Coping with Global Change in Marine Systems:
Exploring Some Conceptual Issues

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Introduction

- “Fisheries management is really people management”?
- Fisheries are linked social-ecological systems in which human activity modifies the ecological subsystem
- The nature of resources and their availability in turn modifies the social subsystem.
- Ecosystem-based management that includes people

Search for alternatives

- If conventional managerial approaches are falling short, what do the alternatives look like?
- What can we learn from a diversity of emerging ideas?
- Paper focuses on four themes:
    - broadening management objectives
    - expanding the range of knowledge used
    - institutions with multi-level linkages
    - governance that goes beyond government

Plan

1. Explore each of these four themes
2. Two conceptual shifts emerge:
   - a re-definition of **resource** and **management** concepts
   - complexity
3. How these conceptual shifts may help deal with global change

1. Broadening management objectives

- Biological, economic, social objectives
- Clark (1985) recognized 22 fishery objectives: 6 related to sustainability, 12 efficiency, 8 equity
- Different objectives cannot be simultaneously optimized
- Trade-offs – not an issue that has a technical solution but subject to negotiation

The task: formulation of objectives

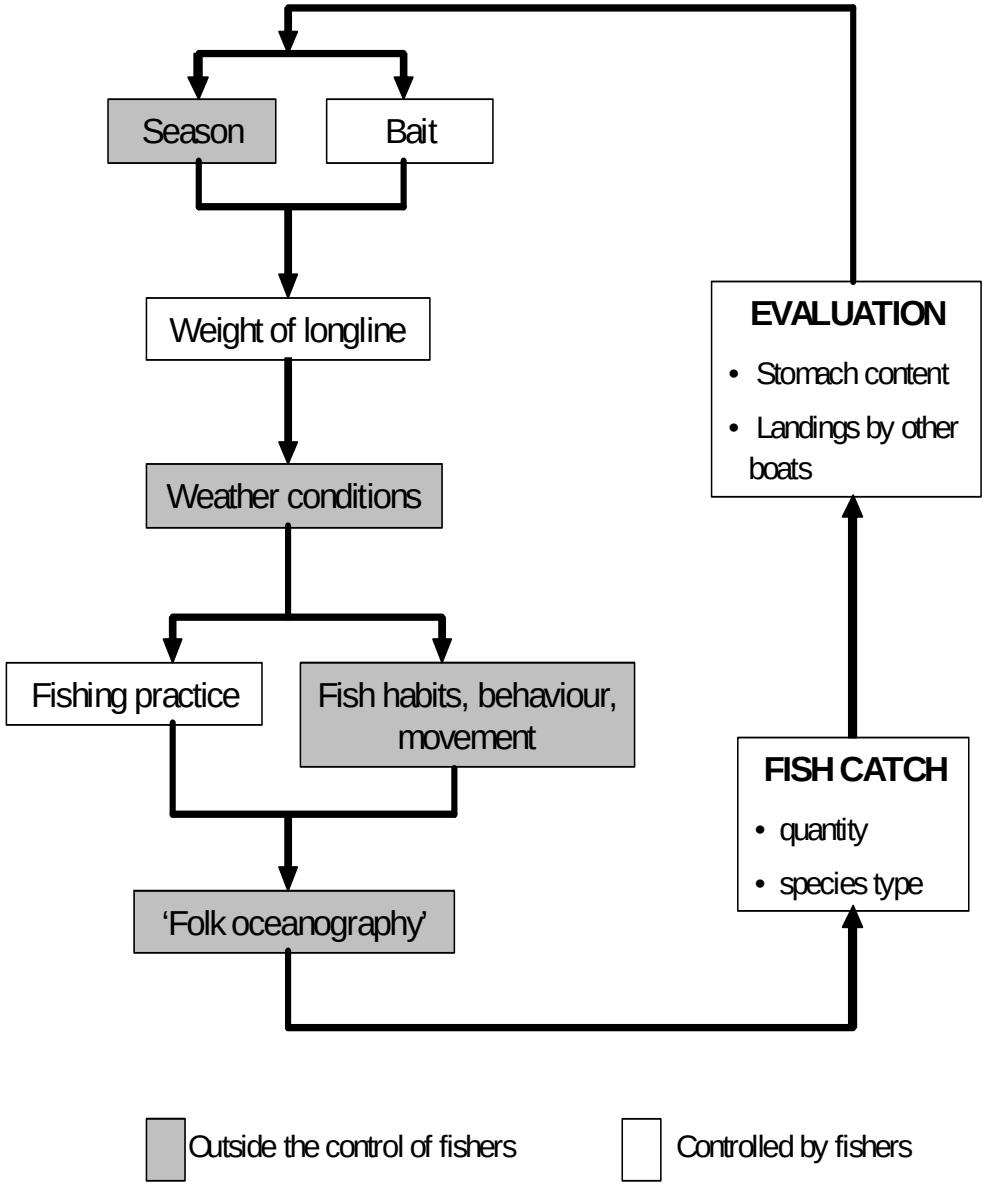
- Biological, economic, social objectives are interdependent
- Fish and fishers, an integrated system
- Need objectives with ecological, economic and social considerations, including sustainable livelihoods
- Trade-offs necessary -- while keeping in mind the sustainability of the integrated social-ecological system as a whole

