



Overview of Management Strategy Evaluation of Atlantic Bluefin Tuna

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Science. Education. Community.



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

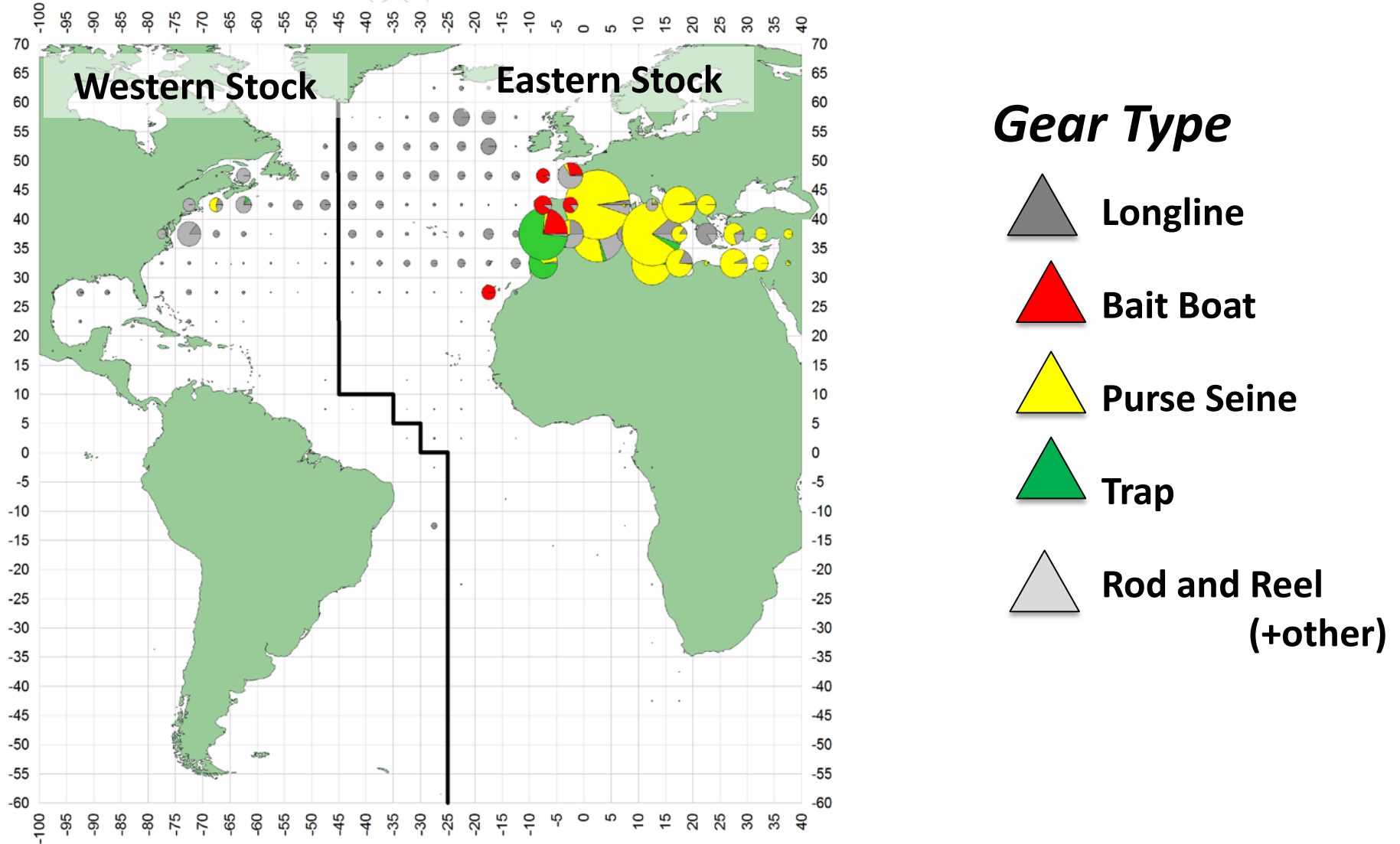


Member Nations: 53 (includes EU)

ICCAT's Job

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

Atlantic Bluefin Tuna Management Units



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.

