

Dendrochronological and wood anatomical
examination of finds from historical
shipwrecks etc. found on the shores of
Svalbard, now kept in the Svalbard Museum
in Longyearbyen -

Material from wooden shipwrecks and other objects

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By Claudia Baittinger and Niels Bonde



National Museum of Denmark
Environmental Archaeology and Materials Science
Dendrochronology and Wood Anatomy

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Dendrochronological and wood anatomical examination of finds from historical shipwrecks etc. found on the shores of Svalbard, now kept in the Svalbard Museum in Longyearbyen – Material from wooden shipwrecks and other objects

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Project nr. **14/14**



RIS-ID 10272

Dendrochronology, wood anatomy and shipwrecks on Svalbard

National Museum of Denmark, Environmental Archaeology and Materials Science, Dendrochronology and Wood Anatomy

Our number: NNU j.nr. **A9281**

Fieldwork in summer 2014 by: Claudia Baittinger, Charlotte Kure Brandstrup, Niels Bonde and Sander Solnes.

Lab work (dendrochronology and wood anatomy) in 2014/15 by: Claudia Baittinger, Charlotte Kure Brandstrup, Jonas Ogdal Jensen and Thomas Bartholin.

In total 44 objects have been examined (19 for dendrochronological analysis).

All samples are going to be returned to the Svalbard Museum when the study is finished.

See also appendix 3:

Jonas Ogdal Jensen og Claudia Baittinger. Vedanatomisk analyse af vrag, vragdele og slæde fra Prins Karls Forland og Edgeøya, Svalbard. NNU rapport 4, 2015.

Additional wood anatomical research done on samples submitted autumn 2014 by Snorre Haukalid, Syssemmannen på Svalbard. Results from these analyses are not included in this report.

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The purpose with this research is to establish knowledge whether it is possible to date material deriving from historical shipwrecks found on the islands of Svalbard. Furthermore wood anatomical analysis is used for determination of the different wood species found in and with the ship parts. Both these parameters are of high importance for the evaluation of the environmental impact on wooden material washed ashore, e.g. how old is it (dating) and what kind of material (tree species).

The approach of the project.

To minimise the costs of sampling we choose to sample material already collected and kept in the storage at Svalbard Museum. This is a fast and cheap way of getting material for the project and the management at the museum and the national authorities gave permission to sample.

On the 19th - 20th May 2014 Claudia Baittinger (CB) from the National Museum of Denmark (NMD) and Sander Solnes (SS) from the Svalbard Museum (SVB) went through the storage and archive at SVB to work out a survey over items suited for examination. In this action a few samples were taken for wood anatomical determination.

Based on the knowledge gained in May 2014 Claudia Baittinger, Charlotte Kure Brandstrup (CKB) NMD, Niels Bonde (NB) NMD along with Sander Solnes 10th – 15th July 2014 sampled more than 40 object at SVB for the project.



Claudia Baittinger and Charlotte Brandstrup evaluating a find for a dendrochronological examination

The samples were analysed in the Laboratory for Wood anatomy and Dendrochronology at the NMD by Claudia Baittinger (dendro and wood identification), Charlotte Kure Brandstrup (dendro), Thomas Bartholin and Jonas Ogdal Jensen (wood identification). A great deal of the samples were taken from parts of ships or boats build in the clinker build fashion where the boards are sewn together. This ship type is traditional in the northern part of Fennoscandia. The wood anatomical study of the material that was used to sew the boards together – the withes - is not done yet.



Planks. Detail with sewn planks.

In total 44 objects have been examined so far - of which 19 for dendrochronological analysis. All samples are going to be returned to the Svalbard Museum when the study is finished.

Dendro-samples were taken as cores and cross sections from items made of pine (*Pinus sylvestris*) (19 pieces), spruce (*Picea* sp.) (3 pieces) and oak (*Quercus* sp.) (2 pieces). Some of the cores were broken or there were other difficulties that made it impossible to work out a single time series that represents a tree – a so called tree curve. The number of annual rings in the tree-ring curves varies between 47 and 270.



Not all the cores came out in one piece. This is an example where the interior of the item is completely degraded.

Samples have been taken from 14 different ships/boats, 10 made of pine, two made of spruce and two made of oak. Only two of the ships have more than one sample namely two! This is a methodical shortage e.g. in analysing samples from a historical shipwreck we ask for c. 15 samples to reach a date and to provenance the timber used for the ship. This is one of the problems we have to address in the future when handling material from Svalbard.

The produced tree ring data are in the catalogue (appendix 1).

Three objects are with absolute date:

Please notice the result for SB 21 (see below). Here a very fine sample with 245 tree-rings has been examined. Although we have only one sample it is possible to cross-date the tree-ring curve with master-chronologies for pine from the northern part of Norway and Sweden. The best result with a chronology for Troms fylke (County) indicating that the tree from where the sample comes has been growing in the region around the town of Tromsø. You could then speculate whether the ship was made there and that it can be seen in the context of the communication between Svalbard and Tromsø.

Please also notice SB 12 (see below). Here a ship part made from oak has been dated to c. 1730. The tree-ring curve cross-dates with master-chronologies for oak from the northern part of Germany. Here the match is not as perfect as in the example mentioned above and it is not possible to indicate an area more precisely. You could speculate whether this item belongs to one of the whalers operating around Svalbard in the first half of the 18th Century.

SB 12, **SVB 2354**, 03090019: Part of ship, probably a bitt (pullert). Oak (*Quercus* sp.).

Tree-ring curve have 95 rings covering the period AD1630 to AD1724. With 14 tree-rings in the sapwood it is possible to calculate the time of felling for the tree from where the sample derive to c. AD1730. The curve cross-date with master-chronologies from Europe, indicating that the tree have been growing in central Europe.

t-value BP 6.64 with DM200001, Niedersachsen Küstenraum (D)

SB 16, **SVB 2984**, 02940019: Ladder. Probably from a (Russian) hunting lodge. Scots pine (*Pinus sylvestris*).

Tree-ring curve have 152 rings covering the period AD1805 to AD1956. With 81 tree-rings in the sapwood and waney edge the time of felling for the tree from where the sample derive is AD1956/1957. The curve cross-dates with master-chronologies from Karelia, indicating that the tree has been growing in the eastern part of northern Fennoscandia.

t-value BP 5.89 with FMP0004a, North Karelia (F)

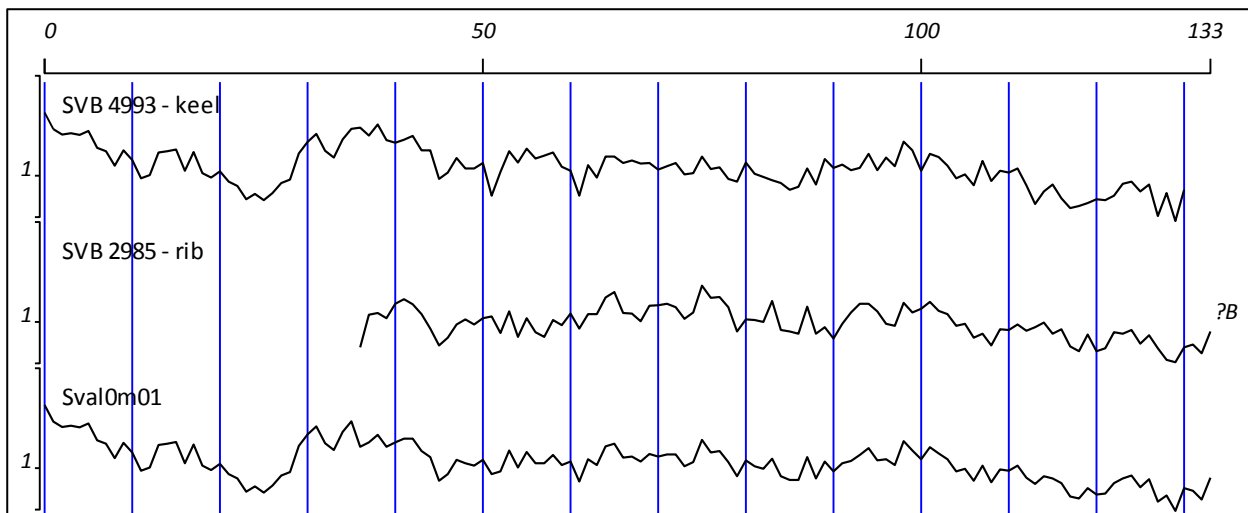
SB 21, **SVB 4991**, 03070019: Part of ship, big rib (most likely). Scots pine (*Pinus sylvestris*).

