# Towards co-management

## Improving industry understanding of research and management to guide strategic industry-driven R&D

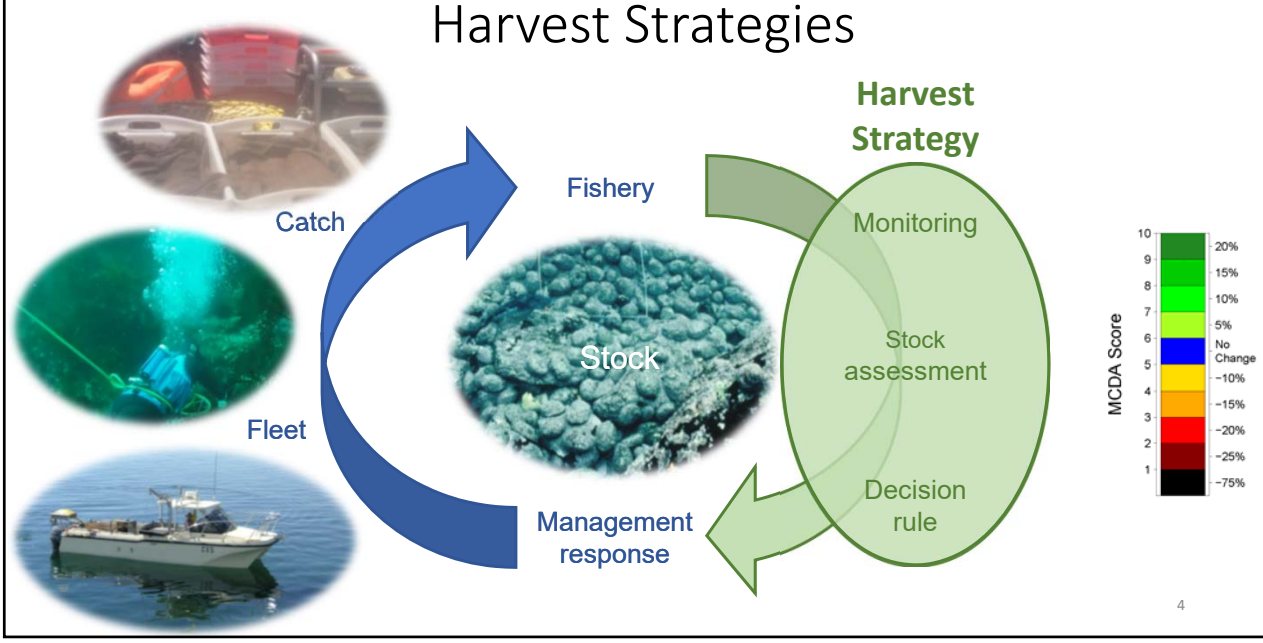
## Issues

- Lack of trust, confidence and understanding: stock assessment/management
- Confusion over the MCDA and the Harvest Strategy
- Need for strategic research and management

# Approach

- Review research and management reports
- Examine data sources and their use
- Provide written review
- Suggest improvements
- Consider feedback from industry

