1ST MEETING OF THE IMBER HUMAN DIMENSIONS WORKING GROUP

IOC-UNESCO, PARIS, 18-20th APRIL 2011

INTRODUCTION

The IMBER Human Dimensions Working Group (HDWG) was established in 2010 in accordance with the recommendations of the IMBER-GLOBEC Transition Task Team, in order to address the issues raised under Theme 4 of the IMBER Science Plan and Implementation Strategy. It will also ensure that the other IMBER working groups and regional programmes include a focus on the socio-economic effects in marine ecosystems, using similar standards and methods.

Meeting attendees included (see Appendix A for contact details):
Alida Bundy (Chair), Marie-Caroline Badjeck, Ratana Chuenpagdee, Sarah Cooley, Omar Defeo, Bernhard Glaeser, Patrice Guillotreau, Moenieba Isaacs, Mitsutaku Makino, Ian Perry, Quentin Grafton (via conference call, Monday 18th April))
Lisa Maddison (IMBER, IPO), Liuming Hu (IMBER RPO – China)
Marion Glaser (via conference call for "Planet Under Pressure" discussion, Wednesday 20th April)

The objectives of the meeting were to:

- Develop the scope of the WG
- Agree on TOR
- Develop the working plan
- Appoint a co-chair from the social sciences
- Plan an international meeting for 2012/13
- Discuss and explore funding possibilities for the 2012/13 meeting

Background presentation on IMBER, the origins of the WG and thoughts on scope.

Alida Bundy
IMBER is an environmental project (under IGBP and SCOR) and consequently has a natural science focus. The supplement to the IMBER Science Plan published in 2010, emphasizes that IMBER Phase II should focus more on human dimension aspects and that the work should build on that of GLOBEC's Focus 4 group.

Discussion
What is the geographic scope of the WG? The WG addresses human-ocean-human

interactions, from biogeochemical cycles to humans in coastal areas and open seas, from coastal communities to global markets and consumers.

Link with other programs (e.g. IHDP, www.ihdp.org) to avoid duplication.

RESEARCH PRESENTATIONS

The meeting began with a series of presentations from the WG members to communicate research interests and goals, and to identify how our research could contribute to the WG. All presentations are available on the IMBER website.

GLOBEC's Focus 4 Working Group on the Human Dimensions of Marine Ecosystem Change

Ian Perry (GLOBEC Focus 4 Working Group & Fisheries and Oceans, Canada)

Abstract

This presentation will provide a brief overview of the GLOBEC (Global Ocean Ecosystems Dynamics: www.globec.org), a sister core project of IGBP and SCOR which operated from the early 1990's until 2010, when the project formally closed. It will then present the background, objectives, and approach of GLOBEC's Focus 4 Working Group (F4WG) on the "human dimensions" of marine ecosystem changes. This will include an overview of the Working Group meetings, topics, and products, and comments on what worked well and what worked perhaps "less well". It will also present some of the major findings of this Working Group as presented at various symposia and published in several books and primary papers.

Summary

The F4WG started in 2001 with the following objectives:

1. Understand the interactions between marine coastal communities and global changes in marine ecosystems;
2. Understand the capacity of these communities (both natural and human) to adjust to these changes.
3. Understand the linked consequences of these adjustments for both the natural marine and human coastal communities.

The F4WG met four times with the final, international meeting, "Coping with Global Change in Marine Socio-Ecological Systems", held jointly with FAO and EUR-OCEANS at FAO headquarters in Rome in 2008. Holding the meeting with FAO gave it a high profile and, due to FAO's work around the globe, was especially attractive to developing countries. It was very much a scoping workshop and it was suggested that if there were a follow-on workshop, it should focus on specific themes.

The F4WG had a core group of members, but the wider membership shifted through time, which was not ideal and the HDWG should aim for more continuity if possible. A great advantage was gained through the affiliation with the "Coasts Under Stress" program, led by the F4WG co-chair Rosemary Ommer. This was ending when the F4WG started up.

At the time when F4WG was formed, the concept of addressing the natural and social sciences together was relatively novel (although social scientists had been calling for it for some time). GLOBEC adopted a "humans-in-nature" approach, i.e. humans are part of a larger concept of ecosystems. They also adopted the methodological approach of coupled social-ecological systems (SES) and explored two key questions:

1. How do marine ecosystem changes affect coastal communities?

2. What are the reciprocal effects of human responses on marine ecosystems?

The F4WG was very productive - 22 papers in the primary literature, book chapters, and a special issue of Marine Policy resulting from the Rome conference. A book from the FAO symposium 'World Fisheries: a social-ecological analysis', edited by Ommer, Perry, Cochrane, and Cury, was published recently. Ian is working on a summary for policy makers from the GLOBEC program, which will include elements from the work of the F4WG.

The F4WG identified biophysical and human drivers of change to biophysical marine ecosystems, and local and global drivers of change in fishing-dependent human communities. Understanding scale is key to addressing these questions – spatial, temporal and institutional scale can affect different components of SES in different ways. For example, drivers of change in biophysical and human sub-systems may differ at different spatial scales.

The F4WG also adopted the IPCC vulnerability framework to address the question of how communities adapt to change. Five case studies were used to explore this and short- (coping) and long- (adaptive) term time scale responses were identified. Note that short term coping strategies may be detrimental in the long term. Ultimately the magnitude of global change may be less important than how humans respond to this change.

Way Forward

Coupled climate-ocean-fish-people models are a good start, but we need to go beyond these to understand peoples' motivations and capacities for adaptation. We also need to recognise the importance of marine products for livelihoods and their roles in reducing poverty – and how these issues interact with global changes. It is also important to recognise that "one size does not fit all" and that exposure, susceptibility and adaptive capacities vary immensely, and consequently policies that allow some flexibility are required.

Discussion

Considering the benefits gained by F4WG's relationship with the "Coasts Under Stress" program – perhaps the HDWG should find a similar type of project to work with.

F4WG/FAO symposium was a great success – the HDWG could be framed up as a follow-on from this.

Adaptation Research in Fisheries: insights from case studies and the road ahead

Marie-Caroline Badjeck (WorldFish Center, Malaysia)

Abstract

With mounting evidence of the impacts of climate variability and change on aquatic ecosystems, the resulting impacts on fisheries livelihoods are likely to be significant. There is increasing concern over the consequences of global warming for the food security and livelihoods of the world's 36 million fisherfolk and the nearly 1.5 billion consumers who rely on fish for more than 20% of their dietary animal protein. Additionally, climate variability and change do not occur in isolation of other drivers of change: processes of environmental, economic and social change will affect the fishery sector now and in the future, compounding the effects of a changing climate. These are compelling reasons for investing in research to guide adaptation planning in fisheries. In this presentation, I will take you through my personal journey in adaptation research, from using climate variability as an analogue to understand adaptation processes in Peruvian artisanal fisheries, to assessing the costs of adaption strategies to future climate change in Vietnamese aquaculture, and using scenarios to understand future adaptation pathways in West Africa. Through this body of work a series of questions that might be relevant in shaping IMBER Theme 4 arise: how (should?) we use the past to inform the future? How to make adaptation research policy relevant? Can we achieve interdisciplinary research when differential knowledge states exist?

Summary

Case studies used to mainstream fisheries in climate change.

1. The vulnerability of national economies to the impact of climate change on fisheries was considered through migration studies in an artisanal scallop fishery in Peru. Migration is a coping strategy for fishers driven by poverty or opportunistic behaviour resulting from the impact of climate change (e.g. El Niño).
2. Economic analysis was used to determine the cost of adaptation to climate change at farm or household level for catfish aquaculture farmers in the Mekong Delta, Vietnam.
3. QUEST-Fish (NERC) aimed to predict the impacts of climate change on global fish production and estimates the consequences for human society (to 2050).

Discussion

Scenarios are useful to address uncertainty about future trajectories in complex systems and for strategic planning. However, they are a tool (not an end in themselves!).

QUEST-Fish is an excellent compliment to GLOBEC with an added forward-looking element.

