Regional Outlook for the Bering-Chukchi-Beaufort Seas

Contribution to the 2018 Sea Ice Outlook

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Winter ice extent in the Bering and Chukchi Seas was well below average during the winter of 2017/2018 (see the June 2018 SIO report). The Chukchi Sea *ice-over date* (taken as the first day with more than 95% ice extent over the entire Chukchi Sea) occurred on 31 December 2017 and was the latest observed since the start of the satellite record (Figure 1). A combination of residual ocean heat and positive sea surface temperature anomalies into winter and northward atmospheric flow persisted into early 2018, keeping sea ice formation and southward advection at bay. As a result, the Bering Sea winter ice extent was the lowest ever observed in the satellite record (Figure 2) as well as in the entire historical record of the past 160 years (see the Historical Sea Ice Atlas).

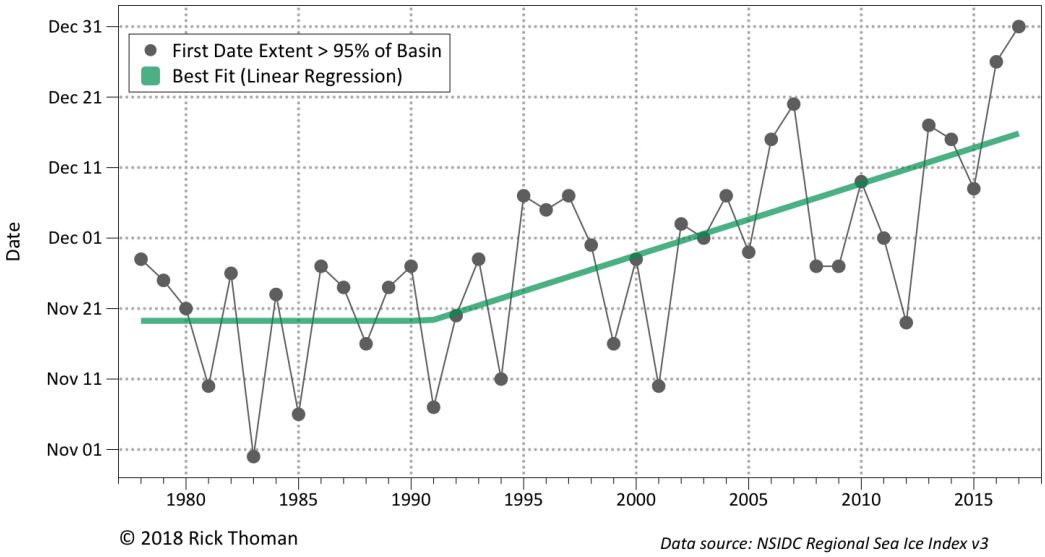

Figure 1. Chukchi Sea autumn ice-over date, 1978-2017. Figure courtesy of Rick Thoman, National Weather Service.

Many coastal communities in the Bering Strait region reported a near-complete absence of sea ice into February and experienced large and rapid shifts in local ice cover with changing wind patterns (Figure 3; see also the Sea Ice for Walrus Outlook). The combination of minimal or absent shorefast ice, low-concentration pack ice, and winter storm activity caused coastal damage in several Bering Sea communities. The near complete absence of sea ice west of St. Lawrence Island also impeded subsistence hunting with walrus largely absent from local waters.

Moreover, the Bering Sea region experienced an unusually warm winter and spring with air temperatures 5-10°C above normal (Figure 4). The Bering Sea *melt-out date* in late April was also two weeks earlier than the previous record set in spring 2017 (Figure 5). A short summary report of the winter 2017/18 is provided by IARC (2018), and a more in depth investigation is planned by Druckenmiller et al.

