Bioeconomics

Past present and future of fisheries of Pulley Ridge

David J. Die
ECOSYSTEM SERVICES PROVIDED BY REEF SYSTEM

- **SEAFOOD**

- **Pulley Ridge/Fl. Keys Ecosystem**

- **RECREATION**

- **HABITAT/PROTECTION**
ECOSYSTEM SERVICES PROVIDED BY REEF SYSTEM

Bioeconomics sub-project focused on federally managed commercial fishery for reef fish as the main SEAFOOD producing activity linked to the Pulley Ridge

SEAFOOD

Pulley Ridge/Fl. Keys Ecosystem
Analysis of responses of Commercial fishing fleets to past management

Economic value of commercial reef fish fisheries in the Pulley Ridge

Analysis of impacts of future management alternatives on ecosystem structure and function in the Pulley Ridge

Other Pulley Ridge Subprojects
Fishery dynamics in response to management changes

- implementation of the Pulley Ridge Habitat Area of Particular Concern in 2005
- reef fish Individual Fishing Quota program in the Gulf of Mexico in 2010

Two analyses:
- Areas 1-6 Florida West Coast
- Areas 1-3 Pulley Ridge and vicinity
Responses of fishing fleets to regulation (Florida West Coast):
Fishing effort around Pulley Ridge

<table>
<thead>
<tr>
<th>Time period</th>
<th>Gear Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 2000-2004 Baseline</td>
<td>HANDLINE</td>
</tr>
<tr>
<td>2 – 2005-2009 Post HAPC</td>
<td>LONGLINE</td>
</tr>
<tr>
<td>3 – 2010-2015 Post Catch shares</td>
<td>HANDLINE</td>
</tr>
</tbody>
</table>

- Some Changes in fleet-level effort: decline in longline after catch shares,
- Fewer changes at vessel level
Analysis of responses of Commercial fishing fleets to past management

**LONGLINE FLEET**

- Square-root transformed annual fishing effort
- Time Periods: 1, 2, 3
- Locations: Collier, Manatee, Pinellas, Lee, Monroe

**HANDLINE FLEET**

- Log-transformed annual fishing effort
- Time Periods: 1, 2, 3
- Locations: Collier, Dade, Monroe

**LONGLINE VESSEL**

- Square-root transformed annual fishing effort
- Locations: Collier, Manatee, Pinellas, Lee, Monroe

**HANDLINE VESSEL**

- Log-transformed annual fishing effort
- Locations: Collier, Dade, Monroe
Predictions of changes in fisheries in response to management changes will be driven by the time schedule and spatial scope of the change and will be associated with large uncertainty

- Fishery-wide management actions (Catch shares) lead to large changes in fishery operations and result and possibly major impacts to resources
  - re-distribution in time and space of fishing effort
  - increase sustainability of fishery operations
  - change fishing community (Ports) links to resources

- Impacts of relative small changes in spatial management (HAPC) are difficult to detect and predict
  - Limitations of available knowledge on resources
  - Confidentiality provisions of fishery data
  - Affect individual business decision making
National Marine Fisheries Service Data Monitoring Areas

Pulley Ridge \sim = 25\% \text{ of } 2483 + 70\% \text{ of } 2583 + 22\% \text{ of } 2683

Data credit:
Dr. David Gloeckner, NMFS
Average **Annual** Commercial Catch in the Florida Gulf Coast and Pulley Ridge, 2012-14 ($)

<table>
<thead>
<tr>
<th>Gulf Coast Landing Region</th>
<th>Total Annual Landing</th>
<th>Total Catch from NMFS Reporting Areas</th>
<th>Catch from Pulley Ridge</th>
<th>Percent Catch of Pulley Ridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Santa Rosa, Escambia, Walton, Okaloosa and Bay</td>
<td>11,853,464</td>
<td>22,996</td>
<td>5,059</td>
<td>0.04</td>
</tr>
<tr>
<td>Lee, Charlotte, &amp; Sarasota</td>
<td>1,473,884</td>
<td>1,282,484</td>
<td>185,380</td>
<td>12.58</td>
</tr>
<tr>
<td>Miami Dade, Broward, Palm Beach and Martin</td>
<td>3,902,834</td>
<td>570,295</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td>Monroe and Collier</td>
<td>8,739,684</td>
<td>8,171,640</td>
<td>587,587</td>
<td>6.72</td>
</tr>
<tr>
<td>Dixie, Taylor, Citrus, Levy, Pasco, Hernando, Franklin, Gulf, Jefferson and Wakula</td>
<td>5,680,545</td>
<td>313,299</td>
<td>23,955</td>
<td>0.42</td>
</tr>
<tr>
<td>Pinellas, Hillsborough, and Manatee</td>
<td>18,558,015</td>
<td>13,407,925</td>
<td>1,358,066</td>
<td>7.32</td>
</tr>
<tr>
<td>Breward, Volusia, St Lucie, and Indian River</td>
<td>4,856,026</td>
<td>4,882</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>55,064,453</strong></td>
<td><strong>23,773,520</strong></td>
<td><strong>2,160,047</strong></td>
<td><strong>3.92</strong></td>
</tr>
</tbody>
</table>

