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MARIA IVANA PEZZO & ALBERTO ZAMATTEO GEROSA

DENDROCHRONOLOGICAL ANALYSIS OF SOME OF BEAMS OF THE SHELTER "AI CADUTI DELL'ADAMELLO", HIGH LOBBIA, TRENTINO

Abstract - MARIA IVANA PEZZO & ALBERTO ZAMATTEO GERO2A - Dendrochronological Analysis applied to the beans of the roof of mountain shelter "*Ai Caduti dell'Adanello*," Lobbia Alta, Trentino, Italy.

The mountain shelter "*Ai caduti dell'Adanello*," was built in 1929 with renains of buildings of the First World War. Thanks to the dendrochronological method of dating applied to the beans of the roof the authors have determined the phases of the building.

Key words: dendrochronology, Adanello, First World War.

Summary - MARIA IVANA PEZZO & ALBERTOZ AMATTEO GERO2A - Dendrochronological analysis of some of beams from the refuge "Ai Caduti dell'Adanello," Lobbia Alta, Trentino.

The Alpine shelter "*Ai caduti dell'Adanello*," built in 1929 with material reused from constructions dating back to World War Prina, was the subject of a study to deternine its construction phases and to date the roof beams thanks to dendrochronology.

Keywords: dendrochronology, Adanello, World War Prina.

The shelter "Ai Caduui dell'Adanello" is located at 2020 m. asl, at the base of the southwestern slope of the Lobbia Alɩa (2196 m). This peak belongs to the rocky ridge separating the basins of the Vedrette della Lobbia (to the east) and the Mandrone (to the west), communicating via the Passo della Lobia Alta. The shelter was built on the sites that were the scene of the White War in the period 1915-1918.

Geologically, the Lobbia area is characterized by the presence of both bedrock and duperficial deposits resulting from the action of geoclimatic

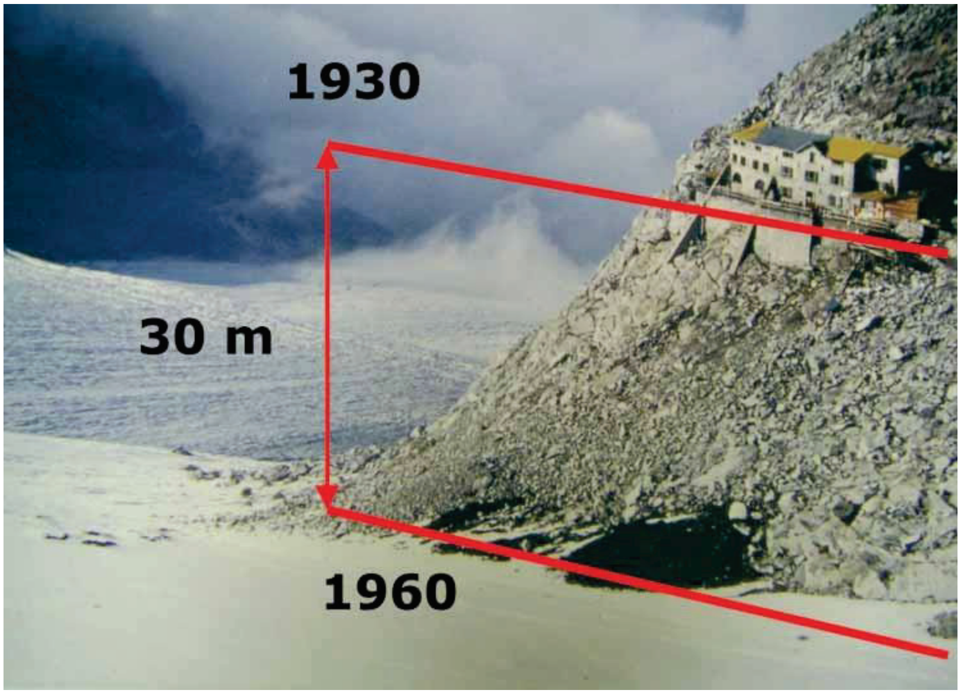

Fig. 1 - Photograph of the tie rods at the foot of the retaining wall, 1966 (Brescia C.A.I. Archives).

agents. As for the rocky substrate, consisting of granodioritic intrusive rock, outcrops are numerous and mainly characterize the mountain peaks. Petrographic characterization of the granodioritic rock shows the abundance of quartz, minute-grained femic elements (bio-tite, amphiboles, pyroxenes); its petrographic definition turns out to be a "biotitic quartz diorite." The outcrops show slight surface alteration and discrete fracturing according to at least 5 sets of discontinuities (DaL Piaz 1947).
The sharp lowering of the upper level of the glacial tongue affecting Lobbia Pass, particularly the slope on which the hut exists, can be measured at about 30 m from 1930 to the present.

