

Supplementary Information

Clade-age-dependent diversification under high species turnover shapes species richness disparities among tropical rainforest lineages of *Bulbophyllum* (Orchidaceae)

Alexander Gamisch and Hans Peter Comes

Department of Biosciences, University of Salzburg, A-5020, Austria

INCLUDING: Supplementary Methods, Figure S1-S5, Tables S1–S5

Supplementary Methods

Occurrence data and Map generation Occurrence data were collected from the Global Biodiversity Information Facility (GBIF) [(18th April 2016) GBIF Occurrence Download <http://doi.org/10.15468/dl.fcg7zi>] and supplemented by additional geo-referenced records taken from both the literature (Averyanov 2010, 2012; Vermeulen and Tsukaya 2011; Karuppusamy and Ravichandran 2013; Chowlu *et al.* 2014; Roy *et al.* 2014; Verma *et al.* 2014; Van Duy and Averyanov 2015; Averyanov *et al.* 2016, 2017; Juswara *et al.* 2016) and herbarium collections (see Gamisch 2014 for full details). Intra-specific locality duplicates were excluded. The resulting map generated in ArcGIS v. 10.4.1 (Fig. 1B) comprised 7,528 presence records (6,944 localities), representing 934 species [c. 47.9% of the total; Madagascar: 73% (154/210); Africa: >100% (106/80); Neotropics: 68% (64/94); Asia-Pacific region: 39% (610/1,564); Sieder *et al.* 2009] plus 388 accessions of unknown species identity (Madagascar: 144; Africa: 91; Neotropics: 16; Asia-Pacific: 137).

Supplementary References

- Averyanov, L. V. Species of orchids (Orchidaceae) newly recorded to the flora of Vietnam. *Taiwania* **55**, 1–7 (2010).
- Averyanov, L. V. New orchid taxa and records in the flora of Vietnam. *Taiwania* **57**, 127–152 (2012).
- Averyanov, L. V. *et al.* New species of orchids (Orchidaceae) in the flora of Vietnam. *Taiwania* **61**, 319–354 (2016).
- Averyanov, L. V., Nguyen, K. S., Nong, V. D., Nguyen, V. C., Truong, B. V. & Maisak, T. V. *Bulbophyllum* sect. *Hirtula* in eastern Indochina. *Taiwania* **62**, 1–23 (2017).
- Chowlu, K., Mahar, K.S., Sharma, H.B., Ngapui, A., Rao, N. & Vij, S. P. *Bulbophyllum dickasonii* Seidenf. (Orchidaceae): a new record for India with a complete morphological description. *Kew Bull.* **69**, 9495 (2014).
- Duy, N. V. & Averyanov, L. V. *Bulbophyllum bidoupense* and *Schoenorchis hangiana* – new species of orchids (Orchidaceae) from southern Vietnam. *Phytotaxa* **213**, 113–121 (2015).
- Gamisch, A. *The evolution of auto-pollination in tropical orchids: Morphological experimental and phylogenetic studies in Bulbophyllum THOUARS from Madagascar*. PhD thesis. (University of Salzburg, Salzburg, 2014).
- Juswara, L., Schuiteman, A. & Droissart, V. Four new orchid species from the Lengguru fold belt, West Papua, Indonesia. *PhytoKeys* **61**, 47–59 (2016).

Karuppusamy, S. & Ravichandran, V. A New Orchid of the Genus *Bulbophyllum* (Orchidaceae) from Western Ghats of Southern India. *TAPROBANICA* **5**, 120–123 (2013).

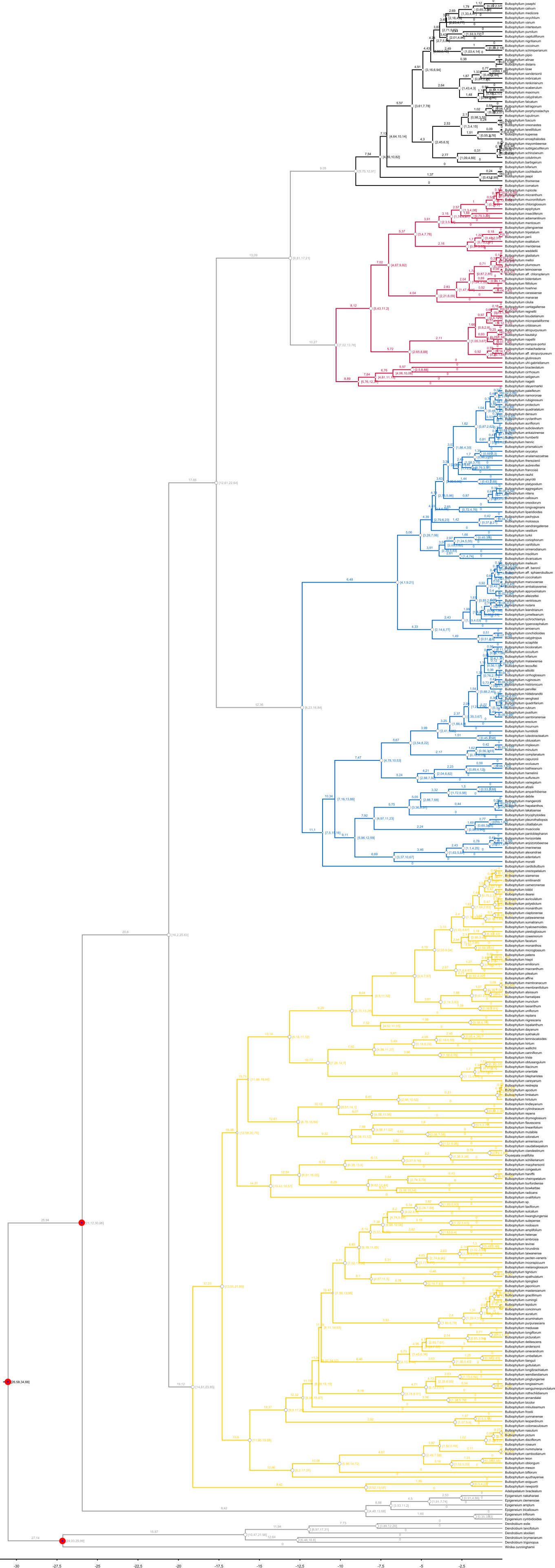
Roy, D., Barbhuiya, H. A., Talukdar, A. D. & Sinha, B. K. *Bulbophyllum mahabendrae* (Orchidaceae: Epidendroideae), a new species from Meghalaya, India. *Phytotaxa* **164**, 291–295 (2014).

