Policy adaptation and dynamic governance of marine social-ecological systems: Coping with climate change and economic change

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Coping with Change

- Prediction: Processes of Change, Vulnerability, Hierarchy of Impacts
- Adaptation: Adaptive Capacity, Resilience, Nature of Governance
- Fisheries Management & Governance Implications

Predicting Change Processes

- Climate Change
- Demand Shifts
- Globalization of Markets
- Technological Change
- Urbanization
- Evolving Governance

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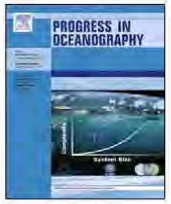


Climate change, uncertainty, and resilient fisheries: Institutional responses through integrative science

Kathleen Miller [a,*], Anthony Charles [b,1], Manuel Barange [c], Keith Brander [d], Vincent F. Gallucci [e], Maria A. Gasalla [f], Ahmed Khan [g], Gordon Munro [h], Raghu Murtugudde [i], Rosemary E. Ommer [j], R. Ian Perry [k]

Predicting Vulnerability

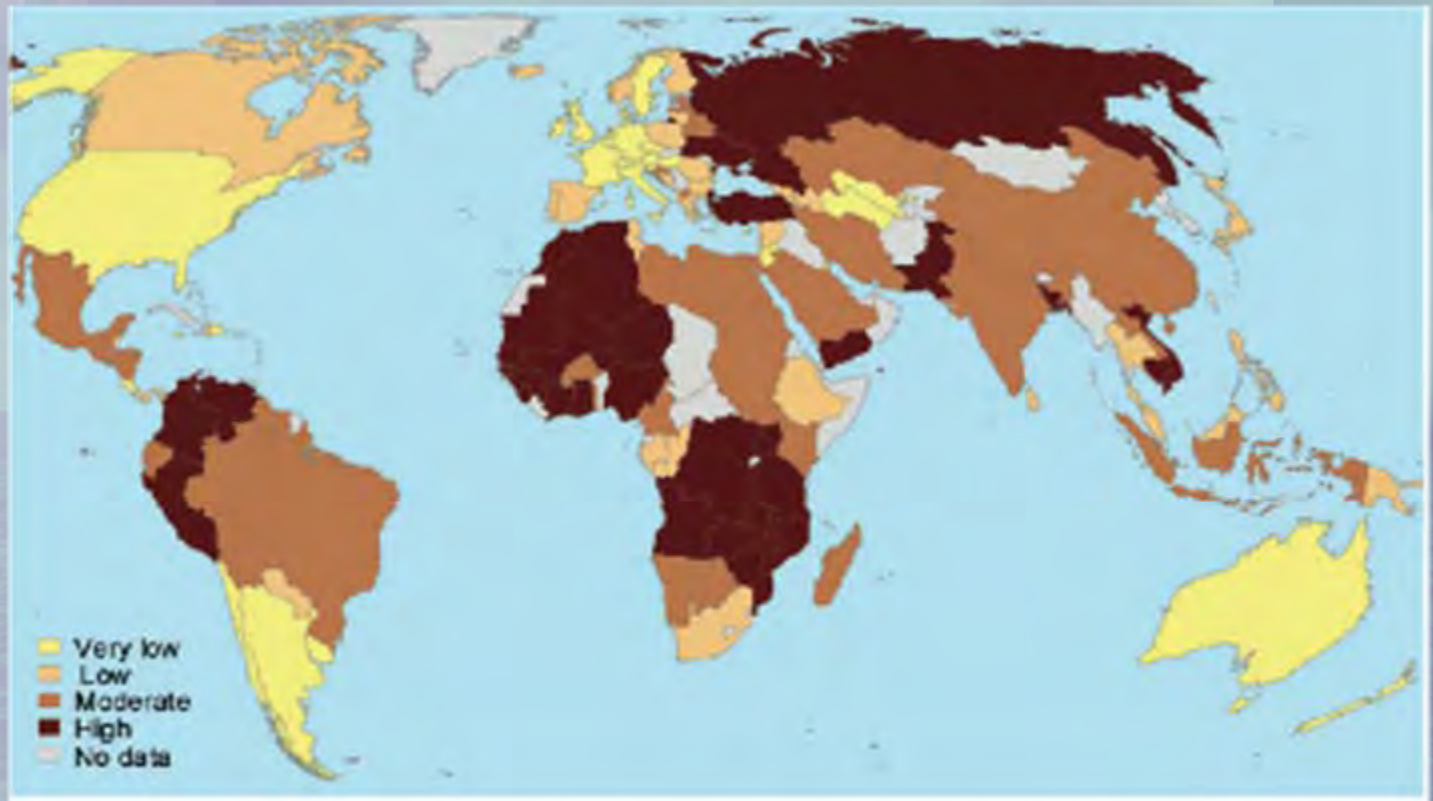


Figure 5 Vulnerability of national economies of potential climate change impacts on fisheries (which integrates exposure, sensitivity and adaptive capacity) under IPCC scenario B2 (local development, lower emissions). Colours represent quartiles with dark brown for the upper quartile (highest index value), yellow for the lowest quartile, and grey where no data were available.

(E.H. Allison *et al.* 2009)

Predicting Socioeconomic Impacts

- Economic Structure and Adaptability
- Benefits, Costs and Net Benefits
- Distributional Impacts by sector & by location
- Impacts on Markets
- Impacts by spatial scale (local to international)
- Impacts by time scale (short-term to long-term)

BIOPHYSICAL/FISH IMPACT ⇒	⇒ SOCIOECONOMIC IMPACT
