

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.aspx
 - 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

<i>Travelodge Silver Spring</i>	<i>Crowne Plaza Silver Spring</i>
8040 13th Street	8777 Georgia Ave
Silver Spring, MD 20910	Silver Spring, MD 20910
Tel: (301) 495-0808	Tel: (301) 589-0800

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:

National Oceanic & Atmospheric Administration (NOAA) Headquarters

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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).

中美海洋生物资源工作组第八次会议总结报告

2011年6月13-15日

美方主席 Ned Cyr 博士宣布中美海洋生物资源协调工作组第八次会议开幕，并代表美方代表团致欢迎辞。Cyr 博士指出工作组自2007年10月起未有会面，他希望通过这次会议能重新启动工作组的活动并明确合作项目。中方主席刘晴女士代表中方代表团对美方的会议筹备工作表示感谢。刘女士指出海洋生物资源对中国人民而言非常重要。中国正面临着诸多挑战，如过度捕捞、保护海洋环境与提供高质量的水产品的制约、栖息地恢复等。因此，发展可持续的海洋经济已至关重要。双方主席均表示同意2011年3月于北京召开的中美海洋与渔业联合工作组第18次会议上中国国家海洋局提出的五年计划的草案。中美双方代表团成员分别作了自我介绍，介绍了各自的单位、职责和科研兴趣点（人员名单见附件3）。此外，双方回顾了往届中美合作项目。

Cyr 博士介绍了会议的日程和讨论内容。全体代表表示同意并通过了会议日程（附件2）。

介绍中美双方的海洋生物资源管理体系和政策

Ned Cyr 博士介绍了美国国家海洋与大气局以及其渔业局的机构设置。刘女士介绍了中国海洋生物资源管理现状。报告重点介绍了中国渔业的概况、相关的管理机构及其职能，重要的渔业及海洋生物资源管理法律、执法情况，重要的研究机构及其研究重点。

气候变化对海洋生物资源的影响

美国 NOAA 渔业局的 Roger Griffs 先生做了题为“美国气候变化及其对渔业的影响”的报告。报告的重点包括美国关于评估并对气候变化影响做出响应的战略性框架、NOAA 的气候研究和管理活动以及潜在的合作领域。重点强调了气候变对及其对渔业（鱼类分布变化、产量）的影响和渔业管理领域的工作。潜在的合作领域包括气候学历史资料、气候变化的区域性预报、气候-海洋-生态系统建模耦合、评估渔业的脆弱性（脆弱性快速评估，了解种群对生态系统的响应以及有目标的建模）等。

中国水产科学研究院东海水产研究所陈雪忠所长做了题为“气候变化及其对渔业的影响：中国的研究进展”报告。报告指出中国政府重视气候变化的问题以及气候变化对鱼类和渔业的影响。东海海平面

温度升温明显，从1985年以来，已经升温1.5度。温度的升高导致了藻华暴发的增加以及沿岸渔业产量的减少。某些浮游植物的总生物量和丰度已经下降，由此可能导致重要渔场分布的变化。中国在研的气候变化对鱼类迁徙的影响大多是定性研究。鱼类的资源量在持续下降。潜在的合作领域包括：（1）气候变化对大洋性经济物种的影响；（2）太平洋磷虾的种群动态以及其对气候变化的响应机制（北太平洋东西海岸开展对比研究）；（3）海洋酸化和海洋升温对东海重要经济鱼种的生物化学构成和育种的影响。中国相关的研究强调气候变化对浮游动物和浮游植物的影响。Cyr 博士指出应主要关注气候变化所造成的各个方面的影响。陈雪忠所长表示目前已经开展了气候变化对沿岸的影响，包括对河口和相关水域的影响等方面的研究。在研究气候变化对开放性的大洋影响方面，应投入更多的科研力量。