# Harvest Strategies

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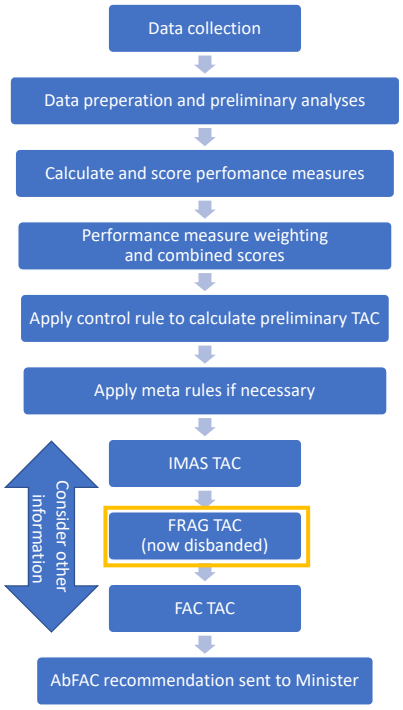
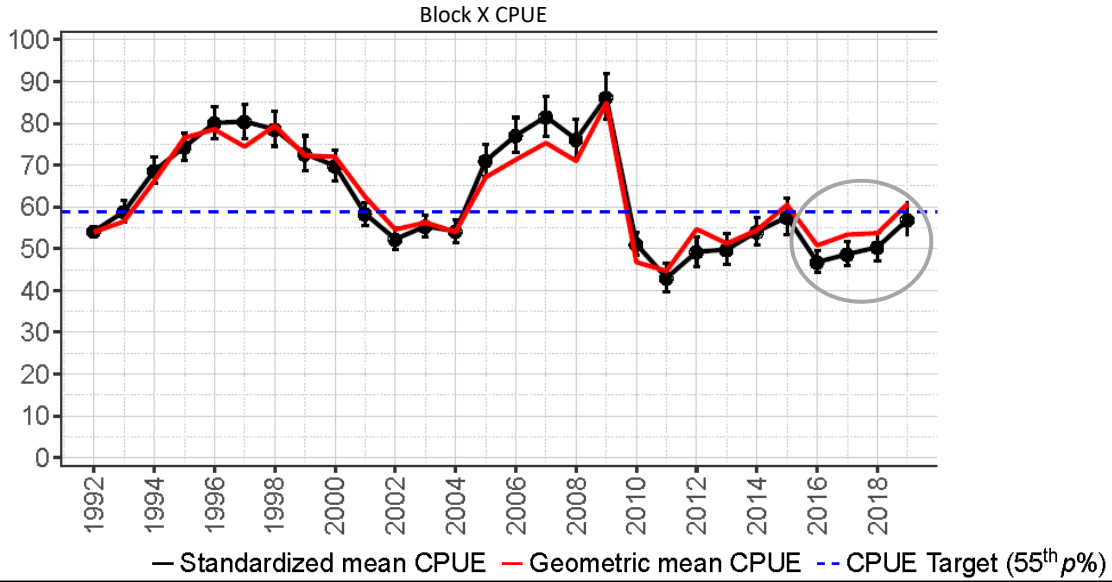
# The Current Process

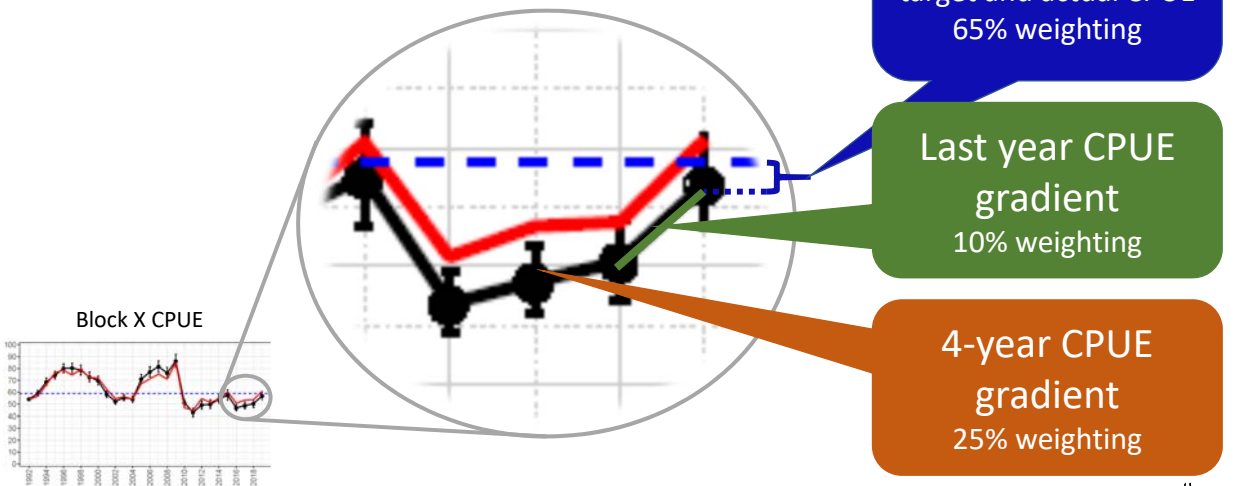
- Blocks assessed by CPUE
- Use MCDA to determine catch for each Block
- Consider other information
- Recommend a zone TAC based on recommended Block catches




