

Jacobsen—*American Journal of Botany* 2021—Appendix S1
 Diversity in conduit and pit structure among extant gymnosperm taxa

Appendix S1. Summary of pit membrane traits for extant gymnosperm genera and the references from which these traits are compiled. When different references have reported conflicting presence/absence reports for the same genus or species, these are highlighted in **red text**. The number of published reports for a given trait within a genus are included parenthetically for some traits. Species that were newly examined from dried wood blocks or fresh samples for the present review are indicated with an asterisk (*); these new examinations were not counted toward the number of reports nor the numbers of observations for trait characters.

Phyla	Family	Genus	Species for which traits have been reported	Reports (#)	Species with reported traits (#)	Vessels present (Y/N)	Pit membrane type (A/B/C)	Torus presence (Y/N)	Pitting (-seriate)	Pitting arrangement (alternate/opposite)	Reference(s)
Ginkgophyta	Ginkgoaceae	<i>Ginkgo</i>	* <i>Ginkgo biloba</i> L.	9	1	N	B (2)	Y (1) and N (6)	uni- & bi-	opposite	Penhallow 1907, Liese 1965, Bauch et al. 1972, Timell 1978, Schulte and Gibson 1988, Yin and Xiao-Mei 1992, Dute 1994, Hacke et al. 2004, Schweingruber et al. 2006
Gnetophyta	Ephedraceae	<i>Ephedra</i>	<i>Ephedra americana</i> Humb. & Bonpl. ex Willd., <i>Ephedra distachya</i> subsp. <i>helvetica</i> (C.A.Mey.) Asch. & Graebn., <i>Ephedra fasciculata</i> A.Nelson, <i>Ephedra foeminea</i> Forssk., <i>Ephedra fragilis</i> Desf., <i>Ephedra major</i> Host, * <i>Ephedra nevadensis</i> S.Watson, <i>Ephedra pachyclada</i> Boiss., <i>Ephedra pedunculata</i> Engelm. ex S.Watson, <i>Ephedra torreyana</i> S.Watson, <i>Ephedra trifurca</i> Torr. ex S.Watson, * <i>Ephedra viridis</i> Coville, <i>Ephedra</i> spp.	22	12	Y (17)	A (2)	Y (17) and N (2) (conduit-type specific)	multi- (vessels)	alternate (vessels)	MacDuffie 1921, Liese 1965, Bauch et al. 1972, Carlquist 1990, Carlquist 1992, Carlquist 1996, Schweingruber et al. 2006, Motomura et al. 2007, Carlquist 2012, Crivellaro and Schweingruber 2013, Dute et al. 2014

Jacobsen—*American Journal of Botany* 2021—Appendix S1
Diversity in conduit and pit structure among extant gymnosperm taxa

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Gnetophyta	Gnetaceae	<i>Gnetum</i>	<i>Gnetum africanum</i> Welw., <i>Gnetum buchholzianum</i> Engl., <i>Gnetum cuspidatum</i> Blume, <i>Gnetum edule</i> (Willd.) Blume, <i>Gnetum gnemon</i> L., <i>Gnetum gnemonoides</i> Brongn., <i>Gnetum leyboldii</i> Tul., <i>Gnetum microcarpum</i> Blume, <i>Gnetum montanum</i> Markgr., <i>Gnetum nodiflorum</i> Brongn., <i>Gnetum paniculatum</i> Spruce ex Benth., <i>Gnetum schwackeanum</i> Taub. ex Schenck, <i>Gnetum urens</i> (Aubl.) Blume, <i>Gnetum venosum</i> Spruce ex Benth., <i>Gnetum</i> spp.	29	14	Y (24)	A (6) and C (3) (conduit-type and species specific)	Y (11) and N (9)	multi- (vessels)	Alternate (vessels)	MacDuffie 1921, Liese 1965, Bauch et al. 1972, Muhammad and Sattler 1982, Carlquist and Robinson 1995, Fisher and Ewers 1995, Carlquist 1996a, Carlquist 1996b, Schweingruber et al. 2006, Carlquist 2012
Gnetophyta	Welwitschiaceae	<i>Welwitschia</i>	* <i>Welwitschia mirabilis</i> Hook.f.	6	1	Y (4)	C (1)	N (5)	multi- (vessels)	alternate (vessels)	Greguss 1965, Liese 1965, Bauch et al. 1972, Carlquist and Gowans 1995, Carlquist 1996

Jacobsen—*American Journal of Botany* 2021—Appendix S1
Diversity in conduit and pit structure among extant gymnosperm taxa

