

**Report of China-U.S. Sea Turtle Workshop**  
**Under the China-U.S. Living Marine Resources Panel**  
**April 10, 2012, Shanghai, China**

**Introduction**

Cooperation between the Chinese Academy of Fishery Sciences (CAFS) and the National Oceanic and Atmospheric Administration (NOAA) can be traced back to 1994. The China-U.S. Living Marine Resources Panel is an important component under the protocol on U.S.-China Marine and Fisheries Science and Technology Cooperation. The Panel aims to establish a platform for promoting effective cooperation on living marine resources in both countries and further strengthen the exchange of information in ocean and fisheries interests. During June 13-15, 2011, the 8<sup>th</sup> U.S.-China Living Marine Resources Panel meeting was held at NOAA Headquarters, Silver Spring, USA. At this meeting, attendees agreed to convene “a workshop on sea turtles” to be held in China in 2012. The goals of the workshop were to exchange information and experience on sea turtle research and management and explore more opportunities for cooperation in sea turtle conservation. Therefore, on April 10<sup>th</sup>, the Division of Academic Exchange and Cooperation and East China Sea Fisheries Research Institute (ECSFRI) of CAFS, successfully convened the joint CAFS-NOAA Sea Turtle Workshop in Shanghai.

Prior to the workshop (April 9<sup>th</sup>, 2012), Prof. Li Jilong, Director of Division of Academic Exchange and Cooperation, CAFS, had an in-depth exchange and discussion with Dr. Gerard Dinardo, Supervisory Research Fish Biologist for NMFS’ Pacific Islands Fisheries Science Center (PIFSC), and Mr. Keith Chanon, International Science Coordinator in NOAA-National Marine Fisheries Service (NMFS)’ Office of Science and Technology. They agreed that joint efforts would be made to strengthen the exchange and cooperation between China and the United States.

**Meeting Report**

The inaugural meeting of the China-U.S. Sea Turtle Workshop was convened at ECSFRI in Shanghai, China on April 10, 2012.

Prof. Li Jilong, initiated the workshop by providing background information and emphasizing the importance of the China-U.S. Sea Turtle Workshop. Mr. Fan Xiangguo, Director of the Office of Aquatic Wild Animal and Plant Conservation, Fishery Law Enforcement Command (Ministry of Agriculture), served as the Chair for China and opened the workshop. Mr. Fan was pleased to announce that China plans to elevate the management / conservation status of sea turtles in China. Since 1988, sea turtles have been listed as Class II status, which includes provincial protection and oversight. In 2012, however, all sea turtles in China will be elevated to Class I, which provides national protection. This may provide a solid platform for CITES collaboration. Mr. Keith Chanon, the Chair for the United States, provided opening remarks on behalf of the U.S. delegation. He thanked the Chinese delegation for their warm hospitality and provided a brief background on the Living Marine Resources Panel and progress that had been made since the last meeting in June, 2011. The next meeting will be scheduled in October, 2012, in Shanghai, China. Both parties recognized the goals of the meeting were to exchange information and experiences associated with sea turtle-related research and management conducted by the Chinese and U.S. governments and identification of opportunities for cooperation related to sea turtle research and conservation. Meeting participants agreed on the content of the agenda (**Appendix 1**). Participants introduced themselves, providing their affiliation, responsibilities and scientific interests (**Appendix 2**). Ms. Christina Fahy, Sea Turtle Recovery Coordinator for the NMFS Southwest Regional Office and Dr. Xing Yingchun, Assistant Researcher of Natural Resource and Environmental Research center of CAFS, served as lead rapporteurs with overall responsibility of assembling the meeting report.

In order to provide background for the workshop participants, Dr. Zhuang Ping, Vice President of the East China Sea Fishery Research Institute of CAFS provided an overview of the institute. The Institute was founded in 1958 and is one of the largest, under the Ministry of Agriculture. Currently, the institute has approximately three hundred employees operating within six research sections involved in fisheries resources/management: (1) Fisheries, which monitors and sets controls of water quality in the area (East China Sea) to maintain healthy seafood; (2) Fishing, which also includes the development and research into new fishing technologies in both the distant water and near shore fisheries; (3) Aquaculture; (4) Biotechnology; (5) Satellite/remote sensing to monitor the fish schools/environment in ocean; and (6) Fishery information and strategic research.

### **Theme 1: Sea turtle conservation strategies and management issues**

Mr. Fan Xiangguo began the session with an overview of aquatic wildlife conservation in China. The “Law on the Protection of Wildlife” was established in 1988. Mr. Fan reviewed the major articles of the

law, including: Article 2 (extinction risk and economic and scientific values of protecting wildlife); Article 4 (pursuit of a policy to strengthen the protection of wildlife, including the active domestication and breeding of wildlife species and the local and national organizations responsible for administering the law; Article 7 (The departments of fishery administration under the local governments at or above the county level shall be responsible for the administration of aquatic wildlife in their respective areas).

“The Law of Fisheries, PRC” was enacted in 1986 and amended in 2000. Specifically, Article 37 states that rare and endangered animals shall have special protection, where killing and injuring of such species are prohibited. Exceptions may include capture for scientific research, propagation, etc.

Other laws and regulations still include ordinance on the management of the natural reserve, People’s Republic of China (1994), The Regulations of the People’s Republic of China on the Administration of the Import and Export of Endangered Wild Animals and Plants (2006), Implemental Regulation on Aquatic wildlife Protection, People’s Republic of China (1993), Rules for the implementation of Law of Fisheries (1987) and Regulations of the People’s Republic of China on Wild Plants Protection (1996).

The National Catalog for Protected Wildlife was established in 1989. Currently, 80 species are included on this list, including 13 as first class (higher level of protection) and 67 in the second class category. Currently, all sea turtles found in China are listed as Class II, but as mentioned earlier, they will soon be “uplisted” to Class I. China’s main research initiatives are to study sea turtle species found in PRC’s waters and their distribution. China has one sea turtle reserve, with a focus on rescuing turtles, domestication, as well as reproduction and releasing. Since 1985, 7 million eggs have been conserved, 60,000 individuals have been hatched and 50,000 individuals have been released.