PACIFIC. Some salmon stocks in southern rivers may decline. In north, salmon productivity may increase.	Distributional impacts: southern communities may suffer vs. north ones, capital-intensive fishers may also do relatively well.
PACIFIC. Cod abundance likely lower. Exotic species will be introduced into the Pacific area from the south.	Lower profits, new opportunities. Fishers and communities that are adaptable will do well. Multi-species licensing policy crucial.
ATLANTIC. Changes to salinity in Bras d'Or lakes may negatively impact Cape Breton oyster culture industry.	Highly local impacts on fisheries, aquaculture imply the need to avoid 'one-size-fits-all' policies & to encourage local management.
ATLANTIC. Environmental change could increase the catchability of lobster, scallop, and other invertebrates.	Higher profits. Management changes (e.g., decreased trap limits, capacity limits) needed to avoid over-exploitation.

BIOPHYSICAL/FISH IMPACT ⇒	⇒ SOCIOECONOMIC IMPACT
ARCTIC. Some species could redistribute into new territories.	Distributional impacts: some fishers lose, some gain, unless licensing alters fishing zones.
ARCTIC. Cumberland Sound turbot fishery prosecuted from ice surface, and so is vulnerable to changes in ice thickness and distribution.	Investment in new fishing methods may be needed or markets may be lost; some fishers may need to shift to other fisheries.
GENERAL. Increased storm surges and coastal erosion will have effects on wetlands (and thus fish habitat).	Loss of habitat on coast could have relatively negative impact on coastal small-boat fishers.

Making Adaptation Work: Key Ingredients of Governance

- Systems thinking
  - across scales, integrating disciplines
- Robust management
  - making policy adaptive
- Participation in stewardship
  - with adaptive co-management
- Integrated indicator frameworks
  - to measure what we value

