

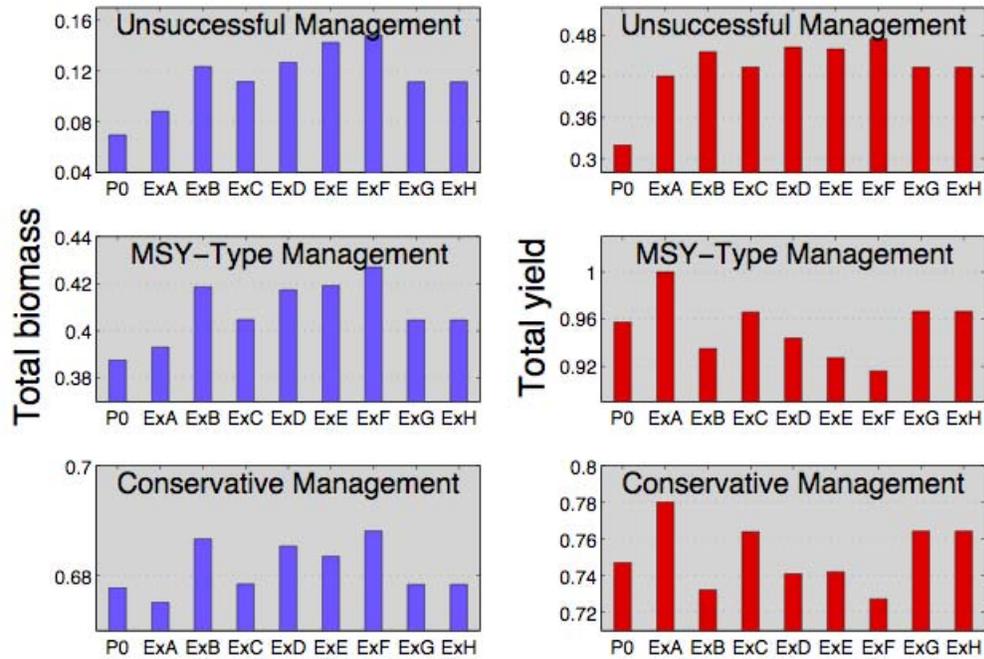
**California MLPA Master Plan Science Advisory Team**  
**Revised Round 1 Outputs from Bioeconomic Model Evaluation:**  
**Revised Figures and Graphs**  
*June 14, 2010 DRAFT*

**Why did the SAT modeling work group revise round 1 modeling evaluations?**

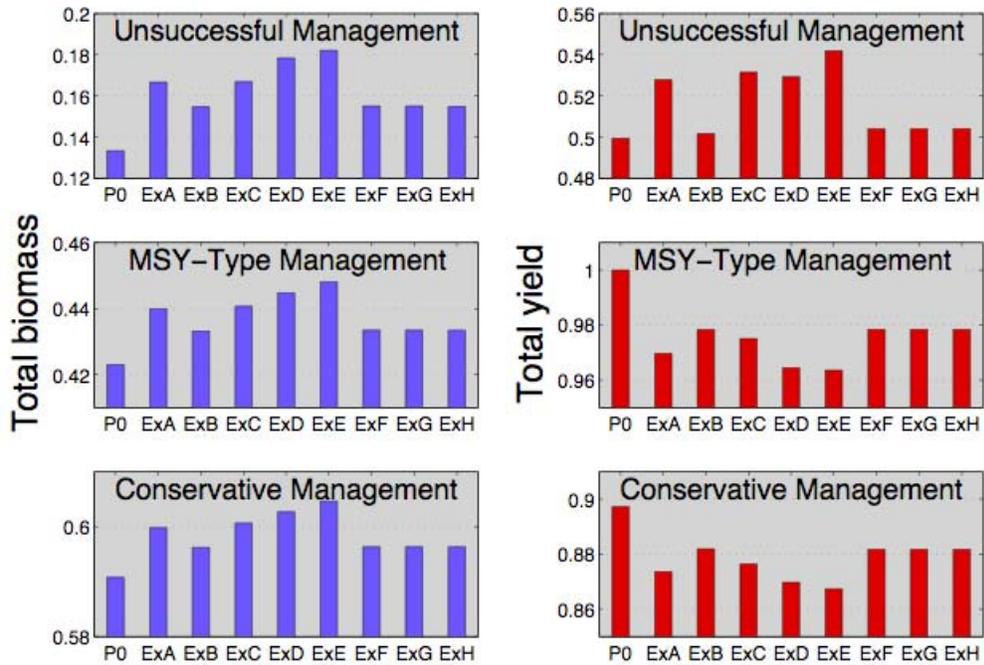
Round 1 bioeconomic modeling evaluations were rerun using the University of California, Santa Barbara (UCSB) and University of California, Davis (UCD) bioeconomic models. The revised round 1 modeling evaluations used the full set of fine-scale habitat maps available in the north coast study region, which better represent habitats in the region as compared to the habitat data used in the initial runs of the round 1 modeling evaluation. The revised round 1 modeling evaluations also used improved connectivity data, which allowed seven species to be evaluated, including black rockfish, brown rockfish, cabezon, redbay surfperch, Dungeness crab, red abalone, and red sea urchin. Results from the revised round 1 modeling evaluations are presented below.

