

The Bering Sea: Current Status and Recent Events

by Jeffrey M. Napp

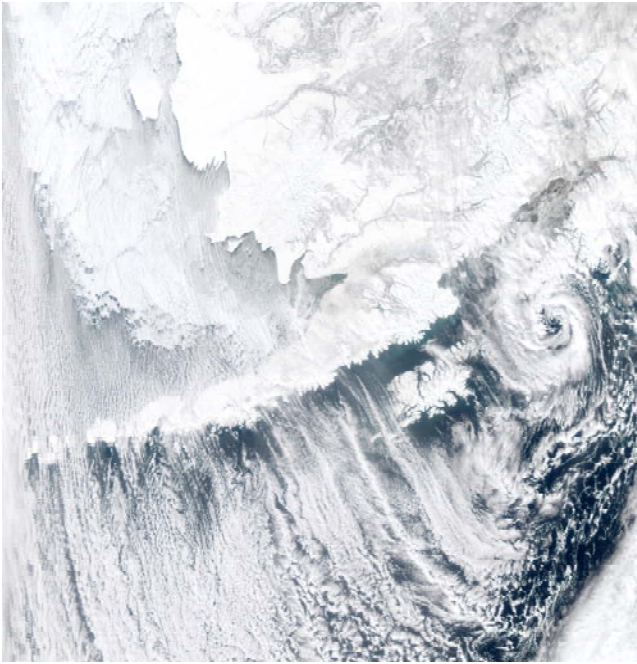


Fig. 1 Satellite image of Bering Sea and Gulf of Alaska (March 19, 2008). Extensive ice is evident over the Bering Sea shelf. Winds out of the north continued to push the ice farther south in March and substantial portions of the southern shelf were covered in May (courtesy of P. Stabeno and S. Salo, NOAA – PMEL).

Current status of the Bering Sea ecosystem

The Bering Sea cooled very quickly in the fall of 2007 but remained largely ice-free until the middle of December because the Arctic was warm. After December, the sea ice expanded quickly over the Bering Sea shelf, reaching St. Matthew Island in early January 2008 and St. Paul Island in

late February 2008. Maximum ice occurred in late March (Fig. 1). Ice remained over substantial parts of the southern shelf in May and persisted in small pockets over the northern shelf until the latter half of June. This year (2008) was one of the most extensive ice years since the very cold period of the early 1970s. While the paradigm that the western Arctic must freeze before the Bering Sea can become ice-covered remained true in 2008, it was surprising how rapidly the Bering Sea could cool and become ice-covered.

The sea surface temperatures of the eastern Bering Sea and west coast of North America were several degrees colder than normal in June 2008 (Fig. 2). The monthly Pacific Decadal Oscillation index, (PDO, first EOF of North Pacific SSTs) switched from positive to negative values in September 2007, was strongly negative during the winter and spring 2008, and has remained so up to the publication of this article. Several times this decade the PDO has been negative (*e.g.*, winter 2002, late fall 2005, fall 2006), but not nearly as strong or for as long as during this recent period. The negative PDO is attributed to La Niña on the equator and a stronger than normal subtropical high. These conditions create a strong flow across the central and eastern North Pacific. If this continues, we can expect a strong flow of subarctic waters into the California Current, with associated transport of subarctic fauna.

Ice and cold affected the biota as well during several expeditions that were set to study the importance of sea ice to this ecosystem. While there was a significant bloom of phytoplankton underneath the ice during the BEST/BSIERP spring cruise (see below), there was no evidence of a large-scale bloom on the middle or outer shelves.

