A Dendroarcheological Analysis of St. Antoine-Padoue Church, Richibucto-Village, New Brunswick

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Abstract

In an effort to obtain old beams of white pine (*Pinus strobus*), sampling was conducted in the basement of St. Antoine-Padoue Church in Richibucto-Village, New Brunswick, on July 21, 2007. Eleven tree-ring samples were collected by the Mount Allison Dendrochronology Lab (MAD Lab). Samples were ultimately deemed not to be white pine, but were processed nonetheless in order to determine the age of the basement of St. Antoine-Padoue Church. Samples were processed and cross-dated to regional master chronologies of both red spruce (*Picea rubens*) and eastern hemlock (*Tsuga canadensis*), and samples were subsequently determined to be red spruce. Beams varied in age, dating between 1817 and 1875. All of the interior beams that were sampled, dated to approximately 1820, which is likely the year the church was moved. One of the sill beams was dated to 1875 - two years before the extension was added to the church. None of the current beams sampled are from the original construction of the church in 1798.

Introduction

In an effort to create a lengthy white pine (*Pinus strobus*) master chronology for the Maritime region, the Mount Allison Dendrochronology Lab (MAD Lab) undertook a search for old structures suspected to be constructed of white pine. The St. Antoine-Padoue Church (Figure 1), located on the eastern coast of New Brunswick, Canada, in Richibucto-Village (Figure 2), was sampled for this purpose. The history of St. Antoine-Padoue states that the church was built in 1798 near the ocean, but was subsequently moved a half a mile inland during the early 1800's. In 1877, construction occurred that expanded upon the original structure.

Figure 1. St. Antoine-Padoue Church.

