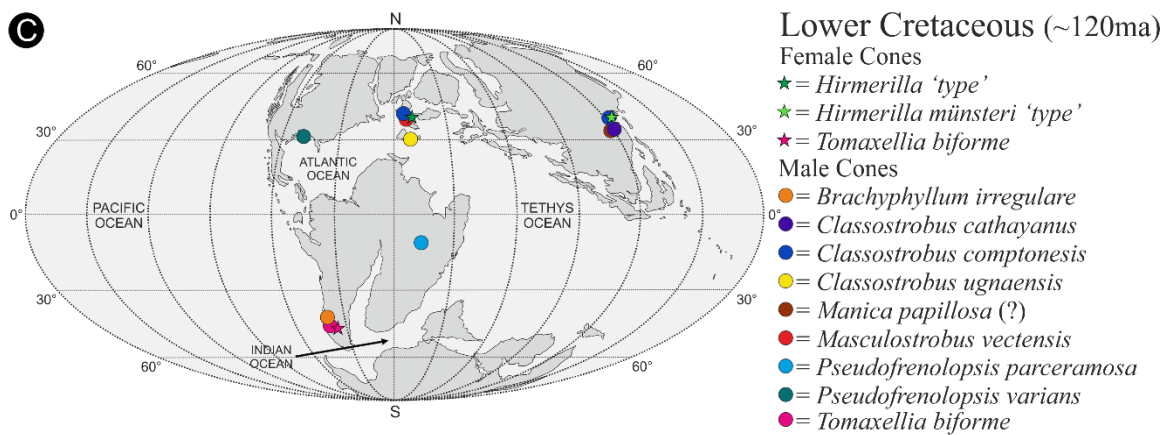
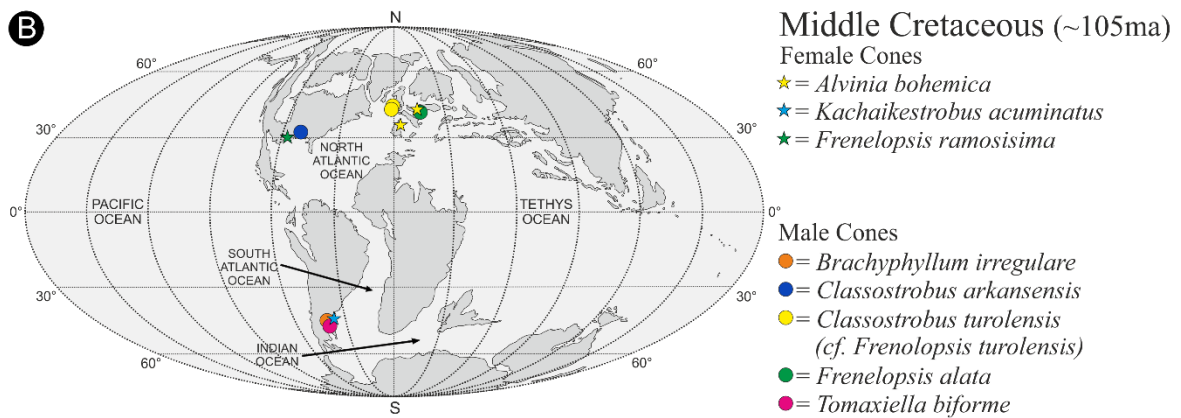
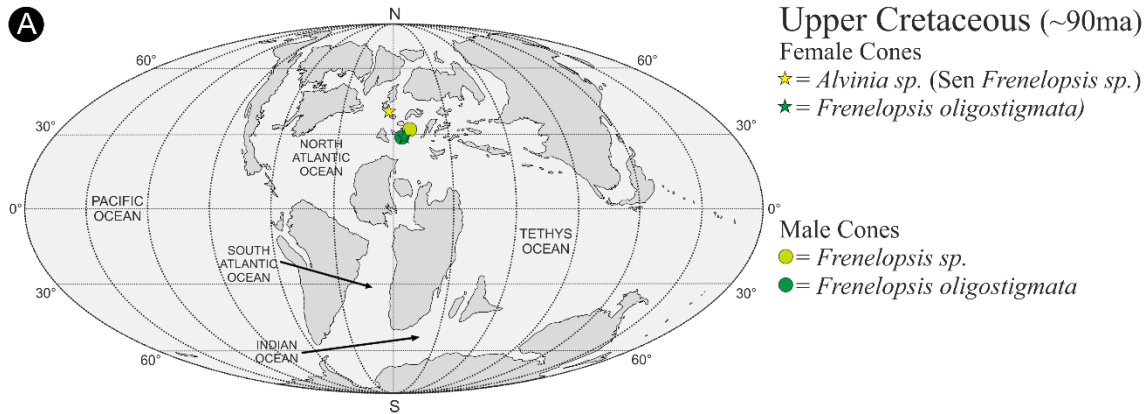