The four measures of fishery management on the aquatic wildlife conservation have been implemented in China, which include constructing nature reserves and strengthening the habitat protection of endangered aquatic wildlife, protecting the endangered species and establishing the wild populations by acclimatization and breeding, stock enhancement, strengthening the supervision and management for aquatic wildlife conservation and advocating the call of “don’t eat wild animals”, respectively.

Prof. Fan Enyuan, Deputy Director of Natural Resource and Environmental Research center, CAFS, next provided an overview of marine turtle conservation under CITES, with a focus on CAFS research. China is a party to the treaty that established CITES in 1973, to regulate trade of Appendix I and II species. Prof. Fan noted that more concern has been focused on marine species in recent years. In addition, while China is not a party to the Convention on Migratory Species (CMS), the country is a signatory to the

Memorandum of Understanding. Based on the historic records, most trade of turtles involved green and hawksbill turtles. Green turtles were primarily traded for meat and use in soup. Although trade volume declined after 2001, meat and eggs are still consumed by some of the signatory parties. So, international cooperation should be emphasized, as shall efforts to reduce destructive fishing (e.g. explosives, poison, and some net fisheries). More funding is needed to help address these threats. China should have a sea turtle conservation action plan which would include collecting basic scientific data of distribution and habitat, addressing threats, such as trade, and emphasizing more involvement in international cooperation and in setting policy.

A brief discussion followed the presentations including the value of sea turtles in Chinese culture and religion. China explained that sea turtles are worshipped for their longevity. The proposal of the elevation from Class II to Class I for sea turtle protection has been made and a group of experts will review the proposal. The recommendation for the proposal would be sent to the Evaluation Committee then to the Minister of Agriculture, then to State Council. A Class I listing generally provides more intensive protection at the national level, less tolerance of prohibited activities, and approval for higher level research (Minister of Agriculture) verses activities affecting Class II species, which are approved at a lower (provincial) level.

The third presentation of the first session was given by Christina Fahy. Ms. Fahy provided an overview of the U.S. law protecting sea turtles (the Endangered Species Act (1973)) and a review of the status of sea turtles found in U.S. waters, highlighting that loggerhead sea turtles, once globally listed as a threatened species are now separated into 9 subpopulations, with the North Pacific subpopulation uplisted to endangered status. Ms. Fahy then provided examples of two management actions the U.S. has taken, using scientific research findings by NOAA science centers in the Southwest Region (California) and the Pacific Islands (Hawaii and other U.S. territories in the central/western Pacific). These include time/area closures to protect leatherbacks and loggerheads from the large mesh drift gillnet fishery targeting swordfish off the U.S. west coast and the pelagic longline fishery targeting swordfish in the North Pacific Ocean (bait/hook requirements, and handling and equipment requirements to reduce injury and mortality). In addition, Ms. Fahy presented information on research that the Pacific Islands Fishery Science Center has developed for longline fishermen entitled "TurtleWatch," which provides weekly updates on oceanographic features in the North Pacific most favored by loggerheads. Fishermen can use this web-based tool to avoid turtle "hot spots," particularly since the fishery is subjected to a turtle "cap," a limit on sea turtle interactions, that, when reached, closes the fishery for the season. TurtleWatch has been translated in several languages and could be translated into Chinese. Ms. Fahy also summarized other activities undertaken by NMFS and other agencies to reduce the threats to sea turtles (e.g. outreach and

education, nesting beach protection, and habitat assessments). A brief discussion with clarifying questions for all three presenters followed.

## **Theme 2: Sea turtle research progress and case studies**

Dr. Jeffrey Seminoff, leader of the Marine Turtle Ecology & Assessment Program at NOAA-Southwest Fisheries Science Center, initiated the next session with a presentation on leatherback turtle movements in the Pacific (abstract included in Appendix III). Much of his presentation focused on the recent work published by NMFS colleagues and other collaborators regarding movements of leatherbacks derived from satellite telemetry studies conducted on leatherbacks nesting in both the western Pacific and the eastern Pacific (Benson et al., 2011 and Schillinger et al. 2008, respectively – see abstract). Dr. Seminoff focused on foraging “hot spots” in the Pacific Ocean and the different strategies that leatherbacks appear to use within several large areas (“large marine ecosystems”) of the Pacific, with some subpopulations migrating thousands of miles across the ocean to access areas of high productivity and other subpopulations remaining closer to their nesting beaches. Dr. Seminoff highlighted the importance of collaborative research throughout the Pacific to understand the importance of protecting nesting beaches as well as areas favored by foraging leatherbacks as well as the threats to individual animals.

A second presentation in this session was given by Mr. George Balazs, leader of the Marine Turtle Research Program in NOAA-Pacific Islands Fisheries Science Center, who provided an overview of the research he leads in Hawaii, particularly on green turtles (abstract included in Appendix III). Mr. Balazs highlighted 40 years of research and conservation on sea turtles, including nesting beach monitoring, development of a sea turtle stranding and health program, rearing hatchlings for movement studies using satellite telemetry, etc. These initiatives have proven successful, with green turtles nesting in the French Frigate Shoals (FFS), increasing steadily, from 67 nesters documented in 1973 to 873 nesters in 2011 (5.7% average increase per year). Rising sea levels may threaten their habitat, however, with a predicted loss of up to 33% of the beaches used on East Island (FFS). Mr. Balazs also emphasized the need for collaborative research with Pacific rim countries, including China.

Ms. Zhang Feiyan, an engineer with the National Gangkou Sea Turtle Reserve, presented information on current sea turtle research and conservation in China. Ms. Zhang first provided basic classification, life history, geographic distribution, foraging grounds and nesting sites of sea turtles in China. Next she introduced the historical context of sea turtles nesting in Sea Turtle Bay (Guang Dong). Prior to 1949,

approximately 300-400 females nested very year. With eggs collected and consumed by local people and nesting females killed, the numbers of nesters has decreased. At present, there are seven aspects on sea turtles being studied in Sea Turtle Bay, including breeding ecology, tracking, genetic population, sex determination, hematology, hatchlings migration and environmental pollution.

