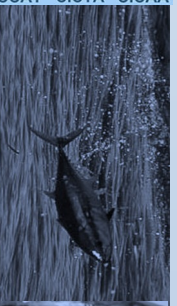
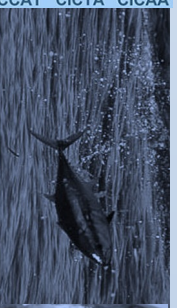


MSE ICCAT context

Overview of process and progress

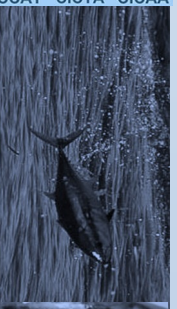
David J. Die



ICCAT MSE

- Initial and existing process

- Current state of ICCAT MSE:
  - Albacore North
  - Bluefin tuna
  - Tropical tunas
  - Swordfish



How did we get here?

2013

Initial proposal for ALBN HCR and target reference points

2014

2015

2016

SCRS

Commission

WGSAM

#2 WG Dialog

2011 Resolution

WG Future of ICCAT

#1 WG Dialog

SCRS

Commission

WGSAM

Rec 2015-04
Rec 2015-07

WGSAM

ALB SA

Panel 2 Sapporo

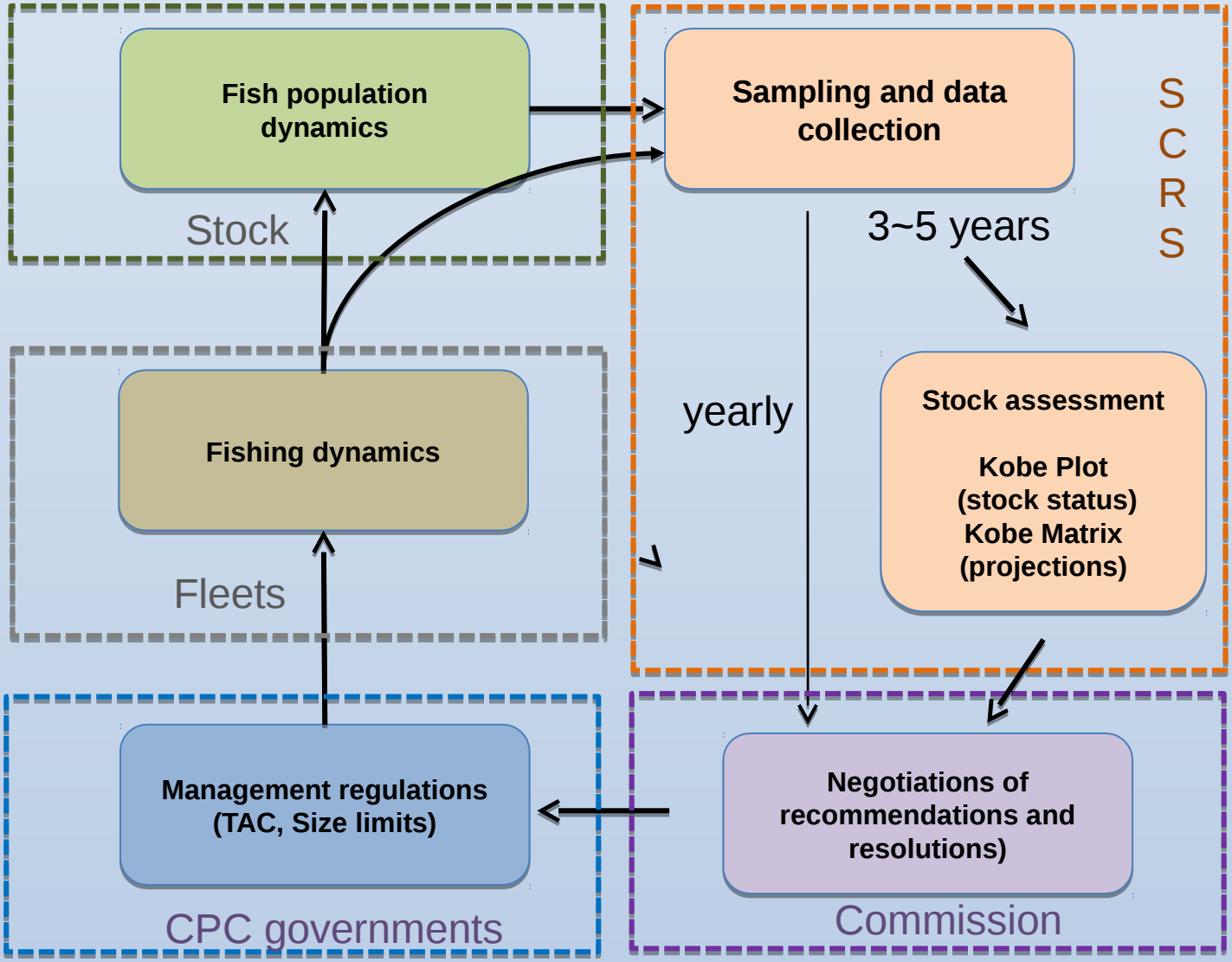
SCRS

Commission

tRFMO MSE

??

Current ICCAT Management



Future ICCAT Management

Rec 2015-04, 2015-07

Stock

Fish population dynamics

Fleets

Fishing dynamics

SCRS

Sampling and data collection

5 ~ 10 years

yearly

1 ~ 3 years

Stock assessment

Stock status
Projections
Review of HCR

Indicators
Reference points
/HCR

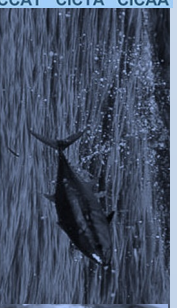
CPC governments

Management regulations (TAC, Size limits)

Commission

Recommendations and Resolutions)

TAC



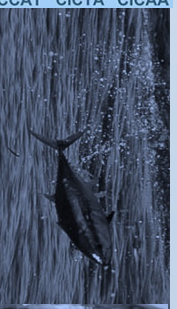
Progress towards MSE: ICCAT Commission

- **Rec 2015-04**

RECOMMENDATION BY ICCAT TO ESTABLISH HARVEST CONTROL RULES FOR THE NORTH ATLANTIC ALBACORE STOCK

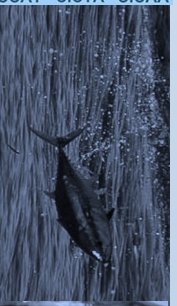
- **Rec 2015-07**

