New PICES MAFF-Sponsored Project on "*Marine Ecosystem Health and Human Well-Being*"

by R. Ian Perry and Mitsutaku Makino

Progress is being made internationally on an ecosystem approach to the management of marine systems, in particular as applied to ecosystem-based fisheries management (EBFM; FAO 2003; Hollowed *et al.* 2011). PICES has contributed to this progress and explored regional applications to the North Pacific, through the activities of the ecosystem-based management Study Group and Working Group reports (Jamieson *et al*. 2005, 2010). Recent initiatives at the global level have expanded the concept of ecosystem approaches to include people in what have been called coupled marine social-ecological systems (*e.g*., De Young *et al*. 2008; Ommer *et al*. 2011). PICES has also contributed to these initiatives (Makino and Fluharty 2011) and has recently formed an expert group to develop the human dimensions of marine ecosystems (Section on *Human Dimensions*, http://www.pices.int/members/sections/S-HD.aspx). The second PICES integrative program, FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems), also has significant activities and strong linkages with ecosystems and people, through its Advisory Panels on *Anthropogenic Influences on Coastal Ecosystems* (AP-AICE; http://www.pices.int/members/advisory_panels/AICE-AP.aspx) and on *Status, Outlooks, Forecasts and Engagement* (AP-SOFE; http://www.pices.int/members/advisory_panels/SOFE-AP.aspx).

Very recently, the concept of human well-being within marine social-ecological systems has become recognized as an important step forward (Coulthard *et al*. 2011; Charles 2012). Well-being shifts the perspective from objective measures of sustainable livelihoods (comprised of the physical, social, human, natural, and financial resources available to a community or country) to include the subjective or perceived well-being of individuals and communities. This represents a shift from people as exploiters of the ocean to people as integral components of resource sustainability and ecosystem health (Coulthard *et al*. 2011; Charles 2012). Therefore, taking account of the dynamics of livelihoods and the concept of well-being can help with the development of policies supporting sustainable and resilient marine social-ecological systems (Charles 2012).

The Japanese concept of *sato-umi* represents one version of this humans-in-nature approach, in which a healthy ecosystem is seen to nourish human well-being, but human activities are seen as necessary for sustaining ecosystem health (Fig. 1). *Sato* means community or village, and *umi* means sea. Therefore, *sato-umi* refers to marine environments that have long-standing relationships with human communities, and in which human interactions have resulted in high marine productivity and biodiversity (Makino 2011, p. 126; Makino and Fluharty 2011). The activities to re-establish and promote the recovery of sea grass beds that have been undertaken by local community members near Yokohama are one example. Comparable types of sea grass and kelp restoration activities have been proposed by local communities in the Strait of Georgia, Canada. The Japanese government has undertaken integrated studies to assess the contributions of social, cultural, economic, and ecological aspects in *sato-umi* type projects in Japan (Yanagi 2012).

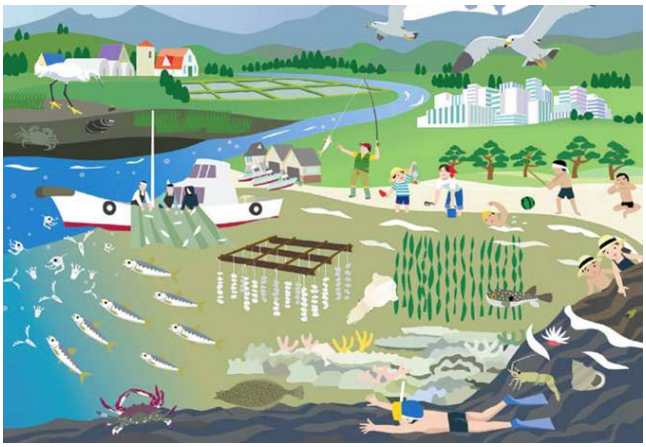

Fig. 1 Image of sato-umi (coastal village and sea): fishing villages, fisheries operations, aquaculture, swimming, shellfish gathering, sport fishing (angling), nature observation, urban area, etc. (source: United Nation University (2010), Japan Satoyama Satoumi Assessment).

As a result of generous funding provided by the government of Japan, through its Ministry of Agriculture, Forestry and Fisheries (MAFF), PICES has developed a new project to explore these issues of marine social-ecological systems and *sato-umi* in the North Pacific. The goal of this PICES project on "*Marine ecosystem health and human well-being*" is to identify the relationships between sustainable human communities and sustainable marine ecosystems in the North Pacific, under the concept of fishery social-ecological systems. Specifically, considering the global changes in climate and human social and economic conditions, the project is expected to answer the following questions: (a) how do marine ecosystems support human well-being? and (b) how do human communities support sustainable and productive marine ecosystems?

