Model Evaluations of April 2008 North Central Coast MPA Proposals

MLPA Master Plan Science Advisory Team
Modeling Sub-team

MLPA I-team staff, Bjorkstedt, Botsford, Costello,
Gaines, Hilborn, Walters, White

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Dr. Christopher Costello*

*Bren School, UC Santa Barbara
Costello@bren.ucsb.edu

Basic model features

- Spatially-explicit habitat data, MPA locations, larval dispersal, adult home range, dynamics to equilibrium
- Predict equilibrium spatial larval supply, biomass, harvest

- <u>Critical question</u>: Future management in open areas?
- <u>Scenarios considered</u>:
    1. Conservative (both models)
    2. Maximum Sustainable Yield (MSY) -type (both models)
    3. Unsuccessful (both models)
    4. Current management as predictor of future (UCD only)
    5. Spatially optimized for economic returns (EDOM only)

Changes from last time…

- Presented results at BRTF meeting in April
- Key changes/additions
  - Scaled results so could easily discern differences among proposals - all are relative to Proposal 0
  - Added spatial results from both models over a range of fishery management scenarios
- Added Integrated Preferred Alternative to the comparison

Proposal evaluations

- Four evaluations for each proposal
  1. Study-area-wide effects on <u>biomass</u> for range of species
     - Change from Proposal 0, as % of unfished biomass
  2. Study-area-wide effects on <u>yield</u>
     - Change from Proposal 0, as % of optimal yield
  3. <u>Tradeoff</u> between yield and biomass
  4. <u>Spatial</u> effects on fish populations – generate monitoring predictions?
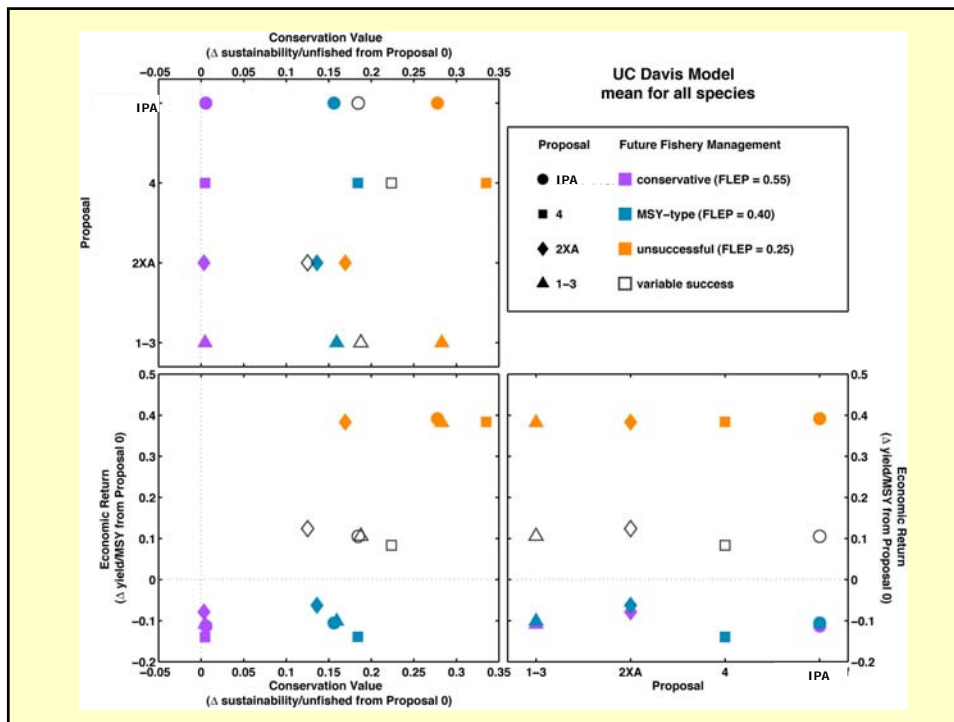
Summary of UC Davis model