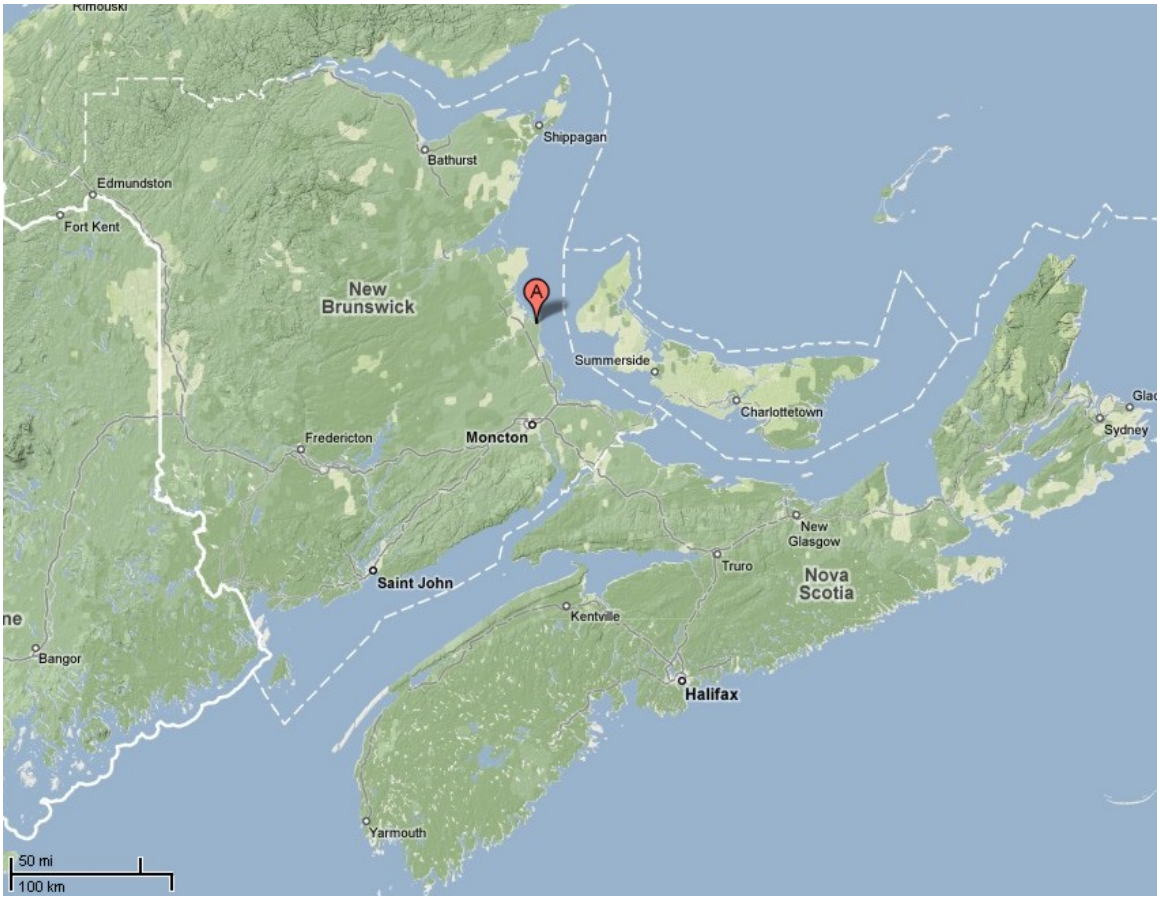

Figure 2. Map of the Maritime provinces, Richibucto-Village (A). Google Maps, 2008.

Methods

Samples were taken from beams on which either remnants of bark or the presence of wormwood could be identified. In the absence of bark, wormwood – which occurs in the cambium between the wood and the bark – is an equally reliable sign that the last year of growth is present. Increment corers were used to collect 11 samples from the basement of St. Antoine-Padoue Church during the summer of 2007 (07BDS000) (Figure 3.).

Figure 3. Basement of the St. Antoine-Padoue Church displaying axe-hewn beams.

In the lab, samples were mounted to boards and sanded with progressively finer sanding paper (40-400 grit) to bring out the cellular structure and annual rings of the wood. Each core was then measured (0.001mm) using the measuring program Windendro. Floating chronologies from the samples were cross-dated to a previously-established master chronology from the area. Cross-dating refers to the practice of taking the pattern of growth from one sample of unknown age and comparing it to another of a known age (Figure 4). The floating chronology from each St. Antoine-Padoue sample was matched to the master chronology using the statistical cross-dating program COFECHA (Holmes 1986). This program uses correlation values to assist in the accurate dating of samples. Higher correlation values indicate that the floating chronology corresponds well to the master chronology. Lower correlation values can indicate, among other things, ecological or climatic variation from the norm or that the sample is inaccurately dated. Due to the uncertainty of the species of wood, the floating chronology was run against both a red spruce (*Picea rubens*) and an eastern hemlock (*Tsuga canadensis*) master chronology. This ensured that the patterns found in the samples could be referenced to one of the two species.