This goal links directly with the PICES FUTURE Research Theme 3 on "How do human activities affect coastal ecosystems and how are societies affected by changes in these ecosystems?", specifically questions 3.1 (*What are*

the dominant anthropogenic pressures in coastal marine ecosystems and how are they changing?) and 3.3 (*How do multiple anthropogenic stressors interact to alter the structure and function of these systems, and what are the cumulate effects?*). In addition, the project will integrate, support, and expand on the activities of several PICES expert groups, including the new Section on *Human Dimensions*, and Working Group 28 on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors*.

A Task Team was established for the project, which had its first meeting at the 2012 PICES Annual Meeting in Hiroshima, Japan (Fig. 2). The meeting reviewed the outputs of this project that are expected by the government of Japan, and outlined the approach and a broad plan for implementation of the project over the next 5 years. The expected outputs include: selection of study sites in Southeast Asia, oceanic Pacific islands, and Central America (3 sites in total); research on ecosystem health and human well-being; workshops at each site; and construction of a database, for example, of case studies of where and how a social-ecological (*sato-umi*) systems approach may be applied. Workshops will be held in three developing countries around the North Pacific to explore their use of marine social-ecological (*sato-umi*) concepts in marine activities, and to develop training manuals for the application of such concepts to help improve the sustainability of both natural marine ecosystems and their dependent human communities. The three countries proposed as main case studies are Indonesia (large population, aquaculture-intensive), Palau (finfish capture fishery focus; existing networks of community-based fisheries) and Guatemala (upwelling system; finfish and aquaculture). The main question to be asked is what tools can PICES provide these countries with respect to developing a social-ecological (*sato-umi*) approach to marine systems. The key outcome will be to provide an approach and tools that advance the following types of 'integrated social-ecological assessments':

- What are the general concepts leading to sustainable human communities and productive marine ecosystems?
- Where does each country and local community 'want' to be within these concepts?
- Where are they now?
- What are the major stresses, for example climate change, and how might these affect the current state and the transitions to the desired state?
- How does human well-being relate to ecosystem services in these countries and locations?

One tool, from psychological research, that will be explored is called the "well-being cube". At the meeting in Hiroshima, Drs. Juri Hori and Mitsutaku Makino presented definitions for human well-being from psychological research, and described the concept of the "well-being cube". In this approach, a person's (or community, region, or country) perception of their well-being can be located in one or more of 27 cells defined by three axes, each with

