# The Australian fisheries management experience: federal fisheries

**Geoff Tuck and David Smith**



CSIRO

# Outline

- **Australian fisheries**
- **Policy drivers in Australian Fisheries**
- **Management structure**
- **ITQs, MPAs**
- **Ecosystem based fisheries management (EBFM)**
- **Tools**
  - **Harvest Strategy Framework**
  - **Ecological Risk Assessment (ERA)**
  - **Atlantis**
- **Conclusion**

# Australian Fisheries

- **Australian Fishing Zone declared 1979**
- **3rd largest fishing area**
- **Despite this, generally low abundance**
  - Narrow shelf, absence of upwellings, low nutrient runoff
- **Characterised as low volume, high value**
- **Commercial fishing and aquaculture value = AUS$2.3 billion (€1.3 billion)**
- **Federal, State, Aquaculture, Recreational, International (tunas, toothfish)**

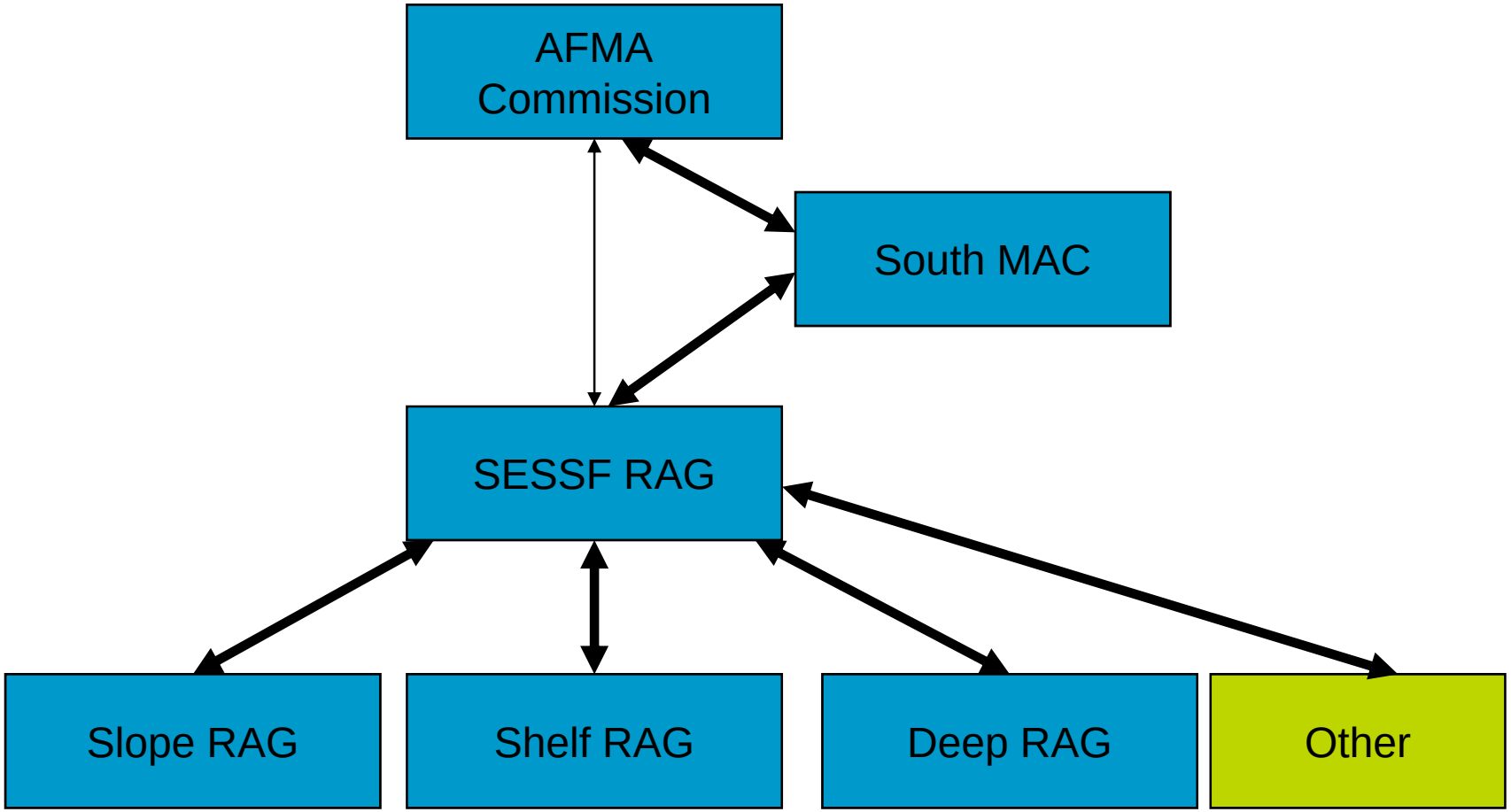
# Australian Fisheries

- **Management system**
  - State management (to 3nm)
  - federal (national) management (3-200nm)
  - Shared management (Offshore Constitutional Settlements – OCS)
- **Many species shared between Australia and northern countries e.g. Indonesia**
- **Very large and diverse area from tropics to the Antarctic**
- **Depths from 50 to 1300 m**

# Participatory management

- **Australian Fisheries Management Authority (AFMA)**
- **Resource Assessment Groups (RAGs)**
  - Provide advice of stock status, bycatch, impact of fishing
  - Recommended biological catches (RBCs) -> TACs
  - Scientists, managers, industry, economists, conservation
- **Management Advisory Committess (MACs),**
