



Environment and
Climate Change Canada

Environnement et
Changement climatique Canada

Seasonal Summary

North American Arctic Waters

Summer 2020

By the Canadian Ice Service



Canada 

Summary over North American Arctic Waters

Again, this year, the early onset of ice melt occurred in the Eastern Arctic as well as northern Hudson Bay and Hudson Strait at the beginning of June. A more modest ice melt event occurred at the same time in the southern Beaufort Sea area. Near to below normal temperatures were observed during the melt season (June to September) along the coast from the northern Alaskan coast to western Amundsen Gulf, around Baffin Island and southwestern Hudson Bay. Elsewhere in the Arctic, temperatures were above to much above normal, particularly over the Arctic Ocean. The ice in Baffin Bay and Davis Strait continued to melt so that by the end of July, they completely cleared except for some lingering ice along the southeastern Baffin Island coast. The ice melt in Eastern Arctic was not record setting like last year however, it ranked around the top three ever since 1968. Meanwhile the southwestern Hudson Bay and southeastern Beaufort Sea areas were a little slower than normal, particularly compared to conditions during the past decade. Certain parts of Hudson Bay, southern Davis Strait as well as the southeastern part of the Beaufort Sea experienced slower than normal ice melt. A similar scenario developed in the southwestern part of Hudson Bay during the mid-period of the shipping season where higher than normal ice concentration covered that area. The impact caused a delay in the development of open water conditions in the area by about one to two weeks.

Some lingering ice in Victoria Strait from around mid-August to early September required some Coast Guard escorts.

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 near 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 2010 (see figure 1).

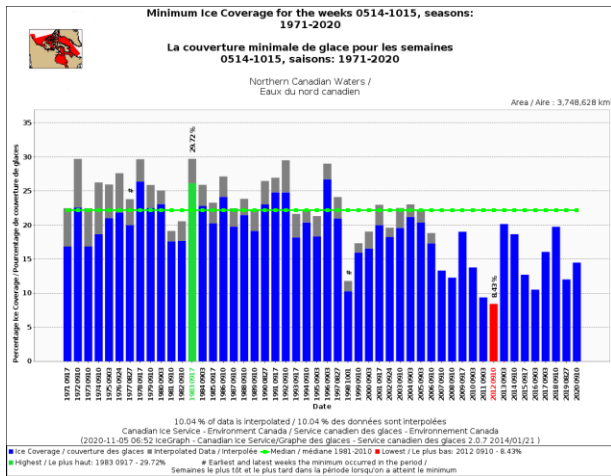


Figure 1: Minimum Ice coverage for Northern Canadian waters (1971-2020)

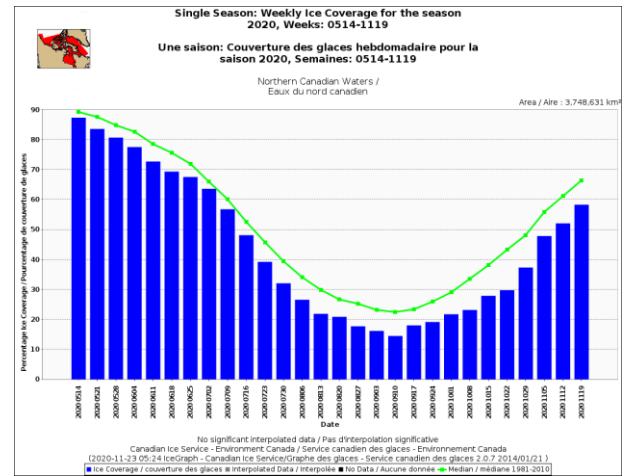


Figure 2: Weekly ice coverage for waters in 2020

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 coast of southwestern Baffin Island and eastern Foxe Basin. Elsewhere, above normal values prevailed (figure 3), in particular, over northeastern Hudson Bay and western Hudson Strait.

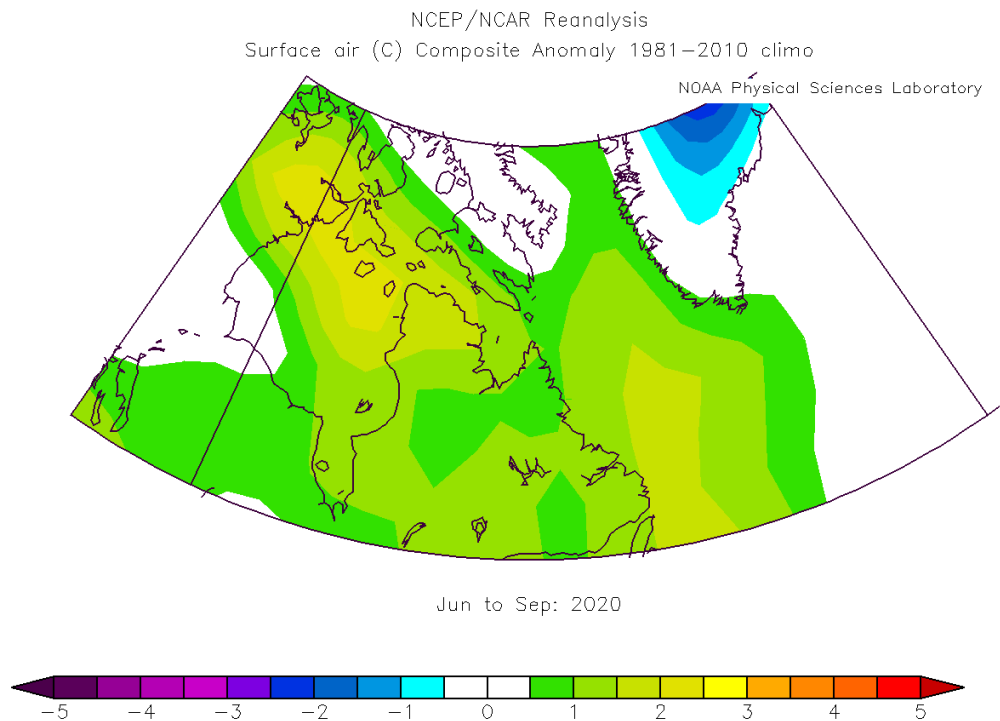


Figure 3: Air temperature anomaly for the Hudson Bay area from June to September 2020

Summary of Ice Conditions:

At the beginning of June, the regions that showed early onset of melt and breakup were the northern part of Hudson Bay as well as most of Hudson Strait. The outer edge of the ice along most of the Labrador coast also experienced earlier than normal ice melt or westward compression due to onshore winds. The cooler than normal temperatures over southwestern Hudson Bay, most of James Bay and the southwestern part of Davis Strait caused ice melt to slow by a few weeks compared to normal. During the first half of July, a southeasterly circulation over the southwestern Hudson Bay area caused ice to drift into the shipping route to Churchill. Hence, some ice was still present in the area where normally ice would have melted. At the same time, the ice along southeastern Baffin Island persisted beyond the normal timeframe. Ice was still present until late August where normally the ice would be gone by early August. Conversely, some areas experienced earlier than normal clearing. One area in particular was the southwestern Foxe Basin, just northeast of Southampton Island, where ice cleared out during the first half of August. The normal clearing of the area would occur around mid-September.

Essentially, all the ice melted out of the Hudson Bay region around mid-September, leaving behind open water, ice free or bergy water conditions. The last region with lingering ice was the southeastern part of Foxe Basin.

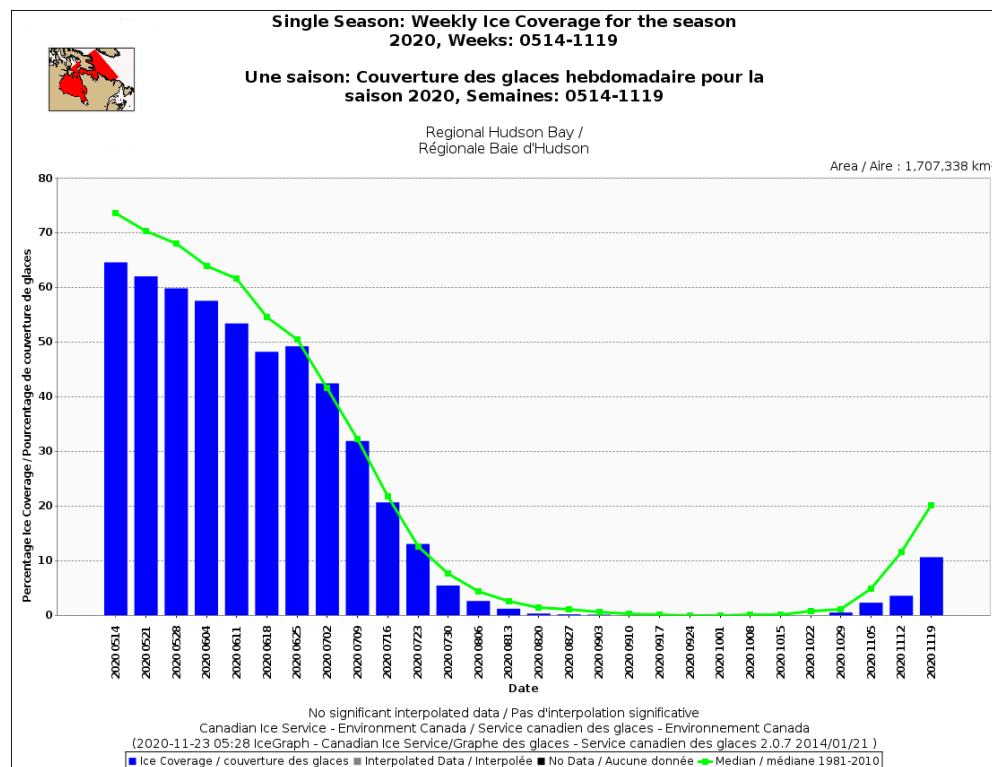


Figure 4: Weekly ice coverage for the Hudson Bay area for the 2020 season

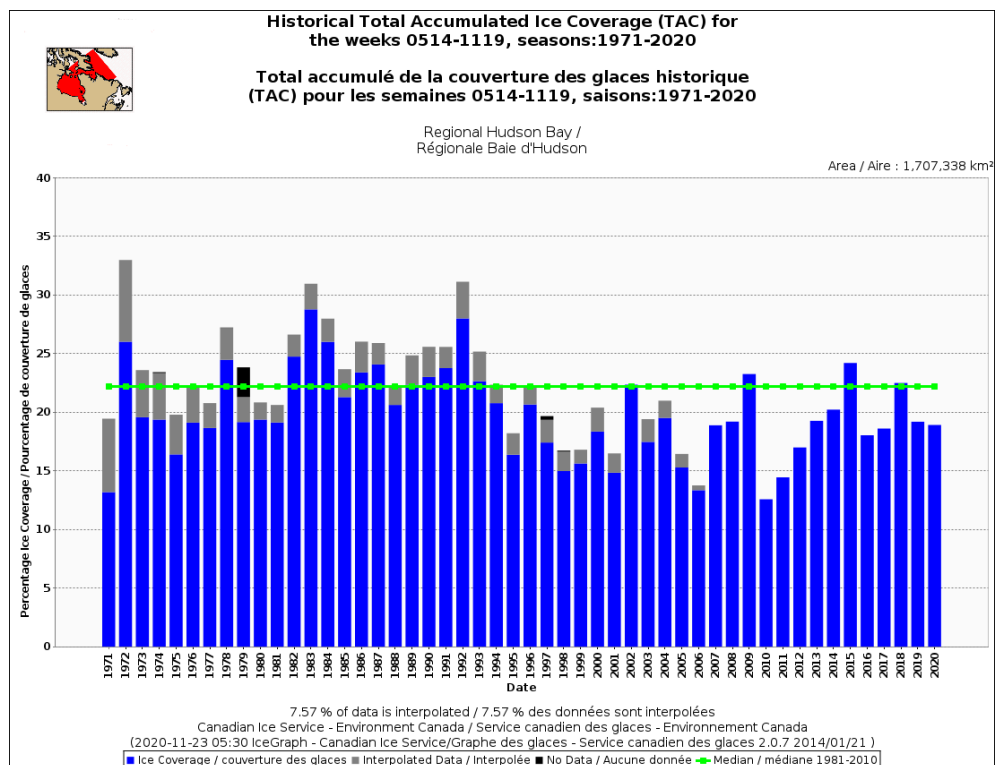


Figure 5: Historical Total Accumulated Ice Coverage for the Hudson Bay area

June Ice Conditions:

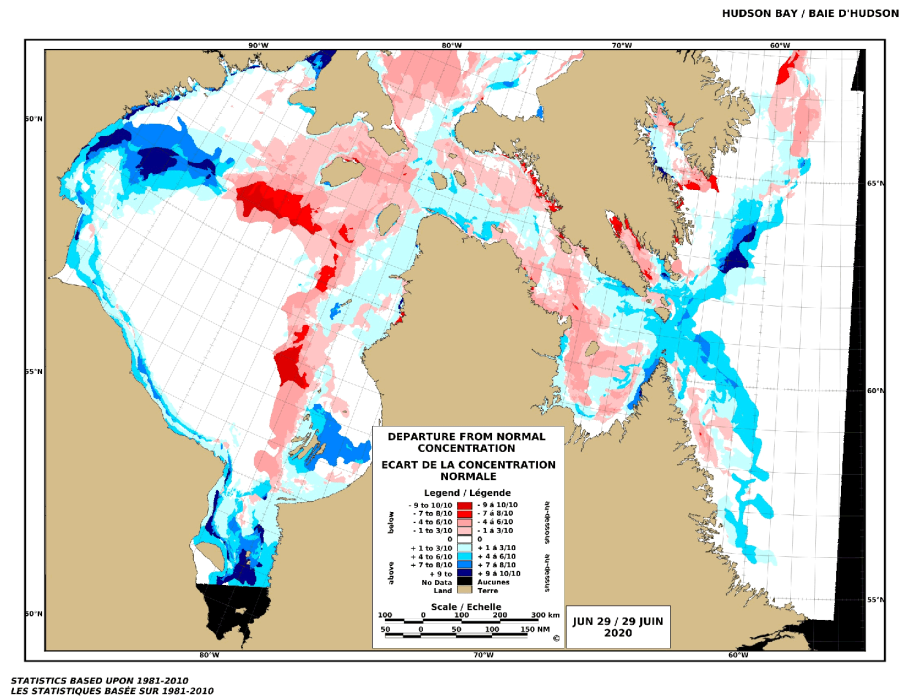


Figure 6: Departure from normal ice concentration for the Hudson Bay area on June 29th, 2020