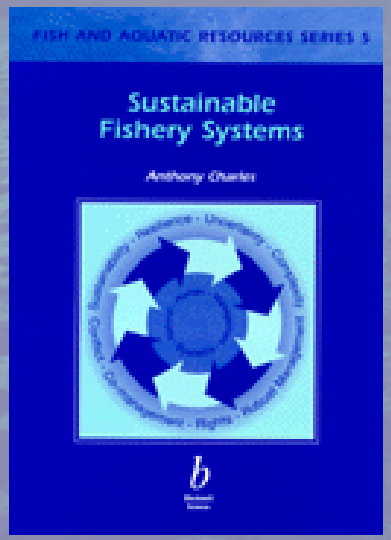
1(a) Systems Thinking

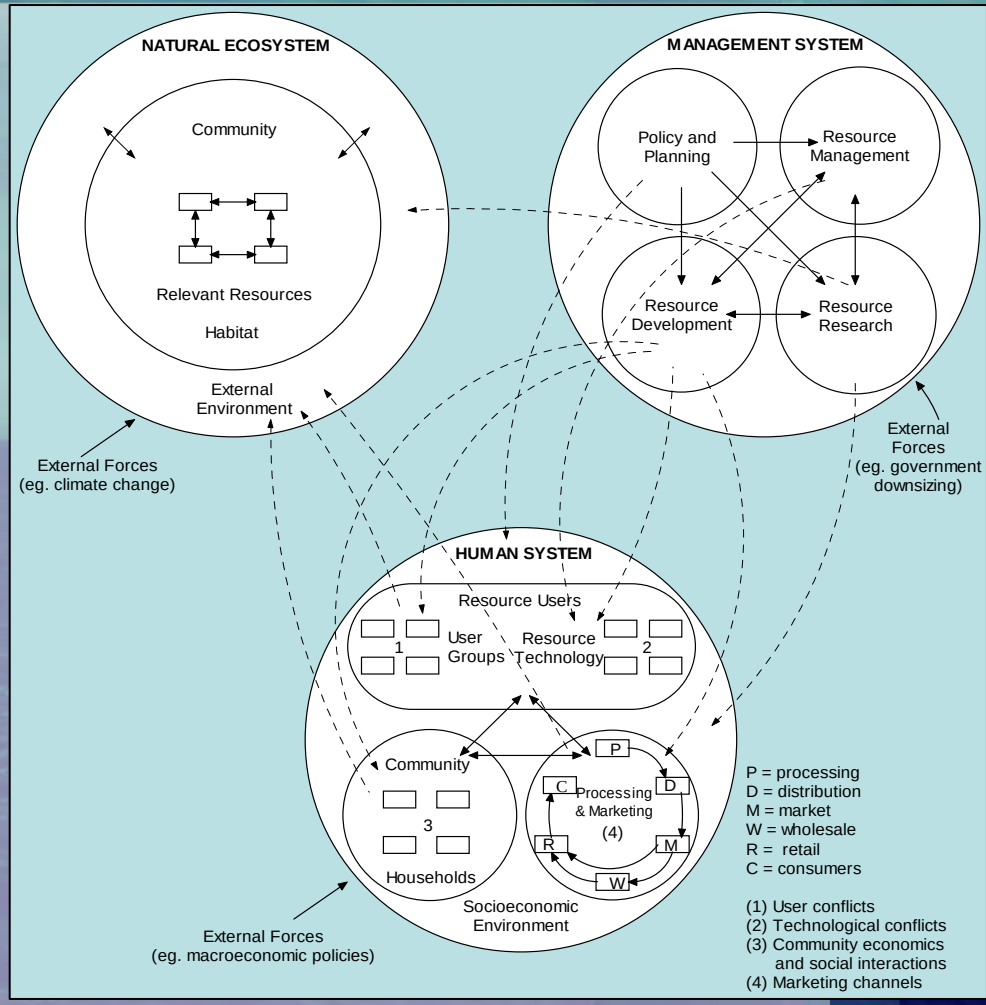
Fishery science: the study of fishery systems

