Dendrochronological dating of a historic dock on the Cayuga Lake Inlet, Ithaca, NY

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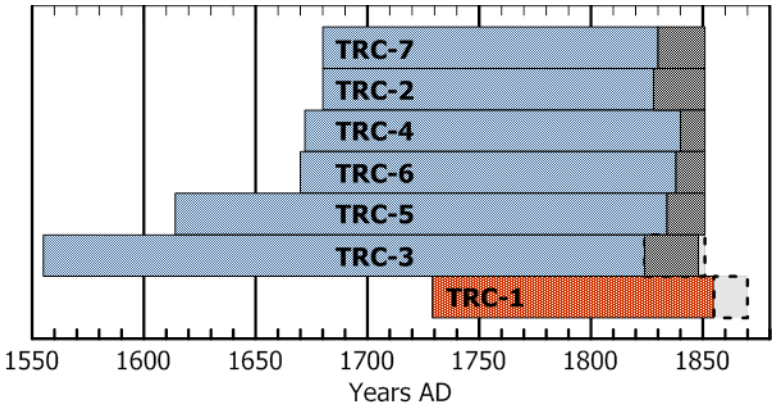
The Collyer Boathouse of Cornell University sits on the east bank of the Cayuga Inlet on the south end of Cayuga Lake just north of where Six Mile Creek drains into the inlet (Figure 1). Todd Kennett, head coach of Cornell University's Rowing Crew, called to tell us that in construction of the new rowing facility, posts and beams had been found along the inlet on the south side of the building, from an old dock and possibly a retaining wall; all are oak timbers. He asked if we would date the construction of the dock, and cut sections off each of seven logs that had been pulled out of the bank of the inlet. He also asked that we return the samples for display at the boathouse.

Figure 1. Collyer Boathouse is the building with 3 docks east of the inlet, and north of the two streams conjunction.

Methods: The cross-sections were sanded progressively from 80 to 1000 grit sandpaper to view the cellular structure and ring boundaries and identify the species. Ring widths were measured with the sample on a moving table, under a microscope with crosshairs, to 0.01mm accuracy. A description of the samples and their specifics are listed in the appendix. The ring-width sequences of samples of the same genus or species were compared to each other to match ring-width patterns using statistical tests to suggest possible positions, and visual comparisons to confirm the secure placement, where patterns are consistently similar across the overlap of the two samples. For the seven

samples, all securely cross-date to each other, and were relatively dated to each other, their individual growth idiosyncracies were removed, and the detrended data were combined into a chronology. The chronology was then similarly compared to established



oak regional chronologies from the central New York region to securely date it in time.

Figure 2. The bars represent the lifespan of the trees and their felling dates. Darker segments to the right are sapwood rings. The dashed lines indicate the estimated numbers of sapwood rings in the two samples without waney edges. The top six bars represent the six samples from the original structure that were felled after the growing season in 1851 to early 1852; the bottom bar represents the addition that was built ca. 1870. The construction dates (and X-axis values) are based on the calendar dates determined by the placement shown in Figure 3.

Results: A bar graph of the time series of the tree-ring widths of the seven samples is illustrated in Figure 2. Note that six of them have measurable sapwood and five of those have a "waney edge" (only bark removed) and end in the same year. The sixth one ends a few years earlier because its outer rings had deteriorated and could not be measured, but an estimated count of those rings plus its number of sapwood rings indicates that it most likely was felled at the same time as the others (the dashed line). The comparison of their chronology to the regional oak chronology places the outer ring date at 1851 (Figure 3); the well-preserved rings on the waney-edged samples are complete rings indicating that the timbers were felled sometime from late summer of 1851 to the late winter of 1852, before the 1852 growing season started.