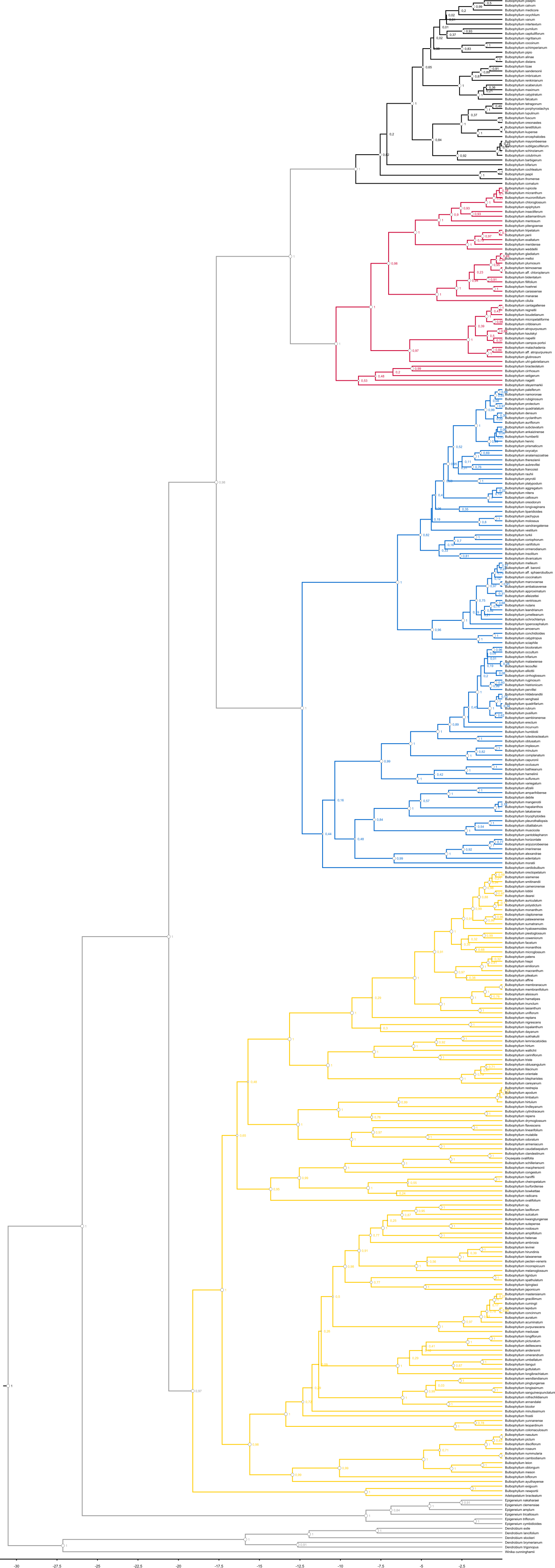
Sieder, A., Rainer, H. & Kiehn, M. *CITES Orchid Checklist. Volume 5. CITES checklist for Bulbophyllum and allied taxa (Orchidaceae)*. (Kew Publishing, Kew, UK, 2009).

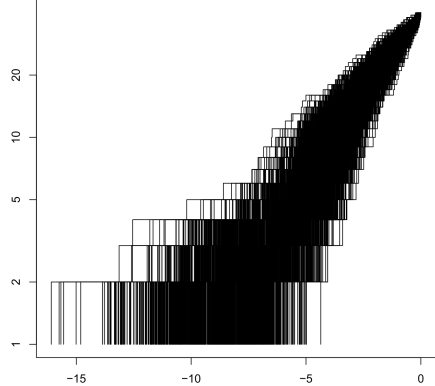
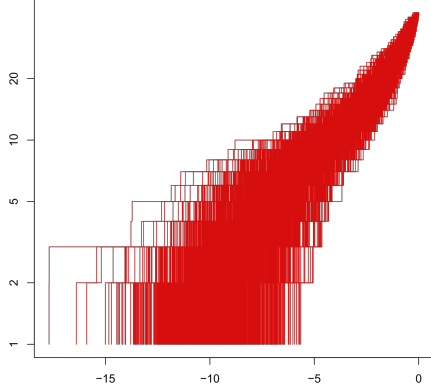
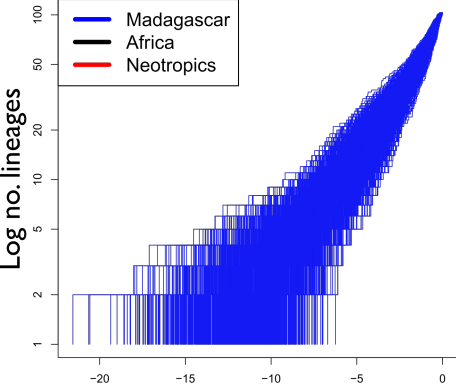
Verma, D., Barbhuiya, H. A. & Lavania, S. *Bulbophyllum cherrapunjeensis* (Orchidaceae), a new species from Meghalaya, India. *Phytotaxa* **156**, 298–300 (2014).

Vermeulen, J. J. & Tsukaya, H. An assumed rheophytic orchid: *Bulbophyllum rheophyton* n. sp., from Borneo. *Plant Syst. Evol.* **293**, 71–73 (2011).

