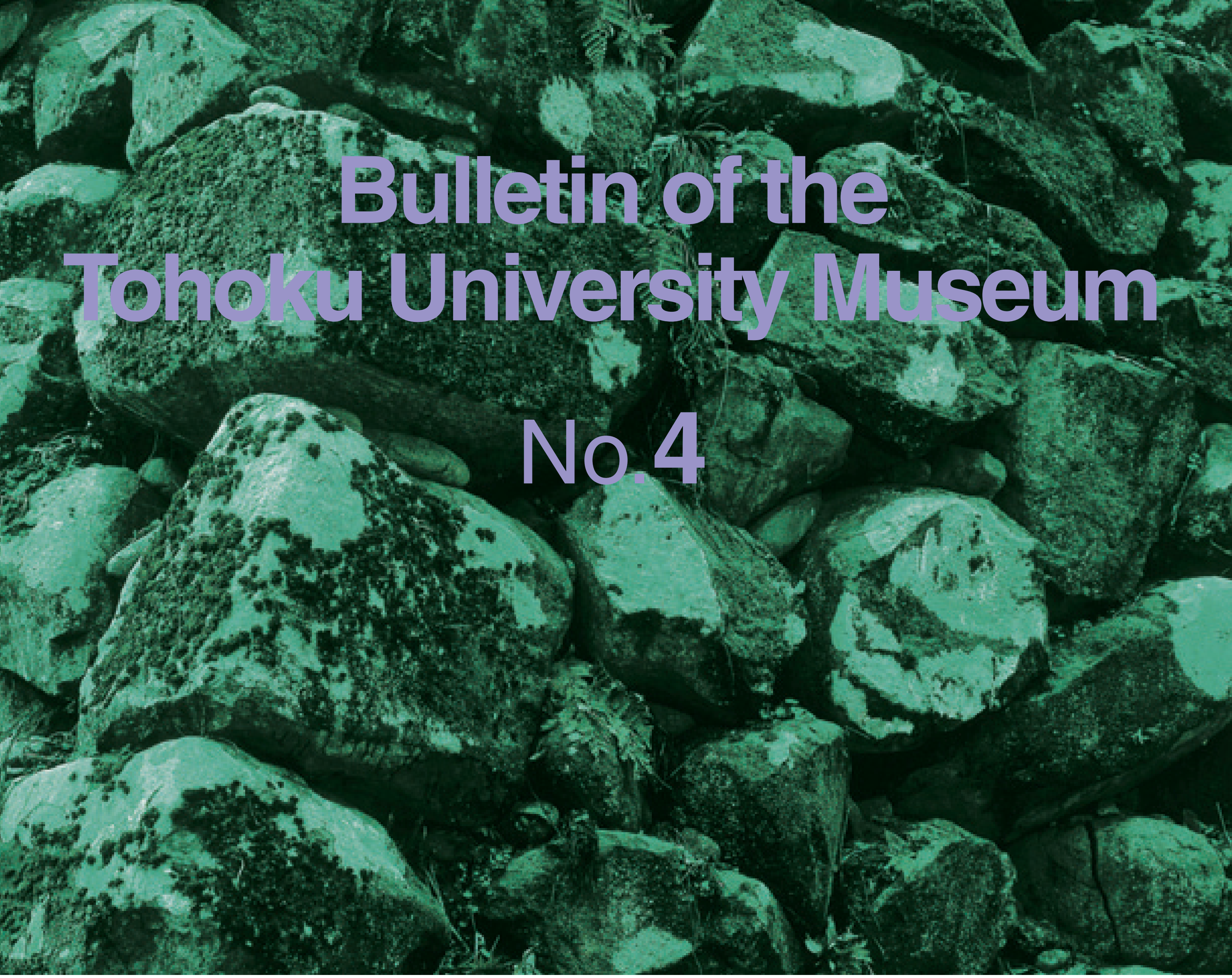
Bulletin of the Tohoku University Museum

No. 4



2005

Bulletin of the Tohoku University Museum

March 31, 2005

Printed by
Sasaki Printing and Publishing Co. Ltd.
8-45, Nishimachi, Rokuchonome, Wakabayashi-ku,
Sendai 984-0011, Japan
Telephone : 022-288-5555

Cover: Moss-overgrown ramparts of the Sendai-jo (castle) ruins,
cornerstones of the past; base for transitions into a new century.
Sendai-jo is often called Aoba-jo (Green Leaves Castle).

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Metric Data of Human Crania from the Tohoku Region, Honshu, Japan, Housed at the Department of Anatomy and Anthropology, Tohoku University School of Medicine

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Introduction

The skeletons of 178 fetuses and the crania of 20 immatures and 191 adults with records for each individual showing the place and date of birth as well as the date and cause of death are curated at the Department of Anatomy and Anthropology, Tohoku University School of Medicine. These skeletal collections are derived from dissecting-room subjects.

Part of the adult cranial series from the Tohoku region was already measured and published by Yamasaki et al. (1967) and Hanihara (2002) ; however, these researchers measured the upper facial height not following the method of Martin (1914) but following the method of Howells (1973). This produces considerable confusion in comparison of cranial measurements between different local samples of the Japanese Islands (Dodo, 2001). To dispel such confusion, we report here the raw data of 18 measurements in all of the 156 adult crania (101 males and 55 females) from the Tohoku region, Honshu, Japan, without deformation due to disease or injury.

Inventory of the Cranial Series

The identification number, provenience, sex, age at death, and date of death for each individual cranium of 101 males and 55 females are given in Table 1. A map of the Tohoku region in Honshu and that of individual prefectures within the Tohoku region are depicted in Figure 1.

The subjects are mostly derived from Miyagi Prefecture where Tohoku University is located (113 crania from Miyagi, 16 from Fukushima, 15 from Yamagata, 5 from Iwate, 4 from Aomori, and 3 from Akita). Photographs of representative male and female crania are given in Figures 2 and 3. The dates of birth range from 1814 to 1916, and the ages at death are from 20 to 90 years (the mean age at death is 48.9). Although the causes of death are not discussed, infectious diseases such as pulmonary tuberculosis are prevailing.

Methods of Measurements

Cranial measurements were taken basically by the method of Martin (1914). Slightly different methods, i.e. that of Martin (1914) and that of Howells (1973), were applied to the measurement of upper facial height. The following are the numbers, measurement items, abbreviations of the item, and brief comments relevant to the Martin's method.

1. Maximum cranial length (L)
5. Cranial base length (BL) : length from the basion to nasion
8. Maximum cranial breadth (B)
9. Minimum frontal breadth (FB)
17. Basion-bregma height (H)
40. Facial length (GL) : length from the basion to prosthion
45. Bizygomatic breadth (J)
48. Upper facial height (GH(1)) : length from the nasion to alveolare (Martin, 1914)
48'. Upper facial height (GH(2)) : length from the nasion to prosthion (Howells, 1973)
51. Orbital breadth (OB)
52. Orbital height (OH)
54. Nasal breadth (NB)
55. Nasal height (NH)

Facial flatness measurements were taken after Yamaguchi (1973). The measurement items, abbreviations of the item, and brief comments are as follows :

- Frontal chord (FC) : chord between the frontomalaria orbitalia
- Frontal subtense (FS) : subtense of the nasion from the frontal chord
- Simotic chord (SC) : minimum horizontal breadth of the nasal bones
- Simotic subtense (SS) : minimum subtense from the median ridge of nasalia to the simotic chord
- Zygomaxillary chord (ZC) : chord between the zygomaxillaria anteriora
- Zygomaxillary subtense (ZS) : subtense of the subspinale from the zygomaxillary chord

Table 1. Inventory of the adult crania from the Tohoku region, Honshu, housed at the Department of Anatomy and Anthropology, Tohoku University School of Medicine

Skull number	Provenience	Sex	Age at death	Date of death
256	Miyagi	male	47	1900
266	Yamagata	male	40	1900
281	Miyagi	male	23	1901
283	Miyagi	male	81	1901
287	Miyagi	male	20	1901
290	Miyagi	male	38	1901
302	Miyagi	female	26	1901
320	Miyagi	male	35	1902
326	Miyagi	male	33	1902
327	Fukushima	male	40	1902
349	Yamagata	male	35	1903
353	Miyagi	female	90	1903
363	Miyagi	male	57	1903
364	Miyagi	male	24	1903
373	Miyagi	female	25	1903
387	Yamagata	female	25	1903
401	Miyagi	female	66	1904
407	Miyagi	male	60	1904
422	Miyagi	male	45	1904
423	Fukushima	female	31	1904
425	Miyagi	female	65	1904
435	Miyagi	male	56	1904
439	Miyagi	female	28	1905
442	Miyagi	female	73	1905
451	Miyagi	male	79	1905
453	Miyagi	female	38	1905
461	Miyagi	male	56	1905
468	Miyagi	male	52	1905
474	Miyagi	male	49	1905
478	Yamagata	female	31	1906
481	Miyagi	male	37	1906
484	Miyagi	male	40	1906
495	Miyagi	female	49	1906
497	Miyagi	male	55	1906
503	Miyagi	female	56	1906
510	Miyagi	female	39	1906
515	Miyagi	male	54	1906
516	Miyagi	female	70	1906
522	Miyagi	male	57	1907
585	Miyagi	male	31	1908
596	Miyagi	female	43	1908
620	Miyagi	male	42	1909
702	Miyagi	female	48	1910
726	Miyagi	male	69	1911
755	Iwate	male	27	1911
770	Miyagi	male	46	1911
788	Miyagi	female	63	1911
842	Miyagi	female	70	1912
874	Miyagi	female	74	1913
875	Yamagata	male	50	1913
891	Miyagi	male	53	1913
904	Miyagi	female	59	1913
905	Miyagi	male	39	1913
912	Miyagi	male	68	1913
925	Miyagi	male	51	1914
936	Miyagi	female	64	1914
937	Miyagi	female	59	1914
939	Miyagi	female	36	1914

Table 1. (Continued)

Skull number	Provenience	Sex	Age at death	Date of death
965	Miyagi	male	68	1914
1004	Miyagi	female	90	1914
1039	Miyagi	female	35	1915
1049	Miyagi	male	30	1915
1058	Iwate	male	26	1915
1066	Yamagata	male	52	1915
1139	Miyagi	female	28	1916
1152	Miyagi	male	47	1916
1183	Miyagi	male	34	1916
1184	Fukushima	male	39	1916
1199	Miyagi	male	32	1916
1203	Miyagi	female	31	1916
1204	Miyagi	male	31	1916
1211	Miyagi	female	52	1916
1216	Yamagata	male	36	1916
1221	Miyagi	female	73	1916
1231	Miyagi	male	46	1917
1261	Miyagi	male	60	1917
1286	Miyagi	female	21	1917
1299	Yamagata	male	24	1917
1315	Miyagi	male	52	1917
1316	Miyagi	female	79	1917
1330	Miyagi	female	61	1917
1342	Miyagi	male	27	1918
1346	Miyagi	male	33	1918
1350	Miyagi	female	73	1918
1352	Yamagata	male	47	1918
1382	Miyagi	female	62	1918
1394	Yamagata	male	50	1918
1397	Miyagi	male	68	1918
1414	Miyagi	male	52	1918
1440	Miyagi	female	52	1918
1443	Miyagi	male	28	1918
1468	Miyagi	male	65	1919
1513	Iwate	male	28	1919
1517	Fukushima	female	46	1919
1553	Miyagi	male	65	1919
1573	Miyagi	male	43	1920
1627	Yamagata	male	29	1920
1630	Fukushima	male	37	1920
1695	Yamagata	male	33	1921
1742	Aomori	male	27	1921
1755	Miyagi	male	50	1922
1957	Yamagata	male	55	1925
2088	Miyagi	male	34	1927
2163	Miyagi	male	85	1928
2164	Miyagi	female	33	1928
2239	Miyagi	male	43	1929
2242	Miyagi	male	64	1929
2319	Miyagi	female	21	1930
2324	Iwate	male	66	1930
2457	Miyagi	male	58	1931
2458	Miyagi	female	61	1931
2480	Fukushima	female	49	1932
2490	Miyagi	male	59	1932
2506	Miyagi	female	39	1932
2539	Akita	male	30	1932
2542	Fukushima	female	28	1932
2544	Aomori	male	22	1932
2547	Miyagi	female	80	1932

Table 1. (Continued)

Skull number	Provenience	Sex	Age at death	Date of death
2564	Miyagi	female	58	1932
2593	Miyagi	female	77	1933
2601	Yamagata	male	27	1933
2612	Miyagi	female	75	1933
2614	Fukushima	female	64	1933
2619	Miyagi	male	48	1933
2711	Miyagi	male	51	1934
2742	Miyagi	male	25	1934
2760	Fukushima	female	67	1934
2777	Miyagi	male	41	1934
3097	Miyagi	male	35	1938
3114	Miyagi	male	56	1938
3134	Miyagi	female	72	1939
3197	Fukushima	female	59	1939
3212	Miyagi	male	59	1940
3226	Aomori	male	33	1940
3237	Akita	male	33	1940
3261	Miyagi	female	88	1940
3264	Miyagi	male	40	1940
3265	Fukushima	male	44	1941
3267	Miyagi	female	70	1941
3271	Fukushima	male	57	1941
3278	Aomori	male	26	1941
3282	Miyagi	male	70	1941
3285	Yamagata	female	85	1941
3290	Miyagi	male	35	1941
3296	Fukushima	male	56	1941
3303	Miyagi	male	68	1941
3307	Iwate	male	44	1941
3313	Fukushima	male	62	1941
3332	Akita	male	31	1942
3334	Miyagi	male	76	1942
3341	Miyagi	male	66	1942
3362	Miyagi	male	46	1942
3363	Fukushima	female	32	1942
3375	Miyagi	male	55	1942
3391	Miyagi	male	56	1942
3466	Fukushima	male	39	1943

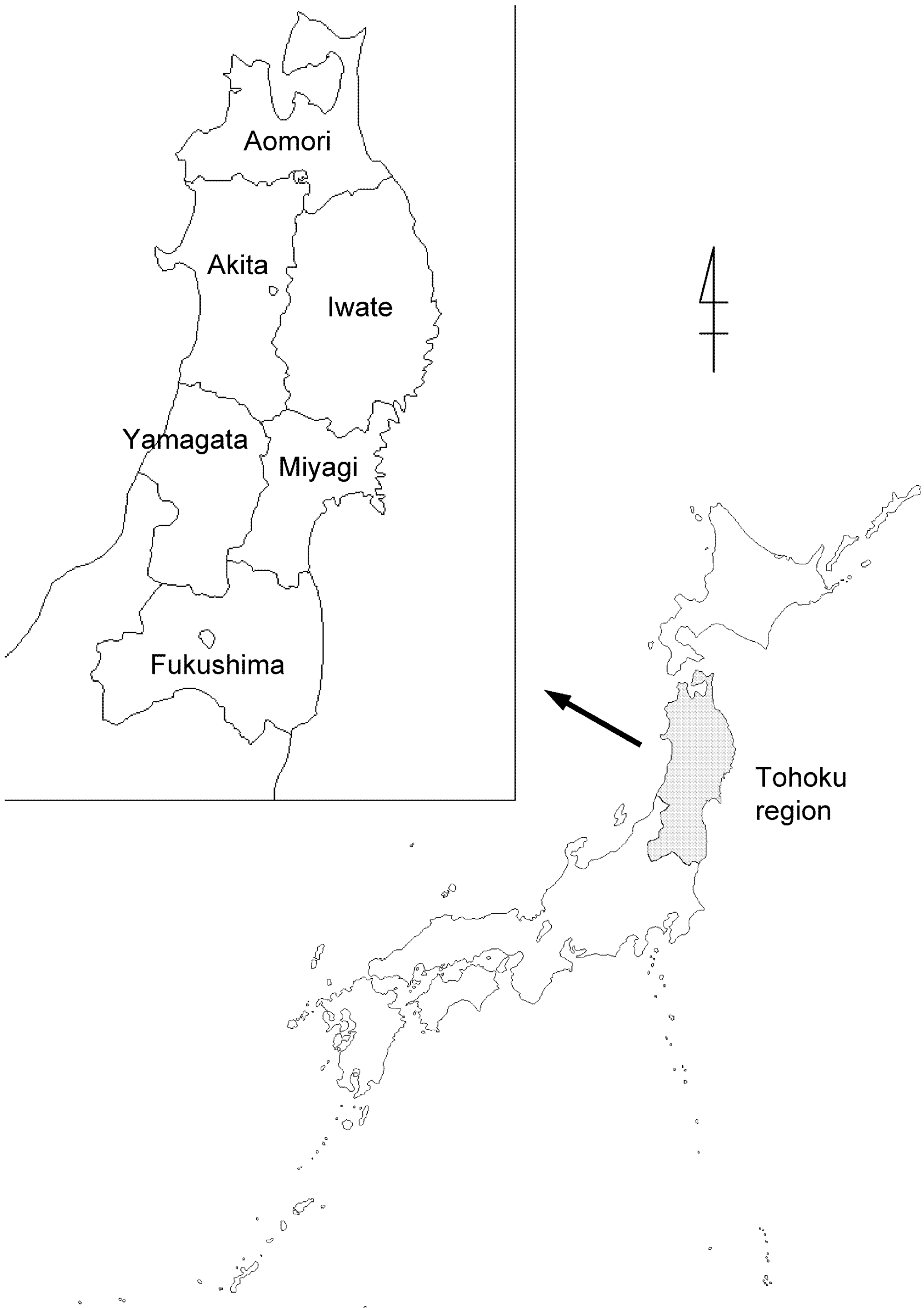

Figure 1. Maps of the Tohoku region, Honshu, Japan, and each individual prefectures within the Tohoku region.

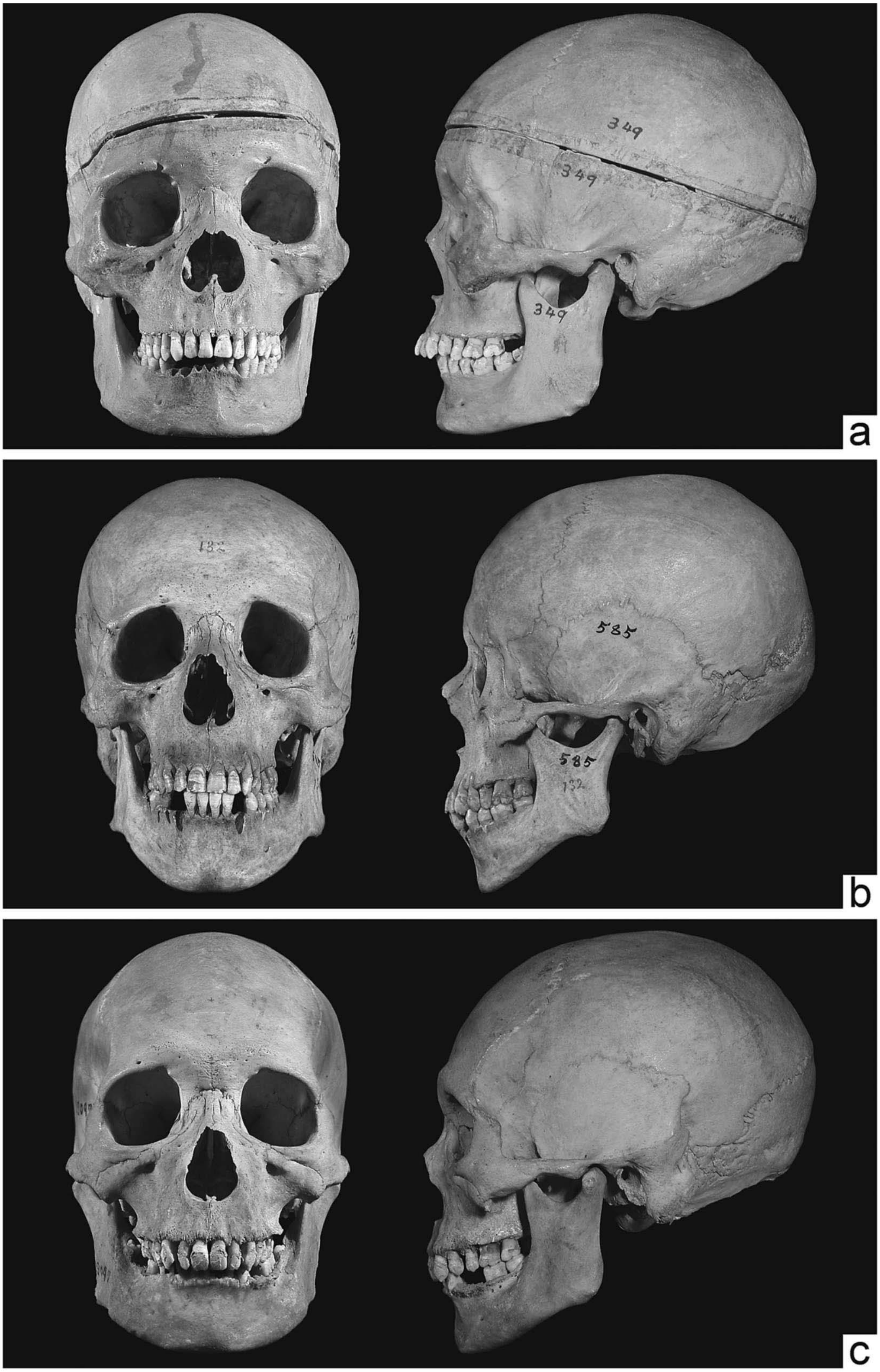

Figure 2. Photographs of male crania of the Tohoku Japanese series.
a : No. 349 (35 years old) b : No. 585 (31 years old) c : No. 3097 (35 years old)

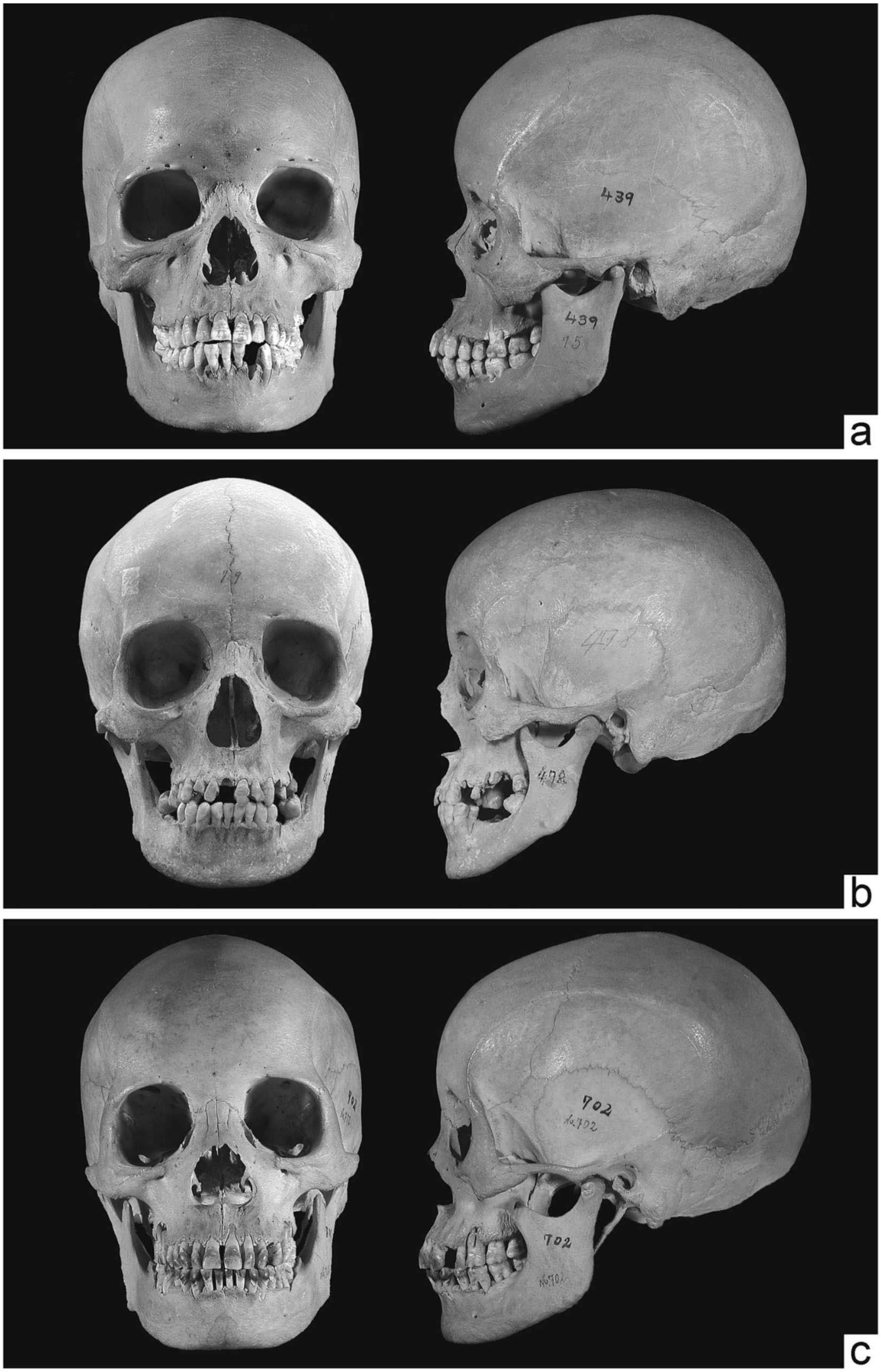

Figure 3. Photographs of female crania of the Tohoku Japanese series.
a : No. 439 (28 years old) b : No. 478 (31 years old) c : No. 702 (48 years old)

Table 2. Measurements of the adult male crania from the Tohoku region, Honshu (mm)

No.	L	BL	B	FB	H	GL	J	GH(1)	GH(2)	OB	OH	NB	NH	FC	FS	SC	SS	ZC	ZS
256	182	104	148	103	141	99	–	79	77	44	39	26	55	94.0	12.9	5.8	3.4	99.3	23.1
266	177	103	139	96	139	104	141	66	63	40	33	27	47	99.4	12.7	5.0	1.5	108.5	22.4
281	173	103	136	90	139	89	–	73	72	39	33	25	55	90.2	18.2	6.2	1.8	88.4	23.5
283	187	104	135	100	140	–	135	–	–	44	34	24	50	102.3	18.4	11.3	2.4	97.6	23.9
287	179	91	139	94	133	91	–	66	65	40	35	24	48	93.5	14.2	6.6	0.6	88.3	25.1
290	177	102	134	96	133	100	137	81	80	44	35	25	55	98.0	13.6	6.9	2.2	101.9	20.6
320	175	98	134	92	132	97	132	69	67	38	31	24	49	92.4	12.5	6.5	2.1	93.0	21.2
326	–	95	–	88	–	91	133	73	70	43	36	25	54	91.1	12.6	4.4	2.3	93.9	22.2
327	185	105	138	93	137	96	130	72	70	41	33	28	51	95.7	18.6	8.9	2.7	97.6	20.0
349	190	106	139	95	141	102	138	69	67	40	34	30	49	98.0	17.6	10.6	3.4	108.2	20.5
363	180	99	137	94	–	–	131	–	–	41	34	27	53	95.8	15.0	8.0	2.6	94.6	23.7
364	182	107	139	96	139	100	135	70	69	42	34	23	53	96.6	18.3	3.8	2.4	98.2	28.3
407	192	113	141	97	152	112	138	76	73	45	39	29	55	101.7	19.5	5.0	1.8	102.4	25.4
422	177	103	139	95	140	100	130	68	67	42	35	23	52	97.1	18.9	7.5	2.1	89.6	26.1
435	188	102	142	95	136	96	128	75	72	41	36	23	55	96.6	16.5	6.7	3.5	92.5	21.6
451	178	108	142	94	–	–	127	–	–	43	34	23	45	95.7	14.8	6.9	1.3	91.6	22.1
461	187	102	–	90	133	97	135	75	72	44	38	26	53	97.3	14.4	5.0	1.6	94.3	24.9
468	182	108	140	103	141	107	138	76	73	46	37	25	55	104.0	18.2	6.8	3.9	97.7	23.2
474	189	99	139	98	140	95	138	75	74	43	37	27	56	96.4	13.5	8.1	2.9	101.9	26.1
481	191	103	142	95	143	100	144	73	69	42	37	29	54	102.0	15.8	8.4	3.9	106.2	19.2
484	179	107	141	88	142	102	133	68	67	44	34	25	50	94.1	17.4	6.2	3.1	88.2	23.1
497	–	98	–	91	–	–	130	–	–	42	35	23	53	94.9	14.3	5.9	2.8	103.5	25.7
515	173	96	138	95	–	89	129	65	64	43	35	26	51	90.9	19.0	5.7	1.7	93.4	19.9
522	182	106	134	90	142	103	140	75	72	44	37	30	57	97.3	16.1	7.5	1.7	100.5	23.0
585	176	101	139	92	134	98	127	73	72	38	32	24	52	86.6	15.4	7.5	3.6	94.5	23.5
620	180	101	134	92	139	97	130	66	65	41	34	22	45	94.7	17.0	3.4	2.8	99.5	26.0
726	184	102	143	94	132	–	131	–	–	41	35	22	51	91.9	17.0	9.2	1.5	93.2	20.0
755	–	104	–	101	–	104	139	76	74	41	33	27	53	101.5	18.4	6.1	2.0	106.1	28.0
770	175	103	139	94	142	99	134	76	75	47	35	26	53	100.5	14.3	7.2	2.5	98.7	19.1
875	184	103	140	94	–	91	132	73	71	41	33	26	51	93.2	11.1	8.1	2.9	90.4	17.4
891	173	97	133	93	–	–	129	–	–	39	34	27	45	97.2	14.4	6.5	0.8	91.8	21.7
905	186	99	139	94	138	–	131	–	–	43	35	26	47	99.7	12.5	9.1	2.9	96.0	–
912	186	101	141	94	132	–	135	–	–	42	34	24	56	94.0	17.1	9.8	1.9	97.9	22.6
925	168	94	136	91	125	98	127	71	70	41	36	27	50	92.7	13.6	4.9	1.7	96.7	20.8
965	179	104	129	87	135	98	129	72	71	42	33	26	53	91.0	16.9	5.8	2.6	94.1	19.5
1049	171	95	131	87	130	85	124	73	70	40	33	22	54	91.3	20.0	9.3	2.7	95.4	24.7
1058	177	103	141	88	132	99	139	68	67	42	34	25	52	90.0	13.4	5.5	1.5	97.3	22.5
1066	187	97	140	93	–	97	135	73	71	42	36	27	48	94.1	12.9	7.5	2.1	100.2	25.0
1152	178	99	137	97	–	99	126	66	64	40	32	25	48	91.3	15.3	6.3	1.1	94.3	21.5
1183	182	93	136	93	138	96	128	77	74	42	34	23	54	92.2	12.2	3.8	0.6	93.2	24.2
1184	185	104	142	91	140	100	135	69	68	41	35	24	50	91.4	14.0	7.2	2.5	98.0	22.9
1199	195	107	134	94	135	106	142	75	74	43	35	26	55	102.6	15.2	9.9	3.2	104.6	21.1
1204	179	104	137	97	137	98	130	70	67	41	36	27	53	97.1	17.5	7.1	2.6	97.2	25.7
1216	164	95	138	95	127	85	–	64	63	43	32	24	50	93.2	17.8	5.7	1.9	–	–
1231	182	104	134	91	136	103	–	77	76	42	35	27	58	95.8	17.7	8.8	5.2	100.5	26.6
1261	182	–	140	94	135	–	128	–	–	45	33	27	51	98.8	16.1	8.8	3.2	102.4	22.3
1299	171	89	127	82	125	89	117	69	67	38	35	22	50	84.3	13.0	6.1	2.1	85.2	21.9
1315	184	101	132	94	136	96	131	66	64	39	33	34	49	94.8	14.4	5.3	2.0	92.7	23.3
1342	181	98	133	89	132	95	129	75	72	39	36	23	55	90.7	13.6	3.7	2.2	92.5	21.8
1346	178	95	135	88	132	100	132	73	72	42	32	26	49	96.3	14.4	8.4	2.0	96.6	20.6
1352	188	105	141	103	143	–	–	–	–	45	35	26	54	99.6	15.5	7.3	3.3	95.9	17.7
1394	176	102	141	90	–	100	132	68	65	42	32	25	50	98.9	19.5	9.4	4.0	95.2	18.9
1397	184	103	145	89	137	–	135	–	–	42	36	29	54	99.2	14.9	10.6	4.7	98.1	23.5
1414	184	104	134	97	136	98	132	77	74	42	35	24	55	99.0	18.9	9.6	1.9	99.1	28.7
1443	178	98	138	89	130	99	125	69	67	37	32	24	51	92.0	19.1	6.8	2.3	97.6	26.5
1468	189	107	149	101	147	–	–	–	–	45	36	28	57	101.1	15.4	10.0	3.6	99.4	22.8
1513	173	91	137	88	–	91	129	73	72	41	35	22	52	91.2	13.1	4.4	1.5	95.2	20.5
1553	186	109	132	97	140	102	–	65	63	42	32	25	49	97.1	17.3	8.9	3.6	–	–
1573	–	112	–	94	–	–	–	–	–	44	34	27	56	100.5	18.2	5.6	1.2	94.7	21.3
1627	179	102	136	94	–	91	136	78	76	40	36	23	59	93.6	17.5	8.5	2.3	106.0	20.3

Table 2. (Continued)

