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Marine Life Protection Act Initiative

Spatial Bioeconomic Model Evaluations of Round 2 Proposed MPA Arrays for the MLPA North Coast Study Region

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Model Description

- Models simulate population dynamics
- Model inputs include:
  - Life history characteristics of modeled species
  - Larval dispersal predicted by ocean currents
  - Habitat data
  - Spatial fishing effort
- Models consider outcomes of three management scenarios:
  - Conservative management
  - Maximum Sustainable Yield (MSY)-type management
  - Unsuccessful management

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Model Description

- For Round 2 model results run by:
  - University of California, Santa Barbara (UCSB)
- For Round 2, six core species were modeled:
  - Black rockfish
  - Brown rockfish
  - Cabezon
  - Redtail surfperch
  - Red sea urchin
  - Red abalone
- For Round 2, the modeling work group assumed that no uses were permitted in marine protected areas (MPAs) unless specifically identified by species and gear type.

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Round 2 Ancillary Results

- **Traditional tribal uses**: The SAT modeling work group also conducted a second partial evaluation assuming all recreational take was allowed in MPAs that proposed traditional tribal uses.
- **Home range movement**: Separate model runs also made using a different representation of adult movement within home ranges, similar to the University of California, Davis (UCD) model in Round 1. These runs produced identical overall rankings.
- **Dungeness crab**: Model outputs for Dungeness crab are presented separately and in the summary document. Because only male crabs are targeted in this fishery, the SAT modeling work group assumed that there is no feedback between fishing and larval production.

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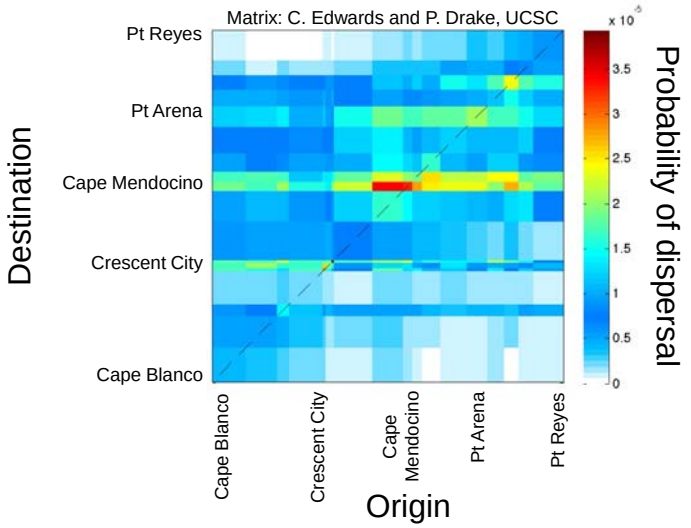
Oceanographic Dispersal Matrix

Matrix for black rockfish (2000-2006 average)



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Model Outputs

- **Biomass**
  - Spatial distribution of biomass
  - Total biomass (summed over study region, weighted sum across species)
- **Fishery Value**
  - Spatial distribution of fishery yield
  - Total fishery yield (summed over study region, weighted sum across species)

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Model Results: Black Rockfish Biomass

- Map represents predicted spatial distribution of biomass
- Outputs available for each:
  - 7 model species
  - 4 proposals
  - 3 management scenarios
- Maps and tables are posted online for:
  - Biomass
  - Fishery yield
  - Fishing effort
  - Larval production
  - Biomass contribution of each MPA (deletion analysis)

Biomass relative to unfished

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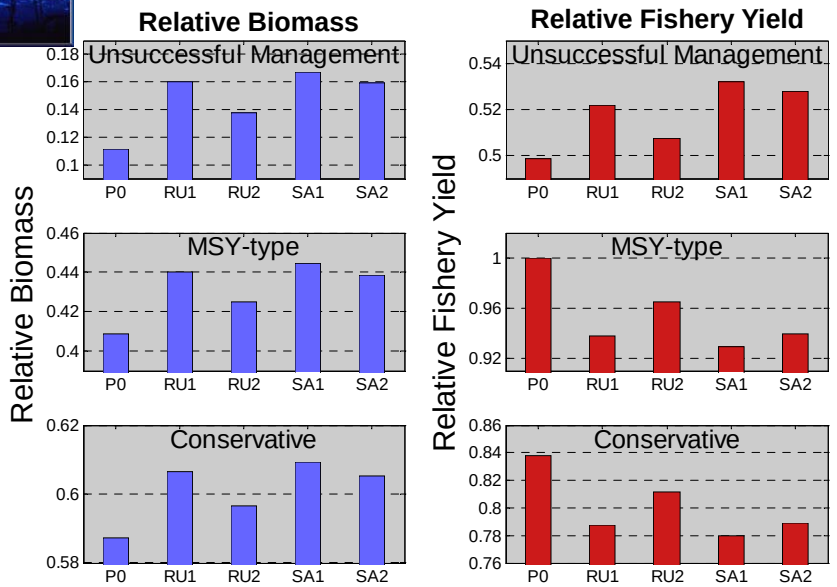
Model Outputs: With Specified Take



