Australian Government
Department of Agriculture
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Weight of Evidence Framework: Stock Status Assessment

Thanks to J. Larcombe for this presentation which was given at the IOTC SC meeting in December 2013.

Research by the Australian Bureau of Agricultural and Resource Economics and Sciences

Today's presentation

- Status reporting in Australia (Commonwealth)
- Trends in "uncertain stocks"
- Weight of evidence (WoE) approach
  - Describe the attributes of the species and fishery
  - Compile lines of evidence for status
  - Status determination (weighing the evidence)
- Our experiences

Australian Government fishery status reporting

Biological stock status reporting
(under Fisheries law)

Economic status of fisheries
(under Fisheries law)

Environmental performance of fisheries
(under Environment & Fisheries law)

18th Edition
www.daff.gov.au/abares/publications

Biological status criteria

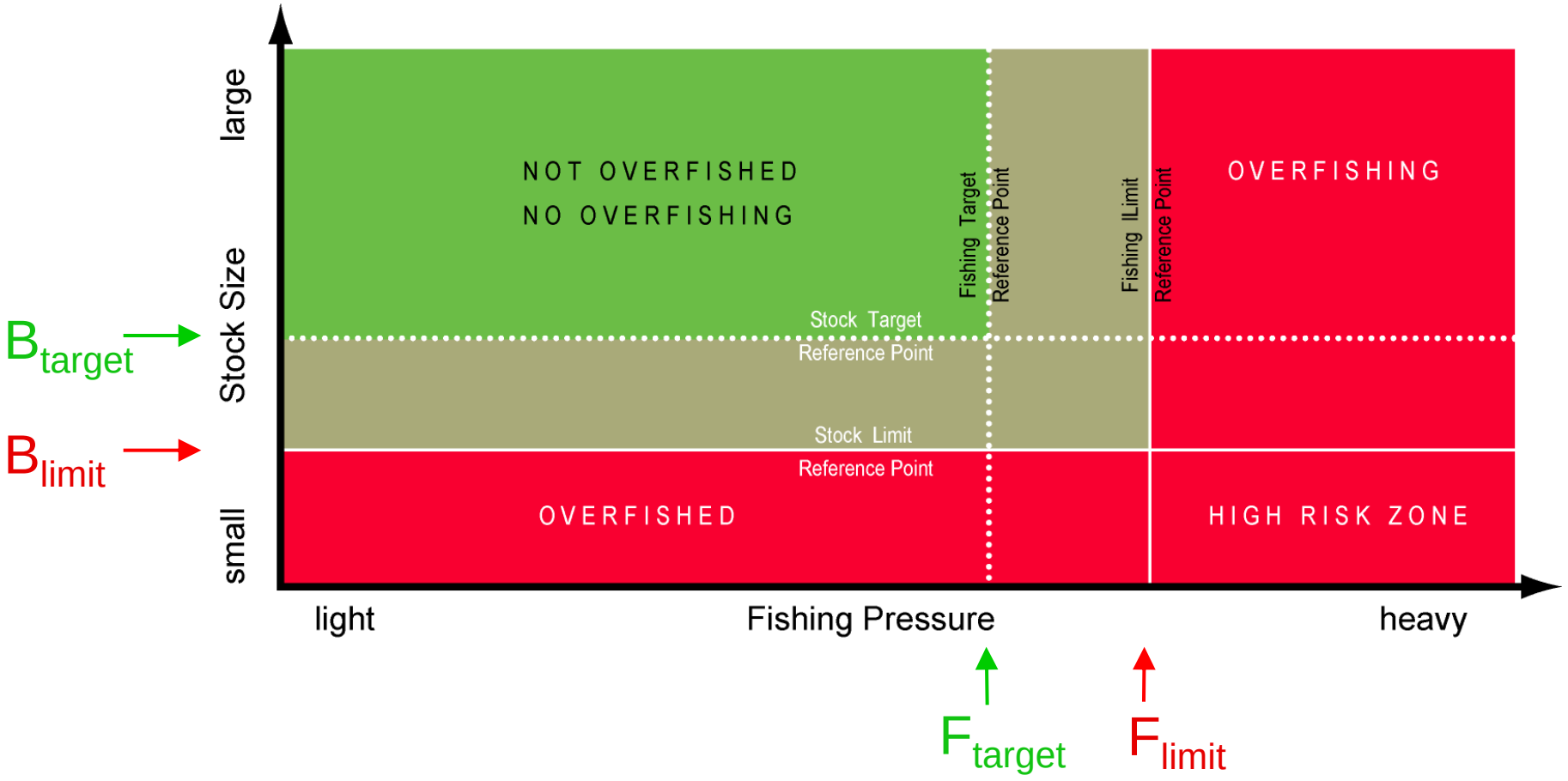
Two simple indicators used to answer complex questions:

- Is the stock **overfished**?
  Biomass status of the stock considers how many fish there are, and whether this number is above the level where the risk to the stock is unacceptable (B_{20} and $½B_{MSY}$)

- Is the stock subject to **overfishing**?
  Fishing mortality status considers how many fish are being caught, and whether that level is likely to move the stock into an overfished state or prevent an overfished stock from rebuilding.