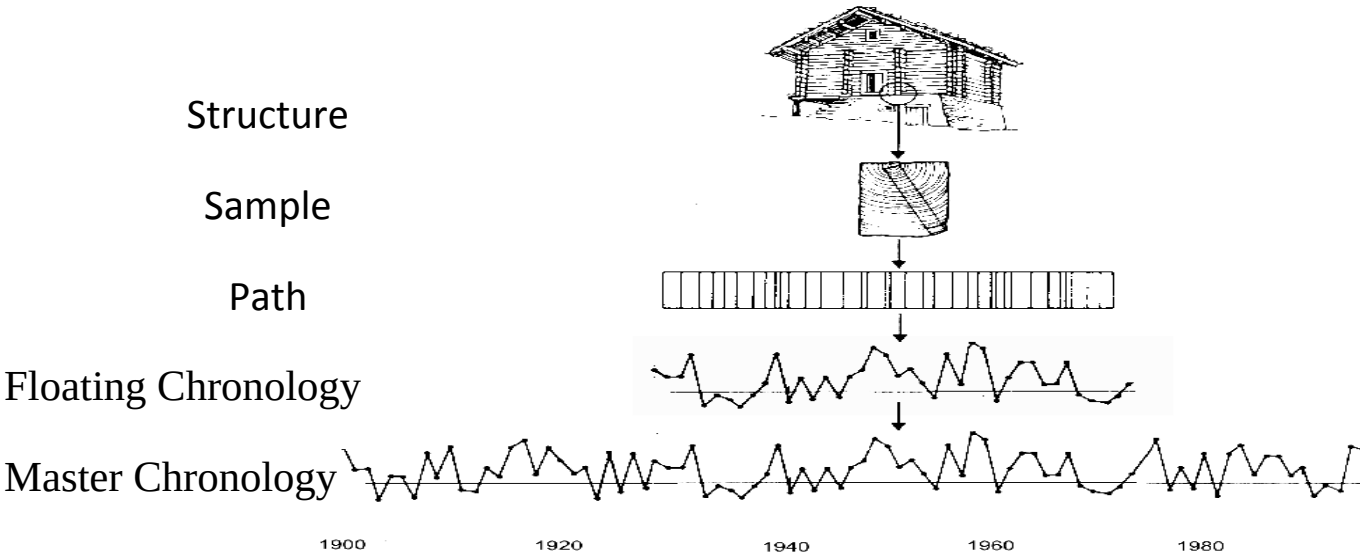

Figure 4. Example of cross-dating by using patterns from a structure (floating chronology) compared to the master chronology.

Visual comparison between the master chronologies and the floating chronologies was conducted. Each of the floating and master chronologies were standardized to have a mean of 1 by using a negative exponential curve in the program ARSTAN (Holmes 1986). Standardizing chronologies allows samples of different ages to be compared.

Results and Discussion

Of the 11 samples taken, only seven could be cross-dated. Four samples could not be dated, as they were too twisted or broken. The correlation of the floating chronology from the samples was 0.541 (Table 1). The floating chronology correlated more closely to the red spruce master chronology (0.372) (Figure 5) than to the hemlock master chronology (0.182) (Figure 6). The floating chronology was locked into time from 1668 to 1875 with the red spruce master chronology.

The red spruce master chronology illustrates occasional periods of reduced ring widths caused by spruce budworm outbreaks. These periods of reduced ring width were also reflected in the floating chronology, with an additional outbreak not seen in the master chronology. The master chronology is primarily comprised of red spruce in southern New Brunswick, where this additional outbreak apparently did not occur.

Table 1. Correlation and time spans of samples taken from the basement of St. Antoine-Padoue Church.

Sample	Correlation	Reference	Condition	Time span
07BDS001	0.362	Uberred.txt	woodworm	1727-1820
07BDS002	0.631	Uberred.txt	woodworm	1701-1875
07BDS003	0.549	Uberred.txt	woodworm	1683-1817
07BDS004	0.655	Uberred.txt	woodworm	1668-1819
07BDS005	0.434	Uberred.txt	woodworm	1733-1820
07BDS006	N/A		Twisted	
07BDS007	0.296	Uberred.txt	woodworm	1772-1837
07BDS008	N/A		broken near end	
07BDS009	0.654	Uberred.txt	woodworm	1705-1820
07BDS010	N/A		Twisted	
07BDS011	N/A		Twisted	
	0.541			1668-18775

