Guiding Selection of Mitigation Metrics to Ensure Broad Recovery of Marine Ecosystem Services

A Focus on Coral Habitats

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Problem

- Ensuring coral mitigation projects provide services commensurate with those lost

Current Approach

- Metrics for Impact Assessment
  - Area (m^2 or acres)
  - Density (corals/m^2)
  - Number of corals (total colonies)

- Mitigation Design
  - Relocate a percentage of colonies
    - High survivorship
    - Site selection critical

  - Install artificial substrate
    - Acknowledged by the World Bank

- Metrics for Evaluating "Success"
  - Survivorship
  - Health
  - Fish abundance

Key Issues with Current Approach
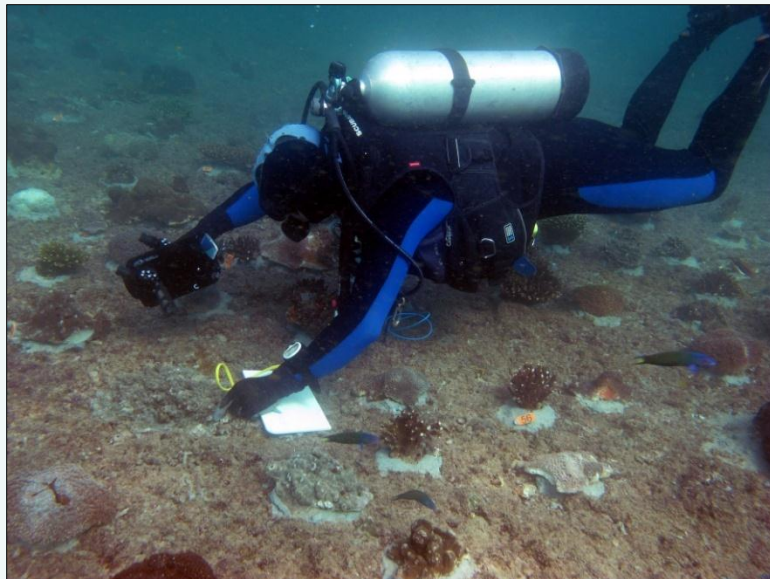
Impact Assessments

- Habitat type & amount
- Focus on climax species
- Minimize value of underlying structural framework
- Service loss is implied

Mitigation Design

- Coral relocation, standard
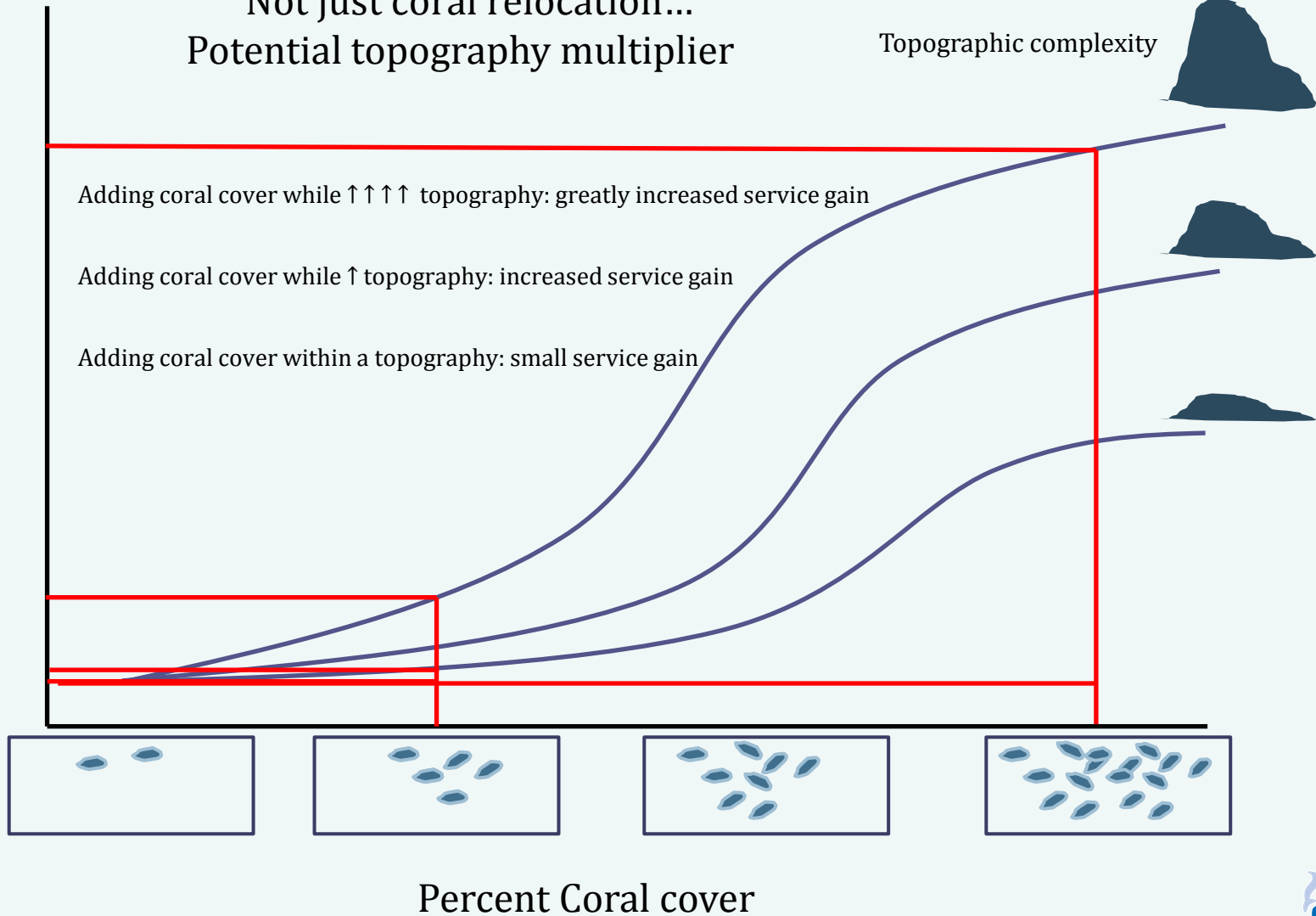 - Implied service gain

