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océaniques

## **THE ICEBERG SIGHTINGS DATABASE: THE ORPHAN BASIN**

SR-2006-15

Surrey Lane

April, 2006

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## **1.0 Introduction**

The Institute for Ocean Technology, is an Institute in St. John's Newfoundland and is part of the National Research Council of Canada. The Institute is comprised of three major testing facilities, including an offshore engineering basin, a 200 meter towing tank, and a 90 meter long ice towing tank. It also contains two cold rooms and a cavitation tunnel. My time here was spent in the ice tank working with Mr. Brian Hill and his colleagues. I got to help out with tests in the tank, and spent most of my time contributing to IOT's iceberg sightings database. This report will focus mainly on the database and its valuable uses, and will take a close look at the Orphan Basin region and attempt to find out if there are many bergs in this area which may pose a risk to any potential oil developments there.

## **1.1 Purpose**

The purpose of this report is to discuss Mr. Brian Hill, Ice Tank supervisor at the Institute for Ocean Technology's Iceberg Sightings Database. It will analyze iceberg data from present days to 1960 in the Orphan Basin, and predict the probability of icebergs passing through this area. This information could be of value in order to see the iceberg trends in the region, because icebergs could be dangerous to the oil rigs which may potentially be built there.

## **1.2 Overview**

The first section of this report will be a bit of general information about icebergs their origin and their general path from Greenland to the Coast of Newfoundland. The second part will focus on IOT's Iceberg Sightings Database and its uses. Next, some information about the Orphan Basin will be displayed, along with some maps of currents around this area and along the coast of Newfoundland. The fourth section will be an accumulation of iceberg data in the Orphan Basin and a discussion on what this data means. The last section on this report will look at freak ice occurrences and the Sable Islands emergency evacuation in 2004.

## **2.0 Icebergs**

Fascination and Interest in icebergs has been around since the 6<sup>th</sup> century when an Irish Monk named Saint Bernard spoke of his voyage to the West: “We passed by towering crystals that rose up to the sky”.

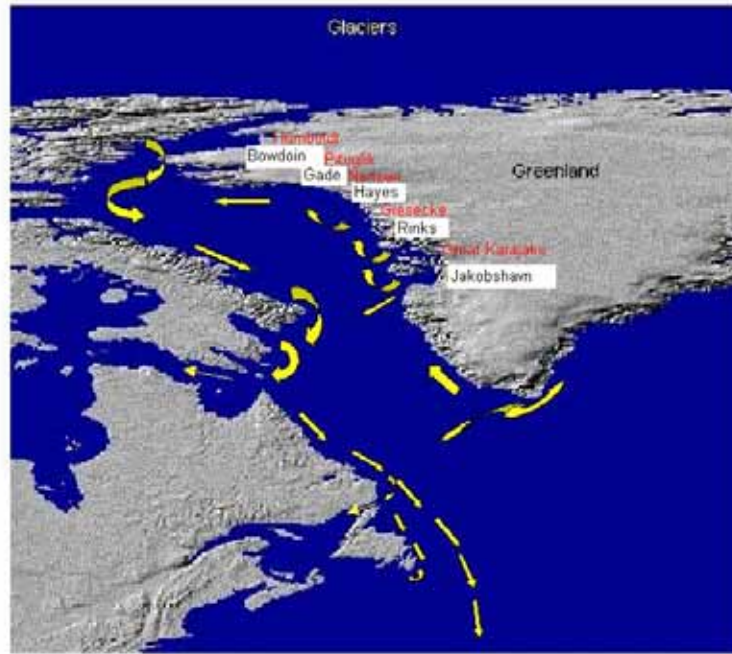
The principle origin of icebergs that reach the Grand Banks are the Tidewater glaciers along the West Coast Greenland. It is estimated that 85% of all icebergs that reach the Grand Banks come from this area. Figure 1 is an image of one of the North Atlantic iceberg producing glaciers on the west coast of Greenland.



**Figure 1: A Glacier on the West Coast of Greenland**



The icebergs break off of glaciers like this one and make their way down to Newfoundland with the Labrador Current. The path that they take is shown in Figure 2, and generally takes an average of 2 to 3 years from beginning to end.



**Figure 2: The General Path of Icebergs**

### **3.0 Iceberg Sightings Database**

Mr. Brian Hill is the supervisor of the ice tank at IOT and one of his projects is to compile a database of all the iceberg sightings throughout the Gulf of St. Lawrence and around the Grand Banks of Newfoundland and Labrador prior to the 1960's. In 1998, BMT Fleet Technology Limited compiled a database called the Program on Energy and Research Development (PERD) Iceberg Sightings database. This database contains all of the iceberg sightings on the Grand Banks and eastern Canada from 1960 to 2004.

PERD is a federal program, which funds research and development designed to ensure a sustainable energy future for Canada, while keeping in mind the best interests of both its economy and environment. The PERD Iceberg Sightings Database allows you to search for any iceberg sighted since 1960, and with IOT's contribution via Mr. Hill, people will be able to search for sightings dating back as far as the 1910's.

