Simmondsiaceae	Simmondsia californica		S
	Caryophyllales	Stenospermataceae	Stenosperma halimifolia		S
	Caryophyllales	Tamaricaceae	Tamarix sp.		S
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Rosids					
	Brassicales	Brassicaceae	Arabidopsis thaliana	X94583	
	Brassicales	Brassicaceae	Brassica chinensis		S
	Brassicales	Brassicaceae	Brassica juncea	AY300014	
	Brassicales	Brassicaceae	Brassica napus	AP006444	
	Brassicales	Brassicaceae	Cardamine sp.		S
	Brassicales	Brassicaceae	Raphanus sativus	X57692	
	Brassicales	Caricaceae	Carica papaya		S
*	Celastrales	Celastraceae	Brexia madagascariensis	AJ223413	
	Celastrales	Celastraceae	Euonymus sp		S
	Celastrales	Celastraceae	Salaciopsis tiwakae		P
	Celastrales	Hippocrateaceae	Dicarpellum baillonianum		P
	Celastrales	Hippocrateaceae	Dicarpellum pancheri		P
	Crossosomatales	Crossosomataceae	Crossosoma bigelovii	DQ317034	
	Crossosomatales	Staphyleaceae	Staphylea trifolia		S
	Cucurbitales	Begoniaceae	Begonia dierna		S
	Cucurbitales	Coriariaceae	Coriaria myrtifolia		S
*	Cucurbitales	Cucurbitaceae	Citrullus lanatus cv. Dixielee	EU069546	
*	Cucurbitales	Cucurbitaceae	Cucumis melo cv. Iroquois	EU069547	
*	Cucurbitales	Cucurbitaceae	Cucumis metuliferus cv. PI 526240	EU069548	
	Cucurbitales	Cucurbitaceae	Cucumis sativus	AJ223416	
	Cucurbitales	Cucurbitaceae	Cucurbita pepo	short sequence	P
	Cucurbitales	Cucurbitaceae	Luffa acutangula	EU156499	S
*	Cucurbitales	Cucurbitaceae	Melothria indica (IND-PK333)	EU069549	P
	Cucurbitales	Datisceae	Datisca glomerata		S
	Fabales	Fabaceae	Archidendropsis streptocarpa		P
	Fabales	Fabaceae	Arthroclianthus sp.		P
	Fabales	Fabaceae	Astragalus adsurgens	ABS20104	
	Fabales	Fabaceae	Astragalus membranaceus	EF685985.1	
	Fabales	Fabaceae	Astragalus uliginosus	ABS20100	
	Fabales	Fabaceae	Calliandra inaequilatera		S
	Fabales	Fabaceae	Cercis canadensis		S
	Fabales	Fabaceae	Glycine max	M16884	
	Fabales	Fabaceae	Glycyrrhiza pallidiflora	ABS20103	
	Fabales	Fabaceae	Hedysarum vicioides	ABS20102	
	Fabales	Fabaceae	Medicago lupulina		S
	Fabales	Fabaceae	Medicago truncatula	AC145156	
	Fabales	Fabaceae	Oxytropis anertii	ABS20101	
	Fabales	Fabaceae	Pisum sativum	X14409	
	Fabales	Fabaceae	Vigna radiata	AF338446	
	Fabales	Polygalaceae	Polygala lindheimeri		S
	Fagales	Casuarinaceae	Casuarina litorea		S
	Fagales	Betulaceae	Betula papyrifera	U77620	
	Fagales	Betulaceae	Betula nigra		S
	Fagales	Fagaceae	Castanea pumila		S
	Fagales	Fagaceae	Chrysolepis sempervirens		S
	Fagales	Fagaceae	Quercus alba		S
	Fagales	Junglandaceae	Carya glabra		S
	Fagales	Myricaceae	Myrica cerifera		S
	Geraniales	Geraniaceae	Erodium chrysanthum	DQ317038	
	Geraniales	Geraniaceae	Erodium pelargoniflorum	DQ317039	

Geraniales	Geraniaceae	Erodium trifolium	DQ317040
Geraniales	Geraniaceae	Geranium himalayense	AF193968
Geraniales	Geraniaceae	Geranium macrorrhizum	DQ317035
Geraniales	Geraniaceae	Monsonia emarginata	DQ317036
Geraniales	Geraniaceae	Pelargonium alchemilloides	DQ317046
Geraniales	Geraniaceae	Pelargonium candicans	DQ317043
Geraniales	Geraniaceae	Pelargonium capitatum	DQ317044
Geraniales	Geraniaceae	Pelargonium cotyledonis	DQ317041
Geraniales	Geraniaceae	Pelargonium quercetorum	DQ317045
Geraniales	Geraniaceae	Pelargonium reniforme	DQ317042
Geraniales	Geraniaceae	Pelargonium x hortorum	DQ317047
Geraniales	Geraniaceae	Sarcocaulon vanderietiae	DQ317037
Geraniales	Hypseocharitaceae	Hypseocharis pimpinellifolia	AF193967
Malpighiales	Balanopaceae	Balanops oliviformis	P
Malpighiales	Clusiaceae	Hypericum sp.	S
* Malpighiales	Clusiaceae	Montrouziera cauliflora (IND-PK444)	EU069550 P
Malpighiales	Erythroxylaceae	Erythroxylum coca	S
* Malpighiales	Euphorbiaceae	Acalypha sp. Qiu95079	AJ247597
* Malpighiales	Euphorbiaceae	Codiaeum peltatum (IND-JM3246)	EU069551 P
* Malpighiales	Euphorbiaceae	Croton sp. Qiu 94027	AJ247608
* Malpighiales	Euphorbiaceae	Euphorbia milii	AJ223418
* Malpighiales	Euphorbiaceae	Hevea brasiliensis	AJ223436
* Malpighiales	Euphorbiaceae	Hura crepitans	AJ247584
* Malpighiales	Linaceae	Linum sp. Qiu96175	AJ247604
* Malpighiales	Malpighiaceae	Malpighia glabra	AJ223433
Malpighiales	Passifloraceae	Passiflora suberosa	S
* Malpighiales	Phyllanthaceae	Breynia nivosa	AJ247605
Malpighiales	Phyllanthaceae	Cleistanthus stipitatus	P
* Malpighiales	Phyllanthaceae	Phyllanthus gneissicus (IND-JM3235)	EU069552 P
Malpighiales	Salicaceae	Populus tremuloides	U77623
Malpighiales	Salicaceae	Lasiochlamys cordifolia	P
Malpighiales	Salicaceae	Salix sp.	S
Malpighiales	Trigoniaceae	Trigonia sp.	EU156507
* Malpighiales	Violaceae	Hybanthus sp. (IND-JM3091)	EU069553 P
* Malpighiales	Violaceae	Viola sp. Qiu95018	AJ247600
* Malvales	Dipterocarpaceae	Shorea talura	AJ247599
Malvales	Malvaceae	Abutilon theophrastii	S
Malvales	Malvaceae	Quararibea aterolepis	S
Malvales	Malvaceae	Theobroma cacao	S
Malvales	Sterculiaceae	Acropogon macrocarpus	P
Myrtales	Lythraceae	Punica granatum	S
Myrtales	Melastomataceae	Melastoma denticulatum	P
Myrtales	Myrtaceae	Callistemon lanceolatus	S
Myrtales	Myrtaceae	Carpolepis sp.	P
Myrtales	Myrtaceae	Eucalyptus cinerea	S
Myrtales	Myrtaceae	Eugenia sp.	P
Myrtales	Myrtaceae	Eugenia uniflora	S
Myrtales	Myrtaceae	Metrosideros brevistylis	P
Myrtales	Myrtaceae	Psidium guajava	S
Myrtales	Myrtaceae	Stereocaryum sp.	P
Myrtales	Myrtaceae	Syzygium aoupinianum	P
Myrtales	Onagraceae	Fuchsia sp.	S
Myrtales	Onagraceae	Oenothera berteriana	X05465
Myrtales	Onagraceae	Oenothera biennis	AF020571
Myrtales	Onagraceae	Oenothera organensis	S
Myrtales	Vochysiaceae	Vochysia sp.	S
Oxalidales	Cephalotaceae	Cephalotus follicularis	AY600111