Discussions following these first three presentations ensued. Ms. Zhang clarified that “head-started” turtles are sometimes transported as hatchlings to Turtle Bay Reserve from other nesting beaches. Regarding the increasing trend in nesting green turtles in Hawaii, Mr. Balazs explained that this may be due to three factors: 1) the population is generally isolated and not threatened by too many fisheries; 2) the U.S. Endangered Species Act (ESA) affords them protection and they are also protected by Hawaii state law (e.g. no direct capture and selling turtle meat); and 3) resiliency – given protection of their habitat and individuals at all life stages, etc. sea turtles have the capacity to recover. Three other green turtle nesting beaches outside of the U.S. (Sarawak and Sabah in the Philippines, and Malaysia) that have been protected have shown increased nesting as of 2011. Regarding the population abundance and distribution of Western Pacific leatherbacks within the South China Sea, Dr. Seminoff explained further that while information is still sparse, past and planned aerial surveys focused more off Malaysia may provide more information. One foraging area has been found off the China mainland (approximately 20 kilometers offshore) and off the northern coast of Borneo.

Dr. Seminoff continued the second session with a presentation on the global assessment on green turtles, including information on genetics, stock structure, and two case studies from Mexico and Hawaii (abstract included in Appendix III). Dr. Seminoff highlighted stock assessments conducted through both the mandates of the ESA and the IUCN’s Red List Programme, with the last assessments completed in 2007 and 2004 under each program, respectively. Dr. Seminoff described the different approaches undertaken for both assessments, with examples from two subpopulations, and concluded that based on new scientific information, new status assessments should be conducted for green turtles. While the assessment under the IUCN should be completed at the end of 2013, the assessment under the mandates of the ESA should be concluded by 2014.

Next, Mr. Balazs presented information on partnership research of marine turtles at the PIFSC, focusing on loggerhead foraging ecology (see Appendix III for further details). Mr. Balazs explained that a major focus of the research at PIFSC is to understand loggerhead movements and foraging patterns associated with underlying oceanographic dynamic features, which may help reduce loggerhead interactions with longline and other fisheries. Research tools include small Argos-linked transmitter tags and satellite remotely sensed oceanographic data, specific for the weekly movement locations of the turtles.

Approximately 450 loggerheads have been tracked, ranging from 2-4 year-old captive reared loggerheads released off Japan, to older turtles found incidentally captured in poundnet and longline fisheries. Research results have been published in journal articles and/or are in press. Diving profiles have also been studied. Of particular interest to the China Region EEZ is the discovery of three distinct ocean "hotspots" for loggerheads located off Shantou (Guangdong Province), Changle (Fujian Province), and Ningbo (Zhejiang Province), People's Republic of China, which underscores the importance of collaborating with CAFS to learn more about the use of this area by loggerheads.

Following this presentation, Dr. Huang Honghui, Associate Professor with the South China Sea Fisheries Research Institute, CAFS, presented information on sea turtle research and conservation in China. There is only one nesting beach on the mainland – National Huidong Sea Turtle Reserve. At the Reserve, researchers have tagged 125 nesting females and protected and rehabilitated (treated) 758 sea turtles. The main threats to sea turtles include: 1) over-fishing; 2) aquaculture, (impacts migratory routes); 3) pollution; 4) offshore and coastal engineering projects; 5) coastal tourism (increased pressure on the ecology of island and nearshore fishing); and 6) lack of a provincial cooperation mechanism to protect sea turtles and enforce prohibitions, etc. Regarding management efforts in the coastal area of China's south sea program, a Dongshan-Nan'ao program has been launched in 2005, which has established some "demonstration sites at the junction sea area." CAFS would like to assist in the formulation of an inter-provincial action plan for marine habitat, to be funded by government and approved by agency administrators. Dr. Huang also described a program that has been in place in the last 5 years entitled "inter-provincial action program on marine biodiversity conservation in Dongshan-Nan'ao area." Under this program, overfishing is under effective control and fishery non-fishing zones and non-fishing periods have been established. Also fishing in some areas have relocated so that coral reefs and habitats can recover from fishing pressure. In addition, training and outreach materials have been prepared for fishermen which have reduced the fishing pressure in the demonstration area and has significantly increased public awareness and participation in biodiversity conservation. From 2010-2011, as many as 83 rescue actions were made in the demo area, 136 turtles were rescued. Dr. Huang expressed interest in collaborating with NOAA in several areas: 1) Research on artificial breeding of sea turtles; 2) Disease control of the main sea turtles; 3) Contaminants on sea turtles and their eggs; 4) Enrich baseline information on migration passage and key habitat distribution of post-nesting females and juvenile sea turtle's through the tracking, tag marking and releasing technology; 5) Developing sea turtle protection and management systems based on GIS; 6) Impact of climate change on reproduction and migration of sea turtles; 7) Strengthening international communication and collaboration.

A discussion followed these presentations, focused mainly on areas of collaboration. Information on fisheries effort by countries involved in regional fishery management organizations may elucidate areas of overlap with important sea turtle habitat. Mr. Balazs also offered to share the data set of loggerhead tracks, particularly those that have shown movement into areas off China. Regarding the survival rate of animals raised and released for research with satellite tags attached, Mr. Balazs surmised that it was likely similar to the natural mortality rate, especially given the hundreds of days these animals are tracked. Dr. Huang indicated that “lung disease” has been seen in captive turtles in China as well as skin infections. He also clarified that the aquaculture facilities (net cage oyster mariculture) off the China mainland are very large and likely impede migration, but they are not adjacent to nesting beaches, so there is no barrier to nesting activities through this threat. Regarding any difference in behavior of migrating females and males, few males have been tracked off Hawaii or elsewhere. It is believed that their migratory routes are similar to the females.

The last presentation in this second session was given by Dr. John Wang, a researcher with NOAA-Pacific Islands Fisheries Science Center, who summarized scientific studies to identify strategies to reduce sea turtle bycatch in coastal net fisheries (abstract included in Appendix III). Dr. Wang first emphasized the importance of this research and applicability worldwide, particularly given past studies, which documented and provided estimates of hundreds to thousands of interactions of sea turtles with coastal net fisheries and high associated mortality. Research to reduce interactions of sea turtles in set gillnet fisheries is ongoing, but preliminary results are very promising, with the use of light sticks to illuminate the net and “alert” turtles to the presence of the net. Reductions in sea turtle bycatch have been shown, with little to no difference in target species catch or value of the targeted species. Even more promising research is conducted to reduce bycatch of sea turtles in coastal pound nets with switched roof systems that are widely used in countries such as Japan, and have high mortality rates. Trials using pound net excluder devices, with fishermen closely involved in gear development, have shown dramatic reductions in sea turtle bycatch with no associated decrease in target species catch per unit effort. Dr. Wang emphasized that fishermen involvement in workshops and trials are critical to the success and adoption of new gear technology.