The information that Mr. Hill uses to build his database, comes from many different sources including newspapers such as The "New York Maritime Register" and the "Hydrographic Bulletin", though most of the reported iceberg sightings come from the International Ice Patrol (IIP). IIP is an organization initiated in 1914 to patrol and detect all icebergs in the Trans Atlantic shipping lanes. This was done in order to warn and protect ships of wreckages, storms, and of course, icebergs. The information reported by IIP is documented in the U.S Treasury Department's Coastguard Bulletin. These bulletins contain reports of ice and other obstructions observed by vessels, lighthouses, and other sources.

To compile the data from the different sources, such as IIP and the newspapers, Mr. Hill's projects requires the transfer of hardcopy information to a Microsoft Excel sheet. Each report of an iceberg or a growler is taken from the bulletins and the articles, and categorized into size and shape, and added to the Excel sheet. Other observations such as iceberg number, sighting source, sighting method, latitude, longitude, year, ice season, date, and the number of reported bergs or growlers, along with any other comments which may be necessary. The database allows for searches to be done by any of these categories.

## **4.0 Orphan Basin**

The Orphan Basin is located to the north-east of the Jeanne D'Arc Basin, home to the Hibernia, Terra Nova and White Rose projects. It is approximately 325 km from the top of the Bonavista peninsula in Newfoundland. It is estimated to have 6 to 8 billion barrels of oil production capacity. The Orphan Basin is very deep, with much of it deeper than 6,000 feet. Figure 3 shows the Orphan Basin's location with respect to the Grand Banks and the Flemish Cap.

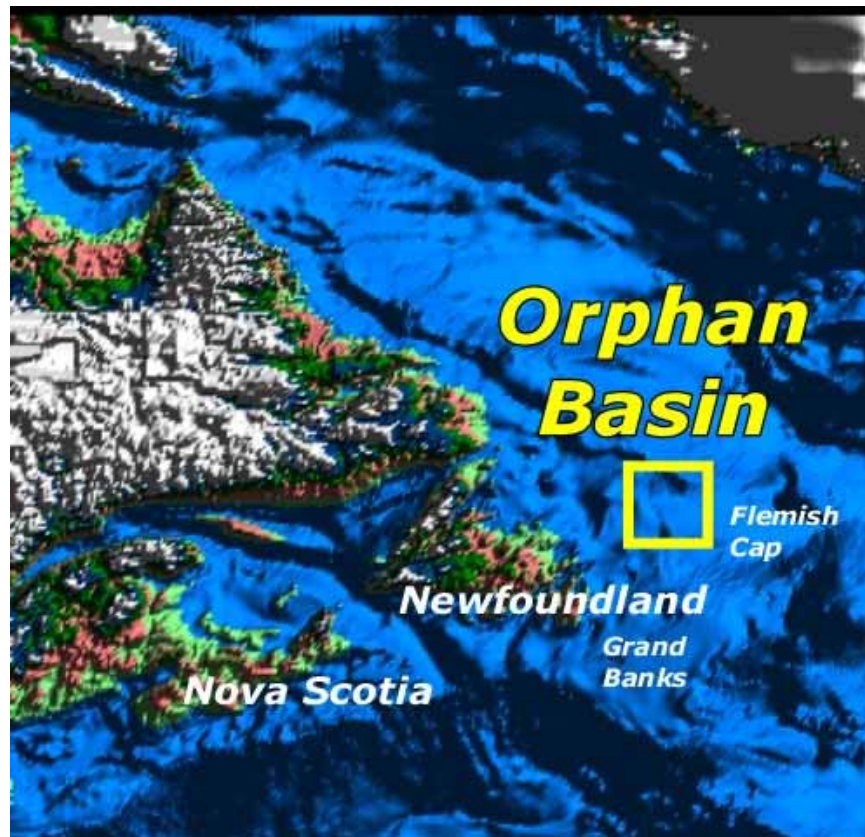
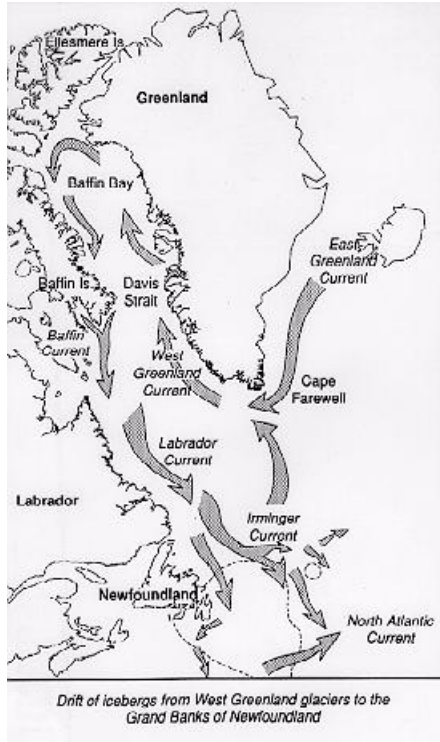