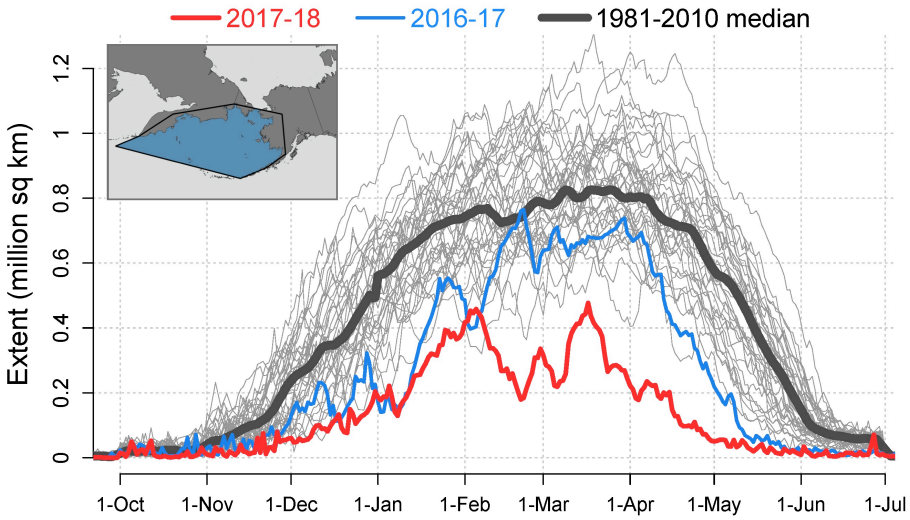

Figure 2. Seasonal sea ice extent in the Bering Sea for years 1979-2018. The extent threshold is 15% ice concentration. (Source: Passive microwave data from the National Snow and Ice Data Center)

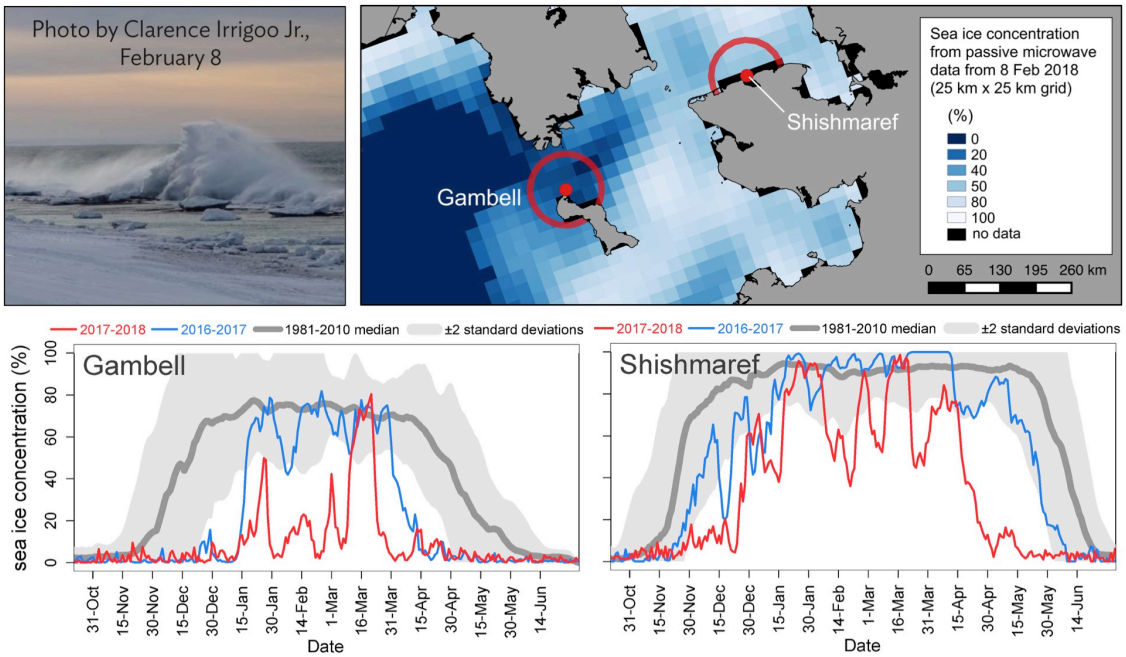

Figure 3. Seasonal sea ice concentration within 65 km of the communities of Gambell and Shishmaref (Source: Passive microwave data from the National Snow and Ice Data Center). The coastal mask used in this analysis was that developed for the NASA Team algorithm. The photo on the upper left by Clarence Irrigoo, Jr (provided through the Local Environmental Observers Network) shows waves breaking on the shore near Gambell on 8 Feb 2018.