2. Expanding the range of knowledge used

- Biological data for stock management; economic data for economic objectives
- But use of multiple objectives requires use of a broader range of information
- Fishers' knowledge (local and traditional) receiving attention (Haggan, Neis, Baird 2006 UNESCO)
- Expansion of scope of management information to include fishers' knowledge and learning (RE Johannes' "dataless management" 1998 TREE)

Broader range of knowledge and understanding

- Fishers' knowledge for participatory mgmt
- Use of deliberative methods for joint problem solving
- Insights from fishers' knowledge (Grant and Berkes 2007 Fisheries Res)
- Use of multiple epistemologies to deal with complexity



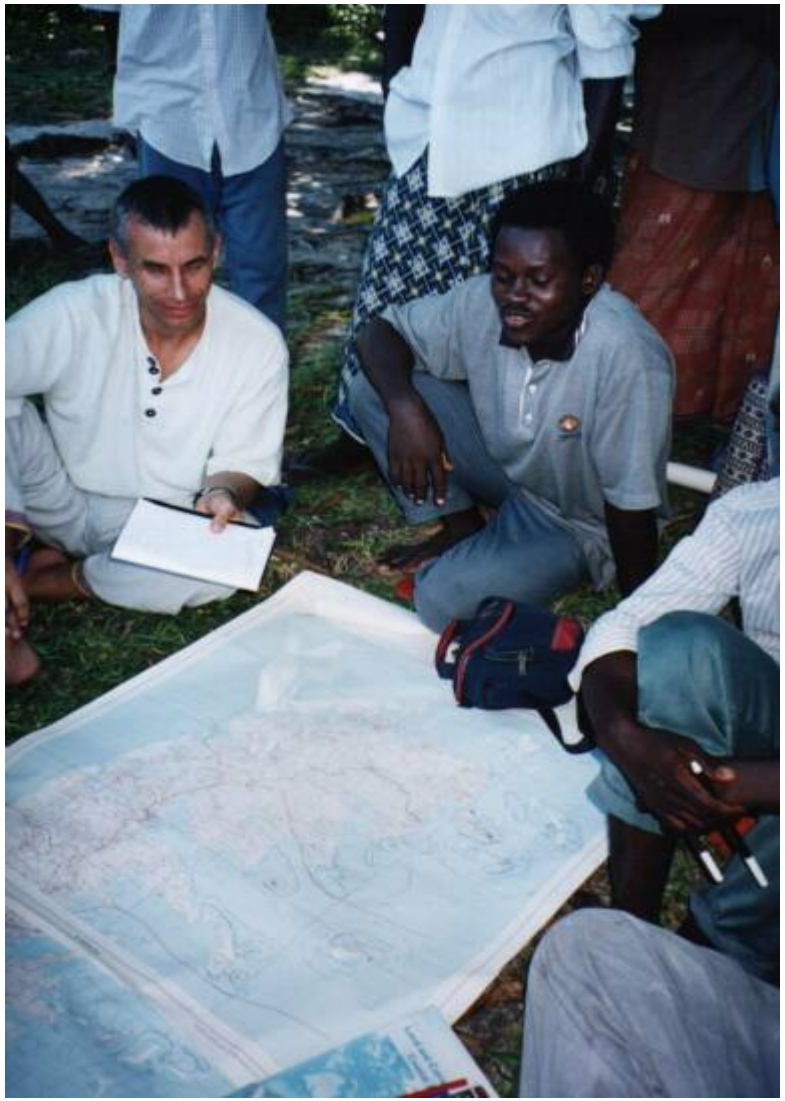
3. Institutions with multi-level linkages

