Goal setting for finfish management and harvest control measures for achieving fishery goals
Training Module #6
• overview of goal setting and decision-making process;
• performance indicators & harvest control rules
• Multispecies goals and draft harvest control measures from March 2020
A multi-indicator adaptive fishery management framework

1. Define social, ecological, and economic goals
2. Identify key target species for management
3. Select performance indicators, reference points, and assessment methods
4. Define harvest control rules
5. Collect and manage data
6. Run Assessments
7. Interpret results
8. Adjust fisheries management controls
9. Adapt cycle
Key features of this framework

1. Define social, ecological, and economic goals
2. Identify key target species for management
3. Select performance indicators, reference points, and assessment methods
4. Define harvest control rules
5. Collect and manage data
6. Perform assessment methods
7. Interpret assessment results
8. Adjust fisheries management controls

- Process of designing the framework is collaborative and stakeholder-driven
- Harvest control rules are transparent and objective
- Uses multiple performance indicators
- Uses performance indicators appropriate for available resources and technical capacity
- Local stakeholder knowledge is incorporated during data interpretation
4. Harvest Control Rules

Harvest Control Rule: Generally, what we want to do under certain scenarios in order to meet our goals.

“Reduce fishing pressure”
“Don’t catch babies”

Harvest Control Measure: Actual mechanism through which we will accomplish the harvest control rule (e.g. catch limit, gear restriction, RBM)
Scientists and managers work with fishermen and other fishery actors to define harvest control rules.

These rules guide managers and tell them what to do in case the indicators are near or below targets and limits.

“IF we find that our fishery is doing X, then we will do Y”

Examples:

• If all indicators show that stock is abundant and productive, fishing mortality can remain the same
• If all indicators show that stock is in decline, fishing mortality will be reduced by X% (depending on severity)
What are fisheries management measures

**Direct Measures:**
- **How much:** Catch limits

**Indirect Measures**
- **Who:** Licenses
- **Where:** Spatial closures
- **When:** Seasonal closures
- **How:** Effort Controls; Gear Restrictions
- **What:** Size and sex-specific regulations
<table>
<thead>
<tr>
<th>Indicators</th>
<th>Reference Points</th>
<th>Stock Status</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; Target</td>
<td></td>
<td>overfished</td>
<td>Increase harvest controls</td>
</tr>
<tr>
<td>= Target</td>
<td></td>
<td>stable</td>
<td>Maintain harvest controls</td>
</tr>
<tr>
<td>&gt; Target</td>
<td></td>
<td>performing better than targets</td>
<td>Relax Harvest Controls</td>
</tr>
<tr>
<td>&lt; Limit</td>
<td></td>
<td>in danger</td>
<td>Close Fishery</td>
</tr>
</tbody>
</table>

IF we find that our fishery is doing X, then we will do Y
If we find that our fishery is doing X, then we will do Y:

- **Indicators < Target Reference Points**
  - Stock is overfished
  - Increase harvest controls

- **Indicators = Target Reference Points**
  - Stock is stable
  - Maintain harvest controls

- **Indicators > Target Reference Points**
  - Stock is performing better than targets
  - Relax Harvest Controls

- **Indicators < Limit Reference Points**
  - Stock is in danger
  - Close Fishery
If we find that our fishery is doing X, then we will do Y:

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  - **Increase harvest controls**

- **Indicators = Target Reference Points**
  - **Stock is stable**
  - **Maintain harvest controls**

- **Indicators > Target Reference Points**
  - **Stock is performing better than targets**
  - **Relax Harvest Controls**

- **Indicators < Limit Reference Points**
  - **Stock is in danger**
  - **Close Fishery**
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  - Stock is performing better than targets
  - Relax Harvest Controls

- **Indicators < Limit Reference Points**
  - Stock is in danger
  - Close Fishery
What is the goal?

**Performance Indicator:**
“Percentage of team Wins”

**Reference Point** 0.500

Above “.500” = Winning Team

Below “.500” = Losing Team
¿What is the performance indicator and reference Point?

**Performance Indicator:**
“Percentage of Team Wins”

**Reference Point** 0.500

Above “.500” = Winning Team

Below “.500” = Losing Team
¿What are some potential control rules?

IF we find that our fishery is doing X, then we will do Y

**Performance Indicator:**
“Percentage of team Wins”

**Reference Point** 0.500

Above “.500” = Winning Team

Below “.500” = Losing Team
¿What measures would you put in place?

**Performance Indicator:**
“Percentage of team Wins”

**Reference Point** 0.500

Above “.500” = Winning Team

Below “.500” = Losing Team
Stakeholder outlined a triple-bottom-line set of social, economic, and biological objectives for management of the country’s finfish fisheries:

1) Sustainability and resilience of food security; 
2) sustainable economic growth and improved livelihoods; and 
3) abundant finfish populations to support healthy ecosystems.

