Ten-step recipe for creating and managing effective marine protected areas

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10-step recipe for effective marine protected areas and networks

Goal

Convey the many considerations for creating MPAs (networks),

Catalyze and advance discussions and recommendations for creating

a pan-arctic network of MPAs

Approach

Present a "recipe"

Provide examples from experience in creation of California's network of MPAs

Hypothetical examples for pan-arctic network of MPAs

10-step recipe for effective marine protected areas and networks

1. Identify threat

2. Identify threatened social, environmental or ecological feature

3. Determine how threat will impact feature

4. Determine whether and how MPA (network) could prevent or ameliorate impact

5. Establish design criteria for MPA (network) to achieve management objective

6. Design planning process to apply MPA (network) design

7. Implement planning process

8. Create MPAs

9. Develop evaluation criteria and program

10. Manage MPA (network) adaptively

science informs and
influences most of these

1. Identify threat

California

Fishing impacts to fished species and marine ecosystems (1999)

Strong conservation focus

Arctic

Climate change
- Sea level rise
- Loss of ice
- Changing ocean temperature
- Changing current patterns
- Changes in productivity
- Ocean acidification
- Hypoxia

Increased shipping activity
- Oil spills
- Invasive species
- Cetacean strikes

Multiple stressors
- Climate change
- Shipping
- Fishing

2. Identify threatened social, environmental or ecological feature

California

- Fished species

- Fished habitats

- Fished (= all) ecosystems and their biodiversity

Arctic

- Arctic ecosystems

  - Arctic marine habitats

  - Biodiversity

  - Ecosystem services

- Coastal human communities

3. Determine how threat will impact feature
(predicted social, environmental, ecological responses)

California

Fishing impacts to fished species
- reduction in population sizes locally and regionally
- altered genetic structure and diversity
- jeopardize population persistence

Fishing impacts to marine ecosystems
- by-catch: declines of other species
- diminished ecological role of fished species
- impact to habitats
- Impacts to ecosystem structure and functions (e.g. productivity)

Arctic

Climate change
Sea level rise
- loss or shift of habitat and ecosystem area
- corresponding decline in species and biodiversity
- impact population and ecosystem connectivity

Loss of ice
- similar to sea level rise

Changing current patterns
- shifts in species distributions
- changes in distribution and magnitude of productivity
- corresponding changes in ecosystem structure and functions

4. Determine whether and how MPA (network) could prevent or ameliorate impact

California

Fishing impacts to fished species

Within MPA
- protect fished populations
- protect genetic composition and diversity

Beyond MPA (via larval export)
- replenish fished populations and genetic composition
- especially with an ecological network

Fishing impacts to marine ecosystems

Within MPA
- eliminate by-catch
- maintain ecological role of fished species
- eliminate impact to habitats
- eliminate impacts to ecosystem structure and function (e.g. productivity) within MPA

Beyond MPA (via larval export and ecosystem connectivity)
- replenish by-catch species populations
- help maintain ecological role of fished species
- continue to subsidize other ecosystems

Arctic

Climate change

Sea level rise and sea ice loss

Within MPA
- protect habitats/ecosystems for species and ecosystems to shift to

Beyond MPA (via larval export and ecosystem connectivity)
- replenish populations in that ecosystem elsewhere
- continue to subsidize other ecosystems
- especially with an ecological network

Changing current patterns
- protect habitats for species and ecosystems to shift to
- protect intact ecosystems to prevent colonization of invasive species

5. Establish design criteria for MPA (network) to achieve management objective

California

Individual MPAs
- ensure sufficient level of protection (e.g., no-take)
- sufficient size to protect persistent populations
- extend from shallow to deep
- include multiple ecosystems
- design as an ecological network

MPA network
- ecosystem representation
- within and among bioregions
- space to ensure larval connectivity

Arctic

Largely the same as California, PLUS...

Individual MPAs
- include and protect habitat for species and ecosystem to shift to (sea level rise)
- locate in refuges (rise, temperature, OA, etc)
- locate to include stressed (adapted) populations

MPA network
- same as above
- if current shifts predictable, locate to accommodate species shifts
- if current shifts uncertain, distribute to maximize likelihood of maintaining network

6. Design planning process to apply MPA (network) design

California

- identify and design for available financial resources

- identify and accommodate geographic variation

- involve authoritative bodies (decision makers) in design and process

- involve science advisory body

- involve representative stakeholders

- region-specific composition of these groups

- allocate design decision authority:

    science advisors generated guidelines, stakeholders applied guidelines,

    decision makers ensured stakeholders incorporated guidelines

- staff to provide information (ecological, socio-economic, traditional knowledge, etc.) for each group

- tools to facilitate each group (GIS, connectivity models, MarineMap)

- *integrate* these groups in the planning process

Arctic

- I'm not familiar with this

7. Implement planning process   MC2

California   Arctic

- identify and accommodate available financial resources

- identify and accommodate geographic constraints

- involve authoritative bodies (decision makers) in design and process

- involve science advisory body

- involve representative stakeholders

- region-specific composition of these groups

- allocate design decision authority:

  science advisors generated guidelines, stakeholders applied guidelines,

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Make these happen

MC2   **And they did this…**
           Mark Carr; 14.9.2017

8. Create the MPAs (network)

California

- Authoritative bod(ies) enact MPA (network)

  California Fish and Game Commission

Arctic

- Who is this?

9. Develop evaluation criteria and program

California   Arctic

- Define evaluation criteria based on MPA goals and objectives

- Individual MPA and network criteria

- Develop appropriate criteria-based metrics

- Develop integrated empirical and analytical designs

- Link results to decisions made for adaptive management

- Develop financial model for evaluation program

- Institutional partnership model (e.g., GO's, NGO's, academia, communities)

- Develop data management model

10. Manage MPA (network) adaptively

California   Arctic

- Not well formulated yet

- Responds to evaluation results

- Requires institutional capacity to make and implement decisons

- Clear decision guidance (appropriate response thresholds)

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