NORTH PACIFIC MARINE SCIENCE ORGANIZATION (PICES)
PROJECT ON "*MARINE ECOSYSTEM HEALTH AND HUMAN WELL-BEING*"

SCIENTIFIC PROGRESS REPORT FOR YEAR 1 (APRIL 1, 2012–MARCH 31, 2013)

1. BACKGROUND

In December 2011, the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan, through the Fisheries Agency of Japan (JFA), approved funding for a 5-year PICES project on "*Marine Ecosystem Health and Human Well-Being*". The project began in April 2012, and is expected to be completed by March 31, 2017. Its goal 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 (known in Japan as the "Sato-umi" fisheries management system). It recognizes that global changes are affecting both climate and human social and economic conditions. Key questions of the project are: a) how do marine ecosystems support human well-being? and b) how do human communities support sustainable and productive marine ecosystems? The project is also intended to foster partnerships with non-PICES member countries and related international programs and organizations. This contribution is from the Official Development Assistance (ODA) Fund and therefore, involvement of developing Pacific Rim countries in activities is required under this project.

The following organizational principles, agreed upon by MAFF/JFA and PICES, apply to the project (Project Principle 3):

- The Project is expected to have strong connections and interactions with, and involve and support the relevant activities of, the PICES FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems) program (Research Theme 3 on "*How do human activities affect coastal ecosystems and how are societies affected by changes in these ecosystems?*") and PICES expert groups such as Section on *Human Dimensions of Marine Systems* (S-HD); Section on *Harmful Algal Blooms in the North Pacific* (S-HAB), Section on Climate Change Effects on Marine Ecosystems (S-CCME), Working Group on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* (WG 28), and Working Group on *Non-indigenous Aquatic Species* (WG 21) among others (Fig. 1). The objectives and activities of the Project are detailed in the workplan.
- The project is directed by a Project Science Team (PST), co-chaired by Drs. Mitsutaku Makino (Fisheries Research Agency, Japan, mmakino@affrc.go.jp) and Ian Perry (Department of Fisheries and Oceans, Canada; Ian.Perry@dfo-mpo.gc.ca), with membership from PICES and non-PICES countries, as deemed appropriate.
- The PST Co-Chairmen are responsible for the scientific implementation of the project and reporting annually to MAFF/JFA and PICES Science Board. The report should be submitted to JFA within 120 days after the close of each project year ending March 31, and include a summary of the activities carried out in the year, with an evaluation on the progress made, and a workplan for the following year.

This progress report summarizes the activities carried out in Year 1 (FY 2012: April 1, 2012–March 31, 2013) and includes a workplan for Year 2 (FY 2013: April 1, 2013–March 31, 2014). The draft budget for Year 2 is provided in the Year 1 financial report being submitted as a separate document simultaneously with this progress report.

2. WORKPLAN FOR YEAR 1

(1) Project Science Team formation
- Establish a Project Science Team to direct the project and organize the first PST meeting.

(2) Study site selection
- Select developing countries in three regions of the North Pacific (Southeast Asia, Central America and Pacific oceanic islands) as study sites for the project;
- Gather information for discussion of potential case studies by the PST and initiate preparations for regional workshops.

(3) Analytical tools and knowledge bases preparation
- Develop analytical tools to be applied to the study sites (case studies);
- Initiate the first social survey on the objective of ecosystem conservation amongst six PICES member countries and 3 study sites.