QUEST-Fish includes downscaling global climate models to regions. This will be published in due course. Downscaling takes 3-4 years. Results from module one will be presented in Plymouth in June 2011.

In many cases, the social science element of projects is added on more as an afterthought, and is not always valued at the same level as other components. In the case of QUEST-Fish, however, social science was integrated right at the start of the project. All components of the project met together every six months. Unfortunately, timing is an issue, as the main social science work (Module 4) is dependent on the other

modules for results, which means that this work is still in progress, while the rest of the project has been completed. Ideally, these work streams would occur in parallel, but this is not always possible (because of the dependence of results from other components).

From a natural science perspective it can be challenging to link up and work with social scientists. Often it is a case of simply not knowing who to approach, or who might be interested in interdisciplinary research. Language differences are also sometimes problematic. Perhaps we should link to the climate change research at the WorldFish Center.

Human dimensions for marine ecosystems and indicator research

Mitsutaku Makino (PICES SG & National Research Institute of Fisheries Science, Japan)

Abstract

The North Pacific Marine Science Organization (PICES) established the Study Group on Human Dimensions (SG-HD) in 2009. SG-HD reviewed the roles of social science practices applied in decision-making in the ecosystem-based fisheries management (EBFM). It also reviewed the social scientific tools and information available for EBFM in PICES member countries. Based on the results of these review works, relevant indicators on human dimensions, their academic backgrounds and analytical tools, cases of indicators in the member countries are presented. Finally, future challenges for a better integrated research on social- and ecological-systems by FUTURE will be discussed.

AND

Models for linking fisheries management, resource dynamics, and social-economic indicators: cases of sea cucumber, Walleye Pollock, and chub mackerel in Japan.

Abstract

"The Grand Design of Fisheries and Resource Management in Japan", which was published in 2009 by the Fisheries Research Agency of Japan, identified five national policy objectives (A: Resource and ecosystem conservation, B: Food provision, C: Industry development, D: Community support, and E: Cultural promotion) and 16 operational objectives in the Japanese fisheries policy. Based on this result, we constructed several empirical models which calculate indicators for some of these operational objectives. The sea cucumber model was devised in collaboration with a local fisheries cooperative association at the northern part of Japan. Using the results of autonomous stock assessments by the association, as well as the results of discussions with local fishers, the model calculates the expected values and risks of sea cucumber resource levels, production volumes, benefits, and fishing ground values (successors' indexes), under various harvesting strategies. In the case of Walleye Pollock, we organized an inter-disciplinary project team composed of the official Walleye Pollock stock assessment team and socio-economic researchers of our agency. The reproductive values, self-sufficiency rates, benefits, number of local employers, and diversity of food consumption style, were calculated for the Pacific stock of Walleye Pollock at various levels of TACs and harvest strategies. For the Pacific stock of chub mackerel, a similar team was organized by the official chub mackerel Pacific stock resource assessment team and social-economic researchers. We conducted a retrospective analysis which

calculates the SSBs, self-sufficiency rates, benefits, and ++++ effects for local economy, under various management scenarios.

Bernhard: Indonesian work – local livelihoods – sea cucumber exported to Hong Kong – local linked to global.

Discussion

What is 'cultural promotion' – one of the five policy objectives mentioned above? It refers to diversity of consumption and how the same resources are consumed by different cultures or communities. The concept is particularly relevant in Asia where there is a very strong food culture – specific types of fish are eaten, not just any fish.

This led to further discussion regarding the terms 'cultural' and 'social' and whether there are differences between social and cultural indicators. Cultural aspects are part of social science. Often social, cultural and economic objectives are lumped together, although they may not necessarily be compatible. There do not seem to be any particular mechanisms to reconcile them when they are incompatible – politics often dictates which gets more weight.

The WorldFish Center is very interested in fish production and food, and how people will adapt to different types of fish. There are important cultural aspects to these questions, which ties in with the "cultural promotion" noted by Makino-san.

When we consider the social cultural and economic dimensions of policy and management, this introduces questions about trade-offs. In Japan it is done through mutual monitoring (ensuring community buy-in) and government support by setting TACs based on scientific information.

There are many ways to aggregate indicators, as done by WFC/QUEST-Fish, IndiSeas and others. We can learn from what others have done and use this information for the HDWG.

Resilience of bio-socio-economic systems and adapting to change
Quentin Grafton (Crawford School of Economics and Government, Australia)

No abstract provided. Presentation made remotely since Quentin was unable to attend the meeting. Powerpoint is available.

Discussion
Quentin provided three definitions of resilience:

Holling Resilience: capacity of a system to absorb, re-organise and maintain function, structure, identity and feedbacks when perturbed;

Pimm Resilience: speed at which the system returns to its original state (or similar) after perturbation.

Economic Resilience: expected time until a system switches from one state to another.

However, there are problems with these definitions. The Pimm definition is more applicable to pelagic fish species, whereas the Holling definition applies more to demersal fish species. But as ecosystems include both species, neither captures the whole system well. Quentin acknowledged that they are different, but considers both useful. The Pimm definition has been widely used in models that explore harvest

strategies, observe ecosystem response and identify robust management strategies. However, these tend to be conducted at the single species level.

Quentin was also asked the extent to which the concept of resilience depends on equilibrium, and whether the equilibrium state needs to be known prior to analysis. He prefers the term 'shifting state' rather than 'equilibrium'. In a particular state, a system provides a range of benefits. This can change to another variable state, with a different set of characteristics and provide a different range of benefits. Considering resilience as an economic concept, one needs to consider the long-term consequences. He also discussed the link between probability and consequences and how climate adaptations could result in a short-term loss but a long-term gain.

Adaptation of a small economy to climate oscillations: the case of Seychelles
Patrice Guillotreau (co-chair of Socio-economic WG CLIOTOP & University of Nantes, France)

Abstract
As co-chair of the working group 5 (socioeconomics) of the CLIOTOP (Climate Impact of Oceanic Top predators) project, I will try in the first part to present the achievements and objectives of this program. The WG5 proposes a multidisciplinary international approach on the management of oceanic top predator species in the context of climate variability and other sources of change and uncertainty. Several community-building workshops and conferences have been organized to promote research in global co-operation on large pelagic ecosystems, and tuna fisheries in particular. The main issues addressed so far concern the organization of global tuna markets (international convergence of prices, division of labour, foreign investment, trade policies, etc.), the dynamics of fisheries and the impact of climate change on fishing effort and revenue.

As an example, I will illustrate in the second part the importance that climate oscillations may have on a small tuna-dependent economy like Seychelles, which is representative of many other small islands or coastal economies in the developing world. A strong climate episode like the 1998 El Niño Southern Oscillation may dramatically change for several months the spatial distribution of tuna and divert the landings and induced shipping revenues that used to contribute to the local economy. If such changes are likely to be repeated in the future, both in magnitude and frequency, the adaptation capacity becomes a key issue for local states and people.

Discussion
The CLIOTOP Socio-economic WG consists mostly of economists and the major topics and issues addressed are global integration of tuna markets, price-quantity relationships, governance of tuna fisheries and broad global change.

The model of the small-scale tuna fishery and the tuna-dependent economy of the Seychelles presented by Patrice used detailed existing economic data to model the fishery. A sensitivity analysis, to determine how sensitive the model results are to the model structure and details, has not been done, but the multi-variate analysis combined with time-series econometric models (cointegration approach, Markov-switching model) indicates which climate variables (basically sea level pressure indices) most influence the economic outcomes.

Discussion about the environmental influences on the western Indian Ocean, why there was a drop in catches in 2007. There was no ENSO then but there was an anomalous deepening of the mixed layer. Because this anomaly was not distributed uniformly in the western Indian Ocean, the purse-seine fleet partially compensated by concentrating on a small area characterized by a shallow thermocline north of Madagascar, rather than relocating to the eastern basin as observed during the 1998 ENSO. As a matter of fact, climatic events other than ENSO can drive a major perturbation to the system.

There is a triad between fish, fish harvesters and pirates in the Indian Oceans, around the horn of Africa (can't fish when there are pirates around). Piracy has essentially created no-take areas or "reserves".