	Oxalidales	Cunoniaceae	<i>Acsmithia brongniartiana</i>	P
	Oxalidales	Cunoniaceae	<i>Cunonia pulchella</i>	P
	Oxalidales	Cunoniaceae	<i>Geissois hippocastaneifolia</i>	P
	Oxalidales	Cunoniaceae	<i>Weinmannia serrata</i>	P
	Oxalidales	Elaeocarpaceae	<i>Elaeocarpus dognyensis</i>	P
	Oxalidales	Elaeocarpaceae	<i>Elaeocarpus angustifolius</i>	P
	Oxalidales	Oxalidaceae	<i>Oxalis</i> sp.	S
	Rosales	Cannabaceae	<i>Humulus lupulus</i>	short sequence S
	Rosales	Elaeagnaceae	<i>Elaeagnus</i> sp.	EU156497
	Rosales	Moraceae	<i>Ficus habrophylla</i>	P
	Rosales	Moraceae	<i>Ficus diversifolia</i>	S
	Rosales	Moraceae	<i>Morus alba</i>	S
	Rosales	Rosaceae	<i>Malus domestica</i>	S
	Rosales	Rosaceae	<i>Prunus serotina</i>	S
*	Rosales	Rhamnaceae	<i>Bathiorhamnus cryptophorus</i> (Kew Ref. No. 2386)	EU069557
	Rosales	Rhamnaceae	<i>Ceanothus</i> sp.	short sequence P
	Rosales	Rhamnaceae	<i>Condalia microphylla</i> (Kew Ref. No. 2383)	EU069556
	Rosales	Rhamnaceae	<i>Discaria chacaye</i> (Kew Ref. No. 914)	EU156529
*	Rosales	Rhamnaceae	<i>Frangula alnus</i> (Kew Ref. No. 1815)	EU156521
*	Rosales	Rhamnaceae	<i>Hovenia dulcis</i>	AJ247583
	Rosales	Rhamnaceae	<i>Karwinskia kumboldtiana</i> (Kew Ref. No. 2382)	EU156522
*	Rosales	Rhamnaceae	<i>Maesopsis eminii</i> (Kew Ref. No. 1338)	EU069554
*	Rosales	Rhamnaceae	<i>Nesiotia elliptica</i> (Kew Ref. No. 500)	EU156528
*	Rosales	Rhamnaceae	<i>Paliurus spina-christi</i> (Kew Ref. No. 969)	EU156525
*	Rosales	Rhamnaceae	<i>Phylica emirnenensis</i> (Kew Ref. No. 19156)	EU069555
*	Rosales	Rhamnaceae	<i>Rhamnella franguloides</i> (Kew Ref. No. 912)	EU156523
*	Rosales	Rhamnaceae	<i>Rhamnus alpina</i> (Kew Ref. No. 8482)	short sequence P
*	Rosales	Rhamnaceae	<i>Rhamnus cathartica</i>	AJ223422
	Rosales	Rhamnaceae	<i>Trymalium cf. floribundum</i> (Kew Ref. No. 2185)	EU156527
	Rosales	Rhamnaceae	<i>Ventilago leiocarpa</i> (Kew Ref. No. 2575)	EU156524
*	Rosales	Rhamnaceae	<i>Ziziphus ornata</i> (Kew Ref. No. 2117)	EU156526
	Rosales	Ulmaceae	<i>Celtis yunnanensis</i>	S
	Rosales	Ulmaceae	<i>Ulmus thomsii</i>	S
	Rosales	Urticaceae	<i>Boehmeria nivea</i>	short sequence S
*	Rosales	Urticaceae	<i>Pilea fontana</i>	AJ247580
	Sapindales	Anacardiaceae	<i>Rhus radicans</i>	EU156505 S
*	Sapindales	Burseraceae	<i>Bursera</i> sp. Qiu 94206	AJ223412
	Sapindales	Burseraceae	<i>Canarium cf. trifoliolatum</i>	P
*	Sapindales	Meliaceae	<i>Dysoxylum canalense</i> (IND-10003)	EU069558 P
*	Sapindales	Meliaceae	<i>Melia toosendan</i>	AJ223420
	Sapindales	Rutaceae	<i>Citrus limon</i>	S
	Sapindales	Rutaceae	<i>Picrella glandulosa</i>	P
	Sapindales	Rutaceae	<i>Triphasia trifolia</i>	S
	Sapindales	Rutaceae	<i>Zanthoxylum</i> sp.	P
	Sapindales	Sapindaceae	<i>Acer saccharum</i>	EU156500 S
	Sapindales	Sapindaceae	<i>Aesculus pavia</i>	S
	Sapindales	Sapindaceae	<i>Cupaniopsis macrocarpa</i>	P
	Sapindales	Sapindaceae	<i>Cupaniopsis oedipoda</i>	P
	Sapindales	Sapindaceae	<i>Gongrodiscus sufferrugineus</i>	P
	Sapindales	Sapindaceae	<i>Podonophelium</i> sp.	P
	Sapindales	Sapindaceae	<i>Storthocalyx</i> sp.	P
*	Sapindales	Simaroubaceae	<i>Leitneria floridana</i>	EU156504 S
Stem Eudicots				
	Buxales	Buxaceae	<i>Buxus</i> sp. Qiu 94069	AF193962
	Buxales	Buxaceae	<i>Pachysandra procumbens</i>	S
	Dilleniales	Dilleniaceae	<i>Tetracera billardieri</i>	P
	Proteales	Nelumbonaceae	<i>Nelumbo lutea</i>	AY009447

