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UBC Martha Piper Research Fund (MPRF)

Valuing the Human Dimensions of Fisheries

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Executive Summary of Principal Project Achievements

- Multidisciplinary, international team from academia, government, industry, NGOs, and UN consultants improved the human dimensions aspects of the *Rapfish* technique for assessing sustainability of fisheries, leaving the revised technique ready for test data.
- *Social*, *Economic, Institutional* and *Ethical* evaluation fields address the semi-quantitative assessment of the status of the human dimensions of fisheries.
- The new *Institutional* evaluation field includes a section covering *Legality* and adopts an innovative but intuitive nested structure.
- Substantial revisions to *Social* and *Economic* evaluation fields address key features of sustainability more effectively.
- Revisions improve the *Ecological* and *Technological* evaluation fields of *Rapfish*.
- Established a public website (www.rapfish.org) that performs *Rapfish* data analysis for any user, and provides full background information and ongoing updates of the technique.
- MPRF Project leads to four oral papers and six academic publications, a Major Thematic Grant proposal to the Peter Wall Institute for Advanced Studies, an NSF proposal, and a research contract (under negotiation) with a consortium of NGOs for *Rapfish* analyses.

Introduction

Rapfish is a scalable, rapid appraisal technique that estimates the status of fisheries in multiple performance modalities, known as evaluation fields. In each field, it uses scores of attributes as indicators of sustainability, making it a normative method. Fisheries are put in rank order, or placed on a 2-D graph, in relation to the best and worst possible cases, using a statistical technique. The standard version of *Rapfish* now evaluates fisheries sustainability in six evaluation fields, *viz*: *Ecological*, *Technological*, *Economic*, *Social*, *Institutional* and *Ethical*. Fish populations, ecosystems and fishing gear are captured in the first two evaluation fields, while the other four fields constitute the human dimensions of fisheries. In addition to evaluating sustainability, *Rapfish* has been applied in diverse policy contexts: 1. to estimate compliance with the UN Code of Conduct for Responsible Fisheries; 2. to evaluate the status of implementation of ecosystem-based management; 3. to monitor the performance of marine protected areas; and 4. to assess sport fishery quality. Given its broad applicability, this MPRF project focused on improving the sustainability analysis and public availability of *Rapfish.*

Several of the human dimensions aspects of the *Rapfish* analysis, first published by the PI in 2001, have been problematic: this MPRF project, *Valuing the Human Dimensions of Fisheries*, aimed to improve how the human dimensions of fisheries sustainability are captured and assessed. By synergizing research in fisheries ecology, policy and governance, economics, and anthropology, the project aimed to refine basic insight of the human dimensions of fisheries to tackle critical societal challenges surrounding common-pool resources.

Our task addresses a fundamental research challenge at the interface of the natural and social sciences: to quantify fishing knowledge and behavior so as to accommodate divergent cultural frameworks and societal policies, while permitting meaningful and reproducible cross-cultural comparisons in the human exploitation of natural resources. Our approach emphasizes empiricism, *i.e.,* factors we observe influencing sustainability, as well as theory, factors we believe are causal. The power of multi-dimensional scaling is that it permits modeling of a wide range of complex social and environmental factors, rather than restricting analysis to a few core attributes. This effort combines contemporary social theory, which assumes that the subject of analysis, human culture, is more complex than our current models address, with recent advances in human ecology and fisheries governance.

During the MPRF project, the human dimensions framework for updated *Rapfish* evaluation fields have been tested and refined by an interdisciplinary research team, experts in fisheries policy who attended the international MPRF workshop. The MPRF research conceptualized fundamental, but typically implicit values. The revised research framework shows *Rapfish* can now better inform policy decisions by making the values of diverse stakeholders explicit, and indicates how all may become part of a decision-making process. The MPRF project has also improved the analysis of *Rapfish* data by providing public access to a website that performs the challenging numerical analysis. This report details the advances and improvements to the *Rapfish* technique achieved under the MPRF project and lists our major project outputs: research presentations and publications, a public website, and new proposals and contracts.

Progress in the Evaluation fields

The MPRF team collaborated on improvements and standardization of the scoring guidelines, revised existing evaluation fields, and added a new *Institutional* field to the human dimensions. Details of each evaluation field are discussed below, while full details are provided in the Appendices

Improved Scoring Guidelines

Since its invention in 2001, *Rapfish* evaluated attributes along arbitrary scales and directions: while not inhibiting publication of a considerable amount of work (over 30 *Rapfish* papers have been reported world wide), it can lead to confusion. In an attempt to standardize scoring ranges for users with very different expectations and backgrounds, the MPRF team agreed on *Rapfish* scoring guidelines that are based on a scoring scale from zero (worst) to 10 (best), with 4/10 representing a bare pass, and 7/10 a good score. This scoring range provides an equal spread that enables discrimination among poor, mediocre and good categories, and does not suffer from the extreme compression of good scores common in North America.

