

Summary Report

8th U.S.-China Living Marine Resources Panel Joint Coordination Meeting

June 13-15, 2011

Dr. Ned Cyr, United States Chair, opened the U.S.-China Living Marine Resources Panel and provided opening remarks on behalf of the U.S. delegation. Dr. Cyr recognized that the Panel had not met since October 2007 and that it was his hope that through this meeting that the Panel would be reinvigorated and that specific joint activities could be identified. Ms. Liu Qing, Chinese Chair thanked the U.S. delegation for their preparation for the Panel meeting. Ms. Liu emphasized the importance of living marine resources to the Chinese. China faces a number of challenges that include overfishing, protection of the marine environment and providing high-quality aquaculture products, and restoration of habitat. Development of a sustainable marine economy is of extreme importance. Both Dr. Cyr and Ms. Liu recognized the draft Five-year Framework that was proposed by the State Oceanic Administration at the 18th Joint Working Group Meeting on Cooperation in Marine and Fishery Science and Technology Protocol held in Beijing in March 2011. The Chinese and U.S. delegations introduced themselves and provided their affiliations, responsibilities, and scientific interests (See Appendix 3 for the delegation lists). Previous joint activities between China and the United States were emphasized.

Dr. Cyr provided an overview of the agenda and topics for the Panel meeting. The agenda was adopted (see Appendix 2) without changes or objections.

U.S. and Chinese Government Systems and Policies for Supporting Living Marine Resource Management

Dr. Ned Cyr provided an overview presentation on the National Oceanic & Atmospheric Administration (NOAA) and NOAA Fisheries Service. Ms. Liu Qing provided an overview presentation on fisheries and Living Marine Resources management in China. The presentations highlighted national fisheries, agency organization and responsibilities, important fisheries/living marine resources laws, enforcement, and priority research organizations and their respective research focus.

Climate Impacts on Living Marine Resources

Roger Griffis, NOAA Fisheries, gave a presentation on Climate and Vulnerability Assessments for Fisheries. The key points of this presentation were the U.S. Strategic Framework to assess and respond to climate change impacts, the variety of NOAA climate research and management activities, and areas for possible collaboration. Examples on climate change/variability and the impacts on fisheries (distribution

shifts, fishery yields), and fisheries management were highlighted. Potential areas of interest include past climatology, regional forecasts of climate change and variability, coupling climate-ocean-ecosystem models, and assessing the vulnerability of fisheries (rapid vulnerability assessment protocols, understanding of species and ecosystem responses, and targeted modeling).

Prof. Chen Xuezhong, Director, East China Sea Fisheries Research Institute, CAFS, gave a presentation entitled "Climate Change and Its Impact on Fisheries: Research Progress in China." The presentation highlighted the importance of global climate change to the Chinese government and the impacts of climate change on the fish and fisheries of China. Sea surface temperature change in the East China Sea has experienced a dramatic increase in temperature (about 1.5 °C since 1985) which has resulted in an increase in the frequency of algal blooms and a decline in coastal fisheries. The total biomass and abundances of some zooplankton species have decreased which is resulting in distribution shifts of important fisheries. Research in China on the impacts of climate change on fish migrations has been mostly qualitative. Production levels of fisheries have been steadily declining. Suggested cooperation includes (1) effects of global climate change on oceanic commercially important species, (2) population dynamics of *Euphausia pacifica*, and its response mechanism to global climate change (a comparison study between the west and east sides of the North Pacific Ocean), and (3) combined effects of ocean acidification and ocean warming on the biochemical composition and breeding of economically important fish from the East China Sea. Research in China has focused on the impacts of ocean temperature on phytoplankton and zooplankton. Dr. Cyr highlighted the importance of looking at all of the various impacts that will result from climate change. Dr. Chen Xuezhong also indicated that there has been significant amounts of research on the impacts of climate change on coastal regions, including estuaries and related watersheds, however more research is needed and should include open ocean research as well.

In the United States, assessment of the vulnerability of fisheries to climate change and modeling are important areas of research. An invitation was extended by Dr. Chen Xuezhong to have U.S. scientists visit China to collaborate on the climate impacts on *Euphausia pacifica*. Dr. Cyr indicated that this is something that should be pursued. A question on carbon sequestration of the ocean ("blue carbon") was raised by Ms. Liu. With respect to carbon sequestration, the U.S. will provide additional information on research assessing methods and approaches for estimating carbon storage and sequestration of carbon by coastal habitats, such as salt marshes, mangrove forests and sea grasses.