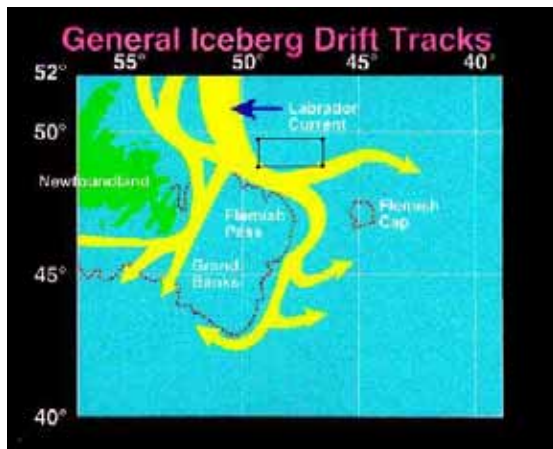
Figure 3: The Orphan Basin



**Figure 4: Major Surface Currents**

Figure 4 illustrates the major surface currents around the Orphan Basin. The Basin is not very well studied yet, but the west side of it is under the influence of the Labrador Current, and the east is under the influence of the North Atlantic Current. With this, one can expect eddies and inconsistent currents within the Basin.

Figure 5 represents the general iceberg drift tracks and more closely demonstrates icebergs entering the Orphan Basin from the West and then entering again from the East.



