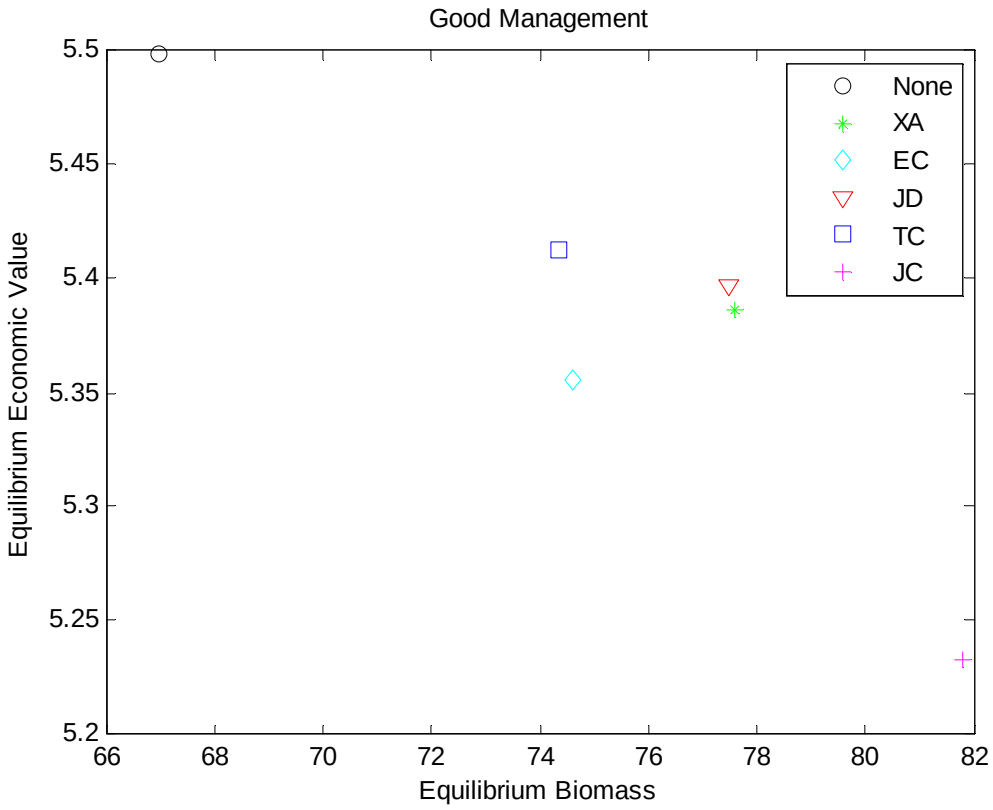
Equilibrium Delay Difference Model: Summary of Results
Presented to the MLPA Master Plan Science Advisory Team by Dr. Chris Costello
January 23, 2008

Biomass vs. Economic Performance

This classic tradeoff curve turns out to depend critically on the assumptions about fishing outside. We ran 3 different scenarios: Good Management (F=.05), Management Fails (F=.15), and Optimized Management (where effort in each cell is chosen to maximize system wide economic performance).