- Ranking for conservation value (1 is best):
    - (1) Prop 4, (2-3) IPA/Prop 1-3, (4) Prop 2-XA
    - Differences tend to diminish as management outside becomes more conservative
    - If management very conservative, all proposals equal.
- Ranking for yield
    - (1) Prop 2-XA, (2-3) IPA/Prop 1-3, (4) Prop 4
    - If management very unsuccessful, all proposals equal
- Yield/Biomass tradeoff:
    - Integrated Preferred Alternative not obviously off of the "frontier"
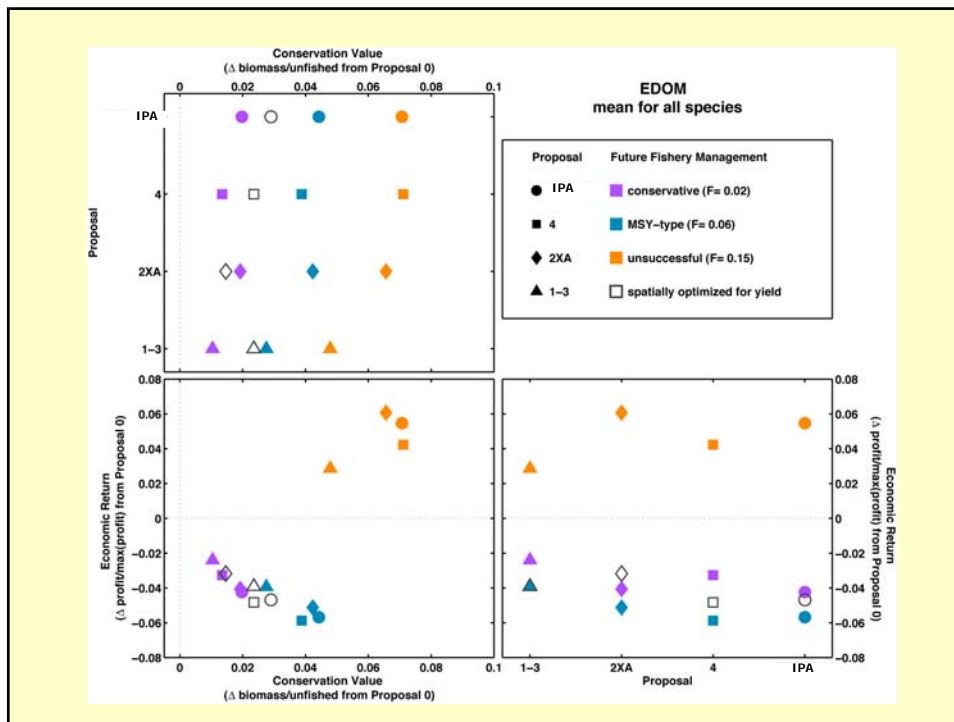
Summary of EDOM Model

- Ranking for conservation value – depends on future fishery management scenario:
  - Conservative/MSY: (1) IPA, (2) Prop 2-XA, (3) Prop 4, (4) Prop 1-3
  - Optimize Profit: (1) IPA, (2) Prop 4, (3) Prop 1-3, (4) Prop 2-XA
  - Unsuccessful: (1) Prop 4, (2) IPA, (3) Prop 2-XA, (4) Prop 1-3
- Ranking for yield – depends on future fishery management scenario:
  - Conservative: (1) Prop 1-3, (2) Prop 4, (3) Prop 2-XA, (4) IPA
  - MSY-type: (1) Prop 1-3, (2) Prop 2-XA, (3) IPA, (4) Prop 4
  - Optimize Profit: (1) Prop 2-XA, (2) Prop 1-3, (3) IPA, (4) Prop 4
  - Unsuccessful: (1) Prop 2-XA, (2) IPA, (3) Prop 4, (4) Prop 1-3
- Yield/Biomass tradeoff
 - Integrated Preferred Alternative tends to push "frontier" outwards