- Institutions: rules-in-use; rules and norms
- Recognizing the importance of local-level institutions
- And their connections to regional-national-international levels (“vertical linkages”)
- Helps solve the two fundamental problems of the commons: exclusion and subtractability


I HEAR IT LACKS DIALOGUE...
NOW PLAYING
"Tragedy of the Commons"

Local-level institutions and the exclusion problem

- Ability to exclude potential users, other than members of a defined group
- Examples: territorial use rights (TURFS), reef and lagoon tenure, MPAs and exclusion



Local-level institutions and the subtractability problem

- Ability to design institutions to regulate resource use
- Often as self-organized rule making by communities
- Design principles for effective community-based institutions

Multi-level institutional linkages

- Is there one most effective institutional level?
- Resources cannot be managed solely at the local level (any more than they can be managed solely at the national level)
- Multi-level management: co-management
- Challenges: building institutional capacity; sharing of management power

4. Governance beyond government

- Civil society -- citizens are no longer treated as subjects but participants in governance
- Part of a trend emphasizing horizontal processes such as partnership and empowerment in all areas of resource mgmt
- Governance as the more inclusive term, followed by policy, and finally by mgmt

Governance challenge

- Development of participatory governance with community-based institutions, and attention to multi-level linkages from local to global, to deal with complexity and change
- **Decentralization** as governance reform?
- Many pitfalls: offloading, loss of public services, elite capture, lack of accountability, increased conflict, local capacity problems (Béné and Neiland 2003; Béné and Neiland 2006 WorldFish)

Two conceptual shifts emerge from the exploration of the above four points:

- Evolving notions of **resource** and **management**, to de-emphasize utilitarianism, reductionism and top-down management;
- Moving to a complex adaptive systems thinking

Need to redefine resource

- Emphasis on production objectives (fish-as-commodity) undermines the need to protect habitats and ecosystems
- The resource system needs to be managed, not for products and commodities, but for ecosystem processes and resilience
- Redefining **resource** to refer to ecosystem services and human well-being (consistent with MA)

Need to redefine management

- Management – not as domination and control of nature but stewardship
- Not as a government task but a partnership (Ludwig: “end of management” Ecosystems 2001)
- Redefining **management** to refer to governance and learning, adaptive management, to maintain productive capacity and resilience of systems

Fisheries as complex adaptive systems

- Fishery mgmt is more than stock assessment
- Fisheries are complex systems of humans & nature
- Addressing complexity means paying attention to:
  - uncertainty (eg adaptive management)
  - nonlinearity (eg thresholds; phase shifts)
  - path-dependence (eg history is important)
  - self-organization
  - scale

Some scale-related problems

- How does the manager choose the spatial and temporal scale of mgmt?
- “One size fits all?”
- Are small-scale fisheries merely a developmental phase toward large-scale fisheries?

Can these conceptual shifts help cope with global change?

- **Global environmental change** include large-scale processes (eg climate change; biodiversity loss)
- **Globalization**: the compression of space and time scales with regards to flows of information, people, goods and services
  (*Global Env Change* special issue, 2006)
- These two processes interact and reinforce one another in a number of ways
  (Leichenko and O'Brien call it “double exposure”)