# TAC Setting: MCDA uses dive docket Std CPUE

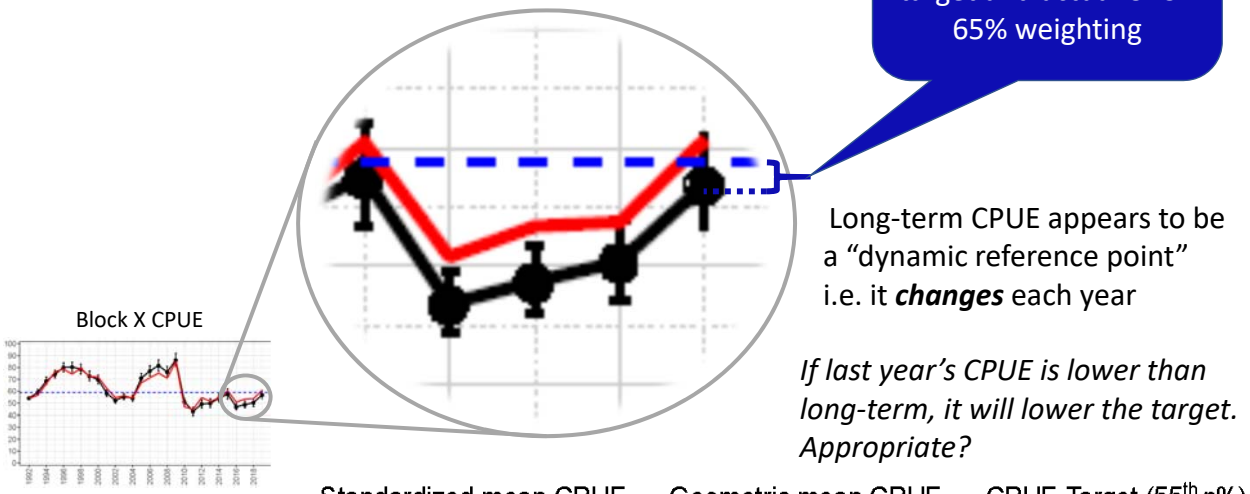


# TAC Setting: MCDA use of CPUE




# MCDA ⟶ Block-level catch

$\Sigma$((**a x 0.65**) + (b x 0.25) + (c x 0.10))

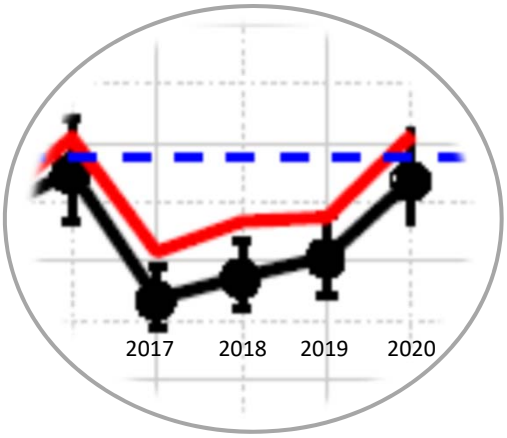



Long-term CPUE appears to be a "dynamic reference point" i.e. it ***changes*** each year

*If last year's CPUE is lower than long-term, it will lower the target. Appropriate?*

# MCDA ⟶ Block-level catch

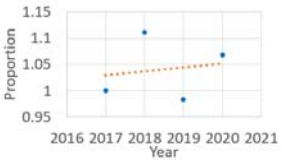
$\Sigma((a \times 0.65) + (b \times 0.25) + (c \times 0.10))$




4-year CPUE gradient
25% weighting

| Year | CPUE | Proportion of change |
|---|---|---|
| 2017 | 54 | 54/54=1.00 |
| 2018 | 60 | 60/54=1.10 |
| 2019 | 59 | 59/54=1.08 |
| 2020 | 63 | 63/54=1.17 |

