

# Today's Menu

- Stock Assessments, What We Know and How We Communicate
- Notions about Overfishing, Overfished and Risk – R Sharma
- Why Conduct Management Procedure Evaluations – C Davies
- Examples – What Can We Learn From
  - Southern bluefin – C Davies
  - Whales – T Kitakado
- What the IOTC WP Meth and Other tRFMOs are doing – I Mosqueira
- IOTC Scientific Committee Recommendations and Process Justification - T Nishida
- Management Objective Guidelines Res 13/10 – P Daniel
- Some Perspectives from April ABNJ Workshop in Sri Lanka – S. Adam
- Group discussion/ Exercises





Project: Sustainable Management  
of Tuna Fisheries  
and Biodiversity Conservation  
in the ABNJ

**CONCEPTS OF STOCK ASSESSMENTS AND  
SUSTAINABLE RATES OF FISHING:  
COMMUNICATING WHAT WE KNOW AND HOW  
WE WORK WITH THAT UNCERTAIN KNOWLEDGE**

Gerald Scott

IOTC MANAGEMENT PROCEDURES DIALOGUE WORKSHOP

Sri Lanka, May 31 2014



Note: Materials borrowed from numerous sources courtesy of V. Restrepo, C. Davies, and others



# Science Communication: What Audiences in Our World?

- Commissions
- Peers
- General Public



# What Advice is Usually Expected by Commissioners?

- *Have actions* taken to date been sufficient to maintain/rebuild stock(s) in/to a condition consistent with Convention Objectives?
- *What additional actions*, drawn from a diverse menu of options, would be needed to achieve the Convention Objectives within a reasonable time frame?
- *Who* are the winners & losers in each potential action?



# What is Usually Expected by Peers?

- How was it determined if actions taken to date were sufficient to maintain/rebuild stock(s) in/to a condition consistent with Convention Objectives?
- How were additional actions evaluated, drawn from a diverse menu of options, to determine what would be needed to achieve the Convention Objectives within a reasonable time frame?
- How were winners & losers in each potential action determined?



# Commission Communications

- Challenge is to transmit main results in a way that can easily be utilized by Decision Makers
  - Express relative to Convention Objectives
  - Address ‘Sustainability’ Concerns
  - Express in a way that Provides for or Elicits Feedback on Relative Risks/Rewards, Thresholds & Targets
- Our focus today is to start a dialogue to elicit feedback on these features



# ❖ Dialogue

- A conversational exchange between two or more people.
  - The conversation should be on-going.
  - It should take account of stake-holder interests.
- Can we structure conversation in a better way to enhance exchange?



