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by Allison Bone and Mark Patton

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# Just the tip of the iceberg

by **Allison Bone** and **Mark Patton**

Icebergs of various shapes and sizes are frequently seen off the coast of Newfoundland and Labrador, leaving locals and visitors in awe and the shipping industry on alert. They have an impact on local economies and culture and may also have an environmental impact on the surrounding waters. Most of the icebergs that make it to Iceberg Alley in Newfoundland and Labrador have made the journey all the way from Greenland (Greene et al., 2024).

## Where and what is Iceberg Alley?

Iceberg Alley runs along the coast from the northern tip of Labrador to the southeast coast of Newfoundland. This area sees a heavy concentration of iceberg flow starting from Greenland, giving it the name Iceberg Alley. The icebergs drift for an average of two to three years. They travel along the Baffin Island Current, then the Labrador Current to the Grand Banks of Newfoundland, and then many of them make their way to Iceberg Alley (Environment and Climate Change Canada, 2015).

### Note to readers

Icebergs are defined as massive pieces of ice of varying size, which have detached from a glacier or ice sheet and could be afloat or aground (Environment and Climate Change Canada, 2017). The main source of data used for this article is the International Ice Patrol (IIP), which was formed in 1913, in response to the *Titanic* sinking in 1912, after an iceberg collision. The IIP and the Canadian Ice Service track individual iceberg movements in the North Atlantic Ocean to provide data on icebergs to the maritime community. Iceberg observation methods were established in 1900 and have been developed over time, including visual observations (ship and aircraft), with key additions of advanced airborne radar in 1983 and satellite imagery in 2017. With these methods, icebergs are observed and tracked; however, the iceberg population is not fully represented because there are limitations to satellite detection and only a fraction of the area is covered by visual and radar observations.

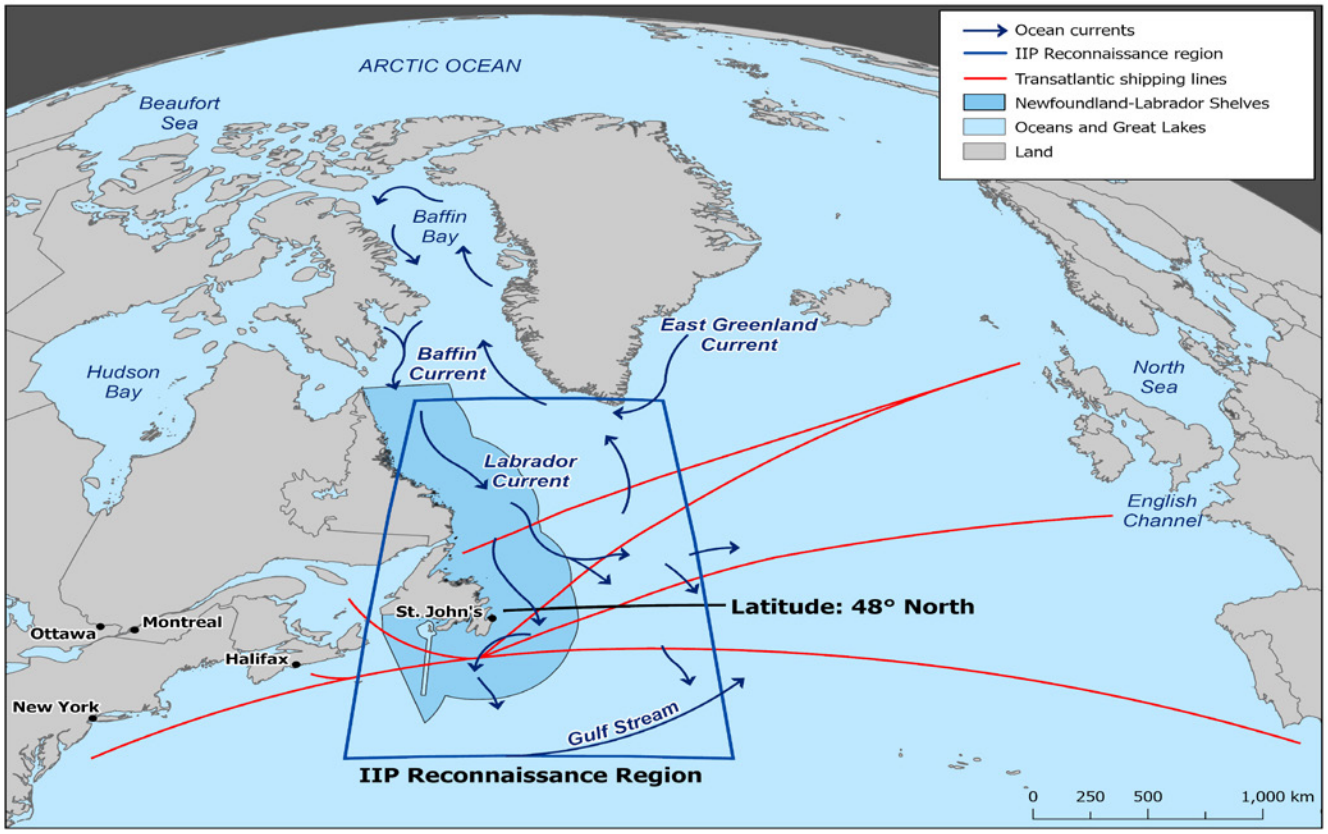
The final released data come in two standardized formats: icebergs south of 48° N and icebergs within the entire reconnaissance region (see Map 1 for details). The primary reason for the separation of datasets is that the icebergs south of 48° N pose an immediate threat to ships crossing the Atlantic. This difference in purpose means that observational periods and variables differ between the two datasets. Both datasets follow the same iceberg classification metrics, as seen in Table 1, to classify icebergs by size. Icebergs are tracked by iceberg year, which differs from calendar year. For example, 2021 is from October 2020 to September 2021.

