

The Bering Sea: Current Status and Recent Events

by Jeffrey Napp

Current status of the Bering Sea ecosystem

Cold, cold, and more cold. Forget what you heard about changing atmospheric conditions and indices. Ignore what you read here and heard at the PICES Annual Meeting and Alaska Marine Science Symposium about the possibility of an “average” winter in the eastern Bering Sea. The cold conditions, begun in 2006, remained during the winter / spring of 2010, with ice around the Pribilof Islands until at least the middle of May. The initial ice retreat started in March of 2010, but in April and May, the region experienced weak, but sustained winds out of the north, pushing the ice farther south. The continued pushing and reorganization of ice promoted ice rafting with many large floes with significant jumbling of ice above the surface. Eventually, the area between St. Matthew and St. Lawrence Islands became ice free, while the area around the Pribilof Islands still had significant ice cover. This year may represent one of the latest ice retreats for the southeastern shelf in about 50 years.

The enduring ice and cold temperatures experienced in the region are somewhat at odds with what was happening in the atmosphere. For example, the multi-variate El Niño index was positive through the winter. Normally, this predisposes the wintertime atmospheric circulation to feature a deeper and eastward-displaced Aleutian Low. It is generally associated with warmer than normal air temperatures for western Alaska and the eastern Bering Sea because of the greater frequency and strength of low pressure centers of maritime origin, and a lower incidence of high pressure centers of Siberian and Arctic origin. The distribution of anomalous sea level pressure (SLP) that occurred during the winter (December to March) of 2009/10 (Fig. 1) closely resembles the composite pattern during El Niños of the last 50–60 years.

The surface air temperatures during the winter of 2009/10 were anomalously warm for the far eastern portion of Asia, and for much of Alaska. In contrast, a localized pocket of significantly negative air temperature anomalies occurred over the southeastern Bering Sea (Fig. 2). These cool air temperatures can be attributed to the state of the underlying ocean, *i.e.*, the cold water temperatures that were a result, in part, of the anomalous water temperatures at the end of last summer (2009). Insolation during the summer was insufficient to bring the water temperatures up to the climatological mean. Thus, we observed feedback between the ocean and atmosphere where the previous year’s heat balance resulted in anomalously cold conditions which suppressed the heating of the atmosphere by the ocean in the current year. In turn, the colder air temperatures promoted the growth and southward advection of sea ice.

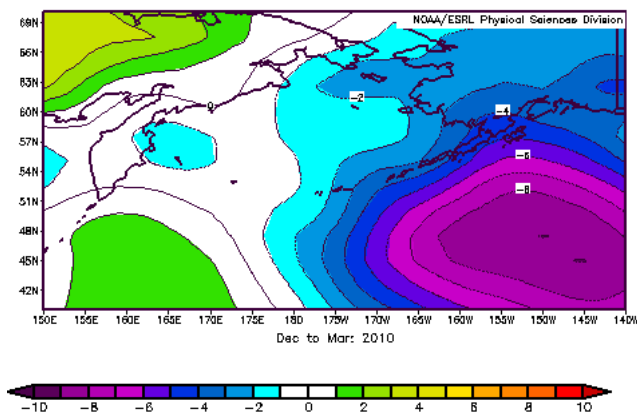


Fig. 1 Winter 2009/10 sea level pressure anomalies computed using a composite or mean sea level pressure for 1968–1998. Image provided by NOAA/ESRL Physical Sciences division (<http://www.esrl.noaa.gov/psd/cgi-bin/data/composites/printpage.pl>).

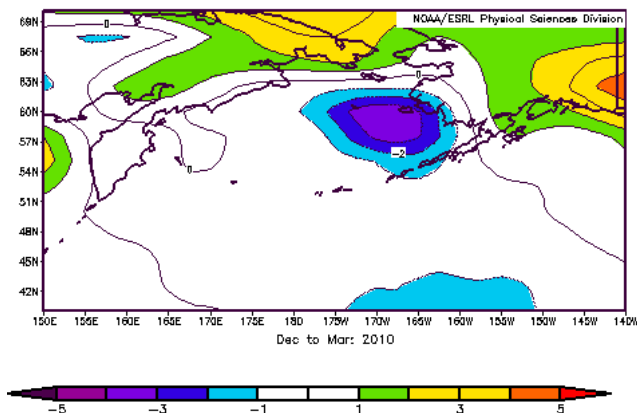


Fig. 2 Winter 2009/10 air temperature anomalies. Image provided by NOAA/ESRL Physical Sciences division.