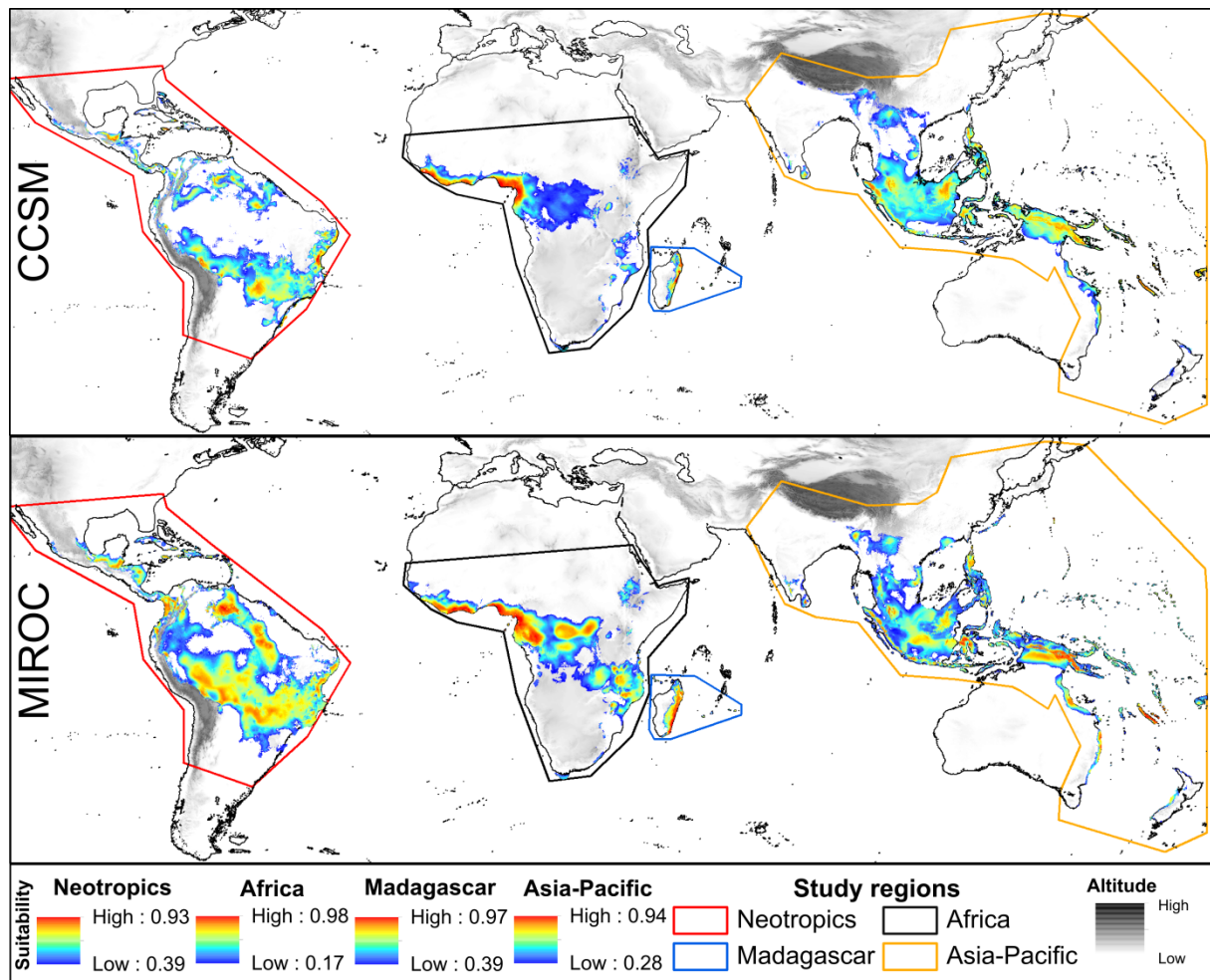
Supplementary Figures







Time before present (Ma)



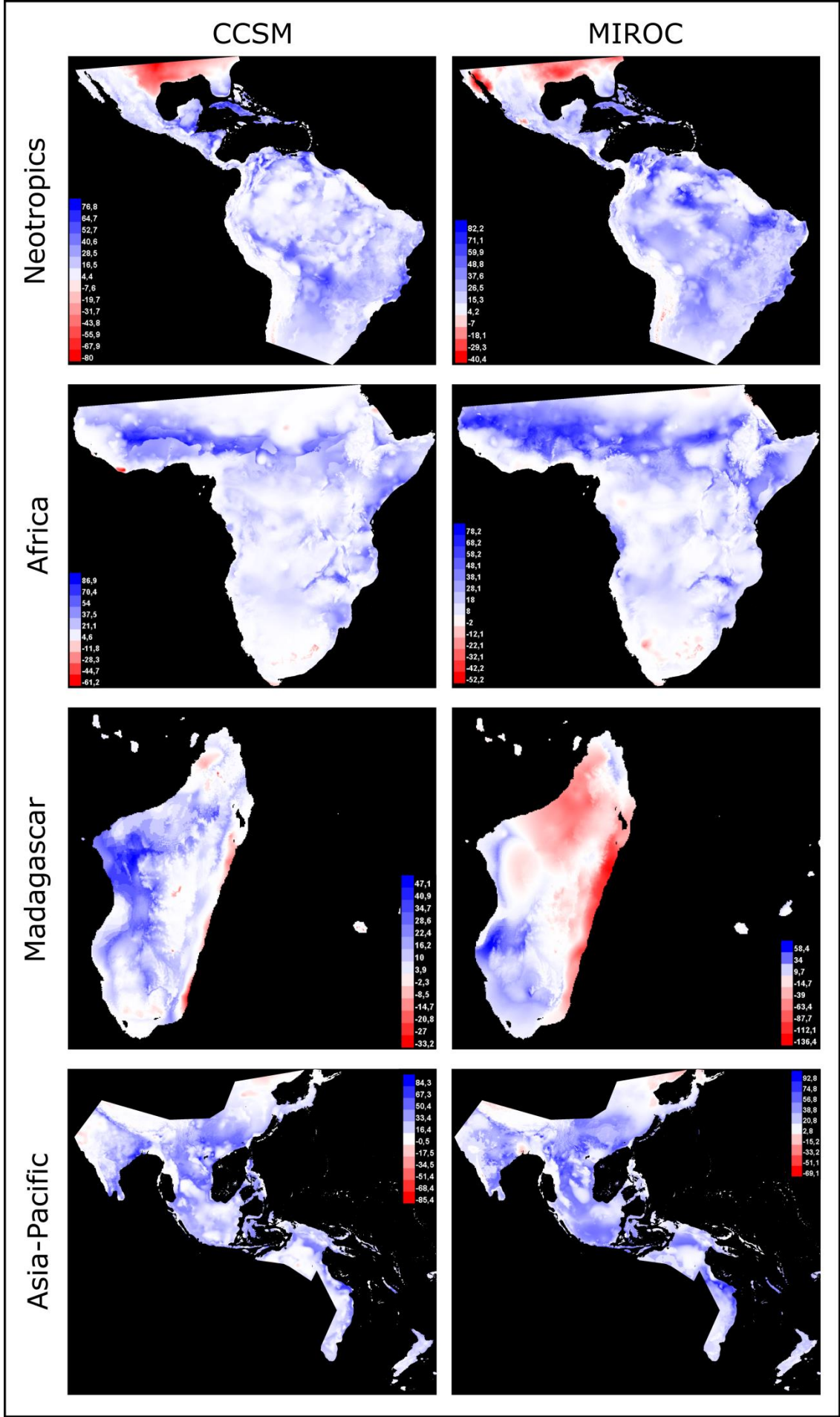


Figure Legends

Figure S1. All ages of the BEAST-derived species-level maximum clade credibility (MCC) chronogram based on ITS sequence data (see also Fig. 2), with branch lengths proportional to time in millions of years, including all 332 taxa (see Table S1 for list of all species included in the analysis). The estimated median age of each node is shown above branches and the range of the 95% HPD interval is indicated in brackets at nodes. Red circles at nodes indicate secondary calibration points (see text).

Figure S2. Posterior probabilities (PP) for the BEAST-derived species-level maximum clade credibility (MCC) chronogram (see Fig. 2).

Figure S3. LTT plots of 1,000 trees sampled from the posterior distribution of the BEAST analyses.