  - Consider the advice of the RAGs
  - Provide recommendations to the AFMA Commission
  - Key stakeholders
  - Members act in best interest of the fishery (not particular group)
- **Board/Commission**
  - Decisions based on advice from MACs, AFMA staff & other committees
- **Shared management costs**

# Participatory management



# Participatory management - Research

- **Various agencies (e.g. CSIRO and State)**
  - Assist with planning, investing and managing R&D
  - Analyse economic performance of fisheries
  - Provide scientific advice for *Ecological Sustainable Development* (ESD)

# Policy Drivers in Australia

**Major shift of emphasis in 1990s**

- **Fisheries Management Act (1991)**
- **National commitment to *ecologically sustainable development* (ESD) (1992)**
- **Australia's Oceans Policy (1998)**
- **Environmental legislation – EPBC (1999)**

# Policy Drivers in Australia

## Recent Initiatives (2005-07)

- **Ministerial Direction to AFMA "rebuild overfished stocks and no more overfishing" (2005)**
- **Adoption of Commonwealth Harvest Strategy Policy (2006)**
- **AUS$220 million (€130 million) restructure package (2006)**
- **Adoption of EBFM as policy goal (2006)**

- **Policy development ran ahead of the scientific tools and methods to support it**

# Fisheries Management - History

- **Prior to 1992, mostly input controlled**
- **Over-capitalisation and over-fishing through the 1980s**
  - Orange roughy, bluefin tuna, gemfish
- **Growing need for a management authority (*ad hoc* policies abound)**
- **Ineffectiveness of input controls**