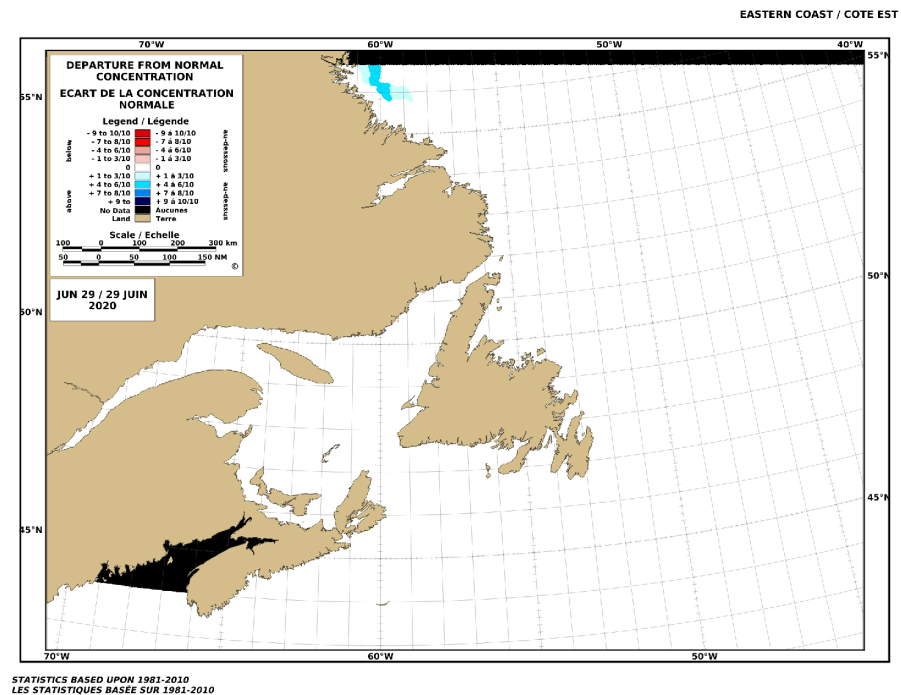


Figure 7: Departure from normal ice concentration for the east coast on June 29th, 2020

At the beginning of June, close to very close pack medium and thick first-year ice with a trace of old ice was generally within 45 to 120 nautical miles of the Labrador coast, north of Groswater Bay. Some patches of open drift to close pack medium and thick first-year ice with a trace of old ice was still present in some of the bays just south of Groswater Bay. Consolidated medium first-year ice remained intact along the coast. By mid-month, a significant amount of melt occurred with open drift to very close pack ice conditions within about 60 nautical miles of the coast with bergy water areas closer to the coast in the southern area. Almost all of the consolidated ice had also fractured by this time. By the end of the month, the southern edge of the pack ice moved north and was located about 90 nautical miles southeast of Nain. Further north along the Labrador coast, a mix of bergy water with very open drift to close pack conditions prevail within about 90 nautical miles of the coast. Ice melt in the northern part of the Labrador coast was slightly later than normal for the entire month of June due to slightly cooler than normal temperatures.

In Lake Melville, open drift to very close pack 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 close to very close pack medium and thick first-year ice including a trace of old ice was located within 90 to 120 nautical miles of the southeastern coast of Baffin Island in the Davis Strait area. A narrow pack of two tenths old ice was located along the eastern coast of the Cumberland Peninsula. Abnormal easterly to southeasterly winds combined with milder than normal temperatures caused the pack ice to become more compact and reduced the extent to within 60 to 90 nautical miles of the Baffin Island coast by mid-June. A general decrease in wind speed during second half of June permitted the pack ice to expand slightly in extent and decrease the overall ice concentration. Meanwhile, the area of two tenths old ice continued to spread slightly eastward, all the way down to the entrance to Cumberland Sound. Temperatures were slightly below normal thereby slowing the ice melt to the point where it was about 10 days to two week later than normal over Davis Strait at the end of June.

Bergy water with large areas of close pack thick first-year ice covered most of Cumberland Sound at the beginning of the month. Consolidated thick first-year ice was present along the coast. The consolidated 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. Elsewhere, ice concentrations remained high with up to two tenths old ice, which had crept in from Davis Strait into the southeastern section of the sound. By the end of the month, some of the consolidated ice was still intact. The bergy water area was still present in the northwestern section however; very open drift ice covered the rest of the sound with very close pack ice, which blocked the southeastern entrance. Overall, the sound had slightly greater than normal ice concentration due to slightly below normal temperatures over the region.

At the beginning of June, most of Frobisher Bay was bergy water with consolidated thick first-year ice in the extreme northern part of Frobisher Bay as well as along the coast. The eastern entrance to the bay had mostly very close pack medium and thick first-year ice with a trace of old ice. No significant changes occurred during the first part of June. During the second half of

June, the consolidated ice along the coast fractured and caused some areas of very open drift ice near the coast. The entrance to the bay continued to experience high ice concentrations of ice with a trace of old ice. Frobisher Bay had less than normal ice concentration at the end of June. The early clearing and lack of southeasterly winds kept conditions generally bergy water for most of the month of June.

The northern part of Hudson Strait had mostly bergy water with some areas of very open drift thick first-year ice at the beginning of June. In the meantime, the eastern entrance to Hudson Strait was composed of open drift to very close pack thick first-year ice including a trace of old ice. In addition, the southern part of the strait had very close pack thick first-year ice. Persistent northerly winds caused the pack ice to compress along the southern shore of Hudson Strait while the eastern section experienced open drift to close pack thick first-year ice with a trace of old ice originating from southern Davis Strait and northwestern Labrador Sea. Elsewhere, bergy water prevailed. By the end of the month, weak winds from the southeast caused the pack ice to expand northward although with concentrations ranging from very open drift to close pack ice with some patches of very close pack. The trace of old ice also drifted further west. Only the northern part of the strait had bergy water conditions. Some signs of consolidated ice fractured along the southern coast of Baffin Island.

Ungava Bay started the month of June with very close pack medium and thick first-year ice in the southeastern section while the northwestern part had very open drift to close pack medium and thick first-year ice. By mid-June, a wedge of very close pack ice was still present in the southeastern section while open drift to close pack ice covered the northwest. At this time, a trace of old ice started to edge into the extreme northern part of the bay. By the end of the month, bergy water areas started to emerge in the southern section and east of Akpatok Island. Elsewhere, generally very open drift thick first-year ice with bands of close pack medium and thick first-year ice. At the end of June, the trace of old ice still lingered in the extreme northern section of the bay. Both Hudson Strait and Ungava Bay had a mixture of greater than normal to less than normal ice concentration at the end of June (see Figure 6: Departure from normal ice concentration for the Hudson Bay area on June 29th, 2020.)

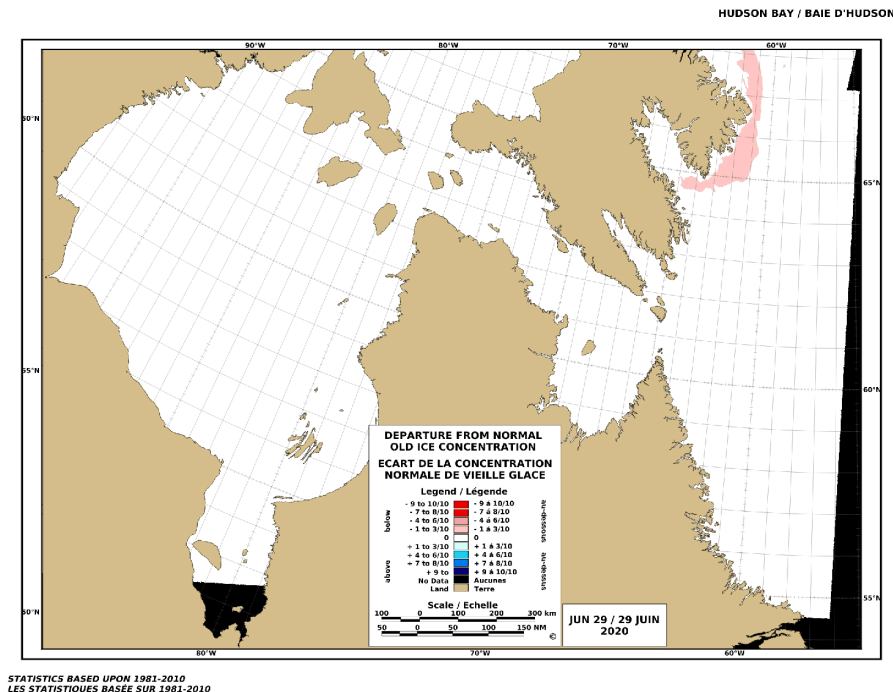


Figure 8: Departure from normal old ice concentration for Hudson Bay on June 29th, 2020

As has been the trend in recent years, the northwestern part of Hudson Bay had already started to clear to open water by the beginning of June. To the southeast of the open water area was a band of very open drift to close pack medium and thick first-year ice. Elsewhere in the bay, very close pack medium and thick first-year ice. By mid-June, the open water areas was still present in the northern part of the bay while signs of open water began to emerge along the southeastern coast of Hudson Bay as well as parts of the southern and eastern shore of James Bay. Elsewhere, very close pack medium and thick first-year ice prevailed with only a few narrow bands of open drift to close pack medium and thick first-year ice along the shore. Signs of fracture of the consolidated ice along the coast began after mid-June. At the end of the month, the open water areas remain more or less the same since mid-June. The ice along the eastern shore of Hudson Bay continued to deteriorate with a mix of open water and areas of very open drift to close pack medium and thick first-year ice. The open water in southern James Bay continued to expand northwards. Elsewhere, very close pack ice prevailed with signs of lower concentrations along the edge and near the shore.

July Ice Conditions:

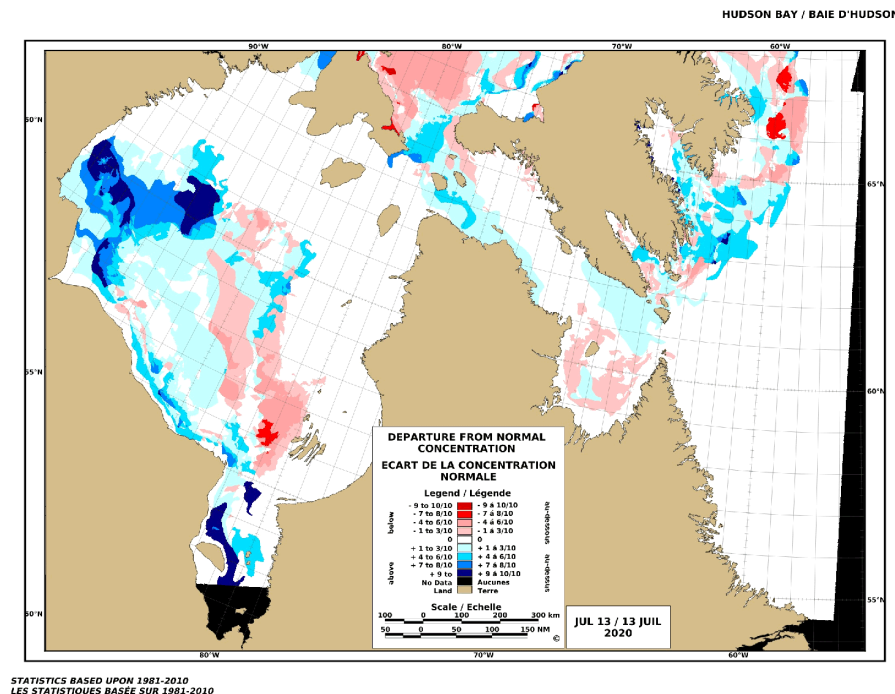


Figure 9: Departure from normal ice concentration for the Hudson Bay area near mid-July 2020

By the end of the first week of July, most of the open drift to close pack rotten thick first-year ice was located just offshore and north of Nain. By mid-month, all the ice had melted. Bergy water prevailed from north to south with ice free conditions in Lake Melville. Ice melt along the northern part of the Labrador Coast was up to one week later than normal due to slightly cooler 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 including a trace of old ice located within 75 nautical miles of the southeastern coast of Baffin Island. Areas of very close pack thick first-year ice including a trace of old ice was present along the east coasts of Cumberland and Hall Peninsulas. The decline in ice extent accelerated during the second half of the month as southeasterly winds persisted during the period. In addition, near to slightly above normal temperatures covered most of the area. Since the middle of July, no ice has drifted towards the entrance to Hudson Strait. By the end of the month, most of the open drift to close pack thick first-year ice including a trace of old ice was within 45 nautical miles of the coast with a few patches just beyond the pack ice edge. A few patches of very close pack thick first-year ice lingered along parts of the eastern coast of Cumberland Peninsula as well as near Hall Peninsula, just east of the entrance to Frobisher Bay. North of Cape Dyer, the rotten very open to close pack thick first-year ice including a trace of old ice was within 60 nautical miles of the coast. The northern portion of Davis Strait had less than normal ice concentration while the south had greater than normal ice. Southeasterly winds over the southern section of Davis Strait maintained higher than normal ice concentration, especially during the latter part of July.

The consolidated thick first-year ice along parts of the coast of Cumberland Sound had fractured during the first half of July. The northwestern part of the sound had generally bergy water with very open drift to close pack first-year ice had covered the remainder. During the first half of July, higher than normal ice concentration prevailed in southeastern Cumberland Sound as well as along parts of the coast in the northwestern section. However, during the second half, persistent southeasterly winds caused the ice to linger longer than normal in the southeastern part of the sound despite milder than normal air temperatures. By the end of July, mainly bergy water prevailed in the northwestern section with open to very open drift rotten thick first-year ice with up to one tenth old ice in the southeastern section.

Almost all of the consolidated thick first-year ice along parts of the coast and in the extreme northwestern section of Frobisher Bay had fractured during the first week of July. The rest of the northwestern section of the bay was bergy water while the southeast had open drift to close pack rotten thick first-year ice including a trace of old ice. By mid-month, all of the northwest was bergy water with the remainder of the bay covered with open to very open drift rotten thick first-year ice including a trace of old ice. During the second half, the remaining ice melted however, ice from the southwestern part of Davis Strait drifted into the southeastern part of the bay. By the end of July, mainly bergy water prevailed other than some patches of very open drift rotten thick first-year ice including a trace of old ice near the entrance to the bay. Normally the entire bay would be mainly bergy water by mid-July.