Anthony T. Charles

Fishery systems and linkages: from clockworks to soft watches

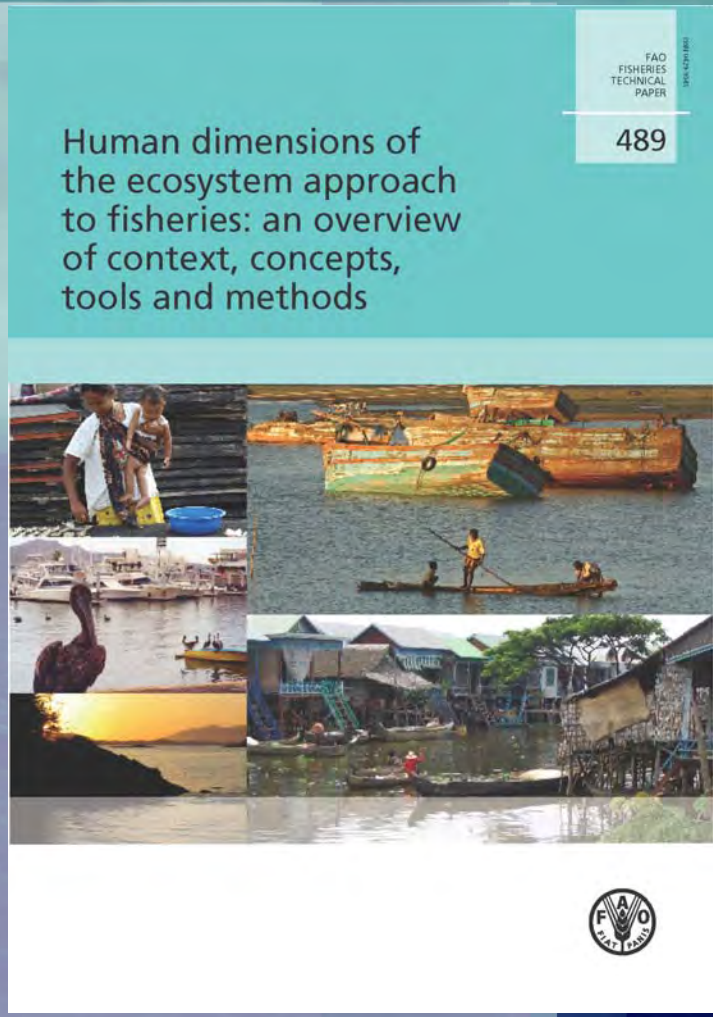
Serge M. Garcia and Anthony T. Charles





1(b) Systems Thinking: EAF and IM

The Ecosystem Approach to Fisheries "strives to balance diverse societal objectives, by taking account of the knowledge and uncertainties of biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries" - FAO



2(a) Robust Management

- Learning to live with uncertainty
- Mutually-reinforcing management ‘portfolio’
- Management measures robust to uncertainty
- Mechanisms to facilitate adaptation/learning
- Aim to achieve ‘reasonable’ performance even if:
  - we have a faulty understanding of the resource system, its environment and processes of change,
  - we can only imperfectly limit exploitation.

2(b) Robust Management in the Face of Climate Change

- Incorporate a precautionary approach within policy
- Avoid ‘Illusion of Certainty’, ‘Fallacy of Controllability’
- Use all sources of knowledge
- Institutionalize adaptive learning
- Promote local management and stewardship
- Self-regulatory institutions, appropriate use rights
- Multi-species fisheries, multiple sources of income
- Diversify the economy (livelihood diversification)

3(a) Participation in Stewardship

Barriers to community participation:

- government and community on different temporal scales
- different geographic scales (large admin space vs. local place-based)
- different purpose (intra/government, versus local ecological/social issues)
- troubles in ‘scaling up’ to government and ‘scaling down’ to community.

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Introduction

The Rio Declaration (1992, UN Conference on Environment and Development) flagged integrated management (IM) as vital to sustainable development, whether focused on coasts, oceans, watersheds, forests, or upland areas. However, the concept has evolved to encompass many more meanings. For example, it has been defined as a multi-disciplinary approach to reconcile sustainability of the biophysical environment with economic growth and prosperity (Olsen, 2003), and as a collaborative planning approach that addresses social, economic, institutional, environmental, and legal interests of multiple stakeholders and of the resources being managed (Christie et al., 2005). Components that require "integration" include political and legal jurisdictions, ecosystem parameters, conflicting uses, social, cultural, and economic needs, different knowledge systems, and controls on anthropogenic impacts.