Figure S4. Current distribution models of the four *Bulbophyllum* lineages projected onto climatic conditions of the LGM derived from CCSM and MIROC, respectively. Predicted distribution probabilities are shown as logistic values of suitability above the region-specific maximum training sensitivity plus specificity (MTSS) thresholds. See also Figure 6B for the consensus prediction.

Figure S5. Representative Multivariate Environmental Similarity Surface (MESS) analyses of individual CCSM and MIROC models for LGM climatic conditions. Positive (blue) and negative (red) MESS scores indicate areas with and without current equivalents (i.e. analogue and no-analogue climates), respectively. Overall, these analyses showed relative good agreement between the CCSM and MIROC climatic data (for the Neotropics, Africa, Asian-Pacific region and also to a lesser extent Madagascar) in terms of similarity between the presently observed climate, used to train the MAXENT model, and the LGM projected climate..

Supplementary Tables

Table S1. GenBank accession numbers and vouchers/references for 332 (nrDNA) ITS sequences of *Bulbophyllum* (320), *Dendrobium* (6) and *Epigeneium* (6), subdivided by geographic region. Note, this list includes 253 accessions obtained from GenBank (NCBI) plus 79 previously unpublished sequences of Gamisch *et al.* [48] (the latter marked in bold).

Species	GenBank number	Origin
<i>Bulbophyllum alinae</i>	MH822366	Africa
<i>Bulbophyllum barbigerum</i>	EF195918.1	Africa
<i>Bulbophyllum bifarium</i>	MH822369	Africa
<i>Bulbophyllum calvum</i>	MH822373	Africa
<i>Bulbophyllum capituliflorum</i>	MH822375	Africa
<i>Bulbophyllum cochleatum</i>	MH822377	Africa
<i>Bulbophyllum cocoinum</i>	MH822378	Africa
<i>Bulbophyllum colubrinum</i>	MH822379	Africa
<i>Bulbophyllum comatum</i>	MH822380	Africa
<i>Bulbophyllum distans</i>	MH822383	Africa
<i>Bulbophyllum encephalodes</i>	MH822385	Africa
<i>Bulbophyllum falcatum</i>	EF195927.1	Africa
<i>Bulbophyllum fuscum</i>	MH822387	Africa
<i>Bulbophyllum hapalanthos</i>	EF195980.1	Africa
<i>Bulbophyllum imbricatum</i>	MH822388	Africa
<i>Bulbophyllum jaapii</i>	MH822389	Africa
<i>Bulbophyllum josephi</i>	MH822390	Africa
<i>Bulbophyllum kupense</i>	MH822392	Africa
<i>Bulbophyllum lizae</i>	MH822395	Africa
<i>Bulbophyllum lupulinum</i>	EF195932.1	Africa
<i>Bulbophyllum malawiense</i>	KJ558759.1	Africa
<i>Bulbophyllum maximum</i>	MH822399	Africa
<i>Bulbophyllum mayombeense</i>	EF195934.1	Africa
<i>Bulbophyllum mediocre</i>	MH822400	Africa
<i>Bulbophyllum nigritanum</i>	MH822405	Africa
<i>Bulbophyllum oreonastes</i>	MH822406	Africa
<i>Bulbophyllum oxychilum</i>	EF195937.1	Africa
<i>Bulbophyllum pipio</i>	MH822409	Africa
<i>Bulbophyllum porphyrostachys</i>	MH822410	Africa
<i>Bulbophyllum pumilum</i>	MH822413	Africa
<i>Bulbophyllum renkinianum</i>	MH822417	Africa
<i>Bulbophyllum sandersonii</i>	MH822418	Africa

<i>Bulbophyllum schimperianum</i>	MH822421	Africa
<i>Bulbophyllum schinzianum</i>	MH822422	Africa
<i>Bulbophyllum subligaculiferum</i>	MH822424	Africa
<i>Bulbophyllum teretifolium</i>	MH822425	Africa
<i>Bulbophyllum tetragonum</i>	MH822426	Africa
<i>Bulbophyllum thomense</i>	MH822428	Africa
<i>Bulbophyllum vanum</i>	MH822443	Africa
<i>Bulbophyllum scaberulum</i>	MH822419	Africa, Asia
<i>Bulbophyllum intertextum</i>	EF195930.1	Africa, Madagascar
<i>Adelopetalum bracteatum</i>	AY239945.1	Asia
<i>Bulbophyllum acuminatum</i>	JF428117.1	Asia
<i>Bulbophyllum affine</i>	KC568305.1	Asia
<i>Bulbophyllum alsiosum</i>	EF195917.1	Asia
<i>Bulbophyllum ambrosia</i>	KC568306.1	Asia
<i>Bulbophyllum amplifolium</i>	KY022454.1	Asia
<i>Bulbophyllum andersonii</i>	JN619417.1	Asia
<i>Bulbophyllum annandalei</i>	KY966427.1	Asia
<i>Bulbophyllum apodum</i>	JF428121.1	Asia
<i>Bulbophyllum armeniacum</i>	JF428112.1	Asia
<i>Bulbophyllum auratum</i>	KY966428.1	Asia
<i>Bulbophyllum auriculatum</i>	MH822430	Asia
<i>Bulbophyllum ayuthayense</i>	KY966429.1	Asia
<i>Bulbophyllum bicolor</i>	KY966430.1	Asia
<i>Bulbophyllum biflorum</i>	EF195919.1	Asia
<i>Bulbophyllum blepharistes</i>	EU477512.1	Asia
<i>Bulbophyllum bowkettiae</i>	MH822370	Asia
<i>Bulbophyllum burfordiense</i>	AY273716.1	Asia
<i>Bulbophyllum cambodianum</i>	KM924469.1	Asia
<i>Bulbophyllum cameronense</i>	MH822431	Asia
<i>Bulbophyllum careyanum</i>	KY966435.1	Asia
<i>Bulbophyllum cariniflorum</i>	KF866243.1	Asia
<i>Bulbophyllum caudatisepalum</i>	JF428108.1	Asia
<i>Bulbophyllum cheiropetalum</i>	JF428109.1	Asia
<i>Bulbophyllum clandestinum</i>	KY966436.1	Asia
<i>Bulbophyllum claptonense</i>	MH822432	Asia
<i>Bulbophyllum colomaculosum</i>	JN619412.1	Asia
<i>Bulbophyllum concinnum</i>	KY966437.1	Asia
<i>Bulbophyllum congestum</i>	KY966438.1	Asia
<i>Bulbophyllum coweniorum</i>	MH822433	Asia
<i>Bulbophyllum cumingii</i>	EF195923.1	Asia