Moderate deterioration of the ice in Hudson Strait as well as Ungava Bay during the first two weeks of July left the northeastern section of the Hudson Strait with open to very open drift rotten thick first-year ice including a trace of old ice. The western section of Hudson Strait and along the northern coast of the Nunavik area of Quebec had very open drift rotten thick first-year ice with patches of close pack ice at mid-month. Ungava Bay had only a few patches of very open drift first-year ice in the southwestern section of the bay. Before the end of the third week, the ice in Ungava Bay as well as the northeastern area of Hudson Strait had melted entirely. By the end of July, only the area just southeast of Foxe Channel had an area of very open drift rotten thick first-year ice. Elsewhere, bergy water. Ice melt was about one week earlier than normal over Ungava Bay and most of Hudson Strait however, the extreme western portion of the strait continued to lag in terms of melt by about one week.

The northern and eastern Hudson Bay areas as well as the southern part of James Bay had large areas of open water developed during the first half of July. By mid-month, open water conditions prevailed in the northern and eastern parts of Hudson Bay and the entire coastal area of James Bay. The consolidated thick first-year ice along the coast fractured during this period. Mostly close to very close pack rotten thick first-year ice with open to very open drift ice along the edge of the main pack in the southwestern part of Hudson Bay and the northwestern part of James Bay. The last of the ice in James Bay melted during the final few days of the month. By the end of July, only the southwestern part of Hudson Bay had ice. A large patch of open drift to very close pack ice was present just north of Churchill. Elsewhere, mainly open water to ice free conditions prevailed. At times during the month of July, ice melt was slightly later than normal (about one week) especially in the southwestern section however, by the end of the month conditions were near normal despite some significant areas of ice remaining.

August Ice Conditions:

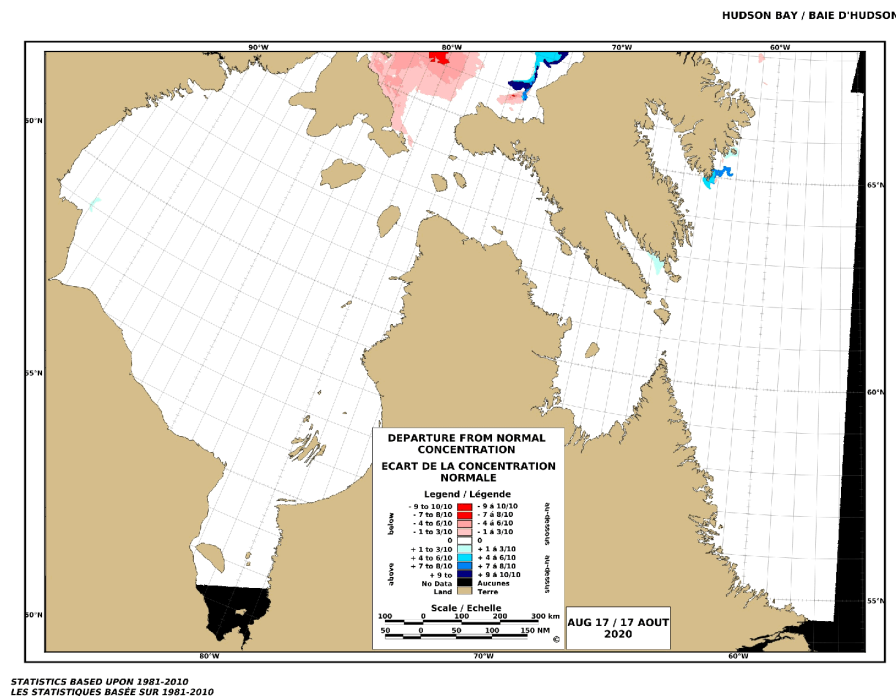


Figure 10: Departure from normal ice concentration for the Hudson Bay area near mid-August 2020

Continued ice melt during the first part of August left only a few small patches of open drift to very close pack rotten thick first-year ice including a trace of old ice along parts of eastern coast of the Cumberland Peninsula and southeastern tip of the Hall Peninsula by mid-month. Soon after the middle of August, the ice near the Hall Peninsula had drifted into Frobisher Bay. By the end of the third week, only a very small patch of open to very open drift rotten first-year ice including a trace of old ice near the southeastern tip of the Cumberland Peninsula. The last of the ice finally melted during the final days of August leaving bergy water everywhere in Davis Strait. Overall, ice melt was about one week earlier than normal.

The remaining ice in southeastern Cumberland Sound continued to melt in the early days of August. By the end of the first week, mostly bergy water covered the sound except open drift rotten thick first-year ice with a trace of old ice. By the middle of August, all of the ice had melted. Essentially, ice melt in the sound was near to slightly earlier than normal.

Occasional patches of rotten thick first-year ice drifted into the entrance to Frobisher Bay during the first half of the month, however soon after, a patch of ice had drifted into the middle section of the bay due to southeasterly winds. Finally, before the end of the third week, all the ice had melted giving way to bergy water. The presence of ice in Frobisher Bay during parts of the month represented a delay of about two to three weeks later than normal in terms of clearing.

The last bits of rotten thick first-year ice in the extreme western part of Hudson Strait, just southeast of Foxe Channel, melted during the first few days of August. This was when we would normally expect the ice to melt based on the CIS ice climatology.

The ice in southwestern Hudson Bay continued to decrease in extent during the first part of August so that by mid-month only a few small patches of rotten thick first-year ice remained just north of Fort Severn as well as northeast of Churchill. Eventually all the ice melted during the third week. Generally open water to ice free conditions prevailed in the bay for the rest of the month. These last patches of ice should have been gone by the end of the first week of August hence this represented a later than normal ice melt over this particular area of the bay of about 10 days to two weeks.

September Ice Conditions:

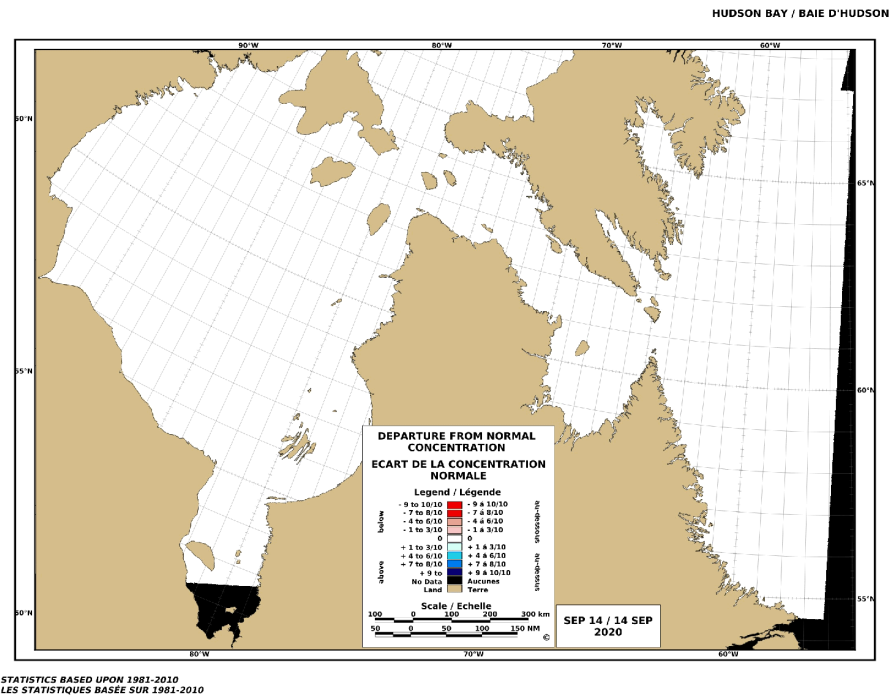


Figure 11: Departure from normal ice concentration for the Hudson Bay area near mid-September 2020

Generally bergy water to ice free conditions prevailed for the month of September over the Hudson Bay, Davis Strait and Labrador Coast region.

Eastern Arctic and Canadian Archipelago

Summer Ice Conditions and Fall Freeze-up

Summer Temperatures: June to September

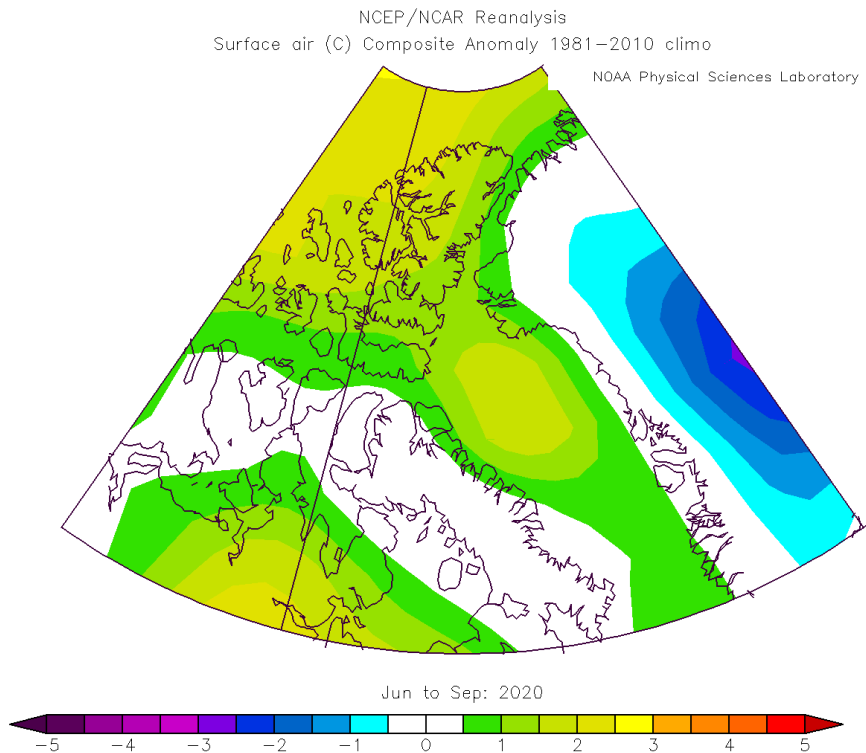


Figure 12: Air temperature anomaly for the Eastern Arctic area from June to September 2020

From June to September, surface air temperatures were above normal over most locations. Baffin Island, northeast Foxe Basin and the Prince Regent Inlet area had temperature that were near normal.

Summary of Ice Conditions:

At the beginning of June, and similar to other years, an area of bergy water had already emerged in parts of the extreme northern Baffin Bay area, just south of Smith Sound. The area adjacent to the bergy water had looser ice conditions. At the same time, the eastern side of the bay, along the western coast of Greenland to 75°N, also had bergy water conditions. Normally, these areas of bergy water would not be as extensive as seen this year at the beginning of June. The rest of the bay had medium and thick first-year ice. A band of a trace of old ice ran up the middle of the bay at that time. During the first half of the melt season, the ice in Baffin Bay continued to melt at a faster than normal rate. For the most part, ice melt in Baffin Bay was about two to three weeks earlier than normal. Yet, there were areas where higher than normal ice concentrations existed along the eastern Baffin Island coast from Home Bay south to the Cumberland Peninsula. Eventually the ice did melt but was about one week later than normal.

Lancaster Sound and Barrow Strait also had less than normal ice concentrations over the same period. Jones Sound fractured earlier than normal and remained about three weeks earlier than normal in terms of ice melt. 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 to two weeks ahead of normal until mid-August. In fact, ice melted out completely in the Gulf of Boothia region, which seems to occur about 40% of the time since 2006.

Overall, the Eastern Arctic did not establish a new record for minimum ice coverage this year however, it came in as the 3rd lowest. Last year (2019) had established the record. For the most part, the early onset of melt in northern and eastern Baffin set the melt season down this path.

