Givnish et al.---American Journal of Botany 2018---Appendix S12 Appendix S12. Phylogram emerging from an ML analysis of plastome-scale data for all taxa sampled, including Thismia (Thismiaceae). Branch support values are 100% except where noted. Names and vertical lines indicate monocot families and subfamilies, as well as tribes of Orchidaceae. The placement of "Kuntheria" in Lilium in Figs. S11 and S12 apparently reflects a lab error; comparison with published data suggests that the sample sequenced actually was *L. lancifolium* or a close relative. Otatea glauca Otatea acuminata Olmeca reflexa iuadua chacoensis Guadua veberbaueri -Merostachys Greco18 Chusquea liebmannii Chusquea circinata Chusquea PFM2015 -Chusquea spectabilis Bambusa oldhamii Bambusa multiplex ambusa emeiensis ambusa arnhemica ambusa bambos Neohouzeaua Clark Attigala1712 Dendrocalamus latiflorus eololeba atra Bambusoideae Geololeba atta Greslania McPherson19217 Hickelia madagascariensis Cryptochloa strictiflora
Lithachne pauciflora
Olyra latifolia
Raddia brasiliensis
Diandrolyra sp. Clark1301 Pariana radiciflora
LEremitis sp.
Buergersiochloa bambusoides
Phyllostachys propinqua
Phyllostachys nigra
Phyllostachys edulis Indocalamus longiauritus Thamnocalamus iongiaumus
Thamnocalamus spathiflorus
Acidosasa purpurea
Arundinaria gigantea
Ferrocalamus rimosivaginus Lolium perenne Lolium multiflorum Festuca ovina Deschampsia antarctica Puccinellia nuttalliana Anthoxanthum odoratum Agrostis stolonifera Avena sterilis
-Phalaris arundinacea Pooideae 99 Ariticum aestivum Aegilops cylindrica Secale cereale
Hordeum vulgare
Brachypodium distachyon Diarrhena obovata
Stipa purpurea
Oryzopsis asperifolia Melica mutica
 Brachyelytrum aristosum Leersia tisserantii
Oryza sativa
Zizania aquatica
Chikusichloa aquatica Poaceae Oryzoideae Microlaena stipoides
Bouteloua gracilis
Bouteloua curtipendula
Distichlis bajaensis
Distichlis spicata Hilaria cenchroides Hilaria rigida Chloris barbata Eleusine coracana Astrebla pectinata Chloridoideae Sporobolus michauxianus Sporobolus heterolepis Zoysia macrantha Eragrostis minor Eragrostis tef Neyraudia reynaudiana —Centropodia glauca Danthonia californica
6 Tenaxia guillarmodiae Danthonioideae Chaetobromus involucratus Chionochloa macra Isachne distichophylla
Isachne stipacea
Micriaich JLC2014 Micrairoideae Arundo donax
Phragmites australis
Monachather paradoxus Arundinoideae Saccharum NCo310 Saccharum officinarum 99-Sorghum bicolor gelinperata cylindrica Schizachyrium scoparium 4 Eymbopogon flexuosus -Andropogon burmanicus -Coix lacryma-jobi Zea mays
Paspalum fimbriatum
Axonopus fissifolius Panicoideae Amphicarpum muhlenbergianum 67.8 Alloteropsis angusta Brachiaria fragrans Echinochloa crus-galli
Cenchrus americanus
Setaria italica
Pantidio dovinteri Sartidia dewinteri
Aristida purpurea Aristidoideae –Puelia olyriformis Puelioideae Leptaspis zeylanica Leptaspis banksii Pharus latifolius Pharoideae Streptochaeta angustifolia
Streptochaeta spicata Anomochlooideae -Anomochloa marantoidea ——Georgeantha hexandra —Ecdeiocolea monostachys Ecdeiocoleaceae I Joinvilleaceae I Flagellariaceae -Joinvillea ascendens Flagellaria indica Hopkinsia Lyginia -Anarthria prolifera Thamnochortus insignis
Thamnochortus punctatus Restionaceae -Centrolepis monogyna Centrolepidaceae -Aratitiyopea
--Abolboda macrostachya Xyridaceae –Eriocaulon Eriocaulaceae -Syngonanthus chrysanthus –Mayaca fluviatilis Mayacaceae Cyperus alternifolius