Ocean Acidification Impacts on Living Marine Resources

A presentation entitled "Assessment and Monitoring of Ecological, Biodiversity, and Fisheries Impacts of Ocean Acidification" was given by Dr. Rusty Brainard, Pacific

Islands Fisheries Science Center and Dr. Mike Sigler, Alaska Fisheries Science Center. Predicted reductions in the calcium carbonate saturation of seawater will make it difficult for some calcifying organisms to survive during certain life history stages. NOAA is currently doing spatial surveys, time series observations, and modeling on seawater carbonate chemistry and ecological impacts of acidification. NOAA has developed Autonomous Reef Monitoring Structures (ARMS) and deployed them to monitor changes in benthic community composition. The deployment of ARMS could be used to monitor and assess Chinese coastal waters. In Alaska, the Pacific Northwest, and the northeast U.S., ocean chemistry is being monitored, experiments are being performed on a range of taxa, and population models and forecasts are being developed. Limited research has been done on ocean acidification impacts on fishery resources in China, but there is interest in collaboration in this area.

Potential collaboration proposed by Dr. Brainard and Dr. Sigler included (1) monitoring carbonate chemistry in Chinese coastal coral reefs, (2) monitoring biodiversity and community structure in Chinese coastal coral reefs using ARMS, (3) monitoring recruitment and calcification in Chinese coastal coral reefs using NOAA Calcification Acidification Units (CAUs), and (4) scientist exchanges to support the above research.

Dr. Chen Xuezhong gave a presentation, “Impact of Ocean Acidification and Ocean Warming on the Biochemical Composition and Breeding of Economically Important Fish from the East China Sea,” on behalf of a postdoctoral researcher, Zheng Yangqiao, at the East China Sea Research Institute, CAFS. The presentation highlighted research on ocean acidification impacts on fishery composition, physiology, and reproductive capability of fish. Potential collaboration that was identified includes: (1) research on the biochemical composition of fish from the East China Sea, and (2) the response of hatching rates of fish to ocean acidification and ocean warming at the molecular level (genetic damage).

Research has been conducted by NOAA on the combined impacts of increased temperature and acidification on coral reef and other species. Dr. Cyr suggested that scientists from both countries explore this area of research along with biodiversity and carbonate chemistry.

Aquaculture

A presentation on Integrated Multi-Trophic Aquaculture (IMTA) in Sanggou Bay, China was given by Mao Yuze, Yellow China Sea Fisheries Research Institute, CAFS. As of 2001, nearly 40% of fishery products in China come from mariculture and it continues to increase. Shellfish and macroalgae make up the largest share of the mariculture production in China. China will need to double its seafood production by 2020 to meet the demand. China is using Integrated Multi-Trophic Aquaculture (IMTA) to take full advantage of nutrients and energy and provide environmental

benefits. An IMTA model (it should be noted that the Chinese IMTA model is a basin/industry wide approach whereas the North American model typically refers to a single integrated operation) was developed for Sanggou Bay in north China. Over 150 publications have resulted from research performed in Sanggou Bay. Kelp aquaculture and shellfish comprise over 90% of the production in Sanggou Bay. Potential cooperation fields include (1) impact of mariculture on ecosystems and the environment, and (2) ecologically-based mariculture models and technologies.

Dr. Huang Honghui, South China Sea Fisheries Research Institute, CAFS gave a presentation on IMTA in Sub Tropical Bays. An overview of Chinese mariculture was provided and the predominant species and regions for mariculture were highlighted. Increased mariculture production has resulted in increased pollution, disease, and negative environmental impacts, yet increased mariculture production will be needed to keep up with projected food demands. A major challenge for China is to increase production while at the same time decrease environmental impacts. IMTA is a primary focus for addressing this challenge. Examples of IMTA models were presented. Potential areas of collaboration included: (1) IMTA model construction (to help determine the optimum number of species and diversified trophic levels and biogeochemical circulation), (2) ecological-environment and IMTA systems assessment (application to food webs including energy and nutrient cycling), (3) assessment of aquatic organism health when IMTA is applied.

A presentation on the effects and assessment of environmental estrogens (EEs) on the health of commercial fish species and their habitat in mariculture areas was given by Dr. Zhang Yusheng, Third Institute of Oceanography, State Oceanic Administration. Long term impacts on macrofauna such as fish are of significant concern given that people ingest the fish and may be impacted by EEs as well. Proposed cooperative study includes developing biomarkers with application to monitoring the effect of EEs on the health of commercial fish, assessing the effects in mariculture areas and developing a strategy of preventing and controlling the effects. Dongshan Island, Fujian, China would serve as an ideal location given its high biodiversity and suitability for aquaculture of commercial fish and shellfish. Thus the mariculture area around the Dongshan Island will be a good site for the study.