Improved Evaluation Fields

During the international workshop, the attributes in the existing *Ecological field* were revised to better reflect sustainability in the light of experience with *Rapfish* over the past ten years.

This field scores the key ecological and ecosystem attributes that foster or inhibit biological sustainability of the resource. Revisions capture a deeper knowledge of species life history and ecology and ecosystem parameters; one former attribute was dropped after being criticized for not properly reflecting sustainability. Ten attributes are now described. Productivity/susceptibility (PSA) analysis was discussed, but it was felt the *Rapfish* technique has no need to emulate this assessment of risks. The group discussed the new "Ocean Health Index" presently being developed, Yale University's Environmental Performance Index, and the Code of Conduct for Responsible Fisheries (the subject of a separate *Rapfish* analysis). Details of the revised *Ecological* field are in Appendix A.

Likewise, the *Technological* field was revised. This field scores fishing gear, fishing vessels and activities that foster or inhibit biological sustainability of the resource. Many of the six attributes (such as trip length) are scored in terms of a change rather than as an absolute level, because changes often signal a technological advance that increases catching power to the detriment of resource sustainability. Three attributes in the technological field were dropped (Presale processing, Landing Sites, Onboard handling), since these derived from an earlier era where reduction of "waste" and the like was thought to be related to sustainability. Details are provided in Appendix B.

The *Economic* evaluation field, one of the human dimensions of fisheries sustainability scoring economic factors (attributes) that foster or inhibit biological sustainability, has been substantially revised under this MPRF project. Although previously set up with the help of social scientists and economists, the field has not worked well in practice to discriminate among fisheries. Here, we have dropped five former attributes. The workshop discussed the pros and cons of including profitability as a scored attribute: the consensus was not to include it because it is not clear how high or low profit relates to sustainability. Changes in profitability, however, are likely to signal concerns for sustainability, and so a non-linear utility relationship has been adopted, where either negative or positive changes trigger lower *Rapfish* scores. Likewise, although the availability of credit (and microcredit) is important to the economic functioning of fisheries, its relation to sustainability is not straightforward. The consensus was to try to cover the fisher's debt load in relation to the average annual income in order to capture the variation in costs of gear/license/quotas. The final revision of the *Economic* evaluation field focuses on eight attributes that cover changes in profitability, the financial discount rate in relation to fish production rate, a poverty index, subsidies, equity of benefits, openness of the fish marketing system, commoditization of the fishery products and opportunity of alternative livelihoods. The debt load attribute is still being revised due to uncertainty in the availability of data for rapid appraisal. Details are provided in Appendix C.

The *Social* evaluation field of *Rapfish*, despite its original construction with social scientists, has been problematic, so the MPRF project completely revised this human dimension field. Six new attributes capture the use of local environmental knowledge, strength of social network, equity and instability of fishing benefits, consumer attitudes to sustainability, and an attribute with nonlinear utility linked to rates of change in fishing operations. Benefits from fishing include non-monetary and cultural aspects. The new *Social* evaluation field is currently in draft ready to be challenged with data. Details are provided in Appendix D.

The *Ethical* evaluation field of *Rapfish*, one of the human dimensions, has not been modified in this project since it was previously the subject of a major interdisciplinary project (the SHRCC-funded *Just Fish* project).

New Evaluation Field
The workshop team has devised a new *Institutional* evaluation field in *Rapfish*. It includes an innovative hierarchical or nested framework for five attributes: quality of *Governance*, and four management attributes, *Legality*, *Regulation, Reporting and Protection*. Each of these five main attributes has a nested set of sub-attributes that are scored using a *Rapfish*-type analysis. As an alternative to this rigorous technique, each of the five main attributes can be scored using a proxy from an available database, such as the World Bank's Governance Index and Fishery Management Quality Index. The hierarchical structure allows an option for rapid assessment or more detailed scoring. Assessment of *Legality* of a fishery was the subject of extensive discussion at the workshop because legality is a quality desired by industry as part of their eco-labelling initiatives that can gain marketing advantages. At one point a separate legal field was discussed, but it seemed more parsimonious to include legal aspects embedded within the *Institutional* field. However, the *Legality* analysis could be performed separately and includes compliance with national and international laws, supply chain, and Code of Conduct issues. Details of the new *Institutional* evaluation field are provided in Appendix E.