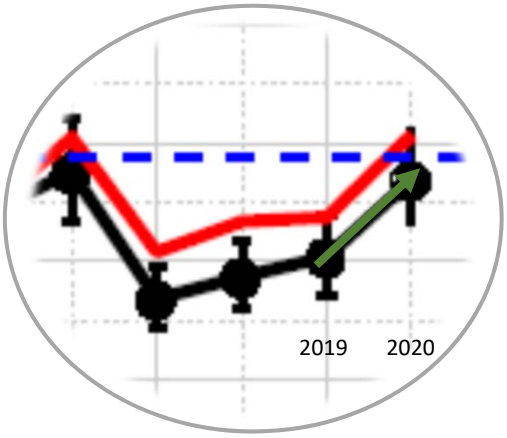
Slope = 0.008




— Standardized mean CPUE — Geometric mean CPUE -- CPUE Target (55$^{th}$ $p$%)

# MCDA ⟶ Block-level catch

$\Sigma((a \times 0.65) + (b \times 0.25) + (c \times 0.10))$




Last year CPUE gradient
10% weighting

| Year | CPUE | Rate of change |
|---|---|---|
| 2019 | 59 | |
| 2020 | 63 | 53/59 – 1 =0.07 |

Rate = 0.07

— Standardized mean CPUE — Geometric mean CPUE -- CPUE Target (55$^{th}$ $p$%)

# Different weighting applies for Performance Measures

**Gradient4 CPUE (25% weighting)**

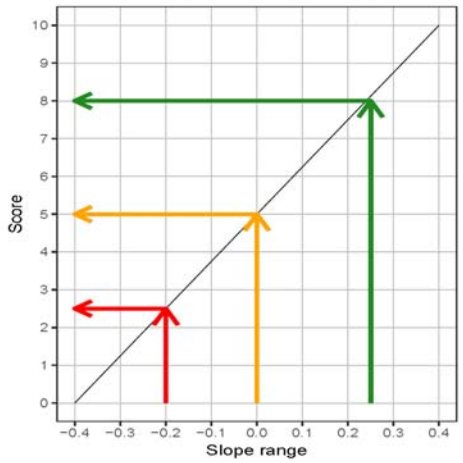
- Long term change in Block catch rates

**Gradient1 CPUE (10% weighting)**

- Short term change in Block catch rates

**But the CPUE for the last year of assessment is counted twice**

- Requires review and link to management strategy evaluation

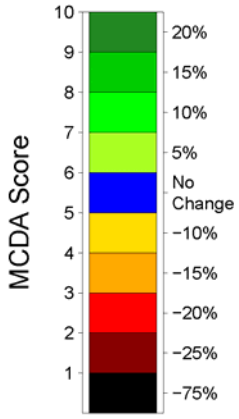



# Weighting and combined PM score

**Table 2.1:** *Harvest Strategy performance measures and weights for this assessment.*

| | TARGET CPUE | CPUE4 | CPUE1 |
|---|---|---|---|
| PM SCORE | a | b | c |
| PM WEIGHT | 0.65 | 0.25 | 0.10 |
| PM TOTAL | a x 0.65 | b x 0.25 | c x 0.10 |
| COMPOSITE INDEX SCORE | Σ((a x 0.65) + (b x 0.25) + (c x 0.10)) | | |

- Control rule applied to composite score
  - PM weights give more influence to the highest weighted PM
  - Composite score close to 5 –> No change in TACC
  - Composite score <4.5 –> TACC reduction ***required***
  - Composite score > 6 TACC increase ***may*** occur



# Initial findings

- Lots of reports, reviews and recommendations
- Many previous recommendations not yet implemented:
  - Routine fishery monitoring other than CPUE e.g. length frequency
  - Formal fishery-independent monitoring including recruitment surveys
  - Include dive logger data in CPUE standardisation
  - Formal environmental data collection
- Improve the existing process (MCDA – Harvest Strategy)
- Work towards co-management

# My recommendations

- Aimed at encouraging co-management
  - Industry
  - DPIPWE
  - IMAS
- Improve the current system
  - Data inputs
  - Analyses
  - Decision rules

## 1. Accept the MCDA as a foundation for management

- A good foundation which requires improvement
- Empirical harvest strategies can work well

## 2. Re-establish a stakeholder review process

- Stakeholder input (e.g. FRAG) valuable
- Need an effective review process
- Capture stakeholder views in assessment and management