Ms. Liu gave a presentation on the management of shellfish mariculture. Issues include contamination of shellfish by heavy metals, accumulation of toxins and pollution, and the banned imports of Chinese shellfish in 1997 by the European Union. China wants to reopen export markets by focusing on preharvest methods (e.g. monitoring and surveillance for quality control) to improve shellfish quality. The goal is to manage the environment in which mariculture occurs. Ms. Liu and Dr. Cyr agreed that this might be an area for future discussion.

Mr. David O'Brien provided an overview on NOAA marine aquaculture activities. Mariculture in the U.S. is focused on shellfish and some finfish such as salmon.

Aquaculture production has not increased significantly in the U.S. in 20 years, despite large increases in production worldwide during that time. The U.S. imports 84% of its seafood, and there is a \$10 billion seafood trade deficit, so there is a desire to increase domestic production in the U.S. However, there is also a concern regarding the environmental impacts of increased production. In June 2011, NOAA and the Department of Commerce released new aquaculture policies. These policies emphasize working with international partners to develop and promote sustainable aquaculture practices to create jobs and protect the environment.

Dr. Mike Rust, NOAA Fisheries and Dr. Jeffrey Silverstein, U.S. Department of Agriculture (USDA), gave a presentation on U.S. Aquaculture Research and Development. Economics, environment, and human health are major considerations for sustainable aquaculture. Key research areas includes: (1) feeds and nutrition (includes fishmeal replacement, fish health, pollution reduction, nutrient requirements, and genetics), (2) aquaculture and the environment (includes models, carbon, recirculating systems, cost assessments, IMTA, climate change impacts, and stock enhancement), (3) genetics (includes selective breeding, genomics, conservation genetics, and metagenomics), (4) fish health (includes genetics, physiology and nutrition; vaccines development, disease management). Ongoing collaboration between USDA and a variety of institutions in China was also highlighted (similar collaborations exist with NOAA labs and China but were not highlighted). Potential collaboration includes specific meetings with experts from each country focused on one or more of the above key research topics.

Dr. Jingjie Chu from the World Bank provided an introduction to the World Bank fisheries program. The World Bank has developed fishery performance indicators and the next step will be to develop aquaculture performance indicators. “Fish to 2030” is a project that will model and predict global seafood supply and demand in the year 2030. The World Bank is interested in developing a sub-model for Asia and China and is interested in collaborating with Chinese officials on this effort. Work on risk assessment for aquaculture activities is also underway.

Discussion followed the presentations addressing many of the topics covered in the presentations. Ms. Liu Qing provided some summary and closing remarks for the session. In her remarks, she stated that points of contact for the various topics that were covered should be identified. Dr. Cyr invited specific activities for joint collaboration. NOAA is interested in collaborating on model development and validation, including models related to IMTA, but requires discussion with specific researchers before developing any detailed proposal. Dr. Jeff Silverstein identified fish health and disease as potential areas of collaboration. Specific areas for collaboration might be co-infections and vaccine development. Mr. David O’Brien indicated that another area of potential collaboration that would involve the World Bank would be “Fish to 2030.” Dr. Jim Anderson, World Bank, emphasized the importance of the Fish to 2030 initiative. The World Bank is also initiating a project

on disease management with application to aquaculture to minimize impacts on aquaculture. Dr. Ned Cyr mentioned that the sanitation of seafood produced from aquaculture might be a good area for potential collaboration between the U.S. and China. Ms. Liu highlighted the importance of disease prevention and the development of vaccines in China and indicated that this would be a good area of collaboration. Ms. Liu indicated an interest by China in working with the World Bank on Fish to 2030 and identified the following specific projects for consideration: (1) Comparative assessment of marine bay habitats in the U.S. and China (development of assessment models - Chesapeake Bay was proposed as a study site), (2) sea ranching and stock enhancement on benthic habitats (including reef habitats), (3) shellfish monitoring and assessment (preproduction with the development of indicators), (4) environmental estrogens, and (5) marine biotechnology.