Spatial results

- What are spatial implications for conservation?
- MPA size and placement interacts with habitat, dispersal, home ranges to create complex spatial consequences.
- Use spatially-explicit models to predict:
  - Larval supply across space (UCD Model)
  - Biomass of modeled fish species across space (EDOM Model)
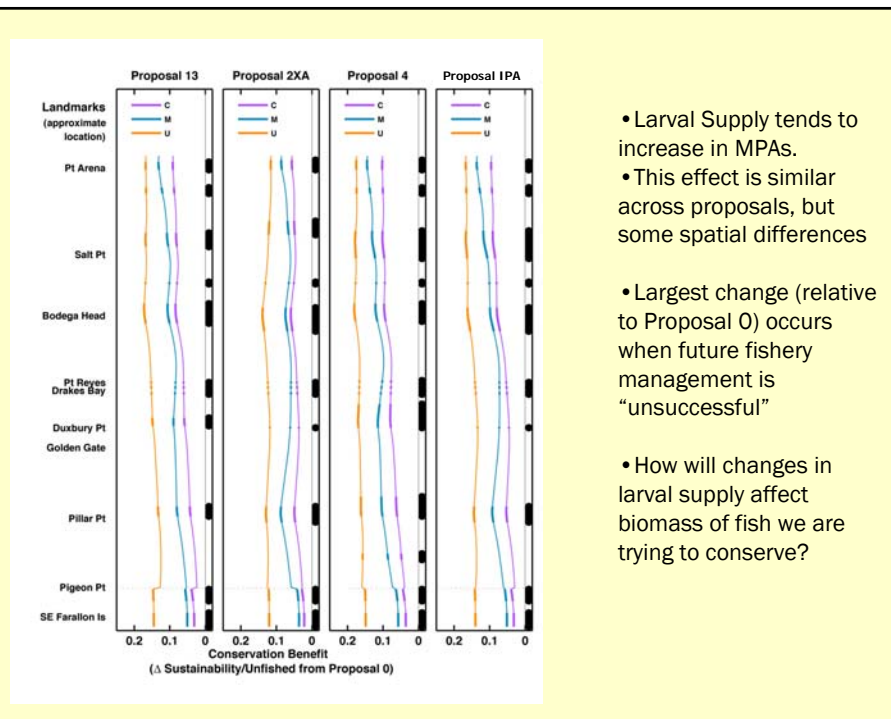
- Larval Supply tends to increase in MPAs.
- This effect is similar across proposals, but some spatial differences

- Largest change (relative to Proposal 0) occurs when future fishery management is "unsuccessful"

- How will changes in larval supply affect biomass of fish we are trying to conserve?
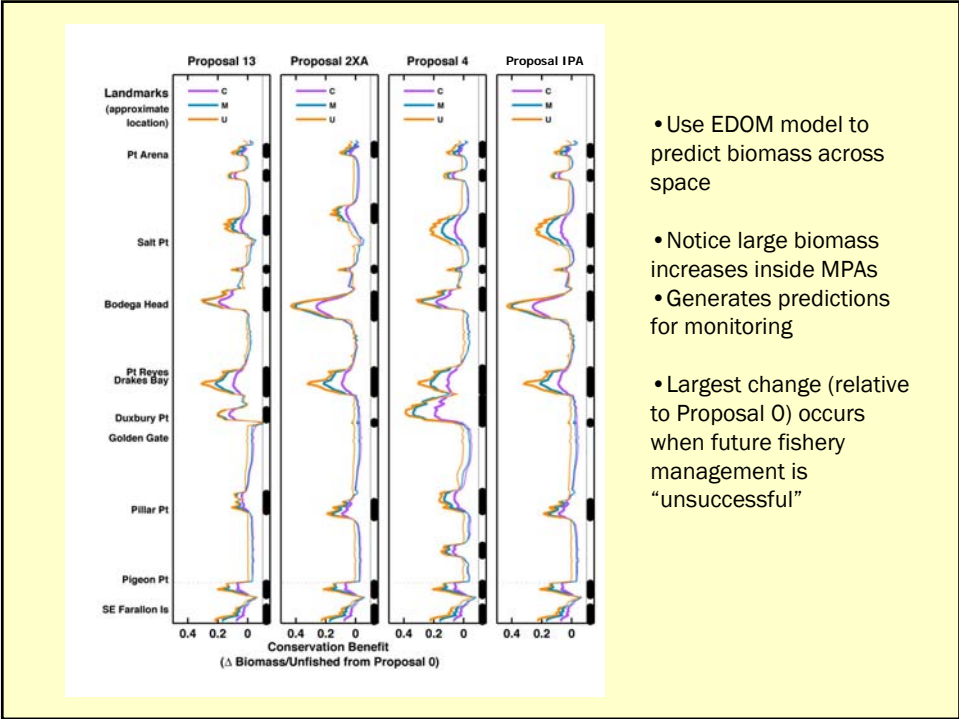
- Use EDOM model to predict biomass across space

- Notice large biomass increases inside MPAs
- Generates predictions for monitoring

- Largest change (relative to Proposal 0) occurs when future fishery management is "unsuccessful"