<i>Bulbophyllum cylindraceum</i>	KX455816.1	Asia
<i>Bulbophyllum dayanum</i>	JF428119.1	Asia
<i>Bulbophyllum dearei</i>	EF195924.1	Asia
<i>Bulbophyllum delitescens</i>	KY966440.1	Asia
<i>Bulbophyllum disciflorum</i>	KY966443.1	Asia
<i>Bulbophyllum drymoglossum</i>	KT338651.1	Asia
<i>Bulbophyllum emiliorum</i>	EF195926.1	Asia
<i>Bulbophyllum exiguum</i>	MH822386	Asia
<i>Bulbophyllum facetum</i>	MH822434	Asia
<i>Bulbophyllum flavescens</i>	JF428102.1	Asia
<i>Bulbophyllum frostii</i>	KY966445.1	Asia
<i>Bulbophyllum gracillimum</i>	KY966446.1	Asia
<i>Bulbophyllum guttulatum</i>	KF866245.1	Asia
<i>Bulbophyllum hamatipes</i>	EF195929.1	Asia
<i>Bulbophyllum haniffii</i>	KY966447.1	Asia
<i>Bulbophyllum helenae</i>	KF866240.1	Asia
<i>Bulbophyllum hiepii</i>	MH822435	Asia
<i>Bulbophyllum hirtulum</i>	JF428126.1	Asia
<i>Bulbophyllum hirtum</i>	KY966448.1	Asia
<i>Bulbophyllum hirundinis</i>	KY022456.1	Asia
<i>Bulbophyllum hyalosemoides</i>	MH822436	Asia
<i>Bulbophyllum inconspicuum</i>	AB786895.1	Asia
<i>Bulbophyllum inunctum</i>	JF428110.1	Asia
<i>Bulbophyllum japonicum</i>	AB786894.1	Asia
<i>Bulbophyllum kwangtungense</i>	JN619414.1	Asia
<i>Bulbophyllum lasianthum</i>	JF428116.1	Asia
<i>Bulbophyllum laxiflorum</i>	KY966449.1	Asia
<i>Bulbophyllum leion</i>	KM924484.1	Asia
<i>Bulbophyllum lemniscatoides</i>	KY966450.1	Asia
<i>Bulbophyllum leopardinum</i>	MH822394	Asia
<i>Bulbophyllum lepidum</i>	KY966452.1	Asia
<i>Bulbophyllum levinei</i>	JN619409.1	Asia
<i>Bulbophyllum lilacinum</i>	JF428111.1	Asia
<i>Bulbophyllum limbatum</i>	JF428122.1	Asia
<i>Bulbophyllum lindleyanum</i>	KY966454.1	Asia
<i>Bulbophyllum linearifolium</i>	JF428103.1	Asia
<i>Bulbophyllum lipingtaoi</i>	KX455817.1	Asia
<i>Bulbophyllum lobbii</i>	EF195931.1	Asia
<i>Bulbophyllum longibrachiatum</i>	KY022457.1	Asia
<i>Bulbophyllum longissimum</i>	KY966458.1	Asia

<i>Bulbophyllum lopalanthum</i>	KY966459.1	Asia
<i>Bulbophyllum macphersonii</i>	MH822397	Asia
<i>Bulbophyllum macranthum</i>	EF195933.1	Asia
<i>Bulbophyllum mastersianum</i>	KY966460.1	Asia
<i>Bulbophyllum medusae</i>	KY966461.1	Asia
<i>Bulbophyllum melanoglossum</i>	KY022458.1	Asia
<i>Bulbophyllum membranacum</i>	MH822401	Asia
<i>Bulbophyllum membranifolium</i>	EF195935.1	Asia
<i>Bulbophyllum meson</i>	KM924490.1	Asia
<i>Bulbophyllum microglossum</i>	MH822437	Asia
<i>Bulbophyllum minutissimum</i>	MH822402	Asia
<i>Bulbophyllum monanthos</i>	KY966462.1	Asia
<i>Bulbophyllum monanthum</i>	MH822438	Asia
<i>Bulbophyllum mutabile</i>	JF428101.1	Asia
<i>Bulbophyllum nasutum</i>	KM924486.1	Asia
<i>Bulbophyllum newportii</i>	JF706720.1	Asia
<i>Bulbophyllum nigrescens</i>	KX455818.1	Asia
<i>Bulbophyllum nodosum</i>	KF866241.1	Asia
<i>Bulbophyllum nummularia</i>	KY966464.1	Asia
<i>Bulbophyllum oblongum</i>	KM924473.1	Asia
<i>Bulbophyllum obtusangulum</i>	JN619410.1	Asia
<i>Bulbophyllum odoratum</i>	JF428113.1	Asia
<i>Bulbophyllum omerandrum</i>	JN619419.1	Asia
<i>Bulbophyllum orectopetalum</i>	EF195936.1	Asia
<i>Bulbophyllum orientale</i>	KY966468.1	Asia
<i>Bulbophyllum ovalifolium</i>	JF428104.1	Asia
<i>Bulbophyllum palawanense</i>	MH822439	Asia
<i>Bulbophyllum patens</i>	EF195938.1	Asia
<i>Bulbophyllum pecten-veneris</i>	KY966471.1	Asia
<i>Bulbophyllum pictum</i>	KY966472.1	Asia
<i>Bulbophyllum picturatum</i>	EF195939.1	Asia
<i>Bulbophyllum piestoglossum</i>	MH822440	Asia
<i>Bulbophyllum pileatum</i>	JF428105.1	Asia
<i>Bulbophyllum pingtungense</i>	KY022459.1	Asia
<i>Bulbophyllum polystictum</i>	MH822441	Asia
<i>Bulbophyllum purpurascens</i>	KY966473.1	Asia
<i>Bulbophyllum radicans</i>	MH822416	Asia
<i>Bulbophyllum repens</i>	KY966475.1	Asia
<i>Bulbophyllum reptans</i>	JN114443.1	Asia
<i>Bulbophyllum restrepia</i>	JF428123.1	Asia

