Environment and Climate Change Canada
Environnement et Changement climatique Canada

# Seasonal Summary

## North American Arctic Waters

## Summer 2019

## By the Canadian Ice Service

Canada

## Summary over North American Arctic Waters

The early fracture of ice in southeastern Beaufort Sea, northern Baffin Bay and northwestern Hudson Bay led to below normal ice conditions during the first part of the 2019 season. In fact, rapid ice decrease in the southeastern Beaufort Sea area was due to persistent and strong southeasterly winds during the latter part of May. Hence, caused the pack ice to move towards the northwest. Temperatures over the area were also much above normal during the month. Meanwhile over Baffin Bay, Davis Strait and Foxe Basin, temperatures were also much above normal. These milder than normal temperatures conditioned the ice to melt at a faster than usual rate later in the summer. Conversely, certain parts of Hudson Bay as well as Frobisher Bay experienced slower than normal ice melt. In particular, the northwestern part of the Hudson Bay had greater that normal ice conditions due to abnormal southeasterly winds which pushed the ice towards the coast during the early part of the shipping season. Eventually, ice melt trended towards a more normal ice regime so that by the end of July virtually all the ice was gone in the area. A similar scenario developed in the southern part of Hudson Bay during the mid-period of the shipping season where anomalously strong northwesterly winds helped concentrate ice in that area. The impact was to delay the development of open water conditions in the area by about two to three weeks. Meanwhile, Frobisher Bay also saw an episode of southeasterly winds in early July, thus maintained higher than normal concentrations of ice until well into early August, which represented a delay of one to two weeks for bergy water conditions for the area.

Some lingering ice in Peel Sound around mid-August required some Coast Guard escorts. However, by the end of August into early September, most of the Northwest Passage was either bergy water or open water.

Freeze up this past fall was significantly later than normal across much of the Canadian Arctic. For the most part, the substantial level of ice melt throughout the Arctic and in particular, the record setting melt in the eastern section of the Arctic certainly contributed to the delay in ice formation. In fact, by mid-October, freeze-up was five weeks later than normal.

The minimum sea ice coverage near mid-September was below the median, similar to the minimum from 2013 (see figure 1).

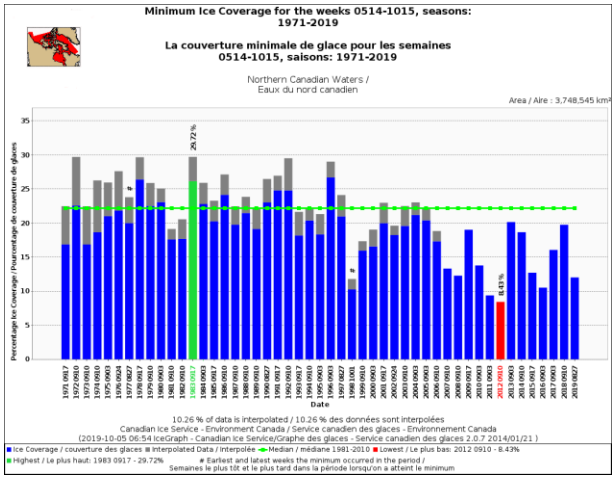



**Figure 1: Minimum Ice coverage for Northern Canadian waters (1971-2019)**

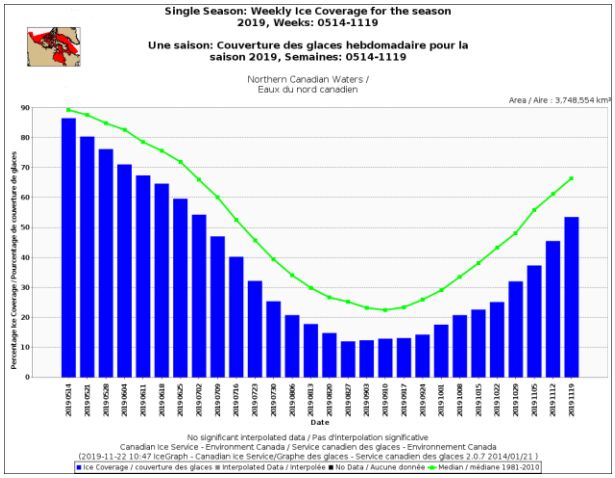



**Figure 2: Weekly ice coverage for Northern waters in 2019**

# Hudson Bay and the Labrador Coast

## Summer Ice Conditions and Fall Freeze-up

### *Summer Temperatures: June to September*

Surface air temperatures were near to slightly below normal over southwestern Hudson Bay and along the Labrador coast. Elsewhere, above normal values prevailed (figure 3), in particular, over Foxe Basin as well as Baffin Island.

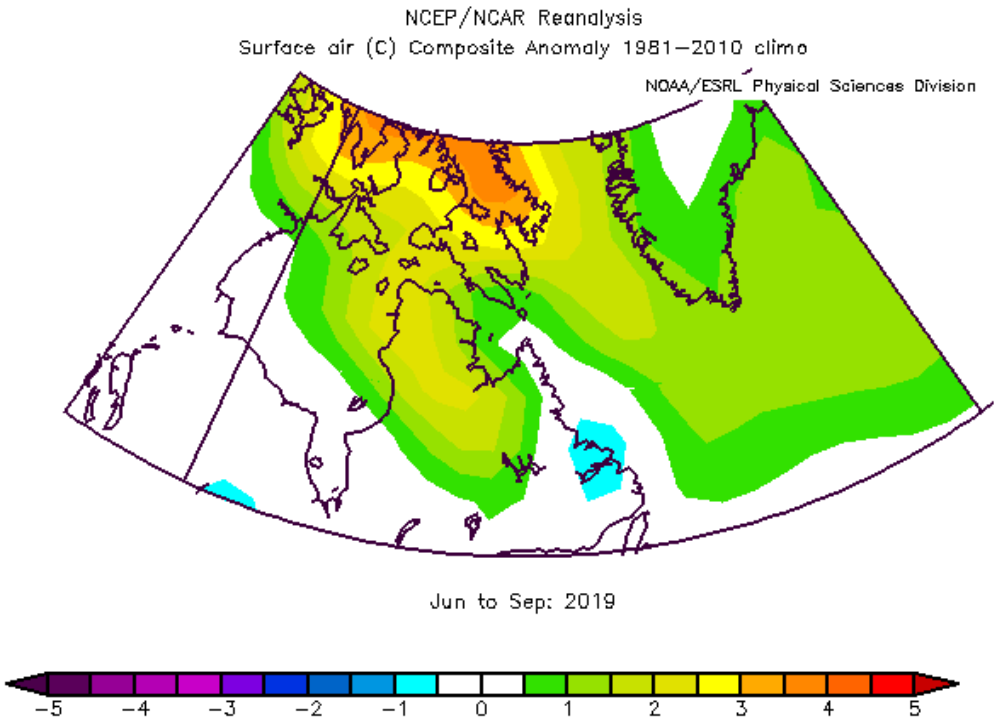



**Figure 3: Air temperature anomaly for the Hudson Bay area from June to September 2019**

## *Summary of Ice Conditions:*

At the beginning of June, northwestern Hudson Bay, parts of James Bay and southeastern Hudson Bay had open water to looser ice coverage areas. Bergy water or looser than normal ice coverage was also present in western and extreme eastern Hudson Strait and eastern Ungava Bay. Elsewhere over the region, close to very close pack ice conditions persisted. In northwestern Hudson Bay, onshore winds caused an increase in ice concentration and was responsible for slower than normal ice melt in the area. A similar scenario developed in the southeastern part of Hudson Bay and into James Bay where cool temperatures compounded the situation during the first half of the melt season. Meanwhile, abnormal winds from the east south-east caused an increase in ice concentration in the northeastern part of Hudson Strait, parts of northwestern Hudson Bay as well as Frobisher Bay thereby slowing down the normal melt of ice in the area.

By early August, most of Hudson Strait, Ungava Bay and most of Hudson Bay where open water or bergy water. However, some ice in Frobisher Bay, along the southeastern Baffin Island coast as well as the eastern part of Cumberland Sound was lingering longer than normal. A similar story was continuing in the southwestern part of Hudson Bay where below normal temperatures were delaying ice melt by about one to two weeks. Except for southwestern Hudson Bay, most regions were ice free soon after mid-August. Eventually Hudson Bay became open water to ice free by the end of the last week of August.

