Climate-adaptive management of Marine Protected Areas

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The ocean absorbs approximately 90% of energy in the climate system, warming it to record levels in 2023.
“Stationarity is dead”
– Jason Link, NOAA
Biodiversity loss and climate change are a ‘twin crisis’
A global assessment of climate change adaptation in marine protected area management plans

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Climate Robustness Index

- Quantifies climate-adaptation principles in MPA planning documents
- Links adaptive management to MPA planning in a changing climate

Twelve Questions → Scoring
- Yes = 2
- Planned/Some = 1
- No = 0

Sum score
OBJECTIVE
Management aim.

STRATEGY
Specific actions, tools or techniques used to achieve an objective.

INDICATOR
An attribute that acts as a signal of the status of a physical, ecological, or sociological component.

TARGET
The optimal or desired condition of the indicator.

MONITORING
Observation and verification of the progress or quality of an indicator over a period of time.

THRESHOLD
A minimum condition or marked change in indicator condition that would elicit management action.

ASSESSMENT
An iterative evaluation to determine the effectiveness of adaptive management measures.
MPA Management Plan Assessment - Climate Robustness Index

Global Score: 39%

O’Regan et al. 2021
MPA Management Plan Assessment - Climate Robustness Index

O’Regan et al. 2021
Climate Robustness Index of MPA Monitoring Plans

Bryce and Hunter 2024
41 monitoring plans
649 MPAs
Mean Climate Robustness score for monitoring plans was 60%

Consistent gaps in climate robustness between MPA management and monitoring plans
a) Management plans

- Indicators
- Baseline conditions
- Commitment to climate monitoring
- Metrics
- Discuss physical climate impacts
- References to other monitoring
- Discuss ecological climate impacts
- Climate strategies
- Discuss climate changes
- Targets
- Climate objectives
- Discuss social impacts
- Thresholds
- Detailed methods

b) Monitoring plans

- Indicators
- Baseline conditions
- Commitment to monitoring
- Adaptive management
- Reference other monitoring
- Metrics
- Indicators linked to climate change
- Climate strategies
- Discuss physical climate impacts
- Discuss ecological climate impacts
- Detailed methods
- Data management
- Climate objectives
- Targets
- Thresholds

O'Regan et al. 2021
Bryce and Hunter 2024
MPA traits assessment

- Conservation focus
- Level of protection
- IUCN category
- Area (km$^2$)
- Governance level

Partnerships may be important for climate-robust MPAs
The Climate Robustness Index reveals opportunities to strengthen MPA adaptive management.

Targets + Thresholds

Sociological dimensions + Climate change objectives

Decision criteria and performance measures

Social-ecological objectives
Why do we want targets and thresholds?

Targets clearly define the desired condition

Thresholds trigger management action
MPAs operate in the context of a social-ecological system.

Social information relating to climate change was poorly represented.

Social information/values were often not explicitly stated in MPA objectives, but were implied.
1) Explore and articulate **social-ecological objectives**

- Diversifying objectives to increase resilience
- Link manageable and unmanageable pressures (e.g. Zentner et al. 2023)
Sociological considerations + climate objectives

2) **Expand partnerships** to support climate-adaptive MPA management and monitoring

- Partnerships may increase climate robustness
- Community-based management + regional coordination
- Inviting, fostering or restoring a stewardship ethic
Adaptation can be…

The Climate Robustness Index advances a proactive, transparent, locally engaged, and scientific approach.
Gaps in adaptive management are opportunities to:

- Establish decision criteria/performance measures
- Creatively engage with social dimensions
Thank you!

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