	Proteales	Nelumbonaceae	Nelumbo nucifera	AF193950	
	Proteales	Platanaceae	Platanus occidentalis	AY009450	
	Proteales	Proteaceae	Beauprea filipes		P
	Proteales	Proteaceae	Grevillea robusta	AY009449	
	Proteales	Proteaceae	Sleumerodendron austrocaledonicum		P
	Ranunculales	Berberidaceae	Mahonia bealei		S
	Ranunculales	Berberidaceae	Podophyllum peltatum		S
	Ranunculales	Eupteleaceae	Euptelea polyandra	AF193963	
	Ranunculales	Fumariaceae	Dicentra sp.		S
	Ranunculales	Fumariaceae	Pseudofumaria lutea	AY009441	
	Ranunculales	Lardizabalaceae	Akebia quinata	AY009429	
	Ranunculales	Menispermaceae	Cissampelos parrira		S
	Ranunculales	Menispermaceae	Cocculus trilobus		S
	Ranunculales	Menispermaceae	Hypserpa neocaledonica		P
	Ranunculales	Papaveraceae	Bocconia frutescens		S
	Ranunculales	Papaveraceae	Sanguinaria canadensis		S
	Ranunculales	Ranunculaceae	Clematis sp. Qiu 95085	AF193960	
	Ranunculales	Ranunculaceae	Ranunculus carolinianus	AY009451	
	Ranunculales	Ranunculaceae	Ranunculus sp. Qiu 95024	DQ317030	
	Ranunculales	Ranunculaceae	Xanthorhiza simplicissima		S
*	Santalales	Opiliaceae	Lepionurus sylvestris	AJ223439	
	Saxifragales	Cercidiphyllaceae	Cercidiphyllum japonicum		S
	Saxifragales	Daphniphyllaceae	Daphniphyllum sp.		S
	Saxifragales	Grossulariaceae	Ribes sp.		S
	Saxifragales	Haloragaceae	Myriophyllum sp.		S
	Saxifragales	Hamamelidaceae	Corylopsis gotoana		S
	Saxifragales	Hamamelidaceae	Distylium racemosus		S
	Saxifragales	Hamamelidaceae	Hamamelis mollis		S
	Saxifragales	Hamamelidaceae	Liquidambar styraciflua		S
	Saxifragales	Hamamelidaceae	Loropetalum chinense		S
	Saxifragales	Hamamelidaceae	Mytilaria laeensis		S
	Saxifragales	Iteaceae	Itea virginica		S
	Saxifragales	Paeoniaceae	Paeonia lactiflora		S
	Saxifragales	Saxifragaceae	Heuchera sp.		S
	Saxifragales	Saxifragaceae	Saxifraga sarmentosa		S
	Trochodendrales	Tetracentraceae	Tetracentron sinense	AY009455	
	Trochodendrales	Trochodendraceae	Trochodendron aralioides	AF020581	
	Unplaced	Sabiaceae	Sabia sp.		S
	Vitales	Vitaceae	Vitis sp.		S
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Magnoliids					
	Canellales	Canellaceae	Canella winterana	AY009437	
	Canellales	Winteraceae	Belliolum pauciflora		S
	Canellales	Winteraceae	Drimys winteri	AY009443	
	Canellales	Winteraceae	Zygogynum stipitatum		P
	Laurales	Calycanthaceae	Calycanthus floridus	AY009436	
	Laurales	Calycanthaceae	Idiospermum australiense		S
	Laurales	Hernandiaceae	Gyrocarpus sp.		S
	Laurales	Lauraceae	Cinnamomum verum	AY009440	
	Laurales	Lauraceae	Cinnamomum camphora		S
	Laurales	Lauraceae	Endiandra sp.		P
	Laurales	Lauraceae	Laurus nobilis	AF193956	
	Laurales	Monimiaceae	Hedycarya sp		P
	Laurales	Monimiaceae	Hedycarya arborea		S
	Magnoliales	Annonaceae	Annona muricata		S
*	Magnoliales	Annonaceae	Asimina triloba	AY009433	
	Magnoliales	Annonaceae	Cananga odorata		S
	Magnoliales	Annonaceae	Polyalthia suberosa	AF193957	

	Magnoliales	Degeneriaceae	Degeneria sp		S
	Magnoliales	Eupomatiaceae	Eupomatia bennetti		S
	Magnoliales	Eupomatiaceae	Eupomatia laurina	AY009444	
	Magnoliales	Himantandraceae	Galbulimima belgraveana		S
	Magnoliales	Magnoliaceae	Liriodendron tulipifera	AF193959	
	Magnoliales	Magnoliaceae	Magnolia grandiflora	AF020568	
	Magnoliales	Magnoliaceae	Magnolia stellata	U77622	
	Magnoliales	Magnoliaceae	Magnolia tripetala		S
	Magnoliales	Magnoliaceae	Talauma singaporensis		S
*	Magnoliales	Myristicaceae	Knema latericia	AJ223430	
*	Magnoliales	Myristicaceae	Myristica fragrans	AJ223434	
	Piperales	Aristolochiaceae	Asarum canadense	AY009432	
	Piperales	Aristolochiaceae	Saruma henryi		S
	Piperales	Lactoridaceae	Lactoris fernandeziana	AY009446	
*	Piperales	Piperaceae	Peperomia cubensis	AF029783	
*	Piperales	Piperaceae	Peperomia griseoargentea	AF029781	
*	Piperales	Piperaceae	Peperomia obtusifolia	AF029782	
*	Piperales	Piperaceae	Peperomia polybotrya	X94594	
	Piperales	Piperaceae	Piper bicolor	AY009448	
	Piperales	Piperaceae	Piper betle		S
	Piperales	Piperaceae	Piper comptonii		P
	Piperales	Saururaceae	Saururus chinensis	AY009452	
Chloranthales					
	Chloranthales	Chloranthaceae	Ascarina solmsiana		P
	Chloranthales	Chloranthaceae	Chloranthus spicatus	AY009439	
	Chloranthales	Chloranthaceae	Sarcandra grandifolia	AF193958	
Monocots					
	Acorales	Acoraceae	Acorus calamus	AF193944	
	Alismatales	Alismataceae	Echinodorus radicans		S
*	Alismatales	Araceae	Amorphophallus konjac	AJ007548	
	Alismatales	Araceae	Anthurium scherzerianum	AJ007551	
*	Alismatales	Araceae	Arisaema triphyllum	AY009454	
	Alismatales	Araceae	Dieffenbachia sp. Qiu 96007	AJ007549	
	Alismatales	Araceae	Lemna gibba	Cho et al 1999	
	Alismatales	Araceae	Orontium aquaticum	AJ007554	
	Alismatales	Araceae	Peltandra virginica	AJ007550	
*	Alismatales	Araceae	Philodendron oxycardium	AJ223438	
*	Alismatales	Araceae	Pistia stratiotes	AJ007546	
	Alismatales	Araceae	Scindapsus aureus	AJ007552	
	Alismatales	Araceae	Spathiphyllum clevelandii		S
	Alismatales	Araceae	Spathiphyllum wallisii	AJ007554	
*	Alismatales	Araceae	Xanthosoma mafaffa	AJ223807	
*	Alismatales	Araceae	Zamioculcas zamiifolia	AJ007547	
	Alismatales	Araceae	Zantedeschia aethiopica	AJ007555	
	Alismatales	Hydrocharitaceae	Anacharis sp		S
	Alismatales	Hydrocharitaceae	Vallisneria americana		S
	Arecales	Arecaceae	Chamaedorea tenella		S
	Arecales	Arecaceae	Chamaerops humilis	U77621	
	Arecales	Arecaceae	Cocos nucifera		S
	Arecales	Arecaceae	Phoenix dactylifera	AY166800	
	Arecales	Arecaceae	Raphis sp.		S
	Arecales	Arecaceae	Sabal palmetto	U77624	
	Asparagales	Agavaceae	Agave attenuata		S
	Asparagales	Agavaceae	Cordyline terminalis		S
	Asparagales	Alliaceae	Allium cepa		S
	Asparagales	Alliaceae	Allium sativum	AF356823	
	Asparagales	Amaryllidaceae	Clivia miniata		S