Improvements to *Rapfish* Data Analysis
Rapfish uses a constrained MDS with Monte Carlo uncertainty and sensitivity analysis. Originally implemented in SPS, and later in Visual Basic for Applications (VBA) inside an Excel spreadsheet, this platform encountered problems when Microsoft altered VBA, and then eliminated it altogether in Macintosh versions of the Office software. Although VBA is now reinstated in the latest ' MS Office' for Mac, since it uses a *.dll* file, the *Rapfish* algorithm fails.

Our programming consultants in the MPRF project have tackled this problem most successfully by setting up a website that implements the *Rapfish* MDS algorithm in the free R programming language: the R website application is an important innovation. Users submit data in a simple spreadsheet format (csv), and the website returns analysis results and a visually attractive graphical summary. The website is already working with test data, but some final details need to be added before the website goes live, likely in October 2011.

A range of alternative analytical techniques was discussed during the workshop, with fuzzy logic and Bayesian Belief Network algorithms looking the most promising. However, this would take a considerable amount of development with only moderate improvement to the results and so the team decided not to pursue it at this time under the MPRF project.

Workshops Held
A *Planning Meeting* of the core team was held on 6 April 2011. The *International Workshop*, held 14 – 16 June 2011 at UBC, was the main work engine during this MPRF project, followed up with considerable discussion and edits to the draft evaluation field guidelines by email and in person among the local team after the meeting. A *Wrap-up Rapfish Workshop* was held on 27th Sept 2011 to draft this report, finalise the evaluation fields, and fine-tune the website. The MPRF team consisted of: *<u>Visitors</u>: Dr Cameron Ainsworth (ecology, U Florida), Ken Lockhart (professional website programming, Surrey); Dr Katrina Nakamura (industry and NGOs, Sustainable Fisheries Program, Hawaii); Dr Ian Perry (management and governance,*

DFO, Nanaimo), Dr Trevor Ward (UN and NGOs, management, Perth, Australia); UBC: Pramod Ganapathiraju, (fisheries, governance), Dr Ling Huang (Economics), Dr Mimi Lam (human ecology and fisheries governance), Lingbo Li (ecology), Dr Andrew Martindale (Anthropology/ Archaeology), Dr Tony Pitcher (PI), Jamie Slogan (restoration ecology), Dr Rashid Sumaila (economics), Lydia Teh (fisher behavior), Dawit Tesfamichael (small scale fisheries), Dr Diyya Varkey (ecology, R programming). [Dr Ron Trosper, an original project proponent, has left UBC.]

Next Steps

The group planned to assemble and score test data from east and west Canadian fisheries, the Red Sea, and the Cook Islands, along with artificial data constructed to cover all extreme cases. Test analyses will have to be completed before some of the output papers can be written. Funding to achieve further test analyses will be sought in the output proposals.

Project Outputs

New Website: www.rapfish.org

A public website has been set up covering all aspects of the *Rapfish* method and applications, including a news section, bibliography and details of this MPRF project. The website includes proformas for all types of *Rapfish* analyses, and has a link to the on-line data analysis facility.

Academic papers

Oral papers delivered at (A, B) the Global Ecological Integrity Group (GEIG) conferences in Vancouver, June 30th 2010, and Prague, July 15th 2011; (C) Ecological Society of America Annual Meeting, Austin, August 10th 2011; (D) Salish Sea Ecosystem conference, Vancouver, 26th October 2011.

Written papers include 6 publications completed or in progress as outputs of this project:

(A - C) Invited papers with new cultural indicator (2010) and *Rapfish* institutional evaluation field (2011), published or submitted to 2 GEIG volumes and a paper to *Human Ecology Review*.

(D) Main research paper documenting the updated method and revised evaluation fields, website algorithm, and Monte Carlo simulations to express uncertainty. Target journal is *Fisheries Research*, which published the original *Rapfish* paper in 2001.

(E) Paper focusing on the human dimensions innovations, "Valuing the Human Dimensions of Fisheries", to be submitted to *Ecology & Society* or *Frontiers in Ecology and the Environment.*

(F) Invited paper, special issue of *Current Opinion in Environmental Sustainability*, Feb. 2012.

Research Proposals

Two current research proposals make extensive use of the multidisciplinary *Rapfish* evaluation technique and theory of fisheries exploitation enhanced under this MPRF project:

A. Major Thematic Grant proposal to the Peter Wall Institute for Advanced Studies is being submitted in October 2011. *The Sea Before Us*, focused on the Salish Sea, (PI: T. Pitcher).

