PICES/MAFF PROJECT ON "*MARINE ECOSYSTEM HEALTH AND HUMAN WELL-BEING*"
SIXTH MEETING OF THE PROJECT SCIENCE TEAM
October 14, 2015
Qingdao, China

The sixth 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 October 14, 2015, in conjunction with the 2015 PICES Annual Meeting in Qingdao, China. The meeting objective was to review progress from the fifth PST meeting in October 2014 and plans for FY 2016 (final year of the project), in particular: a) consistency among case studies and b) concrete and specific image for the final products of this project (manual and database).

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 PROJECT

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.

Dr. Makino briefly reviewed the background and context for the project and summarised the major activities to date, including:

- First PST meeting in conjunction with PICES-2012 (October 11, 2012, Hiroshima, Japan);
- First Indonesia workshop (March 13–14, 2013, Jakarta and Karawang, Indonesia);
- Second PST meeting (June 10–12, 2013, Honolulu, USA);
- First Indonesia social survey (October 2–3, 2013, Karawang, Indonesia);
- Third PST meeting in conjunction with PICES-2013 (October 10, 2013, Nanaimo, Canada);
- Guatemala scouting visit (January 27–31, 2014, Guatemala City, Guatemala);;
- Second Indonesia workshop and second social survey (March 24–27, 2014, Karawang, Indonesia);
- Fourth PST meeting in conjunction with the FUTURE Open Science Meeting (April 13, 2014, Kona, Hawaii, USA);
- Fifth PST meeting in conjunction with PICES-2014 (October 16, 2014, Yeosu, Korea);
- MarWeB Topic Session on "*Ecological and human social analyses and issues relating to Integrated Multi Trophic Aquaculture*" convened at PICES-2014 (October 22, 2014, Yeosu, Korea);
- Third Indonesia workshop (November 25–26, 2014, Pekalongan, Indonesia);
- Social survey and data collection in Guatemala;
- Follow-up visit and first social survey at several locations in Guatemala (February 26–March 7, 2015);
- Follow-up visit by Dr. Mark Wells for overseeing the pond experiment (March 5–10, 2015, Indonesia);
- Third Indonesia social survey (September 2015,
- Fourth Indonesia workshop (October 7–8, 2015, Karawang, Indonesia);
- Progress and financial reports for Year 1 (FY 2012: April 1, 2012 – March 31, 2013), Year 2 (FY 2013: April 1, 2013 – March 31, 2014) and Year 3 (FY 2014: April 1, 2014 – March 31, 2015) submitted to MAFF;
- Four articles published in PICES Press: Vol.21, No. 1 (winter 2013), Vol. 21, No. 2 (summer 2013), and two articles in Vol. 23, No. 2 (summer 2015);
- Sixth PST meeting in conjunction with PICES-2015 (October 14, 2015, Qingdao, China; this meeting).

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. 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.

3.1 Annual Reports for Science Board and MAFF/JFA

The progress and financial reports for Year 3 (FY 2014: April 1, 2014 to March 31, 2015) were presented for information and are available at the project website. The progress report includes a glossary for Japanese readers. Drafts of progress and financial reports for Year 4 (FY 2015: April 1, 2015 to March 31, 2016) are due in April 2016 for preliminary presentation at MAFF/JFA in May 2016.

3.2 Report of the fifth PST meeting

Dr. Perry briefly reviewed the report from the fifth PST meeting held October 16, 2014, in conjunction with the 2014 PICES Annual Meeting in Yeosu, Korea. No revisions were requested, and the report is now available at the project website.

3.3 Development of the research activities in Indonesia

Natural science studies

This project is investigating social-ecological interactions related to integrated multi-trophic aquaculture (IMTA) in Indonesia. The purpose of the pond experiment initiated in August 2014 is to investigate the effect of IMTA to: (1) increase the economic return of pond operation, and 2) improve the water quality of the ponds to reduce the release of nutrients to coastal waters. The underlining hypothesis is that the addition of bivalves (*Anadara*) and seaweed (*Gracilaria*) into the aquaculture ponds of fish (Tilapia species) or shrimp will allow successful growth of all species, and decrease of macronutrient concentrations.

