Marine Spatial Planning from an Ecosystem-Based Management Perspective in Florida, USA

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Largest coral reef system in the continental United States
- ~500 km long
- ~6,000 marine species
- ~400 maritime heritage sites and artificial reefs

6.7 million residents and $4.4 billion sales

Multiple jurisdictions and management areas
- County level
- State Parks
- National Parks (NP)
  - Biscayne NP, Everglades NP, Dry Tortugas NP
- Florida Keys National Marine Sanctuary (FKNMS)
Current Planning Activities

Florida Fish and Wildlife Conservation Commission (FWC)

- Manage fish and wildlife for long-term well-being
- Requires an ecosystem-based management approach
- Extensive monitoring and modeling programs

https://floridakeys.noaa.gov/blueprint/
Current Planning Activities

Florida Fish and Wildlife Conservation Commission (FWC)

FKNMS recognized a need to re-zone existing managed areas
- FWC is one of many stakeholders
- “Existing marine zones and management plan activities designed and implemented by FKNMS in the mid-1990s are no longer sufficient to ensure long-term resource protection and ecosystem function into the future.”

(FKNMS Restoration Blueprint 2019)
Current Planning Activities

FKNMS re-zoning *and reporting* needs
- GIS support
- What is the status of biological resources?
- How will new zones impact biological resources?
- Assistance with data volume

Addressing needs
- Form strategic partnerships
- Promote data standards and visualization
- Create models that inform spatially explicit ecosystem dynamics

Illustration courtesy of F. Chavez/K. Lance (Monterey Bay Research Institute/MBARI)
Partnerships

MBON
Marine Biodiversity Observation Network

Promotes systematic, long-term observation of marine biology and ecosystems across taxonomic, spatial and temporal scales.

◦ Improves our understanding of changes and connections between marine biodiversity and ecosystem functions.
◦ Consists of regional networks of scientists, managers, end-users
◦ Thematic node within the Group on Earth Observations (GEO) Biodiversity Observation Network; US MBON supported by NOAA Integrated Ocean Observing System (IOOS) Office

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Data Visualization

Working within MBON allowed us to:

◦ Combine complex spatially explicit information via interactive data portals
◦ Combine in situ and satellite data across scales
  ◦ 2010 was an unusually cold year, why?
  ◦ Loop current was ‘restricted’
  ◦ High coral mortality
◦ Consider regional factors and time dynamics

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Ecosystem Models

Contrast management zoning strategies and identify indirect trophic effects

Ecopath with Ecosim and Ecospace

- Accessible ecosystem model with active user base
- Aggregate species into trophic groups
  - Requires diets, consumption, production, biomass, and catch
- New capabilities integrate GIS and ecosystem modeling (Steenbeek et al. 2013)
  - Predict species distributions in monthly time steps in response to dynamic environmental factors (chlorophyll $a$, temperature), and management zones
- Identify data gaps and research priorities
  - E.g., movement and effort

Steenbeek et al. (2013) Ecological Modelling 263, 139-151.
Moving Forward

Space-time data visualizations and ecosystem models are technical solutions to informing marine spatial planning from an ecosystem perspective

- Data portals, models, visualizations are fluid
- Combining data is time intensive

Sustaining an ecosystem-based management perspective in MSP

- Maintain feedback from an effective network of managers, scientists, and end-users to understand needs
  - Follow-up, technical workshops, delegate travel funds, etc.
- Promote data standards and best practices
  - Quality control, metadata, access, ownership, and attribution
Resources

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Florida Keys National Marine Sanctuary Restoration Blueprint
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