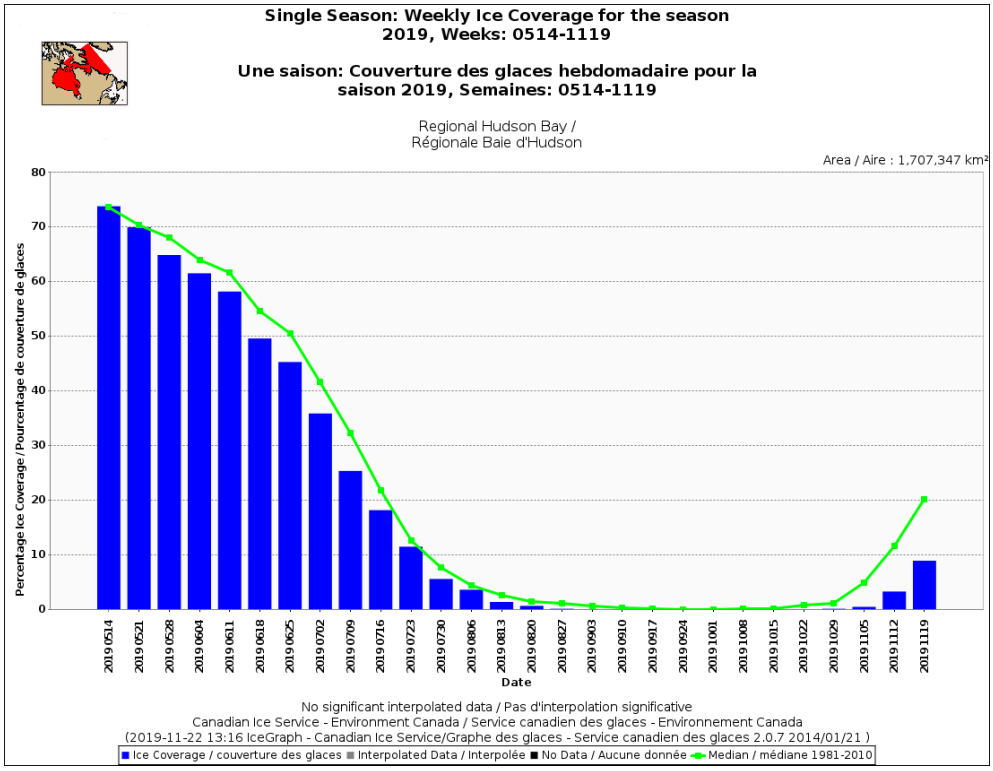



**Figure 4: Weekly ice coverage for the Hudson Bay area for the 2019 season**

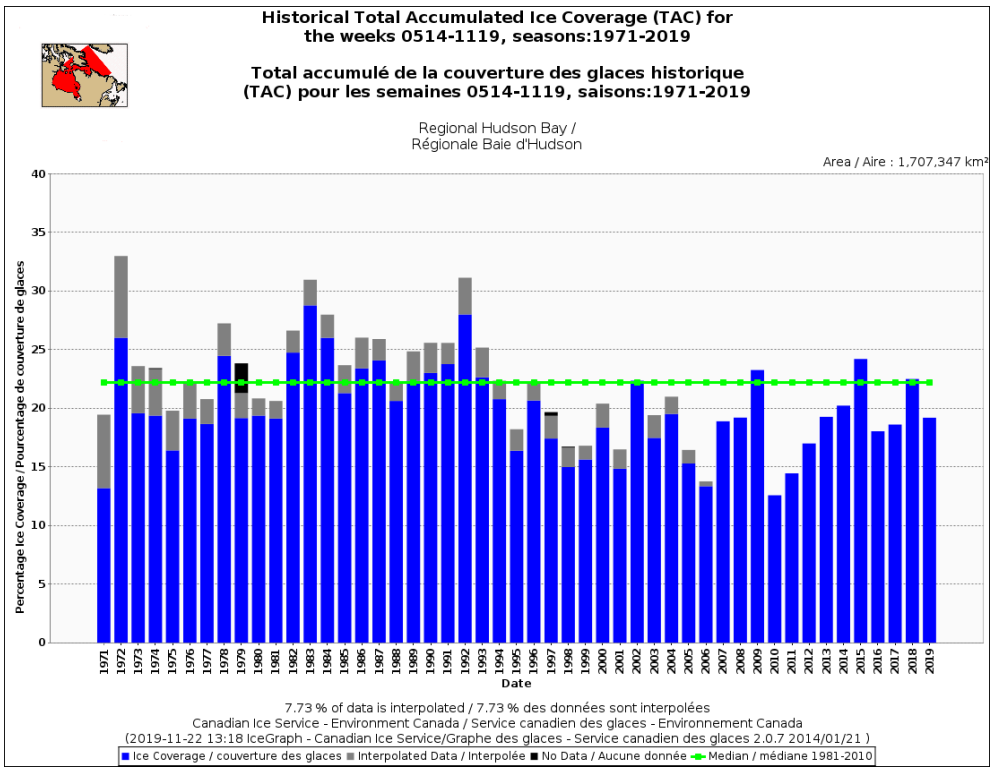



**Figure 5: Historical Total Accumulated Ice Coverage for the Hudson Bay area**

## *June Ice Conditions:*

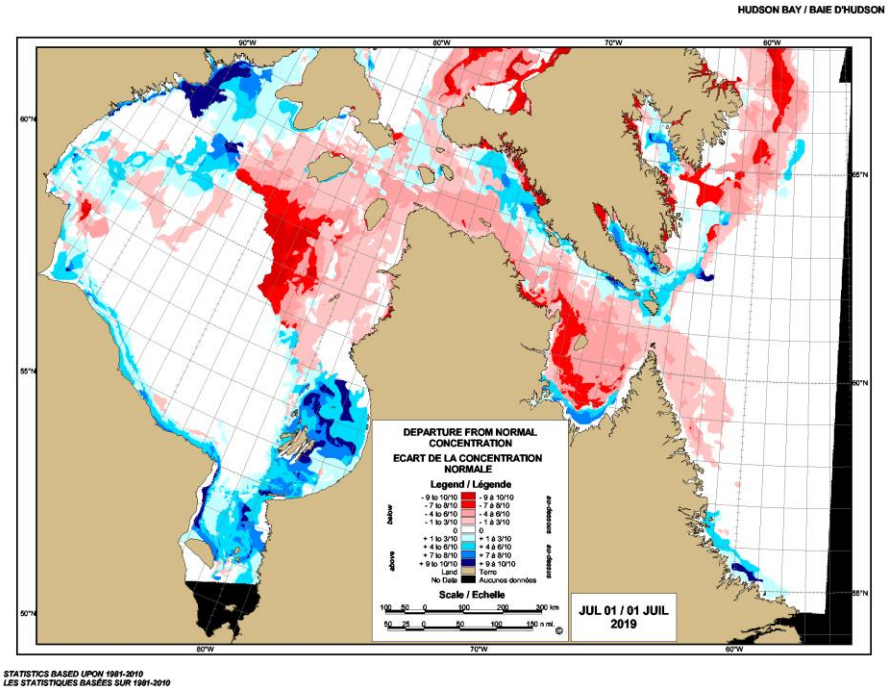



**Figure 6: Departure from normal ice concentration for the Hudson Bay area on July 1st 2019**

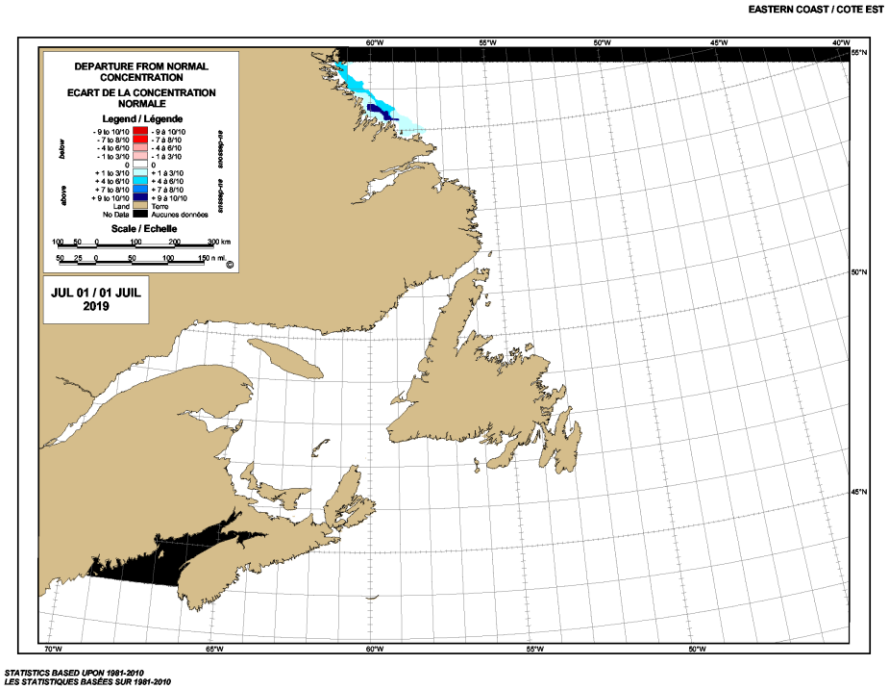



**Figure 7: Departure from normal ice concentration for the east coast on July 1st 2019**

At the beginning of June, open to very open drift medium and thick first-year ice with a trace of old ice was generally within 90 nautical miles of the Labrador coast. Some patches of close to very close pack medium and thick first-year ice with a trace of old ice was located mostly near the coast. Consolidated medium first-year was still intact along the coast. By mid-month, a significant area of ice melted or was otherwise destroyed due to the passage of storms over the region. Most of the consolidated ice had also fractured by this time. By the end of the month, the northern portion of the Labrador coast was bergy water. The remaining ice was located between Nain and Groswater Bay within 40 nautical miles of the coast. Ice melt in the northern part of the Labrador coast was running about 3 weeks earlier than normal for the entire month of June due to strong, destructive winds and slightly milder than normal temperatures.

In Lake Melville, open drift medium first-year ice covered the area at the beginning of the month however by the beginning of the second week, mainly open water conditions prevailed.

The very close pack medium and thick first-year ice with up to two tenths old ice was located within 120 nautical miles of the southeastern coast of Baffin Island in the Davis Strait area. Abnormal easterly to southeasterly winds combined with milder than normal temperature caused the pack ice to decrease in extent during the first half of June. At that time, the ice extend was within 45 to 90 nautical miles of the Baffin Island coast in Davis Strait. A general decrease in wind speed during second half of June caused the pack ice to expand slightly however the overall concentration began to decrease. This coupled with milder than normal temperatures had an overall effect of less than normal ice concentrations from the Cape Dyer area southwestward towards the Hall Peninsula of Baffin Island. Further south, the residual effect of onshore winds along the south section during the first part of June maintained higher than normal ice concentration in the extreme southern section of Davis Strait at the end of the month.

Very close pack thick first-year ice covered most of Cumberland Sound at the beginning of the month. A trace of old ice covered the southeastern section. The exception was a small area of bergy water to close pack thick first-year ice including a trace of old ice in the central section of the sound. The consolidated thick first-year ice along the coast began to fracture during the first half of June. By mid-month, a significant area of bergy water had developed in the northwestern section with looser concentrations in the extreme northern section of the sound. Elsewhere, ice concentrations remained high. By the end of the month, most of the consolidated ice had fractured. The bergy water area expanded somewhat from the western section into the extreme northern section. The remainder of the sound continued to experience generally higher than normal ice concentrations. Abnormal southeasterly winds during the early days of June, in part, caused these conditions.

Consolidated thick first-year ice covered the extreme northern part of Frobisher Bay at the beginning of June. The rest of the bay had mostly very close pack medium and thick first-year ice with a trace of old ice in the southern section. Abnormal southeasterly winds during the first part of June maintained higher than normal ice concentrations during the entire month. Concentrations of old ice increased to three tenths by the end of the month. The exception to the higher than normal concentration of ice was the area in the extreme northwestern section of the bay, near Iqaluit, where mostly bergy water prevailed. The consolidated thick first-year ice

fractured and melted to bergy water conditions by the third week of June due to milder than normal temperatures and the blocking effect of the islands southeast of Iqaluit.

Along the southern coast of Baffin Island in Hudson Strait as well as the western side of Ungava Bay, we observed very close pack medium and thick first-year ice at the beginning of June. Normally the area along the southern coast of Baffin Island would have looser ice conditions, in particular the northwestern section of the strait. However, as stated previously, unusual winds from the east-southeast during the latter part of May caused the pack ice to drift northwestwards, creating areas of higher than normal concentrations. Conversely, areas in the southern and eastern parts of Hudson Strait as well as eastern Ungava Bay experienced looser than normal concentration of open drift to close pack medium and thick first-year ice conditions with some areas of bergy water. These anomalous winds continued into June and perpetuated this dichotomy for most of month. By mid-month, most of Ungava Bay as well as southeastern Hudson Strait were bergy water. By the end of June, large areas of bergy water developed along the southern section of Hudson Strait while the northern part continued to have open drift to close pack thick first-year ice. In fact, these winds managed to drive areas of up to 1 tenth old ice from southwestern Davis Strait into the northeastern section of the Hudson Strait, which in it self, was unusual based on our 30-year ice climatology (see Figure 8: Departure from normal old ice concentration for Hudson Bay on July 1st 2019). Meanwhile most of Ungava was bergy water except for open drift to close pack medium and thick first-year ice along the southern and western shore. For the entire month, Ungava was ahead of normal, in terms of developing bergy water, by about two to three weeks.

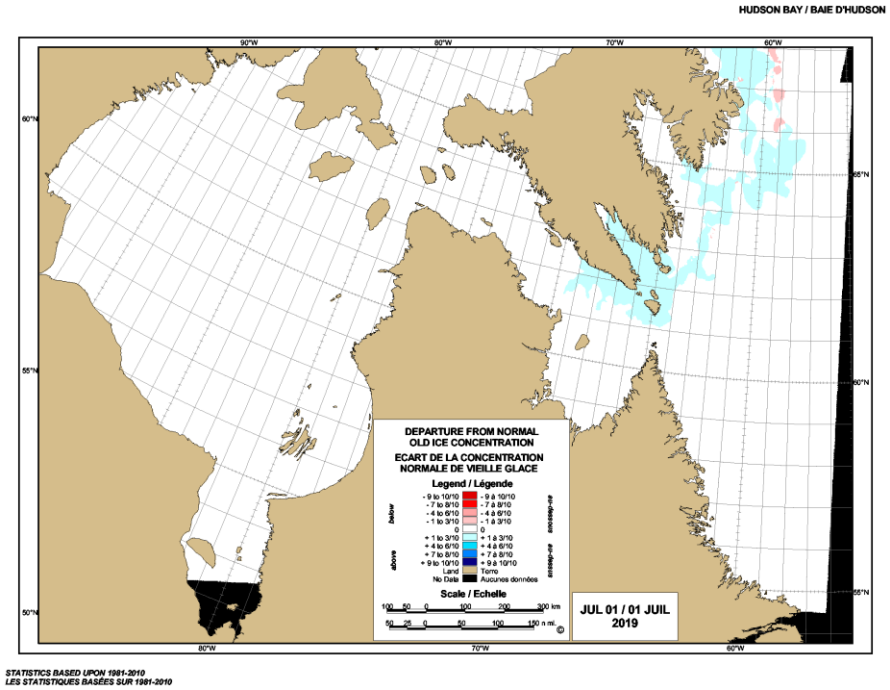



**Figure 8: Departure from normal old ice concentration for Hudson Bay on July 1st 2019**

Generally, winds in the western and northern parts of Hudson Bay were normally offshore however, the latter part of May had easterly to northeasterly winds and delayed the ice breakup in northwestern Hudson Bay. At the beginning of June, an open water area had already developed along the western coast from south of Rankin Inlet southwards to just north of Churchill. Open drift to close pack medium and thick first-year ice was present in parts of the northern and western sections of Hudson Bay while the rest of the area had very close pack medium and thick first-year ice. However, winds from the east during the first week of the month caused the area of open water long the western coast to shrink significantly and generally caused the ice concentration to increase in the western and northern parts of Hudson Bay. Weaker winds in the second week of June saw a return to more normal ice break-up. By mid-June, the northern part of Hudson Bay had open drift to close pack medium and thick first-year ice while an area of open water along the western coast redeveloped. The exception was the northwestern section between Rankin Inlet and Fullerton where very close pack medium and thick first-year ice plagued the coastal area. Elsewhere in the western Hudson Bay area, mainly very close pack medium and thick first-year ice prevailed. The ice continued to deteriorate over most of the northern and western part of Hudson Bay during the second half of the month however, some areas continued to experience slower than normal deterioration. By the end of June, the northern section of Hudson Bay had areas of open water or bergy water with open to very open drift first-year ice just south of Southampton Island. Patches of very close pack thick first-year ice were along parts of the island. The northern part of the western Hudson Bay area was mostly open water with some open to very open drift medium and thick first-year ice. The exception remained the area along the coast between Rankin Inlet and Fullerton where very close pack medium and thick first-year ice prevailed. Further south in the western section, open drift to very close pack conditions persisted. Areas of consolidated thick first-year ice stayed mostly intact along the northwestern coast of Hudson Bay during the month. Areas of above normal ice concentration at the end of the month were observed over the northern and western parts of Hudson Bay. The exception was in the Coats and Mansel Islands area where slightly below normal concentration emerged.

The southwestern section of Hudson Bay did not experience significant changes from the very close pack medium and thick first-year ice during the month of June. The only exception was along the coast where ice concentration did decrease somewhat to open drift medium and thick first-year ice. However, due to persistent colder than normal temperatures over the area, the coastal area had greater than normal ice concentration at the end of June.

The northern section of the eastern Hudson Bay area came under the influence of easterly winds during the last half of May. Hence, some areas of open water with open drift to close pack medium and thick first-year ice were present at the beginning of June. Very close pack medium and thick first-year ice covered the southern part of eastern Hudson Bay as well as northern James Bay while open water with close pack medium first-year ice prevailed over southern James Bay. Easterly winds during the first week of June continued to loosen ice concentration and widen open water areas in the northern section during the first half of the month. Ice coverage in southeastern Hudson Bay did not change significantly, however signs of melt continued to emerge in James Bay, particularly in the southern and eastern coasts. During the

second half of the month, milder than normal temperatures invaded the northern portion thereby accelerated the ice melt in that area. By the end of the month, most of the northern portion of eastern Hudson Bay had open water with areas of open to very open drift thick first-year ice. Looser ice conditions developed around the Belcher Islands eastwards towards the east coast of Hudson Bay however, ice remained very close pack to the west and south of the islands into the northwestern reaches of James Bay. The southern part of James Bay was open water with a mix of open water and open drift medium first-year ice along the northeastern coast.

***July Ice Conditions:***

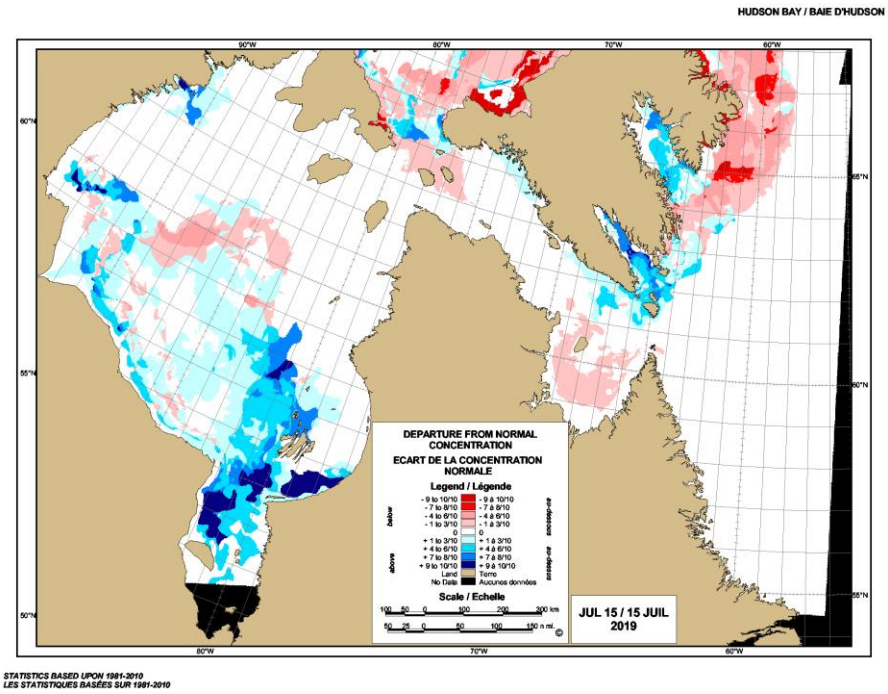



**Figure 9: Departure from normal ice concentration for the Hudson Bay area near mid-July 2019**

By the end of the first week of July, most of the ice along the Labrador coast had melted except for a very small patch of very open drift old ice about 20 nautical miles south of Hopedale. Just before mid-July, mainly bergy water conditions prevailed along the entire length of the Labrador coast. Melt of the ice along the southern part of the Labrador coast was one to two weeks later than normal due to colder than normal temperatures.