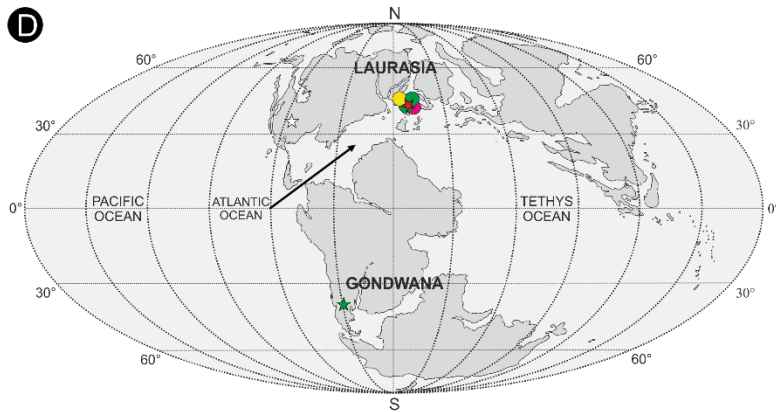
# Supplemental Data S1

A literature survey was carried out to plot the palaeogeographic distribution of all published male and female cones for the Cheirolepidiaceae. Palaeogeographic latitude and longitudes were calculated using PointTracker after determining modern geographical co-ordinates from topographic and geological maps in tandem with Google Earth™. These were plotted using Corel Creative Suite X5™ on to a series of Mesozoic palaeomaps showing individual time slices. The palaeomaps were based on global palaeo-reconstruction maps by Ron Blakely (Blakey, 2008).

This file contains the results, dataset, and references from the literature survey.