In summary, the preliminary results from the experiments include:
- Nutrient release must decrease from shrimp and Tilapia pond aquaculture to coastal waters;
- The question is whether co-culture of *Gracilaria* and *Anadara* with shrimp and Tilapia will decrease dissolved nutrient levels – too soon to tell, but not looking good;
- Early results indicate that inclusion of *Gracilaria* and *Anadara* does not decrease the growth of shrimp or Tilapia – this may be an important source of additional income for communities;
- The addition of co-cultured species into the ponds affects the phytoplankton community composition — benefits to the quality of shrimp and Tilapia – the reasons for this shift are not yet known.

Social science studies

These studies are investigating social-ecological interactions related to IMTA in Indonesia and have focused on the development of commodity chains and how people valued their marine environment. The overall intent is to advance an integrated understanding of the fisheries system (*e.g.*, Fig. 1). In 2015, this research was expanded to cover Sulawesi. The approach included: (1) a preliminary analysis of the human geography of the areas of interest, (2) stakeholder mapping, which is to be followed by (3) a workshop for consensus building. As a result of a change in the research duties of one of the key social science researchers with the Indonesia activity, Dr. Masahito Hirota, comparisons of methods to identify how people interact with their marine environment have been adjusted to include Thailand. The survey method to identify commodity chains was also simplified so that it could be applied by people, such as local officers, who may not have scientific training. An example of how this approach can be integrated and presented is provided in Figure 2.

Recommended activities for Year 4 (FY 2015: April 1, 2015 to March 31, 2016) include: (1) a meeting to interpret pond experiment results, (2) an additional pond experiment, (3) analyses of existing social data and trial of a new format, and (4) linking social analysis with pond experiment.

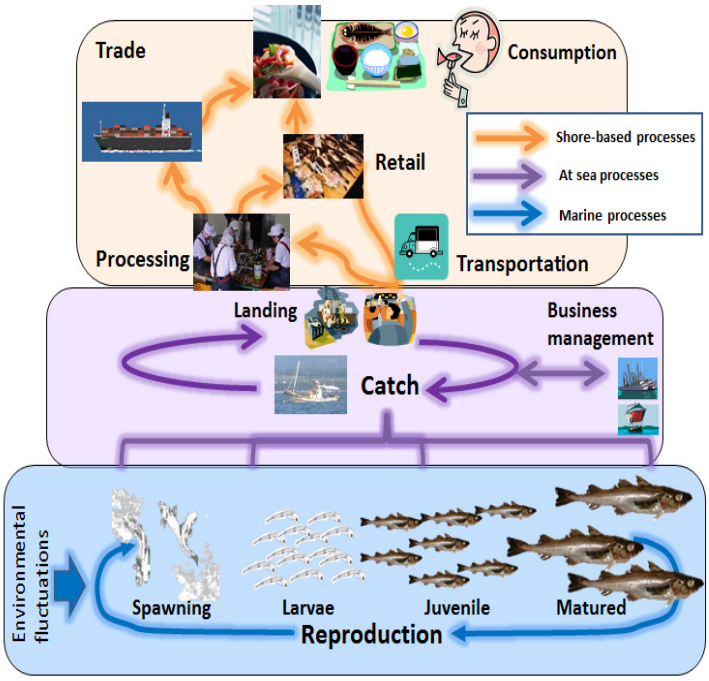

Fig. 1 A concept for an integrated approach to fisheries.