Ice in Davis Strait continued to deteriorate despite near to below normal temperatures over the area. By mid-July, open drift to close pack mostly thick first-year ice with up to two tenths old ice was located within 75 nautical miles of the southeastern coast of Baffin Island. A few patches of very close pack thick first-year ice with some old ice was present along parts of the coast. The

decline in ice extent accelerated during the second half of the month especially in the northern portion of Davis Strait as above normal temperatures blanketed the area (up to 2ºC above normal). The southern portion of Davis Strait towards the entrance to Hudson Strait continued to experience below normal temperatures. By the end of the month, mostly bergy water covered the area however, areas of open drift thick first-year and old ice with patches of very close pack thick first-year with some old ice was within 30 nautical miles of the Baffin Island coast. The northern portion of Davis Strait had less than normal ice concentration while the south had greater than normal. Episodes of southeasterly winds over the southern section of Davis Strait maintained higher than normal ice concentration.

During the first half of July, higher than normal ice concentration prevailed in Cumberland Sound. Generally, the western portion of the sound had bergy water while open drift to close pack thick first-year ice including a trace of old ice covered the eastern portion as well as in the entrance to the sound. However, during the second half, milder than normal air temperatures melted most of the ice so that by the end of July, mainly bergy water prevailed. Some areas of open to very open drift thick first-year ice including a trace of old ice was present near the entrance to the sound.

The high concentration of thick first-year ice with up to three tenths old ice in Frobisher Bay persisted during the first half of July due to occasional southeasterly winds. Yet by mid-month, bergy water with areas of close pack first-year ice with up to three tenths old ice covered the northwestern portion of the bay. The southeastern portion of the bay continued to experience very close pack thick first-year ice with up to three tenths old ice. The trend towards less ice continued during second half of the month however the cooler than normal temperatures mitigated that progress. By the end of July, almost the entire bay had open drift old ice. Only the extreme northwest area near Iqaluit had bergy water. Normally the entire bay would be mainly bergy water by mid-July.

Rapid ice melt continued for the southern portion of Hudson Strait as well as southern Ungava Bay. During the second week of July, all the ice in southern Hudson Strait and all of Ungava Bay had melted. By mid-month, only the southern coast of Baffin Island in Hudson Strait had areas of open to very open drift thick first-year ice. Up to two tenths old ice was present along the coast east of Kimmirut. By the end of July, only the area along the southeastern coast of Baffin Island had very open drift old ice. Otherwise, bergy water prevailed in the rest of Hudson Strait and all of Ungava Bay. Ice melt was about two to three weeks earlier than normal over Ungava Bay and southern Hudson Strait however, the northern portion of the strait continued to lag in terms of melt by about one to two weeks.

The northern and western Hudson Bay area had large areas of open water develop during the first half of July. By mid-month, generally open water conditions prevailed except for the ice along the coast in the northwestern section as well as a band of just north of Churchill. The consolidated thick first-year ice along the coast fractured during this period. The area between Arviat to just north of Chesterfield Inlet had mostly very open drift to close pack thick first-year ice with patches of very close pack thick first year ice. The band just north of Churchill was composed of open drift to very close pack thick first-year ice. Open water to ice free conditions

were observed by the end of the last week of July. At times during the month of July, ice melt was slightly later than normal (about one week) especially in the northwestern section however, by the end of the month conditions were near normal.

The southwestern Hudson Bay area started to have looser ice conditions during the first half of July. Mostly open drift to close pack medium and thick first year ice with areas of very close pack covered the region by the middle of the month. Despite the looser ice conditions, concentrations were generally higher than normal for that time of year. By the end of July, the northern portion of the areas had open water to ice free conditions. The open drift to very close pack ice was located within 80 nautical miles of the southwestern coast. Ice melt was about one week later than normal for the region.

The northern part of eastern Hudson Bay became open water by the end of the second week of July. Areas of close to very close pack medium and thick first-year ice were still present to the west and south of the Belcher Islands and along the southeastern Hudson Bay coast, south of the petite rivière de la Baleine at mid-month. Open water was present in the southern section and along the coastal areas of James Bay while open drift to very close pack ice covered the remainder of the bay. During the second half of the month, the overall concentration decreased however, some open to very open drift medium and thick first-year ice migrated northwards along the southeastern coast up to Inukjuak. Meanwhile, areas of open to very open drift medium and thick first-year ice was still present northwest, west and south of the Belcher Islands. At the end of the month, bands of very open drift thick first-year ice was located in the central part of James Bay with open water to ice free elsewhere.

***August Ice Conditions:***

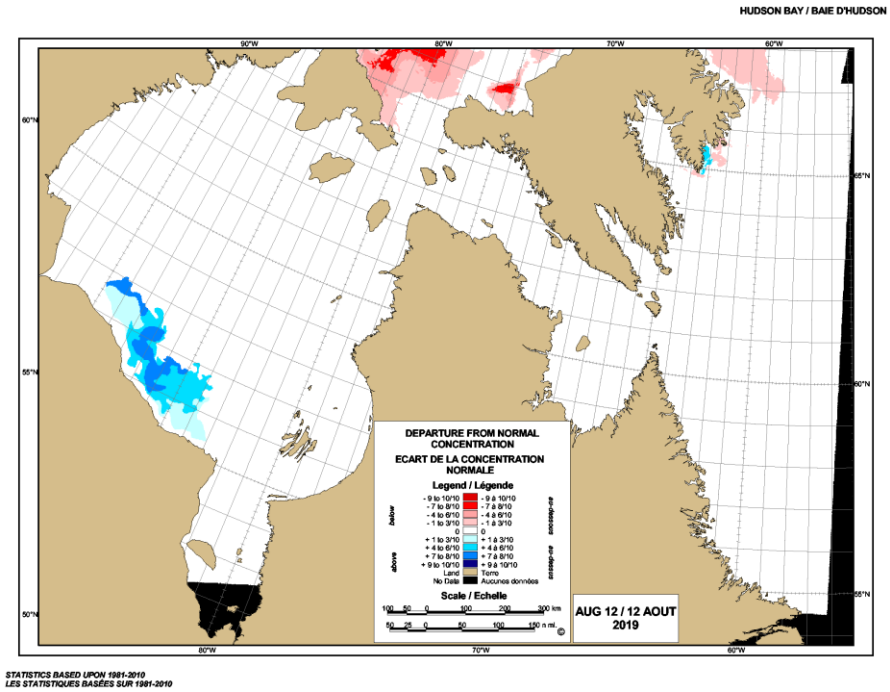



**Figure 10: Departure from normal ice concentration for the Hudson Bay area near mid-August 2019**

Continued ice melt during the first part of August left only a small patch of very open drift thick first-year ice with one tenth old ice along the coast of the Cumberland Peninsula in the Davis Strait region by mid-month. Soon after the middle of August, bergy water conditions prevailed. Overall, ice melt was one to two weeks earlier than normal however, a few patches along the coast melted one week later than normal.

The remaining ice along the extreme southeastern coast of Baffin Island in Hudson Strait finally melted at then end of the first week of August. As with Davis Strait, ice melt was one to two weeks earlier than normal in Hudson Strait however, some patches of ice along the southern coast of Baffin Island melted about one week later than normal.

The ice in the southwestern part of Hudson Bay continued to melt so that by mid-August, the extent remained within about 80 nautical miles of the southwest coast. Very open drift to close pack ice comprised the area of ice with open water to ice free elsewhere. By the end of August, only a very small area of very open drift thick first-year ice remained north of Winisk.

The southeastern Hudson Bay and northern James Bay ice completely melted during the second week of August. Generally, ice melt in the area was about two to three weeks later than normal due to below normal temperatures that persisted throughout most of the melt season.

***September Ice Conditions:***

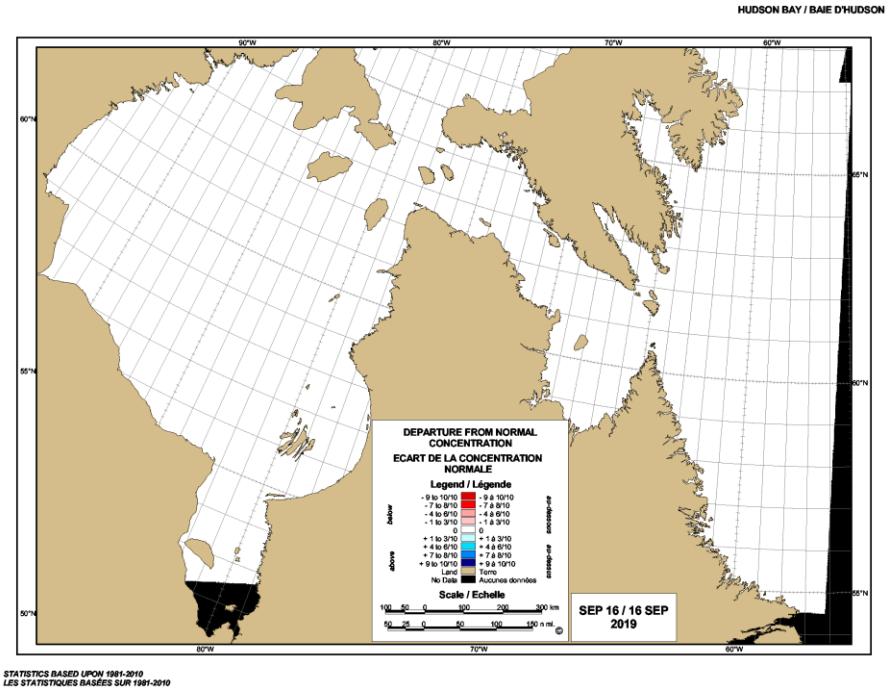



**Figure 11: Departure from normal ice concentration for the Hudson Bay area near mid-September 2019**

The last of the ice located along the southwestern coast of Hudson Bay melted during the first few day of September. Ice free to bergy water conditions prevailed for the remainder of the month of September.

# Eastern Arctic and Canadian Archipelago

## Summer Ice Conditions and Fall Freeze-up

### *Summer Temperatures: June to September*

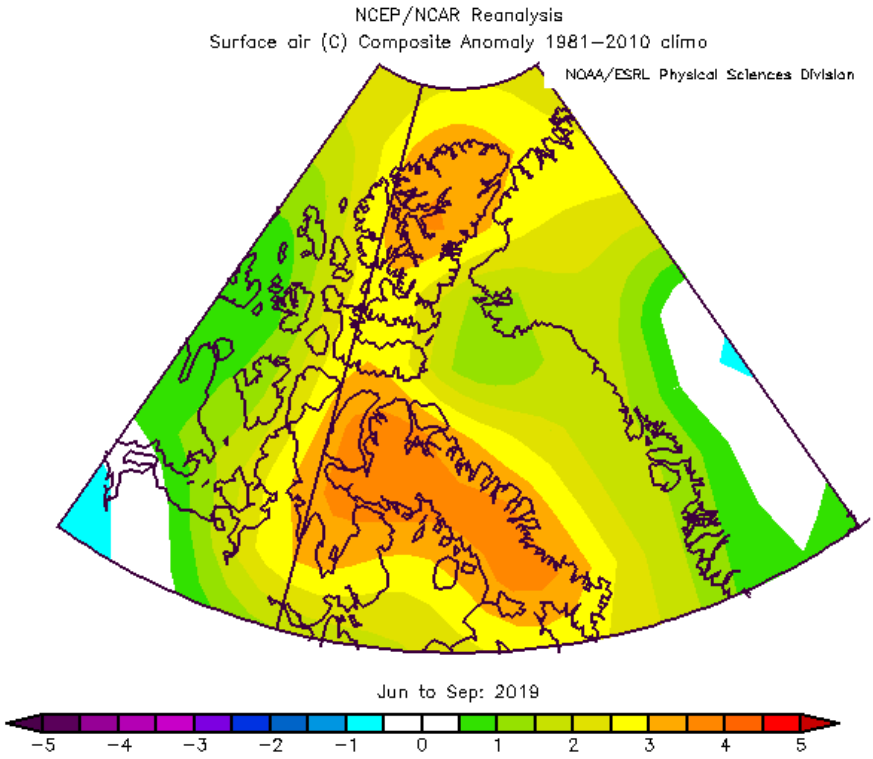



**Figure 12: Air temperature anomaly for the Eastern Arctic area from June to September 2019**

From June to September, surface air temperatures were above normal over most locations except the Ellesmere and Baffin Islands area where much above normal temperatures prevailed.