**Table 1**
**Iceberg classification metrics**

| Iceberg classification | Height above sea surface | Length | Weight (megatonnes) |
|---|---|---|---|
| Growler | Less than 1 metre | Less than 5 metres | 0.001 |
| Bergy bit | 1 metre to less than 5 metres | 5 metres to less than 15 metres | 0.01 |
| Small | 5 metres to 15 metres | 15 metres to 60 metres | 0.1 |
| Medium | 16 metres to 45 metres | 61 metres to 120 metres | 2.0 |
| Large | 46 metres to 75 metres | 121 metres to 200 metres | 10.0 |
| Very large | Greater than 75 metres | Greater than 200 metres | Greater than 10.0 |

**Source:** Canadian Ice Service, 2005. MANICE: Manual of Standard Procedures for Observing and Reporting Ice Conditions, revised 9th ed. (Accessed 15 March 2024).

**Map 1**
**Area of International Ice Patrol coverage**




**Source:** International Ice Patrol, 1995. International Ice Patrol (IIP) Iceberg Sightings Database, Version 1 [Data Set]. Boulder, Colorado USA. National Snow and Ice Data Center. https://doi.org/10.7265/N56Q1V5R (Accessed 19 March 2024); Environment and Climate Change Canada, 2015. Iceberg migration. https://www.canada.ca/en/environment-climate-change/services/ice-forecasts-observations/latest-conditions/educational-resources/icebergs/migration.html. (Accessed 3 May 2024).

## Fluctuating iceberg counts

There is immense variability in the number of icebergs reported each year. Since 2002, more than 6,600 icebergs on average have been tracked each year in the IIP reconnaissance region. There has been a slight increase in the number of small and medium icebergs in recent years, compared with the early 2000s (Chart 1).