Integrated Management: A Coastal Community Perspective

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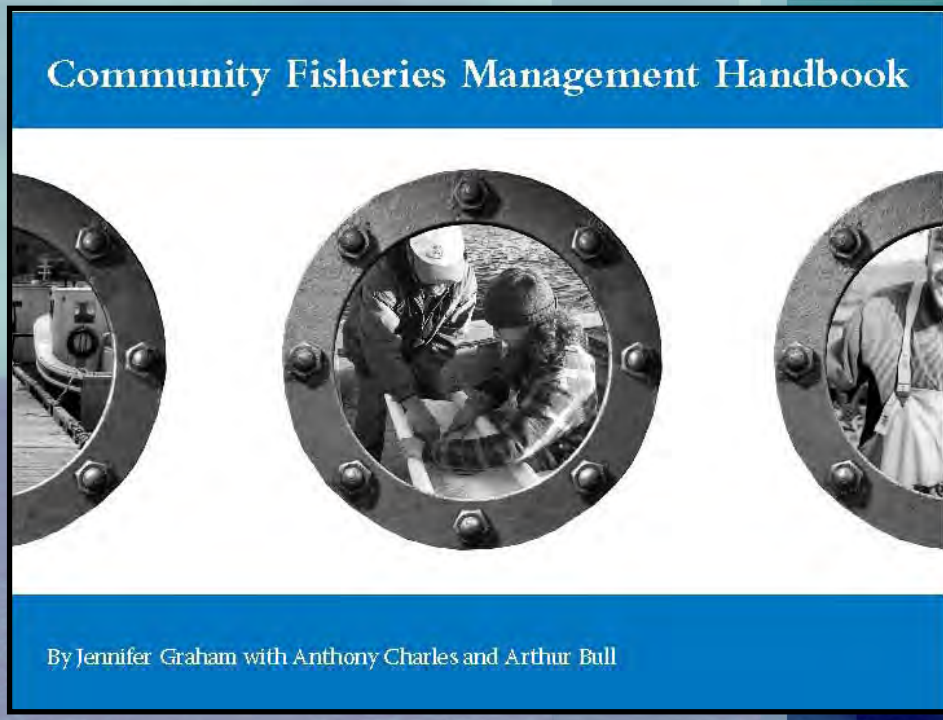
3(b) Participation in Stewardship

Key factors to support community involvement in marine governance:

- Community participation
- Community values
- Legal space, local necessities for effective institutions
- Allow for multiple scales



Community-based management
…a form of co-management

3(c) Values and Outcomes

Values: Intergenerational respect; Building consensus; Informed by indigenous perspective; Place based; Community as advocates not clients; Respect for human rights; Food security.

Outcomes: Healthy and safe ecosystems and communities; Ecological sustainability; Less conflict; Resilience/complexity/diversity; Economies for people; Transformative change.

3(d) Adaptive Co-Management

- Merges co-management and adaptive management, with an emphasis on trust building, institutional development, and social learning.
- Explicitly links learning and collaboration to facilitate effective governance of social-ecological systems.
- Innovative institutional arrangements & incentives.
- Uncertainty is addressed through collaborative processes, recognizing that multiple sources and types of knowledge are relevant to problem solving.