### *Summary of Ice Conditions:*

At the beginning of June, an area of bergy water had already emerged in parts of the northern Baffin Bay area as well as along the eastern side of the bay, near Greenland. The rest of the bay was covered with medium and thick first-year ice with up to four tenths old ice in some locations. Foxe Basin had somewhat looser ice conditions. The less than normal ice concentrations were a harbinger of things to come for the summer melt season. Baffin Bay continued to melt at a faster than normal rate due to milder than normal temperatures in June and early July. However, after mid-July, very much above normal temperatures centred over Baffin Island had an impact on the ice over the entire Eastern Arctic region. For the most part, ice melt in Baffin Bay as well as Foxe Basin were three to four weeks earlier than normal. Yet, there were areas where higher than normal ice concentrations existed. Due to the lack of an ice bridge in Kane Basin/Smith Sound area during the winter months, ice continued to drift southwards from the Lincoln Sea into northern Baffin Bay, and caused somewhat greater than

normal ice concentration in the extreme northwestern section of the bay until the end of July. Lancaster Sound and Barrow Strait also had greater than normal ice concentration over the same period. Jones Sound fractured earlier than normal and remained about three weeks earlier than normal in terms of ice melt. A similar story developed in Norwegian Bay. Ice fractured about one to two weeks earlier than normal. Prince Regent Inlet as well as the Gulf of Boothia also experienced accelerated ice melt, particularly after mid-July. Generally, ice melt was about one week ahead of normal until mid-August. Normally, ice coverage would stabilise around late August at about 30%. However, this year, all the ice melted. It was not a record-setting event as it also occurred in 2007. From a climate perspective, we have not seen a minimum ice coverage of 29% or greater for the Prince Regent Inlet and the Gulf of Boothia area since 2005.

Overall, the Eastern Arctic established a new record for minimum ice coverage (4.01%). The previous record was set in 2011 with an ice coverage of 4.51% (see Figure 15). For the most part, the above normal temperatures during most of the summer over the entire Eastern Arctic region had a large impact on the minimum ice coverage for this year, specifically for Norwegian Bay as well as the southern part of the Gulf of Boothia.

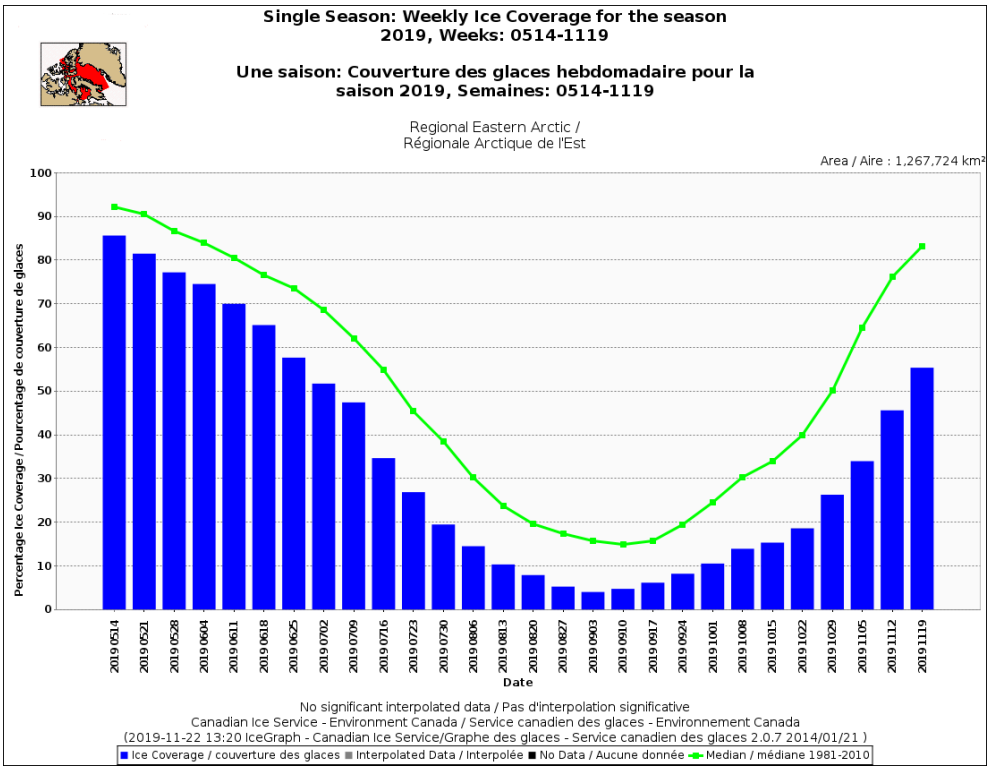



**Figure 13: Weekly ice coverage for the Eastern Arctic area for the 2019 season**

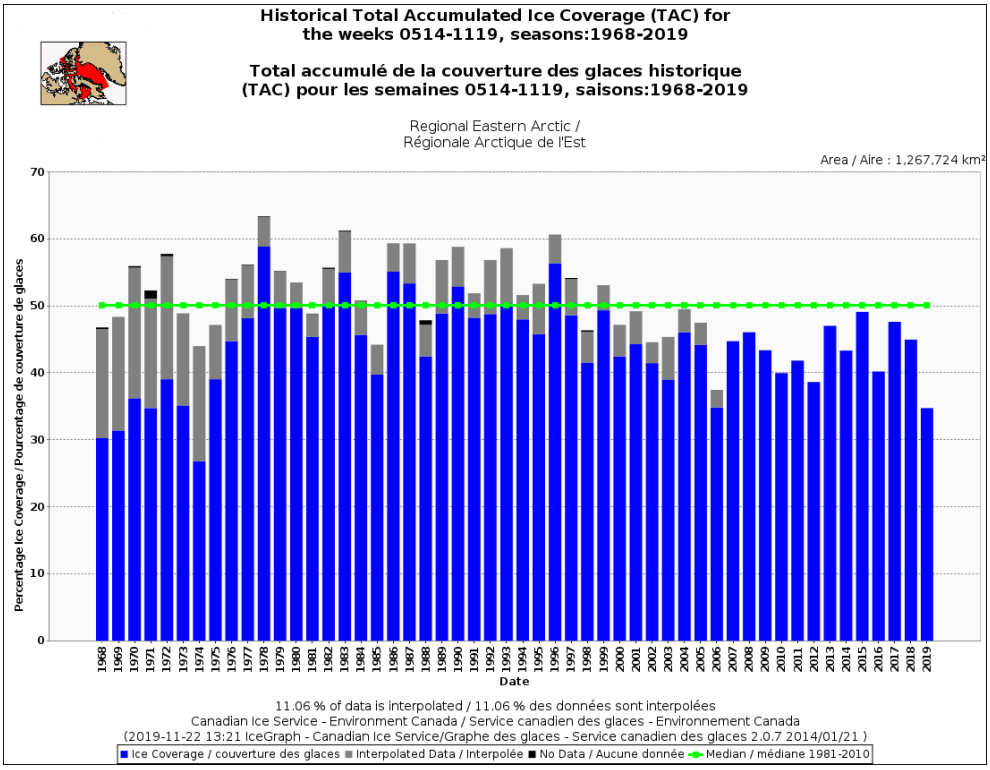



**Figure 14: Historical Total Accumulated Ice Coverage for Eastern Arctic area (1968-2019)**

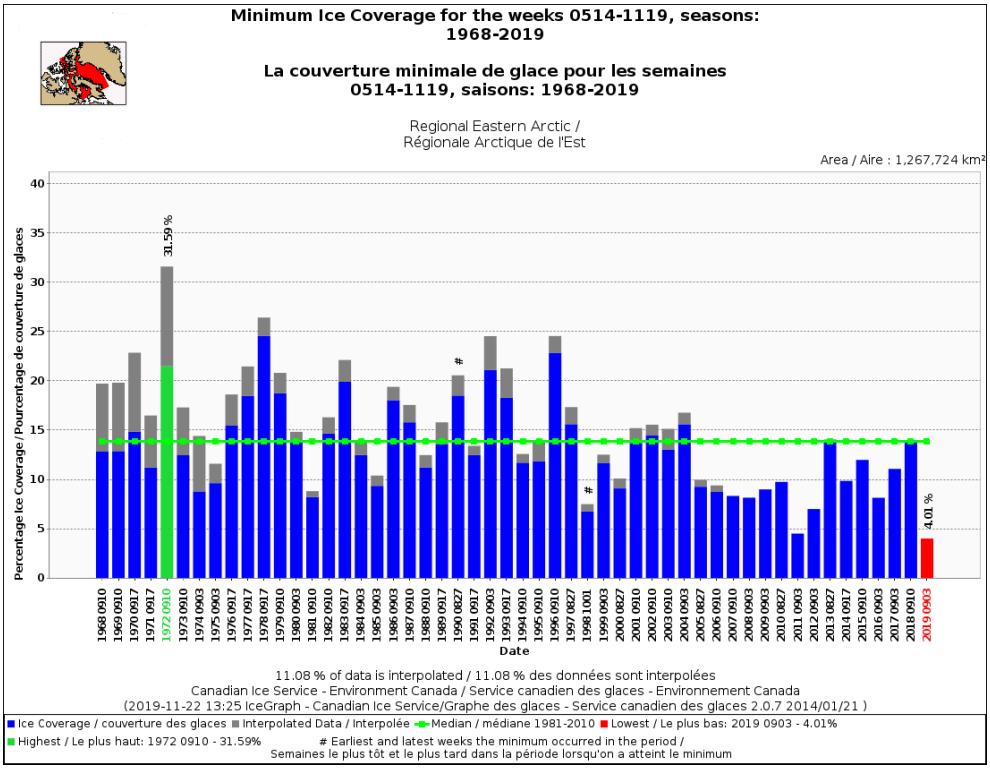



**Figure 15: Minimum Ice Coverage for Eastern Arctic area (1968-2019)**

***June Ice Conditions:***

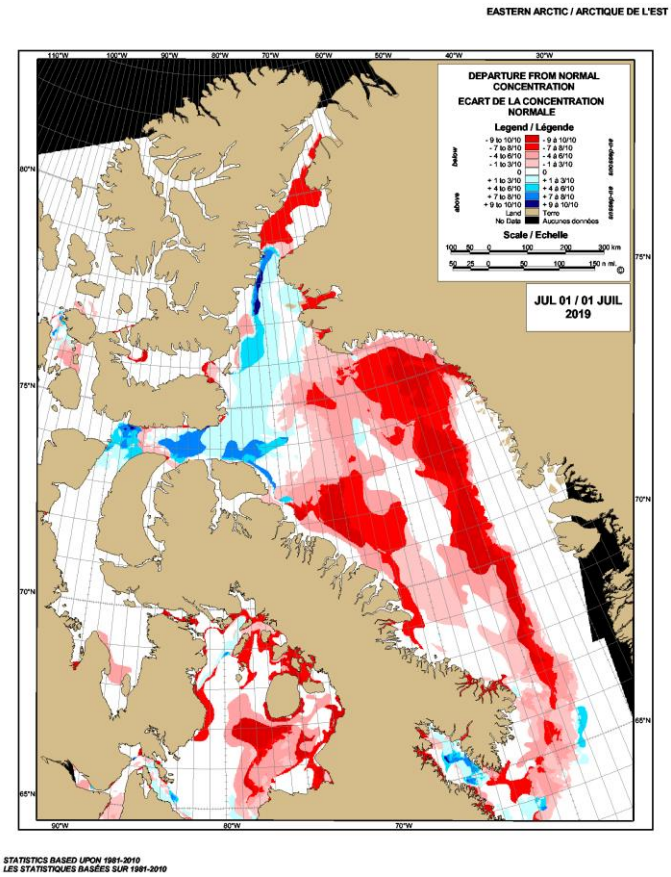



**Figure 16: Departure from normal ice concentration for the Eastern Arctic area on July 1st 2019**

At the beginning of June, the area west of the Greenland coast up to just south of Melville Bay already contained bergy water. Meanwhile, another area of bergy water expanded from the eastern part of Smith Sound southwards to the western part of Melville Bay. Looser ice conditions covered the northern part of Baffin Bay. The less than normal ice concentration at the beginning of June was a function of the much above normal temperatures observed for most of May. In fact, during the first week of May, temperatures were as much as 10ºC above normal over most of Baffin Bay. Since the ice bridge across Nares Strait never formed over the winter, old ice continued to flow into the northwestern part of Baffin Bay. This, in turn, caused this area to experience greater than normal ice concentration. By mid-month, mainly bergy water with only a few patches of very open drift thick first-year and old ice had developed from the western Greenland coast northwards towards Melville Bay and into the Thule area. This usually doesn't occur until mid-July. The pack ice in the southwestern part of Baffin Bay, along the northeastern Baffin Island coast, was also showing early signs of loosening. By the end of June, the eastern side of Baffin Bay was bergy water. The consolidated ice in Melville Bay had decreased. The northwestern part of Baffin Bay had a mix of bergy water with mostly very open drift old ice. Some higher concentrations of ice continued to drift into the extreme northwestern part of the bay from Smith Sound and Nares Strait. The southwestern part of Baffin Bay had some bergy

water areas with large areas of open drift to close pack thick first-year and old ice. The south-central part continued to have very close pack thick first-year ice with up to two tenths old ice.

Eastern Lancaster Sound had close pack first-year ice with up to two tenths old ice at the beginning of June. Ice in Navy Board and Pond Inlets remained consolidated with thick first-year ice with a trace of old. Meanwhile the western part of Lancaster and Barrow Strait had consolidated thick first-year ice with a trace of old ice. Little change occurred by the middle of the month however, some of the fast ice did fracture in the western section of Lancaster Sound. By month's end, some bergy water with patches of close to very close pack thick first-year ice with up to three tenths old ice developed in the eastern two-thirds of the sound. No change to the consolidated ice in western Lancaster Sound, Barrow Strait as well as Navy Board and Pond Inlets.

At the beginning of June, consolidated thick first-year ice with one tenth old ice covered most of Prince Regent Inlet. Only the extreme southern part of the inlet had very close pack thick first-year ice with up to one tenth old ice. By mid-month, only a small portion of the consolidated ice fractured along the southern edge while very close pack thick first-year with up to one tenth old ice still prevailed in the extreme southern portion of the inlet. By the end of June, only the extreme northern portion of the inlet had consolidated ice. The rest was very close pack thick first-year ice with up to one tenth old ice.

No significant changes occurred in the Golf of Boothia region during the month of June. Mainly very close pack thick first-year ice with one tenth old ice covered the area except for consolidated first-year ice with some embedded old ice along the coast.

Fury and Hecla Strait remained consolidated with thick first-year ice with a trace of old ice during the entire month.