# Results



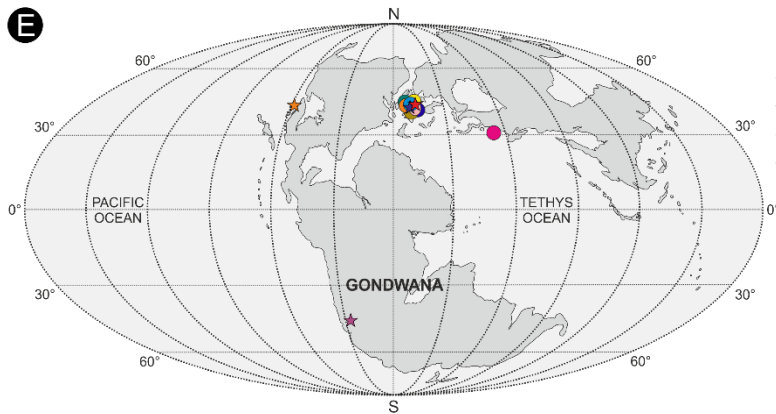
**D****Upper Jurassic (~150ma)**

Female Cones

- ★ = Chicks Grove
- ★ = *Pararaucaria delfueyoi*
- ☆ = *Pararaucaria sp.*

Male Cones

- = *Classostrobus sp.*
- = *Classostrobus crossii*
- = *Pityanthus scalbiensis*

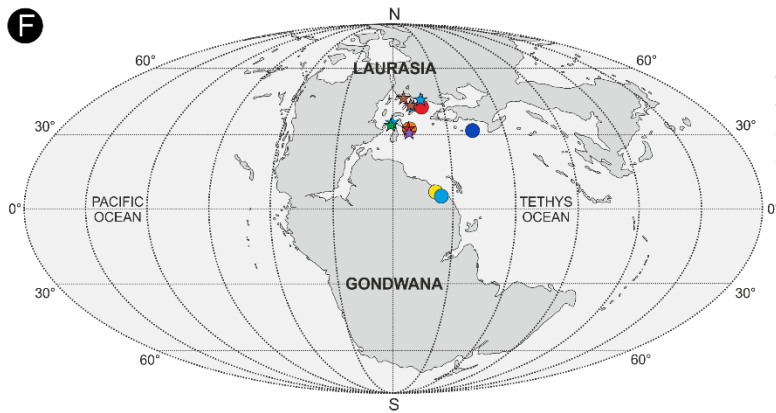
**E****Middle Jurassic (~170ma)**

Female Cones

- ★ = *Pararaucaria carrii*
- ★ = *Pararaucaria patagonica*
- ★ = *Araucarites estonensis*
- ★ = *Hirmeriella kendalliae*

Male Cones

- = *Araucarites estonensis*
- = *Araucarites phillipsi*
- = *Brachyphyllum crucis*
- = *Brachyphyllum mamillare*
- = *Classostrobus cloughtonensis*
- = *Cupressinocladus pseudoexpansum*
- = *Masculostrobus harrisii*
- = *Masculostrobus harrisianus*

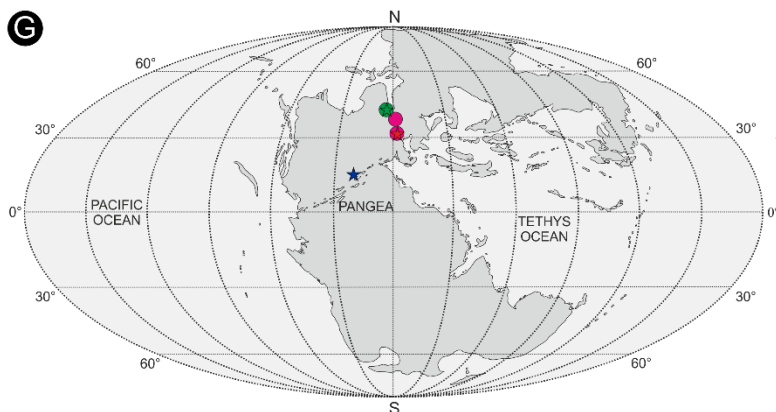
**F****Lower Jurassic (~200ma)**

Female Cones

- ★ = *Classostrobus sp.*
- ★ = *Hirmeriella münsteri*
- ★ = *Hirmeriella sp.*
- ★ = *Hirmeriella peregrinum*

Male Cones

- = *Classostrobus lozerianus*
- = *Cupressinocladus pseudoexpansum*
- = *Cupressinocladus ramonensis*
- = *Hirmeriella münsteri*
- = *Masculostrobus harrisianus*

**G****Upper Triassic (~220ma)**

Female Cones

- ★ = *Pseudohirmeriella delawarensis*
- ★ = *Brachyphyllum scottii*
- ★ = *Hirmeriella airelensis*

Male Cones

- = *Brachyphyllum scottii*
- = *Hirmerella airelensis*
- = *Hirmerella münsteri*