This fact intensified all the geomorphological processes of slope erosion, due to exogenous agents, resulting in a tensional release of the most superficial part of the rocky outcropping substrate, causing a series of consolidation works to ensure the stability of the shelter.

Various are the construction phases of the building: the first dates back to 1928, when construction of the refuge was begun using material present on site. Austrian and later Italian troops had built barracks and trenches to maintain control of the location. At the conclusion of the war, the barracks were abandoned, but the climatic conditions allowed the optimal preservation of the beams so much so that they were used for the construction of the refuge, which was dedicated to the many soldiers who died during the Great War on the Adamello.

1. SITUATION OF THE SITE DURING WORLD WAR I.

In the summer of 1916, Alpine troops halted on the conquered positions using, as far as possible, the barracks and trenches built at the time by the Austrians (Fig. 2).

This was a huge front, stretching from the slopes of Cuna and Mt. Gabbiolo up to Malga Lares and Crozzon del Diavolo (Bre-scia province).

A line consisting almost solely of observation rather than defense outposts, behind which were few resistance nuclei and scant reserves.

To this end, the Adamello presented itself between 1915 and 1918 as a landscape of wooden barracks. Above all, new ones had to be built because the existing ones did not have sufficient capacity for the large number of soldiers who had to provide for the permanent occupation and defense of the area.

The barracks were built close to rock walls so as to be under cover from the firing and observation of the adversary, and many stood on the glacier itself, with cavities, so as to limit as much as possible the consequences resulting from snow moisture, especially in the thaw period.

In addition to the shelters, warehouses for materials, food and ammunition depots, repair workshops, barracks for lookouts and artillery observers were built.

At the same time the various positions were connected by walkways and small tunnels in the snow, equipped with trenches, artillery emplacements and machine-gun emplacements, reflector and grid installations, aid posts and small infirmaries.

A defensive system was thus established on three lines, one for each mountain ridge, with headquarters at the High Lobbia Pass.

The main problem that arose in the occupation of the Adamello during the colder season was the needs that became apparent during the winter sojourn of a garrison of about two thousand men, scattered in small detachments, over a vast mountain region. Two generating sets were located at Lobbia Pass and Garibaldi Pass, respectively; communication and supply route was the Val d'Avio, incessantly battered by avalanches.

Fig. 2 - The dogging of Italian troops at the Lobbia, 1916 (C.A.I. Archives of Brescia).

A long tunnel was then built through the tongue of the glacier that ran through it to the Lobbia Pass at 3020 m (Fig. 3) to remedy this problem. In December 1917, after six months of toil, the tunnel was opened to transit. It turned out to be 5,200 meters long, two meters high and two and a half meters wide. It had 80 chimneys and crossing bridges over 25 crevasses, some of which were an immense chasm, lit with beams of acetylene light. The gallery floor in December varied between five and ten meters below the level of the vedretta. Every two to three hundred meters there were small exchange pads.

The long tunnel was not intended for the passage of man but of specially trained mules to travel through the tunnel pulling a sled filled with food, ammunition, medicine and building materials. This operation could also be repeated several times a day.

Another important means of transportation was the driving force of dogs. Their mobilization began in Milan in October 1915 on the initiative of the Kennel Club, which formed a special committee charged with providing dogs to the army, mostly of shepherd breed, not less than ten months old and not more than three years old. At first it was thought that they could be trained for

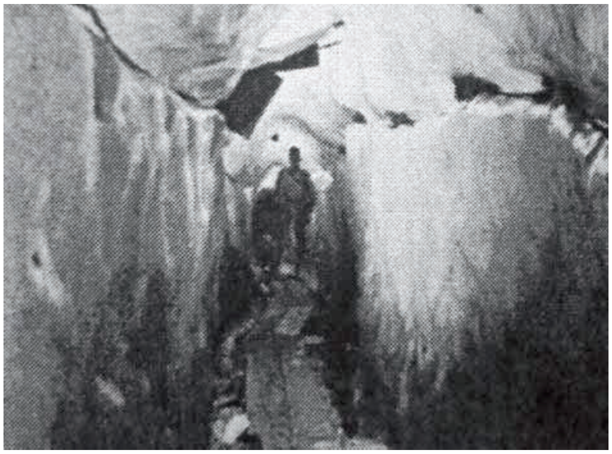

Fig. 2 - Exemption of tunnel excavated in ice (Brescia C.A.IArchives).