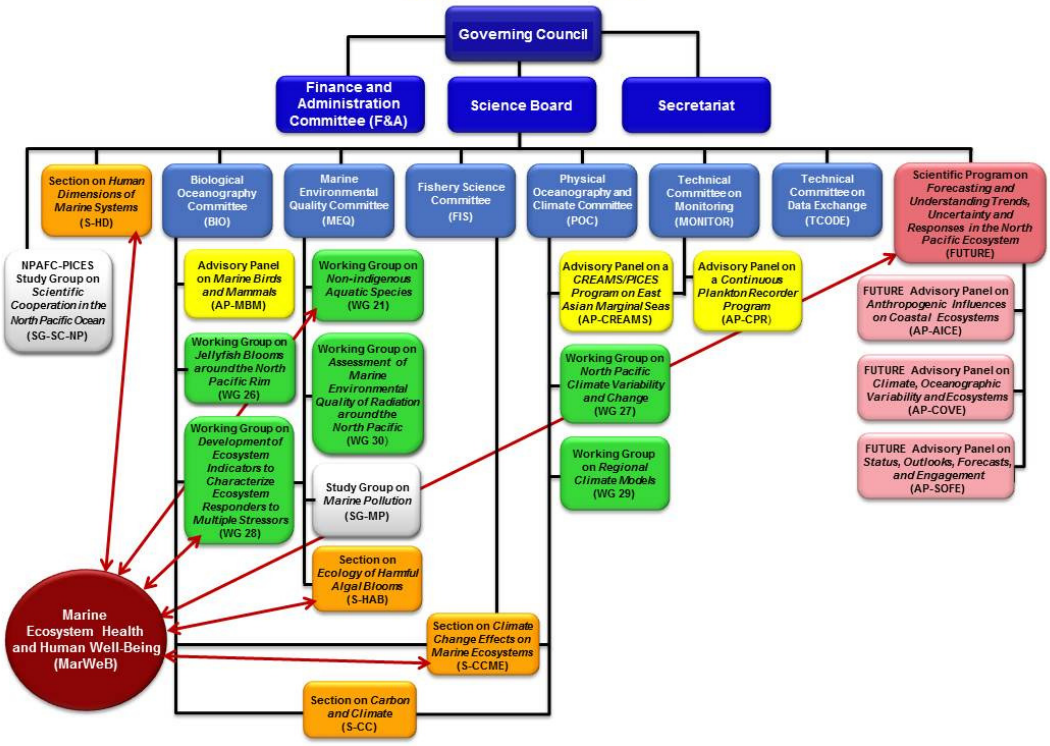

Fig. 1 PICES (North Pacific Marine Science Organization) structure for 2012–2013 showing links between the MarWeB project and expert groups.

3. PROGRESS OF YEAR 1

3.1 Project Science Team

PST membership

The PST was formed in August 2012, in order to make recommendations for the project implementation and review the scientific progress. The PST includes 13 members: 3 from Canada, 3 from Japan, 2 from Korea and 4 from USA, and a representative from the PICES Secretariat (Table 1). A total of six PICES expert groups are represented on the Team: S-HD, S-CCME, S-HAB, WG 28, WG 21 and AP-SOFE (FUTURE Advisory Panel on *Status, Outlooks, Forecasts, and Engagement*).

First PST meeting

The first PST meeting was held October 11, 2012, in conjunction with the PICES 2012 Annual Meeting in Hiroshima, Japan. The main objectives of this meeting were to: 1) share the background information for the project, 2) decide the principal framework, and 3) discuss the workplan and financial allocations for Year 1 of the project. Twelfth PST members were in attendance (Absentee: Dr. Dohoon Kim). The report from the meeting is available on the project's web page at http://meetings.pices.int/projects/marweb.

The main results from the meeting can be summarized as follows:
- The review of the previous PICES/MAFF project on "*Development of the prevention systems for harmful organisms' expansion in the Pacific Rim*" (2007–2012) and information on other relevant activities, including the Sato-umi type research related to the Convention on Biological Diversity, United Nations University, *etc*., were presented;

- The principal framework of the project was approved (Table 2);
- Three field sites and their initial workplans were decided as the case study for this project (Table 3);
- The "Well-Being Cube" was introduced as a tool to scientifically analyze the links between the ecosystem conditions and human well-being;
- The construction of a database was approved in order to facilitate the dissemination of the results of this project and to share the knowledge related to the marine ecosystem health and human well-being.

Table 1 Membership of the Project Science Team

Name	Affiliation	Country/Group
Dr. Harold Batchelder	Oregon State University	USA/AP-SOFE
Dr. Keith Criddle	University of Alaska, Fairbanks	USA/S-HD
Dr. Masahito Hirota	Fisheries Research Agency	Japan/S-HD
Ms. Juri Hori	Rikkyo University	Japan/S-HD
Dr. Dohoon Kim	National Fisheries Research and Development Institute	Korea/S-HD
Dr. Suam Kim	Pukyong National University	Korea/S-CCME
Dr. Skip McKinnell	PICES Secretariat	PICES Secretariat
Dr. Mitsutaku Makino	Fisheries Research Agency	Japan/S-HD
Dr. Grant Murray	Vancouver Island University	Canada/S-HD
Dr. Ian Perry	Department of Fisheries and Oceans	Canada/WG 28
Dr. Thomas Therriault	Department of Fisheries and Oceans	Canada/WG 21
Dr. Vera Trainer	Northeast Fisheries Science Center	USA/S-HAB
Dr. Mark Wells	University of Maine	USA/S-HAB