Relies on stock assessments and information from a range of sources. The thresholds for biomass are based on the reference points set out in the Commonwealth Fisheries Harvest Strategy Policy

Biological status criteria - F and B



Biological status criteria - F and B

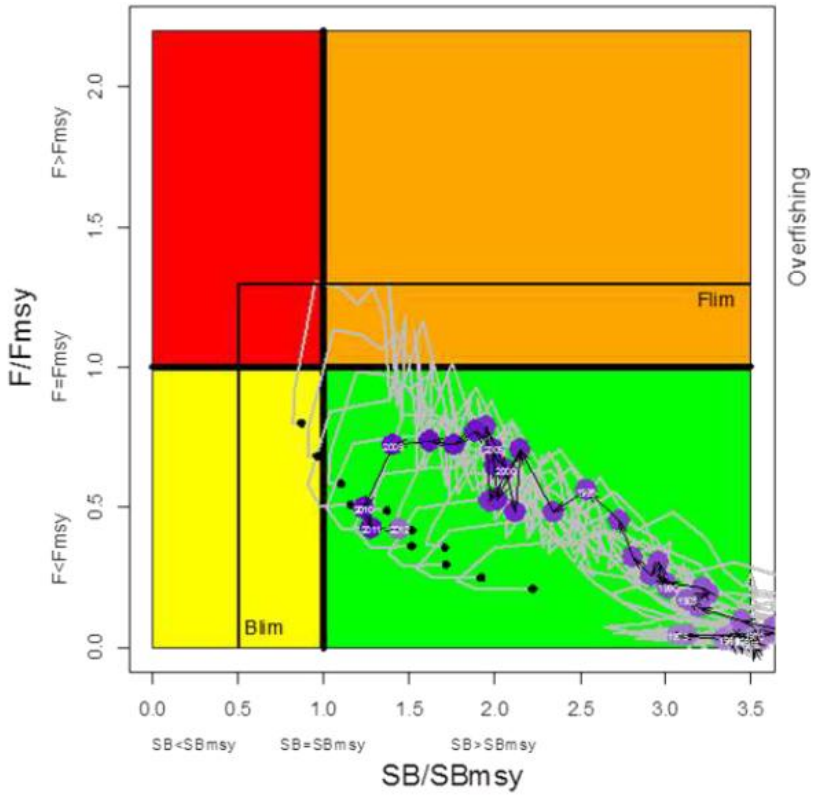
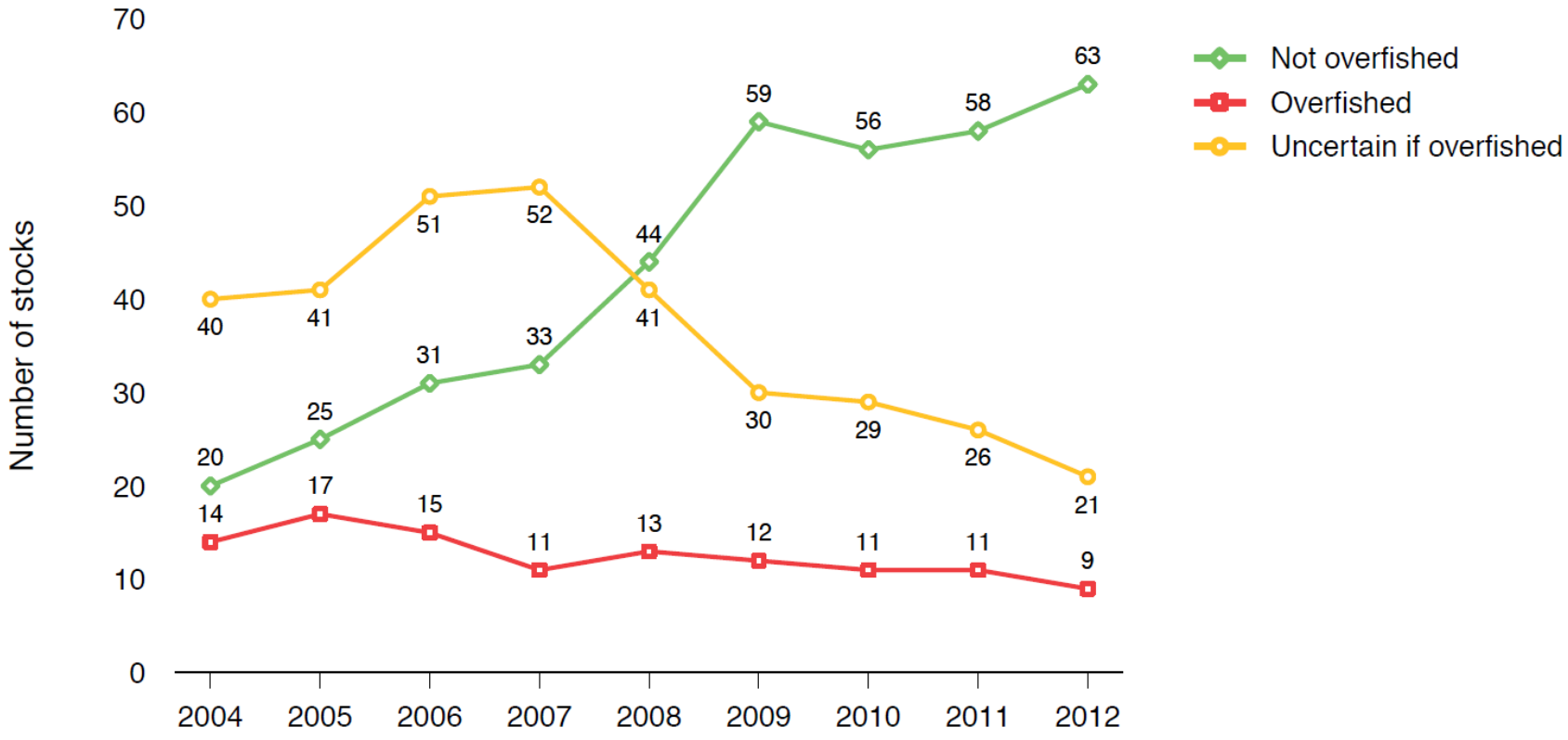