B. NSF proposal to the Dynamics of Coupled Natural and Human Systems program, to be submitted November 2011, focuses on *Dimensions of the Human Coastal Niche* (PI: M. Lam).

Contract under Negotiation

The MPRF project has facilitated a research contract to UBC that is presently under negotiation with a consortium of NGOs for new *Rapfish* analyses of between 25 and 60 countries, Regional Fishery Management Organizations and some individual fisheries.

Rapfish **Revised ECOLOGICAL EVALUATION FIELD** **September 2011**

Revised evaluation field: This field scores ecological and ecosystem factors (attributes) that will foster or inhibit biological sustainability of the resource. Scoring scale is from zero (worst) to 10 (best), with 4/10 representing a bare pass and 7/10 a good score. Scoring guidelines are given beneath each attribute description.

REVISED ECOLOGICAL ATTRIBUTES

1. **Exploitation status of fishery in relation to sustainable levels**
   Scored on an FAO-like scale; local experts, stock assessment, or consult FAO website for status, except collapsed:
   Scoring Guide: Under exploited (10-9); exploited, less than MSY (8-6); fully exploited at approx. MSY (5-4); over-exploited beyond MSY (3-2); heavily exploited well beyond MSY to collapsed (2-0)

Ecosystem factors

2. **Species changes**
   Are there changes in species composition of catch in past 10 years, or compared to the first five years after the fishery began if information is available? A characteristic of overfishing in multispecies fisheries is a catch previously dominated by apex predators replaced by short-lived pelagic species. Score the number of species almost eliminated, greatly reduced or of changed identity in the catch (retained and/or discarded):
   Scoring Guide: low 0-4 (10-9); medium 5-9 (8-6); high 10-14 (5-3); very high >14 (<3)

3. **Intrinsic Vulnerability Index of fish species in the fishery**
   A susceptibility measure for the species in the fishery (index values available by species from www.FishBase.org). Multispecies fishery might need an approx. average score. These *Rapfish* score categories are based on the frequency distribution of the Vulnerability index for 30,000 species (range <10 to 80+).
   Scoring Guide: V Index value 0-9, score (10); 10-14 (9); 15-19 (8); 20-24 (7); 25-29 (6); 30-39 (5); 40-49 (4); 50-59 (3); 60-69 (2); 70-79 (1); >80 (0).

Fish life history factors

4. **Size of fish in catch**
   Has the average fish size reduced in the past 10 years, or compared to the first five years of the fishery if information is available? Includes changes in population size structure and/or species composition.
   Scoring Guide: No or very little (10-9); yes, a gradual change (8-6); yes, a rapid large change (5-3), major rapid reduction (3-0).

5. **Recruitment variability of the exploited fish population**
   Percentage variation in new fish arriving at the fishery (= recruits), year to year. Sustainability is prejudiced by high variability. Fishing increases this variability, but a major cause is often climate change.
   Scoring Guide: Low <20% (10-9); medium 20-60% (8-7); high 60-100% (6-4); very high >200% (3-0)

6. **Catch before maturity**
   Percentage of the fish caught that are smaller or younger than the size or age of maturity:
   Scoring Guide: None (10-9); some >30% (8-6); lots >60% (5-3); a very large amount > 80% (2-0)

Selective fishing factors

7. **Discards**
   Percentage of the catch biomass discarded (includes juveniles of the target species plus other species):
   Scoring Guide: Low 0-9% (10-9); medium low 10-19% (8-6); medium 20-39% (5-4), high >40% (3-2); very high >100% (<2)

8. **Bycatch**
   Percentage of target catch biomass that that is landed bycatch (includes juveniles of the target species plus other species):
   Scoring Guide: Low 0-9% (10-9); medium low 10-19% (8-6); medium 20-39% (5-4), high >40% (3-2); very high >100% (<2)

Spatial (Geographical) stability factors

9. **Range collapse**
   Is there evidence of geographic range reduction of the fish population in the past 10 years, and/or loss of sub populations:
   Scoring Guide: None or very little (10-9); some, slow (8-6); a lot, fast (5-3); very great, rapid (<3).

10. **Migratory range of target fish**
    Number of jurisdictions encountered during life history of the target fish (include international waters as two jurisdictions):
    Scoring Guide: 1 only (10); 2-3 (9-7); 4-5 (6-4); 6-7 (3-2); >7 (1-0)

Rapfish **Revised TECHNOLOGICAL EVALUATION FIELD** **September 2011**

Revised evaluation field: This field scores technological (fishing gear and activities) factors (attributes) that will foster or inhibit biological sustainability of the resource. Scoring scale is from zero (worst) to 10 (best), with 4/10 representing a bare pass and 7/10 a good score. Scoring guidelines are given beneath each attribute description.

