Seasonal Summary

For Eastern Canada

Winter 2009-2010

Produced by the Canadian Ice Service
July 2010

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General overview of the 2009-2010 Season

The 2009-2010 ice season in the Gulf of St Lawrence and the Newfoundland and Labrador waters will be remembered for the lack of ice. For most of the ice season the observed ice conditions were a lot less severe than normal. The total accumulated ice coverage (TAC) in the Gulf of St Lawrence which is a measure of the weekly ice coverage, added over the course of the entire ice season, has been by far the lowest in the Canadian Ice Service (CIS) ice records which date back to the winter of 1968-69 (Figure 4). In fact the TAC for the Gulf for the last ice season was close to 50% less than that of the previous record which was set in the winter of 1968-1969. A new record was also established for the lowest TAC in the east Newfoundland waters. Along the southern Labrador coast the TAC was the second lowest on record after the winter of 2003-2004

The main shipping route through the central gulf was open water or ice free throughout the season which is very unusual. Open water was the norm in the Estuary for most of the winter with the exception of new and grey ice occasionally forming in the southern and western parts. The west coast of Newfoundland including the shipping route to Bay of Islands remained essentially open water to ice free all winter. In the east Newfoundland waters the shipping route along the east coast northward to Cape Freels remained open or bergy water throughout the ice season. Such was the case for Notre Dame Bay except for brief periods when thin ice drifted into the bay.

Ice coverage in the east coast of Canada is very closely correlated to the temperatures. So as can be expected the average January to March temperatures were in general very mild. New records for the least amount of accumulated freezing degree day (FDD) were established in many locations in the Gulf of St Lawrence and along the Labrador coast. Figure 5 indicates the average January to March temperatures in the Gulf of St Lawrence. As well as temperatures, winds also had a major impact on ice formation and development. Frequent storms and associated strong winds at the beginning of the winter season destroyed most of the newly formed ice and greatly suppressed new ice growth which resulted in a very slow start to the ice season.

The daily and weekly ice charts for the Gulf of St Lawrence and the Newfoundland and Labrador waters are available at the following CIS Web site

http://www.ec.gc.ca/glaces-ice/default.asp?lang=En&n=D32C361E-1

by clicking on "*Archive*" then on "*Archived charts*" (both of left hand side menu). The median of ice concentration charts are available on the same Web site by clicking on "*Archive*" then on "Archive charts" then on *"Regional Medians"* then on *"30-year Ice Atlases"* then finally on *"East Coast Charts".*

Gulf of St Lawrence

November and December 2009

Heading into the winter season, temperatures in the Gulf of St Lawrence during the month of November averaged above normal. Although not as pronounced as in the previous month, above normal temperatures continued to prevail in the first half of December. Sea surface water temperatures (SST) in the first part of December were slightly below normal in the northeast section of the Gulf but above normal in the south-western section (figure 1). Despite milder then normal temperatures new and grey ice was found, at mid-December, in most of the shallow bays in the Gulf of Lawrence. The second half of December is normally a period in which we observed moderate to rapid ice development especially in the south-western section of the Gulf. Not this year. Above to well above normal temperatures in all sections of the gulf as well as frequent episodes of strong winds destroyed most of the ice which had just developed and prevented any significant new ice development.

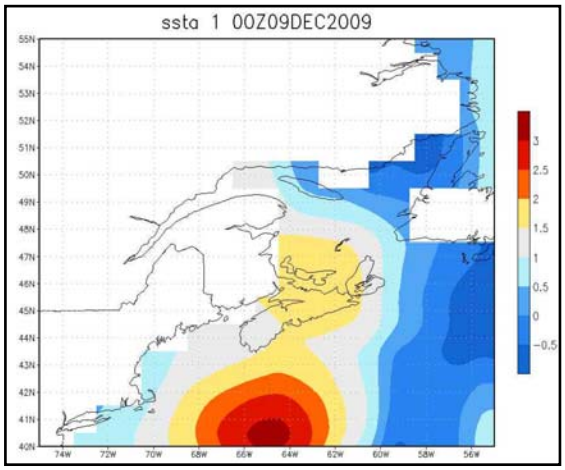

Figure 1: Sea surface temperature anomaly, 09 Dec.

January 2010

Little change in the temperature pattern was observed in the first half of January as above to well above normal temperatures continued to predominate. Some ice development was observed especially in Northumberland Strait and in the western section of the Estuary but very little elsewhere. Despite this ice development, the ice cover in the Gulf of St Lawrence at mid-January was near a minimum record. Little ice development was observed in the second half of January as above to well above normal temperatures continued to be the norm during this period. At the end of January the ice cover in the gulf was the third lowest in the Canadian Ice Service (CIS) ice records (figure 6).

February 2010

The temperatures cooled to near normal values in the first week of February which allowed for some ice development especially in the south-western section of the Gulf of St Lawrence. Of note was the appearance of first

year ice in the eastern portion of Northumberland Strait during this week. The second week of February was exceptionally mild with temperatures ranging from 6ºC to 11ºC above normal (figure 2) which resulted in the destruction and melting of much of the ice which had developed in the previous weeks. The first half of February is normally a period in which the ice cover expands considerably but that wasn't the case this year. In the period mentioned above, the ice cover in the gulf actually shrunk by about 45% which lead to a new record for the minimum ice cover in the Gulf of St Lawrence at mid-February (figure 7). The previous record for the minimum ice cover at mid-February, according to CIS ice record, was set in 1970. The last two weeks of February have been as mild as the second week of the month and consequently the shrinking of the ice cover continued and it remained at a minimum record. At the end of February the ice cover in the gulf was 86% less than that of the previous record (figure 8). Figure 10 shows the actual ice conditions as analysed by CIS, the median of ice concentration, both for February 26th, as well as the departure from normal chart for March 01st.

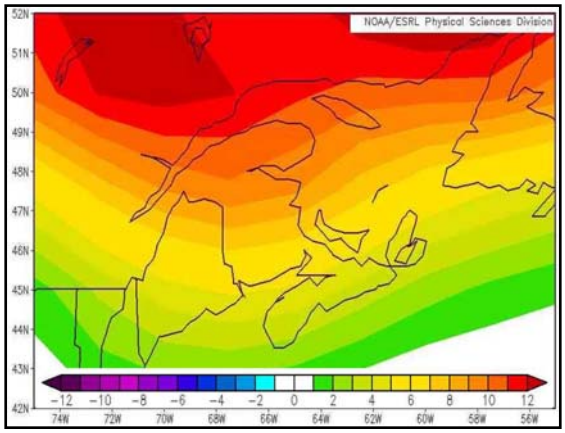

Figure 2: temperature anomaly, 08-15 February

March 2010

The first three weeks of March were also characterized by above to well above normal temperatures. The ice cover diminished gradually and the ice coverage remained at a minimum record during that period. The picture below (figure 3) illustrates the difference in the ice conditions, at the beginning of March 2009 and 2010:

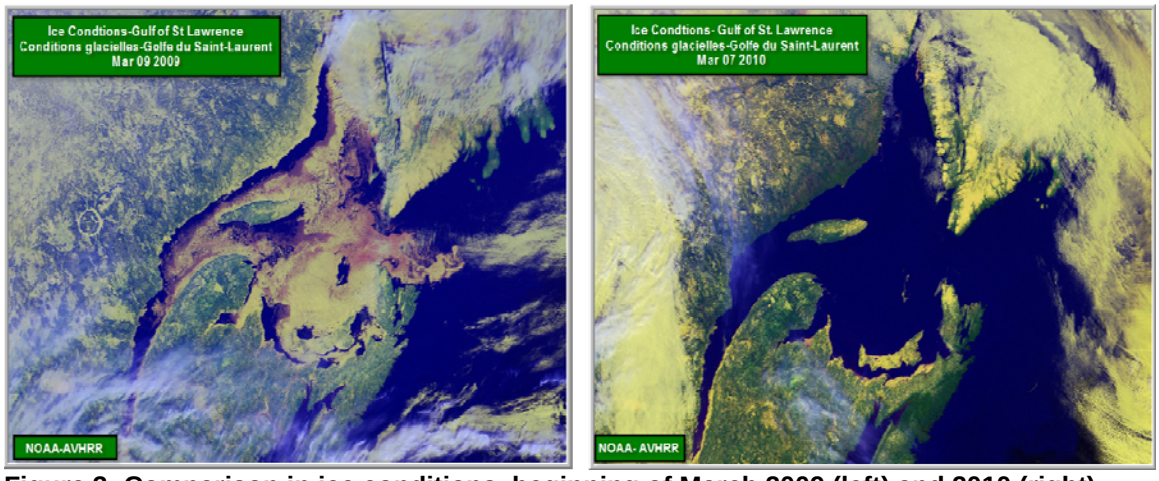

Figure 3: Comparison in ice conditions, beginning of March 2009 (left) and 2010 (right)

