

# The state of the western North Pacific in the first half of 2007

by Shiro Ishizaki

## Sea surface temperature

**Figure 1** shows the monthly mean sea surface temperature (SST) anomalies in the western North Pacific from January to June 2007, computed with respect to JMA's (Japan Meteorological Agency) 1971–2000 climatology. Monthly mean SSTs are calculated from JMA's MGDSST (Merged satellite and *in-situ* data Global Daily SST), which is based on NOAA/AVHRR data, microwave sensor (AQUA/AMSR-E) data and *in-situ* observations. Time series of 10-day mean SST anomalies are presented in **Figure 2** for 9 regions indicated in the bottom panel.

In January and February, SSTs were above normal, except southeast of the Kamchatka Peninsula. In particular, positive SST anomalies exceeding  $+2^{\circ}\text{C}$  were found southeast of Japan. In April, SST anomalies south and east of Japan turned to negative values. In June, negative SST anomalies exceeding  $-2^{\circ}\text{C}$  appeared southeast of Japan and around  $35^{\circ}\text{N}$ ,  $155^{\circ}\text{E}$ . Positive SST anomalies found in April along  $20^{\circ}\text{N}$  east of  $150^{\circ}\text{E}$  spread westward and intensified, and positive anomalies exceeding  $+2^{\circ}\text{C}$  appeared east of  $160^{\circ}\text{E}$  in June.

## Kuroshio and Oyashio

**Figure 3** shows the Kuroshio path for the first half of 2007, at intervals of 10 days. In January, it took a slight meander east of Kyushu Island ( $30^{\circ}\text{N}$ ,  $132^{\circ}\text{E}$ ). From the middle of February to June, the Kuroshio took a meandering path off Tokai ( $135\text{--}140^{\circ}\text{E}$ ). This meander moved eastward, and the current returned to a straight path off Tokai in late June.

**Figure 4** shows the subsurface temperatures at a depth of 100 m east of Japan for March 2007. This chart is based on the numerical ocean data assimilation system (JMA's Ocean Comprehensive Analysis System).

The Oyashio cold water (defined as temperatures less than  $5^{\circ}\text{C}$  in **Fig. 4**) is known to extend southward in spring and return northward from summer until autumn (indicated by the green line in **Fig. 5**). The coastal branch of the Oyashio cold water extended almost to its normal location in March 2007, and returned significantly northward after May (**Fig. 5**). The southernmost point in March was  $39.0^{\circ}\text{N}$ ,  $143.0^{\circ}\text{E}$ , which is 50 km north of the normal location.