REVISED TECHNOLOGICAL ATTRIBUTES

1. **Fleet capacity in relation to resource**
   Is there significant overcapacity in the catching power of this fleet/fishery?
   Score guidelines: Appropriate capacity, under good control (10-9); slight overcapacity, under control (8-7); overcapacity, but under good control (6-4); significant over capacity, under poor control (3-2); huge overcapacity (1-0)

2. **Change in catching power**
   Have fishers altered gear and vessel to increase catching power over past 5-10 years? Note: 'fishing power creep' averages 2% per year in most fisheries. Investment in catching technology, *e.g.,* electronic aids or replacing natural fibres with nylon, often has major impact. Conversely, low tech or traditional materials often impose limit on catching power.
   Score guidelines: Very little change, or a decrease in catching power (10-9); a small amount, less than 1% per year (8-7); somewhat, near the average of 2% (6-4); a lot, more then 2% per annum (3-2); a great amount, rapid increase (1-0)

3. **Change in Vessel Size**
   Have sizes (lengths, GRT) of vessels increased over past 5-10 years? Change measured as approximate percentage change in vessel capacity.
   Score guidelines: Change less than 5% (increase or decrease) (10-9); change 5-20% (8-7); change 20-50% (6-5); change 50-100% (4-3); change more than 100% (2-0).

4. **Change in Trip Length**
   Are there recent changes in trip length in this fishery? Change measured as approximate percentage change in trip duration.
   Score guidelines: Change less than 5% (increase or decrease) (10-9); change 5-20% (8-7); change 20-50% (6-5); change 50-100% (4-3); change more than 100% (2-0).

5. **Selective gear**
   Does the fishery deploy device(s) and/or handling of gear to increase selectivity and reduce bycatch and/or environmental damage?
   Score guidelines: A great amount (10-9); a lot (8-6); some (5-3); very little (2-0)

6. **Fishing Gear Side Effects**
   Does fishing gear have undesirable side effects on the habitats and/or other species. Inherent or through the way the gear is used) (*e.g.*, cyanide, dynamite, bottom trawl, FADS, light attraction). Impacts of some trawls, drift nets and gill nets will depend on deployment and operation, so scores should be based on practice in this fishery.
   Score guidelines: Very few (10-9); some (8-6); a lot (5-3); fishery dominated by destructive fishing practices (<3).

Rapfish **Revised ECONOMICS EVALUTION FIELD** **September 2011**

Revised evaluation field: scores economic factors (attributes) that will foster or inhibit biological sustainability. Scoring zero (worst) to 10 (best), with 4/10 representing a bare pass and 7/10 a good score. Attempt to score generic processes, not specifics. Scoring guidelines are listed beneath each attribute description.

REVISED ECONOMIC ATTRIBUTES

1. **Discount rate in relation to fish productivity**. Sustainability based on the ratio of discount rate to fish population reproductive rate (Clark showed that fish should be wiped out when the discount rate is more than twice reproductive rate of fish population).
   Score guidelines: Discount rate less than 20% of fish reproductive rate (10-9), Discount rate 20-40% of fish reproductive rate (8-6), Discount rate 40-60% of fish reproductive rate (5-4). Discount rate 60-80% of fish reproductive rate (3-2), Discount rate more than 80% of fish reproductive rate (1-0)

2. **Subsidies**. Higher subsidies are bad for sustainability. Subsidy level as %age of gross turnover of fishery. Including hidden subsidies. National figures are available from Rashid Sumaila: these values may be used as a default if there is no specific information on the fishery.
   Score guidelines: Subsidy less than 10% of turnover (10-9), Subsidy less than 20% of turnover (8-6), Subsidy less than 30% of turnover (5-4), Subsidy between 30 and 100% of turnover (3-2), Subsidy more than 100% of turnover (1-0)

3. **Poverty index.** For this fishery, defined as difference between average fishing income and national poverty level (divided by national level to normalize). Non linear, but impact on sustainability large when poverty is high. Values above poverty level are neutral to sustainability. (Non-linear utility).
   Score guidelines: Poverty index above or well above national average (10-9), Poverty index close to national average (8-6), Poverty index up to 10% below national average (5-4). Poverty index up to 30% below national average (3-2), Poverty index more than 30% below national average (1-0)

4. **Rate of change of profitability**: Large changes in either direction are bad for sustainability. Any trend up or down signals concerns for sustainability. (Non-linear utility).
   Score guidelines: Change less than 5% (increase or decrease) (10-9); change 5-20% (8-7); change 20-50% (6-5); change 50-100% (4-3); change more than 100% (2-0).