在美国，气候变化对鱼类带来的影响评估和建模也是重要的研究领域。陈雪忠所长表示愿意邀请美国的科学家来中国研究气候变化对磷虾的影响。Cyr 博士表示这方面有一定的合作空间。刘女士提到了海洋的碳汇功能。就海洋碳汇方面，美方表示将提供分析方法和分析碳汇能力、以及沿岸栖息地如盐沼、红树林和海草等的固碳能力等方面的研究方法。

海洋酸化对海洋生物资源的影响

来自太平洋岛屿渔业科学中心的 Rusty Brainard 博士和来自阿拉斯加渔业科学中心的 Mike Sigler 博士共同做了题为“海洋酸化对生态、生物多样性以及渔业的影响评估与监测”的报告。报告指出海水中碳酸钙饱和度的下降会使得某些钙化生物在某一生长阶段很难存活。NOAA 目前正在开展空间调研，进行时间序列观察，并依据海水碳酸盐化学和酸化对生态的影响进行建模。NOAA 已经研发了礁体自动监测构件（ARMS）并布放这种构件来监测底栖生物群体的变化。这种构件也可以用来监测和评估中国沿海水域。在阿拉斯加、北太平洋西北部、美国东北部，目前正在进行海水化学监测，进行了一系列的分类学实验，并开展种群建模和预测。中国在海洋酸化对渔业的影响的研究方面还处于起步阶段，但是这一领域具有较好的合作前景。

Brainard 和 Sigler 两位博士提出的潜在合作领域包括：（1）监测中国沿岸珊瑚礁的碳酸盐含量；（2）利用 ARMS 对中国沿海珊瑚礁进行生物多样性和群落结构监测；（3）利用 NOAA 的钙化酸化单元（CAUs）对中国沿海珊瑚礁的聚鱼能力和钙化水平进行监测；（4）相关的科学家交流以支持以上的研究。

陈雪忠所长代替东海所的博士生郑仰桥做了题为“海洋酸化和海洋变暖对生物化学构成以及东海重要经济物种繁育的影响”报告。报

告指出海洋酸化对鱼类构成、生理学、繁殖能力的影响。提出主要合作领域包括：（1）研究东海鱼类的生物化学构成；（2）利用分子手段研究海洋酸化和海洋变暖对鱼类的孵化率的影响。NOAA 正在开展气温升高和酸化对珊瑚礁和其他物种的综合影响。Cyr 博士指出双方的科学家应从生物多样性和碳酸盐化学的角度探寻合作的可能性。

水产养殖

来自中国水产科学研究院黄海水产研究所的毛玉泽博士介绍了桑沟湾多营养层次综合养殖模式。从2001年起，中国约1/4的水产品来自海水养殖，且持续增长。贝类和大型藻类是主要的海水养殖产品。为满足消费者的需求，中国海产品的产量到2020年将翻一番。中国正在利用多营养层次的养殖模式以提供充足的营养物质并减少对环境的影响。中国北部的桑沟湾采用了这种多营养层综合养殖模式，到目前为止，该项目已经发表150篇论文论著。桑沟湾的主要养殖品种为海带和贝类，占90%。潜在的合作领域为：（1）海水养殖对生态系统和环境的影响；（2）基于生态的海水养殖模式和技术。

来自中国水产科学研究院南海水产研究所的黄洪辉博士介绍了亚热带多营养层次综合养殖模式。他介绍了中国海水养殖概况，并重点指出海水养殖的主要品种和区域。增长的海水养殖产量导致不断增多的污染，病害和环境负面影响。尽管如此，海水养殖应会继续发展以提供足够的食物来源。中国面临的一个重要挑战是在增加产量的同时减少对环境的负面影响。多营养层次综合养殖模式是解决这一挑战的重点。报告提出了多营养层次综合养殖模式的范例。潜在的合作领域包括：（1）多营养层次模型构建（帮助决定种群的最优数量、多层次的影响层级和生物基因化学循环）；（2）生态环境和多营养层次分析；（3）评估应用多营养层次对水生生物健康的评估。