Quantitative methods were used on an existing data set to determine the impact of an ENSO episode on tuna landings. Added to this was a survey to determine what fishers considered were the greatest threats to their activities. Climate change or ENSO did not feature as major concerns – economic issues such as competition, trade issues, economy and over-fishing were considered to be a far bigger threat. A similar result was obtained in a survey of small-scale pelagic fishers in Peru, regarding the main drivers of change - El Niño was not rated highly.

MPAs and the High Seas: It may be possible to set up MPAs in the central and western Pacific, managed by the coastal states, however, when catches take place in the high seas, where we can't even stop piracy, it makes the whole notion of setting up MPAs much more challenging.

An interactive governance approach to mitigating ecosystem change and enhancing coping capacity

Ratana Chuenpagdee (Memorial University, Canada & Coastal Development Centre, Thailand)

Abstract

An 'interactive governance' perspective emphasizes the need for comprehensive understanding of the characteristics and quality of the natural and social systems that are being governed, the governing systems, and their interactions. It posits that concerns and challenges in fisheries and coastal zones lie in all these aspects, and that the overall quality of governance, including the ability to mitigate change and enhance coping capacity, can be improved given such understanding. The presentation will cover the interactive governance theory, the concept of governability and the governability assessment framework.

Discussion

The interactive governance (IG) framework for coastal and ocean governance is complex, with many dimensions – how does it relate to Elinor Ostrom's framework? There are a lot of similarities (both use governance systems, have a common property derivation and use complementary terms). The interactive governance framework puts high emphasis on meta-order, i.e., drawing more on principles, values, etc. and moves away more from purely economic aspects. Both have their foundations in political

science.
An example of a principle that we explore is the subsidiary principle, which holds that "a larger and greater body should not exercise functions which can be carried out efficiently by one smaller and lesser, but rather the former should support the latter and help to coordinate its activity with the activities of the whole community" – concern was expressed about including this principle since when dealing with large global issues such as climate change, there are limits to the adaptations that can be made at the community level and there are circumstances where higher (or greater) levels come in and help. It may be dangerous to place too much emphasis on communities and work needs to be done to recognise where "a larger and greater body" would be more efficient and effective with respect to global change, than a community approach. We need, for example, to look at vulnerability across the whole food chain.

The point was made that we should not just consider the governance of fisheries – human health is intimately connected to the sea. The oxygen in every second breath that we take originates in the sea. When do we start thinking about carbon policy, global cycles, (a precautionary approach won't work!) – how do we implement this? Do we start by showing that interactive governance can work in fisheries, or do we try for better governance everywhere, all at once? We should try for the latter, recognizing, however, that not all systems are governable and that some perform better than others.

The Interactive Governance framework is very broad and can deal with issues at the global or local level. In the social science of fisheries, the focus is often on institutions and management, but we also have small-scale fisheries, and "small is beautiful" (Elinor Ostrom). There are issues of power and agency that are almost always excluded, and the local is often disconnected from the global. It is important to be able to make arguments at different levels. It's important to note that it is not just biophysical elements that make people vulnerable - they can also be vulnerable to political issues. When we outline our scope, we need to be clear on goal and principles (governance perspectives from a social science point of view draw on a different range of principles to natural scientists). We need to be careful about what we are doing and why.

A note on governance: the question arose whether we are all using the term governance to mean the same thing. Although there are several governance frameworks in use, it was agreed that all shared common principles and that all considered three "governing bodies": state, markets and civil society.

The discussion effectively rephrased the question from "how do we ensure sustainable ecosystems?" to "how do we ensure sustainable livelihoods from the sea?", which can be a useful way to address the question. Another issue is that interactive governance will not happen overnight - do we have time to set up appropriate structures, when really we need to start taking action now? Can this guide us in the steps that we should take?

Creating an enabling environment for fishery-dependent communities to cope, adapt and mitigate climate change
Moenieba Isaacs (University of Western Cape, South Africa)

Abstract

The field of fisheries management has recently undergone a paradigm shift from the traditional single species approach to an ecosystem approach to fisheries management (EAF), which considers social-ecological systems instead of single fish stocks. Notwithstanding the intention to implement an EAF, the current policy environment is dominated by the traditional focus on natural science, not lastly because of the perceived authority gradient from scientific knowledge to practical folk knowledge. However, it is becoming increasingly clear that the sole reliance of fisheries management on scientific knowledge is problematic when facing the challenge of coastal poverty, food insecurity and high unemployment levels, competition for access rights in fishery-dependent communities.

This presentation situates the notion of the human dimension in fishery-dependent communities in the context of the social, political, economic and institutional processes and dynamics. More importantly, how do these dynamics influence the notion of vulnerability and communities' ability to cope with change? In addition, to what extent do fishery policies create an enabling environment for fishery-dependent communities to mitigate, cope and adapt to climate change?

My vision for this working group is to make a significant contribution to the advancement of theory and understanding of Social Ecological Systems (SES). Develop theoretical and conceptual rigour in relation to research design, methodology and processes. Find appropriate multidisciplinary approaches to assess the human dimension in fishery-dependent communities.

Discussion

There was some discussion about the 'dualism' between nature and society. There is interdisciplinary research involving social, political and economic scientists, but when natural scientists are involved, they defend their domains. Transdisciplinary research is not a reality yet.

Modelling in the social sciences was raised. There are many different models available (a model is a simplified representation of a complex system) - qualitative, semi-qualitative and quantitative, Bayesian, fuzzy logic, agent-based, game theoretical models, etc. One way to integrate natural and social scientists is by using different types of models, including conceptual and qualitative models. An example of a social science model is the collection of polling data during election times to make predictions on who might win. These tend to be fairly accurate.

Beyond natural hazards: Research interests contributing to IMBER-HD

Bernhard Glaeser (LOICZ & German Society for Human Ecology, Germany)

Abstract

In a first part, I briefly present my previous work and my research interests. Trained as a philosopher, economist and social scientist, I held the first human ecology chair at Göteborg (Gothenburg) University, Sweden. My research has been environmental policy and sustainability-related and, moved from rural to coastal sites and interests. Research in rural areas included sustainable farming in Tanzania, environmental policy in China

and sustainable housing in India. Coastal research included sustainable coastal management in Sweden, offshore wind energy in Germany-North Sea, regional German-Polish cooperation in the Baltic and socio-environmental dynamics in a coral reef archipelago, Indonesia.

In a second part, I introduce ICM (Integrated Coastal Management) as a science and management approach to resolve conflicts before the issue of governance gained importance and eventually coastal hazards came to dominate much of coastal research. In light of my previous research interests and experience, I move beyond coastal hazards and advocate and suggest for IMBER-HD: Multi-level, multi-scale social-ecological research is to explore the interfaces and feedbacks between global change and local livelihood dynamics in an interdisciplinary mode.

Discussion

Coastal typology was a major theme of LOICZ in its earlier phase, biogeochemicaclly oriented, but is now fading away. BG suggested for IMBER to develop a matrix which includes a coastal typology on the horizontal axis and different government baselines/social stratification or facts on the vertical axis, to give a classification scheme. Such a typology could be a multi-dimensional framework and should be ocean-oriented.

Typologies need an objective - it is not much use simply as an end in itself. The WorldFish Center uses typology together with an adaptive capacity framework to estimate whether outcomes are likely to be win-win, win lose etc., depending on the circumstances.

Some differences of opinion on definitions of the terms inter-, multi-, and trans-disciplinary. Here are some extracts from a paper by Tress et al., see: http://library.wur.nl/frontis/landscape_research/02_tress.pdf

> Multidisciplinary: projects that involve several different academic disciplines researching one theme or problem but with multiple disciplinary goals. Participants exchange knowledge, but do not aim to cross subject boundaries to create new knowledge and theory. The research process progresses as parallel disciplinary efforts without integration but usually with the aim to compare results.
>
> Interdisciplinary: projects that involve several unrelated academic disciplines in a way that forces them to cross subject boundaries to create new knowledge and theory and solve a common research goal. By unrelated, we mean that they have contrasting research paradigms. We might consider the differences between qualitative and quantitative approaches or between analytical and interpretative approaches that bring together disciplines from the humanities and the natural sciences.
>
> Transdisciplinary: projects that both integrate academic researchers from different unrelated disciplines and non-academic participants, such as land managers and the public, to research a common goal and create new knowledge and theory. Transdisciplinarity combines interdisciplinarity with a participatory approach.