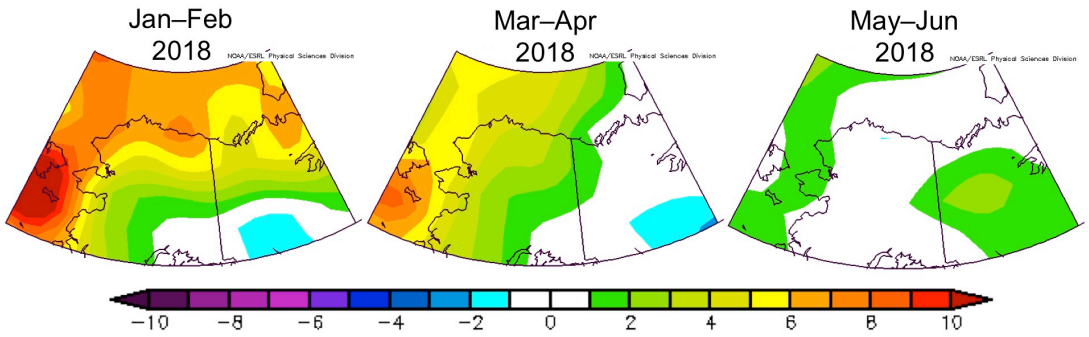

Figure 4. Surface air temperature composite anomalies in degrees C (1981-2010 climatology) for Alaska during winter and spring in 2018. (Source: NCEP/NCAR Reanalysis)

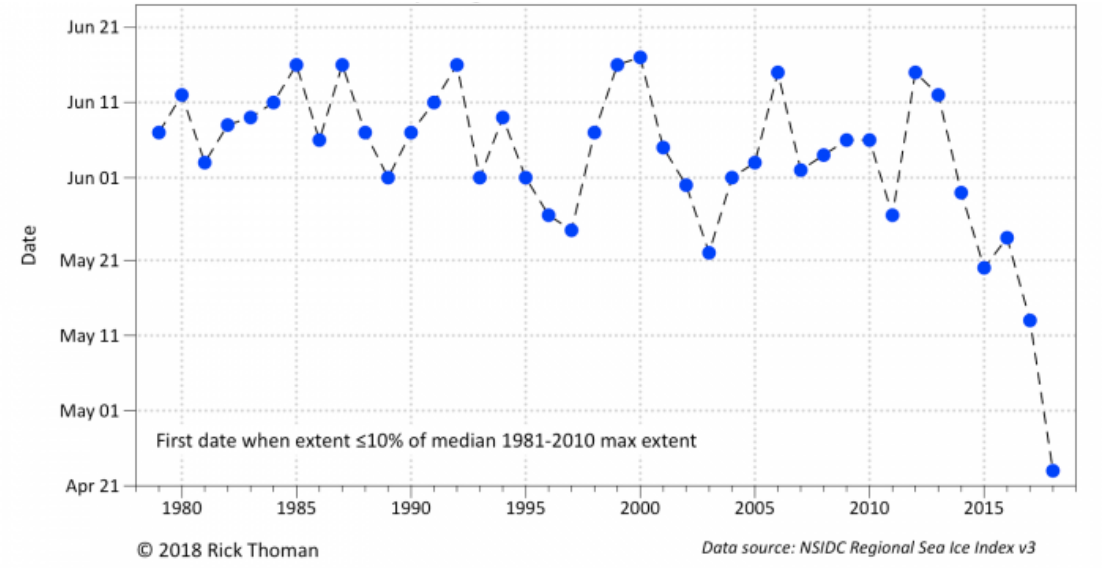

Figure 5. Bering Sea ice extent spring melt-out date, 1979-2018. Figure courtesy of Rick Thoman, National Weather Service.