Asparagales	Amaryllidaceae	Crinum asiaticum	P
Asparagales	Amaryllidaceae	Sprekelia formosissima	S
Asparagales	Asparagaceae	Asparagus officinalis	S
Asparagales	Hemerocallidaceae	Eustrephus latifolius	P
Asparagales	Hemerocallidaceae	Hemerocallis sp.	S
Asparagales	Hyacinthaceae	Hosta sp.	S
Asparagales	Iridaceae	Belamcanda chinensis	S
Asparagales	Iridaceae	Iris sp.	S
Asparagales	Orchidaceae	Bulbophyllum aff. Baladeanum	P
Asparagales	Orchidaceae	Calanthe sp.	P
Asparagales	Orchidaceae	Ceratostylis micrantha	P
Asparagales	Orchidaceae	Dendrobium cf. muricatum	P
Asparagales	Orchidaceae	Glomera macdonaldii	P
Asparagales	Orchidaceae	Grastidium camaridiorum	P
Asparagales	Orchidaceae	Liparis condylobulbon	P
Asparagales	Orchidaceae	Oberonia ensiformis	P
Asparagales	Orchidaceae	Oncidium sphacelatum	S
Asparagales	Orchidaceae	Phalaenopsis sp.	S
Asparagales	Ruscaceae	Danae racemosa	S
Asparagales	Ruscaceae	Dracaena godseffiana	S
Asparagales	Ruscaceae	Polygonatum sp.	S
Asparagales	Ruscaceae	Ruscus hypoglossum	S
Commelinales	Commelinaceae	Tradescantia sp.	S
Commelinales	Haemodoraceae	Anigozanthos sp.	S
Commelinales	Pontederiaceae	Eichhornia crassipes	S
Dioscoreales	Dioscoreaceae	Dioscorea mexicana	AY009442
Liliales	Melanthiaceae	Trillium sp.	S
Liliales	Smilacaceae	Smilax purpurata	P
Pandanales	Pandanaceae	Freycinetia monticola	P
Pandanales	Pandanaceae	Pandanus veitchii	S
Pandanales	Pandanaceae	Pandanus sp.	P
Poales	Bromeliaceae	Guzmania lingulata	S
Poales	Cyperaceae	Cyperus alternifolia	S
Poales	Flagellariaceae	Flagellaria indica	P
Poales	Joinvilleaceae	Joinvillea ascendens subsp. ascendens	P
Poales	Joinvilleaceae	Joinvillea plicata	P
Poales	Juncaceae	Juncus sp.	S
Poales	Poaceae	Aegilops columnaris	U46764
Poales	Poaceae	Avena sativa	P
Poales	Poaceae	Bromus inermis	P
Poales	Poaceae	Chionochloa flavescens	P
Poales	Poaceae	Coix lacryma-jobi	DQ646384
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Poales	Poaceae	Cortaderia seloana	P
Poales	Poaceae	Cortaderia splendens	P
Poales	Poaceae	Danthonia spicata	P
Poales	Poaceae	Dendrocalamus strictus	S
Poales	Poaceae	Elymus sibiricus	AJ296026
Poales	Poaceae	Eragrostis curvula	P
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Poales	Poaceae	Karoochloa purpurea	P
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Poales	Poaceae	Litachne pauciflora	P
Poales	Poaceae	Mersmuellera papposa	P