Bringing management and conservation into Latin American artisanal shellfisheries: the impact of climate, fisheries and governance and potential actions for adaptive and mitigation strategies

Omar Defeo (Universidad de la República, Uruguay)

Abstract

In Latin America, artisanal or traditional small-scale shellfisheries are vital to the livelihoods and sustainable future of coastal communities. However, after several decades of intensive fisheries extraction, exacerbated by coastal degradation, most are overexploited, and many shellfish resources and their ecosystems are near or over the point of functional extinction. Sustaining healthy shellfish resources will require new perspectives for rational shellfish management, which includes the implementation of resilient management systems and effective governance under conditions of change and uncertainty. In addition to improving traditional resource management for sustainable shellfisheries, the dynamic effects of global climate change require attention. Of all marine fisheries, the effects of climate change may be most immediately and profoundly felt in coastal shellfish that inhabit sandy beaches, an ecosystem that covers more than 70% of the open coasts of the world. In some Latin American shellfisheries where co-management and area-based rights were implemented, massive mortalities decimated populations along their entire ranges, suggesting that the effects of climate change could undermine management measures. I assess long-term and large-scale effects of human exploitation and climate change in two shellfisheries developed in the Pacific and Atlantic coasts of South America. I explore the linkages between humans and ecosystems in these complex social-ecological systems, using modeling and bio-socio-economic indicators. The relative importance of climate change and exploitation is shown at different organizational levels (populations, communities and ecosystems). I also suggest some tools for shellfish conservation, management and governance, as well as to raise awareness on how to adapt management to climate-driven changes in shellfish.

Discussion

The Pacific and Atlantic coasts of South America would make a great case study.

The response time scale is an important issue for co-management and the use of MPAs as a management tool:

> In the real world, there is often a mismatch of time scales between the occurrence of an event, such as increasing temperature and the time it takes for management to realize that they have to do something about it. Would co-management be able to respond more rapidly? The answer is not clear.
>
> It takes time to establish an MPA and it is possible that by the time an MPA has been established, climate change may have changed the oceanographic conditions (e.g., increasing temperature as observed along the Atlantic coast of South America) and species the MPA was designed to protect may have altered their distribution.

We need to be able to differentiate between areas that will suffer rapid effects of

climate change, and those that will respond more slowly. This can be linked with modelling work, but there would still be lots of uncertainty, particularly in upwelling areas, such as the Humboldt Current off the coast of Peru and Chile. Social science might be able to fill in some of the gaps.

There is a precedent for using a triage approach to assess impacts and potential impacts of climate and global change. In Australia, they used a triage approach to assess effects on the Great Barrier Reef to determine what was worth saving and what was not in terms of biodiversity.

Resilience is not well parameterized for ecosystems generally as observation periods are not long enough to establish resistance to change over time. It could be misleading to think that if resilience goes down, that it is necessarily bad. Our ability to monitor changes in resilience depends on the indicators used to measure change - are they the right indicators?

Regarding co-management: co-managment has proved to be successful internationally,
but it was a complete failure in the Galapagos;
On the issue of MPAs as management tools - when analysing success it is important to understand how studies were conceptualized and who participated in the study. It is difficult to assess a situation based only on indicators – ideally we want to understand the behaviour behind the indicators, to understand why something was a failure. The International Collective in Support of Fishworkers–on the impacts of MPAs on livelihoods, gave the example of fishers in South Africa who were removed from areas where they traditionally fished when an MPA was established, – so then they became illegal fishers in the area. The underlying issues need to be understood.

The scale of the study will determine the outcome: meta-analyses can cover a wide area, but their content is shallow, whereas smaller comparative studies are narrower, but can explore deeper questions. The approach used should be determined by the purpose of the study

How human communities could "feel" changing ocean biogeochemistry
Sarah Cooley (Woods Hole Oceanographic Institution, USA)

Abstract
Until very recently, even marine scientists sometimes joked that "dilution is the solution to pollution." As the multitude of human influences on our earth become more apparent and better understood, it has also become clear that even the smallest human inputs affect aquatic systems in obvious and not-so-obvious ways. In the oceans, pollution, eutrophication and hypoxia, climate change, and carbon dioxide-driven acidification are now all considered to be broad interactive stressors on ecosystems that provide humans with multiple benefits and services. Work is ongoing to understand the major and minor effects of these stressors, and whether future changes will alter the ecosystem services marine environments provide. In many cases, such as for ocean acidification, our knowledge is rapidly advancing because of recent technological and methodological developments that now allow us to collect the data that we need to understand this

issue. I will review the ways in which we believe changing ocean biogeochemistry could affect human communities, present knowledge gaps, and possible synergies with other research communities.

Sarah also presented a brief overview of the Monaco workshop on the Economics of Ocean Acidification workshop, 16-18 November 2010: "Bridging the Gap Between Impacts of Ocean Acidification and Economic Valuation".

Discussion
How well can we link marine chemistry changes with shifts in human well-being?

The linkages presented by Sarah from the biogeochemical processes to humans are very helpful. However, although we can put a monetary value on marketable services, we cannot understand the social consequences (not financially measurable commodities) of global change in terms of dollars. Many of the present assessments focus only on monetizable benefits in anticipation of global carbon cap and trade agreements. However, social scientists can tell you a lot about direction and effects of change. You should not try to put a dollar value on non-market services.

The notion of ecosystem services is a direct link between the natural and social sciences, i.e., biogeochemistry, ecology, economics, social and cultural services. These could be the building blocks for the typology that we have discussed.

There is an IUCN integrated wetlands tool box that may be of interest. Economists also have tools with respect to monetary evaluation.

Broad interdisciplinary thinkers that are able to cross boundaries are key to the success of integrated approaches to the problem of global change – this is related to capacity building for researchers.

The Economics of Ocean Acidification workshop was fairly groundbreaking in bringing together economists, natural scientists, NGO's, etc. to consider the impacts of OA. Some of the preliminary conclusions of the meeting discussed:

- Risk assessment – identify the regions most at risk (better than ranking the risks);
- Models and development tools that integrate natural science and economics;
- Policy decisions; and
- Funding political initiatives against OA - suggested establishing a blue carbon fund (for carbon sequestration in coastal states) to support OA work and other stressors.
  (Blue Carbon can be traded similarly way to Green Carbon credits and entered into emission and climate mitigation protocols along with other carbon-binding ecosystems – A UNEP2, IOC-UNESCO3, IUCN4 and FAO5 proposal)

M_C – there are existing frameworks that we can use.

IndiSeas: Comparing indicators across fished marine ecosystems
Alida Bundy (IMBER SSC, IMBER HDWG Chair, Fisheries and Oceans Canada)

Abstract
Globally, humans have exploited their marine ecosystems for food and profit before understanding either their ecosystem or the impacts of that exploitation. In the 21st century, we are still working towards those understandings, now enhanced by global communication and the power of large scale comparative analyses. IndiSeas was established to evaluate fishing impacts on the status of marine ecosystems using indicators. A suite of eight selected ecological indicators were assembled for 19 fished marine ecosystems and results of comparative analyses were synthesized to inform stakeholders of relative states and recent trends in the world's fished marine ecosystems. Analyses suggest most of the ecosystems are overexploited and the declining trends in ecological indicators led to 79% of the ecosystems being classified as deteriorating. IndiSeas has moved into its second phase; IndiSeas2 aims at "Evaluating the status of marine ecosystems subject to multiple drivers in a changing world" in support of an ecosystem approach to fisheries. Although IndiSeas indicators were selected to reflect impacts of fishing, results need to be considered in the context of human dimensions and environmental drivers. IndiSeas2 will explore the response of a broader suite of ecosystem indicators to ecosystem change across a wider range of ecosystem types and drivers. Combined effects of fishing and climate on indicators trends will be modeled, and means of testing indicator responsiveness and performance will be developed. Further work is planned to identify indicator thresholds and reference points.
Discussion

How far can an indicator-based approach take us towards coping and adapting with global change? (case study approach – using indicators but also more in depth qualitative work?