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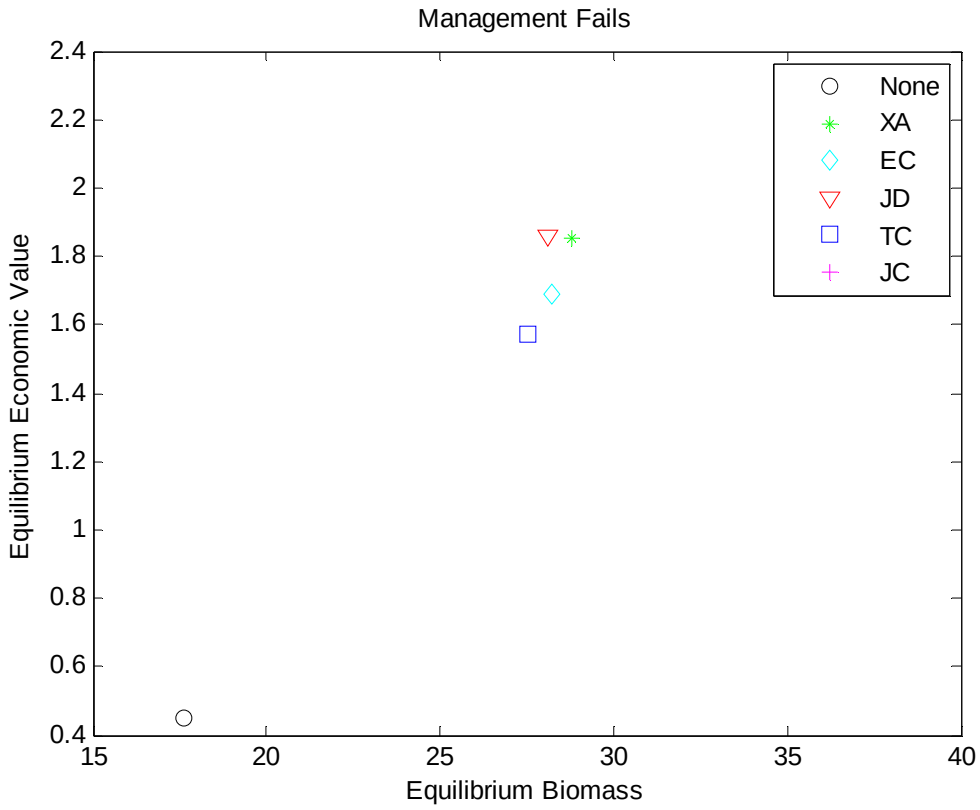
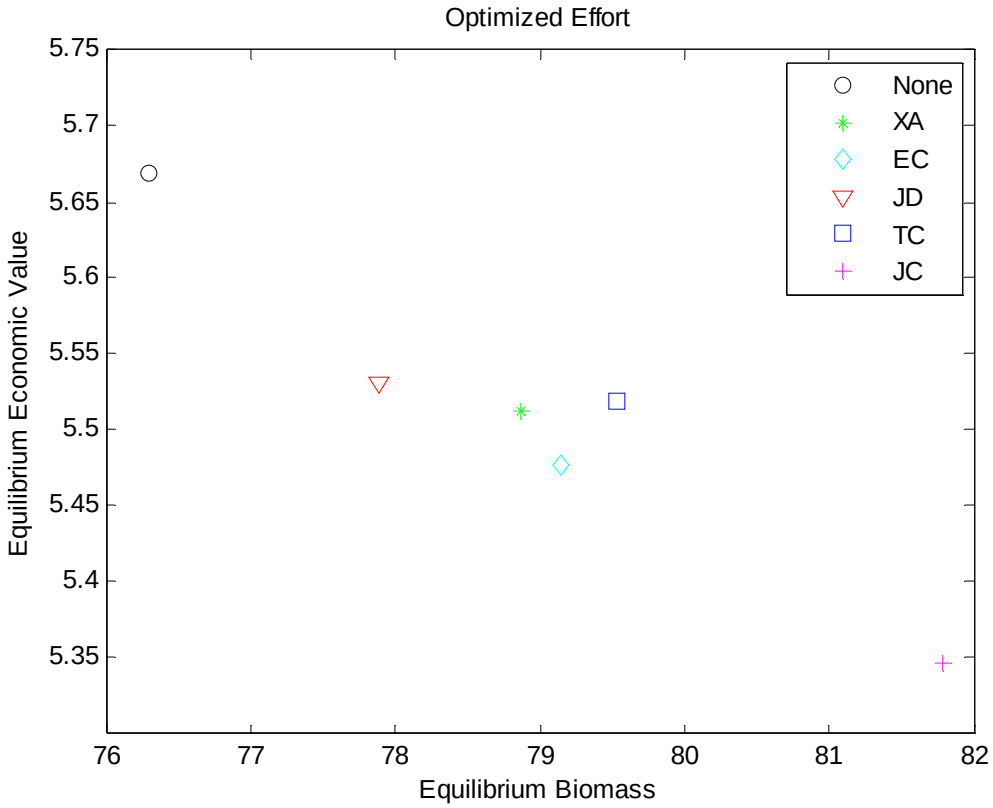




