PICES/MAFF PROJECT ON "*MARINE ECOSYSTEM HEALTH AND HUMAN WELL-BEING*"
SEVENTH MEETING OF THE PROJECT SCIENCE TEAM
June 22–24, 2016
Victoria, Canada

The seventh 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 June 22–24, 2016, in Victoria, Canada.

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 TO 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 do human communities support sustainable and productive marine ecosystems.

Dr. Makino briefly reviewed the background and context for the project and pointed out that objectives for this meeting are to discuss: (1) the features that integrate all of MarWeB activities, in particular lessons learned from two case studies as to what they tell us about marine ecosystem health and human well-being, and how to implement them in practice, and (2) the plan for the manual and the database development with concrete timetable. It was noted that final products are to be submitted to MAFF/JFA by the end of July 2017 and that 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 Case study in Guatemala

The Guatemala case study was conducted at the locations on the Pacific Coast shown in Figure 1, and the following vital aspects of the studied communities were apparent:
- Seafood, in particular pelagic finfish and shrimp, is an important component of local diets;
- 'Fishing' is a culturally-determining part of the community, but many in these communities expressed a desire to move away from such high dependence on the sea.

Implementation of Sato-umi in Guatemala depended upon the building of trust and relationships with local people, and with shifting the focus from fishing to eco-tourism and other activities. Fishermen and women see the future as a balance, and suggest that the next generation of fishermen should be fewer and better educated in sustainable business practices. Creation of sustainable, targeted tourist activities requiring local expertise would provide visitors with a richer, home-grown, more comprehensive experience. But how can these communities achieve this goal? For example, what are the foundations that will support a sustainable project? what product development is needed? and what are the considerations for a community tourism project?

Fig 1 Guatemala case study locations: Monterrico, Las Lisas and La Barrona.

Fig. 2 Cartoon of interactions between healthy natural systems and healthy human systems in coastal regions.

Three needs for the future were identified by the communities: (1) an economy based on tourism, (2) aquaculture for improving the economy and family nutrition (especially with shrimp), and (3) education, especially with respect to sustainable fisheries and harmony with the sea (*e.g.*, see Fig. 2).

To date, the Guatemala case study has the following recommendations:

- A healthier 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.
- An alternative source of fish-based food supplies must be sought, such as 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.

In contrasting the MarWeB case studies, it would be helpful to describe that the studied communities are in different ecosystems (*e.g.*, no seaweeds in Guatemala in contrast to Indonesia), and have different business context for shrimp, both within the two villages compared in Guatemala and with Indonesia.

A second project in Guatemala concerned the culture of the Pacific oyster, *C. gigas* in the coastal estuary at La Barrona. Its primary objectives were to determine: (1) the productivity of bivalve mollusks, (2) growth rates and time needed for then to reach a market size, and (3) survival at different phases of culture. Unfortunately, this project struggled with problems of theft of the equipment and study organisms.

The Guatemala case study team proposed the following workplan for 2017:

- Engage with a UNDP (United Nations Development Program) project on "Conservation and sustainable use of biodiversity in coastal and marine protected areas" intended to support and expand the five Marine Protected Areas (MPAs) on the Pacific coast of Guatemala, and synergize the results of the MarWeB project with their plans to create marine protected areas in the communities of Las Lisas and Monterrico; carry out a final trip to the communities to facilitate their communications with leaders of the UNDP project;
- Continue the oyster project by providing further advice to the community of La Barrona (no additional funding is needed);
- Contribute to the establishment of a community outreach program at the Center for the Study of the Sea and Aquaculture (CEMA) in Monterrico, by providing an example of how to build a sustainable aquaculture pond in the coastal region.

3.2 Case study in Indonesia

As with Guatemala, Indonesia is an under-developed country, and is relatively poor, but with a much larger population and better connections to the outside world. The region of Karawang developed pond aquaculture about 10 years ago, but disease has since wiped out most shrimp, and the ponds have largely been abandoned, leaving a degraded area. Fish are plentiful in the local markets, but are very small. The MarWeB project's focus was to identify methods to help boost economic returns for this activity and to reduce deleterious water quality via multi-trophic aquaculture.

The Indonesia case study has two components: (1) a natural science-based study of improving pond aquaculture, and (2) a social science-based study of markets and human benefits.