No.	L	BL	B	FB	H	GL	J	GH(1)	GH(2)	OB	OH	NB	NH	FC	FS	SC	SS	ZC	ZS
1630	177	102	138	95	135	103	135	77	74	45	37	24	55	101.3	18.0	8.3	2.8	95.4	23.1
1695	176	99	145	89	138	89	–	74	72	39	35	23	51	93.5	15.2	8.2	1.7	–	–
1742	182	108	151	92	142	100	–	69	67	43	35	26	48	98.4	18.5	8.5	2.9	102.3	24.8
1755	180	103	140	90	138	102	137	72	69	39	33	23	50	92.2	12.1	4.7	0.7	104.1	22.4
1957	188	102	143	101	140	–	140	–	–	43	36	26	53	99.3	16.0	9.1	2.7	98.9	22.2
2088	179	107	136	89	137	104	136	70	69	42	35	25	51	95.8	15.4	7.8	3.0	101.6	21.6
2163	174	99	–	93	133	97	128	74	72	41	37	23	55	93.1	14.1	6.3	1.1	99.7	24.3
2239	170	89	132	88	136	–	119	–	–	39	35	22	47	92.2	16.0	6.4	2.8	88.5	25.8
2242	194	104	141	98	142	–	131	80	–	41	34	26	57	98.0	17.7	8.0	2.7	91.8	23.2
2324	187	104	139	92	–	100	135	78	76	44	32	27	57	95.0	9.8	4.4	0.6	100.1	20.5
2457	177	95	138	89	136	92	127	69	66	38	36	22	46	90.9	10.9	6.9	–	95.3	23.4
2490	–	97	–	–	–	97	126	68	65	40	34	24	49	93.5	16.3	7.0	2.0	94.0	18.1
2539	173	95	150	96	–	90	133	74	73	42	39	22	57	94.4	14.7	9.0	2.2	92.8	25.3
2544	182	102	143	98	138	96	131	71	70	45	34	25	52	95.5	12.5	–	–	102.9	23.0
2601	190	99	143	89	129	–	–	–	–	40	36	25	54	88.9	14.2	5.3	1.7	–	–
2619	175	95	136	99	130	86	–	65	61	40	32	23	48	91.0	15.6	6.4	1.3	–	–
2711	177	99	131	93	131	–	127	–	–	41	35	26	52	96.0	14.7	8.8	3.6	94.4	20.8
2742	–	104	–	–	–	107	130	71	69	44	34	25	51	96.8	16.5	7.9	3.1	93.6	24.8
2777	195	107	147	96	133	106	137	74	72	46	37	27	50	102.9	17.5	3.3	1.3	98.5	25.9
3097	195	106	141	96	143	104	140	74	71	43	34	26	53	100.4	17.5	6.7	2.0	107.3	31.3
3114	182	101	141	95	–	96	136	69	67	45	35	24	54	96.1	14.2	6.0	1.1	93.0	19.4
3212	185	–	142	98	–	–	–	73	72	46	37	27	55	103.0	19.2	8.1	2.3	101.6	23.2
3226	182	105	135	94	140	–	131	–	–	42	37	25	53	94.4	18.4	11.0	2.8	96.8	20.6
3237	190	105	143	101	138	–	140	–	–	43	37	22	52	102.0	15.7	5.2	2.6	106.7	26.0
3264	177	98	138	89	134	91	–	65	63	41	34	24	50	92.7	–	7.2	2.5	99.4	25.3
3265	177	102	144	96	136	98	140	75	74	43	36	27	57	100.5	13.4	8.3	0.9	104.5	20.6
3271	180	102	136	94	–	99	141	69	66	41	33	26	51	95.7	12.7	8.2	2.8	95.6	19.7
3278	173	98	130	88	–	104	133	63	62	40	31	28	48	92.7	11.5	5.8	1.1	98.6	16.8
3282	181	103	138	98	138	98	140	74	71	43	36	25	55	96.0	14.5	3.5	0.0	101.1	23.4
3290	192	103	151	100	–	96	140	74	71	43	34	22	52	102.9	16.7	6.9	1.7	98.2	22.1
3296	181	106	134	94	–	–	132	–	–	38	34	27	56	100.9	13.0	12.6	2.8	105.0	21.5
3303	185	106	144	94	–	103	134	74	72	41	33	25	52	95.6	13.2	8.5	3.5	102.0	26.3
3307	186	–	145	99	–	–	141	71	70	43	36	25	50	101.3	16.9	9.6	3.7	97.5	22.3
3313	187	102	138	97	–	96	134	70	66	43	34	27	51	100.0	15.3	6.9	2.3	101.6	22.0
3332	182	106	142	90	139	98	143	74	71	42	36	23	55	94.8	14.9	8.0	3.5	98.4	25.4
3334	177	106	149	98	–	–	141	–	–	41	38	26	52	98.4	15.5	9.3	2.3	100.7	25.7
3341	185	105	132	99	137	–	135	–	–	42	32	27	55	101.1	19.0	7.2	2.4	100.5	25.3
3362	177	95	140	87	–	91	127	77	75	42	34	25	54	90.8	11.2	7.0	3.0	93.6	25.5
3375	178	111	140	103	140	105	137	74	74	43	33	27	53	101.8	18.2	13.7	3.1	100.4	24.8
3391	–	106	–	99	–	103	135	73	71	43	34	24	53	100.0	18.3	9.5	3.6	84.4	25.3
3466	174	99	145	97	130	96	134	71	68	41	35	23	52	96.6	20.1	4.9	2.1	93.5	16.6

Table 3. Measurements of the adult female crania from the Tohoku region, Honshu (mm)

No.	L	BL	B	FB	H	GL	J	GH(1)	GH(2)	OB	OH	NB	NH	FC	FS	SC	SS	ZC	ZS
302	182	101	126	92	–	98	130	71	70	43	35	26	48	97.9	19.4	9.4	3.0	91.1	22.0
353	174	95	126	88	–	–	128	–	–	40	37	24	47	92.8	14.3	–	–	95.3	19.8
373	165	90	140	84	133	87	126	64	62	37	32	25	47	89.9	10.2	5.8	2.3	93.5	21.7
387	175	97	136	93	–	96	122	66	64	37	32	23	46	90.9	16.2	7.9	1.7	89.4	16.9
401	172	91	133	83	127	–	117	–	–	38	35	25	46	87.7	11.2	4.8	0.9	82.7	24.1
423	175	97	137	90	128	95	124	71	70	41	35	25	50	92.9	13.8	7.1	2.7	97.3	23.7
425	165	92	133	87	136	–	129	–	–	43	38	22	50	92.5	10.6	6.3	1.8	91.5	19.7
439	173	98	135	95	137	101	129	65	64	41	33	26	47	95.2	13.8	8.2	3.1	98.0	22.3
442	175	94	136	88	120	–	125	–	–	40	35	24	49	–	–	3.6	1.5	–	–
453	171	101	130	88	129	94	130	65	63	40	33	25	49	93.8	10.2	6.9	1.5	85.8	18.8
478	163	91	136	92	127	83	120	63	62	42	36	24	47	93.0	18.8	5.9	1.4	81.2	19.1
495	176	101	133	93	–	95	125	75	73	45	39	24	55	99.3	17.4	7.9	3.5	89.9	24.4
503	176	99	135	91	141	–	123	–	–	40	33	25	44	92.2	13.4	7.1	2.1	91.2	27.6
510	178	100	130	96	132	–	126	–	–	41	36	25	52	97.1	14.3	7.3	2.1	90.0	21.9
516	187	101	143	94	–	94	135	64	60	42	33	25	47	98.6	14.7	8.6	0.9	97.3	13.5
596	166	97	131	85	130	–	121	–	–	39	32	24	47	91.7	11.2	8.0	3.0	88.2	20.7
702	169	95	129	84	125	92	121	61	60	38	33	27	45	85.5	11.2	8.0	1.3	94.6	17.3
788	164	95	135	83	–	–	126	–	–	40	35	24	52	88.6	13.5	7.1	2.8	92.8	22.1
842	172	101	139	87	–	98	125	77	76	40	39	22	54	88.4	13.8	7.7	3.0	88.5	24.1
874	158	88	132	85	121	–	118	–	–	42	34	25	43	91.9	12.4	5.8	1.6	84.9	16.5
904	180	97	133	90	135	–	124	–	–	39	32	27	50	91.9	15.8	7.2	2.7	95.3	28.0
936	170	100	132	85	–	–	130	–	–	41	34	24	55	90.9	15.0	8.3	2.2	84.8	27.7
937	174	100	128	89	135	99	125	65	64	40	32	26	50	92.0	13.2	8.1	2.6	88.4	22.7
939	179	98	137	92	–	–	127	–	–	42	36	23	50	96.9	16.9	7.7	1.7	93.5	22.7
1004	180	101	130	90	–	–	130	–	–	39	34	24	49	96.5	15.1	12.2	3.8	95.5	21.2
1039	170	91	131	90	129	89	122	67	66	41	36	24	49	88.6	7.9	6.1	1.0	93.5	25.0
1139	190	107	138	98	129	103	131	75	72	42	35	26	57	96.3	15.7	7.5	3.1	102.7	24.6
1203	168	88	138	90	129	90	120	61	60	37	32	21	45	88.7	13.1	2.9	1.4	85.3	24.6
1211	172	93	132	87	127	–	–	–	–	38	34	25	45	92.4	8.4	3.2	1.1	97.7	24.6
1221	170	95	138	90	123	95	120	69	67	42	34	25	50	91.9	15.5	8.0	3.1	89.8	22.7
1286	–	98	–	–	–	95	–	68	66	40	33	24	50	96.3	17.3	10.3	0.0	95.9	22.3
1316	179	105	134	92	130	–	–	–	–	45	37	27	50	100.8	20.7	5.6	2.0	93.0	25.4
1330	171	92	138	91	–	–	119	–	–	41	35	24	49	90.2	10.2	6.4	2.6	85.9	18.1
1350	168	97	130	85	130	98	–	69	67	43	35	25	49	90.3	14.6	7.7	4.1	–	–
1382	168	100	135	84	131	–	131	–	–	42	35	25	54	91.2	14.5	7.5	0.0	–	–
1440	165	93	130	85	131	93	–	68	67	37	35	22	47	87.6	16.9	7.9	3.7	81.5	20.3
1517	177	105	143	92	142	–	129	–	–	42	35	–	–	88.9	13.3	7.5	2.0	–	–
2164	–	93	–	89	–	–	118	–	–	40	34	23	50	88.1	16.0	6.9	1.9	87.8	22.2
2319	172	99	130	90	129	100	131	70	68	42	35	26	50	95.4	14.8	8.1	1.7	100.0	21.8
2458	–	93	–	89	–	–	119	–	–	40	34	25	45	89.3	11.7	7.2	2.5	90.0	21.0
2480	167	93	135	79	124	94	120	70	68	41	37	22	47	90.7	11.1	5.3	1.5	82.5	17.1
2506	173	95	145	90	–	96	130	68	66	39	33	25	48	93.0	14.5	7.7	2.8	95.8	23.0
2542	160	94	132	88	129	86	124	65	64	36	35	21	45	89.8	13.7	5.2	0.5	82.5	15.7
2547	165	95	142	88	–	–	127	–	–	40	35	25	48	91.8	11.4	5.5	0.9	101.6	22.7
2564	165	89	127	86	–	91	120	73	71	40	35	24	51	91.4	11.8	5.2	2.3	87.2	23.3
2593	181	102	129	85	128	–	122	–	–	41	36	23	52	94.6	15.1	6.2	1.0	88.0	19.2
2612	–	95	–	90	–	–	124	–	–	40	31	25	48	88.4	15.2	3.4	1.1	90.2	18.6
2614	160	97	129	77	127	–	124	–	–	38	35	25	51	86.3	14.0	7.1	2.1	89.7	20.3
2760	179	101	132	94	126	98	126	73	71	43	35	23	52	97.3	17.5	7.4	2.4	95.4	25.9
3134	172	100	140	90	137	–	132	–	–	42	36	25	46	93.8	14.2	9.0	2.3	98.7	19.7
3197	176	101	133	91	–	97	125	65	64	39	34	24	50	92.2	15.2	8.4	1.7	93.9	19.8
3261	170	103	134	99	134	–	125	–	–	40	33	27	50	95.7	16.8	12.1	1.8	96.8	22.0
3267	177	100	137	88	–	–	129	–	–	42	37	25	57	93.1	13.6	7.7	0.9	98.4	24.0
3285	162	90	125	82	–	88	121	64	–	41	36	22	45	87.1	13.9	5.8	0.9	84.9	23.2
3363	177	96	132	96	133	–	119	–	–	42	34	30	51	95.3	15.5	7.0	2.3	95.2	28.8

Table 4. Comparison of means of the Tohoku Japanese cranial measurements between different researchers (Male).

Measurement		Kawakubo et al. (present study)	Yamasaki et al. (1967)	Hanihara (2002)
1. L	n	94	61	48
	m	181.2	181.2	182.7
	sd	6.33	6.03	6.91
5. BL	n	98	65	48
	m	101.7	101.5	102.7
	sd	4.80	4.81	5.16
8. B	n	92	60	47
	m	138.9	139.5	138.7
	sd	4.90	5.06	5.09
9. FB	n	99	65	48
	m	94.0	94.1	94.1
	sd	4.27	4.30	4.08
17. H	n	71	60	48
	m	136.6	136.3	137.6
	sd	4.86	4.54	5.12
40. GL	n	76	59	48
	m	97.8	97.5	100.2
	sd	5.48	5.07	5.23
45. J	n	86	52	46
	m	133.2	133.4	133.9
	sd	5.30	5.84	5.48
48. GH(1)	n	79	–	–
	m	71.9	–	–
	sd	4.04	–	–
48′. GH(2)	n	78	58	48
	m	69.8	69.0	70.5
	sd	3.98	4.17	3.98
51. OB	n	101	64	48
	m	41.9	40.2	42.3
	sd	2.04	2.04	2.33
52. OH	n	101	63	47
	m	34.7	35.1	34.3
	sd	1.76	1.77	2.10
54. NB	n	101	64	48
	m	25.2	25.7	25.2
	sd	2.13	2.46	2.24
55. NH	n	101	63	48
	m	52.2	52.0	51.9*
	sd	3.07	3.07	2.76

*Howells (1989)

Table 5. Comparison of means of the Tohoku Japanese cranial measurements between different researchers (Female).

Measurement		Kawakubo et al. (present study)	Yamasaki et al. (1967)	Hanihara (2002)
1. L	n	51	21	15
	m	172.0	173.1	174.0
	sd	6.80	7.14	8.11
5. BL	n	55	23	15
	m	96.7	95.8	97.7
	sd	4.49	4.77	5.88
8. B	n	51	21	15
	m	133.8	134.3	135.9
	sd	4.61	5.33	5.44
9. FB	n	54	22	15
	m	88.9	89.9	91.3
	sd	4.40	4.27	4.65
17. H	n	34	21	15
	m	130.1	130.3	131.3
	sd	5.06	4.16	5.07
40. GL	n	27	22	15
	m	94.3	94.5	95.5
	sd	4.80	5.19	5.33
45. J	n	50	20	15
	m	124.9	125.5	125.9
	sd	4.39	5.63	6.65
48. GH(1)	n	27	–	–
	m	67.9	–	–
	sd	4.29	–	–
48′. GH(2)	n	26	22	15
	m	66.3	65.4	65.6
	sd	4.21	4.08	4.97
51. OB	n	55	23	15
	m	40.5	39.3	40.7
	sd	1.94	1.96	2.19
52. OH	n	55	23	15
	m	34.6	34.7	34.2
	sd	1.76	1.40	2.01
54. NB	n	54	23	15
	m	24.5	24.9	25.5
	sd	1.63	1.66	1.92
55. NH	n	54	23	15
	m	49.1	49.5	48.7*
	sd	3.16	3.20	3.98

*Howells (1989)

Table 6. Cranial measurements of the Japanese series from the Tohoku region and other regions of the Japanese archipelago (Male).

Measurement		Modern Jpn in the Tohoku region[1)]	Modern Jpn in the Kanto region[2)]	Early Modern Ainu in Hokkaido[3)]	Early Modern Ryukyuan in Amami/Okinawa[4)]	Protohistoric Kofun in the Kanto and Tohoku regions[5)]	Prehistoric Yayoi in northern Kyushu/ westernmost Honshu[6)]	Prehistoric Jomon in Hokkaido, Honshu, and Kyushu[7)]
	n	94	53	68	37	41	82	62
1. L	m	181.2	181.8	186.8	178.9	182.6	183.4	182.8
	sd	6.33	5.81	5.30	5.55	5.76	5.30	6.95
	n	98	53	68	37	25	62	59
5. BL	m	101.7	103.5	105.8	101.1	101.6	102.4	103.7
	sd	4.80	4.38	4.08	3.18	4.49	4.04	5.61
	n	92	53	68	37	28	82	62
8. B	m	138.9	141.6	141.8	139.8	143.1	142.3	144.4
	sd	4.90	5.66	3.47	4.76	5.32	4.35	6.17
	n	99	53	68	37	35	82	61
9. FB	m	94.0	95.6	96.7	92.1	94.5	96.0	98.4
	sd	4.27	4.80	3.72	3.84	4.10	5.19	5.16
	n	71	53	68	37	30	62	59
17. H	m	136.6	139.8	138.6	135.8	136.6	137.6	139.4
	sd	4.86	4.62	4.58	4.84	5.15	4.42	6.48
	n	76	53	68	37	13	62	59
40. GL	m	97.8	100.9	104.6	100.6	100.1	100.9	101.2
	sd	5.48	5.42	5.18	4.23	3.09	4.92	5.72
	n	86	53	68	37	16	82	61
45. J	m	133.2	136.1	137.2	134.6	141.6	140.3	142.3
	sd	5.30	4.84	5.13	4.75	3.97	4.82	5.58
	n	79	53	68	–	22	82	61
48. GH(1)	m	71.9	72.4	69.6	–	71.0	74.0	68.1
	sd	4.04	4.23	4.52	–	3.14	3.89	3.96
	n	78	–	–	37	–	–	–
48'. GH(2)	m	69.8	–	–	66.0	–	–	–
	sd	3.98	–	–	4.41	–	–	–
	n	101	53	68	37	32	82	62
51. OB	m	41.9	42.2	43.5	4 1.5	42.9	43.3	44.0
	sd	2.04	1.96	1.72	1.92	1.91	1.60	1.77
	n	101	53	68	37	33	82	62
52. OH	m	34.7	34.5	34.2	33.4	34.3	34.5	33.2
	sd	1.76	2.11	1.83	2.24	1.94	1.98	1.95
	n	101	53	68	37	30	82	61
54. NB	m	25.2	25.7	25.6	26.2	27.1	27.1	26.7
	sd	2.13	1.71	1.75	1.79	1.55	2.04	1.99
	n	101	53	68	37	29	82	61
55. NH	m	52.2	52.5	50.6	50.7	51.4	52.8	49.5
	sd	3.07	3.31	2.69	2.72	2.58	2.97	2.83
	n	101	53	68	37	20	62	59
FC	m	96.0	98.0	99.5	96.3	98.8	100.8	101.5
	sd	4.04	4.23	3.53	3.63	3.47	3.65	3.73

Table 6. (Continued)

Measurement		Modern Jpn in the Tohoku region[1)]	Modern Jpn in the Kanto region[2)]	Early Modern Ainu in Hokkaido[3)]	Early Modern Ryukyuan in Amami/Okinawa[4)]	Protohistoric Kofun in the Kanto and Tohoku regions[5)]	Prehistoric Yayoi in northern Kyushu/westernmost Honshu[6)]	Prehistoric Jomon in Hokkaido, Honshu, and Kyushu[7)]
	n	100	53	68	37	20	62	59
FS	m	15.6	16.7	17.0	14.0	15.2	14.9	16.0
	sd	2.38	2.26	2.32	2.18	2.08	2.06	2.69
	n	100	52	68	37	37	59	44
SC	m	7.3	7.1	8.4	8.5	7.4	8.5	10.1
	sd	2.00	1.78	1.59	1.76	1.75	1.61	1.78
	n	99	52	68	37	37	59	44
SS	m	2.4	2.8	3.7	2.5	2.3	2.4	4.3
	sd	0.94	1.00	0.95	0.87	0.89	0.76	1.01
	n	96	53	58	37	14	58	50
ZC	m	97.5	97.7	100.5	99.5	100.9	104.5	103.5
	sd	5.05	5.23	5.65	4.04	5.47	4.36	5.99
	n	95	53	58	37	14	58	50
ZS	m	22.9	23.8	22.6	20.9	20.3	21.7	22.5
	sd	2.72	3.05	2.22	2.75	3.42	3.08	2.73

1) present study ; 2) measured by K. Mitsuhashi and B. Yamaguchi ; 3) Koganei (1893) supplemented by B. Yamaguchi ; 4) Dodo et al. (2001) ; 5) Yamaguchi (1987) ; 6) Nakahashi and Doi (1988) ; 7) measured by Y. Dodo, H. Matsumura, T. Nakahashi, and N. Doi

Table 7. Cranial measurements of the Japanese series from the Tohoku region and other regions of the Japanese archipelago (Female).

Measurement		Modern Jpn in the Tohoku region[1)]	Modern Jpn in the Kanto region[2)]	Early Modern Ainu in Hokkaido[3)]	Early Modern Ryukyuan in Amami/Okinawa[4)]	Protohistoric Kofun in the Kanto and Tohoku regions[5)]	Prehistoric Yayoi in northern Kyushu/westernmost Honshu[6)]	Prehistoric Jomon in Hokkaido, Honshu, and Kyushu[7)]
	n	51	24	46	34	27	56	24
1. L	m	172.0	173.2	178.3	173.5	174.9	176.4	179.6
	sd	6.80	5.32	6.00	4.81	4.87	5.00	6.00
	n	55	25	46	34	22	56	20
5. BL	m	96.7	96.3	100.5	96.5	97.2	96.7	100.7
	sd	4.49	4.63	3.75	3.67	3.96	3.84	5.33
	n	51	24	46	34	21	56	24
8. B	m	133.8	136.3	136.4	137.1	138.3	138.1	141.7
	sd	4.61	4.72	3.32	3.80	5.09	4.85	5.69
	n	54	25	46	34	22	56	24
9. FB	m	88.9	90.5	92.8	90.0	91.5	92.6	99.5
	sd	4.40	4.06	4.55	4.46	4.19	4.27	4.08
	n	34	24	46	34	26	55	20
17. H	m	130.1	131.8	133.3	131.7	131.3	130.2	135.5
	sd	5.06	4.20	3.95	4.69	3.50	5.00	4.72
	n	27	13	46	34	11	54	20
40. GL	m	94.3	93.7	99.5	95.9	94.9	96.3	99.2
	sd	4.80	3.50	5.15	3.64	4.25	5.25	4.79
	n	50	25	46	34	9	54	24
45. J	m	124.9	125.8	129.3	125.9	131.8	131.9	135.0
	sd	4.39	4.88	4.34	5.25	5.61	4.62	5.27

Table 7. (Continued)

Measurement		Modern Jpn in the Tohoku region[1]	Modern Jpn in the Kanto region[2]	Early Modern Ainu in Hokkaido[3]	Early Modern Ryukyuan in Amami/Okinawa[4]	Protohistoric Kofun in the Kanto and Tohoku regions[5]	Prehistoric Yayoi in northern Kyushu/ westernmost Honshu[6]	Prehistoric Jomon in Hokkaido, Honshu, and Kyushu[7]
	n	27	13	46	–	16	56	22
48. GH(1)	m	67.9	69.0	65.6	–	66.7	69.8	65.3
	sd	4.29	4.53	4.24	–	3.68	4.01	3.61
	n	26	–	–	34	–	–	–
48'. GH(2)	m	66.3	–	–	61.9	–	–	–
	sd	4.21	–	–	2.78	–	–	–
	n	55	25	46	34	24	56	25
51. OB	m	40.5	40.0	41.8	40.1	41.2	41.6	43.0
	sd	1.94	1.59	1.64	1.68	1.29	1.87	1.97
	n	55	25	46	34	22	56	24
52. OH	m	34.6	35.0	33.5	32.4	33.6	33.9	34.3
	sd	1.76	1.72	1.57	1.37	1.47	1.78	2.17
	n	54	25	46	34	18	55	22
54. NB	m	24.5	25.6	25.2	25.7	26.6	26.4	24.6
	sd	1.63	2.16	1.94	2.02	1.04	1.61	1.87
	n	54	25	46	34	17	56	22
55. NH	m	49.1	49.8	47.7	47.7	48.3	49.2	46.7
	sd	3.16	2.52	1.93	2.55	2.17	2.56	2.97
	n	54	25	46	34	12	44	23
FC	m	92.3	92.8	95.2	91.7	93.7	97.1	99.3
	sd	3.51	3.39	3.51	4.11	3.86	3.78	3.94
	n	54	25	46	34	12	44	23
FS	m	14.1	14.5	15.9	13.1	13.2	13.5	14.5
	sd	2.61	2.10	2.45	2.02	1.73	2.44	2.52
	n	54	25	45	34	27	39	18
SC	m	7.1	7.9	8.5	8.1	8.1	7.9	9.8
	sd	1.81	1.42	1.77	1.89	1.25	1.58	1.53
	n	54	25	45	34	27	39	18
SS	m	2.0	1.9	2.9	1.9	1.8	1.8	3.1
	sd	0.93	0.87	0.97	0.81	0.80	0.77	0.79
	n	51	25	37	34	6	42	18
ZC	m	91.5	94.0	95.4	94.0	95.0	99.5	100.3
	sd	5.46	4.39	4.78	4.56	5.68	4.19	3.27
	n	51	25	37	34	6	42	18
ZS	m	21.9	22.5	21.8	19.0	19.7	20.0	21.3
	sd	3.25	2.45	2.59	2.03	2.38	2.02	2.18

1) present study; 2) measured by Y. Kawakubo; 3) Koganei (1893) supplemented by B. Yamaguchi; 4) Dodo et al. (2001); 5) Yamaguchi (1987); 6) Nakahashi and Doi (1988); 7) measured by Y. Dodo and H. Matsumura.

Craniometric Raw Data

Table 2 shows the raw data of 18 cranial and facial flatness measurements for the 101 males and Table 3 shows those for the 55 females. The sample size, mean, and standard deviation of each individual measurement are given in Tables 4 and 5.

Comparison of Measurements between Different Researchers

The number of crania (n), mean measurement (m), and its standard deviation (sd) are compared between the present study, Yamasaki et al. (1967), and Hanihara (2002) in Table 4 for males and Table 5 for females. The latter two researchers did not record upper facial height defined by Martin (1914) and facial flatness measurements. With the exception of these measurements, the mean measurements given by the three different researchers are fairly consistent with each other ; however, we recommend the data of the present study should be used for comparison, because the sample size is large and measurements were taken with great care.

We demonstrated that in a modern Japanese cranial series the differences between the upper facial heights measured by the Martin's method and that of Howells (1973) were on average 2.6 mm for males and 2.0 mm for females, and postulated that the upper facial height measurements taken by the two different methods should not be compared with each other (Dodo, 2001). In the present cranial series, the differences are 2.0 mm in males ($n=78$, $mean=2.0$, $sd=0.98$) and 1.7 mm in females ($n=26$, $mean=1.7$, $sd=0.75$).

Cranial and Facial Flatness Measurement Data in Several Japanese Samples

Publications of craniometric data including those of facial flatness measurement have been, to date, very limited. The data of seven Japanese samples from prehistoric to modern times are compiled in Tables 6 and 7. These samples are the cranial series of the prehistoric Jomon (10,000 B.C. to 500 B.C.) from the Japanese main-islands, the prehistoric Yayoi (500 B.C. to 300 A.D.) from the western-most Honshu and northern Kyushu, the protohistoric Kofun (300 A.D. to 700 A.D.) from the Kanto and southern Tohoku regions in Honshu, the early modern Ryukyuan (17th to 19th century) from the Okinawa and Amami islands, the early modern Ainu (17th to 19th century) from Hokkaido, the modern Japanese (19th to 20th century) from the Kanto region in Honshu, and the modern Japanese (19th to 20th century) from the Tohoku region in Honshu.

These data should be helpful in understanding secular changes and regional variations of the Japanese Islanders in terms of cranial metric features.

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Re-examination of Prof. Shimakura's coniferous fossil wood microscope slides deposited in Tohoku University Museum

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Introduction

Fossil woods are formed through the permineralization of secondary xylem of woody plants and deposited in sedimentary rocks. Secondary xylem is composed of various tissues and cells that are taxon specific on the kinds, shapes, arrangement and relative compositions between them. Thus precise identification of the source plant is possible from the excavated fossil wood based on the anatomical features. In addition to that woods are formed by the annual increment in every year. Thus the environment of a given growth season influences the growth layer that is formed on that year. In the result, an accumulated wood anatomy offers important information for the study of the reconstruction of paleoenvironment because it reflects the past environments.

In addition, the wood is composed of cells that have lignified secondary walls, which result in very hard and stable tissue of wood. Therefore, it is very useful to study for its histological characteristics due to the well-preserved anatomical characteristics in its taphonomy. Moreover, wood tissue usually required a very strong power for the burying in taphonomy. Therefore, it sometimes becomes an important material for the study of fossil plants in the sedimentary layer, which has not contained any ordinary plants fossils, because it can easily preserved in tuff that can hardly contain the leaves, generative organs, and other plant organs.

The study of fossil woods began from the end of 17C in Europe (in Seward, 1919). In the case of Northeast Asia, Japan has a lot more materials than that of Korea or China because it began early in Japan from the end of 19C (Felix, 1882, 1883 ; Reiss, 1907 ; Stopes & Fujii, 1910 ; Yasui 1917 ; Takamatsu, 1929 ; Shimakura, 1936, 1937 ; Ogura, 1944).

The early study of Professor Shimakura on the fossil woods that were excavated from Japan and adjacent regions was the widest and most detailed study among the studies of Japanese researchers (1936, 1937). His first report concerning fossil wood is a miscellaneous note on fossil woods from various areas and of various ages in Japan (Shimakura 1933).

Therefore, it is an important starting point for the study of the fossil woods that were excavated from the Northeast Asia. His microscope slides of fossil woods that were well preserved in the Tohoku University Museum especially become an important material for the study of a junior scholar.

In the case of Korea's fossil woods, there are few studies except for the early studies done by Japanese researchers like Shimakura (1936) or Ogura (1927, 1944). In recent years, however, the study continued again by Kim et al. (2002) and Jeong et al. (2003, 2004) in Korea. Although the study of fossil woods in the study of the fossil plants in the middle and late Mesozoic period of the Northeast Asia can offer very important information, there are few full-scale studies on the issue except for the studies in Japan. Therefore, the study of fossil woods in the Korean peninsula and the east northern area of China is an essential study for the fossil plants of the late Mesozoic period of these areas. In addition, the descriptions of the quantitative approaches have been performed besides the qualitative approach of the past in the descriptions of its anatomical characteristics for the studies of fossil woods in recent years and verified as an important characteristic form and quality in the recognition of species of fossil woods and methodical study (Falcon-Lang & Cantrill, 2000, 2001).

Therefore, this paper attempts to review the fossil wood slides studied by the late Professor Shimakura and deposited in the Tohoku University Museum as a part of the study for the comparison of fossil woods between Korea and Japan by following the results of the study of Korea's fossil woods in the Mesozoic period compared with the Japan's fossil woods. This paper especially examines the quantitative approaches that were not verified and described from the Shimakura's studies in 1936 and 1937, such as 1) the contiguity of tracheids pitting, 2) the ratio of tracheid pit seriation, and 3) the ratio of alternate or opposite tracheid pitting and attempts a new description by excepting the descriptions that have little importance in the study of the recognition of species and methodical study.

(A brief profile of Prof. Shimakura)

The Late Prof. Dr. Misaburo SHIMAKURA was born on 1906 in Niigata Prefecture. He graduated Tohoku Imperial University (Department of Geology, Faculty of Science) on 1932. The title of his graduation thesis is "Studies on Fossil Woods, Part I : Fossil woods from the vicinity of Heijo, Part II : Studies on the structure and affinities of fossil woods in Japan, Korea, Saghalien, and Manchuria". After the graduation, he worked as Assistant Lecturer in the Department of Geology until 1937. During those years, he studied fossil woods more minutely and published many papers as shown in the references. And finally he published two big papers, that is :

Shimakura, M., 1936. Studies on fossil woods from Japan and adjacent lands. Contribution I. Science Reports of the Tohoku Imperial University, Series 2, Vol. 18, pp. 267–310.

Shimakura, M., 1937. Studies on fossil woods from Japan and adjacent lands. Contribution II. Science Reports of the Tohoku Imperial University, Series 2, Vol. 19, pp. 1–73.

In the following descriptions, these two papers are conveniently indicated as SHIMAKURA 1936 and SHIMAKURA 1937, respectively.

The list and re-description of fossil woods in the present paper are the all of Dr. Shimakura's collection during those days when he was in the Tohoku Imperial University. All microscopic slides that he studied were deposited in the Institute of Geology and Paleontology, Faculty of Science, Tohoku (Imperial) University, Sendai (IGPS) till now, although some of them have been missed.

He got position in Shaghai Institute of Natural History and moved China on 1939. After the end of the World War II, he returned Japan in 1947(?) and worked as a professor during 1953 and 1972 in Nara University of Education, Nara, Japan. After the war, his research was shifted from the fossil woods to pollen analysis of young sediments and excavated woods from archeological sites. He has gone on October 1997 in Nara.

Material and Method

In order to perform this study, one of the authors, K. Kim was invited to the Tohoku University Museum from July 1, 2003 to February 29, 2004 as a guest professor for study fossil wood collection in the museum. The microscopic slides of coniferous fossil woods used in the Shimakura's 1936 and 1937 papers were hired from the Tohoku University Museum and reviewed and newly described. In addition, all of the samples were pictured by using a microscopic photographing system installed in the botanical garden of Tohoku University. In this paper prepositive abbreviation of registration numbers (IGPS coll. cat no.) are left out.

(Missing slides)

As the following samples used in the Shimakura's papers have been missed from the fossil wood collection of the Tohoku University Museum, there is no description of them in the present paper.

57601, 57602 *Xenoxylon latiporosum*
57603 *Cupressinoxylon* sp.
58485 *Cupressinoxylon vectense*
58497 *Brachioxylon* sp.
58498 *Paracupressinoxylon cryptomeriopsoides*

Description

1. *Dadoxylon (Araucarioxylon) japonicum* SHIMAKURA Nos. 53325 (holotype), 58419. Plate 1.

SHIMAKURA 1936 : pp. 268–273, Pl.XII, figs. 1–6, text-fig. 1
SHIMAKURA 1937 : pp. 5–6, Pl.I, figs. 7–10.

In RLS, tracheid pitting is variable across growth ring increments. Earlywood is characterized by uniseriate (61.33%), biseriate (37.76%), or triseriate (0.1%) bordered pitting. Where they occur in two or multiple rows, tracheid pits are squarish or hexagonal (16–28 μm in diameter) with circular, oval apertures, and are usually oppositely (83.4%) arranged or partly alternately (16.6%) arranged (but No. 58419 most alternately (95%) arranged). Where they are arranged in single rows, pits are longitudinally flattened (26.4 μm wide by 20.2 μm high) with circular or oval apertures. Pit contiguity is very high with values ranging from 1–55 more (mean 27.72). Rays are composed of parenchymatous cells, 12–34 μm wide and 24–44 μm high with relatively thin and smooth horizontal cell walls. Ray tracheids are absent. Cross-field pitting is consisted of 5–12 (mean 8) circular pits (5.7–9.5 μm in diameter) with obliquely oval to slit like apertures (0.95–5.7 μm in diameter) in each field. Axial parenchyma is absent.

In TLS, tangential bordered pits (12–28 μm in diameter) usually present on latewood. Rays are uniseriate and 1–25 more cells high (mean 10.66) with short biseriate portions.

In TS, growth rings have a mean width of 1.21 mm (n=21), and possess subtle boundaries defined by only 2–7 rows of latewood cells. Maximum earlywood tracheid radial diameter is 80 μm and minimum latewood tracheid radial diameter is 3 μm. Mean tracheid diameter is 27 μm.

2. *Dadoxylon (Araucarioxylon) sidugawaense* SHIMAKURA No. 44234 (holotype) Plate 2.

SHIMAKURA 1936 : pp. 273–276, Pl.XII, figs. 7–8, Pl.XIII, figs. 1–7, text-fig. 2.

In RLS, earlywood tracheid pitting is characterized by uniseriate (54.2%) or biseriate (45.8%) bordered pitting and they are alternately (about 100%) arranged. Where they are arranged and contacted in single rows, pits are longitudinally flattened (23.5 μm wide by 18.07 μm high) with circular apertures. Pit contiguity is very high with values ranging 1–50 more (mean 15.35?). Rays are composed of parenchymatous cells, 18–32 μm wide and 20–30 μm high with smooth horizontal cell walls. Ray tracheids are absent. Cross-field pitting is large oval or circular ; consisting of 1–3 in each field. Axial parenchyma is absent but traumatic ? Parenchymatous cells rarely present.

In TLS, tracheid walls exhibit uniseriate sequences of pits (13–25 μm in diameter). Rays are uniseriate, 1–14 cells high (mean 6.5) with partly biseriate.

In TS, growth rings have a mean width of 1.6 mm (n=37.54), and possess subtle boundaries defined by only 4–14 rows of latewood cells. Maximum earlywood tracheid radial diameter can't measure because of they are extremely irregularity and so incline. Minimum latewood tracheid radial diameter is 12 μm.

3. *Dadoxylon* cfr. *tankoense* STOPES et FUJII No. 58446. Plate 3.

Araucarioxylon tankoense STOPES et FUJII : Studies on the Structure and Affinities of Cretaceous Plants. Phil. Trans. Roy. Soc. London, Ser.B, , Vol. CCI, pp. 41–42, Pl. III, fig. 17–18, 1910.

Dadoxylon tankoense (STOPES et FUJII) SEWARD : Fossil

Plants, Vol. IV, p. 185, 1919.
SHIMAKURA 1937 : pp. 2-4, Pl.I, figs. 1-6.