Note: Total Annual Landing is the total landing at each country group docks including the state-controlled area.
Major Gear Types and Species Caught in Pulley Ridge

Economic value of commercial reef fish fisheries in the Pulley Ridge

Vertical, long lines and buoy
Number 1 gear type
In Pulley Ridge

Groupers followed by snappers are the top species caught
How much income is made in the Pulley Ridge Region?

<table>
<thead>
<tr>
<th>Costs and Profit</th>
<th>Amount ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total revenue</td>
<td>2,160,047</td>
</tr>
<tr>
<td>All non-wage inputs</td>
<td>674,337</td>
</tr>
<tr>
<td>Crew payment</td>
<td>412,674</td>
</tr>
<tr>
<td>Captain pay</td>
<td>490,009</td>
</tr>
</tbody>
</table>

 Owners' profit (Gross profit before netting fixed cost) 583,027
Conclusions from the Economic Analysis...

• Relative impact of partial or full restriction in PR not likely to be significant

• A slightly increased fishing in the neighboring areas

• Neighboring areas already heavily fished

• A primary survey indicates that the fishermen not likely to support the regulation

• Resistance probably rooted in the past regulation experience
Ecosystem models

OSMOSE (Gruss et al)

ECOSPACE (Chagaris et al)

ATLANTIS (Ainsworth et al)

Spatial scope
Pulley Ridge Project

Available models do not match project scope. New model needed
The HAPC is managed separately from the FKNMS.

Western and southern limit: Shelf break ~ 200m isobath.

Northern limit
Northern most part of the extended Pulley Ridge area in alternative 3 of the GOMFMC

Eastern limit
70m isobaths in the northern section of the “L”, then FKNMS boundary all the way to Long Key

EWE study area

Partially based on connectivity conclusions from Pulley Ridge project

Analysis of impacts of future management alternatives on ecosystem structure and function in the Pulley Ridge
ECOPATH

Trophic network of “functional groups”

• Describes and quantifies trophic linkages
• Assumes mass-balance of system over given time
• Run from series of linear equations for each functional group

Landings
• Bycatch/discards
• Discard fate

Biomass
• Production/Biomass
• Consumption/Biomass
• Diet Composition
• Yield (fishery)
• Emigration

Analysis of impacts of future management alternatives on ecosystem structure and function in the Pulley Ridge
Analysis of impacts of future management alternatives on ecosystem structure and function in the Pulley Ridge

**ATLANTIS (Ainsworth et al)**

- Boundary conditions
- Diet matrix

**EWE Model**

- Biomass estimates

- Status Quo
  - The HAPC is managed separately from the FKNMS

**Logbook program MRFSS**

**ECOSPACE (Chagaris et al)**

**OSMOSE (Gruss et al)**

**Pulley Ridge Cruises**

**NOAA NMFS FKNMS surveys**

**Fishery data**
EWE Model for Pulley Ridge-Florida Keys

28 Functional Groups
4 fishing fleets

Balanced for average 2010-2015

Analysis of impacts of future management alternatives on ecosystem structure and function in the Pulley Ridge
Three alternatives management scenarios to be evaluated with EWE

Ready to be run and reported upon

(*) derived from proposals from GOMFMC

Analysis of impacts of future management alternatives on ecosystem structure and function in the Pulley Ridge
DECISION SUPPORT SYSTEM
Will provide easy WEB-based access to highlights of project results
Value of fishery catch associated to Pulley Ridge is significant and will change in response to spatial changes in management.

Fishery dynamics are strongly influenced by management.

Impacts of relatively small changes in spatial management are difficult to detect at the population/ecosystem level.

Ecosystem models can provide a sense of the degree of disruption of ecosystem linkages in response to management changes.

EWE model of Pulley Ridge/FKNMS is ready to produce evaluation of alternative options.

Decision support system will allow for easy access to results of evaluation of management options.
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