## Dataset

\* APT = Age used in PointTracker

Paper	Genus/species	Location	Palaeo-location	Age	APT*	Organ
Alvin, Fraser & Watson, 1981	<i>Hirmeriella</i> 'type'	Hanover Point/Isle of Wright (UK) 50.65;-1.47	41.50; 08.66	Barremian, 129.4 to 125 MA	130 MA	♀ Cone
Alvin, Watson and Spicer, 1994	<i>Classostrobus comptonensis</i> (re-described)	Hanover Point/Isle of Wright (UK) 50.65;-1.47	41.50; 08.66	Barremian, 129.4 to 125 MA	130 MA	♂ Cone
Alvin, Spicer & Warson, 1978	<i>Pseudofrenolopsis parceramosa</i>	Compton bay/Hanover Point (UK) 50.65;-1.47	41.50; 08.66	Barremian, 129.4 to 125.0 MA	130 MA	♂ Cone
Alvin, Spicer & Watson, 1981	<i>Classostrobus comptonensis</i>	Hanover Point/Isle of Wright (UK) 50.65;-1.47	41.50; 08.66	Barremian, 129.4 to 125 MA	130 MA	♂ Cone
Alvin, Watson and Spicer, 1994	<i>Masculostrobus vectenisi</i>	Hanover Point/Isle of Wright (UK) 50.65;-1.47	41.50; 08.66	Barremian, 129.4 to 125 MA	130 MA	♂ Cone
Archangelsky & Gamera, 1967	<i>Tomaxiella biforme</i>	Argentina (Baquero Fm) -46.93; -69.31	-50.85; -39.23	Aptian, 125 to 113 MA (Cesari, et al. 2011 Radiometric - 114.67 MA)	110 MA	♂ Cone
Archangelsky & Gamera, 1967	<i>Brachyphyllum irregulare</i>	Argentina (Baquero Fm) -46.93; -69.31	-50.85; -39.23	Aptian, 125 to 113 MA (Cesari, et al. 2011 Radiometric - 114.67 MA)	110 MA	♂ Cone
Archangelsky, 1966	<i>Tomaxiella biforme</i>	Bajo Grande Fm/Santa Cruz (Argentina) -46.93;-69.32	-47.45; -34.49	Aptian, 125 to 113 MA (Cesari, et al. 2011 Radiometric - 114.67 MA)	120 MA	♂ Cone
Archangelsky, 1968	<i>Tomaxiella biforme</i>	Bajo Grande Fm/Santa Cruz (Argentina) -46.93;-69.32	-47.45; -34.89	Aptian, 125 to 113 MA (Cesari, et al. 2011 Radiometric - 114.67 MA)	120 MA	♂ Cone
Archangesky, 1963	<i>Tomaxiella biforme</i>	Bajo Grande Fm/Santa Cruz (Argentina) -46.93;-69.32	-47.45; -34.89	Aptian, 125 to 113 MA (Cesari, et al. 2011 Radiometric - 114.67 MA)	120 MA	♂ Cone
Archangesky, 1963	<i>Brachyphyllum irregulare</i>	Bajo Grande Fm/Santa Cruz (Argentina) -46.93;-69.32	-47.45; -34.89	Aptian, 125 to 113 MA (Cesari, et al. 2011 Radiometric - 114.67 MA)	120 MA	♂ Cone
Axsmith & Jacobs, 2005	<i>Frenolopsis ramosissima</i>	Jons Ranch/Texas (USA) 32.25; -97.81	30.83; -56.35	Aptian/Albian boundary, ~113 MA	110 MA	♂ and ♀ Cones
Axsmith, Kriggs & Wesselkov, 2004	<i>Classostrobus arkansensis</i> (Sen <i>P. paraceramosa</i> )	Howard County/Nasville (USA) 34.07; -93.84	31.72; -51.02	Aptian/Albian boundary, ~113 MA	110 MA	♂ Cone
Axsmith, Andrews & Fraser, 2004	<i>Pseudohirmerella delawarensis</i>	Smith Clark Quarry/Milford NJ (USA) 40.57;-75.14	14.86; -20.01	Norian, 227 to 208.5	220 MA	♀ Cone
Barale, 1987	<i>Classostrobus</i> sp.	St. Fromond (France) 49.22; -1.09	35.67; 02.99	Rhaetian/Hettangian 208.5 to 199.3 MA	200 MA	♂ and ♀ Cones
Barale, 1987	<i>Hirmeriella</i> sp.	St. Fromond (France) 49.22; -1.09	35.67; 02.99	Rhaetian/Hettangian 208.5 to 199.3 MA	200 MA	♂ and ♀ Cones
Barale, Marron & Ramis, 1976	<i>Frenolopsis</i> sp.	Torrelaguna/Madrid (Spain) 40.84; -3.53	30.94; -00.72	Senonian 89.3 to 65.5 MA	80 MA	♂ Cone
Barnard & Miller, 1975	<i>Cupressinocladus psuedoexpansum</i>	North Iran 38.8; 46.9	29.15; 54.79	Bajocian (Shem Shak Fm) 170.3 to 168.3 MA	170 MA	♂ Cone