In RLS, tracheid pitting is variable across growth ring increments. Earlywood is characterized by uniseriate (10.06%), biseriate (25.74%), triseriate (42.9%), 4-seriate (19.23%) and 5-seriate (2.07%) bordered pitting. Where they occur in multiple rows, tracheid pits are hexagonal (17.48 μm wide by 14.96 μm high) with circular apertures and are mostly alternately (94.9%) arranged. Where they are arranged in single rows, pits are longitudinally flattened (17.13 μm wide by 12.6 μm high) with circular apertures. Pits are always contiguous. Rays are abundant (up to 1.327 mm long) and are composed of parenchymatous cells, 10-36 μm wide and 24-60 μm high with slightly thick horizontal cell walls. Cross-field pitting is not clear. Just Its shape seems to be oval or circular. Axial parenchyma is absent.

In TLS, Tracheid bordered pits are small, contiguous and slightly compressed (about mean 8 μm in diameter). Rays are uniseriate but it is hard to count the number.

In TS, growth ring is interminable. Maximum earlywood tracheid radial diameter is 118.5 μm and minimum earlywood tracheid radial diameter is 31.6 μm. Mean whole earlywood ring tracheid diameter is 76.1 μm.

4. *Dadoxylon* sp. indet. (Cfr. *japonicum* SHIMAKURA) Nos. 58484, 58408. Plate 4.

SHIMAKURA 1937 : pp. 6-7, Pl.V, figs. 7-10.

This specimen is badly preserved.

In RLS, earlywood tracheid pitting is characterized by uniseriate(?) bordered pitting. Pit contiguity is seemed to be high. Rays are composed of parenchymatous cells (about 22 μm in diameter). Cross-field pitting is not clear.

In TLS, Tracheid bordered pits are not clear. Rays are uniseriate or sometimes biseriate, and 1-20 cells high.

In TS, growth rings are indistinct. Maximum earlywood tracheid radial diameter is 63.2 μm, and minimum earlywood tracheid radial diameter is 15.8 μm. Mean whole earlywood ring tracheid diameter is 36.7 μm.

5. *Brachoxylon* aff. *woodworthianum* TORREY No. 58409. Plate 5.

Brachoxylon woodworthianum TORREY : Mesozoic and Tertiary Coniferous Woods. Mem. Boston Soc. Nat. Hist., Vol. 6, no. 2, pp. 80-82, Pl.XII, figs. 37-40, Pl.XIII, figs. 41-43, 1923.
SHIMAKURA 1937 : pp. 7-10, Pl.II, figs. 1-7, text-fig. 1.

This specimen is badly preserved.

In RLS, earlywood tracheid pitting is characterized by uniseriate (77.08%) or biseriate (22.92%) bordered pitting. Where they occur in two rows, tracheid pits are hexagonal (18.66 μm wide by 16.66 μm high) with oval, lenticular apertures and most alternately (93.18%) arranged. Where they are arranged in single rows, pits are longitudinally flattened (22.66 μm wide by 16 μm high) with oval, lenticular apertures. Pit contiguity is very high. Rays are abundant (up to 1.6 mm long) and are composed of parenchymatous cells, 10-32 μm wide and 20-36 μm high with thin horizontal cell walls. Ray tracheids are absent. Cross-field pitting is not clear. Axial parenchyma is absent.

In TLS, Tracheid bordered pits are not clear. Rays are uniseriate, biseriate or triseriate and 1-65 cells high (mean 17.06).

In TS, growth rings present, but their widths unascertainable. Maximum earlywood tracheid radial diameter is 56 μm and minimum earlywood tracheid radial diameter is 24 μm. Mean whole earlywood ring tracheid diameter is 34.6 μm.

6. *Xenoxylon latiporosum* (CRAMER) GOTHAN Nos. 44490, 6870, 30558, 30559, 57601, 51721, 51722, 57602. Plate 6.

Pinites latiporosum CRAMER : In Herr's Flora fossilis arctica I, p. 176, Pl.XL. figs. 1-8, 1968
Xenoxylon latiporosum (CRAMER) GOTHAN : Zur Anatomie lebender und fossiler Gymnospermenhölzer. L.c., p. 38, 1905.
SHIMAKURA 1936 : Vol. 18, pp. 278-281, Pl.XIV, figs. 7-8, Pl. XV, figs. 1-8, Pl.XVI, figs. 1-3, Pl.XVII, figs. 6-7, text-fig. 4.

In RLS, earlywood tracheid pitting is characterized by uniseriate (99.1%) or partly biseriate (0.9%) bordered pitting. Where they occur in two rows, tracheid pits are conical ? shape with circular or oval apertures and they are alternately (100%) arranged. Pit contiguity is high with values ranging from 1-40 (mean 9.1). Rays are abundant (up to 1.03 mm long) and are composed of parenchymatous cells, 16-20 μm wide and 18-32 μm high with thin and smooth horizontal cell walls. Ray tracheids are absent. Cross-field pitting is window-like ? type, consisting of 1-2 (mean 1.06) in each field. Axial parenchyma is absent.

In TLS, Tracheid bordered pits can't identify. Rays are uniseriate and 1-43 cells high (mean 8.8)

In TS, growth rings have a mean width of 1.2 mm (n=74.78), and possess subtle boundaries defined by only 2-5 rows of latewood cells. Maximum earlywood tracheid radial diameter is 92 μm and minimum latewood tracheid radial diameter is 16 μm. Mean whole-ring tracheid diameter is 48.15 μm.

7. *Xenoxylon phyllocladoides* GOTHAN No. 6869. Plate 7.

Xenoxylon phyllocladoides GOTHAN : Fossile Hölzer von König-Karles-Land. L.c.,p. 10, figs. 3-9, 1908.
SHIMAKURA 1936 : pp. 276-278, Pl.XIII, figs. 8-9, Pl.XIV, figs. 1-6, text-fig. 3

In RLS, earlywood tracheid pitting is characterized by uniseriate (about 100%) bordered pitting. Where they are arranged in single rows, pits are longitudinally flattened (22.73 μm wide by 17.50 μm high) with circular or oval apertures. Pit contiguity is low with values ranging from 1-12 (mean 2.6). Rays are composed of parenchymatous cells, 16-28 μm wide and 16-20 μm high with thin and smooth horizontal cell walls. Ray tracheids are absent. Cross-field pitting is window-like type, consisting of 1-2 (mean 1.06) in each field. Axial parenchyma is absent.

In TLS, Tracheid bordered pits are not observable because of it is bad preservation. Rays are uniseriate or rarely partly biseriate, and 1-4 cells high (mean 4.5).

In TS, growth rings have a mean width of 0.94 mm (n=26), but there are sometimes rarely more than 10 mm width. And growth rings possess subtle boundaries by only 1-3 rows of latewood cells. Maximum earlywood tracheid radial diameter is 60 μm and minimum latewood tracheid radial diameter is 12 μm. Mean whole-ring tracheid diameter is 31.4 μm.

8. *Planoxylon Inaii* SHIMAKURA No. 58445 (holotype). Plate 8.

SHIMAKURA 1937 : pp. 11-14, Pl.III, figs. 1-6, text-fig. 3.

In RLS, tracheid pitting is variable across growth ring increments. Earlywood is characterized by uniseriate (21.98%), biseriate (50.25%) or triseriate (19.13%) bordered pitting. Where they occur in multiple rows, tracheid pits are hexagonal (28.92 μm wide by 25.84 μm high) with circular or oval apertures. Where they are arranged in single rows, pits are longitudinally flattened (32 μm wide by 24 μm high) with circular or oval apertures. Pit contiguity is very high. Rays are abundant (up to 4.38 mm long) and are composed of parenchymatous cells, 20-40 μm wide and 32-56 μm high with small thick horizontal cell walls. Cross-field pitting is consisted of 1-5 (mean 2.5), and the shape is circular (10-20 μm in diameter). Axial parenchyma is present but is not abundant.

In TLS, rays are uniseriate, biseriate or rarely partly triseriate and 1-66 cells high (mean 18).

In TS, growth rings have a mean width of 610.4 μm (n= 7.12) and possess boundaries defined by only 1-2 rows of latewood cells. Maximum earlywood tracheid radial diameter is 110.6 μm and minimum latewood tracheid radial diameter is 16 μm. Mean whole-ring tracheid diameter is 51.19 μm.

9. *Protocedroxylon araucarioides* GOTHAN No. 58415. Plate 9.

Protocedroxylon araucarioides GOTHAN : Die fossilen Holzreste von Spitzbergen, Kgl. Svensk. Vetensk. Akad. Handl., Vol. XLV, No. 8, pp. 27-34, PL.V, figs. 3-5, PL.VI, fig. 1, 1910.

SHIMAKURA 1937 : Vol. 19, pp. 15-17, Pl.III, figs. 7-10, text-fig. 4.

In RLS, tracheid pitting is variable across growth ring increments. Earlywood is characterized by uniseriate (65%) or biseriate (35%) bordered pitting. Where they occur in two rows, tracheid pits are hexagonal (20-24 μm in diameter) with oval apertures and are always alternately arranged. Where they are contacted in single rows, pits are longitudinally flattened (19.5 μm wide by 16.8 μm high) with oval apertures. Pit contiguity is very high with values ranging from 1-49 (mean 19.52). Rays are not abundant (up to 987.5 μm long) and are composed of parenchymatous cells, 10-36 μm wide and 20-32 μm high with thick horizontal cell walls. Ray tracheids are absent. Cross-field pitting is consisted of 1-2 (mean 1.76) in each field. Axial parenchyma is absent.

In TLS, rays are uniseriate and 1-41 cells high (mean 17.5).

In TS, growth rings have a mean width of 0.9 mm (n= 21.68), and possess boundaries defined by 1-6 rows of latewood cells. Maximum earlywood tracheid radial diameter is 72 μm and minimum latewood tracheid radial diameter is 16 μm. Mean whole-ring tracheid diameter is 42.24 μm.

10. *Cedroxylon* cfr. *Yendoi* STOPES et FUJII No. 58401. Plate 10.

Cedroxylon Yendoi STOPES et FUJII : Studies on the structure and affinities of Cretaceous plants. Phil. Trans. Roy. Soc. London, Ser.B, Vol. CCI, pp. 44-456, figs. 24-26, 1910.

SHIMAKURA 1937 : pp. 18-20, Pl.IV, figs. 1-5, text-fig. 5.

In RLS, earlywood tracheid pitting is characterized by uniseriate (100%) bordered pitting. Pits are circular (10-18 μm in diameter) with oval apertures. Pit contiguity is very low with values ranging from 1-2 (mean 1.06). Rays are moderate (up to 355.5 μm long) and are composed of parenchymatous cells, 8-24 μm wide and 8-32 μm high with thick horizontal cell walls. Ray tracheids are absent. Cross-field pitting is consisted of 1-2 (mean 1.16) in each field. Pit diameter is 10-20 μm (mean 14.8 μm). Axial parenchyma is rarely present.

In TLS, tracheid pits are separated and their diameter is about 8 μm. Rays are uniseriate or rarely multiseriate and 1-15 cells high (mean 7.36).

In TS, growth rings have a mean width of 1.77 mm. Maximum earlywood tracheid radial diameter is 48 μm and minimum latewood tracheid radial diameter is 4 μm. Mean whole-ring tracheid diameter is 18.38 μm. Traumatic RD is present.

11. *Cedroxylon* sp. indet. No. 58417. Plate 11.

SHIMAKURA 1937 : pp. 20-22, Pl.IV, figs. 6-8.

This specimen is ill preserved.

In RLS, earlywood tracheid pitting is characterized by uniseriate (97.5%) or biseriate (2.5%) bordered pitting. They are usually separated (17.28 μm wide by 16.77 μm high) or sometimes contiguous (19.12 μm wide by 16 μm high). Pit contiguity is low with values ranging from 1-3 (mean 1.08). Rays are not abundant (up to 505.6 μm long) and are composed of parenchymatous cells, 16-52 μm wide and 20-48 μm high with irregularly thick horizontal cell walls. Ray tracheids are apparently absent. Cross-field pitting is consisted of 2-4 (mean 2.6), circular pits (8-16 μm in diameter) with oblique, oval or lenticular apertures in each field. Axial parenchyma is apparently absent.

In TLS, tracheid pits are not clear (about 4-20 μm ? in diameter). Rays are uniseriate or biseriate and 1-29 cells high (mean 8.24 cells)

In TS, growth ring width can not measure because of it is ill preserved. Maximum earlywood tracheid radial diameter is 64 μm and minimum latewood tracheid radial diameter is 12 μm. Mean whole-ring tracheid diameter is 35.04 μm. Traumatic RD is present.

12. *Pinoxylon dakotense* (KNOWLTON) READ No. 57693. Plate 12.

Pinoxylon dakotense KNOWLTON : In WARD's Studies of Mesozoic flora of the United States. 20th Ann. Rep. U. S. Geol. Surv., Pt.II, pp. 420-422, Pl. CLXXIX, figs. 1-6, 1900.

Pinoxylon dakotense READ : *Pinoxylon dakotense* KNOWLTON : from the Cretaceous of the Black Hills. Bot. Gaz., Vol. XCIII, pp. 175-178, figs. 1-12, 1932.

SHIMAKURA 1937 : pp. 22-24, Pl.V, figs. 1-6, text-fig. 6.

In RLS, tracheid pitting is variable across growth ring increments. Earlywood is characterized by uniseriate (51.68%), biseriate (46.34%) or triseriate (1.98%) bordered pitting. Where they occur in multiple rows, tracheid pits are squarish or oval (17.49 μm wide by 15.45 μm high) with circular apertures and are usually opposite (93.16%) or rarely alternate (6.84%). Where they are contacted in single rows, pits are longitudinally flattened (19.33 μm wide by 14.4 μm high). Where they are separated in single rows, pits are circular (16–22 μm in diameter) with circular apertures. Pit contiguity is low with values ranging from 1–3 (mean 1.08). Rays are not abundant (up to 387.1 μm long) and are composed of parenchymatous cells, 8–32 μm wide and 20-40 μm high with irregularly thick horizontal cell walls. Ray tracheids are present. Ray tracheid pits are 5.7–7.6 μm (mean 6.88) in diameter. Cross-field pitting is consisted of 2–5 (mean 2.3), small and half-bordered pits (3.8–5.7 μm in diameter). Axial parenchyma is present at terminal wood. Crassulae is clearly present.

In TLS, tracheid pits are small and circular (about 5.7 μm in diameter). Rays are uniseriate or rarely partly biseriate and 1–24 cells high (mean 10 cells)

In TS, growth rings have a mean width of 1.58 mm (n=43.42), and possess boundaries defined by 7–13 rows of latewood cells. Maximum earlywood tracheid radial diameter is 70 μm and minimum latewood tracheid radial diameter is 14 μm. Mean whole-ring tracheid diameter is 43.36 μm. Normal and traumatic RD are present.

13. *Pinoxylon Yabei* SHIMAKURA No. 30556 (holotype). Plate 13.

SHIMAKURA 1936 : pp. 289–295, Pl. XIX, figs 1–8, text-figs. 8, 9.

In RLS, tracheid pitting is variable across growth ring increments. Earlywood is characterized by uniseriate (26.96%), biseriate (41.34%), triseriate (30.23%) or multiseriate (1.47%) bordered pit arrangement. Pit contiguity is very low with values ranging one, and when they occur in multiple rows, tracheid pits are arranged opposite (97%) and rarely arranged alternate (3%). Tracheid pits are circular or oval (16–24 μm in diameter) with circular apertures. Rays are abundant (up to 1.1 mm long) and are composed of parenchymatous cells, 12–20 μm wide and 16–28 μm high with irregularly thick horizontal cell walls and distinctly pitted (nodular) end cell wall. Marginal ray-tracheids present. Cross-field pitting is consisting of 1–6 (mean 2.87), circular pits (3.8–7.6 μm in diameter) with very small, circular apertures in each field. Axial parenchyma is present in growth ring boundaries. Crassulae is present.

In TLS, rays are usually uniseriate, sometimes biseriate or triseriate and 1–70 cells high (mean 12.4)

In TS, growth rings have a mean width of 3 mm (n=39.44), and possess sharply marked boundaries defined by 3–25 more rows of latewood cells. Maximum earlywood tracheid radial diameter is 160 μm and minimum latewood tracheid radial diameter is 12 μm. Mean whole-ring tracheid diameter is 63.26 μm. Normal and traumatic RD are present in growth rings, either isolated or in tangential rows.

14. *Piceoxylon scleromedullosum* SHIMAKURA No. 58478 (holotype). Plate 14.

SHIMAKURA 1937 : pp. 28–30, Pl.VII, figs. 1–6, text-fig. 8.

In RLS, tracheids exhibit uniseriate (100%), circular bordered pits (12–24 μm in diameter) with oval apertures in the earlywood. Pit contiguity is low with values ranging from 1–8 (mean 1.12). Rays are at least 268.6 μm long, and composed of parenchymatous cells 8–30 μm wide and 15.2–28.8 μm high with thick horizontal cell walls. Cross-field pitting is piceoid ?, consisting 2–6 (mean 3.86), circular to oval pits (3.8–5.7 μm in diameter) in each field. Axial parenchyma is present and consists of resin-filled cells.

In TLS, tracheid walls locally exhibit circular bordered pits (12–16 μm in diameter). Rays are uniseriate and partly biseriate, and 1–12 (mean 6.46) cells high.

In TS, growth rings possess well-marked boundaries defined by 4–10 rows of latewood cells and have a mean ring width of 1.90 mm (n=68.42). Maximum earlywood tracheid radial diameter is 30.4 μm and minimum latewood tracheid radial diameter is 5.7 μm. Mean whole-ring tracheid diameter is 17.86 μm. Normal and traumatic RD are present. Tyloses ? rarely present in resin canals.

15. *Piceoxylon transiens* SHIMAKURA No. 58450 (holotype). Plate 15.

SHIMAKURA 1937 : pp. 24–28, Pl.VI, figs. 1–9, text-fig. 7.

In RLS, earlywood tracheid pitting is characterized by uniseriate (96.16%) or biseriate (3.84%) bordered pitting. Where they are separated in single rows, pits are circular (15.2–20.8 μm in diameter) with circular apertures. Where they are contacted in single rows, pits are longitudinally flattened (18.4 μm wide by 13.84 μm high) with circular apertures. Pit contiguity is low with values ranging from 1–13 (mean 1.95). Rays are not abundant (up to 268.6 μm long) and are composed of parenchymatous cells, 10–28 μm wide and 16–30 μm high with thick horizontal cell walls. Ray tracheids are present. Ray tracheid pits are small and circular. Cross-field pitting is piceoid(?), consisting of 2–4 (mean 3.6), circular or oval (about 4–8 μm in diameter) pits in each field. Axial parenchyma is present.

In TLS, tracheids walls locally exhibit circular bordered pits (12–16 μm in diameter) with vertically elongate oblong or lenticular apertures. Rays are uniseriate or partly biseriate and 1–14 cells high (mean 5.36 cells)

In TS, growth rings have a mean ring width of about 2.44 mm ? Maximum earlywood tracheid radial diameter is 52 μm and minimum latewood tracheid radial diameter 10 μm. Mean whole-ring tracheid diameter is 32.24 μm. Normal and traumatic RD are present and both horizontal and tangential resin canals present in normal wood.

16. *Piceoxylon* sp. (*P. antiguius* GOTHAN ?) no. 58448. Plate 16.

SHIMAKURA 1937 : pp. 30–31, Pl.VI, figs. 10–11.

This specimen is ill preserved.

In RLS, tracheids exhibit uniseriate (about 100%), circular to oval bordered pits (12–20 μm in diameter) with oval apertures in the earlywood. Rays are 474 μm long and are composed of parenchymatous cells, 8–24 μm wide and 16–

40 μm high with thick horizontal cell walls. Cross-field pitting is not clear. Axial parenchyma is present.

In TLS, Tracheid bordered pits are unascertainable. Rays are uniseriate and partly biseriate and 1-24 (mean 10.4) cells high.

In TS, growth rings are ill preserved. Maximum earlywood tracheid radial diameter is 40 μm and minimum latewood tracheid radial diameter is 10 μm. Mean whole-ring tracheid diameter is 22.35 μm. Normal RD is present and scattered singly throughout rings.

17. *Phyllocladoxylon* cfr. *eboracense* HOLDEN No. 30557. Plate 17.

Paraphyllocladoxylon eboracense HOLDEN : Contribution to the Anatomy of Mesozoic Conifers I. L.c., p. 536, Pl. XXXIX, fig. 7-9, 1913.

SHIMAKURA 1936 : 285-287, Pl.XVI, fig. 7, Pl.XVIII, figs. 1-3, text-fig. 6.

In RLS, earlywood tracheid pitting is characterized by uniseriate (99%) bordered pitting. Where they are arranged in single rows, pits are circular and oval (12-24 μm in diameter) with circular or elliptical apertures. Pit contiguity is very low with values ranging one. Rays are not abundant (up to 213.3 μm long) and are composed of parenchymatous cells, 24-42 μm wide and 18-32 μm high with thin and smooth horizontal cell walls. Rays tracheids are absent. Cross-field pitting is consisted of one (rarely two), large, oval or fusiform simple pit in each field. Axial parenchyma is absent.

In TLS, tracheid walls locally exhibit isolated circular bordered pits. Tracheid bordered pits are on latewood. Rays are uniseriate and 1-12 cells high (mean 4.6).

In TS, growth rings have a mean width of 1.33 mm (n=28.22), and possess subtle boundaries defined by only 1-3 rows of latewood cells. Maximum earlywood tracheid radial diameter is 52 μm and minimum latewood tracheid radial diameter is 12 μm. Mean whole-ring tracheid diameter is 31.76 μm.

18. *Phyllocladoxylon* aff. *Gothani* (STOPES) KRÄUSEL No. 58402. Plate 18.

Podocarpoxylon Gothani STOPES : Cat. Mes. Plants Brit. Mus., loc. Cit., pp. 228-234, figs, 65-66, 1915.

Phyllocladoxylon Gothani (STOPES) KRÄUSEL : Die fossilen Koniferenhölzer. Palaeontogr., , Vol. LXII, p. 236, 1919.

SHIMAKURA 1937 : pp. 31-34, Pl.VIII, figs. 1-5, text-fig. 9.

In RLS, earlywood tracheid pitting is characterized by uniseriate (100%) bordered pitting. Where they are arranged in contacted single rows, pits are longitudinally flattened (14.56 μm wide by 10.13 μm high) with oval or lenticular apertures. Where they occur in separated single rows, pits are circular (9.5-13.3 μm in diameter) with oval or lenticular apertures. Pit contiguity is moderate with values ranging from 1-38 (mean 11.27). Rays are not abundant (up to 308.1 μm long) and are composed of parenchymatous cell, 8-20 μm wide and 12-28 μm high with thin horizontal cell walls. Ray tracheids are absent. Cross-field pitting is large, circular, oval or spindle (14.98 μm wide by 15.41 μm high), consisting of 1-2 (mean 1.1) in each field. Axial parenchyma is rarely present.

In TLS, tracheid walls locally exhibit isolated circular bordered pits (5.7-9.5 μm in diameter). Rays are uniseriate or rarely partly biseriate and 1-18 cells high (mean 7.84).

In TS, growth rings possess well-marked boundaries defined by 1-14 rows of latewood cells and have a mean ring width 918 μm (n=20.46). Maximum earlywood tracheid radial diameter is 56 μm and minimum latewood tracheid radial diameter is 10 μm. Mean whole-ring tracheid diameter is 31.23 μm.

19. *Phyllocladoxylon heizyoense* SHIMAKURA Nos. 6871, 6872, 6873, 6874, 6875, 6876, 6877, 6878, 6879. Plate 19.

SHIMAKURA 1936 : pp. 281-285, Pl.XVI, figs. 4-6, Pl.XVII, figs. 1-5, text-fig. 5.

In RLS, earlywood tracheid pitting is characterized by uniseriate (97.72%) or biseriate (2.28%) bordered pitting. Where they occur in two rows, tracheid pits are oval (20-40 μm in diameter) with oval or somewhat circular apertures and always opposite arranged. Where they are arranged in single rows, pits are oval (20-40 μm in diameter). Pit contiguity is very low with values ranging about one. Rays are moderate (up to 355.5 μm long) and are composed of parenchymatous cell, 12-20 μm wide and 20-28 μm high with thin horizontal cell walls. Ray tracheids are absent or very rare. Cross-field pitting is window-like ? type and consisting of 1-2 (mean 1.08). Axial parenchyma is absent. Crassulae is clearly present.

In TLS, tracheid pits (mean 8.23 μm) are elliptical or circular with oval or lenticular apertures. Rays are usually uniseriate or sometimes partly biseriate and 1-18 cells high.

In TS, growth rings have a mean width of 2 mm (n=27), and boundaries defined by 1-5 rows of latewood cells. Maximum earlywood tracheid radial diameter is 84 μm and minimum latewood tracheid radial diameter is 8 μm. Mean whole-ring tracheid diameter is 41.37 μm.

20. *Phyllocladoxylon* ? species indet. No. 30555. Plate 20.

SHIMAKURA 1936 : pp. 287-288, Pl.XVIII, figs. 7-8, text-fig. 7.

These slides show very poor preservation.

In RLS, tracheids exhibit dominantly uniseriate (92.26%) bordered pitting with a few biseriate (7.74%), and alternately (about 100%) pitted tracheids in the earlywood. Uniseriate pits are small, circular or elliptical (12-20 μm in diameter). And pit contiguity is very low with values ranging one, and cross-field pitting looks like window-like type and it is consisted of usually one pits per field.

In TLS, Tracheid bordered pits and rays can not measure because of they are very poor preservation.

In TS, growth rings are indistinguishable and tracheids shape just looks like round, and somewhat squarish.

21. *Podocarpoxylon* cfr. *dakotense* TORREY No. 58406. Plate 21.

Podocarpoxylon dakotense TORREY : Mesozoic and Tertiary coniferous woods. Mem. Boston Soc. Nat. Hist., , Vol.VI, no.

2, pp. 73-74, 1923.
SHIMAKURA 1937 : pp. 36-37, Pl.XI, figs. 7-9, text-fig. 11.

In RLS, tracheids exhibit uniseriate (99%) or biseriate (1%), circular bordered pits (10-18 μm in diameter) with circular or oval apertures. Where biseriate, bordered pits are always arranged oppositely each other (100%). Pit contiguity is very low, with values ranging one. Rays at least 1.1 mm long, and 16-40 μm high with thin and smooth horizontal cell walls. Cross-field pitting is large, circular (12-16 μm in diameter), consisting of 1 (rarely 2 ; mean 1.1) in each field. Axial parenchyma is apparently absent.

In TLS, Tracheid bordered pits are not clear. Rays are uniseriate, biseriate or rarely partly triseriate and 1-60 cells high.

In TS, growth rings possess moderately well marked boundaries and their width is very broad (9.85 mm more, 435 cells more). Maximum earlywood tracheid radial diameter is 36.1 μm and minimum latewood tracheid radial diameter is 8 μm. Mean whole-ring tracheid diameter is 19.96 μm.

22. *Podocarpoxylon woburnense* STOPES No. 58481. Plate 22.

Podocarpoxylon woburnense STOPES : The Cretaceous flora, pt.II, Lower Greesand (Aptian) plants of Britain. Loc. Cit., p. 211, Pl.XX, figs. 1-2, text-figs. 60-63, 1915.
SHIMAKURA 1937 : pp. 34-36, Pl.IX, figs. 1-4, text-fig. 10.

In RLS, tracheids exhibit uniseriate (85.5%) or biseriate (14.5%) circular bordered pitting. Where they are contacted in single rows, tracheid pits are 20 μm wide by 15.34 μm high with circular or oval apertures. Where they are separated in single rows, tracheid pits are circular (12-24 μm in diameter) with circular apertures. Where they occur in couple rows, tracheid pits are 19.2 μm wide by 16.56 μm high with circular or oval apertures and are usually oppositely (98%) arranged. Pit contiguity is low with values ranging from 1-8 (mean 1.25). Rays are at least 1.13 mm long, and are composed of parenchymatous cells, 10-34 μm wide and 16.8-40 μm high with thin horizontal cell walls. Cross-field pitting is large, circular or oval (about 13.56 μm wide by 12.11 μm high), with large oval apertures in each field. Axial parenchyma is scattered and is sometimes more or less zonate.

In TLS, tracheid walls locally exhibit isolated circular bordered pits (9.5-15.2 μm in diameter). Rays are uniseriate or rarely partly biseriate and 1-45 (mean 14.13) cells high.

In TS, growth rings possess well-marked boundaries defined by 3-8 rows of latewood cells and have a mean ring width of 3.27 mm (n=48) (but growth rings are only four). Maximum earlywood tracheid radial diameter is 80 μm and minimum latewood tracheid radial diameter is 16 μm. Mean whole-ring tracheid diameter is 48.96 μm.

23. *Podocarpoxylon* sp. indet. No. 58404. Plate 23.

SHIMAKURA 1937 : pp. 37-38, Pl.VIII, figs. 7-9.

In RLS, tracheids exhibit uniseriate (97.23%) or biseriate (2.77%) bordered pitting. Where they are contacted in single rows, tracheid pits are longitudinally flattened (18.66 μm wide by 11.33 μm high) with oval apertures. Where they are separated in single rows, tracheid pits are circular or oval (22.33 μm wide by 15.33 μm high) with oval apertures. Where they are arranged in two rows, always oppositely arranged. Pit contiguity is very low with values ranging from 1-8 (mean 1.25). Rays are moderate (up to 344 μm long) and are composed of parenchymatous cells, 30-40 μm wide and 20.8-28 μm high with thin smooth horizontal cell walls. Cross-field pitting is comparatively large, circular or oval (8 μm-14 μm in diameter), consisting of 1-2 (rarely 3 ; mean 1.37) in each field. Axial parenchyma is scattered throughout rings.

In TLS, tracheid walls locally exhibit circular bordered pits (12-20 μm in diameter) with oval or lenticular apertures. Rays are uniseriate and 1-16 (mean 3.95) cells high.

In TS, growth rings possess well-marked boundaries defined by 2-10 more rows of latewood cells and have a ring width of 9.22 mm more (n=286 more). Maximum earlywood tracheid radial diameter is 60 μm and minimum latewood tracheid radial diameter is 8 μm. Mean whole-ring tracheid diameter is 28.24 μm.

24. *Paracupressinoxylon cryptomeriopsoides* SHIMAKURA No. 6961. Plate 24.

SHIMAKURA 1937 : pp. 38-41, Pl.X, figs. 1-5, text-fig. 12.

The slides are ill-preserved.

In RLS, tracheids exhibit usually uniseriate or rarely biseriate, circular or oval bordered pits (8-12 μm in diameter) with oval apertures. Where biseriate in contiguous, bordered pits are dominantly arranged alternate each other and where biseriate in separated, bordered pits are arranged opposite each other. Rays are at least 128 μm long, and are composed of parenchymatous cells, 5.7-13.3 μm wide and 9.5-26.6 μm high with thin and smooth horizontal cell walls. Cross-field pitting is circular, consisting of 2-4, with oblong, slit-like, obliquely or vertically elongate apertures in each field. Axial parenchyma is scattered throughout rings.

In TLS, tracheid walls locally exhibit isolated circular bordered pits with oblique or slit-like apertures. Rays are uniseriate and 1-8 cells high (mean 3.18?).

In TS, growth rings possess poorly marked boundaries.

25. *Paracupressinoxylon Solmsi* (STOPES) SHIMAKURA No. 58480. Plate 25.

?*Podocarpoxylon Solmsi* STOPES : The Cretaceous flora, Pt. II, Lower Greensand (Aptian) of Britain. Cat. Mes. Plants Brit. Mus., pp.XXII, text-fig. 67-70, 1915.
SHIMAKURA 1937 : pp. 41-44, Pl.IX, figs. 5-8, text-fig. 13.

In RLS, tracheids exhibit only uniseriate (100%), circular to oval pits (12-20 μm in diameter) with small circular apertures. Rays are at least 209.35 μm long, and are composed of parenchymatous cells 8-20 μm wide and 12-32 μm high with thin and smooth horizontal cell walls. Ray tracheids are absent. Cross-field pitting is poorly preserved, consisting of 1-2, circular to oval pits in each field. Axial parenchyma is scattered throughout rings.

In TLS tracheid walls locally exhibit isolated circular bordered pits (about 4-10 μm in diameter). Rays are uniseriate or partly biseriate and 1-12 cells high (mean 5.8).

In TS, growth rings are ill-preserved. Maximum earlywood tracheid radial diameter is 32.3 μm and minimum latewood tracheid radial diameter is 5.7 μm. Mean whole-ring tracheid diameter is 19.64 μm. Traumatic RD is arranged in tangential direction.

26. *Paracupressinoxylon* sp. (HOLDEN's species) No. 58410. Plate 26.

Paracupressinoxylon sp. HOLDEN : Contributions to the anatomy of Mesozoic conifers II. Bot. Gaz., , Vol. LVIII, p. 173, Pl.XIV, fig.s 20–24, 1914.

SHIMAKURA 1937 : pp. 44–45, Pl.X, figs. 6–9.

In RLS, earlywood tracheid pitting is characterized by uniseriate (88.71%) or biseriate (11.29%) bordered pitting. Where they are contacted in single rows, pits are longitudinally flattened (15.82 μm wide by 11.83 μm high) with oval or oblong apertures. Where they are separated in single rows, pits are circular or oval (8–16 μm in diameter) with oval or oblong apertures. Pit contiguity is low with values ranging from 1–10? (mean 1.47). Rays are sparse (up to 165.9 μm long) and are composed of parenchymatous cells, 12.8–26 μm wide and 12.8–32 μm high with thin and smooth horizontal cell walls. Ray tracheids are absent. Cross-field pitting is rarely preserved but locally 2–4 circular pits (5.7–7.6 μm in diameter) are present. Axial parenchyma is present.

In TLS, Tracheid bordered pits are not clear. Rays are uniseriate and 1–10 (mean 4.64) cells high.

In TS, growth rings possess well marked boundaries defined by 2–10 rows of latewood cells and have a mean ring width of 0.74 mm but the earlywood region is somewhat crushed so that only minimum estimates of ring tracheid number are possible ; a mean minimum ring tracheid is 19. Where locally preserved uncrushed, maximum earlywood tracheid radial diameter is 40 μm and minimum latewood tracheid radial diameter is 4 μm. Mean uncrushed whole-ring tracheid diameter is 24.24 μm

27. *Taxodioxylon albertense* (PENHALLOW) SHIMAKURA Nos. 7699, 58482. Plate 27.

Sequoia albertensis PENHALLOW : Report on a collection of fossil woods from the Cretaceous of Alberta. Ottawa Naturalist., Vol. XXII, no. 4, pp. 83–84, figs. 1–6, 1908.

SHIMAKURA 1937 : pp. 45–48, Pl.IX, figs. 9–10, Pl.XI, figs. 1–6, text-fig. 14.

In RLS, tracheids exhibit uniseriate (88.84%) or biseriate (11.16%), circular bordered pits (16–24 μm in diameter) with circular or oval (3.8–7.6 μm in diameter). Where biseriate, bordered pits are most oppositely arranged each other (99%). Pit contiguity is low, with values ranging from 1–7 (mean 1.25). Ray are moderate (up to 608 μm long), and are composed of parenchymatous cells, 10–36 μm wide and 16–34 μm high with smooth or slightly thick horizontal cell walls. Cross-field pitting is taxodioid, consisting of 1–2 (mean 1.07), circular pits (8–12 μm in diameter) with oblique, oblong or lenticular apertures in each field. Axial parenchyma is squarish and scattered throughout rings, and is sometimes zonate.

In TLS, tracheid walls locally exhibit isolated circular bordered pits (4–16 μm in diameter). Rays are uniseriate, biseriate or partly triseriate and 1–61 (mean 15.76) cells high.

