Model Evaluations of April 2008
North Central Coast MPA Proposals

MLPA Master Plan Science Advisory Team
Modeling Sub-team

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Basic model features

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

Critical question: Future management in open areas?

Scenarios considered:
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 biomass for range of species
     - Change from Proposal 0, as % of unfished biomass
  2. Study-area-wide effects on yield
     - Change from Proposal 0, as % of optimal yield
  3. Tradeoff between yield and biomass
  4. Spatial 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”