	Poales	Poaceae	Merxmullera decora		P
	Poales	Poaceae	Notochloe microdon		P
	Poales	Poaceae	Oryza sativa	BA000029	
	Poales	Poaceae	Pariana radiculiflora		P
	Poales	Poaceae	Pennisetum alopecuroides		P
	Poales	Poaceae	Pentameris macrocalycina		P
	Poales	Poaceae	Pentaschistis aspera		P
	Poales	Poaceae	Phragmites australis		P
	Poales	Poaceae	Plinthanthesis paradoxa		P
	Poales	Poaceae	Secale cereale	AM050161	
	Poales	Poaceae	Setaria poiretiana		P
	Poales	Poaceae	Sorghum bicolor	M14453	
	Poales	Poaceae	Thysanolaena maxima		P
	Poales	Poaceae	Triticum aestivum	AP008982	
	Poales	Poaceae	Zea mays	AY506529	
	Poales	Typhaceae	Typha sp.		S
	Poales	Restionaceae	Chondropetalum tectorum		P
	Poales	Restionaceae	Elegia repens		P
	Zingiberales	Cannaceae	Canna paniculata	AY673037	
	Zingiberales	Costaceae	Costus pulverulentus	AY673038	
	Zingiberales	Costaceae	Costus speciosus		S
	Zingiberales	Heliconiaceae	Heliconia irrasa	AY673039	
	Zingiberales	Lowiaceae	Orchidantha fimbriata	AY673041	
	Zingiberales	Marantaceae	Ataenidia conferta	AY673012	
	Zingiberales	Marantaceae	Calathea metallica	AY673014	
	Zingiberales	Marantaceae	Calathea micans	AY673015	
	Zingiberales	Marantaceae	Calathea rufibarba	AY673016	
	Zingiberales	Marantaceae	Calathea warszewiczii	AY673017	
	Zingiberales	Marantaceae	Cominsia gigantea	AY673018	
*	Zingiberales	Marantaceae	Ctenanthe setosa	AY673019	
	Zingiberales	Marantaceae	Donax canniformis	AY673020	
	Zingiberales	Marantaceae	Haumania sp. Harris 6672	AY673021	
	Zingiberales	Marantaceae	Hypselodelphys sp. Harris 6670	AY673022	
	Zingiberales	Marantaceae	Ischnosiphon helenae	AY673023	
*	Zingiberales	Marantaceae	Maranta bicolor	AY673024	
*	Zingiberales	Marantaceae	Maranta leuconeura	AJ223432	
	Zingiberales	Marantaceae	Marantochloa purpurea	AY673025	
*	Zingiberales	Marantaceae	Monotagma laxum	AY673026	
	Zingiberales	Marantaceae	Phrynium imbricatum	AY673027	
	Zingiberales	Marantaceae	Pleiostachya pruinosa	AY673029	
*	Zingiberales	Marantaceae	Saranthe sp. Kress 96-5737	AY673030	
*	Zingiberales	Marantaceae	Saranthe leptostachya (Kew Ref. No. 3866)	EU069559	
	Zingiberales	Marantaceae	Sarcophrynium brachystachys	AY673031	
	Zingiberales	Marantaceae	Schumannianthus dichotomus	AY673032	
	Zingiberales	Marantaceae	Schumannianthus virgatus	AY673033	
	Zingiberales	Marantaceae	Stachyphrynium repens	AY673028	
	Zingiberales	Marantaceae	Thalia geniculata	AY673034	
	Zingiberales	Marantaceae	Thaumatococcus daniellii	AY673035	
	Zingiberales	Marantaceae	Trachyphrynium braunianum	AY673036	
*	Zingiberales	Musaceae	Musa acuminata	AJ247609	
*	Zingiberales	Musaceae	Musella lasiocarpa	AY673040	
	Zingiberales	Strelitziaceae	Phenakospermum guyanense	AY673042	
	Zingiberales	Strelitziaceae	Strelitzia reginae	EU069571	S
	Zingiberales	Zingiberaceae	Aframomum angustifolium	EU069560	
*	Zingiberales	Zingiberaceae	Boesenbergia rotunda	EU069561	
	Zingiberales	Zingiberaceae	Burbridgea nitida	EU069562	
	Zingiberales	Zingiberaceae	Curcuma longa	EU069563	

*	Zingiberales	Zingiberaceae	Gagnepainia godefroyi	EU069564
*	Zingiberales	Zingiberaceae	Globba sessiliflora	EU069565
*	Zingiberales	Zingiberaceae	Hedychium coronarium	AJ223426
*	Zingiberales	Zingiberaceae	Kaempferia rotunda	EU069566
	Zingiberales	Zingiberaceae	Plagiostachys sp.	EU069567
	Zingiberales	Zingiberaceae	Reidelia sp.	EU069568
*	Zingiberales	Zingiberaceae	Siphonochilus decorus	AY673043
	Zingiberales	Zingiberaceae	Smithatris myanmarensis	EU069569
	Zingiberales	Zingiberaceae	Tamijia sp.	EU069570
Ceratophyllales				
	Ceratophyllales	Ceratophyllaceae	Ceratophyllum demersum	AY009438
Stem Angiosperms				
	Amborellales	Amborellaceae	Amborella trichopoda	AY009430
	Austrobaileyales	Austrobaileyaceae	Austrobaileya scandens	AY009434
	Austrobaileyales	Schisandraceae	Illicium lanceolatum	AY009445
	Austrobaileyales	Schisandraceae	Kadsura japonica	AF193952
	Austrobaileyales	Schisandraceae	Schisandra henryi	AY009453
	Austrobaileyales	Schisandraceae	Schisandra sphenanthera	AF193951
	Austrobaileyales	Trimeniaceae	Trimenia sp. CCWD-2000	AY009456
	Nymphaeales	Cabombaceae	Brasenia schreberi	S
	Nymphaeales	Cabombaceae	Cabomba caroliniana	AY009435
	Nymphaeales	Cabombaceae	Cabomba sp. Palmer 688	AF193949
	Nymphaeales	Nymphaeaceae	Euryale sp. Palmer 790	AF193947
	Nymphaeales	Nymphaeaceae	Nuphar sp. Palmer 689	AF193948
	Nymphaeales	Nymphaeaceae	Nymphaea odorata	AF020570
	Nymphaeales	Nymphaeaceae	Victoria cf. amazonica	AF193946

a- GenBank accession numbers are given for those taxa for which cox1 sequences are available. New sequences are shown in bold.

P- indicates that cox1 intron presence/absence data come from PCR survey (this study)

S indicates that cox1 intron presence/absence data come from Southern blots (Cho et al 1998)

* Asterisks indicate cox1 intron presence.