In TS, growth rings are distinct and the earlywood regions are often compressed and curved (0.5–10 mm width). Maximum earlywood tracheid radial diameter is 60 μm and minimum latewood tracheid radial diameter is 10 μm. Mean whole-ring tracheid diameter is 39.84 μm. Traumatic RD is abundantly present.

28. *Cupressinoxylon sachalinense* SHIMAKURA No. 58403 (holotype). Plate 28.

SHIMAKURA 193 : pp. 50–53, Pl.XII, figs. 1–4, text-fig. 17.

This specimen is poorly preserved.

In RLS, tracheids exhibit uniseriate (92.13%) or biseriate (7.87%), circular bordered pits (16–20 μm in diameter) with small, apparently oval apertures. Where biseriate, bordered pits are mostly arranged opposite each other (about 100%). Rays are moderate (up to 655.7 μm long) and are composed of parenchymatous cells, 12–40 μm wide and 16–48 μm high with thin and smooth horizontal cell walls. Cross-field pitting is consisted of 1 (rarely 2 or 3), small circular or oval pits with obliquely, lenticular or linear apertures in each field. Axial parenchyma is small squarish, and it is diffuse or is terminal.

In TLS, tracheid walls locally isolated exhibit circular bordered pits (about 8 μm in diameter). Rays are uniseriate, biseriate or triseriate and 1–27 (mean 10.36) cells high.

In TS, growth rings possess well-marked boundaries defined by 3–10? rows of latewood cells and have a mean ring width of 2.61 mm (n=57.66). Maximum earlywood tracheid radial diameter is 110.6 μm and minimum latewood tracheid radial diameter is 10 μm. Mean whole-ring tracheid diameter is 52.48 μm.

29. *Cupressinoxylon vectense* BARBER Nos. 58407, 58545. Plate 29.

Cupressinoxylon vectense BARBER : Cupressinoxylon vectense, a fossil conifer from the Lower Greensand of Shanklin in the Isle of Wright. Ann. Bot. Vo. XII, pp. 329–361, Pl.XXIII–XXIV, figs. 1–15, 1898.

SHIMAKURA 1937 : pp. 31–34, Pl.VIII, figs. 1–5, text-fig. 9.

In RLS, tracheids exhibit uniseriate (96%) or biseriate (4%), circular bordered pits (6–14 μm in diameter) with small oval apertures. Where biseriate, bordered pits are dominantly arranged opposite each other (92%). In a few tracheids, pits are also partly alternately arranged (8%). Pit contiguity is low, with values ranging from 1–13 (mean 1.58). Rays are sparse (up to 221.2 μm long) and are composed of parenchymatous cells, 12–28 μm wide 16–36 μm high with thin and smooth horizontal cell walls. Ray tracheids are absent. Cross-field pitting looks like pinoid ?, consisting of 1–3 (rarely 4 ; mean 1.81), oblique pits (3.8–11.4 μm in diameter) in each field. Axial parenchyma is present and scattered throughout rings, or is more or less zonate.

In TLS, tracheid walls locally isolated exhibit circular bordered pits (about 6 μm in diameter) with oval or lenticular apertures. Rays are uniseriate or rarely partly biseriate and 1–12 (mean 5) cells high.

In TS, growth rings possess well-marked boundaries defined by 3–9? rows of latewood cells and have a mean ring width of 0.99 mm (n=45.71). Maximum earlywood tracheid radial diameter is 36 μm and minimum latewood tracheid radial diameter is 8 μm. Mean whole-ring tracheid diameter is 20.94 μm.

30. *Cupressinoxylon* sp. (*C. sachalinense* SHIMAKURA ?) Nos. 30880, 58418. Plate 30.
SHIMAKURA 1937 : pp. 53-54, Pl.XIII, figs. 1-3, text-fig. 16.

In RLS, tracheids exhibit uniseriate (70%) or biseriate (30%), circular bordered pits (10-16 μm in diameter) with small circular apertures. Where biseriate, bordered pits are most oppositely arranged each other (99%). Pit contiguity is low, with values ranging one. Rays are moderate (up to 576.7 μm long), and are composed of parenchymatous cells, 6-32 μm wide and 8-28 μm high with thin and smooth horizontal cell walls. Cross-field pitting is small, circular or oval (about mean 9.5 μm in diameter), consisting of 1-2 (rarely 3 ; mean 1.35), with oblique or oblong apertures in each field. Axial parenchyma is scattered throughout rings.

In TLS, tracheid walls locally exhibit circular bordered pits (about 8-12 μm in diameter) with oval apertures. Rays are uniseriate or sometimes partly biseriate and 1-25 (mean 10.92) cells high.

In TS, growth rings possess well-marked boundaries defined by 2-8 rows of latewood cells and have a mean ring width 4.91 mm (n=126.25). But growth rings are only four. Maximum earlywood tracheid radial diameter is 80 μm and minimum latewood tracheid radial diameter is 8 μm. Mean whole-ring tracheid diameter is 37.29 μm.

31. *Cupressinoxylon* sp. indet No. 58416. Plate 31.
SHIMAKURA 1937 : p. 54, Pl.XII, figs. 10-11.

Slides are all ill-preserved.

In RLS, earlywood tracheid pitting is characterized by uniseriate (97%) or biseriate (3%), circular or oval bordered pits (12-20 μm in diameter) with small oval apertures. Where biseriate, bordered pits are always oppositely arranged each other (100%). Pit contiguity is low with values ranging from 1-3 (mean 1.02). Rays are sparse (up to 276.5 μm more long) and are composed of parenchymatous cells with smooth horizontal cell walls. Cross-field pitting is small oval and half-bordered, consisting of 1-2 (rarely 3-4 ; mean 1.05) with circular or oval apertures in each field. Axial parenchyma is scattered throughout rings.

In TLS, Tracheid bordered pits are not clear. Rays are uniseriate and 1-10 more cells high (mean 5.55)

In TS, growth rings are not clear. Tracheid pits are strongly deformed, just they are seemed to be squarish and thin-walled.

32. *Cupressinoxylon* ? sp. indet. No. 58449. Plate 32.
SHIMAKURA 1937 : pp. 54-55, Pl.XIII, figs. 6-9.

This specimen is very ill-preserved.

In RLS, earlywood tracheid pitting is characterized by uniseriate, circular bordered pits (about 12-16 μm in diameter) with oval apertures. Pits are separated or slightly contiguous. Cross-field pitting is oval or oblong and apparently simple, consisting of 1-2 in each field. Axial parenchyma is diffused or is somewhat zonate

In TLS, Tracheid bordered pits are not clear. Rays are uniseriate.

In TS, growth rings are present but much region of earlywood and latewood are crushed so that only minimum estimates of tracheids radial diameter. Maximum tracheid radial diameter is 28 μm and minimum tracheid radial diameter is 12 μm. Mean tracheid diameter is 19.06 μm.

33. Indeterminable coniferous wood No. 50288. Plate 33.
SHIMAKURA 1936 : pp. 297-298.

This specimen shows very bad preservation. So it can not be observed mostly things. Only in TLS, rays seem to be arranged in uniseriate.

34. Indeterminable wood (A coniferous wood, gen. et sp. indet.) No. 58411. Plate 34.
SHIMAKURA 1937 : p. 62, Pl.VII, figs. 7-9.

This specimen is poorly preserved.

In RLS, tracheids exhibit uniseriate, circular or oval bordered pits (12-18 μm in diameter). Rays are sparse (about up to 244 μm long) and are composed of parenchymatous cells, 12-24 μm wide and 20-36 μm high with thin and smooth horizontal cell walls. Cross-field pitting is not clear. Axial parenchyma is absent.

In TLS, Tracheid bordered pits are not clear. Rays are uniseriate and 1-12 (mean 5.38) cells high.

In TS, growth rings are ill-preserved. Maximum tracheid radial diameter is 48 μm and minimum tracheid radial diameter is 16 μm. Mean whole-ring tracheid radial diameter is 30.8 μm.

35. Indeterminable wood (*Cupressinoxylon* type wood, a) No. 58447. Plate 35.
SHIMAKURA 1937 : pp. 62-63, Pl.VIII, fig. 6.

In RLS, tracheids exhibit uniseriate, circular bordered pits (about 12-20 μm in diameter) with circular or oval apertures. Rays are not clear, they just seem to be uniseriate and 1-8 more cell high. Cross-field pitting is large circular or oval, consisting of only one, with lenticular oblique apertures in each field. Axial parenchyma is present.

In TLS, Tracheid bordered pits are not clear.

In TS, growth rings are mostly crushed so that only somewhat region estimates of latewood ring width are possible ; a mean latewood ring width of 27.46 μm was obtained (n=2.6). Where locally preserved uncrushed, maximum tracheid radial diameter is 40 μm and minimum tracheid radial diameter is 12 μm. Mean tracheid radial diameter is 27.06 μm.

36. Indeterminable wood (*Cupressinoxylon* type wood, b) No. 58412. Plate 36.
SHIMAKURA 1937 : p. 63, Pl.XIII, figs. 10-11.

In RLS, tracheids exhibit uniseriate or rarely biseriate, circular to oval bordered pits (about 16 μm in diameter). Where biseriate, bordered pits are dominantly arranged opposite each other. Rays are moderate (up to 434.5 μm more long) and composed of parenchymatous cells, 8-46 μm wide and 20-48 μm high with smooth horizontal cell walls. Cross-field pitting is not well preserved.

In TLS, Tracheid bordered pits are not clear. Rays are uniseriate.

In TS, growth rings possess well marked boundaries defined by 1-9? rows of latewood cells and have a mean ring width of 1.35 mm (n=45.27). Maximum earlywood tracheid radial diameter is 52 μm and minimum latewood tracheid radial diameter is 12 μm. Mean whole-ring tracheid radial diameter is 35.68 μm.

37. Indeterminable wood (*Cupressinoxylon* type wood, c) No. 7700. Plate 37.

SHIMAKURA 1937 : p. 63, Pl.XIII, figs. 4–5.

In RLS, tracheid pits are separated and circular bordered pitting. Cross-field pitting is indistinct.

In TLS, Tracheid bordered pits are not clear. Rays are uniseriate and 1–10 (mean 4.7) cells high and 16–28 μm wide and 16–32 μm high with thin ? horizontal cell walls.

In TS, growth rings are indeterminable and tracheids are small, irregular. Axial parenchyma is diffused and is sometimes zonate.

Notes

Professor Shimakura collected fossil woods from 1928 to 1934 throughout the areas of Japan, Korea, and Manchuria. The results of his study were published in 1936 and 1937 in which he produced 480 slides based on his study. Almost of the slides deposited in the Tohoku University Museum.

From the published 34 kinds of fossil woods, *Xenoxylon latiporosum*, *X. phyllocladoides*, and *Phyllocladoxylon heizyoense* were collected from Korea in which Phyllocladoxylon heizyoense was a newly collected species, 11 kinds were collected from Japan, 15 kinds were collected from Sakhalin, and 7 kinds were came from Manchuria. In addition, the newly collected species were 8 kinds, such as *Dadoxylon* (*Araucarioxylon*) *japonicum, Dadoxylon* (*Araucarioxylon*) *sidugawaense, Phyllocladoxylon heizyoense, Pinoxylon Yabei, Planoxylon Inaii, Piceoxylon transiens, P. scleromedullosum*, and *Cupressinoxylon sachalinense*, and two species, such as *Paracupressinoxylon Solmsi* (Stopes) and *Taxodioxylon albertense* (Penhallow) were recombined. Moreover, 11 kinds were included to the upper classes due to the poor state of preservation.

Acknowledgement

We wish to thank Mr. Ishida, Mr. Nemoto, Dr. Sato, and other all the members of the University Museum, for providing the samples and administrational help, and also Dr. Oyama, Dr. Yonekura and secretary Miss Yagi Harumi and all the members of the Botanical Gardens, Tohoku University, for their advice and encouragement. And finally We thank to Mr. Uematsu, Director of Yamagata Lijinkan, for his help in fossil wood collection.

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PLATE 1 *Dadoxylon (Araucarioxylon) japonicum* SHIMAKURA (Slide No. 53325, 58419)
Figs. 1-2. Transverse section-1 & 2 : More or less abrupt transition of growth rings and tracheids. Figs. 3-8. Radial section. -3 & 4 : Cross-field pits and radial tracheid pits. -5-8 : Opposite and alternate TRPits. Figs. 9-12. Tangential section. - 9-12 : Rays and TTPits.

PLATE 2 *Dadoxylon (Araucarioxylon) sidugawaence* SHIMAKURA (Slide No. 44234)
Figs. 1-6. Transverse section - 1 & 2 : Gradual transition of growth rings and latewood. - 3 : Traumatic RDs. - 4 : Tracheids. - 5 : Pith. - 6 : Phloem. Figs. 7-9. Radial section - 7-9 : Cross-field pits and TRPits. Figs. 10-12 : Tangential section - 10-12 : Rays and TTPits.

PLATE 3 *Dadoxylon* cfr. *tankoense* STOPES et FUJII (Slide No. 58446)
Figs. 1-3 Transverse section - 1-3 : Tracheids. Figs. 4-5 Radial section - 4 & 5 : Multiseriate TRPits and cross-field pits. Figs. 6 Tangential section - 6 : Rays and TTPits.

PLATE 4 *Dadoxylon* sp. indet. (Cfr. *japonicum* SHIMAKURA) (Slide No. 58484, 58408)
Figs. 1-2 Transverse section - 1 & 2 : Gradual (?) of growth ring and tracheids. Figs. 3-4 Radial section - 3 & 4 : TRPits and cross-field. Figs. 5-6 Tangential section - 5 & 6 : Rays.

PLATE 5 *Brachoxylon* aff. *Woodworthianum* TORREY (Slide No. 58409)
Figs. 1-2 Transverse section - 1 & 2 : Growth ring and tracheids. Figs. 3-5 Radial section - 3-5 : Cross-field pits and TRPits. Figs. 6-9 Tangential section - 6 & 7 : Uni-, bi-, or triseriate rays. - 8 & 9 : TTPits.

PLATE 6 *Xenoxylon latiporosum* (CRAMER) GOTHAN (Slide No. 44490, 6870)
Figs. 1-3 Transverse section - 1 & 2 : Abrupt transition of growth rings. - 3 : Gradual transition of growth rings. Figs. 4-6 Radial section - 4 & 5 : Cross-field pits and TRPits. - 6 : Biseriate TRPits. Figs. 7-9 Tangential section - 7-9 : Uniseriate and biseriate rays and TTPits.

PLATE 7 *Xenoxylon phyllocladoids* GOTHAN (Slide No. 6869)
Figs. 1-2. Transverse section - 1 & 2 : Growth rings and tracheids. Figs. 3-4. Radial section - 3 & 4 : Cross-field pits and TRPits. Figs. 5-6. Tangential section - 5 & 6 : Rays

PLATE 8 *Planoxylon Inaii* SHIMAKURA (Slide No. 58445)
Figs. 1-4 Transverse section - 1-4 : Abrupt transition of growth rings and tracheids. Figs. 5-9 Radial section - 5-9 : Cross-field pits and uni-, bi-, or triseriate TRPits. Figs. 10-12 Tangential section - 10-12 : Rays and TTPits.

PLATE 9 *Protocedroxylon araucarioides* GOTHAN (Slide No. 58415)
Figs. 1-3 Transverse section - 1-3 : More or less abrupt transition of growth rings and tracheids. Figs. 4-9 Radial section - 4-6 : TRPits. - 7 & 9 : Cross-field pits. Figs. 10-12 Tangential section - 10-12 : Uniseriate rays and TTPits.

PLATE 10 *Cedroxylon* cfr. *Yendoi* STOPES et FUJII (Slide No. 58401)
Figs. 1-5 Transverse section - 1-3 : Gradual transition of growth rings, tracheids and traumatic RDs. - 4 : Pith. - 5 : Phloem. Figs. 6-7 Radial section - 6 & 7 : Radially traumatic RD, cross-field pits and TRPits. Figs. 8-12 Tangential section - 8-12 : Tangentially traumatic RD, rays and TTPits.

PLATE 11 *Cedroxylon* sp. indet. (Slide No. 58417)
Figs. 1-3 Transverse section - 1-3 : Tracheids and traumatic RDs. Figs. 4-8 Radial section - 4-8 : Cross-field pits and TRPits. Figs. 9-12 Tangential section - 9-12 : Rays and TTpits.

PLATE 12 *Pinoxylon dakotense* (KNOWLTON) READ (Slide No. 57693)
Figs. 1-6 Transverse section - 1 : Abrupt transition of growth rings. - 2-4 : Normal RDs. - 5 & 6 : Traumatic RDs and tracheids. Figs. 7-9 Radial section - 7-9 : Cross-field pits and TRPits. Figs. 10-12 Tangential section - 10-12 : Rays and TTPits.

PLATE 13 *Pinoxylon Yabei* SHIMAKURA (Slide No. 30556)
Figs. 1-5 Transverse section - 1-4 : Growth rings, tracheids, normal RDs and traumatic RDs. - 5 : Parenchyma cells. Figs. 6-9 Radial section - 6 : uni-, bi- or triseriate TRPits. - 7 : Cross-field pits. - 8 : Radially traumatic RD. - 9 : Nodula lateral and end walls. Figs. 10-12 Tangential section - 10-12 : Fusiform ray, rays and TTPits.

PLATE 14 *Piceoxylon scleromedullosum* SHIMAKURA (Slide No. 58478)
Figs. 1-3 Transverse section - 1 : Growth rings - 2 : Pith. - 3 : Normal RD. Figs. 4-6 Radial section - 4 : Radially pith. - 5 : Cross-field pits. - 6 : TRPits. Figs. 7-9 Tangential section - 7-9 : Rays and TTPits.

PLATE 15 *Piceoxylon transiens* SHIMAKURA (Slide No. 58450)
Figs. 1–3 Transverse section – 1–3 : Growth rings, normal and traumatic RDs. Figs. 4–9 Radial section – 4 : Cross-field pits and TRPits. – 5 : Spiral check. – 6 & 7 : TRPits. – 8 : Spiral thick – 9 : Radially traumatic RD. Figs 10–12 Tangential section – 10–12 : Rays and TTPits.

PLATE 16 *Piceoxylon* sp. (*P. antiquius* GOTHAN?) (Slide No. 58448)
Figs. 1–4 Transverse section – 1–4 : Tracheids and normal RD. Figs. 5–8 Radial section – 5–8 : Cross-field pits (?) and TRPits. Figs. 9 Tangential section – 9 : Rays.

PLATE 17 *Phyllocladoxylon* cfr *eboracense* HOLDEN (Slide No. 30557)
Figs. 1–3 Transverse section – 1–3 : Growth rings and tracheids. Figs. 4–5 Radial section – 4 & 5 : Cross-field pits and TRPits. Figs. 6 Tangential section – 6 : Rays and TTPits.

PLATE 18 *Phyllocladoxylon* aff. *Gothani* (STOPES) KRÄUSEL (Slide No. 58402)
Figs. 1–2 Transverse section – 1 & 2 : Growth rings and tracheids. Figs. 3–6 Radial section – 3–5 : Cross-field pits and TRPIts. – 6 : TRPits. Figs. 7–9 Tangential section –7–9 : Rays and TTPits.

PLATE 19 *Phyllocladoxylon heizyoense* SHIMAKURA (Slide No. 6878, 6873, 6877)
Figs. 1–3 Transverse section – 1 & 2 : Abrupt transition of growth rings. – 3 : Gradual transition of growth rings. Figs. 4–5 Radial section – 4 & 5 : Cross-field pits and TRPits. Figs. 6 Tangential section – 6 : Rays and TTPits.

PLATE 20 *Phyllocladoxylon*? species indet. (Slide No. 30555)
Figs. 1–2 Transverse section – 1 & 2 : Tracheids. Figs. 3–7 Radial section – 3–5 : Cross-field pits and TRPits. – 6 : Alternately biseriate TRPits. – 7 : Cross-field pits and TRPits. Figs. 8–9 Tangential section – 8 & 9 : Rays (?)

PLATE 21 *Podocarpoxylon* cfr. *dakotense* TORREY (Slide No. 58406)
Figs. 1–2 Transverse section – 1 & 2 : Tracheids. Figs. 3–7 Radial section – 3–5 : Cross-field pits and TRPits. – 6 : Spiral check. – 7 : TRPits. Figs. 8–9 Tangential section – 8 & 9 : Rays and TTPits (?)

PLATE 22 *Podocarpoxylon woburnense* STOPES (Slide No. 58481)
Figs. 1–2 Transverse section – 1 & 2 : Gradual transition of growth ring and tracheids. Figs. 3–7 Radial section – 3–5 : Cross-field pits. – 6 & 7 : TRPits. Figs. 8–9 Tangential section – 8 & 9 : Rays and TTPits.

PLATE 23 *Podocarpoxylon* sp. indet. (Slide No. 58404)
Figs. 1–4 Transverse section – 1–3 : Gradual transition of growth rings and tracheids. – 4 : RD(?). Figs. 5–6 Radial section – 5 & 6 : Cross-field pits and TRPits. Figs. 7–9 Tangential section – 7–9 : Rays and TTPits

PLATE 24 *Paracupressinoxylon cryptomeriopsoides* SHIMAKURA (Slide No. 6961)
Figs. 1 Transverse section – 1 : Tracheids. Figs. 2 Radial section – 2 : Cross-field and TRPits. Figs. 3 Tangential section – 3 : Rays.

PLATE 25 *Paracupressinoxylon Solmsi* (STOPES) SHIMAKURA (Slide No. 58480)
Figs. 1–4 Transverse section – 1 & 2 : Pith. – 3 : Traumatic RD. – 4 : Growth ring, tracheids and traumatic RDs. Figs. 5–7 Radial section – 5–7 : Cross-field pits, TRPits and radially traumatic RD. Figs. 8–9 Tangential section – 8 & 9 : Rays and TTPits.

PLATE 26 *Paracupressinoxylon* sp. (HOLDEN's species) (Slide No. 58410)
Figs. 1–3 Transverse section – 1–2 : Abrupt transition of growth rings and tracheids. – 3 : Pith. Figs. 4–8 Radial section – 4–8 : Cross-field pits and TRPits. Figs. 9 Tangential section – 9 : Rays and TTPit (?)

PLATE 27 *Taxodioxylon albertense* (PENHALLOW) SHIMAKURA (Slide No. 58482)
Figs. 1–3 Transverse section – 1–3 : Growth rings, traumatic RDs and tracheids. Figs. 4–7 Radial section – 4–6 : Cross-field pits and TRPits. – 7 : Radially traumatic RDs. Figs. 8–9 Tangential section – 8 & 9 : Rays and TTPits.

PLATE 28 *Cupressinoxylon sachalinense* SHIMAKURA (Slide No. 58403)
Figs. 1–2 Transverse section – 1 & 2 : Abrupt transition of growth rings and tracheids. Figs. 3–4 Radial section – 3 & 4 : Cross-field pits and TRPits. Figs. 5–6 Tangential section – 5 & 6 : Rays and TTPits.

PLATE 29 *Cupressinoxylon vectense* BARBER (Slide No. 58485)
Figs. 1–2 Transverse section – 1 & 2 : Growth rings, tracheids and parenchyma cells. Figs. 3–7 Radial section – 3–7 : Cross-field pits and TRPits. Figs. 8–9 Tangential section – 8 & 9 : Rays and TTPits.

PLATE 30 *Cupressinoxylon* sp. (*C. sachalinense* SHIMAKURA ?) (Slide No. 30880)
Figs. 1-2 Transverse section – 1 & 2 : Gradual transition of growth ring and tracheids. Figs. 3-6 Radial section-3-6 : Cross-field pits and TRPits. Figs. 7-9 Tangential section – 7-9 : Rays and TTPits.

PLATE 31 *Cupressinoxylon* sp. indet. (Slide No. 58416)
Figs. 1 Transverse section – 1 : Tracheids. Figs. 2-5 Radial section – 2-5 : Cross-field pits and TRPits. Figs. 6 Tangential section – 6 : Rays.

PLATE 32 *Cupressinoxylon* ? sp. indet. (Slide No. 58449)
Figs. 1 Transverse section – 1 : Growth ring and tracheids. Figs. 2-3 Radial section – 2 & 3 : Cross-field pits and TRPits. Figs. 4-6 Tangential section – 4 & 6 : Uniseriate rays.

PLATE 33 Indeterminable coniferous wood (Slide No. 50288)
Figs. 1 Transverse section – 1 : Growth rings. Figs. 2 Radial section. Figs. 3 Tangential section – 3 : Uniseriate rays.

PLATE 34 Indeterminable wood (A coniferous wood, gen. et sp. indet.) (Slide No. 58411)
Figs. 1 Transverse section – 1 : Tracheids. Figs. 2 Radial section – 2 : Cross-field pits and TRPits. Figs. 3 Tangential section – 3 : Uniseriate rays.

PLATE 35 Indeterminable wood (*Cupressinoxylon* type wood, a.) (Slide No. 58447)
Figs. 1-2 Transverse section – 1 & 2 : Tracheids. Figs. 3-4 Radial section – 3 & 4 : Cross-field pits and TRPits. Figs. 5-6 Tangential section – 5 & 6 : Uniseriate rays.

PLATE 36 Indeterminable wood (*Cupressinoxylon* type wood, b.) (Slide No. 58412)
Figs. 1 Transverse section – 1 : Gradual transition of growth ring and tracheids. Figs. 2 Radial section. Fig. 3 Tangential section.

PLATE 37 Indeterminable wood (*Cupressinoxylon* type wood, c.) (Slide No. 7700)
Figs 1-2 Transverse section – 1 & 2 : Tracheids and parenchyma cells. Figs. 3-5 Radial section – 3-5 : TRPits and cross-field. Figs. 6 Tangential section – 6 : Rays.

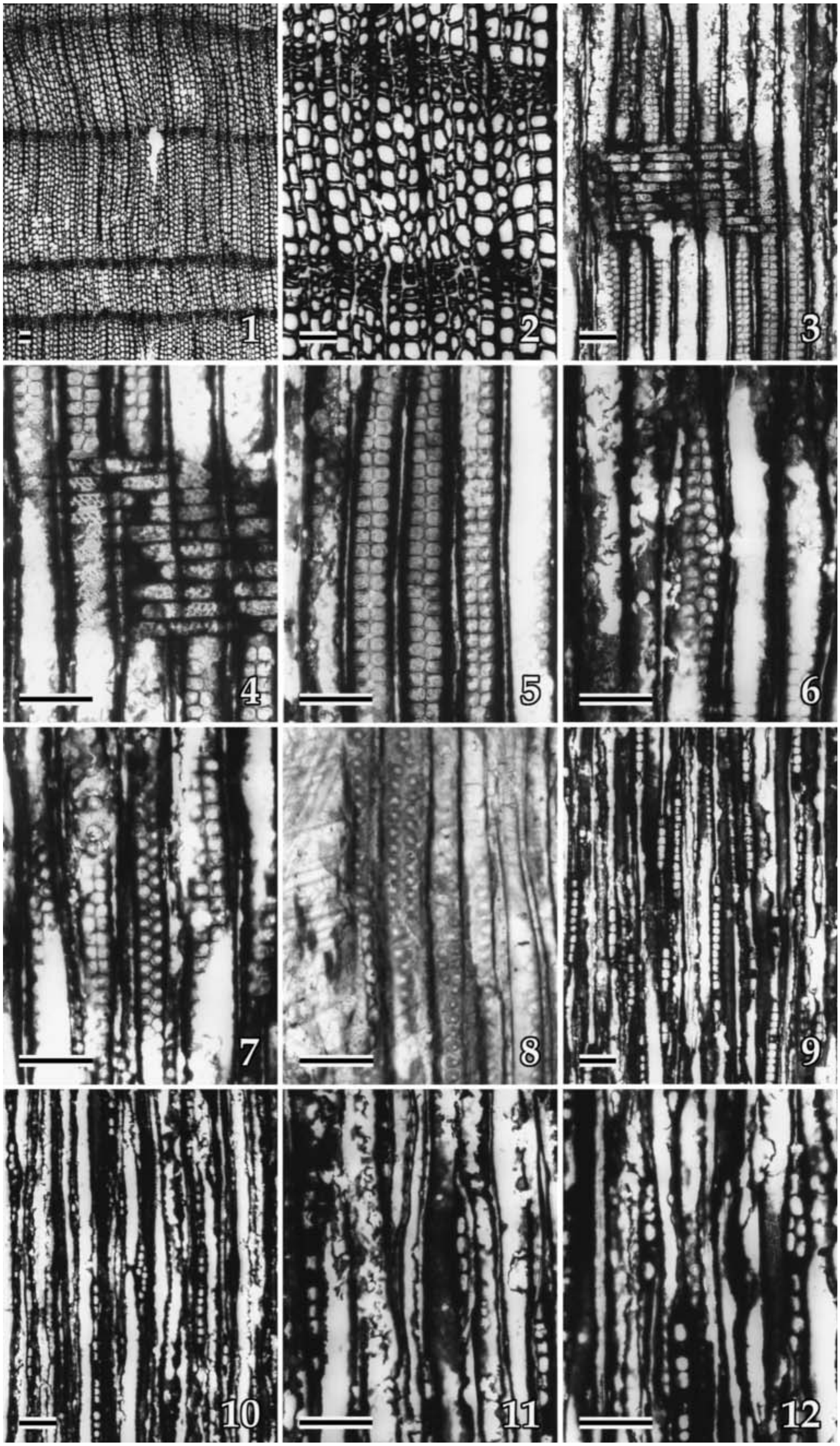
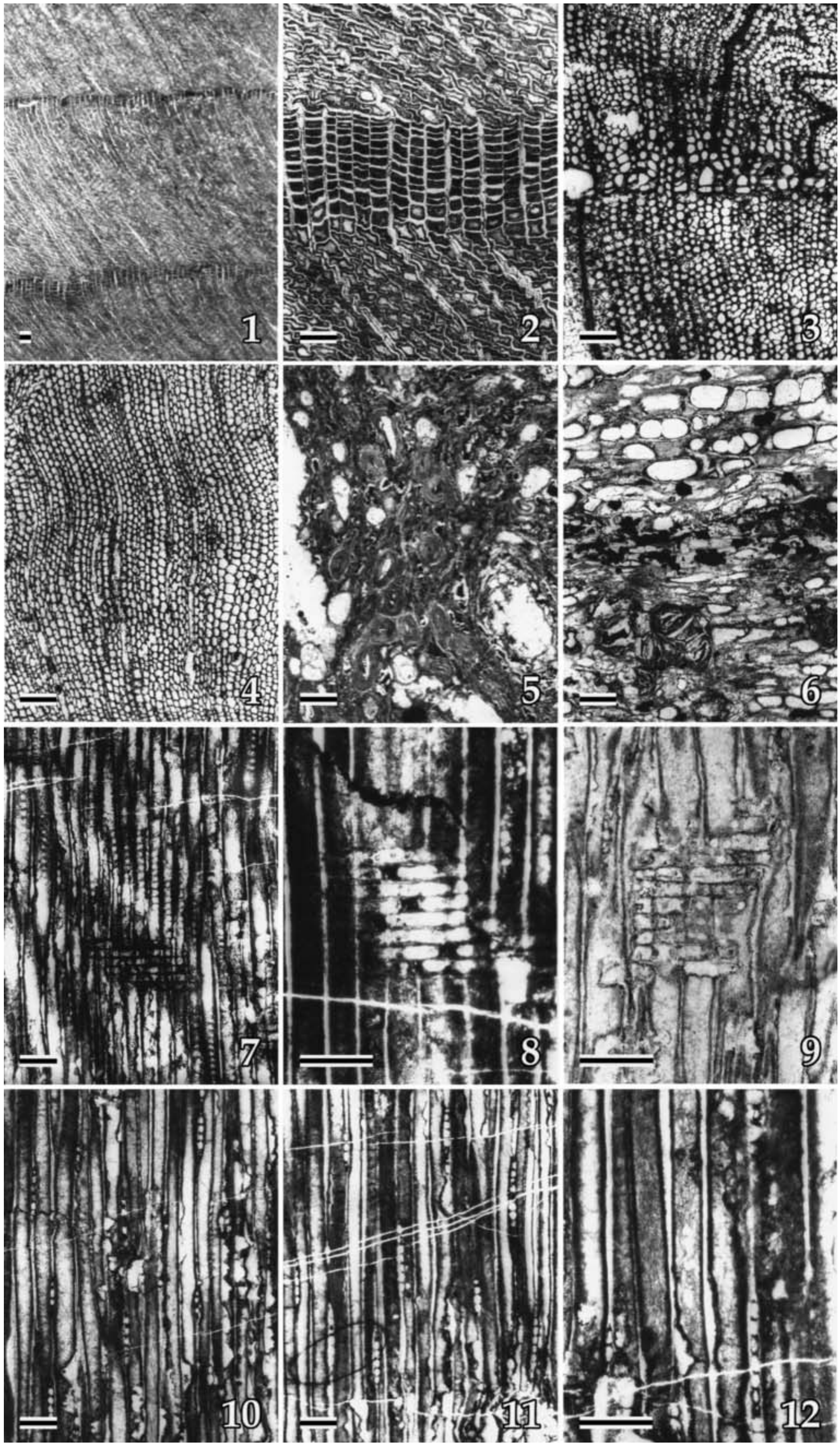


PLATE 1



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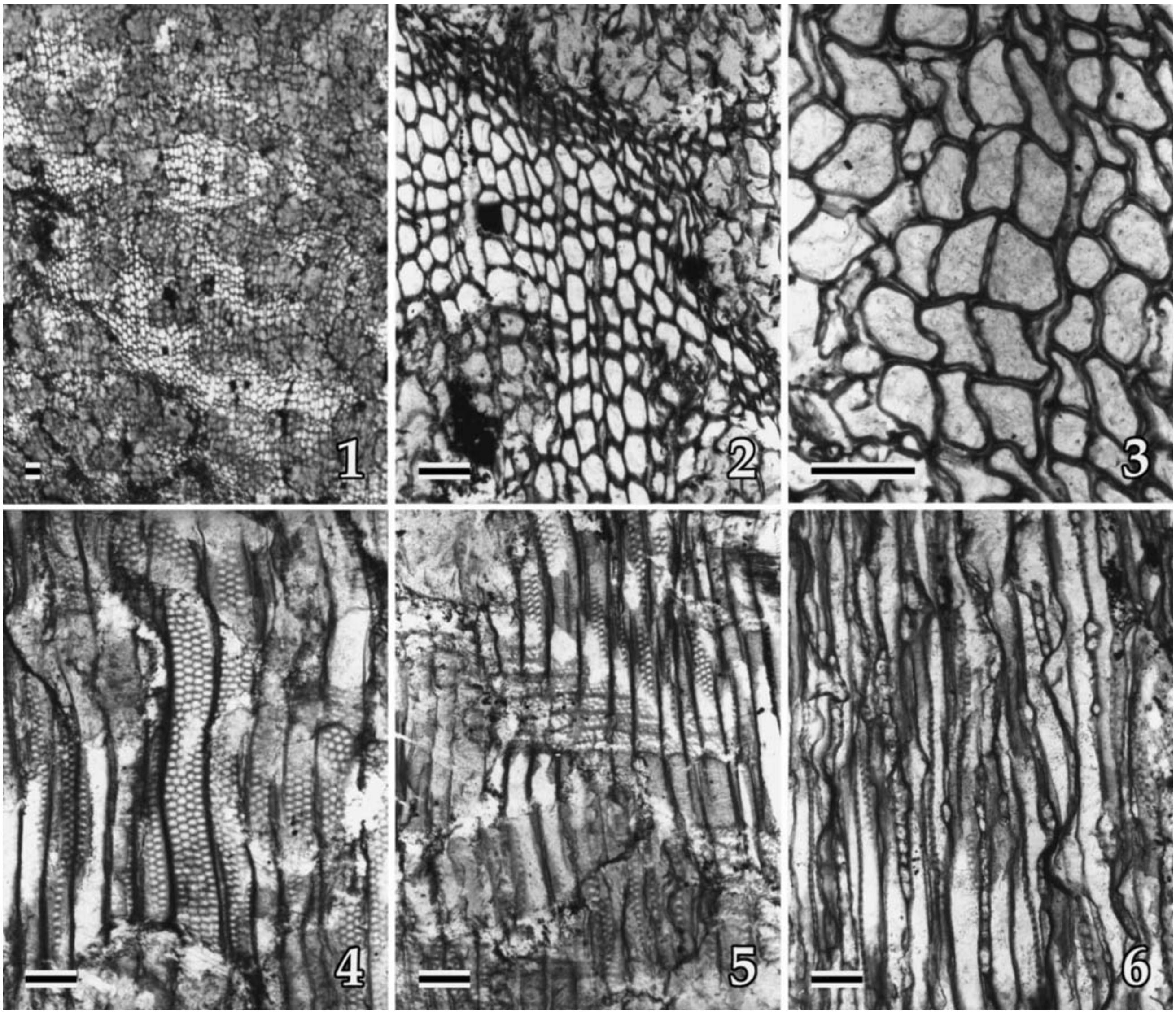

