Recent progress in development of approaches and tools for resilience-based coral reef management

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Outline

Why focus on coral reef resilience?

ICRI, climate change and coral reef resilience

Growing science foundation

Recommendations arising from Phuket Workshop

Resilience in spatial planning

Emerging issues
Coral reefs are ‘disproportionately important’

- the highest ecosystem service value per unit area of all natural systems

- high dependence among coastal people in developing countries

- high dependence in some industry sectors

- very significant contribution to the national economy of many countries

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... and under increasing climate stress

A fifth of the world’s coral reefs have been lost, > 60% under immediate, direct threat. Climate change and ocean acidification will increasingly affect all reefs.

Resilience provides a framework for improving prospects for long term survival and service provision, reducing risks and prioritization of management focus.
a brief history of ICRI decisions

ICRI CPC 1999 Resolution on Coral Bleaching and Climate Change to the Convention on Biological Diversity

ICRI CPC 2001 Resolution on Coral Reefs, Coral Bleaching and Climate Change to the World Summit for Sustainable Development in 2002

ICRI GM 20 Tokyo 2007 Resolution on CR and CC
• Noting e.g. ITMEMS 3 statement on coral reefs and climate change
• Calls on members to support actions to improve coral reef resilience; research; development of sustainable livelihoods; and enhance public awareness
 (+ ICRI Recommendation on Acidification and Coral Reefs)

ICRI GM 28 Recommendation on addressing the decline in coral reef health throughout the wider Caribbean: the taking of parrotfish and similar herbivores
CBD CoP 12: Priority actions to achieve Aichi Biodiversity Target 10 for coral reefs and closely associated ecosystems, based on SBSTTA recommendation XVIII/3

(a) Reducing the impacts of multiple stressors, in particular by addressing those stressors that are more tractable at the regional, national and local levels, noting that this would have multiple benefits;

(b) Enhancing the resilience of coral reefs and closely associated ecosystems through ecosystem-based adaptation to enable the continued provisioning of goods and services;

(c) Maintaining sustainable livelihoods and food security in reef-dependent coastal communities and providing for viable alternative livelihoods, where appropriate;

(d) Increasing the capability of local and national managers to forecast and plan proactively for climate risks and associated secondary effects, applying ecosystem-based adaptation measures;

(e) Enhancing international and regional cooperation in support of national implementation of priority actions, building upon existing international and regional initiatives and creating synergies with various relevant areas of work within the Convention;
RESEARCH REVIEW

Operationalizing resilience for adaptive coral reef management under global environmental change

Management of press-type stresses most effective to enhance resilience

Additional direct action on pulse-type disturbances can help restore resilience

Coral reef restoration is effective only under particular conditions

Solutions likely to focus on supporting resilience at finer spatial scales and provision of ecosystem goods and services

Facilitates inclusion of social resilience management among strategies available to coral reef managers
Status and Trends of Caribbean Coral Reefs 1970-2012

35,000 survey events at 95 locations in 32 countries/territories over 44 years

Very large variability in reef health between locations

Coral cover today correlated with overfishing, coastal development and population density, less so with hurricanes or bleaching

=> Good local management offers hope for continued coral reef service provision also in the face of CC
Caribbean: managing for resilience

Bermuda: Fish traps banned 1990, parrotfish abundant. 4 hurricanes since 1984 => no loss in average coral cover

Belize: Overfished reefs, no severe bleaching in 1998 => coral cover declined by almost half after 3 hurricanes => fishing parrot fish banned 2012

Bahamas: MPAs => increased parrotfish grazing and decrease in macroalgal cover from >20% to <5% => more than a doubling in coral recruitment

A science basis for policy and management decisions
- ICRI Resolution
- Monitoring indicators and recommended methods
- Network of sites
- Better access to data for planning
- Towards SPAW protocol listing of parrotfish?
General findings

Growing degree of confidence in our ability to identify naturally resilient areas as well as anthropogenic drivers of resilience

- Particular need to enhance the use of resilience data in planning and management. This requires improving interpretation and presentation of resilience data

- Resilience assessments and their application in planning need to be conducted with close attention to planning process, management regime and jurisdiction

- Biodiversity conservation and fisheries management the most obvious applications of coral reef resilience data. Coastal tourism and land-use planning also relevant

- Marine Spatial Planning offers an opportunity to reduce negative impacts on coral reefs from marine uses
Much indicator development has been carried out. Some resilience indicators primarily have application in coral reef science.

