PICES/MAFF PROJECT ON "*MARINE ECOSYSTEM HEALTH AND HUMAN WELL-BEING*"
EIGHTH MEETING OF THE PROJECT SCIENCE TEAM
November 2, 2016
San Diego, USA

The eighth meeting of the Project Science Team (PST) for the PICES/MAFF project on "*Marine Ecosystem Health and Human Well-Being*" (MarWeB), funded by the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan, through the Fisheries Agency of Japan (JFA), was held November 2, 2016, in conjunction with the 2016 PICES Annual Meeting in San Diego, USA.

The meeting was co-chaired by Drs. Mitsutaku Makino (Japan) and Ian Perry (Canada). The Project Science Team members and meeting participants are identified in *Appendix 1*.

1. ADOPTION OF THE AGENDA

The agenda was adopted as proposed (*Appendix 2*).

2. INTRODUCTION OF THE MEETING

The goal of this project is to identify the relationships between sustainable human communities and productive marine ecosystems in the North Pacific, under the concept of fishery social-ecological systems. Considering the global changes are affecting both climate and human social and economic conditions, the project is expected to determine: (a) how marine ecosystems support human well-being, and (b) how human communities support sustainable and productive marine ecosystems.

The meeting objectives were to finalize: (1) the research, especially, the two case studies in Indonesia and Guatemala and human well-being analysis, and (2) the timetable until the end of this project, especially, the manual and database development.

Reports from previous PST meetings, annual progress and financial reports, and other project-related materials are available on the project's website at http://meetings.pices.int/projects/marweb.

3. BUDGET SITUATION

The Project Coordinator, Dr. Alexander Bychkov, noted the MarWeB project is in its final year, and all final reports must be submitted to MAFF by July 31, 2017. It was suggested in discussion that a meeting of a few members of the Project Science Team may be needed to discuss issues that are likely to arise as the PICES Scientific Report and Advisory Report/Manual are being finalized. One opportunity for a low-cost meeting would be to hold it coincident with the Small Pelagics Symposium (March 6–11, 2017, in Victoria, Canada) as a number of Project Science Team members will attend that symposium or live nearby.

It was recommended that some of the remaining funds for the project be made available to assist with a final visit to Guatemala in January–February 2017, and preparation of the final reports and assembly of data, photos and the bibliography that will comprise the MarWeB database. Funding for the publication of the Scientific and Advisory Report is expected to come from the PICES general publication budget.

4. PROGRESS REPORTS

The MarWeB project has focussed on three major initiatives:
1. Social-ecological interactions related to integrated multi-trophic aquaculture in Indonesia;
2. Social-ecological interactions related to small-scale shrimp aquaculture in Guatemala;
3. Development of the "well-being cube" approach to assessing national well-being related to marine systems.

4.1 Guatemala case study

Conclusions to date from the Guatemala case study included:
- Tourism is not just for visitors, but improves life for the whole community by bringing in opportunities for education and income for community members – women, men, children.

- A more healthy lifestyle can be facilitated with opportunities for better education; sustainable, environmentally-friendly tourism; and environmentally-considerate aquaculture opportunities.
- Protection of the lagoon waters is essential, as these waters are breeding grounds for many major economically valuable species.
- Community-wide, coordinated eco-tourism and fishing trips for tourists can be implemented to create a more sustainable alternative to fishing for sustenance.
- Alternative source of fish-based food supplies must be sought – such as through aquaculture.
- The communities have a relationship with the Universidad de San Carlos de Guatemala and should work with the faculty and researchers to develop sustainable associations.

The oyster aquaculture trial study had difficulties with theft of installations. However, the community was very enthusiastic about the project. The results obtained from the trial period demonstrate that culturing of *C. gigas* is feasible in Guatemala despite relatively low water recirculation rates and a high amount of suspended solids in the water column. *C. gigas* can achieve the commercial market size of 70 mm in diameter in six months; however, the system must be cleaned every 15 days in order to maintain and/or improve the survival rates.

Lessons from the Guatemala case study in regards to establishing a *Sato-umi* type approach to people and the sea included:
- the 'clicker' surveys allow anonymity (language and cultural barriers);
- collaboration is essential for decision making (not the "big daddy" approach);
- open mindedness and listening are critical;
- in country constantly consulted "point person" is needed (feedback loop);
- oyster culture can work as an alternative to high intensity shrimp culture.

A final visit to Guatemala is planned for February 2017, to facilitate communications among these communities and leaders of a United Nations Development Program (UNDP) project intended to support and expand the five Marine Protected Areas on the Pacific coast of Guatemala.