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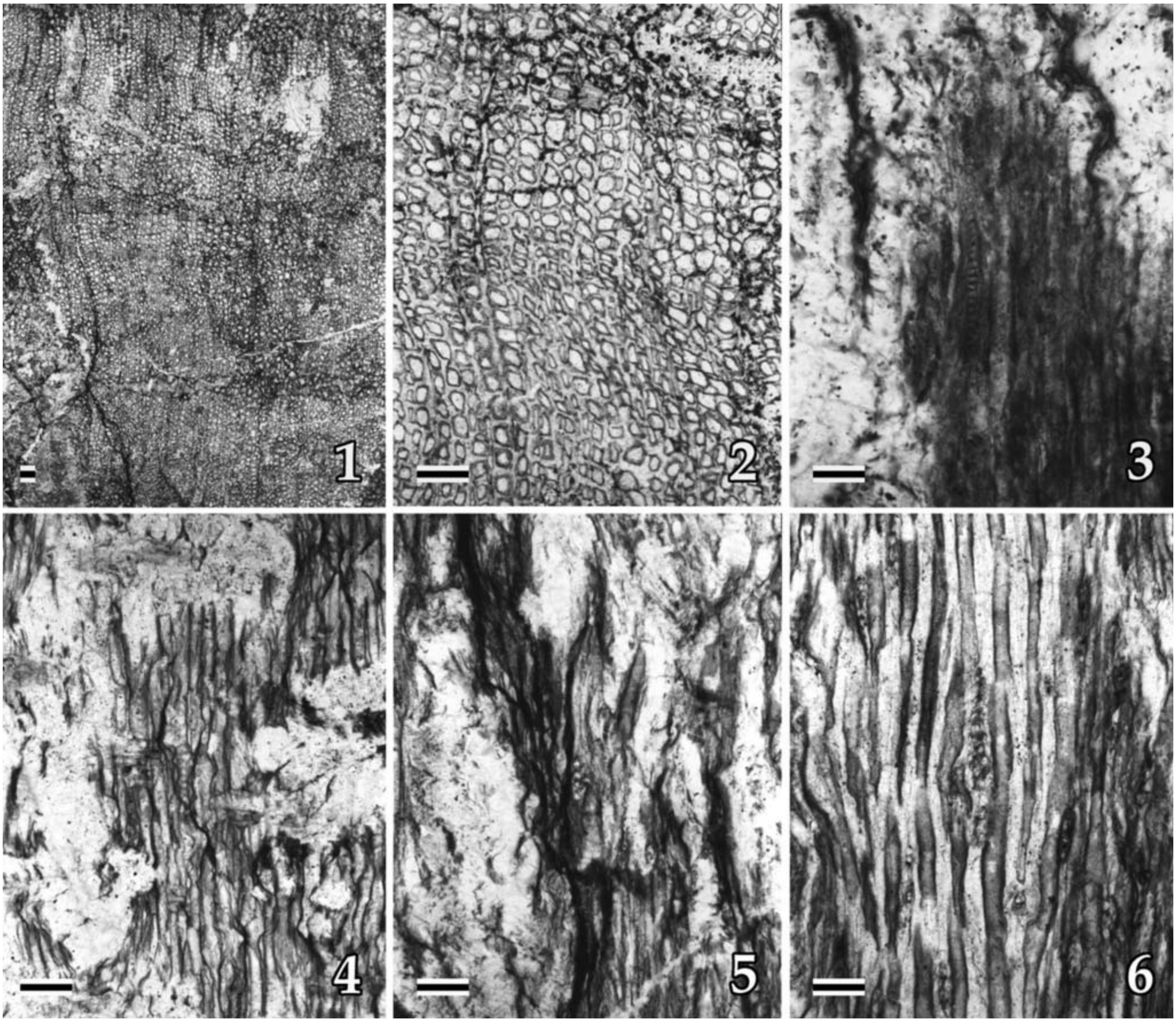

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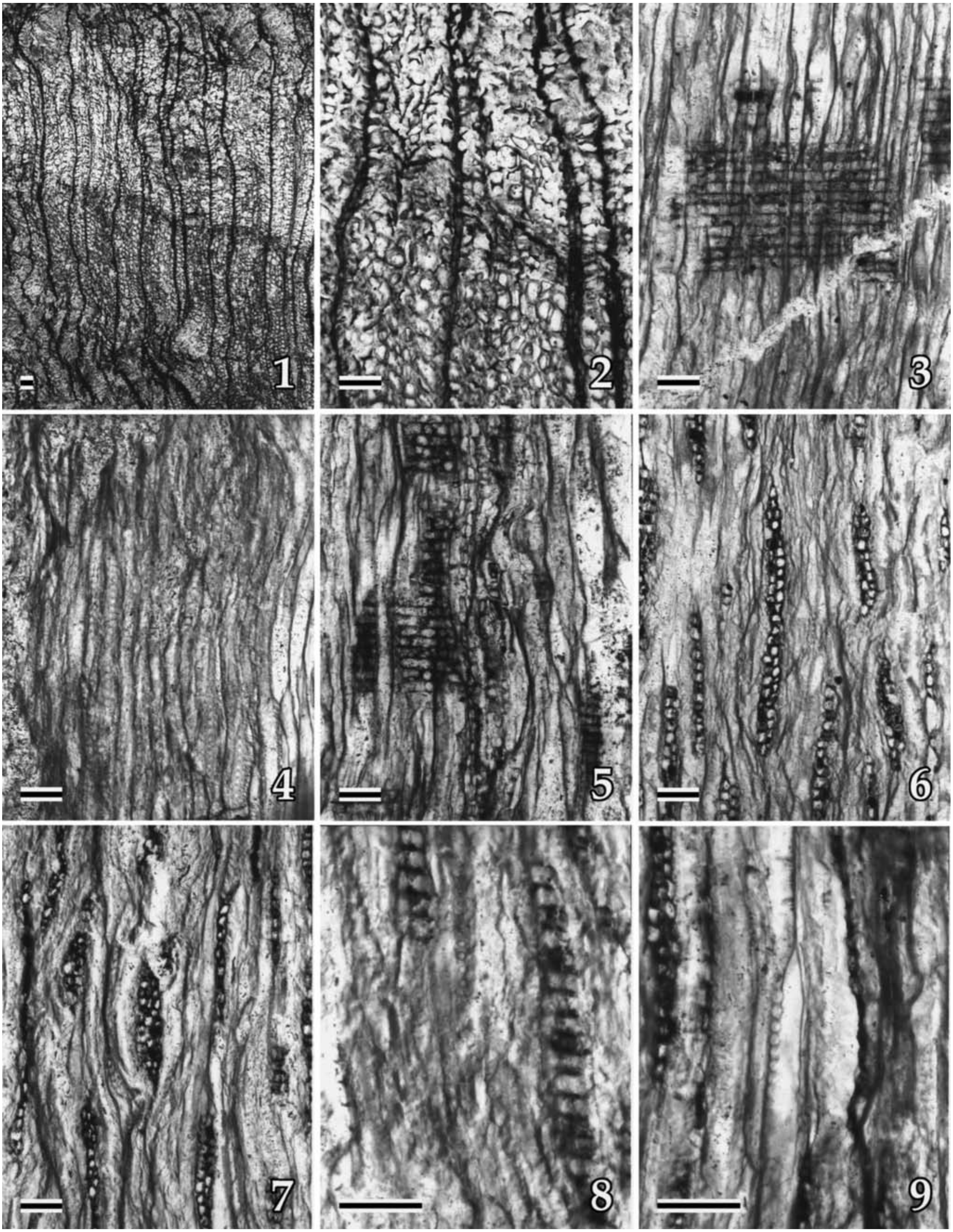

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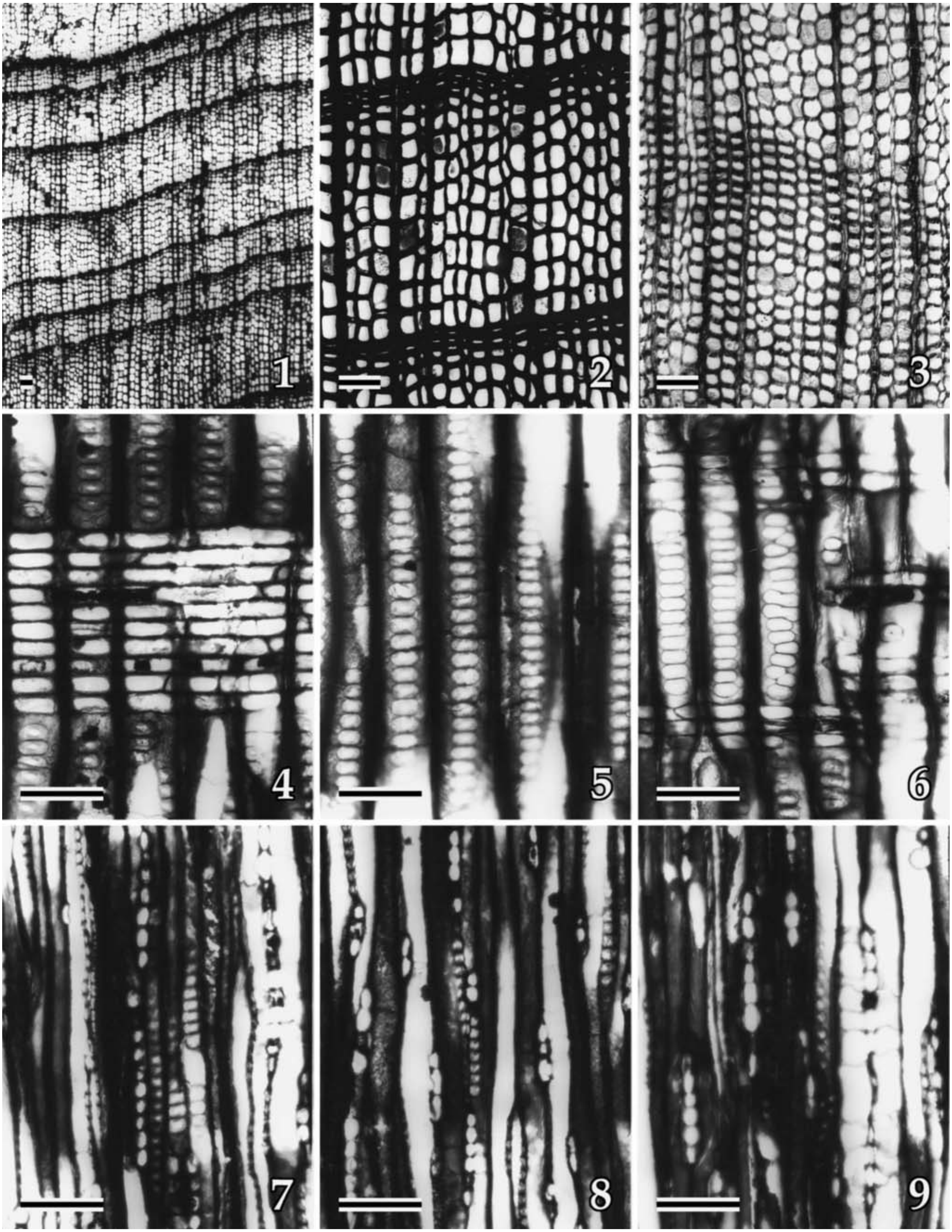

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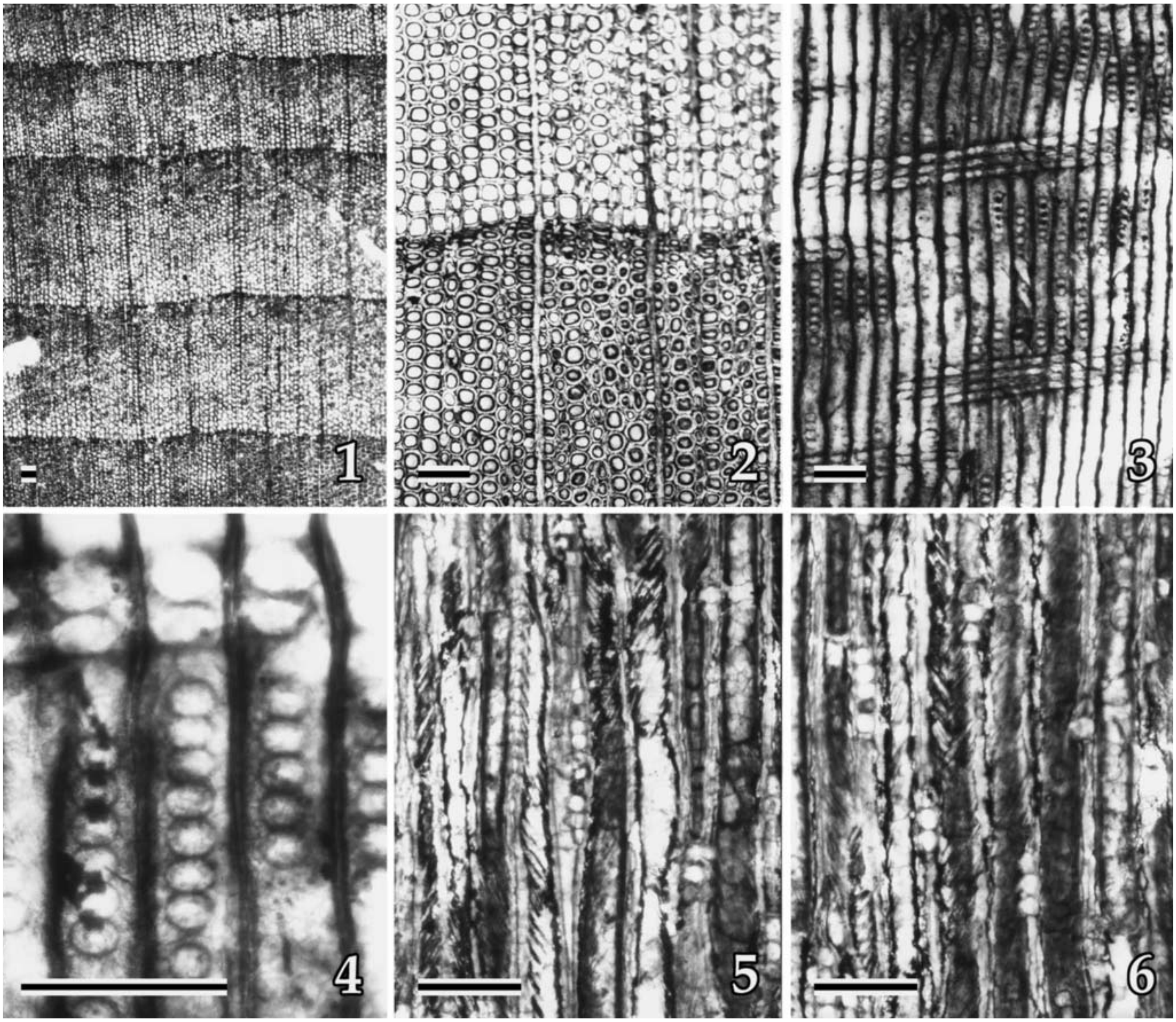

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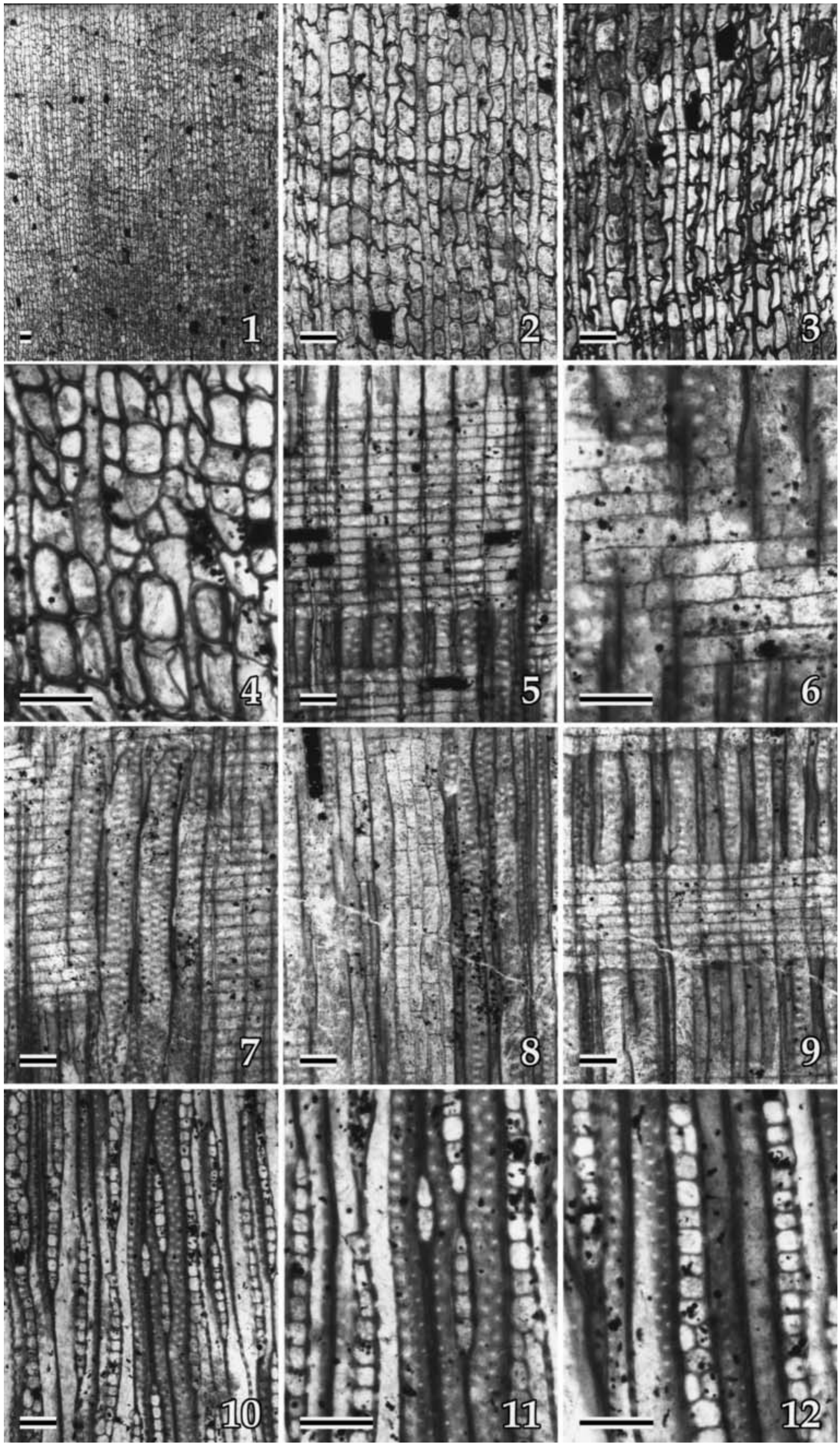

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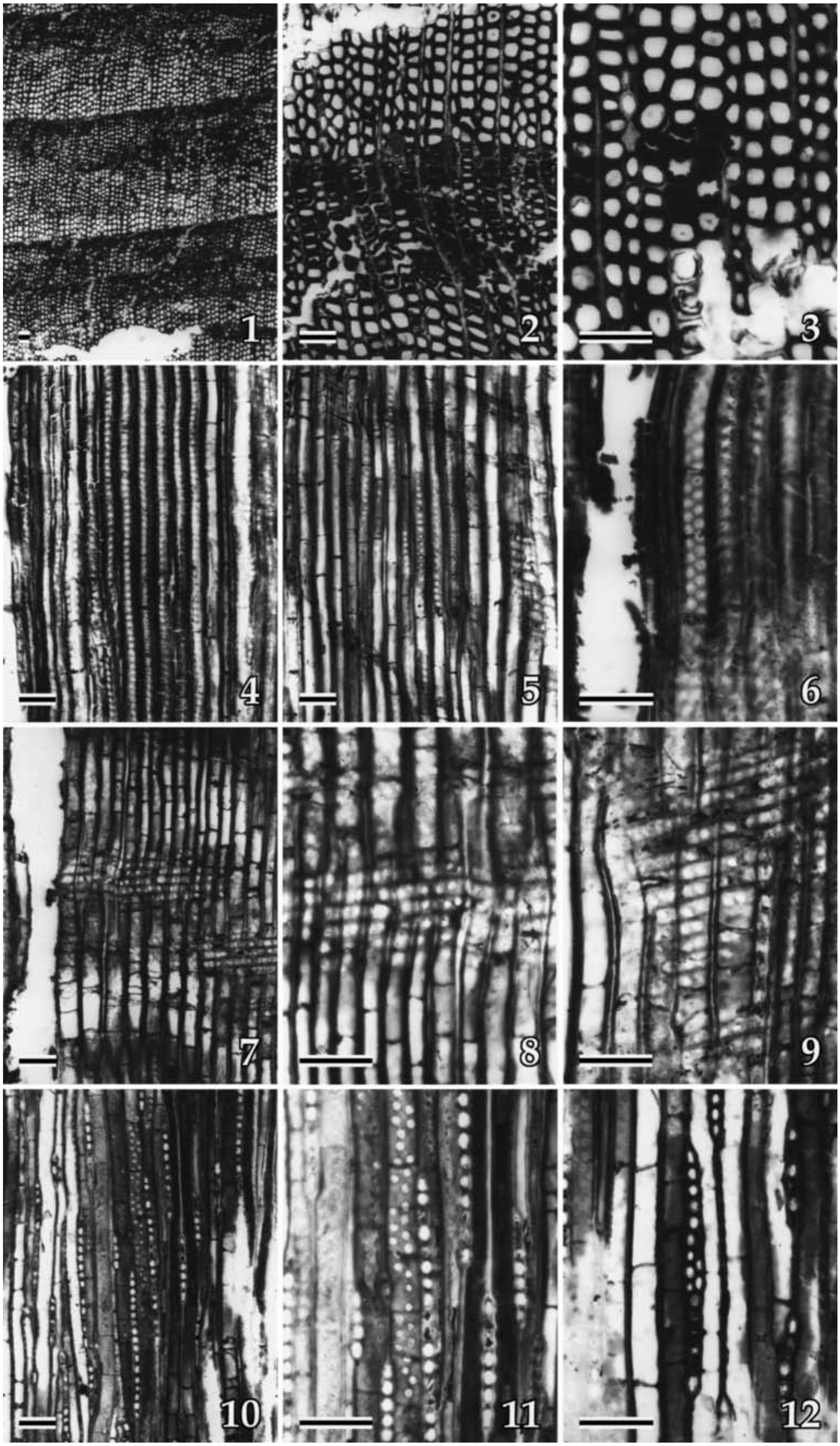
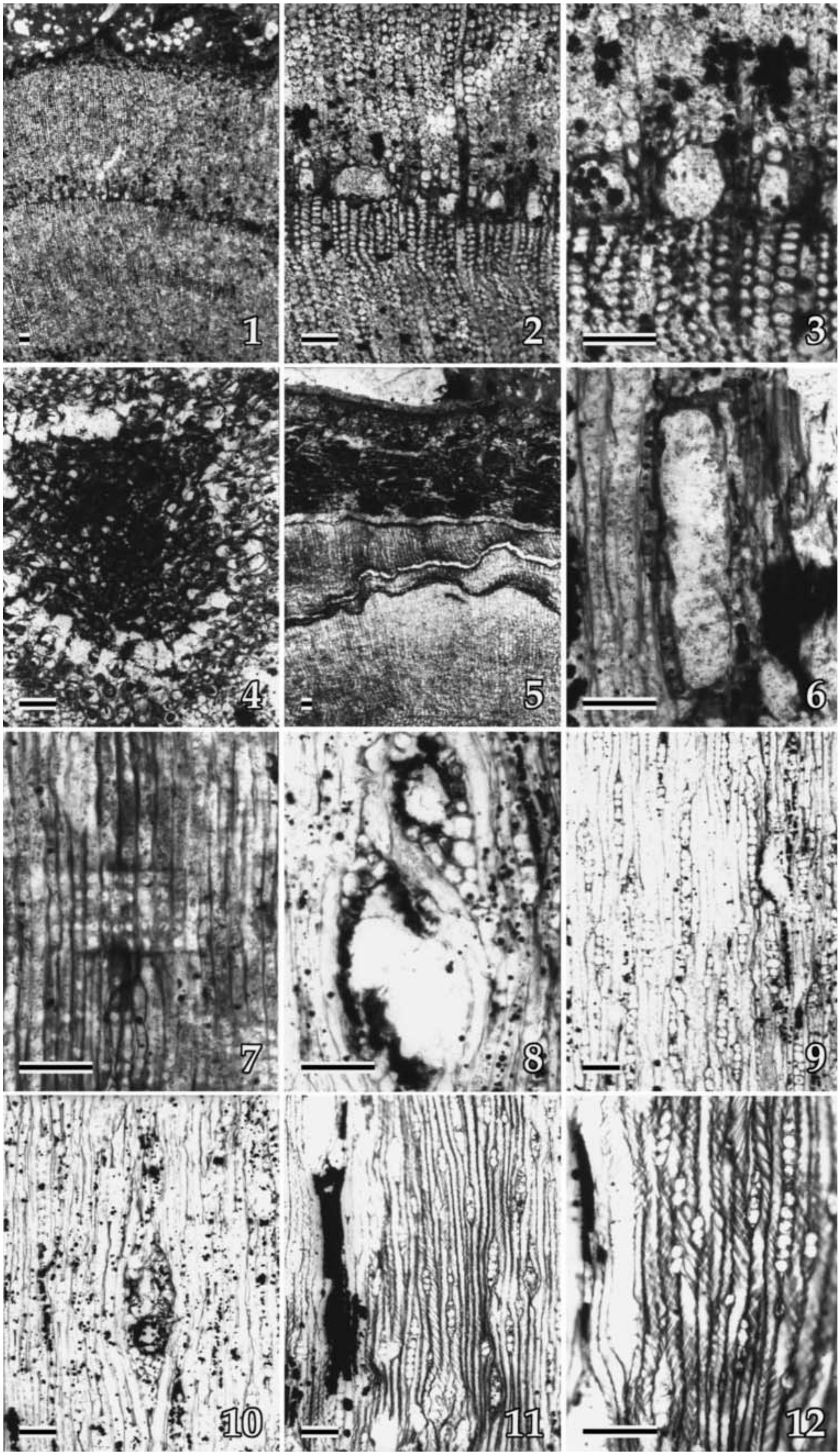


PLATE 9



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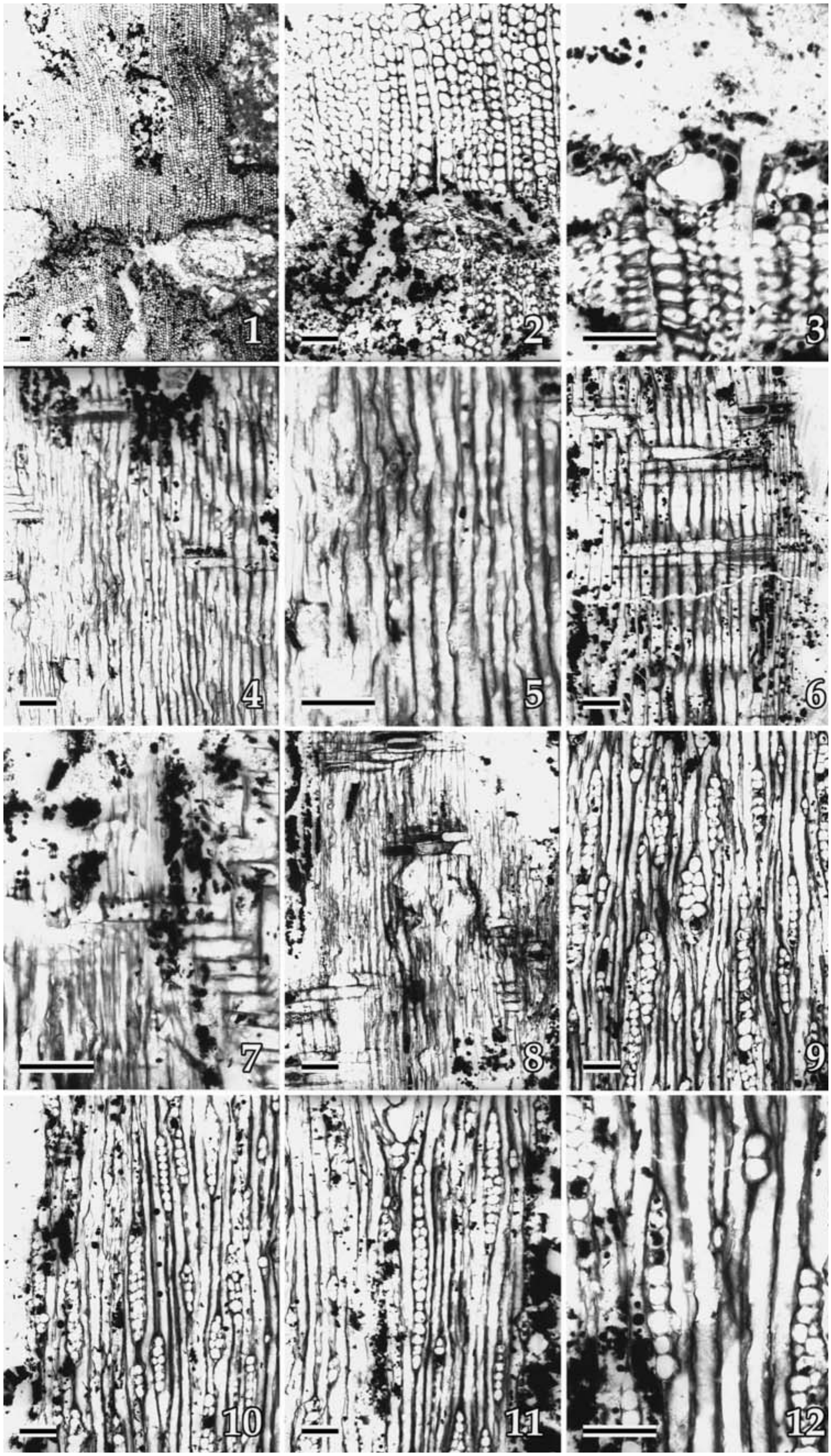

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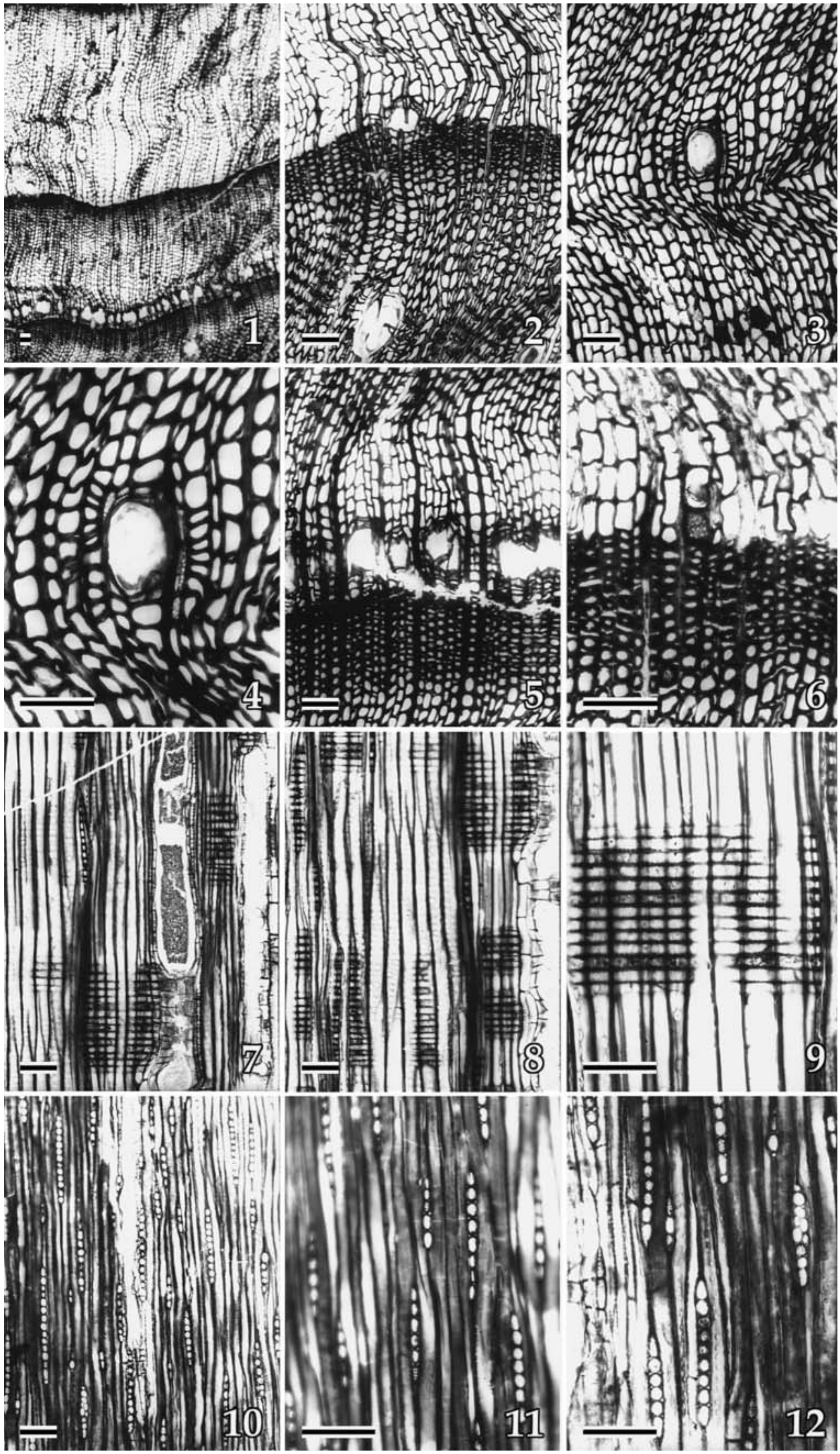