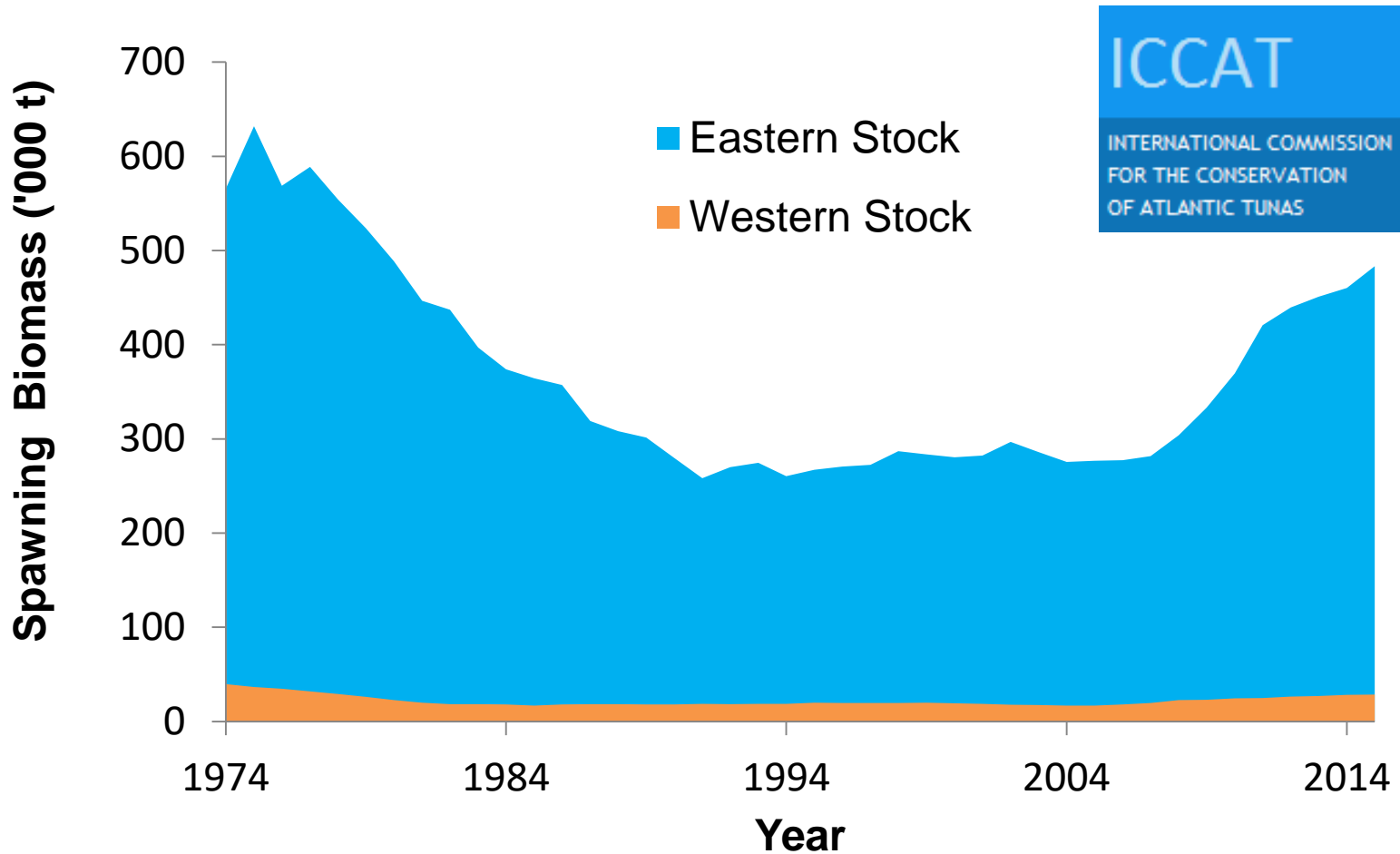
Biological Reference Points

- 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.

