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Seasonal Summary

Eastern Canada
Winter 2015-2016

By



Canadian Ice Service
Le service canadien des glaces

Summary for the East Coast

The East Coast winter of 2015-2016 was distinctly separated by the geography of the region. The Estuary and Gulf of St. Lawrence experienced much lower ice coverages than that recorded over the Southern Labrador Sea and the East Newfoundland Waters. Surface air temperatures were anomalously warm for the beginning of the ice season over the Gulf and into the estuary. This pattern persisted until March 2016 as temperatures then returned to near normal values with respect to the 1981 to 2010 climatology. Near the northeast Newfoundland coast and northwards toward the South Labrador Sea, near normal air temperatures were the dominant feature for the whole 2015-2016 ice season.

The ice coverage values for the East Coast closely followed this anomaly temperature pattern. Total accumulated ice coverage (TAC) values were well below the median values during the winter for the Gulf of St. Lawrence, but fluctuated closely around the median for the East Newfoundland Waters and the Southern Labrador Sea. The onset of peak ice coverage values for Newfoundland waters and along the Labrador coast was delayed somewhat with respect to the 1981 to 2010 median, with the maximum values being registered up to three weeks later than normal.

Ice thicknesses across the Gulf of St. Lawrence also lagged well behind the usual climatological expectations. Ice types present during the winter were often a full stage development behind the typical predominant ice type according to the associated climatology. This delay did not manifest in the East Newfoundland Waters or the Southern Labrador Sea due to the near normal temperature conditions that were observed.

Due to the limited extent of the ice and significantly lower than normal thicknesses, the deterioration of this ice in the Gulf was swift once the melt commenced. By late early April the ice melt was nearly complete, concluding the season approximately two to three weeks faster than normal. The deterioration of the ice followed a more normal trend from the Newfoundland waters and northwards along the Labrador coast, coming to a conclusion in early June 2016 as the ice receded north of Groswater Bay.

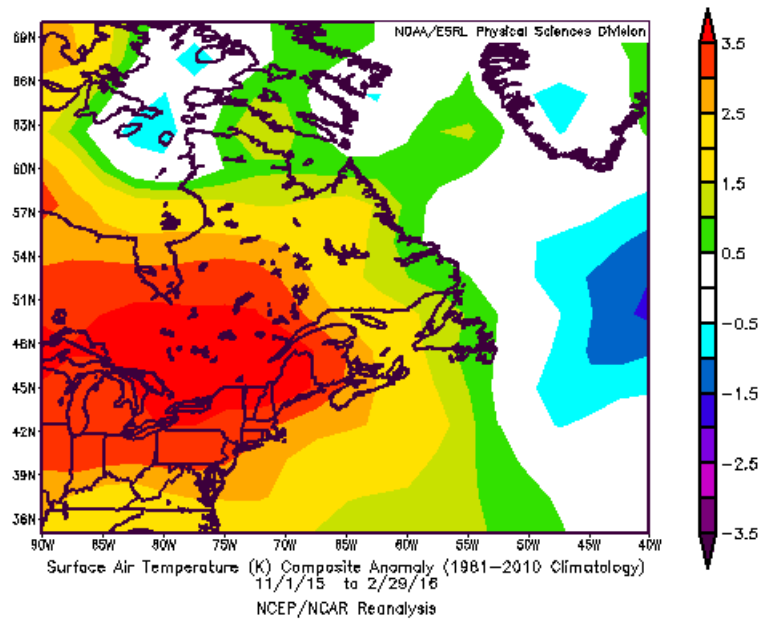


Figure 1: Surface Air Temperature Anomaly November 2015 to February 2016.

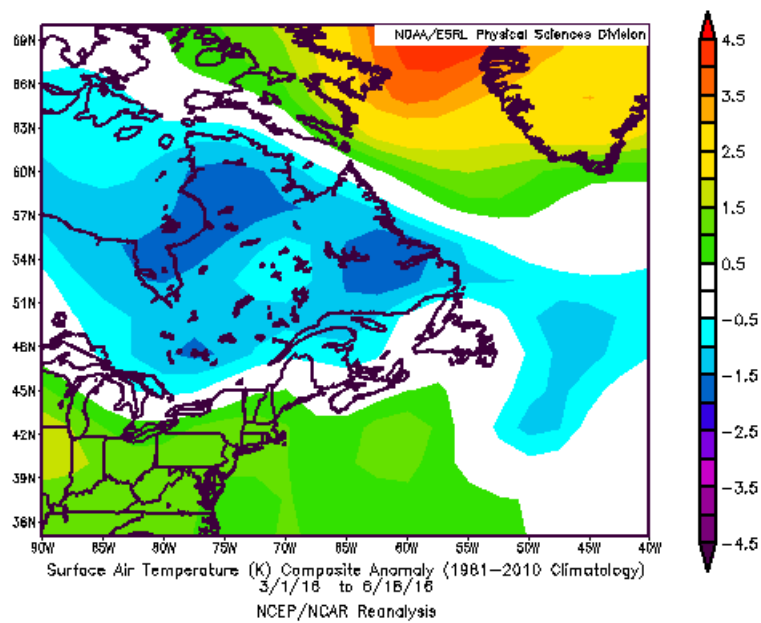


Figure 2: Surface Air Temperature Anomaly March 2016 to mid-June 2016.

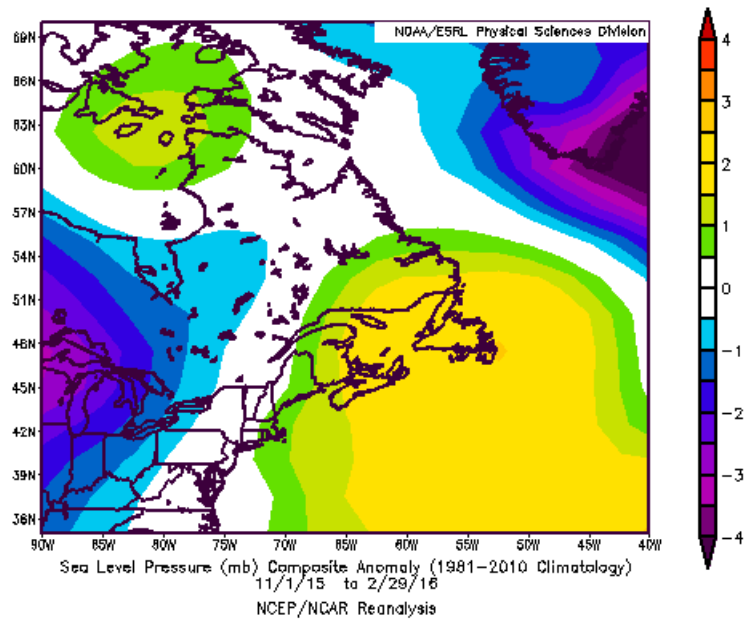


Figure 3: Sea Level Pressure Anomaly November 2015 to February 2016.

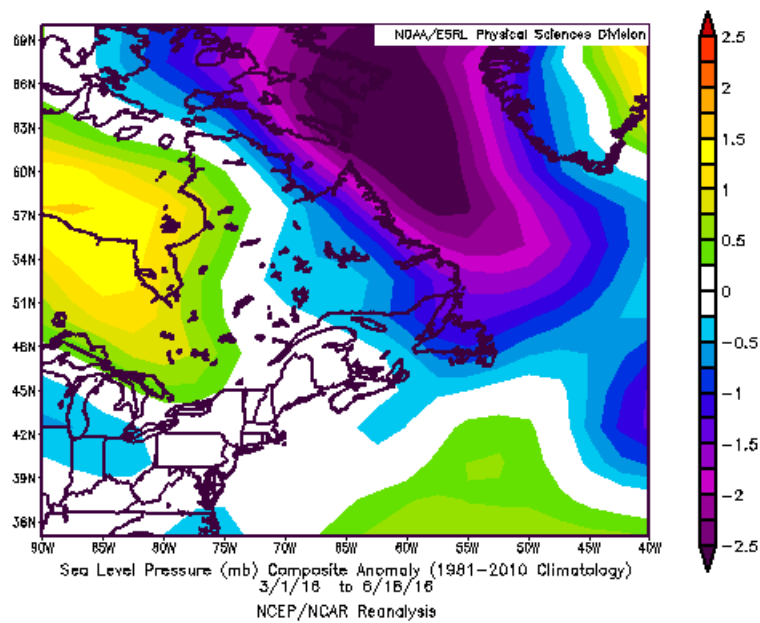


Figure 4: Sea Level Pressure Anomaly March 2016 to mid-June 2016.