# What Decision Support Material did tRFMOs Request?

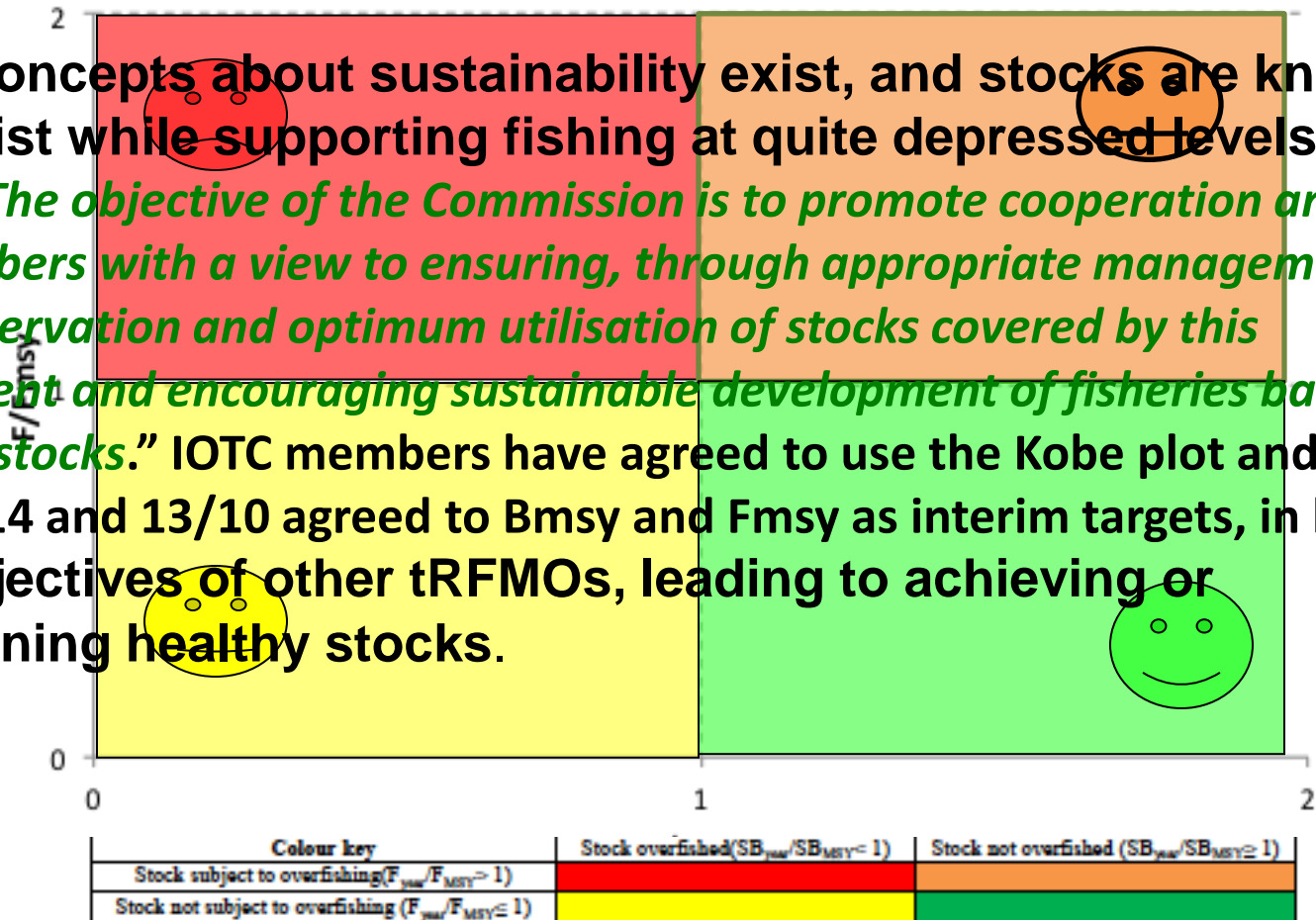
- At Kobe I, tRFMOs recommended standardization of presentation of stock assessments and to base management decisions upon the scientific advice, including the application of the precautionary approach.
- Regarding standardization, it was agreed that stock assessment results across all five tRFMOs should be presented in the “four quadrant, red-yellow-green” format now referred to as the Kobe Plot. This graphical aid has been widely embraced as a practical, user-friendly method for presenting stock status information.





# Management Objective <-> Sustainability

Many concepts about sustainability exist, and stocks are known to persist while supporting fishing at quite depressed levels. For IOTC *"The objective of the Commission is to promote cooperation among its Members with a view to ensuring, through appropriate management, the conservation and optimum utilisation of stocks covered by this Agreement and encouraging sustainable development of fisheries based on such stocks."* IOTC members have agreed to use the Kobe plot and in Res 12/14 and 13/10 agreed to Bmsy and Fmsy as interim targets, in line with objectives of other tRFMOs, leading to achieving or maintaining healthy stocks.