Figure S1

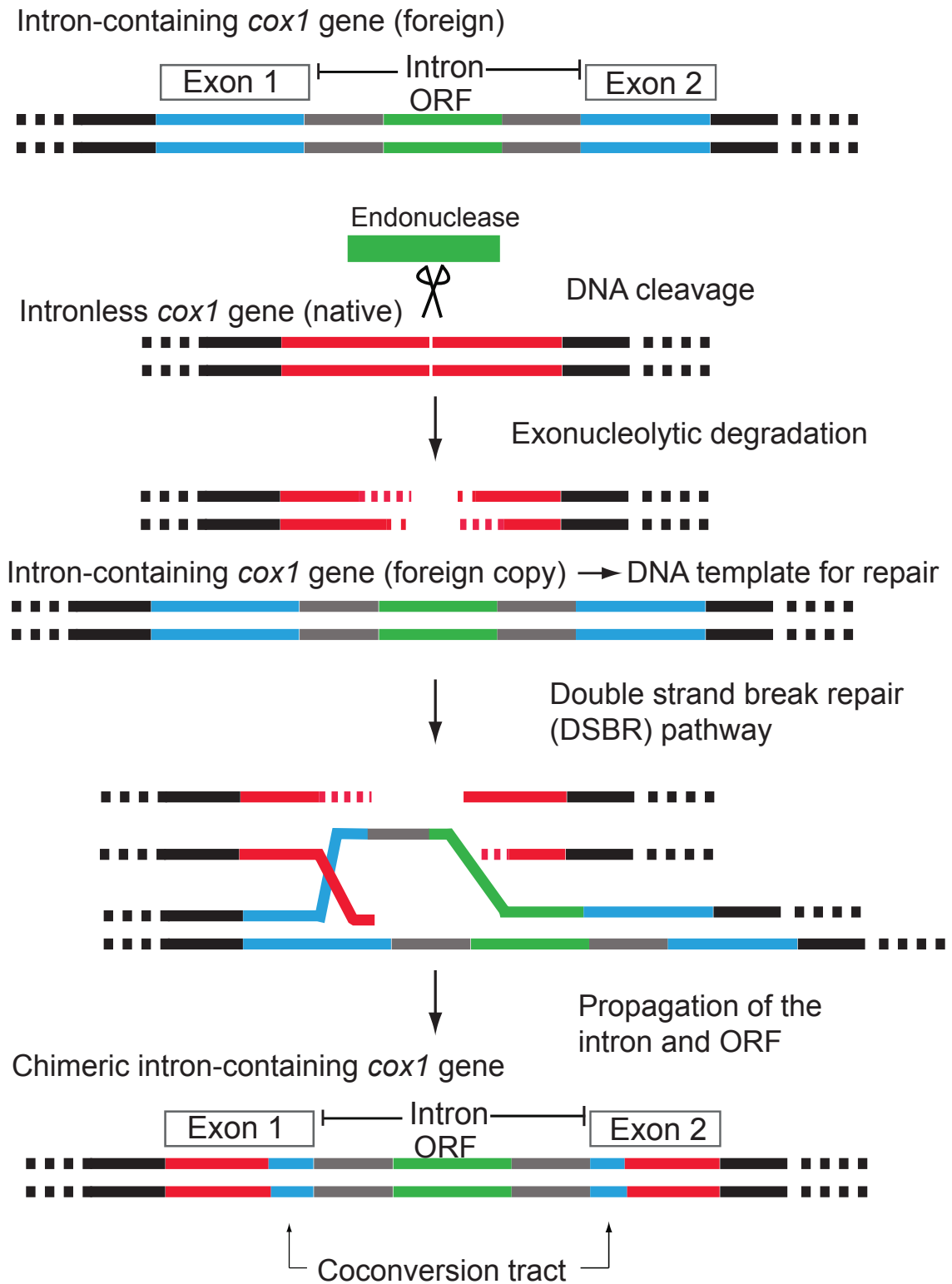


Figure S2

	COX1 EXON 1	INTRON	INSERTION SITE	COX1 EXON 2
NYMPnymp Nuphar_sp_Palmer_689	GGAGACCCCA TATTATACCA GCATCTCTTT CGGTTCTTCC	GT-----	CATCCAGAGG	TGTATATTC CATTCCGCCT GGATTCGGTA TCATAAGT
AMBoambo Amborella trichopoda	.....T.....C.....			.....T.....C.....
NYMPcabo Cabomba_caroliniana_M	..G...T.....			.....T.....
NYMPcabo Cabomba_sp	.....G.....			.....T...C.....
NYMPcabo Cabomba_sp_Palmer_68	..G...T.T.....			.....T.....
NYMPnymp Euryale_sp_Palmer_79	.....T.....			.....T.....
NYMPnymp Nymphaea odorata	.....T.....			.....T.....
NYMPnymp Victoria_cf_amazonic	.....T.....			.....T.....
AUSTaust Austrobaileya	.....T.....			.....T.....
AUSTschi Illicium lanceolatum	.....T.....			.....C.....
AUSTschi Kadsura japonica	.....T.....			.....A...C.....
AUSTschi Schisandra henryi	.....T.....			.....A...C.....
AUSTschi Schisandra sphenanthe	.....T.....			.....A...C.....
AUSTtrim Trimenia_sp.	.....T.....			.....C.....
CERAcera Ceratophyllum	.....T.....			.....T.....
CHLOchlo Chloranthus spicatus	.....G.....			.....C.....
CHLOchlo Sarcandra grandifolia	.....A...G.....			.....C.....
CANcane Canella winterana	.....T.....			.....C...T...T.....
CANewint Drimys winteri	.....T.....			.....T.....C.....
PIPEaris Asarum canadense	.....T.....			.....T.....
PIPElact Lactoris	.....T.....			.....T.....C.....
PIPEpipe Piper bicolor	.....A.....			.....T...CT.....
PIPEpipe Peperomia cubensis	.....A.....			.....C.T.A.....T...CT.....
PIPEsaur Saururus chinensis	.....A.....			.....T.....C.....
LAURcaly Calycanthus floridus	.....T.....			.....T.....
LAURLaur Cinnamomum	.....T.....			.....C.....
LAURLaur Laurus nobilis	.....T.....			.....C.....
MAGNmagn Liriodendron	.....T.....			.....T.....C.....
MAGNmagn Magnolia grandiflora	.....T.....			.....T.....C.....
MAGNmagn Magnolia stellata	.....T.....			.....T.....C.....
MAGNMyri Asimina triloba	.....C.T.A.....T.C.C.C.T.....			.....T.....C.....
MGNMyris Knema latericia	.....C.T.A.....T.C.C.C.T.....			.....T.....C.....
MAGNMyris Myristica fragrans	.....C.T.A.....T.C.C.C.T.....			.....T.....C.....
MAGNanno Polyalthia suberosa	.....C.T.A.....T.....			.....T.....C.....
MAGNeupo Eupomatia laurina	.....C.....			.....T.....C.....
ACORacor Acorus calamus	.....A...C.....A...T...T.....			.....C...T...T.....T.....
ALISalis Alisma	.....T.....			.....T...T.....T.T.T.....
ALISarac Anthurium	.....T.....			.....T...C.....T.T.T.....
ALISarac Dieffenbachia	.....T.....			.....T...T.....T.T.T.....
ALISarac Zantedeschia aethiopica	.....AT...TA.....			.....T.....A...T.T.T.....
ALISarac Amorphophallus rivieri	.....C.T.A.....T.C.C.C.T.....			.....T.....T.T.T.....
ALISarac Xanthosoma mafaffa	.....C.....A.....			.....T.....T.T.T.....
ALISarac Philodendron oxycardium	.....T.....C.T.A.....			.....T.....T.T.T.....
ALISarac Arisaema triphyllum	.....C.T.A.....T.C.C.C.T.....			.....T.....T.T.T.....
ALISarac Zamioculcas zamiifolia	.....C.T.A.....T.C.C.C.T.....			.....T.....T.T.T.....
ALISarac Pistia stratiotes	.....T.....C.T.A.....T.C.C.C.T.....			.....T...G.....T.T.T.....
ALISarac Orontium aquaticum	.....T.....			.....T.....C.....T.T.T.....
ALISarac Peltandra virginica	.....T.....			.....T.....T.T.T.....
ALISarac Scindapsus aureus	.....T.....			.....T.....T.T.T.....
ALISarac Spathiphyllum wallisi	.....T.....			.....T.....T.T.T.....
DIOsdios DioscoreaT.....		T...A...C.....T.T.T.....
ZINcos CostusT.....		T.....C.....T.T.T.....
ZINlow Orchidantha fimbriataT.....		T.....C.....T.T.T.....
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ZINzin Siphonochilus decorusC...T.....		T.....C.C.C.T.....T.T.T.....
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ZINzin BurbidgiaT.....		T.....T.....T.T.T.....
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ZINzin BoesenbergiaT.....C.T.A.....T.....T.....		T.....T.T.T.....
ZINzin GlobbaT.....C.T.A.....T.....T.....		T.....T.T.T.....
ZINzin GagnepainiaT.....C.T.A.....T.....T.....		T.....T.T.T.....
ZINnmar Saranthe leptostachya	.....C.T.....			.....T.....C.....T.T.T.....
ZINnmar Saranthe_sp	.....C.T.....			.....T.....C.....T.T.T.....
ZINnmar Marantal euconeura	.....C.T.A.....T.C.C.C.T.....			.....T.....C.....T.T.T.....
ZINnmar Monotagma laxum	.....C.T.A.....T.C.C.C.T.....			.....T.....C.....T.T.T.....
ZINnmar Ctenanthe setosaC.T.A.....T.C.C.C.T.....		T.....C.....T.T.T.....
ZINnmar Calathea warscewicziiT.....		T.....C.....T.T.T.....
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ZINnmar Thaumtococcus danielliiT.....		T.....C.....T.T.T.....
ZINnmar Maranta bicolorC.T.A.....T.C.C.C.T.....		T.....C.....T.T.T.....
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ZINnmar Marantochloa purpureaT.....		T.....C.....T.T.T.....
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ZINnmar HaumaniaT.....		T.....C.....T.T.T.....
ZINnmar Donax canniformisT.....		T.....C.....T.T.T.....
ZINnmar Ataenidia confertaT.....		T.....C.....T.T.T.....
ZINnmar Stachyphrynium repens	.....C.....			.....T.....C.....T.T.T.....
ZINnmar Cominsia giganteaT.....		T.....C.....T.T.T.....
ZINnmar Phrynium imbricatumT.....		T...CT.....T.T.T.....
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ASPorc CalantheG.....		T.....C.....T.T.T.....
ASPorc DendrobiumG.....		A...T.....C.....T.T.T.....
ASPorc BulbophyllumG.....		T.....C.....T.T.T.....
ASPorc CeratostylisG.....		A...T.....C.....T.T.T.....
ASPorc DendrobiumG.....		T.....C.....T.T.T.....
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ARECarec Phoenix dactyliferaT.....		T.....C.....T.T.T.....
ARECarec Sabal palmettoT.....		T.....C.....T.T.T.....
POALpoac Aegilops colummarisA.....T.....		T.....T.....T.T.T.....