来自中国国家海洋局第三研究所的张玉生研究员做了题为“环境雌激素对养殖区海洋经济鱼类健康及其生境影响与评估”的报告。环境雌激素对大型生物如鱼类的长期影响应引起广泛关注，因为人类食用鱼类也可能受到环境激素的间接影响。报告指出可以开展以下几个方面的合作，如研究利用生物标志监测环境雌激素对海洋经济鱼类的影响，评估其对养殖区的影响，并向政府部门提出预防和控制海水养殖区环境激素污染对经济鱼类影响的策略。位于福建的东山岛生物多样性丰富，适合经济鱼类贝类养殖，因此东山岛附近的海水养殖区可以作为研究的选点。

刘女士介绍了贝类海水养殖的管理情况。讨论的内容包括贝类重金属污染、毒性和污染聚集。欧盟1997年开始禁止从中国进口贝类，中国希望恢复对欧盟的贝类出口。通过采捕前检查的方法，如质量监

测和管理，来提高贝类质量。目标是管理贝类养殖的环境。刘女士和Cyr博士同意在此领域继续探讨。

David O' Brien 先生对 NOAA 的海水养殖活动进行了综合性介绍。美国的海水养殖主要是贝类和一些鱼类如鲑鱼等。近20年来，美国水产养殖产量没有明显的增长。美国84%的水产品仍依赖进口，水产品贸易逆差达到100亿美元。美国希望增加其国内的水产品产量。然后，不少人士担心增长的产量对环境的影响。2011年6月 NOAA 和美国商务部联合发布了最新的养殖政策。这些政策强调和国际伙伴一起发展可持续的水产养殖以提供就业机会，并加强对环境的保护。

NOAA 渔业局的 Mike Rust 博士与美国农业部的 Jeffrey Silverstein 博士介绍了美国水产养殖研究及中美合作展望。经济价值、环境因素和人类健康是可持续水产养殖的关键。重要的研究领域包括：（1）饲料和营养（包括鱼粉的替代品，鱼类健康，减少污染，营养需要和遗传）；（2）水产养殖和养殖环境（包括模式、碳汇、循环水养殖系统、费用分析、多营养层次综合养殖模式，气候变化的影响、增殖放流）；（3）遗传（包括选育、基因组学、生理学和营养、疫苗开发、疾病管理）。报告还介绍了美国农业部目前与中国一些机构开展的合作。NOAA 与中国的一些机构也有类似的合作，但没有重点提及。潜在的合作领域包括双方组织科学家就以上热点领域召开专门的研讨会。

来自世界银行的楚敬杰博士介绍了世界银行的渔业项目。世行制订了渔业行为指标，下一步即将制订水产养殖行为指标。“鱼类2030”（Fish to 2030）是一个对2030年全球水产品供求进行建模和预测的项目。世行希望开发一个亚洲子模块，希望中国能参与这方面的工作。目前该项目正在研究开展养殖活动的风险分析。

随后讨论了水产养殖方面的报告。刘晴女士对这一部分做了总结性的概要发言。她指出，双方提到的合作领域应尽早确定联系人。Cyr博士也表示希望能有具体的合作项目。NOAA 对建模与耦合方面的合作比较感兴趣，包括多营养层级综合养殖，但是希望双方在拟定合作项目前先经过科学家间充分的交流。Jeff Silverstein 博士指出鱼类健康和疾病可以是潜在的合作领域，具体的合作领域可以是合并感染和疫苗开发。David O' Brien 先生指出世行的“鱼类2030”项目也是潜在的合作领域。来自世行的 Jim Anderson 博士再次强调了“鱼类2030”项目的重要性。世行也在考虑一个关于水产养殖疾病管理方面的项目，以减少病害对养殖的影响。Ned Cyr 博士指出水产养殖产品的卫生状况也可以是中美合作的潜在领域。刘晴女士表示中方愿意与世行一起开展“鱼类2030”项目的合作并提出了以下几个领域的合作：（1）典型海湾生境资源修复及效果评价技术（开发分析模型，以