<i>Bulbophyllum roseum</i>	KM924485.1	Asia
<i>Bulbophyllum rothschildianum</i>	KX455819.1	Asia
<i>Bulbophyllum sanguineopunctatum</i>	KY966476.1	Asia
<i>Bulbophyllum schillerianum</i>	MH822420	Asia
<i>Bulbophyllum siamense</i>	EF195942.1	Asia
<i>Bulbophyllum smitinandii</i>	EF195943.1	Asia
<i>Bulbophyllum sp.</i>	MH822414	Asia
<i>Bulbophyllum spathulatum</i>	KY966478.1	Asia
<i>Bulbophyllum sukhakulii</i>	KY966481.1	Asia
<i>Bulbophyllum sulcatum</i>	JF428106.1	Asia
<i>Bulbophyllum sumatranum</i>	MH822442	Asia
<i>Bulbophyllum sutepense</i>	KY966482.1	Asia
<i>Bulbophyllum taiwanense</i>	KY022460.1	Asia
<i>Bulbophyllum tianguii</i>	JN619415.1	Asia
<i>Bulbophyllum tigrinum</i>	KX455820.1	Asia
<i>Bulbophyllum triste</i>	KY966483.1	Asia
<i>Bulbophyllum umbellatum</i>	KY966484.1	Asia
<i>Bulbophyllum uniflorum</i>	JF428098.1	Asia
<i>Bulbophyllum wallichii</i>	JN619411.1	Asia
<i>Bulbophyllum wendlandianum</i>	KY966485.1	Asia
<i>Bulbophyllum yunnanense</i>	KX455822.1	Asia
<i>Bulbophyllum longiflorum</i>	EF196023.1	Asia, Madagascar, Africa
<i>Oxysepala ovalifolia</i>	AY240018.1	Asia
<i>Bulbophyllum aff. baronii</i>	EF195947.1	Madagascar
<i>Bulbophyllum aff. sphaerobulbum</i>	EF195950.1	Madagascar
<i>Bulbophyllum afzelii</i>	MH822365	Madagascar
<i>Bulbophyllum aggregatum</i>	EF195951.1	Madagascar
<i>Bulbophyllum alexandrae</i>	EF195952.1	Madagascar
<i>Bulbophyllum alleizettei</i>	EF195953.1	Madagascar
<i>Bulbophyllum ambatoavense</i>	EF195954.1	Madagascar
<i>Bulbophyllum amoenum</i>	EF195955.1	Madagascar
<i>Bulbophyllum amparihibense</i>	MH822367	Madagascar
<i>Bulbophyllum analamazoatrae</i>	EF195957.1	Madagascar
<i>Bulbophyllum anjozorobeense</i>	EF195958.1	Madagascar
<i>Bulbophyllum ankaizinense</i>	EF195959.1	Madagascar
<i>Bulbophyllum approximatum</i>	EF195960.1	Madagascar
<i>Bulbophyllum aubrevillei</i>	EF195962.1	Madagascar
<i>Bulbophyllum auriflorum</i>	EF195963.1	Madagascar

<i>Bulbophyllum bathieanum</i>	MH822368	Madagascar
<i>Bulbophyllum bicoloratum</i>	EF195964.1	Madagascar
<i>Bulbophyllum bryophytoides</i>	MH822371	Madagascar
<i>Bulbophyllum callosum</i>	MH822372	Madagascar
<i>Bulbophyllum calyptratum</i>	MH822374	Madagascar
<i>Bulbophyllum calyptropus</i>	EF195965.1	Madagascar
<i>Bulbophyllum capuronii</i>	EF195966.1	Madagascar
<i>Bulbophyllum cardiobulbum</i>	KJ558721.1	Madagascar
<i>Bulbophyllum ciliatilabrum</i>	EF195968.1	Madagascar
<i>Bulbophyllum cirrhoglossum</i>	KJ558728.1	Madagascar
<i>Bulbophyllum coccinatum</i>	MH822376	Madagascar
<i>Bulbophyllum complanatum</i>	KJ558750.1	Madagascar
<i>Bulbophyllum conchidioides</i>	EF195969.1	Madagascar
<i>Bulbophyllum coriophorum</i>	EF195970.1	Madagascar
<i>Bulbophyllum cyclanthum</i>	EF195971.1	Madagascar
<i>Bulbophyllum debile</i>	MH822381	Madagascar
<i>Bulbophyllum densum</i>	MH822382	Madagascar
<i>Bulbophyllum divaricatum</i>	MH822384	Madagascar
<i>Bulbophyllum edentatum</i>	EF195972.1	Madagascar
<i>Bulbophyllum erectum</i>	KJ558716.1	Madagascar
<i>Bulbophyllum francoisii</i>	EF195977.1	Madagascar
<i>Bulbophyllum hamelinii</i>	EF195979.1	Madagascar
<i>Bulbophyllum henrici</i>	EF195981.1	Madagascar
<i>Bulbophyllum hildebrandtii</i>	KJ558720.1	Madagascar
<i>Bulbophyllum histrionicum</i>	KJ558758.1	Madagascar
<i>Bulbophyllum horizontale</i>	KJ558712.1	Madagascar
<i>Bulbophyllum humbertii</i>	EF195985.1	Madagascar
<i>Bulbophyllum imerinense</i>	EF195987.1	Madagascar
<i>Bulbophyllum implexum</i>	KJ558757.1	Madagascar
<i>Bulbophyllum incurvum</i>	KJ558718.1	Madagascar
<i>Bulbophyllum insolitum</i>	EF196019.1	Madagascar
<i>Bulbophyllum jumelleianum</i>	MH822391	Madagascar
<i>Bulbophyllum lakatoense</i>	MH822393	Madagascar
<i>Bulbophyllum leandrianum</i>	EF196021.1	Madagascar
<i>Bulbophyllum lecouflei</i>	KJ558723.1	Madagascar
<i>Bulbophyllum liparidioides</i>	EF196022.1	Madagascar
<i>Bulbophyllum longivagins</i>	EF196025.1	Madagascar
<i>Bulbophyllum luteobracteatum</i>	KJ558738.1	Madagascar
<i>Bulbophyllum lyperocephalum</i>	MH822396	Madagascar
<i>Bulbophyllum mangelotii</i>	MH822398	Madagascar