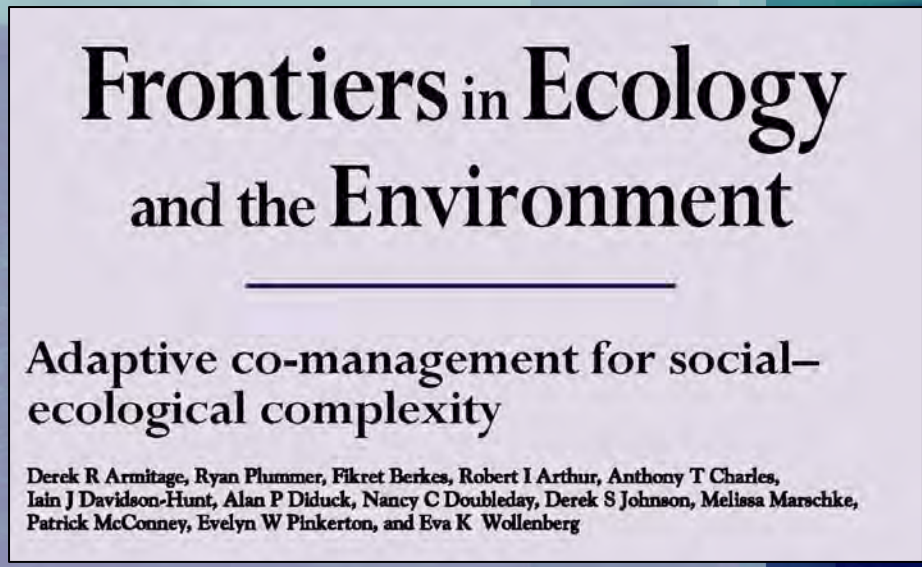


Table 2. Ten conditions for successful adaptive co-management

Condition of success	*Explanation*
Well-defined resource system	Systems characterized by relatively immobile (as opposed to highly migratory and/or transboundary) resource stocks are likely to generate fewer institutional challenges and conflicts, while creating an enabling environment for learning.
Small-scale resource use contexts	Small-scale systems (eg management of a specific rangeland or local fishery) will reduce the number of competing interests, institutional complexities, and layers of organization. Larger-scale resource contexts (transboundary stocks, large watersheds) will exacerbate challenges.
Clear and identifiable set of social entities with shared interests	In situations where stakeholders have limited or no connection to "place", building linkages and trust will be problematic. In such situations, efforts by local/regional organizations to achieve better outcomes may be undermined by non-local economic and political forces.
Reasonably clear property rights to resources of concern (eg fisheries, forest)	Where rights or bundles of rights to resource use are reasonably clear (whether common property or individual), enhanced security of access and incentives may better facilitate governance innovation and learning over the long term. Such rights need to be associated with corresponding responsibilities (eg for conservation practices, participation in resource management).
Access to adaptable portfolio of management measures	Participants in an adaptive co-management process must have flexibility to test and apply a diversity of management measures or tools to achieve desired outcomes. These measures may include licensing and quota setting, regulations, technological adjustments (eg gear size), education schemes, and so on. In other words, economic, regulatory, and collaborative tools should all be available.
Commitment to support a long-term institution-building process	Success is more likely where stakeholders accept the long-term nature of the process, and recognize that a blueprint approach to institutions or management strategies is probably not advantageous. Commitments of this type can provide a degree of relative stability in the context of numerous changes and stresses from within and outside the system.
Provision of training, capacity building, and resources for local-, regional-, and national-level stakeholders	Few stakeholder groups will possess all the necessary resources in an adaptive co-management context. At the local level, resources that facilitate collaboration and effective sharing of decision-making power are required. Regional- and national-level entities must also be provided with the necessary resources.
Key leaders or individuals prepared to champion the process	Key individuals are needed to maintain a focus on collaboration and the creation of opportunities for reflection and learning. Ideally, these individuals will have a long-term connection to "place" and the resource, or, within a bureaucracy, to policy and its implementation. Such individuals will be viewed as effective mediators in resolving conflict.
Openness of participants to share and draw upon a plurality of knowledge systems and sources	Both expert and non-expert knowledge can play productive and essential roles in problem identification, framing, and analysis. The tendency in most resource management contexts is to emphasize differences in knowledge systems. However, there are substantial contributions to social–ecological understanding, trust building, and learning, where the complementarities between formal, expert knowledge and non-expert knowledge are recognized.
National and regional policy environment explicitly supportive of collaborative management efforts	Explicit support for collaborative processes and multi-stakeholder engagement will enhance success. This support can be articulated through federal or state/provincial legislation or land claim agreements, and the willingness to distribute functions across organizational levels. Additionally, consistent support across policy sectors will enhance the likelihood of success, and encourage clear objectives, provision of resources, and the devolution of real power to local actors and user groups.

Coastal Communities Saving the Seas

Oceans are so vast, the problems so immense… can one coastal community make a difference? YES!

The challenges facing the world's oceans are mostly close to shore – land-based pollution, marine habitat damage, fishing pressure and the like. Coastal communities are truly on the front lines, with most at stake in protecting coast and oceans.

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Save Money!

Governments and NGOs: in your marine conservation plans, be sure to support plenty of small-scale community-based initiatives. They work well and can save us money…

One Brick at a Time!

Local-level community-based conservation is making a real difference for ocean ecosystems!

Combining *ecosystem-based* management and *community-based* management can improve marine conservation in three key ways…

- Adding traditional ecological knowledge and 'local knowledge'.
- Drawing on strong human institutions and community support.
- Using participatory research involving local people and scientists.

Connecting Communities to Ecosystems…

Around the world, coastal communities are taking action, to solve major marine conservation problems and protect livelihoods. These community success stories reflect the inspiration of community action.