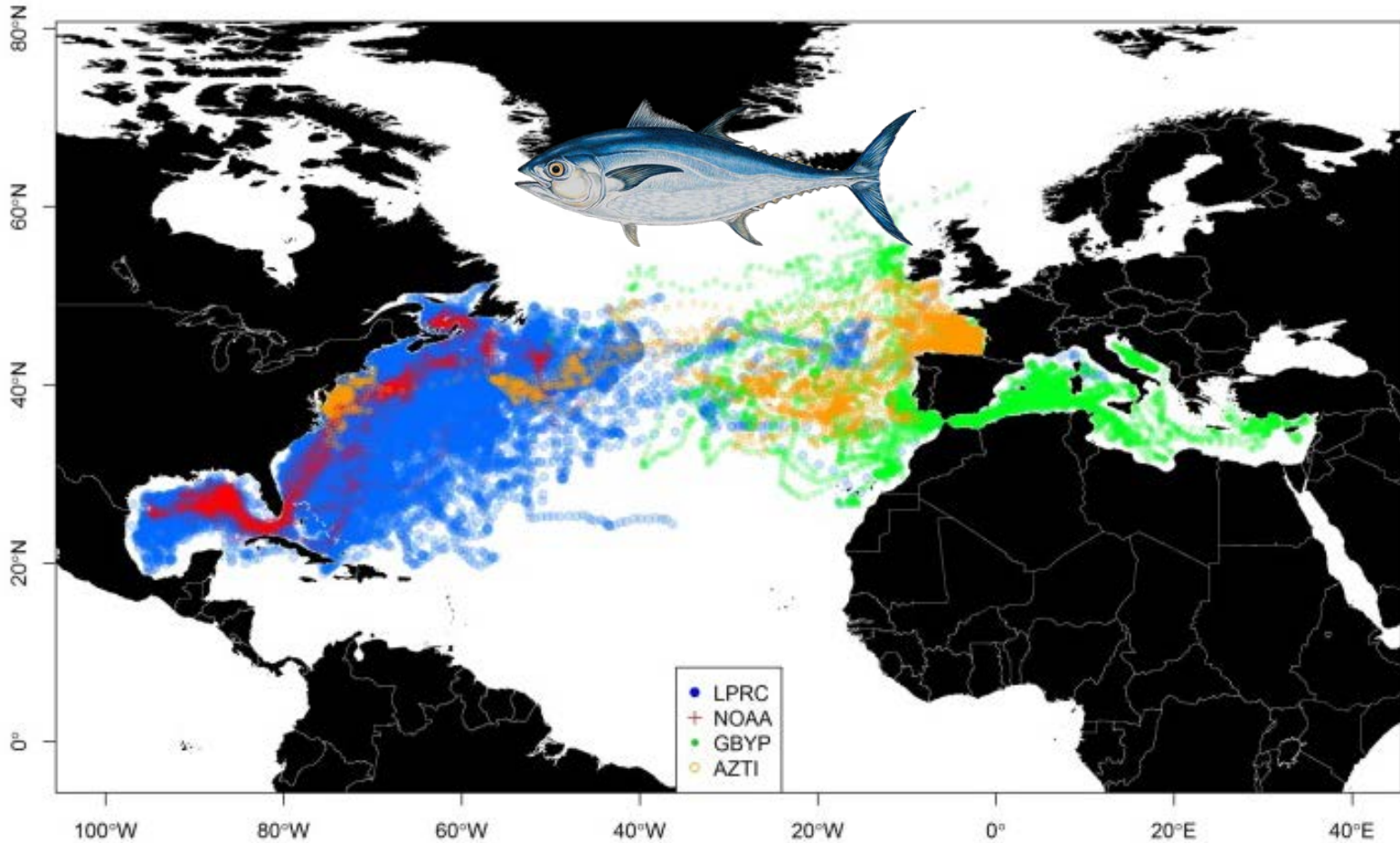
ICCAT Stock Status: 2017