Carex siderosticta
—Mapania palustris Cyperaceae Juncaceae —Juncus effusus Prionium
Thurnia sphaerocephala Thurniaceae Rapatea
Potarophytum riparium Rapateaceae L_Stegolepis Sparganium eurycarpum
Typha latifolia Typhaceae Neoregelia carolinae Neoregalia sp. -Puya laxa Bromelioideae Puyoideae -Pitcarnia feliciana 25 2 Fosterella caulescens Pitcairnioideae Bromeliaceae Naviodeae Navia saxicola -Tillandsia usneoides Brocchinia micrantha Brocchinia prismatica Brocchinioideae -Aframomum angustifolium -Renealmia alpinia -Elettariopsis stenosiphon Alpinia purpurata Etlingera elatior Alpinia zerumbet Riedelia sp.
Siamanthus siliquosus Zingiberaceae -Zingiber spectabile
-Zingiber officinale
-Scaphochlamys sp. 33
-Curcuma roscoeana
-Curcuma longa Hedychium coronarium
Globba winitii
Siphonochilus kirkii Costus osae Gostus pictus Costus pulverulentus Costus dubius Costaceae Cheilocostus apeinochilos ananassae Monocostus uniflorus Dimerocostus strobilaceus Maranta leuconeura
Stromanthe stromanthoides -Marantachloa leucantha Marantaceae -Calathea roseopicta Ishnosiphon helenae Donax canniformis —Thaumatococcus daniellii Canna jaegeriana
Canna indica Cannaceae Canna iridiflora Musa ornata Musa acuminata Musa balbisiana Musa textilis Musaceae Ensete superbum Ensete ventricosum Heliconia collinsiana Heliconia collinsiana 23 Heliconia nutans leliconia sp. 25 Heliconia acuminata Strelitzia reginae
Strelitzia caudata
-Strelitzia caudata
-Ravenala madagascariensis Strelitziaceae Orchidantha fimbriata Orchidantha maxillarioides Lowiaceae 9918 Hydrothrix gardneri 9918 Eichhornia paniculata Pontederia cordata Xiphidium caeruleum Pontederiaceae Haemodoraceae —Anigozanthos flavidus Helmholtzia Philydraceae -Philydrella Phylidrum lanuginosum Tradescantia ohiensis
Belosynapsis ciliata
Palisota Commelinaceae ---Palisota —Cartonema Hanguana malayana Serenoa repens 90 Acoelorrhaphe wrightii Licuala paludosa Hanguanaceae Brahea brandegeei Chamaerops humilis Washingtonia robusta Pritchardia thurstonii Colpothrinax cookii Phoenix dactylifera eucothrinax morrisii -Trithrinax brasiliensis -Sabal domingensis Coryphoideae Borassodendron machadonis Roraccus flahellifer odoicea maldivica Bismarckia nobilis orvpha lecomte Arenga caudata Wallichia densiflora Caryota mitis Chuniophoenix nana Tahina spectabilis Arecaceae Elaeis oleifera Elaeis guineensis Cocos nucifera Areca vestiaria Veitchia arecina Arecoideae —Chamaedorea seifrizii -Pseudophoenix vinifera Phytelephas aequatorialis Ceroxyloideae -Ravenea hildebrandtii -Nypa fruticans . I Nypoideae Calamus caryotoides
Pigafetta elata
Metroxylon warbergii 98 Salacca ramosiana Eremospatha macrocarpa Calamoideae Mauritia flexuosa Eugeissona tristis Dasypogon bromeliifolius
Calectasia narragara Dasypogonaceae Ringia australis
Baxteria australis Camassia scilloides Chlorogalum pomeridianum Hesperocallis undulata Schoenolirion croceum Hesperoyucca whipplei Manfreda virginica Agavoideae Agave attenuata Beschorneria septentrionalis -Yucca schidigera -Hosta ventricosa -Chlorophytum rhizopendulum Chlorophytum rnizoperio
Herreria bonplandii
Anemarrhena asphodeloides Aphyllanthoideae —Aphyllanthus monspeliensis Dichelostemma capitatum
Brodiaea californica Asparagaceae Androstephium coeruleum
Triteleia hyacinthina Bowiea volubilis
Ledebouria cordifolia
Ornithogalum tenuifolium
Albuca kirkii Brodiaeoideae Lirope spicata