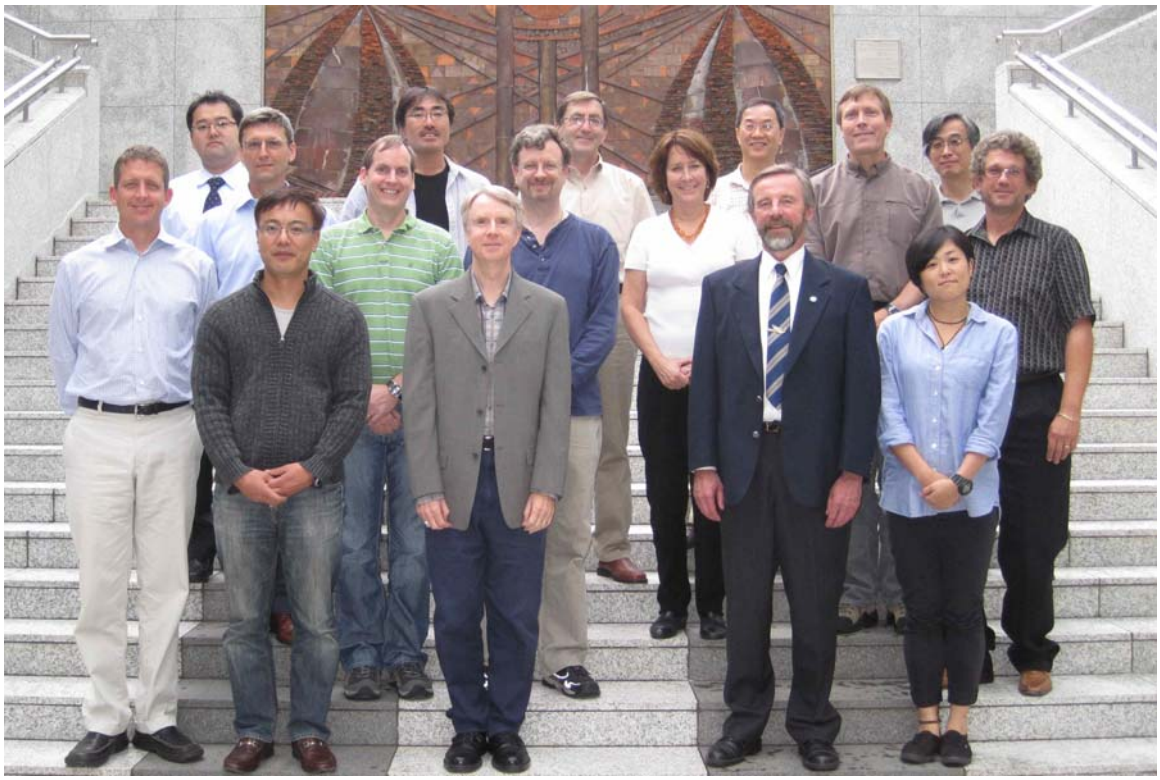

Fig. 2 Participants and Task Team members at the first meeting of the PICES MAFF-sponsored project on "Marine ecosystem health and human well-being", October 11, 2012, Hiroshima, Japan. From left to right, front row: Grant Murray, Mitsutaku Makino, Ian Perry, Skip McKinnell and Juri Hori; middle row: Igor Trofimov, Thomas Therriault, Harold (Hal) Batchelder, Vera Trainer, Keith Criddle and Mark Wells; back row: Takaomi Kaneko, Masahito Hirota, Alexander Bychkov, Suam Kim and Sinjae Yoo.

three categories: the extent of conscious interpretation of their situation, their level of active response to their situation, and their view of how they fit into their world (Fig. 3).

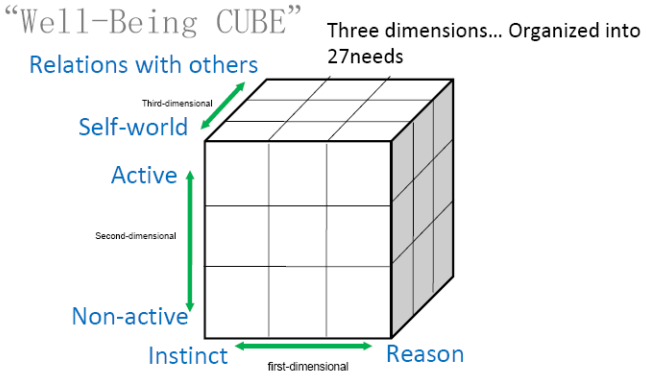

Fig. 3 Example of the "well-being cube" concept for human interactions with their environment.

The first workshop is being organized for Indonesia in March of 2013. Indonesia already has some knowledge and experience with the *sato-umi* concept as applied to coastal aquaculture and local community systems. The goal of this first workshop will be to use broad scientific and local knowledge to develop the contents of a manual on this approach for use in other coastal communities of Indonesia, and to assess the applicability of scientific tools for describing and applying these concepts in real situations. The results of this experience will be presented and discussed at the second meeting of the project Task Team, scheduled for June 2013.

This 5-year MAFF-sponsored PICES project is planned to provide many opportunities to test and support the activities and contributions of several PICES expert groups and the FUTURE program.

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Dr. Mitsutaku Makino (mmakino@affrc.go.jp; see group photo) co-chairs the new PICES project on "Marine ecosystem health and human well-being" and PICES Section on Human Dimensions (he was a former Chairman of PICES Study Group on Human Dimensions). His major is institutional and economic analysis of marine policies, including fisheries management and ecosystem-based management. He is currently the Head of the Fisheries Management Group at the National Research Institute of Fisheries Science, Fisheries Research Agency of Japan, and a member of many international research activities such as IUCN Commission of Ecosystem Management (CEM) Fisheries Expert Group (FEG), IMBER Human Dimension Working Group, United Nation University Sustainable Ocean Initiative. Also, he is now serving as an editor of ICES Journal of Marine Science as well as a Scientific Committee member of the Japanese Society of Ocean Policy. He teaches several courses at Japanese universities (Hokkaido University, Yokohama National University, Nagasaki University, Tokyo Agricultural University, etc.) as an Associate Professor. One of his major publications in recent years is "Fisheries Management in Japan", which was published by Springer in autumn 2011.

Dr. Ian Perry (Ian.Perry@dfo-mpo.gc.ca; see group photo) co-chairs the new PICES project on "Marine ecosystem health and human well-being" and PICES Working Group on Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors. He is a research scientist with Fisheries and Oceans Canada (DFO) at the Pacific Biological Station (PBS) in Nanaimo, BC. In addition, Ian is an Adjunct Professor at the Fisheries Centre of the University of British Columbia, and has taught courses on fisheries oceanography at universities in Canada, Chile, and Portugal. He currently heads the Ecosystem Approaches Program at PBS, and is one of two leaders for the DFO Strait of Georgia Ecosystem Research Initiative. His research expertise includes the effects of the environment on finfish and invertebrates; the structure and function of marine ecosystems; ecosystem-based approaches to the management of marine resources; the human dimensions of marine ecosystem changes; and scientific leadership of international and inter-governmental programs on marine ecosystems and global change. Ian is a former Chairman of the international Global Ocean Ecosystem Dynamics (GLOBEC) program, whose goal was to understand how global changes affect the abundance, diversity and productivity of marine populations, and a former Chairman of the Science Board for PICES. He is a past Editor for the scientific journal Fisheries Oceanography, and is presently an Associate Editor for the journal Ecology and Society, and a member of the Editorial Boards for Fisheries Oceanography and Current Opinion in Environmental Sustainability.