Tree-ring curve have 245 rings covering the period AD1560 to AD1804. It is not possible to identify sapwood or waney edge. The time of felling for the tree from where the sample derive can be set to the first decade in the 19th Century (AD1804 or shortly after). The tree-ring curve cross-dates with master-chronologies from the northern part of present Norway/Sweden, indicating that the tree has been growing in that region.

t-value BP 10.5 with Troms (N) and *t*-value BP 8.6 with Lappland (S).

Relative date:

The tree-ring curves from two samples coming from two different items made of spruce (*Picea* sp.) – SVB 2985, rib (SB 6, sample 02950019) and SVB 4993, keel (SB 18, sample 02960019) do cross-date. *t*-value BP 4.91 checked visually, and a mean curve was calculated (Sval0m01).



Mean curve *Picea* sp.: Sval0m01.d

Title : A9281 Svalbard SB 6+18, 2 timber 02950019+02960019

Chronology mean Ring-width PCSP data of 140 years length

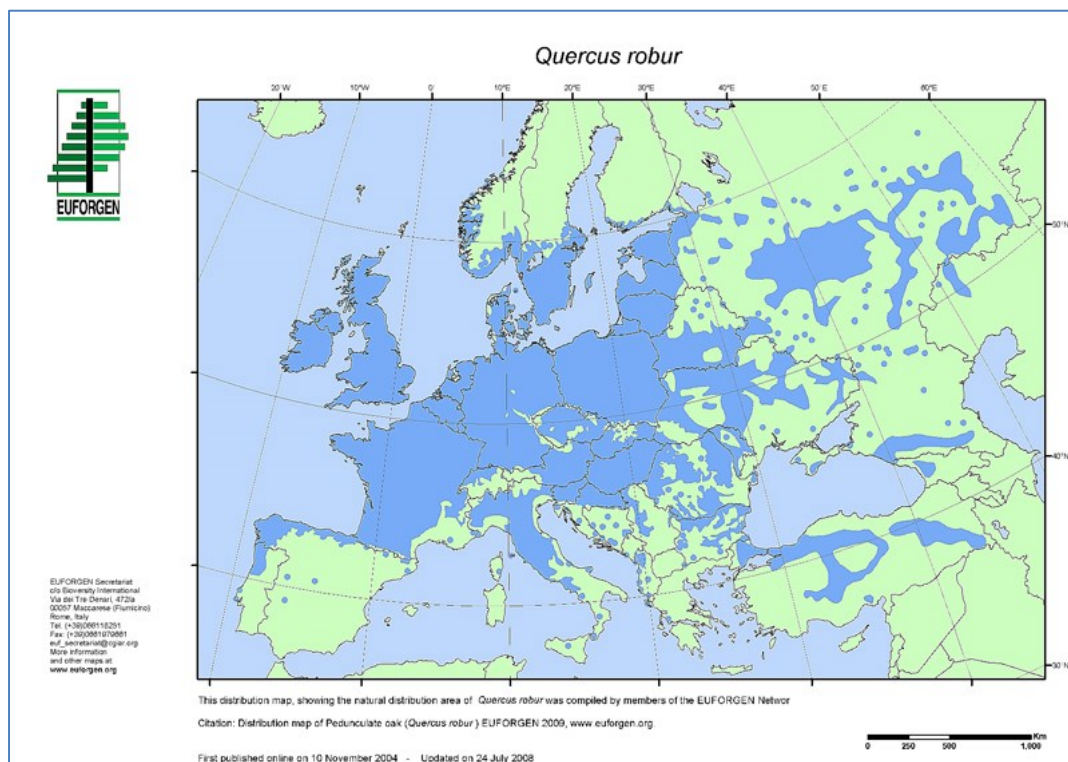
Average ring width 114.41 Sensitivity 0.15

270	208	191	195	190	202	155	147	117	149
128	96	101	144	147	151	108	145	104	97
107	91	85	69	75	68	76	89	94	142
170	193	148	133	177	209	140	150	169	140
150	159	159	131	119	82	91	114	108	104
114	91	95	132	101	129	108	108	123	105
111	81	115	105	141	147	118	120	111	125
120	124	124	103	110	156	128	131	110	88
113	103	99	116	88	83	83	119	85	111
95	108	112	123	137	113	115	105	153	132
115	139	126	115	95	99	82	104	80	98
96	104	86	78	88	85	79	64	62	73
66	67	79	85	89	74	84	59	65	51
73	70	61	86						

Wood anatomical analysis

In total 40 wood identifications have been made (including the samples used for dendrochronology). Four species have been detected and the natural distribution for three of the species – all conifers - covers the northern part of Fennoscandia.

Three samples are of **oak** (*Quercus* sp.) where the natural distribution of the species will be Europe going as far north as the southern part of Scandinavia (Norway and Sweden). The items where the samples come from are most likely objects from the communication between Svalbard and Europe.



Map of the natural distribution of oak

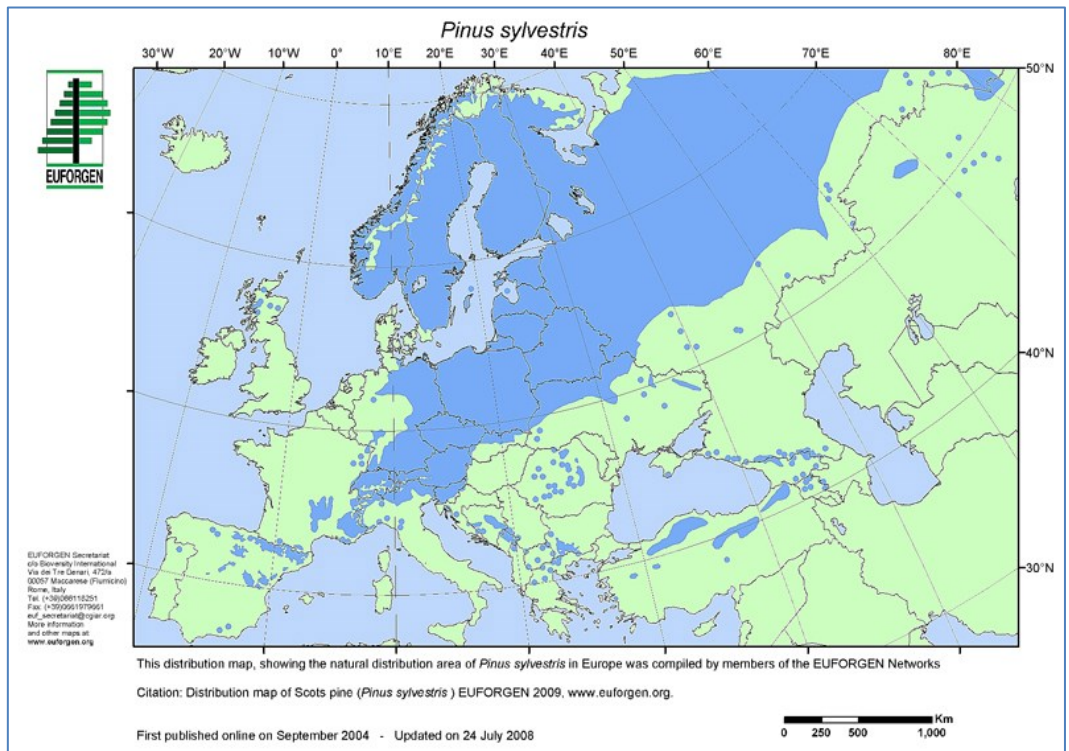
The most common species in the conifer group is **Scots pine** (*Pinus sylvestris*); 23 objects. Pine is the best material for boat/shipbuilding in the north (outside the natural distribution of oak). Pine is used for all parts of a vessel: keel, planks, pegs, wedges etc. This along with the tradition of making clinker build boats and ships where the planks are sewn together indicates that most of the material examined comes from vessels build in Fennoscandia.

Spruce (*Picea* sp.) is also represented in the material with a good number of items. But of the 13 identifications only four are from 'ship-timber' (keel, planks etc.), seven objects are pegs and wedges used for the sewing of the planks. Again it fits with the traditional ship and boat building tradition in Fennoscandia. Additionally one sample comes from a barrel stave.