The late spring retreat of ice in the Chukchi Sea got off to the earliest start in the satellite record in late-April and early-May (Figure 6), likely due to the thin and sparse ice conditions throughout the preceding winter together with warm spring temperatures (Figure 4). By mid-July, ice retreat in the Chukchi had slowed slightly to bring conditions just below average, at least in part, due to coastward drift of ice from the north that compensated for in situ melt. On the contrary, summer ice retreat in the Beaufort Sea has progressed in-line with average conditions (Figure 7), which also has been largely supported by winds keeping ice well dispersed.

Spring surface-based EM surveys of ice thickness at Utqiaġvik, Alaska (formerly Barrow) revealed very thin shorefast ice conditions near the community. Thickness surveys conducted along whale hunting trails over the shorefast ice are able to identify the level first year ice thickness mode, which is driven by both local freeze-up processes and timing, and weather, ocean and ice conditions in the region

throughout fall and winter. This year, the thickness of level first-year shorefast ice was between 80 and 90 cm (Figure 8). This was the thinnest shorefast ice cover observed at Utqiaġvik since regular observations began in 1999. By comparison, the thickness in 2017 was approximately 1.35 m.

Despite the unusually thin shorefast ice cover, which was also largely devoid of substantial grounded ridges, the shorefast ice along the Chukchi coastline between Utqiaġvik and the southern end of Peard Bay persisted mostly intact through June and into the first week of July, similar to the 2017 shorefast ice break-out period.

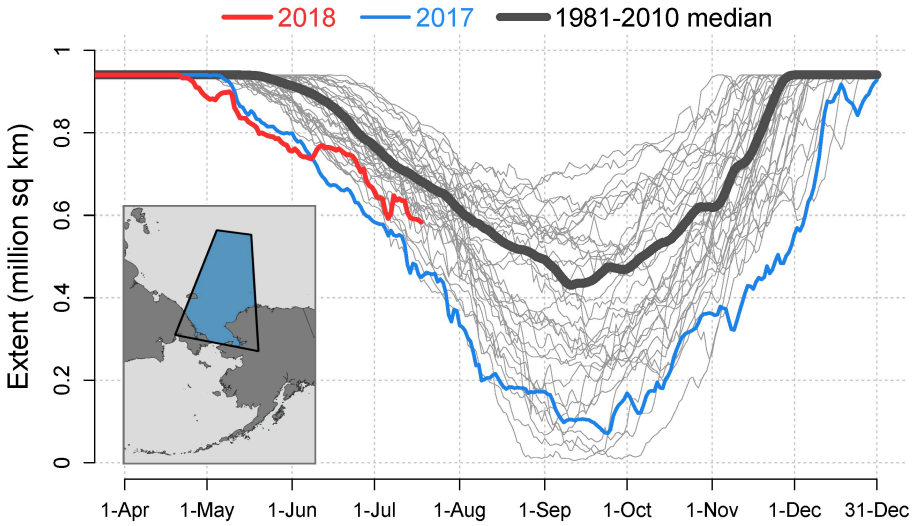

Figure 6. Sea ice extent in the Chukchi Sea. (Source: Passive microwave data from the National Snow and Ice Data Center)