At the end of the third week of March loose medium and thin first year ice was found in the eastern half of Northumberland Strait. At this time the rest of the gulf

was for the most part ice free except open water in coastal areas. While the ice in Northumberland Strait melted in the last week of the month, an intense storm and associated north-easterly winds resulted in ice drifting from the Strait of Belle Isle into the northeast section of the Gulf of St Lawrence. As a result the ice cover in the Gulf increased and towards the end of March the ice cover was not at a minimum record anymore. Figure 9 shows that, at this time, 1981 holds the record for the least amount of ice, just below this year.

April and May 2010

At the beginning of April the Gulf of St Lawrence was essentially ice free except for loose areas of thick first year ice with a trace of old ice in the northeast end of the gulf which melted early in the second week of the month. Open or bergy water persisted in the northeast end of the gulf until the last week of April at which time another storm and associated north-easterly winds brought a significant amount of medium first year with a trace of old ice back into the northeast section of the gulf as far west as Harrington Harbour (figure 11). Above normal temperatures as well as offshore winds contributed to the rapid melting of this ice late in the first week of May.

The total accumulated ice coverage (TAC) for the 2009-2010 ice season in the Gulf of St Lawrence was close to 50% less than that of the previous record (figure 4) which was set in the winter of 1968-69. Figure 12 shows the weekly evolution of the ice coverage over the entire ice season in the gulf.

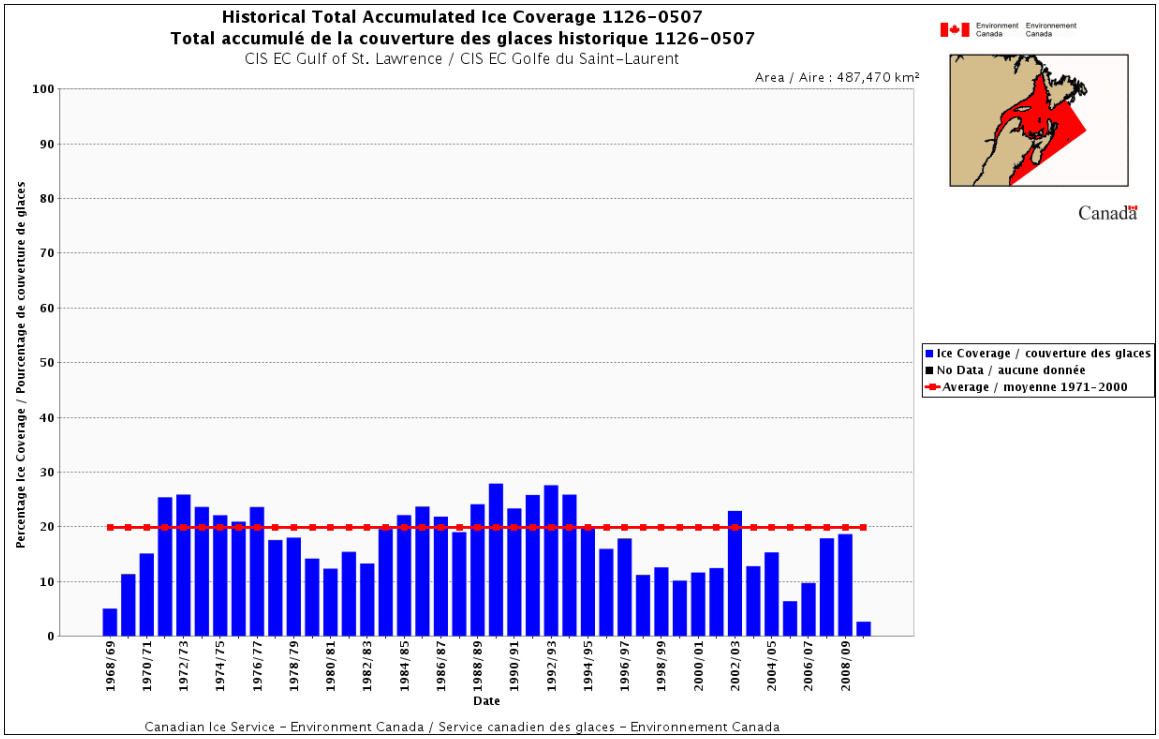

Figure 4: Total accumulated ice coverage (TAC)

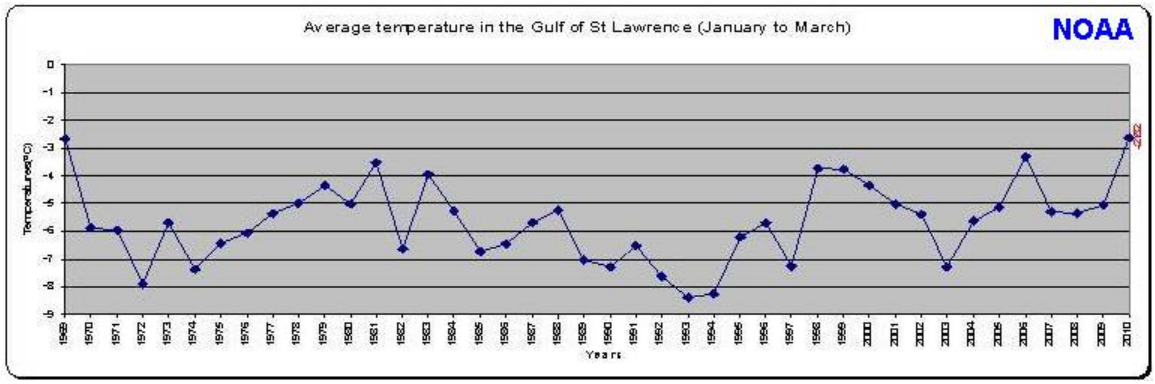

Figure 5: January to March temperatures, Gulf of St Lawrence, for the years 1969 to 2010