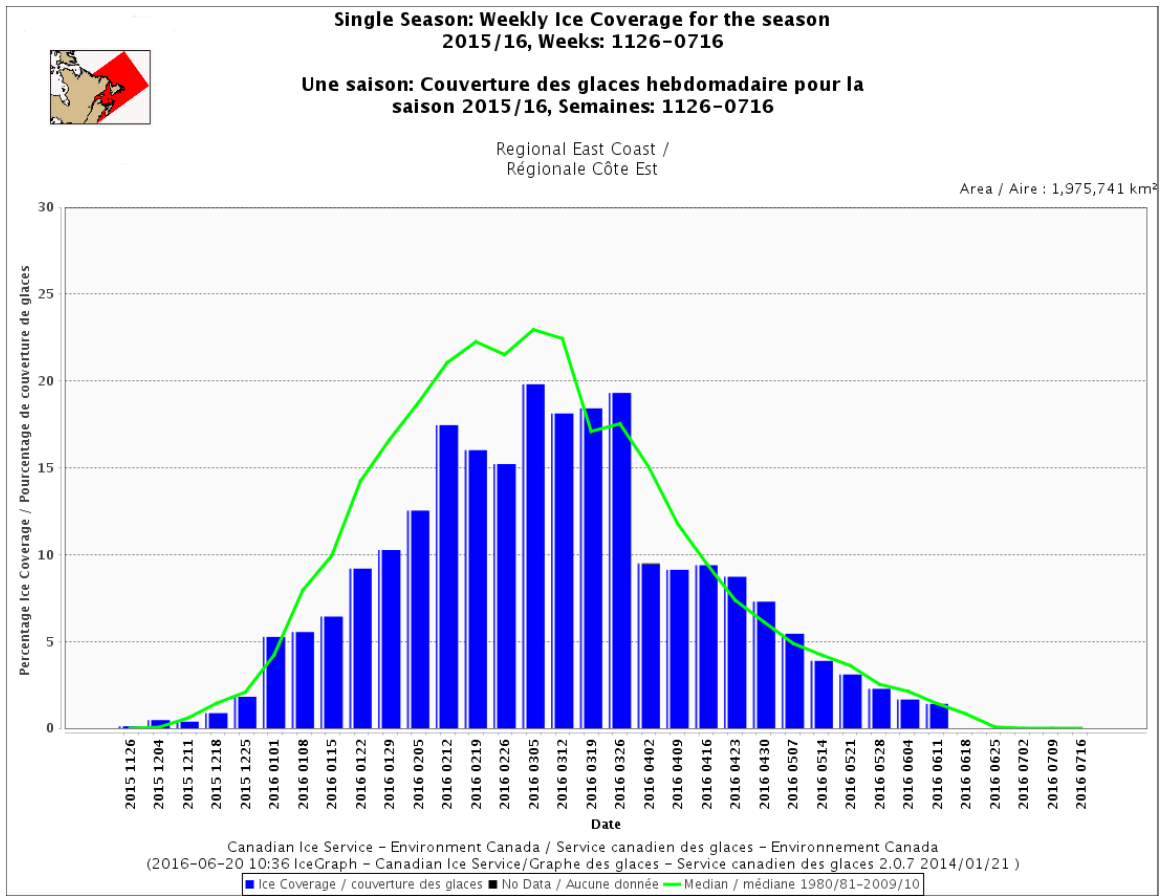


Figure 5: East Coast Weekly Ice Coverage for the 2015-16 winter season.

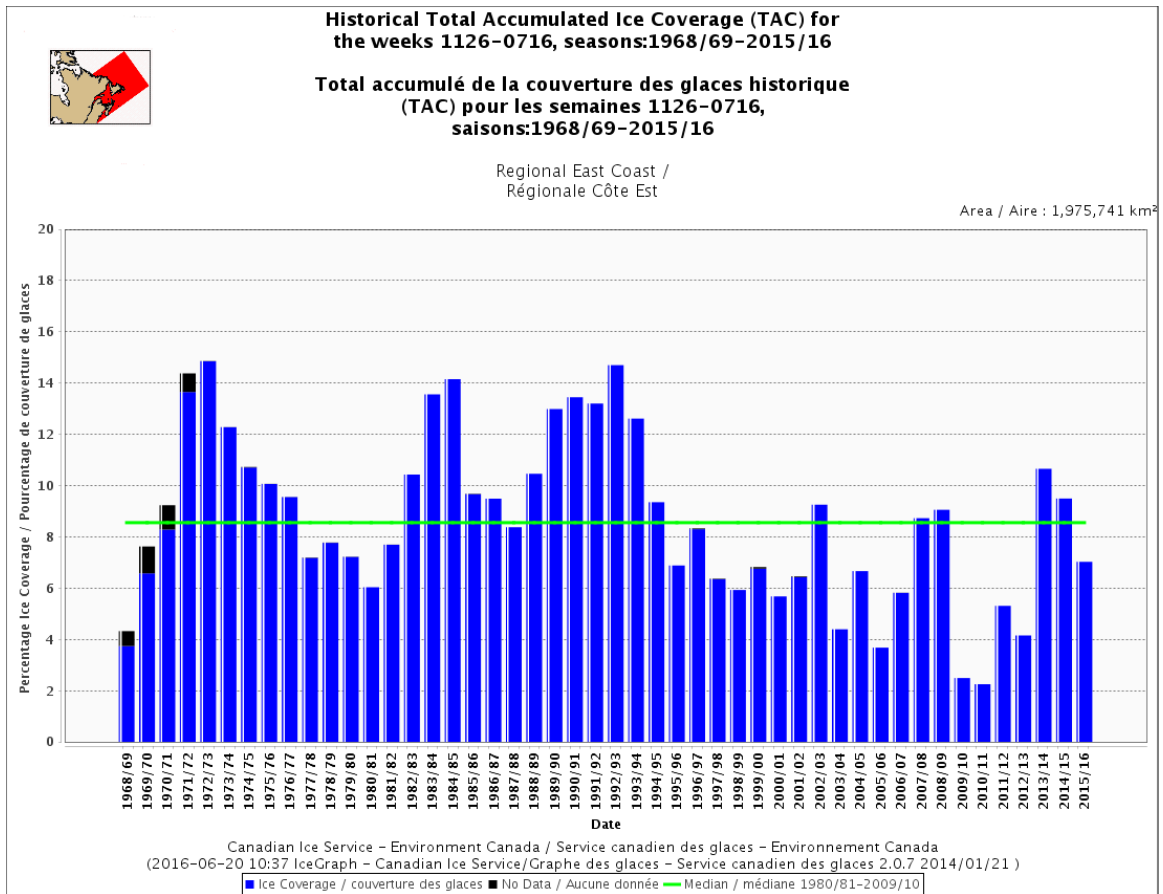


Figure 6: East Coast Historical Total Accumulated Ice Coverage by season, 1968-2016.