Fig. 1. Bigeye tuna: SS3 Aggregated Indian Ocean assessment Kobe plot. The Kobe plot presents the trajectories for the range of 12 plausible model options included in the formulation of the final management advice (grey lines with the black point representing the terminal year of 2012). The trajectory of the median of the 12 plausible model options (purple points) is also presented. The biomass (B_{lim}) and fishing mortality limit (F_{lim}) reference points are also presented.

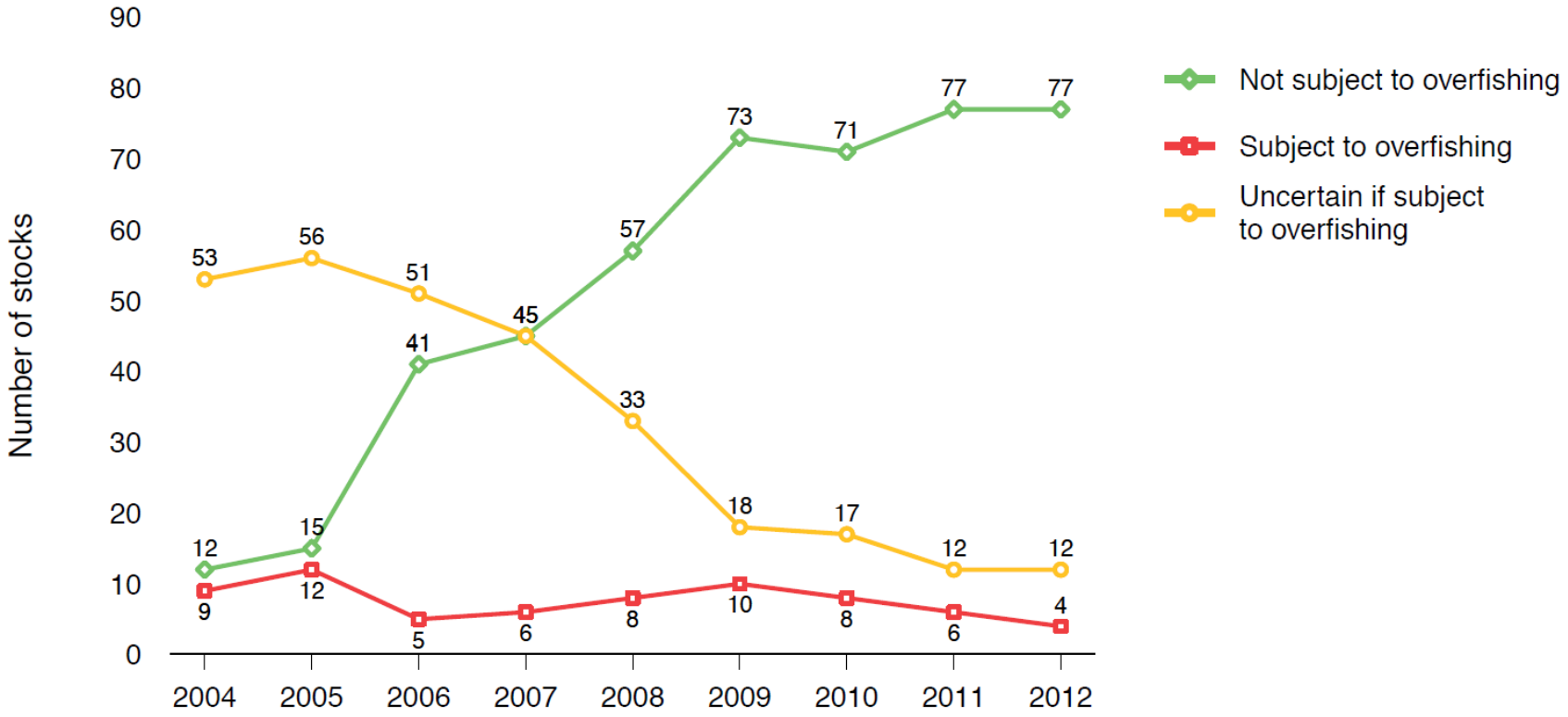
Australia status of fish stocks – Biomass