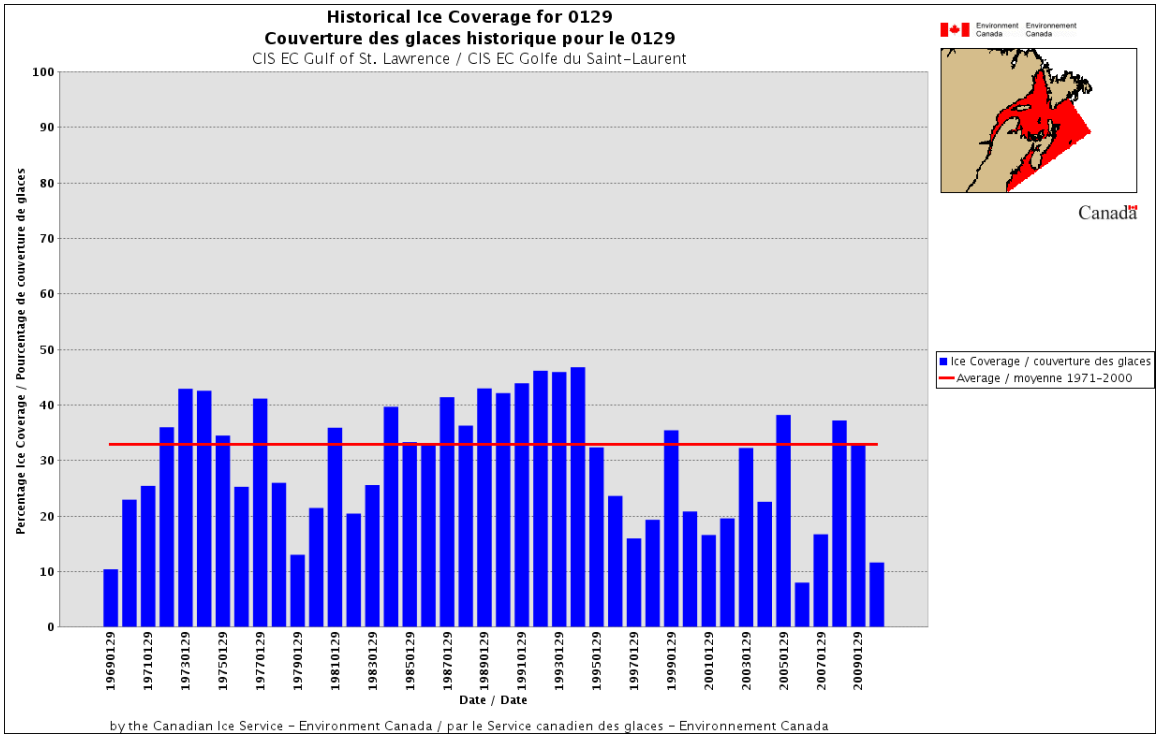

Figure 6: Ice cover, January 29

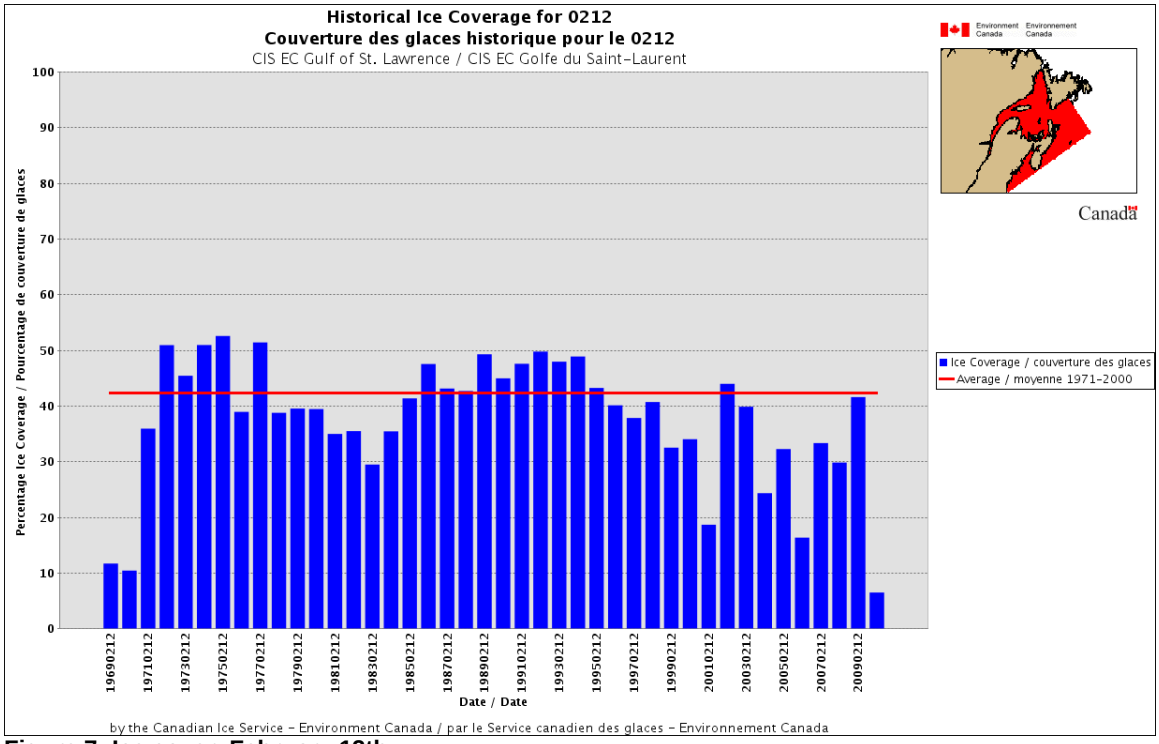

Figure 7: Ice cover, February 12th

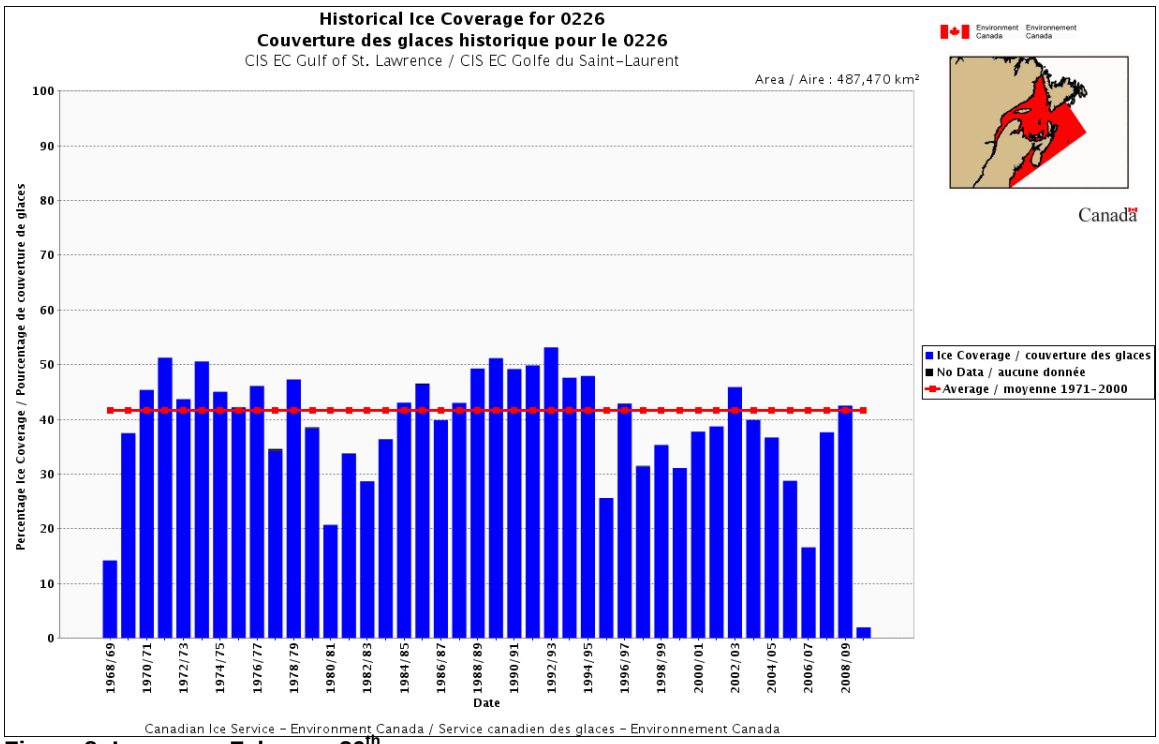

Figure 8: Ice cover, February 26th