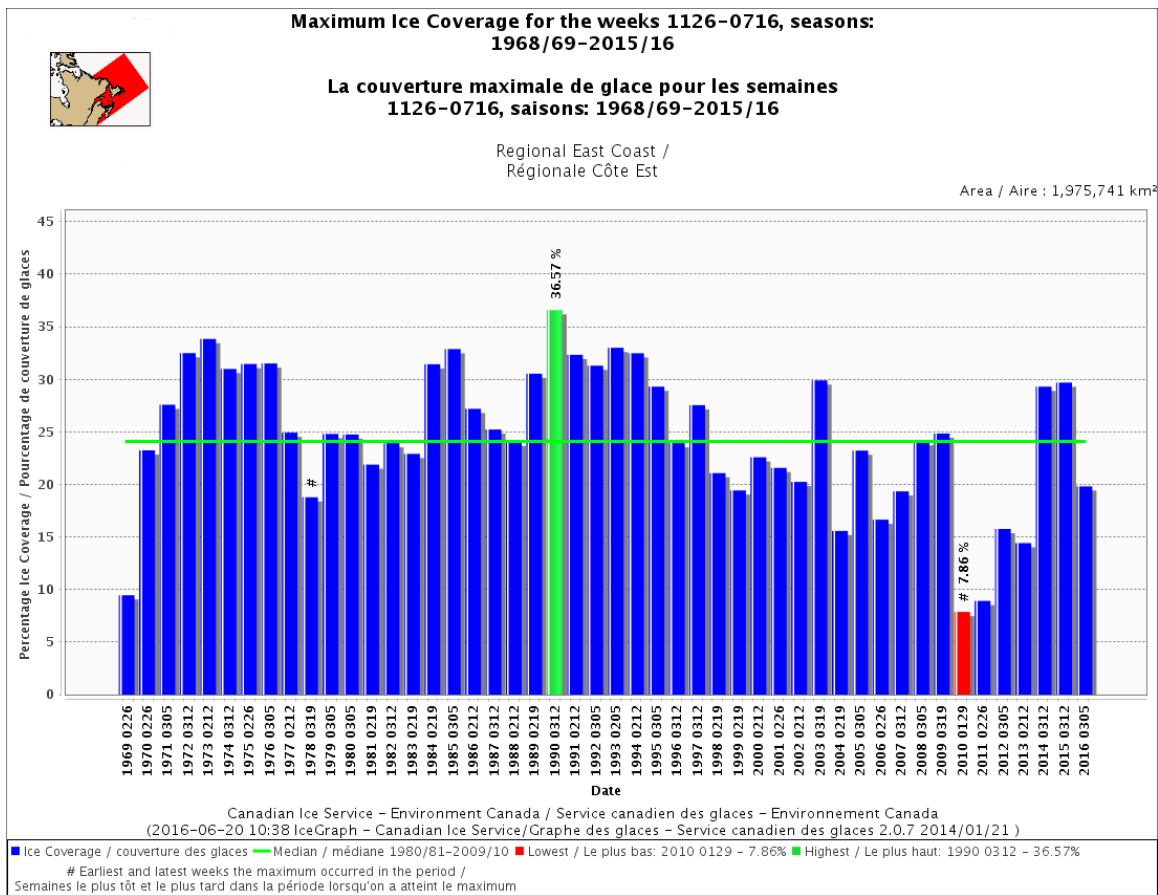


Figure 7: East Coast Historical Maximum Ice Coverage by season, 1968-2016.

Gulf of St Lawrence

2015-2016 Season temperatures and weather: November to June.

Across the Gulf of St. Lawrence from December 2015 through February 2016, surface air temperatures were anomalously warm. The strength of this anomaly was relatively stable during this period, fluctuating between 0.5 to 6.0°C above the climatology. Persistent southerly flow over the region was noted as a steady source of warm air into the Gulf region. This flow regime was supported by the establishment of an anomalously strong ridge of high pressure centred southeast of Newfoundland and an accompanying anomaly low pressure system situated over the western Great Lakes.

Conditions returned to near normal with respect to surface air temperature for the Gulf after February. Surface air temperature anomalies were weak and disorganized over the region through May 2016 and account for the stable pattern observed in the ice coverage values during this period. Sea level

pressure anomalies previously observed from November to February changed substantially, with the anomalous high pressure area weakening south of Newfoundland. A significant low pressure anomaly developed over Davis Strait and projected its influence southward along the Labrador coast and into the Northeast Newfoundland Waters. This sustained a weak northwesterly flow over the Gulf that would support the maintenance of near normal winter temperatures across the Maritimes.

December ice conditions:

New ice first developed in the second week of the month in isolated bays and inlets along the north shore of Quebec and the New Brunswick coast. Ice growth was slow through mid-month and expanded to isolated sections of the estuary. Only at the end of the month did ice development accelerate, with new ice covering the Strait of Belle Isle near Blanc Sablon and along the shores of Chaleur Bay and the St. Lawrence River estuary. Sea ice progress was lagging approximately one week behind the normal climatological value at this point.

January ice conditions:

The pattern of delayed ice growth continued into January 2016 with the anomalously warm surface air temperatures. In the first week ice did advance to the grey ice stage along the New Brunswick coast, north shore of Quebec and in the Strait of Belle Isle. During the second week the western section of the estuary experienced enhanced ice development and grey-white ice began to appear along the western Newfoundland coast near Flower's Cove. Near mid-month, additional sea ice growth took place in the western section of the Strait of Northumberland and along the coasts of Prince Edward Island and Anticosti Island. A destruction event did reverse some of the growth witnessed in the estuary and the Strait of Belle Isle though. As the end of the month approached, grey ice expanded rapidly across the Northumberland Strait and through the estuary along the shoreline of the Gaspé Peninsula. Ice reformed in the Strait of Belle Isle and along the north shore of Quebec near Harrington Harbour. Even with this growth, ice conditions were two to three weeks behind the climate normal for the region.

February ice conditions:

By the end of the first week of February, the ice in the mouth of the St. Lawrence River and along the New Brunswick coast into the Northumberland Strait thickened to the grey stage. Typically, ice in Northumberland Strait in early February has advanced to the grey-white and first-year stages, demonstrating yet again the delay in the development of the ice observed during this ice season. Mid-February experienced a doubling of ice coverage over the Gulf due to a cold outbreak in the region. Ice expanded across the Honguedo Strait and

Jacques Cartier Passage for the first time in the season, as well as along the northern coast of Prince Edward Island and near the Magdalen Islands. Chaleur Bay was fully covered with grey and grey-white ice for the first time in the season as well. Predominantly grey-white ice was now noted in the Strait of Belle Isle, extending southwestward into the northeast arm of the Gulf, as well as in Northumberland Strait. On average, ice would be expected to cover the entirety of the Gulf except along the western Newfoundland coast south of Daniel's Harbour by mid-February. Instead, ice was limited to an area within 100 nautical miles of the New Brunswick coast into Northumberland Strait, the estuary and along the north shore of Quebec into the Strait of Belle Isle. Several destruction events followed this brief maximum in the Gulf and ice concentrations and coverages were significantly reduced by month end. TAC was hovering at nearly one third of the climatological value.

March ice conditions:

March was a month marked by its high degree of variability in ice coverages. Another cold phase drove the development of ice across the eastern section of the Gulf to encircle the Magdalen Islands and first-year ice became more prevalent in Northumberland Strait. This marked the peak of the ice growth in the Gulf, reaching a TAC of 25.79% in the first week of the month. This maximum was well below the typical seasonal maximum of 45.61%. A powerful winter storm at mid-month forced the retraction of this ice growth, destroying much of the ice in the estuary, Chaleur Bay and Northumberland Strait. Significant areas of grey and grey-white sea ice with some first-year ice remained north of Prince Edward Island and in the Strait of Belle Isle. Ice coverage values remained stagnant until near the end of the month when sea ice growth restarted over the eastern section of the estuary and from Chaleur Bay southward to the eastern section of Northumberland Strait. In the last days of March, destruction again took precedence as ice retreated to an isolated area west of Anticosti Island, an area covering the eastern Gulf from south of Anticosti to Cape Breton and in the Strait of Belle Isle.

April – May ice conditions:

The final stages of the ice season for the Gulf progressed rapidly in early April. As ice in the central Gulf melted, it was also briefly transported through the western section of Cabot Strait along the Cape Breton coast. During the second week of the month, most of the Gulf ice was reduced to strips and patches with only notable ice remaining in coastal bays and inlets. Ice diminished at a pace much faster than normal and was nearly a month ahead of the climatology. Fast ice near Sept-Îles, the Magdalen Islands and in Chaleur Bay all broke up in the final week of April. The final areas of fast ice along the north shore of Quebec disappeared by mid-May, thus concluding the 2015-2016 ice season for the Gulf of St. Lawrence.