美国 Chesapeake 湾 为典型对照海域)；(2) 底栖生境的增殖放流(包括珊瑚礁栖息地)；(3) 贝类环境监测和评估(设计产前评估的指标)；(4) 环境雌激素；(5) 海洋生物技术。

有害藻华

NOAA 国家海洋局的 Robert Magnien 博士介绍了美国的有害藻华研究进展以及相关的国际合作。Magnien 博士介绍了有害藻华的分布以及藻华类型及其所产生的毒素。报告介绍了相关的美国立法——《美国有害藻华及缺氧区研究和管理法案》，并提出了该领域的合作重点方向。报告中概述一些国家级项目，涉及有害藻华与环境(ECOHAB)，有害藻华监测与环境响应(MERHAB)，有害藻华的防治(PCM)。报告还介绍了国际政府间海洋学委员会(IOC)下设的有害藻华小组(IPHAB)。美国也通过 GEOHAB、ICES 等国际组织开展此方面的研究。作为 IPHAB 小组的主席，Magnien 博士邀请中方代表团参加该小组及其活动。刘晴女士指出中国沿海和大型湖泊都面临着有害藻华的问题，如蓝藻等。赤潮也是影响中国海水养殖和渔业的问题。水产品质量、安全和健康是关注的重点。监测以及预报预警机制是重点。气候变化导致了赤潮的大范围发生。中国国家海洋局在有害藻华监测方面拥有很大的职能。

中国去年发生了大约80次有害藻华。赤潮的预防至关重要，目前正在开展不同类型的藻华研究。目标就是研究预防赤潮的机制。中国科学院海洋所目前在有害藻华研究方面有一些大的项目。使用化学物质和粘土来帮助去除湖泊的藻华。王启尧先生表示他将指定中科院专门的联系人与 Magnien 博士联系进一步合作事宜。他也对美国相关的立法表示关注。来自国家海洋局三所的张玉生研究员表示海洋局一所目前正在开展海洋赤潮的研究，Magnien 博士可以在海洋局找到合作伙伴。Magnien 博士希望更多地了解中国开展的相关项目，并希望开展具体的合作。他指出营养物质的污染及其所造成的缺氧区带来的影响。IOC 的生态毒素工作小组正在起草相关的方案。

栖息地监测、评估及修复(包括人工鱼礁)

南海水产研究所的黄洪辉博士做了题为“人工鱼礁与海洋牧场建设与研究：以广东省为例”的报告。报告介绍了人工鱼礁建设的历史、广东省沿海投放的人工鱼礁类型。据介绍，建设人工鱼礁的目的是为了减少过度捕捞的影响，进而增加捕捞能力，减缓对天然鱼礁的破坏、以及增加鱼类的栖息地(保护幼鱼)。现在人工鱼礁项目正处于建设阶段，并将持续到2015年。工作重点为人工鱼礁结构的优化、附着、聚鱼能力以及效果评估。报告还介绍了目前在研的一些项目。海洋牧场包括综合利用人工鱼礁技术进行鱼类增殖和监测。调查显示人工鱼礁对幼鱼具有良好的聚集能力。

NOAA 渔业局的 Michael Abbey 先生介绍了 NOAA 与水科院的人工鱼礁项目的进展情况。他指出2011年9月双方将在佛罗里达州的迈阿密召开科学研讨会。会议将是讨论性的，希望可以达成一项合作计划。作为后续安排，NOAA 的科学家将访问水科院。他希望水科院可以支持此次互访，目的是保护中国的天然珊瑚礁。

濒危物种

来自 NOAA 渔业局的 Angela Somma 女士介绍了美国海洋保护物种项目。美国涉及物种保护的主要法律包括《濒危物种法案》和《海洋哺乳动物保护法》。NOAA 在这些法律的权限内开展海洋和溯河产卵的物种的保护和恢复工作。一些濒危物种是全球性的，如海龟。物种保护需要的科学支持包括丰度估算、栖息地利用、遗传评估、受保护物种副渔获物的观察数据、所列物种的现状评估和保护措施。来自 NOAA 渔业局太平洋岛屿科学中心的 Evan Howell 简要介绍了关于卫星标记的蠍龟的迁移研究。这项研究揭示在中国东海有一个蠍龟的热点区域以及海洋表面温度和叶绿素值之间很强的相关性。这项研究后续有一项“海龟观察”项目，旨在减少夏威夷延绳钓渔业对蠍龟的误捕。