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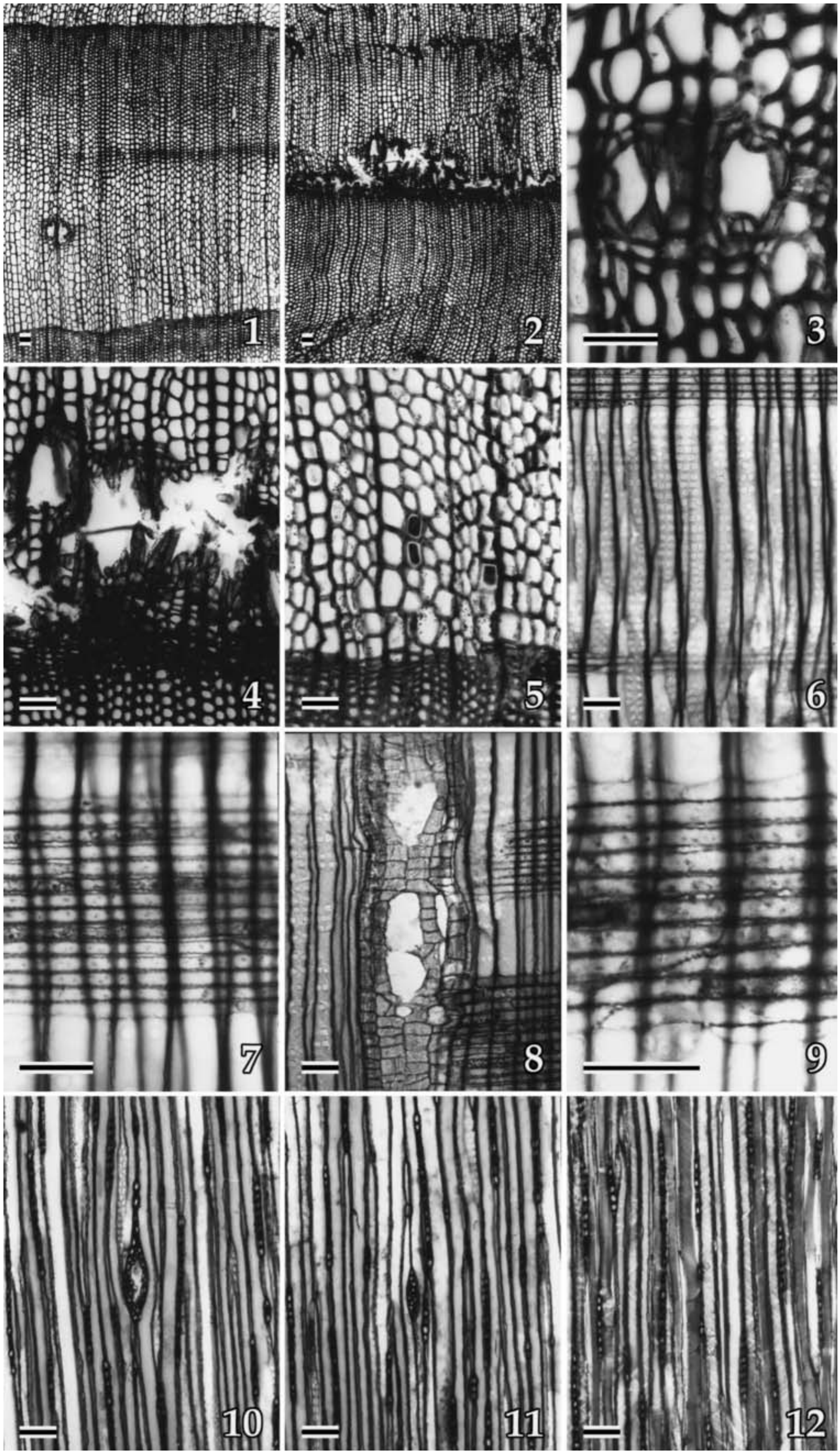

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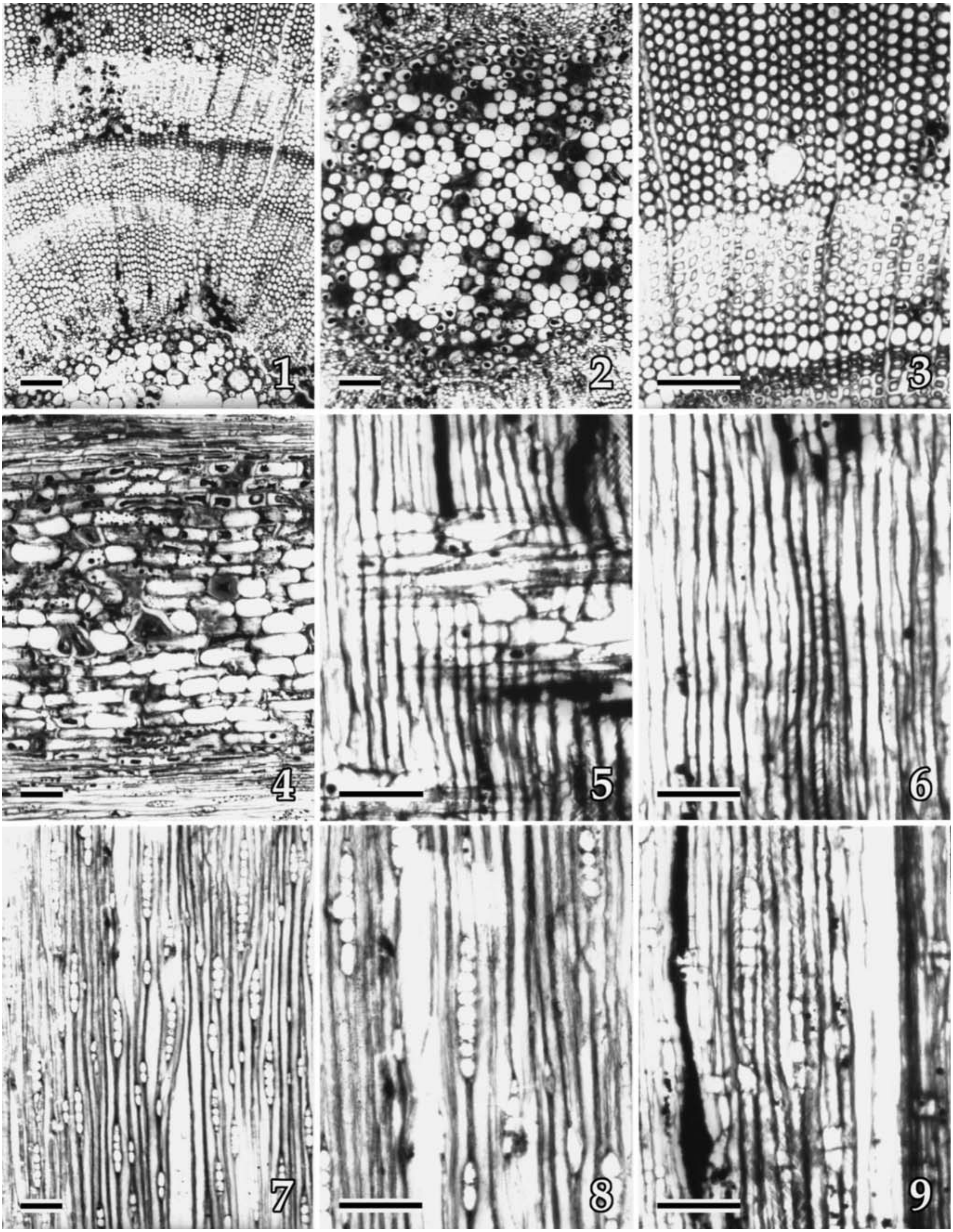

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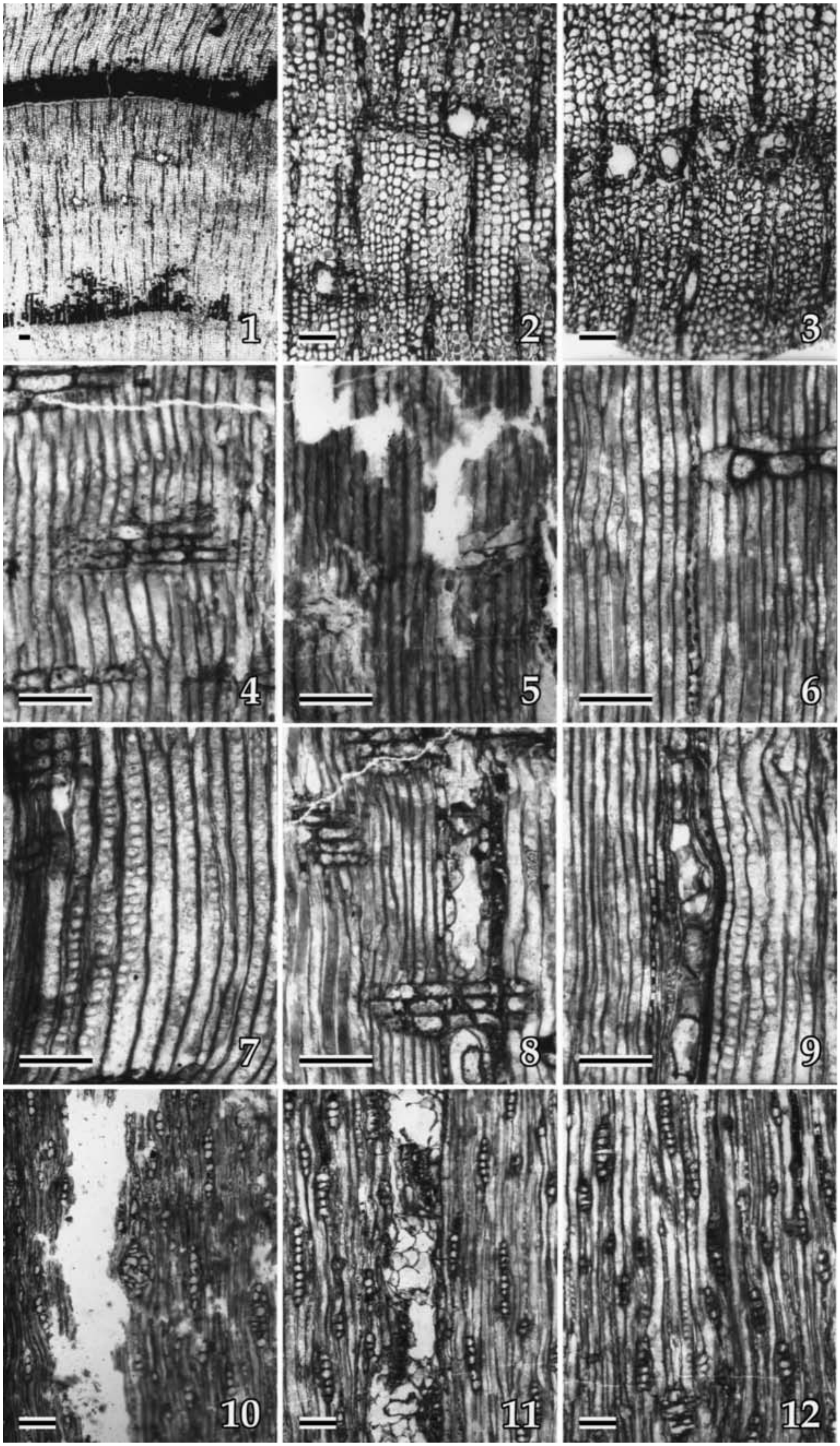

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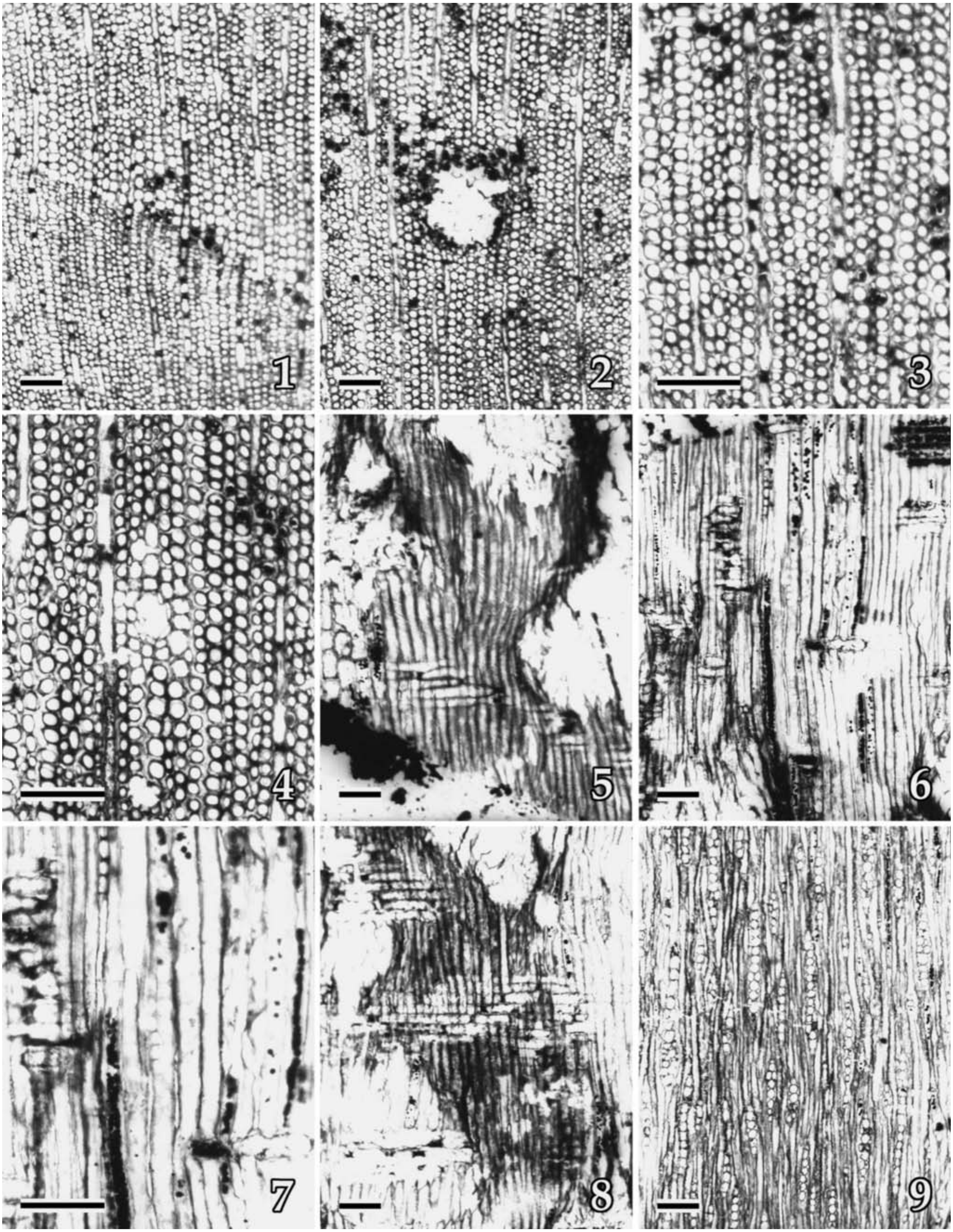

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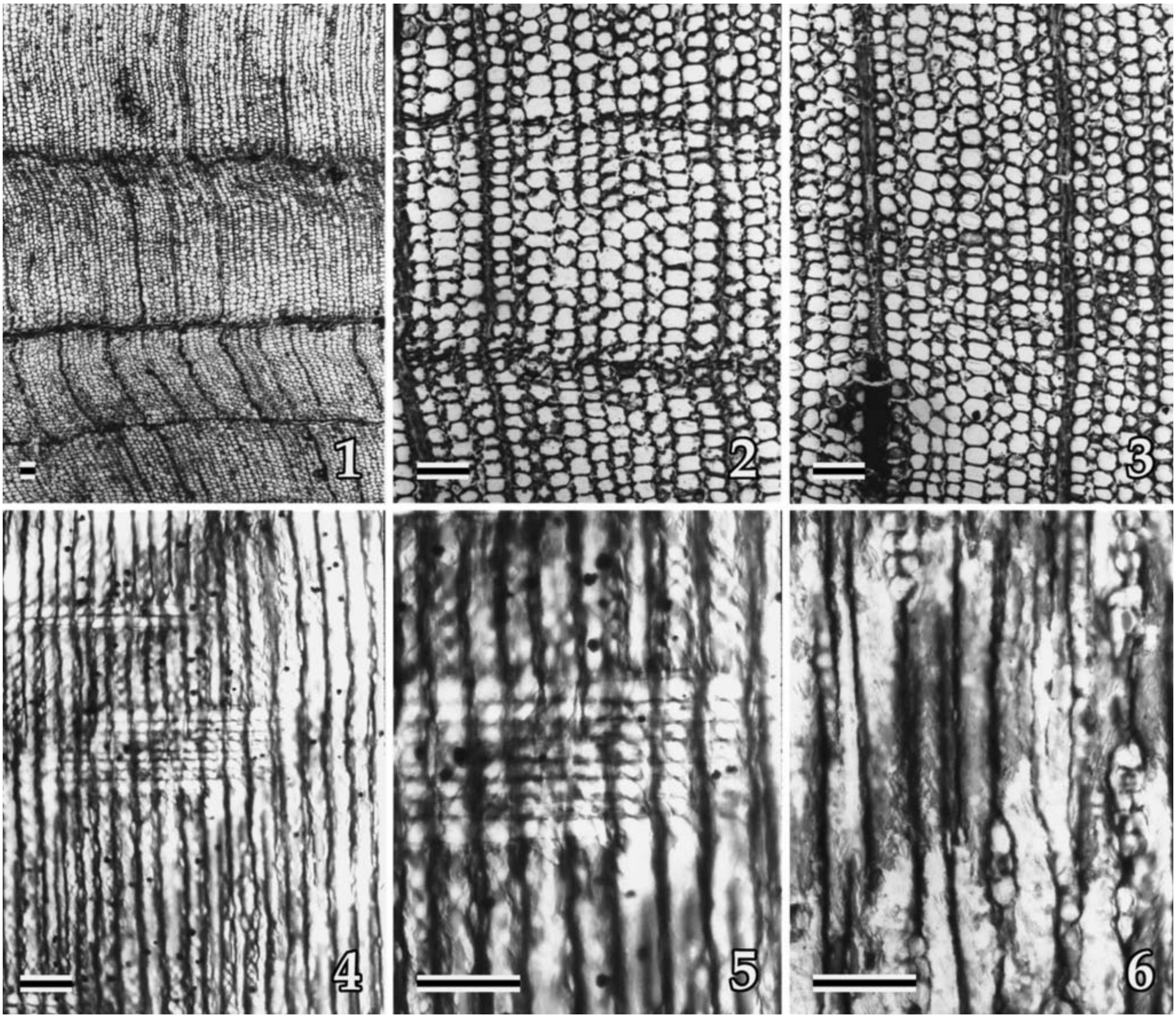

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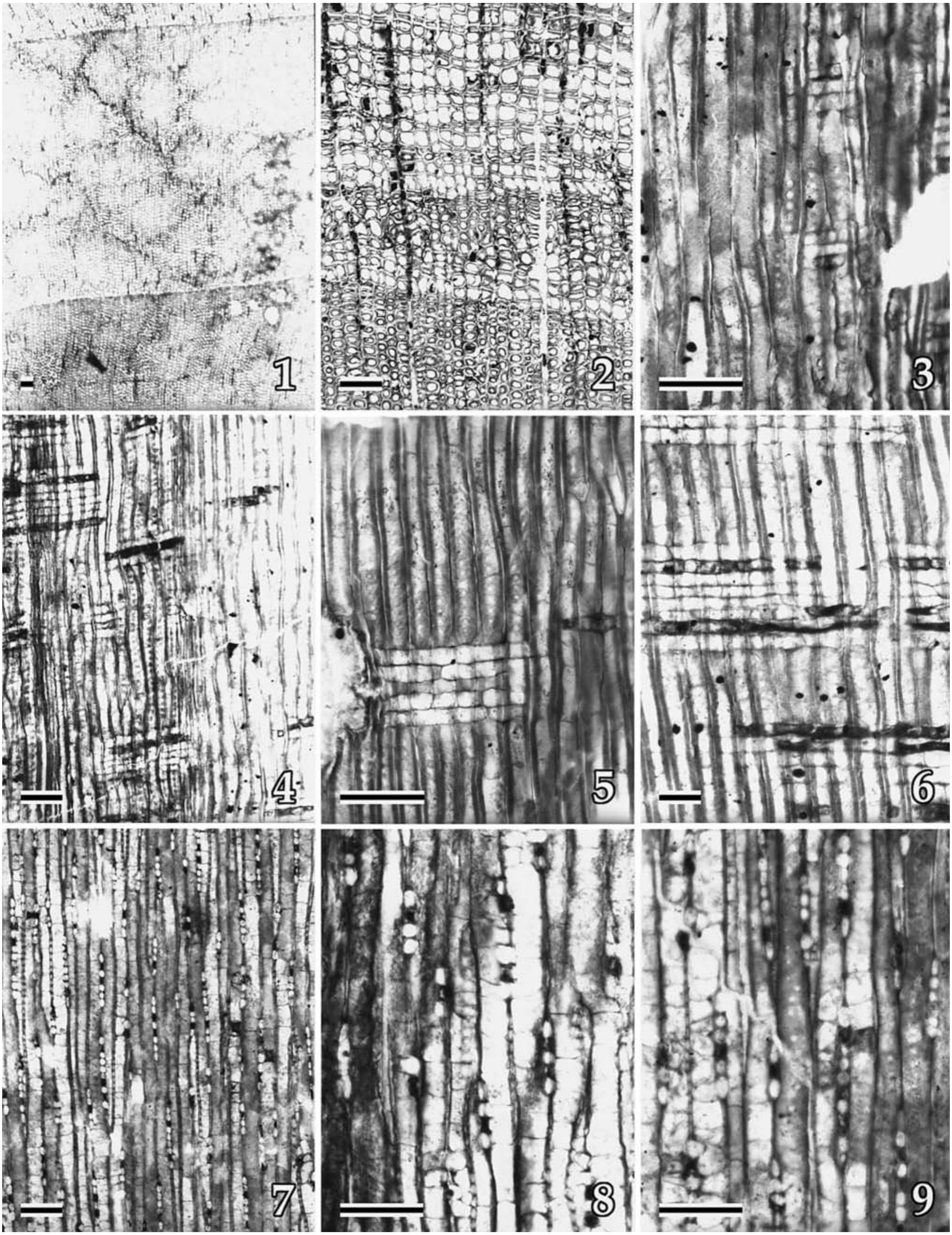

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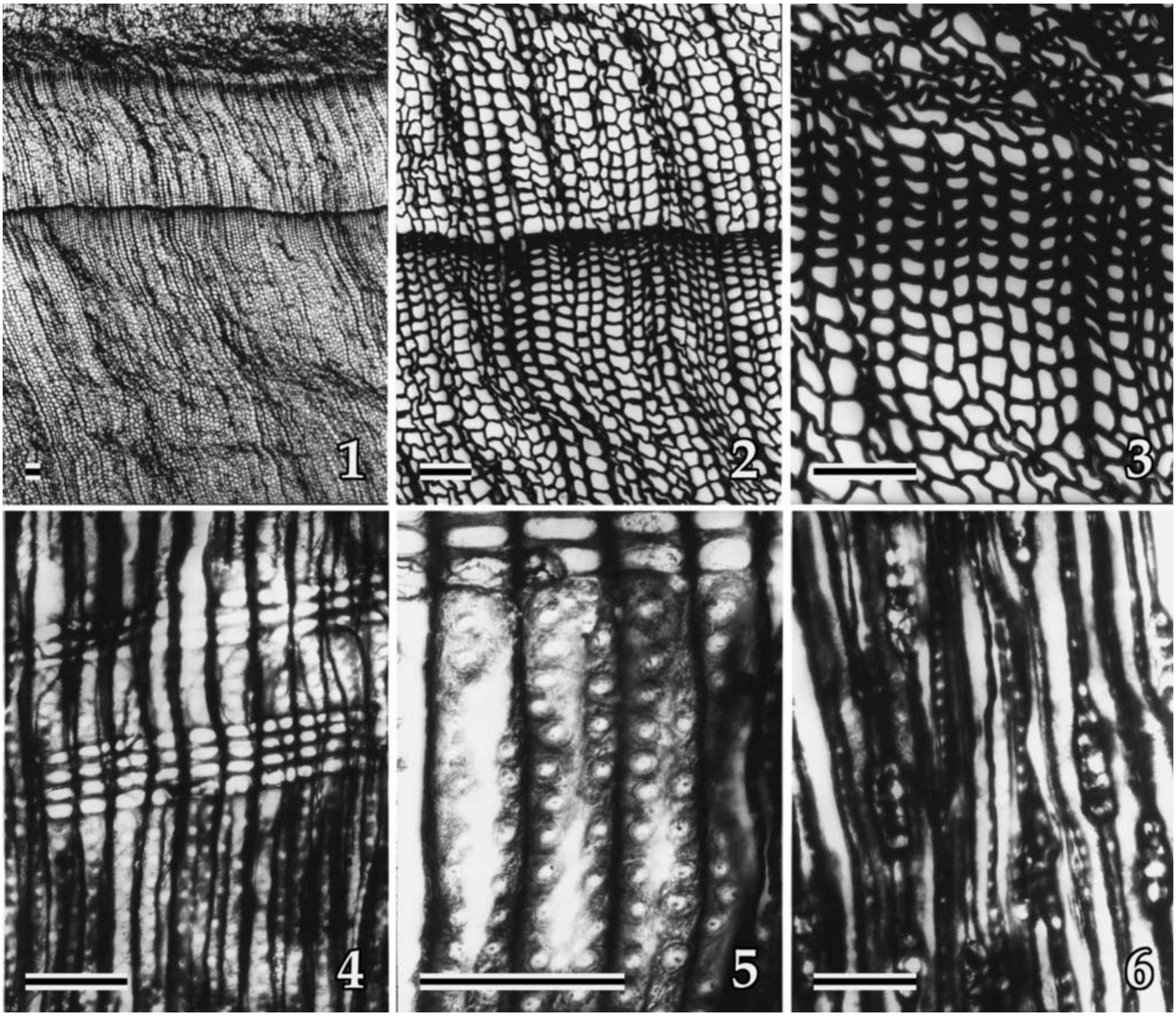

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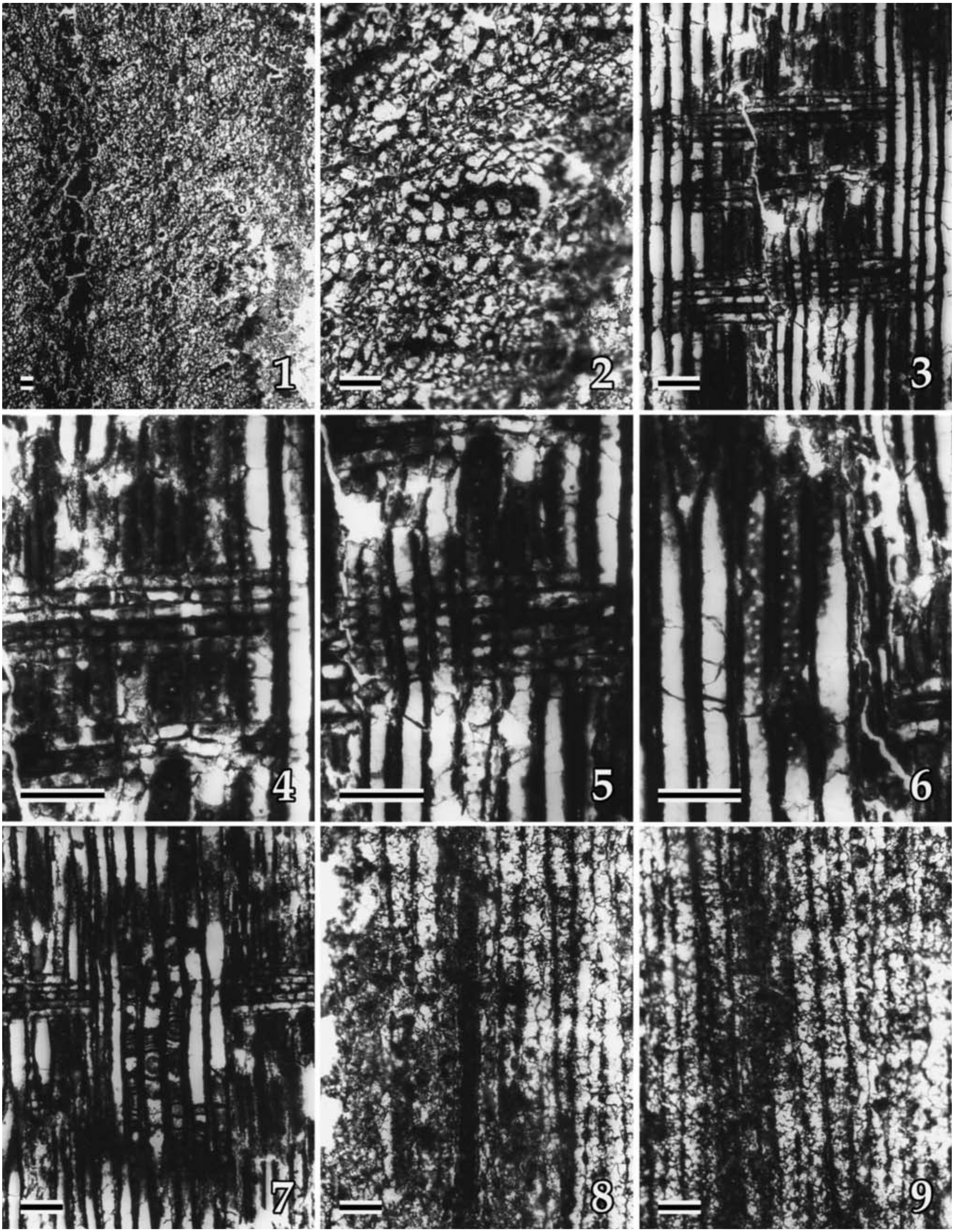

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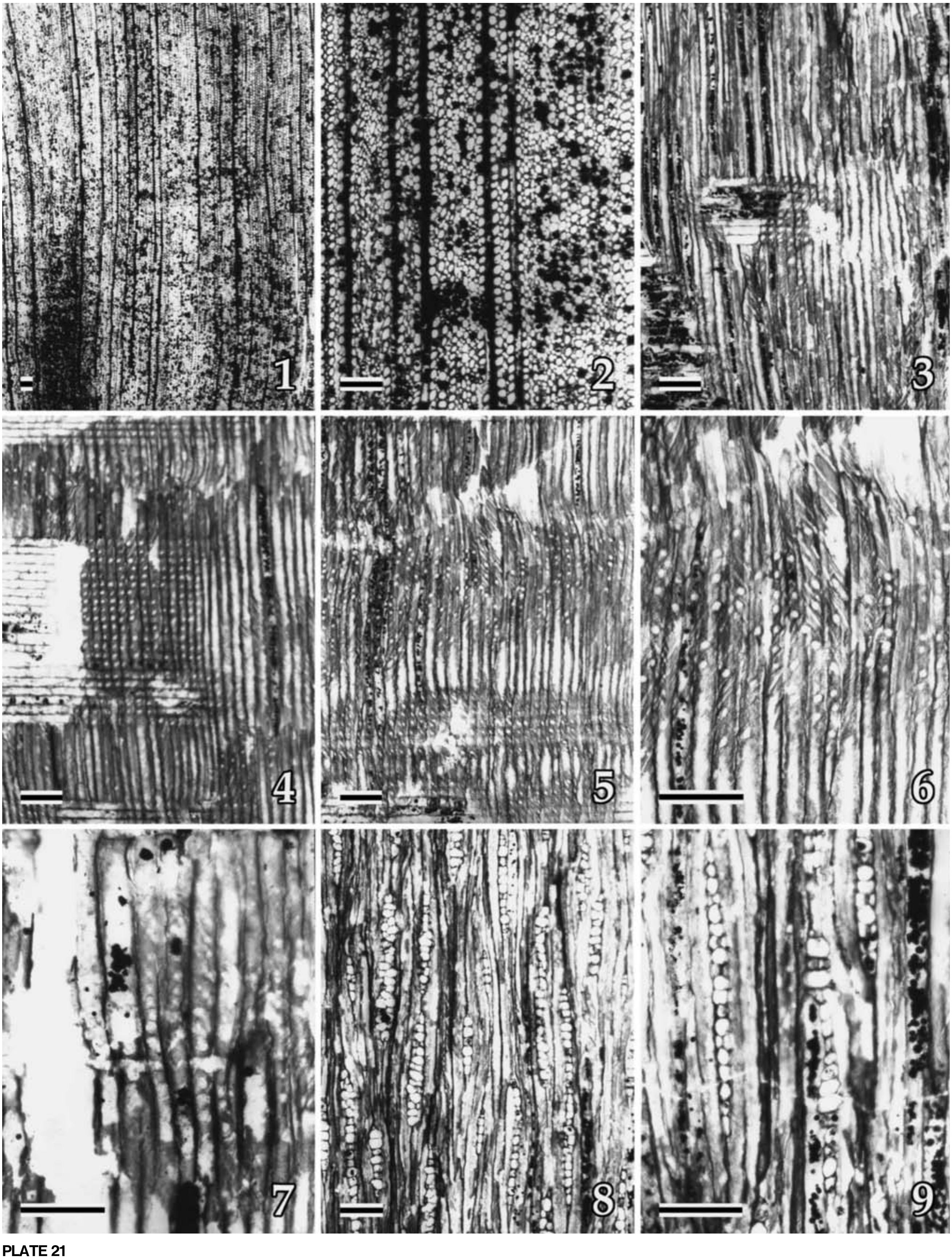

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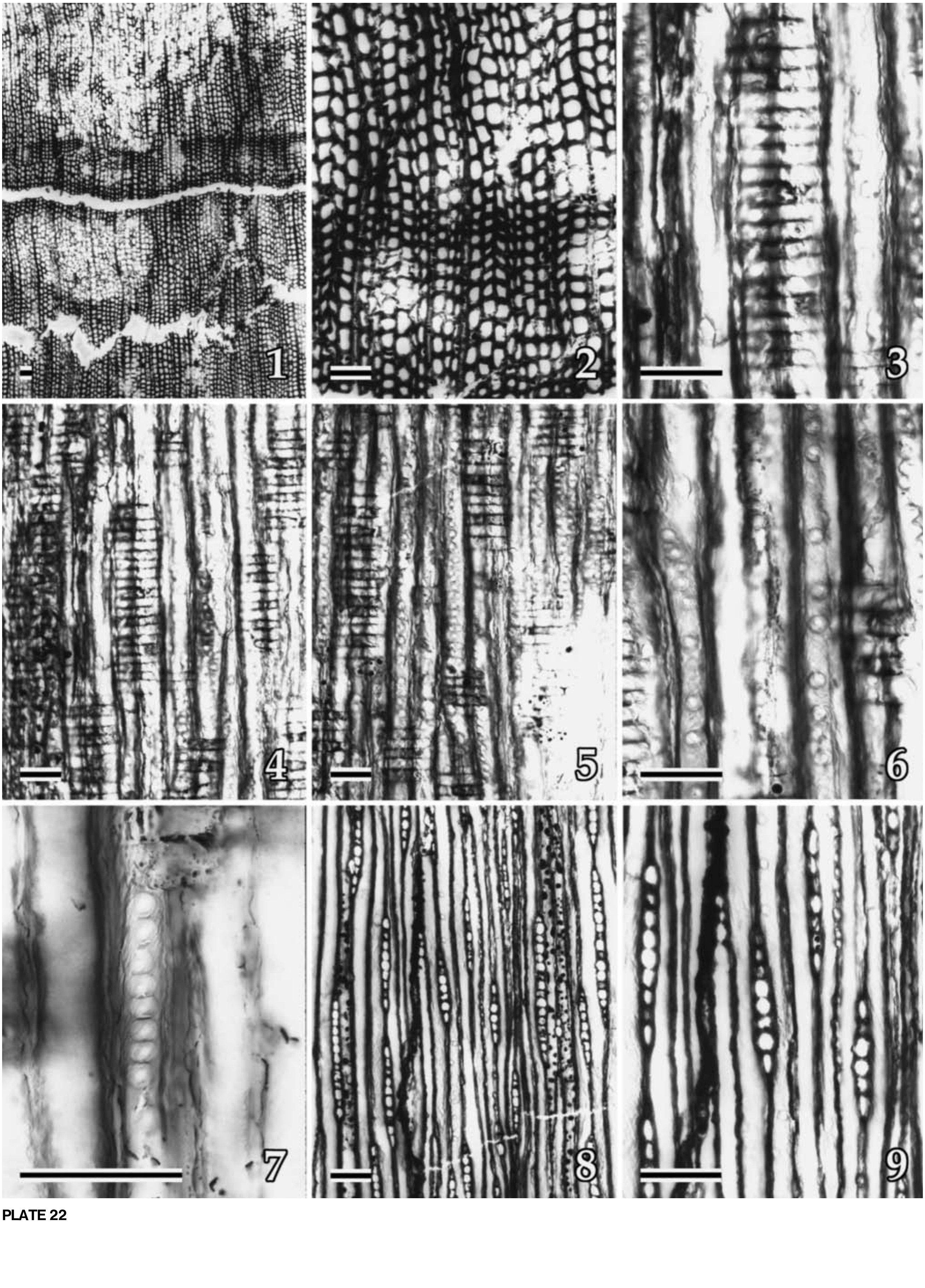

