USING INDICATORS OF STOCK STATUS WHEN TRADITIONAL REFERENCE POINTS ARE NOT AVAILABLE: EVALUATION AND APPLICATION TO SKIPJACK TUNA IN THE EASTERN PACIFIC OCEAN

Mark Maunder and Rick Deriso
Problems with the EPO skipjack assessment

• High and variable productivity (i.e. annual recruitment is a large proportion of total biomass)
• Difficult to detect the effect of fishing on the population with standard fisheries data and stock assessment methods.
• Continuous recruitment and rapid growth mean that the temporal stratification needed to observe modes in length-frequency data make the current sample sizes inadequate.
• Not known whether catch per day fished for purse-seine fisheries is proportional to abundance
• Lack of age-frequency data and the limited tagging data.
• Possible dome-shaped selectivity curve
• yield per recruit (YPR) maximized by catching the youngest skipjack in the model
• Neither biomass- or fishing mortality-based reference points or the indicators to which they are compared are available
2002 assessment

Biomass (t) – Biomasa (t)

- Nonmonotonic – No monotónica
- Monotonic – Monotónica
2004 assessment

- Base case – Caso base
- Nonmonotonic – No monotónica
Methods

• Identify data based indicators
  – CPUE
  – Standardized effort
  – Average weight
  – Catch

• Develop reference levels
  – 5th and 95th percentiles

• Compare with previous assessment results

• Investigate compatibility with simple population dynamics model
Indicators from the 2004 assessment
Exploitation rates from assessment model and standardized effort
<table>
<thead>
<tr>
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<th>Upper reference level</th>
</tr>
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<tbody>
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<tr>
<td>Average weight</td>
<td>Undesirable, but may be due to large recruitment</td>
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Average weight

Cohort moves through fishery

Recruitment
Exploitation rate indicator based on standardized effort
Catch

Purse seine catch

Time in years

0.0 0.5 1.0 1.5 2.0 2.5 3.0
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Summary of indicators

• Average weight near lower reference level - Undesirable, but may be due to large recruitment
• Exploitation rate near upper reference level - Undesirable
• CPUE near upper reference level - Healthy, but may be due to increased catchability
• Catch near upper reference level - Ambiguous
Simple stock assessment model

• Data
  – Catch
  – CPUE
    • FO
    • UA
  – Average weight
Conclusions

• Contradiction between the recent CPUE increase and the changes in the standardized effort (increase) and average weight (decrease)

• Can be explained by
  – a parallel increase in both exploitation rate and abundance OR
  – increasing catchability
Indicators of stock status for skipjack tuna compared to estimates of exploitable biomass and exploitation rate from the 2004 assessment.