Paper (cont...)	Genus/species (cont...)	Location (cont...)	Palaeo-location (cont...)	Age (cont...)	APT* (cont...)	Organ (cont...)
Carpentier, 1937	<i>Frenelopsis</i> sp.	Saint Baume Massif (France) 43.32; 5.76	33.12; 07.63	Lower Campanian, 83.6 to 72.1 MA	80 MA	♂ Cone
Chaloner & Lorch, 1960	<i>Cupressinocladus ramonensis</i>	Israel 30.57;34.91	11.58; 27.08	Rhaetian/Liassic, 208.5 to 199.3 MA	200 MA	♂ Cone
Lorch, 1968	<i>Cupressinocladus ramonensis</i>	Israel 30.57;34.91	11.58; 27.08	Rhaetian/Liassic, 208.5 to 199.3 MA	200 MA	♂ Cone
Cleal, 2003	<i>Classostrobus</i> sp.	Stonesfield slate (UK) 51.85; -1.43	40.80; 09.50	Bathonian, 168.3 to 166.1 MA	170 MA	♂ Cone
Clement-Westerhoff & Van Konijnenburg-Van Cittert, 1991	<i>Hirmeriella muensteri</i>	Unterschreez - Bayreuth (Germany) 49.95; 11.57	39.85; 12.85	Hettangian, 201.3 to 199.3 MA	200 MA	♂ Cone
Daviero, et al., 2001	<i>Frenelopsis turoloensis</i>	Rubielos de Mara (Spain) 40.19; -0.65	28.76; 05.94	Middle Albian, 113 to 100.5 MA	110 MA	♂ Cone (immature cone)
Del Fueyo, et al., 2008	<i>Kachaikastrobus acuminatus</i>	Santa Cruz Provence (Argentina) ~-42.9;-67.08	-46.83; -37.18	Albian, 113 to 100.5 MA	110 MA	♀ Cone
Escapa, et al., 2013	<i>Pararacaria delfueyoi</i>	Chubut Prvence (Argentina) -43.19;-69.22	-39.79; -29.71	Oxfordian/Kimmeridgian, 157.5 MA (Radiometric)	160 MA	♀ Cone
Fontaine, 1893; Watson, 1977	<i>Pseudofrenelopsis varians</i>	Glen Rose/Texas/USA 32.23, -97.76	30.1; -50.36	Aptian/Lower most Albian 125 - ~113 MA	120 MA	♂ Cone
Francis, 1983	<i>Classostrobus</i> sp.	Purbeck/Dorset (UK) 50.53;-2.44	44.14; 01.44	Tithonian, 152.1 to 145 MA	150 MA	♂ Cone