Biomass



Australia status of fish stocks – Fishing Mortality

Fishing mortality



An approach for determining stock status
in the absence of complete assessments

- Many uncertain stocks did not have a reliable stock assessment for deriving status
- However, in many cases there are indicators and information to make a reasoned assessment of likely status
- We needed a process for making stock status determinations, in the absence of more complete assessments (data poor stocks and fisheries).
- Transparent (documented) and repeatable process
- Formalise the process and re-examine many of the ‘uncertain stocks’

The weight of evidence approach

1. Describe the attributes of the species and fishery

2. Compile lines of evidence for status

3. Status Determination (weighing the evidence)
   - Overfished / Not overfished (Biomass)
   - Overfishing / Not overfishing (Fishing mortality)

1. Describe the species and fishery

May influence the interpretation of the indicators, or suggest the level of precaution (risk) in status determination.

Species

- Management unit: Species/'basket group'
- Productivity:
  - life span
  - maturity
  - Fecundity
  - trophic level
- Estimate of Natural mortality
- Aggregation
- Mobility
- Stock structure: in comparison to management unit

Fishery

- Target species, byproduct, bycatch
- Number of fisheries/sectors (other sources of F)

2. Lines of evidence

Potential indicators of B or F . Critically review each line of evidence (responsive to change, impacts of other drivers, potential bias)

A. Empirical indicators (e.g)
   - Catch / effort
   - Size (or age) mean/frequency
   - Effort trend & recent effort
   - CPUE (standardised) trend
   - Spatial distribution of catch/effort over time
   - Proportion of the species distribution fished

B. Risk assessments
   - PSA (relative risk); SAFE (absolute risk)

C. Fishery independent surveys
   - Trends in estimated biomass; estimates of recent biomass
   - Compared with reference points

2. Lines of evidence (continued)

D. Modelling/assessment results
- CPUE trend analysis
- Fishery – dependent depletion analysis
- Catch curve analysis
- Non-equilibrium surplus production model
- Delay-difference model
- Integrated stock assessment model
- Outputs compared with reference points

E. Harvest strategies
- Reference points (target and limit); performance measures; harvest control rules
- MSE testing may demonstrate effectiveness of the harvest strategy
- Compliance with harvest strategy

3. Status determination

A. Weighing the evidence

- An integrated stock assessment model
- Fishery independent survey
- A robust form of assessment, with appropriate reference points
- A robust catch curve (F status)
- A robust CPUE analysis (B status)

B. Expert input/review

- Status determination workshop
- External review

C. Reasoning and documentation

- Key indicators/evidence used
- Interpretation of weight of evidence, implications for status
- Conclusion on status
- Inconsistent indicators (if any)
- Key information gaps