Table 2 Principal framework of the MarWeB project

1. Case studies and manual creation in developing countries (3 sites)
2. Well-Being Cube analysis for the link between ecosystems and human well-being
3. Database construction for better dissemination and sharing of the knowledge

Table 3 Initial workplan for the project

	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Indonesia	1st Workshop	2nd Workshop	Draft manual		Completed manual
Guatemala		1st Workshop	2nd Workshop	Draft manual	Completed Manual
Palau (tentative)			1st Workshop	2nd Workshop	Completed Manual
Well-Being Cube analysis	3 PICES member countries	1 of developing countries	1 of developing countries	3 PICES member countries	1 of developing countries
Database Construction	Outline decided	Data input	Data input	Data input	Database completed

3.2 Case study: Indonesia

Three developing countries in three regions of the North Pacific (Southeast Asia, Pacific oceanic islands, and Central America) were selected as study sites for the project. Indonesia was selected because of its large population and aquaculture-intensive industry. Guatemala was chosen because its coastline features an upwelling system favorable for the finfish fishery and aquaculture. Palau was selected because of its focus on the finfish

capture fishery and its existing networks of community-based fisheries. It was decided to conduct two training workshops in each of these countries. In Year 1, the main focus was on Indonesia.

Many coastal mangroves in Indonesia were cut for advancing shrimp aquaculture in the 1990s, causing much erosion. For example, in one location on the north coast of Java, 3 kilometers of coastline were lost due to this process. The Indonesian Agency for the Assessment and Application of Technology (Badan Pengkajian dan Penerapan Teknologi – BPPT) has developed a concept of managing coastal and marine resources by actively involving the community. This Indonesian concept is called GEMPITA-SPL (Gerakkan Masyarakat Peduli Kelestarian Sumberdaya Perikanan, Pesisir dan Laut) or, in English, SFiCoMS (Sustainable Utilization of Fisheries, Coastal and Marine Resources for the Society). The GEMPITA-SPL concept fits very well within the framework of fishery social-ecological systems (Sato-umi) in the PICES/MAFF project. Based on this concept, BPPT and the Java Department of Fisheries and Marine Affairs initiated a "GAPURA" program (Fig. 2) in the northern coastal area of West Java (initially in Karawang) through the development and promotion of environmentally friendly aquaculture technology called Integrated Multi-Trophic Aquaculture (IMTA). The expectation is that by applying IMTA, the coastal environment, which has been heavily damaged by shrimp monoculture, can be recovered to become more biodiverse and productive, leading to a balanced and harmonious way to improve the welfare of local communities. Unfortunately, impacts to local systems or environmental quality (nutrients, bacteria, phytoplankton, *etc*.) have not been monitored. The Indonesian government would like to scientifically verify this activity, build capacity, and then disseminate the concept to other areas of the country. Thus, this case study aims to: (1) scientifically verify the benefits of IMTA to the social-ecological systems, (2) develop scientific capacity in Indonesia, and (3) develop manual for dissemination to other areas in Indonesia.