5. **Opportunity for Alternative Livelihoods.** Other sources of livelihood, other income.

   Score guidelines: Many other sources of livelihood (10-9); a lot (8-6); some (5-3); very few (2-0)

6. **Marketing system**. Open system better for sustainability, for example open auction system. Closed, monopoly buyer not good for sustainability.
   Score guidelines: Fully open market auction system (10-9); partially open market auction system (8-6); semi-closed market system (5-3); monopoly or government buyer, fixed price system (2-0)

7. **Equity of economic benefits**. Covers monetary and other material benefits. Benefits accrue to owners of fishing vessels, gears and licences, skippers and crew providing labour and skills, and shore-side processing and marketing. Includes spatial location of benefits in that equitable local benefits are more likely to foster sustainability.

Score guidelines: equitable distribution of economic benefits (10-9); partially equitable distribution of economic benefits (8-6); inequitable distribution of economic benefits (5-3); grossly inequitable distribution of economic benefits (2-0)

8. **Commoditization**. Treating fishery products as a global commodity is inimical to sustainability. On the other hand, labelling products with ecolabels, provenance or niche creates market pressures that could foster sustainability.
   Score guidelines: Fishery products are marketed with a specific, local provenance and/or niche (10-9), Fishery products are to a large extent marketed with a local provenance and/or niche (8-6), Fishery products are to a minor extent marketed with a local provenance and/or niche (5-3), Fishery products are marketed as generic and global products with no local provenance or niche (2-0)

Candidate Attribute still under development

9. **Debt level** of fishers in this fishery relative to national (figures available ??). This can include formal debts to financial institutions like banks, but also debts to kin that may have to reciprocated later, and patronage debt where investors finance gear, fishing vessels or supplies, as in many developing world fisheries. Ratio of capital investments in fishing to average annual income may be an alternative, high values signal poor sustainability. (*scoring scale needs thought*)

Rapfish **NEW INSTITUTIONAL EVALUATION FIELD 4th DRAFT** **September 2011**

New evaluation field: scores institutional arrangements (attributes) that will foster or inhibit biological sustainability. Five main attributes (comprised of 1 governance and 4 management attributes), includes a legality analysis that could be performed separately. Option allows either rapid approximate score (Rapid version) or a nested version where each of the five attributes is treated as a subfield with a full scoring of sub-attributes and *Rapfish* analysis.

Scoring zero (worst) to 10 (best), with 4/10 representing a bare pass and 7/10 a good score. Attempt to score generic processes, not specifics. Consider demonstrate resilience to change when scoring. (Resilience is defined as capacity for recovery from a perturbation).

To add scoring guidelines for each Question

INSTITUTIONAL ATTRIBUTES: RAPID VERSION

One key index is used as proxy for the attribute. Usually the index refers to the state, so expert opinion could be used to estimate a modification to the score for the particular fishery being evaluated.

1. **Governance:** Overall quality or capacity of jurisdiction (e.g., nation states) to provide enabling conditions for legal, regulated, reported, and protected fisheries.
   World Bank Governance Index
2. **Legality:** Demonstrated compliance to international obligations and national laws concerning the fishery, including the supply chain to the retailers.
   Relative UN Code of Conduct Compliance Score (from Pitcher et al. 2009)
3. **Regulation:** State of responsible and effective management for this fishery in ensuring sustainable stock levels and healthy populations. Uses best available scientific evidence and managers follow scientific advice. Regulation to include EBFM, multispecies attempts, ecosystem approach to management, monitoring and assessment, adapting to change.
   Fishery Management Quality Index (Mora et al. 2009)
4. **Reporting:** Accurate, transparent reporting of fishing activities and fish extracted to national authority or RFMOs
   Quality of reporting index based on relative IUU score for country. Corruption index from Transparency International as a proxy.
5. **Protection:** Community-based or legislated protection for the productive value of the ecosystem for sacred, ceremonial or utilitarian purposes, habitat conservation and restoration, resource management, public trust, and common heritage.
   Protection Parameter index from extent and effectiveness of closed areas [extent of IUCN I and II designation] and fishery closures; readily available in qualitative form in most places

INSTITUTIONAL ATTRIBUTES: NESTED VERSION

1. **Governance:** Overall quality or capacity of jurisdiction (e.g., nation states) to provide enabling conditions for legal, regulated, reported, and protected fisheries.
   4 attributes to score
   1. Collaborative governance framework: management responsibilities shared by government with fishing enterprises and corporations and civil society, including scientists, NGOs, consumers and community leaders.
   2. Accountability [linear]
   3. Transparency [linear]
   4. Trend in conflict status among resource users to management changes [non-linear utility]