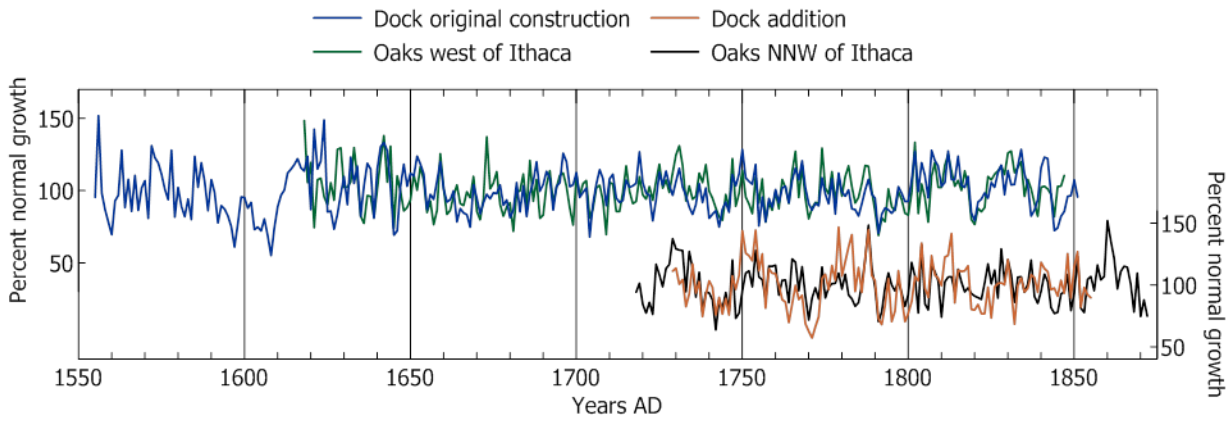


Figure 3. The placement of the chronologies of the original construction and the addition on two regional oak chronologies, west, and NNW of Ithaca. All the four data sets correlate significantly with each other with T-scores above 5.8 and correlation coefficients above 0.47. There are visible differences in the growth patterns of the two groups above during certain periods (e.g. 1800-1830), indicating a more local than regional climate pattern at those times.

The tree-ring sequence of the seventh sample, a squared beam with crushed sapwood, ends in 1855 at the heartwood/sapwood boundary, with no clear evidence of a waney edge beyond the sapwood (Figure 3). From the minimum sapwood count of 11 rings from the other six samples, this tree was probably cut down sometime after 1865, most likely in the early 1870s, and was part of a repair or addition to the structure at that time. Its slightly different ring-width patterns also indicate that this timber probably came from a different source.

The narrow ring width and the age of the trees used in the original construction (172 to 294) indicate that they came from a closed old-growth forest, with the oldest tree's pith ring dating to 1554 AD. The sample from the addition comes from a younger tree but still has narrow ring widths.

Historic context (based on personal interpretation with no in-depth historic research) The settlement of this region in the late 1700s-early 1800s depended on the Finger Lakes for transpotation and commerce, especially with their connection to the Erie Canal, completed in 1824. The railways became the main *modus operendi* by the mid-1800s, but the use of the Finger Lakes was still important for transportation of goods north and south with the rugged terrain between lakes; and to supply the many railways that operated over limited areas. This structure is located within 100m from railroad tracks.

Appendix:

Sample	Description	Number of rings	Dates
Samples from the original dock; TRC-3 and 5 are squared, the others are whole logs:			
TRC-2	Cross-section; maximum diameter of 29.5 cm. 21 sapwood rings plus waney edge. Same tree as TRC-7.	N= p+172W	1679p – 1851W
TRC-3	Cross-section; squared 24 x 32cm , log's max diameter approx 34 cm. 24 sapwood rings with outer ring very close to its waney edge. This tree's felling date is most likely the same as those from the original dock.	N=p+294+1v	1554p – 1849+v
TRC-4	Cross-section; maximum diameter of 26 cm. 11 sapwood rings plus waney edge.	N=p+180W	1671p – 1851W
TRC-5	Cross-section; squared, 30 x 27cm; log's maximum diameter was 37 cm. 17 sapwood rings and waney edge.	N= p+238W	1613p – 1851W
TRC-6	Cross-section; maximum diameter of 28 cm. 16 sapwood rings and waney edge.	N= p+182W	1669p – 1851W
TRC-7	Cross-section, maximum diameter of 29.5 cm. 23 sapwood rings plus waney edge. Same tree as TRC-2.	N= p+172W	1659p – 1851W

Sample	Description	Number of rings	Dates
Sample from the addition:			
TRC-1	Cross-section; maximum diameter of 22 cm. Contains sapwood, but sapwood rings are not measurable and cannot be counted. The measured sequence ends right at the heartwood/sapwood boundary, an estimation of its sapwood indicate it was probably felled in the early 1870's.	N = p+127+vv	1728p – 1855+vv