IndiSeas = Indicators of the Seas – see http://www.indiseas.org/

One of the goals of human dimensions indicators is to consider the well-being of fishers and their resilience or capacity to adapt to change. This work could be complementary to the work of the HDWG, which should go beyond just using indicators – integration and synthesis and identification of the missing parts, more process-orientated. QUEST-Fish uses a different approach – aggregation and weighting. Issues raised by the limited number and time span of indicators.

DISCUSSION SESSION: GOALS AND SCOPE OF WG

Objective:
Develop 2-3 key questions that the HDWG want to pursue and that fulfill IMBER's objectives for Theme 4:

- Promote an understanding of the multiple feedbacks between human and ocean systems,
- Clarify what human institutions can do, either to mitigate anthropogenic perturbations of the ocean system, or to adapt to such changes

IMBER Regional Projects
Alida presented a brief overview of the four IMBER regional programs (see presentation):
ESSAS - Ecosystem Studies of Sub-Arctic Seas - http://www.imr.no/essas
CLIOTOP - CLimate Impacts on Oceanic TOp Predators - http://www.imber.info/cliotop.html
SIBER - Sustained Indian Ocean Biogeochemical and Ecological Research - http://www.imber.info/SIBER.html
ICED - Integrating Climate and Ecosystem Dynamics in the Southern Ocean - http://www.iced.ac.uk/index.htm

Theme 4, "Responses of Society" cuts across the regional projects. In developing the scope of the HDWG and its implementation plan, we must consider (a) how we can contribute to these projects and (b) whether our role is co-ordination, facilitation or oversight.

Some Initial Thoughts on Scope:
Alida outlined some ideas on the potential scope of the HDWG:

- Include all scales:
  - local, regional, national, international, N,S,E,W
    - Links with IMBER Regional Programmes
    - Links to other regional initiatives?
  - past, present, future
  - small scale, large scale, distant water fleets (DWF)
- Move beyond fishing and include the larger role of the ocean:
  - "the oxygen in every second breath you take is derived from the ocean"
  - Impacts of ocean acidification & other anthropogenically linked marine biogeochemical shifts (low oxygen, warming, etc.)

Each participant was asked to outline the question(s) that most interests them concerning global change and marine ecosystems and their interdependent human societies.

Alida Bundy
From a fisheries perspective, how can we cope with the broader global change issues when we are not even able to cope with issues such as overexploitation?
Comments/discussion:

We are not necessarily focused on climate change. Why are we not able to effect change – on land and ocean? Climate change is part of the issue not the only one.

Patrice Guillotreau
Understand functioning markets at the global level – working, interacting, links to people, information flows –. Explore the consequences of a big supply shock, for example from an environmental event or conservation measures in part of the ocean, on global markets. Can use a network approach — how market needs meets supply.
Comments/discussion:

- There is some existing work in this area – for example, Christian Mullon has explored this from a modelling perspective in QUEST-Fish (Mullon, C., J.F. Mittaine, O. Thebaud, G. Peron, G. Merino and M. Barange (2009). Modelling the global fish meal and fish oil markets. Natural Resource Modelling, 22:564-609.). Global value chains or rent-sharing can also be used to explore this question.

Ian Perry
Characterise vulnerability and what determines "resilience" or adaptive capacity for natural and social systems. There is room for more case studies, could be tied into the typology idea and could include governance issues.
Comments/discussion:

- Extending this idea further, it was noted that Eddie Allison is exploring the vulnerability of value chains – institutions, governance systems, i.e. looking at the vulnerability at different units of analysis, beyond economic analysis. Josh Cinner has looked at why fishers remain in fishing – occupational pluralism. Treat fishers as predators and approach from an optimal foraging position.
- There are formal and informal value chains (trend is towards formalisation, putting it into the retail market to give benefit back to the community). However, in South Africa it was noted that formalising a food chain could remove protein from dependent communities (reducing their food security), transferring these commodities to consumers with greater purchasing power. Formalising a food chain makes it more traceable – but is also makes the end product more expensive when it is sold at higher end markets. There is a similar situation regarding fishmeal – that is commodification of food supply – once higher values are put on fishmeal, this can change costs.
- There is a danger that the move to obtain MSC certification for small scale fisheries could lead to a formalisation of the value chain, which could reduce access to fish/protein for poorer communities.

Marie-Caroline Badjeck
Two questions:
1. Process **-** how to improve sustainability science including end-to-end modelling – is it possible to do with available science – how to make interdisciplinary science better, more fluid and more relevant to policy?
2. Adaptation and Appraisal of options- what is different about adapting to climate change. We need to identify how fishing communities adapt to changing markets, climate variation, targeted interventions, etc. Need to assess what works and where it works - Bernhard's typology idea could be useful to determine what works for climate change versus other drivers.

Within this we need to include an appraising option, to identify the determinants of adapting to climate change and appraise their likely outcomes – cf win-win, win-lose, lose-win, lose-lose, no-regrets. Not much has been done in this area – see UK Climate Impacts Programme (UKCIP).

Ratana Chuenpagdee
What is it going to take to change with respect to governance? Governability assessment has not been situated in the global change context. We can analyse the Interactive Governance framework using a case study approach or examine a system or area or community from a poverty perspective, or to explore why people do not follow rules.

Moenieba Isaacs
It is important to look at poverty alleviation and food security –this should be the goal for understanding the impacts of global change. For example, there is a lot of good science done in the Benguela system, but the connections are not made between natural and social sciences – we could use a case study approach to find more data, or link local, regional, global. There is need for in-depth case studies or for social science to provide some of the missing data to answer these questions or to provide depth for indicators.

Sarah Cooley
What are the best methods for linking marine process from biogeochemical cycles to humans? What elements are missing to make these connections? We need more sampling, better understanding at the human end. If the methods were laid out better, the effects of changes in these systems could be explored and predictions about the effects of change could perhaps be made.
Comments/discussion:
- QUEST-Fish is doing this to some degree already with the end-to-end modelling
- This could be a one or two way process
- Re-word as "marine changes and processes impacting people"? No consensus on this. To think only in terms of processes excludes other functions of the system such as carbon stocks (note that processes change stocks).

Mitsutaku Makino
Need to develop framework(s) for interdisciplinary research – what structure will best fit the global change issues challenging us? This is a question about the role of science (natural and social) for society. We need to provide information and empowerment schemes for research and development programs.
Comments/discussion:
- Do we mean society or policy? – i.e. science for policy development and options. It depends who the audience is, it could require science-society-policy interactions.
- We would need different frameworks for different questions, i.e. different combinations of methods, tools, etc. We can use this to find what science can and cannot do.
- This could be further developed by considering questions from different disciplinary viewpoints. It could also include tool development, or recommendations for using tools in different ways – transdisciplinary tools?
- We could consider the science questions (where the social aspects are excluded) of

the IMBER regional programmes from our perspective, and determine how to address them. Many tools already exist but we must ensure that we use appropriate ones for the questions at hand. It is easy to misuse tools and we need to avoid "painting the floor with a hammer" (Degnbol et al., 2006, Marine Policy 30(5): 534-543). What is the state of the art? This could be developed as a "best practices guide".
- Who would be the audience for this framework? i.e., who is the framework aimed towards – IMBER science?

Bernhard Glaeser
Climate change and feedbacks with local dynamics using a comparative analysis across scales (link between global and local scales, intermediated by the national dimension) and across sites. Goal would be to develop an ecosystem governance typology. This would probably encompass most of what has been discussed so far. Science policy, etc. should be part of the recommendation.
Comments/discussion:
- When comparing across scales we need to be careful that we are exploring the same questions – it is easy for the questions to change at different scales.
- It must be explicit that this working group provides something that the IMBER regional programmes don't provide.
- Explore the impact of a recent shock, such as an environmental shock, or fuel increase, and use a case study approach across different scales to explore this.

