

Supplementary Information

Manuscript title: Distribution of Cenozoic plant relicts in China explained by drought in dry season

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Supplementary Table S1. The Cenozoic relict genera considered in this study.

Genus	Family	Phenology	Time of seed germination*
<i>Amentotaxus</i>	Taxaceae	Evergreen	April
<i>Amesiodendron</i>	Sapindaceae	Evergreen	March to April
<i>Apterosperma</i>	Theaceae	Evergreen	Unknown
<i>Archiboehmeria</i>	Urticaceae	Evergreen	Unknown
<i>Bretschneidera</i>	Akeniaceae	Deciduous	Spring
<i>Camptotheca</i>	Nyssaceae	Deciduous	March to April
<i>Cathaya</i>	Pinaceae	Evergreen	April to June
<i>Cephalotaxus</i>	Taxaceae	Evergreen	April
<i>Cercidiphyllum</i>	Cercidiphyllaceae	Deciduous	Seed not dormant
<i>Choerospondias</i>	Anacardiaceae	Deciduous	January to March
<i>Corylopsis</i>	Hamamelidaceae	Deciduous	December to January
<i>Craigia</i>	Malvaceae	Deciduous	Unknown
<i>Cryptomeria</i>	Cupressaceae	Evergreen	Unknown
<i>Cunninghamia</i>	Cupressaceae	Evergreen	Unknown
<i>Cyclocarya</i>	Juglandaceae	Deciduous	Spring
<i>Davidia</i>	Nyssaceae	Deciduous	March to April
<i>Decaisnea</i>	Lardizabalaceae	Deciduous	Unknown
<i>Dipelta</i>	Caprifoliaceae	Deciduous	Unknown
<i>Diplopanax</i>	Nyssaceae	Evergreen	Unknown
<i>Dipteronia</i>	Aceraceae	Deciduous	April
<i>Disanthus</i>	Hamamelidaceae	Deciduous	Unknown
<i>Eucommia</i>	Eucommiaceae	Deciduous	Winter and spring
<i>Euptelea</i>	Eupteleaceae	Deciduous	April to May
<i>Eurycorymbus</i>	Sapindaceae	Deciduous	Seed not dormant
<i>Euryodendron</i>	Pentaphylacaceae	Evergreen	Unknown
<i>Euscaphis</i>	Staphyleaceae	Deciduous	March to April
<i>Fortunearia</i>	Hamamelidaceae	Deciduous	April
<i>Glyptostrobus</i>	Cupressaceae	Semi-evergreen	Unknown
<i>Hemiptelea</i>	Ulmaceae	Deciduous	May
<i>Heptacodium</i>	Caprifoliaceae	Deciduous	Unknown
<i>Hovenia</i>	Rhamnaceae	Deciduous	March to April
<i>Idesia</i>	Flacourtiaceae	Deciduous	Unknown
<i>Keteleeria</i>	Pinaceae	Evergreen	Seed not dormant
<i>Koelreuteria</i>	Sapindaceae	Deciduous	Unknown
<i>Kolkwitzia</i>	Caprifoliaceae	Deciduous	Unknown
<i>Malaria</i>	Ximeniaceae	Evergreen	Unknown
<i>Meliiodendron</i>	Styracaceae	Deciduous	Unknown
<i>Metasequoia</i>	Taxodiaceae	Deciduous	Seed not dormant
<i>Monimopetalum</i>	Celastraceae	Deciduous	Spring
<i>Ostryopsis</i>	Betulaceae	Deciduous	Unknown
<i>Parapyrenaria</i>	Theaceae	Evergreen	Unknown
<i>Paulownia</i>	Paulowniaceae	Deciduous	March to April