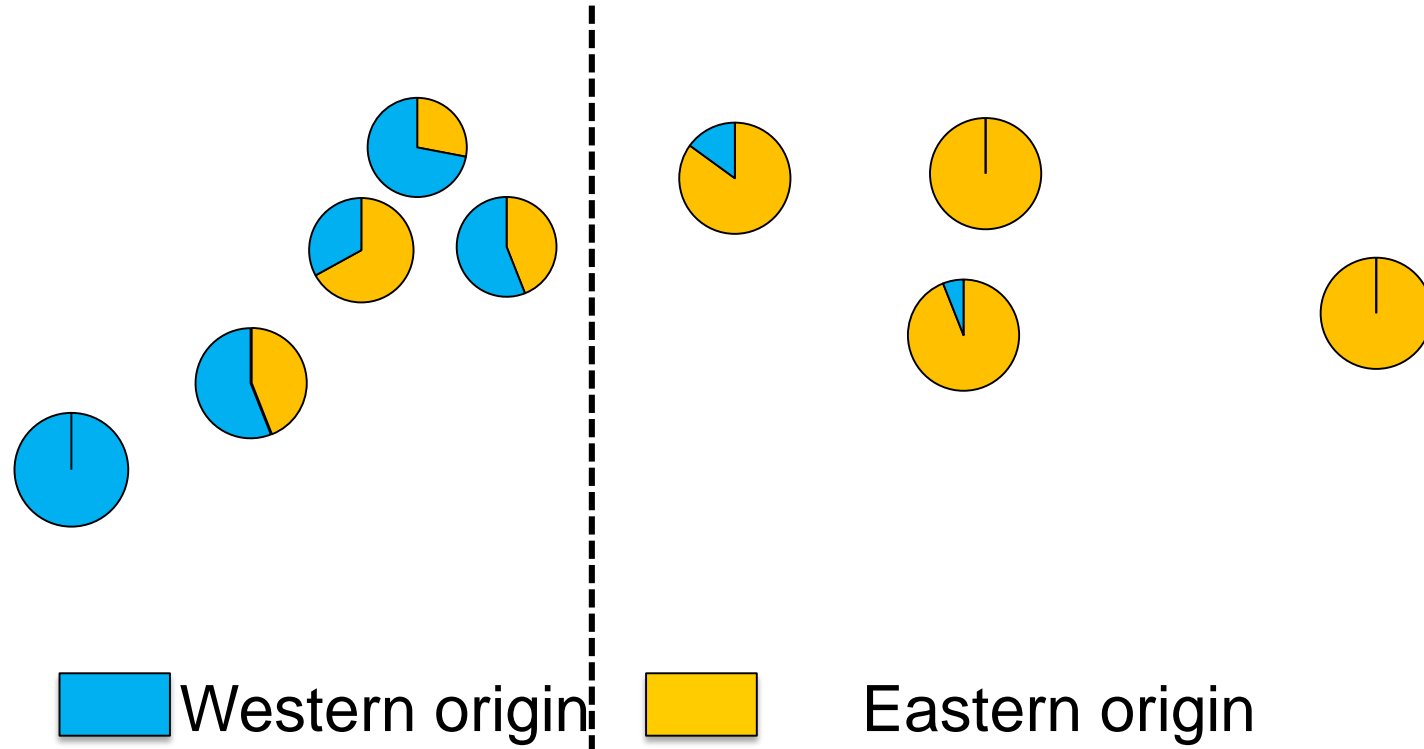
Western Stock: No overfishing
Overfished status is undetermined