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Cycadophyta	Cycadaceae	<i>Cycas</i>	<i>Cycas circinalis</i> L., <i>Cycas ferruginea</i> F.N.Wei, <i>Cycas media</i> R.Br., <i>Cycas panzhihuaensis</i> L.Zhou & S.Y.Yang, * <i>Cycas revoluta</i> Thunb., <i>Cycas siamensis</i> Miq., <i>Cycas szechuanensis</i> W.C.Cheng & L.K.Fu, <i>Cycas taitungensis</i> C.F.Shen, K.D.Hill, C.H.Tsou & C.J.Chen, <i>Cycas taiwaniana</i> Carruth., <i>Cycas</i> spp.	11	9	Y (5) and N (2)	C (4)	N (4)	multi-	alternate	Greguss 1961, Greguss 1965, Liese 1965, Bauch et al. 1972, Huang and Wu 2007, Schneider et al. 2007, Huang et al. 2010, Huang et al. 2017
Cycadophyta	Zamiaceae	<i>Bowenia</i>		0	0						
Cycadophyta	Zamiaceae	<i>Ceratozamia</i>	<i>Ceratozamia robusta</i> Miq., <i>Ceratozamia becerrae</i> Pérez-Farr., Vovides & Schutzman, <i>Ceratozamia euryphyllidia</i> Vázq.Torres, Sabato & D.W.Stev., <i>Ceratozamia hondurensis</i> J.L.Haynes, Whitelock, Schutzman & R.S.Adams	4	4	Y (3) and N (1)	C (1)	N (1)			Schneider et al. 2007, Vovides et al. 2000
Cycadophyta	Zamiaceae	<i>Dioon</i>	<i>Dioon edule</i> Lindl., <i>Dioon holmgrenii</i> De Luca, <i>Dioon merolae</i> De Luca, Sabato & Vázq.Torres, <i>Dioon purpusii</i> Rose, <i>Dioon spinulosum</i> Dyer ex Eickl.	7	5	Y (1) and N (4)	C (1)	N (3)	multi-	alternate	Chamberlain 1911, Bailey 1925, Greguss 1961, Schulte and Gibson 1988, Schneider et al. 2007, Huang et al. 2010
Cycadophyta	Zamiaceae	<i>Encephalartos</i>	<i>Encephalartos altensteinii</i> Lehm., <i>Encephalartos barteri</i> Carruth. ex Miq., <i>Encephalartos gratus</i> Prain,	5	4	N (2)	C (2)	N (2)	multi-	alternate	Greguss 1961, Greguss 1965, Schneider et al. 2007

Jacobsen—*American Journal of Botany* 2021—Appendix S1
Diversity in conduit and pit structure among extant gymnosperm taxa

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			<i>Encephalartos senticosus</i> Vorster, <i>Encephalartos</i> sp.								
Cycadophyta	Zamiaceae	<i>Lepidozamia</i>	<i>Lepidozamia hopei</i> (W.Hill) Regel	1	1	Y (1)			multi-	alternate	Greguss 1961
Cycadophyta	Zamiaceae	<i>Macrozamia</i>	<i>Macrozamia communis</i> L.A.S.Johnson, <i>Macrozamia macdonnellii</i> (F.Muell. ex Miq.) A.DC., <i>Macrozamia moorei</i> F.Muell., <i>Macrozamia</i> sp.	4	3	Y (1) and N (2)		N (2)	multi-	alternate	Greguss 1965, Schneider et al. 2007, Huang et al. 2010
Cycadophyta	Zamiaceae	<i>Microcycas</i>	<i>Microcycas calocoma</i> (Miq.) A.DC., <i>Microcycas</i> sp.	2	1	N (1)			multi-		Greguss 1961, Greguss 1965
Cycadophyta	Zamiaceae	<i>Stangeria</i>	<i>Stangeria eriopus</i> (Kunze) Baill.	3	1	Y (1) and N (1)		N (1)			Greguss 1965, Schneider et al. 2007, Huang et al. 2010
Cycadophyta	Zamiaceae	<i>Zamia</i>	<i>Zamia furfuracea</i> L.f. ex Aiton, <i>Zamia loddigesii</i> Miq., <i>Zamia neurophyllidia</i> D.W.Stev., <i>Zamia skinneri</i> Warsz. ex A.Dietr., <i>Zamia muricata</i> Willd.	6	5	Y (1) and N (2)	C (1)	N (2)	multi-	alternate	Greguss 1961, Greguss 1965, Yuyuan and Hongda 1998, Schneider et al. 2007
Coniferophyta	Araucariaceae	<i>Agathis</i>	* <i>Agathis australis</i> (D.Don) Lindl., <i>Agathis borneensis</i> Warb., * <i>Agathis dammara</i> (Lamb.) Poir., <i>Agathis macrophylla</i> (Lindl.) Mast., <i>Agathis philippinensis</i> Warb., <i>Agathis robusta</i> (C.Moore) ex F.Muell.) F.M.Bailey	10	6	N	B (4)	N (5)	bi- & multi-	alternate	Penhallow 1907, Patel 1968a, Jane et al. 1970, Bauch et al. 1972, Donaldson 1983, Dickson 2000