Somma 女士在报告的结尾强调美国和中国之间有一些共同的物种，如海龟（蠍龟、绿海龟、棱皮龟、玳瑁）以及鲸（座头鲸，塞鲸，抹香鲸，灰鲸，蓝鲸和长须鲸）。她还介绍了关于海洋哺乳动物和海龟的合作可能性，包括召开探讨海龟方面合作的研究会，如觅食的研究和栖息地使用，以推动保护工作。

刘晴女士介绍了中国濒危物种保护策略。所面临的挑战包括：水电开发、建坝、工业废水和污水、沿海开发建设，以及水产养殖水体富营养化等。中国加入了生物多样性公约和濒危物种贸易公约。研究重点包括渔业相关的环境影响评估模型、重建退化的水生生态系统和相关的环境修复、环境污染及其对水生生态系统的影响、渔区的可持续发展、濒危水生野生动物的保护技术等。从事保护工作的研究平台包括生态环境监测网络、湿地和水生野生动物保护分委会、遥感数据和地理信息系统的分析等。

这方面与美国的国际合作一直是重要的。目前的研究包括对在美国栖息地的保护项目的信息收集，调查和分析栖息地保护战略、管理计划、管理政策，以及资源恢复的技术和方法的影响分析等。

南海水产研究所的黄洪辉博士介绍了中国的海龟保护情况。在中国，90%的海龟生活在南海，其中大部分为绿海龟。中国大陆唯一的产卵场在广东的惠东。惠东港海龟自然保护区的设立就是为了保护绿海龟的产卵场。在这个位置筑巢的海龟数量一直在下降。已标记了8头绿海龟，以确定迁移模式、游泳的速度以及在不同水深的停留时间。研究的成果将有助于为绿海龟的保护提供发展战略。一个由全球环境

基金、联合国开发计划署、国家海洋局和 NOAA 的示范项目已经启动。潜在的合作领域包括：(1) 人工养殖海龟，(2) 海龟的疾病防控研究，(3) 迁移模式和产后雌海龟以及幼海龟的主要栖息地的基本信息，(4) 地理信息系统等相关数据的分析，以协助制订海龟保护和管理措施，(5) 气候变化对海龟迁移的影响，(6) 加强国际交流与合作。

来自国家海洋局三所的张玉生博士代表祝茜研究员（海洋局三所）做了报告。提出的共同研究领域包括：(1) 气候变化对北极熊的影响；(2) 北极露脊鲸和中华白海豚的保护技术与保护对策。三所希望能在上述两个方面与美方开展合作。主要的合作内容包括北极露脊鲸和中华白海豚的种群估测、声学研究、中华白海豚的全基因组测序，以及研究北极露脊鲸和中华白海豚的保护对策。

合作机制讨论（包括潜在的科技交流项目）

刘晴女士提出应根据2011年3月联合工作组会议上所讨论的“中美海洋和渔业科学技术议定书”之下的五年框架计划确定初步的合作领域。她表示工作组应以务实的精神，按照实际的工作需要，重点推进已有一定合作基础并有相关经费的项目。在工作层面上，她建议工作组确定双方联络人、项目负责人，并建立一个专家小组以加强协作。应建立一个人员和信息交流机制。虽然中国也许能够支持一些交流项目，但应该探索其他的经费来源（例如，世界银行“鱼类2030”计划）。