**Figure 5: General Iceberg Drift Tracks and The Orphan Basin**

## 5.0 Data

### 5.1 1981-2000

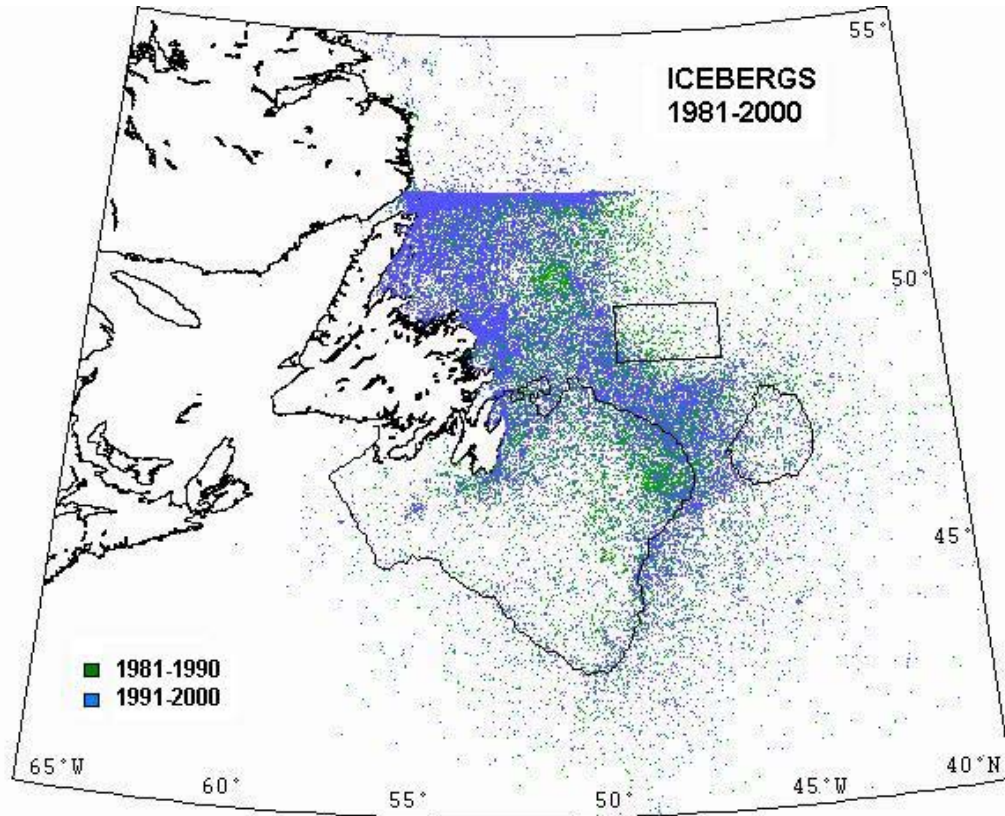


Figure 6: Iceberg Sightings 1981-2000

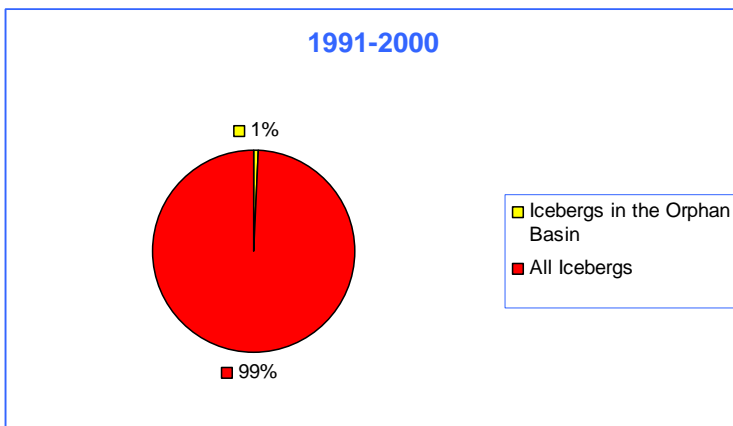


Figure 7: Icebergs 1990's

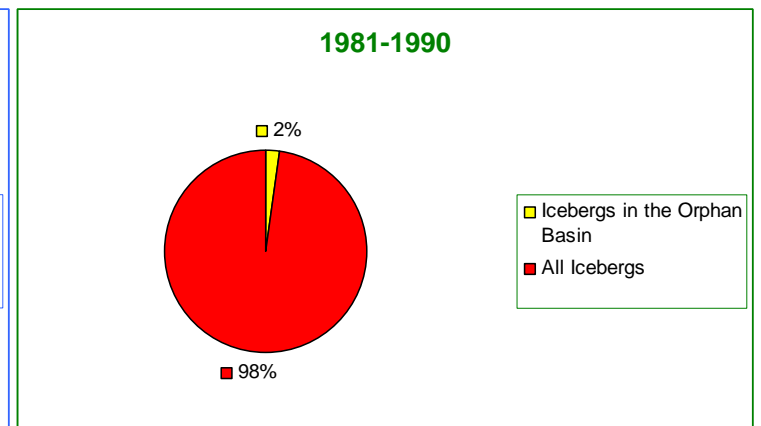


Figure 8: Icebergs 1980's

The information from these two most recent decades comes from PERD's existing database and were sighted mostly by aircraft by the International Ice Patrol or Provincial Airlines. Figure 6 shows the distribution of all iceberg sightings during this time period. It is interesting to note that the bergs seem to line the edge of the Grand Banks and tend to follow the path of the currents between the Flemish Cap and the Grand Banks. It is also interesting to point out the "artifact" at the top of the graph. The line of bergs which seems to go straight across the 52<sup>nd</sup> parallel is due to the fact that the International Ice Patrol would patrol the waters up to this point and then turn around and come back down towards the south. That is why there are not many bergs past this point.

Another thing to point out from Figure 6 is that the Orphan Basin does not seem to have too many bergs, in comparison to the total number of bergs spotted. This is also demonstrated in the pie charts in Figures 7 and 8. The percentages of bergs spotted in the Orphan Basin the 1990's (Figure 7) and the 1980's (Figure 8) are simply 1% and 2%, respectively, of the total number of bergs sighted those years.