Jacobsen—*American Journal of Botany* 2021—Appendix S1
Diversity in conduit and pit structure among extant gymnosperm taxa

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Coniferophyta	Araucariaceae	<i>Araucaria</i>	* <i>Araucaria angustifolia</i> (Bertol.) Kuntze, * <i>Araucaria bidwillii</i> Hook., * <i>Araucaria columnaris</i> (G.Forst.) Hook., * <i>Araucaria cunninghamii</i> Mudie, * <i>Araucaria heterophylla</i> (Salisb.) Franco, <i>Araucaria</i> spp.	15	5	N	B (7)	N (7)	uni-, bi-, & multi-	alternate	Penhallow 1907, Liese 1965, Jane et al. 1970, Bauch et al. 1972, Butterfield and Meylan 1980, Yin and Xiao-Mei 1992, Schweingruber et al. 2006, Carlquist 2017
Coniferophyta	Araucariaceae	<i>Wollemia</i>	<i>Wollemia nobilis</i> W.G.Jones, K.D.Hill & J.M.Allen	1	1	N	B (1)	N (1)	uni- & bi-	alternate	Heady et al. 2002
Coniferophyta	Cupressaceae	<i>Athrotaxis</i>	<i>Athrotaxis × laxifolia</i> Hook., <i>Athrotaxis</i> sp.	3	1	N	B (1)	Y (2) and N (1)	uni- (bi-)		Bauch et al. 1972, Pittermann et al. 2010, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Austrocedrus</i>	<i>Austrocedrus chilensis</i> (D.Don) Pic.Serm. & Bizzarri	2	1	N	A (1)	Y (2)	uni- (bi-)	alternate	Roig 1992, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Callitris</i>	* <i>Callitris columellaris</i> F.Muell., <i>Callitris muelleri</i> (Parl.) Benth. & Hook.f. ex F.Muell., <i>Callitris pancheri</i> (Carrière) Byng, <i>Callitris pyramidalis</i> (Miq.) J.E.Piggin & J.J.Bruhl, <i>Callitris rhomboidea</i> R.Br. ex Rich., <i>Callitris robusta</i> R.Br. ex Mirb., <i>Callitris</i> spp.	11	6	N	A (3)	Y (10)	uni-		Bauch et al. 1972, Butterfield and Meylan 1980, Gadek et al. 2000, Delzon et al. 2010, Pittermann et al. 2010, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Callitropsis</i>	* <i>Callitropsis nootkatensis</i> (D.Don) Oerst.	3	1	N	A (1)	Y (2)	uni- (bi-)		Penhallow 1907, Bauch et al. 1972, Román-Jordán et al. 2017

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Coniferophyta	Cupressaceae	<i>Calocedrus</i>	* <i>Calocedrus decurrens</i> (Torr.) Florin, <i>Calocedrus macrolepis</i> Kurz	5	2	N	A (1)	Y (4)	uni- (bi-)		Penhallow 1907, Bauch et al. 1972, Pittermann et al. 2010, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Chamaecyparis</i>	* <i>Chamaecyparis lawsoniana</i> (A.Murray bis) Parl., <i>Chamaecyparis obtusa</i> (Siebold & Zucc.) Endl., <i>Chamaecyparis pisifera</i> (Siebold & Zucc.) Endl., * <i>Chamaecyparis thyoides</i> (L.) Britton, Sterns & Poggenb.	12	4	N	A (4)	Y (6)	uni- & bi-	opposite	Penhallow 1907, Bauch et al. 1972, Butterfield and Meylan 1980, Román-Jordán et al. 2017, Huang et al. 2017
Coniferophyta	Cupressaceae	<i>Cryptomeria</i>	* <i>Cryptomeria japonica</i> (Thunb. ex L.f.) D.Don	6	1	N	A (2)	Y (5)	uni- (bi-)		Penhallow 1907, Bauch et al. 1972, Fujii et al. 1997, Kitin et al. 2009, Pittermann et al. 2010, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Cunninghamia</i>	* <i>Cunninghamia lanceolata</i> (Lamb.) Hook.	2	1	N	B (1)	Y (1) and N (1)	uni- (bi-)		Bauch et al. 1972, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Cupressus</i>	* <i>Cupressus sempervirens</i> L.	4	1	N	A (1)	Y (4)	uni-		Bauch et al. 1972, Delzon et al. 2010, Crivellaro and Schweingruber 2013, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Diselma</i>	<i>Diselma archeri</i> Hook.f.	2	1	N	A (1)	Y (2)	uni-		Bauch et al. 1972, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Fitzroya</i>	* <i>Fitzroya cupressoides</i> (Molina) I.M.Johnst.	4	1	N	A (2)	Y (4)	uni- (bi-)	alternate	Bauch et al. 1972, Roig 1992, Pittermann et al. 2010, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Fokienia</i>	<i>Fokienia hodginsii</i> (Dunn) A.Henry & H.H.Thomas	2	1	N	A (1)	Y (2)	uni-		Bauch et al. 1972, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Glyptostrobus</i>	<i>Glyptostrobus pensilis</i> (Staunton ex D.Don) K.Koch	2	1	N		Y (2)	uni- (bi-)		Pittermann et al. 2010, Román-Jordán et al. 2017