<i>Phellodendron</i>	Rutaceae	Deciduous	Unknown
<i>Platycarya</i>	Juglandaceae	Deciduous	April to May
<i>Poliothyrsis</i>	Salicaceae	Deciduous	Unknown
<i>Poncirus</i>	Rutaceae	Semi-evergreen	April to May
<i>Pseudolarix</i>	Pinaceae	Deciduous	March to April
<i>Pseudotaxus</i>	Taxaceae	Evergreen	Unknown
<i>Pteroceltis</i>	Ulmaceae	Deciduous	Spring
<i>Pterostyrax</i>	Styracaceae	Deciduous	Unknown
<i>Schizophragma</i>	Hydrangeaceae	Deciduous	Unknown
<i>Semiliquidambar</i>	Altingiaceae	Deciduous or evergreen	Unknown
<i>Sinofranchetia</i>	Lardizabalaceae	Deciduous	Unknown
<i>Sinojackia</i>	Styracaceae	Deciduous	Spring
<i>Sinopanax</i>	Araliaceae	Evergreen	Unknown
<i>Sinowilsonia</i>	Hamamelidaceae	Deciduous	Unknown
<i>Taiwania</i>	Cupressaceae	Evergreen	Unknown
<i>Tapiscia</i>	Tapisciaceae	Deciduous	March to April
<i>Tetracentron</i>	Tetracentron	Evergreen	May
<i>Tetrapanax</i>	Araliaceae	Evergreen	March to August
<i>Tetrathyrium</i>	Hamamelidaceae	Evergreen	Unknown
<i>Thujiopsis</i>	Cupressaceae	Evergreen	March to May
<i>Toricellia</i>	Toricelliaceae	Deciduous	Unknown
<i>Tripterygium</i>	Celastraceae	Deciduous	Unknown
<i>Weigela</i>	Caprifoliaceae	Deciduous	Unknown

* Information of seed germination is based on “Seeds of Woody Plants in China”¹.

Related reference

1. National Service Center for State-Owned Forest Farms and Forestry Seed Seedling Affairs of the Forestry Administration. Seeds of woody plants in China. (Chinese Forestry Publishing House, Beijing, 2003).

Supplementary Table S2. Percentage contribution of each climatic parameter to explain the geographic distribution.

Genus	Bio4 (°C)	Bio7 (°C)	CMMT (°C)	Pautumn (mm)	Pspring (mm)	Psummer (mm)	Pwinter (mm)
<i>Amentotaxus</i>	17.8	51	17.3	1.4	10.5	1.8	0.1
<i>Amesiodendron</i>	1.8	33.8	40.8	0.4	14.8	6.5	1.9
<i>Apterosperma</i>	2.8	3.4	25.8	1.1	62.8	3.1	1
<i>Archiboehmeria</i>	2.8	17	47.8	15.1	14.1	1	2.2
<i>Bretschneidera</i>	17.4	1.6	0.7	0.7	79.1	0.3	0.3
<i>Camptotheca</i>	10.7	6.7	4.1	23.2	33.5	19.2	2.6
<i>Cathaya</i>	28.3	6.2	2.3	7	38.8	1	16.3
<i>Cephalotaxus</i>	1.6	4	14.7	77.9	0.6	0.6	0.6
<i>Cercidiphyllum</i>	7.8	6.4	11.2	40.1	18.4	2.2	13.8
<i>Choerospondias</i>	2.5	53.9	32.4	1.8	2	0.7	6.8
<i>Corylopsis</i>	12.9	34.5	3.6	44.2	0.9	3.9	0.1
<i>Craigia</i>	3.8	34.2	17.1	2	26.7	3.9	12.3
<i>Cryptomeria</i>	1.3	23.7	2.3	63.5	1.7	1.1	6.4
<i>Cunninghamia</i>	3.4	33.1	2	53	4.3	1	3.2
<i>Cyclocarya</i>	3.1	10.2	3.2	3.5	70.5	9	0.6
<i>Davidia</i>	15.4	17.2	13.7	30.5	11.4	0.6	11.2
<i>Decaisnea</i>	16.3	29.1	5.6	34.7	0.8	1.4	12.1
<i>Dipelta</i>	12.1	28.6	13.1	24.7	1.8	0.3	19.4
<i>Diplopanax</i>	12.4	28.9	2.6	4.6	41	5	5.6
<i>Dipteronia</i>	5.3	7.3	16.2	59.6	0.7	0.7	10.1