Fig. 4 - The dogs at Lobbia Alta (Brescia C.A.I. Archives).

Fig. 5 - Use of dogs at Lobbia Alta (Brescia C.A.I. Archives).

medical service, for the purpose of accompanying wounded bearers to the battlefield to bring relief to the fallen, but environmental reasons and the barrages of fire on the battlefields discouraged their use (Fig. 4 and 5).

Later, as the war spread to the glaciers of the Adamello, thought was given to the possibility of having sleds transported as was normally done on the polar ice shelf.

The first experiments in the summer of 1916 yielded excellent results: the dogs withstood the climate and the exertions of the mountains and were also adapted to the demands of alpine warfare.

In the years between 1917 and 1918 the Adamello canine grouping reached two hundred units, assembled in teams dependent on a special logistics command.

Each sled, with a payload of up to one hundred and fifty kilograms, was pulled by three dogs, under the expert guidance of a soldier.

2. HISTORY OF THE SHELTER (THE CONSTRUCTION PHASES)

At the end of the war saw the light of day a proposal to dedicate a refuge for the fallen of the bloody First World War to Italy. To this end, construction of the building began in the summer of 1928 based on a design by surveyor Remo Segala. The shelter in its first design of 1929 (Fig. 6) was developed on two floors plus attic, it placed, in the first elevated floor the kitchen, dining room and bathroom, while in the second there were four bedrooms that could accommodate up to 20 people respectively in an eight-bed room (5.50 x 3.55 m) and three four-bed rooms (3.60 x 2.20 m).

As for the roof, in the original design it consisted of a pitched roof and a dormer relating to the entrance.

The building rested on a foundation curb, above which the building plan was developed, and consisted of granite rock bearing walls and a roof made of wood and galvanized sheets.

In the early years the influx to the hut was so great that a first extension was necessary in 1933, so here the roof was raised in order to make the attic habitable and obtain more beds and also a second wing was added on the left side of the building as can be seen from the photo and the reconstruction of the plan in Autocad based on the original plan viewed at the Brescia CAI (see Fig. 7).

A second extension in 1945 (Fig. 8) affected the northwest wing of the building and its rear. Note in the new space the presence of two pillars on which was placed a truss on which the two ridge beams of the roof rested.

Fig. 6-The refuge in 1928 during construction and at the inauguration on August 29, 1929 (Brescia C.A.I. Archives).

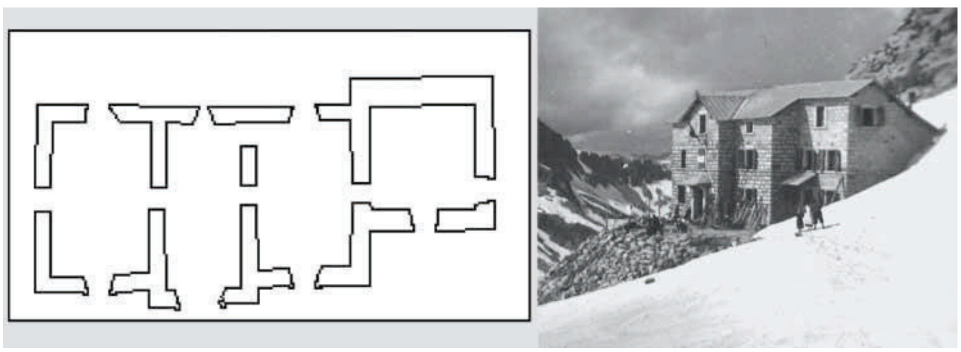

Fig. 7-The refuge after 1922, plan and photos (C.A.I. Archives of Brescia).

At the same time as the expansion, consolidation work was carried out, which did not affect the existing wall structure but mainly involved the consolidation of the rock underneath the hut, which, as a result of glacier retreat, was landsliding downstream.