Jacobsen—*American Journal of Botany* 2021—Appendix S1
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Coniferophyta	Cupressaceae	<i>Hesperocyparis</i>	* <i>Hesperocyparis arizonica</i> (Greene) Bartel, <i>Hesperocyparis forbesii</i> (Jeps.) Bartel, <i>Hesperocyparis goveniana</i> (Gordon) Bartel, <i>Hesperocyparis lusitanica</i> (Mill.) Bartel, <i>Hesperocyparis macnabiana</i> (A. Murray bis) Bartel, <i>Hesperocyparis macrocarpa</i> (Hartw.) Bartel	10	6	N	A (2)	Y (5)	uni- (bi-)	opposite	Penhallow 1907, Bauch et al. 1972, Butterfield and Meylan 1980, Delzon et al. 2010, Pittermann et al. 2010, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Juniperus</i>	<i>Juniperus ashei</i> J. Buchholz, <i>Juniperus californica</i> Carrière, <i>Juniperus chinensis</i> L., <i>Juniperus communis</i> L., <i>Juniperus deppeana</i> Steud., <i>Juniperus drupacea</i> Labill., <i>Juniperus excelsa</i> M. Bieb., <i>Juniperus foetidissima</i> Willd., <i>Juniperus monosperma</i> (Engelm.) Sarg., * <i>Juniperus occidentalis</i> Hook., <i>Juniperus osteosperma</i> (Torr.) Little, <i>Juniperus oxycedrus</i> L., <i>Juniperus phoenicea</i> L., <i>Juniperus procera</i> Hochst. ex Endl., <i>Juniperus rigida</i> Siebold & Zucc., <i>Juniperus sabina</i> L.,	31	18	N	A (6)	Y (20)	uni- (bi-)	opposite	Penhallow 1907, Bauch et al. 1972, Butterfield and Meylan 1980, Hacke et al. 2004, Schweingruber et al. 2006, Delzon et al. 2010, Pittermann et al. 2010, Crivellaro and Schweingruber 2013, Román-Jordán et al. 2017

Jacobsen—*American Journal of Botany* 2021—Appendix S1
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			<i>Juniperus scopulorum</i> Sarg., * <i>Juniperus virginiana</i> L.								
Coniferophyta	Cupressaceae	<i>Libocedrus</i>	<i>Libocedrus bidwillii</i> Hook.f., <i>Libocedrus plumosa</i> (D.Don) Druce, <i>Libocedrus yateensis</i> Guillaumin	7	3	N	A (1)	Y (5)	uni- (bi-)	opposite	Patel 1968a, Bauch et al. 1972, Butterfield and Meylan 1980, Pittermann et al. 2010, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Metasequoia</i>	* <i>Metasequoia glyptostroboides</i> Hu & W.C.Cheng	7	1	N	B	Y (4) and N (3)	uni- (bi-)		Bauch et al. 1972, Dute et al. 2008, Delzon et al. 2010, Pittermann et al. 2010, Jansen et al. 2012, Huang et al. 2017, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Microbiota</i>	<i>Microbiota decussata</i> Kom.	1	1	N		Y	uni-		Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Papuacedrus</i>	<i>Papuacedrus papuana</i> (F.Muell.) H.L.Li	1	1	N		Y	uni- (bi-)		Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Pilgerodendron</i>	<i>Pilgerodendron uviferum</i> (D.Don) Florin	2	1	N	A	Y	uni-		Roig 1992, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Platyclusus</i>	<i>Platyclusus orientalis</i> (L.) Franco	2	1	N	B	Y (1) and N (1)	uni- & bi-		Yin and Xiao-Mei 1992, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Sequoia</i>	* <i>Sequoia sempervirens</i> (D.Don) Endl.	8	1	N	A (2)	Y (6)	uni- & bi-	opposite	Penhallow 1907, Jane et al. 1970, Bauch et al. 1972, Hacke et al. 2004, Delzon et al. 2010, Pittermann et al. 2010,

