Aging the keel of the Theresa E. Connor schooner

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Abstract

The Theresa E. Connor Schooner underwent renovations and repairs during the spring of 2009. As part of the renovation cores were taken from portions of the boat that were believed to be part of the original structure. Four cores from the keel of the schooner were sent to the Mount Allison Dendrochronology Laboratory (MAD Lab) to determine the age of the wood used in the construction of the keel. Samples were given the MAD Lab code 09CS000, glued to boards, measured and cross-dated to related species. The samples consisted of two genera: *Betula* (birch) and *Picea* (spruce) though neither could be identified down to the species level.

Introduction

In 1937 the Schooner Theresa E. Conner (Figure 1) was built in Lunenburg, Nova Scotia. This ship worked as a fishing schooner years before the decline of fishing via schooners. The Theresa E. Conner was a contemporary of the Bluenose, though it did not compete in races. In 1967 it was decided to preserve the Theresa E. Conner as a symbol of the fishing industry and of the cultural heritage it represented from the south shore of Nova Scotia.

During the spring of 2009 the Theresa E. Conner underwent restoration in Lunenburg. There are few original portions of the boat remaining due to previous repairs. One of the main sections of the schooner that is still represented is the keel and the keelson. During the restoration process four cores were taken from the keel of the schooner in order to test the soundness of the wood (Figure 1). These samples were sent to the Mount Allison Dendrochronology Laboratory (MAD Lab) for potential dendrochronological dating of the wood. Dendrochronology is a scientific field that uses patterns in the annual growth rings of trees to establish a chronology (or pattern) that samples can be dated against.

Figure 1 - Painting of the Theresa E. Connor. Samples of the approximate position that the cores were extracted from the keel are labeled on image. (Source http://www.nsschooner.ca/grandbankers/grandbankers.html).

Methodology

The cores taken from the Theresa E. Connor were extracted in pieces and sent to the MAD Lab. Samples were given a MAD Lab code of 09CS000. The cores were as carefully as possible put back together before processing (Appendix A). The pieces were then glued to slotted mounting boards and sanded with progressively finer sanding paper (80-400grit) to bring out the cellular structures of the annual rings of the wood. Rings were counted and measured from the perimeter

to the center of each core using a Velmex measuring system with an accuracy of 0.001mm. A number of the samples were broken near the last few years of growth, preventing accurate measurement and dating (see Appendix A).

The floating chronologies from the four samples were then cross-dated to previously-established master chronologies of each species from Nova Scotia. Cross-dating is the practice of taking the pattern of growth from one sample and comparing it to that of another (Figure 2). In this case, we took the floating chronology from each keel sample path and matched its patterns to the previously developed master chronology using the statistical cross-dating program COFECHA (Holmes 1986). This program uses correlation values to assist in accurately dating samples. Higher correlation values indicate that the floating chronology corresponds better to the master chronology. Lower correlation values can indicate a variety of things such as ecological or climatic variation from the norm or that the sample is inaccurately dated.

Given that we only had four samples to assess, and that the samples were short in length, two independent assessments of each core taken from the Theresa E. Conner were conducted. Though this does not increase the statistical correlation, it does add confidence to any results.