Eastern Stock: No overfishing
Overfished status is undetermined

Uncertainties: Atlantic Bluefin Tuna Spatial Dynamics



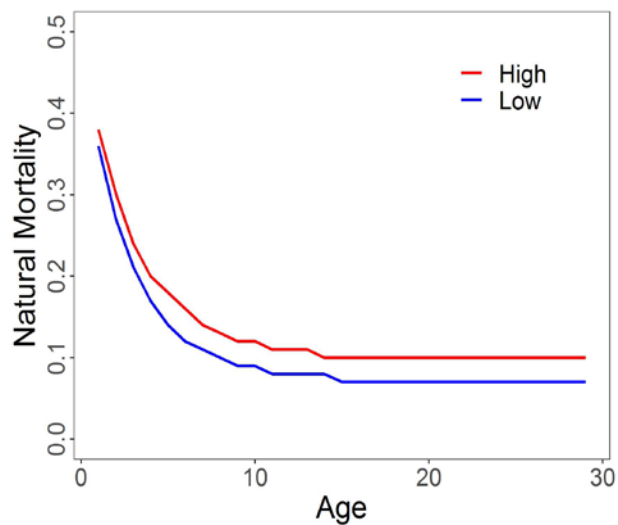
Uncertainties: Stock Mixing



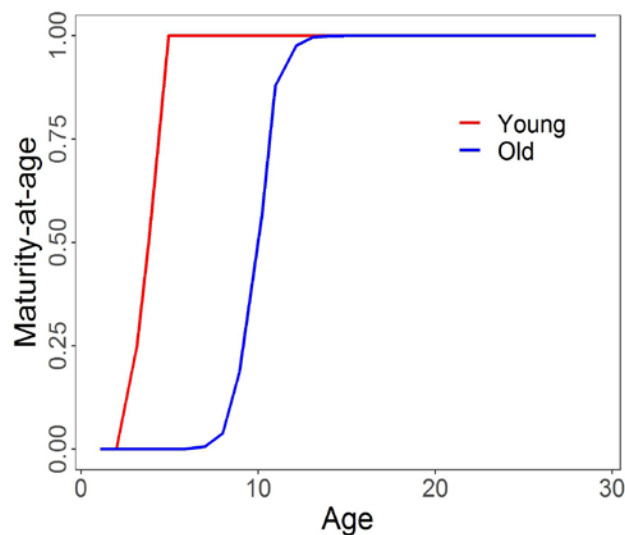
Otolith chemistry can provide insight on the proportion of western and eastern origin fish in a region.

