Florida Keys National Marine Sanctuary
Condition Report 2011

Ecosystem Protection Working Group
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Marathon Garden Club

Scott Donahue, Joanne Delaney, Brenda Altmeier, Billy Causey, Sarah Fangman, Brian Keller, Kathy Broughton, Steve Gittings, Vernon R. Leeworthy, Michelle Johnston

http://floridakeys.noaa.gov/scipublications/condition.html
Florida Keys National Marine Sanctuary and Protection Act – 1990 (Passed By US Congress)

- 2900 nm²
- Jurisdiction to mean high tide
- Surrounds Florida Keys
- Co-trustee Management with State of Florida
- 60% State Waters
- 40% Federal Waters
- Management Plan implemented in 1997
- 1600 Keys / 1800 miles of shoreline
FKNNMS Condition Report was the logical progression from existing reporting tools.
General details of the report

- Executive-level summary
- 17 questions standard among all sanctuaries
- Workshops with experts to answer questions
- Formal review process
- Revisited prior to Management Plan updates (~ 5 years)
17 Standard Questions

1. Are specific or multiple stressors, including changing oceanographic and atmospheric conditions, affecting water quality?
2. What is the eutrophic condition of sanctuary waters and how is it changing?
3. Do sanctuary waters pose risks to human health?
4. What are the levels of human activities that may influence water quality and how are they changing?
5. What is the abundance and distribution of major habitat types and how is it changing?
6. What is the condition of biologically-structured habitats and how is it changing?
7. What are the contaminant concentrations in sanctuary habitats and how are they changing?
8. What are the levels of human activities that may influence habitat quality and how are they changing?
9. What is the status of biodiversity and how is it changing?
10. What is the status of environmentally sustainable fishing and how is it changing?
11. What is the status of non-indigenous species and how is it changing?
12. What is the status of key species and how is it changing?
13. What is the condition or health of key species and how is it changing?
14. What are the levels of human activities that may influence living resource quality and how are they changing?
15. What is the integrity of known maritime archaeological resources and how is it changing?
16. Do known maritime archaeological resources pose an environmental hazard and is this threat changing?
17. What are the levels of human activities that may influence maritime archaeological resource quality and how are they changing?
Standardized Question Ratings

Living Resources

Biodiversity

9. What is the status of biodiversity and how is it changing?

This is intended to elicit thought and assessment of the condition of living resources based on expected biodiversity levels and the interactions between species. Intact ecosystems require that all parts not only exist, but that they function together, resulting in natural symbioses, competition, and predator-prey relationships. Community integrity, resistance and resilience all depend on these relationships. Abundance, relative abundance, trophic structure, richness, H' diversity, evenness, and other measures are often used to assess these attributes.

- **Good**: Biodiversity appears to reflect pristine or near-pristine conditions and promotes ecosystem integrity (full community development and function).
- **Good/Fair**: Selected biodiversity loss has taken place, precluding full community development and function, but it is unlikely to cause substantial or persistent degradation of ecosystem integrity.
- **Fair**: Selected biodiversity loss may inhibit full community development and function, and may cause measurable but not severe degradation of ecosystem integrity.
- **Fair/Poor**: Selected biodiversity loss has caused or is likely to cause severe declines in some but not all ecosystem components and reduce ecosystem integrity.
- **Poor**: Selected biodiversity loss has caused or is likely to cause severe declines in ecosystem integrity.

**TRENDS:**

- Improving to the next category .......... ▲
- Not Changing .... —
- Undetermined ............................. ?
- Declining to the next category ........ ▼
- Not applicable ............................. N/A
Condition Report Layout

- Overview
- Site History & Resources
- Pressures (Stressors & Issues) on the Sanctuary
- Status & Trends (State) of Sanctuary Resources
- Sanctuary’s Response to Pressures
- Literature Cited
- Appendices - Explanation of Questions and Process to develop report
Pressures on Resources

Habitat Destruction

Intense Coastal Development

Massive Algal Blooms

Nutrients from Pollution

Wastewater Nutrients

Introduction of Marine Exotics

Coral Diseases

Overfishing

Stormwater Runoff
Pressures to FKNMS Resources

- Point Sources of Pollution
- Non-point Sources of Pollution
- Swimming Activities
- External Inputs
- Harmful Algal Blooms
- Marinas and boats
- Live-Aboard Vessels

- Mosquito Control
- Cruise Ships
- Fishing Pressures
- Coral Bleaching
- Climate Change
- Diseases of Marine Organisms
- Coastal Development
- Non-Indigenous Species
- Marine Debris