2. **Legality:** Demonstrated compliance to international obligations and national laws concerning the fishery, including the supply chain to the retailers

   12 attributes to score

   National Legal compliance issues

   1. Fishery is in compliance with national laws fishery control measures.
   2. Fishery is in compliance with conservation and management measures including catch limitations for this fishery.
   3. The Fishery management takes account of Customary use/Indigenous rights
   4. The fishery has proper documentation, registration, fees and taxes as established by law or local custom.

   Supply Chain issues

   5. Supply chain. The product can be traced to the fishery, and to the vessel/fisher.
   6. Supply chain. The supply chain actively avoids purchasing illegally-caught product
   7. Supply Chain. The supply chain avoids purchase from blacklisted vessels
   8. Supply chain. The supply chain actively avoids co-mingling with products of unknown provenance.

   Code of Conduct IUU issues

   9. Amount of illegal fishing in this jurisdiction/fishery (Code Rapfish, Q6.4)
   10. Control of illegal fishing in this jurisdiction/fishery (Code Rapfish Q6.5)
   11. Flags of convenience in this jurisdiction/fishery (Code Rapfish Q6.6)
   12. MCS quality score for this jurisdiction/fishery (MCS Rapfish from Pramod)

3. **Regulation:** State of responsible and effective management for this fishery in ensuring sustainable stock levels and healthy populations. Uses best available scientific evidence and managers follow scientific advice. Regulation to include EBFM, multispecies attempts, ecosystem approach to management, monitoring and assessment, adapting to change.

   6 attributes to score

   1. Secure Access Privileges to harvest allocations, fishing grounds, or fishing periods – consider allocations to individuals, communities, or cooperatives, transferability, durability, etc.
   2. Participatory multi-stakeholder decision-making (e.g., co-management)
   3. Implementation of Ecosystem-based fisheries management. Country score may be available from Pitcher et al 2009)
   4. Fishers' compliance with reporting regulations (incentives to misreport, illegal fishing)
   5. Precautionary approach (lack of scientific evidence that an action is harmful will not support that action to be taken) based on best available scientific evidence – default value can be country score available for 'precaution' under the Code of Conduct compliance analysis
   6. Effectiveness of Monitoring, Control, and Surveillance (MCS Rapfish analysis from Pramod Ganapathiraju*)*

4. **Reporting:** Accurate, transparent reporting of fishing activities and fish extracted to national authority or RFMOs

   5 attributes to score

   1. Publically or easily available data and analysis.
   2. Reliable mandated documentation of catch landings.
   3. Scientific analysis of extractions (e.g., catch reconstructions).
   4. Independent observer programs, or other appropriate safeguards to verify at-sea practices.
   5. Verified reporting of discards and bycatch, and ongoing analysis of misreporting.

5. **Protection:** Community-based or legislated protection for the productive value of the ecosystem for sacred, ceremonial or utilitarian purposes, habitat conservation and restoration, resource management, public trust, and common heritage.

   5 attributes to score

   1. Protected areas are applied for fishery purposes and outcomes (e.g., MPAs, spatial management, no-take zones)
   2. Protected species are recognized and avoided by fishery practices (e.g., SARA, Endangered Species Act, COSEWIC)
   3. Protected (closed) fisheries are recognized and implemented (e.g., international ban on whaling)
   4. Protective legislation or administrative arrangements ensure that protected and vulnerable habitats are protected from environmental harm (e.g., back-off rules in VMEs or bans against destructive or non-selective gear types and practices, such as use of trawls, drift nets, dynamite, cyanide or light traps/attractants)
   5. Protective legislation or administrative arrangements secures important and special relationships with fishery resources (e.g., Indigenous Peoples' access for food, social, and ceremonial purposes)

Rapfish **Revised SOCIAL EVALUATION FIELD Draft 5 September 2011**

Revised evaluation field: This field Scores social factors (attributes) that foster or inhibit biological sustainability of the resource. Scoring scale is from zero (worst) to 10 (best), with 4/10 representing a bare pass and 7/10 a good score. Scoring guidelines are given beneath each attribute description. Consider demonstrated resilience to change when scoring. (Resilience is defined as capacity for recovery from a perturbation). Scoring guidelines follow each set of attribute notes (need finalizing)

REVISED SOCIAL ATTRIBUTES

Social distance factors

1. **Strength of social network**, strength of social peer-group support for fisher's decisions. (former social attribute was called Socialization of Fishing, and meaning is the same as before). Now combined with former attribute 'Kin in Fishery', as it has the same function. Could be called social resilience, social distance; implies shared risks, shared experiences. Includes presence of leaders in the community who on one hand improve cohesiveness of the community and on the other hand interact with the institutions responsible for management. High values in social network and/or kin foster sustainability. Social Network: two elements (a) stronger social network = better sustainability; (b) more kin involved in fishery = better sustainability.
   Linear function: 0 (lowest sustainability) to 10 (highest sustainability); equal weighting for the two elements if both scored.