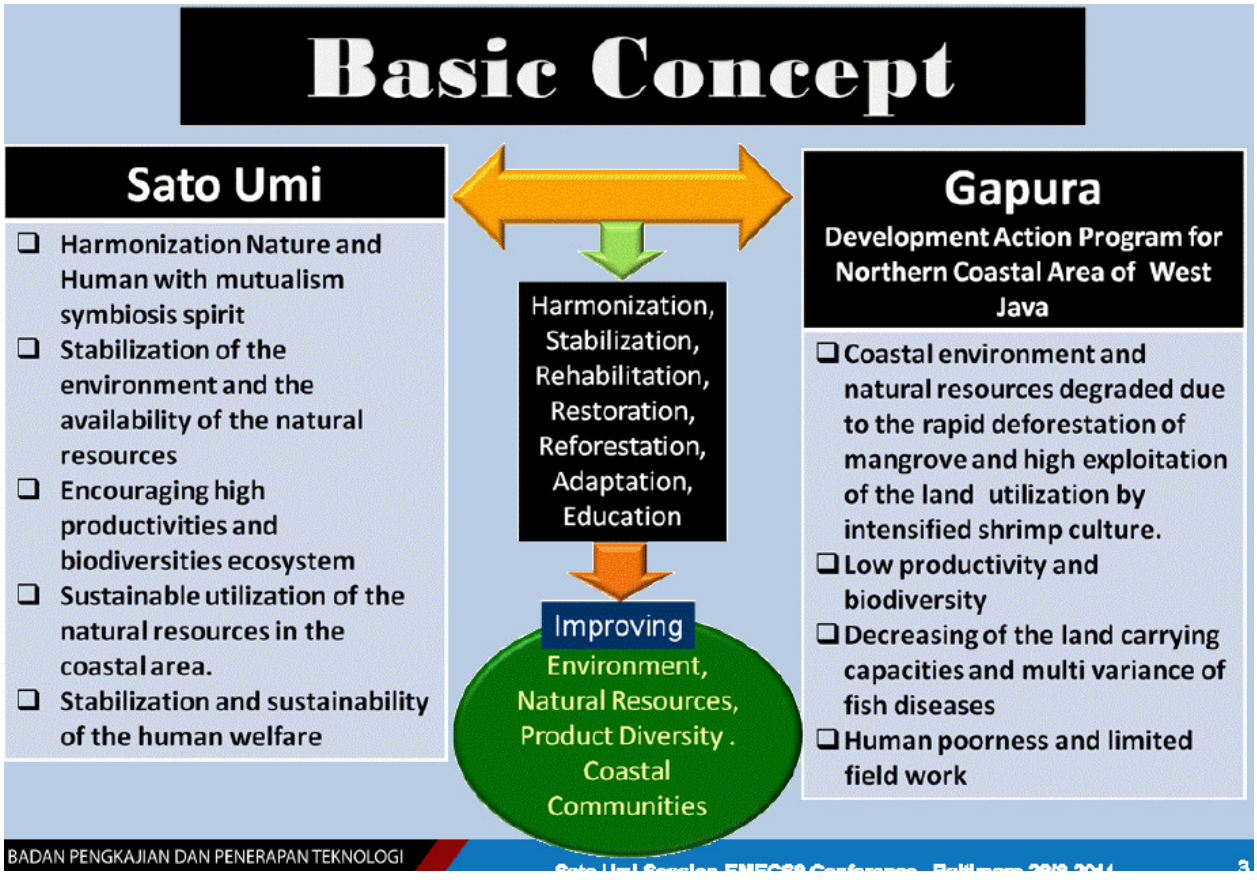

Fig. 2 Relationships between Sato-umi and Gapura concepts (from presentation by S. Sachoemar and T. Yanagi, PICES/BPPT workshop, Jakarta, March 13, 2013).

The planning meeting for this case study was held January 22–23, 2013, at the BPPT Headquarters in Jakarta. Drs. Mitsutaku Makino, Masahito Hirota and Mark Wells participated on behalf of the PST; the Indonesian counterpart was Prof. Suhendar Sachoemar. The objectives of this meeting were to understand the local needs, to prepare the draft agenda for a workshop to be held in March of 2013, and to develop plans for this case study through to March 2017 (the PICES/MAFF project period).

Based on the results of the January 2013 meeting, the first Indonesia training workshop was held March 13, 2013, at the BPPT Headquarters in Jakarta, with a field trip to the site at Karawang on March 14. The objectives of the workshop were to: (1) develop the contents of a manual that will describe GEMPITA-SPL and GAPURA experiences in Java Province according to local conditions at some candidate sites, and (2) assess the utility of PICES' scientific tools for enhancing the human well-being of local communities and rehabilitating coastal ecosystem at some candidate sites. It was a high-profile event in Indonesia, with many reports appearing in newspapers, on TV and the web.

A total of 93 participants from Indonesia, Japan and USA attended the workshop. The PICES/MAFF project was represented by four PST members, Drs. Makino, Hirota, Wells and William Cochlan. Dr. Makino introduced the project; Dr. Wells described previous activities of PICES in Indonesia and suggested ways that PICES science can support GEMPITA-SPL/GAPURA; and Dr. Hirota talked about PICES scientific tools for the analysis of human well-being in coastal societies.