A key message is that while the world's seas are vast, ocean conservation can and is successful "one brick at a time"; real support from governments and international bodies can help multiply these success stories many times.

Coastal Community Example #1

In Eastport (Newfoundland, Canada), local fishermen partnered with government and universities to improve ocean habitat and lobster stocks. This led to an official marine protected area that now protects their fishing livelihoods.

After the devastating collapse of the Atlantic cod fishery, the fishers of the community of Eastport, in Newfoundland on the Atlantic coast of Canada, organized themselves to take action to protect their lobster-fishing livelihoods. The fishers worked with scientists and involved the children in local schools, to create a real conservation success… both improving their lobster stocks and protecting the ocean ecosystem for the benefit of all…

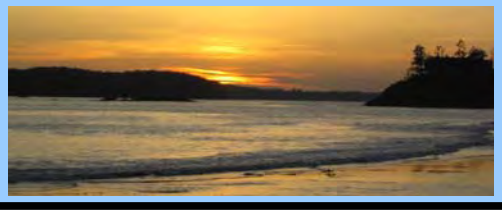
Coastal Community Example #2

Youth in the native community of Bear River (Nova Scotia, Canada) have worked together to restore local streams, following their traditional aboriginal practices in harmony with Nature. The fish are now returning to reproduce again…

The aboriginal Mi'kmaq people in Canada have lived off local natural resources for many thousands of years. One community, Bear River, in the Bay of Fundy, has seen neighboring lands deforested and local ocean areas polluted. They see the land and the sea as fundamentally connected, notably by the streams that run through their land. They have worked hard to restore these streams, based on traditional aboriginal practices of living in harmony with Nature.

Coastal Community Example #3

Native and non-Native communities on Vancouver Island (Pacific coast of Canada) came together to create an *Aquatic Management Board*, which supports a common vision of sustainability and respect for the people and nature in the region.



On Canada's Pacific coast, fishing families, conservationists and aboriginal communities living on the west coast of Vancouver Island all share a common concern over the fate of the marine environment they love. The communities came together to form the West Coast Vancouver Island Aquatic Management Board… a vehicle to plan coastal activities that are in keeping with sustainability and with "respect" for people and nature in the region.

4(a) Integrated Indicator Frameworks

- "Measure what we value"
- Cod collapse 'hidden' by partial and faulty fishery indicators
- Oil spills help the economy
- Sustainability Assessment, with all components of sustainability: i.e. ecological, socioeconomic, community and institutional.
- Place value on natural, human, and social capital, not only the dominant 'produced capital'.