RECOMMENDATION BY ICCAT ON THE DEVELOPMENT OF HARVEST CONTROL RULES AND OF MANAGEMENT STRATEGY EVALUATION



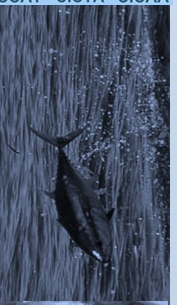
Rec 2015-07 (Generic MSE)

- Starts defining MSE related concepts
- Requests Commission panels to guide MSE process for ALB(N), BFT, SWO(N) and Tropical Tunas
- Requests the SCRS to define candidate MPs for each stock and test these



Rec 2015-04 (Northern Albacore MSE)

- Defined specific objectives
- Asked the SCRS to use MSE to test MPs and report to Commission
- Committed to implement a MP (including a HCR)



SCRS progress on MSE simulations

– Albacore North

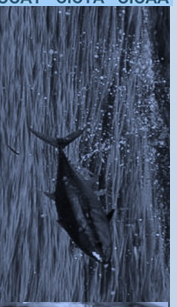
First full set of MSE simulations completed
Report on performance of alternative MPs

– Bluefin tuna (GBYP)

Simulation framework developed
Supporting BFT assessment

– Swordfish North

– Tropical tunas



Atlantic Albacore North

Full set of simulations conducted:

- Wide range of operating models
- Wide range of candidate HCRs
- Report on a set of Performance indicators

2016 Albacore MSE simulations

Operating sub-model
Age-structured

"true" Dynamics

Observation sub-model
Produces history of CPUE and catch

"observed" Dynamics

SIMULATIONS

Performance

- Mean catch
- Catch variance
- Prob. green quadrant

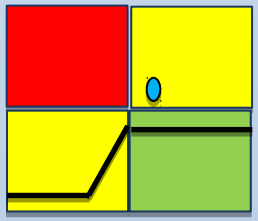
Catch

MS sub-model

Production model

HCR based on F

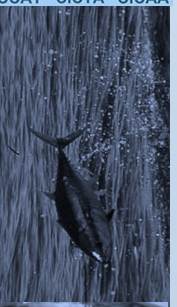
Implementation sub-model



TAC

Perceived stock status
Pre-agreed actions (HCR)