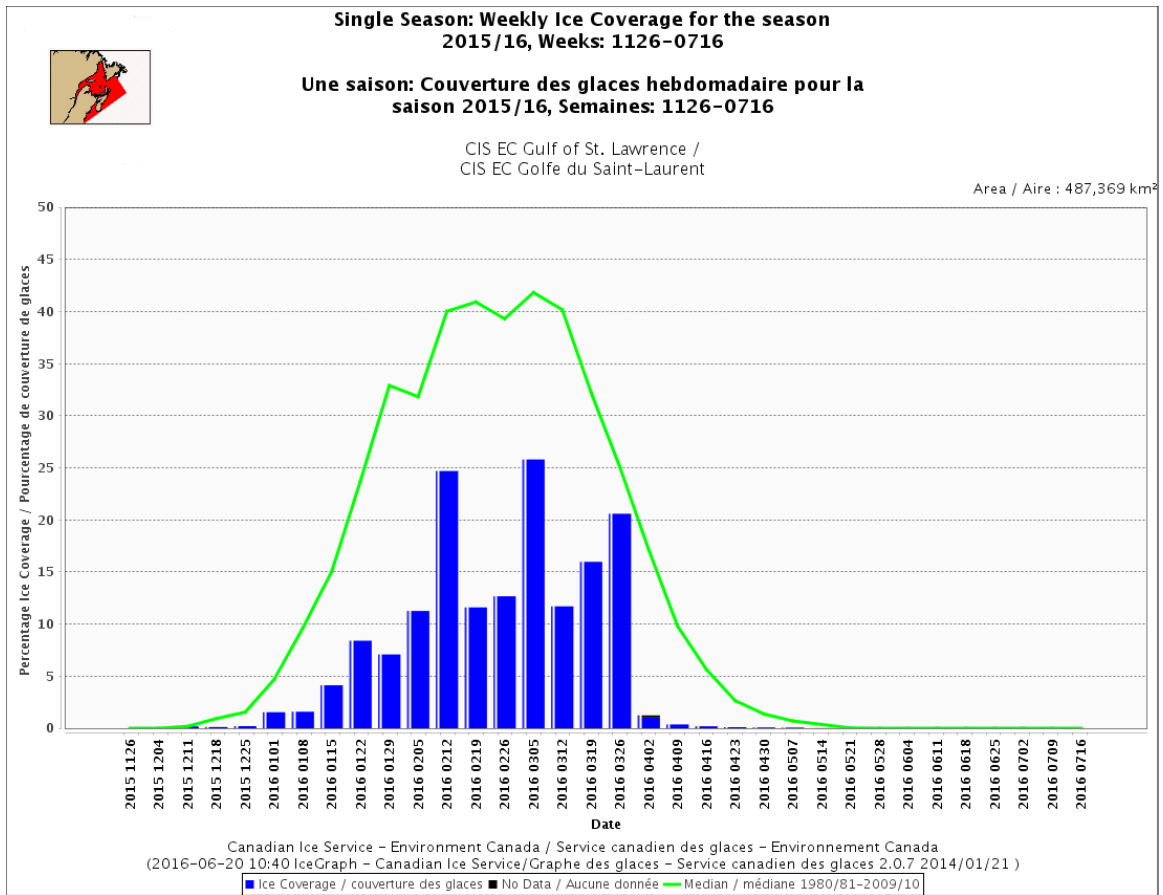


Figure 8: Weekly Ice Coverage for the 2015-2016 season in the Gulf of St. Lawrence.

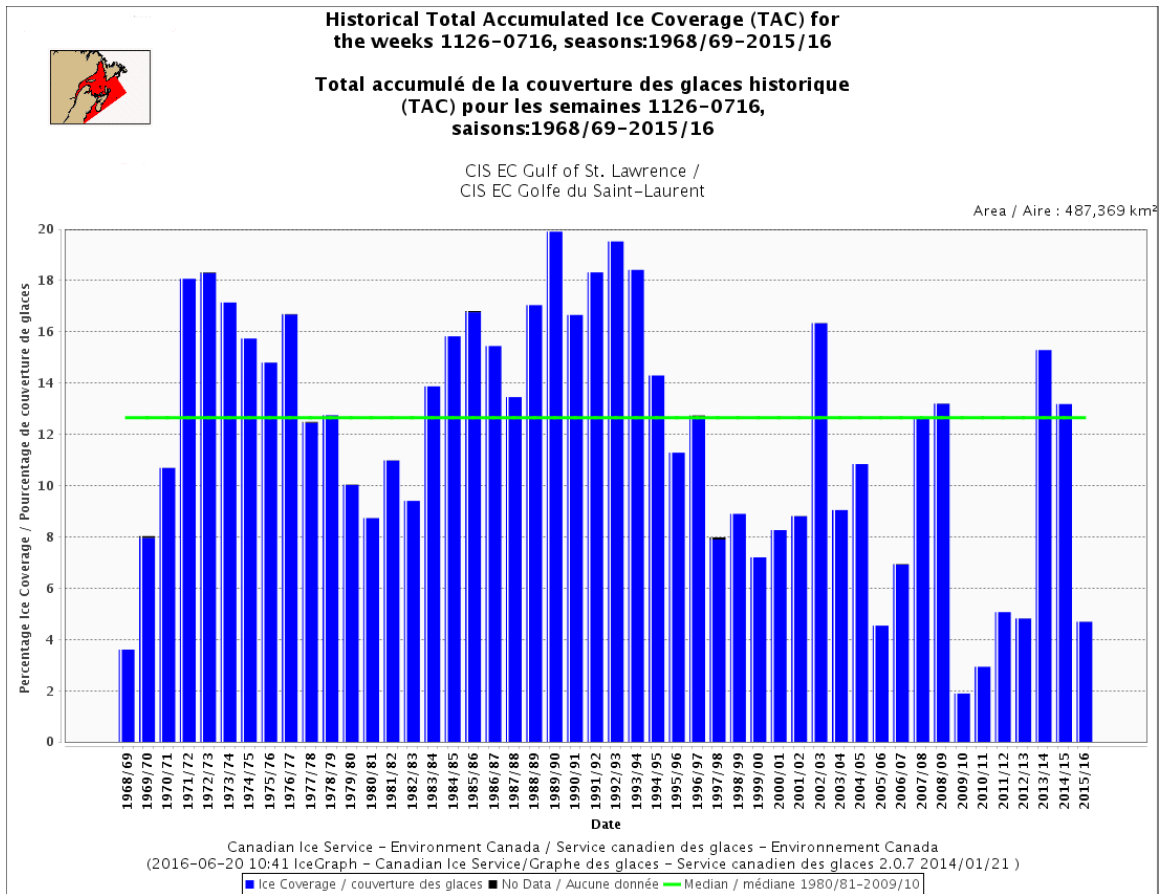


Figure 9: Historical Total Accumulated Ice Coverage for the Gulf of St. Lawrence by season, 1968-2016.