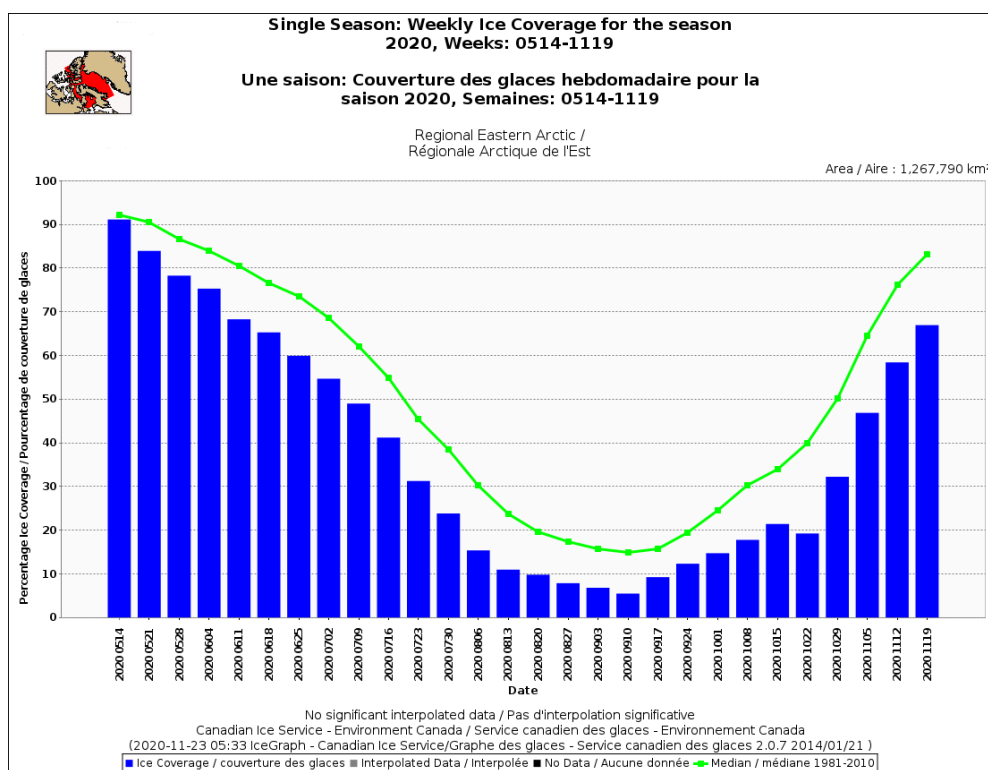


Figure 13: Weekly ice coverage for the Eastern Arctic area for the 2020 season

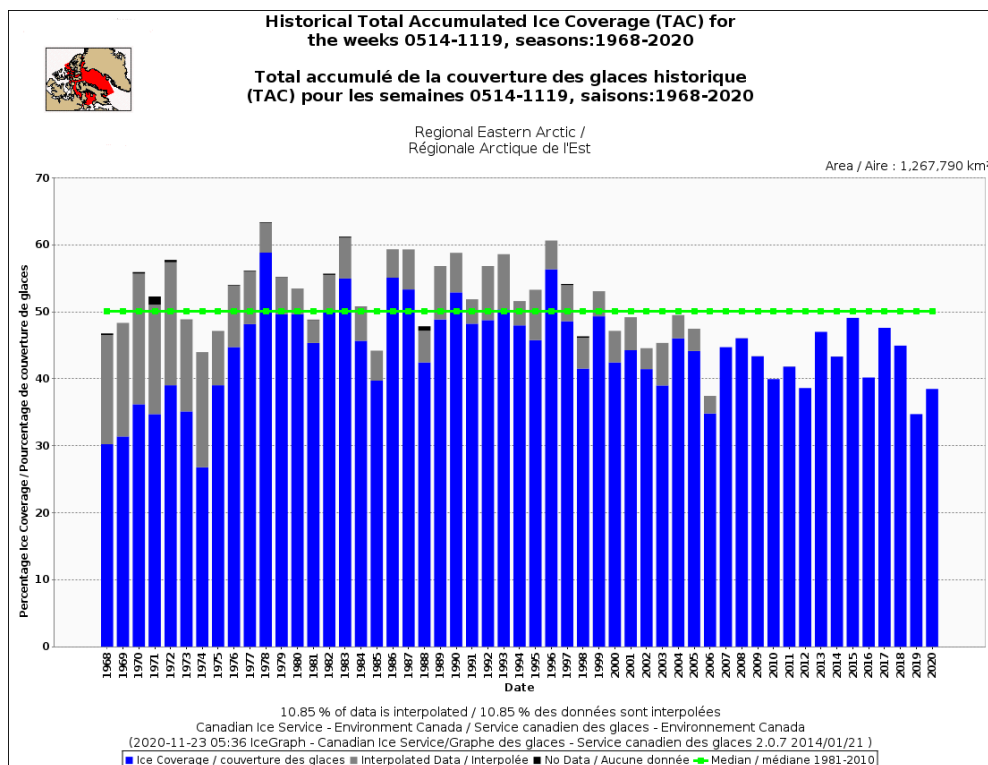


Figure 14: Historical Total Accumulated Ice Coverage for Eastern Arctic area (1968-2020)

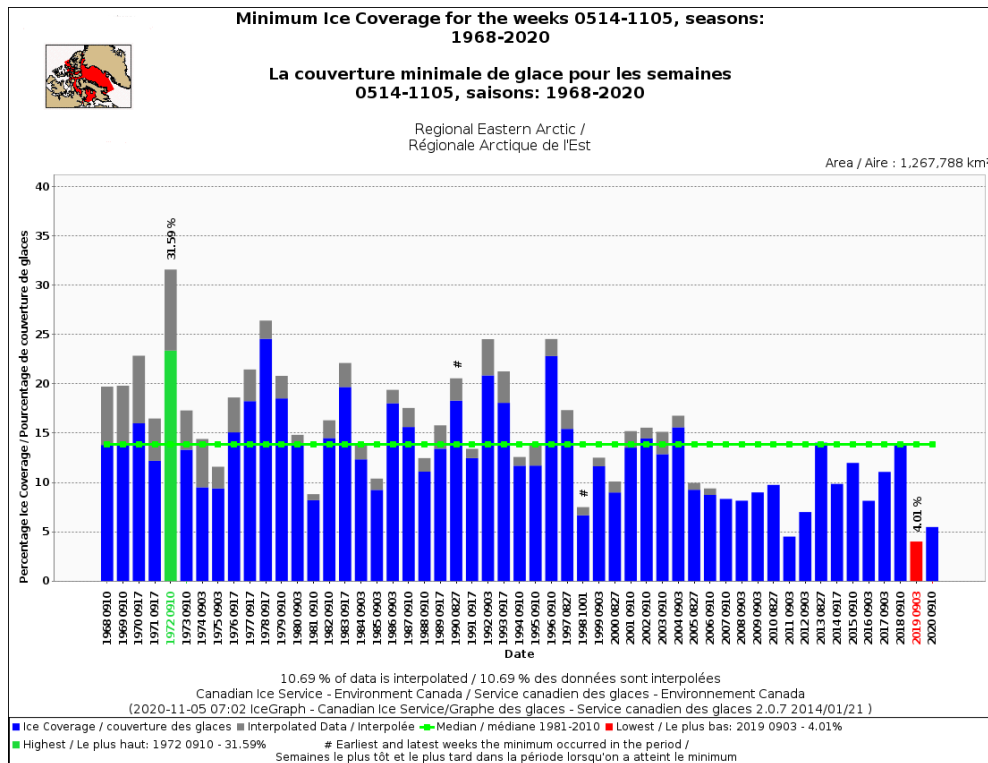


Figure 15: Minimum Ice Coverage for Eastern Arctic area (1968-2020)

June Ice Conditions:

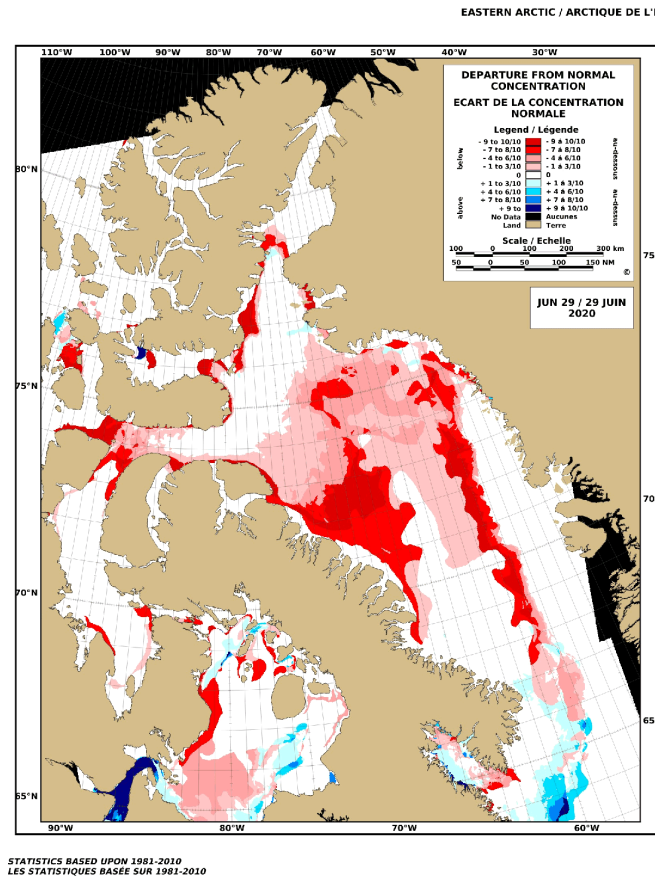


Figure 16: Departure from normal ice concentration for the Eastern Arctic area on June 29th, 2020

At the beginning of June, and similar to other years, an area of bergy water had already emerged in parts of the northern Baffin Bay area. At the same time, the eastern side of the bay, along the western coast of Greenland to 75°N, also had bergy water conditions. Normally, these areas of bergy water would not be as extensive as was witnessed at the beginning of June. The rest of the bay had medium and thick first-year ice. A band of a trace of old ice ran up the middle of the bay at that time. During the first half of the month, the eastern ice edge remained more or less unchanged. However, the bergy water area in the northwestern part of the bay continued to expand southwards and reached just southeast of the entrance to Pond Inlet. Meanwhile, the ice concentration in the north-central part of the bay became looser, running between open drift to close pack medium and thick first-year ice with a trace of old ice. The eastern ice edge during the second half of June began to move westward and was located west of 60°W at the end of the month. The bergy water in the northwestern section continued its march southwards. At the end of the month, the ice edge was east of 65°W and south of about 72°N with only a few patches of medium and thick first-year ice to the northwest. Ice concentrations also loosened over most of the area except in the southern section of Baffin Bay. In the northern part of the ice pack, open drift to close pack medium and thick first-year ice with a band of very open drift. Normally we do not see these low ice concentrations across the northern part of the bay until mid-July.

With the formation of the ice bridge across the southern part of Kane Basin during the winter, the influx of old ice from the Lincoln Sea was cut off. Hence, the overall old ice concentration in Baffin Bay was near normal. The ice bridge remain intact until the last week of June. The consolidated ice in Kane Basin and Kennedy Channel fractured entirely on the last day of the month.

Eastern and south-central Lancaster Sound had open to very open drift medium and thick first-year ice at the beginning of June. The rest of Lancaster Sound was bergy water. No old ice was present in the sound as the consolidated ice had formed in western Barrow Strait back in January and permitted the old ice to drift eastwards and out of the sound before June. By mid-month, most of the sound had bergy water except for some patches of very open drift thick first-year ice. This continued until the end of June.

The consolidated medium and thick first-year ice with up to one tenth old ice in Barrow Strait started to fracture in the eastern section during the third week of June. No more fracturing occurred during the last week of the month.

No significant changes to the consolidated ice in Navy Board Inlet, Pont Inlet and Admiralty Inlet happened in June except for a very small part of the extreme northern part of Admiralty Inlet, which fractured during the last few days of the month.

At the beginning of June, consolidated thick first-year ice covered the central and southwestern part of Prince Regent Inlet. The southeastern part of the inlet had very close pack thick first-year ice while the northern section was bergy water with some very close pack medium and thick first-year ice. By mid-month, the southwestern part of the consolidated ice had fractured with the southern section covered with very close pack thick first-year ice. Meanwhile, the northern part had bergy water with areas of very open drift thick first-year ice. The last of the consolidated ice fractured during the third week so that by the end of the month most of inlet had very close pack thick first-year ice except for the extreme northern section where bergy water with some areas of very open drift thick first-year ice prevailed.

No significant changes occurred in the Gulf of Boothia region during the month of June. Mainly very close pack thick first-year ice covered the area except for consolidated thick first-year ice along the coast.

Fury and Hecla Strait remained consolidated with thick first-year ice during the entire month except for some very small areas of mobile ice mostly in the southeastern section, which emerged during the last week of June.

Very close pack thick first-year ice covered most of Foxe Basin except the northwestern section where an area of open water had developed already at the beginning of June. Loosening of the ice was already underway in the southern part of the basin during the first half of the month. This was somewhat unusual, as looser ice would not develop until the second half of the month. By the end of June, open to very open drift thick first-year ice covered a significant part of the southern Foxe Basin area. Normally this region would remain close to very close pack ice, particularly the area to the northeast of Southampton Island, until the end of July. As for the

northeastern section of the basin, the open water area had increased slightly while the rest was very close pack thick first-year ice.

Consolidated thick first-year ice with a trace of old ice covered most of Jones Sound except the extreme northwestern section including Cardigan Strait and Hell Gate where bergy water prevailed at the start of June. By the end of the month some of the consolidated ice in the northwestern section had fractured thereby left a mix of bergy water with areas of very close pack thick first year ice including a trace of old ice.

No change occurred in Norwegian Bay as well as Eureka Sound, which remained covered with consolidated thick first-year ice with up to one tenth old ice.

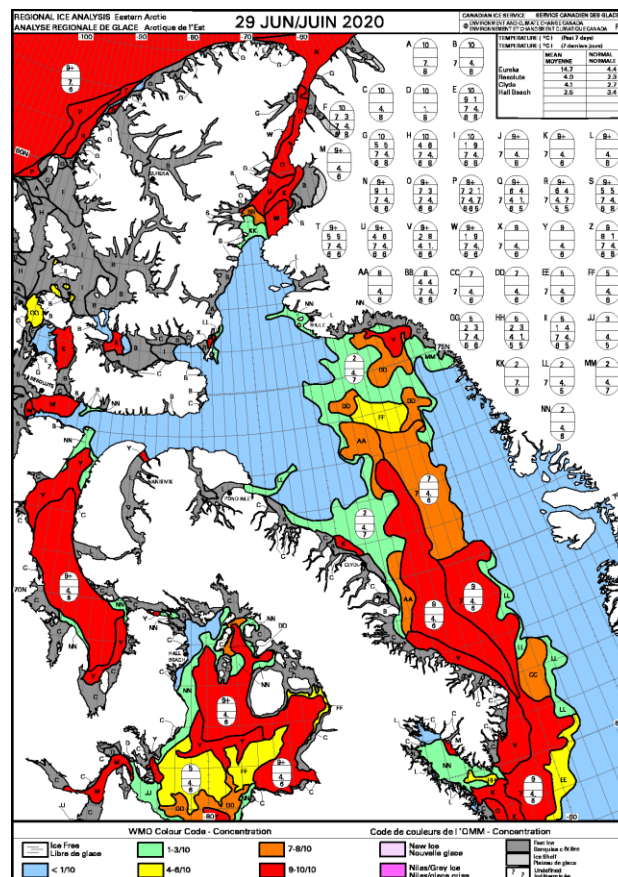


Figure 17: Eastern Regional ice chart for June 29th 2020

July Ice Conditions:

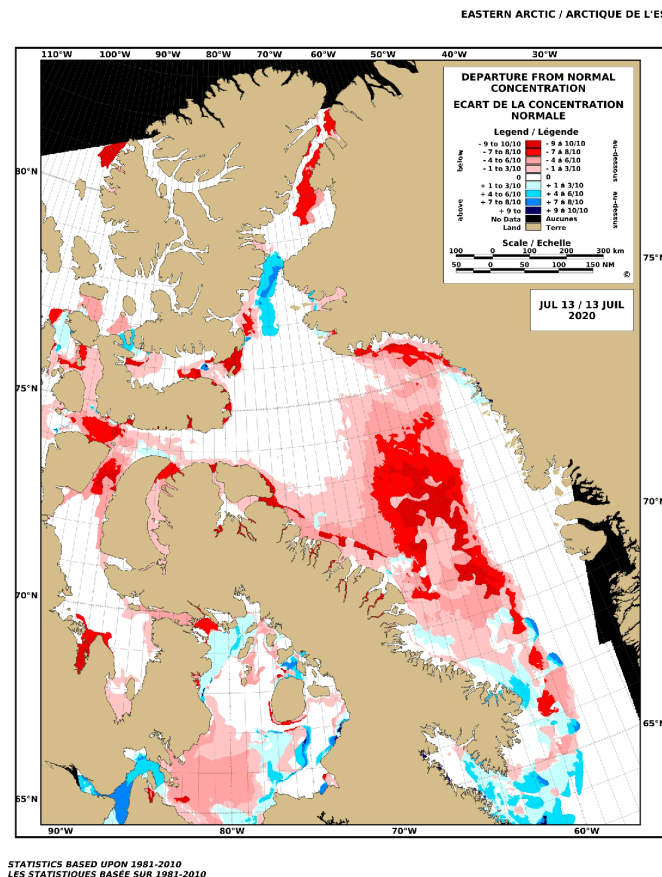


Figure 18: Departure from normal ice concentration for the Eastern Arctic area near mid-July 2020

During the first week of July, a bergy water route in the northern part of Baffin Bay became established. Further south, in the central part of Baffin Bay, it was covered with open drift to close pack thick first-year ice including a trace of old ice while the southwestern section, near the Baffin Island coast, had very close pack thick first-year ice including a trace of old ice. Due to the broken ice bridge in Kane Basin, some areas of open drift thick first-year and old ice began to drift into the extreme northwestern part of Baffin Bay. At the end of the first week of July, a bergy water route emerged in the northern portion of Baffin Bay. Normally this bergy water route would not develop until the last week of July. By mid-month, a broad area of bergy water in the northern part of Baffin Bay with the exception of Melville Bay along the Greenland coast where close pack to consolidated thick first-year ice prevailed. The southwestern section, along the Baffin Island coast, still had open drift thick first-year ice with a trace of old ice while the fiords contained consolidated thick first-year ice. Meanwhile the south-central part of the bay contained very open drift to close pack thick first-year ice including a trace of old ice. Some patches of open drift thick first-year and old ice drifted southwards from Kane Basin in the extreme northwestern part of Baffin Bay. By the end of July, all of the consolidated ice in the fiords had fractured and melted with only a few patches of very open drift rotten thick first-year ice including

a trace of old ice in the extreme southwestern section, near the Baffin Island coast, remained. The ice situation in Melville Bay area had changed significantly where only very open drift rotten thick first-year ice remained near the coast. Continued incursions of thick first-year and old ice in the extreme northwestern part of Baffin Bay, just south of Smith Sound, at month's end. The ice situation at the end of July was what we would normally expect during the third week of August.

The consolidated thick first-year ice including a trace of old ice in Pond Inlet and Navy Board Inlet began to fracture in the northern entrance to Navy Board during the first week of July. By mid-month, most of the consolidated ice had fractured except to the southern reached of Pond Inlet. A combination of close to very close pack thick first-year ice including a trace of old ice covered the remaining area. The last of the consolidated ice fractured during the third week. By the end of the month, almost all of the ice had melted except for an isolated strip of thick first-year ice and old ice.

The consolidated thick first-year ice in Admiralty Inlet fractured before the middle of July. Ice melted during the second half of the month leaving bergy water conditions at the end of July.

Occasional bands of very open drift thick first-year ice including a trace of old ice invaded the southwestern section of Lancaster Sound during the first half of July but soon into the third week, all the ice had melted. Bergy water conditions prevailed until the end of July.

Meanwhile, the eastern end of Barrow Strait had an area of bergy water in the northern reaches while a large area of very close pack thick first-year ice covered the south at the end of the first week of July. In the western Barrow Strait area, the consolidated thick first-year ice including a trace of old ice remained intact. By mid-July, Barrow Strait east had very open drift thick first-year ice with a trace of old ice while most of the consolidated ice in the west had fractured except for most of the northwestern section where it endured. The last of the consolidated ice finally fractured during the third week. By the end of the month, mostly bergy water with a few bands of thick first-year ice including a trace of old ice was present in the eastern Barrow Strait area while the western half had a mix of open drift to very close pack thick first-year ice including up to two tenths old ice.

In Prince Regent Inlet, a gradual clearing began soon after mid-July so that by the end of July, bergy water prevailed in the northern section. In the south, generally very open drift with a large area of very close pack thick first-year ice covered the southeastern section.

In the Gulf of Boothia area, the consolidated thick first-year ice along the coast, in parts of Pelly Bay as well as the southern part of Committee Bay began to fracture during the first week of July. The rest of the gulf had very close pack thick first-year ice. General deterioration of the pack ice was well underway as the remainder of the consolidated ice continued during the second and third week of the month. By the end of the third week, Pelly Bay had mainly open water conditions. At the end of July, generally close to very close pack thick first-year ice covered most of the Gulf of Boothia area. However bergy water areas developed along parts of the coast.

With the swift current combined with milder temperatures, the consolidated thick first-year ice in Fury and Hecla Strait began to fracture during the first week of July. The higher concentration of ice cleared during the month however, occasional areas of open drift thick first-year ice drifted in from northeastern Committee Bay.

In Foxe Basin, the early signs of ice melt in southwestern section, northeast of Southampton Island, continued in early July. By the end of month, large areas of open water stretched from just northeast of Southampton Island towards Prince Charles Island and in the northwestern section of the basin into Fury and Hecla Strait. Very close pack thick first-year ice covered the central part of the basin as well as the coastal area along the southeastern coast while looser ice conditions prevailed in proximity to the areas of higher concentration

In Jones Sound, some early signs of break up of the consolidated thick first-year ice including up to one tenth old ice began to show during the first half of July. Soon after mid-July, the remaining consolidated ice fractured. By the end of the month, some patches of very open drift thick first-year ice including a trace of old ice remained along parts of the northern coast as well as the southwestern section of the sound. A few patches of very open drift old and thick first-year ice drifted into the extreme northwestern section. Otherwise, bergy water conditions covered a good portion of the sound.

Consolidated thick first-year ice including up to one tenth old ice in Norwegian Bay began to fracture in the southern section. No significant changes to fracture activity during the next two weeks however the last week had the southern part of the bay fracture entirely while the north remained mostly intact.

Meanwhile, the consolidated thick first-year ice including trace of old ice in Eureka Sound started to fracture in the northern section in the first few days of July. By mid-month, the northern two-thirds of the sound had fractured with some bergy water area emerging at the time. The last of the consolidated ice in the extreme southern section fractured during the last few days of the month. Vast stretches of the sound had bergy water with some isolated patches of very open drift rotten thick first-year ice including a trace of old ice floating through.

By the end of July, ice melt was the 5th lowest for the entire Eastern Arctic. The majority of the greater than normal ice melt was located in Baffin Bay, southwestern Foxe Basin, most of Prince Regent Inlet, Jones Sound, Eureka Sound, Nansen Sound, Greely Fiord and Kane Basin. However, there were a few areas where greater than normal ice concentrations were observed at the end of the month. The coastal area of eastern Baffin Island from Clyde River to the entrance to Cumberland Sound had more ice than normal. The eastern portion as well as the northwestern portion of Foxe Basin as well as the area from southern Kane Basin southwards to just north of the entrance to Jones Sound also had greater than normal ice concentrations.

August Ice Conditions:

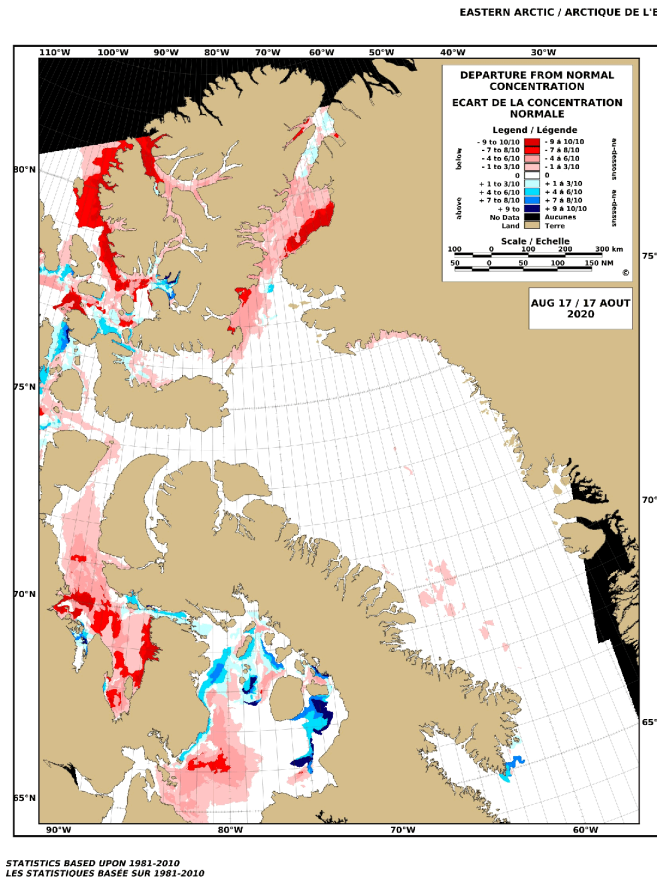


Figure 19: Departure from normal ice concentration for the Eastern Arctic area near mid-August 2020.

The ice along the Baffin Island coast, north of Cape Dyer, melted by mid-August. The last of the very open drift to close pack thick first-year ice including a trace of old ice remained along the eastern coast of the Cumberland Peninsula during the second half of August but finally melted on the last day of the month.

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

Lancaster Sound remained bergy water for the vast majority of August however during the last five days of the month, very open drift thick first-year and old ice drifted into the extreme southwestern portion of the sound from eastern Barrow Strait.

In the eastern section of Barrow Strait, bands of very open drift to close pack thick first-year ice with up to one tenth old ice mostly along the northern coast of Somerset Island while the rest was bergy water during the first half of August. The western section of Barrow Strait had open drift to very close pack thick first-year ice with up to one tenth old ice. During the second half of the month, very open drift to close pack thick first-year ice with up to one tenth old ice prevailed along the northern coast of Somerset Island while the rest was still mostly bergy water.

The ice in Prince Regent Inlet continued to decrease in concentration so that by mid-August, mainly very open drift thick first-year ice remained in the southeastern section while the rest of the inlet had mostly bergy water. Meanwhile some patches of very open drift thick first-year and old ice started drifting from southeastern Barrow Strait into the extreme northwestern corner of the inlet. During the third week of August, all ice had melted. Bergy water condition prevailed until the last few days of August where some open to very open drift thick first-year with up to one tenth old ice drifted into the extreme northwestern section 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 however occasional patches of close pack thick first-year ice drifted into the northern reaches of the bay. Elsewhere, bergy water covered the northwestern part of the gulf while open drift to very close pack thick first-year ice covered the rest of the area. The ice continued to deteriorate in the second half of August so that by the end of the month, the northern and most of the central part of the gulf as well as the southern part of Committee Bay was bergy water. Very open drift to close pack thick first-year ice covered the east-central part of the Gulf of Boothia as well as around the Simpson Peninsula. Some of that ice made its way into the extreme northern part of Pelly Bay.

The thick first-year ice including a trace of old ice along the coast in Jones Sound melted during the first week of August. However, incursions of open to very open drift thick first-year ice including up to one tenth old ice drifted into the western part of Jones Sound from Cardigan Strait and Hell Gate. By the end of August, open to very open drift thick first-year ice including one tenth old ice remained in the western part of Jones Sound with the rest being bergy water.

During the first few days of August, the consolidated thick first-year ice including up to one-tenth old ice in northern Norwegian Bay finally fractured. By mid-month an area of bergy water developed in the northwestern part of bay while the southern and the east-central part of the bay was covered with very close pack thick first-year ice including a trace of old ice. A general decrease in concentration continued during the second half of the month so that by the end of August, most of the bay had open to very open drift thick first-year ice as southerly winds pushed some ice into the northwestern section.

Some transient patches of open drift thick first-year ice including one tenth old ice drifted south through Eureka Sound during the first three weeks of August and became mainly bergy water during the last week.

As has been seen during most of the summer melt season, large areas of less than normal median ice concentration continued during the month of August for the Eastern Arctic region. Slightly less than normal median ice concentration was present in southwestern Foxe Basin. In the Gulf of Boothia including Committee Bay, less than normal ice concentration predominated. All of Smith Sound down to Kane Basin and extreme northwestern Baffin Bay also had a lack of ice compared to climatology. Lastly, areas around Ellesmere Island also had mostly a deficit of ice compared to normal.

September Ice Conditions:

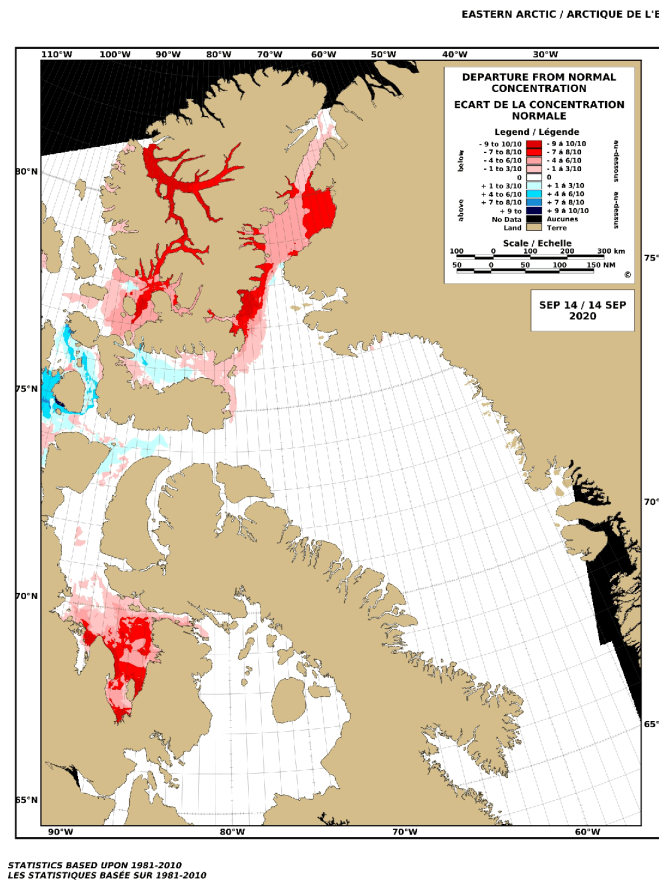


Figure 20: Departure from normal ice concentration for the Eastern Arctic area near mid-September 2020

Bergy water prevailed over most of Baffin Bay during the first three weeks of September. Some new ice began to form in Melville Bay along the Greenland coast as well as the extreme northwestern part of the bay during the last week of the month.