Incorporating UNCERTAINTY



Operating sub-model

10 alternative “realities”

Observation sub-model

Hundreds of different cpues and catch:

- Unbiased
- Biased

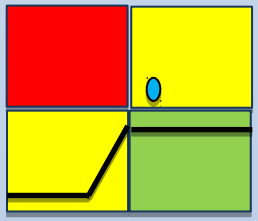
SIMULATIONS

Performance

- Mean catch
- Catch variance
- Prob. green quadrant

Catch

Implementation sub-model



MS sub-model

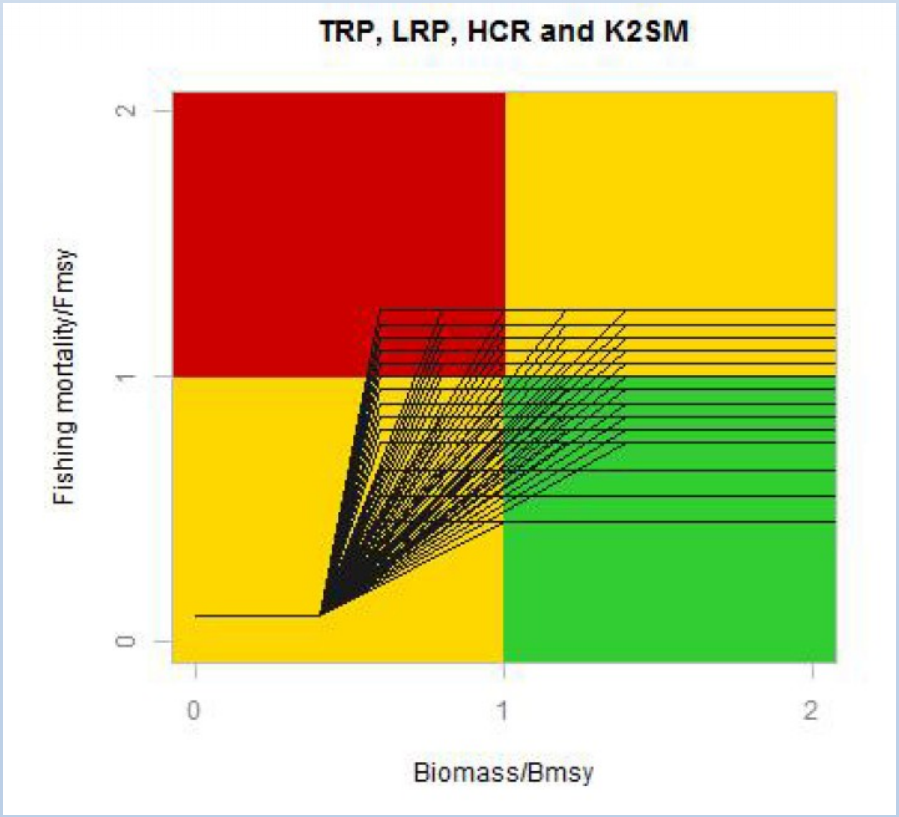
Limited estimation error

TAC

Perceived stock status
Pre-agreed actions (HCR)

Full set of HCRs tested

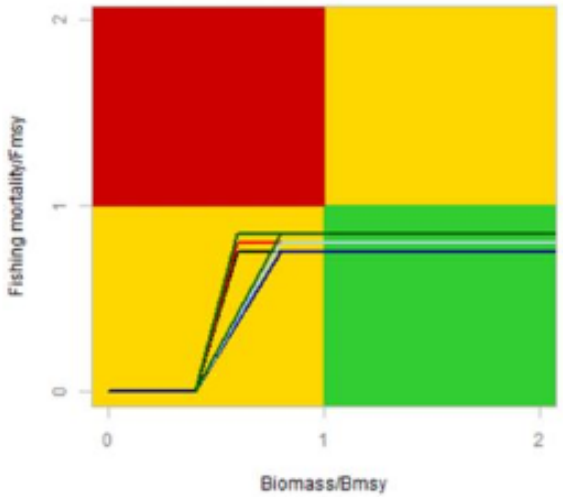
B threshold	F target													
	0.45	0.55	0.65	0.75	0.80	0.85	0.9	0.95	1.0	1.05	1.1	1.15	1.20	1.25
0.6	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
0.8	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
1.0	■	■	■	■	■	■	■	■	■	■	■	■	■	■
1.2	+	+	+	+	+	+	+	+	+	+	+	+	+	+
1.4	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗



2. Results (candidate HCRs)

1. Discard HCRs if pGreen < 0.6
2. Ftar with high yield
3. Select Bthresh that will avoid drastic reductions of catch

"More precaution and less action"

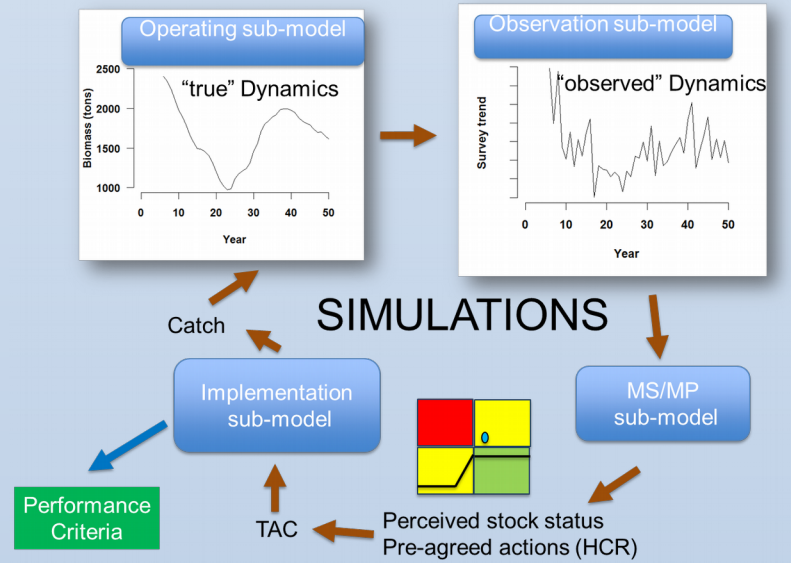


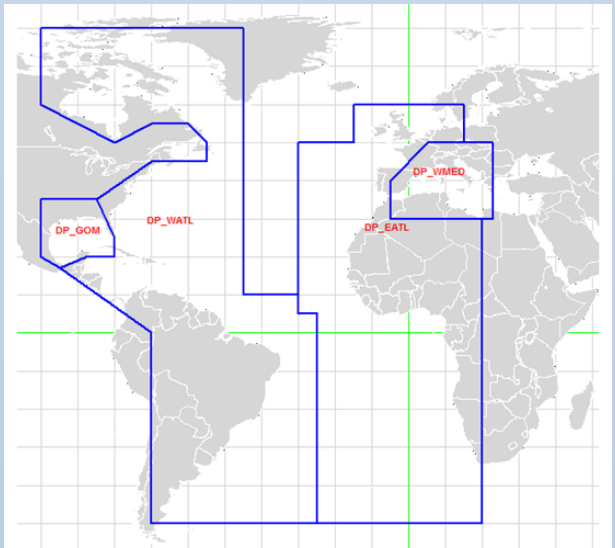
HCR	Blim	Bthresh	Ftar
1	0.4	0.6	0.75
2	0.4	0.6	0.8
3	0.4	0.6	0.85
4	0.4	0.8	0.75
5	0.4	0.8	0.8
6	0.4	0.8	0.85

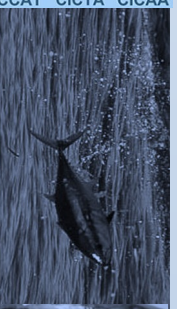
Figure 7. Candidate HCRs and RPs resulting from the analyses of this project.

BFT MSE: capturing hypotheses

- Developed a multi-stock, spatial, quarterly, statistical catch-at-length model (M3)
- Move away from catch-at-age data
- Finer spatial resolution
- Run much faster than previous multi-stock models

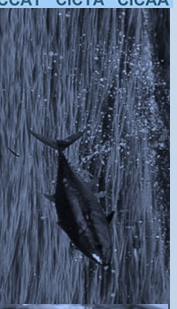






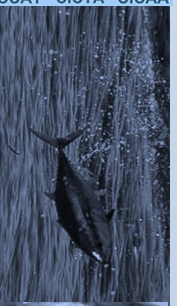
MSE BFT

- Very flexible framework developed
- Interim objective is to use MSE framework for improving current stock assessment
- Testing of new assessment models to support 2017 assessment of BFT
- After 2017 – use framework for full MSE