Harmful Algal Blooms (HABs)

Dr. Robert Magnien, NOAA National Ocean Service, gave a presentation on Harmful Algal Blooms (HABs) Research in the U.S. and Links to International Efforts. Dr. Magnien identified HAB distribution and specific types of blooms and the toxins they produce. He referred to U.S. legislation, the Harmful Algal Bloom and Hypoxia Research and Control Act (HABHRCA), and identified research priorities for HABs. A number of national programs were described including ECOHAB; Monitoring and Event Response of HABs (MERHAB); and Prevention, Control and Mitigation of HABs (PCM). The IOC Intergovernmental Panel on Harmful Algal Blooms (IPHAB) was also described. The United States also works with other international groups such as GEOHAB and ICES. As the Chair of IPHAB, Dr. Magnien extended an invitation to the Chinese delegation to participate on IPHAB and its activities. Ms Liu indicated that there are increasing HABs and other algal blooms in Chinese coastal waters and in large lakes (blue-green algae blooms). Red tides are the greatest problem for Chinese mariculture and fisheries with seafood quality, safety, and health identified as priority areas of concern. Monitoring and the ability to predict and issue warnings are priorities. Climate change may be contributing to the increased number of red tide events. SOA has a major responsibility for HABs.

Last year there were over 80 HAB events in China. Prevention of red tide events is important and research on different types of algae is ongoing. The goal is to work towards a mechanism to prevent red tides. CAS launched several key projects to deal with HABs. Chemicals and clays are being used to help clean up lakes. Dr. Wang Qiyao indicated that he would like to identify potential contacts at CAS for Dr. Magnien to contact about potential collaboration. There is also interest in learning more about U.S. legislation. Dr. Zhang Yusheng, SOA indicated that SOA's First Institute of Oceanography has been working on oceanic red tides and that contacts for Dr. Magnien could be identified in SOA. Dr. Magnien indicated that he would like to learn more about those projects and was hopeful that specific topics for collaboration can be identified and pursued. Dr. Magnien also mentioned the impacts of nutrient

pollution and resulting hypoxic zones: The IOC Biotoxin Work Group has been formed to work on developing testing protocols.

Habitat Monitoring, Assessment and Restoration (including reef habitat)

Dr. Huang Honghui, South China Sea Fisheries Research Institute, CAFS gave a presentation on Research and Construction of Artificial Reefs and Sea Ranching in China: A Case Study in Guangdong Province. A history of artificial reef construction was described. Different types of artificial reefs have been deployed along the coast of Guangdong Province. The purpose of the artificial reef program is to reduce overfishing and increase fishing capacity, mitigate the loss of natural reefs, and increase habitat for fish (including juveniles). The work is in the development stage through 2015 and will focus on optimization of artificial reef structure, adhesion, fish attraction, and evaluation. Specific projects are now being implemented. Sea ranching in China includes the integration of artificial reefs, fisheries enhancement, and monitoring. Evaluation of the ecological and economic benefits of artificial reefs is underway. Surveys have shown that fish are attracted to the artificial reefs and juveniles are present.

Michael Abbey, NOAA Fisheries gave an update on the planning and status of the NOAA-CAFS reef project. A joint scientific meeting will be held in Miami, Florida in September 2011. The meeting will be exploratory in nature, but with a goal of identifying a specific plan for collaboration. As a follow-up, NOAA scientists would visit CAFS. It is hoped that CAFS will support this visit. The goal is to work towards conservation and protection for natural reefs in China.

Endangered Species

Ms. Angela Somma, NOAA Fisheries gave a presentation on U.S. Conservation Programs for Marine Protected Species. The key legal mandates for protected species in the United States are the Endangered Species Act and the Marine Mammal Protection Act. Under these statutes, NOAA works to conserve and recover primarily marine and anadromous species. Some endangered species listings are global, like sea turtles. Science needed to support species conservation includes abundance estimates, habitat use, genetic stock assessment, observer data on bycatch of protected species, status reviews of listed species, and mitigation measures. Evan Howell, NOAA Fisheries Pacific Islands Science Center, gave a brief overview about research on the migration of satellite-tagged loggerhead turtles. This research revealed a hot spot in the East China Sea and a strong correlation to sea surface temperature and chlorophyll values. It also resulted in the development of "Turtle Watch," a program designed to aid in the bycatch reduction of loggerhead turtles in the Hawaii-based longline fishery.

Ms. Somma concluded the presentation by highlighting some of the shared species

between the United States and China, such as sea turtles (Loggerhead, Green, Leatherback, and Hawksbills) and whales (Humpback, Sei, Sperm, Gray, Blue and Fin). She also presented ideas for future collaboration on marine mammals and sea turtles, including a workshop to explore joint research opportunities on sea turtles, such as foraging studies and habitat uses to advance conservation efforts.