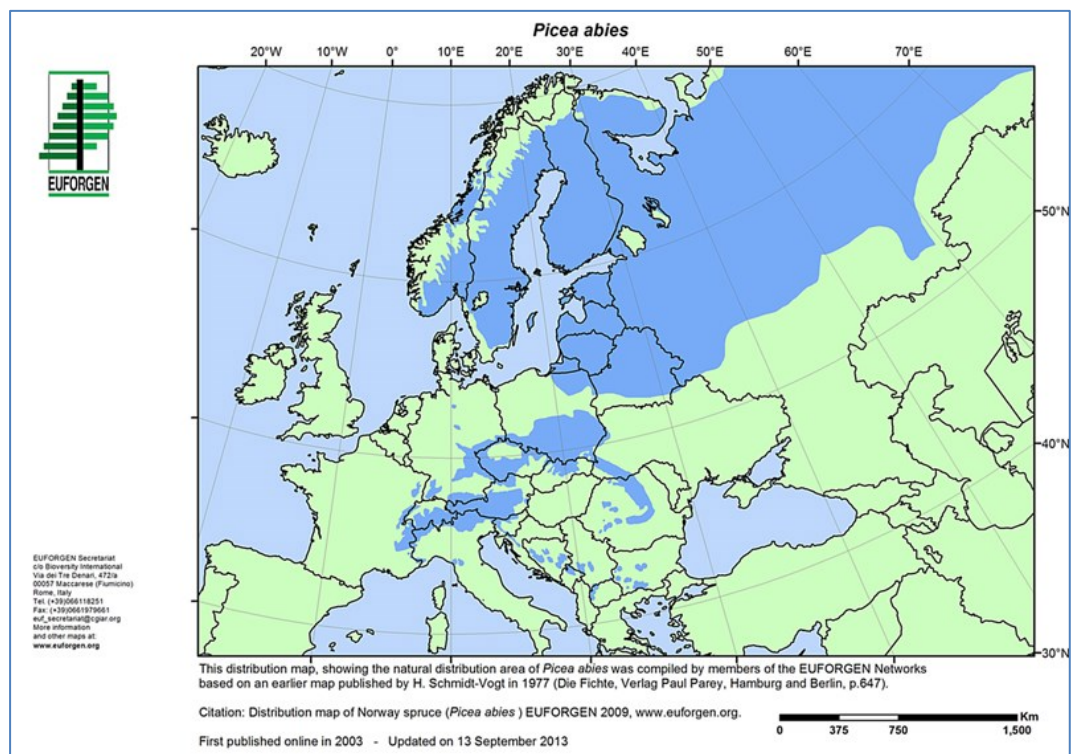
Finally the sample from one peg is identified as **Common juniper** (*Juniperus communis*).

See also appendix 3. Jonas Ogdal Jensen og Claudia Baittinger. Vedanatommisk analyse af vrag, vragdele og slæde fra Prins Karls Forland og Edgeøya, Svalbard. NNU rapport 4, 2015.

Additional wood anatomical research done on samples submitted autumn 2014 by Snorre Haukalid, Sysselmannen på Svalbard. Results from these analyses are not included in this chapter.



Map of the natural distribution of Scots pine



Map of the natural distribution of spruce

Distribution maps: www.euforgen.org

Appendix 1

Catalogue over samples taken from finds from historical ship parts etc. stored in Svalbard Museum - with tree-ring series and photos

All data are raw data; ring width 1/100mm.

Lab nr. **SVB nr.** **Sample description, photos, and data**

SB 1 **SVB 4996** Part of boat/ship - rib?

1 4996 No dendro-sample taken. The object is not suited for dendrochronological study due to poor state of preservation and few and wide annual rings (less than 20).
Sample for wood identification taken, and sample of wooden peg taken. Both are made of spruce (*Picea* sp.)



Photo: National Museum of Denmark

Not on digitaltmuseum.no

SB 2 **SVB 3921** Part of ship, knee (big) from clinker built ship, 42.5x111cm

2 3921 Most likely branch, pith on the bottom, eccentric growth.
No dendro-sample taken. The object is not suited for dendrochronological study due to eccentric growth and wide and few annual rings.
Sample for wood identification taken. The object is made of Scots pine (*Pinus sylvestris*).
Sample of wooden peg taken. The peg is made of spruce (*Picea* sp.).



Photo: Svalbard Museum

<https://digitaltmuseum.no/011025370021/?query=SVB%2003921&pos=0&count=1>

- SB SVB** Part of ship, rib (probably)
3 3920 No dendro-sample taken. The object is not suited for dendrochronological study due to eccentric growth and poor state of preservation.
Sample for wood identification taken. It is not possible to identify the tree species due to poor state of preservation.



Photo: Svalbard Museum

<https://digitaltmuseum.no/011025370018/?query=SVB%203920&pos=0&count=1>

SB SVB Two ship planks, ca. 260 cm long, sewn together, with caulking and wooden pegs and wedges.
4 3916 Both planks are made of Scots pine (*Pinus sylvestris*).
 3 cores taken from one plank. Sapwood destroyed when drilling. Not dated.
 Sapwood stabilization according to the method described by Pressler was tried (see appendix). Although the sapwood seemed intact the core broke along the border between the stabilized and non-stabilized material. App. 32 tree-rings in sapwood counted, not measured. The cores broken. The resulting tree-ring curve covers 73 tree-rings. Cross section is needed for further research or CT-scanning.
 Samples for wood identification were taken from caulking, wedges, wooden peg and sewing/withes. Identification of caulking and sewing/withes not carried out yet. Two wedges and the wooden peg are made of spruce (*Picea* sp.).

Tree curve: **03010019.d**

Title : A9281 SB 4 SVB 3916 plank rad a-c

Raw Ring-width PISY data of 73 years length

Undated; relative dates - 0 to 72

0 sapwood rings but possible h/s boundary; ca. 32 sapwood rings unmeasured

Average ring width 102.49 Sensitivity 0.14

136	154	168	119	100	95	120	78	89	138
118	81	118	120	135	112	103	130	147	119
116	124	109	106	73	74	83	88	109	87
120	115	95	131	89	87	87	83	111	115
111	100	90	103	92	101	86	82	98	110
112	100	83	100	84	88	85	86	100	107
102	99	74	79	107	93	102	106	103	78
67	83	89							



Photo: National Museum of Denmark



Photo: National Museum of Denmark



Photo: Svalbard Museum

<https://digitaltmuseum.no/011025370007/?query=SVB%2003916&pos=0&count=1>

- SB SVB** 2 ship boards, ca. 190 cm long, sewn together, with caulking and wooden wedges.
5 3915 Both planks are made of Scots pine (*Pinus sylvestris*).
 2 cores taken from the largest board. Not dated.
 Sapwood stabilization according to the method described by Pressler was used (see appendix).

Tree curve: **03030019.d**
 Title : A9281 SB 5 SVB 3915 radii a+b
 Raw Ring-width PISY data of 47 years length
 Undated; relative dates - -4 to 42
 Number of sapwood rings unknown and no bark surface
 Average ring width 140.36 Sensitivity 0.14

161	183	204	208	167	182	242	249	206	221
212	204	165	186	154	151	188	198	197	149
126	129	156	130	123	125	96	96	92	127
127	99	122	105	135	115	110	141	98	79
84	66	71	70	46	49	53			



Photo: National Museum of Denmark



Photo: Svalbard Museum



Photo: National Museum of Denmark

<https://digitaltmuseum.no/011025370005/?query=SVB%2003915&pos=0&count=1>

SB SVB Part of ship, rib, 13x16x383cm
 6 2985 Made of spruce (*Picea* sp.).
 1 core samples taken and 1 disc. Not dated.

Tree curve: **02950019.d**

Title : A9281 Svalbard SB 6 SVB 2985 rib rad a-d

Raw Ring-width PCSP data of 98 years length

Undated; relative dates - 36 to 133

Number of sapwood rings unknown and possible bark surface

Average ring width 100.73 Sensitivity 0.16

67	112	115	106	133	143	132	113	90	69
78	96	104	96	106	109	84	118	79	106
85	79	103	95	114	90	113	113	147	160
115	114	101	129	130	133	126	105	116	177
146	148	126	86	104	103	100	139	88	86
83	127	83	92	77	97	116	133	133	118
97	94	135	116	123	137	119	113	94	97
78	83	69	89	88	96	87	92	99	83
89	68	63	82	63	66	85	83	88	71
81	66	55	53	67	70	61	86		

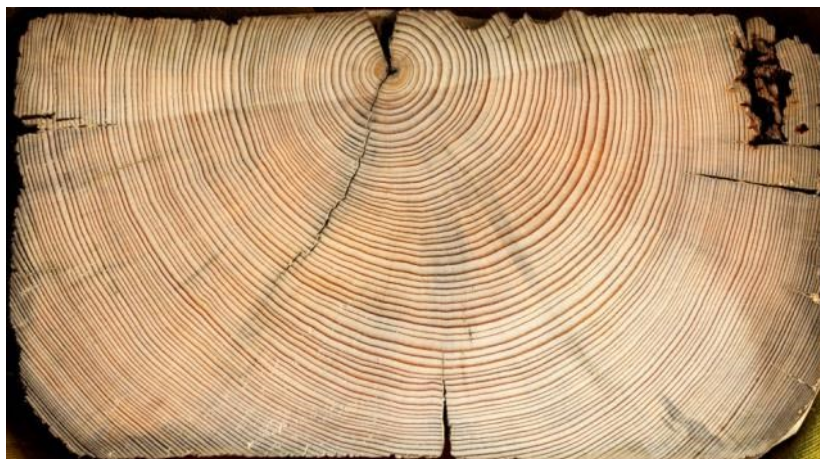


Photo: National Museum of Denmark



Photo: Svalbard Museum

<https://digitaltmuseum.no/011025166208/?query=SVB%2002985&pos=0&count=1>

- SB SVB** Part of ship, keel, with sewing/withes, 12.3x18.5x353cm
7 1736 1 disc sample taken. Made of Scots pine (*Pinus sylvestris*). Not dated.
 Samples for wood identification taken from wooden peg and sewing/withes. Peg made of spruce (*Picea* sp.). Identification of sewing not carried out yet.