A discussion focused on this second session followed. Members of the Chinese delegation clarified that safe handling procedures were followed by fishermen outside of the reserve, but by local fishermen only, which did not include gillnetters. Fishermen that operate on the high seas are trained in proper handling of sea turtles through the regional fishery management organizations.

### **Next Steps**

Dr. Li Jilong and Dr. Gerard Dinardo led the discussion that followed, which was focused on sea turtle progress to date, case studies, and moving forward with collaborative research. Workshop attendees agreed that, as a first step, they should focus on a short-term project (1-2 years) that would be of interest and useful for both countries. They also agreed that the three sea turtles of interest currently include green sea turtles, loggerheads, and leatherbacks.

A summary of major discussion points and areas of potential collaboration are as follows:

### **Priority Research Projects**

1. Biology and Ecology:
  - a. Develop proposal on a specific area/region to assess foraging ecology (PIFSC, SWFSC, SCSFRI)
2. Distribution:
  - a. Analyze tagging data mapped to oceanographic parameters (2-3 dimensional) (PIFSC, SWFSC, SCSFRI)

### **Other Potential Research Projects**

3. Assess stock structure (genetics & tagging)
4. Identify critical habitat (risks to turtles in the open ocean & meta-population analysis)
5. Evaluate impacts from environmental contaminants
6. Develop Ecosystem approaches to management
7. Stock enhancement techniques
8. Bycatch Mitigation: Gear modifications, decision tools (Turtle Watch), safe practices (training-outreach: conducted at the Guangdong Turtle Reserve)
9. Enhance Baseline Data Collection (a natural outcome of collaboration)
10. Management: Strategies for managing natural reserves (e.g., monitoring, research, outreach, development of evaluation metrics...) and use of visualization tools for decision making
11. Climate Change: Impacts on spawning /feeding migrations and nesting beaches

### **Mechanisms for Collaboration**

- Establishment of a joint Sea Turtle Working Group (U.S. Leads: Jeffrey Seminoff (SWFSC) and George Balazs (PIFSC); Chinese Leads: Huang Honghui (SCFRI), and Zhang Feiyan (Gangkou Sea Turtle Reserve)

- Data sharing and analyses, including scientist exchanges (recommended method to achieve the foraging ecology and distribution research)
- Regular meetings to discuss activities and successes

**Adjournment**

The meeting adjourned. Mr. Fan Xiangguo and Mr. Keith Chanon expressed their appreciation to all participants for their contributions and cooperation in completing a successful meeting.

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Fan Xiangguo

Chinese Chair



Keith Chanon

U.S. Chair

## **Appendix 1**

### Meeting Agenda

#### 会议日程

U.S.-China Meeting on Living Marine Resources: China-U.S. Sea Turtle Workshop

中美海洋生物资源会议: 中美海龟项目研讨会

April 10, 2012

Shanghai, China

2012年4月10日

中国上海

#### Goals of the Meeting:

#### 会议目标

Exchange information and experience associated with sea turtle related research and management conducted by the Chinese and United States governments and identification of opportunities for cooperation related to sea turtle research and conservation.

中美双方就海龟保护相关科研及管理情况交流信息和经验，探讨潜在合作项目。

**Tuesday, April 10**

**4月10日星期二**

9:00 Opening Statements (*Mr. Fan Xiangguo & Mr. Keith Chanon ; Mr. zhuangping*)

开幕辞 (中方主席樊祥国处长介绍本次研讨会的背景&美方主席 Keith Chanon 先生介绍中美海洋生物合作背景; 庄平所长作为会议承办单位致欢迎词)

9:20 Introduction

代表团成员介绍

9:30 Adoption of the Agenda & Assignment of Rapporteurs (Dr. Jeffrey Seminoff & Dr. Xing

Yingchun)

通过会议日程、确定报告撰写人

9:40 Theme 1: Sea Turtle conservation strategies and management issues

*(Leaders: Dr. Jeffrey Seminoff)*

第一主题：中美海龟保护策略及管理情况概述

( 召集人：Dr. Jeffrey Seminoff )

Speakers:

发言人 1. Aquatic wildlife conservation in china (DirectorFan Xiangguo)

发言人 2. Marine turtle conservation under CITES ---- CAFS research focus (Prof. Fan Enyuan )

发言人 3. The U.S. Endangered Species Act and application of science in management and recovery planning (Christina Fahy)

10:40 Open Discussion - Sea Turtle conservation strategies and management issues

开放式讨论：中美海龟保护策略及管理情况概述

11:00 Coffee Break 茶歇

11:20 Theme 2: Sea turtle research progress and case studies

*(Leaders Prof. Fan Enyuan)*

第二主题：中美海龟相关科研进展及案例分析

( 召集人：樊思源研究员 )

Speakers:

发言人 1. Leatherback turtle movements in the Pacific (Dr. Jeffrey Seminoff)

发言人 2. Hawaii research overview and collaborations with emphasis on Hawaii green turtles  
(Mr. George Balazs)

发言人 3. Current sea turtle research and conservation in China  
(EngineerZhang Feiyan)

12:30 Lunch 午餐

14:00 Theme 2: Sea turtle research progress and case studies (continued)

*(Leader: Mr. George Balazs)*

第二主题：中美海龟相关科研进展及案例分析(继续)

(召集人：Mr. George Balazs)

Speakers:

发言人 1. Green turtle global assessment, genetics, stock structure, and case studies of Mexico and Hawaii (Dr. Seminoff)

发言人 2. North Pacific loggerhead movements (Mr. Balazs)

发言人 3. Sea Turtle Research and Conservation in China (Dr. Huang Honghui)

发言人 4. Developing sea turtle bycatch reduction technologies in coastal net fisheries.

