

Fisheries and ecosystem responses to recent regime shifts

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Dr. Jacquelynne King is a research scientist in Groundfish Stock Assessment, at the Pacific Biological Station in Nanaimo, Canada. Her research focuses on the impacts of climatic and oceanographic variability on marine fish population dynamics and the implications for fisheries management. She has published research on a suite of disciplines including marine fish life history strategies, statistical methodology, climate impacts on ecosystems, aging methodology, stock assessment, fish population dynamics and behavioural ecology. Dr. King chairs the PICES Study Group on Fisheries and Ecosystem Responses to Recent Regime Shifts, and is also a member of the PICES WG 16 on Climate Change, Shifts in Fish Production, and Fisheries Management.



At last year's PICES Annual Meeting, Science Board formed a Study Group to address a formal request made by the United States government, asking for scientific advice on the implications of the 1998 regime shift for fisheries. This is the first such formal request for scientific advice made to PICES by a member nation. The request is a clear recognition of PICES' expertise and scientific leadership on the topic of ecosystem regime shifts, and represents an exciting new direction for the Organization.

Following the strong 1997-1998 El Niño, the North Pacific climate underwent a rapid and striking transition, the persistence of which suggests that a regime shift has occurred (Fig. 1, taken from Bond, J.A., J.E. Overland, M. Spillane and P. Stabeno. 2003. Recent shifts in the state of the North Pacific. *Geophys. Res. Lett.* 30(23): 2183-2186). Upwelling-favorable winds strengthened over the California Current (CC), and the Pacific Decadal Oscillation (PDO) reversed sign and remained negative through the summer of 2002. In the northern CC, the zooplankton biomass doubled and switched from a prevalence of warm-water species to cold-water species. Coho and chinook salmon stocks rebounded, and anchovy and osmeriid stocks increased. Previous regime shifts have had serious implications for ecosystems, and consequently for fish populations and the fishing industry. As such, the National Marine Fisheries Service has requested scientific advice from PICES that addresses six specific questions:

1. Has the North Pacific shifted to a different state or regime since the late 1980s?
2. What is the nature of the new state?
3. What are the ecosystem responses?
4. How long can the shift be expected to last?
5. Is it possible to predict when the regime will shift back and what indicators should be used to determine when it happens?
6. What are the implications for the management of marine resources?

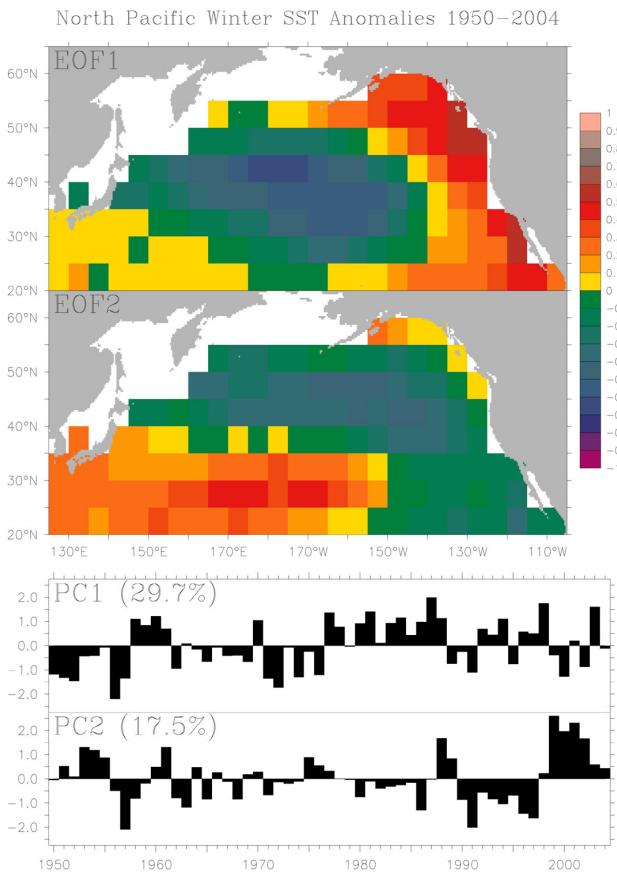


Fig. 1 Principal Component Analysis of North Pacific winter (November – March) SST fields north of 20°N. The first EOF corresponds to the Pacific Decadal Oscillation pattern, and its evolution over time is represented by PC1. The evolution of the second EOF pattern shows large magnitudes since the 1990s with a shift to large positive values in 1999-2002.



Fig. 2 Participants of the Study Group organizational meeting on February 9-10, 2004, in Victoria, Canada (from left to right): Franklin Schwing, Suam Kim, William Crawford, Ian Perry, Akihiko Yatsu, Alec MacCall, Nathan Mantua, David Mackas, James Overland, Gordon McFarlane, Jacquelynne King, Jake Schweigert, Harold Batchelder and Jennifer Boldt.

In December 2003, a Study Group on *Fisheries and Ecosystem Responses to Recent Regime Shifts* (FERRRS) was formed. Jacquelynne King (Canada) was appointed to chair this group, and was joined by PICES scientists from Canada (William Crawford, David Mackas, Gordon McFarlane and Jake Schweigert), People's Republic of China (Qi-Sheng Tang and Jin-Ping Zhao), Japan (Akihiko Yatsu), Republic of Korea (Suam Kim), Russian Federation (Victor Lapko), the United States of America (Harold Batchelder, Jennifer Boldt, Anne Hollowed, Alec MacCall, Nathan Mantua, James Overland, Jeffrey Polovina and Franklin Schwing) along with PICES ex-officio members (Alexander Bychkov, Stewart (Skip) McKinnell and Ian Perry).

The Study Group held its first meeting on February 9-10, 2004, in Victoria, Canada. The meeting was well attended (14 of 18 official members and 3 ex-officio members), and the group was able to organize an approach to tackle the task. The Study Group will provide the PICES Science

Board with a formal report, addressing the six questions posed by the United States government. The Study Group will rely on published literature and data, as well as any current, yet unpublished data, to formulate its advice. The anticipated completion of the report is August 2004, and a draft outline of the report, with general chapter topics, can presently be viewed through the PICES website.

The next meeting for FERRRS will be a 3-day workshop, to be held June 14-16, 2004, in Seattle, U.S.A. At this workshop, Study Group members will present the sections of the report that they are responsible for developing. The Study Group as a whole will review each section and provide feedback and guidance for revisions to all sections of the report. A major focus for the workshop will be the description of coherent regional responses to the 1998 regime shift, and the development of advice on resource management approaches. The workshop will provide the opportunity for the Study Group to formulate a collective response to the six questions of the US request for advice.

PICES Interns

PICES offers sincere thanks to Mr. Chuanlin Huo (National Marine Environmental Monitoring Center, State Oceanic Administration), the 2003-2004 PICES intern, who completed his term at the Secretariat at the end of May, and has returned to China. We are very grateful for his dedicated work during this past year.

We are pleased to welcome Mr. Gong-Gu Back (National Oceanographic Research Institute, Ministry of Maritime Affairs and Fisheries) Seoul, Korea, to the Secretariat as the Fifth PICES Intern. Mr. Back was behind the scenes helping us out at the Twelfth Annual Meeting in Seoul last year, and you will see him again at PICES XIII in Honolulu this year!



Mr. Gong-Gu Back and Mr. Chuanlin Huo together at PICES XII in Seoul, Korea, in October 2003.