## 5.2 1961-1980

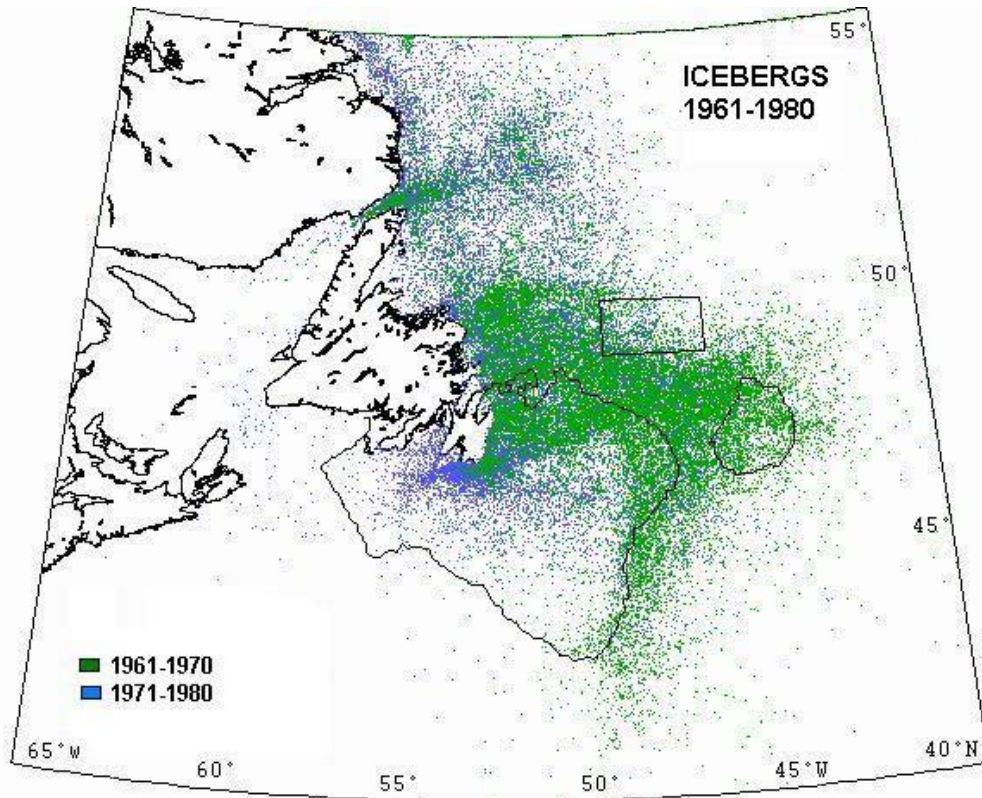


Figure 9: Iceberg Sightings 1961-1980

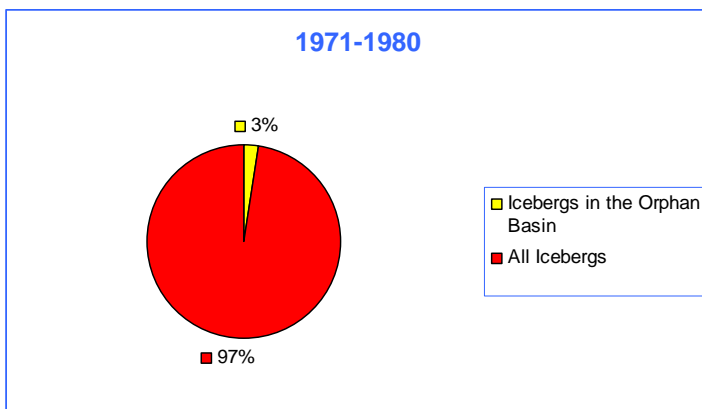


Figure 10: Icebergs 1970's

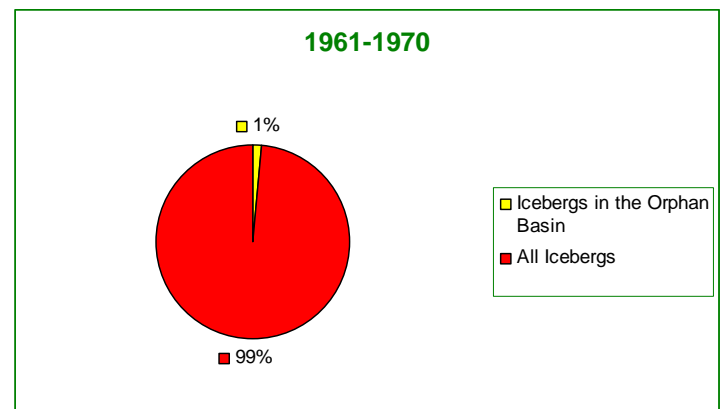


Figure 11: Icebergs 1960's

Figure 9 illustrates that the bergs spotted between 1961 and 1980 also tend to be around the edge of the Grand Banks. Figures 10 and 11 show the percentage of



bergs in the Orphan Basin, and once again they are very low percentages with 3% in the 70's and 1% in the 80's.