(Dr. Wang)

15:30 Open Discussion - Sea turtle research progress and case studies

开放式讨论：中美海龟相关科研进展及案例分析

16:00 Coffee Break and group photo

茶歇、集体照

16:30 Discussion

*( Leaders Prof. Li Jilong & Mr. Keith Chanon )*

1. Management issues 管理体系
2. Research suggestions 研究建议
3. Following steps 下一步合作

18:00 Closing

*( Leaders Prof. Li Jilong & Mr. Keith Chanon )*

会议结束

## **Appendix 2**

### **Meeting Participants**

#### **China Delegation:**

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### **Appendix 3**

#### **Abstracts of Presentations (in order of Agenda):**

#### **Conservation and Management of Aquatic Wildlife in China**

##### **Fan Xiangguo**

The presentation content mainly content four aspects, including regulations in aquatic endangered species conservation, the national catalog for protected wildlife, management on the aquatic wildlife conservation and main initiatives of sea turtle conservation in China, respectively.

There are two important national laws at present, Law on the protection of Wildlife, People's Republic of China (1988) and Law of Fisheries, People's Republic of China (1986, amended in 2000), as well as five related laws and regulations of nation and Ministry of Agriculture on regulations in aquatic endangered species conservation. The laws and regulations clearly define departments and their responsibilities, methods and requirements of management on aquatic wildlife conservation.

In the National Catalog for Protected Wildlife, there are totally 80 species, and 13 species in the First Class and 67 in the Second Class among them. These species belong to mammal, reptile, amphibian, fish, invertebrates, mollusks and coral.

Chinese government have taken four main measures to manage the aquatic wildlife, which include constructing nature reserves and strengthening the habitat protection of endangered aquatic wildlife, protecting the endangered species and establishing the wild populations by taming and breeding, enhancement and fish stocking, strengthening the supervision and management for aquatic wildlife conservation and advocating the view of "no eating of wild animals", encouraging green recipe for food.

The nature reserve is proved to be an effective way to conserve the aquatic wildlife, there are more than 200 nature reserves established in China, more than 3 times the number in 1999. Among them, 14 in national level, 50 in provincial level and 140 in city or county level. The habitats for *Lipotes vexillifer*, *Acipenser sinensis*, *Andrias davidianus*, *Pomacanthus paru*, turtles, etc. have been under protection. Many aquatic ecosystems also have been preserved.

At present, Ministry of Agriculture have established more than 40 treatment and breeding centers for aquatic wildlife. It is estimated that 10000 individuals of *Acipenser Sinensis*, *Arctictis binturong* and

*Chelonia mydas* have been rescued and released back to the natural water, which have cost more than 10 million Yuan.

A large amount of scientific researches, field surveys, law enforcements have been taken on the aquatic wildlife conservation.

### **Marine turtle conservation under CITES-CAFS research focus**

#### **Fan Enyuan**

The presentation firstly introduced the basic taxonomy and distribution of marine turtle over the world. There are totally 8 sea turtle valid species all over the world, and they are widely distributed in Atlantic, Pacific and Indian Ocean.

At present, the managers and researchers have make a great number of efforts on sea turtle, including establishing and strengthening protected areas around nesting beaches, raising awareness and promoting ecotourism at marine turtle sites, local communities involved in and benefit from protecting turtles and their nests, lobbying for turtle-friendly fishing practices, such as the use of turtle excluder devices in nets and halting the illegal trade of turtle meat and eggs, through TRAFFIC, the wildlife trade monitoring network created by WWF and IUCN.

CITES is an international treaty, developed in 1973, to regulate trade in certain wildlife species. CITES Appendix I includes species identified as endangered (species faces a very high risk of extinction). It is the most efficient convention, gives more concern on marine species in recent year and some special methology has been designed. There are 7 sea turtle species have been listed in the Appendices of CITES, 6 species are in the Appendices I and only one species is in the Appendices II.

In recognition of the global plight, sea turtles were among the list species listed on the CITES Appendices when the treaty came into force, and CITES protection over the past 35 years has been critical to ensuring their survival. Formidable opposition from some CITES Parties to all attempts to weaken sea turtle protection and effort from the conservation community have been key to maintaining the international ban on trade. According to the data of CITES, the trade status and changeable trend were analyzed in the presentation, we found the international trading of sea turtle is still on going.

The World Conservation Union (IUCN) is an organization which links together government agencies, non-government agencies, and independent states to encourage a worldwide approach to conservation. According to the data of IUCN, there are 3 sea turtle species are critically endangered and 3 are endangered.

Endangered Species Act (ESA) 1973 is administered by the U.S. Departments of Interior and Commerce. It seeks to stop the extinction of wild animals and plants in the United States, other nations, and at sea. All sea turtles except the flatback are listed as threatened or endangered on the U.S. Endangered and Threatened Wildlife and Plants List. It is illegal to harm, or in any way interfere with, a sea turtle or its eggs.

In China, 5 regulations on aquatic endangered species conservation have been implemented since 1989.

The presentation also gave out awareness and suggestions. We should aware that China and U.S. have made more efforts on management of sea turtle but its international trading is still on going, sea turtle conservation strategy should be improved in member Parties, international cooperation should be encouraged and more funding required. Presenter suggested Chines conservation action plan for sea turtle should be continued, researchers should pay more attention to collect basic scientific data of fishery, population, trading of sea turtle, China should more involve in the international cooperation.

From the angle of CAFS, CAFS should more focus on the fishery research, be listed in the Sino-U.S. Cooperation Framework, as well as pay more attention to study on the natural reserve and habitat, natural resource and distribution, policy, market trading of sea turtle.

## **Sea Turtle Research and Conservation in China**

### **Huang Honghui**

Sea turtles have been ever sighted at South China Sea, East China Sea, Yellow Sea and Bohai Sea, but about 90% sea turtles distribute in the South China Sea, and the number of green sea turtle account for more than 85%. The sea turtle nesting ground in China only distribute in South China Sea coast and island beaches. There were lots of record of sea turtles coming to lay eggs along the north coast sea beaches before 1940s, but now the nesting grounds only exist at Huidong China mainland, Hongkong and Taiwan.

Huidong Gangkou Sea Turtle Nature Reserve, the only sea turtle nesting ground in China Mainland, was established to protect the sea turtle nesting ground by the People's Government of Guangdong Province in 1985, and upgraded to national nature reserve by the approve of State Council in 1992. From 1985 to 2005, a total of 1184 heads (times) sea turtle landed on the beach of the reserve, nested 665 nests with 75319 eggs, and 62118 heads were incubated artificially, 53203 heads were released, 125 heads were tagged, and 758 heads were saved or treated in the reserve from 1985 to 2005.