<i>Disanthus</i>	11.8	21.1	8	7.2	21.5	0.9	29.5
<i>Eucommia</i>	6.8	12.2	4.1	47.7	19.3	3.8	6.1
<i>Euptelea</i>	2.5	4.5	11.8	24.3	42.7	0.5	13.8
<i>Eurycorymbus</i>	14.3	17.2	1.9	1.2	54	0.3	11.1
<i>Euryodendron</i>	1	2.4	21.9	1.3	66.9	6.2	0.2
<i>Euscaphis</i>	2.7	7.7	21.1	65.3	2.2	0.9	0.2
<i>Fortunearia</i>	14.7	1.4	30.2	23.6	28.5	0.9	0.8
<i>Glyptostrobus</i>	15.9	23.6	1.7	6	31.5	9.3	11.9
<i>Hemiptelea</i>	17.5	9.4	26.3	3.3	2.6	25.7	15.2
<i>Heptacodium</i>	10.5	1.6	3.2	51.8	6	6.4	20.5
<i>Hovenia</i>	3	6.8	63.9	15.5	1.9	8.9	0.1
<i>Idesia</i>	1.7	21.1	2.3	13.2	51.2	10.2	0.4
<i>Keteleeria</i>	4.3	29.8	1.2	57.8	2.9	3.3	0.8
<i>Koelreuteria</i>	1.3	3.1	31.7	22.7	11.6	26.7	3
<i>Kolkwitzia</i>	22.2	1.7	38.3	30.4	0.7	3.4	3.3
<i>Malania</i>	11.1	36.3	17.3	7	28.1	0.3	0
<i>Melliodendron</i>	15.3	18.3	13.2	4.8	30.4	0.5	17.6
<i>Metasequoia</i>	7.8	0.1	2.5	35.7	45.4	0.5	7.9
<i>Monimopetalum</i>	11.7	9.8	3	4.5	20.7	2	48.3
<i>Ostryopsis</i>	8.7	12.2	12.9	31	9.8	1.8	23.7
<i>Parapyrenaria</i>	6.5	4.9	80.8	6	0.1	1.2	0.4
<i>Paulownia</i>	5.2	5.1	14	73	0.9	1.5	0.3
<i>Phellodendron</i>	18.1	6.8	4.7	8.7	1.7	57.9	2
<i>Platycarya</i>	6.6	0.6	24.7	60.8	5.5	0.8	1
<i>Poliothyrsis</i>	7	0.8	11.2	25.1	44.9	7.1	4
<i>Poncirus</i>	14.2	0.5	41.9	3.1	27.6	1.1	11.7
<i>Pseudolarix</i>	6.7	1.6	35.5	0.9	36.5	15.3	3.5
<i>Pseudotaxus</i>	19.7	1.4	1.2	0.9	52.7	4.9	19.1
<i>Pteroceltis</i>	12.5	7.3	12.5	20	25	18.8	3.8
<i>Pterostyrax</i>	10	23.8	2	0.3	62.4	0.7	0.8
<i>Schizophragma</i>	5.5	3.4	5.7	39.3	29.1	16.9	0.2
<i>Semiliquidambar</i>	9.4	22.1	22.7	1.1	24.5	7.4	12.9
<i>Sinofranchetia</i>	3.4	11.3	17.1	35.9	21.8	1.9	8.5
<i>Sinojackia</i>	7.3	31.5	1.9	29.5	6.9	10.1	12.9
<i>Sinopanax</i>	14.4	69.1	0.3	0.3	7.6	6.8	1.4
<i>Sinowilsonia</i>	13.6	2.4	49.4	10.4	16.6	0.3	7.3
<i>Taiwania</i>	19.6	32.6	7.6	8.6	16.5	0.1	14.9
<i>Tapiscia</i>	5	23.5	8.8	55.2	4.8	1.2	1.6
<i>Tetracentron</i>	26.5	47.6	9.1	1	1.7	6.6	7.6
<i>Tetrapanax</i>	12.1	28.7	7	34.3	5.1	4.8	8
<i>Tetrathyrium</i>	7.3	6.6	47.4	0.1	0	5.4	33.2
<i>Thujopsis</i>	12.8	13	16.8	4.9	6.6	11.2	34.8
<i>Toricellia</i>	10.7	31.6	10.8	28.4	6.8	1.6	10.1
<i>Trypterygium</i>	8.8	2	1.1	6.8	35.2	43.7	2.4
<i>Weigela</i>	33.9	2.7	1.7	2.2	18.6	40.8	0.1