2. Dendrochronological analysis of beams

Samples for dendrochronological analysis were taken from the beams of the building. They consisted of 18 washers with a thickness of 4 cm that were analyzed to determine the year of the last ring present.

The samples come from various parts of the building; in particular, samples LOB-1, LOB-2, LOB-3, LOB-4, LOB-5, LOB-6, LOB-7, LOB-8, LOB-9

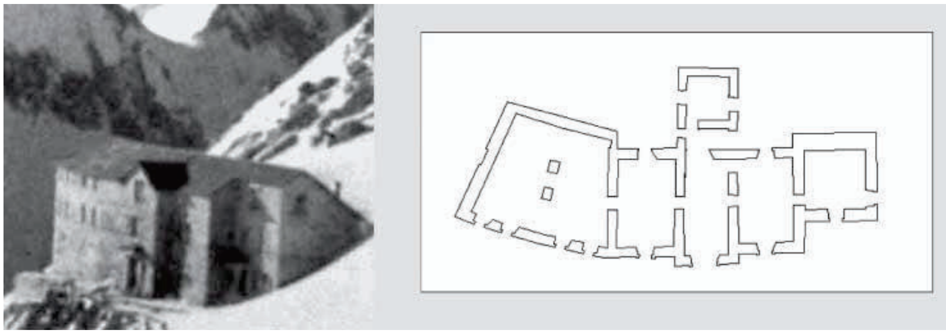

Fig. 8 - The refuge in 1945 photo and reconstruction (C.A.I. Archives of Brescia).

belong to the beams used for the first core of the building. All specimens are in excellent condition and the rings, after cleaning and polishing, are perfectly visible and measurable. Two tree species were used for the beams: larch (Larix decidua Mill.) and spruce (Picea abies Karst.); two chronologies were constructed, one for spruce of 122 years consisting of 13 samples (Fig. 9); another chronology was constructed for larch, covering a span of 75 years and derived from five samples (Fig. 10). The samples were analyzed with the instrumentation of the dendrochronology laboratory at the Museo Civico di Rovereto, and the data were processed with the TSAP program (4) and compared with existing curves for conifers for the Alpine area (2).

Tree species determination was performed by Dr. Stefano Marconi and Dr. Maurizio Battisti of the Museo Civico di Rovereto.

SAMPLES MEASURED

LOB - 1

Sample beam.
Measurements: max. diam. 17 cm; max. radius 8.5 cm; max. height 4.5 cm.
Rings: 69
Species: spruce (Picea abies Karst.).
Dating: 1888

> The sample has an annular sequence with regular growth; the last few rings are particulary thin. The canpion has been hewed on one side only, is devoid of all traces of bark, and the annular sequence is intact from the nidulla to the subcortex.

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(1) RINN FRANK,1 996, TSAP, *Reference manual*, Heidelberg.

(2) SIEBENLIST-KERNER V., 1984, *Der Aufðau ron JaSrrsngcSronologsen fuer Zsrðelksefer*, *LaercSe und rs-cSte esnez alpsnen HocSgeðsrgztandortez*, Dendrochronologia 2, pp. 9-29 ; BEBBER A.E.,1990, *A chronolo-gsa of the larsce* (*Larsx decsdua* Mill.) *of the Stalsan Alps orsentals*, Dendrochronologia 8, pp. 119-140.