可安排专家间互访以支持个案研究，比如桑沟湾等。中方确定的项目建议书将支持联合工作组制定的五年框架计划。合作的优先领域包括：(1) 生态系统评估（水产养殖 - 气候变化和海洋酸化对贝类的影响；(2) 资源的保护（包括珊瑚礁的保护，这方面中方有一定的科研经费支持）；(3) 水产养殖技术（包括水母的项目）；(4) 洪涝灾害的影响；(5) 赤潮及有害藻华。

Cyr 博士支持刘女士提出的合作机制。美方提出可以通过联合项目以及科技交流来维持双方的合作。NOAA 渔业局首席科学顾问 Sam Pooley 博士，提出在中美海洋和渔业科学技术议定书下拟定一个科学交流计划。该方案将包括两个组成部分：(1) 访问学者和学生互访计划，以支持科研人员的交流（1个月至1年）；(2) 系列性科学研讨会，可以突出新的研究领域的主题。研讨会可以每两年召开一次。双方还讨论了 NOAA 渔业科学中心的几个具体建议。中国科学院海洋研究所王启尧书记表示中科院可以向来访的科学家和来自美国的学生提供长达一年的支持。Sam Pooley 博士同时指出北太平洋海洋科学组织可以作为更广泛地开展合作的平台，该组织的合作领域涉及到很多双方所讨论的议题。

Abbey 先生提到，亚太渔业委员会可以作为一个推进双方合作的有效平台。亚太经合组织在北京的海洋中心（目前正在筹备中）可以

为一些确定的合作项目提供培训机会。

讨论潜在合作项目和合作项目的规模

双方总结了会谈期间讨论的双方潜在合作领域并按主题列出。重点合作领域及其描述见附件1。

中美海洋生物资源工作组第九次会议

Cyr 博士指出为了保证合作机制顺利，希望不要将中美海洋生物资源工作组下一次的时间拖得太长。刘晴女士表示下一次会议按照惯例应在中国召开。考虑到从第七次会议到第八次会议间断很长，双方协定下一次会议于2012年下半年召开。Cyr 博士指出会议的具体时间可以会后再具体协商决定，但希望在中国开会期间可以顺访相关的实验室和实验点。刘晴女士表示希望美方能在2011年7月1日前提出下次开会的地点。

工作组确定了下一步的行动计划（见附件4）。Keith Chanon 先生（美方 NOAA）和静莹女士（中方 水科院）被指定为工作组的联络员。

刘晴女士和 Cyr 博士致闭幕辞。中美海洋生物资源工作组第八次会议于2011年6月14日闭幕。

Ned Cyr, Ph. D.
美方主席

刘晴
中方主席

附件1. 潜在的合作领域

气候变化对海洋生物资源的影响

- 气候学的原始资料
- 气候变化的区域性预测
- 海洋生态系统模型耦合
- 评估气候变化对海洋生物资源的影响（快速的脆弱性评估、了解物种对生态系统的响应并有针对性地建模）
- 全球气候变化对北太平洋洄游鱼类种群的影响
- 南极磷虾的种群动态特征以及其对气候变化的响应，以东海和加州暖流为例（对比研究）
- 海洋酸化和海洋变暖对中国东海重要经济鱼类的生理和繁殖能力的综合影响
- 沿海栖息地对碳的吸收和储存作用（例如，盐沼，红树林，海草）

海洋酸化对海洋生物资源的影响

- 研究海洋酸化和气候变暖对东海鱼类的生理效应（包括潜在的遗传效应）
- 监测中国沿海的珊瑚礁碳酸盐化学
- 利用礁体自动监测构件（ARMS）对中国沿海的珊瑚礁群落结构和生物多样性进行监测
- 利用 NOAA 钙化—酸化单元（CAUs）对中国沿海的珊瑚礁的钙化程度和发展情况进行检测

水产养殖

重点合作领域：

- 多营养层次综合养殖模式
- 开发和验证可以预测环境影响的模型，对养殖选点进行指导
- 贝类污染和病害的风险预测及评估，以避免对人类健康的影响（如持久性有机污染物、麻痹性贝类毒素、重金属等）
- “鱼类2030”项目（世界银行）