<u>Pond experiment</u>

The approach was experimental, using Integrated Multi-trophic Aquaculture (IMTA) methods that are amenable to the low-intensity, low technology, and limited financial resource conditions of community-scale aquaculture in Karawang, Indonesia. The goal is to identify project outcomes that have tangible effects on improving human well-being in this region. The focus here has been to optimize the balance between:

- maximum harvest of the primary aquaculture product (shrimp or tilapia),
- added income through by-production of co-cultured food or marine products, and
- minimum excess nutrient discharge from these operations into coastal waters, which currently leads to degradation of coastal ecosystems.

The 2015 experiment was more successful than in 2014 in that the Whiteleg shrimp (*Litopenaeus vannamei*) and *Tilapia* sp. showed good growth in all treatments. The overall product yield was less than NCBA (National Center for Brackishwater Aquaculture) staff had hoped for (even in the controls), for reasons they do not know. One difference between years was that the ponds were filled with brackish canal water in 2014, but brackish groundwater in 2015. The overall health of these primary aquaculture products (the economic mainstays) was good up until the final few days of the experiment when signs of stress were observed in all ponds at equal levels (*i.e*., there was no correlation with treatments or controls). Neither *Gracilaria* nor *Anadara* showed significant growth over the experiment in 2015, despite elevated levels of dissolve nutrients (for *Gracilaria*) and phytoplankton and detrital abundance (for *Anadara*).

In 2016, the plan was to concentrate on shrimp aquaculture and leave out Tilapia: the shrimp IMTA showed a tangible profit, and the simplicity of a two species IMTA stands a better chance of being implemented by community growers. *Gracilaria* would be used but not *Anadara*, because there was no growth of *Anadara* in previous experiments and it is not common in the region. There also is anecdotal evidence that *Gracilaria* may restrict pathogen growth. In addition, the abundance of *Gracilaria* in the ponds was increased from the current 0.1 kg/m^2 to three treatments of 0.5, 1.0 and 2.0 kg/m^2. *Gracilaria* in the ponds was also placed on floating rafts rather than attaching it to the bottom, in an attempt to increase its growth by increasing the light intensities to which it is exposed.

Social studies

- What are the people's needs for marine ecosystem services in Indonesia (well-being cube analysis)?
- How can IMTA respond to these needs? What are the ecological and social benefits to be delivered by IMTA?
- How can such effects contribute to human well-being (for example, analysed using a structural equation modelling approach to human well-being)?

The Indonesian case study attempted to introduce 'change' to the community in both the natural and social systems, leading to improved well-being. Well-being here is interpreted to mean having free time to spend with family, and a wide variety of jobs (a varied commodity chain). Using the well-being cube approach, well-being concepts for the community involved economic growth and local capacity building. Key words included stability, beneficial, aesthetic (*e.g*., food culture and variety), and the ability to change.

The well-being cube analysis identified psychological needs for marine ecosystem services in Indonesia. IMTA can meet these needs by six expected effects: (1) more food, (2) safer food, (3) more jobs, (4) more wealth, (5) better water quality, and (6) protection of land and coastline. These effects improve the human well-being as defined by the Millennium Ecosystem Assessment (2005), mainly via "basic materials for good life". This leads to "freedom of choice and action" and to a broader introduction of IMTA etc., for producing a healthy and sustainable ecosystem for Indonesian people. Recent studies by Kasperski *et al*. (Amber Himes-Cornell and Stephen Kasperski. 2016. Using socioeconomic and fisheries involvement indices to understand Alaska fishing community well-being. Coastal Management 44: 36–70) may be useful as a guide to potential analyses of the Indonesia data.

3.3 Case study comparisons

The section on case study comparisons in the MarWeB scientific report could include the following components:

- features that integrate activities;
- lessons learned;
- interactions between the social and ecological systems;
- how to implement the case studies;
- importance of community involvement, *i.e*. reflections on the process;
- recommendations;
- ways forward / next steps.

Both case studies are combinations of research questions, and interventions, *i.e*. attempts to fix the identified problems (*e.g*., via IMTA), but there are points to recognise regarding similarities and differences of case studies.

The comparison could contrast shrimp aquaculture in both countries, e.g.

- Compare top-down *versus* bottom-up drivers of change, and who "sees" the presence of a social and/or ecological problem, and the need for solutions:
  - Indonesia: Government "sees" the problems, and wants development and change. Government is interested to enable people to put food 'on their tables', but also to improve environmental quality. The motivation in Indonesia may be to achieve a "sustainable environment".
  - Guatemala: Large industry "sees" no problems, and therefore is reluctant to change the existing processes of intensive shrimp culture. The community need is to put food on the table on a daily basis. The motivation in Guatemala may be 'subsistence'.
- Indonesia appears to have developed a 'discovery – based' process, *e.g*., the introduction of IMTA. The government plans to increase aquaculture significantly, and the concept of well-being can help identify non-economic consequences of such intensive aquaculture development.
- Guatemala appears to have developed a 'risk-averse' process*, e.g*., don't change what is working now.

