Integrated Ecosystem Assessment (IEA): Overview

Chris Harvey
NOAA NWFSC, Conservation Biology Division

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Marine ecosystems are integrated socio-ecological systems

INTEGRATED SOCIO-ECOLOGICAL SYSTEM OF THE CALIFORNIA CURRENT

FOCAL ECOSYSTEM COMPONENTS
- Ecological Integrity: Diversity, Seabirds, Marine mammals, Salmon, Forage species, Groundfish, Species interactions
- Human Wellbeing: Conditions, Connections, Capabilities (e.g., safety, community, livelihood)

MEDIATING COMPONENTS
- Habitat: Marine, Estuarine, Freshwater
- Local Social Systems: (e.g., laws, policies, economies, institutions, social networks, hierarchies, cultural values, built environment)

DRIVERS AND PRESSURES
- Climate & Ocean Drivers: (e.g., climate, ocean upwelling)
- Social Drivers: (e.g., population growth and settlement patterns, national and global economic and political systems, historical legacies, dominant cultural values, and class systems)

Human Activities: (e.g., fishing, farming, mining, recreation, research, education, activism, restoration, management)
What is IEA?

  - “a framework for organizing science in order to inform decisions in marine ecosystem-based management”
  - “a formal synthesis and quantitative analysis of information on relevant natural and socioeconomic factors, in relation to specified ecosystem management objectives”
  - Emphasis is on the framework, tools and products rather than “the IEA program” (Harvey et al. 2017, ICES J Mar Sci)
The IEA Framework
SCOPING EFFORTS and CONCEPTUAL MODELS frame the issues. Is the ecosystem “healthy”?

Screen appropriate INDICATORS. Field and remote data provide indices on STATUS AND TRENDS.

How vulnerable is the ecosystem to human uses and natural perturbations?

SCENARIO MODELING generates estimates of outcomes and tradeoffs from different mgmt actions.

RISK ASSESSMENT quantifies and ranks threats to humans and natural resources.

What are the management options?

How does the ecosystem respond to human uses and natural perturbations?

RISK ASSSESSMENT quantifies and ranks threats to humans and natural resources.

ACTIONS are taken and evaluated, and then the next iteration of the IEA loop begins.

Exposure Sensitivity

LOW RISK HIGH RISK

What are the management options?

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For example...

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Samhouri et al., in prep
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MANAGEMENT STRATEGY EVALUATION: we have operational models that could be used to explore climate-driven scenarios and tradeoffs in ecology and socioeconomics

**ATLANTIS ecosystem model** (Isaac Kaplan)

Kaplan et al., in press
IEA engagement with management partners
California Current IEA team engagement with the PFMC in FY17

1. Annual ecosystem status report, March 2017
   • Highlighted the decline of the Warm Blob and El Niño, and described observed & anticipated ecological responses
   • Presented status and trends of indicators of key species, fisheries, non-fishing human activities, and social vulnerability of coastal communities

2. Technical reviews of CCIEA analyses and products by SSC
   • Time series analyses of several indicators
   • Detection of ecosystem thresholds and early warning indexes
   • Fishery participation under changing climate (Dan Holland)

3. Described climate and food web drivers of sablefish recruitment

4. Assisting with development of the EBFM Road Map and the Regional Action Plan for climate science

5. Forthcoming FEP initiative will likely involve focus on climate change and/or coastal communities
IEA engagement with management partners

Tribal Communities
- Examining impacts of ocean acidification on tribal communities **(Melissa Poe)**

State of Washington
- Developing conceptual models and indicators for marine spatial planning
- Supporting Puget Sound Partnership with EBM and restoration of Puget Sound

CA Drift Gillnet Fishery
- Providing fishers with near-real time estimates of likelihood of protected species bycatch

West Coast Regional Office
- Assessing human-marine mammal interactions

National Marine Sanctuaries
- Developing conceptual models
- Quantitative indicators for Condition Reports
- Risk assessments

*Image: Su Kim*
Looking forward

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  - In particular, risk assessments and scenario analyses that emphasize outcomes and tradeoffs spanning ecological and social domains
- IEA science will be a key part of new agency initiatives, and hopefully become a more common framework for doing NOAA science

The six “Guiding Principles” of the NOAA EBFM Road Map
Questions and Discussion

Chris.Harvey@noaa.gov