The Navy Board and Pond Inlets remained bergy water for almost the entire month of September. However, in the last few days saw some small patches of new ice form along parts of the coast while some very open drift old ice entered the northern entrance to Navy Board Inlet.

Admiralty Inlet was bergy water for most of September however, during the last week some very open drift old ice entered the northern part of the Inlet.

During the first half of September, open to very open drift thick first-year and old ice drifted in from Barrow Strait and covered the southwestern part of Lancaster Sound while the rest remained bergy water. Soon after mid-month, new ice started to form around the drifting first-year and old ice while it spread to cover the western section of the sound. By the end of the month, most of the open to very open drift thick first-year and old ice with some new ice was located along the southern section and reached the northern entrance to Navy Board Inlet. The rest of the sound still had bergy water.

Ice conditions at mid-September in eastern Barrow Strait were such that the open to very open drift thick first-year and old ice was located along the Somerset Island coast as well as the western section. The rest was bergy water. As for the western Barrow Strait section, mostly open drift thick first-year and old ice with a few patches very close pack ice, mostly in the western section. Some new ice began to form around the floes near mid-month. By the end of September, open drift to close pack thick first-year and old ice with some new and grey ice around the floes was present in the eastern section. Meanwhile the western part of Barrow Strait, close to very close pack thick first-year and grey ice with up to three tenths old ice.

The northern part of Prince Regent Inlet had incursions of open to very open drift thick first-year and old ice, which originated from southwestern Lancaster Sound during the first half of September. The southern part of the inlet had bergy water. By the end of September, patches of very open drift thick first-year and old ice drifted into the southern part of Prince Regent Inlet while the northern section was mainly open to very open drift thick first-year and old ice with some new ice around the floes. Patches of new ice started to form along the coast.

The southeastern part of the Gulf of Boothia, including northern Committee Bay, had open to very open drift thick first-year ice at the beginning of September. Elsewhere, bergy water prevailed. By mid-month, only a small patch of very open drift thick first-year ice remained in the northern Committee Bay area. All other areas had bergy water. During the third week, the last of the ice melted to bergy water conditions and persisted until the end of the month.

Generally, very open drift thick first-year ice in Fury and Hecla melted away by the end of the first week of September. The balance of the month had bergy water conditions.

The last of the patches of open to very open drift thick first-year ice in northeastern Foxe Basin melted before the end of the second week of September. Ice free conditions prevailed at the end of the month over the entire basin.

Jones Sound continued to have very open drift with occasional patches of close pack thick first-year ice including up to two tenths old ice in the western section during the first week of September. The central and eastern parts were still bergy water. By mid-month, the ice had expanded to cover the western half of the basin. New ice began to form, mostly in the western section, soon after the middle of September. By the end of the month, the western and central sections had open to very open drift old ice with some new ice. A few patches of new ice formed along parts of the coast.

Norwegian Bay began to fill in with very open drift to close pack thick first-year and old ice drifting in from the west during the first half of September. Some new ice formed between the floes. By the end of September, the southwestern section had very close pack thick first-year, old and grey ice while the northeast had very close pack grey and new ice with a trace of old ice.

During the first half of September, Eureka Sound had bergy water. Soon after mid-month, new ice began to form. By the end of September, the entire length of the sound had open drift to close pack grey and new ice.

The past melt season was not record setting for the Eastern Arctic region however; it did have the third lowest since 1968 in terms of minimum ice coverage. Last year was the lowest minimum ice coverage followed by 2012. Due to the significant ice melt, freeze-up this past fall was delayed. By the end of September, ice coverage was already three week later than usual.

Western Arctic

Summer Ice Conditions and Fall Freeze-up

Summer Temperatures: June to September

From June to September, surface air temperatures were near to below normal stretching from the northern Alaskan coast to western Amundsen Gulf as well as eastern Coronation Gulf north to M'Clintock and Peel Sounds. Elsewhere, above normal temperatures prevailed during the same period.

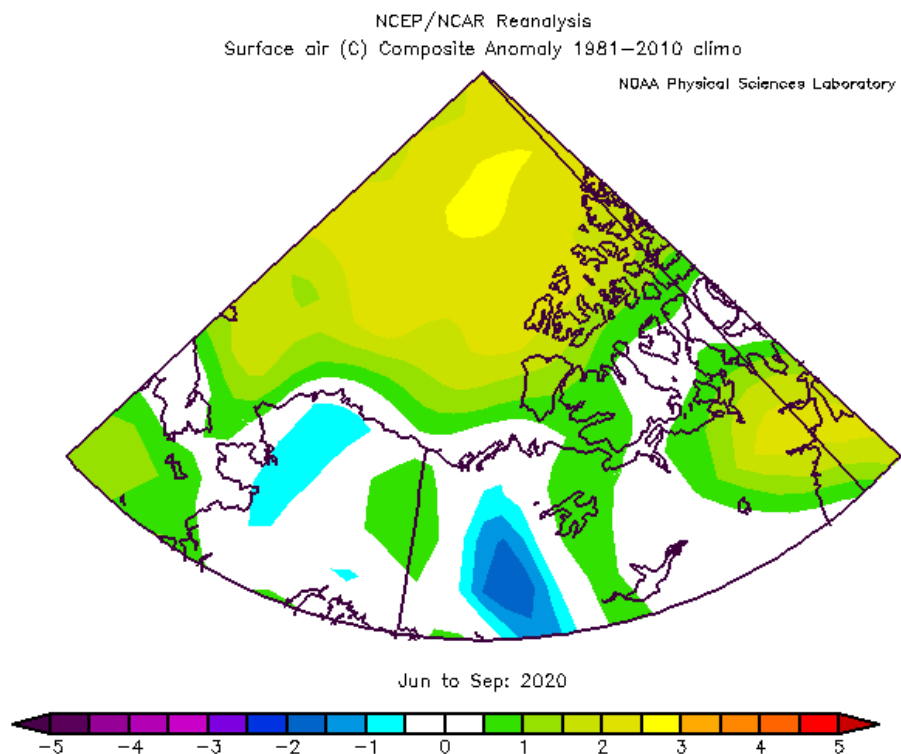


Figure 21: Air temperature anomaly for the Western Arctic area from June to September 2020

Summary of Ice Conditions:

Areas of looser ice conditions with some areas of open water in the southeastern Beaufort Sea and parts of Amundsen Gulf were already present at the beginning of June. However, some small but notable areas of above normal ice concentration were also in the same region. This would be a precursor of how the melt ice season would evolve for this particular area. The Amundsen Gulf also had areas of open water, mostly in the eastern and southern parts. This trend continued during the first half of June however, a shift in wind direction caused the pack ice to slump southwards in southeastern Beaufort Sea and western Amundsen Gulf for the balance of the month and into July. Below normal temperatures accompanied these winds and slowed down ice melt along the north coast from western Amundsen Gulf to Point Barrow. Looser ice concentrations began in southwestern Beaufort Sea during the month of July. Meanwhile areas of consolidated ice began to fracture in Coronation Gulf and Victoria Strait early in July and continued over the rest of the Northwest Passage. Soon after mid-July, the ice was mobile in Coronation Gulf, Queen Maud and Victoria Strait while Larsen Sound, Peel Sound, M'Clintock Channel, and Viscount Melville Sound remained consolidated. These regions finally fractured during the second half of the month. By the end of July, Amundsen Gulf, Coronation Gulf and Queen Maud Gulf were mostly open water. Looser ice conditions developed in Peel Sound as well as the area just north of Cape Bathurst and the Tuktoyaktuk Peninsula during most of July and August. By early August, looser ice concentration began to emerge in the north-central part of the Beaufort Sea and south-central part of the Arctic Ocean. By the end of August, open water to ice free conditions prevailed from Amundsen Gulf eastwards to Queen Maud Gulf as well as Peel Sound. However, ice lingered in the southwestern part of Larsen Sound into Victoria Strait during the month of August causing some issues with ships transiting the region through to the end of the month. The southwestern and south-central part of the Beaufort Sea was open water to ice free while the southeastern section had open water near the coast with open drift to close pack mostly old ice with some thick first-year ice further offshore, just north of Cape Bathurst and the Tuktoyaktuk Peninsula. The unusual area of open to very open drift old ice in the north-central part of the Beaufort Sea and south-central part of the Arctic Ocean expanded during the month of August. Around the end of the first week of September, ice conditions reached the season minimum ice coverage. Overall, the Western Arctic region did not come close to establishing a new minimum ice coverage this year. In fact, this year represented the 11th lowest ice coverage at the end of the ice melt season. Soon after mid-September, new ice began to form between the ice floes, mostly in the northern regions.

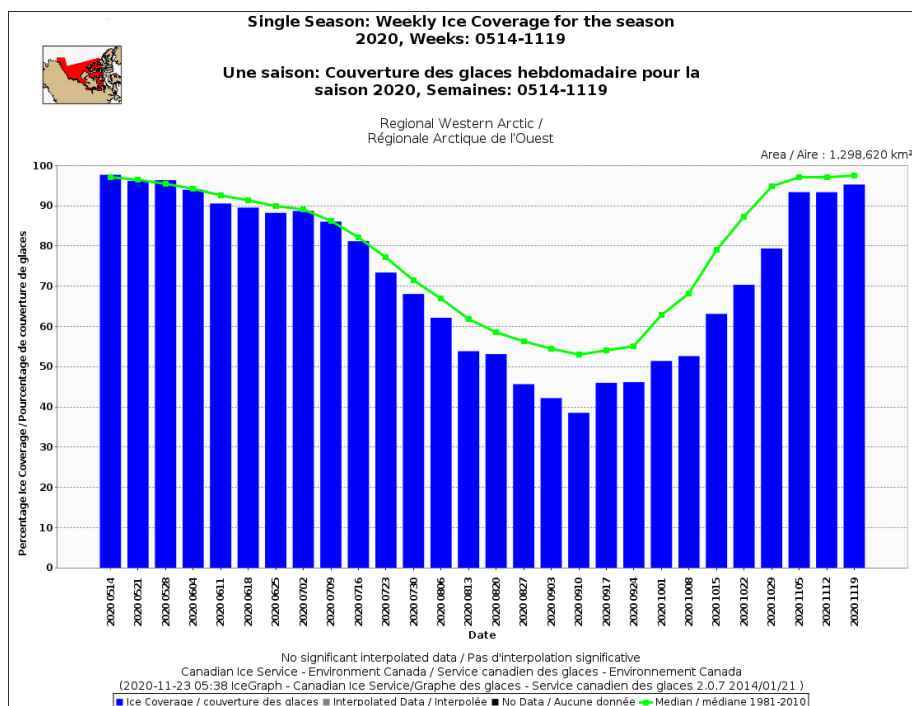


Figure 22: Weekly ice coverage for Western Arctic area for the 2020 season

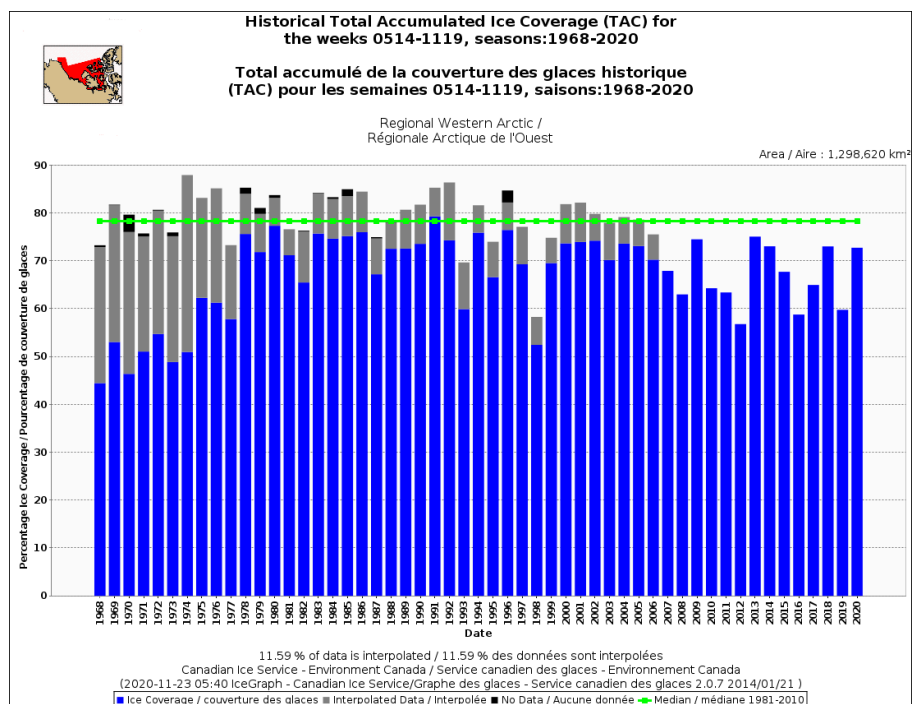


Figure 23: Historical Total Accumulated Ice Coverage for Western Arctic area (1968-2020)