## 3. Improve CPUE input to the MCDA

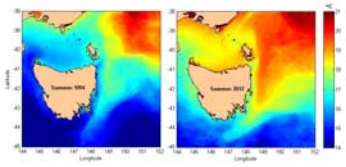
- Total reliance on dive-docket CPUE
- Heavy weighting on target CPUE (mean CPUE since 1992)
- Doubling up of the last year's CPUE (Gradient 1 and 4)

## 3. Improve CPUE input to the MCDA

- Many factors affect CPUE e.g. weather, dive conditions, experience
- Daily CPUE can remain the same by shifting effort
- Dive logger data can provide finer-scale information
- Opportunity to improve CPUE standardisation
- Confusion over application of "meta" and "control" rules

# 4. Consider additional factors for CPUE standardisation

- Add standardised dive-logger CPUE to current dive docket CPUE
- Include more factors in dive docket (e.g sea temperature)
- Identify climate-change impacts



"Rapid warming in SE Australia is synonymous with increased ocean temperature, salinity, sea levels and currents; decreased pH and rainfall; and more frequent extreme weather events"

- Slower growth / more disease / sea urchin barrens

# 5. Dive logger data a useful input to MCDA

- Dive profiles (time on site) can be useful indicators
- Can provide additional information on relative abundance
- Fine-scale spatial information of diver dynamics and changing behaviour

## 6. Settle the LML issue


- Size at Maturity
- Growth rates
- Reproductive capacity
- Spawning biomass

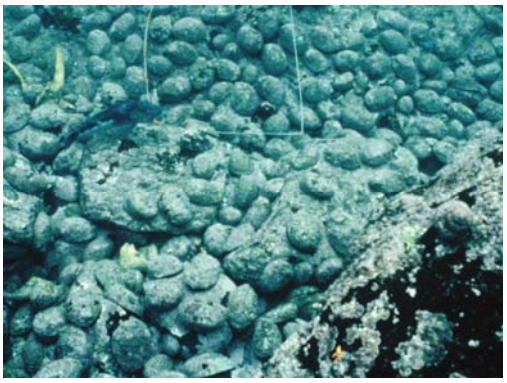
- SAM? SAM+2? SAM+3?
- Hold a workshop to sort it out once and for all

## 7. Changing LMLs affects CPUE analysis

- Changing the size limit will alter CPUE and affect the MCDA
- Changing LMLs will alter spatial distribution of effort
- Capture any LML change in CPUE standardisation

## 8. Develop a fishery-independent abundance index

- How can fishery independent data be best used in assessment?



## 9. Settle on an appropriate survey method

- Lots of methods with pros and cons
- Trade off precision and cost (of surveys)
- Good surveys require lots of replication
- Power to detect change in change in abundance
- Timed-swims a good option
  - Involve industry in survey site selection

# 9. Settle on an appropriate survey method

- Juvenile surveys useful in recruitment forecasting

Timed swims

Post-settlement monitors

$ $$ $$$

What will enter our fishery next year?

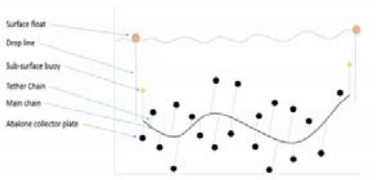
Is climate change affecting recruitment?

Potential for high industry involvement

- Maybe a bit of both required?

# 10. Incorporate fishery independent abundance measures in the MCDA

- Establish a time-series of data
- Include size (length) data
- Use as indicators for the MCDA?



## 11. Re-evaluate the MCDA reference period

- The “target CPUE” has the greatest weighting in the MCDA (65%)
- A “dynamic” reference point linked to 1992 data (and later years)
  - Is this what we want?
  - If CPUE is falling then the target CPUE will also reduce
  - Can affect stock rebuilding
- What is the most appropriate benchmark CPUE time-series?
  - Does it have to be the same for each Block?

## Further work

- Integrate other projects e.g.
  - review of Harvest Strategy (Little)
  - MSE testing (Dichmont)
- Consider my recommendations
- Hold final workshop to prioritise research and management initiatives
- Industry education following revised MCDA process

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For discussion……