Thus, Sustainability in many tRFMO contexts is to **“get green and be happy”**



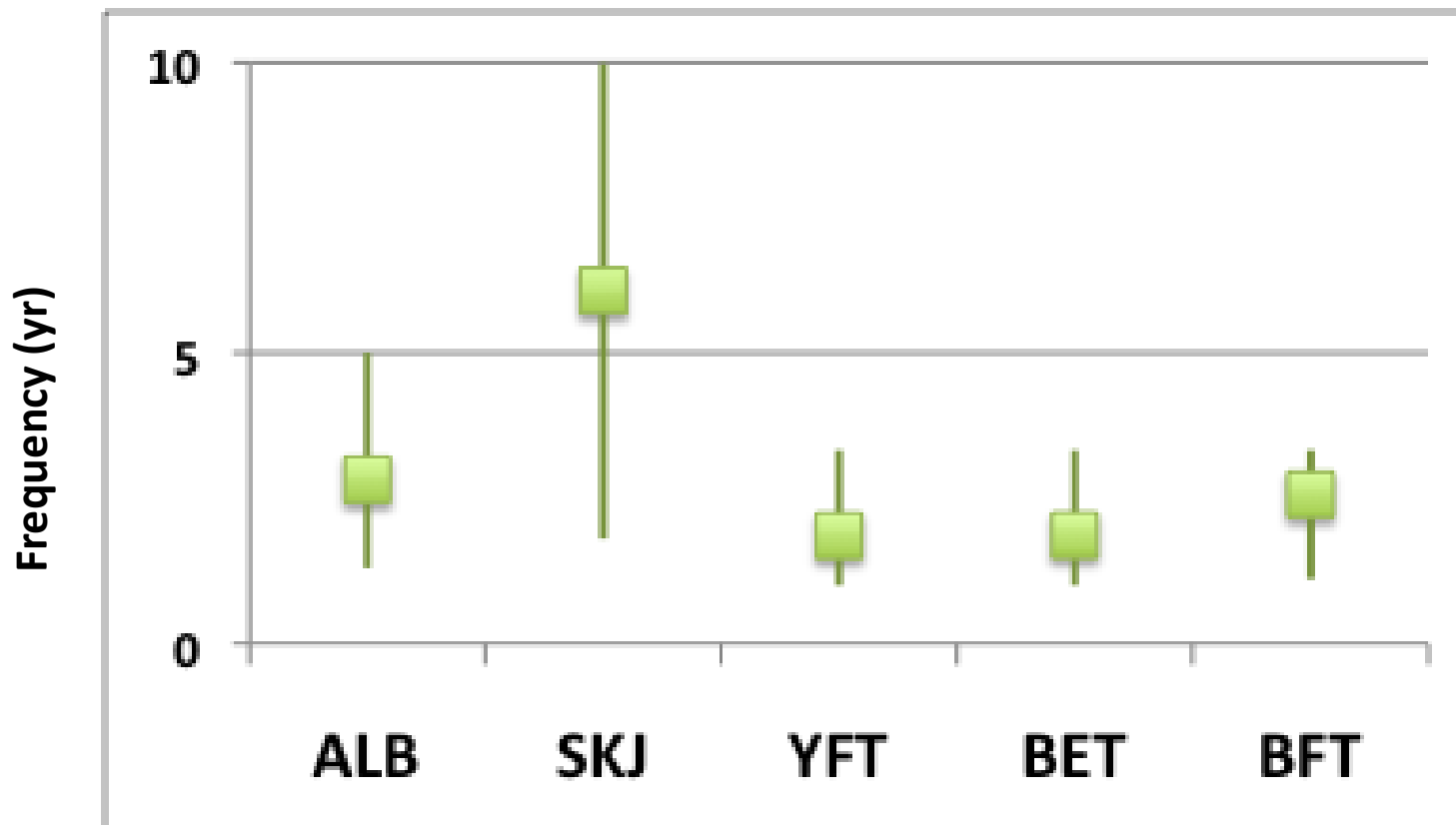
# T-RFMO Assessments

- Assessments are frameworks to integrate different sources of information to provide advice.
- Tuna (and tuna-like species) assessments are conducted by RFMO Secretariats or by RFMO formal scientific bodies, or both.



# T-RFMO Assessments

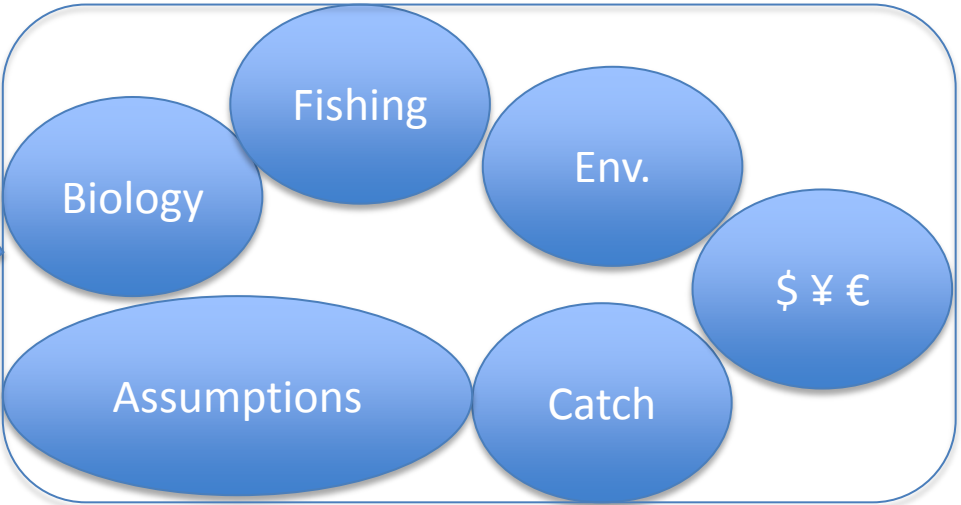
- On average, the main tuna species are assessed every 2-3 years (varies by RFMO), except skipjack. Assessments of other species are less frequent.