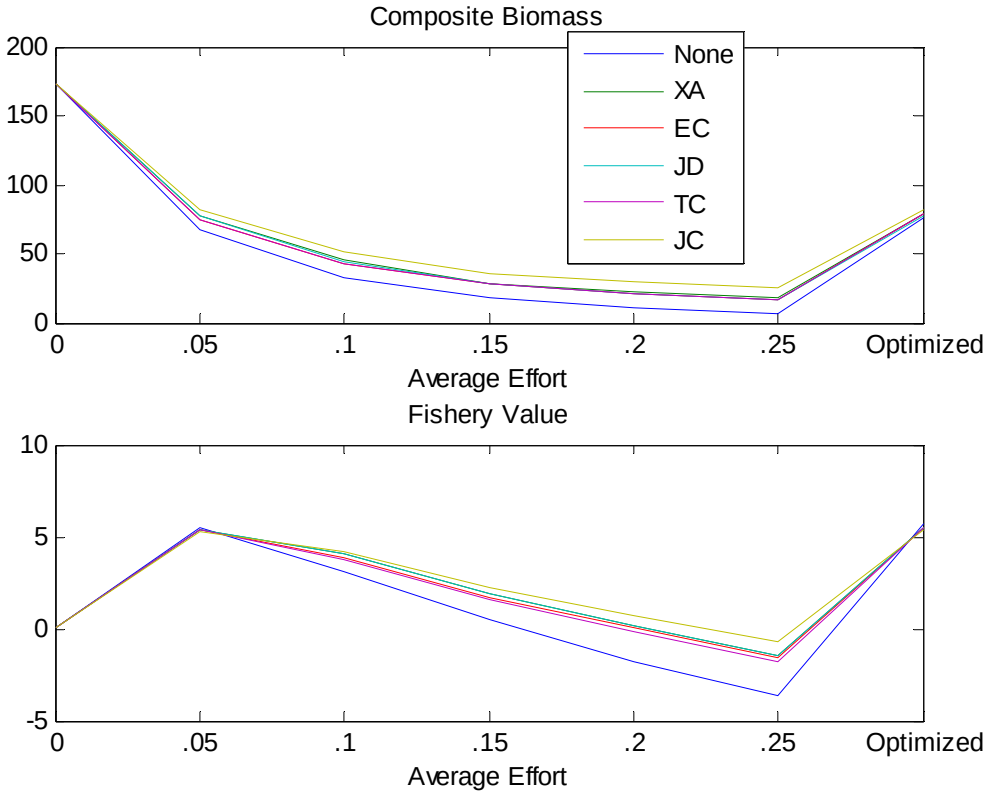
Under low effort, there is a classic tradeoff. One thing we can say for sure is that Packages XA and EC should not be chosen because they lie inside the frontier. Under management fails, there is no tradeoff: Package JC dominates on both dimensions (note that it is hidden behind the legend). Under Optimized effort, the losses in fishery value are significantly diminished.

Sensitivity Analyses

A key question that keeps arising is whether the ranking of policies is sensitive to different model assumptions. The three key parameters that arouse suspicion are (1) fishing pressure outside, (2) home range sizes, and (3) larval dispersal distance. We ran a series of sensitivity analysis to compare model rankings (judged by biomass by species, composite biomass, and economic performance) and their sensitivity to these parameters.

Sensitivity to Fishing Pressure Outside Reserves

We ran a gravity-based fleet model for fishing mortality rates of between 0 to 0.25, including an optimized effort scenario.



They key result here is that package JC dominates in biomass for all effort values examined. Package JC dominates in fishery value for reasonably high fishing mortality rates. When fishing mortality rates are low, other packages (including no action) can generate more fisheries profit, but since fishing pressure is low, these differences are not large, relative to those that could be achieved at or near optimal rates. Also note that when fishing is optimized, all packages generate nearly the same fishery value, and that JC no longer is the best (though it is close).

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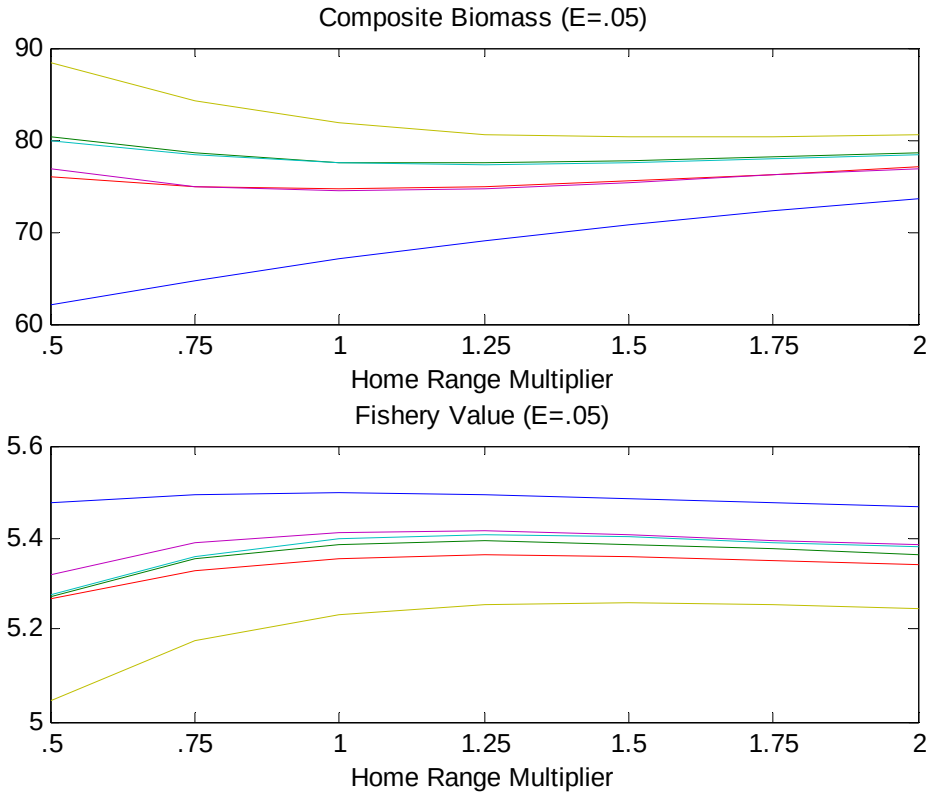
Sensitivity to Home Range Size