Mitigation Monitoring

- Primarily survivorship
- Metrics (e.g., coral cover) imply function
- Dead – end data

Non-Linear Service Gains

Not just coral relocation...
Potential topography multiplier
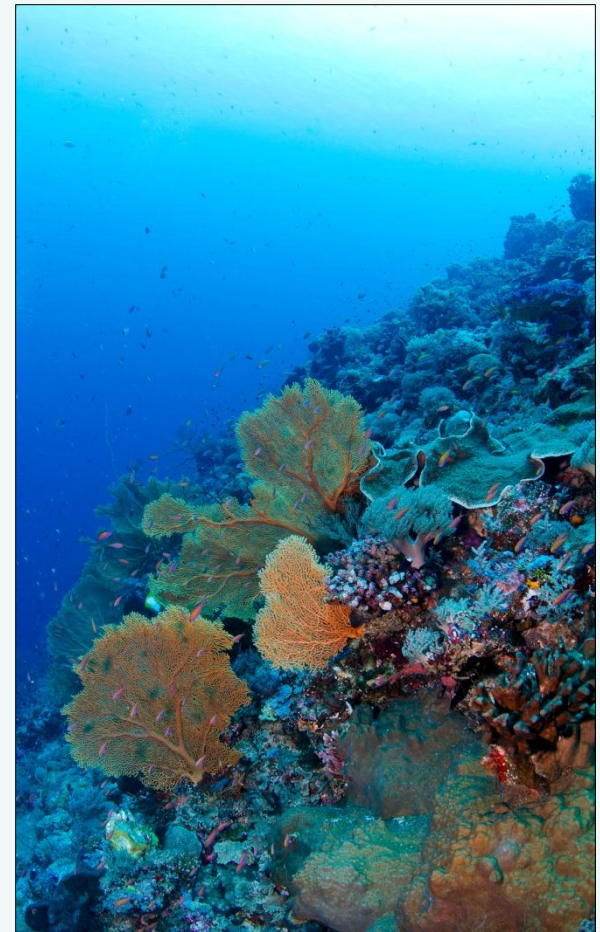
Topographic complexity

Adding coral cover while ↑↑↑↑ topography: greatly increased service gain

Adding coral cover while ↑ topography: increased service gain

Adding coral cover within a topography: small service gain

Ecosystem Services (e.g., biodiversity, fisheries, N-cycling, recreation)

Percent Coral cover

Adapting Assessment Metrics

- Adapting what we are already doing

- More emphasis on services

- IFC Performance Standards

- Four categories of ecosystem services
  - Provisioning – Food, fisheries, biomedical
  - Regulating – Biodiversity, wave attenuation
  - Supporting – N-Fixation, atmospheric C cycling
  - Cultural/Social – Tourism, recreation

- Direct Proxy, Index, Scoring/Grading System

Revising Mitigation Project Design

Set specific mitigation goals

- Based on services loss
  - Wave attenuation
 - Biodiversity

Design Project

- For service gain
  - Recreate topographic complexity
  - Relocate a greater representative range of species
    - Not just corals

Targeted Monitoring Metrics

- Evaluate meaningful parameters over the appropriate time scale
  - Survivorship – short-term metric to validate method
  - Diversity – long-term metric to assess service level
    - Coral recruitment and growth – slow process
  - Rugosity – before/after

- Reduce collection of data for metrics with no targets
  - Invertebrate counts
  - Water column characterization

- Adjust frequency of data collection to match anticipated change
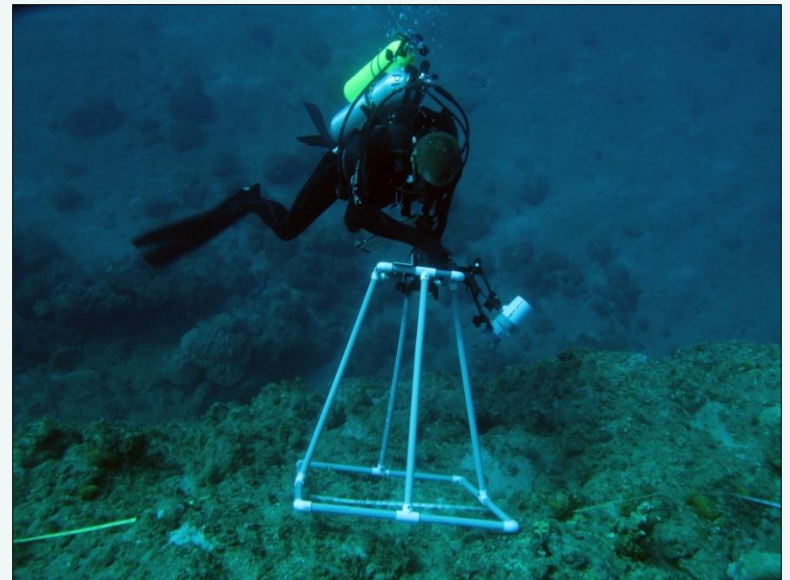
Take-home Points

- Non-Linear

- Ecosystem function over area

- Knowledge of these systems key to success

Thank you

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