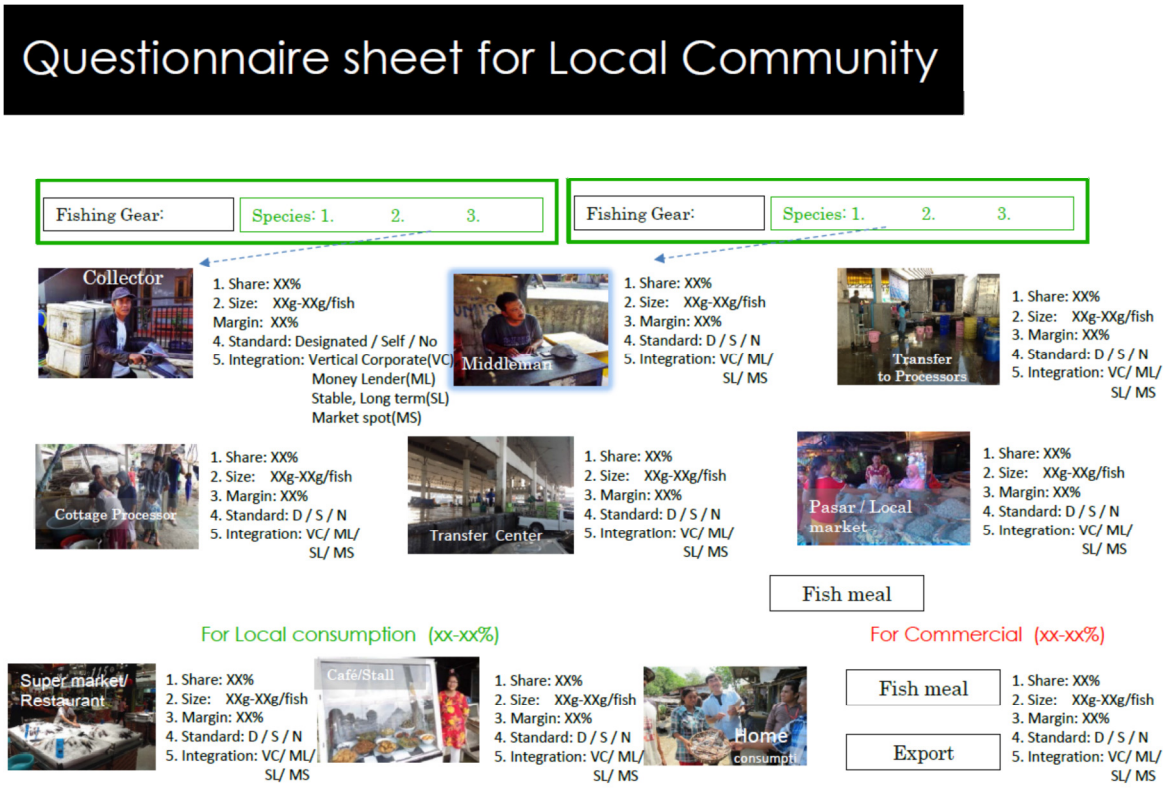

Fig. 2 An example of how the simplified social survey can be presented to develop a marine commodity chain (from presentation by M. Hirota at the sixth PST meeting, October 14, 2015).

3.4 Development of the research activities in Guatemala

The MarWeB project activities in Guatemala during Year 4 were focused on two studies: (1) a Community Needs Assessment of two small coastal communities in regards to social-ecological interactions related to small-scale shrimp aquaculture, and (2) an oyster aquaculture project (for cross-comparisons with MarWeB activities in Indonesia).

The Community Needs Assessment was conducted at two small coastal communities: Las Lisas and Monterrico. These two communities represent extremes in community responses to the demise of the local fisheries. Community members from Las Lisas were enthusiastic for change that would allow for the return of the resources and the survival of their community. Community members for Monterrico were mostly despondent about the future – declaring themselves as the "last fishermen on earth." Questions were asked that probed the demand and accessibility of fish/protein supply, and that examined the willingness of villagers to change their relationship with fisheries resources. Responses indicated that fishermen could supply fish for their family, but not enough for community. Protein from fresh finfish contributes 1–2 meals per month in Las Lisas, somewhat less for Monterrico. As a consequence, the communities rely on canned fish and frozen non-local products. Fish abundances have declined over the last decade, and the quality of the fish caught locally has diminished; the term "contaminated" was used often. There was no confidence that communities would survive with the present association with natural fisheries. This response is in contrast to the positive feelings towards the sea – perhaps an acceptance that the sea defines their location, transport and history – but is no longer a reliable provider. The path to the new economy was less clear. Most agreed there is a need for better education. Fishermen clearly stated that more education was needed.

Recommended activities for Year 5 (FY 2016: April 1, 2016 to March 31, 2017) include:

- Community Needs Assessment to communities – presentation and feedback;
- Establish shrimp aquaculture for transitioning to community ($5–6 K);
- Continue oyster aquaculture project (no additional funds);
- Explore pairing of shrimp and oyster aquaculture;
- Visit to Guatemala, a group to include an expert(s) from the Indonesia case study.