Two other factors are hypothesized to have strongly influenced this year’s late ice retreat: a late winter cold snap and anomalous northerly winds. An extended period of unusually cold weather occurred from late February through mid-March 2010. During this period, the low-level wind anomalies were from the northwest, bringing relatively cold and dry air originating from eastern Siberia. St. Paul Island recorded air temperatures consistently 10°C lower than normal during this 3-week period. Cold-air outbreaks near the end of winter are especially effective at generating sea ice in the southern portion of the shelf.

In addition to the late winter cold snap, the eastern Bering Sea experienced anomalous northerlies in spring. The period from April 26 to May 21, 2010 included an anomalous ridge of high pressure extending from the western Bering Sea into eastern Siberia (Fig. 3). To the east of this ridge, over the southeastern Bering Sea shelf, the northerly component of

the winds averaged about 4 m/s, as compared with mean values at this time of year of ~2 m/s. An important consequence was a seasonally late advance in sea ice on the Bering Sea shelf during May 2010. The advance in sea ice in this case can be attributed to advection since air temperatures were generally near normal. Through their impacts on the distribution of sea ice during the spring bloom, these kinds of episodic weather events may be of particular importance to the ecosystem.

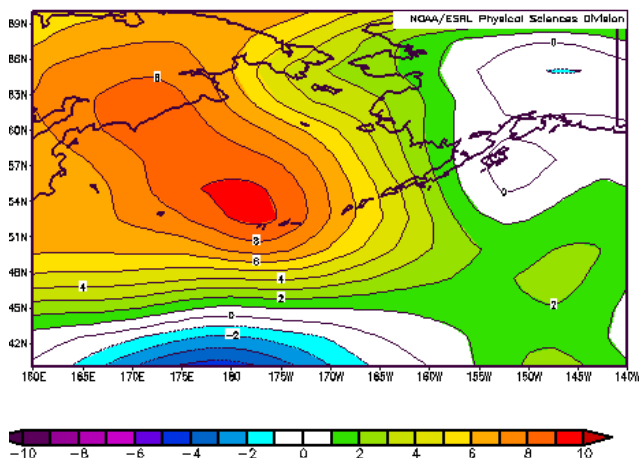


Fig. 3 Mean sea level pressure anomalies from April 26–May 21, 2010. Image provided by NOAA/ESRL Physical Sciences division.

Thus, the cold conditions this past winter in the eastern Bering Sea resulted from a series of both regional and basin-wide events, including the state of the ocean during the previous summer. The events, their timing, and magnitude all contributed to the end result – a very cold winter with delayed retreat of sea ice.

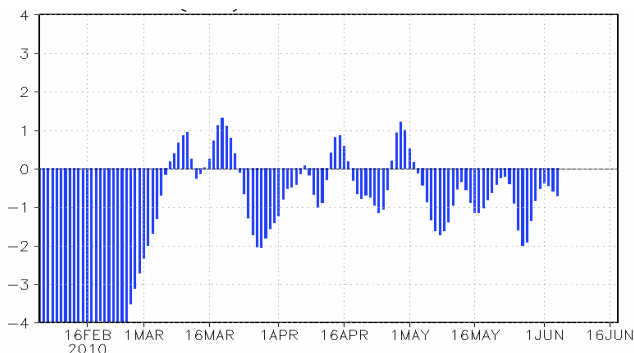


Fig. 4 Daily Arctic Oscillation Index (http://www.cpc.noaa.gov/products/precip/CWink/daily_ao_index/ao_index.html).