Gee, et al, 2014	<i>Pararaucaria</i> sp.	Morrison Formation (USA) 38.82; -110.41	35.63,-58.43	Kimmeridian to Tithonian, 157 to 145 Ma	150 MA	♀ Cone
Gomez, et al., 2002	<i>Classostrobus ugunaensis</i> (c.f. <i>F. ugunaensis</i> )	Cuenca (Spain) 40.01; -2.14	30.88; 07.85	Upper Barremian 129.4 to 125 MA	130 MA	♂ Cone
Gomez, et al., 2002	<i>Classostrobus turoloensis</i> (c.f. <i>F. turoloensis</i> )	Teruel (Spain) 40.35; -1.11	28.76; 05.94	Lower/Middle Albian, 113 to 100.5 MA	110 MA	♂ Cone
Harris, 1957	<i>Cheirolepis munsteri</i>	Glamorgan (Wales, UK) 51.49; -3.26	38.03; 00.18	Rhaetian, 208.5 to 201.3 MA	200 MA	♂ Cone
Harris, 1979	<i>Brachyphyllum crucis</i>	Yorkshire(UK) 53.7; -1.56	42.72; 08.40	Bajocian to Bathonian, 170.3 to 166.1 MA	170 MA	♂ Cone
Hirmer & Horhamer, 1934	<i>Hirmeriella muensteri</i>	Germany/Wales 10; 16	39.58; 11.60	Rhaetian/Liassic, 208.5 to 199.3 MA	200 MA	♂ and ♀ Cones
HlustiK & K0nzalova, 1976	<i>Frenelopsis alata</i>	Hlochetin (Prague-Czech Republic) 51.11;14.54	40.17; 14.13	Cenomanian, 100.5 to 93.9 MA	100 MA	♂ Cone
Horhamer, 1933 (see also Jung, 1967)	<i>Hirmeriella muensteri</i>	Germany/Wales 10; 16	39.58; 11.60	Rhaetian/Liassic, 208.5 to 199.3 MA	200 MA	♂ and ♀ Cones
Jung, 1967	<i>Cheirolepis munsteri</i> (name changed to <i>Hirmerella munsteri</i> )	Schnaittach/Nurmburg region Germany 49.5; 11.3	39.58; 11.60	Rhaetian/Liassic, 208.5 to 199.3 MA	200 MA	♀ (seedless) Cones
Jung, 1967	<i>Hirmerella</i>	Altdorf, Germany 49.39, 11.36	38.67; 12.12	Rhaetian–Toarcian 208.5-174.1	200 MA	Sterile Cone
Jung, 1968	<i>Hirmerella munsteri</i> (name changed from <i>Cheirolepis munsteri</i> )	Grossbellhofen, Franconia (Germany) 49.57; 11.31	39.58; 11.60	Rhaetian/Liassic, 208.5 to 199.3 MA	200 MA	♀ Cone