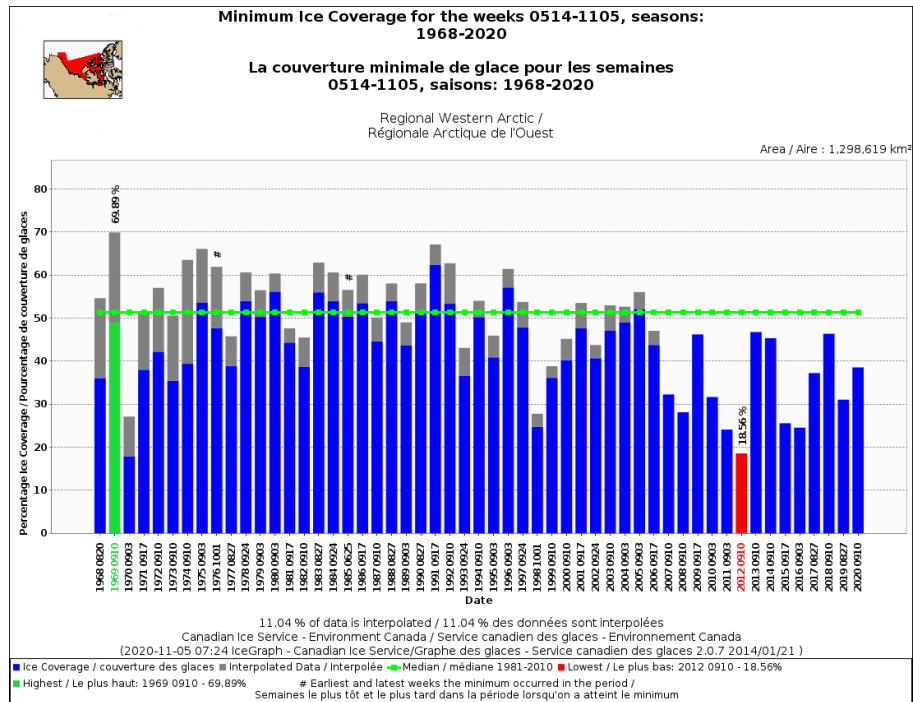


Figure 24: Minimum Ice Coverage for the Western Arctic area (1968-2020)

June Ice Conditions:

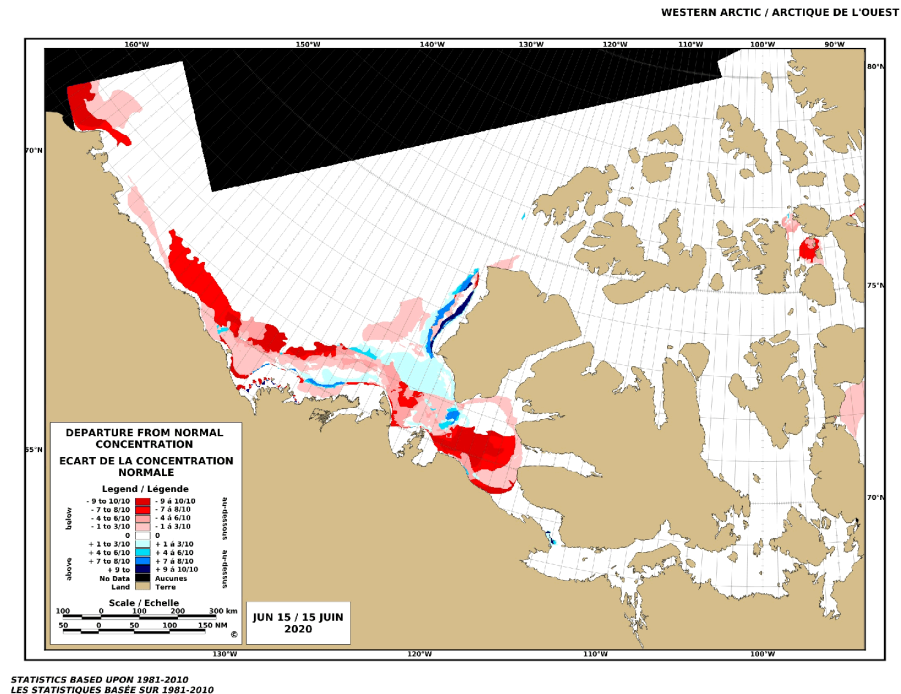


Figure 25: Departure from normal ice concentration for the Western Arctic area for mid-June 2020

Once again, open water areas started to emerge in late May so that by the beginning of June, open water was observed along the fast ice edge from Baillie Island to west of Herschel Island. Elsewhere very close pack thick first-year ice with up to three tenths old ice in the northern section of the southeastern part of the Beaufort Sea. By mid-month, the open water was slightly wider while the consolidated ice along the coast showed signs of break-up, in particular the outflow area of the Mackenzie River as well as Kugmallit Bay. Further north, close to very close pack thick first-year with up to three tenths old ice covered the area. By the end of June, a significant portion of the consolidated thick first-year ice had fractured with only the area near the northeastern tip of the Tuktoyaktuk Peninsula towards Baillie Island that remained intact. A mix of open water with some open drift thick first-year ice with up to two tenths old ice in the central part while the northern section had open drift to very close pack mostly old ice with up to 2 tenths thick first-year ice.

Ice conditions just north of the consolidated thick first-year ice including a trace of old ice along the Yukon coast as well as the northern Alaskan Coast started to loosen. By mid-June, very open drift thick first-year ice including a trace of old ice mostly in the eastern section while further west, very close pack thick first-year ice including a trace of old ice prevailed. Mostly very close pack old ice was located about 40 to 60 nautical miles north of the coast. By the end of the month, some of the consolidated ice fractured with open to very open drift thick first-year ice along parts of the coast. The eastern section had some open water with areas of very open drift

thick first-year ice including a trace of old ice. From 40 to 90 nautical miles from the coast, 2 tenths old ice with some areas of 7 tenths old ice.

Some coastal consolidated thick first-year ice started to fracture during the first half of June in Amundsen Gulf. 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 the southern portion of the gulf while open drift to very close pack thick first-year ice remained in the northern section. By the end of the month, more consolidated thick first-year ice, mostly along the southern shore, fractured and drifted into the gulf so that mostly very open drift with areas of close pack thick first-year ice covered the area. A trace of old ice drifted into the northwestern section for the southeastern Beaufort Sea.

Dolphin and Union Strait remained consolidated thick first-year ice for most of the month of June except for some very small areas of open water in the extreme southeastern section. However, this area began to fracture during the last week of the month so that a small area of very open drift thick first-year ice emerged.

Consolidated old ice around Queen Elizabeth Islands as well as 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. Southern Queen Maud Gulf, St. Roch and Rasmussen Basins as well as Coronation Gulf was consolidated thick first-year ice for all of June.

July Ice Conditions:

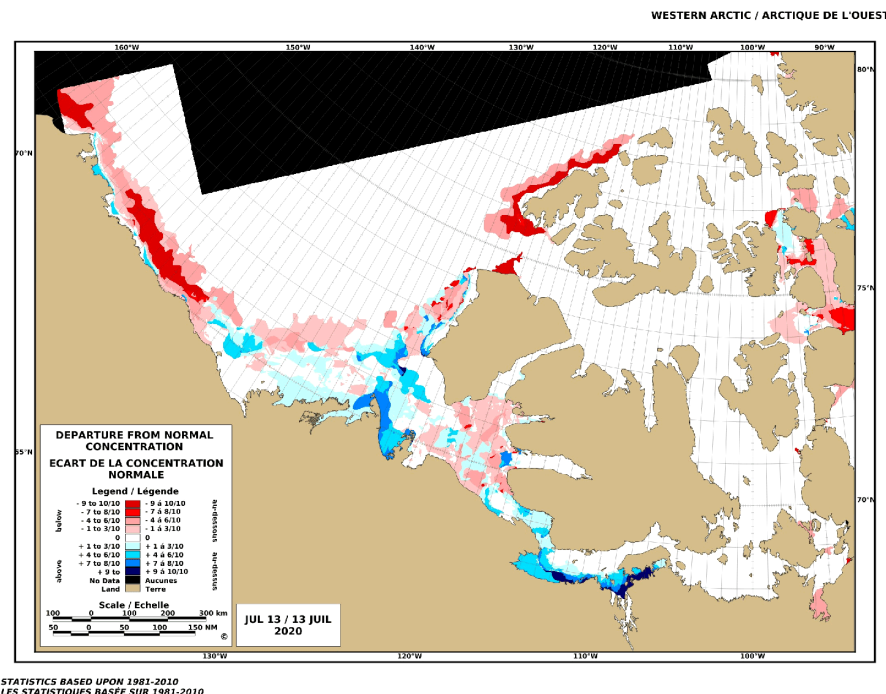


Figure 26: Departure from normal ice concentration for the Western Arctic area near mid-July 2020

The last of the consolidated thick first-year ice along the coast of the southeast Beaufort Sea area fractured during the first week of July. By mid-July, an open water area from the Mackenzie Delta northwest along the coast as well as southwest and west of Banks Island developed. North of the Tuktoyaktuk Peninsula and Baillie Island, mostly very open drift thick first-year and old ice emerged. About 60 nautical miles from the southern coast, the area had close to very close pack mostly old ice.

Along the Yukon and northern Alaskan coasts, the rest of the consolidated thick first-year ice including a trace of old ice fractured during the first week. By mid-July, open water with areas of open drift thick first-year ice including a trace of old ice was located along the coast. About 30 to 45 nautical miles north of the coast, very close pack thick first-year ice including up to two tenths old ice. By the end of July, a narrow band of open water extended from the Yukon coast to just west of Prudhoe Bay. From Prudhoe Bay to Point Barrow, a mix of open water with some very open drift thick first-year ice including a trace of old ice. Beyond 30-45 nautical miles from the coast, close to very close pack thick first-year ice including up to two tenths old ice. Further north into the northern Beaufort Sea and the Arctic Basin, no significant changes were observed for the entire month of July.

Most of the consolidated thick first-year ice in the southern section of Amundsen Gulf fractured during the first week of July with the last of the consolidated around the Parry Peninsula breaking up during the third week. Most of the consolidated thick first-year ice in Prince Albert Sound and Minto Inlet was all fracture during the last week of the month. A vast area of open water emerged in most of the gulf during the third week with some very open drift thick first-year ice in the

southern section. By the end of the month, almost all the ice had melted in the gulf except for some patches of thick first-year ice including a trace of old ice in the extreme northern and northwestern sections.

Prince of Wales Strait started to fracture in the southern section during the second week of July. By the last week of July, the last of the consolidated ice in the northern section fracture so that open to very open drift thick first-year ice including a trace of old ice in the southern section and very close pack thick first-year including up to one tenth old ice in the north.

The northwestern section of Dolphin and Union Strait fractured during the first week of July while the rest was gone during the second week. By mid-month, mostly very close pack thick first-year ice covered the strait. Significant ice melt occurred during the last half of July so that by the end of the month, only the extreme southeastern part of the sound had a patch of very open drift thick first-year ice. The rest of the sound was open water.

Signs of breakup began during the first week of July in the extreme southwestern section of Coronation Gulf while the rest of the consolidated thick first-year ice in the gulf remained intact. By mid-month, all of the consolidated ice had fracture. The southwestern section of the gulf was open drift thick first-year ice while the rest was very close pack thick first-year ice. By the end of the third week, significant open water areas developed in the southwestern section as well as into Bathurst Inlet. Elsewhere, very close pack thick first-year ice covered that region. By the end of the month, only a few patches of very open drift rotten thick first-year ice remained in the extreme western section of Coronation Gulf.

Queen Maud started to show signs of breakup in the extreme northern section, south of Victoria Strait, during the first week of July. Elsewhere, the consolidated thick first-year ice remained unbroken. By the middle of July, the extreme northern areas of Queen Maud had a slightly larger area of very close pack thick first-year ice including a trace of old ice, just south of Victoria Strait. Chantrey Inlet, south of Rasmussen Basin, had fractured to open drift thick first-year ice. Elsewhere, conditions remained unchanged. During the third week, most of the consolidated ice broke to very close pack thick first-year ice with some open water areas, mostly along the southern coast of Chantrey Inlet and in southern St. Roch Basin. By the end of the month, not much ice remained. Only a few patches of very open drift thick first-year ice including a trace of old ice in the extreme northern section of Queen Maud, just south of Victoria Strait. As well, only a few strips of thick first-year ice in the extreme northern reaches of Simpson Strait. Elsewhere in Queen Maud, Rasmussen Basin and southern St. Roch Basin, generally open water.

The western part of Victoria Strait began to fracture during the first week of July while the rest of the strait and all of Larsen Sound remained consolidated with a mix of thick first-year and old ice. By mid-month, almost all of Victoria Strait had fractured to very close pack thick first-year ice including a trace of old ice in the western section and very close pack thick first-year and old ice in the east section. At the same time, no changes occurred to the consolidated ice in Larsen Sound. During the third week, significant portion of Larsen Sound fractured so that by the last week, mostly very close pack thick first year and old ice covered the sound and the northern part of Victoria Strait. The southern Victoria Strait area had open to very open drift thick first-year and old ice.

Peel Sound remained consolidated with thick first-year ice including a trace of old ice during the first half of July but near the end of the third week, the northern and southern sections started to show signs of fracture. By the beginning of the last week, the entire length of the sound had fractured so that by the end of July, the northern part had open drift thick first-year ice including a trace of old ice. Meanwhile, the southern part had mostly very close pack thick first-year ice including a trace of old ice except for some open water along the southeastern coast of Prince of Wales Island.

M'Clintock Channel did not fracture until the end of third week of July. At that point, the northern and southeastern sections broke up while the centre remained intact. Soon into the last week, the entire length of the channel fractured to very close pack thick first-year and old ice. By the end of the month, an area of open water had opened along the southwestern coast of Prince of Wales Island while the rest of channel remained very close pack thick first-year and old ice.

The western entrance to M'Clure Channel was mobile with close to very close pack mostly old ice while eastern M'Clure Channel and Viscount Melville Sound remained consolidated with a mix of thick first-year and old ice at the beginning of July. Before the end of the first week of the month, the central part of M'Clure Strait fractured. No significant change occurred until the end of the third week when the all of the remaining consolidated ice had fractured. By the end of July, M'Clure Strait had mostly close to very close pack thick first-year and old ice while further east into Viscount Melville Sound was very close pack old ice.

Elsewhere, no significant change in the western Queen Elizabeth Islands region except northeast of Bathurst Island where the consolidated thick first-year with up to four tenths old ice fractured during the second week of July. Ice fracturing continued to spread northwards and reached the southern tip of Ellef Ringnes Island by the end of the third week. By the end of the month, the ice fracturing extended to the southwestern coast of Ellef Ringnes Island with a mix of very close pack thick first-year and old ice. No Significant changes elsewhere in the western Queen Elizabeth Islands.