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Printed: Tuesday, May 27, 2008 12:15:56 PM

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Arecaceae	00
Musa	11
Musella	11
'Strelizia+'	00
Heliconia	00
Siphonochilus	11
Tamijia	00
Globba	11
Gagnepainia	11
Boesenbergia	11

Hedychium	11
Kaempferia	11
Smithatris	00
Curcuma	00
Afamomum_etal	00
Costus	00
Monotagma	11
'Ischnosiphon+'	00
Haumania	00
Sarcophyllum_etal	00
Stachyphrynum_etal	00
MarantaClade	11
Thalia_etal	00
Canna	00
Canellales	00
Paulownia	11
Rehmannia	11
Petrea	00
Sesamum	11
Callicarpa	00
Lamiaceae	11
Tecomaria	00
Catalpa	11
Deplanchea_etal	00
Pandorea	00
Acanthaceae	11
Celsia	11
Scrophularia	11
Verbascum	00
Myoporum	00
Buddleja	00
Drymonia	11
Nematanthus	11
Streptocarpus	00
Calceolaria	11
Jasminum	11
Ipomoea	11
Solanaceae	00
Ehretia	11
Heliotropium	11
Borago	00
Brunnera	00
'Galium+'	00
Coffea	11
Psilanthus	11
Calycosiphonia	11
Bertiera	00
'Gardenia+'	00
Ixora	11
Ixora2	11
Scyphiphora	00
Alstonia	11
Neisosperma	11
Ochrosia	11
Vinca	11
Alyxia	11
Carissa	00

Nerium	11
Hoya	11
Strychnos	11
Nymphoides	00
Asterales	00
Dipsacales	00
Hydrocotyle	11
Daucus	00
Ilex	11
Chamaedaphne	00
Andromeda	00
Pyrola	11
Symplocos	11
Diospyros	11
Phlox	00
Barringtonia	11
_Cymbalaria	00
Antirrhinum	00
Sibthorpia	11
Hippuris	00
Callitriche	11
Hebe	11
Veronica	11
Aragoa	11
Plantagoplantago	01
Plantagocoronopus	11
Psarcophylla_etal	11
Pbellardi_etal	01
Plagopus_etal	11
Lactoris_etal	00
Peperomia_etal	11
Piper	00
Saururus	00
Commelinales	0?
Liliales	0?
Lemna	0?
Hydrocharitaceae	0?
Degeneria	0?
Galbulimima	0?
Cornales	0?
Impatiens	0?
Sapotaceae	0?
Myrsinaceae	0?
Halesia	0?
Sarraceniaceae	0?
Clethra	0?
Cyrilla	0?
Citronella	0?
'Hedera+'	0?
Polyscias	0?
Garryales	0?
Neuburgia	0?
Olea_etal	0?
Forsythia	0?
Coronanthera	0?
Byblis	0?
Lentibulariaceae	1?

Printed: Tuesday, May 27, 2008 12:15:56 PM

```
Sabia                0?  
Tetracera           0?  
Malvaceae           0?  
Canarium            0?  
Salaciopsis         0?  
Hippocrateaceae    0?  
Cleistanthus        0?  
Passiflora          0?  
Hypericum           0?  
Prunus              0?  
Ulmus               0?  
Datisca             0?  
Coriaria            0?  
Begonia             0?  
;  
END;
```

```
BEGIN ASSUMPTIONS;  
  OPTIONS  DEFTYPE=unord PolyTcount=MINSTEPS ;  
END;
```

```
BEGIN TREES;
```

```
  TRANSLATE
```

```
  1  EarlyAngiosperms,  
  2  Dysoxylum,  
  3  Melia,  
  4  Leitneria,  
  5  Rutaceae,  
  6  Sapindaceae,  
  7  Rhus,  
  8  Bursera,  
  9  Shorea,  
 10  Brassicales,  
 11  Crossosomatales,  
 12  Geraniales,  
 13  Myrtales,  
 14  Salicaceae_etal,  
 15  Mountrouziera,  
 16  Hybanthus,  
 17  Viola,  
 18  Malpighia,  
 19  Linum,  
 20  Euphorbia,  
 21  Hura,  
 22  Croton,  
 23  Codiaeum,  
 24  Hevea,  
 25  Acalypha,  
 26  Phyllanthus,  
 27  Breynia,  
 28  Oxaliales,  
 29  Brexia,  
 30  Fabaceae,  
 31  Discaria,
```