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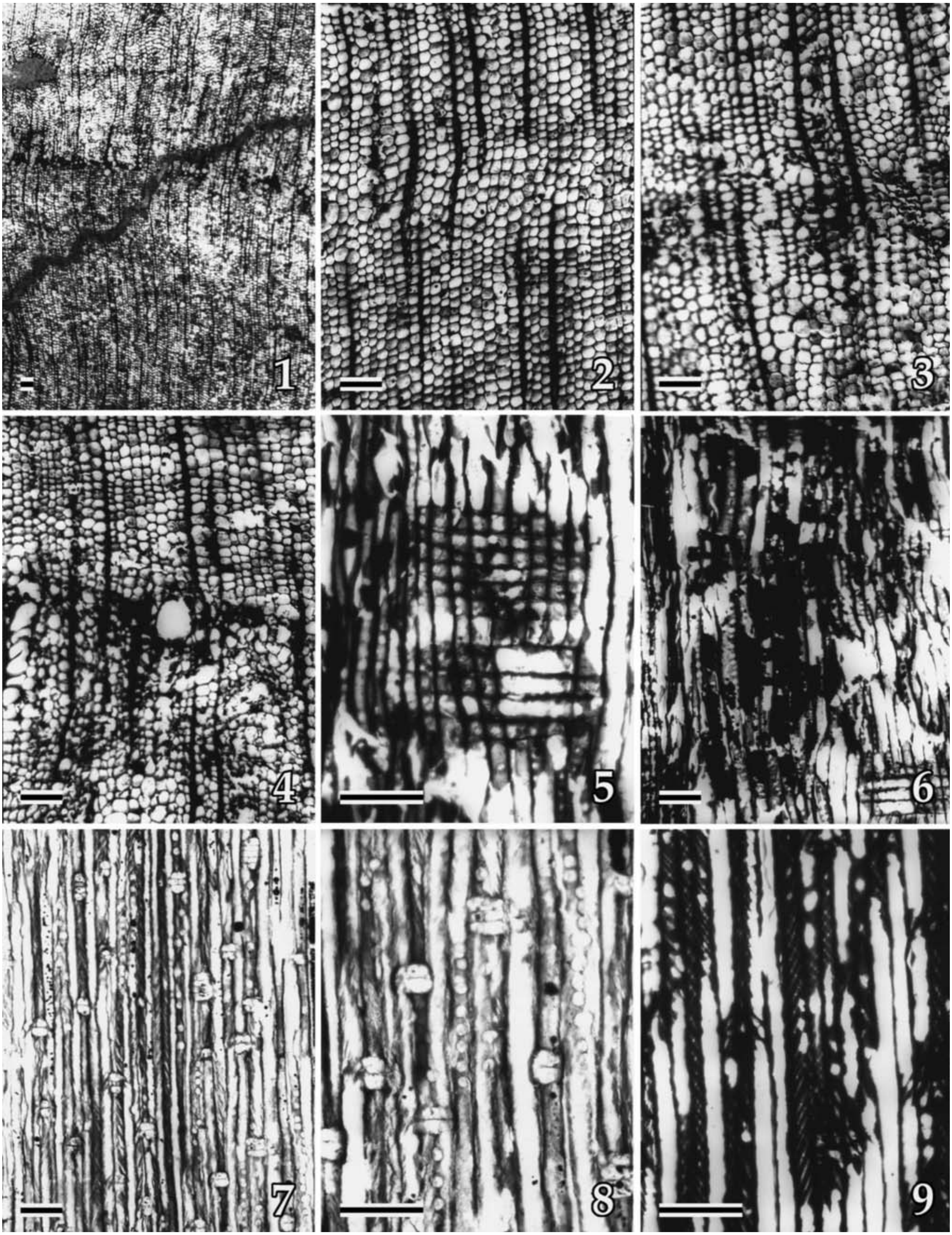

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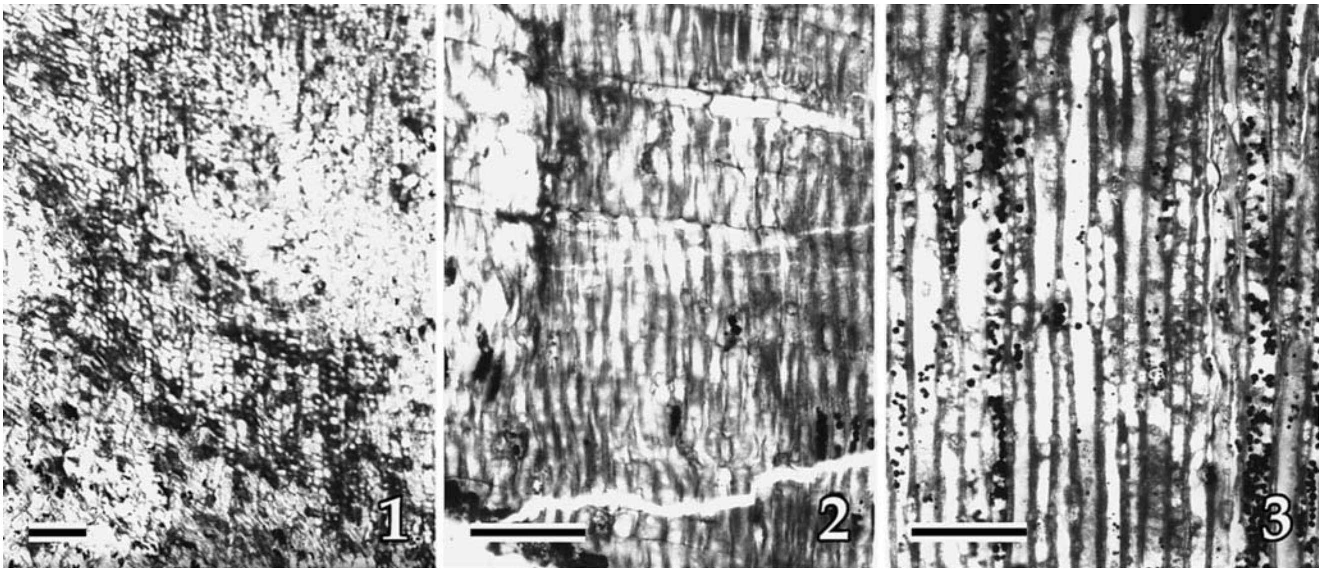

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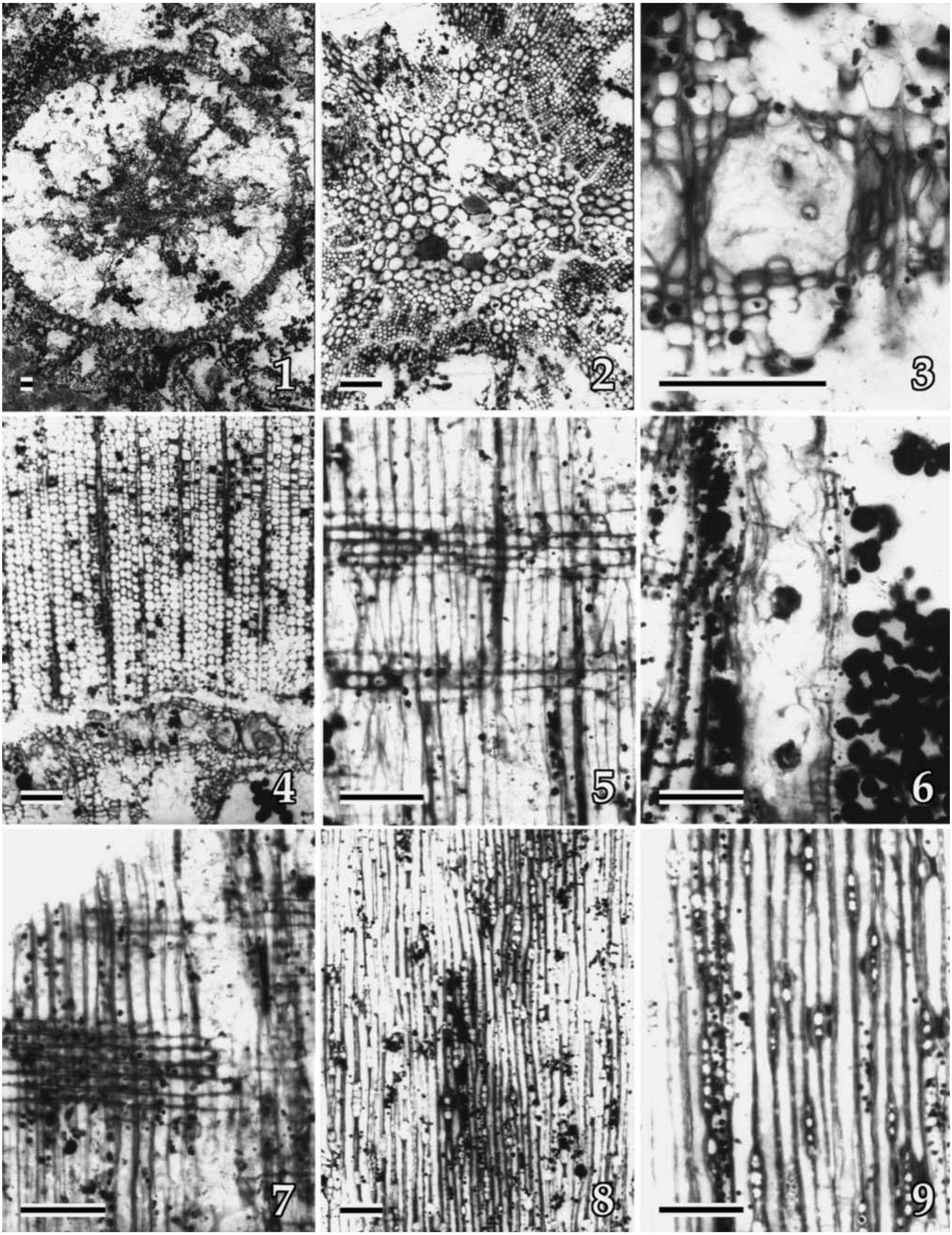

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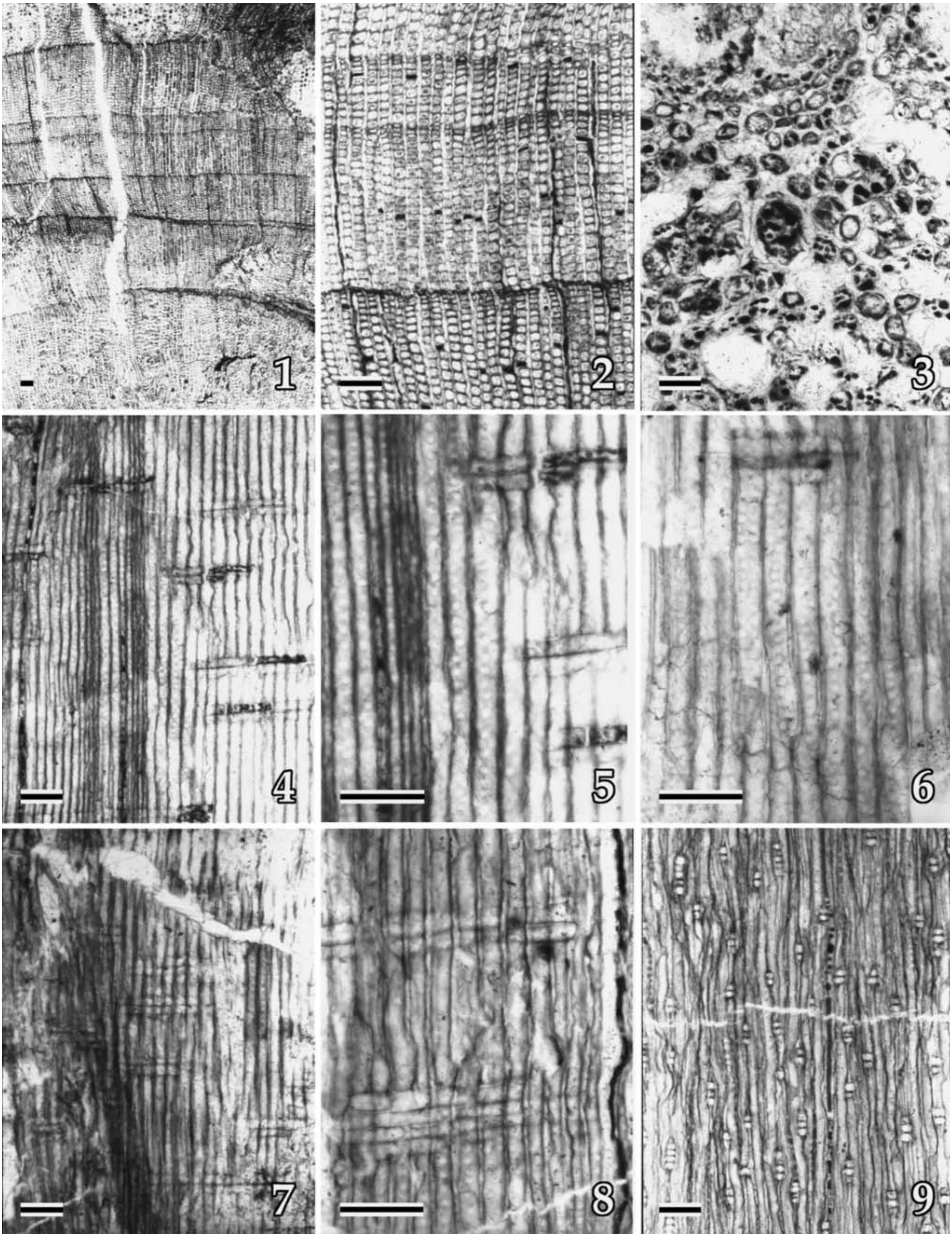
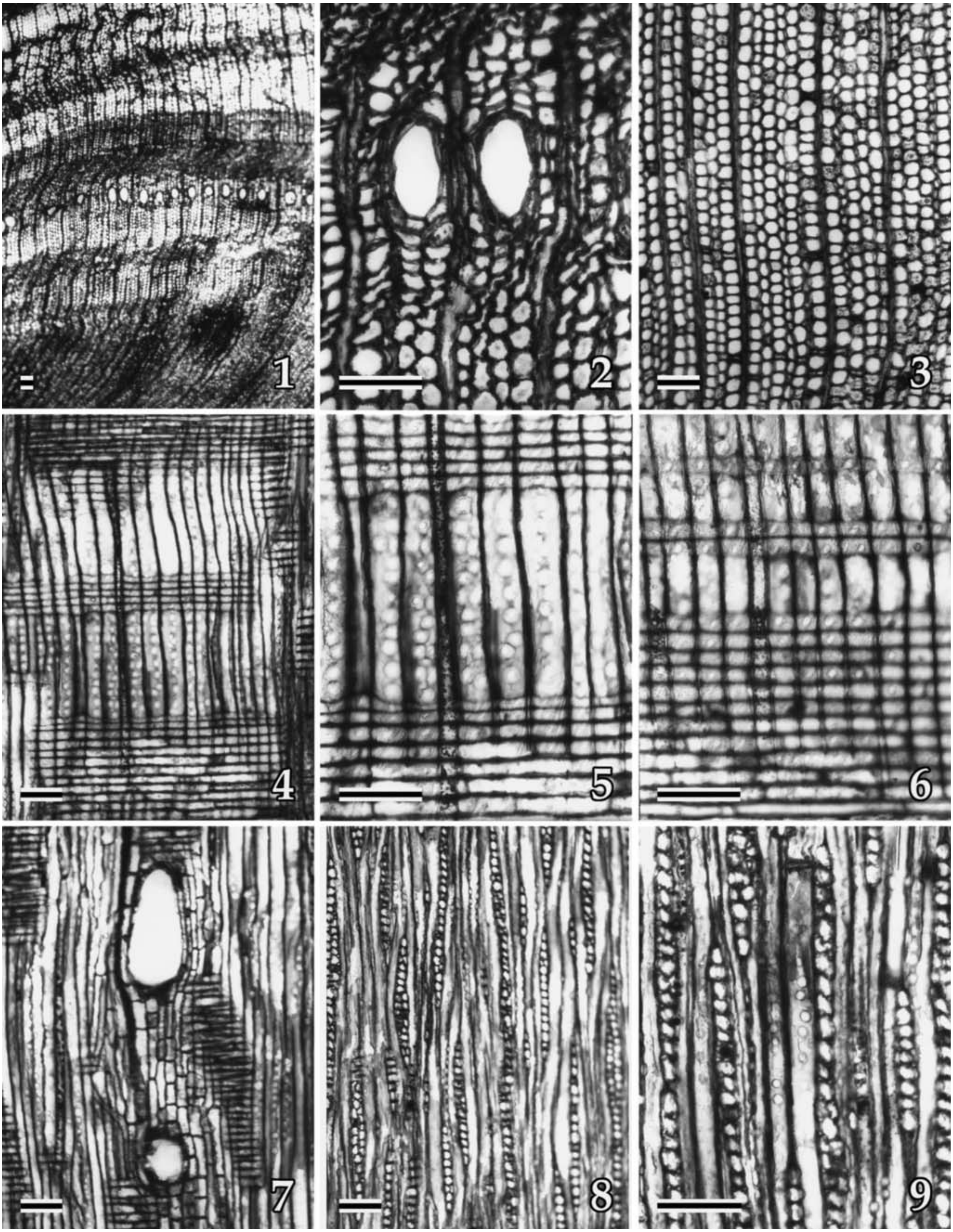


PLATE 26



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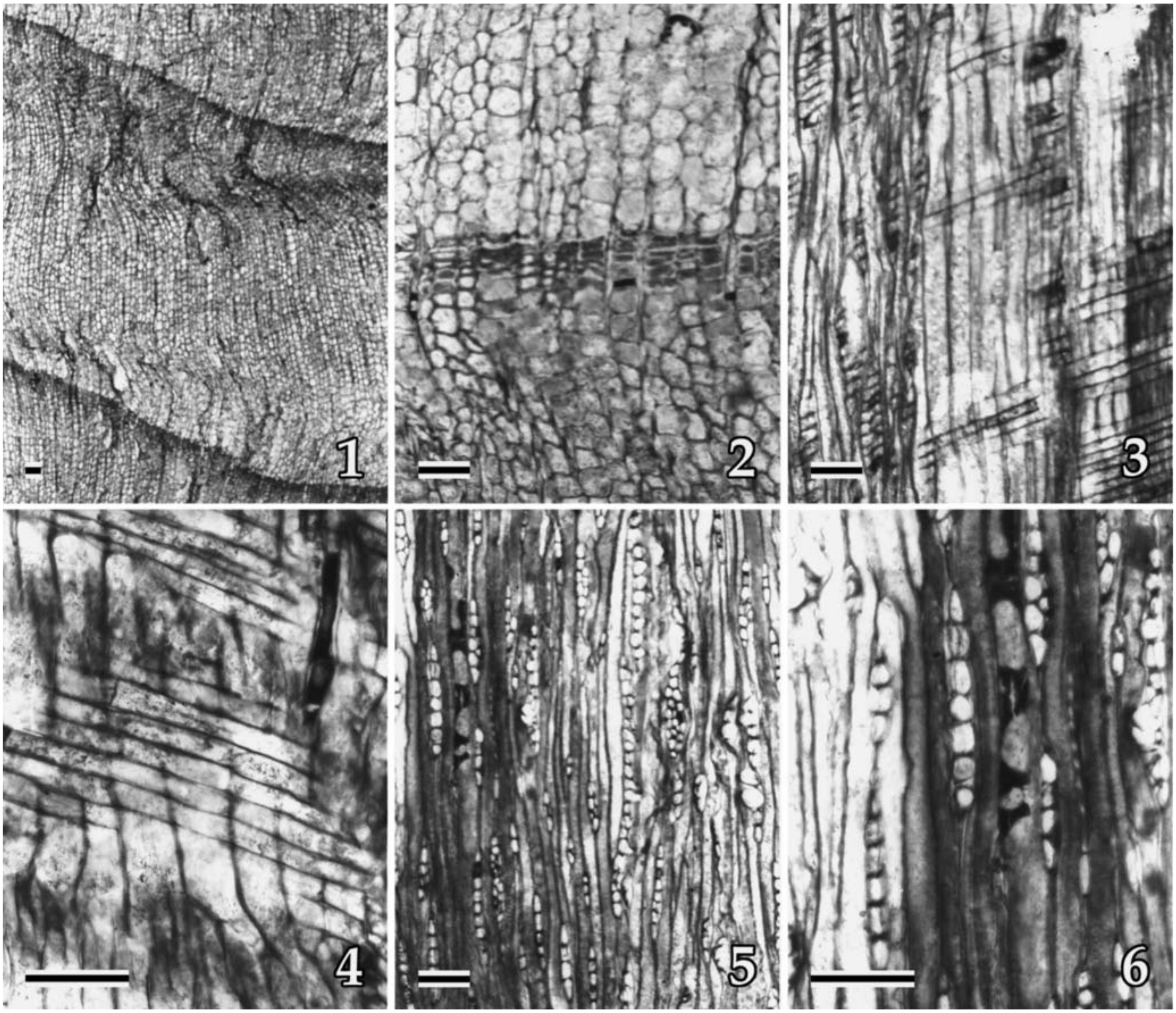

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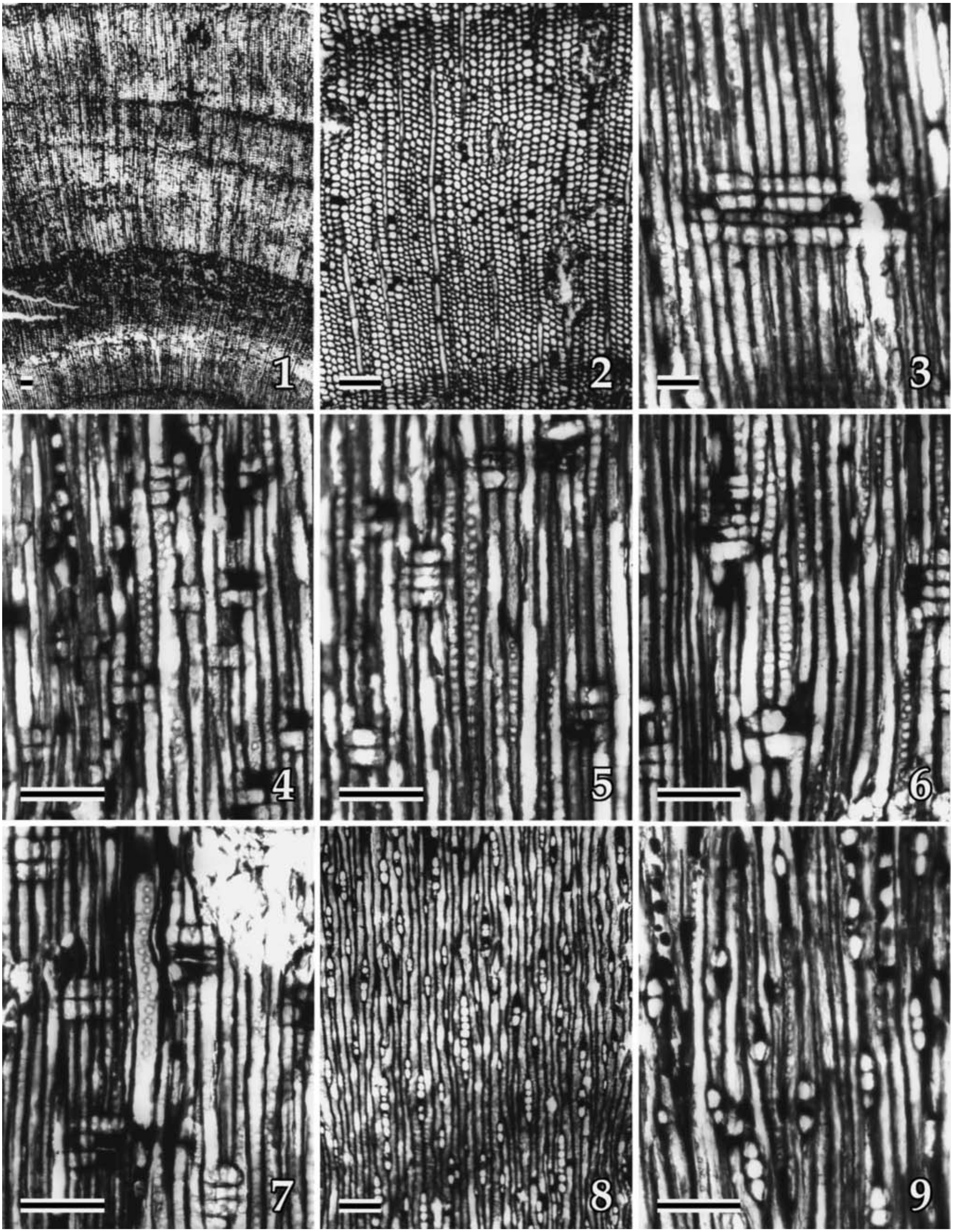