Ms. Liu Qing, CAFS provided a presentation on conservation strategies in China. Challenges include hydroelectric development, building of dams, industrial effluent and sewage, coastal development, and eutrophication from aquaculture. China participates in the Convention on Biological Diversity and CITES. Priorities include fishery related environmental impact assessment modeling, reconstruction of degraded aquatic ecosystems and related environmental restoration, environmental pollution and its impact on aquatic ecosystems, sustainable development of fishing communities, and conservation techniques for endangered aquatic wildlife. Research platforms for conservation include an eco-environment monitoring network, subcommittee on wetland and management of aquatic wildlife, remote sensing data, and GIS analysis.

International cooperation with the U.S. has been important. Current research includes the collection of information on habitat conservation programs in the U.S. and investigation and analysis on habitat protection strategies, management plans, management policies, and effects of resource recovery technologies and methods.

Huang Honghui, South China Sea Fisheries Research Institute, CAFS provided a presentation on sea turtles conservation. Ninety percent of China's sea turtles are found in the South China Sea with the majority being Green sea turtles. The only nesting ground on the mainland of China is in Huidong. The Huidong Gangkou Sea Turtle Reserve was established to protect this nesting ground. The number of sea turtles nesting at this location has been declining. Eight Green sea turtles have been tagged to determine migration patterns and swimming speeds, and residence times at different water depths. Information from this research will help to develop strategies for the protection of green sea turtles. A demonstration project with GEF, UNDP, SOA and NOAA has been initiated. Possible areas of cooperation include: (1) artificial breeding of sea turtles, (2) research on preventing and controlling disease in sea turtles, (3) acquisition of baseline information on migration patterns and key habitats for post-nesting adult females as well as juveniles, (4) data analysis, such as GIS, to assist in the development of sea turtle protection and management measures, (5) impacts of climate change on the migration of sea turtles, and (6) strengthening international communication and collaboration.

Dr. Zhang Yusheng, Third Institute of Oceanography, SOA gave a presentation on behalf of Prof. Qian Zhu (also from the Third Institute of Oceanography) on a proposed cooperative study on 1) effects and assessment of climate change on polar bears, and 2) protection techniques and conservation strategies of Bowhead Whale

and Indo-Pacific Humpback Dolphin. The Third Institute hopes cooperatively to conduct research to strengthen the conservation of polar bears and to protect Bowhead Whales and Indo-Pacific Humpback Dolphins. The latter research will estimate the population of the whales and dolphins, conduct acoustic studies, analyze the genome structure of the Humpback Dolphin, and develop conservation strategies.

Mechanisms to Sustain Cooperation (including potential scientific exchanges)

Ms. Liu mentioned that the Five-Year Framework Plan, under the U.S.-China Marine and Fishery Science and Technology Protocol, which was discussed at the Joint Working Group meeting in March 2011, identifies initial areas for collaboration. She indicated that the Panel needs to be practical and build on ongoing projects that already have funding. At the working level, she suggested that the Panel identify points of contact, project leads, and establish an experts group to strengthen collaboration. An exchange mechanism for personnel and information should be established. While the Chinese may be able to provide funding for some exchanges, other sources of funding should be explored (e.g., such as the World Bank's Fish to 2030 Program). Expert visits could be arranged to support case studies such as in Sanggou Bay. The Chinese project proposals were identified in order to support the draft Five-Year Framework Plan. Suggested priority areas for collaboration include, 1) assessment of ecosystems (aquaculture – impact of climate and ocean acidification on shellfish); 2) protection/conservation of resources (including reefs -- this receives extensive research funding in China); 3) technology/techniques of aquaculture (possible project on jellyfish); 4) impact of draughts and floods; and 5) red tides/HABs.

Dr. Cyr supported the mechanisms put forward by Ms. Liu. The U.S. proposes to sustain cooperation through joint projects as well as scientific exchanges. Dr. Sam Pooley, Acting Chief Science Advisor for NOAA Fisheries, proposed a Sino-American Scientific Exchange Program under the Marine and Fishery Science and Technology Protocol. The program would include two components: (1) A visiting scientist and visiting student program that supports staff exchanges (between 1 month and 1 year); and (2) A scientific seminar series that could highlight new areas of research on a number of topics. The seminar could be convened every two years. Specific proposals from several of the NOAA Fisheries Science Centers were described. Dr. Wang Qiyao, Institute of Oceanology, CAS indicated that up to one year of support could be provided to visiting scientists and students from the United States. Dr. Pooley, also identified PICES as a positive venue for a broad area of collaboration that embraces many of the topics we have discussed.