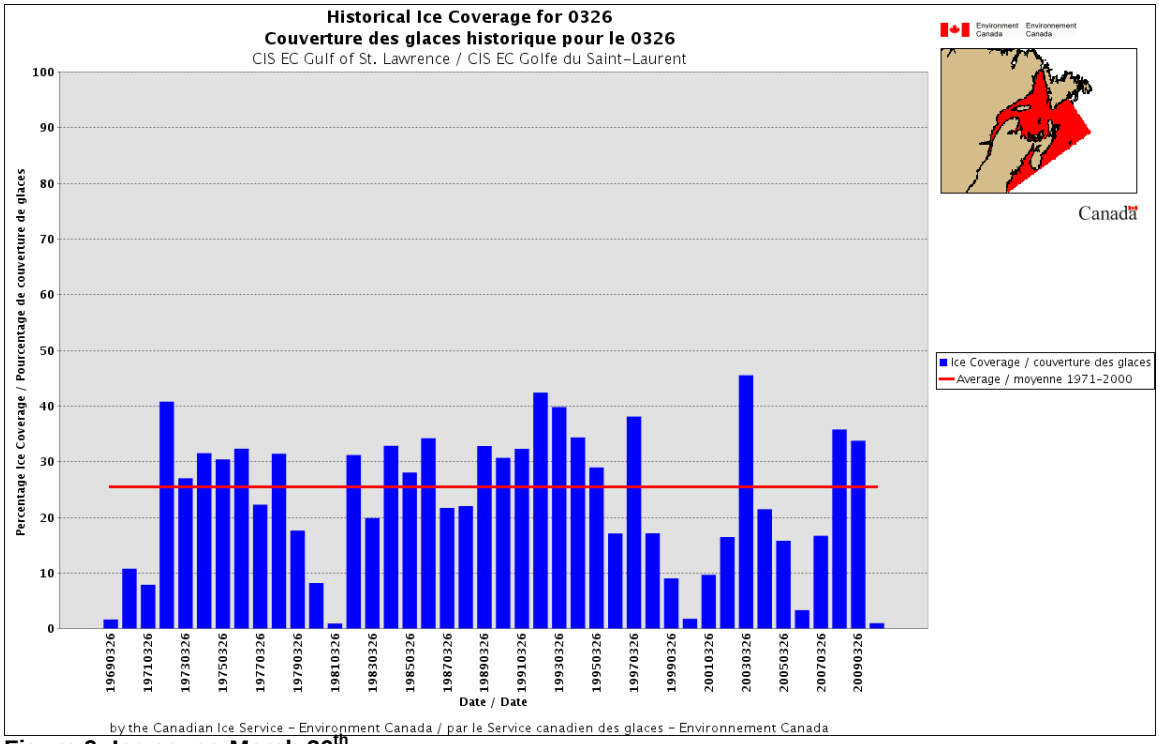

Figure 9: Ice cover, March 26th

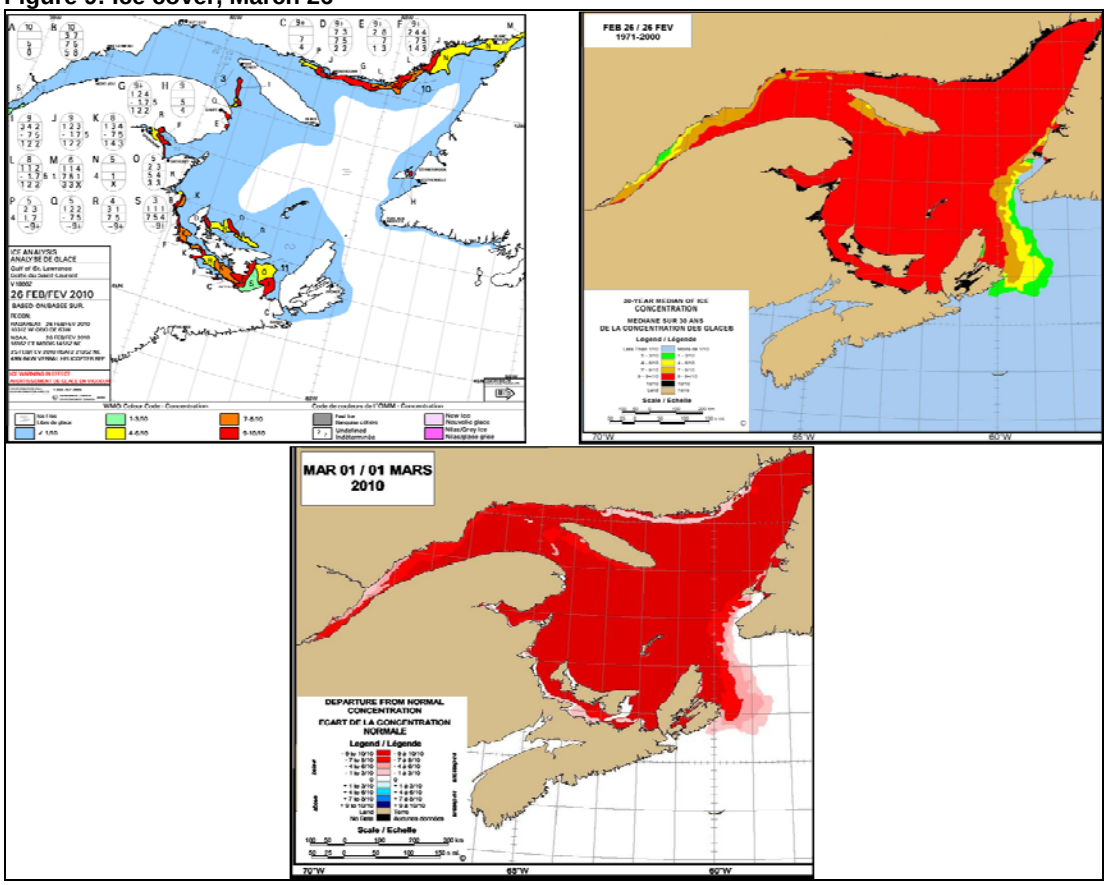

Figure 10: Actual ice conditions, median of ice concentration and departure from normal near the end of February