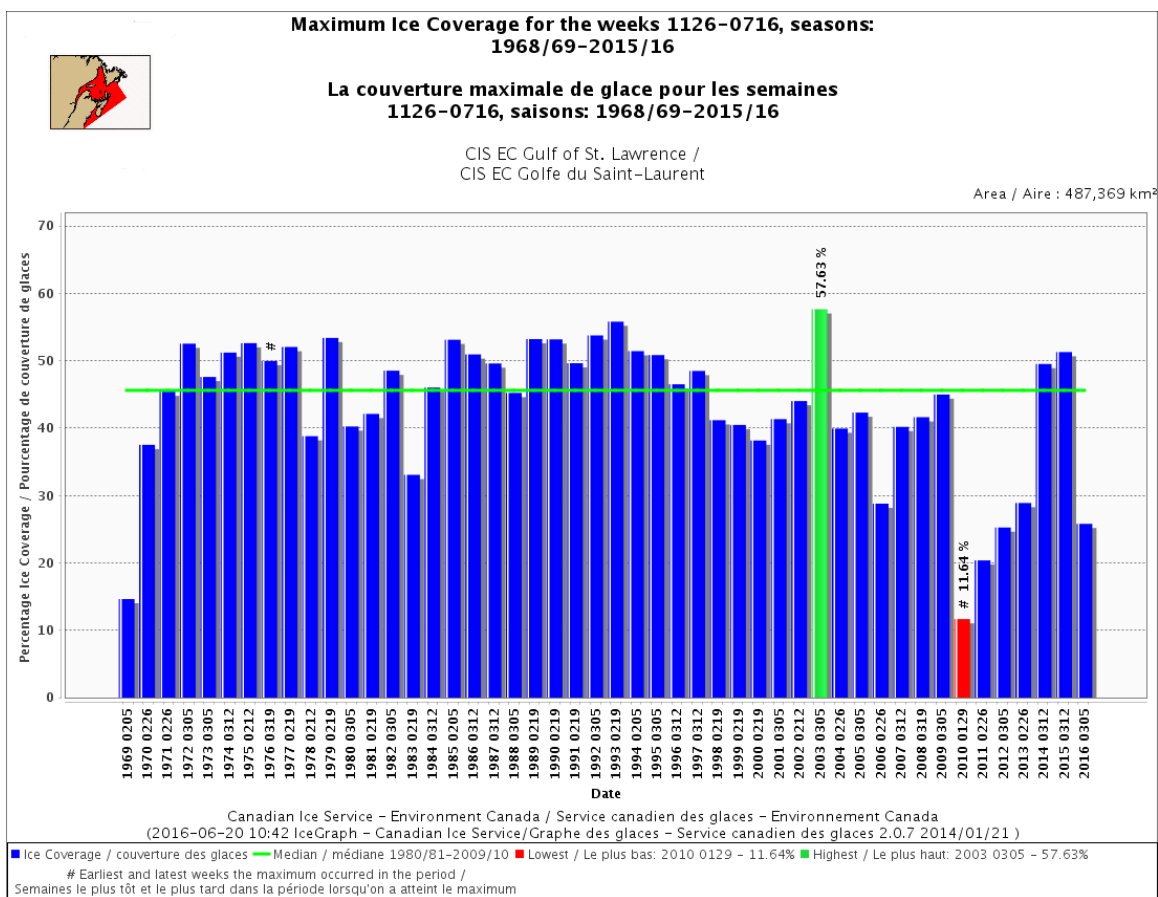


Figure 10: Maximum Ice Coverage in the Gulf of St. Lawrence by season, 1968-2016.

Newfoundland and Labrador waters

2015-2016 Season temperatures and Weather: November to mid-June

Across the Newfoundland and Labrador waters, surface air temperatures were steadily near normal to slightly below normal during the 2015-2016 ice season. Slight seasonal variability was masked in this overall trend though, with periods of above normal surface air temperatures also observed.

During the period of November to December 2015, air temperature anomalies at the surface were generally near normal across the region. This pattern was replaced by slightly above normal temperature anomalies for the start of 2016, as January and February recorded values of up to 3.5°C above the climatological values. March experienced a shift back to below normal air temperature anomalies, primarily concentrated along the Labrador coast with values up to 3.0°C below the normal. This episode of cold was short-lived and near normal surface temperatures returned for May and the first-half of June.

November ice conditions:

By mid-November new ice began to form over the western section of Lake Melville. This ice slowly expanded across the lake by the end of the month and new ice also developed in isolated bays along the southern Labrador coast.

December ice conditions:

New ice started to appear in isolated bays and inlets along the northeast coast of Newfoundland and the ice in Lake Melville became predominantly grey ice. A narrow band of new and grey ice extended from Groswater Bay southwards to the Strait of Belle Isle. Grey ice then advanced to grey-white during the second week of December in Lake Melville and the extreme western section of the lake became fast near mid-month. By the end of the month, new and grey ice with some grey-white ice extended up to 60 nautical miles from the Labrador coast and had filled the Strait of Belle Isle. Lake Melville sea ice advanced to become predominantly thin first-year ice as well, and fast ice covered the eastern entrance to the lake.

January ice conditions:

Sea ice progressed steadily southwards and in the second week of January reached the Grey Islands and the Northern Peninsula. Pack ice was predominantly grey-white by mid-month from Battle Harbour and northward and Lake Melville was completely consolidated with thin first-year ice. Only in the fourth week did grey and grey-white ice move into White Bay and Notre Dame Bay, and begin to form near Cape Freels. The ice extent along the Labrador coast and in the Northeast Newfoundland waters approached 100 nautical miles, and was well in line with what would be expected according to the climate normal.

February - March – April ice conditions:

The sea ice continued to advance southwards as predominantly thin first-year ice reached the eastern end of the Strait of Belle Isle by mid-February and predominantly grey-white ice approached 49°W. New and grey ice covered Bonavista Bay and Notre Dame Bay at this point and ice was reaching up to 150 nautical from the coasts of Newfoundland and Labrador. Medium first-year ice was first identified in Lake Melville also, becoming the predominant ice type at this time. The peak ice cover was attained along the Southern Labrador Coast during the third week of February 2016 at 30.49%, above the peak median value of 24.32% usually documented during the second week of this month. In the week following the seasonal maximum, medium first-year ice was analyzed offshore of Groswater Bay as the ice continued to thicken.

A higher degree of variability in ice coverages over the East Newfoundland Waters was witnessed in March 2016. The buildup of ice cover was undone in the first week of the month as ice retreated northward to the Grey Islands. But a persistently cold air mass moved over the region and enhanced the formation of sea ice. New and grey ice rapidly reformed and an influx of grey-white and thin first-year ice off the coast of Newfoundland led to the peak coverage being recorded during the second week of March. The ice cover was measured at 15.64%, above the peak median value of 11.11% recorded in the third week of March. During the second half of the month, ice cover approached 46°N on multiple occasions before being quickly destroyed by passing winter storms. By month end, thin and medium first-year ice were present in the pack ice offshore of the northeast Newfoundland coast.

By the first week of April, the first trace of old ice was noted offshore of Groswater Bay. This trace would progress south of Cartwright by the second week but advance no further the rest of the month. Significant declines in the sea ice extent had already begun in March across the Southern Labrador Coast region as the ice edge was now less than 90 nautical miles from the coast. Ice cleared quickly from Notre Dame, Bonavista and White Bays as well as the Strait of Belle Isle early in April and had retreated to 49°N by mid-month. Significant areas of bergy water developed along the southern Labrador coast as well, from Groswater Bay and southward.

May to mid-June ice conditions:

Ice concentrations over the Northeast Newfoundland Waters dropped considerably in early May even as the trace of old ice moved into the region near the northern tip of the Northern Peninsula. Reductions in ice concentrations continued to spread northward along the Labrador coast in the second week and the fast ice covering the entrance to Lake Melville began to break up. The old ice trace pushed further southward near Notre Dame Bay but melted back to the Grey Islands by the fourth week of the month. At this time more fast ice breakup was underway in Lake Melville, this time in the extreme western portion and this was quickly followed by full breakup in the next few days. Ice in the Northeast Newfoundland Waters melted by the end of May while the final remnants of ice along the Labrador coast near Cartwright cleared by mid-June after a brief southward push of sea ice along the coast in early June.