We multiplied the base case estimates for home range size by a factor of between 0.5 (smaller home range) and 2 (larger home range), and saved system wide biomass and fishery value estimates. We ran this for low (F=.05) and medium (F=.1) effort scenarios.



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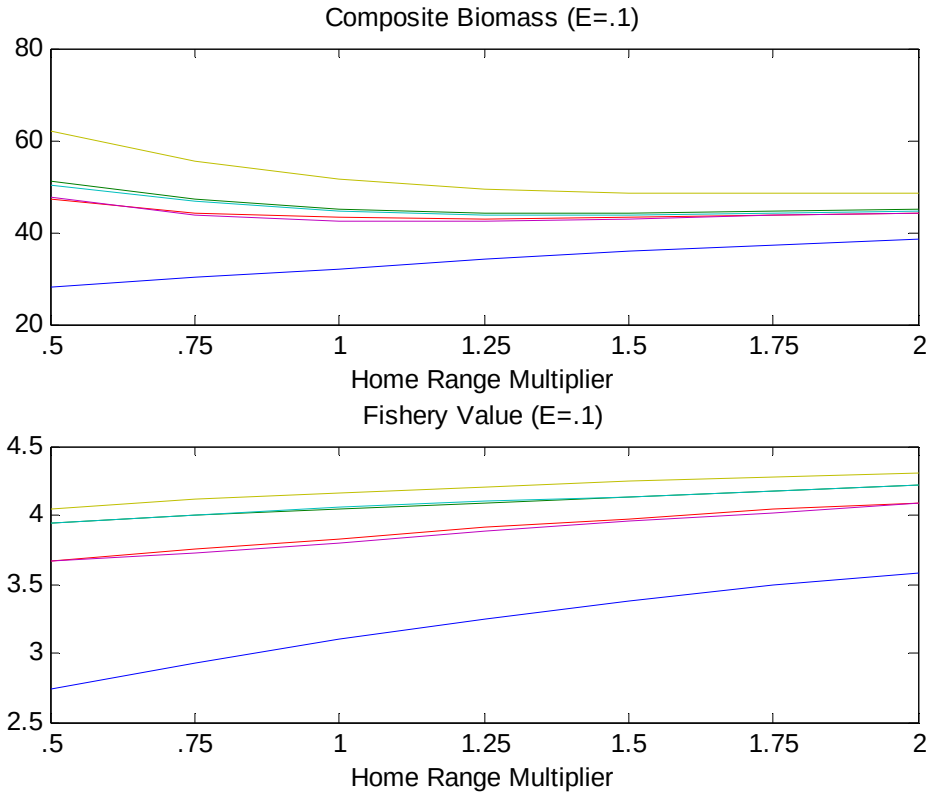

The key result here is that the ranking of policies does not depend on a home range multiplier. Whether we use low fishing rates (.05) or medium rates (.1), the ranking is unchanged by home range multiplier.

Sensitivity to Larval Dispersal Distance

We multiplied our original larval dispersal estimates (s.d. of Gaussian larval dispersal kernel) by a factor ranging from .5 (indicated lower dispersal) to 2 (indicated longer dispersal distances). We ran this for low (F=.05) and medium (F=.1) effort scenarios.