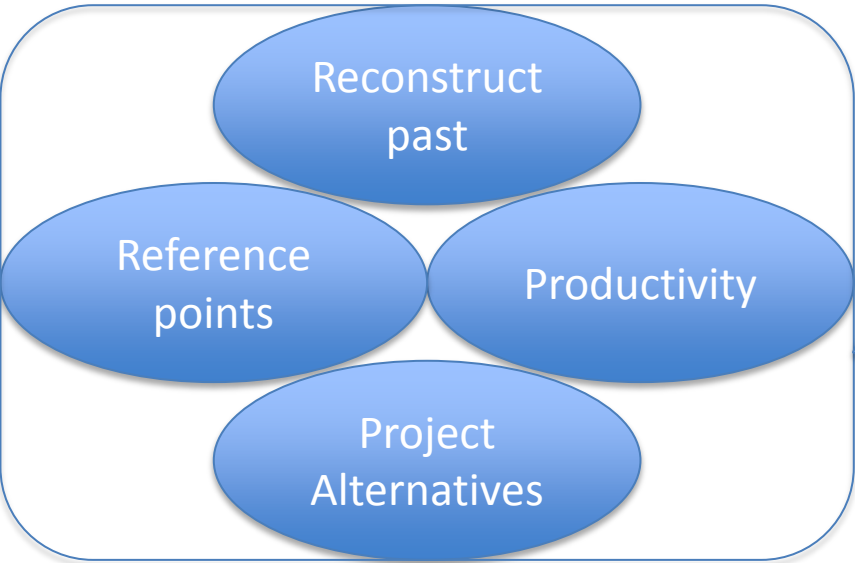
# Assessments

Assessments are a framework to integrate different sources of information to provide advice