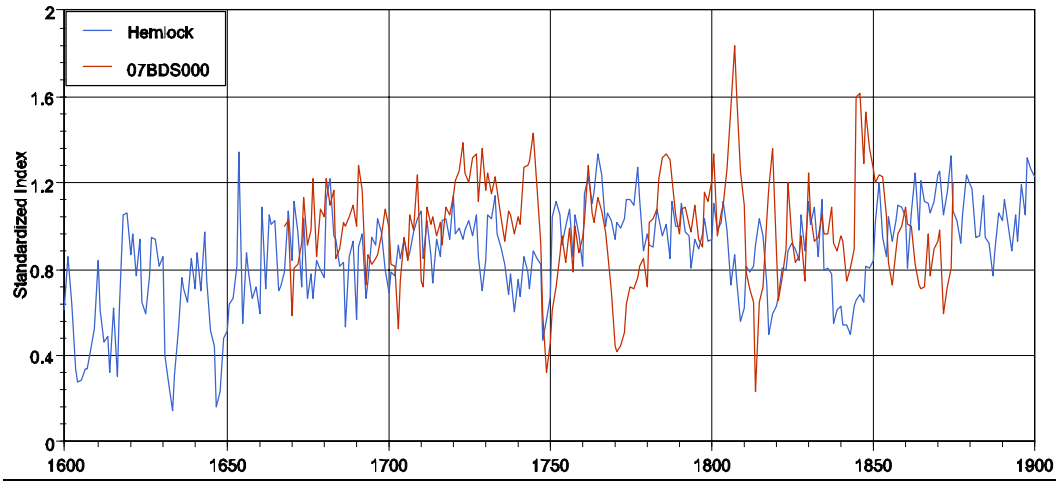

Figure 5. Comparison between the master hemlock chronology and the floating chronology

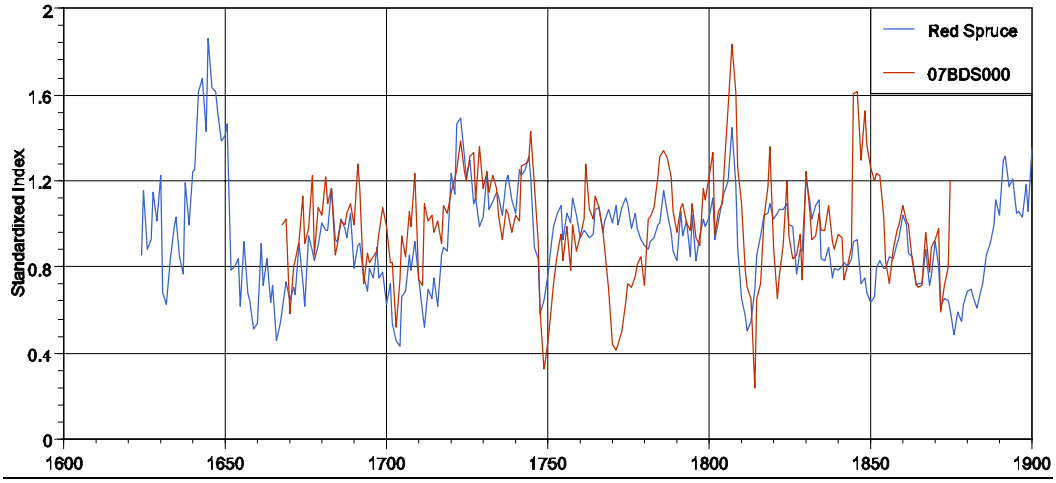

Figure 6. Comparison between the master red spruce chronology and the floating chronlogy

Of the seven dated samples, five had end years of approximately 1820 (1817-1820) while two samples were younger (1837 and 1875) (Table 1, Figure 7). The two younger samples were obtained from sill beams on the exterior portion of the building. The youngest sample (1875) was obtained from a sill beam between two portions of the church (Figure 7). This beam was most likely installed during the expansion of the church in 1877. The 1837 sample was from an exterior sill beam, which is more susceptible to rot and damage than an interior beam, and is thus more frequently replaced. The fact that all five of the interior beams dated to approximately 1820 suggests that in 1820-1821 the basement was either constructed or reconstructed. This could also suggest the possible year in which the church was moved from the coast.