Paper (cont...)	Genus/species (cont...)	Location (cont...)	Palaeo-location (cont...)	Age (cont...)	APT* (cont...)	Organ (cont...)
Kendall, 1949	<i>Brachyphyllum scottii</i>	Larachberg/Morvern (Scotland) 56.57;-5.78	42.08; -04.27	Rhaetian/Liassic, 208.5 to 199.3 MA	210 MA	♂ and ♀ Cone, Cone scales and cone axes
Kendall, 1952	<i>Pagiophyllum connivens</i> (c.f. <i>Araucarites estonensis</i> )	Eston Moor/Yorkshire (UK) 54.55; -1.12	42.72; 08.40	Bajocian, 170.3 to 168.3 MA	170 MA	♂ and ♀ Cone
Kendall, 1952	<i>Araucarites phillipsi</i>	Whitby/Yorkshire (UK) 54.48; -0.61	42.72; 08.40	Bajocian, 170.3 to 168.3 MA	170 MA	♂ Cone
Kim, et al., 2012	<i>Classostrobus comptonensis</i>	Youngdong Group(South Korea) 36.20, 127.78	40.45; 127.07	Berriasian–Albian 145.0–100.5	130 MA	♂ Cone
Kim, et al., 2012	Unnamed ( <i>Hirmerella münsteri</i> type)	Youngdong Group(South Korea) 36.20, 127.78	40.45; 127.07	Berriasian–Albian 145.0–100.5	130 MA	♀ Cone
Krassilov, 1982	<i>Hirmerella</i> sp.	Odrovaz (Poland) 49.49; 19.85	42.08; 18.49	Hettangian, 201.3 to 199.3 MA	200 MA	♀ Samara from Cone
Kvacek, 2000	<i>Frenelopsis alata</i> (♀ cones reassigned to <i>Alvinia bohémica</i> )	Pecinov Quarry (Czech Republic) 50.14;13.89	39.11; 13.45	Cenomanian(Middle), 100.5 to 93.9 MA	100 MA	♂ Cone
Kvacek, 2000	<i>Alvinia bohémica</i> (this is the reassigned name for ♀ cones of <i>Frenelopsis alata</i> )	Lipenêc(Czech Republic) 50.31, 13.71	39.11; 13.45	Cenomainian 100.5–93.9	100 MA	♀ Cone
Kvacek, 2000	<i>Alvinia bohémica</i>	Lipenêc(Czech Republic) 50.31, 13.71	39.11; 13.45	Cenomainian 100.5–93.9	100 MA	♀ Cone
Lorch, 1986	<i>Masclostrobus harrisianus</i>	Makhtesh Ramon(Israel) 30.61, 34.88	11.58; 27.08	Rhaetian–Pliensbachian 208.5–185.0	200 MA	♂ Cone
Muir & Van Konijnenburg-Van Cittert, 1970	<i>Hirmeriella airelensis</i>	Airel (France) 49.22; -1.08	32.92; 01.66	Norian to Hettangian 227 to 201 MA	210 MA	♂ and ♀ Cone scales and pollen
Pons & Broutin, 1978	<i>Frenelopsis oligostomata</i>	Portugal 38.69; -9.35	29.72; -05.53	Senonian 89.3 to 65.5 MA	80 MA	♂ and ♀ Cones
Pons, 1979	<i>Frenelopsis alata</i>	L'Anjou (France) 47.67; -0.21	36.44; 02.06	Cenomanian, 100.5 to 93.9 MA	100 MA	♂ and ♀ Cones
Rothwell, et al., 2007	<i>Classostrebus crossii</i>	Cirencester (UK) 51.77;-1.97	42.58; 08.02	Callovian, 166.1 to 163.5 MA	160 MA	♂ Cone
Rothwell, et al., 2007	<i>Classostrobus crossii</i>	Freeth's Wood Gravel Pit/Ashton Keynes(UK) 51.64, -1.95	42.58; 08.01	Callovian 166.1–163.5	160 MA	♂ Cone
Stockey & Rothwell, 2013	<i>Pararacaria carrii</i>	Izee/Oregon (USA) 44.07;-119.37	37.80; -63.14	Callovian(Officer member), 166.1 to 163.5 MA	160 MA	♀ Cone
Stockey, 1977; Calder, 1953; Escapa, et al., 2012	<i>Pararacaria patagonia</i>	Cero Cuadrado (Argentina) -51.26;-72.33	-48.04; -29.91	La Matilde Fm; Callovian, 166.1 to 163.5	160 MA	♀ Cone
Thevenard, 1993	<i>Classostrobus lozerianus</i>	Chaldecoste outcrop/Lozere(France) 44.53, 3.49	32.89; 07.79	Hettangian–Sinemurian 201.3–190.8	200 MA	♂ Cone
Thevenard, 1993	<i>Hirmeriella airelensis</i>	Chaldecoste outcrop/Lozere(France) 44.53, 3.49	32.89; 07.79	Hettangian–Sinemurian 201.3–190.8	200 MA	♀ Cone Scale
Thevenard,1993	<i>Hirmeriella peregrinum</i>	Chaldecoste outcrop/Lozere(France) 44.53, 3.49	32.89; 07.79	Hettangian–Sinemurian 201.3–190.8	200 MA	♀ Cone Scale

