Is the science lost at sea? Case studies from Australia

Marine Park Planning and Recreational Fishing

Author: Daryl McPhee, Bond University (Australia)
presented by Oscar Sagué Pla (FEDAS)

Management of marine ecosystems

- Spatial management through marine reserves → Highly contentious.
- Benefits for biodiversity conservation and fisheries management → Not universal
- Influences:
  - Biology and ecology of individual species.
  - Fisheries management regime (enforcement).
  - Anthropogenic impacts on the marine environment.

Marine reserves

- Institutional and societal issues:
  - Meaningful participation in design, management and monitoring.
  - Dislocation and displacement of fishers.
  - Costs and benefits of marine reserves and their distribution.
  - Governance arrangements.
  - Nature of existing access rights.

Australia

- Since 1991 → NRSMPA.
- Aim → Biodiversity protection.
- Highly protected areas →Fishing activities prohibited.
- Consequence → Conflict (public rallies, government inquires).
- 19,5% population (2003)
- Estuaries and inshore coastal waters.
- Annual expenditure: $1.85 billion (2001/2002)

Main points of contention

- Costs poorly understood by marine park planners, poorly assessed or not assessed at all.
- Benefits overstated and not necessarily of local relevance.
- MR not mitigate against a large number of non-fishing hazards and risks.
- Lack of opportunity for meaningful input.

Costs and benefits of MR for RF

- MR historically promoted by biologists/ecologists with little input from economists or social scientists (Smith and Wilen (2003)).
- Literature focused on benefits.
- RF consider MR to result in costs.
  - Loss of fishing access.
  - Overcrowding in areas remaining open.
- Costs are tangible and immediate while the benefits are less tangible and may be longer term (if they occur at all).
- No detailed RF cost-benefit analyses.

Cost-benefit analyses

- Costs
  - General terms.
  - Not identified as significant or persistent.
- Benefits
  - Increased spillover.
  - Enhanced fish stocks and fish habitats.

The Spillover Effect

- Benefits of MR (increased biomass, species richness, average size…) are not universal (Jones et all. 2004).
- Not sufficient in itself.
- Spillover of adult fish or eggs and larvae.
- Adult fish
  - Marine reserve size.
  - Density dependent effects (Le Quesne and Codling, 2009; Moffit et al., 2009; Miethe et al., 2010; Kellner et al., 2010).
  - Body size, habitat, depth range, schooling behaviour (Claudet et al., 2010)
  - Limited spatially to 100s meters from MR boundary (Russ, 2004; Halpern et al., 2010).
  - Adult spillover too large → No biodiversity outcomes (Mora et al., 2006; Miethe et al., 2010)

The Spillover effect

- Eggs and larvae
  - Fished species must reproduce within the MR.
  - Magnitude of egg and larval spillover is extremely difficult to assess empirically.
  - Spawning stock-recruitment relationship → Asymptotic (Penn and Fletcher, 2010).
  - Individual biology of the species, hydrodynamic factors, environmental quality within and adjacent to MR and the fisheries management regime.
- Conclusion → Broad statements of benefits to RF through spillover effects is an oversimplification.

Impact of MR on Recreational Fisheries

- Heterogeneity of recreational fishers.
- Reasons diverse → Catch and non-catch motivations.
- Recreational fishing sub-sectors (methods, motivations, investment, frequency and spatial distribution).

Recreational specialisation

- Costs and benefits will not be spread evenly through the recreational fishers population.

Once a year → **Fish frequently**

- Little investment
- Catching fish is no important
- Little understanding of resource management
- Fishing may be easily substituted

- High investment, both in social and economical terms.
- Catching fish is important
-Fishing is their main leisure activity and may not be substituted easily.
-Locations that maximize satisfaction level may be very limited or in fact unique

Impact of MR on Recreational Fisheries

- Disproportional
  - Limited ability to respond to change and spatially adapt their fishing activities (younger/older, physical disabilities, financial hardship).
  - Those with the most to lose and least able to adapt spatially to change to achieve the same or similar satisfaction levels from their preferred leisure activity.
- Incorporation of specialisation theory into studies of RF and MR.
- Ability of recreational fishers to adapt spatially needs to be considered.

Mitigation of environmental hazards and risks

- Marine reserves → Mitigate fishing.
- Other hazards and risks (Bailey at al., 2000; Boesch et al., 2001; Halpern et al., 2007; Ogburn et al., 2007; Lewis, 2009):
  - Water quality impacts.
  - Oil spills.
  - Invasive species.
  - Timing and volume of freshwater inputs.
  - Habitat destruction or modification.

Mitigation of environmental hazards and risks

- Early live history (larval) stages → Very sensitive to chemicals.
- Large population centres or significant agricultural or industrial development occur.
- Larval spillover and other recruitment processes → MR are largely ineffective (Dee Boersma and Parrish, 1999)
- Clear disconnect → hazards and risks and MR.
- Disconnect not communicated in MR planning documents but well known by recreational fishers and a key contention.
- False sense of security that the marine environment is protected while root causes of marine biodiversity and fisheries decline continue unchecked.

Mitigation of environmental hazards and risks

- MR should be incorporated in a risk based approach to management of marine systems where they mitigate key identified risks from fishing at a regional or local level. Where risks cannot be plausibly mitigated through the development and implementation of MR, other tools should be utilised.

Participatory approaches for MR design and monitoring

- Technocratic approach with extensive public consultation.
- Heavy reliance on simple consultative mechanisms (public meetings and/or circulation of information).
- Dissatisfaction:
  - Outcomes of the process predetermined.
  - Recreational fishers not treated fairly compared to other stakeholders.
  - Insufficient feedback about how information provided by recreational fishers is used in the process.

Participatory approaches for MR design and monitoring

- Effective participation by stakeholders:
  - MR planners will take advantage of expert local knowledge of the marine environment.
  - Collection of information on fishing activities at a fine scale (mitigation of conflict).
  - Participatory approaches to the design of MR should be embraced by government.
- Conflict can be reduced.

Conclusion

- Rethinking the developing and implementation of MR for biodiversity protection.
  - Commitment to more participatory approaches.
  - Participatory partnerships (scientists, managers and the community) in the monitoring of MR.
- Acknowledgement that MR have potential costs as well as possible benefits to the RF and a commitment to robustly assess them.
- MR are not a panacea.

Conclusion

- Management of marine biodiversity should be through mitigation of hazards and risks, which includes but is far from limited to, the implementation of marine reserves.

THANK YOU!