4.2 Indonesia Case Study

Dr. Masahito Hirota presented his work on a commodity chain analysis of seafood in Karawang Province, and how the products from the MarWeB Integrated Multi-Trophic Aquaculture (IMTA) study may benefit the community. It was recommended that this material be included in the Scientific Report and the Advisory Report/Manual from this project. It was also suggested that the Advisory and Scientific Reports comment on the common steps for social science surveys conducted in Indonesia and Guatemala (*i.e.*, the commodity chain analysis in Indonesia and the community needs assessment in Guatemala), but also note their differences due to the different local situations.

Dr. Mark Wells described progress in the pond experiments in Indonesia, specifically in regards to reducing nutrients and generating new products using an IMTA approach. Our local MarWeB scientific collaborators were beginning to make positive progress, perhaps in part as a result of becoming more familiar with these new approaches. A paper in the primary scientific literature is being planned.

4.3 Well-being cube study

Dr. Makino presented the latest results on the well-being cube study on behalf of Ms. Juri Hori. He noted the recent publication of a paper on this subject: Hori, J., and Makino, M. 2016. Analysis and international comparison of structure of human well-being provided by marine ecosystem services. Bull. Japan Soc. Fish. Oceanogr., 80(3): 199–206 (in Japanese with English Abstract). The abstract of this paper states:

> In order to evaluate how the marine ecosystems and social environments affect human well-being, feeling of satisfaction according to the five components of human well-being defined by the Millennium Ecosystem Assessment （Security, Basic material for good life, Health, Good social relations, and Freedom of choice and action) was examined by means of questionnaires. Structural Equation Modeling (SEM) analysis was applied to visualize the basic structure of human well-being and to compare among three Asian countries （Japan, Korea and Indonesia) which are highly dependent on fisheries. The SEM

analysis showed that the three countries shared a common basic structure of the human well-being, with the five components interacting with each other. However, the intensity of interaction between each component differed among the three countries. "Good social relationship" strongly influences "Freedom of choice and action" as the most important component in Japan and Korea, while "Health" does in Indonesia. Consideration of the differences in the structure of human well-being among the countries is suggested to be important for better conservation and management of marine ecosystems.

4.4 Discussion

The Project Science Team recommended the Scientific Report and Advisory Report should include these scientific outputs, possibly highlighted as boxes to the main text. An example of *Sato-umi* in practice should be included as an additional box. It was also noted that the relationships of marine ecosystem health and human well-being are place-dependent, as demonstrated for example by the outcomes of the well-being cube analyses and by comparisons among the three communities in the Guatemala case study. Therefore, there is a need to identify the local perceptions of the specific problems faced by these communities (and hence the importance of the community needs assessment and the commodity chain analyses).

5. MANUAL AND DATABASE DEVELOPMENT

It was recommended that the manual focus on the format of a PICES Advisory Report.

Contents of the database were recommended to include:

Bibliography on relevant topics (social-ecological systems, Sato-umi, IMTA, oyster aquaculture, well-being, *etc*.):

- list of references as a searchable Word document;
- published papers on a password-protected site (noting copyright issues with commercially-published papers);
- list of key words for specific topic areas that can be used to obtain recent papers;
- "must-read" references for key topic areas (similar to Current Opinion in Environmental Studies highlighting) to be identified during report sections writing;
- base bibliography of well-being in English to be provided by Dr. Murray who has a student working on this topic;
- activity to be led by Dr. Makino and completed by the end of March 2017.

Photos:

- lots of photos were taken during the case studies, including photos of people;
- no problem with non-people photos, but we are likely not going to be able to post people photos due to privacy issues.

Data (from the pond experiments in Indonesia and oyster experiments in Guatemala; from the social surveys in Indonesia and Guatemala, and from the "well-being cube" analysis in PICES member countries):

- likely no problem with posting raw data (*e.g*. from the 'clicker' surveys in Guatemala);
- need adequate meta-data and descriptors;
- need to clear posting data with case study partners;
- need some work to provide English translations (*e.g*., the well-being cube study questions from Japanese).

6. OTHER MATTERS

6.1 Topic session proposal for PICES-2017

A topic session proposal for PICES-2017 (Vladivostok, Russia) is included in *Appendix 3*.

6.2 Next PICES-MAFF project for 2017–2019

Dr. Hirota presented a proposal for the next PICES-MAFF project, "*Building capacity for ecosystem-based management in small-scale nearshore fisheries impacted by coastal zone development*" (tentative title), recommended for 2017–2019.