Omar Defeo
What is the relative importance of climate change, fishing, and other stressors in ecosystems in order to assess the sensitivity of social-ecological systems to these stressors?

Use a case study approach at different scales: spatial, temporal (long, medium, short term). Use interdisciplinary approaches, model and non-model based, composite indicators of system status, bio-social-economic indicators at different spatial scale, system dependent and independent, at different organisational levels, i.e., population, community and ecosystem. The case studies and analyses would be performed at whole system level including governance issues, with large and small scale fishing sectors operating on resources at the same time. There are few examples addressing SES where the whole fishery system is included. By approaching this at different scales, we can move from individual cases to global analyses. This requires strong interaction amongst groups, testing methods to work at different spatial and temporal scales. The ultimate goal would be to improve the resilience and adaptive capacity and governance of fisheries.
Comments/discussion:
- Question about what we mean by long term when dealing with whole systems – if we think of generational times, this is very different for humans compared to shorter-lived organisms.
- The time and spatial scales of the social and ecological parts of SES are different. For example, markets for fishery products can be global.
- There is a link to adaptation and the use of historical case studies.
- Do these systems need different ways to adapt to different changes?

- If we build the capacity of researchers to better understand ecological and social adaptation to climate change, then these adaptation methods can be added to an educational toolbox.

Synthesis and Discussion of the BIG questions

Based on the ideas outlined above, Alida presented a synthesis and possible way forward for the group. The main objective would be to:

- take a broad comparative approach to provide frameworks to understand and forecast human-ocean-human interactions with respect to global change.
- use a comparative case study approach at all scales to explore questions related to:
  i. Adaptive capacities of SES (using appraisal/typology approach)
  ii. Governance/food security/poverty reduction
  iii. Global markets/food security/poverty reduction
  iv. Define physical/biogeochemical links to humans

Ian, Marie-Caroline, Bernhard and Omars' questions were rolled into "Adaptive capacities of SES (using appraisal/typology approach)"; "Governance/food security/poverty reduction" encompasses Ratana and Moeniebas' questions and "Global markets/food security/poverty reduction" encompasses those of Patrice and Moenieba ("Food security/poverty reduction" is actually relevant to all four bullet points); "Define physical/biogeochemical links to humans" covers Sarah's question. Makino-san's question is also encompassed in the first bullet point and a special note was made to ensure that the contribution of methodologies frameworks for social-economic-natural research was a key component of our work and we discussed the idea of developing a methodological guide as output of this group.

Summary of Discussion

The group agreed that the points above are linked, and hence they were combined for the discussion.

There are already several publications reviewing the adaptive capacity/resilience of SES to climate change variability (e.g. several of the GLOBEC Focus 4 WG publications, Badjeck et al., 2010). However, we have introduced several new and important aspects to this issue: governance, appraisal and typology.

- Governance - what have been the various responses to global change at different institutional and governance levels? What are the legal aspects? How effective have those responses been?
- Appraisal – there has been no appraisal of the success of the different coping/adaptation strategies of SES for marine systems in response to global change. Importantly, policy makers don't have the tools to decide what to do, or to understand the trade-offs.
- Typology – classify systems by drivers, state and response, including appraisal of effectiveness or response. The typology could be developed into a powerful tool for policy makers to use as a guide/framework to assess response to global change, i.e. they would locate their system in the typology (based on key components to be developed) and use this to evaluate what has worked well in similar systems and

what has not. It could be likened to triage in an emergency room.

We also extend the concept to global change (not just climate variability). The review and appraisal would include the linkages from biogeochemical cycles through to the dependent human societies, and could include impact pathways and the effects of ocean acidification on ecosystems and human societies.

Food security and poverty reduction is inherent to the whole question of human-ocean-human interactions: we have a growing global population and a shrinking resource base with multiple threats. There are links with global markets, questions of economic and nutritional parity and equity in resource sharing. These ideas can probably be best conceptualized within a governance framework, but there are direct links to economics/markets and global trade, adaptive capacity and ecosystem "processes".

Based on the above, develop a broad case study review and write a review article on the different adaptation capacities that communities can have with respect to global change. Then outline the options and their consequences. This would then lead to the second part - the development of the typology that could even be classified as a best practice guide?

There are existing typologies developed by the IPCC, where they classify outcomes into win-win, no regrets (i.e., there would be no regrets to following this policy option even in the absence of climate change), etc. Quentin also showed some possible outcomes and trade-offs in his presentation (win-win/win-lose/lose-win/lose-lose). These are different from the IPCC's. We can review existing work and either develop our own typology, or use or modify existing ones.

The development of a review, appraisal and typology of human-ocean-human interactions would be a major contribution to understanding the adaptive capacity, resilience and response of human societies to global change. It will cut across IMBER's regional and national programmes and those of the wider global change community. The whole group can contribute to this synthesis, developing a final product that is informative and practical. It is also a really nice way to do retrospective analysis to make sure that it is grounded. The development of the typology is perhaps the largest challenge.

This could form the core of a proposal that could bring a larger group together. It was agreed that the HDWG needs to meet more than once per year to move this ahead. Ideas for bringing a group together in November 2011, before the next "official" WG meeting (slated for March 2012, following the Planet Under Pressure meeting in London, UK) were discussed. One option was to apply to the Canadian Social Science and Humanities Research Council for funding for a network meeting – Marie-Caroline, Ratana, Alida, Bernhard and Omar agreed to draft a proposal (NB UPDATE: we have since learned that the internal University deadline for this round of SSHRC submissions has already passed, so this is not longer an option for November 2011. The next application deadline is Nov 1, 2011 for a workshop in 2012). See also funding discussion below. Ideally, if we are able to move ahead with this quickly, we could contribute to IPCC AR5, RIO 20+, but time is getting short for this.

We should look to this a being high level publication in Nature, Science, Nature Climate Change, or similar.

The above discussion concerned a broad comparative approach, but the price paid for breadth, is lack of depth. In order to address the big question of the impact on, and responses of, human and natural systems to global change and their interactions, we also need to take an in-depth comparative approach across a small number of case studies. It was agreed that we should be ambitious and try to do both, and seek funding to undertake some in-depth case studies, which would ideally include IMBER regional programmes. The questions to be addressed in these case studies would follow largely from the broad comparative review, appraisal and typology discussed above. The first naturally flows into the second, and would include inter-related natural and social science questions.

Possible Case Studies:

1. Namibia and South Africa - Comparative study of the human dimensions of the industrial hake fishery to look at what fish workers/managers/skippers and fishers understand about, and how they view, the ecosystem and its ecology. Policy and governance around small scale fisheries could be a case study.
2. Bangladesh – The WorldFish Center is doing lots of work in Bangladesh on value chains (Fish with Favour?). CGIAR are focused on this and it could fit with SIBER.
3. Ghana – This could follow on from the work of Perry and Sumaila (2007, Marine Policy 31: 125-134) and also QUEST-Fish. The latter was done at the national level, whereas we could go to the community level. There is also a WorldFish co-management and illegal fishing project in Ghana that ends in 2013. They may have funds to bring in guests.
4. Peru and the Latin American Network (mentioned by Omar earlier). Marie-Caroline did her PhD work in Peru and collected lots of data that has not been used yet. We could do a regional case study (in line with Omar's Pew project) with a focus on shellfish in Peru, Chile, Brazil, Mexico, Ecuador, Columbia, Uruguay. Alternatively, the focus could be several sites on the Pacific coast that are separated into biogeographical regions with different observed trends. A nested approach from macro to local level could be developed. Not all the research conducted in the Latin American Network is related to global change, but at least three of the case studies are relevant to the questions that we want to address, e.g. coping with climate change in fisheries. Ratana also has a student who will start her research work in the Galapagos soon.

It was suggested that we should look for a case study from one or more of the IMBER regional programmes such as ESSAS, SIBER or ICED, which could be specifically linked to exploring the 4th bullet point above (i.e. Define physical/biogeochemical links to humans).