Jacobsen—*American Journal of Botany* 2021—Appendix S1
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											Jansen et al. 2012, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Sequoiadendron</i>	* <i>Sequoiadendron giganteum</i> (Lindl.) J.Buchholz	7	1	N	A (2)	Y (6)	uni- (bi-)		Penhallow 1907, Bauch et al. 1972, Gadek et al. 2004, Delzon et al. 2010, Pittermann et al. 2010, Jansen et al. 2012, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Taiwania</i>	<i>Taiwania cryptomerioides</i> Hayata	3	1	N	B (1)	Y (2) and N (1)	uni- & bi-		Bauch et al. 1972, Pittermann et al. 2010, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Taxodium</i>	* <i>Taxodium distichum</i> (L.) Rich.	8	1	N	B (2)	Y (2) and N (3)	uni-, bi-, & multi-	opposite	Penhallow 1907, Bauch et al. 1972, Thomas 1972, Butterfield and Meylan 1980, Panshin and de Zeeuw 1980, Hacke et al. 2004, Pittermann et al. 2010, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Tetraclinis</i>	* <i>Tetraclinis articulata</i> (Vahl) Mast.	2	1	N	A (1)	Y (2)	uni- (bi-)		Bauch et al. 1972, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Thuja</i>	* <i>Thuja occidentalis</i> L., * <i>Thuja plicata</i> Donn ex D.Don, <i>Thuja standishii</i> (Gordon) Carrière	15	3	N	B (6)	Y (1) and N (11)	uni- & bi-		Penhallow 1907, Liese 1965, Bauch et al. 1972, Krahmer and Cote 1963, Panshin and de Zeeuw 1980, Domec et al. 2007, Delzon et al. 2010, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Thujopsis</i>	* <i>Thujopsis dolabrata</i> (L.f.) Siebold & Zucc.	5	1	N	B (4)	N (4)	uni- (bi-)		Penhallow 1907, Liese 1965, Bauch et al. 1972, Jansen et al. 2012, Román-Jordán et al. 2017

Jacobsen—*American Journal of Botany* 2021—Appendix S1
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Coniferophyta	Cupressaceae	<i>Widdringtonia</i>	<i>Widdringtonia nodiflora</i> (L.) Powrie, <i>Widdringtonia wallichii</i> Endl. ex Carrière, <i>Widdringtonia</i> sp.	3	2	N	A (1)	Y (3)	uni- (bi-)		Bauch et al. 1972, Pittermann et al. 2010, Román-Jordán et al. 2017
Coniferophyta	Cupressaceae	<i>Xanthocyparis</i>		0	0						
Coniferophyta	Pinaceae	<i>Abies</i>	<i>Abies alba</i> Mill., <i>Abies amabilis</i> (Douglas ex Loudon) J.Forbes, <i>Abies balsamea</i> (L.) Mill., <i>Abies bracteata</i> (D.Don) Poit., <i>Abies cilicica</i> (Antoine & Kotschy) Carrière, * <i>Abies concolor</i> (Gordon & Glend.) Lindl. ex Hildebr., * <i>Abies firma</i> Siebold & Zucc., <i>Abies fraseri</i> (Pursh) Poir., <i>Abies grandis</i> (Douglas ex D.Don) Lindl., <i>Abies lasiocarpa</i> (Hook.) Nutt., * <i>Abies magnifica</i> A.Murray bis, * <i>Abies nordmanniana</i> (Steven) Spach, <i>Abies pinsapo</i> Boiss., <i>Abies procera</i> Rehder, <i>Abies sachalinensis</i> (F.Schmidt) Mast., <i>Abies veitchii</i> Lindl.	30	16	N	A (13)	Y (19)	uni- (bi-)	opposite	Penhallow 1907, Liese 1965, Bauch et al. 1972, Sano et al. 1999, Hacke et al. 2004, Dute et al. 2008, Delzon et al. 2010, Carlquist 2017
Coniferophyta	Pinaceae	<i>Cathaya</i>		0	0						
Coniferophyta	Pinaceae	<i>Cedrus</i>	* <i>Cedrus atlantica</i> (Endl.) Manetti ex Carrière, * <i>Cedrus deodara</i> (Roxb. ex D.Don) G.Don, <i>Cedrus libani</i> A.Rich.	12	3	N	A (4)	Y (11)	uni- (bi-)	opposite	Liese 1965, Jane et al. 1970, Bauch et al. 1972, Dickison 2000, Esteban and Palacios 2009,

Jacobsen—*American Journal of Botany* 2021—Appendix S1
 Diversity in conduit and pit structure among extant gymnosperm taxa