### 5.3 1941-1960

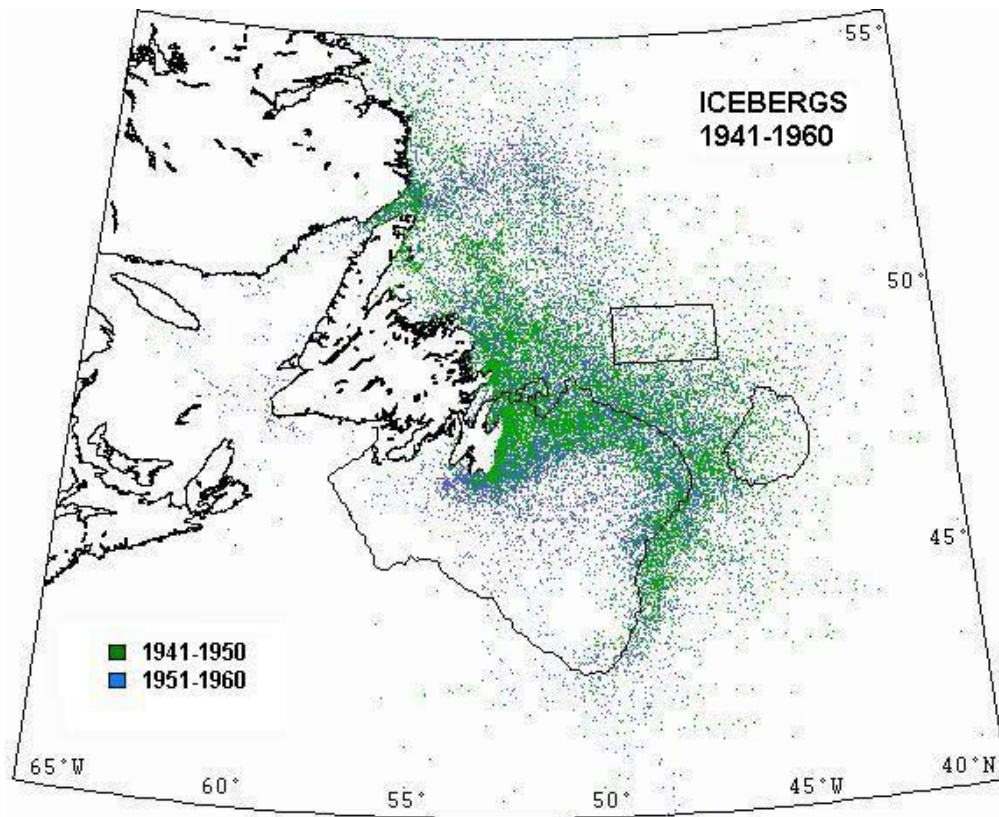


Figure 12: Iceberg Sightings 1941-1960

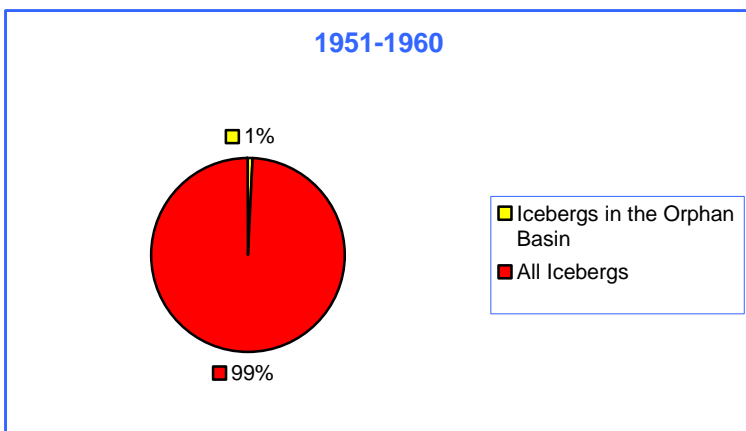