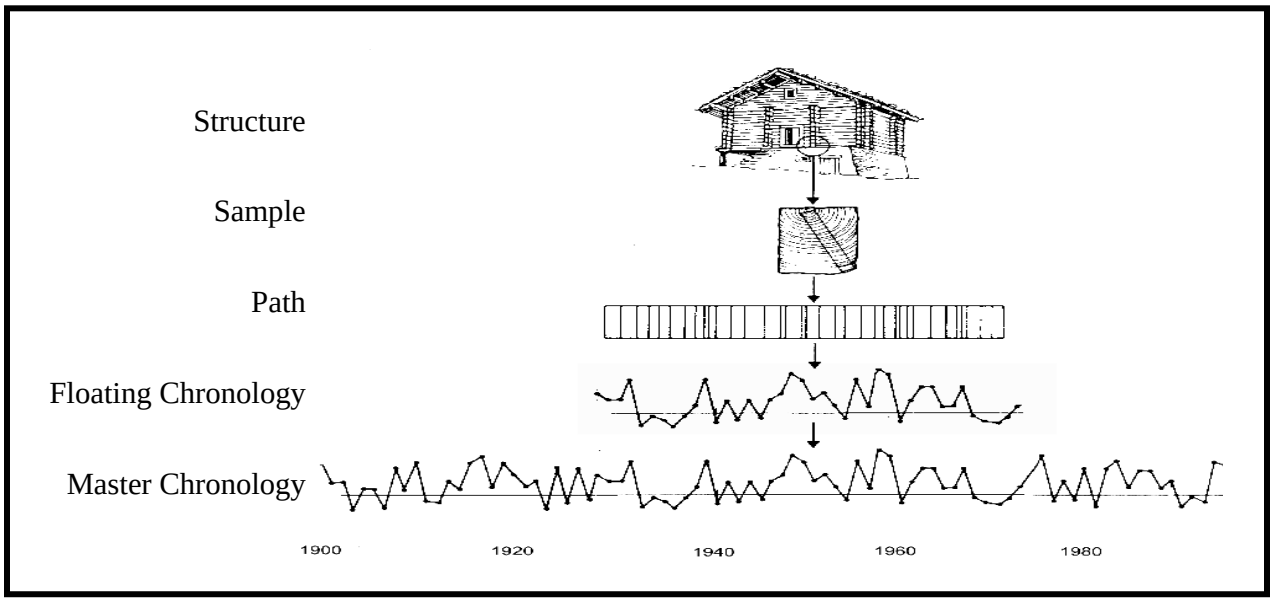

Figure 2 - Example of cross-dating by using patterns from a structure (floating chronology) compared to the master chronology.

Results and Discussion

Three of the cores taken from the keel and keelson of the Theresa E. Connor were birch while the fourth core was composed of spruce. The birch samples have drastically changed color due to being submersed in salt water for the past 70 years. It was identified as birch by comparing the samples to other samples in the MAD Lab which have also been submerged in saltwater for a long period of time. The spruce sample's anatomically and visually looks as though it has just

been removed from a tree. The contrast in the wood coloration is due to birch being a diffuse porous species of hardwood. These pours allowed saltwater to enter the wood and alter the woods composition. None of the sample had outer rings or bark present.

Table 1 - Sample, predicted species, actual species, location in boat, number of years, inter-series correlation and date of the cores taken from the keel of the Theresa E. Connor.

Sample	Predicted Species	Species	Location	Years	Inter-series	Date
09CS001	Birch	Birch	Aft end of fish hold	56	0.371	?
09CS003	Birch	Birch	Mid fish hold	25	0.308	?
09CS004	Birch, Maple, Elm	Birch	Sternpost	48	0.174	?
09CS002	Spruce	Spruce	Ahead of foremast	77	-	1827-1903

The average age of the cores was 51.5 years (Table 1). In order to successfully cross-date a series statistically, 30-50 years of rings are generally needed, and the longer the series the more reliable any dating becomes. The spruce core was cross-dated to the MAD Lab's regional red spruce chronology with a correlation of 0.317 (Figure 3). The last year present on the spruce core was from 1903, though this is not the cut year due the wood being carved into the keel. The birch cores were cross-dated with each other with an inter-series correlation of 0.280 (Figure 4). The cores were then cross-dated against three yellow birch chronologies from the Bay of Fundy region in New Brunswick. They however, could not be pattern-matched.

Difficulties in dating the birch potentially occurred due to the trees in both chronologies being affected by different growing environments. Trees growing in the Bay of Fundy are affected by climate patterns from both continental and maritime environments, and through interactions with the bay. Conversely, the trees growing in the Lunenburg area are affected by climate patterns from the open Atlantic Ocean. Another possibility is that the cores are from white birch, while the master chronologies are from yellow birch.