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											Delzon et al. 2010, Crivellaro and Schweingruber 2013
Coniferophyta	Pinaceae	<i>Keteleeria</i>	<i>Keteleeria davidiana</i> (C.E.Bertrand) Beissn.	1	1	N	A (1)	Y (1)			Bauch et al. 1972
Coniferophyta	Pinaceae	<i>Larix</i>	* <i>Larix decidua</i> Mill., <i>Larix kaempferi</i> (Lamb.) Carrière, <i>Larix laricina</i> (Du Roi) K.Koch, <i>Larix lyallii</i> Parl., <i>Larix occidentalis</i> Nutt.	10	5	N	A (4)	Y (6)	uni- & bi-		Penhallow 1907, Bauch et al. 1972, Schweingruber et al. 2007, Delzon et al. 2010, Jansen et al. 2012
Coniferophyta	Pinaceae	<i>Nothotsuga</i>	<i>Nothotsuga longibracteata</i> (W.C.Cheng) H.H.Hu ex C.N.Page	1	1				uni- & bi-	opposite	Esteban and Palacios 2009
Coniferophyta	Pinaceae	<i>Picea</i>	* <i>Picea abies</i> (L.) H.Karst., <i>Picea alcoquiana</i> (H.J.Veitch ex Lindl.) Carrière, <i>Picea breweriana</i> S.Watson, <i>Picea engelmannii</i> Parry ex Engelm., <i>Picea jezoensis</i> (Siebold & Zucc.) Carrière, <i>Picea laxa</i> (Münchh.) Sarg., <i>Picea mariana</i> (Mill.) Britton, Sterns & Poggenb., <i>Picea polita</i> (Siebold & Zucc.) Carrière, <i>Picea pungens</i> Engelm., <i>Picea sitchensis</i> (Bong.) Carrière, <i>Picea</i> sp.	16	10	N	A (3)	Y (5)	uni-		Penhallow 1907, Jane et al. 1970, Bauch et al. 1972, Hacke et al. 2004, Román-Jordán et al. 2017

Jacobsen—*American Journal of Botany* 2021—Appendix S1
Diversity in conduit and pit structure among extant gymnosperm taxa

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Coniferophyta	Pinaceae	<i>Pinus</i>	<i>Pinus albicaulis</i> Engelm., <i>Pinus aristata</i> Engelm., <i>Pinus arizonica</i> Engelm., <i>Pinus balfouriana</i> Balf., <i>Pinus banksiana</i> Lamb., <i>Pinus brutia</i> Ten., <i>Pinus cembra</i> L., <i>Pinus cembraoides</i> Zucc., <i>Pinus clausa</i> (Chapm. ex Engelm.) Vasey ex Sarg., * <i>Pinus contorta</i> Douglas ex Loudon, <i>Pinus coulteri</i> D. Don, <i>Pinus cubensis</i> Griseb., <i>Pinus densiflora</i> Siebold & Zucc., <i>Pinus echinata</i> Mill., <i>Pinus edulis</i> Engelm., <i>Pinus flexilis</i> E. James, <i>Pinus glabra</i> Walter, * <i>Pinus halepensis</i> Mill., <i>Pinus hartwegii</i> Lindl., <i>Pinus jeffreyi</i> Balf., <i>Pinus kesiya</i> var. <i>langbianensis</i> (A. Chev.) Gaussen ex Bui, <i>Pinus lambertiana</i> Douglas, <i>Pinus lawsonii</i> Roehl ex Gordon, <i>Pinus leiophylla</i> Schiede ex Schlttdl. & Cham., <i>Pinus monophylla</i> Torr. & Frém., <i>Pinus montezumae</i> Lamb., * <i>Pinus monticola</i> Douglas ex D. Don, <i>Pinus mugo</i> Turra, <i>Pinus muricata</i> D. Don, * <i>Pinus nigra</i> J.F. Arnold,	93	50	N	A (30)	Y (50)	uni- & bi-	opposite	Penhallow 1907, Liese 1965, Thomas 1969, Bauch et al. 1972, Butterfield and Meylan 1980, Panshin and de Zeeuw 1980, Hacke et al. 2004, Schweingruber et al. 2006, Delzon et al. 2010, Jansen et al. 2012, Crivellaro and Schweingruber 2013

Jacobsen—*American Journal of Botany* 2021—Appendix S1
Diversity in conduit and pit structure among extant gymnosperm taxa

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			<i>*Pinus palustris</i> Mill., <i>Pinus parviflora</i> Siebold & Zucc., <i>Pinus pinaster</i> Aiton, <i>Pinus pinea</i> L., <i>Pinus ponderosa</i> Douglas ex C.Lawson, <i>Pinus pungens</i> Lamb., <i>*Pinus radiata</i> D.Don, <i>Pinus reflexa</i> (Engelm.) Engelm., <i>Pinus resinosa</i> Aiton, <i>Pinus rigida</i> Mill., <i>Pinus sabiniana</i> Douglas, <i>Pinus scopulorum</i> (Engelm.) Lemmon, <i>*Pinus serotina</i> Michx., <i>*Pinus strobus</i> L., <i>Pinus sylvestris</i> L., <i>Pinus taeda</i> L., <i>Pinus thunbergii</i> Parl., <i>Pinus torreyana</i> Parry ex Carrière, <i>Pinus tropicalis</i> Morelet, <i>Pinus uncinata</i> Ramond ex DC., <i>Pinus</i> spp.								
Coniferophyta	Pinaceae	<i>Pseudolarix</i>	<i>*Pseudolarix amabilis</i> (J.Nelson) Rehder	2	1	N	A (1)	Y (1)	uni- & bi-	opposite	Bauch et al. 1972, Esteban and Palacios 2009
Coniferophyta	Pinaceae	<i>Pseudotsuga</i>	<i>Pseudotsuga macrocarpa</i> (Vasey) Mayr, <i>*Pseudotsuga menziesii</i> (Mirb.) Franco	10	2	N	A (4)	Y (7)	uni- (bi-)		Penhallow 1907, Krahrmer and Cote 1963, Jane et al. 1970, Bauch et al. 1972, Butterfield and Meylan 1980, Panshin and de Zeeuw 1980, Hacke et al. 2004, Domec et al. 2007, Delzon et al. 2010