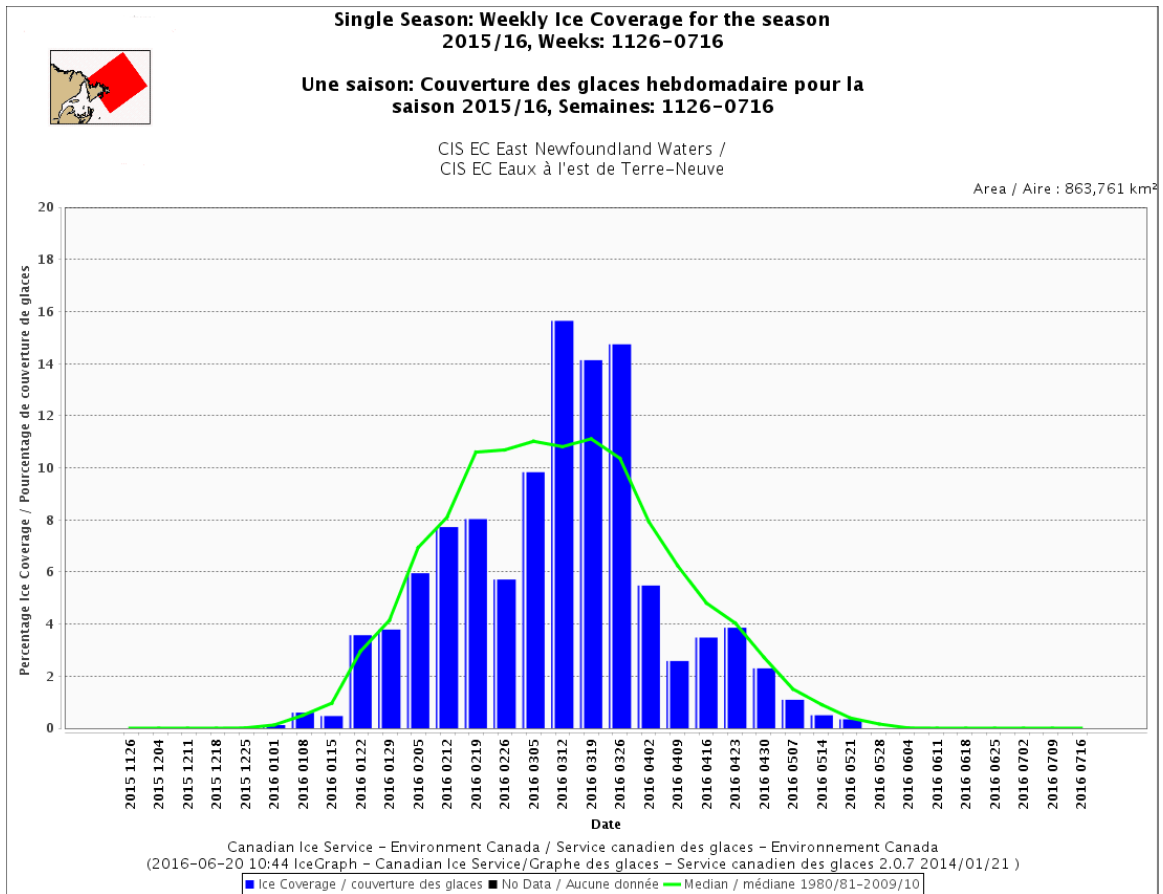


Figure 11: Weekly Ice Coverage for the 2015-2016 season in East Newfoundland Waters.

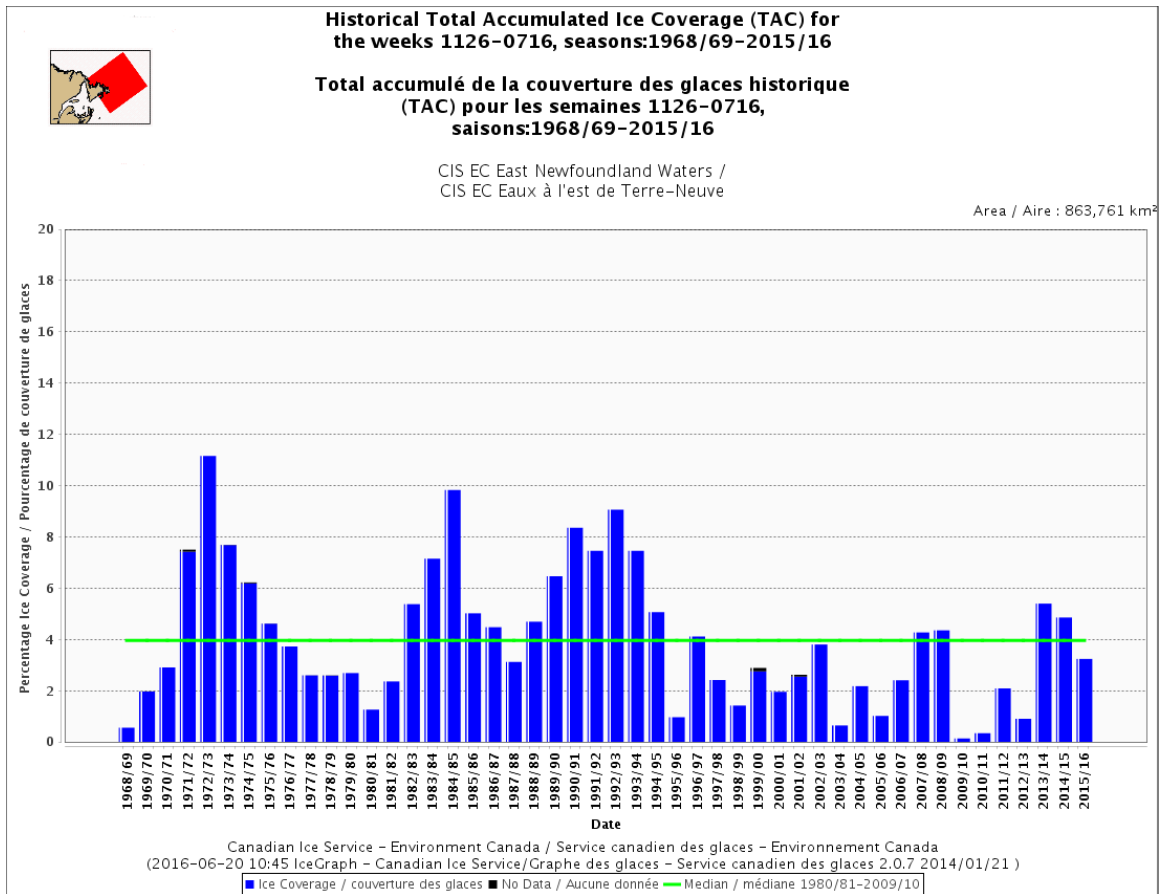


Figure 12: Historical Total Accumulated Ice Coverage for the 2015-2016 winter season in East Newfoundland Waters.

