Economic Analysis of Red Snapper Allocation Alternatives in the Gulf of Mexico (RF 28)

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NOAA Fisheries Economic Considerations of Allocation Decisions
Seattle, WA September 2014
Task: Measure Economic Net Benefits of Reallocation

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Commercial Sector</th>
<th>Recreational Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quota (mp gw)</td>
<td>Percent</td>
</tr>
<tr>
<td>1 (Status quo)</td>
<td>5.06</td>
<td>51.0</td>
</tr>
<tr>
<td>2</td>
<td>4.76</td>
<td>48.0</td>
</tr>
<tr>
<td>3</td>
<td>4.56</td>
<td>46.0</td>
</tr>
<tr>
<td>4</td>
<td>4.06</td>
<td>41.0</td>
</tr>
<tr>
<td>5</td>
<td>4.61</td>
<td>46.6</td>
</tr>
<tr>
<td>6</td>
<td>4.19</td>
<td>42.3</td>
</tr>
</tbody>
</table>
Commercial Sector Analysis
Fishery Background

In 2013, 368 vessels landed 4.9 mp. g.w. of red snapper were valued at $21 m. dockside.

Multispecies, multi-gear fishery.

Management regime:
Pre-2007: limited entry, trips limits, seasonal closures and quotas
2007- present: IFQ (good for mitigating race to fish but overcapacity still a problem)
Commercial Sector Valuation

• **General Equilibrium Approach**
  • “Retail” demand (Thurman & Easley, 1992)

• **Partial Equilibrium Approach**
  • Virtual pricing (Carter et al., 2008-GOM red grouper; Gentner et al., 2010-NE summer flounder, Agar & Carter, 2011, Gentner, 2012-Scup)
  • Harvesting privilege price relationship (IFQ, Newell et al., 2005, Agar and Carter, 2014)
Allocation Price Equals Incremental WTP

Price/cost ($/lb)

Allocation price = Incremental WTP for leasing quota ($/lb)

“Expected profit from leasing an additional quota” ($/lb)
Framework

• Objective: Examine changes in commercial net benefits as a function quota levels.

• Allocation prices is used as a proxy of net benefits

• Allocation price = f(dockside price, harvesting costs, quota, temporal dummies)

• Measure welfare changes by integrating under the net benefit function between the status quo and the other 5 reallocation proposals.
Allocation price relationship

Allocation price ($/lb)

Quota (mp gw)

3.71 4.06 5.06

36%
Methods

OLS to model monthly allocation prices as function of dockside prices, costs, quota (ACL) and quarterly and yearly dummy variables.

Data:

- **SERO IFQ Program**: allocation, dockside prices and quota (ACL) levels (2007-2012)
- **BLS**: diesel 2 index (proxy for harvesting costs)

N=72
Allocation prices as function of quota

![Graph showing allocation prices as function of quota](image)
### Results of Commercial Analysis

#### Status Quo

<table>
<thead>
<tr>
<th>Alt</th>
<th>Quota (mp gw)</th>
<th>Quota share (%)</th>
<th>Difference from Alt1 (mp gw)</th>
<th>Forgone Net Benefits ($ million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.06</td>
<td>51</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>4.76</td>
<td>48</td>
<td>0.30</td>
<td>1.2 (0.9-1.6)</td>
</tr>
<tr>
<td>3</td>
<td>4.56</td>
<td>46</td>
<td>0.50</td>
<td>2.0 (1.5-2.6)</td>
</tr>
<tr>
<td>4</td>
<td>4.06</td>
<td>41</td>
<td>1.00</td>
<td>4.0 (3.0-5.2)</td>
</tr>
<tr>
<td>5</td>
<td>4.61</td>
<td>46.6</td>
<td>0.45</td>
<td>1.8 (1.3-2.3)</td>
</tr>
<tr>
<td>6</td>
<td>4.19</td>
<td>42.3</td>
<td>0.87</td>
<td>3.5 (2.6-4.5)</td>
</tr>
</tbody>
</table>
Limitations of analysis

- Data limitations (identification of arm’s length transactions)

- Statistical methods geared towards predicting small changes in allocation (not 10-36% increases from the highest quota levels~2012)

- Model only captures forgone benefits to the harvesting sector, not post-harvest sector (i.e., wholesalers, distributors, and consumers).
Recreational Sector Analysis
Increase recreational harvest

More pounds per trip

- More fish (biology, bag limits, tech., fishing time)
- Bigger fish (biology, size limits, tech., selectivity)

More trips (e.g., season length)

- New anglers
- New trips
- Redirected from other species
Some Assumptions

Increases implemented via longer season

No new trips are created with longer season

- Trips previously fishing other species redirect to red snapper
- Other species include grouper, king mackerel and dolphinfish
Some More Assumptions

All trips harvest 2 fish per angler

Only measuring changes in value to angler

WTP estimated using data from 2003
Recipe for the Change in Economic Value

Change in allocation (MP) \times \frac{\text{Net benefit for 2 red snapper per trip}}{2 \times \text{lbs per fish}}

Benefit per pound
Example Choice Question from 2003 SPCE

Random utility model in WTP space:
- 45,416 choices from 5,677 anglers
- Kept fish, released fish, min. size
- Kept and released transformed with inverse hyperbolic sine
- Random-correlated parameters on keep
Average WTP (benefit) by # of Fish per Angler per Trip

\[ WTP(h) = b \sinh^{-1} h \]
Net Benefit for 2 red snapper per trip: Calculation

Draw 10k “anglers” (coefficient vectors, $b$) from the multivariate normal

Calculate total benefit (TB) for 2 fish per trip for each species

Keep the “red snapper anglers” where the TB for red snapper is greater than the TB for other species

For each “red snapper angler”, calculate TB for red snapper minus TB for next best species

Do this 10k times.
### Net Benefit for 2 Red Snapper per Trip (2012 dollars)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Simulated Mean</th>
<th>Simulated Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>95Lower</td>
<td>$130.46</td>
<td>$104.76</td>
</tr>
<tr>
<td>Mean</td>
<td>$142.11</td>
<td>$115.56</td>
</tr>
<tr>
<td>95Upper</td>
<td>$154.16</td>
<td>$126.76</td>
</tr>
</tbody>
</table>
### Some Assumptions and the Effect on Results

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Relaxing Assumption Makes Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>No new anglers or trips</td>
<td>Higher</td>
</tr>
<tr>
<td>All trips harvest 2 red snapper</td>
<td>Higher</td>
</tr>
<tr>
<td>Only measured value to angler</td>
<td>Higher</td>
</tr>
<tr>
<td>Data from 2003</td>
<td>?</td>
</tr>
</tbody>
</table>
Summary
Net Economic Benefits: Confidence Intervals ($millions)
Uncertainty Not Addressed in Confidence Intervals

Commercial

• Model specification
• Extrapolation
• Prices

Recreational

• Model specification
• Lbs per fish
• Fish per trip
Some Issues

Do the assumptions hold over the range of alternatives?

Have enough resources been “allocated” to allocation?

Other allocation mechanisms?

- Market-based approaches in the recreational sector
- Auctioning some harvest for research purposes