The indices used to characterize the climate system have been anything but static during the cool to cold period of 2006–2010 for the Bering Sea. The El Niño of 2009/10 is over and there are increasing indications, based on observational trends and a variety of model projections, that a La Niña is likely to develop by fall 2010. While the Pacific Decadal Oscillation (PDO) index was weakly positive during the first four months of 2010, it might be anticipated to trend negative due to the developing La Niña. The Arctic

Oscillation (AO) index was strongly negative through February, but has decreased in magnitude and oscillated between positive and negative values since then (Fig. 4). As reported in the last issue of PICES Press, winter values for the AO had not been of this sign and magnitude since the late 1970s.

2010 Bering Sea field season

This is the last field year for the current BEST/BSIERP partnership (see <http://bsierp.nprb.org>). Due to scheduled maintenance for the U.S. Coast Guard (USCG) Icebreaker *Healy*, the March cruise was on the USCG Icebreaker *Polar Sea*; a full report of this successful cruise is available at <http://bsierp.nprb.org/fieldwork/2010/polarsea01.html>. The spring and summer cruises are using the R/V *Thomas G. Thompson*. The spring cruise was scheduled to begin later this year than in the past two years (May rather than April), and considering the earlier predictions of an average spring in the Bering Sea, there was concern that the spring cruise would be late for initialization of the spring bloom. Mechanical issues and the Chilean earthquake further delayed the start of this cruise. However, the exceptionally late ice retreat put those concerns to rest, ironically replaced by difficulties occupying planned stations due to heavy sea ice in the intended operations area. Field reports from the spring cruise are available at <http://bsierp.nprb.org/fieldwork/2010/thompson01.html>. The summer cruise is scheduled to begin on June 17, and reports from that cruise – and from other BEST/BSIERP field, LTK, and modeling efforts – will be available on the project website.

Several of the intended spring and summer cruises to the eastern Bering Sea have been cancelled or modified. For example, after the U.S. announced that Bristol Bay was no longer open to oil exploration, funding for some cruises sponsored by the U.S. Minerals Management Service was cancelled. In addition, this year, the T/S *Oshoro Maru* (Hokkaido University, Japan) will concentrate its summer survey around the Aleutian Islands chain and will not sample the eastern Bering Sea shelf as it has done most years since 1955. There are still plans to expand an annual summer bottom trawl survey, conducted by NOAA’s Groundfish Assessment Program at the Alaska Fisheries Science Center, into the Northern Bering Sea Research Area this summer (http://www.fakr.noaa.gov/NPFMC/current_issues/ecosystem/NBSRA_files/NBSRA_outline509.pdf).

Recent developments for the Arctic

The U.S. arctic waters are still being considered as an area open to oil and gas extraction. However, in response to the emergency in the Gulf of Mexico at the Deepwater Horizon MC232 site, permit applications filed by the Shell Oil Company for exploratory drilling this summer were not granted. A large number of scientific research cruises were planned to the lease sites in this area to coincide with the

exploratory drilling. At this time, it is not clear which previously planned science projects will sample this summer.

A draft document entitled “NOAA’s Arctic Vision and Strategy” (http://www.arctic.noaa.gov/docs/arctic_strat_2010.pdf) was recently released to provide background information for the nation’s emerging ocean science efforts in the Arctic.

Upcoming science meetings

There are multiple science symposia and workshops occurring in 2010 and 2011 that may be of interest to researchers working in the Bering Sea. Some of these are:

- ESSAS Annual Science Meeting (August 30–September 2, 2010, Reykjavik, Iceland);

- PICES Annual Meeting (October 22–31, 2010, Portland, Oregon, U.S.A.);
- 5th International Zooplankton Production Symposium (March 14–18, 2011, Pucón, Chile);
- ESSAS Open Science Meeting (May 22–26, 2011, Seattle, Washington, U.S.A.).

The International Symposium on “*Climate change effects on fish and fisheries*” convened this spring in Sendai, Japan, was a huge success, bringing together fisheries scientists from all over the world (several reports from this symposium can be found in this issue of PICES Press). A special volume is planned and several of the authors of presentations on climate and fisheries in the Bering Sea, intend to submit manuscripts to that special journal issue.

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