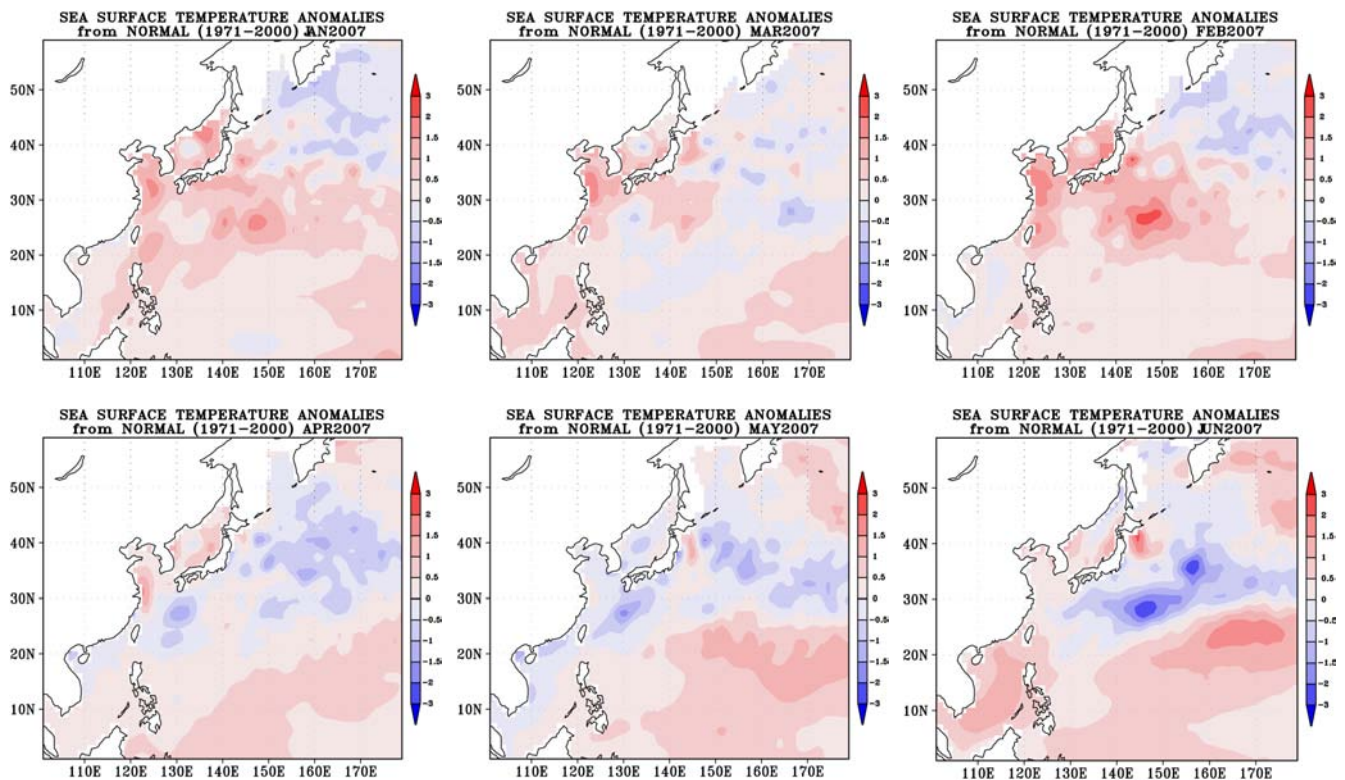


Fig. 1 Monthly mean sea surface temperature anomalies ( $^{\circ}\text{C}$ ) from January to June 2007. Anomalies are deviations from JMA's 1971–2000 climatology.

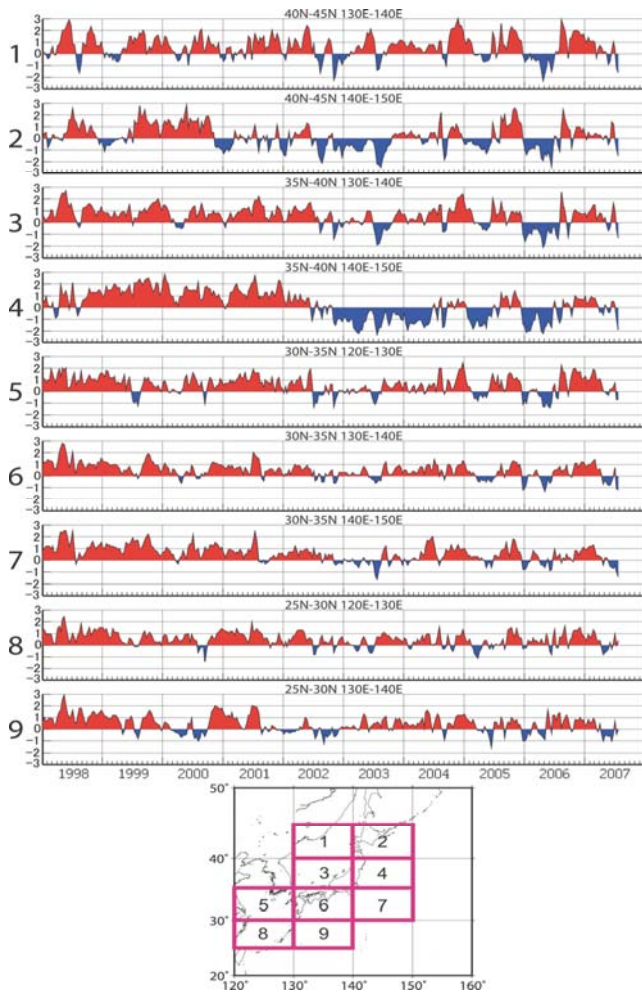


Fig. 2 Time series of 10-day mean SST anomalies ( $^{\circ}\text{C}$ ) averaged for the sub-areas shown in the bottom panel. Anomalies are deviations from JMA's 1971–2000 climatology.

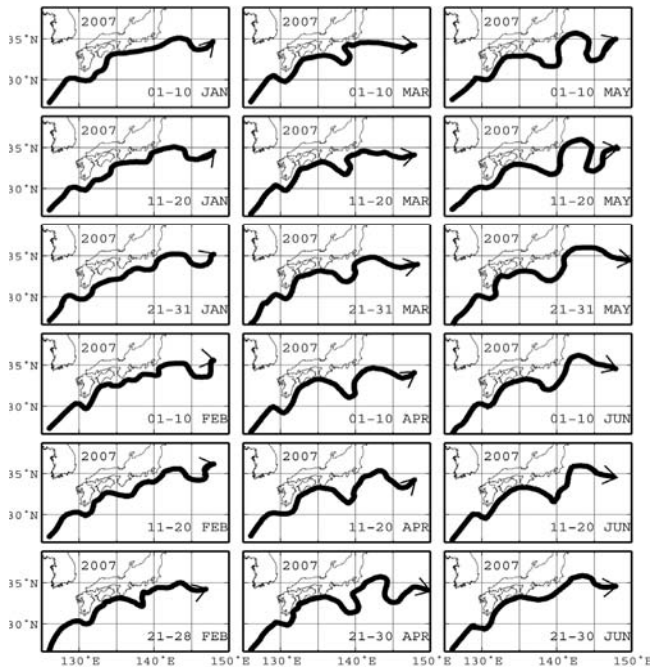


Fig. 3 Location of the Kuroshio path from January to June 2007.