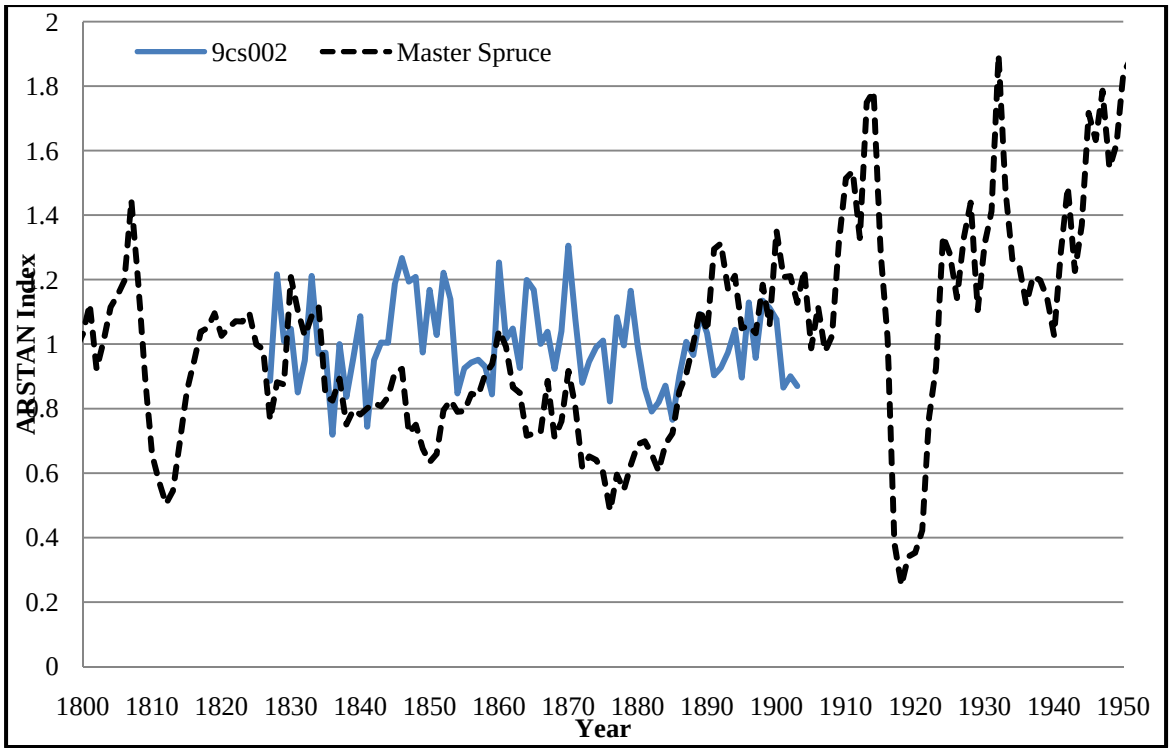

Figure 3 - Spruce chronology from the keel of the Theresa E. Conner compared with the regional master red spruce chronologies.

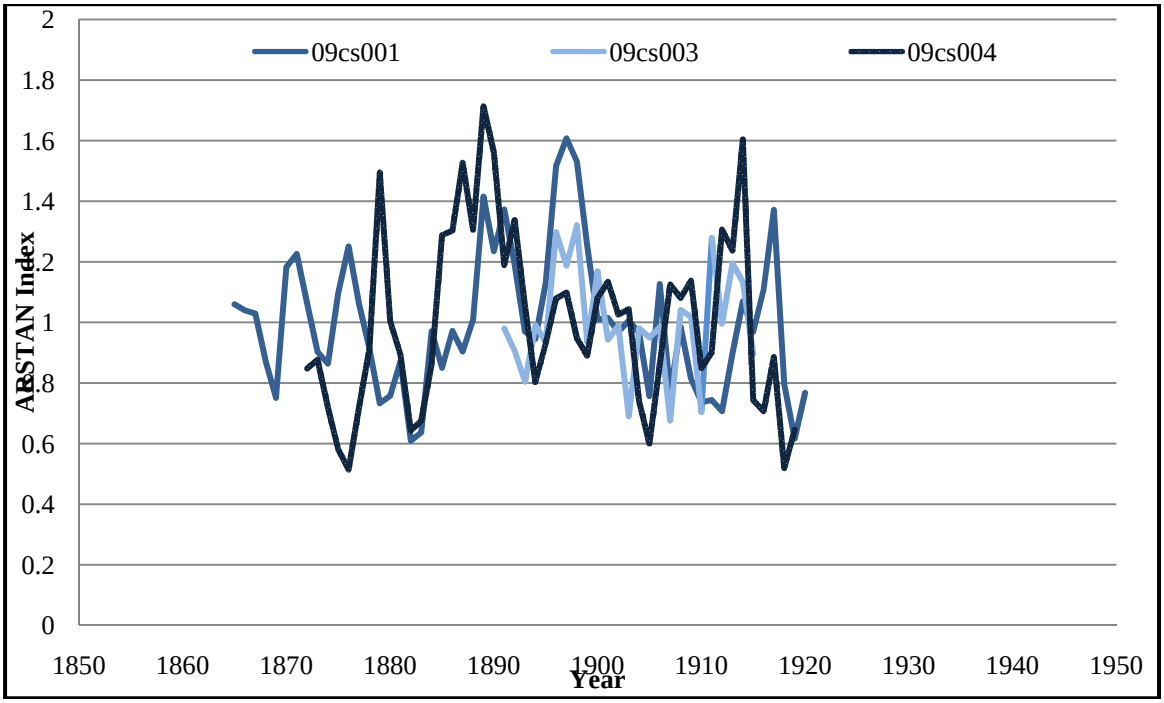

Figure 4 - Birch chronologies from the keel of the Theresa E. Conner compared to one another.

Conclusion

In this case, dendrochronological analysis cannot determine the age of the beams used for the keel of the Theresa E. Connor Schooner for a number of reasons. The primary reason is that there are no outer rings or bark present to indicate the year that the logs were harvested. Secondly, the birch cores could not be accurately pattern-matched to establish yellow birch chronologies from the Fundy Bay area of New Brunswick.

The spruce core that was taken from ahead of the foremast covers the time span from 1827 to 1903. In order to more accurately date the keel samples, a live chronology from the southeastern shore of Nova Scotia would need to be created. Even with this procedure being completed, there would be no guarantee that the cores could be dated due to the relatively small number of rings present on each sample core, and the exact origin of the wood used in the keel unknown.

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.

Nova Scotia Schooner Association (2009)
http://www.nsschooner.ca/grandbankers/grandbankers.html

09CS001 - Aft end of Fish Hold - Birch?

09CS002 - Ahead of Foremast - Spruce

09CS003 - Mid Fish Hold - Birch? Beech

09CS004 - Sternpost - Birch? Maple? Elm?