



# The Lac Gour Dugout

## A MAJOR QUEBEC DISCOVERY

### *History and Conservation Process*

In spite of an abundance of lakes and rivers in Quebec, discoveries of dugout canoes are rare. Only 11 have been found, all in Southern Quebec. Unfortunately, we don't generally know enough about the context of their discovery to date them or identify their cultural affiliation with any precision. Some of them may have been used by European settlers while others may have belonged to Amerindian groups.

The dugout found in Lac Gour in 1986 is one of the most remarkable because of its condition, its size and its age. Made of white pine, this *monoxyle* pirogue has vastly enriched our knowledge of this mode of transportation and has helped us develop some expertise in the treatment of *water-logged* materials.



Figure 1: Mr. Albert L'Heureux near Lac Gour  
Photo: Anne-Marie Balac, MCCQ

\* Words in *italics / orange* are defined in a glossary on page 6.

*July 28, 1986...*

On July 28, 1986, the Montreal office of the ministère de la Culture et des Communications was informed of a rare discovery. The day before, near Chertsey, an amateur diver named Albert L'Heureux had discovered a pirogue at the bottom of Lac Gour, under 7 metres of water. Because he had taken it out of the water, time was of the essence to stop it from deteriorating. An archaeologist quickly went to look at it and realized it was a very important discovery.

The pirogue, measuring more than 5 metres long, was made of a hollowed out tree trunk and we could still see the marks left by the axes used to shape it. The interior was finished by controlled burning and traces of this operation were still visible. During the conservation process, a sample was taken and dated, showing the dugout was from the 15th Century and could be of Amerindian origin.

Many accounts from early 17th Century explorers helped us understand how these dugout vessels were built over several days.

Samuel de Champlain, in his *Relations de voyages*, described the techniques used by Amerindian groups of the Boston Bay Area:

*“After much effort and time used to cut the biggest and tallest tree they could find with stone hatchets, they strip the bark from all sides except one, where they burn it in many places... When it is hollow enough, they scrape it completely with stones.”*

These stone tools were perhaps gouges, adzes or scrapers fitted to a handle. A paddle was also necessary to propel the pirogue.

The dimensions of the pirogues inventoried in Quebec lead us to believe that they held between one and three people with their cargo and were relatively stable.

### *A fragile specimen*

As soon as the pirogue was discovered, measures had to be taken to ensure the conservation of this fragile specimen. Organic materials such as wood do not generally keep in the acidic soil of our forests, but when they are submerged in water, they can last for hundreds, even thousands of years. This preservation is possible because of the small amount of bacteria that can proliferate under water, which is an *anaerobic* environment. Given enough time, however, anaerobic bacteria will damage the cellulose and penetrate the wood structure and progressively, equilibrium will be found between the wood and its immediate environment. But when a waterlogged object is quickly taken out of the



Figure 2: The Lac Gour dugout canoe being taken out of the water.

Photo: Anne-Marie Balac, MCCQ



Figure 3: The Lac Gour dugout being wrapped.  
Photo: Anne-Marie Balac, MCCQ

water, it is exposed to oxygen and to higher temperatures where water or sediments no longer support the structure of the wood. This sudden withdrawal of a wooden object from the water will provoke the irreversible collapse of the cells and encourage splitting and warping.

That is why the Lac Gour dugout was kept in the water until it was picked up on August 13, 1986. It was then covered in fabric soaked with water and wrapped in many layers of polyethylene bubble pack before being transported to Quebec City.



Figure 4: A piece of wood cut in three and treated three different ways. The piece on the right was dried at room temperature, the one in the centre was freeze-dried without PEG pre-treatment, and the one on the left was treated with PEG, then freeze-dried. Notice the differences of appearance and structure in the three samples. Both samples that were not treated with PEG are cracked while the one that was treated shows almost no cracks.

Photo: André Bergeron, Centre de conservation du Québec

Upon arrival at the Centre de conservation du Québec, the dugout was placed in a water-filled basin. Over a period of five months, a solution of *polyethylene glycol* (commonly called PEG) was added to the pre-treatment basin. Polyethylene glycol, a *cryoprotector*, covered the wood cells and entered its structure to reduce cracking during the freeze-drying treatment. The final result was far superior to that obtained when wood is not thus pre-treated.

## *Freeze-drying*

Freeze-drying, based on the *sublimation* principle, lets water contained in the wood progressively escape, just as it does in your freezer's ice tray. For small objects, a device called a *lyophilizator* uses a vacuum to accelerate the sublimation process. Because we did not have a sufficiently large lyophilizator, we placed the pirogue in a canvas shelter and took advantage of Quebec's many days of subzero temperatures to treat the pirogue.

The shelter, a kind of canvas carport, is in line with the prevailing winds. Both ends can be opened to change the air and maximize the humidity deficit. And because sublimation requires a bit of energy to take place faster, south side windows let the sun penetrate and slightly warm the interior of the shelter.

The combined action of freezing temperatures, wind and solar energy made the treatment of the pirogue possible, as shown in figures 5 and 6. The relationship between the percentage of weight loss, used to measure the effectiveness of the treatment, and the amount of sunshine and the wind speed is quite obvious.