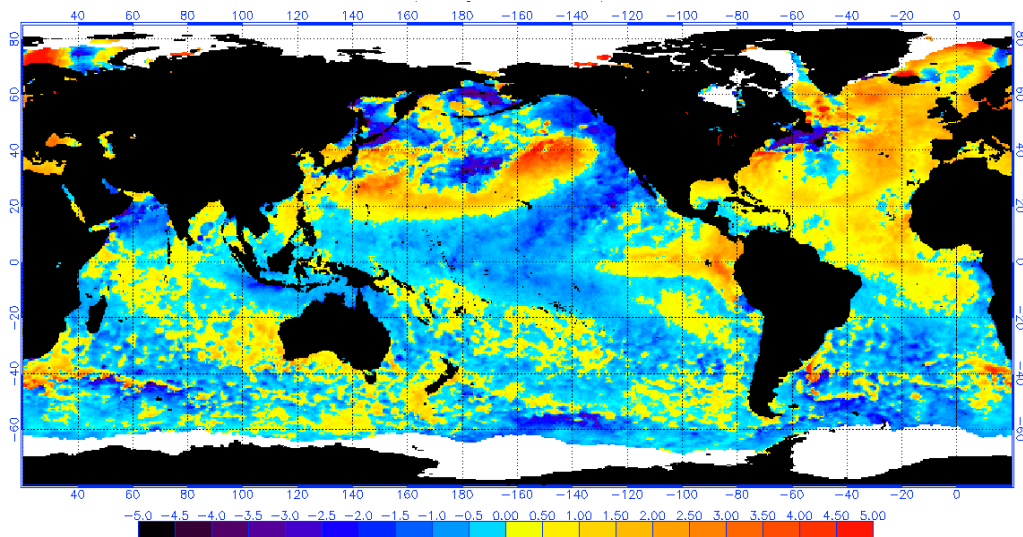


Fig. 2 NOAA/NESDIS sea surface temperature anomalies for June 16, 2008 (www.osdpd.noaa.gov/PSB/EPS/SST/data/anomnight.6.16.2008.gif).

Development of pollock and cod larvae along the Alaska Peninsula was somewhat delayed, in part due to the cold. The cold spring created excellent conditions for scientists who are seeking to learn how climate variability and loss of sea ice will influence the Bering Sea ecosystem. Scientists began their most recent attempts at understanding the eastern Bering Sea in the mid- to late 1990s. That period provided both warm and cool conditions, while 2000–2005 was warm. With the most recent collections in 2007 and 2008, scientists now have samples for both cool and warm phases of the region.

Next year in the Bering Sea ecosystem?

While correlations between ENSO and ice extent in the Bering Sea are not very high, there is a tendency during La Niña for more extensive ice in the Bering Sea. La Niña is weakening and the ENSO index is now neutral. In addition, the Arctic Oscillation (AO) has been strongly positive for the last two winters. A positive AO also tends to be associated with more extensive ice in the Bering Sea because it limits the propagation of storms from the south. These two large-scale climate patterns contributed to the cold and extensive ice formation in 2008. For 2009, there is considerable uncertainty in ENSO forecasts, but the spectra of the AO is red, so there is a tendency for patterns to repeat. One possible scenario for the winter of 2009 is a positive AO and neutral or even negative ENSO, and hence a continuation of the average to above average spring ice extent that we saw during the winters of 2006–2008.

2008 activities in the Eastern Bering and Chukchi Seas

There are several ongoing projects with significant observation days this year. The U.S.-led **Bering Ecosystem Study (BEST)** and the **Bering Sea Integrated Ecosystem Research Program (BSIERP)** have multiple cruises to the eastern Bering Sea (http://bsierp.nprb.org/cruises/cruise_calendar.html). The spring ice expedition by this partnership (March 31 to May 6) accomplished three major cross-shelf transects to the eastern Bering Sea using the U.S. Coast Guard Cutter (icebreaker) *Healy*. As this is being published, a shorter summer cruise (June 20 to July 18) is underway using the same platform. On the spring cruise, 12 scientific projects carried out a mix of process studies and observations. They collected many

measurements of standing stock and rates in the ice, underneath the ice in the water column, and in the benthos. The cruise completed three cross-shelf transects, occupying stations along the 70-m isobath line, ice stations, and underway observations of marine mammals and seabirds. A final cruise report will soon be available on the BSIERP website. It is interesting to note that the extremely cold air temperatures initially made it difficult to conduct shipboard rate measurements because the outdoor incubations could not be kept ice-free.

There are other important expeditions to the Bering Sea this year. The Japanese Training Ship *Oshoro maru* from Hokkaido University is continuing its expanded geographic coverage of the eastern Bering Sea shelf and Chukchi Sea. A scheduled Russian–American Long-Term Census of the Arctic (RUSALCA) cruise aboard the Russian Research Vessel *Academic Lavrentiev* (August 27 to September 24) has been shortened. There were initially two legs: one to deploy moorings and another to make follow-up hydrographic, plankton and fisheries observations that began in 2004. At the time of this article, the hydrographic, plankton, and fisheries investigations (Leg 2) were postponed until the late summer of 2009. There are also reports that the Chinese icebreaker *Xue Long* will transit the Bering Sea in the fall for a cruise to the Chukchi Sea. Information about IPY Ocean projects can be viewed at <http://www.ipy.org/index.php?ipy/content/projects/C34>. A relevant question facing scientists and institutions in all PICES member countries is whether or not the rising prices of fuel will affect our abilities to fully execute existing research program implementation plans. Research and survey cruises to this remote, but economically important region may be negatively impacted.

A 1-day joint PICES/ESSAS workshop entitled “*Status of marine ecosystems in the sub-arctic and arctic seas – Preliminary results of IPY field monitoring in 2007 and 2008*” will be convened on October 24, 2008, at the PICES Seventeenth Annual Meeting in Dalian, China, for the presentation and discussion of results from IPY field projects. We hope to see you there!

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