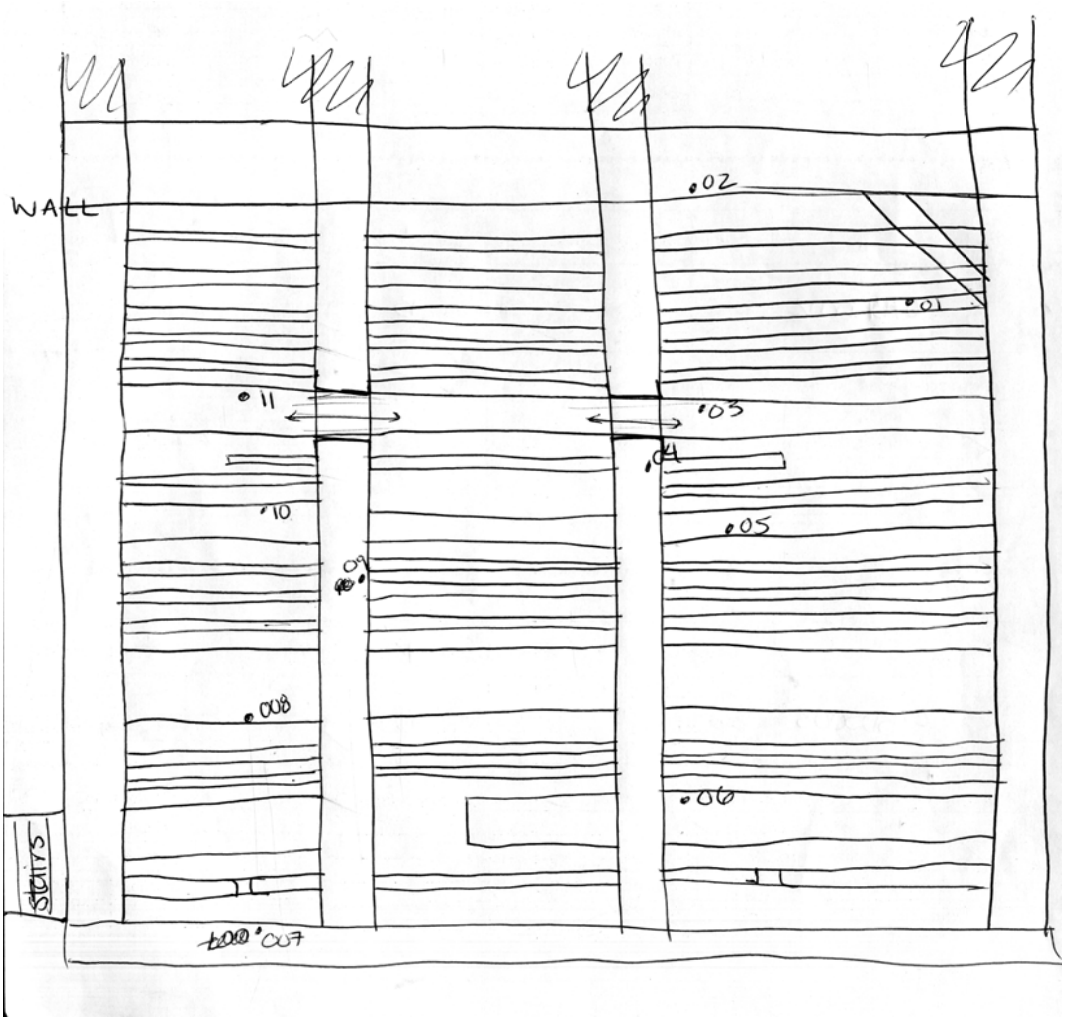

Figure 7. Hand sketched map of the basement of St. Antoine-Padoue Church. Numbers denote where samples were taken.

Conclusions

The St. Antoine-Padoue Church basement is not composed of white pine, but rather of red spruce. None of the current support beams are from the original construction of the church in 1798. Five of the beams date to approximately 1820, which is potentially the year that the church was moved from the coast. The sill beam connecting the older portions of the church to the new portions has a kill date of 1875 – two years before the extensions were added. The chronology created from St. Antoine-Padoue adds to the regional chronology of red spruce and shows evidence of a spruce budworm outbreak not found in southern New Brunswick.

References

Holmes, R.L. (1986). Users manual for program COFECHA. In *Tree-ring chronologies of western North America: California, eastern Oregon, and northern Great Basin* (eds R.L. Holmes, R.K. Adams & H.C. Fritts), pp. 41-49. Laboratory of Tree-Ring Research, University of Arizona, Tucson.

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