3.5 Case study in Palau

A cast study visit to Palau was requested by MAFF. Ms. Kumiko Suzuki, research scientist from the Japan Wildlife Research Center (JWRC) will travel to Palau in November 2015 in order to assess the feasibility of Palau as a study site of the MarWeB project. After the visit, she will work with Dr. Makino to prepare a report summarizing the visit outcomes.

3.6 Findings of each case and consistency among cases

Following these case study reports, discussions focused on plans for next year, and how to integrate the outcomes from different case studies into the MarWeB manual and final report. The outcomes from these discussions are reported in 4.1 below.

3.7 Update on "well-being cube" work

As Ms. Juri Hori was unable to attend this meeting, a summary of the work on the "well-being cube" was presented by Dr. Makino. The "well-being cube" was developed to understand the structure of human well-being (HWB) in relation to the sea (*i.e.*, in a Sato-umi context). A short paper describing this approach is available in PICES Press (Hori, J. 2015. *A psychological perspective on "human well-being": an international comparison of the well-being structur*e. PICES Press 23(2): 28-30). In Year 1, a survey of 1000 people in Japan was conducted to assess their relationships with the sea. In Year 2, the same questionnaire was used to survey 500 people in each Korea and the United States. In Year 3, a survey of 200 people was conducted in collaboration with BPPT in several Indonesian provinces. In Year 4, the same questionnaire was used to survey 500 people in each of China and Russia. In Year 5 (2016), this survey will be conducted in Canada.

4. FINAL PRODUCTS AND SUMMARY PRESENTATIONS

4.1 Manual development

Three key items should be represented in the manual:
1. Knowledge behind the tasks, including concepts, goals, concrete activities, relationships among activities, technical terms, *etc*.
2. Procedures/steps to do the tasks, such as flowcharts, steps of each activity, tips, *etc*.
3. Quality/standard for the tasks, including guidelines, criteria for judgements, qualities to be achieved, *etc*.

Rather than a general manual, the MarWeB outcome manual should provide an overview of Sato-umi and human-environment/social-ecological systems. It should then build from the two case studies, and include lessons learned and recommendations. It should also include links to the database (case studies data, bibliography, *etc*.). Consideration needs to be given to the intended readers of this manual, which will help define the manual format. MAFF has agreed that one manual will be sufficient, which would include lessons learned and integration from all of the MarweB case study activities. The expectation is that this manual would be posted on the PICES website, rather than printed in hard copy (although that is also an option for communication with local communities in Indonesia and Guatemala, in which case the manual would also need to be translated).

Six steps for manual development were recommended:
1. Clarification of objectives
   - What is the goal? Who will use it? Why is the manual needed? How/when the manual will be used?
2. Formation of the manual writing team
   - Setting the timetable, assigning the roles for authors, management of the writing process (progress report, data management, sharing the manuscripts/data, share the tools/software)
3. Development of the manual structure
   - Establishing the contents (structure of the manual), list of technical terms, concepts, basic knowledge, *etc*.
4. Organize the manual
   - Collect/arrange the information of each part, develop the flowchart of process, define/explain the unit of activities, *etc*.
5. Organize the judgment standard/criteria and tips for users
   - Set the judgment criteria for completing each activity, explain the matters to keep in mind, to-do and not-to-do, tips, develop the check list, often asked questions/mistakes, *etc*.
6. Write the text

Ms. Hori suggested putting the emphasis on the local situation, not the conceptual framework of the project itself, not requiring drastic changes but moderate and gradual improvements, emphasising the "beauty" of the goal to be achieved, and using photos of group activities (collective activities by people).

The outline for the manual was proposed as:
1. Introduction (Concept)
2. Why we need it? (Necessity)
3. How to introduce it? (Procedure)
4. How to assess it? (Quality standard)
5. Glossary

It was suggested that the main objective for the manual is to help local people work through their own specific situations towards the desired end result, under the general concept of Sato-umi (or marine ecosystem health and human well-being). It could include identifying the social-natural science interface, discussing social science survey methods (the methods used in MarWeB differed between the two case studies), and comparison of integrated results between the two case studies. An inter-sessional workshop was proposed to focus on the development of this manual.