32 Nesiota,
33 Phyllica,
34 Ceanothus,
35 Trymalium,
36 Ziziphus,
37 Paliurus,
38 Hovenia,
39 Bathiorhamnus,
40 Ventilago,
41 Maesopsis,
42 Rhamnella,
43 _Condalia,
44 Karwinskia,
45 Frangula,
46 Rhamnus,
47 Elaeagnus,
48 Boehmeria,
49 Pilea,
50 Humulus,
51 Luffa,
52 Cucurbita,
53 Melothria,
54 Cucumis,
55 Fagales,
56 Lepionurus,
57 Dionaea,
58 Tamarix,
59 Plumbago_etal,
60 OtherCaryophyllales,
61 Vitis,
62 Saxifragales,
63 Buxaceae,
64 Trochodendrales,
65 Proteales,
66 Ranunculales,
67 Chloranthaceae,
68 Ceratophyllum,
69 Laurales,
70 Myristicaceae,
71 Magnoliaceae,
72 Eupomatiaceae,
73 Annona,
74 Asimina,
75 Polyalthia,
76 Cananga,
77 'anthurium+',
78 Zantedeschia,
79 Zamiodulcas,
80 Dieffenbachia,
81 Philodendron,
82 Peltandra,
83 Pistia,
84 Arisaema,
85 Xanthosoma,
86 Amorphophallus,
87 Orontium,
88 Dioscorea,

89 Asparagales,
90 Poales,
91 Arecaceae,
92 Musa,
93 Musella,
94 'Strelizia+',
95 Heliconia,
96 Siphonochilus,
97 Tamijia,
98 Globba,
99 Gagnepainia,
100 Boesenbergia,
101 Hedychium,
102 Kaempferia,
103 Smithatris,
104 Curcuma,
105 Afamomum_etal,
106 Costus,
107 Monotagma,
108 'Ischnosiphon+',
109 Haumania,
110 Sarcophyllum_etal,
111 Stachyphrynum_etal,
112 MarantaClade,
113 Thalia_etal,
114 Canna,
115 Canellales,
116 Paulownia,
117 Rehmannia,
118 Petrea,
119 Sesamum,
120 Callicarpa,
121 Lamiaceae,
122 Tecomaria,
123 Catalpa,
124 Deplanchea_etal,
125 Pandorea,
126 Acanthaceae,
127 Celsia,
128 Scrophularia,
129 Verbascum,
130 Myoporum,
131 Buddleja,
132 Drymonia,
133 Nematanthus,
134 Streptocarpus,
135 Calceolaria,
136 Jasminum,
137 Ipomoea,
138 Solanaceae,
139 Ehretia,
140 Heliotropium,
141 Borago,
142 Brunnera,
143 'Galium+',
144 Coffea,
145 Psilanthus,

146 Calycosiphonia,
147 Bertiera,
148 'Gardenia+',
149 Ixora,
150 Ixora2,
151 Scyphiphora,
152 Alstonia,
153 Neisosperma,
154 Ochrosia,
155 Vinca,
156 Alyxia,
157 Carissa,
158 Nerium,
159 Hoya,
160 Strychnos,
161 Nymphoides,
162 Asterales,
163 Dipsacales,
164 Hydrocotyle,
165 Daucus,
166 Ilex,
167 Chamaedaphne,
168 Andromeda,
169 Pyrola,
170 Symplocos,
171 Diospyros,
172 Phlox,
173 Barringtonia,
174 _Cymbalaria,
175 Antirrhinum,
176 Sibthorpia,
177 Hippuris,
178 Callitriche,
179 Hebe,
180 Veronica,
181 Aragoa,
182 Plantagoplantago,
183 Plantagocoronopus,
184 Psarcophylla_etal,
185 Pbellardi_etal,
186 Plagopus_etal,
187 Lactoris_etal,
188 Peperomia_etal,
189 Piper,
190 Saururus,
191 Commelinales,
192 Liliales,
193 Lemna,
194 Hydrocharitaceae,
195 Degeneria,
196 Galbulimima,
197 Cornales,
198 Impatiens,
199 Sapotaceae,
200 Myrsinaceae,
201 Halesia,
202 Sarraceniaceae,

- 203 Clethra,
- 204 Cyrilla,
- 205 Citronella,
- 206 'Hedera+',
- 207 Polyscias,
- 208 Garryales,
- 209 Neuburgia,
- 210 Olea_etal,
- 211 Forsythia,
- 212 Coronanthera,
- 213 Byblis,
- 214 Lentibulariaceae,
- 215 Sabia,
- 216 Tetracera,
- 217 Malvaceae,
- 218 Canarium,
- 219 Salaciopsis,
- 220 Hippocrateaceae,
- 221 Cleistanthus,
- 222 Passiflora,
- 223 Hypericum,
- 224 Prunus,
- 225 Ulmus,
- 226 Datisca,
- 227 Coriaria,
- 228 Begonia

```

;
TREE * cladogram = [&R]
(1,(((((((((((53,54),52),51),226),227),228),55),((((49,48),50),225)
,47,((((45,46),((43,44),
42)),41),40),39,((36,37),38),34,35,(32,33),31))),224),30,(((22,23),(
20,21),24,25),((26,27),221
),19,18,((16,17),222),((15,223),14),28,(220,(219,29))),13,12,11,((((2
,3),4,5,6),7,(218,8)),(217
,9)),10)),61,62,216,((((((((168,169),204),203),202),167,(201,170)),(
199,(200,171))),172,173),
198),197,((((((((128,127),129),130),131),126,(123,124,122,125),(
121,120),119,118,(117,116),(
214,213)),((((180,179),(((184,185),186),182,183)),181)),((178,177),
176)),(175,174))),212,(133
,132),134)),135,(211,(210,136))),138,137),(142,141,140,139),(((((((
159,158),157),156),((154,
153),155)),152),(209,160)),161),(((150,149),151),((146,(145,144)),147
,148)),143))),208),((165,
(206,207,164)),163,162),(205,166))),((58,59,57),60),56)),63,64),65,
215,66),((((((((93,92),94,
95,((((((((104,103),((101,102),100)),(99,98)),105),97),96),106),((113
,(111,112)),(110,(109,(108
,107))),114))),191),91),90),89),192),88),194,(((((((86,85),((84,83),
82)),81,80),79,78),77),193
),87))),67,68,((115,((190,(189,188)),187)),(69,(70,195,(71,(196,(72,((
74,73),75),76))))))));

```

END;