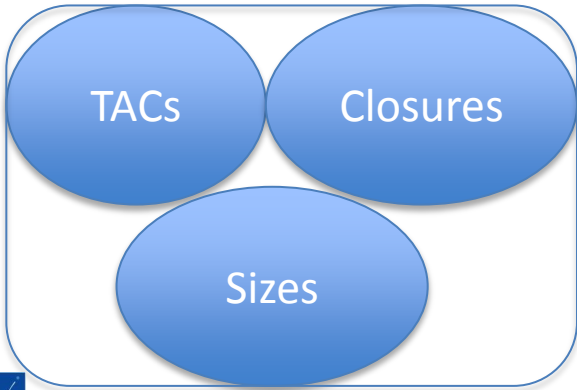
## INPUTS



## MODEL

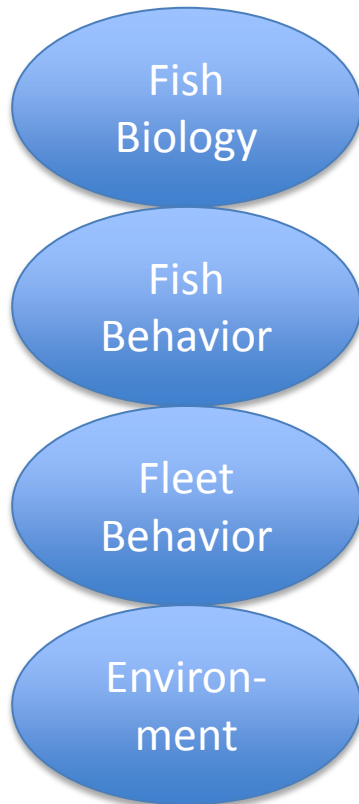


## ADVICE

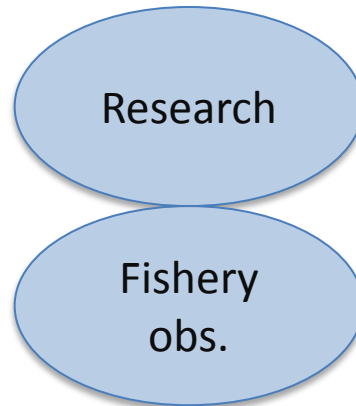


# Model vs Reality

## Complex Reality



## Limited Data



Models are an  
**approximation**  
of reality



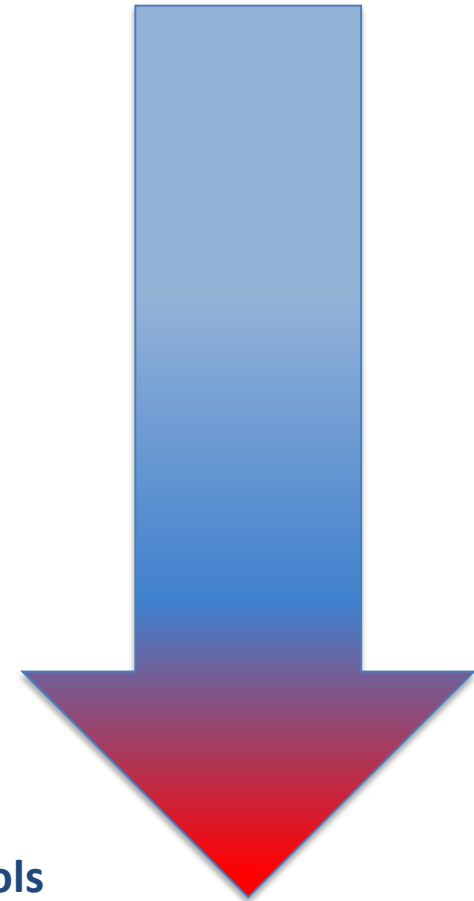
# METHODS

- Fishery Indicators
- Per-Recruit Analyses
- Biomass Production Model
- Ecological Risk Assessment (PSA)
- Age-structured Production Model
- Sequential Population Analysis (VPA)
- Integrated Statistical Models
- Spatially-explicit

Some are all-in-one tools



## Data Needs



# METHODS

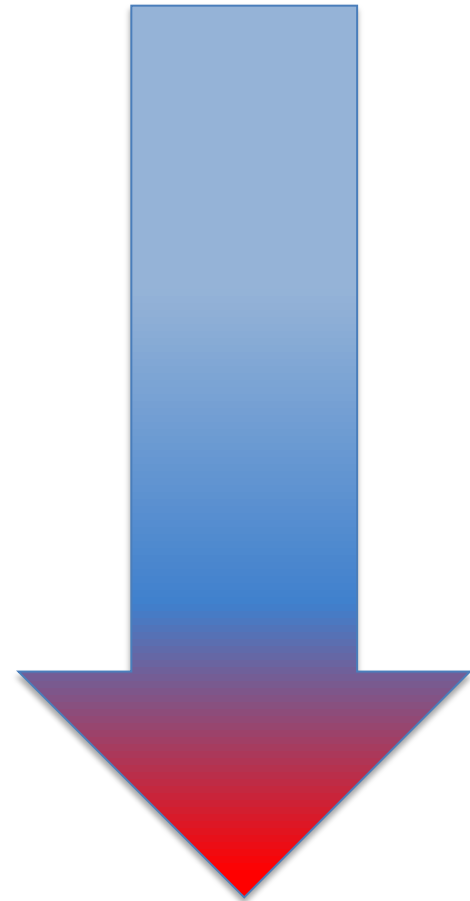


**Indicators**



**Models that integrate multiple data sets**

**Data Complexity**



# METHODS – Choice of method

- Primarily depends on data types available
  - Highly aggregated: Indicators, production models
  - Operational data (set-by-set): Integrated models
- Some level of subjectivity: tradition, familiarity
- For a given stock, there is some level of continuity
- Peer review (QC) is becoming more frequent