Globalization-related drivers impacting fisheries

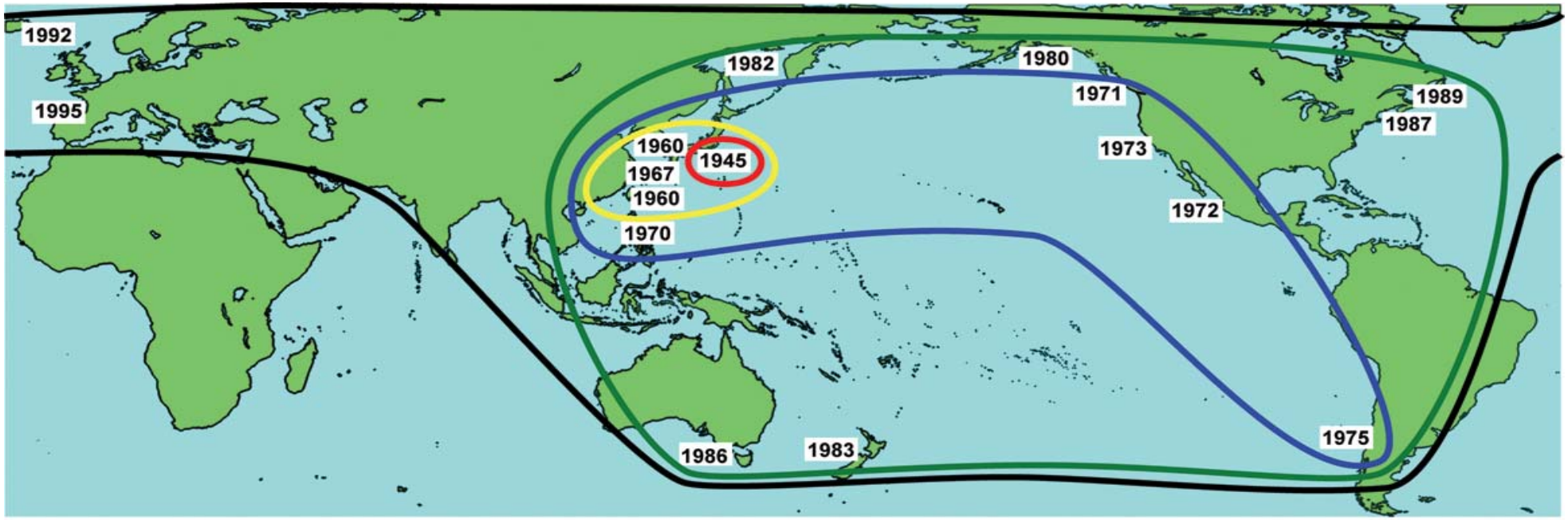
Drivers associated with globalization include:

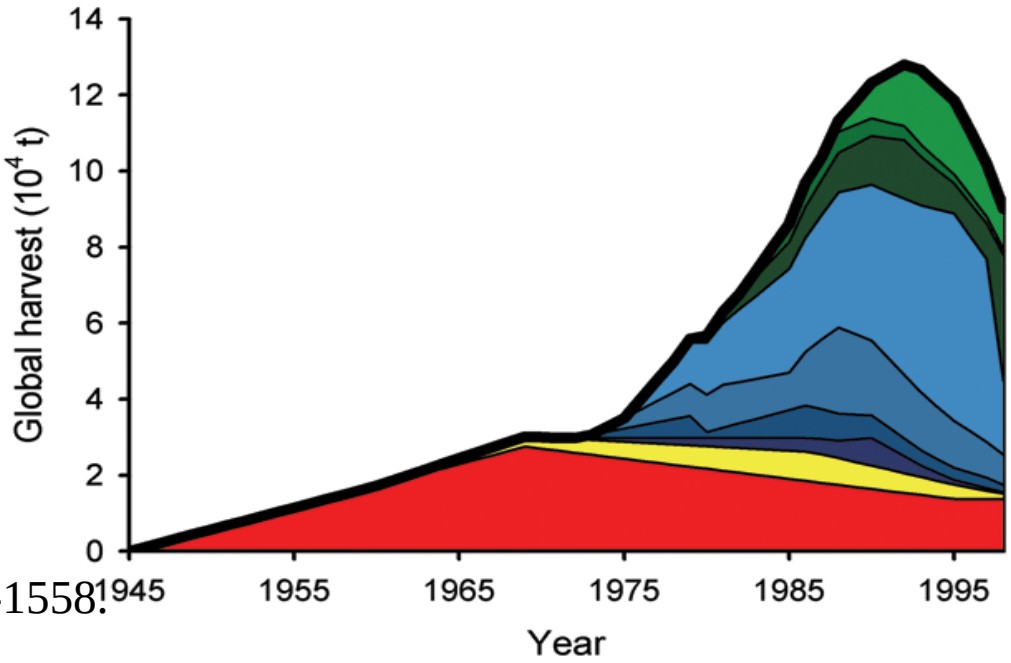
- Environmental movements that can influence the activities of fishing fleets
- Certification and eco-labelling that can shape fishing practices, marketing
- Rapid development and invasiveness of international markets in shaping management at the local, national and international levels