潜在的合作领域：

- 开发新的水产养殖饲料（减少鱼粉和鱼油的使用）
- 鱼类健康（病害管理、疫苗开发、营养）
- 增殖放流
- 孵化技术和遗传研究
- 环境雌激素的影响

有害藻华

- 共享关于有害藻华监测、预测、防控方面的信息、经验和技術
- 联合研究有害藻华的预警机制和控制技术
- 有害藻华对海洋生物资源的影响以及减轻影响的技术
- 希望中国参与 IOC 和 IPHAB
- 确定联系人，交换相关网页

提交国会的相关报告

http://www.cop.noaa.gov/stressors/extremeevents/hab/habhrca/Report_Plans.aspx

IOC: 有害藻华政府间工作组

http://ioc-unesco.org/hab/index.php?option=com_content&task=view&id=10&Itemid=0

美国相关的立法:

<http://www.cop.noaa.gov/stressors/extremeevents/hab/habhrca/default.aspx>

栖息地监测、评估和修复

- 人工鱼礁项目将于2011年9月访问美国佛罗里达州迈阿密
- 美方专家将访问中国继续合作

濒危物种

- 召开研讨会，讨论绿海龟、蠍龟、玳瑁等保护物种，以促进信息共享（方法，研究项目等）
- 交流北极露脊鲸、灰鲸、印度太平洋座头鲸和中华白海豚的保护技术、保护战略和相关的调研情况
- 就种群评估技术开展信息交换和合作
- 濒危物种栖息地的恢复

支持合作的机制

- 设立中美双方工作组联络员
- 成立专家小组对重点领域和项目负责人进行把关
- 建立研究成果和信息的长效交换机制
- 中美科学家交换项目
 - 访问学者和访问学生项目（访问学者为期不超过一年，访问学生为期不超过1-3个月）
 - 系列性科学研讨会

近期的对话机会

- 中美海洋科学论坛（预计今年下半年在美国华盛顿召开）可最终确

定中美海洋科学和技术合作的框架计划第8条草案。

附件2. 会议日程

议程

会议目标：

1. 了解双方海洋生物资源的管理体系
2. 确定合作重点及优先合作领域（短期和长期活动）
3. 讨论海洋生物资源工作组未来的工作机制以及经费来源

6月12日（星期日）

中方代表团到达

宾馆：Travelodge Silver Spring
CROWN PLAZA HOTEL

6月13日（星期一）NOAA 13836会议室

09:00 - 10:00 到达美国海洋与大气局总部（NOAA）

开幕式

- 10:00 - 10:20 开幕致辞及介绍代表团成员
- Dr. Ned Cyr, 美方主席
 - 刘晴, 中方主席
- 10:20 - 10:30 通过会议议程（美方主席）

介绍中美双方的海洋生物资源管理体系和政策

- 10:30 - 11:00 美国海洋与大气管理局
Dr. Ned Cyr, 美方主席
- 11:00 - 12:00 中国海洋生物资源管理概况
刘晴, 中方主席

12:00-13:30午餐

讨论合作的重点领域

重点领域1. 环境变化对海洋生物资源的影响

- 13:30 - 13:50 气候变化对渔业的影响, Roger Griffis,
NOAA 科技办公室
- 13:50 - 14:10 中国在全球气候对渔业资源的影响研究进展
东海水产研究所 陈雪忠所长
- 14:10 - 14:40 讨论