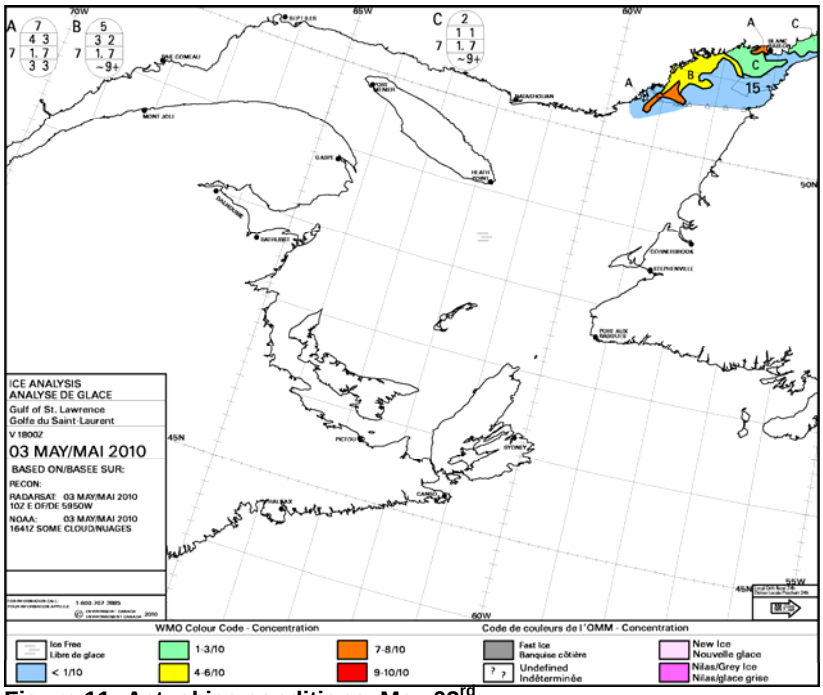

Figure 11: Actual ice conditions, May 03rd

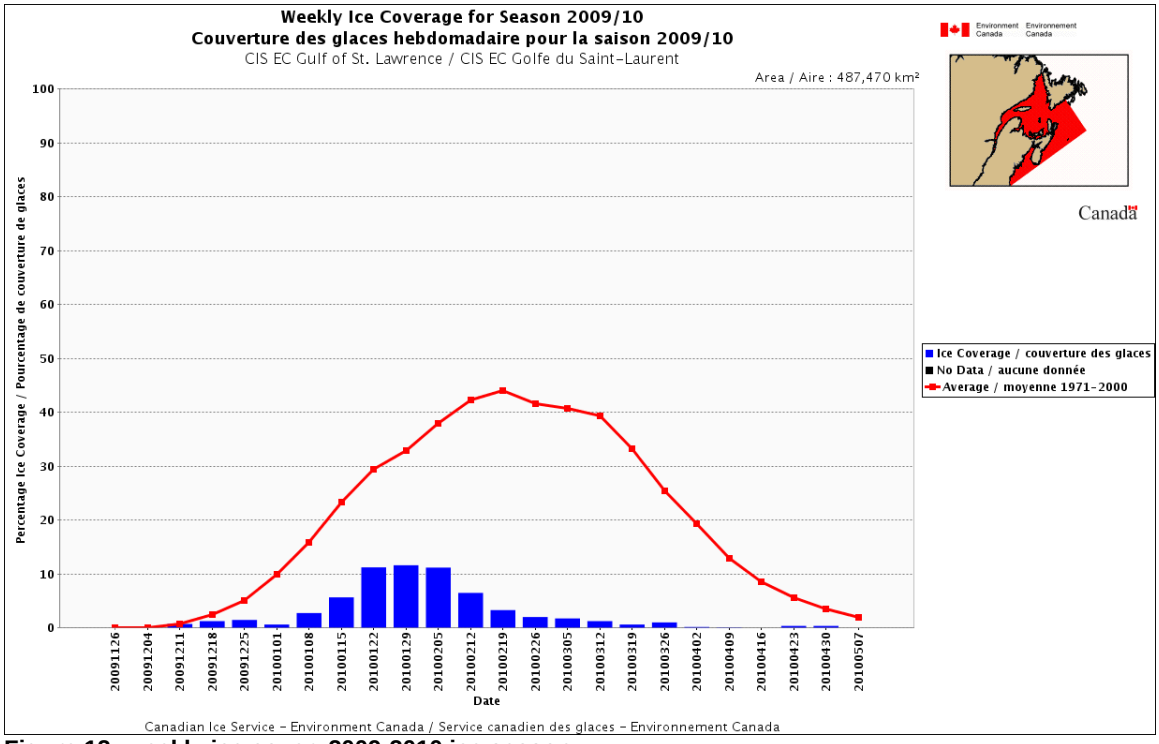

Figure 12: weekly ice cover, 2009-2010 ice season

Newfoundland and Labrador waters

November and December 2009

Temperatures in November and in the first half of December have generally been above normal along the Labrador coast and in the Newfoundland waters. Sea surface temperatures were in general close to normal except colder in the southeast Newfoundland waters (figure 13). This resulted in a delay in ice formation along the Labrador coast. The second half of December was particularly mild with temperatures anomalies ranging between 3ºC to 7ºC above normal in many locations along the Labrador coast (figure 14). Hence little ice formation was reported along the Labrador coast except for new ice that developed but melted a few days later. The second half of December is a period when we normally observed rapid ice development along the Labrador coast. Besides the temperature, winds play also a major role in ice development. The second half of December was characterized by strong easterly winds which suppressed much of the new ice formation and prevented the little that had formed from drifting southward. At the end of December very little ice was found along the Labrador coast. At that time there is normally a 30 to 60 mile wide band of mainly greywhite ice along the Labrador coast extending as far south as the northern tip of the Northern Peninsula. The ice development at the end of December was already a month late and the ice cover along the Labrador coast was the lowest in CIS ice records which dates back to the winter of 1970-1971.

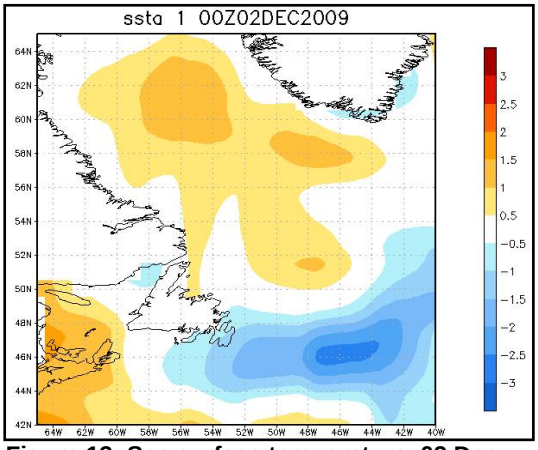

Figure 13: Sea surface temperature, 02 Dec.

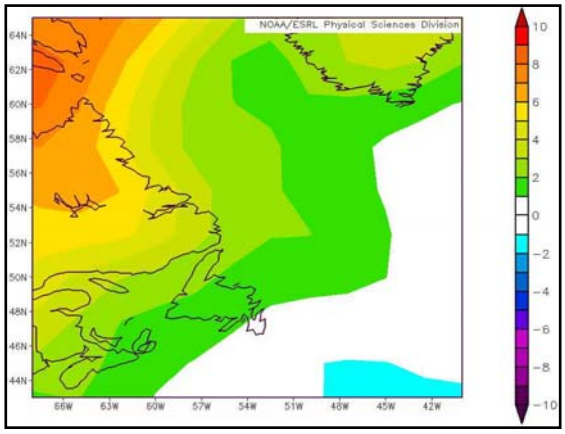

Figure 14: temperature anomaly, 16-31 Dec.

January 2010

In the first two weeks of January, the significantly milder than normal temperatures coupled with the anomalous east to northeast winds continued to predominate along the Labrador coast. Temperatures anomalies along the Labrador coast were in the order of 8˚C to 13˚C above normal in the first half of January (Figure 15). At mid-month a narrow band of new ice was generally found

along the Labrador coast where, at this time, thin first year and greywhite ice is normally found. Lake Melville was still mobile which is highly unusual at mid-January. Temperatures did temperate somewhat in the second half of January and winds back from a north-westerly direction. This allowed moderate ice development and at the end of January greywhite and thin first year ice were generally found along the northern section of the Labrador coast. New and grey ice was predominant along the southern section of the coast. At the end of January no ice was found in the Newfoundland waters with the exceptions of new and grey ice present in shallow bays along the northeast coast of Newfoundland. At that time the central section of Lake Melville was still mobile. Figure 16, below shows the ice conditions along the southern Labrador coast and in the Newfoundland water as analysed by CIS on January 29th (left) and the normal ice conditions (right). We can appreciate the difference especially in the Newfoundland waters:

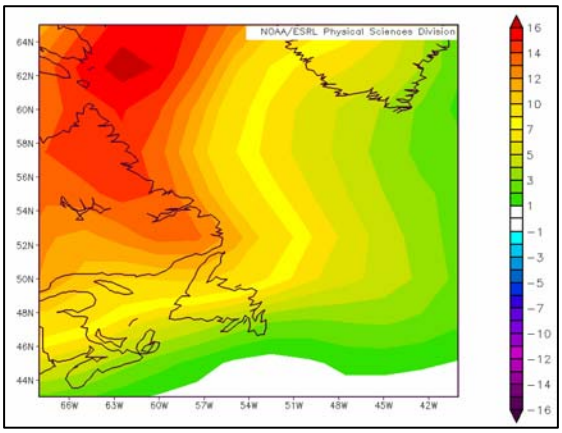

Figure 15: temperature anomaly, 01-15 Jan.

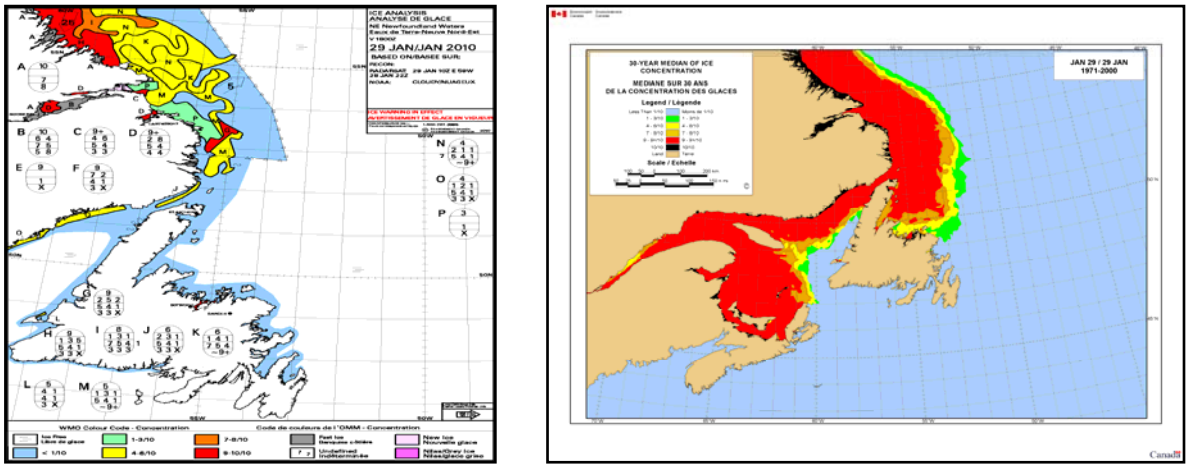

Figure 16: Reported ice conditions and normal ice conditions, end of January

February 2010

Reported temperatures along the Labrador coast and in the Newfoundland waters have been relatively close to normal in the first week of February which allowed ice to thicken along the Labrador coast and to spread in the Newfoundland waters as far south as the northern section of Notre Dame Bay. The rest of Lake Melville consolidated in the first week of February. However the period of near normal temperatures did not persist. Very mild temperatures as well as predominant onshore winds in the second week of February destroyed almost all the drifting ice that was then found in the Newfoundland waters. Also