- Some further work is recommended e.g.
  - defining indicators/metrics for widespread use in planning or management processes
  - attention to potentially important areas and processes such as depth refugia
  - potential new resilience indicators identified through research, e.g. wave exposure
  - development of resilience index or indices drawing on readily accessible data (factors that stress corals; properties that promote stress resistance or growth)

- Improving prospects for broad adoption and use, e.g. modest data acquisition cost; easy to measure; draw on and integrate with ongoing monitoring

- Indicators and analytical outputs should be relevant to planning or management decisions

- Critical need for guidance on how to select and use the most appropriate resilience indicators depending on context
Enhancing utility and use of existing data

A more structured approach to utilizing existing data sources needed, to enable broader, consistent resilience analyses and guide and strategically target in situ surveys

• Need to enhance access to existing ‘predictive’ resilience data. Much exists but is scattered and/or can’t be immediately drawn into an analysis
• E.g. developing system/interface that would provide access to
  • temperature variability and anomalies, past and predicted
  • bathymetry, geomorphology
  • currents, upwelling
  • wave exposure
  • land-based loading, e.g. nutrient and sediment plumes
  • a post-millennium global coral reef layer using Landsat 8 (if feasible)
• e.g. NOAA; UNEP-Live; UNEP-WCMC; Reefbase

• Need to strengthen links between monitoring and resilience assessment
  • Structured approach for using monitoring data, e.g. evidence of past impact and recovery
  • Including relevant resilience indicators in monitoring protocols, where possible
Pilot implementation

Pilot studies to map coral reef resilience at different spatial scales are needed.

- E.g. using a nested approach from regional to national to sub-national level:
  - Regional maps of relative/predicted resilience drawing on existing GIS datasets
  - More detailed resilience mapping at national/subregional scale encompassing additional indicators, drawing on existing data (RS, in situ, secondary)
  - Detailed resilience assessment at subnational/local level for site level planning

- Pilot testing will identify and organize available data, and support acquisition of additional/new resilience data as may be required for specific applications

=> Support and strengthen

- networking among institutions and practitioners in relation to resilience assessment, data sharing and joint analyses
- sharing of case studies and lessons learned
- uptake and use in planning
Resilience in Spatial Planning

Growing use of MSP provides opportunities to plan reef management within a cross-sectoral process.

Guidance document to synthesize:
- information on resilience science
- how it is or can be used in spatial planning to achieve both conservation and sustainable use objectives, and
- provide guidance and key considerations, including identifying ‘entry points’ and practical steps

=> Define areas for protection
- safeguard key processes, protect refugia
- sustain delivery of ecosystem services

=> Define management required within various zones
- identify key resilience drivers
- prioritization of interventions
- trade-off analysis and risk spreading
Mesophotic reefs and their resilience to climate change and human impacts
UNEP, GRID-Arendal, JCU and others. In prep, for release Q1 2015

Emerging issues – e.g. mesophotic reefs

Coral reefs that sustain low impact from land and occur in water that is naturally cooled are more likely to survive climate change.

Mesophotic reefs occur from 30m to beyond 100m, i.e. they are buffered from many human and natural disturbances and may provide a source of reseeding and recovery.

Mesophotic reefs are widespread and diverse, but largely uninvestigated => currently not considered in conservation planning, marine zoning, sectoral policies etc.

Technical report to raise awareness, bring science to policy and management, and catalyse further work.

Bridge et al 2013 Nature Climate Change doi:10.1038/nclimate1879
UNEP - RSCAP coral reef partnership

Follow-up to recommendations and priorities identified

Collaboration with technical partners including ICRI members

Reporting on progress to ICRI GM 30