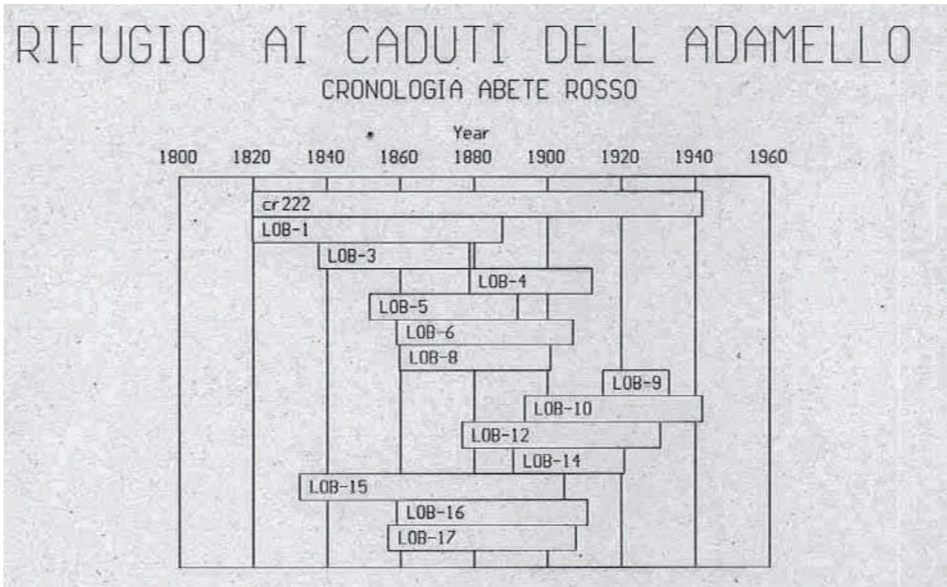

Fig. 9 - In the graph, spruce samples placed on the tenporal scale are presented; the top is the chronology of 122 years .

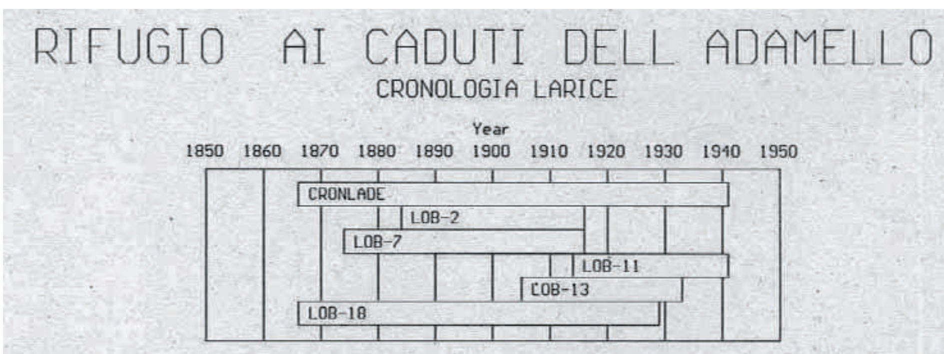

Fig. 10 - In the graph, note the chronology for the 75-year-old larch with the five samples from which it is derived.

LOB - 2

Sample beam.
Measurements: max. diam. cm 22, max. radius cm 13
Rings: 33
Species: larch (Larix decidua Mill.).
Dating: 1916

The specimen shows an annular sequence with rather thick rings; pith is present, but no cortex.

LOB - 3
Sample beam.
Measurements: max. diam. cm 23, max. radius cm 12
Rings: 42
Species: spruce (Picea abies Karst.)
Dating: 1879

The sample, squared on three sides, shows a regular annular sequence but with rings of rather thick.

LOB - 4
Sample beam.
Measurements: max. diam. cm 23, max. radius cm 14
Rings: 34
Species: spruce (Picea abies Karst.)
Dating: 1917

The specimen squared on all sides, shows a regular annular sequence but with rather thick rings. The last rings are missing.

LOB - 5
Sample beam.
Measurements: max. diam. cm 20, max. radius cm 12.5
Rings: 41
Species: spruce (Picea abies Karst.)
Dating: 1892

The specimen squared on all sides, shows a regular annular sequence but with rather thick rings. The last rings are missing.

LOB - 6
Sample beam.
Measurements: max. diam. cm 18, max. radius cm 12.8
Rings: 41
Species: spruce (Picea abies Karst.)
Dating: 1907

The specimen squared on all sides, shows a regular annular sequence but with rather thick rings. The last rings are missing.

LOB - 7
Sample beam.
Measurements: max. diam. cm 16.8, max. radius cm 12
Rings: 43
Species: larch (Larix decidua Mill.).
Dating: 1916

The specimen squared on all sides, shows a regular annular sequence but with rather thick rings. The last rings are missing.

LOB - 8
Sample beam.
Measurements: max. diam. cm 16.8, max. radius cm 12
Rings: 42
Species: spruce (Picea abies Karst.)
Dating: 1901

The specimen squared on all sides, shows a regular annular sequence but with rather thick rings. The last rings are missing.

LOB - 9
Sample beam.
Measurements: max. diam. cm 20, max. radius cm 11
Rings: 19
Species: spruce (Picea abies Karst.)
Dating: 1910

The specimen squared on all sides, shows a regular annular sequence but with rather thick rings. The last rings are missing.