these onshore winds compact the ice in a narrow band against the Labrador coast. The temperature trend that established itself in the second week of February continued to predominate in the last half of the month as very mild temperatures as well as east to northeast winds continued to be the norm. Figure 17 indicates the temperature anomaly in the last 3 weeks of February which ranged from 12 to 15˚C above normal along the Labrador coast and from 5 to 10˚C above normal in the east Newfoundland waters. At the end of February first year ice was predominant along the Labrador coast but its thickness and seaward extent was a lot less than normal. In the Newfoundland waters no ice was found at the end of February which is a highly unusual situation for the time of the year. The last time such a situation was observed was in 1969, which happens to be the year CIS started collecting data for the east coast of Canada. The graphics below (Figure 18 and Figure 19) indicate the accumulated freezing degree day (FDD) at Cartwright and Gander respectively up to the end of February.

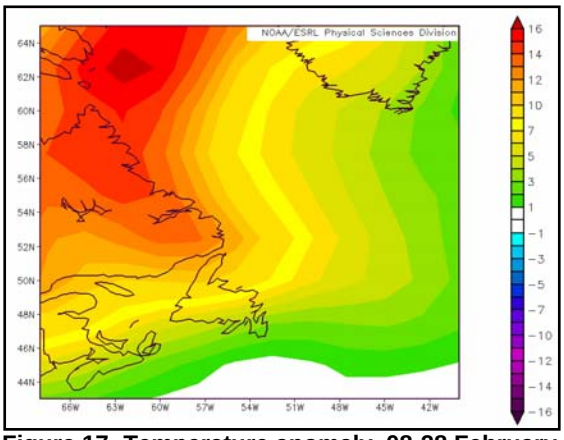

Figure 17: Temperature anomaly, 08-28 February

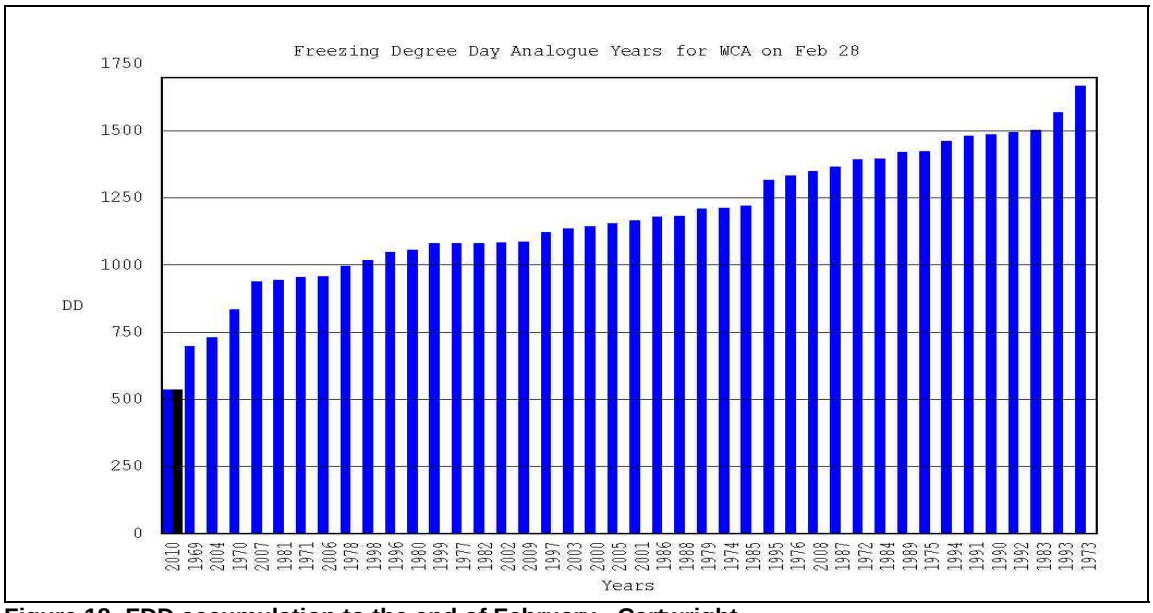

Figure 18: FDD accumulation to the end of February - Cartwright

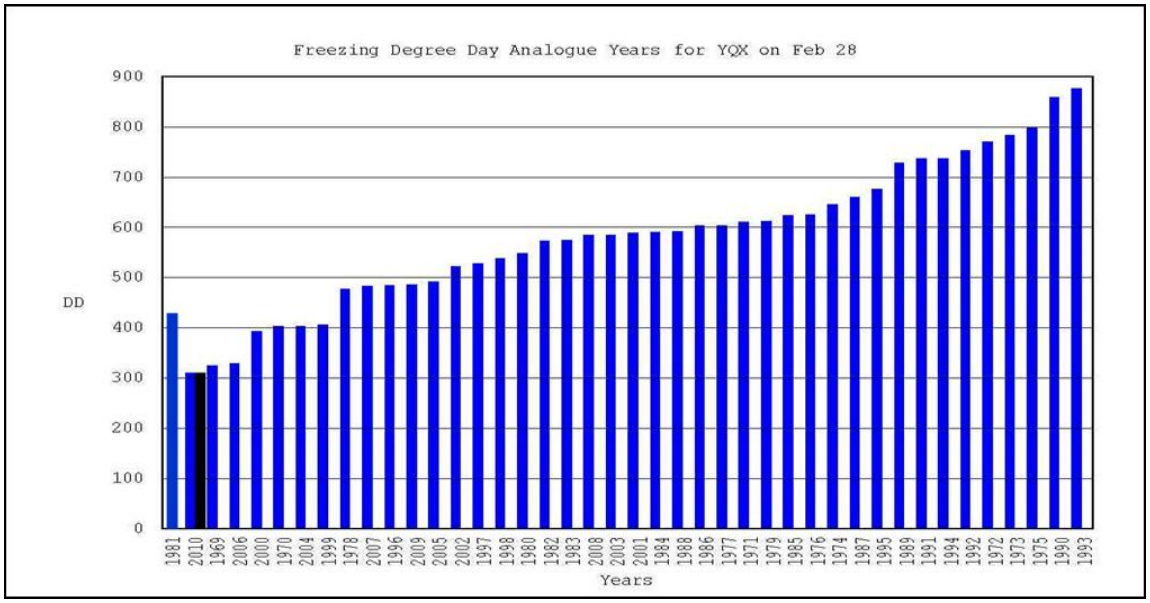

Figure 19: FDD accumulation to the end of February - Gander

At Cartwright the previous record for the least amount of FDD, at the end of February, was set in 1969. This year (winter 2009-10) this record was beaten with 36% less FDD than that in the winter of 1969. Gander also registered a record minimum amount of FDD's since 1969 but by a very weak margin. The graphic below (Figure 20) shows the total ice coverage in the Newfoundland waters and along the southern Labrador coast up to the end of February:

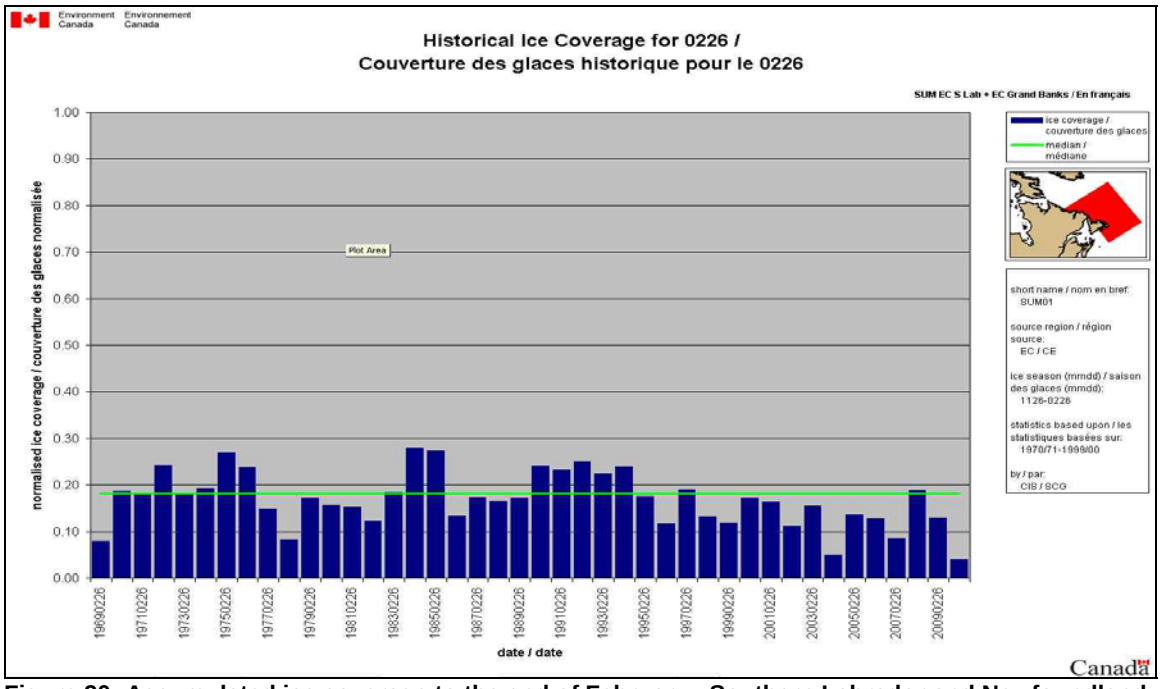

Figure 20: Accumulated ice coverage to the end of February - Southern Labrador and Newfoundland waters

It shows that the ice coverage on February 26th along the southern Labrador and in Newfoundland waters was the lowest in CIS ice records which dates back to the winter of 1968-69. The graphic below (Figure 21) shows the ice coverage, this time in the Newfoundland waters only:

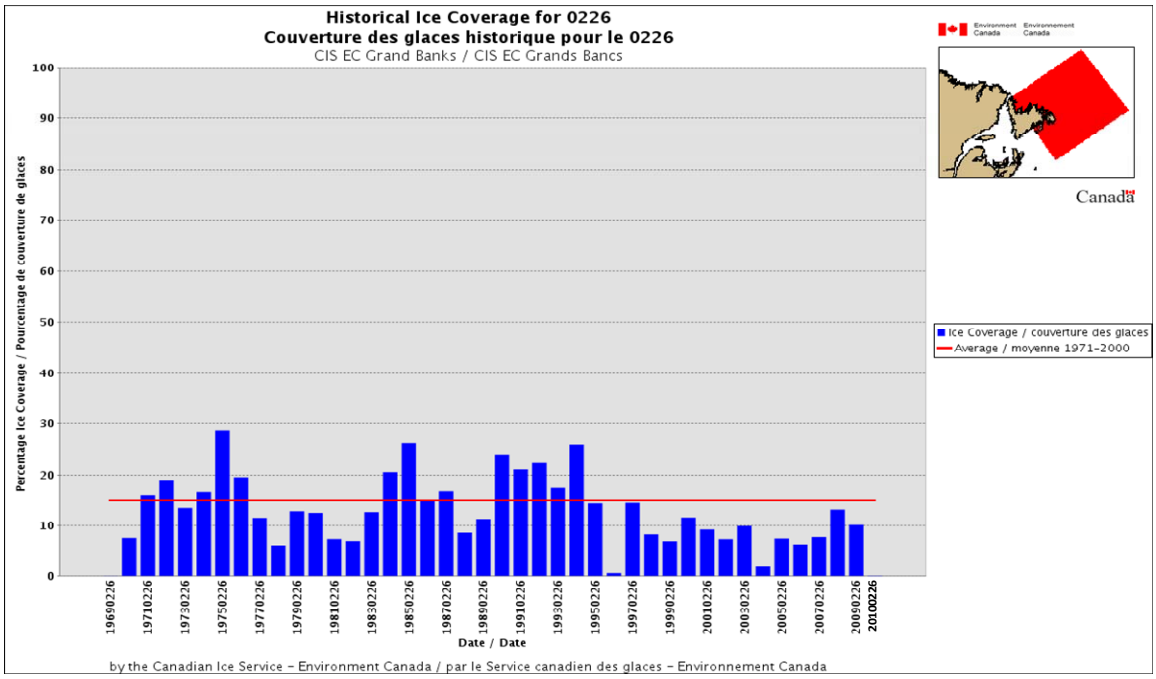

Figure 21: Accumulated ice coverage to the end of February - Newfoundland waters

It shows that this winter's ice coverage, at the end of February is the lowest in CIS ice records since 1969. In fact, in both 1969 and 2010, there was almost no ice in the Newfoundland waters.

March 2010

In term of temperatures, the first half of March, while not as mild as the last three weeks of February, remained above to well above normal. As winds remained from the east northeast little changed was observed in the first week of the month. In the second week the predominant winds changed from a north-westerly direction allowing the pack to move south, reaching the northern tip of the Northern Peninsula, and to expand seaward. Temperatures remained above normal in the third week of March but dipped to slightly below normal in the last week of the month. This, combined with episodes of offshore winds allowed the pack to move down the Northern Peninsula coast to just north of Notre Dame by the end of March. Another consequence of this has been the seaward expansion of the pack along the mid and south Labrador coasts. Along the mid Labrador coast the seaward extent of the pack was more than normal (Figure 22).

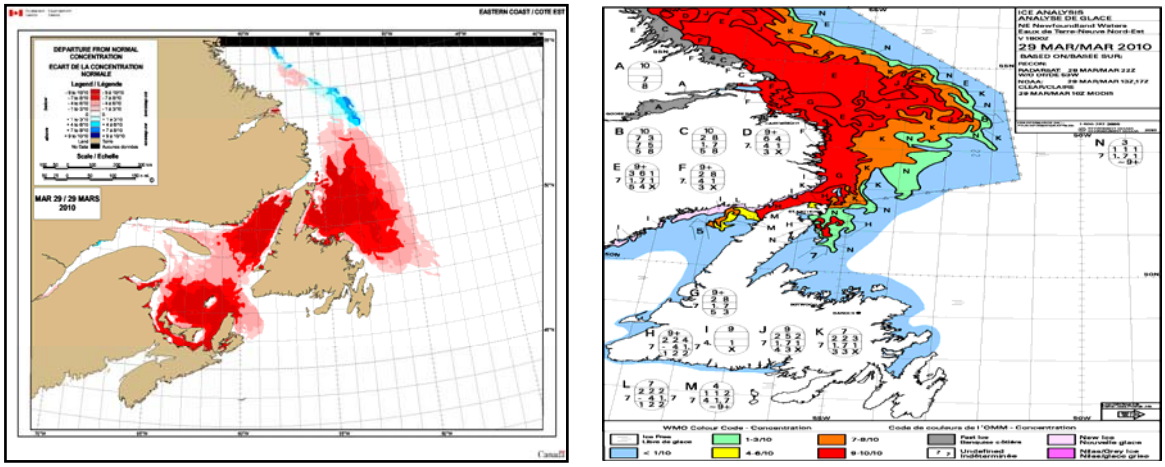

Figure 22: Median of ice concentration and ice conditions - end of March

April 2010

Above normal temperatures continued to be the norm in the first two weeks of April. This, combined with a generally offshore flow, contributed greatly to a general loosening of the pack especially along the southern part of the Labrador coast and to keeping it offshore. Lake Melville started to break-up just before mid-April. Temperatures continued to average above normal values in the second half of April. In that same time period, persistent east north-easterly winds were generally reported and the pack moved right back to the south Labrador coast. Also this wind pattern allowed the ice to drift down the northern Peninsula and, at the end of April, White Bay was filled with medium and thick first year ice. Break-up continued in Lake Melville and loose ice conditions prevailed in the lake at the end of April. At that time very close pack ice conditions existed along the northern Labrador coast but the eastern limit of the pack was starting to retreat. Much of the fast ice along the Labrador coast south of 56N fractured during the second half of April.