Jacobsen—*American Journal of Botany* 2021—Appendix S1
Diversity in conduit and pit structure among extant gymnosperm taxa

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Coniferophyta	Pinaceae	<i>Tsuga</i>	* <i>Tsuga canadensis</i> (L.) Carrière, <i>Tsuga caroliniana</i> Engelm., <i>Tsuga diversifolia</i> (Maxim.) Mast., * <i>Tsuga heterophylla</i> (Raf.) Sarg., * <i>Tsuga mertensiana</i> (Bong.) Carrière, <i>Tsuga sieboldii</i> Carrière	17	6	N	A (9)	Y (11)	uni- (bi-)		Penhallow 1907, Krahmer and Cote 1963, Liese 1965, Jane et al. 1970, Bauch et al. 1972, Panshin and de Zeeuw 1980, Domec et al. 2007, Esteban and Palacios 2009
Coniferophyta	Podocarpaceae	<i>Acmopyle</i>		0	0						
Coniferophyta	Podocarpaceae	<i>Afrocarpus</i>	* <i>Afrocarpus gracilior</i> (Pilg.) C.N.Page	1	1	N	A (1)	Y (1)			Bauch et al. 1972
Coniferophyta	Podocarpaceae	<i>Dacrycarpus</i>	<i>Dacrycarpus dacrydioides</i> (A.Rich.) de Laub., <i>Dacrycarpus imbricatus</i> (Blume) de Laub.	5	2	N	A (2)	Y (2)	uni- & bi-	opposite	Patel 1967b, Bauch et al. 1972, Butterfield and Meylan 1980, Donaldson 1983
Coniferophyta	Podocarpaceae	<i>Dacrydium</i>	* <i>Dacrydium cupressinum</i> Sol. ex G.Forst., <i>Dacrydium elatum</i> (Roxb.) Wall. ex Hook., <i>Dacrydium guillauminii</i> J.Buchholz	7	3	N	A (3)	Y (3)	uni- & bi-	opposite	Patel 1967a, Bauch et al. 1972, Pocknall 1977, Butterfield and Meylan 1980, Donaldson 1983, Carlquist 2017
Coniferophyta	Podocarpaceae	<i>Falcatifolium</i>		0	0						
Coniferophyta	Podocarpaceae	<i>Halocarpus</i>	<i>Halocarpus bidwillii</i> (Hook.f. ex Kirk) C.J.Quinn, <i>Halocarpus biformis</i> (Hook.) C.J.Quinn, <i>Halocarpus kirkii</i> (F.Muell. ex Parl.) C.J.Quinn	6	3				uni- (bi-)	opposite	Patel 1967a, Pocknall 1977
Coniferophyta	Podocarpaceae	<i>Lagarostrobos</i>	* <i>Lagarostrobos franklinii</i> (Hook.f.) Quinn	1	1	N	A (1)	Y (1)			Bauch et al. 1972
Coniferophyta	Podocarpaceae	<i>Lepidothamnus</i>	<i>Lepidothamnus</i> <i>intermedius</i> (Kirk) Quinn,	4	2				uni- (bi-)	opposite	Patel 1967a, Pocknall 1977
Coniferophyta	Podocarpaceae	<i>Manoao</i>	<i>Manoao colensoi</i> (Hook.) Molloy	2	1				uni- (bi-)	opposite	Patel 1967a, Pocknall 1977
Coniferophyta	Podocarpaceae	<i>Microcachrys</i>		0	0						

Jacobsen—*American Journal of Botany* 2021—Appendix S1
Diversity in conduit and pit structure among extant gymnosperm taxa