Supplementary Table S3. Permutation importance of each climatic parameter to explain the geographic distribution.

Genus	Bio4 (°C)	Bio7 (°C)	CMMT (°C)	Pautumn (mm)	Pspring (mm)	Psummer (mm)	Pwinter (mm)
<i>Amentotaxus</i>	38.6	5.4	17.7	6.4	22.2	8.8	0.9
<i>Amesiodendron</i>	2.5	20.7	32.9	0.7	29.7	1.6	11.9
<i>Apterosperma</i>	12.2	23.4	3.5	6.4	50.2	2.9	1.4
<i>Archiboehmeria</i>	3.6	10.9	60.4	8.8	12.4	0.6	3.3
<i>Bretschneidera</i>	15.4	3.7	2.1	1.6	72.7	3.5	1.1

<i>Camptotheca</i>	17.5	3.2	4.5	6.4	12	46	10.4
<i>Cathaya</i>	42.7	6.3	3.3	2.4	14.9	0.8	29.7
<i>Cephalotaxus</i>	9.9	4.8	20.5	35.4	14.6	7.9	6.9
<i>Cercidiphyllum</i>	7.9	2.9	6.7	62	8.4	8.4	3.8
<i>Choerospondias</i>	17.2	24.1	17.2	6.1	22.1	6.1	7.2
<i>Corylopsis</i>	33.6	9.7	13.2	13.8	11	13.8	4.8
<i>Craigia</i>	1.2	18.9	11.1	1.4	40.5	4.5	22.4
<i>Cryptomeria</i>	9.3	37.3	7.5	16.3	5.6	11.7	12.4
<i>Cunninghamia</i>	13.1	21.6	9.8	10.9	22.5	10.6	11.6
<i>Cyclocarya</i>	7.9	25.1	4.8	7.6	35.5	18.3	0.8
<i>Davidia</i>	26	8.4	19.4	5.5	11.4	7.7	21.6
<i>Decaisnea</i>	7.1	8.2	4.8	65.9	0.7	10.1	3.2
<i>Dipelta</i>	2.7	12.6	27.8	11.7	5.8	2.8	12.2
<i>Diplopanax</i>	36.9	3.4	7.9	10.7	24.7	8.2	8.3
<i>Dipteronia</i>	4.6	4.3	12.3	66	1.2	2.3	9.3
<i>Disanthus</i>	15	3.4	18.2	7.4	12.5	6.1	37.4
<i>Eucommia</i>	12.9	13	6.4	40.1	4.9	7.1	15.6
<i>Euptelea</i>	12.1	2.2	18.5	29.7	24.8	5.6	7
<i>Eurycorymbus</i>	27.1	3.8	9.5	3.3	18.2	6.5	31.7
<i>Euryodendron</i>	0.1	26.3	3.9	5.9	57.1	6.6	0.1
<i>Euscaphis</i>	21.1	14.6	26.5	13.4	9.5	11.8	3
<i>Fortunearia</i>	6.7	7.1	13.7	59.1	6.3	1.7	5.4
<i>Glyptostrobus</i>	10.6	30.1	2.3	15.5	18	6	17.4
<i>Hemiptelea</i>	19.9	1.5	29.6	2.5	8.5	11.7	26.3
<i>Heptacodium</i>	3.1	1.6	8.3	44.3	3.8	0.3	38.6
<i>Hovenia</i>	9.4	13.6	34.7	1.5	24.5	10.2	6.2
<i>Idesia</i>	19.1	5.3	8.6	5.6	37.5	18.1	5.8
<i>Keteleeria</i>	10.9	15	6.6	41.2	6.3	14.2	5.8