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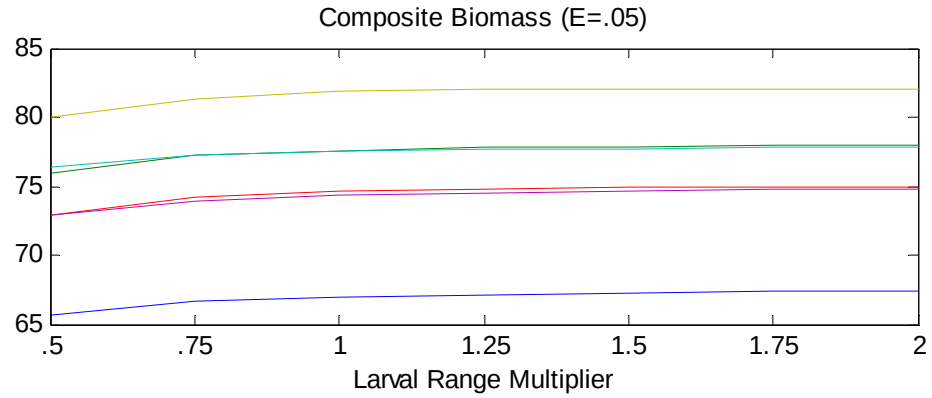

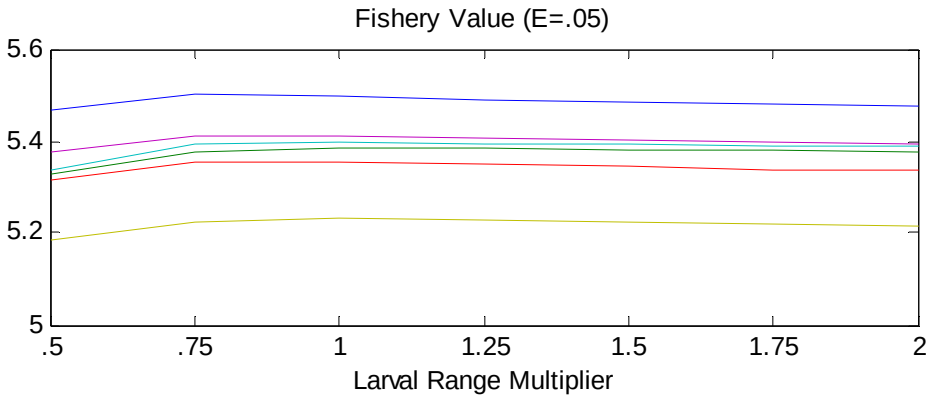

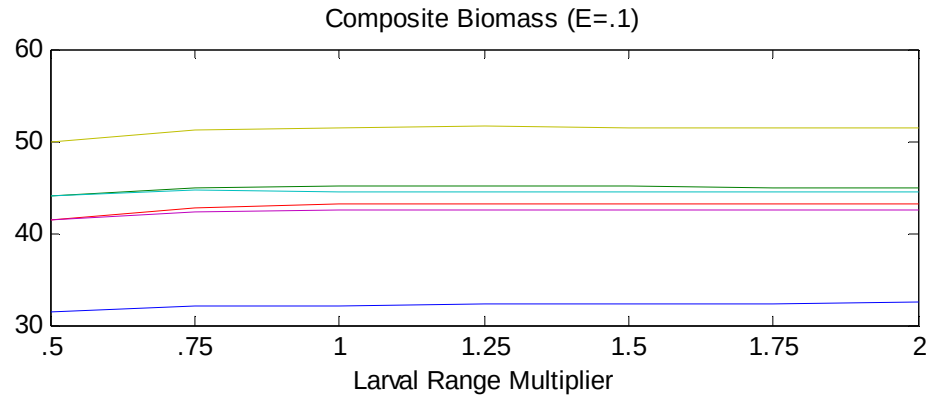

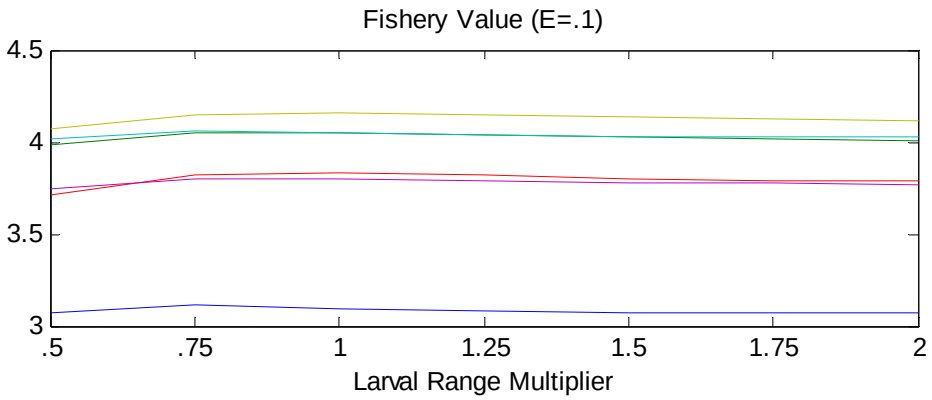

All policies independently, and the overall ranking of policies, are insensitive to larval dispersal distances (within the range considered).