The MarWeB report should be in the PICES Scientific Reports series. It could be organised as different activities, for example:

- Large-scale comparisons of people's responses and feelings towards the sea – i.e. well-being cube analyses;
- Case study comparisons, as examples of 'Sato-umi' type approaches with respect to people and how they feel about the sea;
- Descriptions of the manual, and database, to accompany the scientific report.

The Introduction should address the conceptual difference (e.g., as identified in PICES Working Group 19 report (PICES Scientific Report 37, 2010). For example, how can we have productive and biodiverse marine ecosystems which include people? PICES WG 19 concluded that concepts differ among PICES member nations with respect to what constitutes a 'healthy' ecosystem. For example, US, Canada, Russia have 'wild' systems which they are trying to maintain; whereas Japan, Korea, China have human-dominated systems. These different perceptions lead, in North America, to concepts or marine protected areas whose objectives are largely to protect and preserve existing (relatively undeveloped) conditions, whereas for East Asian nations concepts in which people are fully part of the system are more realistic goals.

The use of a livelihoods approach could be a helpful way to compare these two case studies, which could also be used to contrast the importance of wild fisheries and aquaculture to these communities. For example, where is each case study on the same scale of fisheries/aquaculture development? When fisheries are in decline, aquaculture is often seen as an alternative. But what are the local problems and issues for developing such approaches? What are the local (and social) benefits of developing integrated multi-trophic aquaculture?

The report should include the following elements and considerations:

- Features that integrate all of our activities, lessons learned, interactions between social and ecological systems, how to implement it, recommendations, way forward, *etc*.;
- Similarities: Problems in capture fisheries and introduction of aquaculture, including both research questions and interventions, key person/local point person (academic);
- Differences: Structure of shrimp farming industry, top-down *vs*. bottom-up, outsiders, livelihoods;
- Need to be careful to define concepts correctly for local situations. For example, the practice of "markets" differs between Guatemala and Indonesia. In the former, markets are very local, for example using small stalls, whereas in the latter markets are larger and more diverse.
- The Guatemala case study was highly successful at reporting back to the communities on the results of their 'clicker' surveys, and including a booklet of photos taken during the meetings (so that participants, and others in the villages, could show themselves present and participating in the meetings);
- What can be learned from the Guatemala oyster experiment in La Barrona (and its problems) regarding how to apply similar experimental studies to other communities that indicate aquaculture as a solution?
- From the Indonesia case study, the manual could describe how the pond experiments were conducted, and why they were chosen;
- The use of the commodity chain approach, and how to create a commodity chain in the local community, could be a useful method to compare and contrast different case studies.

General lessons learned:

- relationship building, and trust;
- persistence;
- feedback of results;
- investment of time and effort;
- building capacity of local researchers and people;
- successful research partnerships;
- how do these activities help the local point-people / contacts, *i.e*., their personal motivations.

Lessons learned from the Guatemala case study:

- Clicker surveys allow anonymity, and help to overcome language and cultural barriers. It is very important to carefully develop the questions to be posed to the community;
- Collaboration is essential for decision making (not the "big daddy" approach);
- Open mindedness and listening are critical;
- An in-country "point person" is essential for consultations and to provide a "feedback loop" in regards to the activities and for interpreting the outcomes.

Negative lessons learned:

- declining budget;
- lack of capacity (*e.g*., complex social-ecological systems modelling) – may need to provide direct support or direct collaborations, rather than via contracts;
- community leadership / directions are positive, but may make comparisons among case studies difficult, for example, both case studies were begun with ideas of IMTA and community support, but each evolved in different ways due to community interests and directions.

The following identifies key aspects features of marine social-ecological systems, and how the compare between Guatemala and Indonesia:

	Guatemala	**Indonesia**
Driving change	Community (bottom-up)	Government (top-down)
Shrimp aquaculture	Industry reluctant to change	Government promoting change
Key contacts	Academic scientists	Government scientists
History	Over-exploitation (internal and external)	Over-exploitation (internal)
Community-scale aquaculture	Risk-averse	Discovery-based
Motivation	Subsistence	Sustainable development
Industry-scale aquaculture	Profit-oriented	Profit
Outreach/education	Local outreach centres	Workshops organised by federal government
Role of PICES scientists	Advisor to local university and communities	Advisor to government
Population (demographics, affluence)	Few	Many
Commodity change	Simple	Extensive (local and export consumption)

Well-being, and how this was addressed or manifested differently in each case study, may provide a helpful integrating concept. Where, and how, is well-being achieved? This also relates to each community's self-concept of well-being, *e.g*., the contrast between the different perceptions of community well-being between Montericco and Las Lisas in Guatemala. This can also be compared with the results for well-being from the well-being cube analyses.