Mr. Abbey mentioned that the Asia-Pacific Fisheries Commission might serve as a useful venue to advance our collaboration. The APEC Oceanographic Center (currently under development) in Beijing could provide opportunities for training in support for some of the identified activities.

Discussion of Potential Activities and Scope for the Joint Program

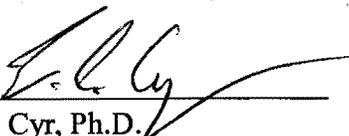
Potential areas for collaboration mentioned during the meeting were organized by topical themes for review by both delegations. The list and descriptions can be found in Appendix 1.

9th Living Marine Resources Panel Meeting

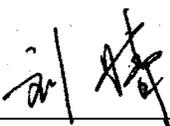
Dr. Cyr indicated that to maintain momentum, it was important to not wait too long before convening the next Living Marine Resources Panel meeting. Ms. Liu indicated that the next Panel meeting should take place in China. Given the hiatus since the 7th Living Marine Resources Panel meeting, there is agreement that the next meeting should be held in the latter half of 2012. Dr. Cyr indicated that the specific venue could remain undetermined at this time, but would like to have the possibility of visiting laboratory and/or research sites while in China. However, Ms Liu indicated that she would appreciate an indication of a potential location for the meeting by July 1, 2011.

Specific actions were identified as a result of the Panel meeting (see Appendix 4). Mr. Keith Chanon (NOAA, U.S.) and Ms. Jing Ying (CAFS, China) were designated as official Points of Contact for the Panel.

Ms. Liu and Dr. Cyr provided closing comments. The 8th U.S.-China Living Marine Resources Panel meeting was concluded on June 14, 2011.



Ned Cyr, Ph.D.
U.S. Chair



Liu Qing
Chinese Chair

Appendix 1

Potential Areas for Collaboration

Climate Impacts on Living Marine Resources

- Past climatology
- Regional forecasts of climate change and variability
- Coupling climate-ocean-ecosystem models
- Assessing the vulnerability of living marine resources to climate (rapid vulnerability assessment protocols, understanding of species and ecosystem responses, and targeted modeling)
- Effects of global climate change on highly migratory species in the north Pacific ocean.
- Population dynamics of *Euphausia pacifica* and its response to climate change and variability in the California Current and East China Sea (comparison study)
- Combined effects of ocean acidification and ocean warming on the physiology and reproduction of economically important fish from the East China Sea.
- Role of coastal habitats (e.g., salt marshes, mangrove forests, sea grasses) in carbon sequestration and storage.

Ocean Acidification Impacts on Living Marine Resources

- Research on the physiological effects (including potential genetic effects) of ocean acidification and warming on fish from the East China Sea
- Monitoring carbonate chemistry in Chinese coastal coral reefs
- Monitoring biodiversity and community structure in Chinese coastal coral reefs using Autonomous Reef Monitoring Structures (ARMS)
- Monitoring recruitment and calcification in Chinese coastal coral reefs using NOAA Calcification Acidification Units (CAUs)

Aquaculture

High Priority Areas:

- Integrated Multi-Trophic Aquaculture
- Development and verification of models to predict environmental effects and guide location of aquaculture operations
- Monitoring, assessing, and predicting contamination and disease risk in shellfish aquaculture to avoid human health impacts (e.g., persistent organic pollutants, paralytic shellfish poisoning, heavy metals)
- Fish to 2030 (World Bank)

Additional potential collaboration:

- Develop new aquaculture feeds (e.g., with reduced fish meal and fish oil)
- Fish health (e.g., disease management, vaccine development, nutrition)
- Stock enhancement

- Hatchery technology and genetics
- Impacts of environmental estrogens

Harmful Algal Blooms (HABs)

- Sharing information, experiences and techniques on monitoring, prediction, control and prevention of HABs
- Joint research on early warning and control of HABs
- Effects of HABs on living marine resources and techniques to mitigate the effects
- Engagement by China in IOC/IPHAB
- Exchange points of contacts and websites
 - US reports to Congress:
http://www.cop.noaa.gov/stressors/extremeevents/hab/habhrca/Report_Plans.asp
 - IOC - Intergovernmental Panel on HABs (IPHAB):
http://ioc-unesco.org/hab/index.php?option=com_content&task=view&id=10&Itemid=0
- US to provide information on legislation
 - US legislation and regional HAB and Hypoxia research:
<http://www.cop.noaa.gov/stressors/extremeevents/hab/habhrca/default.aspx>