LOB - 10
Sample beam.
Measurements: max. diam. cm 17.6, max. radius cm 14.5
Rings: 49
Species: spruce (Picea abies Karst.)
Dating: 1942

The specimen, squared on all sides, shows a regular annular sequence with the first 20 rings of rather significant thickness. The last rings are missing and the pith is partially visible, since the beam, squared, is derived only from a section of the trunk.

LOB - 11
Sample beam.
Measurements: max. diam. cm 12.5, max. radius cm 7.5
Rings: 28
Species: larch (Larix decidua Mill.).
Dating: 1941

The double-sided square specimen shows a complete and regular annular sequence.

LOB - 12
Sample beam.
Measurements: max. diam. cm 21.5, max. radius cm 12.8
Rings: 55
Species: spruce (Picea abies Karst.)
Dating: 1931

The specimen squared on all sides, shows a regular annular sequence. The last rings are missing..

LOB - 13
Sample beam.
Measurements: max. diam. cm 17, max. radius cm 12.6
Rings: 29
Species: larch (Larix decidua Mill.).
Dating: 1933

The specimen squared on all sides, shows a regular annular sequence but with rings of relevant thickness. The last rings are missing and the pith is only partially visible.

LOB - 14
Sample beam.
Measurements: max. diam. cm 24, max. radius cm 14
Rings: 31
Species: spruce (Picea abies Karst.) Dating: 1921

The specimen squared on all sides, shows a regular annular sequence. The last rings are missing and the pith is only partially visible.

LOB - 15

Sample beam.
Measurements: max. diam. cm 16.5, max. radius cm 9.5
Rings: 73
Species: spruce (Picea abies Karst.)
Dating: 1905

The specimen shows a complete annular sequence. The annular growth is regular with minute rings in the part near the cortex.

LOB - 16

Sample beam.
Measurements: max. diam. cm 21, max. radius cm 12
Rings: 53
Species: spruce (Picea abies Karst.)
Dating: 1911

The specimen, squared on all sides, shows an irregular annular sequence with the first 21 rings of considerable thickness and the last 32 more minute. The last rings are missing.

LOB - 17

Sample beam.
Measurements: max. diam. cm 16, max. radius cm 8.5
Rings: 52
Species: spruce (Picea abies Karst.)
Dating: 1908

The specimen shows an almost complete annular sequence. The annular growth is rather regular but the rings near the cortex are missing.

LOB - 18

Sample beam.
Measurements: max. diam. cm 22.5, max. radius cm 11.2
Rings: 64
Species: larch (Larix decidua Mill.).
Dating: 1929

The specimen squared on all sides, shows an incomplete annular sequence, as the last rings are missing.

4. Conclusions

The shelter was built in 1929, expanded first during 1933, and finally in 1945. Through dendrochronological analysis, the tree species and the year to which the last ring present on the beams used for the construction, in particular, of the roof were determined. The oldest samples are of spruce and date from 1879 (LOB-3) to 1888 (LOB-1) and 1892 (LOB-5).

Almost all of the samples have been squared and therefore the last rings are missing, however, it can be said that these beams came from the first constructions on Lobbia Pass and were later used for the 1929 building. To the reuse material belong all the samples dating back to the first 17 years of the 20th century (LOB-4, LOB-6, LOB-8, LOB-15, LOB-16 and LOB-17 for spruce and LOB-2, LOB-7 for larch).

Two samples date from the 1920s: LOB-14 for spruce and LOB-18 for larch; while three samples belong to the 1930s: LOB-12, LOB-9 for spruce and LOB-13 for larch. These samples are probably from the beams used for the 1933 expansion. Finally, there is a pair of samples from the 1940s: LOB-10 for spruce and LOB-11 for larch, clear evidence of the 1945 rebuilding.

Noteworthy is the ability to withstand the harsh high mountain climate, and the resulting weight of snow, of the beams that remained in use until a few years ago. In fact, some of the beams derive from plants cut in all likelihood in the last years of the nineteenth or early twentieth century and have performed excellently their supporting function for a relevant span of time in an environment marked by extreme climatic conditions.

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Authors' address
Maria Ivana Pezzo - Laboratory of dendrochronology - Museo Civico di Rovereto - Borgo Santa Caterina, 41 - I-28068 Rovereto (TN)
Alberto Zanatteo Gerosa - via don Dallafior, 20 - I-28050 Povo (TN)