- Military Use
- Artificial Reefs
- Weather Disturbances
- Poaching
- Treasure Hunting
State of Water Quality
(focus of Water Quality Protection Program)

<table>
<thead>
<tr>
<th>Status and Trends</th>
<th>Basis for Judgment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stressors</td>
<td>Large-scale changes in flushing dynamics over many decades have altered many aspects of water quality; nearshore problems related to runoff and other watershed stressors; localized problems related to infrastructure.</td>
</tr>
<tr>
<td>Eutrophic Condition</td>
<td>Long-term increase in inputs from land; large, persistent phytoplankton bloom events, many of which originate outside the sanctuary but enter and injure sanctuary resources.</td>
</tr>
<tr>
<td>Human Health</td>
<td>Rating is a general assessment of “all waters” of the sanctuary, knowing that in very specific locations, the rating could be as low as “poor.” Increased frequency of HABs and periodic swim advisories.</td>
</tr>
<tr>
<td>Human Activities</td>
<td>Historically, destructive activities have been widespread throughout the Florida Keys, but many recent management actions are intended to reduce threats to water quality.</td>
</tr>
</tbody>
</table>
State of Maritime Archaeological Resources (not the focus of this Working Group)

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<tr>
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<tr>
<td>Integrity</td>
<td>▼</td>
<td>Resources are non-renewable and are subject to deterioration or loss resulting from looting, chemical processes, shifting sediments, marine life, fishing gear entanglement and vessel groundings (the last two are increasing in frequency).</td>
</tr>
<tr>
<td>Threat to Environment</td>
<td>—</td>
<td>Movement of sunken vessels during storm threatens nearby resources.</td>
</tr>
<tr>
<td>Human activities</td>
<td>▼</td>
<td>Reports of looting and vessel grounding cases involving potential resources are increasing.</td>
</tr>
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</table>
## State of Habitat

(focus of this Working Group)

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<td>Abundance/Distribution</td>
<td>—</td>
<td>In general, mangrove and benthic habitats are still present and their distribution is unchanged, with the exception of the mangrove community, which is about half of what it was historically. The addition of causeways has changed the distribution of nearshore benthic habitats in their vicinity.</td>
</tr>
<tr>
<td>Structure</td>
<td>▼</td>
<td>Loss of shallow (&lt;10 meters) <em>Acropora</em> and <em>Montastreae</em> corals has dramatically changed shallow habitats; regional declines in coral cover since the 1970s have led to changes in coral-algal abundance patterns in most habitats; destruction of seagrass by propeller scarring; vessel grounding impacts on benthic environment; alteration of hard-bottom habitat by illegal casitas.</td>
</tr>
<tr>
<td>Contaminants</td>
<td>?</td>
<td>Few studies, but no synthesis of information.</td>
</tr>
<tr>
<td>Human Activities</td>
<td>▼</td>
<td>Coastal development, highway construction, vessel groundings, over-fishing, shoreline hardening, marine debris (including derelict fishing gear), treasure salvaging, increasing number of private boats, and consequences of long-term changes in land cover on nearshore habitats.</td>
</tr>
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</table>
Habitat

Abundance/Distribution

Benthic Habitat
- Patch Reefs
- Platform Margin Reefs
- Continuous Seagrass
- Patchy Seagrass
- Hardbottom
- Bare Substrate
- Unknown Bottom
- Land

Photo: FWC
Habitat

Structure

(Source: adapted from Gardner et al. 2003)
Habitat

Contaminants

Mosquito control?

Pharmaceuticals and other Endocrine Disruptors?

- Estradiol
- Testosterone
- Thyroid Hormones

Human Activities

Habitat

Number of Vessel Registrations
- Commercial
- Recreational

Florida

Population in Millions
- Florida
- Broward County
- Dade County
- Monroe County
- Palm Beach County
State of Living Resources  
(focus of this Working Group)

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<td>Biodiversity</td>
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<td>Relative abundance across a spectrum of species has been substantially altered, with the most significant being large reef-building corals, large-bodied fish, sea turtles, and many invertebrates, including, the long-spined sea urchin. Recovery is questionable.</td>
</tr>
<tr>
<td>Environmentally Sustainable Fishing</td>
<td>?</td>
<td>Historical effects of recreational and commercial fishing and collection of both targeted and non-targeted species; it is too early to determine ecosystem effects of new fishery regulations and new ecosystem approaches to fishery management.</td>
</tr>
<tr>
<td>Non-indigenous species</td>
<td>▼</td>
<td>Several species are known to exist; lionfish have already invaded and will likely cause ecosystem level impacts; impacts of other non-indigenous species have not been studied.</td>
</tr>
<tr>
<td>Key species</td>
<td>—</td>
<td>Reduced abundance of selected key species including corals (many species), queen conch, long-spined sea urchin, groupers and sea turtles.</td>
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### State of Living Resources - continued (focus of this Working Group)