Case studies should also be linked to food security in the area. This is an obvious fit for SIBER. It could be linked with Monsoon effects on the ocean, which are very important in Indonesia – traditional east–west trade routes – tie into SIBER observational work.

Food security is a huge issue there.

To introduce contrast and comparisons across different social backgrounds we could include a case study from a country that exports most of its fish, e.g., New Zealand where 98% of the catch is exported. Here modern management tools such as ITQs have been introduced. Measures to cope with global change may be different for such countries. Some of the work in South Africa could work here too, since there is a large industrial fishery. One way to categorise systems would be as high/low producers, - consumers, or - exporters and consider the management systems employed.

Global market study of the impacts of tsunamis on global markets/food security. Study of external shocks. Note that Eddie Allison did a review of food security for OECD, which explored links between trade and food security, and links to global markets.

DISCUSSION AND PLANNING FOR PLANET UNDER PRESSURE CONFERENCE
(Marion Glaser, co-convenor from LOICZ joined the discussion by Webinar)

The proposed session has four components:

- An invited speaker to set the stage and introduce the main issues (30 mins)
- Presentations of three case studies, spanning the five dimensions (modeling, indicators, economics, policy and governance) and addressing issues of scale (space, time, administrative level) and type of human-nature relation involved. (30 mins)
- Panel discussion (three invited panel members from regional and global fisheries and global change agencies). The Panel will be asked to respond to the previous talk and case studies, giving their perspectives and asked to present their key action pathways to adapt to global change. (30 mins)
- Invited Poster session

Everyone approved the content and format of the proposal submitted. It was emphasized that one of the main issues that we want to highlight is the question of scale: spatial (from local to global), temporal (past to present to future) and institutional (society, markets, state).

Potential speakers for the invited talk and panel members need to be identified. The posters and case studies will be selected from submitted papers. It was agreed that all submissions would initially be considered as papers, and then the three which best address the themes of the session will be selected for oral presentations in the case study part of the section.

The invited speaker should ideally be someone relatively fresh with new ideas, who brings experience and the ability to integrate and synthesise across the multiple dimensions concerning humans, marine systems and global change. Several suggestions were put forward, which were then ranked as follows:

1. Eddie Allison, WorldFish Center, Malaysia.
2. Bonnie McCay, Department of Human Ecology, Rutgers the State University, USA.

3. Derek Armitage, Department of Geography and Environmental Studies, Wilfrid Laurier University, Canada.

Potential panel members were also listed. They should represent the natural and social sciences and an NGO or industry. Suggestions were:

1. Rashid Sumailla - UBC Fisheries Centre, Vancouver, Canada
2. Chandrika Sharma (ICSF, Chennai, India), icsf@icsf.net
3. Juan Carlos Castilla –Centro de Estudios Avanzados en Ecología & Biodiversidad, Santiago, Chile

Other possible speakers/panel members included:

Rosemary Ommer
Isabella Niang involved in IPCC process
Narriman Jiddawi
Joyeeta Gupta (Earth System Governance probably too terrestrial focused)
Fikret Berkes
Carl Folke

Other comments:
The conference could be a first goal post for outputs of this WG - submitting posters, which may also be considered for presentation as case studies.

Invited speakers and panel members will be contacted when we receive a positive response to our session submission from the Planet Under Pressure organisers. NB. We will have to seek funding to support the costs of invited speakers and panel members.

Once the co-chair(s) of the WG have been established, they will be added to the list of co-convenors.

Terms of Reference
The TOR had been agreed to via email prior to the WG meeting. No changes were made to the TOR during this meeting – see Appendix B.

DISCUSSION AND PLANNING FOR INTERNATIONAL MEETING

The TOR specify that we should "organise an international workshop/conference that will bring together natural and social sciences to develop the issues and questions to be addressed in IMBER Theme 4". We discussed two options:

1. Hold an independent meeting, comparable to the GLOBEC/FAO/EUR-OCEANS Symposium organised by the GLOBEC Focus 4 WG
2. Plan a session as part of a larger meeting. The IMBER SSC suggested at its recent SSC meeting that we use the IMBIZO III meeting for this purpose. Lisa Maddison gave a short presentation on the IMBIZO meetings to inform those not familiar with the format.

The second option was preferred and does not preclude holding an independent

meeting at a later stage. A disadvantage of hosting a session at the IMBIZO is that these meetings are not well attended by social scientists. However, it was agreed that bringing natural and social scientists together is part of the challenge of the WG, and that we will have to work at interesting our social science (as well as natural science) colleagues in this research and attending the IMBIZO. The Planet Under Pressure conference can be used to advertise the IMBIZO and encourage participants at the session to contribute papers.

WORK PLANNING

The group defined some initial steps for work planning. Most are contingent on securing external funding to facilitate meetings, followed by funding for specific research.

2011:

- Write a proposal to SSHRC or other funding agencies to hold a "network" (or similar) meeting (possibly with a broader membership) to conduct a review, appraisal and develop a typology of the adaptive capacity/resilience of human-ocean-human interactions to global change.
- Develop an outline for review, select a number of case studies representing different geographic and socio-economic conditions, and assemble data for these case studies in preparation for the next meeting.
- If possible, hold 'Review, Appraisal and Typology of Human-Ocean-Human Interactions' meeting before March 2012.

2012:

- Organise and lead the session at the Planet Under Pressure (PUP) conference
- Hold a HDWG meeting immediately after the PUP conference
    - Further develop "review, appraisal and typology of the adaptive capacity/resilience of human-ocean-human interactions to global change, focusing on the typology
    - Discuss options for in-depth case studies
    - Develop an implementation plan for the HDWG based on these discussions

2013:

- IMBIZO III
    - International meeting centred on the core themes of the implementation plan
    - Report on initial progress and results
    - Hold WG meeting.

APPOINT CO-CHAIR(S)

Moenieba Isaacs and Marie-Caroline Badjeck agreed to be co-chairs of the WG.

FUNDING OPTIONS

IMBER provides support for the HDWG to hold annual meetings (usually about US$15K). However, we need to seek additional funding to hold other working meetings, supplement IMBER funding for the HDWG meetings, cover costs for invited

speakers/panel members to attend the Planet Under Pressure conference, supplement costs for HDWG members to attend the Planet Under Pressure conference and to fund scientific research.

Our immediate needs are to seek funds to hold our proposed "Review, Appraisal and Typology of Human-Ocean-Human Interactions" meeting and to seek additional funds to support our activities at the Planet Under Pressure conference.

Several funding sources were mentioned. Lisa Maddison will find out further information about these options, including eligibility, purpose of funds, criteria, closing dates, any constraints, and funds available.

NSF – Research Co-ordination Networks - The goal of the RCN program is to advance a field or create new directions in research or education. Groups of investigators will be supported to communicate and coordinate their research, training and educational activities across disciplinary, organizational, geographic and international boundaries. RCN provides opportunities to foster new collaborations, including international partnerships, and address interdisciplinary topics. Innovative ideas for implementing novel networking strategies, collaborative technologies, and development of community standards for data and meta-data are especially encouraged. Deadline May 24th 2011
Note that these may be aimed at research that is more fully formed

NSF – Catalysing new international collaborations - Call 11-508 – Need to check whether it is appropriate ($10 – 100K). Due dates: September 1, 2011 (September 1, annually thereafter) and March 1, 2012 (March 1, annually thereafter).

NSF - CNH – Coupled Natural and Human systems –this has strong natural and social science component – Nov 16th See What the precendent is. NSF 10-612 Due DATE: November 15, 2011. (Bonnie McCay is a recipient of the CNH award).

**NB: NSF funds may not be used to support the expenses of the international scientists and students within their own organizations, but in RCN projects that involve international partners, NSF funds may be used for travel expenses for (1) U.S. scientists and students participating in exchange visits integral to the RCN project; (2) RCN-related expenses for international partners to travel to and participate in networking activities in the U.S.; and (3) RCN-related expenses for U.S. participants to conduct networking activities in the international partner's nation.