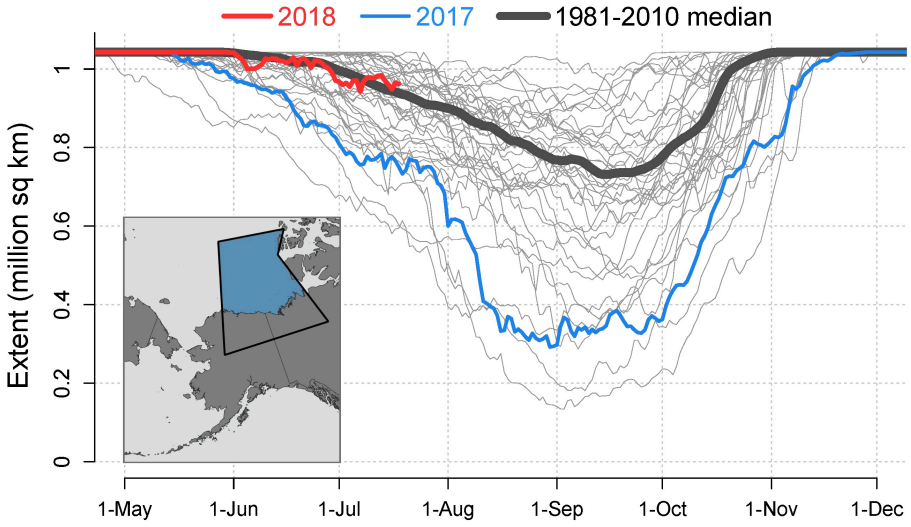

Figure 7. Sea ice extent in the Beaufort Sea. (Source: Passive microwave data from the National Snow and Ice Data Center)

Community observations, and surveys during the March ICEX expedition suggest predominance of comparatively thin sea ice across at least the southern Beaufort Sea this year. Therefore, despite average ice extent in Beaufort Sea through July (and slightly below average conditions according to ice area), rapid disintegration of the ice cover in the southern Beaufort Sea is likely, with an expected steep decline in extent. A photo from a recent aerial marine mammal survey depicts an ice cover that is still intact but highly vulnerable to rapid ice loss with late-stage melt pond coverage (Figure 9). Whether 2018 ice retreat in the Beaufort Sea will surpass that of 2017 will depend on the regional wind conditions and how quickly the peak melt season tapers off with increased cloudiness and reduced shortwave fluxes going into August.

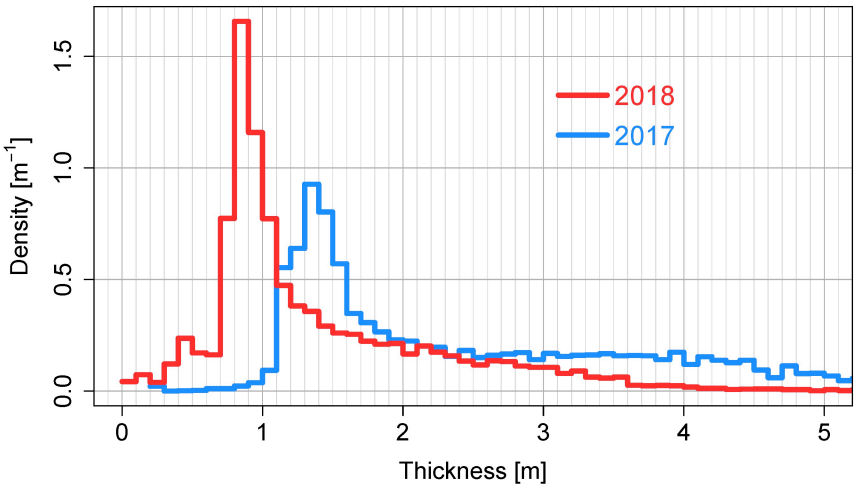

Figure 8. Thickness distribution of shorefast sea ice along trails used by Utqiaġvik hunters. (Source: Surface-based EM surveys between 3-8 May 2017 and 27 April to 3 May 2018).

Figure 9. Sea ice in the south central Beaufort Sea, approximately 60 km offshore of the US-Canada Border. Photo by Vicki Beaver (NOAA/NMFS/AFSC/MML) on 20 June 2018. (70.4937N, 141.847W, Bearing 90°)

References

IARC, 2018. Bering Strait: An overview of winter 2018 sea ice conditions. International Arctic Research Center. Available at: https://uaf-iarc.org/2018/04/09/new-summary-available-on-bering-strait-winter-2018-sea-ice-conditions/