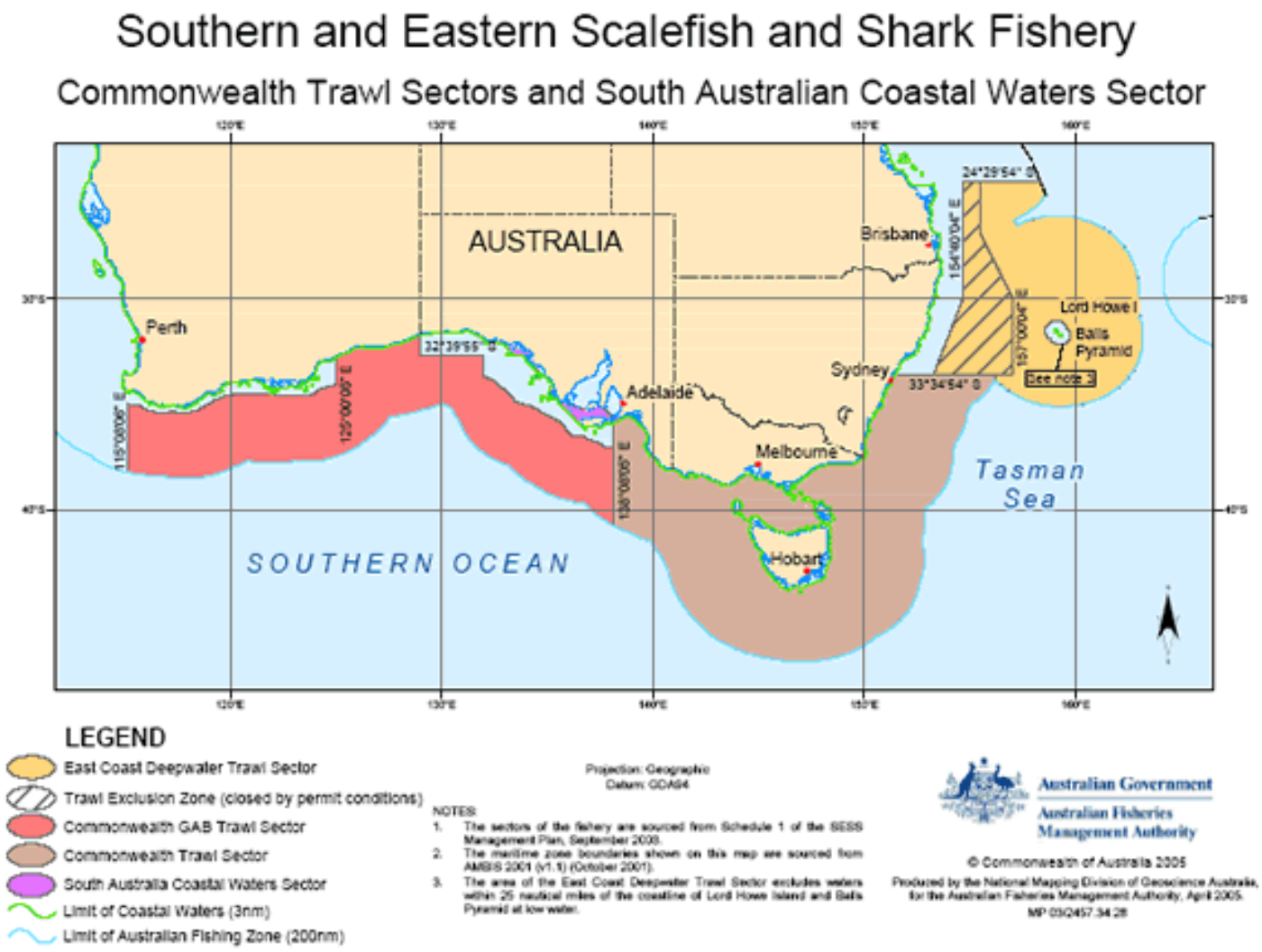
# Fisheries Management - History

- **The Fisheries Management Act (1991)**
- **Australian Fisheries Management Authority (AFMA) formed in 1992**
  - Mandate to prepare management plans, grant concessions and provide foreign fishing licenses
- **Specific Objectives**
  - Efficient and cost effective management
  - Exploitation is consistent with ESD
  - Maximise net economic returns
  - Accountable to fishing industry and Australian community
- **ESD a key principle, but in mid-1990s economic considerations dominate environmental and social objectives**