Tree curve: **02990019.d**
 Title : A9281 Svalbard SB 7 SVB 1736 keel radii a+b
 Raw Ring-width PISY data of 100 years length
 Undated; relative dates - 0 to 99
 Number of sapwood rings unknown and no bark surface
 Average ring width 99.32 Sensitivity 0.15

241	273	262	267	197	160	156	104	104	199
212	205	195	104	55	55	64	70	90	134
125	101	81	109	95	115	102	134	185	153
177	189	235	149	106	91	98	96	109	119
121	110	115	120	100	86	95	71	74	69
67	63	75	63	55	76	84	69	86	76
68	76	70	75	70	62	59	55	54	62
68	70	65	50	69	73	99	93	72	67
59	64	58	76	83	72	75	56	44	51
50	56	68	57	67	64	47	44	39	34



Photo: National Museum of Denmark

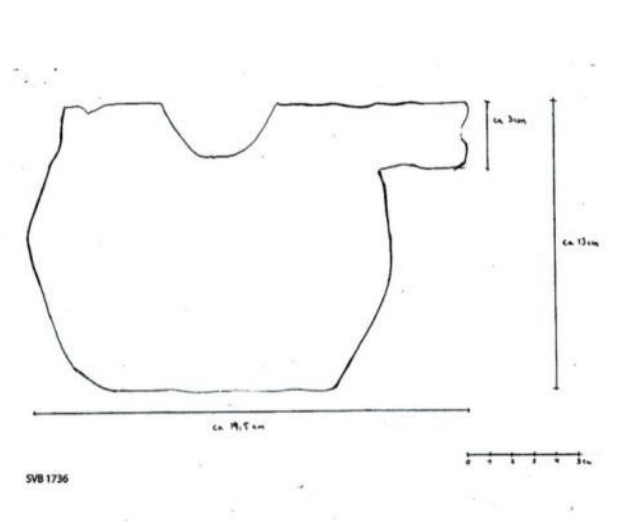


Photo: Svalbard Museum



Photo: Svalbard Museum

<https://digitaltmuseum.no/011025161460/?query=SVB%2001736&pos=0&count=1>

- SB SVB 8 1733** Part of ship, keel, with sewing/withes, 18x21x401cm
Sampling without success. No dendro-sample taken. Poor state of preservation, dried out, wide annual rings. The object is not suited for dendrochronological studies. Wood identification is missing.



Photo: Svalbard Museum

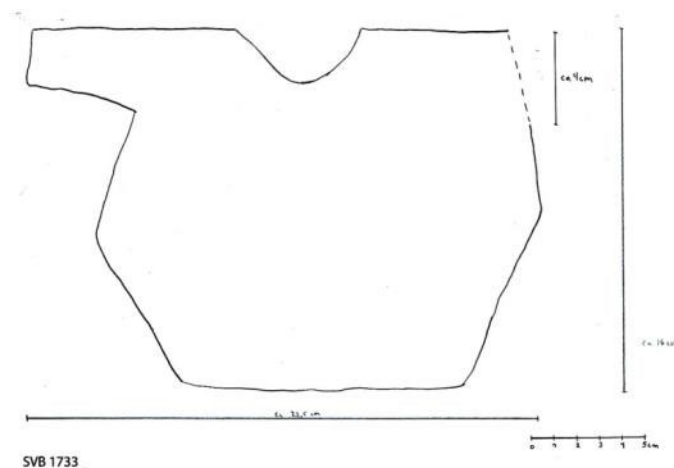


Photo: Svalbard Museum

<https://digitaltmuseum.no/011025161443/?query=SVB%2001733a&pos=0&count=1>

- SB SVB 9 372** Part of ship, rib, 15x15x112cm
No dendro-sample taken. The object is not suited for dendrochronological study due to poor state of preservation (dried out) and few and wide annual rings. Wood identification is missing.



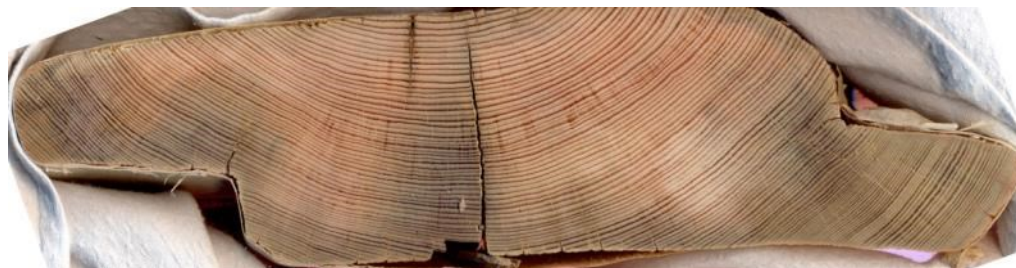
Photo: Svalbard Museum

<https://digitaltmuseum.no/011025154705/?query=SVB%2000372&pos=0&count=3>

- SB SVB** Part of ship, plank, 5,5x27x287cm, with sewing/witthes.
10 1737 1 disc sample taken, 27x17cm. Plank made of Scots pine (*Pinus sylvestris*). Not dated. Samples for wood identification taken from wedges and sewing. Identification of sewing not carried out yet. The wedge is made of spruce (*Picea* sp.).

Tree curve: **02930019.d**
 Title : A9281 Svalbard SB 10 SVM 1737 bord radii a+b
 Raw Ring-width PISY data of 114 years length
 Undated; relative dates - 1 to 114
 Number of sapwood rings unknown and no bark surface
 Average ring width 105.49 Sensitivity 0.18

159	184	158	143	159	153	153	153	142	133
210	131	128	108	169	166	130	153	131	138
152	115	80	128	88	94	98	114	140	119
102	125	133	123	140	133	116	114	119	144
160	126	98	99	96	102	90	103	131	134
96	92	99	102	83	101	77	103	100	88
94	139	112	90	64	104	92	106	122	92
87	85	93	53	43	53	36	57	53	55
61	79	63	87	78	72	85	84	68	79
95	86	66	68	102	99	85	114	146	95
112	144	121	76	100	70	53	70	85	81
66	68	91	89						



Sample 02930019. Plank, 27cm wide. Photo: National Museum of Denmark



Photo: Svalbard Museum

<https://digitaltmuseum.no/011025161470/?query=SVB%2001737&pos=0&count=1>

SB 11 SVB 1730 Part of ship, floor-timber, aft? (bundstok, agter?), 10.5x32x326cm, with sewing/withes. 2 core samples taken. Plank made of Scots pine (*Pinus sylvestris*). Very narrow rings (see photo), samples were remeasured to check for narrow rings, possibility for missing rings, cross-section would be helpful to find missing rings. Not dated. Samples for wood identification taken from wooden peg, wedge and sewing/withes. Identification of sewing/withes not carried out yet. One big peg and the wedge are made of Scots pine (*Pinus sylvestris*). Another peg is made of Common Juniper (*Juniperus communis*).