Ophiopogon japonicus Maianthemum stellatum Dasylirion wheeleri Nolinoideae 91.2 Sansevieria trifasciata Ruscus aculeatus Eriospermum cervicorne Asparagoideae -Asparagus officinalis ———Lomandra longifolia —Cordyline australis Eucharis grandiflora Amaryllis belladonna Amaryllidoideae -Scadoxus cinnabarinus Crinum asiaticum
Tulbaghia violacea
Gillesia graminea Amaryllidaceae ————Allium cepa —Agapanthus praecox Agapanthoideae Aloe vera
Haworthia cymbiformis
Kniphofia linearifolia
Asphodelus Asphodelaceae Phormium tenex Hemerocallidoideae -Hemerocallis —Xanthorrhoea preissii Xanthorrhoeoideae Xeronemataceae -Xeronema callistemon Iridaceae

Cyanastrum ———Ixiolirion —Curculigo capitulata —Curculigo capitula 66 —Lanaria 6 —Neoastelia spectabilis —Blandfordia Oncidium sphacelatum Oncidium Erycina pusilla
Coryanthes macrantha
Zygopetalum mackayi Cymbidieae —Cyrtopodium paranaense Eulophia petersii
Catasetum integerrinum Cymbidium aloifolium

8 Cymbidium lancifolium —Maxillaria variabilis
—Eria rosea
—Phalaenopsis equestris
—Phalaenopsis aphrodite
—Angraecum sesquipedale I Podochileae I Maxillarieae Vandeae Cattleya liliputana Cattleya aurantiaca

-Masdevalia coccinea -Coelia triptera

Calanthe triplicata
Phaius tankervillieae

—Liparis loeselii Coelogyne flaccida

Calopogon tuberosus
Tropidia polystachya

Listera fugongensis

–Listera cordata Aa palacea
Anoectochilus emeiensis

Sobralia
Triphora trianthophora

-Thelymitra cyanea

-Corycium carnosum Dactylorhiza
Codonorchis lessonii

---Apostasia sp.

Fritillaria cirrhosa Fritillaria taipaiensis ||Fritillaria hupehensis Lilium longiflorum Lilium sp. LLilium superbum Cardiocrinum cathayanum Cardiocrinum cordatum Cardiocrinum giganteum

-CAmana edulis Tulipa pulchella 80.4 Clintonia borealis Medeola virginiana -Tricyrtis macropoda Calochortus
Prosartes lanuginosa Philesia buxifolia Lapageria rosea Ripogonum album

> 98 Trillium cuneatum Trillium maculatum Trillium decumbens

-Trillium tschonoskii Daiswa chinensis Daiswa dunniana Daiswa forrestii
Paris verticillata

Bomarea edulis Bomarea sp. 878

-Petermannia cirrosa

Campynema lineare

Pandanus tectorius
9912 Pandanus
9912 Pandanus
9912 Preycinetia banksii

Sararanga sinuosa Cyclanthus bipartitus Carludovica palmata

Aletris spicata Aletris fauriei

9**9**4 Japonolirion osense

Stichoneuron caudatum Croomia japonica Stemona tuho

—Pentastemona sumatrana —Xerophyta retinervis

91.6 Dioscorea rotundata
Dioscorea elephantipes Tacca chantrieri

---Lophiola americana -Petrosavia stellaris

____Drymophila moorei ___Luzuriaga radicans

Alstroemeria longistaminea
Alstroemeria aurea

—Wurmbea pygmaea Burchardia umbellata Uvularia grandiflora Uvularia sessiliflora

—Campynemanthe viridiflora

-Pandanus utilis

-Corsia boridiensis

—Burmannia bicolor

Limnobium laevigatum

Hydrocharis morsus-ranae

—Caldesia oligococca –Ranalisma humile 822 Butomopsis latifolia

—Cymodocea nodosa
—Thalassodendron pachyrhizum
4—Amphibolis griffithii

–Ruppia polycarpa

Groenlandia densa
Stuckenia pectinata
85_2 Potamogeton richardsonii

Zostera mulleri
Phyllospadix scouleri

——Lepilaena australis ——Zannichellia palustris

-Posidonia ostenfeldii

—Maundia triglochinoides Triglochin maritima

Ga 688 — Cycnogeton procerum

Tetropolium

> Typhonium blumei
> Arisaema franchetianum Pinellia pedatisecta
> 95. Pinellia tripartita rAlocasia fornicata