4.2 Database development

The database could consist of a bibliography on relevant topics such as social-ecological systems, Sato-umi, IMTA, oyster aquaculture, well-being, *etc*. It could also include data from the pond (Indonesia) and oyster

(Guatemala) experiments, data from the social surveys (Indonesia, Guatemala), and data from the "well-being cube" analyses (PICES member countries). The database should also be linked to the manual, so that the database provides the 'raw' information for the manual. The database would be small, and so, perhaps, could be hosted on the PICES server.

Outstanding questions for discussion include:
- What "topics" or "key words" should be covered by the bibliography?
- How to conduct it? (Dr. Makino is prepared to lead this activity, but needs help for reviewing the product by each member country.)
- How will the data (social and ecological data from 2 cases and cube analyses) be prepared, and by whom?
- What should the database look like (structure)?
- Timeline (Deadline March 2017)

4.3 Possible need for an inter-sessional MarWeB meeting to work on product development

An inter-sessional meeting was felt to be needed to focus on product development. It was proposed to have this meeting in June 2016 in Victoria, Canada.

4.4 Presentations from MarWeb at major symposia/meetings

A MarWeB presentation at the ICES-led international symposium on "*Understanding marine socio-ecological systems: Including the human dimension in Integrated Ecosystem Assessments*" (June 2016, Brest, France) was suggested, with the potential funding included for a speaker. This would explain what the project is about, and raise its profile internationally. Dr. Keith Criddle, who is also one of the symposium convenors, or Dr. Grant Murray were proposed to represent MarWeB.

A MarWeb presentation at the PICES 2016 Annual Meeting was also suggested, for further discussion at the (possible) June 2016 inter-sessional meeting.

5. PROJECT MANAGEMENT

The estimated budget for the fifth year of the project (FY 2016: April 1, 2016 – March 31, 2017) is $60,000. There may be a small carry-over of unspent funds from FY 2015, and this will be confirmed once the accounting for Year 4 has been completed. The preliminary allocations for Year 5 are shown in Table 1. It should be noted that the proposed budget does not include allocations for an inter-sessional PST meeting and for travel support of a MarWeB speaker to the ICES human dimensions symposium, and the PICES overhead, which has been paid by each of the previous financial years. A request was made to use this overhead to cover the costs for the proposed inter-sessional PST meeting.

Table 1 Proposed MarWeB budget breakdown for Project Year 5 (FY 2016)

Indonesia		
Pond experiment	15,000	**20,000**
social survey	5,000	
Guatemala		
Oyster project and follow up visit	23,000	**23,000**
Well-being cube		
Social survey in Canada	7,000	**7,000**
Meetings		
Travel support for 2016 PICES Annual Meeting	10,000	**10,000**
TOTAL		**60,000**

6. OTHER MATTERS

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 2015 meeting:

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

Appendix 2

Sixth Project Science Team meeting agenda

1. Adoption of the agenda
2. Introduction to the project (Mitsutaku Makino)
3. Progress reports
   - 3.1 Annual Reports for Science Board and MAFF/JFA (Co-Chairs)
   - 3.2 Summary of the fifth PST meeting (Co-Chairs)
   - 3.3 Case study in Indonesia (Mark Wells, Masahito Hirota)
   - 3.4 Case study in Guatemala (Vera Trainer and Charles Trick)
   - 3.5 Case study in Palau (Mitsutaku Makino)
   - 3.6 Findings of each case and consistency among cases (All)
   - 3.7 Update on "well-being cube" work (Mitsutaku Makino)
4. Final products and summary presentations
   - 4.1 Manual development
   - 4.2 Database development
   - 4.3 Possible need for an inter-sessional meeting to work on product development
   - 4.4 Presentations from MarWeb at major symposia/meetings:
     - ICES-led symposium on human dimensions in fisheries (June 2016, Brest, France),
     - 2016 PICES Annual Meeting (November 2016, San Diego, USA),
     - PICES human dimension symposium (spring 2018, Japan?)
   - 4.5 Others
5. Project management
   - 5.1 Project Science Team membership
   - 5.2 Year 4 (FY 2015) workplan and budget execution (Alexander Bychkov)
   - 5.3 Year 5 (FY 2016) workplan and budget
6. Other matters (related expert groups in PICES, PICES Press, publications, *etc*.)