Paper (cont...)	Genus/species (cont...)	Location (cont...)	Palaeo-location (cont...)	Age (cont...)	APT* (cont...)	Organ (cont...)
Van Cittert, 1971	<i>Masculostrobus harrisii</i>	Yorkshire (UK) 53.7; -1.56	42.72; 08.40	Bajocian to Bathonian, 170.3 to 166.1 MA	170 MA	♂ Cone
Van Cittert, 1971	<i>Brachyphyllum crucis</i>	Yorkshire (UK) 53.7; -1.56	42.72; 08.40	Bajocian to Bathonian, 170.3 to 166.1 MA	170 MA	♂ Cone
Van Konijnenburg-Van Cittert, 1971	<i>Brachyphyllum crucis</i>	Lower Deltaic/Hasty Bank/Yorkshire(UK) 54.42, -1.13	42.78; 09.19	Aalenian 174.1–170.3	170 MA	♂ Cone
Van Konijnenburg-Van Cittert, 1971	<i>Pagiophyllum connivens</i> , (c.f. <i>Pagiophyllum kurri</i> )	Lower/Middle Deltaic/Eston Moor/Yorkshire(UK) 54.55, -1.12	43.78; 09.03	Bajocian 170.3–168.3	170 MA	♂ Cone
Van Konijnenburg-Van Cittert, 1971	<i>Masculostrobus harrisianus</i>	Middle Deltaic/Cayton Bay/Yorkshire(UK) 54.24, -0.36	42.86 09.99	Aalenian–Bajocian 174.1–168.3	170 MA	♂ Cone
Van Konijnenburg-Van Cittert, 1971	<i>Brachyphyllum mamillare</i> , (pos. <i>Araucaria</i> )	Lower-Middle-Upper Deltaic/Whitby/Yorkshire(UK) 54.49, -0.63	42.78; 09.19	Aalenian–Bathonian 174.1–166.1	170 MA	♂ Cone
Van Konijnenburg-Van Cittert, 1987	<i>Classostrobus cloughtonensis</i>	Cloughton Wykes, Yorkshire(England) 54.34, -0.45	42.86; 09.19	Aalenian–Bajocian 174.1–168.3	170 MA	♂ Cone
Van Konijnenburg-Van Cittert, 1987	<i>Hirmeriella kendalliae</i>	Cloughton Wykes, Yorkshire(England) 54.34, -0.45	42.86; 09.19	Aalenian–Bajocian 174.1–168.3	170 MA	♀ Cone
Van Konijnenburg-Van Cittert, 1971	<i>Pityanthus scalbiensis</i> (family assignation dubious)	Upper Deltaic/Scalby Wake/Yorkshire(UK) 54.32, -0.45	44.64; 09.51	Bathonian 168.3–166.1	160 MA	♂ Cone
Wason & Alvin, 1976	<i>Pseudofrenelopsis paraceramosa</i>	Jebel Dirra/Eastern Daefur(Sudan) 13.59; 26.06	-05.36; 6.44	Berriasian to Albian (estimate in Watson 1982), 145-100.5	130 MA	♂ or ♀ Cones not specified (check again)
Zhou, 1983	<i>Classostrobus cathayanus</i>	Qiya Town/Nanjing/China 32.00, 118.60	35.52; 120.5	Lower Cretaceous ~113-145 MA	120MA	♂ Cone
Zhou, 1995	<i>Manica papillosa</i>	Suqing/Xinchang/Zhejiang/China 29.40,120.9	34.18; 122.6	Lower Cretaceous ~113-145 MA	120MA	♂ Cone

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