Post-nesting sea turtles from China Mainland, Hong Kong and Taiwan have been tagged to determine migratory routes, swimming speeds and residence times at different water depths with transmitter on their back. Information from this research will help to develop strategies for the protection of green sea turtles. The results shows the junction sea area of Guangdong, Fujian and Taiwan provinces is a key transit center for the important migratory species of sea turtle.

In order to protect the important and rare species of sea turtle, GEF, UNDP and SOA started the "Management in the Coastal Area of China's South Sea" program and established an Inter-provincial action program demonstration sites on marine biodiversity conservation in the junction sea area in 2005, and achieved the approval of Guangdong and Fujian ocean and fisheries administration. Since then, overfishing in the area has been controlled effectively, and fishery resources conservation is getting more and more strengthened, and the fishing pressure in the demo area reduced, the public awareness and participation in biodiversity conservation significant upgraded. From 2010-2011, as many as 83 rescue actions were made in the demo area, 136 turtles were rescued.

## **Current Sea Turtle Research and Conservation in China**

### **ZhangFeiyan**

The presentation introduced four main aspects of sea turtle of China, including valid species and geographic distributions, status, researches, conservation management of sea turtle.

There are 7 sea turtle species all over the world, which are widely distributed in the tropical and subtropical ocean. Five species, including leatherback, loggerhead, green, hawksbill and olive ridley turtles, were found in the waters of east and south of mainland China and the associated islands.

Decades of harvesting, habitat degradation, fishery bycatch and pollution have led to a drastic decline in the population of sea turtle since the last century. They are all listed as "critically endangered" on IUCN.

Currently known sea turtle nesting sites consist of Sea Turtle Bay, Wanan Island, Lanyu Island and Lamna Island.

A number of measures were implemented in China with a view to protect the endangered sea turtles and their habitats. These measures are briefly described as building rescue center, community participating, public education, special training and education to the local fishermen and workshop.

Population monitoring and tagging projects have been employed since then to study the population dynamics and nesting ecology of the sea turtles. In recent years, various studies were carried out on the satellite telemetry for green sea turtle migration study, temperature determine sex and genetic population study. In addition, a head starting program has been conducted to improve the survivorship of population of sea turtle.

Biological and environmental parameters were collected for the nesting ecological studies. The effects of environmental parameters to hatching rate include sand size, humidity, temperature and so on. Gravid females, incubated eggs and hatchling also have close contact. The results show that larger females will deposit larger clutch size, thus decrease the hatching period. Larger eggs, especially heavier, will produce larger and heavier hatchlings.

## **The U.S. Endangered Species Act and Application of Science in Management and Recovery Planning**

### **Christina Fahy**

All species of sea turtles found in the exclusive economic zone of the United States are listed as endangered or threatened under the U.S. Endangered Species Act (ESA), with some species (the North Pacific loggerhead, for example) divided into subpopulations, or “distinct population segments.” The ESA was enacted in 1973 to provide a means and a program for plants and animals at risk, and under the law, it is illegal to: harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The ESA also gives the agencies (NOAA’s National Marine Fisheries Service and/or the U.S. Fish and Wildlife Service) to designate “critical habitat” to protect habitat features which are considered essential to the conservation of the species (for example, critical habitat for Pacific leatherbacks was recently designated off the U.S. west coast -- <http://www.nmfs.noaa.gov/pr/pdfs/fr/fr77-4170.pdf>). The goal of the ESA is to “recover” endangered and threatened species so they can be removed from the list. Pacific sea turtles all have recovery plans, which can be found at: <http://www.nmfs.noaa.gov/pr/recovery/plans.htm>. At the Southwest Regional Office in California, we

implement management and policy regarding activities that may negatively affect sea turtles and we rely heavily on the best available scientific research to help inform our decisions.

I present two examples of management actions that NMFS has taken in the last decade to reduce the threat of fishing activity on sea turtles foraging in the North Pacific. One example is our large mesh drift gillnet fishery, targeting swordfish, which has carried observers since 1990 and operates offshore of California. We used information gathered by the observer program and research conducted by the Southwest Fisheries Science Center (genetic analyses of samples, satellite telemetry studies, and aerial and boat-based surveys), also located in California, to assess the impact of the fishery on leatherback sea turtles. Given the nesting beach origin of leatherbacks foraging off the U.S. west coast, the status of this subpopulation, and the resulting increased risk to extinction of leatherbacks, NMFS implemented a time/area closure in 2001 to protect leatherbacks in an area and during a time where they predictably forage. While the closure appears to have worked (sharp reduction in leatherback interactions), the fishermen are not able to fish in an area that historically provided them with higher catch per unit effort of swordfish. Based on research conducted in the last ten years, NMFS now plans to review the current time/area closure to determine if the area or closure time can be modified to allow limited fishing. In the longline fishery based out of Honolulu Hawaii, NMFS used information gleaned from research in the North Atlantic that showed that replacing standard sized “J” hooks with large circle hooks, combined with replacing squid bait with fish (mackerel) bait would reduce interactions with sea turtles by 90 per cent. Following the adoption of this requirement, the Hawaii longline fishery has seen a comparative reduction in sea turtle bycatch, particularly loggerhead sea turtles. Based on telemetry studies of loggerheads and their association with sea surface temperatures and other oceanographic features, the Pacific Islands Science Center developed a computer-based product called “TurtleWatch,” which is updated weekly during the longline season and provides information on potential loggerhead hot-spots in the north Pacific Ocean. The program is available in several languages and could be translated into Chinese.

Other regional management activities are focused to reduce impacts to sea turtles both domestically (e.g., boat strikes, power plant entrainment, responsible viewing, and coastal development) and internationally, through regional fishery management organizations, international agreements, collaborative research and capacity building.