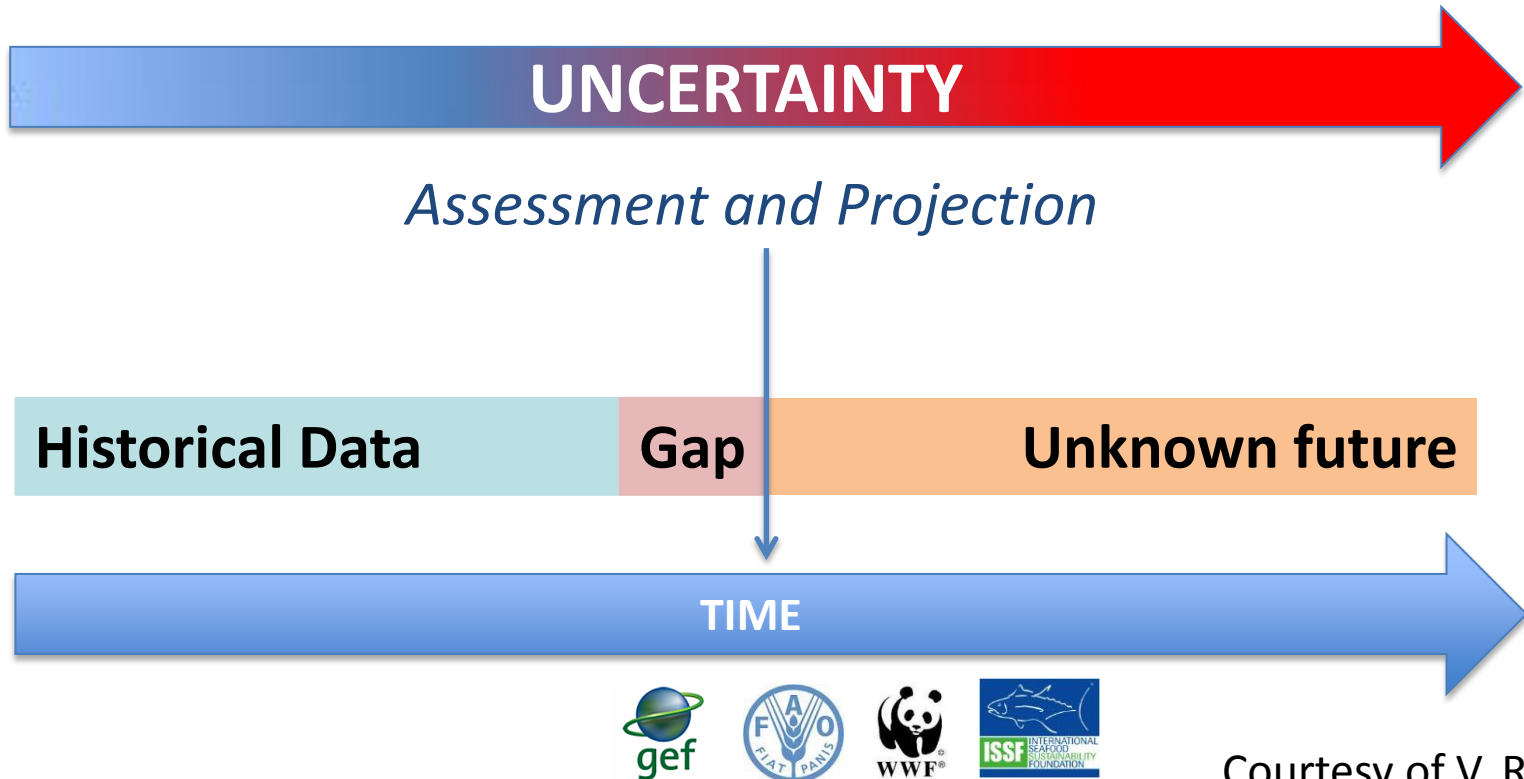


# UNCERTAINTY

The “Gap” can have large influence on Uncertainty into the future.

Very often, information from the fisheries that have already occurred which could be available are not due to lags in reporting systems.

This “Gap” in knowledge can lead to a lack of trust that the scientific assessment captures realities of the current state.



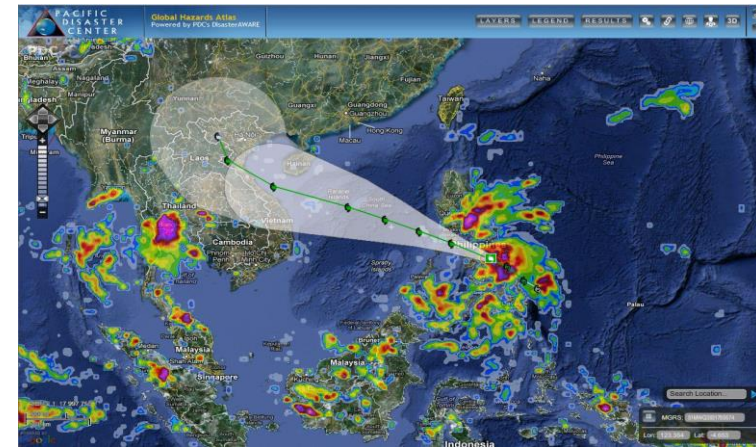
Courtesy of V. Restrepo

# Uncertainty into the future

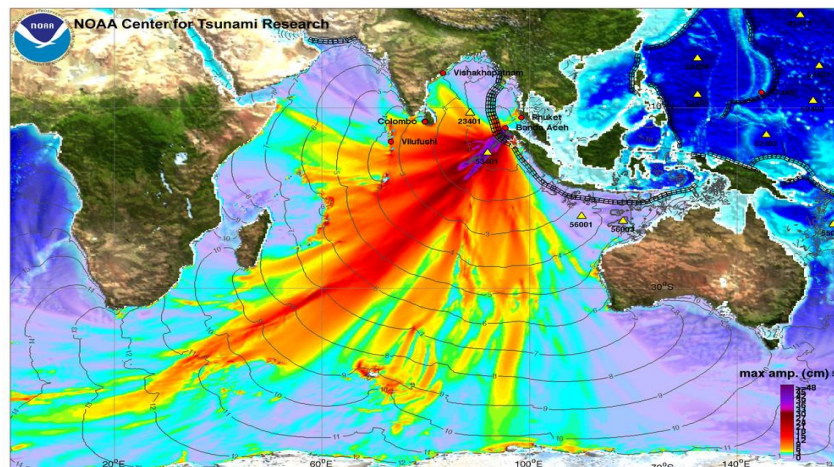
Future predictions of stock condition reflect an expanding 'Cone of Uncertainty' with time, as often reflected in other disciplines, like.....