Figure 13: Icebergs 1950's

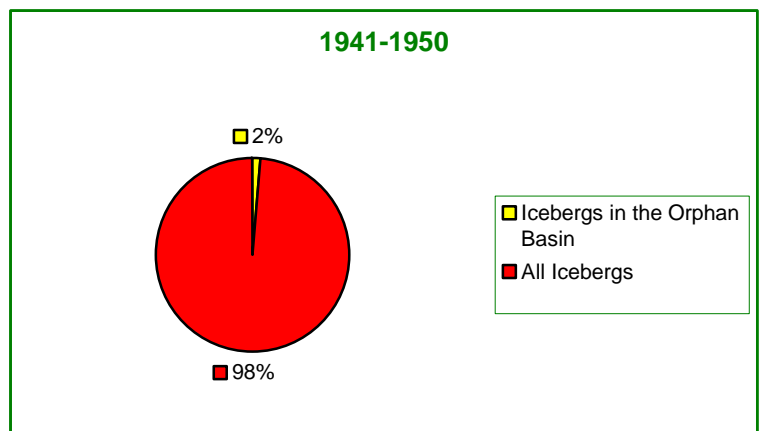
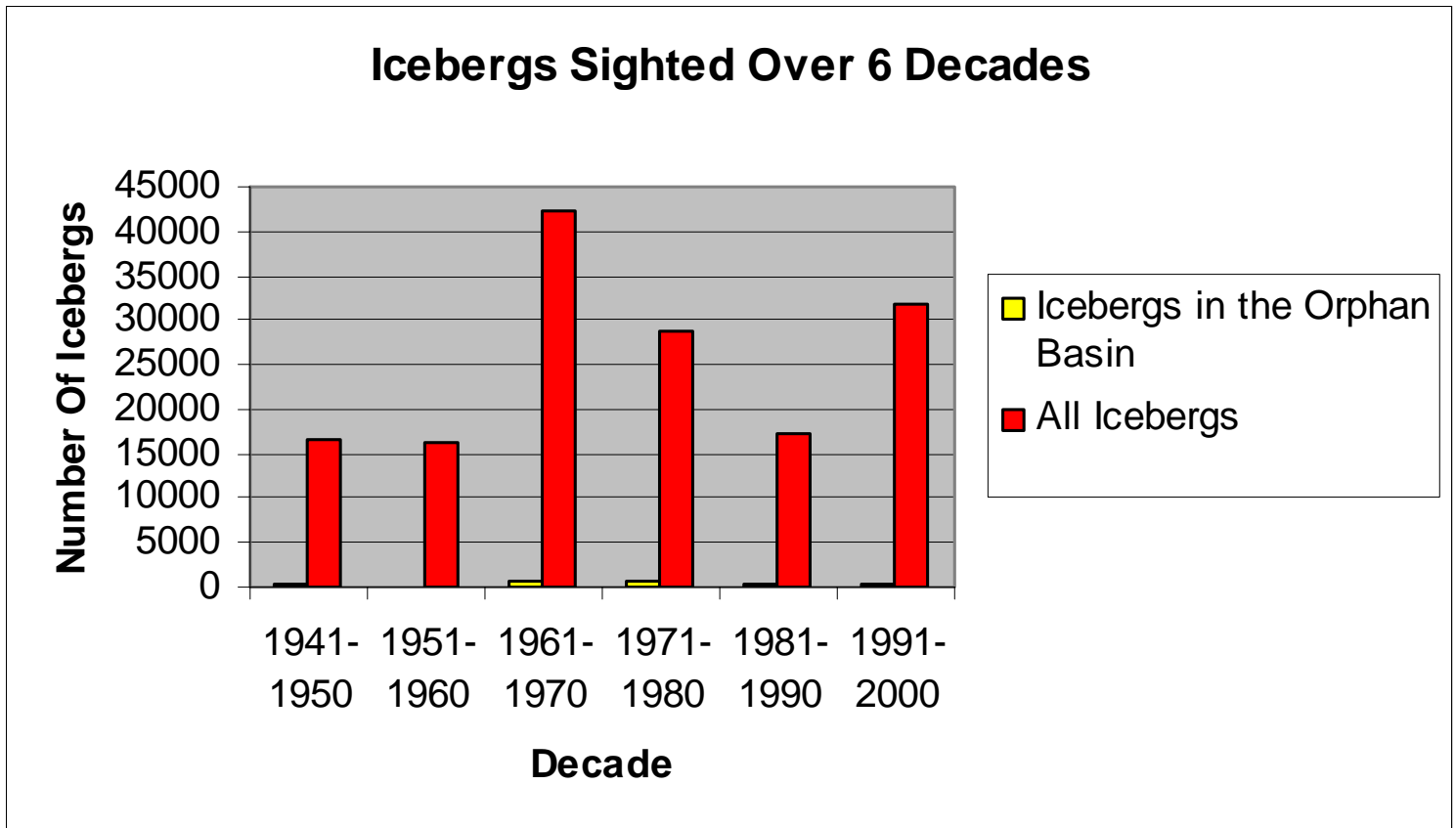