**Revised Figures 1-6: Total Biomass and Total Fishery Yield.** Revised Figures 1-6 show total biomass and fishery yield predicted for each of six species for revised Round 1 evaluations of external marine protected area (MPA) arrays using the University of California, Santa Barbara (UCSB) and University of California, Davis (UCD) bioeconomic models. The total biomass of each species is estimated at equilibrium for each square kilometer of the study region. Values are scaled relative to total unfished biomass such that values of 0 indicate no biomass and values of 1 indicate maximum unfished biomass. Total yield is the total harvest of each species relative to maximum sustainable yield (MSY) of the species with the current set of MPAs (proposal 0). For revised round 1 evaluations, seven species were modeled: Black rockfish, brown rockfish, cabezon, redbay surfperch, Dungeness crab, red abalone, and red sea urchin. Due to the unique characteristics of the Dungeness crab fishery, this species is presented separately in Tables 7-8. Model results were calculated for 3 different fishery management scenarios; the results in this table are from the maximum sustainable yield (MSY)-type management scenario. Total biomass and yield are the average across these six modeled species. Due to limitations of the SAT's current evaluation methods, for revised round 1, proposed MPAs in external MPA array A were considered static rather than mobile. Traditional tribal uses were not integrated into revised round 1 evaluations of external MPA arrays due to the limited information about tribal uses.

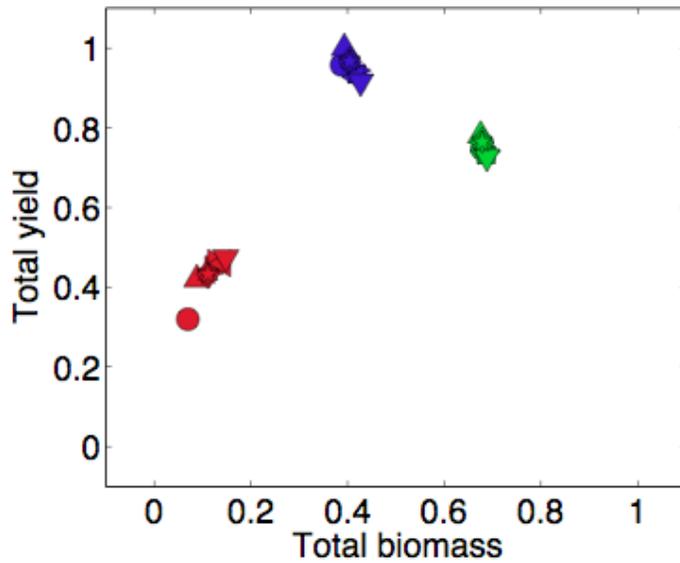
**Revised Figure 1: Total biomass and total fishery yield, UCD model**



**Revised Figure 2: Total biomass and total fishery yield, UCSB model**

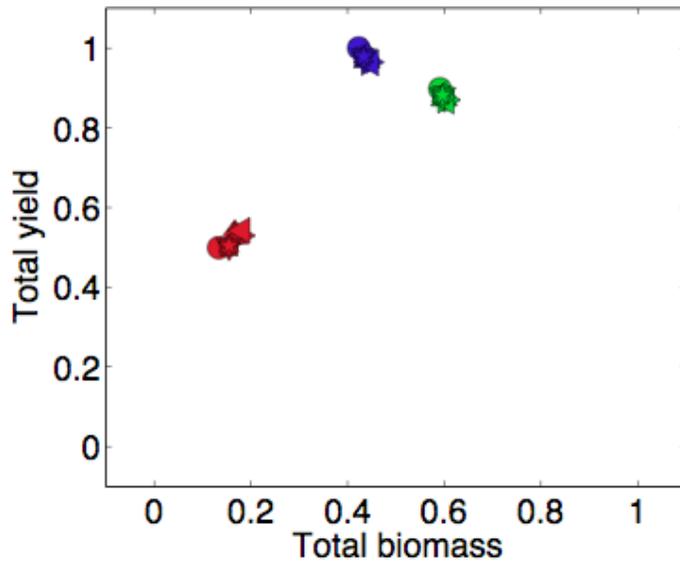


**Revised Figure 3: Total biomass versus total fishery yield, UCD model**



Symbol color indicates management scenario: unsuccessful (red), MSY-type (blue), or conservative (green). Symbol shape indicates array: P0 (circle), ExA (upward triangle), ExB (square), ExC (diamond), ExD (right triangle), ExE (left triangle), ExF (down triangle), ExG (hexagon), ExH (pentagon).

