

## New PICES Jellyfish Working Group Formed

by Richard Brodeur and Shin-ichi Uye

Similar to many other regions in the world, the North Pacific Ocean and surrounding marginal seas have experienced high numbers of jellyfish in recent years, culminating in massive blooms in some coastal areas. This region is among the most productive in the world in terms of fisheries catch, and many millions of people, especially those living in Asia, are dependent on the ocean for their nutritional needs. Scientists and managers have become increasingly concerned about the potential rise in the prevalence and magnitude of jellyfish blooms in recent years, and their potential impact on ecosystem services such as fisheries, tourism, and power generation. PICES has long recognized the importance of gelatinous zooplankton in marine ecosystems and the present limitations to our understanding of what initiates and maintains the blooms and their effects on other marine resources, and scientists from PICES member countries plan to work together to promote understanding and propose solutions to problems affecting the North Pacific. At the 2010 PICES Annual Meeting, a new Working Group on *Jellyfish Blooms around the North Pacific Rim: Causes and Consequence* was established with the explicit goal of bringing together experts from the member countries to address this issue and come up with potential solutions to reverse the increasing trend in jellyfish blooms in coastal waters. The terms of reference and the membership of the Group can be found at [http://www.pices.int/members/working\\_groups/wg26.aspx](http://www.pices.int/members/working_groups/wg26.aspx).

The Working Group met for the first time this past October in Khabarovsk (Russia), in conjunction with the 2011 PICES Annual Meeting. Fourteen out of 20 Working Group members attended this inaugural meeting. In order to grasp the general status of the jellyfish blooms around

the North Pacific Rim, information about current and past jellyfish blooms and related research was presented for each member country.

Lucas Brotz (University of British Columbia, Canada), found that jellyfish have fluctuated over recent decades but have not shown any significant increases in Canadian Pacific coastal waters. He followed this with a presentation on trends in global jellyfish blooms, based on various sources of information from scientific literature to mass media articles. His results suggest that jellyfish have increased globally in recent decades with some certainty in about 70% of 64 Large Marine Ecosystems of the world, and these increases seem to be related to human impacts.

China currently runs two big national projects on jellyfish blooms. Siqing Chen (Yellow Sea Fisheries Research Institute) described the project on “*Key Processes, Mechanism and Ecological Consequences of Jellyfish Bloom in Chinese Coastal Waters*” that aims to understand the causes of jellyfish blooms in Chinese waters and their impacts on the ecosystem. Zijun Xu (North China Sea Environmental Monitoring Center, State Oceanic Administration) explained another project, focusing mainly on the establishment of a monitoring system for early warning of possible jellyfish blooms and determining techniques for minimizing their impacts on human society.

Japanese waters are substantially affected by jellyfish blooms, most intensively by the moon jellyfish *Aurelia aurita* and the giant jellyfish *Nemopilema nomurai*. Japanese scientists are examining the jellyfish problems under two major projects. Hideki Akiyama (Seikai National Fisheries



Group photo taken during a banquet after the 2011 Working Group 26 meeting. Front row from left: C. Han (Korea), J. Purcell (U.S.A.), S. Uye (Japan), E. Dulepova (Russia), K. Cieciel (U.S.A.) and Z. Xu (China). Back row from left: G. Liu (China, non-member), S. Chen (China), A. Zavolokin (Russia), L. Brotz (Canada), X. Pu (China), Y. Xu (China, non-member) and J. Field (U.S.A.). Missing from photo: H. Akiyama and H. Ishii (Japan).

Research Institute) reported on the China-Japan-Korea International Giant Jellyfish Bloom Project, which includes a monitoring component and development of predictive indices. Shin-ichi Uye (Hiroshima University) summarized the results from the project entitled “*Studies on Prediction and Control of Jellyfish Outbreak*” (STOPJELLY), which aims to understand factors leading to the blooms, predict their severity, and develop chemical and biological methods to control jellyfish populations.