## *A final voyage*

In March 1987, the pirogue was moved to the premises of the Centre de conservation du Québec to become acclimatized to a new environment. A crack in the lower section of the *stem* was strength-



Figure 5: The Lac Gour pirogue in its treatment shelter.  
Photo: Guy Couture, Centre de conservation du Québec

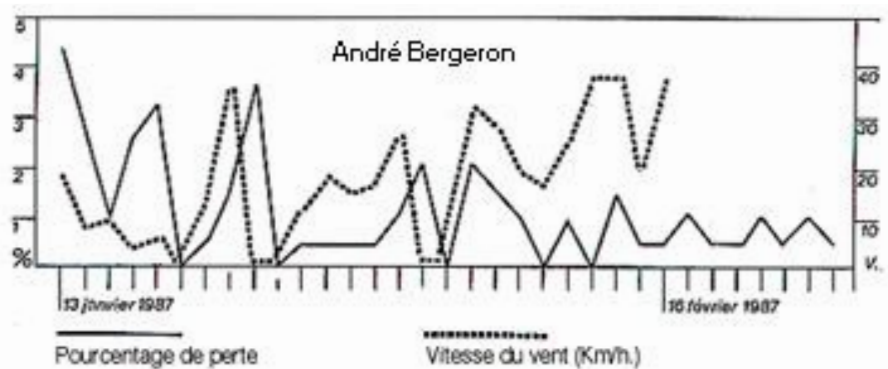


Figure 6: Evolution of the loss of weight of the pirogue, expressed as a % of the initial weight, relative to the average wind speed when measurements were taken.

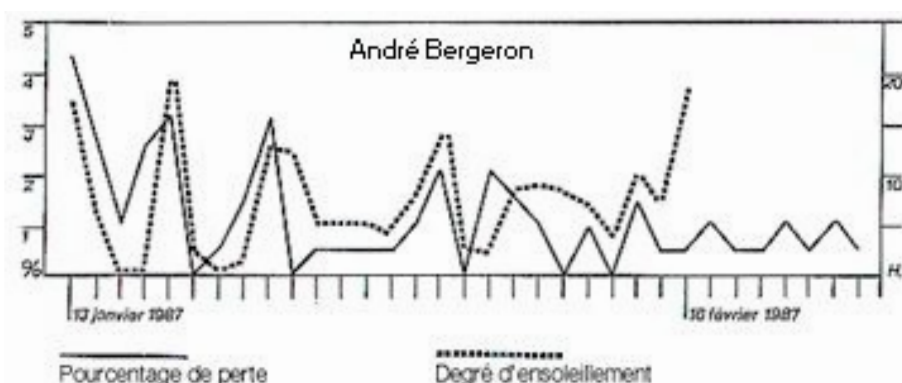


Figure 7. Evolution of the loss of weight of the pirogue, expressed as a % of the initial weight, relative to the number of hours of sunshine when measurements were taken.

ened with a piece of linden. To preserve this dugout canoe for a long time, it was placed in an air-tight showcase conditioned with silica gel, a buffer material that helps maintain a stable degree of relative humidity. So on March 30, 1989, our pirogue was transported toward Melocheville, now Beauharnois, to the Pointe-du-Buisson Interpretation Centre, to be preserved for a long time and shared with a large public.

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Figure 8 : The Lac Gour pirogue at the Pointe-du-Buisson Archaeological Park

Photo: [lucbouvrette.com](http://lucbouvrette.com)

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## *Glossary*

*Anaerobic environment:* environment where there is no free oxygen. Biological activity is limited to bacteria that can survive without it.

*Cryoprotector:* any product that helps reduce mechanical stresses caused by ice formation during freeze-drying. Polyethylene glycol (PEG) is one of the products that is most frequently used for this type of treatment.

*Monoxyle:* made of a single piece of wood.

*Polyethylene glycol (PEG):* a substance used by conservators to treat waterlogged materials, most specifically wood and leather. According to its degree of polymerization, it is found in either a liquid or a solid state, or as a paste. PEG is used in different concentrations to pre-treat objects that will undergo controlled drying and lyophilization.

*Stem:* protruding piece that is part of a ship's bow.

*Sublimation:* conversion from a solid state directly to its vapour without liquefaction.

*Waterlogged (material):* any organic material (wood, leather or textile) that spent some time under water and whose structure deteriorates and becomes saturated with water. Wood's water content, for instance, shows the extent of its degradation.

To find out more about the services offered by the Quebec Conservation Centre, visit:  
[www.ccq.gouv.qc.ca](http://www.ccq.gouv.qc.ca)

For more information on pirogues: Laroche, Daniel, *Précis sur l'existence et l'usage des pirogues monoxyles ou bateaux de bois au Québec et en Amérique*, Questions d'archéologie maritime, Archéologiques, Collection hors série No. 1, p. 62-84, 2003. Available through the Quebec Association of Archaeologists: [www.archeologie.qc.ca](http://www.archeologie.qc.ca)