GPIAtlantic

MEASURING SUSTAINABLE DEVELOPMENT

APPLICATION OF THE GENUINE PROGRESS INDEX TO NOVA SCOTIA

FISHERIES AND THE MARINE ENVIRONMENT IN NOVA SCOTIA: SEARCHING FOR SUSTAINABILITY AND RESILIENCE

by

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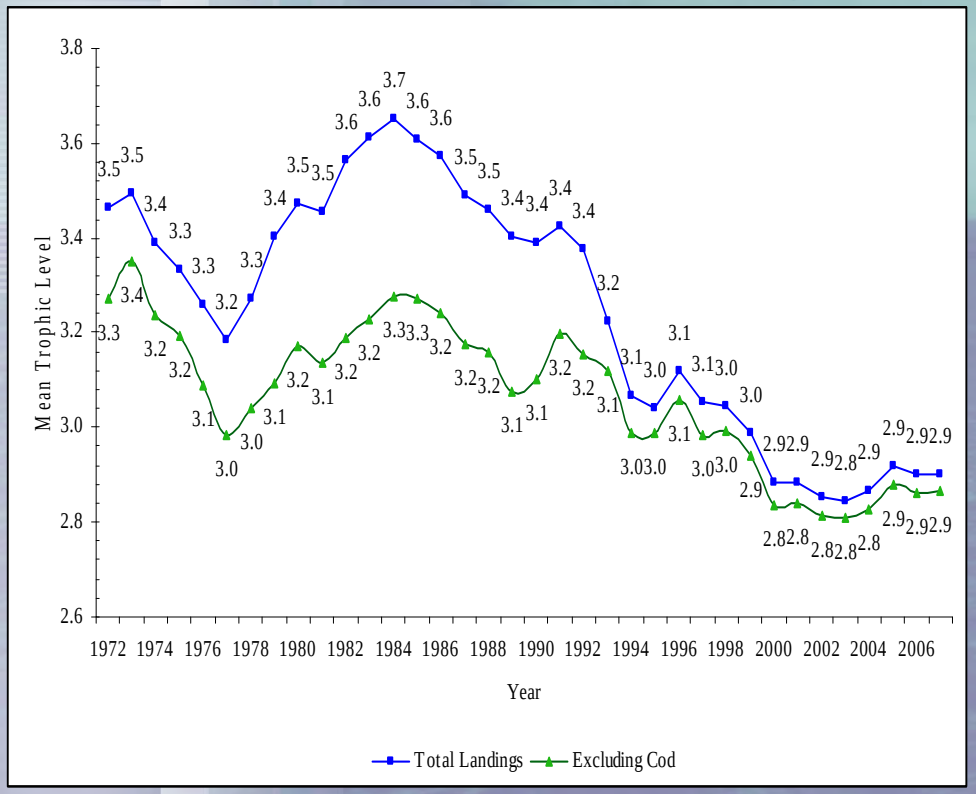
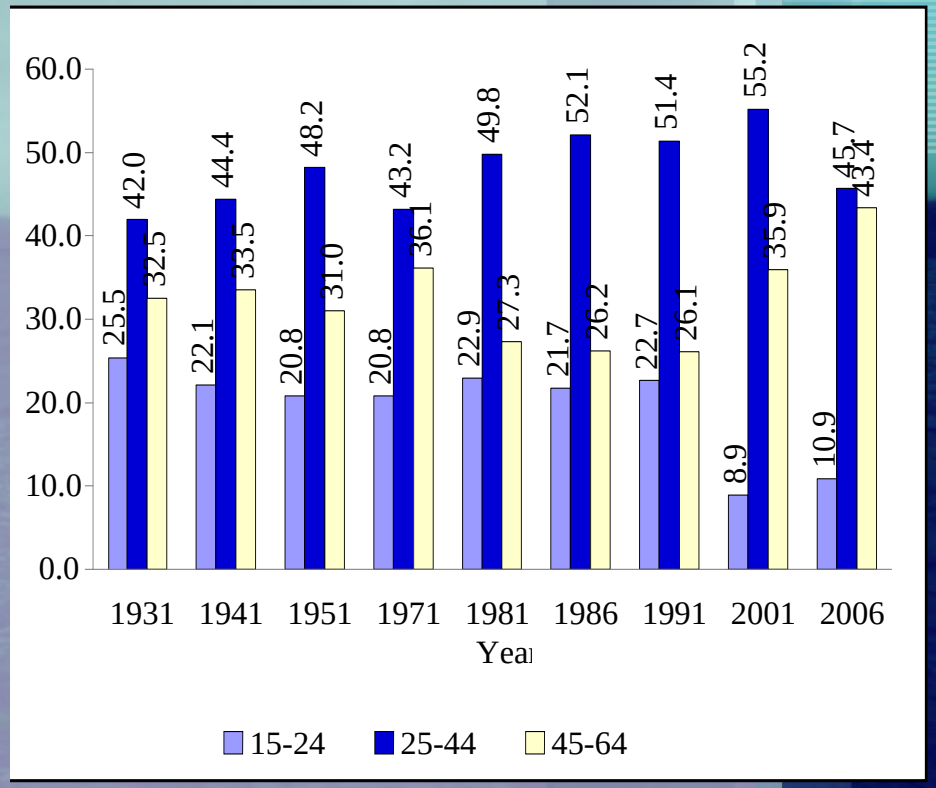
4(b) Integrated Indicator Frameworks

Mean trophic level in fishery, 1972–2007 (weighted by landed weight)



Age distribution of fishers in Nova Scotia, 1931–2006 (in three age classes)



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Conclusion

- Prediction and adaptation
- Systems thinking
- Robust management
- Participation in stewardship
- Integrated indicator systems
- What is the adaptive capacity of governance? For ‘policy adaptation’, need to change management & governance

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