To reiterate: The weight of evidence approach

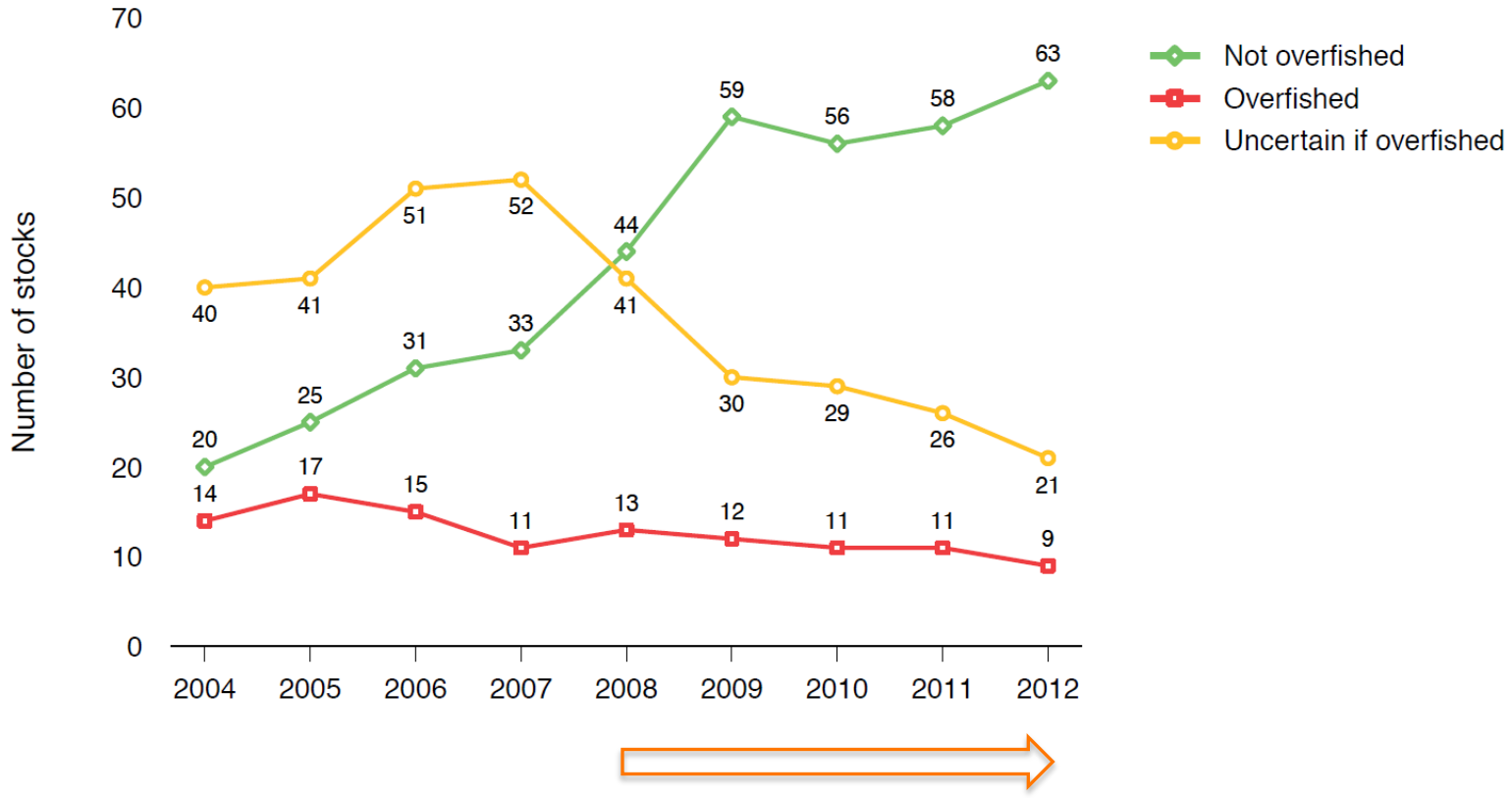
1. Describe the attributes of the species and fishery

2. Compile lines of evidence for status

3. Status Determination (weighing the evidence)
   - Overfished / Not overfished (Biomass)
   - Overfishing / Not overfishing (Fishing mortality)

Our experience

- WoE was effective at reducing the numbers of uncertain stocks



Our experience

- Expanded our ability to provide advice on status (and therefore advice for management)
- We often knew more than we thought
- Most effective for resolving status for species with light-moderate history of fishing pressure (F)
- A structure for utilising multiple lines of evidence rather than needing to rely on the outputs of a single stock assessment (or single assessment sensitivity)
- It's not new ... It's not rocket science

Thankyou

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