ESF Research Conferences Scheme - Call for proposals for 2013:

- 70-130 participants
- No more than 25 invited speakers and convenors
- A duration of 4 full conference days (3 full conference days for conferences in social sciences and humanities)
- Core activities:
  - lectures by invited speakers
  - active participation of early stage researchers through short talks, poster

sessions and extensive discussion periods
    - Forward Look Plenary Discussion about future developments in the field
    - no parallel sessions
- Joint meals and social activities to encourage further contact and networking
- 3 Full conference days
- DEADLINE: 15 SEP 2011
- Conference takes place at the venue selected by ESF
- NB – the timing of this is not good since this is the year we plan for the IMBIZO meeting and since the conference takes place at the venue selected by ESF, it does not look like we could use these funds to support the IMBIZO meeting.

EUR-Oceans Foresight Workshops

- Focus on emerging and important topics in marine ecosystem studies, which address EO scientific themes or priorities and require Europeanwide coordination. They generally aim at establishing a scientific vision or a roadmap at the scale of a decade and may notably (but not exclusively) be used upstream of future EO 'flagships' or conferences, to pave the way for future EO calls or larger projects. Foresight workshops can also focus on review exercises of particular relevance to EO priorities (e.g., science-governance interface and scenario construction).
- Funding - $15K
- Deadline – was Feb 2011 – need to wait for next year!

PEW Funding: Omar is a PEW fellow and will enquire about funding at the PEW regional meeting for southern Pew fellows in Uruguay in May. The purpose of this meeting is to develop regional research programs for all South American Pew fellows.

SSRHC Partnership Grant – would need to be a larger programme to do research for 4-7 years – CAN $2 million. Call comes out for LOI – early January. So in 2012 we could put in a proposal and if we are successful we could get $20, 000 to develop and write a full proposal.

IDRC (International Development Research Centre) – this is a public corporation created by the Canadian government that supports research in developing countries to promote growth and development. Apparently they just had a call for coastal adaptation to CC (with economic focus) and there was also a recent call concerning food security. This is worth looking into, but may be difficult to succeed.

NORAD – Norwegian Agency for Development Cooperation – they have a theme of "Climate Change and the Environment", including adaptation and mitigation. They do fund regional programs and workshops.

It was agreed that it would be useful to have one or two drafted proposals that could be adapted to different funding calls as they arise (a proposal toolbox?). These can be developed as our plans and ideas are further formulated.

ARTICLE FOR IGBP GLOBAL CHANGE MAGAZINE

Earlier this year, it was suggested that we contribute an article on human-ocean-human interactions and global change to the IGBP magazine. Their features tend to be of two types: a) Those that elucidate interesting and novel scientific results of broad significance, and b) Those that offer opinions or commentary on scientific topics of societal and policy relevance. This latter category would be the most appropriate for an article that we could write.

The next issue will be out in December, so the deadline will likely be around October. The three co-chairs will draft an article and then circulate it for comment and input.

PAPER FOR ESSAS MEETING

ESSAS is holding an Open Science Meeting from 22-26 May 2011, in Seattle) with a session "Anticipating socio-economic and policy consequences of global changes in sub-polar and polar marine ecosystems". Ian Perry and Alida Bundy submitted an abstract entitled "Understanding the human dimensions of marine global change: the IMBER Working Group" which Ian will present. Ian gave a short presentation describing the meeting.

NEXT WORKING GROUP MEETING

The next annual HDWG meeting is planned to take place after the Planet Under Pressure conference, either in London, or at a cheaper venue outside London (e.g. Cambridge, University of East Anglia (Norwich)). If we stay in London, the Royal Society might be a venue for meeting.

If this plan falls through, Plan B would be to hold the next meeting at Woods Hole, Massachusetts, USA, hosted by Sarah Cooley.

NEXT STEPS:

- Alida Bundy and Lisa Maddison to write the meeting report (this document)
- Alida Bundy and Ian Perry to develop a presentation for the ESSAS OSM which Ian will present
- Alida Bundy, Ratana Chuenpagdee, Marie-Caroline Badjeck, Omar Defeo and Bernhard Glaeser to:
    - further develop ideas for the planned "Review, appraisal and typology of human-ocean-human interactions" meeting
    - write a proposal for funding and plan the meeting
    - write paper outline
- Co-convenors of Planet Under Pressure conference to:
    - send out invitations to speakers and panel members once we know that we have secured a session at the conference
    - seek funding to support invited speakers and panel members
- Co-chairs to write an article on human-ocean-human interactions and global change for the IGBP magazine
- ALL – keep look out for funding opportunities and send information to the co-chairs
- Update website – Lisa Maddison and Liuming Hu

GLOSSARY

CGIAR: Consultative Group on International Agricultural Research
CLIOTOP: Climate Impacts on Oceanic Top Predators
CLIOTOP-WG5: Working group 5 Socioeconomic aspects and management strategies
DWF: distant water fleets
EAF: Ecosystem approach to fisheries management
EBFM: Ecosystem-based fisheries management
ENSO: El Niño Southern Oscillation
ESSAS: Ecosystem Studies of Sub-Arctic Seas
ESSAS-OSM: Open Science Meeting
F4WG: Focus 4 Working Group of GLOBEC
FAO: Food and Agricultural Organization (UN)
GLOBEC: Global Ocean Ecosystem Dynamics
HDWG: IMBER Human Dimensions Working Group
ICED: Integrating Climate and Ecosystem Dynamics
ICM: Integrated Coastal Management
IDRC: International Development Research Centre
IG: Interactive governance framework for coastal and ocean governance
IGBP: International Geosphere-Biosphere Programme
IHDP: International Human Dimensions Programme
IMBER: Integrated Marine Bio-Geochemistry and Ecosystem Research
IMBIZO: Integrated Marine Bio-Geochemistry and Ecosystems in a Changing Ocean
IOC: Intergovernmental Oceanographic Commission (Unesco)
IPCC: Intergovernmental Panel on Climate Change
IUCN: International Union for the Conservation of Nature
LOICZ: Land-Ocean Interactions in the Coastal Zone
MACROES: Macroscope for Oceanic Earth System
MPA: Marine Protected Area
MSC: Marine Stewardship Council
NGO: Non-Governmental Organisation
NORAD: Norwegian Agency for Development Cooperation
NSF: Natural (US National?) Science Foundation?
NSF-CNH – Coupled Natural and Human systems
NSF –RCN: Research Co-ordination Networks
OA: Ocean Acidification
PICES: North Pacific Marine Science Organization
PICES- SGHD: Study Group on Human Dimensions
PUP: Planet Under Pressure
QUEST-Fish: project funded by the UK Natural Environment Research council (NERC) with co-funding from the WorldFish Centre and the Plymouth Marine Laboratory.
SCOR: Scientific Committee on Oceanic Research
SIBER: Sustained Indian Ocean Biogeochemistry and Ecosystem Research
SSHRC: Social Sciences and Humanities Research Council (Canada)
TAC: Total Allowable Catch
TOR: Terms of Reference
UKCIP: United Kingdom Climate Impacts Programme
WFC: WorldFish Center

Appendix A

Meeting attendees

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Appendix B

Terms of Reference

IMBER 'Human Dimensions' Working Group

Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) Project

The 'Human Dimensions" working group will be appointed by the IMBER Scientific Steering Committee (SSC). It will consist of two co-chairs, a natural scientist and a social scientist, and approximately 8-9 members assembled for their experience in the social and natural sciences of the ocean. The co-chairs of the working group will ensure good communication between the SSC, the International Project Office (IPO) and the working group.

The tasks of the group are:

- To outline the scope of 'Responses of Society' (Theme 4 in the IMBER Science Plan and Implementation Strategy; SP/IS)
- To organise an international workshop/conference that will bring together natural and social sciences to develop the issues and question to be addressed in IMBER Theme 4.
- Develop a draft of the Issues and Questions to be addressed in theme 4 in a manner consistent with the rest of the IMBER SP/IS.
- Recommend how Theme 4 of the IMBER project should be implemented.