Round 2, UCSB Model – Results assuming that no uses are permitted unless proposed by species and gear type

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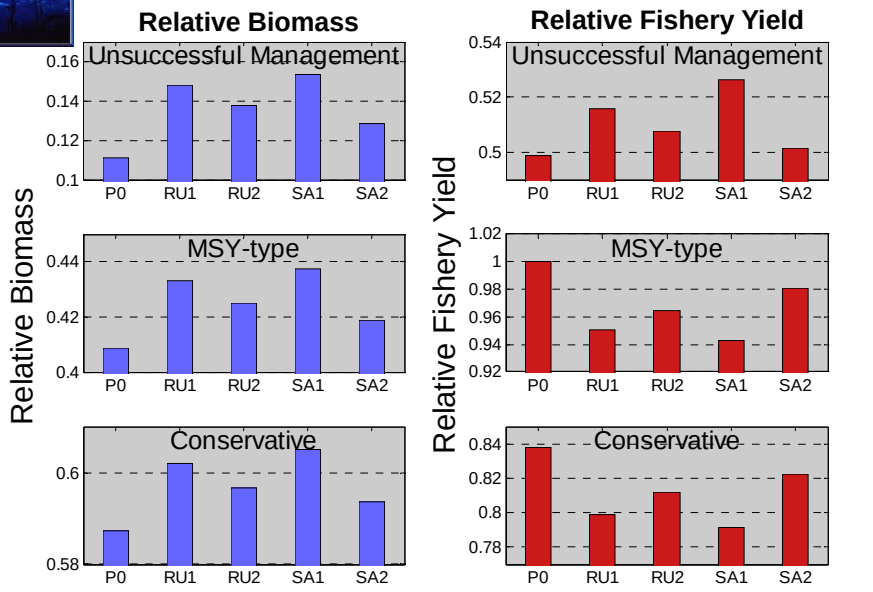
Model Outputs: Additional Recreational Take



Round 2, UCSB Model – Results assuming all recreational take is allowed in MPAs that proposed tribal uses

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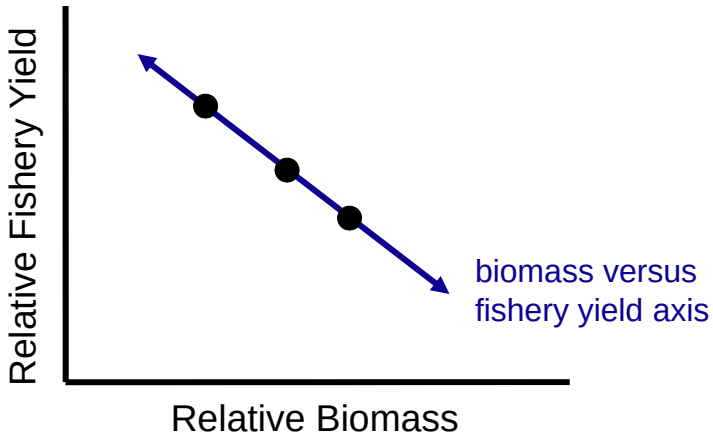
Model Results: Rankings in Context



- Choice along this axis is a matter of priorities, not science
- Models can put the options in context

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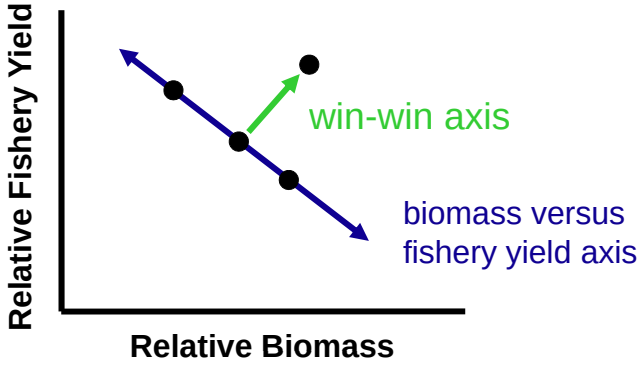
Model Results: Rankings in Context



- Models can reveal where one proposal performs better than another for the species modeled
- Differences are most apparent under assumption of unsuccessful management

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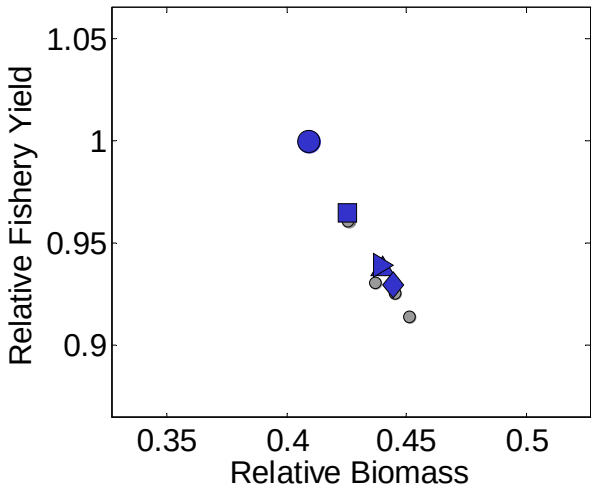
Results: MSY-type Management