4. MANUAL DEVELOPMENT

A rather general "Manual", providing an overview of the social-ecological systems approach and Sato-Umi, for local government officers and researchers in developing countries is expected. It was recommended to consider the manual as a PICES Advisory Report (see, as an example, the Advisory Report on "*Fisheries and Ecosystem Responses to Recent Regime Shifts in the North Pacific*" at http://www.pices.int/publications/ brochures/default.aspx). The date for submission of this report to MAFF is July 31, 2017.

The process would be to develop the longer PICES Scientific Report (as described above), from which core material would be extracted and reformatted as a general "how-to" manual of advisory report. For example, the Advisory Report would have about 12–16 pages, many pictures, a focus on lessons learned and recommended approaches, with perhaps case studies and the well-being cube approach as 'boxes' to explain and highlight how things were done in these studies. The beginning should highlight a broad definition of well-being, and ecosystem health, *etc*., and how (and why) this was implemented in this project. It should also point out the importance of starting with broad questions, and then refining these in discussions with the local communities and/or governments. The outcome of this process may then require changes to the expertise of the project team.

Additional points to consider include:

- Why we choose these particular case studies, and how to select case studies, *i.e*. criteria for selection:
  - importance of existing connections and relationships (for example, in this project case studies were selected in part based on previous relationships, including those established during the previous MAFF-funded PICES projects)
  - selection considered 'degraded' systems – therefore, we do not want to 'sustain' these systems, but to help them improve.
- For successful projects it would essential to have:
  - dedicated in-country co-participants, for example from the University in the case of Guatemala or from the state agency in the case of Indonesia;
  - a dedicated interpreter who understands the project and Project Science Team needs, as well as enthusiastic locals who can provide translation.

Based on discussions and comparison of the two case studies, it was recommended that the manual include elements such as:

- Local needs identification (community needs assessments, clicker survey, well-being cube analysis, hearings, *etc*.) for "healthy and sustainable ecosystems";
- How to define human well-being, and its complementary question about how to define healthy marine ecosystems; Indonesia may be a 'more developed' version of Guatemala in regards to responding to these questions;
- Interventions: the use of new technologies, activities, or operations (eco-tourism, oyster aquaculture, IMTA, education, *etc*.) to meet such needs;
- Scientists / universities / government / international organizations and programs (UNDP, NGOs, *etc*.) are important for outreach and training processes;
- "Point people" are the key to making every step successful;
- "Trial and error" is to be expected (*e.g*., the Indonesia pond experiments);
- Declines in fishing are common, as are intentions to supplement with aquaculture.

Appendix 3 provides a first draft outline for the manual contents.

Manual and database development timeline:

- Zero order draft of the Scientific Report, suggestions of the manual contents: October 3, 2016;
- Writing the manual: November and December 2016;
- Visit to Guatemala and Indonesia: January 2017;
- Final draft (both Scientific Report and manual) and draft bibliography: March 31, 2017;
- Circulate and update the bibliography, prepare the project presentations, prepare the raw data from two case studies: April to June 2017;
- Submission: The end of July 31, 2017.

5. DATABASE DEVELOPMENT

Appendix 4 provides a first draft outline of the database contents. This could 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);
- references to literature cited in our MarWeB publications/reports;
- 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).

The database should be linked to the manual, so that it provides the 'raw' information for the manual. The database would be small, and so, perhaps, could be hosted on the PICES server.

It was also agreed to build a MarWeB Final Presentation and made it available on the project website for all to use. It was suggested that perhaps two presentations are needed: one more general and high-level and the other with more scientific details.

5. OTHER MATTERS

5.1 Budget and proposed allocations for Year 5

The MAFF contribution for Year 5 of the project (April 1, 2016 – March 31, 2017) is $66,989. Moving the Year 4 account balance of $7,411 to Year 5 brings the total available funding for the final year of the project to $74,400. The proposed Year 5 budget breakdown is shown Table 1 (Year 4 balance is credited to "Contracts").