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<td>Health of Key Species</td>
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<td>Hard coral and gorgonian diseases and bleaching frequency and severity have caused substantial declines over the last two decades; long-term changes in seagrass condition; disease in sea turtles; sponge die-offs; low reproduction in queen conch; cyanobacterial blooms; lost fishing gear and other marine debris impacts on marine life.</td>
</tr>
<tr>
<td>Human Activities</td>
<td></td>
<td>Despite the human population decrease and overall reduction in fishing in the Florida Keys since the 1990s, heavy recreational and commercial fishing pressure continues to suppress biodiversity. Vessel groundings occur regularly within the sanctuary. Annual mean number of reported petroleum and chemical spills were around 150 during that time period, with diesel fuel, motor oil, and gasoline representing 49% of these incidents collectively. Over the long term, localized direct impacts may be overwhelmed by the adverse and wide-ranging indirect effects of anthropogenic climate change resulting in sea level rise, abnormal air and water temperatures, and changing ocean chemistry.</td>
</tr>
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Living Resources

Biodiversity

Marine Life landings 2006-2009

Source: FWC

CREMP 2010 Executive Summary

- M. annularis
- M. cavernosa
- S. siderea
- P. astreoides
- C. natans
- A. palmata

- Stony Coral
- Macroalgae
- Octocoral
- Sponge

Percent Cover (%)
5/18/2011 – Fishers on spawning aggregation off Western Dry Rocks

Credit: FWC
Non-indigenous species

Photo: Joyce and Frank Burek

Photo by J. Randall, Bishop Museum
Living Resources

Key species
Living Resources

Human Activities

Fuel Spill
Photo: FWC

Illegal casitas
Appendix A - The National Marine Sanctuaries Act

Title 16, Chapter 32, Sections 1431 et seq, United States Code
As amended by Public Law 106-583, November 2000

Appendix B - The Florida Keys National Marine Sanctuary and Protection Act
Public Law 101-605 (H.R. 5909)

Appendix C - FKNMS Regulations

§ 922.160 Purpose
(a) The purpose of this part is to regulate and control activities that could contribute to the degradation of the Florida Keys National Marine Sanctuary.
Responses to Pressures

Florida Keys
National Marine Sanctuary
Revised Management Plan

December 2007

U.S. Department of Commerce
National Oceanic and
Atmospheric Administration
National Ocean Service
National Marine Sanctuary Program

NOAA's Florida Keys National Marine Sanctuary

- Florida Keys National Marine Sanctuary (FKNNMS)
- National Park Boundaries
- DHA Research Natural Area
- FKNMS Tortugas Bank NO Anchoring Area
- John Pennekamp Coral Reef State Park
- Florida State Waters
- Area To Be Avoided (50 meters or greater LOA)
- FKNMS Sanctuary Preservation Areas
- FKNMS Ecological Reserves
- FKNMS Existing Management Areas
- USFWS National Wildlife Refuges
Responses to Pressures

Blue Star Operator
Committed to Coral Conservation

DOLPHIN SMART

Responses to Pressures

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Responses to Pressures
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Responses to Pressures

- Water Quality Protection Program
- Marine Zoning
- Regulations Prohibiting Discharge Sanctuary-wide
- PSSA designation (2002)
- Florida’s “Healthy Beaches”
- MEERA
- Law Enforcement
- Mooring Buoys
- Education and Outreach
- Marine Debris Removal
- Habitat Restoration
- Prohibition of Mineral & Hydrocarbon Exploration
- Large Ship Navigation Beacons
- Permitting Program

- BleachWatch
- Dolphin SMART
- Blue Star
- Spill Preparedness Drills
- Florida Reef Resilience Program Partner
- Vessel Grounding Assessments and Coral Rescue
- ATBA
- Advanced Wastewater Treatment for Monroe County by 2015
- Changing Fishing Regulations
Responses to Management

Bohsack et al., 2009
Responses to Management

Photo: J. Luo

Photo: C. Parsons
Summary

• This is the first Condition Report for the FKNMS.

• The status and trends of FKNMS resources reflect it inherited a compromised ecosystem from more than a century of pressures.

• There are many successes in the relatively short time frame of management.

• We still have a long way to go…
If we want to succeed, these have to change…

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