Atlantic  
Hurricanes



Pacific  
Cyclones



Indian Ocean  
Tsunamis

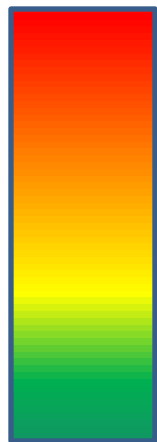
# What Additional Decision Support Material did tRFMOs Want?

- At Kobe II, it was agreed that the next logical step is a “strategy matrix” for managers that lays out options for meeting management targets, including if necessary, ending overfishing or rebuilding overfished stocks.
- The Strategy Matrix would be a harmonized format for RFMO science bodies to convey advice. Based on targets specified by the Commission for each fishery, the matrix would present the specific management measures that would achieve the intended management target with a certain probability by a certain time.



# Kobe 2 Strategy Matrix

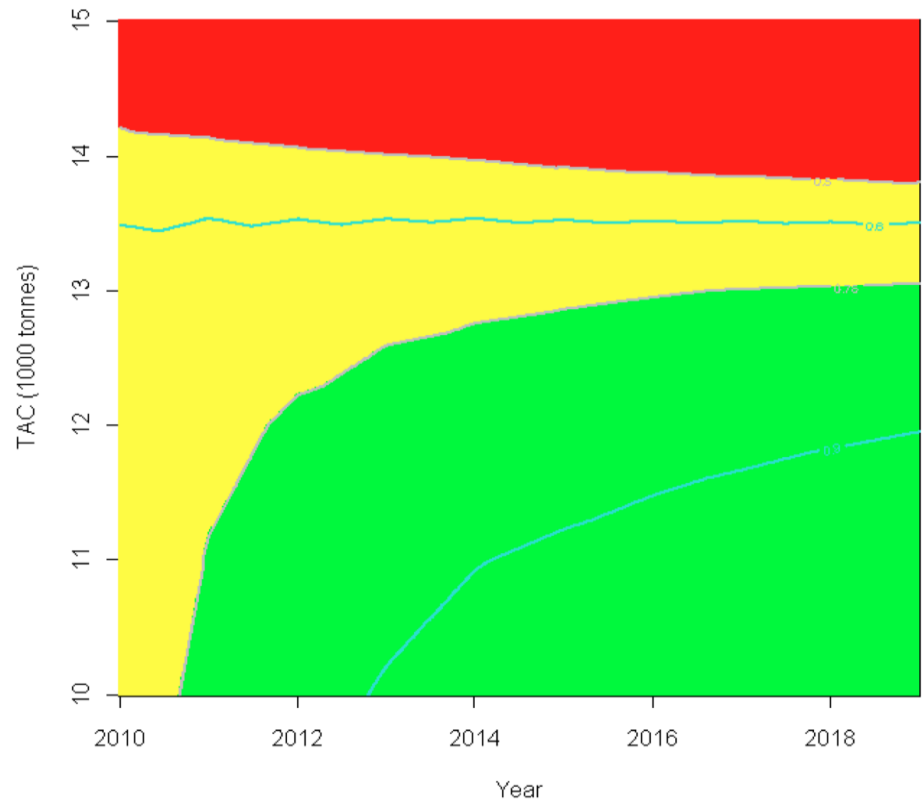
K2SM: a form of decision table informing on quantified risks of achieving management objective