During the workshop, the Sato-umi concept was introduced, detailed local needs were gathered from local stakeholders, and the development of a GEMPITA-SPL/GAPURA manual was discussed (a table of contents was prepared) to facilitate the dissemination of GEMPITA-SPL activities in Indonesia. The agreement was reached to conduct a pond experiment in Year 2 of the PICES/MAFF project to examine the natural ecological system and human system benefits of IMTA. A draft protocol for the experiment in sample ponds where GEMPITA-SPL has been implemented and a draft list of parameters to be measured during this experiment was developed. A Letter of Intent between PICES and BPPT was signed to recognize the importance of continued collaborative work on the project. The workshop report and PICES Press article describing this event (Vol. 21, No. 2, pp. 18–19) are available on the project website at http://meetings.pices.int/projects/marweb.

3.3 Analytical tools and database

Analysis of human well-being in relation to environmental conditions

"Well-being" is defined by psychologists as involving peoples' positive evaluations of their lives such as positive emotions, engagement, satisfaction, and meaning. As indicated in the UN Millennium Ecosystem Assessment, human well-being (HWB) has multiple constituents, such as basic materials for a good life, security, health, good social relations, and freedom of choice. The constituents of well-being, as experienced and perceived by people, are situation-dependent, reflecting local geography, culture, and ecological circumstances. These factors are complex and value-laden. In the present study, HWB is being explored as a means to connect ecosystem services and freedom of choice and action, and in part to understand motivations for these choices and actions.

In 2012, a survey of 1000 people in Japan was conducted to develop the method and assess their relationships with the sea. Preliminary results suggest great importance of sea food for well-being among those Japanese people who identified themselves as having high connections with the ocean.

Database construction

The PST discussed the potential content of the 'database' and agreed on the following outlines:

- The database could be a bibliography, for example, of social-ecological systems interactions and related references that would be useful for research and capacity building activities.
- It would be desirable for this database to also support the work of the PICES FUTURE program, and to link with the work of PICES WG 28 on human activities (and their related indicators) that affect the ocean.
- The database could also store the techniques, tools, and results developed from the Indonesia and Guatemala case studies and their manuals.

3.4 Other activities

The International Sustainability Unit (ISU) of the UK Prince Charles' Charitable Foundation has a marine program (http://www.pcfisu.org/marine-programme) which was initiated, among other objectives, to help strengthen international consensus around the best solutions for the sustainable management of wild marine fish stocks. The ISU recently released a report based on interviews with fishing communities from 50 different fisheries around the world about the benefits they are experiencing from managing their fisheries more sustainably. The report demonstrates the possibilities for more sustainable management through what is already being achieved. The ISU is now developing a project to implement Fisheries Management Plans (FMP) and Transition Financing, and is considering Vietnam and Central America as primary locations. In this regard, the ISU organized a regional workshop on "*The opportunities of sustainable fisheries in Vietnam: Identifying the transition pathway*" (October 30–31, 2012, Nha Trang, Vietnam), which was co-sponsored by PICES (through this project). Although a useful meeting, it turned out to be somewhat off the main topic of our project. It was recommended that the PST be informed of developments within the ISU but, at this stage, not to actively participate.

4. WORKPLAN FOR YEAR 2

(1) Project Science Team Meetings
- Organize two PST meetings, one inter-sessional and one in conjunction with the 2013 PICES Annual Meeting (October 2013, Nanaimo, Canada).

(2) Case Studies

In Indonesia
- Set-up a pond experiment and carry out a training workshop (leaders: Mark Wells and Mitsutaku Makino);
- Model the carrying capacity of the experimental pond site (leader: Susanna Nurdjaman, Institute of Technology, Bandung, Indonesia);
- Conduct social human well-being survey (leaders: Masahito Hirota and Mitsutaku Makino);
- Initiate preparations for an Indonesia training workshop to be conducted in Year 3.

In Guatemala
- Identify the potential topics to be investigated, which are likely to include issues of integrated multi-trophic aquaculture and local development (to be comparable with the Indonesia case study) and to initiate a field study.

In Palau
- Initiate information gathering for the workshop to be conducted in Year 3.

(3) Human well-being surveys
- Analyze the results from the 2012 human well-being survey in Japan and, based on these result, conduct human well-being surveys in Korea and USA to enable international comparisons.

(4) Database
- Initiate development of the database containing a bibliography of social-ecological systems interactions, the well-being survey data and information from the Indonesia and Guatemala case studies.