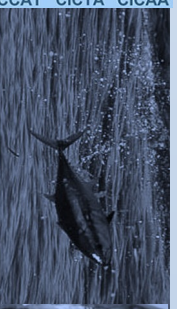
ICCAT Panel 2 (BFT and ALB (N)

- General support for the idea that the range of HCRs tested for albacore N was sufficient
- Modified the list of performance indicators to be used in MSE
- Requested further work on additional sources of uncertainty to be considered in MSE simulations
- Need to develop other tools to communicate trade-offs between performance indicators
- Requested a proposal including resources required to complete the future work on MSE required by the commission



Panel 2: Performance indicators

1. **Status of stock/fishery**
2. **Safety**
3. **Yield**
4. **Stability**



Panel 2: Performance indicators

1. Status of stock/fishery

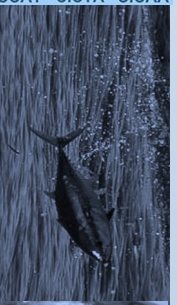
1.1 Minimum spawner biomass relative to B_{MSY} (B/B_{MSY})

1.2 Mean spawner biomass relative to B_{MSY} (B/B_{MSY})

1.3 Mean fishing mortality relative to F_{MSY} (F/F_{MSY})

1.4 Probability of being in the Kobe green quadrant (B, F)

1.5 Probability of being in the Kobe red quadrant (B, F)


Panel 2: Performance indicators

2. Safety

2.1 Probability that spawner biomass is above $B_{lim}(0.4B_{MSY})$ (B/B_{MSY})

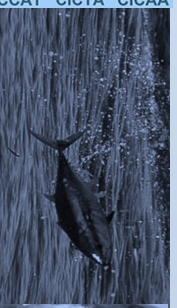
2.2 Probability of $B_{lim}<B<B_{thresh}$ (B/B_{MSY})

3. Yield

3.1 Mean catch – short term (catch)

3.2 Mean catch – medium term (catch)

3.3 Mean catch – long term (catch)



Panel 2: Performance indicators

4. Stability

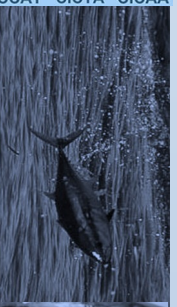
4.1 Mean absolute proportional change in catch (catch (C))

4.2 Variance in catch (catch (C))

4.3 Probability of shutdown (TAC)

4.4 Probability of TAC change over a certain level (TAC)

4.5 Maximum amount of TAC change between management periods (TAC)



MSE N ALB future steps

- Exploring additional hypotheses for operating models:
  (e.g. considering autocorrelated recruitment or regime shifts)

- Improving observation error models
  (e.g. considering changes in catchability over time)

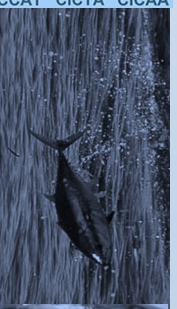
- consider alternative management procedures

(e.g. harvest control rules with bounds in the management action, alternative stock assessment models, and CPUEs with different characteristics, such as very noisy CPUEs or CPUEs that track only some age classes)

- Considering implementation error (or systematic bias)
- Report on additional performance indicators proposed by panel 2
- find better ways to communicate results.