Global sea urchin harvests

Initiation year of major fishery by area:

- Japan, 1945
- Korea, 1960
- Washington and Oregon, 1971
- Baja, 1972; California, 1973
- Chile, 1975
- Alaska and Br. Columbia, 1980; Russia, 1982
- Maine, 1987; Nova Scotia & New Brwck, 1989



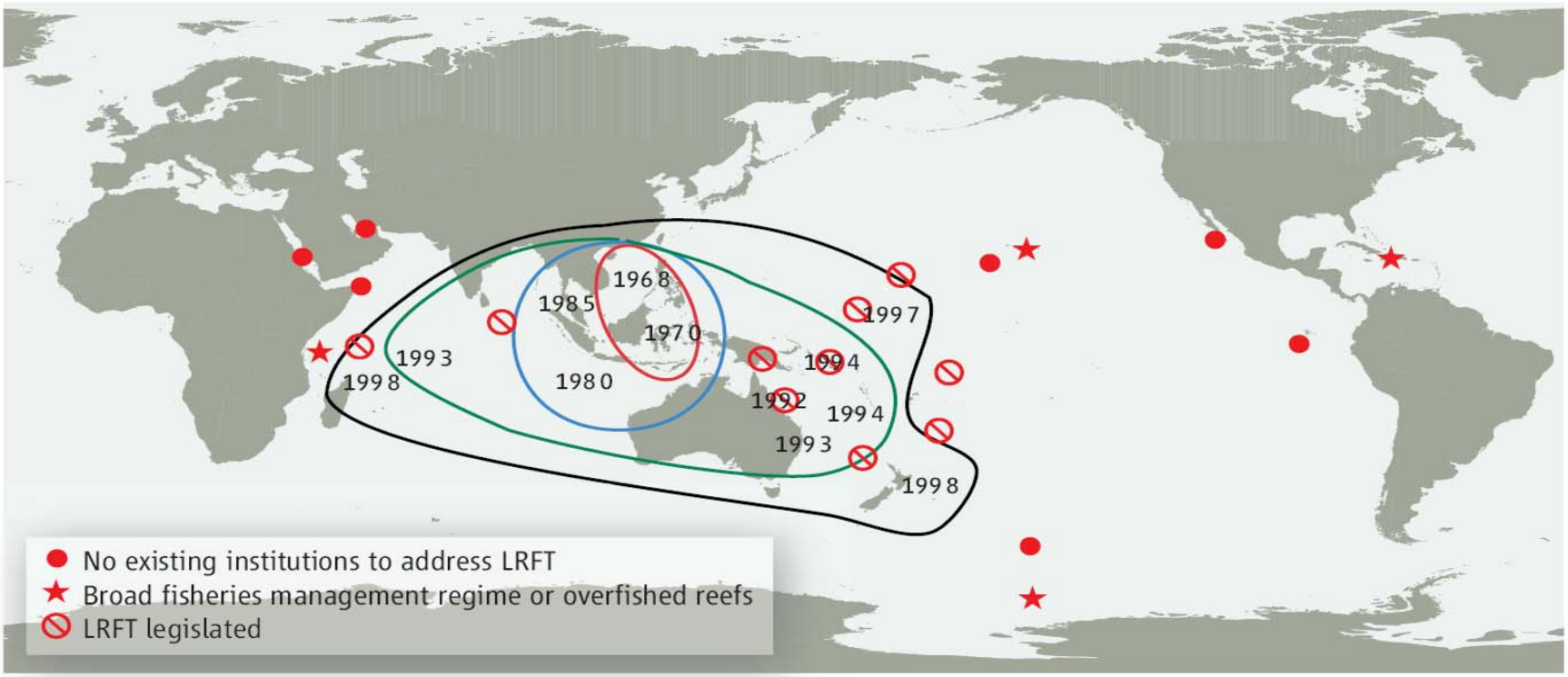


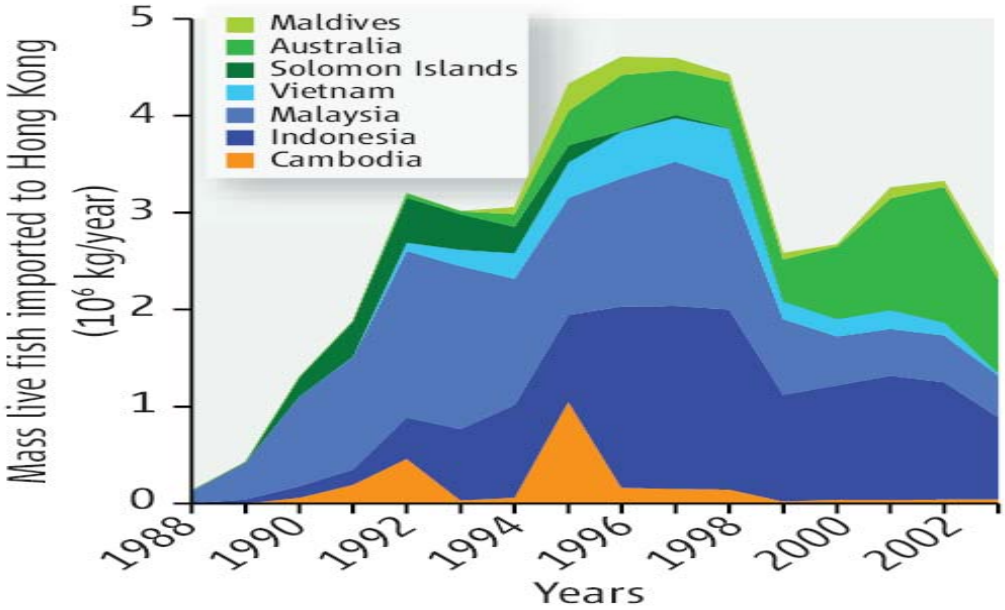
Source: Berkes et al. 2006. Science 311; 1557-1558.

Data from: Andrew *et al.* 2002. Oceanogr Mar Biol Annu Rev 40: 343.

Sequential exploitation and globalization

- Spatial expansion of harvests and sequential depletion of stocks by waves of exploitation
- What's new now, different from historical cases?
- Globalized world: new markets can develop so rapidly that the speed of exploitation overwhelms the ability to respond
- Local and national institutions are caught by surprise, unable to constrain harvesting





Roving bandits and Live Reef Fish (LRF) trade: Scales et al. 2006. Science 313: 612-3

Addressing roving bandits: Live Aquarium Fish Trade (LAFT)

- Colorful reef fish for saltwater tanks
- A luxury item that has become popular only in the last two decades, started Philippines
- Harvesters used cyanide in coral reef areas
- Local recognition of reef damage as major concern, triggering action
- Harvesters now turning to use of nets for LAFT, and to reef restoration


ICAKA 1924

Solutions: the LAFT case

- Effective response coming from the community level – but not yet multi-level
- Institution building -- about 10 yr
- Community – NGO – international donor agency partnerships
- Coral reef rehabilitation as a way of ensuring long-term productivity of LAFT
- Spin-off benefits, eg income from dive tourism

FAO Code of Conduct as globalization?

- Globalization also includes deliberately introduced measures
  - FAO Code of Conduct for Responsible Fisheries
  - UN Millennium Development Goals
- These measures also act as drivers
- They bring in new national & international measures that influence management

Conclusions

- Foster stewardship consistent with norms such as the FAO Code of Conduct for Responsible Fisheries
- Turn the older managerial approach on it head:
- Instead of control-of-nature utilitarianism, emphasize humans-in-ecosystem management
- Instead of sole reliance on expert-knows-best science, local & traditional knowledge also used

Conclusions - 2

- Instead of top-down decision-making, participatory governance
- Instead of fishing-as-business, focus on sustainable livelihoods
- Instead of reductionism and positivism, develop complex systems thinking
- Coping with global change in marine systems? Complex adaptive systems approaches

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