Uncertainties: Life History

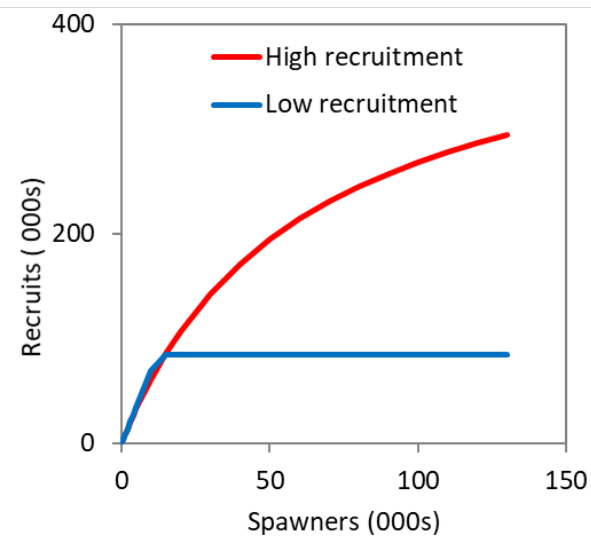
Natural Mortality



Maturity



Recruitment



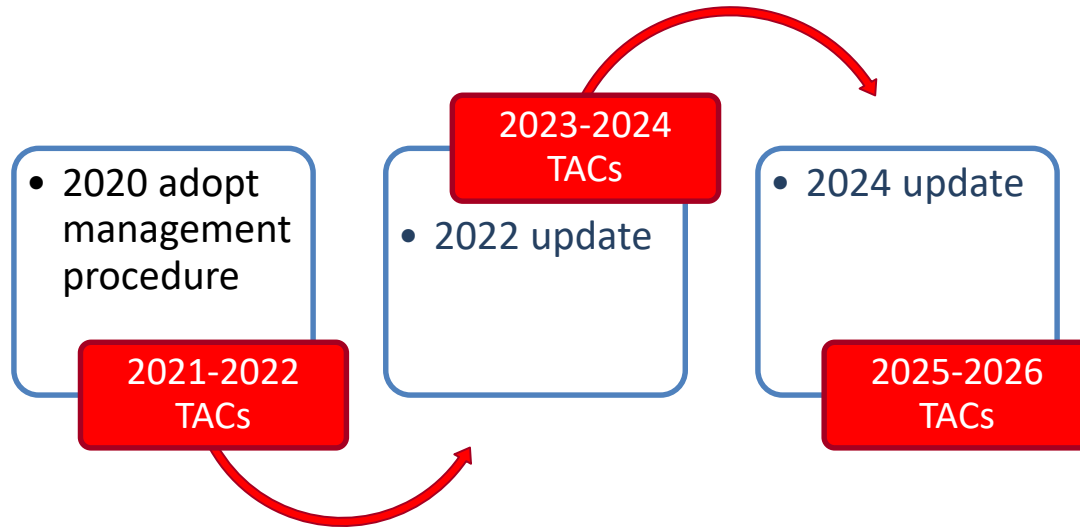


Management Strategy Evaluation of Atlantic Bluefin Tuna

- 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)

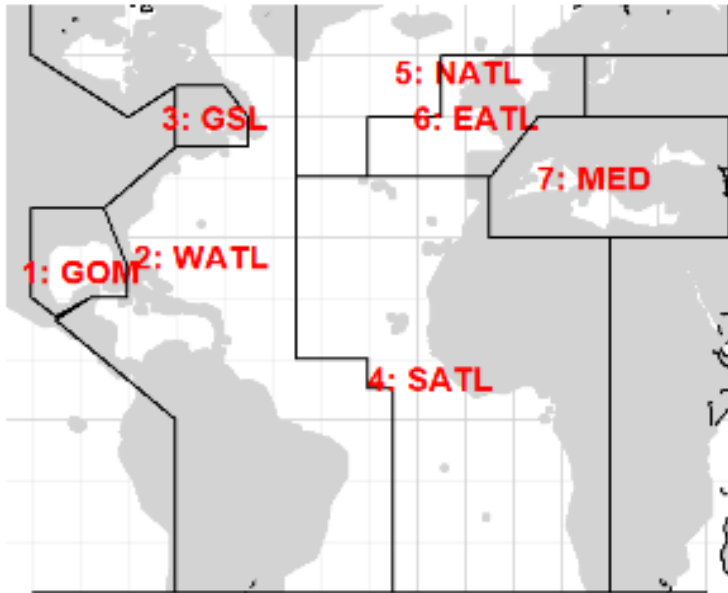
A topographic map showing contour lines and elevation markers, serving as a background for the title.

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
- Presentations to ICCAT MSE Technical Team and SCRS for feedback 2012, 2013, 2014, 2017, 2019



ICCAT and U.S. BTRP: Complementary MP Testing

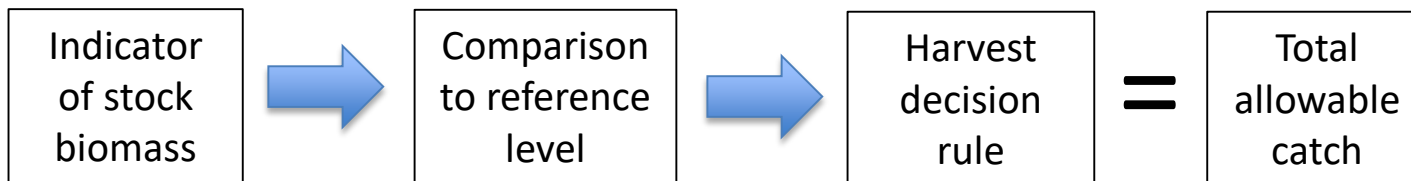
Similarities

- Similar in structure:
 - Generation of data
 - Application of stock assessment method
 - Testing management procedure