Foxe Basin already had areas of looser than normal ice concentration at the beginning of June. In particular, the southeast sector, north of Foxe Channel, as well as around the eastern coast and around the islands in the northeastern section. The rest of the basin had normal conditions of very close pack thick first-year ice. A trace of old ice was present in the northeastern section of the basin. By mid-month, the area of below normal ice concentration continued to expand northwards to just south of Prince Charles Island as well as around islands in the northeastern portion of the basin. Much above normal temperatures blanketed the entire area during the second half of June, which accelerated the deterioration of the pack ice. By the end of the month, large areas of open water to open drift thick first-year ice developed in the southeastern, eastern and northwestern sections of the basin.

Most of Jones Sound, Norwegian Bay and Eureka Sound remained consolidated thick first-year and old ice during the month of June. The exception was the Cardigan Strait and Hell Gate area where open water to some areas of thick first-year and old ice prevailed.

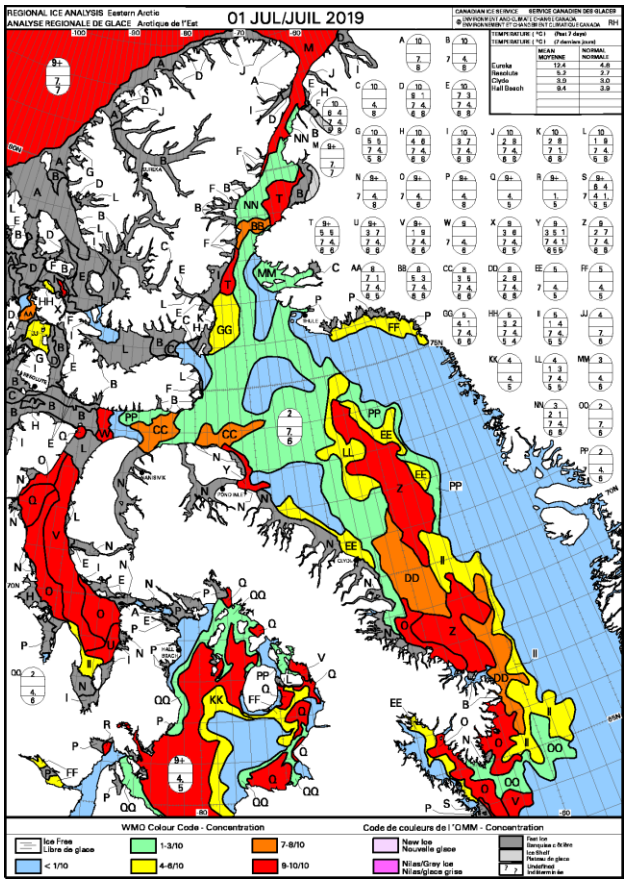



**Figure 17: Eastern Regional ice chart for July 1st 2019**

***July Ice Conditions:***

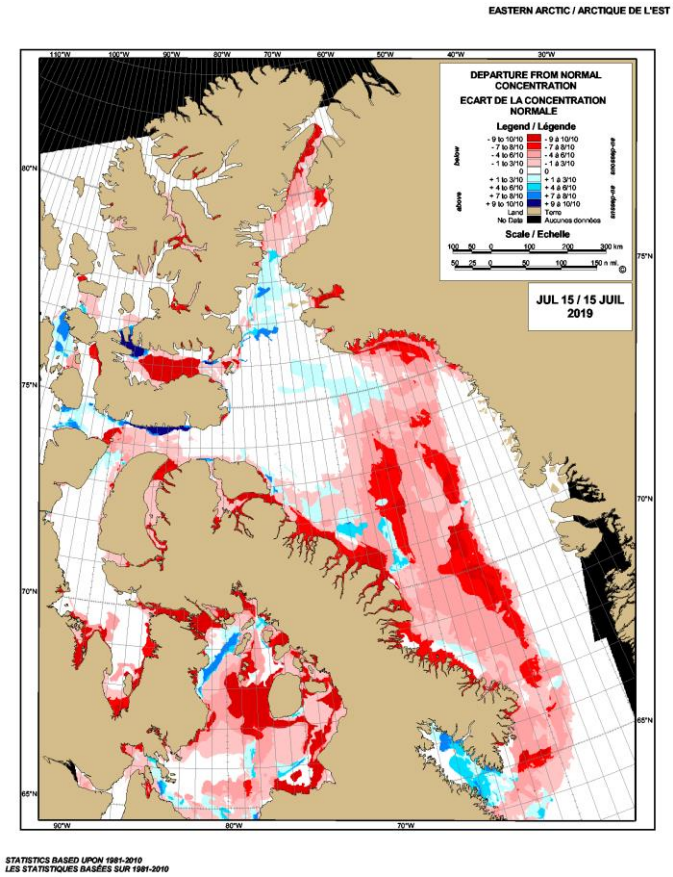



**Figure 18: Departure from normal ice concentration for the Eastern Arctic area near mid-July 2019**

During the first half of July, the eastern side of Baffin Bay was bergy water except for some rotten very open drift thick first-year ice in Melville Bay. The northern portion of Baffin Bay had patches of very open drift old ice but otherwise mostly bergy water prevailed by mid-July. Some patches of open drift thick first-year and old ice drifted southwards from Kane Basin. The areas east of the Baffin Island had areas of very close pack thick first-year ice but for the most part, bergy water to very open drift thick first-year ice. These conditions at mid-month (see figure 18), were well ahead of normal in terms of ice melt. In fact, ice melt in Baffin Bay was about three weeks earlier than normal. Warmer than normal temperatures continued into the second half of the month and faster than normal ice melt was the result. By the end of July, almost all of the ice had melted. Only a few patches of thick first-year and old ice prevailed along the northeastern coast of Baffin Island while very open drift to close pack thick first-year and old ice was still present along the coast north of Cape Dyer. There continued to be areas of open drift thick first-year and old ice drifting into the northwestern part of Baffin Bay from Kane Basin. At that point, ice melt was about four to five weeks earlier than normal for most of Baffin Bay. The ice extent at this time of year was challenging minimum historical ice coverage. Only 2012 had slightly less ice than this year at the end of July.

Signs of ice fracture of the consolidated thick first-year ice with a trace of old ice began during the first week of July in Pond Inlet while Navy Board Inlet remained consolidated with thick first-year ice and a trace of old ice. By mid-month, almost all of the consolidated thick first-year ice and a trace of old ice had fractured in Navy Board. Only a small area of consolidated ice remained intact. Bergy water with large areas of very close pack thick first-year ice including a trace of old ice covered Pond Inlet. Influenced by warmer than normal temperatures during the second part of July, ice melt moved ahead at an accelerated pace. All the ice in Navy Board and Pond Inlets had melted to give way to bergy water conditions before the end of the last week of July.

The consolidated thick first-year ice including a trace of old ice in Admiralty Inlet began to fracture and melt in the southern section during the first week of July. By mid-month, most of the northern portion of the inlet had fractured and became bergy water while the central section continued to have consolidated ice. The southern part of the inlet had a mixture of bergy water with areas of close pack thick first-year ice including a trace of old ice. Ice melt continued from the north while the central and southern part had very open drift with some close pack thick first-year ice including a trace of old ice during the third week of July. Some ice from the southern section had drifted northwards during the last week of the month and entered Strathcona and Adams Sounds causing some issues for the Arctic Bay and Nanisivik area. However, milder temperatures eventually melted all the ice so that by the end of July, bergy water conditions prevailed.

The consolidated thick first-year ice including a trace of old ice in the western part of Lancaster and eastern Barrow Strait fractured during the first week of July while the western Barrow Strait remained consolidated. In central and eastern Lancaster, bergy water and very open drift thick first-year ice including a trace of old ice covered most of the area except for a band of very close pack thick first-year ice including a trace of old ice along the southern coast of Devon Island. A moderate southerly to southeasterly circulation caused a band of high concentration of ice to develop during the second week of July. By mid-month, most of Lancaster Sound had bergy water except for the persistent band of very close pack thick first-year ice including a trace of old ice along the southern coast of Devon Island. In the meantime, all the remaining consolidated thick first-year ice and patches of old ice in western Barrow Strait had fractured. As the third week evolved, the band of ice along the southern Devon Island coast began to drift into the central and southern parts of Lancaster Sound as open to very open drift thick first-year ice including a trace of old ice. Meanwhile, the very close pack thick first-year ice began to drift eastward from Barrow Strait into extreme western Lancaster Sound. A return to a weak southeasterly circulation over the area caused some ice destruction or sequestered the ice on the northern side of eastern Barrow as well as along the Devon Island coast. By the end of July, mainly bergy water with only a few patches of very close pack thick first-year ice remained along the southern coast Devon Island as well as the southern coast of Cornwallis island. The western part of Barrow Strait had a mix of thick first-year and old ice with lower concentrations in the southern portion of western Barrow Strait. Due to these unusual southeasterly winds, ice concentrations along southern Cornwallis Island and parts of the southern coast of Devon Island were greater than normal whereas the southern part of Barrow Strait had lower than normal ice concentrations.

The last bit of consolidated thick first-year ice including one tenth old ice in the northern part of Prince Regent Inlet fractured before the end of the first week of July. The remainder of the inlet continued to have very close pack thick first-year ice with up to one tenth old ice. Not much changed during the second week except for some looser ice concentration in the northeastern section. However, during the third week of July, concentrations decreased to mostly very open drift thick first-year and old ice in the northern section while very close pack thick first-year including a trace of old ice prevailed. Looser ice concentrations propagated into the southwestern part of Prince Regent Inlet during the last week of July with the southeastern part having very close pack ice.

Signs of consolidated thick first-year ice with up to three tenths old ice in some locations began to fracture, mostly in the southern section of the Gulf of Boothia in early July. Open water started to develop in Pelly Bay. By mid-month, most of Pelly Bay was open water. Looser thick first-year ice with up to two tenths old ice developed in southern Committee Bay. The remainder of the Gulf of Boothia was very close pack thick first-year including up to two tenths old ice. By the end of July, open drift with areas of very close pack thick first-year ice including two tenths old ice covered the southern portion of the gulf with Pelly Bay being open water. Elsewhere, mainly very close pack thick first-year ice including up to two tenths old ice shrouded the northern portion of the gulf.

Signs of melt and fracture began to develop in Fury and Hecla Strait during the first few days of July. By the end of the first week, all of the consolidated thick first-year including a trace of old ice had fractured. By mid-month, most of the strait was bergy water except for the western entrance where very close pack thick first-year ice including a trace of old ice still prevailed. As the pack ice to the west of the western entrance to Fury and Hecla Strait loosen, very open drift thick first-year ice drifted westwards during the second half of July.

In Foxe Basin, ice concentration continued to decrease during the entire month. By the end of July, large areas of open water had developed with generally very open drift to close pack thick first-year ice, especially in the southwestern section north of Southampton Island. Conditions at that time of year were almost four weeks earlier than normal in term of ice melt. Despite the advanced ice melt, it was not record setting for the end of July but did represent the second lowest ice coverage for that time of year, just behind 2006.

In Jones Sound, some early signs of break up of consolidated thick first-year ice including up to one tenth old ice began to show during the first week of July. However, strong southeasterly winds in the second week cause the fracture of the consolidated ice as well as a general drift of the pack ice into the western and northern reaches of the sound. By mid-July, very close pack thick first-year ice including up to two tenths old ice was mostly along the southern coast of Ellesmere Island, as well as the western and southwestern portions of Jones Sound. Elsewhere in Jones Sound, mostly bergy water with a few patches of very open drift thick first-year ice. Easing of the winds in the third week permitted the ice to drift into the central part of the sound however, a return of moderate southeasterly winds caused the ice to drift back onto the southern Ellesmere Island coast and the extreme western portion of Jones Sound while the rest of the sound developed bergy water conditions.

Consolidated thick first-year ice including up to three tenths old ice in parts of Eureka Sound and the southern portion of Norwegian Bay began to fracture during the first week of July. By mid-month, the northern portion of Eureka Sound fractured completely with little change to the consolidated ice in Norwegian Bay. During the third week of July, the consolidated ice in all of Norwegian Bay as well as the remainder of Eureka Sound had finally fractured. In fact by the end of the third week, areas of bergy water developed in parts of Eureka Sound with areas of open drift to close pack thick first-year ice including a trace of old ice. Nearly all of Eureka Sound had bergy water at the end of the month except for very close pack thick first-year ice including one tenth old ice in the extreme northern portion of the sound. In the meantime, only slight changes to the ice coverage occurred in Norwegian Bay. Overall, ice melt and break-up was about two weeks earlier than normal at the end of July.

***August Ice Conditions:***

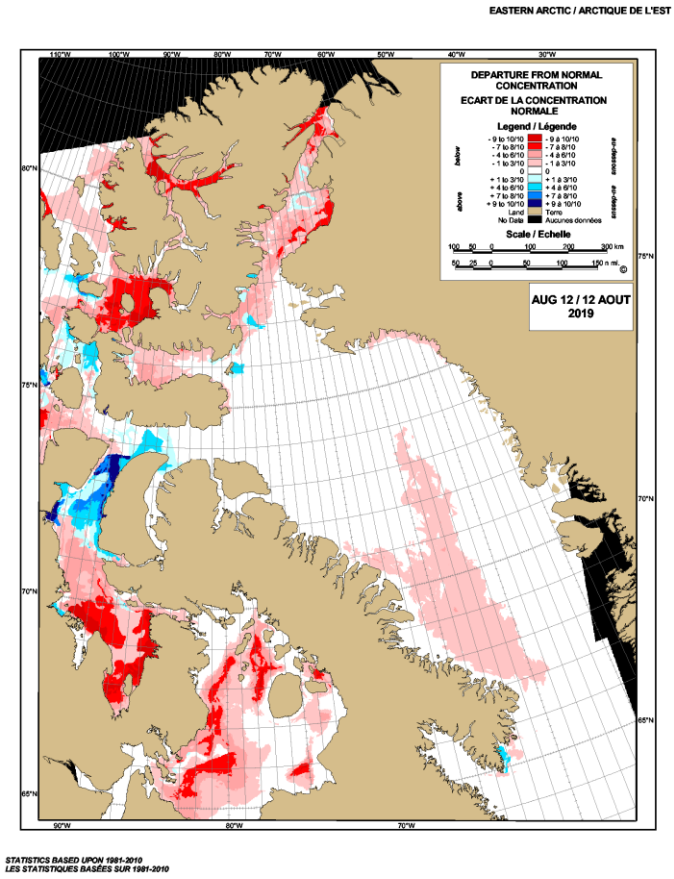



**Figure 19: Departure from normal ice concentration for the Eastern Arctic area near mid-August 2019**

In Baffin Bay, very open drift old ice was still present along the Baffin Island coast, north of Cape Dyer after the first week of August however soon afterwards, mainly bergy water prevailed. Elsewhere in the bay, open to very open drift old ice occasionally drifted into the extreme northwestern portion from the Kane Basin area. However, by the end of the third week, bergy water conditions prevailed everywhere in the bay.