Colocasia esculenta Steudnera colocasiifolia Arisarum simorrhinum Carlephyton glaucophyllum Ulearum donburnsii Xanthosoma helleborifolium Zomicarpella amazonica

Syngonium angustatum
—Amorphophallus titanum -Schismatoglottis calyptrata –Calla palustris Aglaonema nitidum
Aglaonema modestum
Aglaonema costatum

—Anchomanes hookeri

Taccarum caudatum
Dieffenbachia parlatorei 8-Philodendron lanceolatum -Montrichardia arborescens -Anubias heterophylla —Zamioculcas zamiifolia ——Stylochaeton bogneri —L asia spinosa

Rhaphidophora amplissima
Monstera obliqua

Orontium aquaticum

-----Vitis vinifera --Buxus microphylla -Platanus occidentalis

—Calvcanthus floridus -Liriodendron tulipifera

-Amborella trichopoda

—Drimys granadensis

-Illicium oligandrum -Nuphar advena

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Acorus calamus

Acorus americanus

—Nandina domestica —Ceratophyllum demersum

-Piper cenocladum

Stenospermation multiovulatum Spathiphyllum patulinervum

Pothos scandens

Anthurium huixtlense

Wolffiella lingulata

Wolffia australiana

Lemna minor

Spirodela polyrhiza

Panax ginseng
Panax japonicus
Anethum graveolens

—Helianthus annuus —Coffea arabica

–Populus trichocarpa

——Spinacia оюльс —Cucumis sativus -———Medicago papillosa

-Trithuria inconspicua

-Zantedeschia aethiopica

Triantha occidentalis Triantha glutinosa Tofieldia coccinea

-Tetroncium magellanicum —Scheuchzeria palustris —Aponogeton distachyos

<u>Limnocharis flava</u> —Hydrocleys nymphoides

Wiesneria triandra
Astonia australiensis
Sagittaria latifolia —Helanthium bolivianum -Echinodorus amazonicus

Egeria najas 98.2 Elodea canadensis Apalanthe granatensis

rAlisma triviale Baldellia ranunculoides
Damasonium minus Luronium natans
Syringodium filiforme
Cymodocea serrulata

Ottelia ovalifolia Blyxa aubertii -Stratiotes aloides

Thalassia testudinum —Halophila decipiens

Najas flexilis Najas guadalupensis

-Sciaphila densiflora

—Nechamandra alternifolia

Phragmipedium longifolium
Phragmipedium
Pogonia ophioglossoides

-Vanilla planifolia

—Rhizanthella gardneri

Sobralia callosa

-Chlorea

Dendrobium catenatum
Dendrobium officinale
Dendrobium huoshanense

Corallorhiza striata
Corallorhiza odontorhiza
Calypso bulbosa

–Earina autumnalis

Cypripedioideae Vanilloideae Apostasioideae Parideae Chionographideae Melanthieae Luzuriagoideae

Aroideae

Lasioideae

Pothoideae

Lemnoideae

Orontioideae

EUDICOTS

Ceratophyllaceae

MAGNOLIIDS

Nymphaeales

Amborellales

Monsteroideae

Orchidaceae Liliaceae Ripogonaceae Alstroemeriaceae Petermanniaceae Corsiaceae Campynemataceae Pandanaceae Cyclanthaceae Velloziaceae -Thismisaceae I Burmanniaceae Nartheciaceae Petrosaviaceae Hydrocharitaceae Butomaceae Alismataceae Cymodoceaceae Ruppiaceae Potamogetonaceae Zosteraceae Maundiaceae Juncaginaceae Scheuchzeriaceae Aponogetonaceae Tofieldiaceae Araceae Acoraceae

-Thismia tentaculata

Doryanthaceae

I Ixiolirionaceae

Lanariaceae Blandfordiaceae
 Boryaceae

Epidendreae

Calypsoeae

Collabieae

Dendrobieae Malaxideae

Arethuseae

Sobraliinae

Triphoreae

Neottieae

Coelogyneae Tropideae

Agrostophyllinae

Epidendroideae

Orchidoideae

Tecophilaeaceae
Hypoxidaceae