Overview of Management Strategy
Evaluation of Atlantic Bluefin Tuna

Lisa Kerr
Gulf of Maine Research Institute
Outline

• ICCAT management structure.
• Current management approach and stock status.
• Motivation for MSE: Issues with assessment and management.
• ICCAT MSE Process
  – Modeling process
  – Stakeholder process
  – Timeline and current status.
Atlantic Bluefin Tuna Management

International Commission for the Conservation of Atlantic Tunas (ICCAT)

- Responsible for conservation of tunas and tuna-like species

ICCAT’s Job

1. Compiles data
2. Coordinates stock assessment.
3. Develops management recommendations.

Member Nations: 53 (includes EU)
Atlantic bluefin tuna are managed as an eastern and western stock divided by a management unit boundary at the 45 degree meridian.
Atlantic Bluefin Tuna Management

Countries Participating in Western Stock Fisheries

- United States: 57%
- Canada: 24%
- Japan: 19%

Countries Participating in Eastern Stock Fisheries

- Spain
- France
- Italy
- Portugal
- Greece
- Ireland
- Croatia
- Morocco: 10%
- Tunisia: 8%
- Japan: 8%
- Libya: 6%
- Turkey: 4%

European Union: 62%

< 1% Albania, Algeria, China, Egypt, Iceland, Korea, Norway, Syria, Chinese Taipei
Current Approach to Management

Stock Assessments
• East (VPA) and West (VPA and SS) use different methods.
• Uncertainties are not fully considered.

Biological Reference Points
• $F_{MSY}$ proxy ($F_{0.1}$).
• Biomass based reference point undetermined (due to uncertainty in recruitment potential).

Total Allowable Catch (TAC)
• $F_{0.1}$ management strategy.
• Catch advice somewhat based on scientific advice.
• Negotiated among different agendas.
ICCAT Stock Status: 2017

Western Stock: No overfishing
Overfished status is undetermined

Eastern Stock: No overfishing
Overfished status is undetermined
Uncertainties: Atlantic Bluefin Tuna Spatial Dynamics
Uncertainties: Stock Mixing

Otolith chemistry can provide insight on the proportion of western and eastern origin fish in a region.

Uncertainties: Life History

Natural Mortality

Maturity

Recruitment
Management Strategy Evaluation of Atlantic Bluefin Tuna

• Inspired by southern bluefin tuna, ICCAT decided to develop a Management Strategy Evaluation for Atlantic bluefin tuna in 2012.

• Motivation:
  – Stock assessments have been challenged by several issues and uncertainties.
  – Develop harvest strategies that are robust to uncertainties.
  – Desire to make TAC setting easier through pre-agreed procedure.
  – Make fisheries more stable and secure against risk.
A Different Approach to Fishery Management

- Regularly scheduled assessment updates (e.g., every 2 years) using the method that performs best under simulation
- **Total Allowable Catch (TAC)** based on pre-agreed management procedures (with pre-agreed exceptions)

- Re-evaluate and potentially refine the management procedure (every ~5 years)

J. Walter
ICCAT MSE Modeling Process

• Lead analyst: Tom Carruthers, Doug Butterworth

• ICCAT MSE Technical Working Group
  – Meetings of broad science group to inform model development.

• Review Group: Standing Committee on Research and Statistics (SCRS).

• Simulation models were developed in association with the Atlantic bluefin tuna stock assessments.
Bluefin Tuna Operating Model

Spatial definitions

Specifications

- 1864-2015
- 7-area model
- 4 Quarters (Jan-Mar, Apr-Jun, Jul-Sept, and Oct-Dec)
- 2 spawning areas
- 3 main uncertainty axes:
  - Future recruitment (3 scenarios)
    - High/low recruitment regimes
  - Mixing/movement
  - Natural mortality/maturity (2 scenarios)
- Multi-fleet (indices for fitting OM’s)
  - 14 CPUE indices
  - 5 fishery independent indices
Management Strategy Evaluation of Atlantic Bluefin Tuna