Bergy water conditions prevailed in Navy Board and Pond Inlets during the entire month of August.

Admiralty Inlet had generally bergy water however, occasional incursions of very open drift thick first-year and old ice in the northern section occurred during August.

The area of very close pack thick first-year ice including a trace of old ice in the northwestern part of Lancaster Sound as well as the northeastern part of Barrow Strait drifted southwards and dispersed during the first week of August. Further west in western Barrow Strait, very close pack thick first-year and old ice prevailed during the same period. By mid-month, mainly bergy water with very open drift thick first-year and old ice in the south-central part of Lancaster Sound. The eastern Barrow only had very close pack old ice while the rest was bergy water. Very close pack thick first-year and old ice covered the western Barrow Strait region except in the southern section where open drift to close pack thick first-year and old ice was present. By the end of the third week of August, Lancaster Sound and eastern Barrow Strait had mainly bergy water. Looser ice conditions in western Barrow Strait of open drift to very close pack thick first-year and old ice still prevailed. However, during the last week of the month, open to very open drift thick first-year and old ice from Prince Regent Inlet started to migrate into south-central Lancaster Sound and eventually eastwards into southeastern Lancaster Sound, west of Navy Board Inlet. Meanwhile, open water to close pack thick first-year and old ice from western Barrow Strait drifted eastwards into eastern Barrow Strait and southwestern Lancaster Sound, north of Somerset Island.

The ice in Prince Regent Inlet continued to decrease in concentration so that by mid-August, mainly open drift thick first-year ice including one tenth old ice with areas of very close pack thick first-year ice including one tenth old ice. This ice regime continued into the third week of August however by the end of August, mainly bergy water conditions prevailed with only narrow bands of old and thick first-year ice in mostly the central part of the inlet.

A general decrease in ice concentration occurred in Gulf of Boothia during the first half of August. By mid-August, ice free conditions prevailed in Pelly Bay. Elsewhere, bergy water to very open drift thick first-year and old ice covered the majority of the gulf with areas of close pack thick first-year ice including one tenth old ice. Continued deterioration of the ice into the second half of August so that by the end of the month, only a small patch of very open drift thick first-year and old ice in the east-central part of the Gulf of Boothia, just west of Fury and Hecla Strait.

For the combined area of Prince Regent Inlet and Gulf of Boothia, ice conditions at the end of August established a new record minimum ice coverage. The region this year only had about 4% ice coverage. The previous record from 2011 had about 8% of the region covered with ice.

The thick first-year ice including up to one tenth old ice in Jones Sound was mostly along the coastal area in the north and southwestern section, which melted almost entirely by mid-month. Only a few strips and patches in the northeastern and southwestern areas along the coast survived. Elsewhere, bergy water conditions prevailed. Before the end of the third week of August, the ice melted completely and gave way to bergy water.

A significant amount of ice melt occurred in Norwegian Bay during the first two week of August so that by mid-month, bergy water with two tenths old ice covered most of the area. Open drift to close pack ice was present in the northwestern and extreme southwestern sections. By the end of August, only a few patches of very open drift old ice was present in the northwestern and western sections of the bay. The rest of the bay was bergy water. Normally, Norwegian Bay would have slightly less than 50% ice coverage by the end of August. This year, the bay had only about 4% ice. Although not record setting in terms of minimum ice coverage, it was the second lowest, just behind 2011 (about 1.6% ice coverage).

Eureka Sound became mainly bergy water soon after the beginning of August and persisted for the entire month.

***September Ice Conditions:***

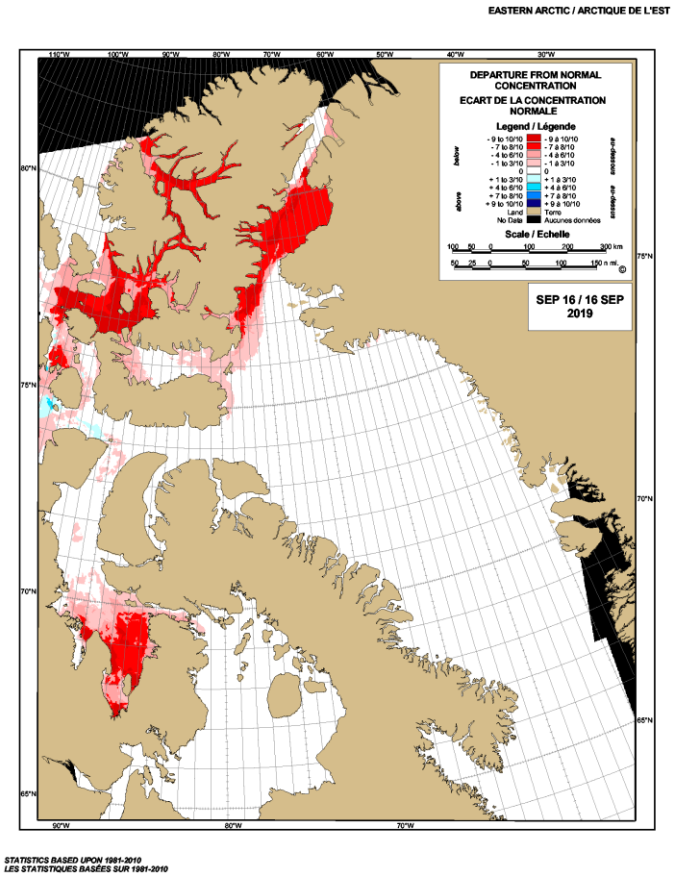



**Figure 20: Departure from normal ice concentration for the Eastern Arctic area near mid-September 2019**

Baffin Bay continued to have bergy water conditions for most of September. However, by the last week of the month, some patches of very open drift old ice originating from Kane Basin drifted into the extreme northwestern part of the bay.

The Navy Board and Pond Inlets remained bergy water during the entire month of September.

Lancaster Sound had predominantly bergy water for most of September. Yet, by the last week, areas of new ice started forming in some of the small inlet in the extreme western section.

In eastern Barrow Strait, a narrow band of open drift old ice along the north coast of Somerset Island prevailed during the first two weeks of September however soon after mid-month, a southerly circulation caused the ice to drift towards to middle of the strait. Just before the end of the third week, the ice drifted back towards the north coast of Somerset Island. By the last week of the month, areas of open drift new ice with some embedded trace of old ice developed in the area.

In Prince Regent Inlet, the last of the very open drift old ice in bands melted during the first week of September. Nonetheless, strips of open drift old and thick first-year ice drifted in from Lancaster Sound into the northern part of the Inlet during the first week. By the middle of the

second week, all of the ice finally melted. Ice only returned to the area during the last few days of September as patches of very open drift new ice formed along parts of the coast. Elsewhere mainly bergy water prevailed.

The last patches of very open drift old and thick first-year ice in the southeastern part of the Gulf of Boothia, just west of Fury and Hecla Strait, melted during the first few days of September. The remainder of the month was bergy water except in Pelly Bay where ice free conditions prevailed.

Very small patches of very open drift old ice was still present at the beginning of September in the western part of Fury and Hecla Strait but finally melted soon afterwards. Bergy water conditions was the norm elsewhere and for the remainder of the month. Normally, there would be significant amounts of close to very close pack thick first-year and old ice in southeastern Gulf of Boothia as well as Committee Bay at the end of the month. In fact, the Prince Regent, Gulf of Boothia and Committee Bay would normally be about 50% ice covered by the end of September.

Foxe Basin remained ice free for the entire month of September.

Bergy water conditions persisted for most of September in Jones Sound. Then by the last week, very open drift new ice began forming along parts of the coasts.

Most of Norwegian Bay was bergy water with only open to very open drift old ice in the extreme western part of the bay during the first two weeks of September. New and grey ice began to form around old ice floes in western Norwegian Bay soon after mid-month and continued to spread eastwards and increase in concentration during the latter part of September. By the end of the month, open drift to very close pack grey and new ice with up to 3 tenths old ice covered most of the bay except the northeastern section where bergy water with some patches of very close pack new ice prevailed.

Eureka Sound was mostly bergy water for the first half of September but patches of very open drift old ice with some new ice began to drift into the northern section of the sound. By the end of September, the northern half of Eureka Sound was covered with open drift old and new ice while the southern part had open drift new ice.

The ice coverage for the Eureka Sound and Norwegian Bay area at the end of September was about half of what is normally observed, based on the CIS 30-year ice climatology.

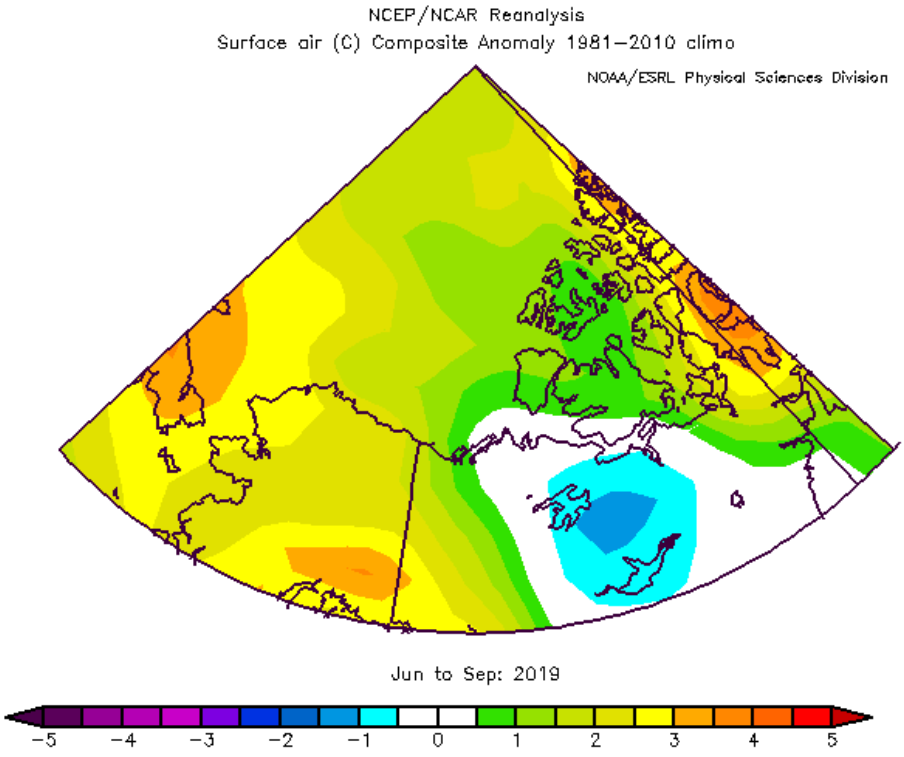
# Western Arctic

## Summer Ice Conditions and Fall Freeze-up

### *Summer Temperatures: June to September*

From June to September, surface air temperatures were below normal stretching from Amundsen Gulf into Coronation Gulf. Elsewhere, above normal temperatures prevailed during the same period.

**Figure 21: Air temperature anomaly for the Western Arctic area from June to September 2019**




***Summary of Ice Conditions:***

Vast areas of looser ice conditions with areas of open water in the Beaufort Sea were already present at the beginning of June. Winds from the southeast during the latter part of May had pushed the pack ice northwestwards. The Amundsen Gulf also had significant areas of open water. This trend continued during the first half of June however, a shift in wind direction caused the pack ice to slump southwards for the balance of the month. Below normal temperatures accompanied these winds and slowed down ice melt. Looser ice concentrations continued to spread northwards in the Beaufort Seas, mostly in the southeastern section during the month of July. Meanwhile the southwestern section had significant ice melt so that by the end of July a large area of open water was established. Areas of consolidated ice began to fracture in Coronation Gulf and Victoria Strait early in July and continued over the rest of the eastern part of the Northwest Passage. Soon after mid-July, the ice was mobile in Coronation Gulf, Queen Maud, Larsen Sound and Peel Sound as well as M'Clintock Channel, M'Clure Strait, and Viscount Melville Sound. By the end of July, Amundsen Gulf and Coronation Gulf were open water. Looser ice conditions lurked just north of Cape Bathurst and the Tuktoyaktuk Peninsula

during most of July and August.  Early in August, Queen Maud as well as Gulf Rasmussen and St Roch Basins were open water. Looser conditions developed in Peel Sound. By the end of August, open water to ice free conditions prevailed from Amundsen Gulf eastwards to most of Larsen Sound. The southwestern and south-central part of the Beaufort Sea was also open water to ice free while the southeastern section had open drift to close pack first-year and old ice, just north of Cape Bathurst. The extreme northern part of Larsen Sound into Peel Sound had very open drift to close pack thick first-year and old ice with isolated patches of very close pack thick first-year and old ice along the south and southwestern shore of Prince of Wales Island. At the end of August, ice conditions reached the season minimum ice coverage. Overall, the Western Arctic region did not establish a new minimum ice coverage this year. In fact, this year represented the 8$^{th}$ lowest ice coverage at the end of the ice melt season. However, looking at the regional level, the Beaufort Sea area registered it 4$^{th}$ lowest behind 2012, 2016 and 2008. Soon after mid-September, new ice began to form between the ice floes, mostly in the northern regions.