## Leatherback turtle movements in the Pacific

Jeffrey A. Seminoff

Pacific leatherback turtles (*Dermochelys coriacea*) have declined significantly during past decades. This metapopulation nests year-round at beaches of several western Pacific nations and seasonally at several sites in the eastern Pacific. Together, leatherbacks in the Pacific constitute two separate stocks, as documented through genetic analysis and telemetry studies. To provide a large-scale perspective of the movements, high-use areas, and habitat associations of leatherbacks nesting in the Western Pacific, this presentation reported the findings of a recent scientific article by Benson et al. (2011, see below for citation). Telemetry results are given for 126 satellite telemetry deployments conducted on leatherbacks at western Pacific nesting beaches and at one eastern Pacific foraging ground during 2000–2007. This presentation also summarized satellite telemetry results for leatherbacks nesting in the eastern Pacific, as reported by Shillinger et al. (2008, see below for citation). From the telemetry results we were able to determine the hotspots for foraging activity in the Pacific. For Western Pacific nesting females there was a clear separation of migratory destinations for boreal summer vs. boreal winter nesters. Leatherbacks that nested during boreal summer moved into Large Marine Ecosystems (LMEs) of the temperate North Pacific Ocean, often near the U.S. west coast, or into tropical waters of the South China Sea. Turtles that nested during boreal winter moved into temperate and tropical LMEs of the southern hemisphere. Foraging behavior occurred in temperate and tropical waters at diverse pelagic and coastal regions exhibiting a wide range of oceanographic features, including mesoscale eddies, coastal retention areas, current boundaries, or stationary fronts, all of which are known mechanisms for aggregating leatherback prey. Use of the most distant and temperate foraging ground, the California Current LME, required a 10–12 month trans-Pacific migration and commonly involved multiple years of migrating between high-latitude summer foraging grounds and low-latitude eastern tropical Pacific wintering areas without returning to western Pacific nesting beaches. In contrast, tropical foraging destinations were reached within 5–7 months and appeared to support year-round foraging, potentially allowing a more rapid return to nesting beaches. Based on these observations, we hypothesize that demographic differences are likely among nesting females using different LMEs of the Indo-Pacific. In the eastern Pacific, movements were much less diverse, with the great majority of tracked animals moving to southern latitudes of the southeastern Pacific Ocean. The differences in movements and foraging strategies underscore the importance of and the need for ecosystem-based management and coordinated Pacific-wide conservation efforts.

Citations:

Benson, S. R., T. Eguchi, D. G. Foley, K. A. Forney, H. Bailey, C. Hitipeuw, B. P. Samber, R. F. Tapilatu, V. Rei, P. Ramohia, J. Pita, and P. H. Dutton. 2011. Large-scale movements and high-use areas of western Pacific leatherback turtles, *Dermochelys coriacea*. *Ecosphere* 2(7):art84. doi:10.1890/ES11-00053.1

Shillinger GL, Palacios DM, Bailey H, Bograd SJ, Swithenbank AM, et al. (2008) Persistent Leatherback Turtle Migrations Present Opportunities for Conservation. *PLoS Biology* 6:e17

**Partnership research of marine turtles at the NOAA Pacific Islands Fisheries Science Center: Hawaii, East Asia, and the North Pacific.**

**George Balazs**

The NOAA Pacific Islands Fisheries Science Center (PIFSC) in Hawaii conducts an array of marine turtle studies involving several programs and disciplines that include stock assessment, biology and life history, bycatch analysis and mitigation, physiology, and pelagic ecology. Both national and international collaborative research by the PIFSC occurs across a broad region of the Pacific, from the Americas to East and Southeast Asia. Hawaii is well-situated for such partnership roles due to its mid-Pacific location 4000 km from the USA Mainland, and a multi-cultural heritage linked closely to China, Japan, Korea, and the Philippines. A strong teamwork approach is promoted for all research partners by building upon mutual respect, trust, and the free flow of information. NOAA scientists at the PIFSC and the Southwest Fisheries Science Center (in California) have a close and coordinated relationship exemplified in the fields of turtle genetics, migration patterns, and foraging ecology.

Research of marine turtles at the PIFSC traces its origin to 1972 when the Hawaii Institute of Marine Biology (State of Hawaii) initiated a captive rearing study of green turtles (*Cheloniemydas*) and started a systematic monitoring and tagging program of seasonal nesting at East Island in the remote Northwestern Hawaiian Islands. Flipper tags were significantly improved upon during this early era. The ocean capture and tagging of immature turtles in Hawaii's coastal foraging areas began in the late 1970's. In 1982, a turtle stranding and necropsy program was started to examine health, disease, and causes of mortality. In 1992, satellite tracking was initiated of nesters and later expanded to immature turtles as transmitter tags became smaller. Forty years of continuous turtle research in Hawaii has resulted in numerous comprehensive computerized data sets useful for management and available for cooperative study. Forty years of conservation efforts in Hawaii have resulted in an increasing green turtle population well on the way to biological recovery. And last but not least, 40 years of research and conservation experiences in

Hawaii offer superb opportunities for academic exchange to strengthen and expand China/USA bilateral science capacity and cooperation, facilitated by NOAA and the Chinese Academy of Fishery Sciences.

### **Green turtle global assessment under the IUCN Red List and US Endangered Species Act**

**Jeffrey A. Seminoff**

Understanding the status of wildlife species is fundamental to their conservation. For green sea turtles (*Chelonia mydas*), management decisions regarding common themes like bycatch reduction and nesting beach protection require information on the status of individual populations being impacted. At present green turtles are listed as Endangered on the IUCN Red List of Threatened Species, and Threatened under the U.S. Endangered Species Act (ESA) with subpopulations in Florida and Mexico listed as Endangered). At a global level, the IUCN Red List Programme generates status assessments; identifying a species' 'extinction risk' based, for example, on past vs. present abundance across its entire geographic range. More recently, there have been efforts to conduct assessments at subglobal levels, such as the Regional Management Unit (RMU) framework. In addition to the IUCN Red List Assessment framework, the U.S. implements a separate assessment approach, based on mandates outlined in the ESA. Under this framework, efforts are made to classify sub-global populations, known Distinct Population Segments (DPS), which are determined based on genetic and life history spatial variation. Both the IUCN and the ESA approaches have been implemented for green turtles, with the most recent IUCN assessment in 2004, and the most recent ESA assessment in 2007. Since these previous efforts, many new population trend data sets and demographic data have come available for green turtle populations in many regions, suggesting that a population status update is warranted. As a result, in 2012 the IUCN and ESA will both conduct new, updated assessments of green turtles. The IUCN Red List Assessment will be conducted by the IUCN Marine Turtle Specialist Group, under the leadership of Jeffrey Seminoff and Camryn Allen. The ESA Assessment will be conducted by a team of biologists from NOAA (leader not yet known). Under both initiatives, there will be efforts to conduct sub-global assessments in order to capture the regional differences in population status, and thus enhance our ability to make the best-informed management decisions at local and regional levels. Whereas the IUCN assessment should be completed by the end of 2013, the ESA assessment will likely take longer, perhaps reaching completion by the end of 2014. For both efforts, the input of data from China would be a valuable contribution to future assessment efforts.