• U.S. Bluefin Tuna Research Program

• NOAA funded collaborations since 2011 (SMAST, GMRI, NMFS SEFSC, Univ Maryland, LPRC, Canada DFO, ABTA, AZTI, …)
  – Implications of Mixing between Eastern and Western Stocks
  – Simulation Model of Stock Mixing
  – Integrating Tagging into Stock Assessment
  – Incorporation of Stock Mixing in Stock Assessment
  – Otolith Chemistry to Inform Stock Assessment
  – Stock Assessment Models for Mixed Stocks
  – Management Strategy Evaluation
  – Stakeholder Engagement

ICCAT and U.S. BTRP: Complementary MP Testing

Similarities
– Similar in structure:
  • Generation of data
  • Application of stock assessment method
  • Testing management procedure

Key Differences
• ICCAT:
  – Length-based stock assessment model (statistical catch at length).
  – Testing to date focused on empirical management procedures.
• BTRP:
  – Age-structured stock assessment model (virtual population analysis).
  – Testing to date focused on ICCAT status quo management procedure.
Empirical Management Procedures

Indicator of stock biomass → Comparison to reference level → Harvest decision rule = Total allowable catch

Example:

Gulf of Mexico Larval Survey

Survey Index

1980 1990 2000 2010

Index → Catch

Decision point: How much should the TAC (F) change year to year e.g., cannot increase +/- 10%? 20%?.
Model Based Management Procedure

ICCAT’s Status Quo Management Procedure

1. Stock Assessment
2. Comparison to reference level
3. Harvest decision rule

Total allowable catch

Relative Fishing Mortality

Fishing mortality > target → Catch

Fishing mortality < target → Catch

Constant F
ICCAT MSE Stakeholder Process

- ICCAT Commissioners viewed as key stakeholder representatives and decision makers in process.
  - Increased scientific involvement at ICCAT Commission meetings on MSE development.

- ICCAT established SWGSM: Standing Working Group on Dialogue Between Fisheries Scientists and Managers.
  - Enhancing the Dialogue between Fisheries Scientists and Managers

- Responsibility within countries to conduct further outreach to stakeholders
  - US ICCAT Advisory Committee, public stakeholder calls, public in-person meeting
Initial operational management objectives from Panel 2 meeting of ICCAT Commission

Status (of biological stock, East and West)
• ≥60% probability of being in the green zone of the Kobe plot.
• SCRS will present results of simulation in plots with a trajectory so that managers can evaluate status of the stock (F/F_{MSY} and B/B_{MSY}) at intermediate points between 0 and 30 years, and at the end of the 30-year period.

Safety (of biological stock, east and west)
• ≤15% chance of stock falling below B_{LIM} at any point during the 30 year evaluation period.
• A definition of B_{LIM} should be recommended by SCRS.

Yield (of catch by area, east and west)
• Evaluate outcomes related to maximizing mean catch levels with respect to each management area over the short, medium, and long-term.

Stability (of catch by area, east and west)
• Evaluate outcomes of 20%, 30%, and 40% as well as no limitation on the change in TAC between management periods.
Atlantic Bluefin Tuna Management Strategy Evaluation Workshop for US Stakeholders

April 29-30 2019, New Bedford, MA

Goals:

• Introduce MSE, the MSE process being used by ICCAT, and an application of MSE for Atlantic Bluefin Tuna.
• Solicit feedback on management objectives, model specification, management procedures, and performance indicators.

Outcomes of this meeting are non-binding and solely used for the purposes of future research and reporting to ICCAT.
ICCAT MSE Timeline

• 2017 Stock Assessment
  • Set 2018, 2019, 2020 quotas for east and west

• 2019:
  – Goal to finalize operating models.
  – Develop operational management objectives
  – Test Management Procedures
  – Plan A: continue with MSE; Plan B delay MSE start stock assessment for 2020

• 2020:
  – Commission adopt a management procedure for setting quotas...now delayed.
  – ICCAT Commission sets 2021 quota: Either through MSE or with stock assessment
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