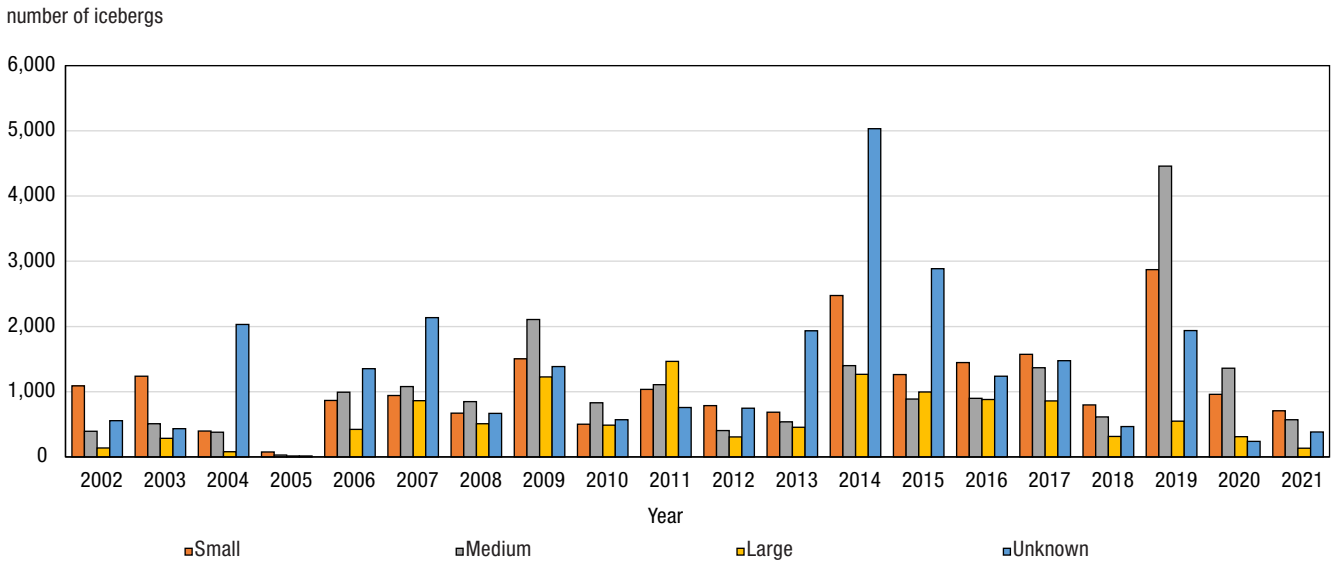
South of 48° N, the number of icebergs seen each year also varies, with icebergs getting progressively smaller and eventually disappearing as they make their way south because of warmer temperatures and erosion from waves. The highest number tracked south of 48° N was 2,202 icebergs in 1984 (a year after advanced airborne radar was added to the tools that the IIP uses to track icebergs), but no icebergs were reported in 1966 and 2006 (International Ice Patrol, 2020) (Chart 2). Going forward, this variability will be important to track because a greater number of icebergs could increase the risk of danger in shipping lanes, while fewer icebergs could have an economic impact on cultural sectors, such as tourism.

## Part of the culture

Icebergs play a significant role in tourism in Newfoundland and Labrador. Overall, tourism activities contributed $547 million to gross domestic product (1.6% of the economy of Newfoundland and Labrador) in 2019 (Statistics Canada, 2019). A survey of tourists who visited the area in 2016 indicated that just over one-quarter of respondents made sure to take part in iceberg viewing while visiting the island (Government of Newfoundland and Labrador, 2018).

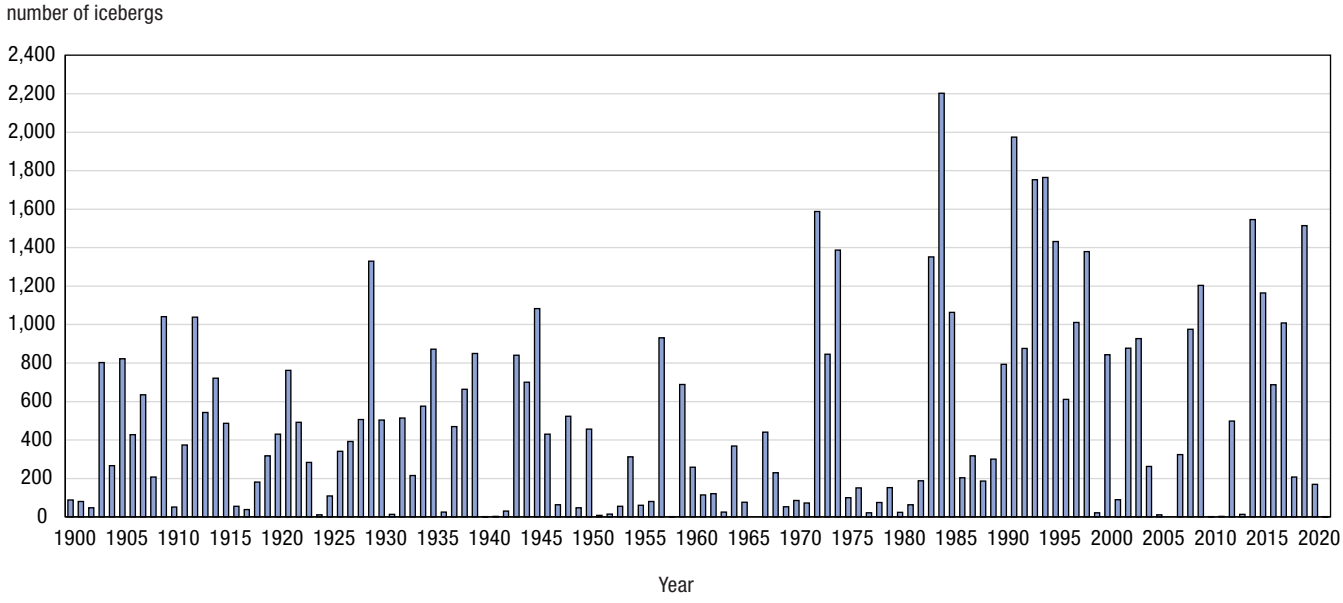
Icebergs are celebrated in the local culture as well, with the annual Iceberg Festival held in St. Anthony, Newfoundland and Labrador. Iceberg harvesting has also become an economic activity on the island, with water from icebergs used to make products such as vodka, beer, wine, bottled water and cosmetics (Jones, 2019).