Dr. Makino thanked the participants for their ongoing efforts in support of the MarWeB project. The meeting was adjourned at 1800.

Appendix 1

Project Science Team membership

Harold (Hal) P. Batchelder	PICES Secretariat
Keith R. Criddle	University of Alaska, Fairbanks, USA
Masahito Hirota	Fisheries Research Agency, Japan
Juri Hori*	Rikkyo University, Japan
Suam Kim	Pukyong National University, Korea
Mitsutaku Makino (Co-Chairman)	Fisheries Research Agency, Japan
Grant Murray	Institute for Coastal Research, Canada
Jongoh Nam*	Maritime Institute, Korea
Ian Perry (Co-Chairman)	Pacific Biological Station, Department of Fisheries and Oceans, Canada
Thomas Therriault	Pacific Biological Station, Department of Fisheries and Oceans, Canada
Vera Trainer	Northwest Fisheries Science Center, NOAA Fisheries, USA
Charles Trick*	University of Western Ontario, Canada
Mark Wells	University of Maine, USA

* Unable to participate in the meeting.

Additional participants in the 2016 Victoria meeting:

Alexander Bychkov	PICES Special Projects Coordinator
Toyomitsu Horii	Fisheries Research and Education Agency, Japan

Participants of the eighth Project Science Team meeting for the PICES/MAFF project on "Marine ecosystem health and well-being" (left to right): Masahito Hirota (Japan), Mark Wells (USA), Keith Criddle (USA), Alexander Bychkov (PICES), Mitsutaku Makino (Japan; Co-Chairman), Vera Trainer (USA), Thomas Therriault (Canada), Suam Kim (Korea), Toyomitsu Horii (Japan), Harold Batchelder (PICES) and Ian Perry (Canada; Co-Chairman).

Appendix 2

Eighth Project Science Team meeting agenda

1. Adoption of the agenda
2. Introduction to the meeting (Mitsutaku Makino)
3. Budget situation (Alexander Bychkov)
4. Final progress reports
   - 4.1 Case study in Guatemala (Vera Trainer and Charles Trick)
   - 4.2 Case study in Indonesia (Mark Wells, Masahito Hirota)
   - 4.3 Well-being analysis (Mitsutaku Makino)
   - 4.4 Discussion
5. Manual and database development
   - 5.1 Contents and outline (Mitsutaku Makino)
   - 5.2 Timetable till March 2017
6. Next steps
   - 6.1 Topic session proposal for PICES-2017 (Ian Perry)
   - 6.2 Next PICES-MAFF Project for 2017–2019 (Masahito Hirota)

Appendix 3

MarWeB Topic Session for PICES-2017

Title:
Marine ecosystem health and human well-being: A social-ecological systems approach

Convenors:
Mitsutaku Makino (Japan), Ian Perry (Canada), Mark Wells (USA) and Masahito Hirota (Japan)

Session Description:
Ecosystem-based fisheries management seeks to restore, enhance, and protect living resources, their habitats, and ecological relationships to sustain all fisheries and provide for balanced ecosystems. Progress has been made internationally toward adopting ecosystem-based fisheries management of marine systems (EBFM), with PICES countries contributing through regional applications in the North Pacific. Examples are: the Study Group on Ecosystem-based management science and its application to the North Pacific (SG-EBM: 2003–2004) and the Working Group on Ecosystem-based management science and its application to the North Pacific (WG-19: 2004–2009). Recent initiatives have expanded the concept of ecosystem to include human influences, both positive and negative, which is emerging as coupled marine social-ecological studies (Marine SES). An integrated understanding of how ecosystem changes affect human social systems and their well-being, and *vice versa*, is necessary to improve environmental stewardship. The PICES Study Group on Human Dimensions (SG-HD: 2009–2011), Section on Human Dimensions of Marine Systems (S-HD: 2011), and PICES-MAFF Project on "Marine Ecosystem Health and Human Well-Being" (MarWeB: 2012–2017) have contributed to progress in ecosystem-based management efforts in the North Pacific. Also, cooperation with other international scientific organizations and programs has been developing, such as MSEAS-2016, which was co-sponsored by PICES. ICES, IFREMER, *etc*. Key questions of that structure these scientific activities are: (a) how do marine ecosystems support human well-being? and (b) how do human communities support sustainable and productive marine ecosystems? Topic Session welcomes papers that address any aspect of marine social-ecological systems, and particularly research that address the above two questions.

Potential invited speakers:
– Suhendar Sachoamer (Indonesia)
– TBD (related to the MarWeB Guatemala case study)