Habitat Monitoring, Assessment and Restoration

- Artificial reef project with initial visit for September 2011 in Miami, Florida
- Follow-up visit by U.S. experts to China to further the collaboration

Endangered Species

- Workshop on Green, Loggerhead, and Hawksbill Turtles to promote information sharing (methodologies, research projects...)
- Protection techniques, conservation strategies, and surveys of Bowhead, Gray and Indo-Pacific Humpback Whales and Chinese White Dolphins
- Exchange of information and collaboration on population assessment techniques
- Restoration of habitats for endangered species

Mechanisms to Sustain Cooperation

- Establish Points of Contact for LMR Panel
- Establish Experts Group to finalize research priorities and project leads
- Set-up regular exchange mechanisms for latest research work and findings
- Sino-American Scientific Exchange Program
 - Visiting Scientist and Visiting Student Program (Up to 1 yr. for scientist and 1-3 months for student exchange)
 - Scientific Seminar Series

Near-Term Opportunities for Dialog

- US-China Marine Science Forum (to be held in DC later this year) can be used to finalize Section 8 of the draft U.S. – China framework plan for cooperation on ocean science and technology

Appendix 2

Meeting Agenda

**8th U.S.-China Living Marine Resources Panel
Joint Coordination Meeting
June 13-15, 2011**

**NOAA Headquarters
1315 East West Highway
Silver Spring, MD 20910 USA**

Meeting Objectives:

- *Educate each other on the Chinese and U.S. government systems for supporting the management of living marine resources*
- *Identify joint priorities and specific areas for collaboration (short and longer-term activities)*
- *Define the scope and future of the LMR Panel and identify mechanisms and resources to sustain cooperation and joint activities over the next five years*

Sunday, June 12

Chinese delegation arrives in Washington

Travelodge Silver Spring

Crowne Plaza Silver Spring

Monday, June 13 (Room 13836)

09:00 – 10:00 Transportation to NOAA HQ (Meet in hotel lobby) and security clearance; 1315 East West Highway, Silver Spring, MD 20910

Opening Session of the LMR Panel Meeting

10:00 – 10:20 Opening Remarks and Introduction of the Delegations

- Dr. Ned Cyr, U.S. Chair
- Ms. Liu Qing, Chinese Chair

10:20 – 10:30 Adoption of the Agenda (U.S. Chair)

U.S. and Chinese Government Systems and Policies for Supporting Living Marine Resource Management

10:30 – 11:00 National Oceanic & Atmospheric Administration
Dr. Ned Cyr, U.S. Chair

11:00 - 12:00 Overview of Chinese Fisheries/Living Marine Resource Management
Agencies, Ms. Liu Qing, Chinese Chair

12:00 – 13:30 Lunch (Local Restaurant)

Discussion of Select Priority Topics for Potential Collaboration

Climate Impacts on Living Marine Resources

13:30 – 13:50 Climate and Vulnerability Assessments for Fisheries, Roger Griffis,
NOAA Fisheries

13:50 – 14:10 Climate Change and Its Impact on Fisheries: Research Progress in
China, Prof. Chen Xuezhong, East China Sea Fisheries Research
Institute, CAFS.

14:10 – 14:40 Discussion

Ocean Acidification Impacts on Living Marine Resources

14:40 – 15:00 Assessment and Monitoring of Ecological Impacts of Ocean
Acidification, Rusty Brainard, Pacific Islands Fisheries Science Center
and Mike Sigler, Alaska Fisheries Science Center

15:00 – 15:10 Impact of Ocean Acidification and Ocean Warming on the Biochemical
Composition and Breeding of Economic Fish from the East Sea of
China, Chen Xuezhong, East China Sea Fisheries Research Institute,
CAFS

15:10 – 15:40 Discussion

15:40 – 16:00 Coffee Break

Aquaculture (including enhancement, mollusk culture and ecosystem assessment)

16:00 – 17:00 Integrated Multi-trophic aquaculture in Sanggou Bay, China. Mao
Yuze, Yellow China Sea Fisheries Research Institute, CAFS

Ecosystem-based Culture Technologies in Sub Tropical Bays. Huang
Honghui, South China Sea Fisheries Research Institute, CAFS

Effects and Assessment of Environmental Estrogens on Commercial
Species of Fish Health and their Habitat in Mariculture Areas, Zhang
Yusheng, Third Institute of Oceanography, State Oceanic
Administration