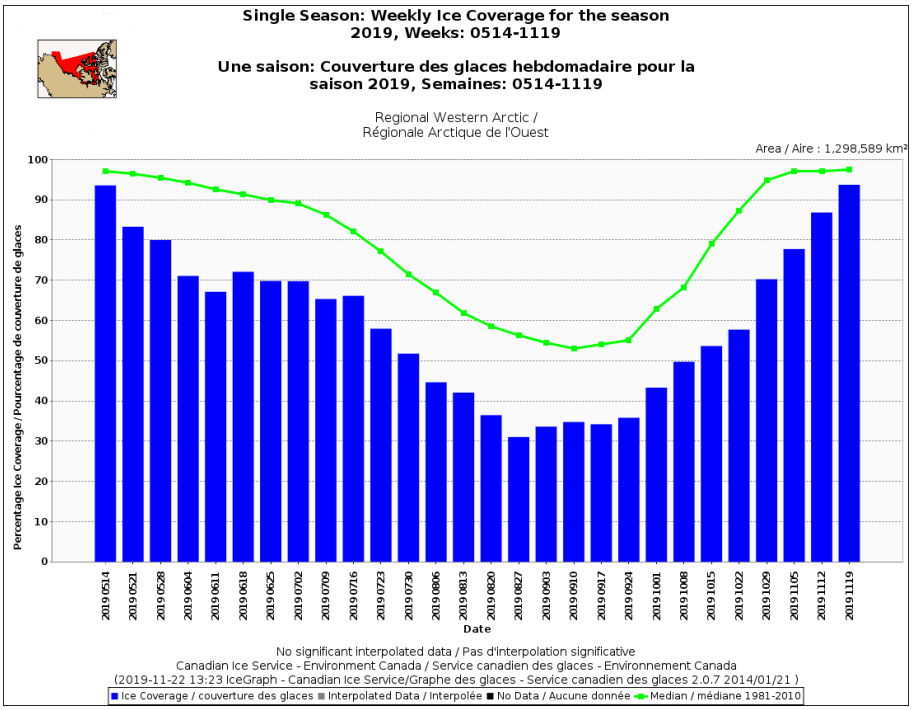



**Figure 22: Weekly ice coverage for Western Arctic area for the 2019 season**

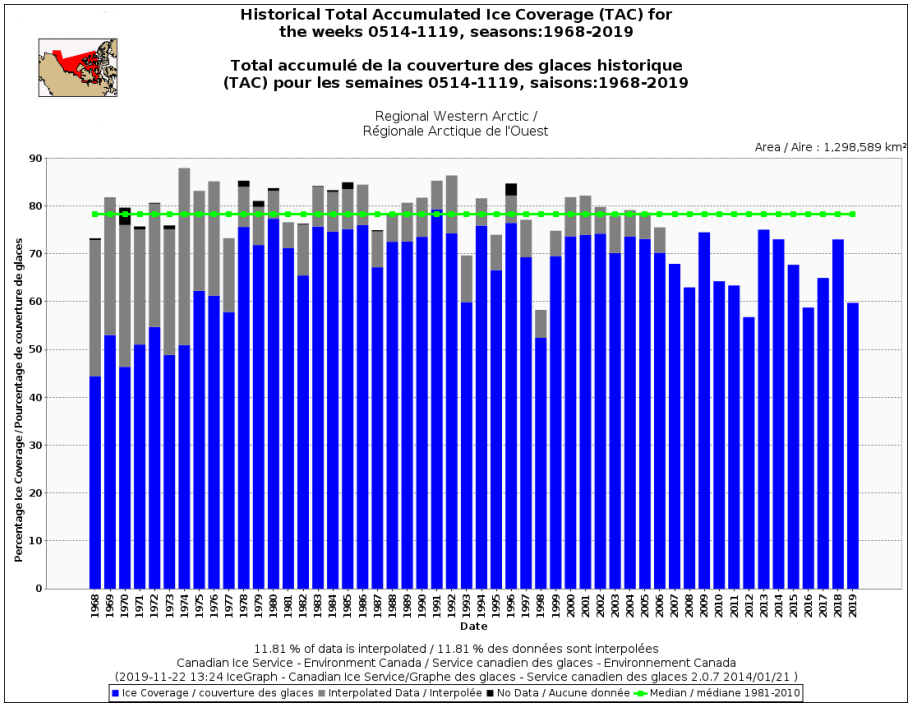



**Figure 23: Historical Total Accumulated Ice Coverage for Western Arctic area (1968-2019)**

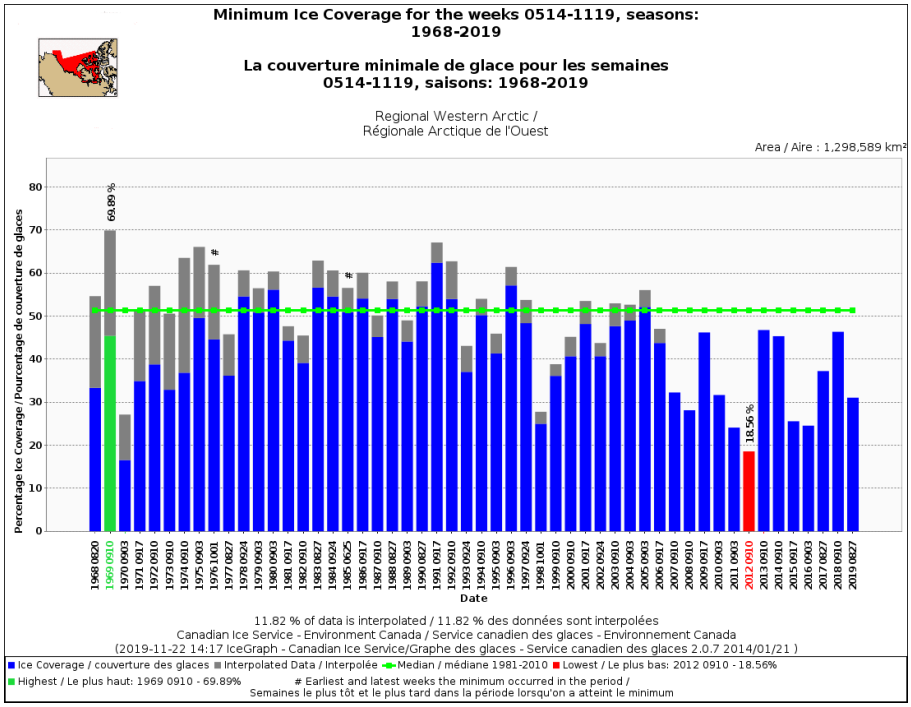



**Figure 24: Minimum Ice Coverage for the Western Arctic area (1968-2019)**

***June Ice Conditions:***

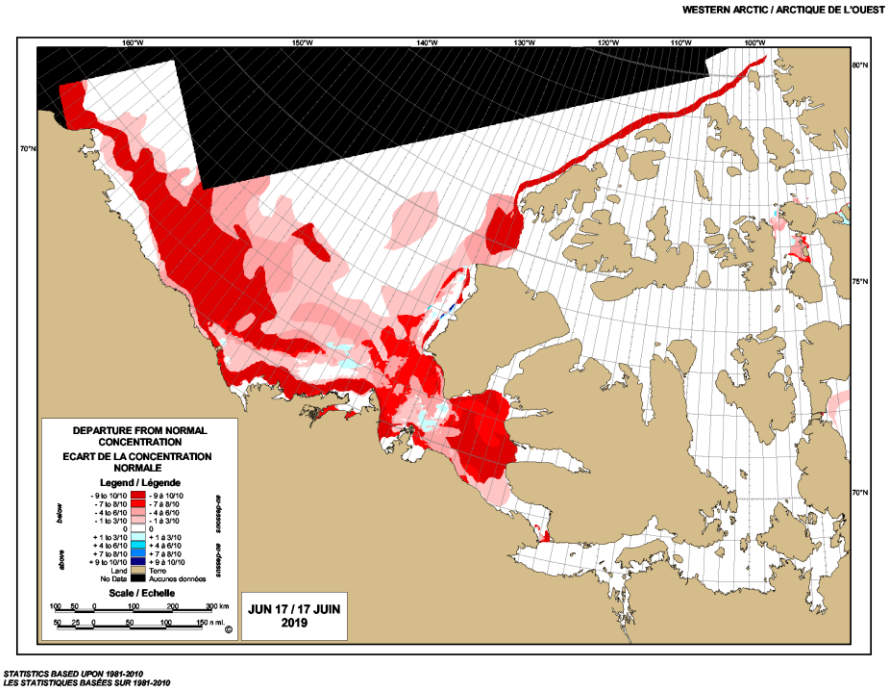



**Figure 25: Departure from normal ice concentration for the Western Arctic area near mid-June 2019**

As the calendar changed from May to June, significant areas of open water had already developed in the southern part of the Beaufort Sea, just offshore from the northern coast of Yukon and Alaska. A good portion of Amundsen Gulf also had areas of open water with very open drift first-year ice with a trace of old ice in the northwestern portion of the gulf. Even the southwestern part of the Beaufort Sea, west of Banks Island, had ice concentrations lower than normal. The area had open drift to close pack old ice with some thick first-year ice. The region west and southwest of Point Barrow also had open water. Consolidated ice along the Tuktoyaktuk Peninsula, Yukon and Alaskan coasts began to fracture during the first two weeks of June. Some coastal fast ice in Amundsen Gulf had fractured. By mid-month, a mix of open water with areas of very open drift to close pack thick first-year ice with a trace of old ice covered Amundsen Gulf while the open water area remained more or less intact in the southern Beaufort Sea, north of the Yukon and Alaskan coasts. At the same time, concentrations in most of the southeastern part of the Beaufort Sea increased during the first two weeks of June however, some very open drift to close pack old ice with some thick first-year ice along the ice edge still remained. During the third week, the ice pack in the southern Beaufort somewhat relaxed however the leading edge continued to progress towards the coasts of the Tuktoyaktuk Peninsula, Yukon and Alaska. In the meantime, the consolidated ice along the coast continued to fracture, particularly in Darnley and Franklin Bays as well as Liverpool Bay. Open water conditions continued to spread in Amundsen Gulf however the fractured consolidated ice in some areas drifted into the gulf forming some areas of open to very open drift thick first-year ice with trace of old ice. By the end of June, the very open drift to close pack old ice in southeastern Beaufort Sea reached Baillie Island and drifted into the western side of Franklin Bay and the northern part of Liverpool Bay. The leading edge of old ice was located about 10 to 45 miles

north of the Tuktoyaktuk Peninsula, Yukon and northeastern Alaskan coast. Almost all the consolidated ice along the northwestern coast of Alaska fractured. Most of Amundsen Gulf was open water except for some open drift thick first-year ice in the eastern section and very open drift old ice in the northwestern part. Despite the cooler than normal temperatures and periodic winds from the north to northwest, ice concentrations in the southern Beaufort Sea were lower than normal during the month of June. The only area where slightly greater than normal ice concentrations developed was the area west of Banks Island and north of the Tuktoyaktuk Peninsula at the end of June.

Most of Dolphin and Union Strait was consolidated thick first-year ice except for the extreme southeastern section where a small area of open water was already present in early June. The western section fractured soon after mid-June and was covered with open to very open drift thick first year ice by the end of the third week. The area of open water in the extreme southeastern section expanded slightly, then became filled with very open drift thick first-year ice by the end of June. .

Consolidated old ice around Queen Elizabeth Island and in most of M'Clure Strait and Viscount Melville Sound remained intact for June. A mix of thick first-year and old ice in M'Clintock Channel, Peel Sound, Larsen Sound and northern Queen Maud Gulf also remained consolidated. And southern Queen Maud Gulf, St. Roch and Rasmussen Basins as well as most of Coronation Gulf was consolidated thick first-year ice for all of June. Signs of fracturing of consolidated thick first-year ice in western Coronation Gulf began during the last week of June.

***July Ice Conditions:***

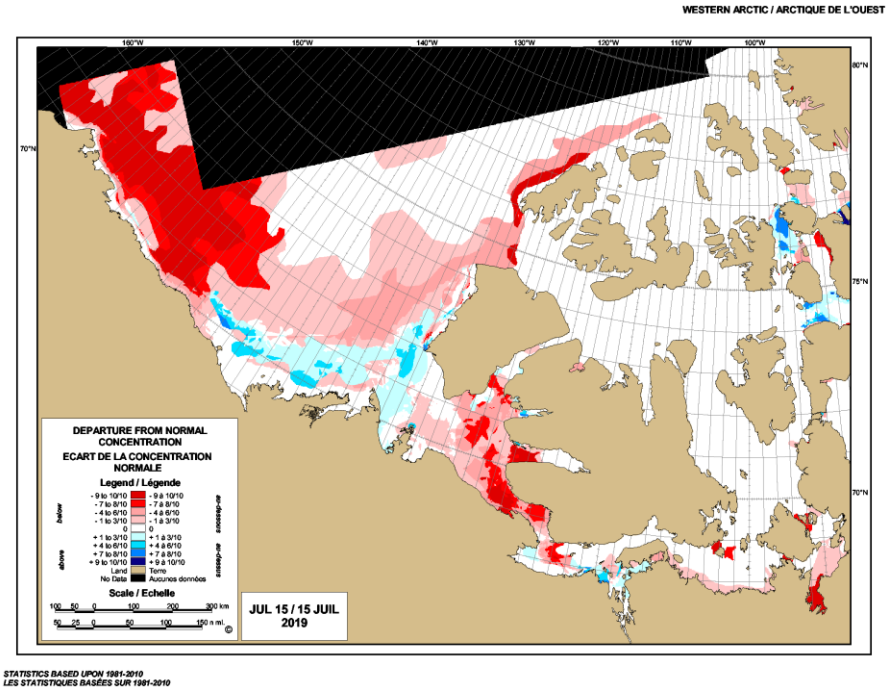



**Figure 26: Departure from normal ice concentration for the Western Arctic area near mid-July 2019**

Little change occurred during the first three weeks of July over the southeastern Beaufort Sea area. Open drift to close pack old ice with some thick first-year ice covered most of the area. Very open drift old ice originating from southwest of Banks Island continued to plague Franklin Bay during the same period. Meanwhile, the southwestern part of the Beaufort Sea began to loosen with open water areas expanding northwards slightly. The band of thick first-year ice with some old ice along the northwest coast of Alaska decreased in concentration so that by the end of the third week, only a small area of open drift old and thick first-year ice remained within 30 nautical miles of the coast. By the end of July, the open water area extended about 75 to 120 nautical miles north of the Tuktoyaktuk Peninsula and the Yukon Coast and about 180 to 240 nautical miles from the Alaskan Coast. Only a small patch of very open drift old and thick first-year ice remained along the Alaskan Coast. Based on the Canadian Ice Service's 30-year ice climatology, ice coverage for the Beaufort Sea area at the end of July was one of the lowest on record but was not record setting. 2008 was the year with the lowest ice coverage at the end of July. 2019 came out at number three.