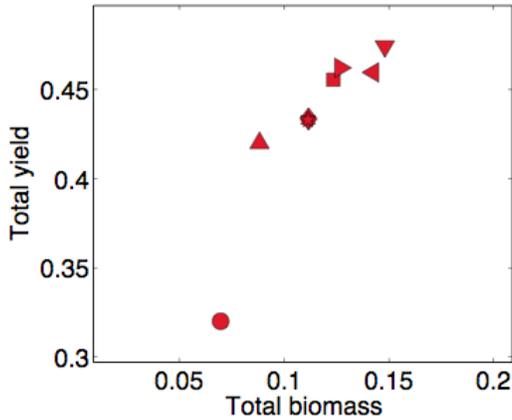
**Revised Figure 4: Total biomass versus total fishery yield, UCSB model**



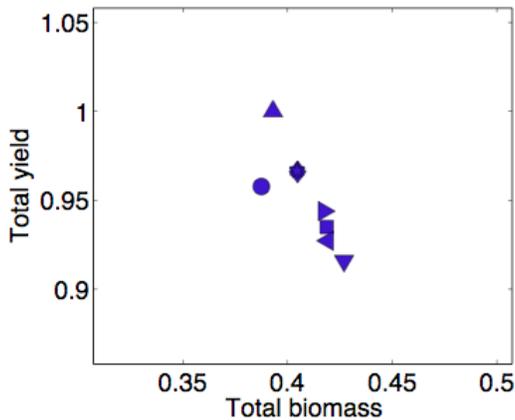
Symbol color indicates management scenario: unsuccessful (red), MSY-type (blue), or conservative (green). Symbol shape indicates array: P0 (circle), ExA (upward triangle), ExB (square), ExC (diamond), ExD (right triangle), ExE (left triangle), ExF (down triangle), ExG (hexagon), ExH (pentagon).

**Revised Figure 5: Total biomass versus total fishery yield, UCD model.** Management scenarios are shown in separate panels: 5A is unsuccessful (red), 5B is MSY-type (blue), and 5C is conservative (green). Symbol shape indicates array: P0 (circle), ExA (upward triangle), ExB (square), ExC (diamond), ExD (right triangle), ExE (left triangle), ExF (down triangle), ExG (hexagon), ExH (pentagon).

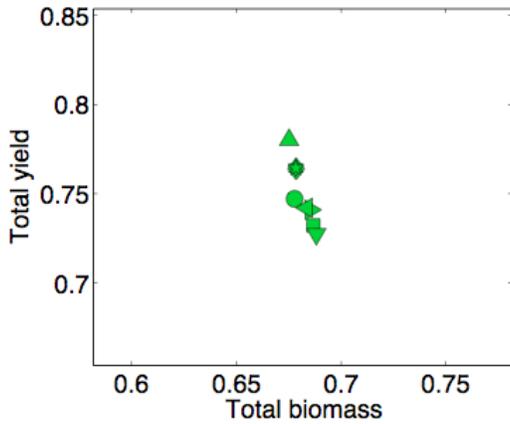
**Revised Figure 5A. Unsuccessful management**



**Revised Figure 5B. MSY-type management**

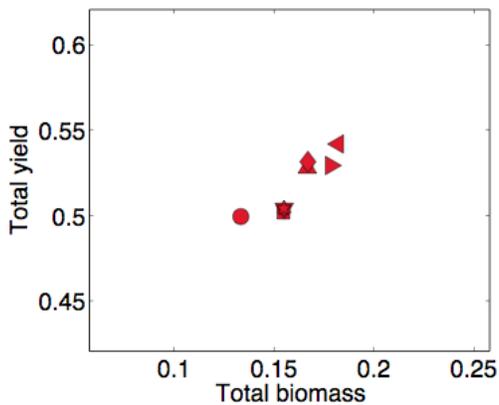


### Revised Figure 5C. Conservative management

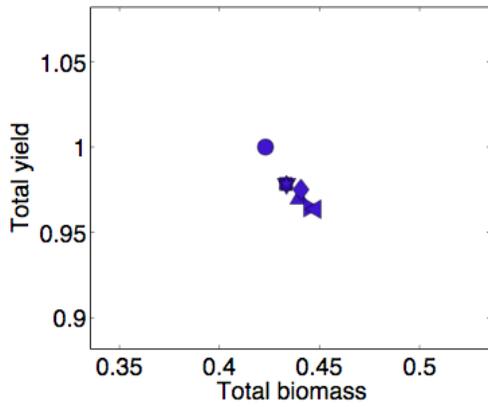


**Revised Figure 6: Total biomass versus total fishery yield, UCSB model.** Management scenarios are shown in separate panels: 6A is unsuccessful (red), 6B is MSY-type (blue), and 6C is conservative (green). Symbol shape indicates array: P0 (circle), ExA (upward triangle), ExB (square), ExC (diamond), ExD (right triangle), ExE (left triangle), ExF (down triangle), ExG (hexagon), ExH (pentagon).