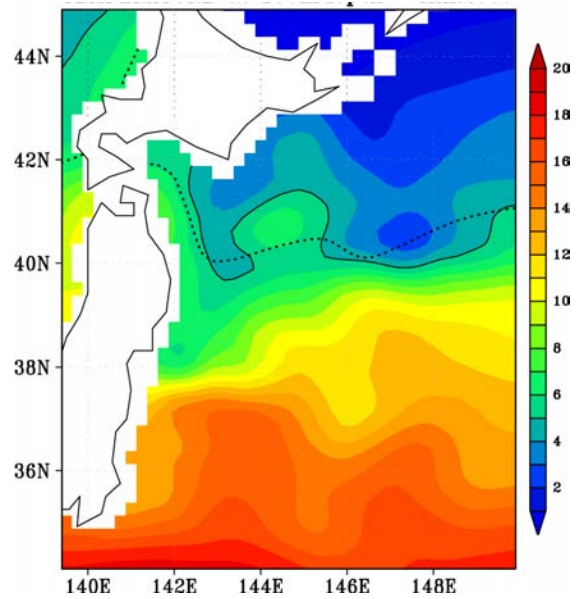


Fig. 4 Subsurface temperatures ( $^{\circ}\text{C}$ ) at 100 m depth east of Japan for March 2007. The solid line denotes the  $5^{\circ}\text{C}$  isotherm and the dotted line is its climatology (averaged values from 1971 to 2000).

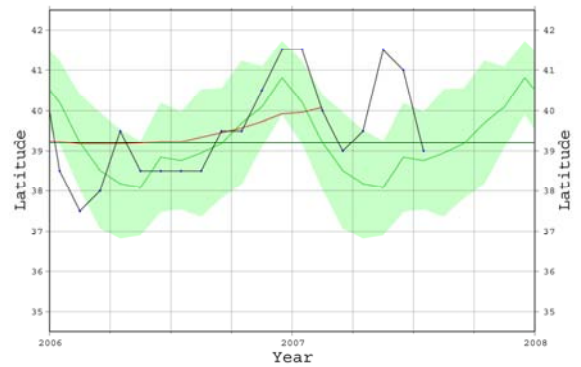


Fig. 5 The southernmost position of the coastal branch of the Oyashio cold water from January 2006 to July 2007 (black line), and the 30-year averaged values (green line), with the range of one standard deviation (green area) from 1971 to 2000.

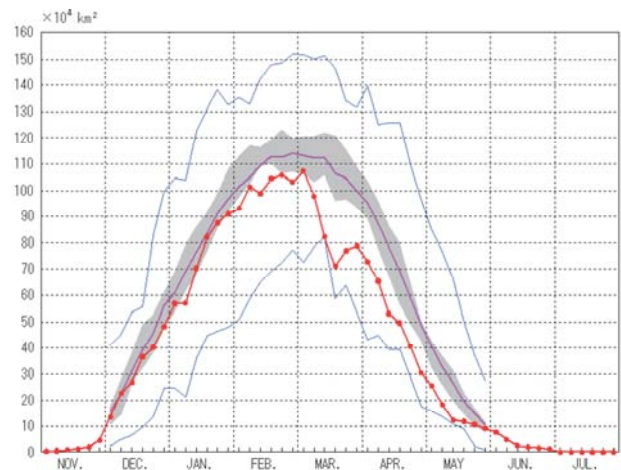


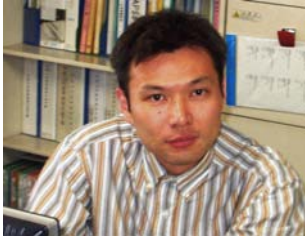
Fig. 6 Time series of sea ice extent in the Sea of Okhotsk from November 2006 to July 2007 (red line: 2006–2007 analysis; pink line: JMA's 1971–2000 climatology; blue lines: maximum/minimum sea ice extent since 1971; gray area: normal range).