**Partnership research of marine turtles at the NOAA Pacific Islands Fisheries Science Center:  
Identifying loggerhead pelagic foraging ecology**

**George Balazs**

Since 1997, the Ecosystems and Oceanography Division and the Marine Turtle Research Program of the NOAA Pacific Islands Fisheries Science Center in Honolulu, Hawaii have effectively worked together with an array of national and international Pacific partners to study the endangered loggerhead turtle, *Carettacaretta*. Loggerheads in the North Pacific range from East Asia to North America and consist of one genetic stock with nesting exclusively in Japan. Our research of this far-ranging highly migratory species focuses on movements and foraging patterns that significantly involve both high-seas and coastal habitats. A major objective of this work is to understand the underlying oceanographic dynamic features associated with loggerhead movements, hence foraging ecology. The results of this partnership are experimentally used to reduce loggerhead interactions with longline and other fisheries, thereby aiding in the conservation of the species. Our research tools include small Argos-linked transmitter tags and satellite remotely sensed oceanographic data, specific for the weekly movement locations of the turtles.

Many of the loggerheads used in our studies have been reared from hatchlings for 2-4 years at the Port of Nagoya Public Aquarium in Japan. Argos-linked tags are attached to the carapace and the turtles are released offshore in appropriate habitats. Other loggerheads in our studies have been tagged and released after incidental capture in poundnet and longline fisheries. To date, we have successfully tracked and investigated the movements of 450 loggerheads. The profiling of diving patterns has also been studied. Releasing loggerheads for research in this manner has resulted in 11 prominent journal publications. Additional papers are currently in preparation. Four of the publications featured in this powerpoint presentation are listed below. Of particular interest to the China Region EEZ is the discovery of three distinct ocean "hotspots" for loggerheads located off Shantou (Guangdong Province), Changle (Fujian Province), and Ningbo (Zhejiang Province), People's Republic of China (see Kobayashi et al. 2011 below).

Having new colleagues from China in this international research partnership, facilitated by the Chinese Academy of Fishery Sciences, would greatly expand and strengthen China/USA bilateral capacity and cooperation to learn more about loggerheads in an important region of the species range. We sincerely welcome and encourage China's involvement in this international science effort.

Howell, Kobayashi, Parker, Balazs and Polovina. 2008. TurtleWatch: A tool to aid in the bycatch reduction of loggerhead turtles in the Hawaii-based pelagic longline fishery. *Endangered Species Research*, 5: 267-278.

Howell, Dutton, Polovina, Bailey, Parker and Balazs. 2010. Oceanographic influences on the dive behavior of juvenile loggerhead turtles in the North Pacific Ocean. *Marine Biology* 157:1011-1026.

Kobayashi, Cheng, Parker, Polovina, Kamezaki and Balazs. 2011. Loggerhead movement off the coast of Taiwan: characterization of a hotspot in the East China Sea and investigation of mesoscale eddies. *ICES J. Marine Science*.

Polovina, Uchida, Balazs, Howell, Parker and Dutton. 2006. The Kuroshio Extension Bifurcation Region: A pelagic hotspot for juvenile loggerhead sea turtles. *Deep Sea Research II* 53(2006)326-339

### **Developing sea turtle bycatch reduction technologies in coastal net fisheries**

**John Wang**, Yonat Swimmer, Shara Fisler, Takashi Ishihara,

Yoshimasa Matsusawa, Hoyt Peckham

Coastal fisheries are found throughout the world and are often problematic. Gillnet fisheries, in particular, have been associated with significant sea turtle bycatch rates. For example, the coastal gillnet fishery based in Lopez Mateo, Baja California, MX interacts with up to 800 loggerhead turtles (*Caretta caretta*) per year, while gillnet fisheries off the coast of Northern Peru catches over 300 green sea turtles (*Chelonia mydas*) per year. In addition, poundnet fisheries such as those located off the coast of Japan have also been associated with large numbers of sea turtle mortalities. As such, developing strategies and bycatch reduction technologies to decrease the unwanted interaction rates and mortality between these fisheries and sea turtles is of great interest. In this report, we present two studies in which we describe the development and testing of sea turtle bycatch reduction technologies (BRTs).

1) Experiments with illuminated gillnets show that green sea turtle interaction rates can be reduced by 40-60%. When adapted to commercial bottomset gillnet fisheries, these illuminated nets do

not significantly affect the catch rates of target species or value of catch. Currently, we have expanded net illumination projects into coastal gillnet fisheries located in Northern Peru, Baja California Sur (Mexico) and Southern Brazil. In addition, we have begun testing the use of ultra-violet (UV) lightsticks to illuminate gillnets. Preliminary results suggest that UV illuminated nets reduce sea turtle interactions by 50%. Initial results suggest that halibut catch rates in UV illuminated nets increase. California halibut (*Paralichthys californicus*) are the primary target fish species and hold the most value per kilo.

2) In Japan, closed top pound net fisheries are associated with high rates of many loggerhead and green sea turtles and are likely a major obstacle to the recovery of the North Pacific loggerhead. Such pound nets prevent sea turtles from reaching the surface to breathe. To address high rates of bycatch mortality of adult and subadult loggerhead and green turtles in pound nets, we initiated an international multi-sector program to develop and test bycatch mitigation solutions. We convened three International Pound net Escape Device (PED) Workshops combined with experimental trials at Suma Aqualife Park (Kobe, Japan) with fishers, gear manufacturers, government representatives and marine scientists. Participants collaborated during the workshops to develop and then test several innovative categories of PEDs. In total we ran 126 turtle escape trials on 25 PED designs with fish retention trials on the most promising. During the third workshop in October 2011 we identified 4 PED designs that exhibited 80%-100% turtle escape with 100% fish retention. The public setting yielded firsthand views of turtles that were struggling to escape from the pound net trap in order reach the surface to breathe. This resulted in extensive press coverage detailing the bycatch problem and the collaborative process of developing PEDs. Thus the education and public awareness raised throughout this process has been as influential as the PED research itself.