# Introduction of ITQs – The South East Trawl Fishery

- **South East Trawl as an example**
  - Multi-species
  - Supplies fresh fish for eastern and southern Australia
  - Main species: Then: Orange roughy, gemfish,
    Now: flathead, blue grenadier, pink ling
  - Value: AUS$50 million (€29 million)
  - 15 species not subject to over-fishing, 8 unknown, 1 over-fishing (ling), [4 over-fished]

# Introduction of ITQs – The South East Trawl Fishery



# ITQs – The South East Trawl Fishery

- **Multi-species fishery**
- **By late 1980s grave concern for gemfish (dominant species by $ and quantity)**
  - Declining catches, catch rates
- **TAC set for gemfish in 1988 (3000 t)**
- **ITQ introduced in 1989**
- **TAC reduced for gemfish in 1991 (500 t)**
- **Co-incidental discovery of large orange roughy stock**
  - Large catches, over-capitalisation, collapse, shift to blue grenadier

# ITQs – The South East Trawl Fishery

- **Early 1990s - Change in philosophy from input to output controls and emphasis on economic efficiency**

- **1992:**
  - Australian Fisheries Management Authority (AFMA) established
  - ITQs introduced for remaining 15 commercial species

- **1993 the TAC for gemfish was zero!**

# ITQs – The South East Trawl Fishery

- **ITQs – in theory…**
  - No ‘race’ to fish
  - Lead to economic efficiency (high cost operators sell quota & assets)
  - Reduce effort
  - Reduce political pressure to increase TAC
  - Reduce administration costs (market drives quota prices)
  - Encourage innovation and investment

# ITQs – The South East Trawl Fishery

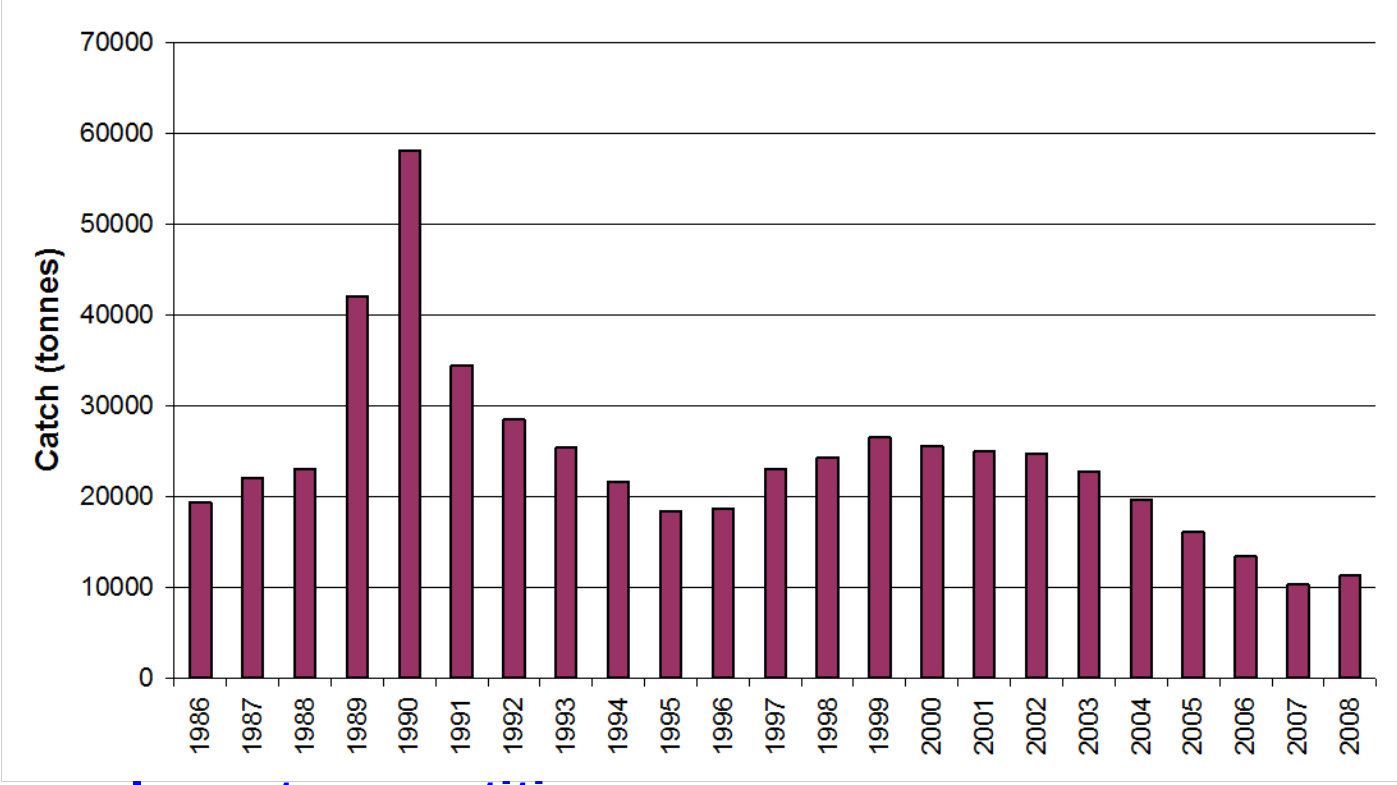
- **ITQs – in practice**
  - **Allocation based on**
    - **catch history (minimum 5 years in fishery)**
    - **investment in the fishery**
  - **Allocation has been problematic in many Australian fisheries leading to reviews, court hearings**
  - **Administration costs increased**
  - **Uncertainty, scepticism over calculation of TACs**
    - **TAC initially set too high**
    - **Research costs**