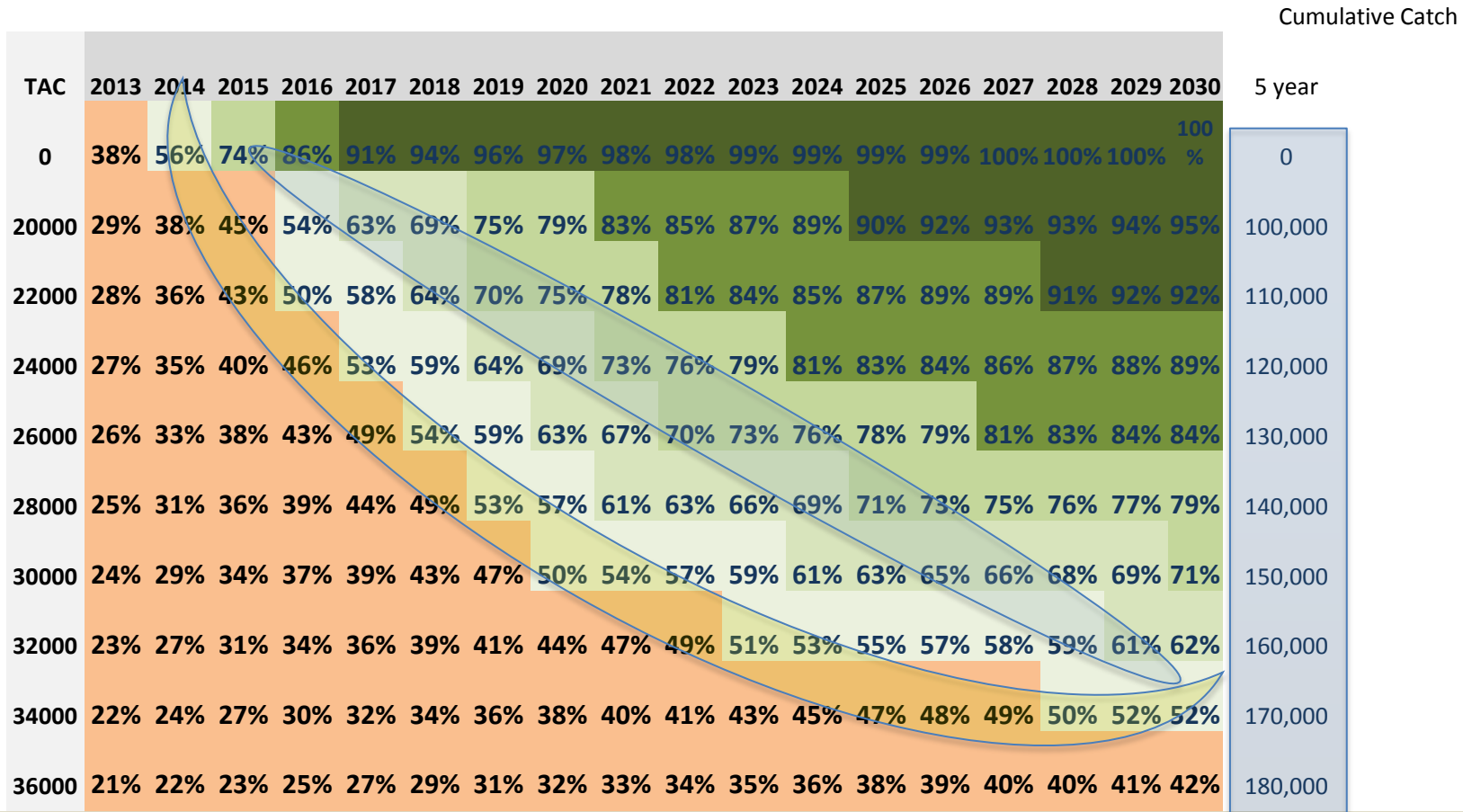
< 50%, worse than a coin toss

50 - 75%, coin toss to 3 out of 4

>75% better than 3 out of 4



# Constant Catch Kobe Matrix



- The time required for achieving at least a 50% chance of getting 'Green' increases with increasing constant catch
- Higher probabilities require a longer time or lower catch or both.
- Cumulative catches for a fixed probability and time frame are typically less than for an F based strategy



# Who wants want?

## MANAGERS

- Stability
- Consistency
- No Surprises

## SCIENTISTS

- Advancement
- Variety
- Surprises?

*As assessments become more sophisticated, the estimation of uncertainty could increase.*



- ❖ From a given starting point, multiple pathways (management strategies) exist which could be used to achieve the goals (management objectives) of the Commission.
- ❖ The particular approach that best meets the objectives of the Commission depends upon how certain the Commission wishes to be to achieve its goal and over what time frame.
- ❖ Because of this, trade-offs need to be considered related to total catch, inter-annual variability in catch, socio-economic, ecosystem, or other concerns which must be balanced in choosing the most appropriate pathway.

## Trade-offs & Uncertainties



- Advancing the PA requires significant feedback (dialogue) between scientists and policy-makers to progress.
  - What is needed from the tRFMO policy makers : building on Res [13-10] - definitions of the management objectives, time-frames, and tolerable risk-of-failure levels (degree of precaution) in achieving objectives.
  - What is needed from tRFMO scientists: continued work toward full characterization of uncertainty in stock status evaluations to improve advice on the odds of achieving management objectives.
- While there are a number of methods employed to characterize and quantify these uncertainties, there remain a range of unquantified uncertainties that can be reasonably captured in **Management Strategy Evaluations** (Simulations) to move this process forward.

## Advancing the PA: What more is needed?