Due to fracturing of consolidated ice in Prince of Wales Strait as well as the bays in the northeastern part of Amundsen Gulf, occasional patches of thick first-year ice with a trace of old ice invaded the mostly open water of the gulf.

Mostly consolidated thick first-year ice in Minto Inlet and Prince Albert Sound began to fracture in the western sections during the first week of July. The consolidated thick first-year ice in Prince Albert Sound fractured completely at the end of the third. At the same time, Minto Inlet still had consolidated thick first-year ice with a trace of old ice in the eastern section while the western

part had open water, the consolidated ice soon fractured after mid-month. By the end of the month all ice had melted in Minto Inlet and Prince Albert Sound.

In Prince of Wales Strait, small signs of fracturing of the consolidated thick first-year ice with a trace of old ice began during the first week of July. By the end of the third week, all of the consolidated ice had fractured. By the end of July, the southern two-thirds was close pack thick first-year ice with a trace of old ice while the northern third had very close pack old ice with some thick first-year ice.

Dolphin and Union Strait fractured entirely during the second week of July and became open water during the third week.

At the end of the first-week of July, the western end of Coronation Gulf had fractured while the rest remained consolidated with thick first-year ice. Fracturing of the remaining consolidated ice continued to progress eastwards so that by third week of July, all of it was mobile. The western end of the gulf was open water during the third week while the ice in the eastern end completely melted by the last week of July.

Dease Strait, covered with consolidated thick first-year ice, began to fracture after mid-July and mostly melted by the end of July. Only open to very open drift thick first-year ice remained in the eastern end of the strait. Elsewhere, open water conditions prevailed.

The Queen Maud Gulf area started to fracture from the Victoria Strait region and extended southwards into the extreme northern gulf during the first week of July. Ice melt and fracture began along the southern coast during the second week while the fracture zone in the north expanded slightly during the same period. The remaining consolidated thick first-year ice with up to three tenths old ice fractured after mid-month. By the end of the month, mainly open water conditions prevailed with only a few areas of open to very open drift old ice remained in Queen Maud Gulf.

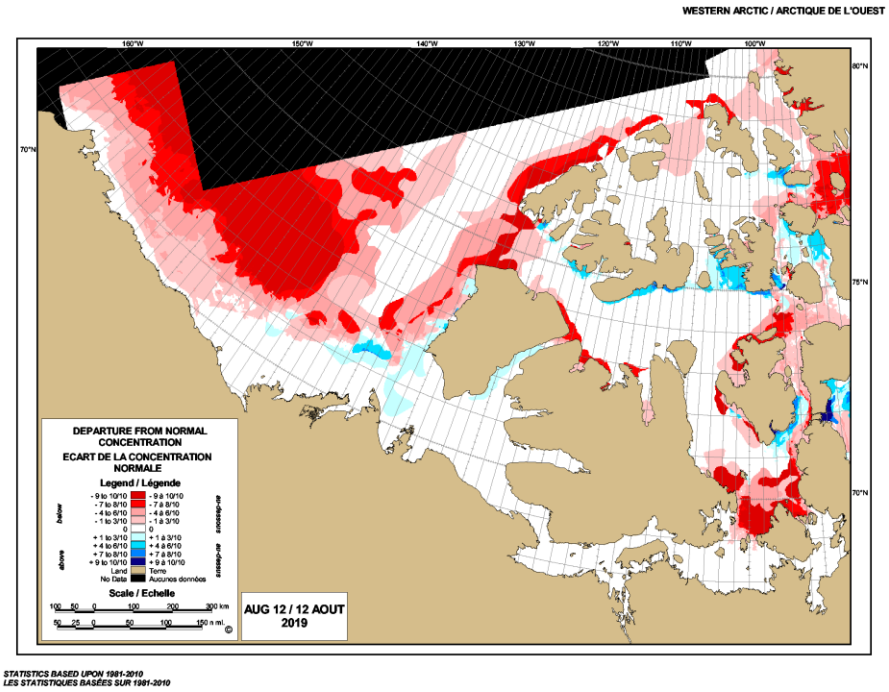
The consolidated thick first-year and old ice in Larsen Sound remained intact during the first half of July however, signs of fracture developed in Victoria Strait during the second week of the month. By the end of the third week, all of the consolidated ice fractured giving way to very close pack old and thick first year ice until the end of month.

Peel Sound remained consolidated with mostly thick first-year ice with up to three tenths old ice during the first two weeks of July however soon afterwards, this ice fractured. The area remained mostly very close pack ice however, some areas of open water developed due to southeasterly winds during the last week of the month.

The consolidated old ice in M’Clintock Channel and Viscount Melville Sound remained intact until mid-July. However soon afterwards, the ice fractured. The remainder of the month saw little change in ice extent except for isolated areas of looser ice or open water conditions.

Elsewhere, no significant change.

***August Ice Conditions:***




STATISTICS BASED UPON 1981-2010
LES STATISTIQUES BASÉES SUR 1981-2010

**Figure 27: Departure from normal ice concentration for the Western Arctic area near mid-August 2019**

The southeastern part of the Beaufort Sea continued to have various concentration of thick first-year and old ice during the month of August. Occasionally, the ice edge slumped southwards towards Baillie Island into Franklin Bay. During the latter part of August, light to moderate northwesterly winds helped push the ice southwards. Hence, this area experienced a slightly greater than normal ice concentration in that area, especially along the leading edge of the ice pack. Temperatures were also colder than normal over the area.

Further westward in the Beaufort Sea, a large area of open water was established and continued to expand northeastwards during the month of August. The area was bathed with much warmer than normal temperatures and kept the area ice-free.

The Amundsen Gulf area was mostly open water during the entire month of August except for the occasional patch of very open drift thick first-year ice which drifted in from Prince of Wales Strait during the first week.

Prince of Wales Strait experienced melt back to very open drift thick first-year and old ice during August. At the end of the month, most of the strait was open water with some close pack old ice in the extreme northern part.

Dolphin and Union Strait as well as Coronation Gulf started as open water however, by the second week of August, ice free conditions developed and persisted until the end of the month.

The last bit of very open drift thick first-year and old ice in Dease Strait as well as Queen Maud Gulf melted in the first few days of August and gave way to open water to ice free conditions for the remainder of the month.

The ice in Victoria Strait and Larsen Sound began to experience a northward retreat during the first week of August. Open water prevailed in Victoria Strait by the end of the first week while southern Larsen Sound had some open water with mainly open drift to close pack old ice. The northern portion of the sound remained generally very close pack old and thick first-year ice. Not much changed during the second week, except for a band of open water along the eastern shore of Larsen Sound. By the last week of August, areas of open water were present in Victoria Strait as well as the southern and eastern areas of Larsen Sound with the rest of the sound covered with close to very close pack thick first-year ice with up to three tenths old ice.

A significant decrease in ice concentration occurred in Peel Sound during the first week of August. By mid-month, mostly open water to very open drift old ice covered a large part of the sound. The exception was along the southeastern coast of Prince of Wales Island where very close pack thick first-year ice with up to seven tenths old ice covered this region. Moderate southeasterly winds over Peel Sound as well as Larsen Sound affected the ice during the first week. By the end of August, mostly open water prevailed except for some very close pack old ice along the extreme northeastern coast of Prince of Wales Island with patches of open drift thick first-year ice with up to two tenths old ice along the southeastern coast of the Island.

Ice in M'Clintock Channel, Viscount Melville Sound and M'Clure Strait area loosen up during August. The northern part of M'Clure Strait and Viscount Melville Sound had open water to open drift thick first-year and old ice while the central and southern sections had close to very close pack mostly old ice. The extreme southwestern part of M'Clintock Channel had open water while the western part had open drift to close pack first-year ice with up to three tenths old ice. The eastern section, along the western coast of Prince of Wales Island, had mostly very close pack old ice. Normally, the southwestern coast of Prince of Wales Island would have open water however this year, and especially during the last week of August, winds were from the west and pushed the ice towards the west coast of island.

***September Ice Conditions:***

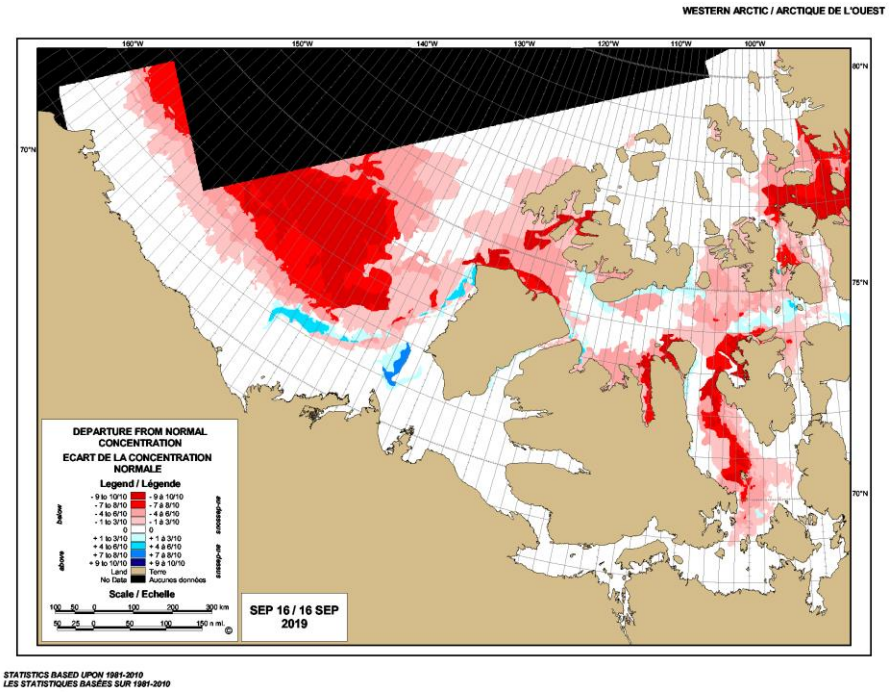



**Figure 28: Departure from normal ice concentration for the Western Arctic area near mid-September 2019**

The western and south-central parts of the Beaufort Sea remained open water to ice free during the entire month of September. Meanwhile, the very open drift to close pack mostly old ice in the eastern and north-central part of the Beaufort Sea area persisted. During the first few days of September, open to very open drift mostly old ice was present in the northern part of Franklin Bay but drifted northwards or melted so that by the end of the first-week, mostly open water conditions prevailed. Elsewhere, occasional wind events during the month caused some redistribution. In particular, moderate to strong easterly winds in the third week pushed the ice offshore from the western coast of Banks Island. Some new ice began to form in the pack ice in the north-central part of the Beaufort Sea by the end of the third week and spread eastwards as well as thickened to grey ice by the end of September.

Occasional patches of old ice from Prince of Wales Strait drifted into the extreme northern part of Amundsen Gulf during September. Elsewhere in Amundsen Gulf as well as Dolphin and Union Strait, Coronation Gulf and Dease Strait, ice free conditions prevailed.

Open water covered the southern and central parts of Prince of Wales Strait while open to very open drift mostly old ice was present in the north at be beginning of September. However, this ice began to drift southwards soon afterwards. By the last week, ice melted in most of the strait so that only the northern end had close pack mostly old ice with some new ice growth between the floes.

Queen Maud Gulf was mostly ice free however, occasional patches of very open drift old ice drifted southwards from Victoria Strait in the extreme northern section of the gulf during the

month of September. By the end of the last week, some patches of new ice began to form along the coast.

At the beginning of September, the ice distribution in Larsen Sound was mostly over the west-central part with some patches of old ice elsewhere. Meanwhile, open water prevailed in Victoria Strait. Moderate to strong northerly winds during the first week drove the ice into southwestern Larsen Sound and western Victoria Strait. Mostly close to very close pack thick first-year and old ice was in southwestern Larsen Sound while western Victoria Strait had very open drift to close pack thick first-year and old ice. A light to moderate southeasterly circulation caused the ice coverage to decrease during the second week. At the end of the second week, most of the ice in Victoria Strait was along northwestern shore with some patches of open drift ice in the north-central section. Larsen Sound was mostly open water while open drift to very close pack old ice persisted in the extreme southwestern section. This general ice distribution remained more or less the same for the last half of the month however, some new and grey ice began to form in the western section during the last week of September.

Peel Sound was mostly open water at the beginning of the month with only patches of very close pack thick first-year ice with up to three tenths old ice along the southeastern coast of Prince of Wales Island and very close pack mostly old ice along the northeastern coast of the island. A moderate northerly circulation during the first week of September caused the ice in the southwestern section to disperse and melt. Meanwhile the ice in the northwestern section expanded into the northern part of Peel Sound with very open to open drift old ice with patches of very close pack old ice along the northwestern coast. By mid-month, the northern third of the sound had open to very open drift old ice while the rest of the sound had open water. Soon after mid-month, the entire length of Peel Sound had open water with only lingering narrow patches of open to very open drift old ice along the northeastern coast of Prince of Wales Island.

M’Clintock Channel experienced a significant shift in ice distribution during the first few days of September. A moderate to strong northerly to northeasterly wind propelled the ice along the southwestern coast of Prince of Wales Island towards the eastern coast of Victoria Island. By the end of the first week, very close pack thick first-year ice with up to four tenths old ice lined the eastern coast of Victoria Island. Elsewhere in the channel, mostly open water with areas of close pack thick first year and old ice was located in the northeastern reaches. Subtle changes in ice distribution occurred during the second and third week of September however very close pack thick first-year and old ice remained in the western section while open water with areas of open to very open drift thick first-year and old ice covered the eastern section. By the last week, new and grey ice began to form within the pack ice.

The western part of M’Clure Strait was mostly open to very open drift old ice for most of the month. New and grey ice began to grow in the last 10 days. Eastern M’Clure into Viscount Melville Sound had large areas of very close pack thick first-year and old ice with open to very open drift thick first-year and old ice along parts of the coasts. New and grey ice began to form during the latter part of the month.