August Ice Conditions:

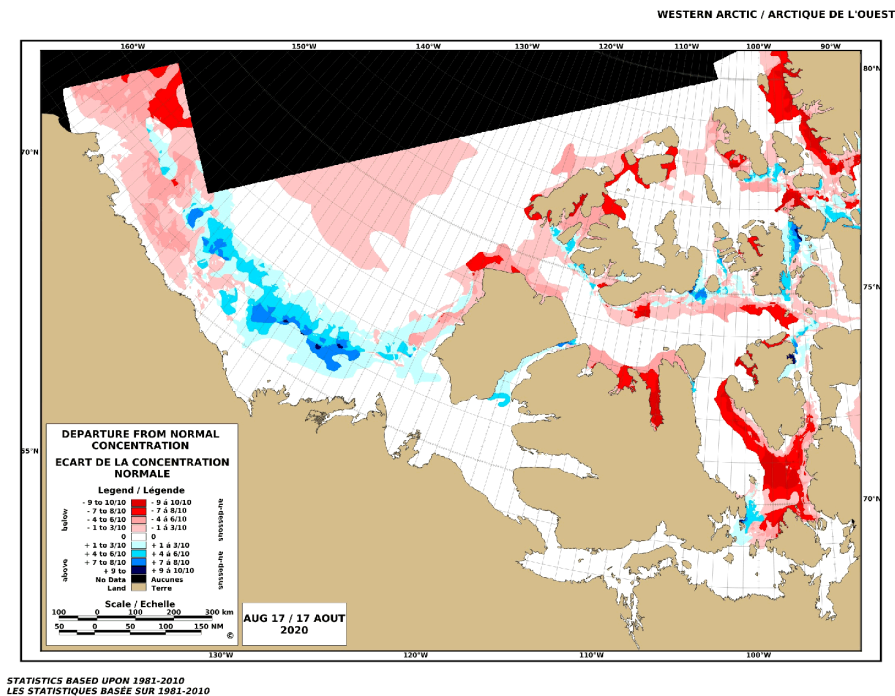


Figure 27: Departure from normal ice concentration for the Western Arctic area near mid-August 2020

The coastal water lead along the southeastern part of the Beaufort Sea prevailed for the entire month of August. However, the location of the southern ice edge was never more than 90 nautical miles from the southern coast. In fact, the ice edge was oscillating between 30 to 60 nautical miles from the Tuktoyaktuk Peninsula during a good portion of the month. As well, during the first week, a few patches of very open drift old ice had drifted near the Baillie Island/Cape Parry areas as well as into the northern part of Franklin Bay. In the northern section of the southeast Beaufort Sea, mostly close to very close pack old ice including some thick first-year ice with a few areas of open to very open drift old ice covered the region.

Along the Yukon and northern coast of Alaska, a mix of open water and open to very open drift thick first-year ice including a trace of old ice within 40 nautical miles of the coast during the first week of August. Further north, generally close to very close pack thick first-year ice including up to two tenths old ice. In the northwestern Beaufort Sea and the southwestern Arctic Ocean, signs of looser ice conditions started to emerge during the first week of August. Generally, close pack thick first-year and old ice covered the area. By the beginning of second week, generally open water conditions prevailed along the Yukon and northern Alaskan Coast and extended about 45 to 90 nautical miles with the exception of the area 60 nautical miles northwest of Herschel Island where the ice edge was only about 30 nautical miles off the coast. By the end of the third week, the open water area in the western section, north of Point Barrow region, was about 120 to 145 nautical miles offshore while further east near Herschel Island, the ice edge was around 45 to 60 nautical miles to the north. Continued decrease in ice concentration in northwestern Beaufort Sea and the southwestern Arctic Ocean to open drift to close pack range composed of old and

thick first-year ice. By the end of the month, the southern ice edge was still around 145 nautical miles north of Point Barrow and 90 nautical miles north of Herschel Island. Just north of the ice edge a narrow band of very open drift old ice was present. Further north in the pack ice in the west-central part of the Beaufort Sea, close to very close pack old and thick first-year ice. The northwestern Beaufort Sea and southwestern Arctic Ocean, open drift to very open drift old and thick first-year ice prevailed.

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 a few areas of very open drift old ice in the south with some close pack old ice in the northern part.

The last few patches of very open drift rotten thick first-year ice in Dolphin and Union Strait as well as extreme western Coronation Gulf melted during the first few days of August. By the second week of August, ice free conditions developed and persisted until the end of the month over these regions.

Dease Strait and Queen Maud Gulf were open water during the first week of August however some patches of very open drift old ice started to creep into the extreme northern part of Queen Maud Gulf for the remainder of the month. Otherwise, open water to ice free conditions prevailed.

Ice conditions in Larsen Sound remained very close pack old and thick first-year ice except for open drift to close pack thick first-year ice including a trace of old ice in the northern section in the first week of August. In Victoria Strait, open drift to close pack thick first-year ice including up to one tenth old ice. By mid-month, very close pack old ice with some thick first-year ice was in western Larsen Sound while the southeastern section had open drift to close pack old and some thick first-year ice. To the north, open water with areas of very open drift thick first-year ice including a trace of old ice. The western side of Victoria Strait had close to very close pack old ice with some thick first-year ice while the eastern and central section had open water with some very open drift old ice. Significant clearing of ice occurred in most of the northern section of Larsen Sound so that by the end of the third week, mostly open water prevailed. The exception was close to very close pack old ice with some thick first-year ice in the extreme western section of the sound and western Victoria Strait. Near the western and northern coast of King William Island, open drift to close pack old and thick first-year ice was present. By the end of the month, generally open drift to close pack old and thick first-year ice covered Victoria Strait as well as southern and western Larsen Sound. Elsewhere, open water with a narrow band of very open drift old ice along parts of the western Boothia Peninsula.

Peel Sound had a wide band of very close pack thick first-year ice including a trace of old ice along the southeastern coast of Prince of Wales Island while the rest of the southern part and the western part of central Peel Sound had open water with some open drift thick first-year including a trace of old ice. Some very open drift thick first-year ice including a trace of old ice in the extreme northern section. Elsewhere, open water. By mid-month, the southern part of Peel

Sound had open water with areas of very open drift thick first-year ice including a trace of old ice. The northern portion had open drift with some very close pack thick first-year ice including up to two tenths old ice. Elsewhere, open water. The last of the ice in the southern section of Peel Sound melted during the third week however, ice in the north drifted into the central section of the sound. A mix of open water with open drift thick first-year ice with a trace of old ice except for an area of very close pack thick first-year ice including up to two tenths old ice in the extreme northern section. A combination of ice melt and a northern retreat of the ice during the last week left only the northern section with some ice. A narrow band of very close pack thick first-year ice including three tenths old ice remained along the northeastern coast of Prince of Wales Island while the extreme northern section had very open drift thick first-year ice including one tenth old ice. Elsewhere, open water.

Ice in M'Clintock Channel, Viscount Melville Sound and M'Clure Strait area loosen up during August. By then end of the month, the northern parts of M'Clure Strait and Viscount Melville Sound had open water to open drift old and thick first-year ice while the central and southern sections had close to very close pack old and thick first-year ice. The exception was the area around and west of Byam Martin Island where very close pack mostly old ice with some embedded thick first-year ice that drifted into the extreme northern reaches of Viscount Melville Sound. The northeastern part of M'Clintock Channel, along the southwestern part of Prince of Wales Island, had open water with very open drift old and thick first-year ice while the rest of the channel had very close pack old and thick first-year ice.

The last of the consolidated old and thick first-year ice in the western Queen Elizabeth Islands continued to fracture during the first days of August. Looser ice conditions developed during the month so that by the end of August, open to very open drift old ice areas were present south of Ellef Ringnes Island towards Penny Strait, the southwestern coast of Ellesmere Island and between Prince Patrick Island and Melville Island. Otherwise, very close pack old and thick first-year ice prevailed.

September Ice Conditions:

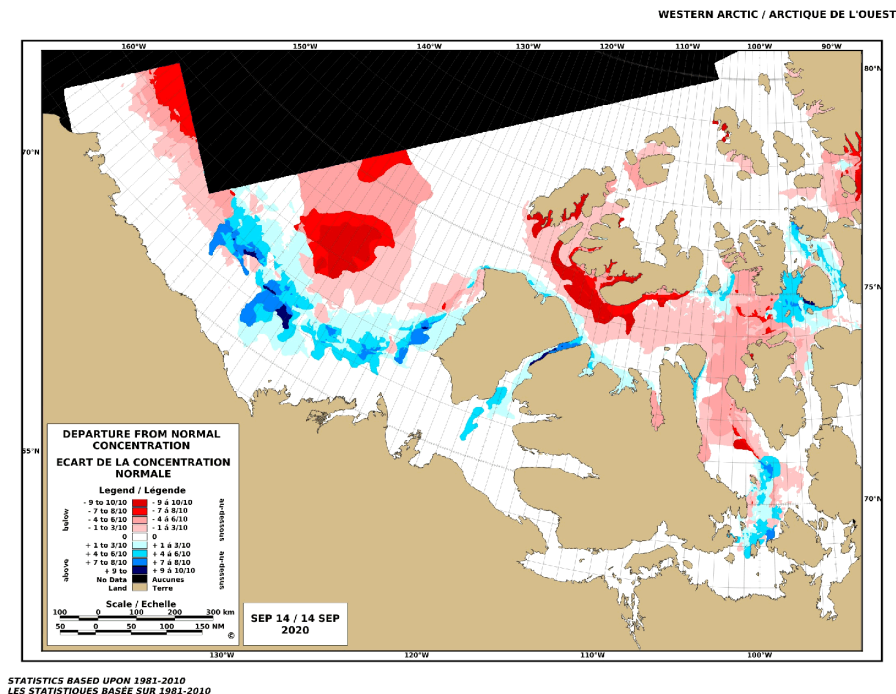


Figure 28: Departure from normal ice concentration for the Western Arctic area near mid-September 2020

The open water area in the southeastern Beaufort Sea expanded to about 60 to 90 nautical miles north of the coast during the first week of September. However, the ice edge slumped southwards during the second week and was located about 45 to 60 nautical miles north of the coast. At mid-month, the ice was comprised of mostly open drift to close pack old ice with some thick first-year ice near the ice edge and increased in concentration to close to very close pack old and thick-first year ice further north. Into the northern Beaufort Sea and southeastern Arctic Ocean, an open water area had expanded with open to very open drift old and thick first-year ice around the edge. Further north into the rest of the Arctic Ocean, very close pack old ice. During the last half of the month, a switch from general ice melt to ice formation occurred. By the end of September, the ice edge was about 60 to 90 nautical miles from the coast. Generally open to very open drift old and some thick first-year ice with new ice forming around the floes just north of the ice edge. A few broad areas of very close pack old and thick first-year ice further north. A 30 to 45 nautical miles wide area of open water was located west of Banks Island. The open water in the north-central Beaufort Sea and south-central part of the Arctic Ocean had drifted slightly to the west during the last two weeks with open drift to close pack old with some thick first-year ice and some new and grey ice around the floes. Further north, Very close pack old ice.

Along the Yukon and the northern Alaskan Coast, an open water area, about 60 nautical miles in the east to 140 nautical miles wide in the west, was present at the end of the first week of September. By the middle of September, the ice edge sagged southward in the east to about 45 nautical miles and about 180 nautical miles to the northeast of Point Barrow. Generally, open

drift to very close pack old ice with some thick first-year ice was located north of the ice edge. The second half of September saw new and grey ice growth between the floes. By the end of the month, the ice edge in the east had slumped even further south to about 15 to 30 nautical miles from the coast. Further west, it was located about 120 nautical miles north of Point Barrow. Just north of the ice edge, open drift to very close pack old ice with some thick first-year ice including some new ice while further north, grey ice forming between the floes.

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 to very open drift old ice with some thick first-year ice covered the southern and central parts of Prince of Wales Strait while very close pack mostly old ice was present in the north at the middle of September. By the end of the last week, a narrow band of very close pack old with some thick first-year ice along the eastern coast of Banks Island while the rest of the strait had a mix of open water and very open drift old ice with some new ice forming between the floes.

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

During the first week of September, the old ice with some thick first-year ice in Larsen Sound and Victoria Strait drifted westward. At the end of the first week, open water prevailed in most of Larsen Sound and Victoria Strait. However, close to very close pack old ice with up to three tenths thick first-year ice covered the extreme western sections of the sound and strait. By mid-month, the ice expanded somewhat eastwards. Victoria Strait had open drift to close pack old and thick first-year ice except for narrow areas of open water on either side. The southwestern part of Larsen Sound had open drift to very close pack old ice and thick first-year ice while the rest of the sound was open water. By the end of September, northern part of Victoria Strait still had mostly open drift to close pack old and thick first-year ice with some new ice growth between the floes. In the southern section of the strait, a mix of open water with areas of open to very open drift old and thick first-year ice with some new ice growth between the floes. Most of Larsen Sound was open drift to close pack except very close pack old and thick first-year ice in the western section. The northern section was mostly open water with some very open drift old and thick first-year ice.

The first half of September in Peel Sound, open to very open drift old and thick first-year ice was present in the northern section while the central and southern sections remained open water. Some new ice formed around the floes in the north near mid-month. Near the end of the third week, a southerly wind circulation pushed more of the ice out of the northern section of the strait except for a few patches of very open drift old ice with some new ice. By the end of September, the majority of the strait remained open water however some patches of new ice began to form along parts of the coast. Only the extreme northern part had close to very close pack old, thick first-year, grey and new ice.

By the middle of September, close to very close pack old ice with up to up three-tenths thick first-year ice lined the eastern coast of Victoria Island in M'Clintock Channel. Elsewhere in the channel, mostly open water with areas of very open drift old and thick first year ice. By the end of the month, generally close to very close pack old, thick first-year, new ice with some grey ice around floes in the northern sections. The only the area near the southwestern and western coast of Prince of Wales Island had some open water with very open drift old ice.

At mid-September, very close pack old ice with up to three tenths thick first-year ice was mostly along the southern parts of M'Clure Strait and Viscount Melville Sound. Further north, a mix of open water with areas of close pack old, thick first-year and new ice covered the area. By the end of September, most of M'Clure Strait had open to very open drift old, thick first-year and new ice except for the extreme western section where an area of very close pack old ice was present. Further east into Viscount Melville Sound, mostly very close pack old, thick first-year and grey ice.

In the western Queen Elizabeth Islands, areas of very close pack grey ice with up to three tenths old and thick first-year ice were present around Mackenzie King Island, south and southeast of Ellef Ringnes Island as well as southwestern of Ellesmere Island at mid-September. Elsewhere generally very close pack old ice with some thick first-year ice. By the end of the month, old ice from the eastern Arctic Ocean started to percolate into the western Queen Elizabeth Islands. Generally very close pack old and thick first-year ice with some grey-white and grey ice in between the floes.