<i>Koelreuteria</i>	5.7	7.1	21.1	12.3	26.3	14.1	13.5
<i>Kolkwitzia</i>	37.8	16.7	15.3	8.6	6.8	1.3	13.5
<i>Malania</i>	8.5	3	12.1	10.3	65.3	0.7	0
<i>Melliodendron</i>	22.4	23.2	2	5.6	13	1.3	32.6
<i>Metasequoia</i>	1.8	2.8	0.3	28.9	57.1	0.6	8.6
<i>Monimopetalum</i>	0.7	1.6	6	3.5	87	0.3	0.7
<i>Ostryopsis</i>	12.9	10.1	18.5	18.4	12.6	4.3	23.2
<i>Parapyrenaria</i>	0	54.4	43.8	0.3	0.4	0.2	0.9
<i>Paulownia</i>	14	7.4	19.4	32.3	10.2	9.3	7.4
<i>Phellodendron</i>	27.8	8.5	2.5	7.2	3.2	49.3	1.5
<i>Platycarya</i>	17.1	3.4	30.8	14.7	15.1	11.5	7.6
<i>Poliothyrsis</i>	10	6.1	11.9	59.2	4.7	5.3	2.9
<i>Poncirus</i>	14.7	1	17.3	11.8	5.2	4.8	45.1
<i>Pseudolarix</i>	9.3	1.8	8.2	5.7	15.3	42.7	17
<i>Pseudotaxus</i>	36.8	0.8	2.1	4.3	5.6	30.3	20.2
<i>Pteroceltis</i>	21.6	6.5	11.2	13.2	5.4	33.1	8.9
<i>Pterostyrax</i>	20.3	8.6	8.3	4.7	48.6	0.5	9
<i>Schizophragma</i>	24.4	12.1	9.1	3.5	22.8	27.1	1.1
<i>Semiliquidambar</i>	29	12.2	15.7	3.7	26.7	5.2	7.6
<i>Sinofranchetia</i>	1.8	5.5	4.2	69.2	4.5	11.3	3.5
<i>Sinojackia</i>	11.3	22.3	3.8	4.3	47.1	1.9	9.4
<i>Sinopanax</i>	0	98.6	0.3	0.2	0.1	0	0.6
<i>Sinowilsonia</i>	50.7	15.1	21.9	4.6	1.4	0.2	6.1
<i>Taiwania</i>	50.3	6.5	7.7	0.5	3.1	1.3	30.5
<i>Tapiscia</i>	25.9	10.1	17.2	6.3	24.5	2.5	13.5
<i>Tetracentron</i>	26	23.4	14.5	0.9	10.5	14.5	10.1
<i>Tetrapanax</i>	19.1	2.2	12.8	5.6	19.8	24.6	16
<i>Tetrathyrium</i>	1.9	0	92	0	0	0.2	5.9
<i>Thujopsis</i>	19.9	22.1	27	4.7	2.5	7.7	16.2

<i>Toricellia</i>	19.3	9.9	13.9	15.6	13.2	16.5	11.6
<i>Trypterygium</i>	20.3	7.4	8.7	13.2	36.1	11.9	2.5
<i>Weigela</i>	30	3.2	8.1	5.6	28.2	24.6	0.3

Supplementary Table S4. Number of times each parameter best explains the geographic distribution of relict genera in China.

Parameter	Percent contribution	Permutation importance
Bio4	0	14
Bio7	10	5
CMMT	11	8
Pautumn	19	12
Pspring	19	15
Psummer	3	6
Pwinter	3	5