<i>Bulbophyllum marovoense</i>	EF196027.1	Madagascar
<i>Bulbophyllum melleum</i>	EF196030.1	Madagascar
<i>Bulbophyllum minutum</i>	EF196031.1	Madagascar
<i>Bulbophyllum molossus</i>	EF196032.1	Madagascar
<i>Bulbophyllum moratii</i>	MH822403	Madagascar
<i>Bulbophyllum muscicola</i>	EF196033.1	Madagascar
<i>Bulbophyllum namoronae</i>	MH822404	Madagascar
<i>Bulbophyllum nitens</i>	EF196034.1	Madagascar
<i>Bulbophyllum nutans</i>	EF196036.1	Madagascar
<i>Bulbophyllum obtusatum</i>	EF196039.1	Madagascar
<i>Bulbophyllum occlusum</i>	EF196040.1	Madagascar
<i>Bulbophyllum occultum</i>	KJ558760.1	Madagascar
<i>Bulbophyllum ochrochlamys</i>	EF196042.1	Madagascar
<i>Bulbophyllum oreodorum</i>	EF196043.1	Madagascar
<i>Bulbophyllum ormerodianum</i>	MH822407	Madagascar
<i>Bulbophyllum oxycalyx</i>	EF196044.1	Madagascar
<i>Bulbophyllum pachypus</i>	EF196047.1	Madagascar
<i>Bulbophyllum paleiferum</i>	MH822408	Madagascar
<i>Bulbophyllum pantoblepharon</i>	EF196048.1	Madagascar
<i>Bulbophyllum pervillei</i>	EF196049.1	Madagascar
<i>Bulbophyllum peyrotii</i>	EF196051.1	Madagascar
<i>Bulbophyllum platypodum</i>	EF196052.1	Madagascar
<i>Bulbophyllum pleurothallopsis</i>	EF196053.1	Madagascar
<i>Bulbophyllum prismaticum</i>	MH822411	Madagascar
<i>Bulbophyllum protectum</i>	MH822412	Madagascar
<i>Bulbophyllum quadrialatum</i>	MH822415	Madagascar
<i>Bulbophyllum quadrifarium</i>	KJ558754.1	Madagascar
<i>Bulbophyllum rauhii</i>	EF196055.1	Madagascar
<i>Bulbophyllum rubiginosum</i>	EF196056.1	Madagascar
<i>Bulbophyllum rubrum</i>	KJ558741.1	Madagascar
<i>Bulbophyllum ruginosum</i>	KJ558751.1	Madagascar
<i>Bulbophyllum sambiranense</i>	KJ558746.1	Madagascar
<i>Bulbophyllum sandrangatense</i>	EF196058.1	Madagascar
<i>Bulbophyllum sciaphile</i>	EF196059.1	Madagascar
<i>Bulbophyllum senghasii</i>	KJ558727.1	Madagascar
<i>Bulbophyllum subclavatum</i>	MH822423	Madagascar
<i>Bulbophyllum sulfureum</i>	EF196071.1	Madagascar
<i>Bulbophyllum therezienii</i>	MH822427	Madagascar
<i>Bulbophyllum trifarium</i>	KJ558719.1	Madagascar
<i>Bulbophyllum turkii</i>	EF196073.1	Madagascar

<i>Bulbophyllum variegatum</i>	KJ558713.1	Madagascar
<i>Bulbophyllum variifolium</i>	MH822429	Madagascar
<i>Bulbophyllum ventriosum</i>	EF196075.1	Madagascar
<i>Bulbophyllum vestitum</i>	EF196076.1	Madagascar
<i>Bulbophyllum elliottii</i>	EF195976.1	Madagascar, Africa
<i>Bulbophyllum pusillum</i>	KJ558730.1	Madagascar, Africa
<i>Bulbophyllum humblotii</i>	EF195986.1	Madagascar, Africa
<i>Bulbophyllum adiamantinum</i>	GQ339691.1	Neotropics
<i>Bulbophyllum aff. atropurpureum</i>	GQ862980.1	Neotropics
<i>Bulbophyllum aff. chloropterum</i>	EF195921.1	Neotropics
<i>Bulbophyllum atropurpureum</i>	GQ339706.1	Neotropics
<i>Bulbophyllum bidentatum</i>	GQ339701.1	Neotropics
<i>Bulbophyllum boudetianum</i>	GQ339723.1	Neotropics
<i>Bulbophyllum bracteolatum</i>	EF195920.1	Neotropics
<i>Bulbophyllum campos-portoi</i>	GQ339721.1	Neotropics
<i>Bulbophyllum cantagallense</i>	GQ339722.1	Neotropics
<i>Bulbophyllum carassense</i>	GQ339717.1	Neotropics
<i>Bulbophyllum chloroglossum</i>	GQ339694.1	Neotropics
<i>Bulbophyllum cilulia</i>	GQ339698.1	Neotropics
<i>Bulbophyllum cirrhosum</i>	GQ339685.1	Neotropics
<i>Bulbophyllum cribbianum</i>	EF195922.1	Neotropics
<i>Bulbophyllum epiphytum</i>	GQ339693.1	Neotropics
<i>Bulbophyllum exaltatum</i>	GQ339715.1	Neotropics
<i>Bulbophyllum filifolium</i>	GQ339699.1	Neotropics
<i>Bulbophyllum gladiatum</i>	GQ339718.1	Neotropics
<i>Bulbophyllum glutinosum</i>	EF195928.1	Neotropics
<i>Bulbophyllum hoehnei</i>	GQ339700.1	Neotropics
<i>Bulbophyllum insectiferum</i>	GQ339692.1	Neotropics
<i>Bulbophyllum kautskyi</i>	GQ339705.1	Neotropics
<i>Bulbophyllum malachadenia</i>	GQ339708.1	Neotropics
<i>Bulbophyllum manarae</i>	GQ339704.1	Neotropics
<i>Bulbophyllum melloi</i>	GQ339719.1	Neotropics
<i>Bulbophyllum mentosum</i>	GQ339690.1	Neotropics
<i>Bulbophyllum meridense</i>	GQ339712.1	Neotropics
<i>Bulbophyllum micranthum</i>	GQ339697.1	Neotropics
<i>Bulbophyllum micropetaliforme</i>	GQ339709.1	Neotropics
<i>Bulbophyllum mucronifolium</i>	GQ339695.1	Neotropics
<i>Bulbophyllum nagelii</i>	GQ339720.1	Neotropics
<i>Bulbophyllum napellii</i>	GQ339711.1	Neotropics

<i>Bulbophyllum perii</i>	GQ862815.1	Neotropics
<i>Bulbophyllum pitengoense</i>	KC581944.1	Neotropics
<i>Bulbophyllum plumosum</i>	EF195941.1	Neotropics
<i>Bulbophyllum regnellii</i>	GQ339710.1	Neotropics
<i>Bulbophyllum rupicola</i>	GQ339696.1	Neotropics
<i>Bulbophyllum setigerum</i>	GQ339689.1	Neotropics
<i>Bulbophyllum steyermarkii</i>	GQ339688.1	Neotropics
<i>Bulbophyllum teimosense</i>	GQ339703.1	Neotropics
<i>Bulbophyllum tripetalum</i>	GQ339716.1	Neotropics
<i>Bulbophyllum uhl-gabrielianum</i>	KC581945.1	Neotropics
<i>Bulbophyllum weddellii</i>	GQ339713.1	Neotropics
<i>Dendrobium brymerianum</i>	KF143432.1	Asia
<i>Dendrobium exile</i>	KF143456.1	Asia
<i>Dendrobium lancifolium</i>	AY239976.1	Asia
<i>Dendrobium stockeri</i>	AB593667.1	Asia
<i>Dendrobium trigonopus</i>	KF143521.1	Asia
<i>Winika cunninghamii</i>	AY240019.1	Asia
<i>Epigeneium amplum</i>	AY240010.1	Asia
<i>Epigeneium clemensiae</i>	KF143530.1	Asia
<i>Epigeneium cymbidioides</i>	AY240011.1	Asia
<i>Epigeneium nakaharaei</i>	AF521618.1	Asia
<i>Epigeneium tricallosum</i>	JF706721.1	Asia
<i>Epigeneium triflorum</i>	AY240013.1	Asia

Table S2. Statistical support for ancestral areas against alternative states of three key nodes (i.e. I: the crown node of *Bulbophyllum*, II: the stem node of the Madagascan, African and Neotropical lineages, and III: the stem node of the African and Neotropical lineages; see also Fig. 2) using 2 logarithmic Bayes Factor (BF) comparisons. Positive values indicate support of the rows model compared to the columns model. A: Asia-Pacific; B: Madagascar; C: Neotropics; D: Africa.