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Coniferophyta	Podocarpaceae	<i>Nageia</i>	<i>Nageia nagi</i> (Thunb.) Kuntze, <i>Nageia wallichiana</i> (C.Presl) Kuntze	2	2	N	A (1) and B (1)	Y (1) / N (1)	bi-		Bauch et al. 1972, Schulte and Gibson 1988
Coniferophyta	Podocarpaceae	<i>Parasitaxus</i>	<i>Parasitaxus usta</i> (Vieill.) de Laub.	1	1	N	C (1)	N (1)			Carlquist 2017
Coniferophyta	Podocarpaceae	<i>Pherosphaera</i>		0	0						
Coniferophyta	Podocarpaceae	<i>Phyllocladus</i>	* <i>Phyllocladus aspleniifolius</i> (Labill.) Hook.f., <i>Phyllocladus toatoa</i> Molloy, <i>Phyllocladus trichomanoides</i> D.Don	6	3	N	A (3)	Y (3)	uni- (bi-)		Patel 1968b, Bauch et al. 1972
Coniferophyta	Podocarpaceae	<i>Podocarpus</i>	<i>Podocarpus acutifolius</i> Kirk, <i>Podocarpus henkelii</i> Stapf ex Dallim. & B.D.Jacks., <i>Podocarpus laetus</i> Hooibr. ex Endl., * <i>Podocarpus macrophyllus</i> (Thunb.) Sweet, <i>Podocarpus milanjanus</i> Rendle, <i>Podocarpus nivalis</i> Hook., <i>Podocarpus nubigenus</i> Lindl., <i>Podocarpus rumphii</i> Blume, <i>Podocarpus totara</i> G.Benn. ex D.Don	12	9	N	A (5)	Y (5)	uni- (bi-)	opposite	Penhallow 1907, Patel 1967b, Bauch et al. 1972, Butterfield and Meylan 1980, Donaldson 1983
Coniferophyta	Podocarpaceae	<i>Prumnopitys</i>	<i>Prumnopitys andina</i> (Poepp. ex Endl.) de Laub., <i>Prumnopitys ferruginea</i> (G.Benn. ex D.Don) de Laub.	6	2	N	A (1)	Y (2)	uni- (bi-)	opposite	Patel 1967b, Bauch et al. 1972, Butterfield and Meylan 1980, Donaldson 1983
Coniferophyta	Podocarpaceae	<i>Retrophyllum</i>	<i>Retrophyllum rospigliosii</i> (Pilg.) C.N.Page	1	1	N	A (1)	Y (1)			Bauch et al. 1972
Coniferophyta	Podocarpaceae	<i>Saxegothaea</i>	<i>Saxegothaea conspicua</i> Lindl.	1	1	N	B (1)	N (1)			Bauch et al. 1972

Jacobsen—*American Journal of Botany* 2021—Appendix S1
Diversity in conduit and pit structure among extant gymnosperm taxa

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Coniferophyta	Podocarpaceae	<i>Sundacarpus</i>		0	0						
Coniferophyta	Sciadopityaceae	<i>Sciadopitys</i>	* <i>Sciadopitys verticillata</i> (Thunb.) Siebold & Zucc.	3	1	N	B (2)	Y (1) and N (2)	uni-		Bauch et al. 1972, Yin and Xiao-Mei 1992, Román-Jordán et al. 2017
Coniferophyta	Taxaceae	<i>Amentotaxus</i>	<i>Amentotaxus argotaenia</i> (Hance) Pilg., <i>Amentotaxus yunnanensis</i> H.L.Li, <i>Amentotaxus</i> sp.	3	2	N	B (1)	Y (1) and N (1)	uni-		Bauch et al. 1972, Ghimire et al. 2015, Román-Jordán et al. 2017
Coniferophyta	Taxaceae	<i>Austrotaxus</i>	<i>Austrotaxus spicata</i> Compton	1	1				uni-		Ghimire et al. 2015
Coniferophyta	Taxaceae	<i>Cephalotaxus</i>	<i>Cephalotaxus harringtonia</i> (Knight ex J.Forbes) K.Koch, <i>Cephalotaxus nana</i> Nakai	4	2		A (2)	Y (2)	uni-		Bauch et al. 1972, Jansen et al. 2012, Ghimire et al. 2015
Coniferophyta	Taxaceae	<i>Pseudotaxus</i>		0	0						
Coniferophyta	Taxaceae	<i>Taxus</i>	* <i>Taxus baccata</i> L., * <i>Taxus brevifolia</i> Nutt., <i>Taxus canadensis</i> Marshall, * <i>Taxus cuspidata</i> Siebold & Zucc., <i>Taxus floridana</i> Nutt. ex Chapm.	12	5	N	B (3)	Y (3) and N (3)	uni- & bi-		Penhallow 1907, Bauch et al. 1972, Butterfield and Meylan 1980, Ghimire et al. 2015, Delzon et al. 2010, Crivellaro and Schweingruber 2013
Coniferophyta	Taxaceae	<i>Torreya</i>	* <i>Torreya californica</i> Torr., <i>Torreya grandis</i> Fortune ex Lindl., <i>Torreya nucifera</i> (L.) Siebold & Zucc., <i>Torreya taxifolia</i> Arn.	8	4	N	B (4)	N (4)	uni- & bi-	opposite	Penhallow 1907, Bauch et al. 1972, Ghimire et al. 2015, Jansen et al. 2012

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