Tropical tunas MSE

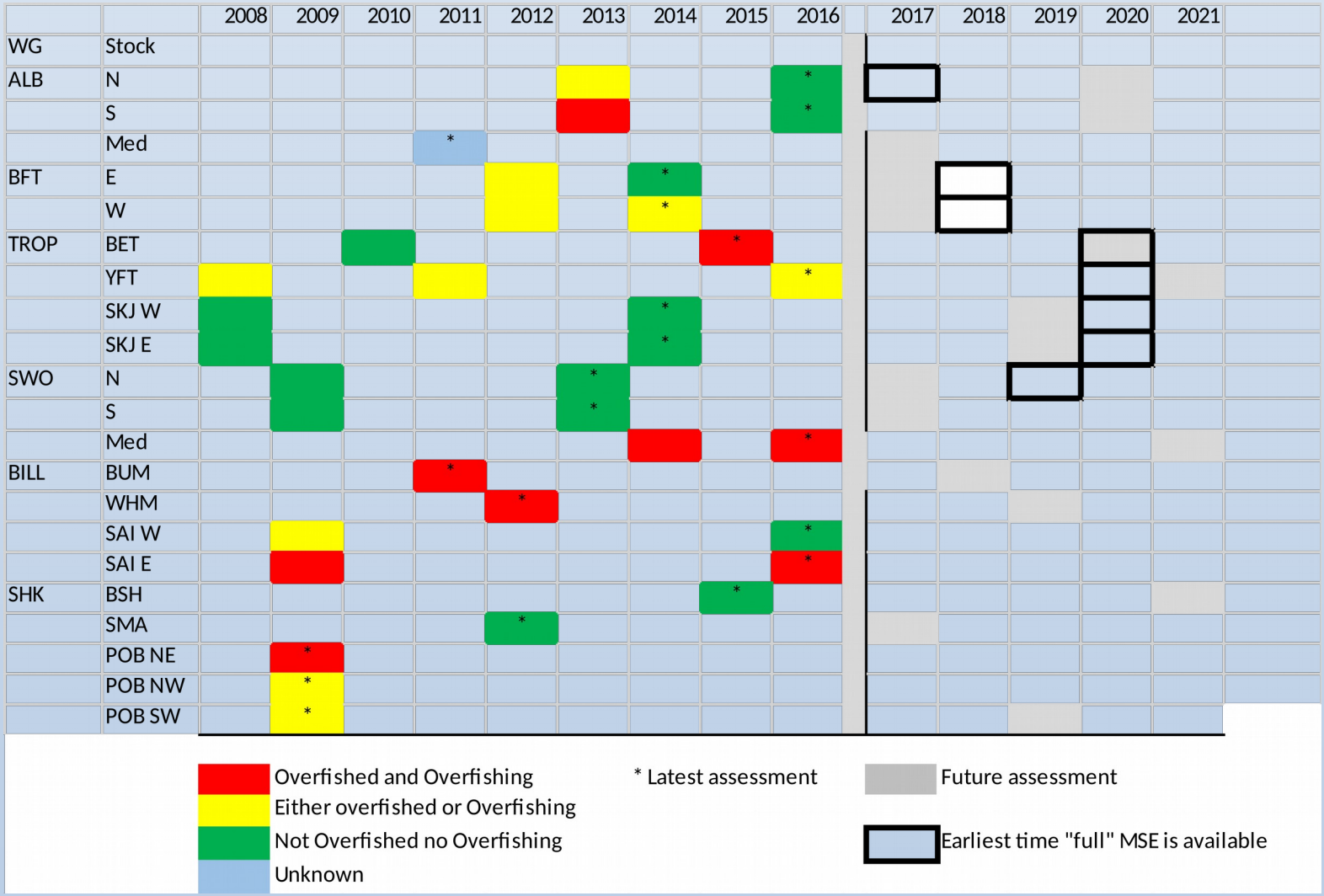
- Some work done in the early 2000s
- Review performance indicators for yellowfin and bigeye
- Provide feedback regarding initial performance metrics for yellowfin and bigeye
- Review existing operating models and provide feedback on potential tropical tuna design issues for MSE
- Develop a programme to implement and fund MSE for tropical tunas for a minimum of three years



Northern Stock of Swordfish

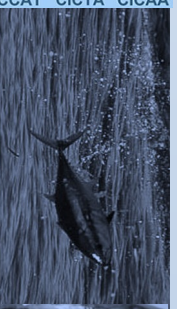
- Some work presented at the WGSAM to help development of operating model
- SWO WG needs to develop a workplan for the MSE work

ICCAT MSE calendar (draft)



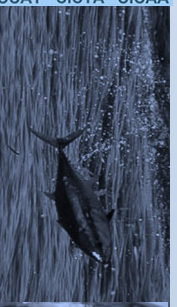
ICCAT MSE – next steps

- Commission meeting Nov 2016:
  - Review progress:
    - Panel 2 recommendations
    - SCRS simulations and proposed calendar
  - Next steps: WG on dialog or panels
- SCRS WGs review progress:
  - BFT WG March 2017
  - ALB WG June 2017
  - TRO WG September 2017


Conclusion: challenges

- Commission needs to allocate enough resources to support:
  - MSE simulations
  - Dialog between stakeholders
- SCRS
  - ALB – complete more simulations
  - BFT – start HCR evaluations support assessment
  - SWO – develop operating model
  - TRO - develop multi-species operating model



Acknowledgments

Assessment colleagues from ICCAT SCRS

Research conducted at CIMAS

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