	Marginal likelihood	S. E.	2 (log BF)			
Restricted node			I restricted to A	I restricted to B	I restricted to C	I restricted to D
I restricted to A	-28.603	+/- 0.033	-	11.28	15.63	11.566
I restricted to B	-34.24	+/- 0.047	-11.276	-	4.352	0.29
I restricted to C	-36.416	+/- 0.161	-15.628	-4.352	-	-4.062
I restricted to D	-34.386	+/- 0.099	-11.566	-0.29	4.062	-
			II restricted to A	II restricted to B	II restricted to C	II restricted to D
II restricted to A	-30.106	+/- 0.022	-	-1.372	-0.102	0.41
II restricted to B	-29.42	+/- 0.096	1.372	-	1.27	1.782
II restricted to C	-30.055	+/- 0.028	0.102	-1.27	-	0.512
II restricted to D	-30.311	+/- 0.103	-0.41	-1.782	-0.512	-
			III restricted to A	III restricted to B	III restricted to C	III restricted to D
III restricted to A	-33.827	+/- 0.123	-	-6.742	-8.272	-8.076
III restricted to B	-30.456	+/- 0.078	6.742	-	-1.528	-1.332
III restricted to C	-29.692	+/- 0.071	8.272	1.528	-	0.196
III restricted to D	-29.79	+/- 0.07	8.076	1.332	-0.196	-

Table S3. Three biogeographic models compared by BioGeoBEARS as implemented in RASP. Models are ranked from best to worst, according to dAICc scores (best model marked in bold). See Table S4 for abbreviations.

Model	Nb	LH	AICc	dAICc
DEC	2	-69.4	142,8	0
DIVALIKE	2	-71.33	146,7	3,9
BAYAREALIKE	2	-98.69	201,4	58,6

Table S4. Nine diversification models fitted to the crown groups of the Madagascan, African and Neotropical *Bulbophyllum* lineages (see Fig. 2), using RPANDA v. 1.3. Models are ranked from best to worst, according to AICc scores. Note that a constant rate speciation and extinction (birth-death) model (marked bold) was favoured in the case of Madagascar and the Neotropics, and performed not significantly worse than the best-fitting model for Africa (no extinction and constant speciation rate). For each clade (lineage), sample frequencies are shown in parentheses as number of sampled/extant species (the latter according to Sieder *et al.* 2009).

Madagascar (103/210)				
Description	Nb	LH	AICc	dAICc
Constant speciation and extinction rates	2	-188.4508	381.0217	0
No extinction and exponential variation in speciation rate through time	2	-188.6469	381.4138	0.39
Exponential variation in speciation and constant extinction rates	4	-188.1023	382.447	1.43
Constant speciation rate and linear variation in extinction rate	3	-188.1203	382.4831	1.46
Linear variation in speciation rate and constant extinction rate	3	-188.1206	382.4836	1.46
Constant speciation rate and exponential variation in extinction rate	3	-188.1304	382.5033	1.48
No extinction and linear variation in speciation rate	2	-190.1134	384.3468	3.33
Exponential variation in speciation and extinction rates	4	-188.0805	384.5693	3.55
No extinction and constant speciation rate	1	-196.6185	395.2766	14.25
Neotropic (43/94)				
Description	Nb	LH	AICc	dAICc
Constant speciation and extinction rates	2	-82.21047	168.7209	0
Exponential variation in speciation and constant extinction rates	4	-81.82851	170.2724	1.55
Constant speciation rate and linear variation in extinction rate	3	-81.82963	170.2746	1.55
Linear variation in speciation rate and constant extinction rate	3	-81.8297	170.2748	1.55
Constant speciation rate and exponential variation in extinction rate	3	-81.83751	170.2904	1.57
No extinction and exponential variation in speciation rate through time	2	-84.05735	172.4147	3.69
Exponential variation in speciation and extinction rates	4	-81.99867	173.05	4.33
No extinction and linear variation in speciation rate	2	-85.30366	174.9073	6.19
No extinction and constant speciation rate	1	-88.53768	179.1729	10.45
Africa (40/80)				
Description	Nb	LH	AICc	dAICc
No extinction and constant speciation rate	1	-77.5409	157.19	0
No extinction and linear variation in speciation rate	2	-76.60034	157.53	0.34
No extinction and exponential variation in speciation rate through time	2	-76.64988	157.62	0.44
Constant speciation and extinction rates	2	-76.82769	157.98	0.79
Constant speciation rate and exponential variation in extinction rate	3	-76.53411	159.73	2.55
Linear variation in speciation rate and constant extinction rate	3	-76.60036	159.87	2.68
Constant speciation rate and linear variation in extinction rate	3	-76.61756	159.90	2.71
Exponential variation in speciation and constant extinction rates	4	-76.64964	159.97	2.78
Exponential variation in speciation and extinction rates	4	-76.64988	162.44	5.26

Abbreviations: Nb, number of parameters per model; LH, log-likelihood; AICc, Akaike's Information Criterion corrected for finite sample size; Δ AICc, difference in the AICc scores between the alternative model and the model with the lowest AICc.

Table S5. Bioclimatic variables used for the ecological niche modelling (ENM) of *Bulbophyllum* lineages per region and after excluding highly redundant variables (Pearson's correlation > 0.9).

Bioclimatic variable	Neotropics	Africa	Madagascar	Asia-Pacific
BIO1 = Annual mean temperature	x	x	x	x
BIO3 = Isothermality	x			
BIO5 = Max. temperature of warmest month	x	x	x	x
BIO6 = Min. temperature of coldest month	x	x	x	x
BIO7 = Temperature annual range	x	x	x	x
BIO8 = Mean temperature of wettest quarter		x	x	x
BIO9 = Mean temperature of driest quarter	x	x	x	x
BIO11 = Mean temperature of coldest quarter			x	
BIO12 = Annual precipitation	x	x		
BIO13 = Precipitation of wettest month	x	x	x	x
BIO14 = Precipitation of driest month	x	x	x	x
BIO15 = Precipitation seasonality			x	
BIO19 = Precipitation of coldest quarter			x	