17:00 – 17:45 Introductory Remarks: David O'Brien, NOAA Fisheries

U.S. Aquaculture Research and Opportunities for Collaboration, Jeff
Silverstein, US Department of Agriculture (USDA) and Mike Rust,
NOAA Fisheries

Fish to 2030, Jim Anderson and Jingjie Chu, World Bank

17:45 – 18:15 Discussion

18:15 Adjourn for the Day

Dinner (Hosted by U.S. Delegation)

Restaurant: TBD

Tuesday, June 14 (Room 13836)

08:30 – 09:30 Transportation to NOAA HQ (Meet in hotel lobby) and security clearance

09:30 – 10:00 Summary of Day 1 Discussions

10:00 – 10:45 Harmful Algal Blooms (HABs): HABs Research in the U.S., Robert Magnien, NOAA National Ocean Service

Discussion of Select Priority Topics for Potential Collaboration (continued from previous day)

Habitat Monitoring, Assessment and Restoration (including reef habitat)

10:45 – 11:00 Artificial Reef Projects, Huang Honghui, South China Sea Fisheries Research Institute, CAFS

11:00 – 11:05 Coral Reef Conservation Program and Project Status, Michael Abbey, NOAA Fisheries

11:05 – 11:15 Discussion

Mechanisms to Sustain Cooperation (including potential scientific exchanges)

11:15 – 11:30 Remarks by the Chinese Chair

11:30 – 11:45 Remarks by the U.S. Chair and Sam Pooley, NOAA Fisheries, Acting Science Advisor

11:45 – 12:15 Discussion

12:15 – 13:45 Lunch (Local Restaurant)

13:45 – 14:00 Group Photo

Endangered Species

14:00 – 14:20 U.S. Conservation Programs for Marine Protected Species, Angela Somma, NOAA Fisheries

14:20 – 14:40 Conservation Strategies, Liu Qing, CAFS

Green Turtle Conservation, Huang Honghui, South China Sea

Fisheries Research Institute, CAFS

Bowhead Whale and Indo-Pacific Humpback Dolphin Conservation,
Zhang Yusheng, Third Institute of Oceanography, SOA

14:40 – 15:00 Discussion

Discussion of Potential Activities and Scope for the Joint Program (short and long-term)

15:00 – 16:00 Chinese Chair
U.S. Chair

16:00 – 16:15 Coffee Break

9th Living Marine Resources Panel Meeting

16:15 – 16:30 Planning for the Next Panel Meeting (location, timing, other issues)

Executive Secretaries Meeting

16:30 – 18:00 Preparation of Panel Meeting Summary Report
- Chinese Executive Secretary
- U.S. Executive Secretary

Reconvene Plenary Session

18:00 – 18:45 Review and Final Approval of Meeting Minutes
- U.S. Chair
- Chinese Chair

18:45 Signing Ceremony

18:45 8th LMR Panel Meeting Adjourns

Dinner (Hosted by Chinese Delegation)

Wednesday, June 15

Field Trip

08:30 – 10:00 Transportation to Baltimore, MD

10:00 – 12:00 [Visit to University of Maryland Biotechnology Institute
(UMBI)]

12:00 – 13:30 Lunch (Inner Harbor)

13:30 – 16:30 [Travel to Washington, D.C. and Smithsonian Museums]

16:30 – 17:00 Transportation to hotel

17:00 Adjourn for the Day

Friday, June 17

Chinese Delegation Departs to Airport (Time: TBD)

Appendix 3

Meeting Participants

United States Delegation:

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Appendix 4

Action Items

1. Invitation offered by Dr. Chen Xuezhong for U.S. scientists to visit China to collaborate on the climate impacts on krill.
2. U.S. to provide information on research assessing methods and approaches for estimating carbon storage and sequestration by coastal habitats (e.g., salt marshes, mangrove forests, sea grasses).
3. Identify scientists from each country to explore cooperative research on the combined impacts of increased temperature and acidification on coral reefs and other species, along with biodiversity and carbonate chemistry.
4. Dr. Wang Qiyao to identify HABs experts at CAS.
5. U.S. to provide information on HABs legislation.
6. Invitation offered by Dr. Wang Qiyao to host the exchange of senior scientists and students.
7. U.S. to provide suggestions for the location of the 2012 LMR Panel meeting (July 1, 2011).
8. Identify collaborative activities (July 15, 2011) and finalize project proposals (September 15).