Knowledge of Resource factors

2. **Extent of Local Environmental Knowledge (LEK)** contributing to fishing practices and ownership, management decisions, and governance. Covers positive effects of LEK and intergenerational learning on sustainability, as former social attribute, now broadened to cover same effect from other factors. Traditional Ecological Knowledge or TEK (indigenous, but also knowledge from, for example, a council of elders) is included as a subcategory of LEK. New entrants to fishery – high value means fishery is expanding with novices, expressing social vitality. Dropped former attribute of processing sector. Includes new cultural indicator, G-index = number of generations resource has been fished by individuals, families, or communities living adjacent to resource; high values should help sustainability. Includes age profile, where large proportion of older fishers should aid sustainability. LEK: two aspects (a) number of generations that local individuals, families, or communities have conducted this fishery — more generations = better sustainability; (b) median age of fishers in the fishery — older fishers bring wisdom and perspective, so older median = better sustainability. Extent of LEK in fishery: three aspects (a) fishing practices and ownership of licenses or Total Allowable Catch (TAC); (b) management decisions; and (c) governance.
   Linear function: 0 (lowest sustainability) to 10 (highest sustainability). May be scored using G-index as a proxy = number of generations those exploiting/managing/governing the fishery resource have lived in the place adjacent to the resource.

Socio-economic factors

3. **Equity of fishing benefits**. Includes estimates of cultural and social benefits, not just monetary. Aspects covered by this include spatial location of owners in that local are more likely to foster sustainability. Type of debt to other sectors ranges from reciprocal, market regulated; unregulated (loan sharking) as a measure of sustainable to unsustainable. Spatial and demographic equity in benefit distribution. Power relationship. Lower fishers/owners ratio acts for sustainability. Owners = corporate enterprise. Benefit Distribution: ratio of recipients, beneficiaries, owners, patrons, buyers or processors to fishers — high ratio (e.g., many recipients or owners to the

number of fishers) = better sustainability. Subsumes former attribute of sector diversity
Categorical function: ratio >10 = poor (score 0-3); ratio 10 to 4 (score 3-8); ratio <4 = excellent (score 9-10)

Change of State factors

4. **Instability of fishing benefits.** As for #3, includes cultural and social benefits, not just monetary. More instability signals concerns for sustainability.
   Linear utility: Rate of change <10%/year – good scores, change 10 to 20% year, medium scores; change >20% a year – poor scores

5. **Change in Fishing Practices.** May be trip length. Distance or time. Any trend in trip length up or down signals concerns for sustainability as it may be a response to new fishing gear or serial depletion. Rarely, for well-managed recovering stocks, it might be a good signal, so it should be scored with care. (Non-linear utility). Trip Length: duration/distance of median trips in the fishery either higher or lower than an established benchmark for median trip duration/length; this would be user-defined benchmark, could be set by community/fisher consensus for example to maximise social utility for the community in question (or could simply be the duration/distance accurately known from some earlier time); standardized by benchmark. Or can be changes in the cultural diversity of fishery. Participants' Demography: proportion of participants of each type of extraction from the stock (say commercial: aboriginal: recreational: subsistence); extent of shift away from a benchmark or target set by community/fisher consensus. user-defined benchmark, could be set by community/fisher consensus for example to maximise social utility for the community in question (or could simply be the duration/distance accurately known from some earlier time); standardized by benchmark duration;
   Non-linear utility, with 'change' scored as in other change attributes.
   Score guidelines: Change less than 5% (increase or decrease) (10-9); change 5-20% (8-7); change 20-50% (6-5); change 50-100% (4-3); change more than 100% (2-0).

Market factors

6. **Consumer Attitudes to Sustainability**. Social consumer demand factors have impact on the fishing community and can foster sustainability. e.g, niche markets, ecolabels, provenance information, restaurants.
   Categorical function: nothing, poor (score 0-3): medium level (score 3-8); ecolabels, clear provenance = excellent (score 9-10)