Happy fishers, happy people, happy fish!
<table>
<thead>
<tr>
<th>Common name</th>
<th>Species name</th>
<th>Group Identity</th>
<th>Priority</th>
<th>Harvest Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mahi mahi</td>
<td>Coryphaena hippurus</td>
<td>pelagic/migratory/gear</td>
<td>Moderate</td>
<td>sport license, bag limit</td>
</tr>
<tr>
<td>Wahoo</td>
<td>Acanthocybium solandri</td>
<td></td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Marlin - white/ stripe</td>
<td>Kajikia albida/ Kajikia audax</td>
<td></td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Swordfish</td>
<td>Xiphias gladius</td>
<td></td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>White grunt</td>
<td>Haemulon plumieri</td>
<td>beach traps</td>
<td>Moderate</td>
<td>develop/synergy around the rules of engaging with fishers. Future of tourism</td>
</tr>
<tr>
<td>Gray snapper</td>
<td>Lutjanus griseus</td>
<td></td>
<td>Moderate</td>
<td>efforts - has its own license. size limits, closed seasons,</td>
</tr>
<tr>
<td>Bluestrip grunt</td>
<td>Haemulon sciurus</td>
<td></td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Great barracuda</td>
<td>Sphyraena barracuda</td>
<td></td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Mojarra (yellowfin)</td>
<td>Gerres cinereus</td>
<td></td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Mojarra (pompano)</td>
<td>Diapterus auratus</td>
<td></td>
<td>Moderate</td>
<td></td>
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<tr>
<td>Dog snapper</td>
<td>Lutjanus jocu</td>
<td>opportunistic sling</td>
<td>Moderate</td>
<td>season, size limit</td>
</tr>
<tr>
<td>Schoolmaster</td>
<td>Lutjanus apodus</td>
<td></td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Mangrove/Mahogany snapper</td>
<td>Lutjanus mahogoni</td>
<td></td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Sailor choice</td>
<td>Haemulon parra</td>
<td></td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Margate</td>
<td>Haemulon album</td>
<td></td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Silk Snapper</td>
<td>Lutjanus vivanus</td>
<td></td>
<td>Moderate</td>
<td></td>
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<tr>
<td>Deep water blackfin snapper</td>
<td>Lutjanus buccanella</td>
<td>deep-slope fishery</td>
<td>Moderate</td>
<td>license, gear type, gear spec, nationality for license. Allocate spatial ownership to</td>
</tr>
<tr>
<td>Champagne</td>
<td>Etelis oculatus</td>
<td></td>
<td>Moderate</td>
<td>MA fishers.</td>
</tr>
<tr>
<td>Queen Silk Snapper</td>
<td>Ocyurus chrysurus</td>
<td></td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Yellow-eye Snapper</td>
<td>Rhomboplites aurorubens</td>
<td></td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Vermillion Snapper</td>
<td></td>
<td></td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Cubera snapper</td>
<td>Lutjanus cyanopterus</td>
<td>forereef/open/handline</td>
<td>Low</td>
<td>season, size limit</td>
</tr>
<tr>
<td>Great Amberjack</td>
<td>Seriola dumerili</td>
<td></td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Mullet</td>
<td>Mugiil spp.</td>
<td>bait for other fisheries</td>
<td>High</td>
<td>TAC. limit access spatially or temporally</td>
</tr>
<tr>
<td>Sardine</td>
<td>Sardinella spp.</td>
<td></td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Sprat</td>
<td>Sprattus spp.</td>
<td></td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Group ID</td>
<td>Common name</td>
<td>Species name</td>
<td>Group Identity</td>
<td>Priority</td>
</tr>
<tr>
<td>---------</td>
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<td>---------------------------</td>
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<td>----------------</td>
</tr>
<tr>
<td>7</td>
<td>Snook</td>
<td><em>Centropomus undecimalis</em></td>
<td>habitat/traps/lines/nets</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>Bay snook</td>
<td><em>Petenia splendida</em></td>
<td></td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>Crana</td>
<td><em>Cichlosomas urophthalmus</em></td>
<td></td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>Tuba</td>
<td><em>Cichlasoma synspilum</em></td>
<td></td>
<td>Moderate</td>
</tr>
<tr>
<td>8</td>
<td>Spanish mackerel</td>
<td><em>Scomberomorus maculatus</em></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Crevalle</td>
<td><em>Caranx hippos</em></td>
<td>pelagic/migratory/ground -- handline</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>King mackerel</td>
<td><em>Scomberomorus cavalla</em></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Cerro mackerel</td>
<td><em>Scomberomorus regalis</em></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td>9</td>
<td>Black grp</td>
<td><em>Mycteroperca bonaci</em></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Goliath</td>
<td><em>Epinephelus itajara</em></td>
<td>large groupers</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Tiger</td>
<td><em>Mycteroperca tigris</em></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Yellowfin grouper</td>
<td><em>Mycteroperca venenosa</em></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td>10</td>
<td>Mutton</td>
<td><em>Lutjanus analis</em></td>
<td>fished together, mutton needs to be managed</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Red hind</td>
<td><em>Epinephelus guttatus</em></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td>11</td>
<td>Hogfish</td>
<td><em>Lachnolaimus maximus</em></td>
<td>needs to be rebuilt</td>
<td>High</td>
</tr>
<tr>
<td>12</td>
<td>Nassau grouper</td>
<td><em>Epinephelus striatus</em></td>
<td>special considerations</td>
<td>High</td>
</tr>
<tr>
<td>13</td>
<td>Yellowtail snapper</td>
<td><em>Ocyurus chrysurus</em></td>
<td>resilient and rebuild</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>Lane snapper</td>
<td><em>Lutjanus synagris</em></td>
<td></td>
<td>Moderate</td>
</tr>
</tbody>
</table>
Collaborative multispecies finfish Belize draft FMP work (March 2020)

• For **13 independent fish baskets**, the harvest control measure options on the table for these various species include:
  • Input control
    • Temporary ban, closed seasons, license limits, gear restrictions, and expansion of no-take zones.
  • Output controls
    • Catch limits, bag limits, size limits (minimum and/or slot)
Science to action

Adaptive cycle

1. Define social, ecological, and economic goals
2. Identify key target species for management
3. Identify performance indicators
4. Set reference points for each performance indicator
5. Define harvest control rules
6. Collect and manage data
7. Run Assessments
8. Interpret results
9. Adjust fisheries management controls
Questions?