*MSY is Maximum Sustainable Yield



P0 ● **RU1** ▲ **RU2** ■ **SA1** ♦ **SA2** ▶

Smaller grey dots indicate external MPA arrays from Round 1

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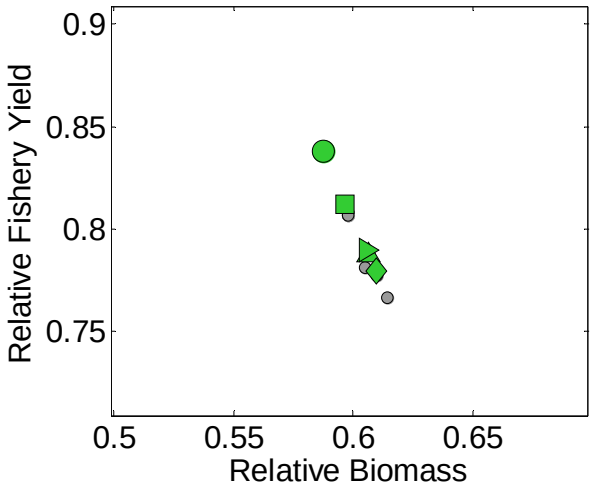
Results: Conservative Management



P0 **RU1** **RU2** **SA1** **SA2**

Smaller grey dots indicate external MPA arrays from Round 1

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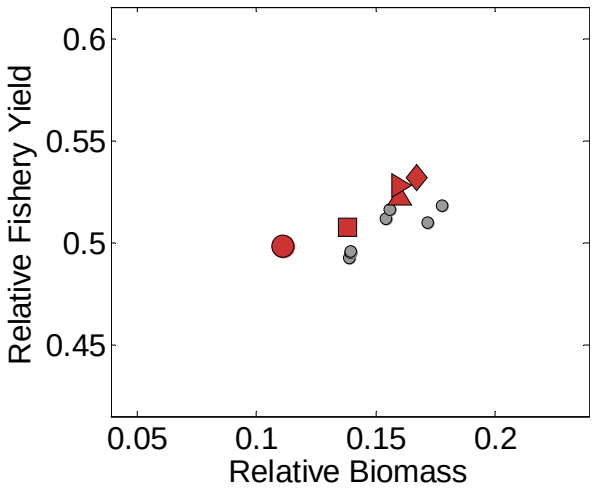
Results: Unsuccessful Management



P0 **RU1** **RU2** **SA1** **SA2**

Smaller grey dots indicate external MPA arrays from Round 1

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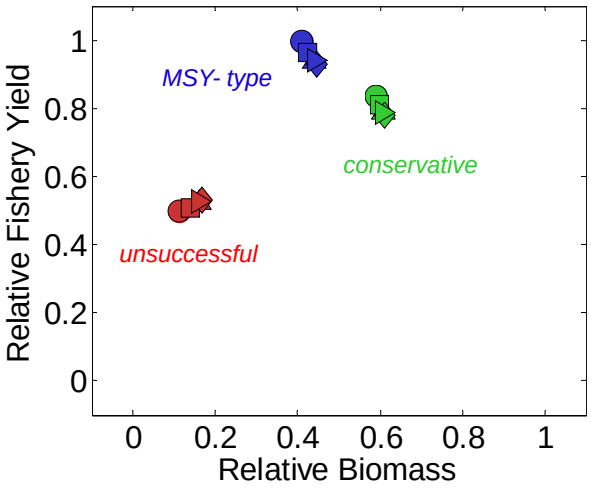
Results: Comparing Scenarios



P0 ● RU1 ▲ RU2 ■ SA1 ♦ SA2 ▶

Smaller grey dots indicate external MPA arrays from Round 1

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Conclusions

- Differences in assumptions about future fishery management influence biomass and fishery yield more than the differences among draft MPA proposals
- Assuming that no uses were permitted in MPAs unless described by species and gear type:
  - **Proposals SA1, RU1, and SA2** consistently had highest relative biomass
  - **Proposals SA1 and SA2** had highest relative fishery yield under unsuccessful management, while **Proposals P0 and RU2** had the highest relative fishery yield under MSY-type or conservative management

- Outputs focus on six species: Black rockfish, brown rockfish, cabezon, redtail surfperch, red abalone, and red sea urchin.

- Results for Dungeness crab were consistent with results for other species under conservative management.

Conclusions, continued

- Assuming that all recreational uses were permitted in MPAs that proposed traditional tribal uses
  - **Proposals SA1 and RU1** consistently had highest relative biomass
  - **Proposal SA1** had highest relative fishery yield under unsuccessful management, while **Proposal P0 and SA2** had the highest relative fishery yield under MSY-type or conservative management
  - **Proposal SA2** exhibited the greatest difference in results between the two assumptions regarding tribal uses
- All model outputs from Round 2 on website at www.dfg.ca.gov/mlpa/mpaproposals_nc.asp

- Outputs focus on six species: Black rockfish, brown rockfish, cabezon, redtail surfperch, red abalone, and red sea urchin.