Figure 14: Icebergs 1940's

The icebergs sighted between 1941 and 1960 were taken from PERD, and were compiled mostly by IOT. The same trends can be seen here, such as the distribution of bergs around the Grand Banks' edges, and the sparseness of ice in the Orphan Basin. Figures 13 and 14 also illustrate the small percentage of total bergs in the Basin, with just 1% in the 50's and 2% in the 40's. A Summary of total bergs and bergs in the Orphan Basin can be seen in Figure 15.

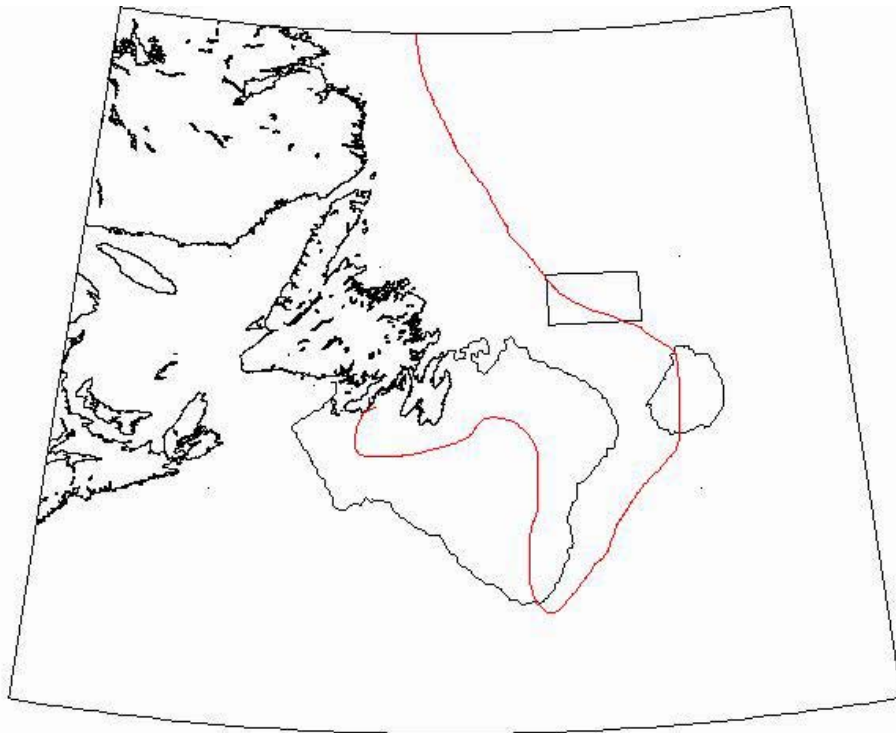


**Figure 15: Comparison Summary of Icebergs Sighted Over 6 Decades**

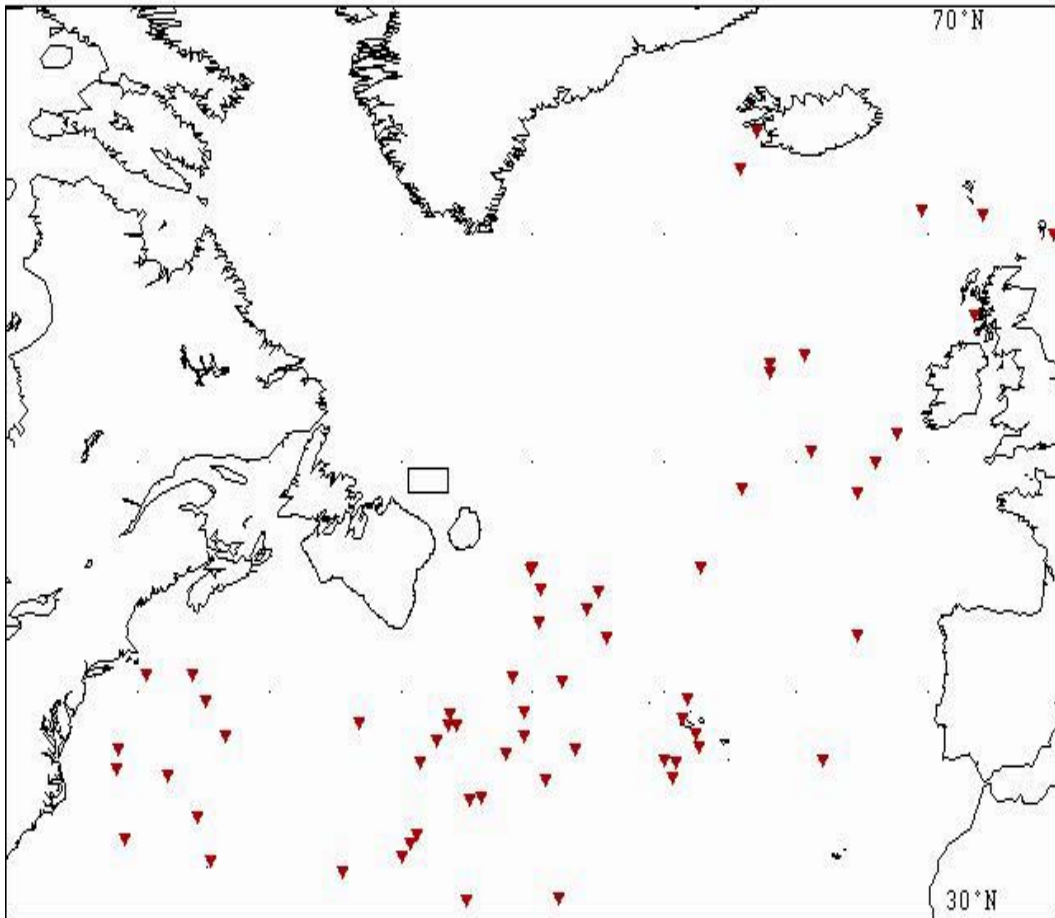
Figure 15 illustrates the total number of bergs sighted in a decade, as well as the number of bergs sighted in the Orphan Basin. It can be seen from this figure that there is a large peak in number of bergs sighted in the 1960's. This may be due to ever changing observation techniques and climate differences in each decade.

## **6.0 Freak Ice**

There have often been times when ice ends up in places you would never expect, or at a time of year when it is normally never around. Figure 16 is an illustration of the boundaries of normal distribution of icebergs around Newfoundland, and is followed by Figure 17, which illustrates the “Freak ice” sightings. This information came from the Canadian Ice Service. This can cause problems that even careful research from previous years cannot predict. An example of this concern, is the Sable Island’s oil and gas project off the coast of Nova Scotia. The studies for this project concluded that the region had been ice-free for decades. In 2004, the offshore platforms had to be suddenly evacuated due to the appearance of sea ice.



**Figure 16: Normal Distribution of Icebergs 1941-2000**



**Figure 17: Freak Ice Sightings**

100 people were evacuated and one of the platforms did not even resume operation afterwards. Ice had not reached that far east in a decade, but more thorough research would have shown that it was a much more normal occurrence a few decades earlier.

The Database once complete will hopefully help to determine whether the freak ice sighting mentioned above were legitimate, or if they were in fact simply errors. It will also aid with people doing research of icebergs in an area.

## **7.0 Conclusion**

This report took a detailed look at the Iceberg Sightings Database, a project being completed at IOT. It used the database to observe icebergs in the Orphan Basin, and to view iceberg trends from the 1960's to present days.

It was seen that icebergs in the Orphan Basin were a very small percentage of the total number of bergs sighted around Newfoundland between these years. The icebergs tend to flow with the currents and are very densely populated around the edge of the Grand Banks.

Another use for the database is to see if some freak ice sightings are legitimate. Upon completion, it will also be useful for researching historic sightings of icebergs in order to research an area and calculate the probability of icebergs showing up in this region. These are just some examples of the usefulness of the Iceberg Sightings Database.

## **8.0 References**

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