Assessment and Management of Belize Nearshore Fisheries

Jono Wilson
19 November 2013
Maximizing Fishing and Conservation

<table>
<thead>
<tr>
<th>Fishing Mortality</th>
<th>Biomass</th>
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<tbody>
<tr>
<td>Overfished &amp; overfishing</td>
<td>Overfishing</td>
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<td>+ Conservation</td>
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<td>Overfished</td>
<td>Profits</td>
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Adaptive Management

1) Harvest Regulations

2) Data Collection

3) Stock Assessment

4) Reference points

5) Control Rule
   - Target reference points met
   - Threshold reference points surpassed

M. Kay
Data Collection

![Histogram of Fish Lengths](image1.png)

![Table of Data](image2.png)

- **Histogram**: Numbers of Fish vs. Lengths (cm)
- **Table**: Date, Species, Total Length (cm)
Adaptive Management

1. Harvest Regulations
2. Data Collection
3. Stock Assessment
4. Reference points
5. Control Rule
   - Target reference points met
   - Threshold reference points surpassed

Fishing
Collaborative research
Agency/academic research

No change to harvest regulations
Modify harvest regulations
Data Poor Stock Assessments

Catch Curve Analysis

Unfished Sizes of Fish

Observed Sizes Of Fish

Size of fish

MPA Ratios

Percent frequency

Observed Sizes Of Fish

Inside MPA
N = 809

Outside MPA
N = 3490

Total Length (mm)
Adaptive Management

1) Harvest Regulations
   Fishing
   Collaborative research
   Agency/academic research

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M. Kay
Reference points

- Target reference point
- Performance indicator
- Performance measure
Length–frequency distribution of Lane Snapper using all gear types
Sample Size = 7483

Fishing Mortality Rate

F = 1.0
SPR = 11%
“If you don’t know where you’re going, you’ll end up someplace else”
Increase size limits or reduce fishing mortality

Lane Snapper

- SPR
- Fishing Mortality
- Size Limit (cm)

- 0.80-1.00
- 0.60-0.80
- 0.40-0.60
- 0.20-0.40
- 0.00-0.20
An Adaptive Management Framework for Decision-Making
<table>
<thead>
<tr>
<th>Scenario</th>
<th>Performance Indicators: relative to target</th>
<th>Interpretation / possible causes</th>
<th>Suggested management response sequence</th>
</tr>
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<tbody>
<tr>
<td></td>
<td><strong>SPR</strong></td>
<td><strong>Local Knowledge</strong></td>
<td><strong>MPA Ratio</strong></td>
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| 5        | ↑            | ↑      | ↓      | ○ F and mean length still too high even though they have been decreasing  
           | 5            | ↑      | ↓      | ○ F or SPR estimate(s) in error?  
           | SPR         | Local Knowledge | MPA Ratio |  
| 6        | ↓            | ↑      | ↓      | ○ Overfishing, or  
           | 6            | ↓      | ↓      | ○ Error in calculations  
           | 7            | ↓      | ↓      |  
| 7        | ↑            | ↓      | ↓      | ○ Overfishing, or  
           | 7            | ↓      | ↓      | ○ Error in calculations  
           | 8            | ↓      | ↓      | ○ Hyperstability in size  
| 8        | ↓            | ↓      | ↓      | ○ Overfishing  
           | 8            | ↓      | ↓      |  

**Response required:** Harvest rate reduction  
1) consider additional regulatory options  
a) Increase min size limit  
1) Harvest rate reduction  
2) consider additional regulatory options  
a) Increase Min size limit
Food For Thought

• What are the key elements of stock assessments?

• What types of information can be used in data poor stock assessments?

• What types of situations can data poor assessments facilitate?

• What data biases create challenges for data poor stock assessments?

• Why are density estimates from underwater surveys difficult to use in decision-making?