Tree curve: **03060019.d**

Title : A9281 Svalbard SB 11 SVB 1730 floor-timber radii a-c

Raw Ring-width PISY data of 270 years length

Undated; relative dates - 1 to 270

84 sapwood rings and no bark surface

Average ring width 52.40 Sensitivity 0.19

118	125	107	114	95	143	91	110	112	71
78	77	69	61	60	65	90	77	71	57
50	79	62	70	83	86	78	87	80	64
68	61	93	80	54	66	67	95	83	82
92	72	95	104	62	83	83	66	95	97
71	67	68	44	40	60	66	81	59	64
59	54	62	55	55	54	64	72	51	46
57	55	65	55	64	49	34	49	45	59
43	45	51	54	64	62	43	49	44	68
56	51	66	45	66	50	47	54	36	33
37	28	40	38	51	52	54	39	56	56
45	46	31	36	38	29	33	23	37	47
30	39	41	27	29	39	44	43	40	36
36	40	30	39	44	37	35	38	32	33
34	27	32	37	23	27	34	28	32	27
25	16	22	29	32	19	32	20	26	29
24	19	23	28	16	17	19	21	26	24
23	32	28	22	52	41	64	69	67	64
85	75	60	60	65	70	82	44	57	44
83	43	52	77	56	32	28	23	40	38
41	53	52	41	38	39	53	46	48	38
52	51	55	43	27	38	40	46	38	31
53	71	74	54	60	60	60	47	45	58
52	57	63	52	64	51	71	42	52	46
52	52	46	41	47	47	38	47	40	36
40	40	42	45	51	48	44	52	46	52
60	50	50	41	49	41	40	43	36	60



Photo: National Museum of Denmark



Photo: Svalbard Museum

<https://digitaltmuseum.no/011025161429/?query=SVB%2001730&pos=0&count=1>

SB SVB Part of ship, probably bitt (pullert), 14x15x102cm.
12 2354 1 core sample taken. Made of oak (*Quercus* sp.). Dated.

Tree curve: **03090019.d**

Title : A9281 Svalbard SB 12 SVB 2354 bitt radii a+b

Raw Ring-width QUSP data of 95 years length

Dated AD1630 to AD1724

14 sapwood rings and no bark surface

Average ring width 106.73 Sensitivity 0.25

Interpretation AD1725-40

159	155	120	121	76	59	66	58	102	113
93	107	73	72	66	122	145	109	103	107
78	89	68	163	205	203	159	122	116	105
145	88	210	216	179	139	189	106	104	114
87	106	86	120	121	88	108	134	96	109
69	97	97	81	80	59	97	184	115	126
118	113	59	104	108	90	103	106	145	73
57	87	107	134	146	137	141	76	71	61
41	56	93	96	74	96	99	112	57	55
64	106	90	118	62					

Sapwood statistics for oak: 20 [-5, +10].



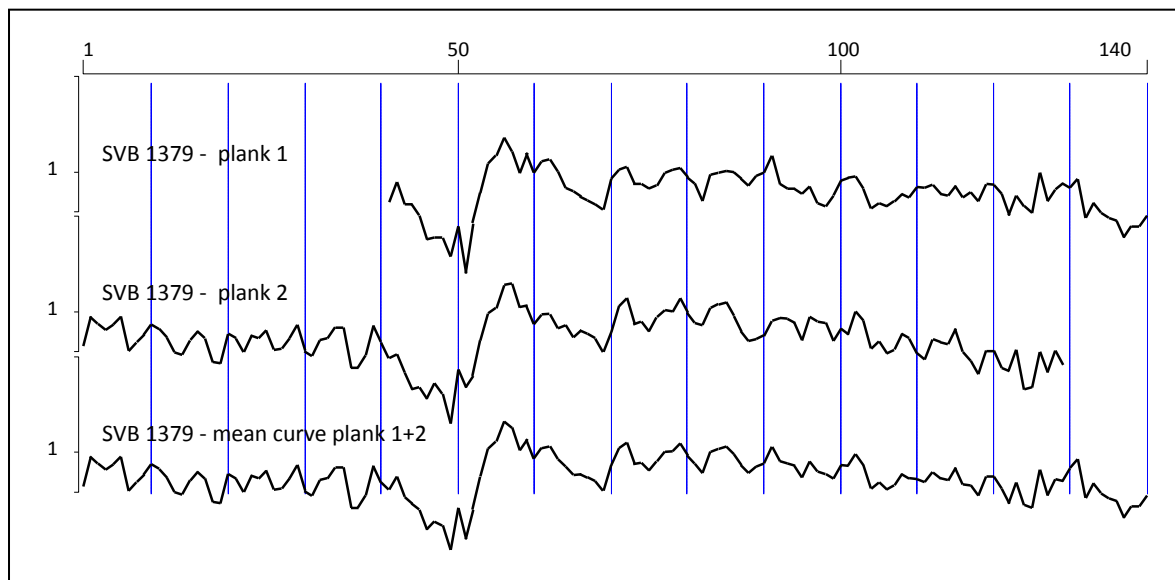
Photo: National Museum of Denmark



Photo: Svalbard Museum

<http://digitaltmuseum.no/011025164299?query=SVB%2002354&pos=0&count=1>

- SB SVB** Part of ship, 3 planks, 10.5x29x175cm, with sewing/witthes.
13 1379 Disc samples from 2 planks taken. Planks made of Scots pine (*Pinus sylvestris*). Not dated. The two tree-rings curves cross-date. Mean curve calculated. Wood identification of wedges and sewing not carried out yet.



Tree curve: **02970019.d**

Title : A9281 Svalbard SB 13 SVB 1379 bord 1 radii a+b

Raw Ring-width PISY data of 100 years length

Undated; relative dates - 41 to 140

Number of sapwood rings unknown and no bark surface

Average ring width 76.03 Sensitivity 0.19

61	85	59	59	49	33	34	34	25	41
19	43	71	115	131	176	140	98	137	99
119	123	101	77	73	67	63	59	54	90
104	109	82	82	76	80	99	104	107	92
83	62	96	99	102	100	90	80	94	99
131	82	76	76	70	79	60	57	68	87
91	93	76	55	60	57	62	70	66	78
77	81	70	68	80	66	72	62	82	81
70	49	68	57	51	99	62	75	83	77
89	47	60	51	47	45	34	41	41	49

Tree curve: **02970029.d**

Title : A9281 Svalbard SB 13 SVB 1379 bord 2 radii a-d

Raw Ring-width PISY data of 129 years length

Undated; relative dates - 1 to 129

Number of sapwood rings unknown and no bark surface

Average ring width 68.79 Sensitivity 0.21

57	93	83	75	82	93	53	61	69	82
76	66	52	50	63	73	65	44	43	70
65	52	68	65	74	54	55	65	81	53
49	63	65	78	78	40	40	49	80	61
47	50	37	28	29	24	31	26	16	39
29	35	63	98	107	156	160	108	111	82
96	97	77	81	66	74	70	65	52	72
111	126	82	86	73	92	103	101	126	99

84	81	107	114	118	94	73	62	64	68
87	91	90	84	63	93	86	84	62	76
69	101	87	55	62	51	54	70	65	51
46	64	61	59	76	52	45	36	53	53
40	38	54	28	29	52	37	53	42	

Mean curve: **02970m01.d**

Title : A9281 Svalbard SB 13 SVB 1379 board 1+2

Chronology mean Ring-width PISY data of 140 years length

Undated; relative dates - 1 to 140

Average ring width 70.01 Sensitivity 0.19

57	93	83	75	82	93	53	61	69	82
76	66	52	50	63	73	65	44	43	70
65	52	68	65	74	54	55	65	81	53
49	63	65	78	78	40	40	49	80	61
54	67	48	43	39	28	32	30	20	40
24	39	67	106	119	166	150	103	124	90
107	110	89	79	69	70	66	62	53	81
107	117	82	84	74	86	101	102	116	95
83	71	101	106	110	97	81	71	79	83
109	86	83	80	66	86	73	70	65	81
80	97	81	55	61	54	58	70	65	64
61	72	65	63	78	59	58	49	67	67
55	43	61	42	40	75	49	64	62	77
89	47	60	51	47	45	34	41	41	49



Sample 02970019. Plank, 15cm wide. Photo: National Museum of Denmark



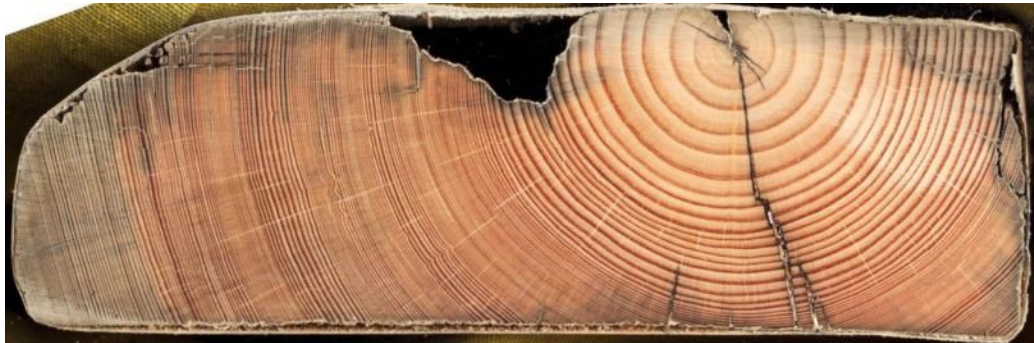
Sample 02970029. Plank, 15cm wide. Photo: National Museum of Denmark



Photo: Svalbard Museum

<https://digitaltmuseum.no/011025368180/?query=svb%2001379&pos=0&count=1>

- SB SVB** Part of ship, plank (or gunwhale?), 4x17x400cm, with sewing.
- 14 2415** Sample taken as cross section. Plank made of Scots pine (*Pinus sylvestris*). No reliable measurement obtained due to very narrow annual rings (see photo) and the possibility of missing rings. The radii do not cross date. So far we had to give up on the sample. Due to this there are no data in the catalogue relating to this sample. We recommend to remeasure the sample after cutting off a disc, ca. 3cm thick. Wood identification of wedges and sewing/withes not carried out yet.