May 2010

Temperatures returned to near normal values and winds weakened, but remained generally onshore, in the first half of May. The ice in White Bay and along sections on the Northern Peninsula coast melted in the first week of May and Lake Melville was open water in the second week which is a month earlier than normal. At mid-May only a narrow band of ice was present along the southern Labrador coast which is a lot less than normal. Winds were generally from a north north-easterly direction in the second half of May. This wind pattern kept the ice closely packed along the Labrador coast which prevented it from melting. At the same time this wind pattern allowed the ice to progress southward. As a result at the end of May, despite near minimum ice record throughout most of the winter season, the southern extent of the pack along the

southern Labrador coast was near its normal position. The seaward extent of the pack remained, however, less than normal. At the end of May a lot of ice was still found along the northern Labrador coast but its compactness and the seaward extent of the pack have diminished significantly. Most of the fast ice along the northern section of the Labrador coast fractured in the second half of May.

June and July 2010

June's temperatures remained in general close to normal. The winds were still showing an onshore component which kept the ice pack close to the Labrador coast. As a result the ice melted at a slower pace than it would normally do that late in the ice season. A southward progression of the pack was also observed so that at the end of the third week of June the southward extent of the pack was more than normal as seen on the departure from normal chart (figure 23). The northern section of the Labrador coast cleared just before the end of June. At that time patchy areas of thick first year ice with a trace of old ice was still present along sections of the mid-Labrador coast but this ice all melted in the first week of July. As seen in Figure 24, the TAC for the 2009-2010 ice season in the Newfoundland waters, was the lowest in CIS ice record.

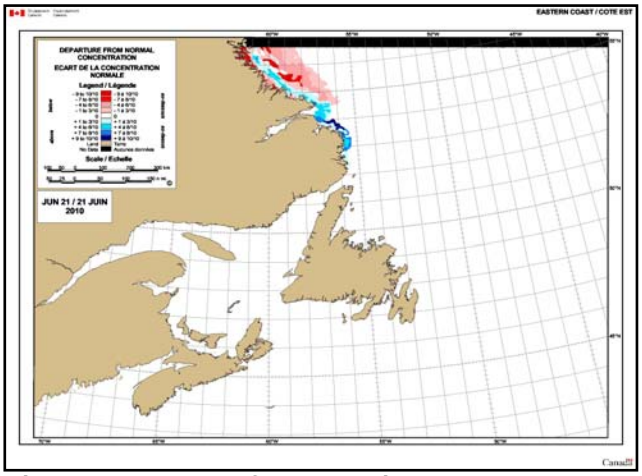

Figure 23: Departure from normal - 21 June

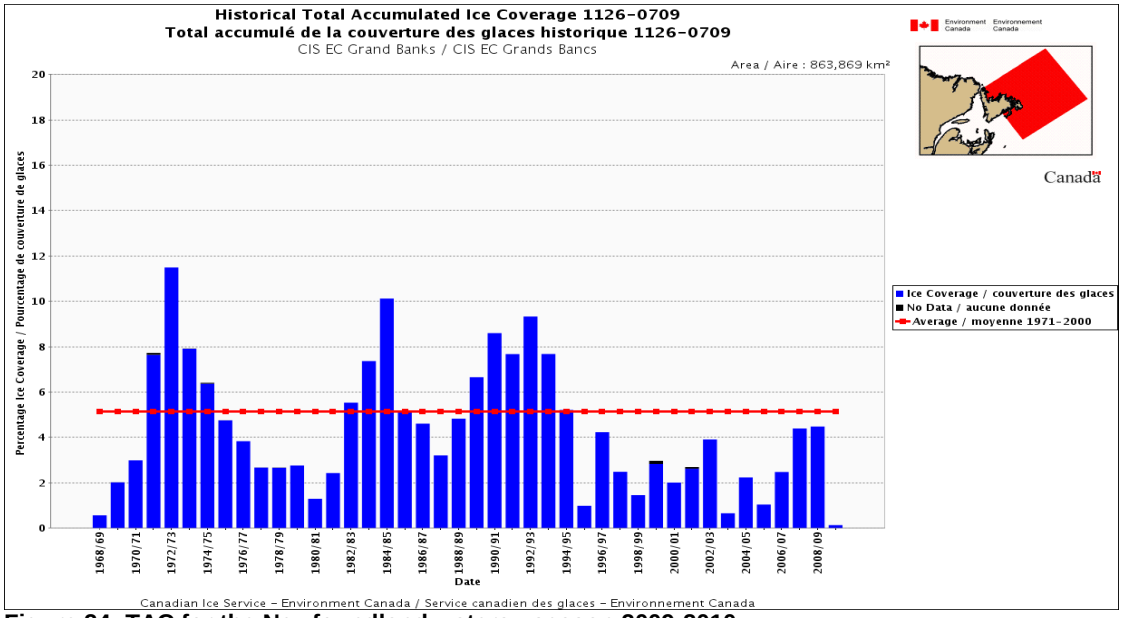

Figure 24: TAC for the Newfoundland waters - season 2009-2010

Along the southern Labrador coast the TAC, while not setting a new record, was one of the lowest ever recorded (Figure 25).

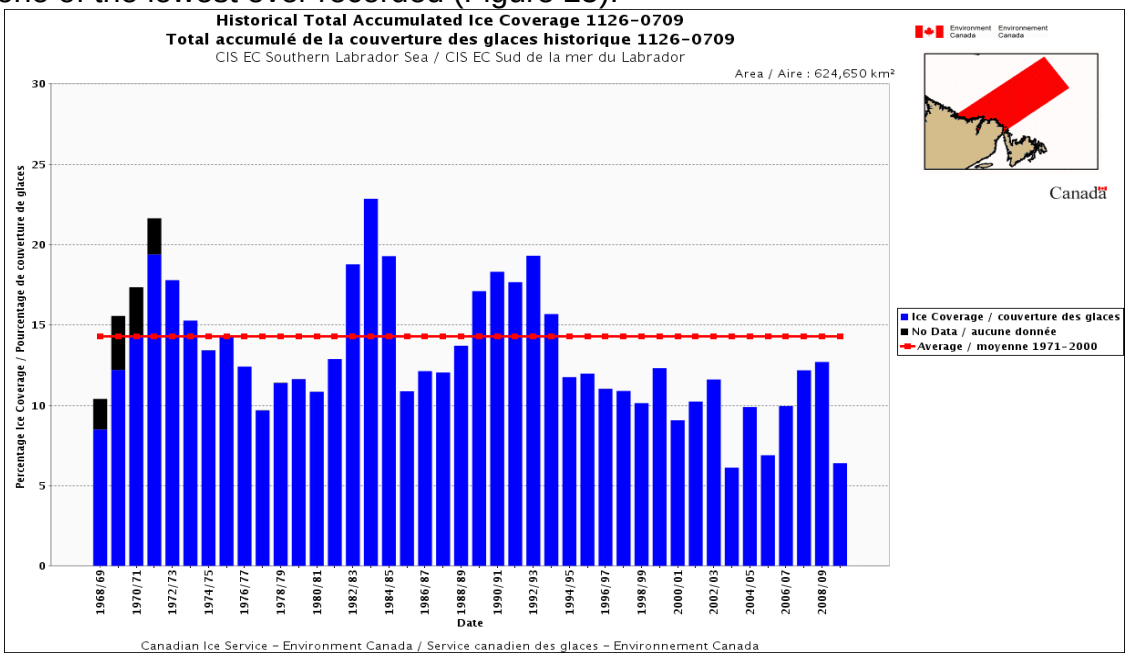

Figure 25: TAC for the southern Labrador coast - season 2009-2010