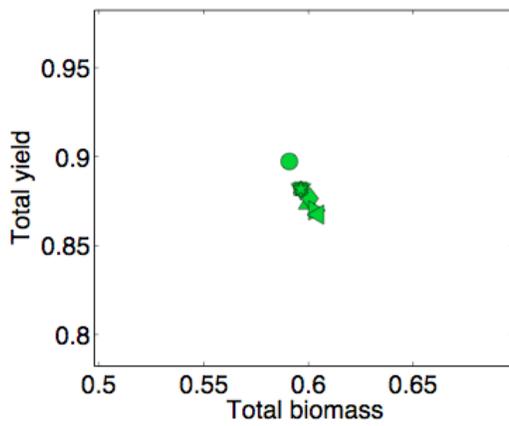
### Revised Figure 6A. Unsuccessful management



**Revised Figure 6A. MSY-type management**

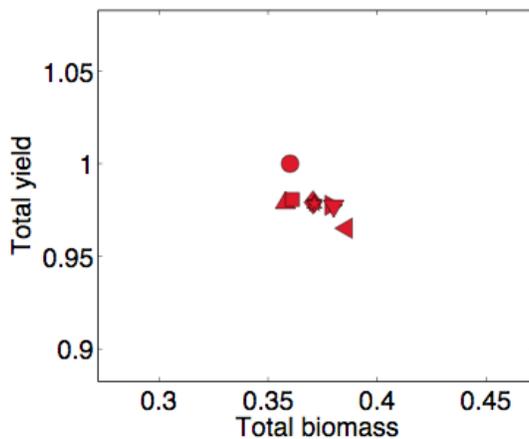


**Revised Figure 6C. Conservative management**



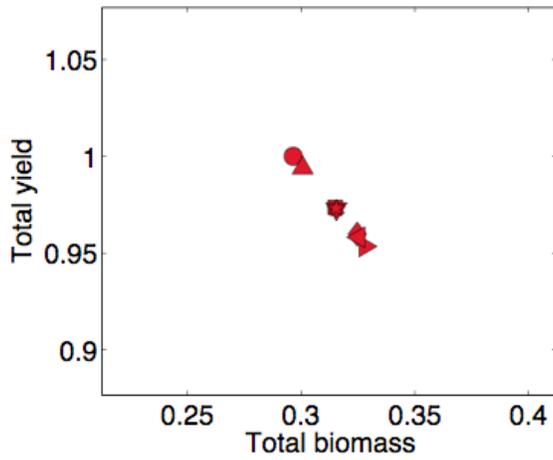
**Figures 7-8: Dungeness crab total biomass and total fishery yield.** Figures 7 and 8 show total biomass and fishery yield predicted for Dungeness crab species for revised Round 1 evaluations of external marine protected area (MPA) arrays using the University of California, Santa Barbara (UCSB) and University of California, Davis (UCD) bioeconomic models. The total biomass of male crabs is estimated at equilibrium for each square kilometer of the study region. Values are scaled relative to total unfished biomass of male crabs such that values of 0 indicate no biomass and values of 1 indicate maximum unfished biomass. Total yield is the total harvest of each species relative to yield under the current set of MPAs (proposal 0). Fishing effort for Dungeness crab was set to the level that reduces male crab abundance by 90% within the first year they enter the fishery under proposal 0. In the model, only male crabs are fished; it is assumed that egg production by female crabs is unaffected by fishing and remains at a constant, unfished level in all simulations. Due to limitations of the SAT's current evaluation methods, for revised round 1 evaluation, proposed MPAs in external MPA array A were considered static rather than mobile. Traditional tribal uses were not integrated into revised round 1 evaluations of external MPA arrays due to the limited information about tribal uses.

**Figure 7. Dungeness crab total biomass versus total fishery yield; UCD model**



Symbol shape indicates array: P0 (circle), ExA (upward triangle), ExB (square), ExC (diamond), ExD (right triangle), ExE (left triangle), ExF (down triangle), ExG (hexagon), ExH (pentagon).

**Figure 8. Dungeness crab total biomass versus total fishery yield; UCSB model**



Symbol shape indicates array: P0 (circle), ExA (upward triangle), ExB (square), ExC (diamond), ExD (right triangle), ExE (left triangle), ExF (down triangle), ExG (hexagon), ExH (pentagon).