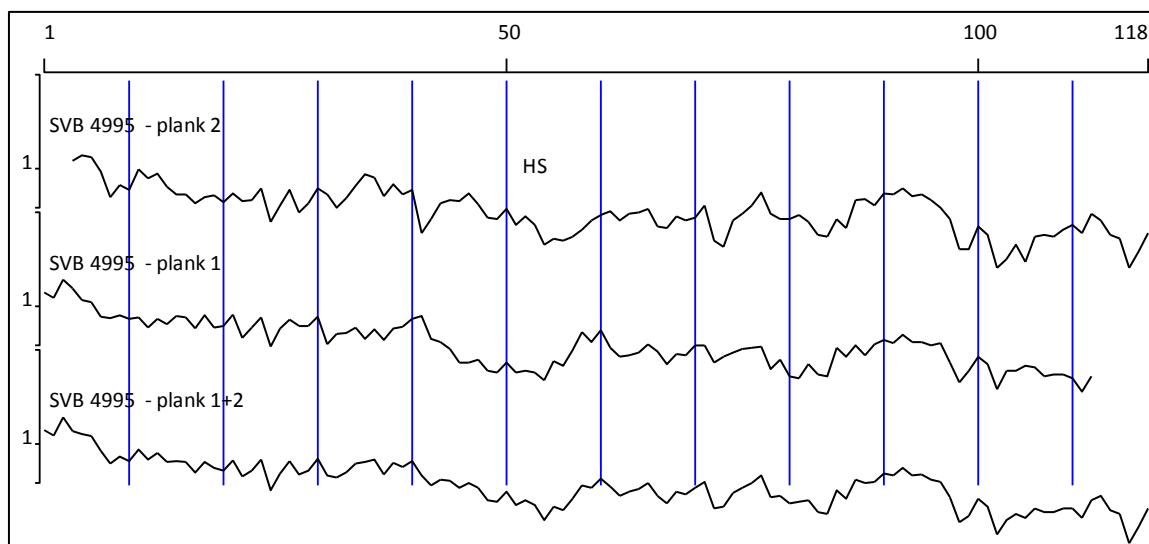
Sample 0300001, 15cm wide. Photo: National Museum of Denmark



Photo: Svalbard Museum

<https://digitaltmuseum.no/011025164447/?query=SVB%2002415&pos=0&count=1>

- SB SVB** Part of ship, 3 planks, 4.5x21.5x149cm, with sewing/withes.
15 4995 Disc samples from 2 planks taken. Planks made of Scots pine (*Pinus sylvestris*). Not dated. The two tree-rings curves cross-date. A mean curve calculated. Samples from caulking taken; identification not carried out yet. Wood identification of wedges and sewing/withes not carried out yet.



Tree curve: **02980019.d**
 Title : A9281 Svalbard SB 15 SVB 4995 plank 1 radii a-c
 Raw Ring-width PISY data of 112 years length
 Undated; relative dates - -3 to 108
 Number of sapwood rings unknown and no bark surface
 Average ring width 56.60 Sensitivity 0.15

126	115	156	135	111	107	84	82	86	81
83	70	81	74	85	83	69	86	70	72
87	59	70	83	51	69	80	72	72	84
53	63	64	70	58	68	57	69	71	81
85	58	55	49	39	39	41	34	33	39
33	34	33	29	40	37	48	65	55	67
50	43	44	46	53	47	38	45	44	52
52	39	43	46	49	50	51	35	41	31
30	38	32	31	50	43	52	44	53	57
54	62	55	55	52	54	39	28	34	43
38	25	34	34	37	36	31	32	32	30
24	31								

Tree curve: **02980029.d**
 Title : A9281 Svalbard SB 15 SVB 4995 plank 2 radii a-d
 Raw Ring-width PISY data of 115 years length
 Undated; relative dates - 0 to 114
 65 sapwood rings and no bark surface
 Average ring width 52.15 Sensitivity 0.18

114	125	121	95	62	76	70	99	85	92
74	65	65	56	62	64	57	66	58	59
72	41	54	70	48	56	72	65	52	61
75	91	86	63	77	65	70	34	43	56
59	58	66	55	44	43	51	39	45	39
28	31	30	32	36	42	46	49	42	47

48	51	38	37	45	42	44	54	30	27
42	47	54	67	47	43	43	46	41	33
32	43	37	59	60	54	66	65	72	63
65	59	52	43	26	26	38	33	19	22
28	21	32	33	32	36	39	34	47	42
33	31	19	25	34					

Mean curve: **02980m01.d**

Title : A9281 Svalbard SB 15 SVB 4995 sample 02980019+02980029

Chronology mean Ring-width PISY data of 118 years length

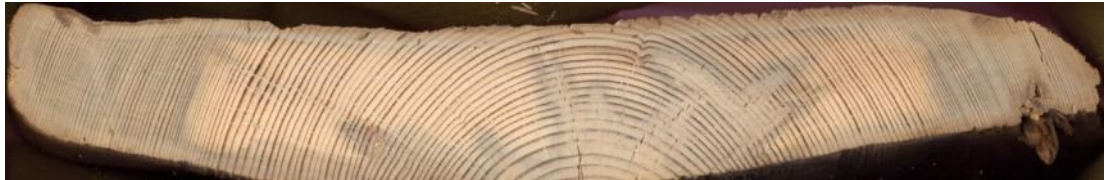
Undated; relative dates - -3 to 114

Average ring width 54.53 Sensitivity 0.15

126	115	156	124	118	114	89	72	81	75
91	77	86	74	75	74	62	74	67	64
76	58	64	77	46	61	75	60	64	78
59	57	62	72	74	77	60	73	68	75
59	50	55	54	48	52	48	39	38	45
36	39	36	28	35	33	40	50	48	56
49	42	45	47	52	42	37	45	43	48
53	34	35	44	48	52	59	41	42	37
38	39	32	31	46	40	55	52	53	61
59	67	59	60	55	53	41	27	30	40
35	22	28	31	29	34	32	32	34	34
29	39	42	33	31	19	25	34		



Sample 02980019. Plank, 7cm wide. Photo: National Museum of Denmark



Sample 02980029. Plank, 17,5cm wide. Photo: National Museum of Denmark



Photo: Svalbard Museum

<https://digitaltmuseum.no/011025370219/?query=svb%2004995&pos=0&count=1>

SB SVB Ladder, 299cm long. Probably from a (Russian) hunting lodge.
16 2984 1 disc sample taken, cross section. Ladder made of Scots pine (*Pinus sylvestris*). Dated. Made out of driftwood? Cross-date with chronologies from Karelia. FMP0004a, *t*-value BP 5,98, CDI 40

Tree curve: 02940019.d
 Title : A9281 Svalbard SB 16 SVB 2984 ladder rad a-d
 Raw Ring-width PISY data of 152 years length
 Dated AD1805 to AD1956
 81 sapwood rings and bark surface
 Average ring width 71.28 Sensitivity 0.14

104	100	117	110	151	109	123	101	118	137
171	181	150	156	176	154	181	169	162	147
152	113	125	105	119	89	96	89	79	71
47	46	49	62	83	78	77	69	73	66
60	65	60	60	113	104	94	78	89	78
70	87	95	78	61	67	71	70	88	85
78	69	55	63	57	64	58	40	40	45
60	41	57	72	54	53	39	35	31	38
63	55	59	63	72	71	66	72	67	53
43	55	47	52	45	44	61	45	54	64
67	52	49	50	46	37	35	40	36	43
47	48	50	43	40	34	34	43	41	45
34	30	35	37	43	58	43	49	38	45
40	46	51	46	55	61	54	47	55	49
63	54	59	73	72	70	74	60	59	58
65	53								



Sample 02940019. Ladder, diameter 23cm. Photo: National Museum of Denmark



Photo: Svalbard Museum

<https://digitaltmuseum.no/011025166206/?query=svb%2002984&pos=0&count=1>

- SB SVB** Stave from barrel, 2.4x15.5x119cm
17 3917 No dendro-sample taken. The object is not suited for dendrochronological study due to few and wide annual rings (56 rings).
Sample for wood identification taken. The stave is made of spruce (*Picea* sp.).