**Chart 1**
**Number of icebergs reported by size in IIP reconnaissance region, 2002 to 2021**




**Note:** For the purpose of this graph, Small includes Growlers, Bergy Bits and Small icebergs, and Large includes Large and Very large icebergs, as measured by the IIP. Individual icebergs are tracked and may change size as they make their way south. In this graph, the size of the iceberg reflects the size when it was first spotted by the IIP.
**Source:** International Ice Patrol, 1995. International Ice Patrol (IIP) Iceberg Sightings Database, Version 1 [Data Set]. Boulder, Colorado USA. National Snow and Ice Data Center. https://doi.org/10.7265/N56Q1V5R. (Accessed 19 March 2024).

**Chart 2**
**Total number of icebergs, south of 48 degrees north, 1900 to 2021**




**Source:** International Ice Patrol, 2020. International Ice Patrol Annual Count of Icebergs South of 48 Degrees North, 1900 to Present, Version 1 [Data Set]. https://doi.org/10.7265/z6e8-3027. (Accessed 19 March 2024).

## Icebergs and their surrounding ecosystems

Icebergs can impact ocean conditions and ecosystems. This can be seen most often in the epipelagic water layer, which is up to 200 metres deep. This is because small and medium-sized icebergs—the most frequently observed iceberg sizes recorded by the IIP—can be as deep as 150 metres. The significance of this impact on ocean conditions and ecosystems in Canada is unclear because the majority of the research on icebergs has been conducted in the Antarctic (Smith et al., 2013).

The waters in the Newfoundland and Labrador Shelves have been warming, with recent annual average temperatures that were 0.4°C higher than the climate normal for the epipelagic water layer (Statistics Canada, 2022). This could have an impact on the speed at which the icebergs melt and their size as they make their way down Iceberg Alley.

Freshwater from melting icebergs can affect the salinity of the immediate surrounding waters, though salinity levels are primarily driven by large-scale ocean circulation patterns. Based on data from 2005 to 2017, the salinity in the Newfoundland and Labrador Shelves, including much of Iceberg Alley, is slightly lower than the climate normal average, particularly in the spring (Statistics Canada, 2022). Reduced salinity in surface water layers can strengthen stratification or layering of water, forming a barrier for the cold, dense nutrient-rich water at depth to mix with surface waters (Smith et al., 2013). This lower nutrient availability can limit phytoplankton, which sequester large amounts of carbon.

However, icebergs also release micronutrients, such as nitrate and silicate, in surrounding waters as they melt, providing the nutrients needed for phytoplankton activity (Smith et al., 2013). Higher levels of phytoplankton are a source of food for phytoplankton grazers (copepods, larvaceans) in the water around icebergs. There have also been sightings of small fish that live in little caves within the icebergs (Smith et al., 2013).

While the overall ecological impact of icebergs may be minimal, the thrill that tourists and locals alike experience when they see an iceberg off the coast of Newfoundland and Labrador is unmistakable.

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