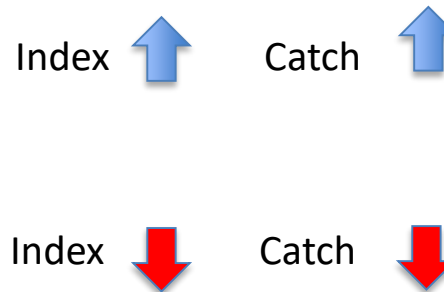
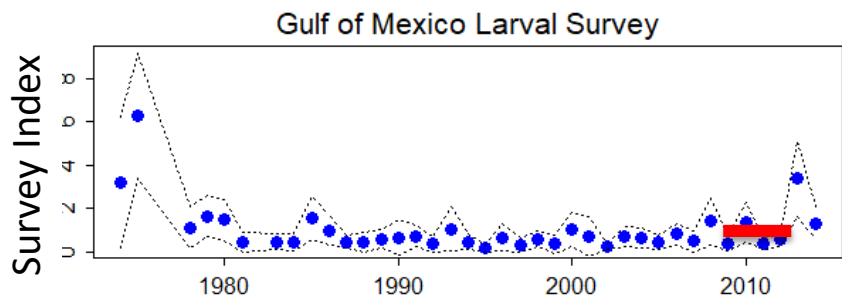
Key Differences

- 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



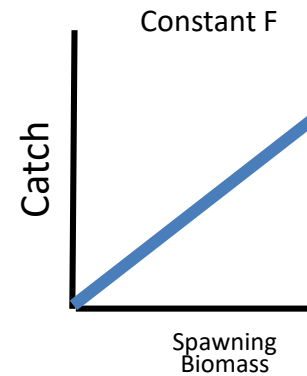
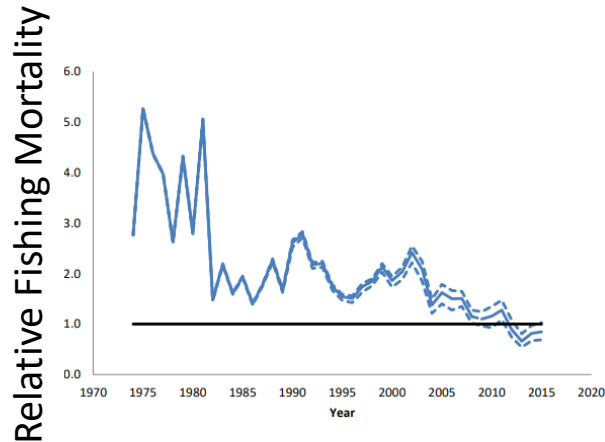
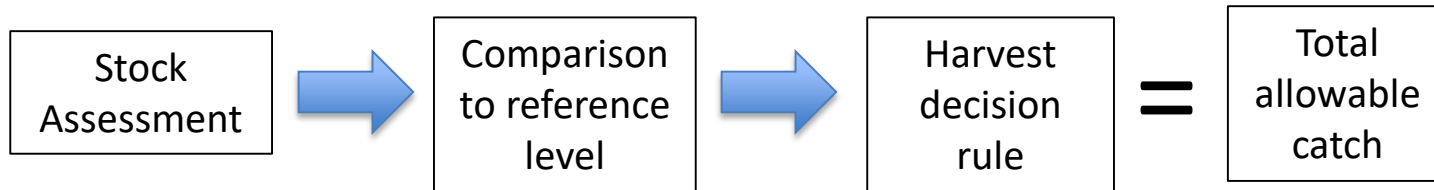
Example:





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



Fishing mortality > target  Catch

Fishing mortality < target  Catch



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)

- $\geq 60\%$ 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)

- $\leq 15\%$ 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

Acknowledgements

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- ICCAT MSE technical working group.
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