Photo: Svalbard Museum

<https://digitaltmuseum.no/011025370009/?query=svb%2003917&pos=0&count=1>

SB SVB Part from ship, keel with one plank. 'Kjøøl fra Hiorthhamn'
18 4993 4 cores taken: 1 from plank, 2 from the wigs of the keel, 1 from the keel.
 1 disc sample taken from the plank, 2.3x10.4cm. Keel and plank are made of spruce (*Picea* sp.). The tree curves of keel and board do not cross date, and no mean curve was calculated. Samples for wood identification taken from sewing; wood identification not carried out yet.

Tree curve: **02960019.d**

Title : A9281 Svalbard SB 18 SVB 4993 kjoel rad a-d

Raw Ring-width PCSP data of 131 years length

Undated; relative dates - 0 to 130

Number of sapwood rings unknown and no bark surface

Average ring width 119.45 Sensitivity 0.17

270	208	191	195	190	202	155	147	117	149
128	96	101	144	147	151	108	145	104	97
107	91	85	69	75	68	76	89	94	142
170	193	148	133	177	209	213	188	224	175
168	176	187	149	149	95	105	132	112	112
122	73	106	147	123	153	131	137	144	115
108	73	118	97	135	135	122	127	121	122
110	116	122	102	104	135	111	114	95	91
123	103	98	93	89	80	84	112	87	130
113	119	109	113	141	109	133	116	171	149
108	141	134	117	96	102	86	126	92	108
105	112	86	64	78	87	70	60	62	65
69	68	73	88	91	78	87	53	76	49
80									

Tree curve: **02960029.d**

Title : A9281 Svalbard SB 18 SVB 4993 bord rad a-c

Raw Ring-width PCSP data of 107 years length

Undated; relative dates - 1 to 107

Number of sapwood rings unknown and no bark surface

Average ring width 68.85 Sensitivity 0.20

108	132	70	87	100	121	216	208	135	154
152	165	117	102	90	88	67	51	56	84
100	108	71	109	60	66	73	71	67	51
47	60	54	75	77	85	83	80	87	75
80	69	64	73	59	51	53	46	59	53
43	47	51	47	36	32	38	38	29	39
43	42	32	38	48	34	41	39	39	31
44	59	37	20	24	54	62	86	78	80
75	83	85	61	47	72	55	59	15	38
35	74	66	72	57	59	67	72	58	57
66	62	53	60	51	67	61			



Sample 02960019. Keel, core samples. Photo: National Museum of Denmark



Sample 02960029. Plank, 10cm wide. Photo: National Museum of Denmark



Sample 02960019. Charlotte Kure Brandstrup is taking a core sample from the keel. Photo: National Museum of Denmark



Sample 02960019, keel. Photo: National Museum of Denmark



Photo: National Museum of Denmark

- SB SVB** Part of ship, wooden sculpture, figurehead with lion head, 58x273cm.
19 2049 The figurehead is made of Scots pine (*Pinus sylvestris*). Not dated.
2 core samples taken (sample nr. 0304001 and 0304002). The cores were broken and the radii do not cross date. No tree curve was calculated. So far we had to give up on this object. Due to this there are no data in the catalogue relating to this sample.



Photo: National Museum of Denmark



Photo: Svalbard Museum

<https://digitaltmuseum.no/011025162651/?query=svb%2002049&pos=0&count=1>

- SB SVB** Part of ship, rib, 45x45x270cm
20 4992 No dendro-samples taken. Not accessible. No context. The object is assumed to come from a Russian ship/boat type. This is not supported by the wood determination. Sample for wood identification taken. The object is made of oak (*Quercus* sp.)



Photo: Svalbard Museum

<https://digitaltmuseum.no/021025690319/?query=svb%2004992&pos=0&count=1>

SB 21 SVB 4991 Part of ship, big rib (most likely), ca. 30x30x255cm, with 16 wooden pegs on one side and ca. 17 on the other.

Two core samples were taken. The object is made of Scots pine (*Pinus sylvestris*).

Dated:

Troms, *t*-value BP 10.5, CDI 79

Nordland, *t*-value BP 8.1, CDI 54

Four samples for wood identification taken from wooden pegs. The pegs are made of Scots pine (*Pinus sylvestris*).

Tree curve: **03070019.d**

Title: A9281 Svalbard SB 21 SVB 4991 rib radii a-e

Raw Ring-width PISY data of 245 years length

Dated AD1560 to AD1804

Number of sapwood rings unknown and no bark surface

Average ring width 64.06 Sensitivity 0.16

Comment: 25 rings close to pith rejected

119	127	87	98	83	88	100	94	88	90
83	71	55	55	38	64	49	65	63	75
64	93	84	83	129	135	117	93	95	77
93	91	101	108	123	136	123	106	97	94
108	62	80	99	72	76	100	78	87	90
95	102	95	105	92	75	105	113	119	97
90	107	89	123	108	102	115	110	88	92
89	91	100	67	110	100	104	100	89	108
74	62	57	63	47	47	61	66	51	57
61	74	64	82	68	79	88	95	83	60
60	57	75	74	75	65	55	42	61	55
47	53	51	51	47	40	48	47	42	39
27	36	42	45	41	42	43	33	31	36
38	36	40	56	57	48	46	45	65	59
64	52	47	49	97	85	70	93	78	49
76	72	57	53	47	59	51	55	74	47
51	49	42	26	32	51	44	47	43	49
61	45	40	42	30	36	45	38	49	67
57	53	62	46	42	34	40	34	51	45
45	43	41	40	51	51	57	55	57	47
55	53	61	53	53	70	64	68	34	34
38	19	33	47	46	41	34	29	42	49
47	44	45	30	36	51	41	42	30	34
34	34	25	30	34	36	36	26	42	36
32	36	30	32	41					



Photo: National Museum of Denmark



Photo: National Museum of Denmark



Photo: National Museum of Denmark

Not on digitaltmuseum.no

- SB SVB** Part of skip, wooden sculpture (atlant) with 'mount'/beam.
22 4990 2 core samples taken from mount/beam. The wooden sculpture is made of Scots pine (*Pinus sylvestris*), and the beam is made of oak (*Quercus* sp.).
 No dendro-sample taken from the sculpture. It is not suited for dendrochronological study due to few and wide annual rings.

Tree curve: **03080019.d**

Title : A9281 Svalbard SB 22 SVB 4990 ophaeng atlant radii a+b

Raw Ring-width QUSP data of 53 years length

Undated; relative dates - 1 to 53

9 sapwood rings and no bark surface

Average ring width 174.60 Sensitivity 0.21

259	217	317	340	199	308	272	241	318	366
197	130	161	159	238	245	173	155	114	80
87	62	36	49	51	54	79	88	92	64
53	56	55	83	71	91	135	123	149	168
155	168	207	247	276	197	175	184	226	250
293	370	371							



Charlotte Kure Brandstrup is taking a core sample from the beam. Photo: National Museum of Denmark

Not on digitaltmuseum.no

- SB SVB** Part of ship, wooden sculpture, 18x45x305cm
23 4994 2 core samples taken. The object is made of Scots pine (*Pinus sylvestris*). Not dated. Core broken. App. 50 tree-rings toward pit, not measured. It is possible to prepare radii on the end surface (cross section)

Tree curve: **03050019.d**

Title : A9281 Svalbard SB 23 SVB 4994 figurehead radii a+b

Raw Ring-width PISY data of 107 years length

Undated; relative dates - 1 to 107

65 sapwood rings and no bark surface

Average ring width 93.95 Sensitivity 0.18

193	174	144	141	127	125	163	161	150	106
192	138	123	127	125	81	121	150	131	78
85	123	111	110	131	125	98	92	89	100
150	208	218	166	140	163	100	142	146	122
136	130	97	98	89	72	112	97	96	91
101	77	75	106	70	84	85	86	103	106
74	82	93	86	67	75	51	56	70	45
63	76	71	69	58	58	66	63	64	65
67	47	51	54	63	69	61	55	43	45
57	55	55	55	46	30	51	38	74	64
78	55	36	55	53	34	30			



Photo: National Museum of Denmark



Photo: Svalbard Museum

<https://digitaltmuseum.no/011025370215/?query=svb%2004994&pos=0&count=1>

SB SVB Wooden object, probably snow shovel or spade, 2x21x108cm

24 3918 No dendro-sample taken.