重点领域2. 海洋酸化对海洋生物资源的影响

14:40 - 15:00 海洋酸化的对鱼类生理学的影响

Rusty Brainard, 太平洋列岛渔业科学中心, Mike Sigler,
阿拉斯加渔业科学中心, John Stein, 西北部渔业中心

15:00 - 15:10 海洋酸化与海洋变暖对我国东海经济鱼类生化组成及繁殖能力的影响
东海水产研究所 陈雪忠所长

15:10 - 15:40 讨论

15:40 - 16:00 咖啡间休

重点领域3. 水产养殖（包括增殖放流，贝类养殖和生态系统评价）

16:00 - 17:00 桑沟湾多营养层次综合养殖模式

黄海水产研究所 毛玉泽老师

基于生态系统的亚热带海湾综合养殖技术研究

南海水产研究所 黄洪辉老师

环境雌激素对养殖区海洋经济鱼类健康及其生境影响与评估
海洋局三所 张玉生老师

17:00 - 17:45 美方介绍性发言: David O' Brien, NOAA Fisheries

美国水产养殖研究及中美合作展望

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 讨论

18: 15 第一天会议结束

晚餐：美方宴请

地点：待定

6月14日（星期二）地点：NOAA 13836 会议室

08:30 - 09:30 到达美国海洋与大气局（NOAA）总部

09:30 - 10:00 第一天讨论内容总结

10:00 - 10:45 美国有害藻华的研究进展, Robert Magnien, NOAA
National Ocean Service

讨论合作的重点领域

重点领域4. 栖息地监测、评估及修复（包括人工鱼礁）

- 10:45 - 11:00 南海人工鱼礁项目
南海水产研究所 黄洪辉老师
- 11:00 - 11:05 Michael Abbey, NOAA Fisheries, Office of International Affairs
- 11:05 - 11:15 讨论

合作机制讨论（包括潜在的科技交流项目）

- 11:15 - 11:30 中方主席发言
- 11:30 - 11:45 美方主席发言, Sam Pooley, NOAA 渔业科学指导 NOAA Fisheries Acting Science Advisor
- 11:45 - 12:15 讨论
- 12:15 - 13:45 午餐
- 13:45 - 14:00 集体合影

重点领域5. 濒危物种

- 14:00 - 14:20 美国海洋保护物种项目介绍 Angela Somma, NOAA Fisheries
- 14:20 - 14:40 1) 中美濒危物种资源和栖息地保护策略研究
刘晴 中方主席
- 2) 绿海龟保护项目介绍
南海水产研究所 黄洪辉老师
- 3) 北极露脊鲸和中华白海豚的保护技术与保护对策研究
海洋局三所张玉生老师
- 14:40 - 15:00 讨论

讨论潜在合作项目（短期和长期）

- 15:00 - 16:00 中方主席
美方主席
对上述所谈及的项目进行总结和规划。
- 16:00 - 16:15 咖啡间休

中美海洋生物资源工作组第九次会议

- 16:15 - 16:30 讨论确定下次会议的时间、地点及其他事宜

执行秘书会议

- 16:30 - 18:00 双方协调组秘书准备会议纪要

闭幕式

18:00 - 18:45 全体会议，通过会议纪要
- 双方主席致闭幕词
18:45 签署会议纪要
18:45 第二天会议结束

晚餐：中方宴请

6月15日（星期三）

参观考察

08:00 - 09:00 抵达参观地点

09:00 - 12:00 参观养殖设备/切萨皮克海湾项目及其他

12:00 - 13:30 午餐（地点、宴请方待定）

13:30 - 16:30 第二处参观

16:30 - 17:30 返回宾馆

17:30 会议结束

6月17日（星期五）

送中方代表团至机场（时间待定）

附件3：参会代表

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附件4:

行动项目

1. 陈雪忠博士邀请美方专家访问中国并开展气候变化对南极磷虾影响的研究
2. 美方提供分析沿岸栖息地（如盐沼地、红树林、海草等）固碳能力的研究方法和手段
3. 双方确定科学家从生物多样性和碳酸盐化学角度分析气候变化和海洋酸化对珊瑚礁和其他物种的综合影响。
4. 王启尧博士确定中科院有害藻华方面的联系人
5. 美方提供美国有害藻华相关的立法资料
6. 王启尧博士邀请美方专家和学生开展交流
7. 美方提出2012年中美海洋生物资源工作组的会议地点（2011年7月1日前）
8. 确定合作项目并修改完成相关的项目建议书