PLATE 29

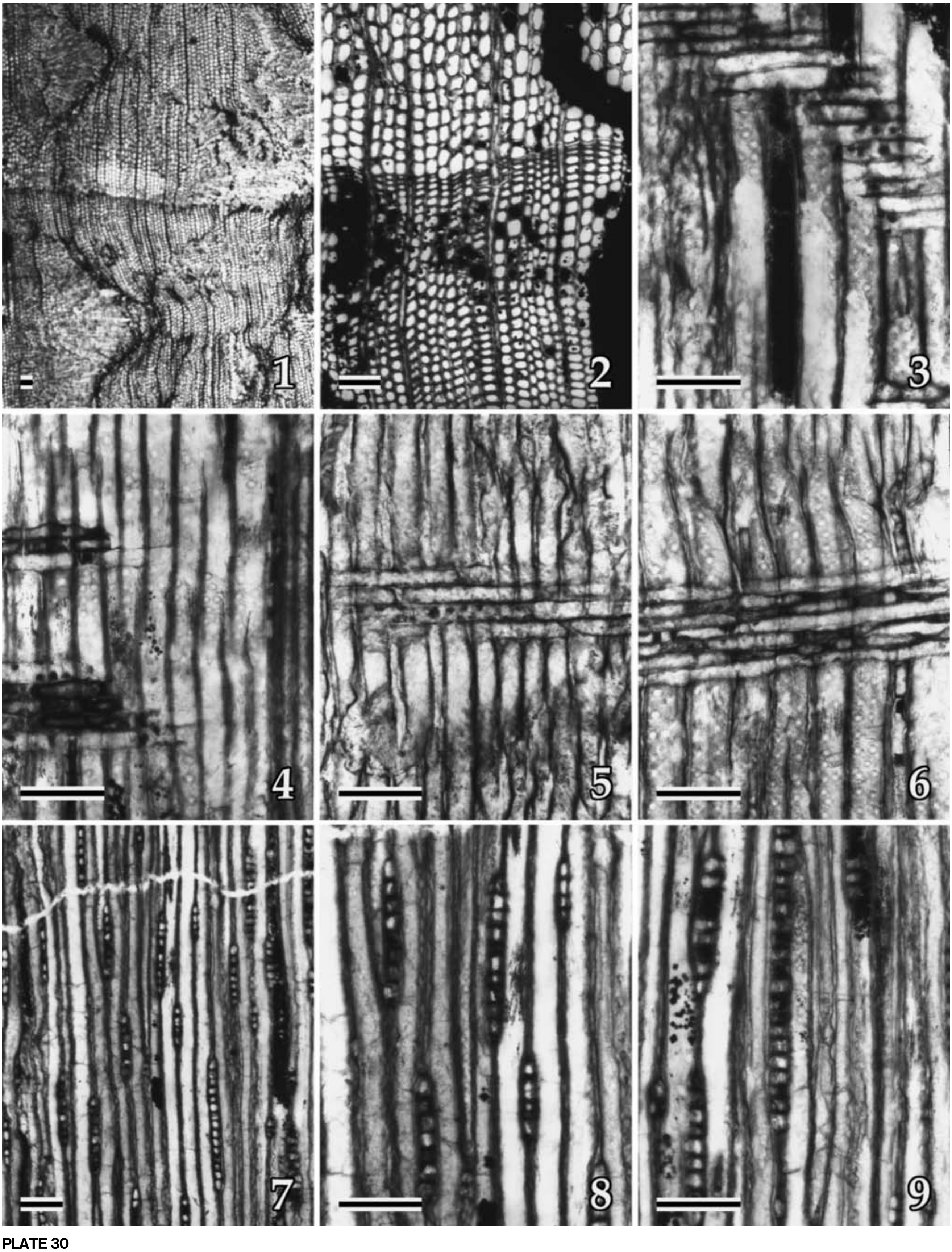

PLATE 30

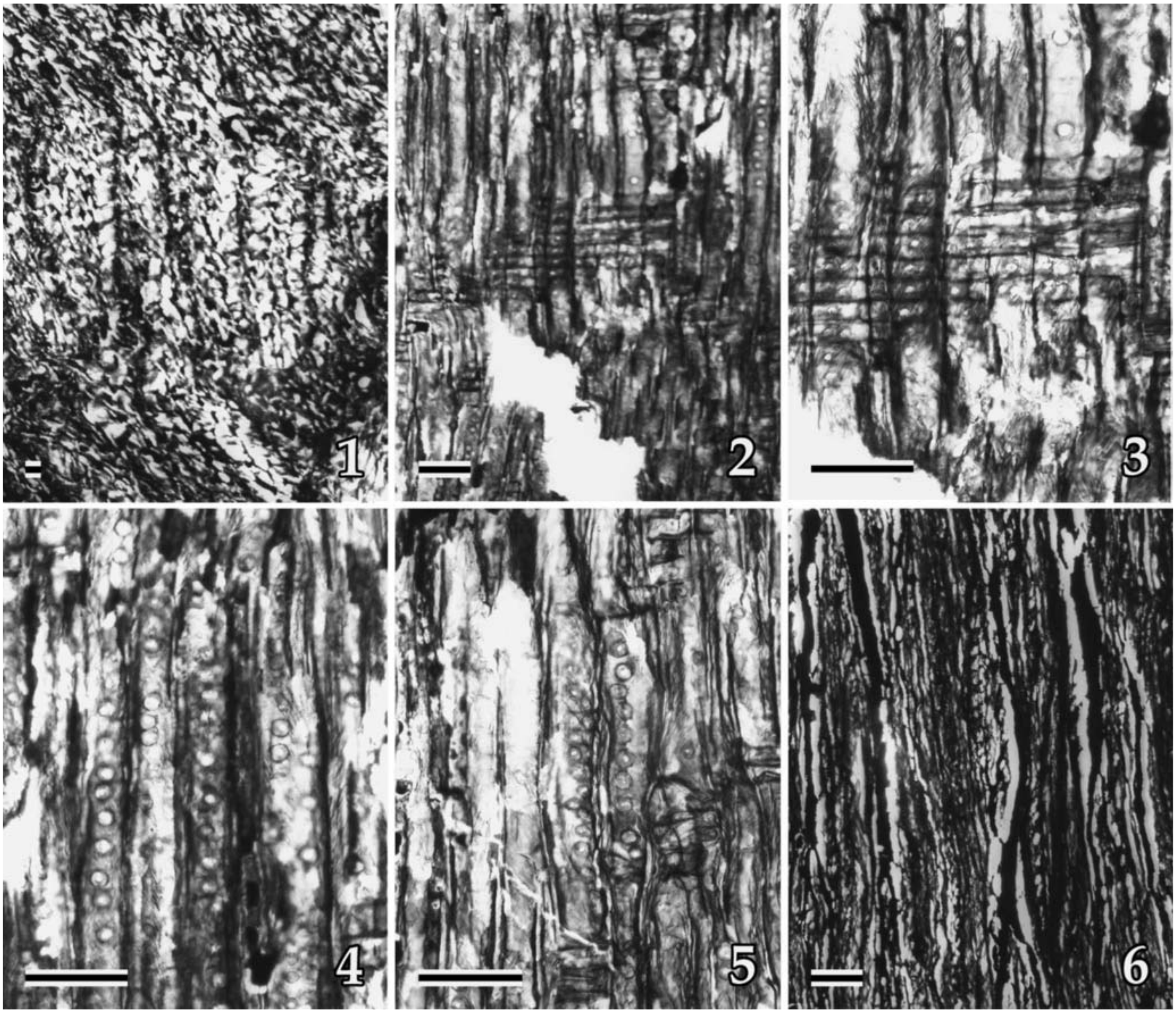

PLATE 31

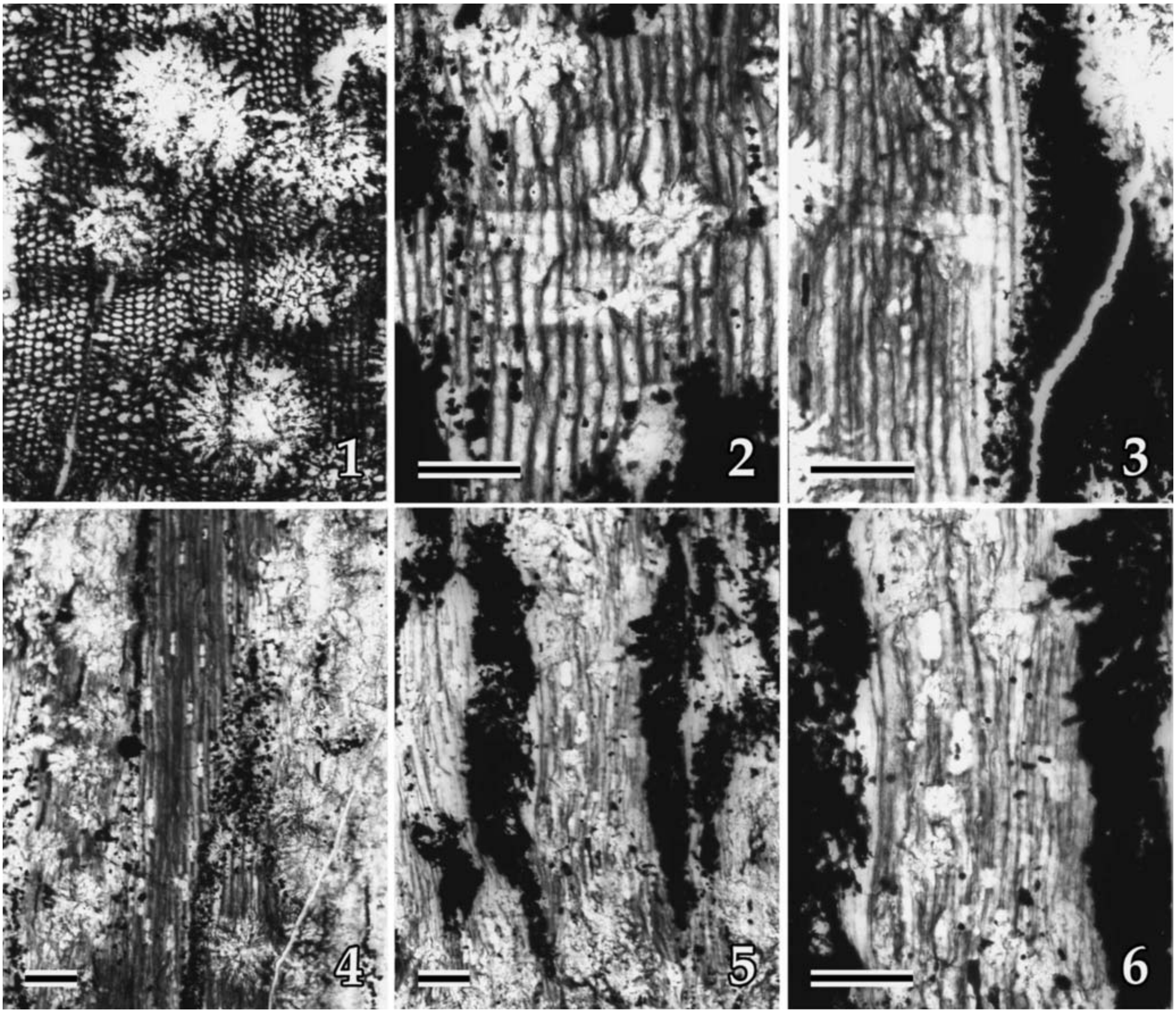

PLATE 32

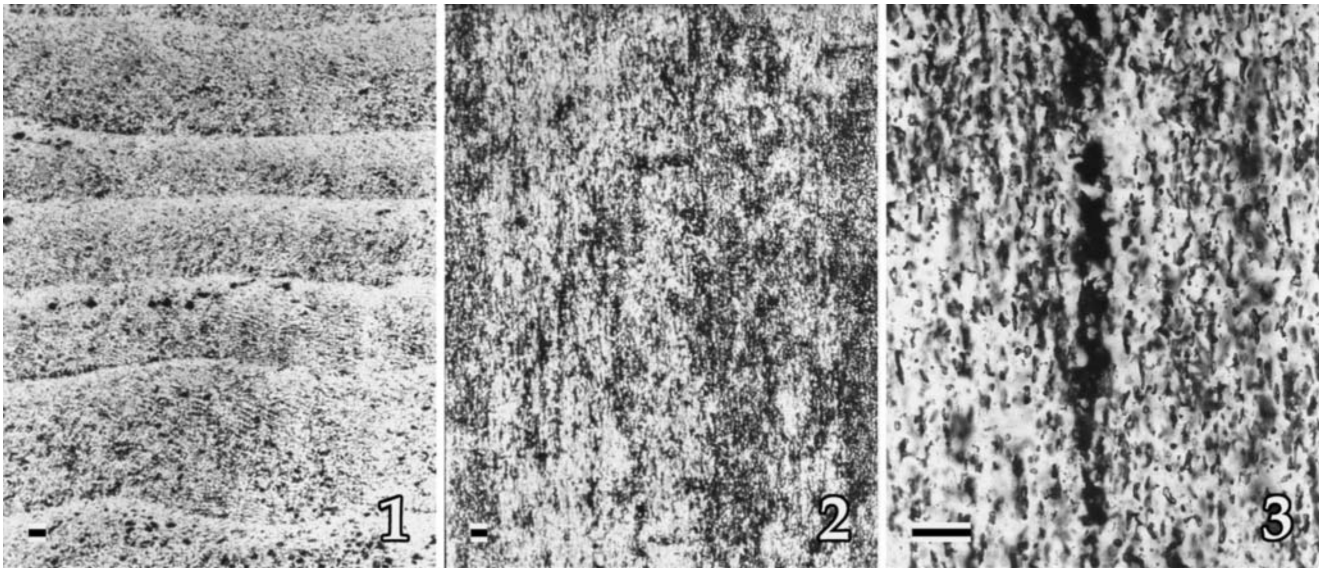

PLATE 33

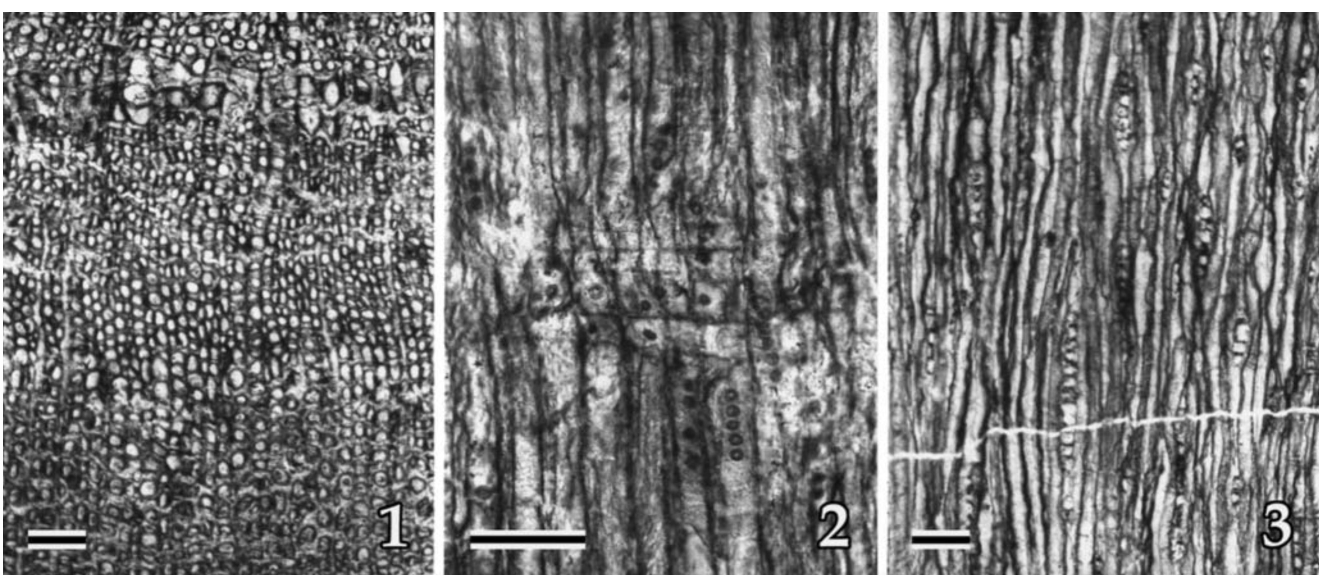

PLATE 34

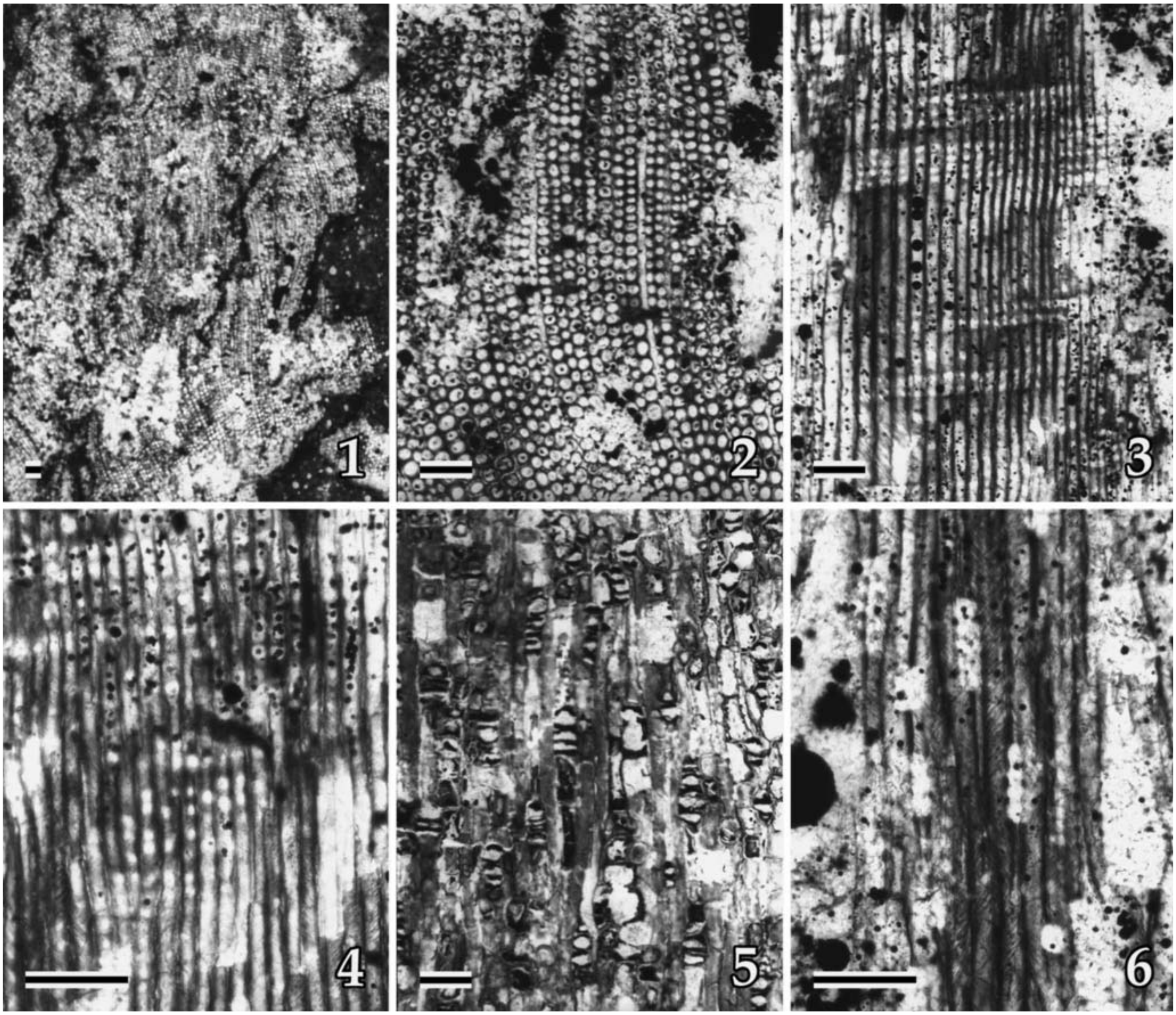

PLATE 35

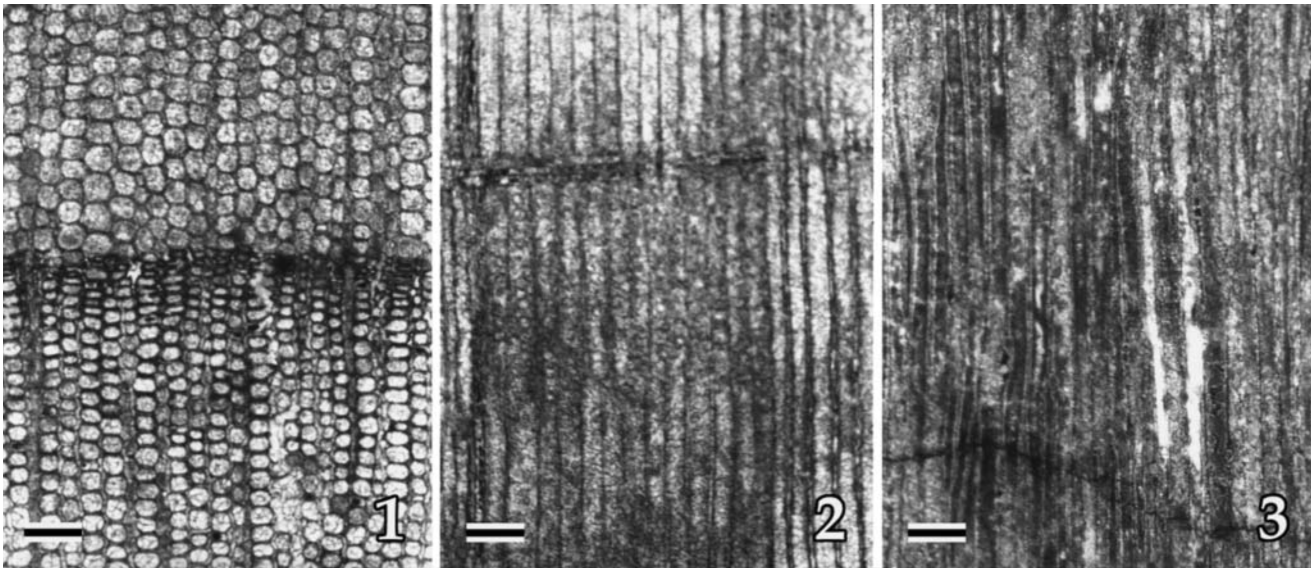

PLATE 36

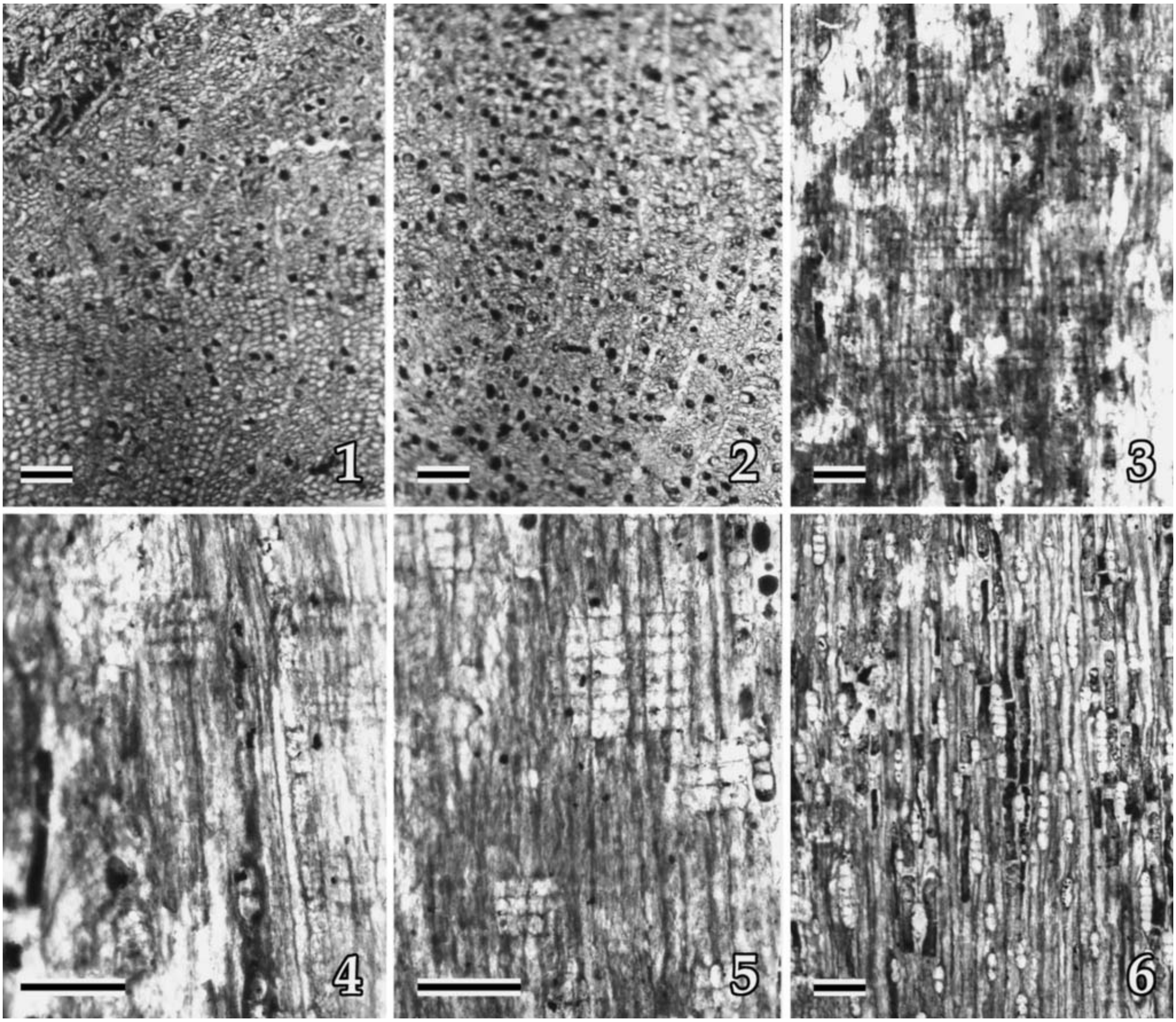

PLATE 37

Appendix. List of Microscopic Slides of Professor Shimakura's Fossil Woods deposited in University Museum, Tohoku University

No.	Botanic Name	SN	Remakrs	PR	Locality	Formation	References
534	coniferous wood	4		B	樺太内淵川三炭川支流	unknown	no
6858	Celtis sp.	3		M	missed	unknown	no
6869	Xenoxylon phyllocladoides	12		M	The Banks of the Daiddko-river, Heizyo-city, Tyosen (Korea)	Lowae Daido Formation (L Jr)	1936(278)
6870	Xenoxylon latiporosum	7		M	The quarry of Botandai, Hiezyo-city, Tyosen (Korea)	Tetori Series (U Jr)	1936(281)
6871	Phyllocladoxylon heizyoense	5	sp.nov	B	The court of the Heizyo Middle school, Heizyo-city, Tyosen (Korea)	Middle Daido Formation	1936(285)
6872	Phyllocladoxylon heizyoense	3		G	The court of the Heizyo Middle school, Heizyo-city, Tyosen (Korea)	Middle Daido Formation	1936(285)
6873	Phyllocladoxylon heizyoense	6		M	The court of the Heizyo Middle school, Heizyo-city, Tyosen (Korea)	Middle Daido Formation	1936(285)
6874	Phyllocladoxylon heizyoense	4		M	The court of the Heizyo Middle school, Heizyo-city, Tyosen (Korea)	Middle Daido Formation	1936(285)
6875	Phyllocladoxylon heizyoense	5		M	The court of the Heizyo Middle school, Heizyo-city, Tyosen (Korea)	Middle Daido Formation	1936(285)
6876	Phyllocladoxylon heizyoense	4		M	The court of the Heizyo Middle school, Heizyo-city, Tyosen (Korea)	Middle Daido Formation	1936(285)
6877	Phyllocladoxylon heizyoense	7		M	The court of the Heizyo Middle school, Heizyo-city, Tyosen (Korea)	Middle Daido Formation	1936(285)
6878	Phyllocladoxylon heizyoense	3		G	The court of the Heizyo Middle school, Heizyo-city, Tyosen (Korea)	Middle Daido Formation	1936(285)
6879	Phyllocladoxylon heizyoense	2		M	The court of the Heizyo Middle school, Heizyo-city, Tyosen (Korea)	Middle Daido Formation	1936(285)
6881	Dryoxylon cfr. Yezoense	5		M	The Yubari-gawa, Oyubari, Yubari-gun, Hokkaido	Upper Ammonite Beds (Senonian)	1937(57)
6882	coniferous wood	1		B	石狩河	unknown	no
6883	Phyllocladoxylon sp.	2		M	石狩国ホロムイ上流●●ノ沢*	unknown	no
6905	Araucarioxylon schrollianus	1		B	unknown	unknown	no
6961	Paracupressinoxylon cryptomeriopsoides	6	sp.nov	B	Saghalien	Urakawa Series (Senonian)	1937(41)
7699	Taxodioxylon albertense	19		B	The second valley, soth of the Oriki Mineral-spring, Hirono-mura, Hutaba-gun, Hukusima-ken	Urakawa Series (Senonian)	1937(45)
7700	Cupressinoxylon type wood	16		B	Dogihara, Ohisa-mura, Hutaba-gun, Hukusima-ken	Urakawa Series (Senonian)	1937(63)
22178	Ficoxylon sp.?	2		M	Green label, unreaderble	unknown	
30555	Phyllocladoxylon sp.	4		B	Huo-shih-ling, Chu-jin, Manchoukuo	Middle Jurassic	1936(298)
30556	Pinoxylon yabei	13		G	Huo-shih-ling, Chu-jin, Manchoukuo	Middle Jurassic	1936(295)
30557	Phyllocladoxylon cfr. Eborasense	7		M	Huo-shih-ling, Chu-jin, Manchoukuo	Middle Jurassic	1936(287)
30558	Xenoxylon latiporosum	5		B	Shahotsu, Shang-tu, Chu-lin, Manchoukuo	Middle Jurassic	1936(281)
30559	Xenoxylon latiporosum	4		B	Shahotsu, Shang-tu, Chu-lin, Manchoukuo	Middle Jurassic	1936(281)

No.	Botanic Name	SN	Remakrs	PR	Locality	Formation	References
30880	Cupressinoxylon sp.	4		B	The Santan-gawa, a tributary of the Naibuti-gawa, Miho, Otiai-mati, Sakaehama-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	1937 (54)
38405	Unidentified	1		B	unknown	unknown	
38419	Unidentified	1		B	unknown	unknown	
44234	Dadoxylon sidugawaense	12	sp.nov	G	The Coast of Hosoura, Sidugawa-mati, Miyagi-ken, Japan	Sidugawa Seires (Liassic)	1936(276)
44490	Xenoxylon latiporosum	8		M	Kuwasima-mura, Noumi-gun, Isikawa-ken, Japan	Tetori Series (U Jr)	1936(281)
50288	Unidentified	3		B	北滿興安省達頼湖附近		no
51721	Xenoxylon latiporosum	3		M	Ta-yang, Shu-kou, Chao-yan, Jehol	Jurassic	1936(281)
51722	Xenoxylon latiporosum	6		M	Ta-yang, Shu-kou, Chao-yan, Jehol	Jurassic	1936(281)
53325	Dadoxylon japonicum	5		M	Yatuzi, zihara-mura, Takaoka-gun, Koti-ken, Japan	Torinosu-Group (Upper Jr.)	1936(273)
57693	Pinoxylon dakotense	9		G	Pen-his-hu, Pen-his-hsien, Feng-tien Province, Manchoukuo	Honkeiko Bed (Lower Cretaceous)	1937(24)
58401	Cedroxylon cfr. Yendoi	12		M	Kawakami Coal-mine, Kawakami-mura, Toyohara-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	1937(18)
58402	Phyllocladoxylon aff. Gothanii	14		M	Kawakami Coal-mine, Kawakami-mura, Toyohara-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	1937(34)
58403	Cupressinoxylon sachalinense	9	sp.nov	M	Kawakami Coal-mine, Kawakami-mura, Toyohara-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	1937(53)
58404	Podocarpoxylon sp.	6		B	Kawakami Coal-mine, Kawakami-mura, Toyohara-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	1937(38)
58405	Aptiana ? Sp. Indet.	7		M	Kikumen-zawa, a branch of the Ikusyunbetu, Mikasayama-mura, Sorati- gun, Hokkaido	Upper Ammonite Beds (Senonian)	1937(59)
58406	Podocarpoxylon dakotense	8		M	The Kisegawa, a tributary of the Naibuti- gawa, Miho, Otiai-mati, Sakaehama-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	1937(37)
58407	Cupressinoxylon vectense	6		M	Kawakami Coal-mine, Kawakami-mura, Toyohara-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	1937(50)
58408	Dadoxylon sp. Indet. (cfr.japonicum)	7		B	Mosi-Matusima, Omoto-mura, Simo-Hei-gun, Iwate-ken	Monobegawa Series	1937(7)
58409	Brachyoxylon aff. Woodworthianum	15		B	Mosi, Omoto-mura, Simo-Hei-gun, Iwate-ken	Monobegawa Series	1937(10)
58410	Paracupressinoxylon sp.	11		M	Tanohata-mura, Simo-hei-gun, Iwate-ken	Monobegawa Series	1937(45)

No.	Botanic Name	SN	Remakrs	PR	Locality	Formation	References
58411	coniferous wood	9		B	Haipe, Tanohata-mura, Simo-Hei-gun, Iwate-ken	Monobegawa Series	1937(62)
58412	Cupressinoxylon type wood	6		M	The North of the large Sertunai River, naear Mgach, North Saghalien	Gyliak Series	1937(63)
58413	Casuaroxylon japonicum	12	sp.nov		Kikumen-zawa, a branch of the Ikusyunbetu, Mikasayama-mura, Sorati-gun, Hokkaido	Upper Ammonite Beds (Senonian)	1937(60)
58414	dicotyledonous wood	2		B	常磐廣野村上ケ目木		no
58415	Protocedroxylon araucarioides	11		G	Tiao-wo-kou, Chao-yang-ssu-hui, Kwanto-syu, Liao-tung Peninsula	Basal conglomerate of the Cretaceous (?) deposit	1937(17)
58416	Cupressinoxylon sp.	7		B	Toptoeusinai, Pommosiri, Asibetu-mura, Ishikari-gun, Hokkaido	Gyliak Series	1937(54)
58417	Cedroxylon sp.	8		B	The Kikumen-zawa, Mikasayama-mura, Sorati-gun, Hokkaido	Upper Ammonite Beds (Turonian -Senonian)	1937(22)
58418	Cupressinoxylon sp.	1		B	Kawakami Coal-mine, Kawakami-mura, Toyohara-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	1937(54)
58419	Dadoxylon japonicum	7		M	Koikorobe, Tanohata-mura, Simo Hei-gun, Iwate-ken	Momobegawa Series	1937(6)
58439	dicotyledonous wood	3		M	仙台郊外行燈松北方谷	unknown	
58445	Planoxylon inaii	9	sp.nov	G	Right valley of the 10th Bridge, Ikusa-gawa, Toyohara-mati, Toyohara-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	1937(14)
58446	Dadoxylon cfr. Tankoense	9		M	The Minami-Rokusen-zawa, Toyohara-mati, Toyohara-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	1937(4)
58447	Cupressinoxylon sp.	5		B	Minami-Rokusen-zawa, Namikawa, Toyohara-mati, Toyohara-gun, Karahuto	Urakawa Series (Senonian)	1937(63)
58448	Piceoxylon sp.	14		M	Minami-Hassen-zawa, Toyohara-mati, Toyohara-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	1937(31)
58449	Cupressinoxylon sp.	4		B	Minami-Hassen-zawa, Namikawa, Toyohara-mati, Toyohara-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	1937(55)
58450	Piceoxylon transiense	9	sp.nov	M	The left valley of the Utasinai-gawa, Sunakawa-mura, Sorati-gun, Hokkaido	Upper Ammonite Beds (Turonian -Senonian)	1937(24)
58478	Piceoxylon scleromedullosum	12	sp.nov	G	The Santan-gawa, a brtanch steam of the Naibuti-gawa, Miho, Otiai-mati, Sakaehama-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	1937(30)
58479	dicotyledonous wood	4		B	Santan-gawa, a tributary of the Naibuti- gawa, Miho, Otiai-mati, Sakaehama-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	no

No.	Botanic Name	SN	Remakrs	PR	Locality	Formation	References
58480	Paracupressinoxylon solmsi	9	comb. Nov	M	The Santan-gawa, a tributary of the Naibuti-gawa, Otiai-mati, Sakaehama-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	1937(44)
58481	Podocarpoxylon cfr. Woburnense	8		M	Minaziri, Huzinami-mura, Arita-gun, Wakayama-ken	Minaziri Bed(?) of the Monobe-rawa Series(?) (Barremian)	1937(36)
58482	Taxodioxylon albertense	9		G	The south bank of the Asami-gawa, Hirono-mura, Hutaba-gun, Hukusima-ken	Urakawa Series (Senonian)	1937(45)
58484	Dadoxylon sp. Indet. (cfr.japonicum)	7		B	Hidesima, Sakiyama-mura, Simo-Hei-gun, Iwate-Ken	Momobegawa Series	1937(7)
58485	Cupressinoxylon vectense ?	3		M	樺太豊原郡川上郡奥川上	unknown	
58495	Paracupressinoxylon cryptomeriopsoides	6	sp.nov	M	Kawakami Coal-mine, Kawakami-mura, Toyohara-gun, Karahuto (South Saghalien)	Urakawa Series (Senonian)	1937(41)
61201	Dadoxylon japonicum	5		B	Iwato-mura, kitakanri-gun, Gunma-ken	unknown	no
61202	Phyllocladoxylon heizyoense	12		M	The court of the Heizyo Middle school, Heizyo-city, Tyosen (Korea)	Middle Daido Formation	no
[s.n.]	Juglans angustiparenchymatosa	9	holotype	B	Tobishima Island, Aumi-gun, Yamagata-ken	Tobishima Formation	Terada1998(21)

SN : number of slides
PR : the state of preservation
References : 1936 (page)＝Studies on Fossil Woods from Japan and Adjacent Lands Contribution I. Sci. Rep. Tohoku Imp. Univ. Ser. 2. (Geology) 18 : 267-310
1937 (page)＝Studies on Fossil Woods from Japan and Adjacent Lands Contribution II. Sci. Rep. Tohoku Imp. Univ. Ser. 2. (Geology) 19 : 1-73
*unreadable

Missing Slides	
58497	Brachioxylon sp.
58485	Cupressinoxylon vectense
57601	Xenoxylon laitporosum
57602	Xenoxylon laitporosum
57603	Cupressinoxylon sp.
50288	indeterminable coniferous
58418	dicotyledonous wood
58499	dicotyledonous wood
58450	Aptiana

List of Uncertain Microscopic Slides

SN			slide no.	Locality
62001	conifer	Taxodioxylon？	3	No information
62002	conifer		2	No information
62003	conifer		2	No information
62004	conifer	Taxoxylon？	1	No information
62005	conifer	Cupressinoxylon？	2	No information
62006	conifer		2	No information
62007	conifer	Cupressinoxylon sp.	2	滿州本溪縣田師付溝
62008	conifer		2	ニラノ浜
62009	conifer	Araucarioxylon arizonicum	1	北米 Arizona 州
62010	conifer		23	南樺太川上炭坑
62011	conifer	Taxodioxylon？	4	No information
62012	conifer	Taxodioxylon？	4	越後谷澤村寺
62013	conifer		1	No information
62014	conifer		1	No information
62015	conifer		1	No information
62016	conifer	Cupressinoxylon？	3	樺太川上炭坑
62017	conifer	Cupressinoxylon？	4	No information
62018	conifer	Brachyoxylon sp.	2	樺太川上炭坑
62019	conifer		9	樺太川上炭坑
62020	conifer		9	No information
62021	conifer		1	樺太豊原町
62022	conifer	Podocarpoxylon？	1	No information
62023	conifer	Taxodioxylon？	1	No information
62024	conifer	Cupressinoxylon sp.	4	松島馬淵氏
62025	conifer		1	No information
62026	conifer		1	No information
62027	conifer		1	No information
62028	conifer	Xenoxylon latiporosum	1	No information
62029	conifer		4	Petrified forest near Adamana Arizona
62030	conifer		3	七北田
62031	conifer	Taxodioxylon？	4	廣瀬川オタマヤ 橋下
62032	conifer		2	岩手県氣仙郡末崎村
62033	conifer		1	仙台市向山東洋館の東 fossil valley
62034	conifer		1	No information
62035	conifer	Glyptostroboxylob	1	No information
62036	conifer	Taxodioxylon sequoianum	2	塩釜古墳
62037	conifer		4	北樺太 Aguneo 海岸
62038	conifer	Taxodioxylon sequoianum	3	越後谷澤村寺，阿賀ノ川岸，阿賀野川
62039	conifer		1	樺太 アグネラ
62040	conifer		1	青森
62041	conifer		1	No information
62042	conifer		1	No information
62043	conifer		1	No information
62044	conifer		1	No information
62045	conifer		1	No information
62046	Dicotyledon	Ring？	1	松島浜町停留所北 Kutling 尾山
62047	Dicotyledon	Diffuse	3	No information
62048	Dicotyledon		1	No information
62049	Dicotyledon	Ring	2	No information
62050	Dicotyledon	Diffuse	1	No information
62051	Dicotyledon		2	No information
62052	Dicotyledon		1	No information
62053	Dicotyledon		1	南樺太川上炭坑

SN			slide no.	Locality
62054	Dicotyledon		1	樺太豊原郡川上炭坑
62055	Dicotyledon	Diffuse	1	No information
62056	Dicotyledon		1	No information
62057	Dicotyledon	Diffuse	4	No information
62058	Dicotyledon		1	No information
62059	Fern ?		2	No information
62060	Unidentified		1	滝ノ口 Tuff 中炭
62061	Unidentified		1	樺太豊原町並川南_線澤
62062	Unidentified		1	岩手県小本村師松島
62063	Unidentified		1	桐谷戸富山県
62064	Dicotyledon		1	No information
62065	Dicotyledon	Arthropitys	11	Suzuri Sasagaya (硯笹谷)
62066	conifer	Dadoxylon sp	1	No information
62067	Protopinaceae	Xenoxylon latiporosum	4	The court of the Heizyo Middle school, Heizyo-city, Tyosen (Korea)
62068	Protopinaceae	Xenoxylon latiporosum	4	滿州鐵嶺県大寶山炭坑
62069	Protopinaceae	Xenoxylon latiporosum	5	熱河省西興隆溝

31 slides were not numbered due to be impossible to identify and no information.

List of Microsocpic Slides of Some Lower Vascular Plants from England

44	Sigillariostrobus horburyensis, M.S. Megaspore	1		G	Middle Coal Measures Yorkshire England
75	Stigmaria ficoides	1	T. SN of axis	G	Halifax Hard Coal, Lanarkian Series Yorkshire England
76	Lyginodendron oldhamium Lagenostoma lomaxi	1		G	Upper Foot Coal, Colne, Lancashire
77	Rachiopteris bibractiensis	1		G	Dulesgate
78	Lepidodendron pettycurense Kidston Sphenophyllum insigne Astromyeton pettycurense Stauropteris burritistandica	1		G G	Yorkshire
79	Calamostachys binneyana	1		G	Carbon, Dulesgate, England
80	Thaloxylon thokeri	1		G	Carbon, Dulesgate, England
81	Calamites sp.	1		G	Carbon, Shore Littleborough, England
82	Lepidodendron seleginordes	1		G	Halifax Hard Bed

遠藤誠道先生 Cycadeoidea Preparates List

	No.	Label 1	Label 2
1.	Green	Cycadeoidea nipponica Endo 1	Cycadeoidea nipponica Endo III
2.	green	Cycadeoidea nipponica Endo	Tangential section of the stem
3.	white	Unidentified	Unidentified
4.	Green	Cycadeoidea nipponica n.sp.	Tangential longitudinal section of the stem
5.	White	Unidentified	Unidentified
6.	Green	Cycadeoidea nipponica Endo	Label missed
7.	White	Cycadeoidea nipponica	登川函淵砂岩
8.	White	Cycadeoidea nipponica Endo	北海道夕張郡函淵砂岩
9.	White	Cycadeoidea nipponica Endo	北海道夕張郡函淵砂岩層
10.	White	Cycadeoidea nipponica Endo	Sanusibe 函淵砂岩
11.	White	Cycadeoidea nipponica Endo	膽振郡勇拂郡サヌシベ川上流
12.	White	Cycadeoidea nipponica Endo 22179	Longitudinal section, through armour
13.	Green	Cycadeoidea nipponica Endo	Cross section of the cortex
14.	White	Cycadeoidea nipponica Endo	Longitudinal section, through armour
15.	Green	Cycadeoidea nipponica Endo	Longitudinal section, through armour
16.	Green	Cycadeoidea nipponica n.sp.	Tangential section through armour 1.5 cm inside from the surface
17.	Green	Cycadeoidea nipponica Endo	Longitudinal section, through armour
18.	Green	(Label missed)	Cross section througn armour (Leaf base Vascular bundle)