A very small sample was taken with the help of a piece of tape because we didn't want to destroy the object. There was too little material to identify the tree species. The object is made of wood from a broad leaved tree, not from a coniferous tree. Exact wood identification would require more material.



Photo: Svalbard Museum

<https://digitaltmuseum.no/011025370012/?query=svb%2003918&pos=0&count=1>

Acknowledgements

Anders Kirchhefer, Thomas Bartholin, Pentti Zetterberg and Willy Tegel have kindly provided reference-chronologies for conifers from Fennoscandia.

References:

t-value BP: Baillie, M G L, and Pilcher, J R. 1973. A simple crossdating program for tree-ring research. *Tree Ring Bulletin*, 33, 7-14.

Stabilisation of sapwood:

<http://www.pressler.com.de/englisch/preservation-of-sapwood->

Dendro-programs used:

Dendro by Ian Tyers

TSAP-Win™ <http://www.rinntech.de/content/view/17/48/lang,english/index.html>

LIGNOVISION™ <http://www.rinntech.de/content/view/18/49/lang,english/index.html>

Appendix 2

List over samples taken with permission from the Museum og Svalbard.

Gjenstandsnummer fra søknad	SVB Nummer	Tillatelse fra Svalbard Museum	Utført prøvetaking
1	SVB 4996	Prøvetaking utføres i henhold til søknad	ingen dendroprøve, 1 trænagle, materiale til vedbestemmelse
2	SVB 3921	Prøvetaking utføres ved å sage ut en skive	ingen dendroprøve, excentrisk vækst
3	SVB 3920	Prøvetaking utføres ved å sage ut en skive	ingen dendroprøve, excentrisk vækst, nedbrudt
4	SVB 3916	Prøvetaking med 9,5mm hulbor og prøvetaking av syng	3 boreprøver + splintstabilisering
5	SVB 3915	Prøvetaking med 9,5mm hulbor og prøvetaking av syng	2 boreprøver + splintstabilisering
6	SVB 2985	Prøvetaking med hulbor eventuelt sage ut en skive.	1 endestykke, 1 boreprøve
7	SVB 1736	Prøvetaking med hulbor eventuelt sage ut en skive.	1 endestykke, del af trænagle til vedbestemmelse
8	SVB 1733	Prøvetaking med 9,5mm hulbor	2 boreprøver, prøver kasseret
9	SVB 372	Prøvetaking utføres ved å sage ut en skive	ingen dendroprøve, dårlig bevaringstilstand, meget indtørret
10	SVB 1737	Prøvetaking utføres ved å sage ut en skive om det sages nær en ende.	1 endestykke
11	SVB 1730	Prøvetaking med hulbor	2 boreprøver, stor trænagle
12	SVB 2354	Prøvetaking med 9,5mm hulbor	1 boreprøve
13	SVB 1379	Prøvetaking med hulbor eventuelt sage ut en skive.	1 endestykke, som inneholder 2 brædder

Gjenstandsnummer fra søknad	SVB Nummer	Tillatelse fra Svalbard Museum	Utført prøvetaking
14	SVB 2415	Prøvetaking med hulbor eventuelt sage ut en skive.	1 endestykke
15	SVB 4995	Prøvetaking med hulbor eventuelt sage ut en skive.	1 endestykke, som inneholder 2 brædder
16	SVB 2984	Prøvetaking med hulbor eventuelt sage ut en skive.	1 skive
17	SVB 3917	Prøvetaking ved å sage ut en skive.	Ingen dendroprøve taget, kun 56 årringe
18	SVB 4993	Prøvetaking med hulbor	4 boreprøver, 1 skive fra bord
19	SVB 2049	Prøvetaking med hulbor	2 boreprøver
20	SVB 4992	Prøvetaking med hulbor	Ingen dendroprøve taget
21	SVB 4991	Prøvetaking med hulbor	2 boreprøver
22	SVB 4990	Prøvetaking med hulbor	2 boreprøver
23	SVB 4994	Prøvetaking med hulbor og preparering av målebaner i enden.	2 boreprøver
24	SVB 3918	Formentlig sneskovl	Overflate rensed af med Wishab og sotsvamp, bilder taget til dendroundersøgelse. Gel lifter + tape til vedbestemmelse.

Vedanatomisk analyse af vrag, vragdele og slæde fra Prins Karls Forland og Edgeøya, Svalbard

NNU rapport 4 ● 2015
NNU j.nr. A9281

Jonas Ogdal Jensen og
Claudia Baittinger



Bevaring og Naturvidenskab
Miljøarkæologi og Materialeforskning
Dendrokronologi

Sponsored by



**Vedanatomisk analyse af vrag, vragdele og slæde fra Prins Karls
Forland og Edgeøya, Svalbard**

af

Jonas Ogdal Jensen og Claudia Baittinger

Prins Karls Forland

Fylke: Svalbard

Kommune: Forlandet nasjonalpark

Træartsbestemmelse af vrag og vragdele.

Prøver taget af Kristin Foosnæs juni/juli 2014.

Edgeøya

Fylke: Svalbard

Kommune: Søraust-Svalbard naturreservat

Træartsbestemmelse af vrag, vragdele og slæde.

Prøver taget af Snorre Haukalid sommer 2014.

Indsendt af Sysselemanden på Svalbard ved Snorre Haukalid.

Prøver modtaget i oktober 2014.

Undersøgt af Jonas Ogdal Jensen og Claudia Baittinger.

Rapport udarbejdet i februar 2015.

NNU j.nr. A9281

Efter gennemført undersøgelse returneres prøverne til Sysselemanden på Svalbard.

Publicering

Med mindre andet er aftalt, kan resultatet frit anvendes med henvisning til denne rapport. Kontakt evt. laboratoriet for hjælp og yderlige oplysninger (dendro@natmus.dk).

Prins Karls Forland

Prøver fra 4 vrag/vragdele og slæde er undersøgt og artsbestemt.

Prøve:

Askeladden ID

177950 Slæde af træ. Løsfund. Fra Poolepynten – Damsiget.
Koordinater; X:430188, Y:87092013

1. Prøve fra tværbjælke er bestemt til ***Picea sp.*** (gran).
2. Prøve fra træ fundet under slæden er bestemt til ***Alnus sp.*** (el, or).

Askeladden ID

177951 Skibsdel af lukke eller skylightramme. Fra Poolepynten – Damsiget.
Koordinater; X:430183, Y: 8701186

1. Prøve fra skibsdel er bestemt til ***Picea sp.*** (gran).

Askeladden ID

177924 Letbåd eller fangstbåd. Skibsvrag. Fra Poolepynten – Damsiget.
Koordinater; X:429835, Y: 8708432

1. Prøve af skibsvrag er bestemt til ***Picea sp.*** (gran).

Askeladden ID

177923 Agterspejl af gammelt sejlskib. Skibsdel. Fra Lagunestranda.
Koordinater; X:428567, Y:8709685

1. Prøve fra skibsdel er bestemt til ***Pinus sp.*** (fyrretræ, furu).

Mureflota på Edgeøya

Prøver fra 3 vrug sydøst på Edgeøya er undersøgt og artsbestemt.

Prøve:

Askeladden ID

92772 Skibsvrag. Hele bundsektionen af et fartøj.

1. Prøve fra plugg er bestemt til *Quercus sp.* (eg, eik).
2. Prøve fra spant er bestemt til *Quercus sp.* (eg, eik).
3. Prøve fra kjøll er bestemt til *Quercus sp.* (eg, eik).
4. Prøve fra bord er bestemt til *Quercus sp.* (eg, eik).

Askeladden ID

134721 Skibsvrag. Delvist begravet.

1. Prøve fra spant er bestemt til *Quercus sp.* (eg, eik).
2. Prøve fra plugg er bestemt til *Quercus sp.* (eg, eik).
3. Prøve fra bord er bestemt til *Quercus sp.* (eg, eik).

Askeladden ID

134722 Vragdele liggende løst på sandet.

1. Prøven er bestemt til *Quercus sp.* (eg, eik).

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