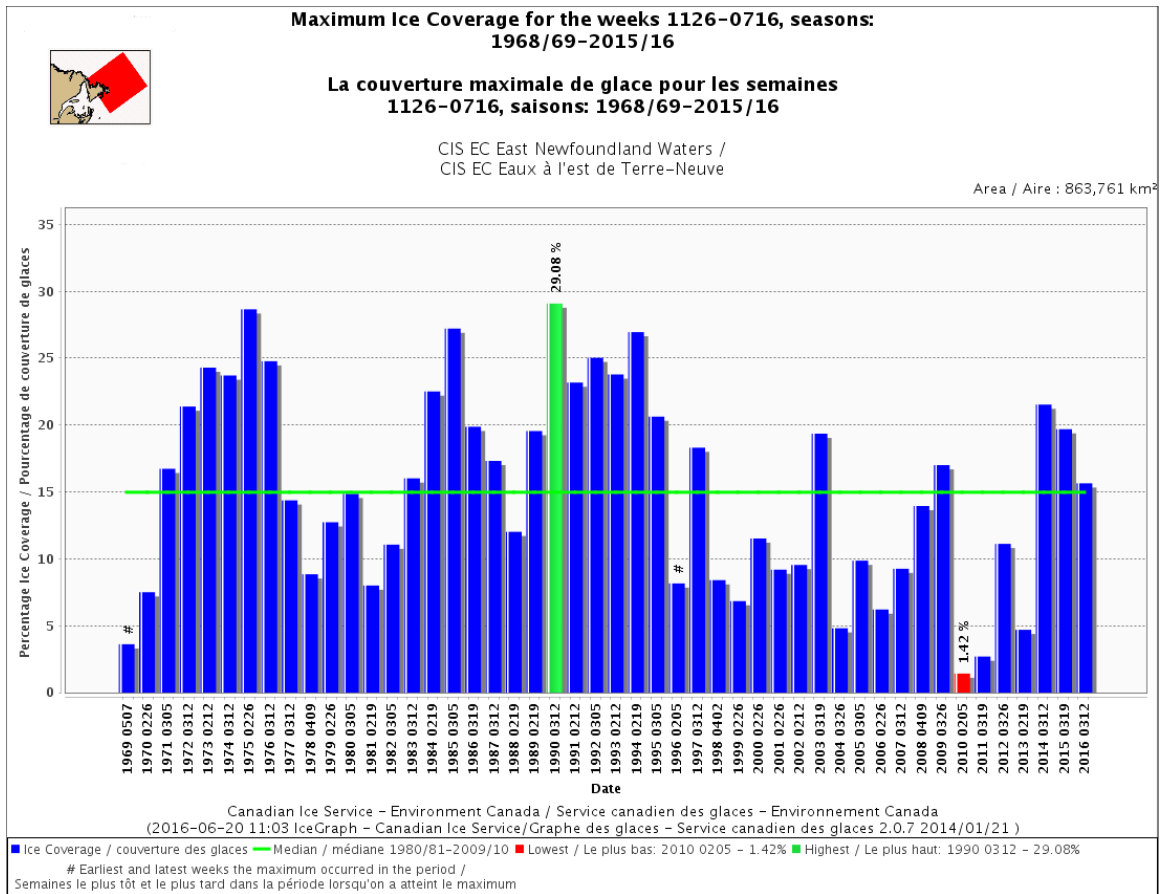


Figure 13: Maximum Ice Coverage in East Newfoundland Waters by season, 1968-2015.

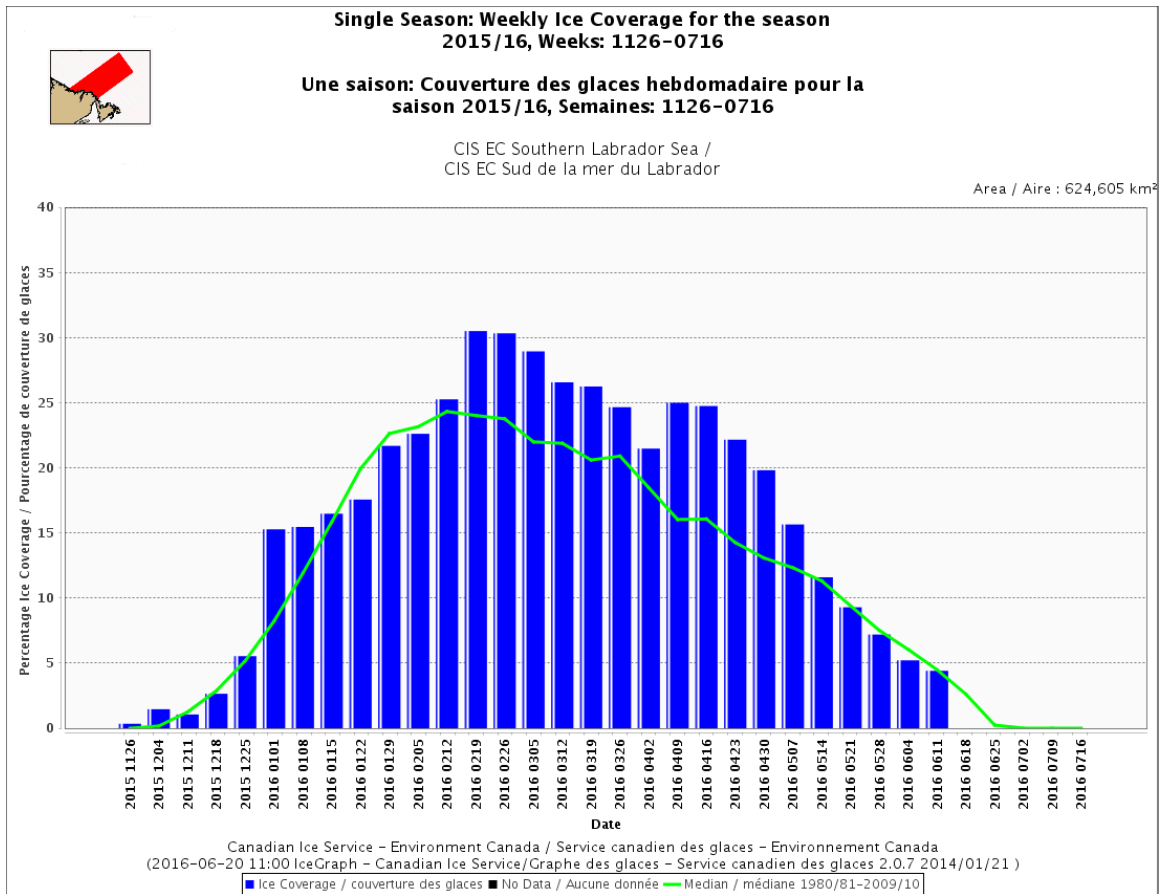


Figure 14: Weekly Ice Coverage for the 2015-2016 season for the Southern Labrador Coast.

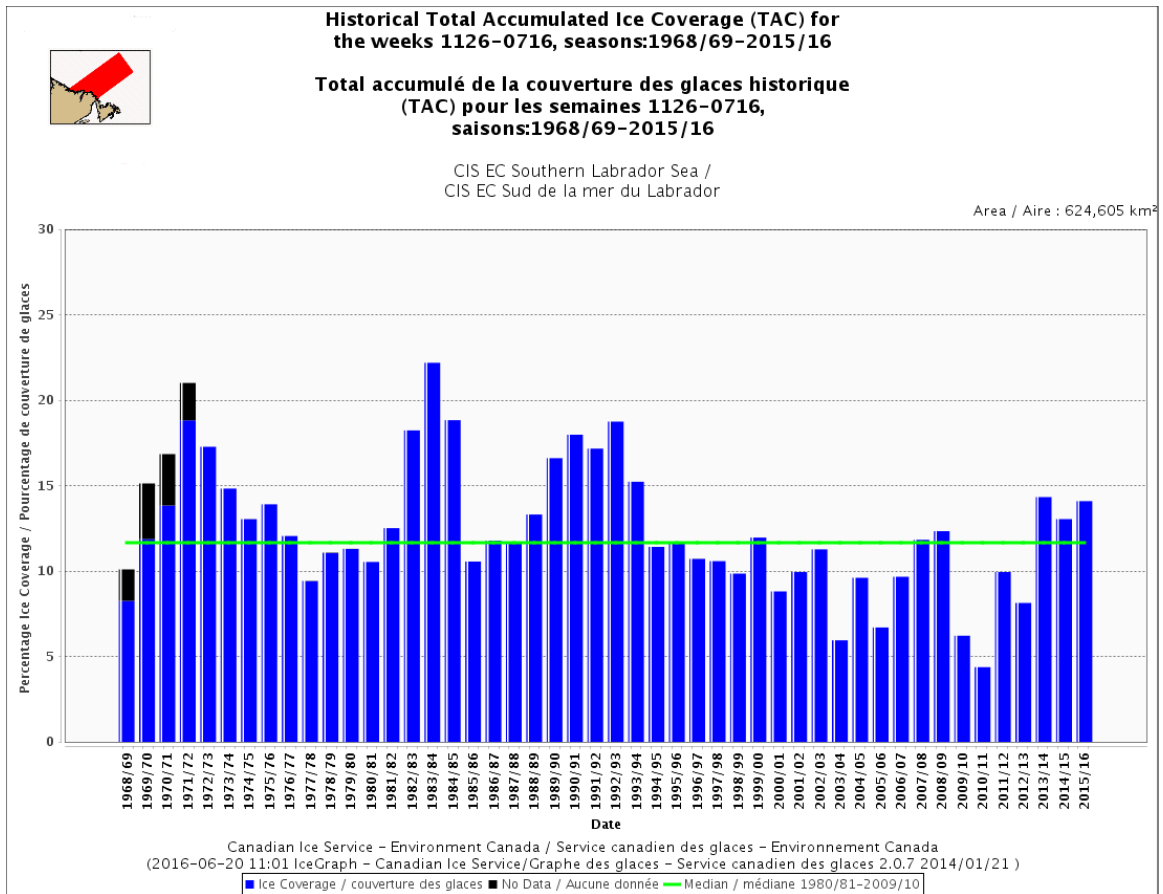


Figure 15: Historical Total Accumulated Ice Coverage along the Southern Labrador Coast by season, 1968-2016.