Representing Korea, Changhoon Han (National Fisheries Research and Development Institute) explained that his country is also suffering from jellyfish blooms, with a total economic loss of \$265 million US in an intense bloom year. The Korean government has established a Jellyfish Monitoring and Countermeasure Center to tackle this problem and has initiated a program to minimize jellyfish damage to fisheries and tourism.

Alexander Zavolokin (Pacific Research Institute of Fisheries and Oceanography) reported that Russian scientists have been studying jellyfish (mainly taxonomic composition, abundance and biomass) since 1990 in the western Bering Sea, Okhotsk Sea and other Russian waters by trawl netting, sampling more than 10,000 stations in these regions. According to the results of their studies, the annual jellyfish biomass has fluctuated widely but did not show any consistent trends in the Bering Sea or Okhotsk Sea.

Jennifer Purcell (Shannon Point Marine Center, Western Washington University, U.S.A.) updated the jellyfish biomass in the eastern Bering Sea, where the jellyfish data have been consistently monitored since 1979. Biomass increased in the 1990s and declined substantially for 8 years after 2000, but has surged again since 2009. She also presented the geographical distribution of jellyfish along Puget Sound, where they are more abundant in waters adjacent to more populated cities, indicating some positive effects by human activity on jellyfish population increase. Finally, studies along the U.S. west coast were summarized, which have attempted to link jellyfish biomass with environmental changes.

The Working Group will be active for at least the next 3 years and is planning to sponsor symposia and workshops at future scientific meetings. A Topic Session on “*Jellyfish in marine ecosystems and their interactions with fish and fisheries*” has been proposed and approved by Science Board for the 2012 PICES Annual Meeting to be held in Hiroshima, Japan, and will be co-sponsored by ICES. The Working Group hopes to sponsor collaborative research cruises among PICES member countries in the future and suggest ways to adapt to, or control, jellyfish blooms. Anyone who has data from within the PICES study region to contribute to the Working Group report is welcome to contact members of the Group.



*Dr. Richard Brodeur (Rick.Brodeur@noaa.gov) is a Research Fisheries Oceanographer working in the Fish Ecology Division of the Northwest Fisheries Science Center, NOAA Fisheries, and is based in Newport (Oregon, U.S.A.). Ric began his career working on early life history and recruitment dynamics of walleye pollock in the Gulf of Alaska and Bering Sea for the Alaska Fisheries Science Center and became interested in jellyfish following their dramatic increase in that ecosystem. He came to Oregon to work on habitat preferences and trophic ecology of juvenile salmon and other pelagic fishes as well as recruitment processes in marine fishes. He has published on a variety of topics ranging from satellite oceanography to fish bioenergetics to fisheries acoustics, but has focused much of his research on feeding and food web interactions in the pelagic ecosystem. Ric has been heavily involved in PICES, serving on several committees and expert groups and organizing a number of special sessions and workshops at past meetings. He serves now as a Co-Chairman of the PICES Working Group on Jellyfish Blooms around the North Pacific Rim: Causes and Consequence.*

*Dr. Shin-ichi Uye (suye@hiroshima-u.ac.jp) is a Professor of biological oceanography at Hiroshima University. He initially studied zooplankton production ecology through intensive research on the population dynamics and productivity of major copepod species in Japanese coastal waters. Around 1990, he noticed a significant increase of unhealthy copepods coated in jellyfish mucus, and then gradually shifted his research interest to jellyfish biology. Shin-ichi is now involved in two Japanese jellyfish research projects: Studies on Prediction and Control of Jellyfish Outbreak (STOPJELLY) and the China-Japan-Korea International Project on the Giant Jellyfish Bloom. He was former President of the Plankton Society of Japan (2001–2004) and former President of the World Association of Copepodologists (2005–2008). Shin-ichi was awarded the Oceanographic Society of Japan Prize in 2010 for his advancement of zooplankton research, particularly on their functional roles in coastal marine ecosystems. He now serves as a Co-Chairman of the PICES Working Group on Jellyfish Blooms around the North Pacific Rim: Causes and Consequence.*