## Sea ice in the Sea of Okhotsk

The extent of sea ice in the Sea of Okhotsk was below normal (30-year averaged values from 1971 to 2000) throughout the period from December 2006 to May 2007 (Fig. 6). After reaching its seasonal maximum of  $107.3 \times 10^4 \text{ km}^2$  on March 5 (the normal value is  $122.8 \times 10^4$

$\text{km}^2$ ), the sea ice area rapidly decreased to a near-record minimum. Sea ice conditions for March 2007 show a rapid retreat of the sea ice edge over the northern and eastern Sea of Okhotsk. The accumulated sea ice extent, defined as the sum of the 5-day sea ice areas from December to May, was  $2153.4 \times 10^4 \text{ km}^2$  (the normal value is  $2574.3 \times 10^4 \text{ km}^2$ ).



Shiro Ishizaki ([s\\_ishizaki@met.kishou.go.jp](mailto:s_ishizaki@met.kishou.go.jp)) is a Scientific Officer of the Office of Marine Prediction at the Japan Meteorological Agency (JMA). He works as a member of a group in charge of oceanic information in the western North Pacific. Using the data assimilation system named "Ocean Comprehensive Analysis System", this group provides an operational surface current prognosis (for the upcoming month) as well as seawater temperature and an analysis of currents with a  $0.25 \times 0.25$  degree resolution for waters adjacent to Japan. Shiro is now involved in developing a new analysis system for temperature, salinity and currents, that will be altered with the Ocean Comprehensive Analysis System.

## PICES Calendar

- Inter-sessional meeting of PICES Working Group on *Ecosystem-based management science and its application to the North Pacific* (WG 19), February 21–22, 2008, Seattle, U.S.A.
- Inter-sessional meeting of PICES Working Group on *Non-indigenous aquatic species* (WG 21) to evaluate the protocols and reach final agreement on standards, data elements and data entry templates for the MIS (Marine/Estuarine Invasive Species) Database for the project on "Development of the prevention systems for harmful organisms' expansion in the Pacific Rim", March 3–5, 2008, Busan, Korea.
- ICES/PICES meeting on "Environmental interactions of mariculture", April 14–18, 2008, Victoria, Canada.
- Workshop of PICES *Climate Forcing and Marine Ecosystem Response* (CFAME) Task Team on "Linking and visualizing climate forcing and marine ecosystem changes: A comparative approach", April 15–17, 2008, Honolulu, U.S.A.
- Inter-sessional Science Board meeting and Workshop to develop an Implementation Plan for the new PICES integrative scientific program, FUTURE, April 23–25, 2008, Seattle, U.S.A.
- International Symposium on "Effects of climate change on the world's oceans" (primary sponsors: ICES, PICES and IOC; co-sponsoring organizations: GLOBEC, SCOR, WCRP, DFO, NOAA, NASA, KORDI, The City of Gijón, Port Authority of Gijón, Spanish Science Foundation), May 19–23, 2008, Gijón, Spain.
- International Symposium on "Coping with global change in marine social-ecological systems" (primary sponsors: GLOBEC, EUR-OCEANS and FAO; co-sponsoring organizations: IRD, IFREMER PICES, SCOR, IMBER, ICES), July 8–11, 2008, Rome, Italy.
- Second PICES Summer School on "Biomass-based management", August 22–25, 2008, Hakodate, Japan.
- International Symposium on "Herring: Linking biology, ecology and status of populations in the context of changing environments" (primary sponsors: ICES, PICES and GLOBEC), August 26–29, 2008, Galway, Ireland.
- Fourth PICES Workshop on "The Okhotsk Sea and adjacent areas", August 27–29, 2008, Abashiri, Japan.
- ESSAS/PICES Workshops at the ESSAS Annual Meeting, September 15–19, 2008, Halifax, Canada.
- ICES/PICES Theme Sessions on "Coupled physical and biological models", "Marine spatial planning in support of integrated management – tools, methods, and approaches" and "New methodology for tracking fish, mammals and seabird migrations and behaviour" at the ICES Annual Science Conference, September 22–26, 2008, Halifax, Canada.
- PICES/ICES Theme Session on "The effects of ocean acidification on fisheries and ecosystems" at the International Symposium on "The Ocean in a High CO<sub>2</sub> World – II" (primary sponsors: SCOR, IOC, IAEA and IGBP), October 6–8, 2008, Monaco.
- PICES Seventeenth Annual Meeting, October 23–November 2, 2008, Dalian, China.
- Sixth International Conference on "Marine bioinvasions" (primary sponsors: PICES, ICES and the U.S. National Sea Grant College Program), summer of 2009, Portland, U.S.A.
- Third PICES Summer School on "Recent methods of investigating red-tide organisms and controlling red tides", August 2009, Busan, Korea.
- ICES/PICES Symposium on "Rebuilding depleted fish stocks: Biology, ecology, social science and management strategies", September 2009, Hamburg, Germany.
- PICES Eighteenth Annual Meeting, October 23–November 2, 2009, Busan, Korea.