Table 1 Proposed budget breakdown for Year 5

Category	Year 5 Allocation	Year 4 Balance	Total Allocation
Travel & meetings	28,089		35,500
Contracts	29,400		29,400
Equipment & supplies			
Miscellaneous	791		791
Overhead	8,709		8,709
Total	**66,989**	**7,411**	**74,400**

A budget of $25,000 was requested for the final project work in Guatemala:

- Final trip to Guatemala (1 week in Jan/Feb 2017) – $10,000 (assuming that the UN project pays local costs);
- Nutrient analysis and consulting on sustainable aquaculture outreach – $7,000 (contract);
- Translation services – $5,000 (contract);
- Guatemala student and PI liaisons and supplies – $3,000.

5.2 Topic session proposal for PICES 2017

A proposal for a 1-day Topic Session to be held at the 2017 PICES Annual Meeting (Vladivostok, Russia) will be developed by PST Co-Chairs during the summer, circulated for discussion and submitted through the PICES online system in September. The session focus would be on well-being, or social-ecological marine systems, and should include links among social and natural sciences. Suggested session titles are: "*Well-being in marine resources management*" or "*Marine ecosystem health and human well-being*". Though the session description should expand beyond the scope of the project, it is expected to have two presentations from each MarWeB case study, plus an introduction and a concluding presentation. Dr. Makino will contact Dr. Tetsuo Yanagi for possible contribution.

5.3 Potential next MAFF-supported project

A new MAFF-supported project, involving natural and social scientists, is still being developed. The anticipated project duration is 3 years, with funding at the level of $100,000 CAD per year. The project emphases are on capacity building in local communities, local food security, and manual development for social assessments, and project keywords are Sato-umi and blue growth aquaculture. Expected case study locations are Indonesia and Vietnam.

The meeting concluded at 1200 on June 24. The next PST meeting will take place on November 2, 2016, in conjunction with the 25th Annual Meeting of PICES.

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/Duke University, Canada/USA
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:

Robin Brown	PICES Executive Secretary
Alexander Bychkov	PICES Special Projects Coordinator
Elizabeth Figus	University of Alaska, Fairbanks, USA

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

Appendix 2

Seventh Project Science Team meeting agenda

1. Adoption of the agenda
2. Introduction to the meeting (Co-Chairs)
3. Progress reports from two case studies
   - 3.1 Case study in Guatemala (V. Trainer and C. Trick)
   - 3.2 Case study in Indonesia (M. Wells, M. Hirota and M. Makino)
   - 3.3 Discussion: Features that integrate all of MarWeB activities, lessons learned, interactions between social and ecological systems, how to implement it, recommendations, way forward, *etc*.
4. Manual development
   - 4.1 Contents and outlines
   - 4.2 Role allotment
   - 4.3 Timetable till March 2017
5. Database development
   - 5.1 Contents and outlines
   - 5.2 Role allotment
   - 5.3 Timetable till March 20176.
6. Other matters (PICES-2017 Topic Session, other related project in the future, *etc*.)

Appendix 3

Contents of the Manual (Draft)

1. Introduction (M. Makino and I. Perry)
   - 1.1 What is the Social-Ecological Systems (SES) approach?
   - 1.2 Why it is useful for local fishing community?
2. Procedures for the fisheries SES analysis (M. Makino and I. Perry)
   - 2.1 Identification of site and point person
   - 2.2 Identification of local needs
   - 2.3 Potential intervention and SES impact assessment
   - 2.4 Outreach
3. Case study (1): Oyster aquaculture in Guatemala (V. Trainer and C. Trick)
   - 3.1 Identification of site and point person
   - 3.2 Identification of local needs
   - 3.3 Potential intervention and SES impact assessment
   - 3.4 Outreach
4. Case study (2): IMTA for shrimp aquaculture in Indonesia (M. Wells, M. Hirota, J. Hori and M. Makino)
   - 5.1 Identification of site and point person
   - 5.2 Identification of local needs
   - 5.3 Potential intervention and SES impact assessment
   - 4.4 Outreach
5. Conclusions (M. Makino, I. Perry and all)
   - 5.1 How marine ecosystems support human well-being
   - 5.2 How human community support “ideal” or “healthy” marine ecosystems

Appendix: Glossary

Appendix 4

Contents of the Database (Draft)

1. Presentations, articles, and reports about MarWeB Project.
2. Bibliography on SES approach, Sato-umi, IMTA, oyster aquaculture, commodity chain analysis, well-being analysis, community analysis, *etc*.
3. Data from case studies (Guatemala, Indonesia, photographs, *etc*.).