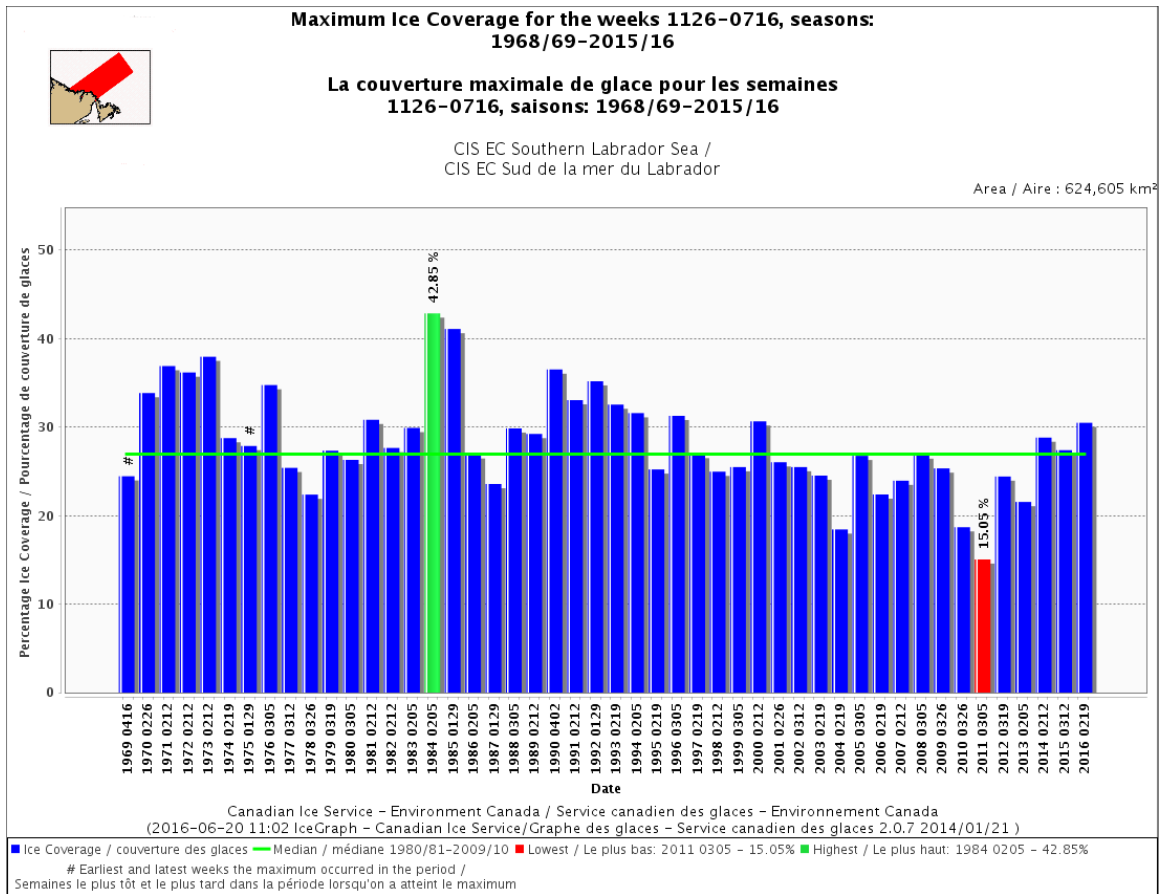


Figure 16: Maximum Ice Coverage in the Southern Labrador Sea by season, 1968-2015.

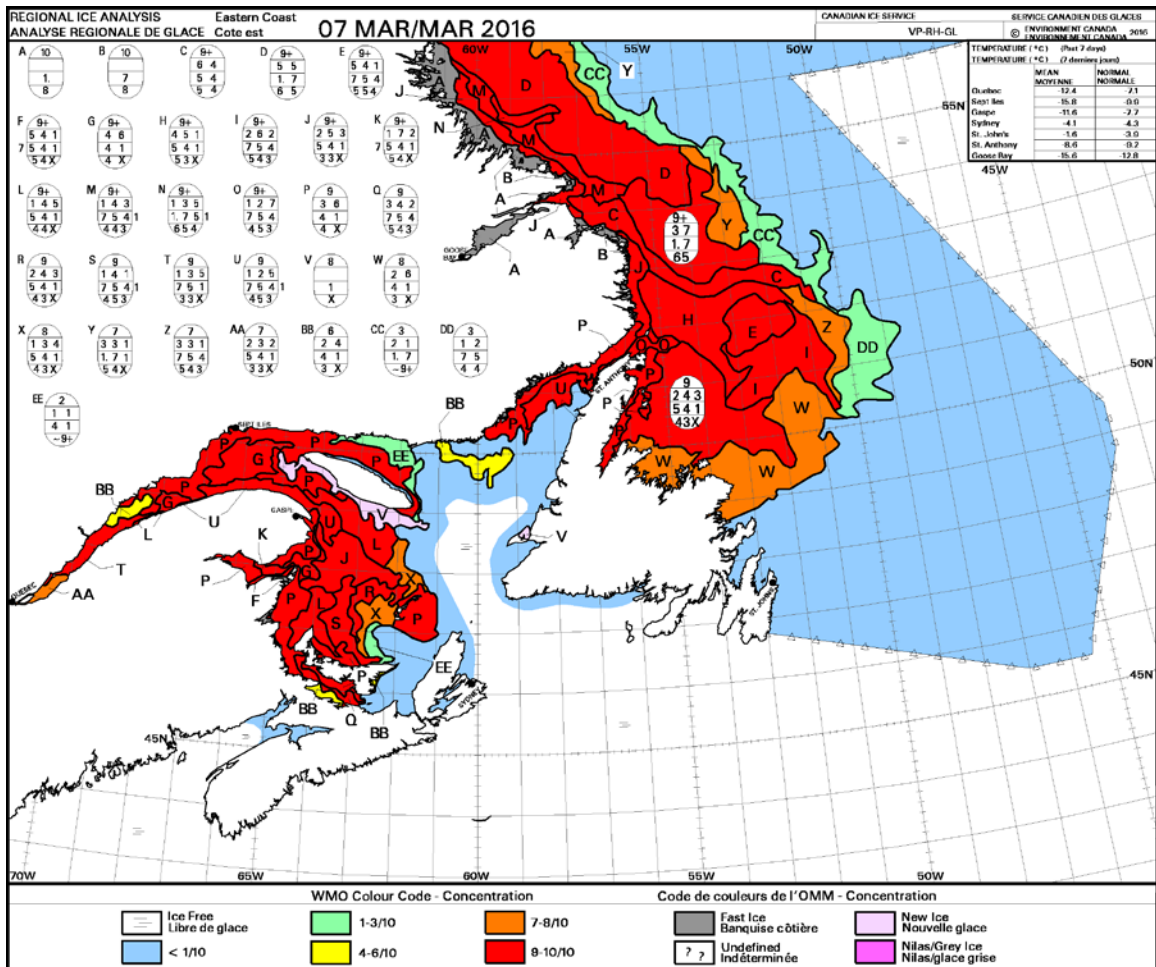


Figure 17: Maximum ice coverage on the East Coast during the 2015-16 season.