# ITQs – The South East Trawl Fishery

- **No ‘race’ so more planning, catching for value**
- **Changed fishing practices - diversity of catch across species**
- **However, profitability continued to decrease**
  - Adjustment occurring but slow
- **Why?**

# ITQs – The South East Trawl Fishery

**Effort increased following introduction of ITQs, while**

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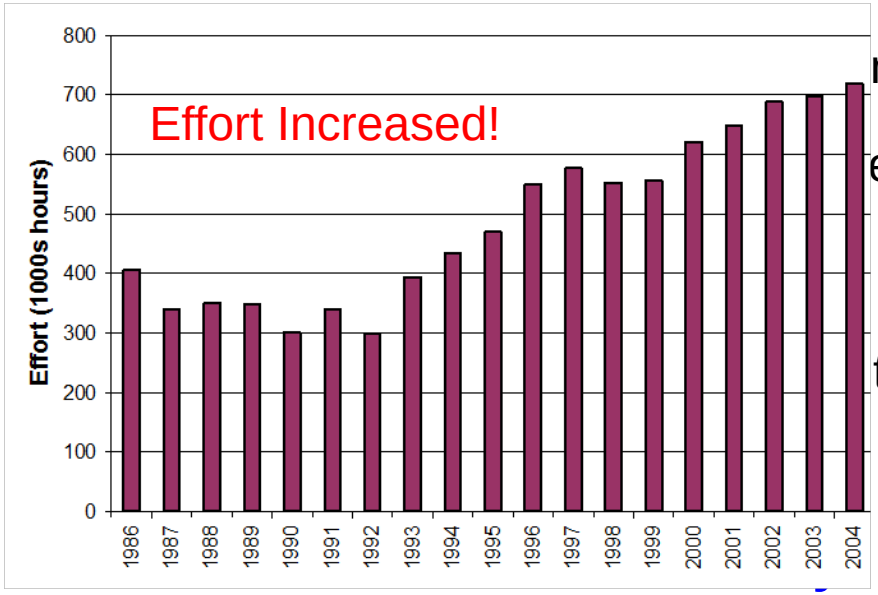
- **Import competition**

# ITQs – The South East Trawl Fishery

- **No reduction in effort**
  - No viable alternative use of vessels (old fleet)
  - nt opportunities
  - e!)
  - tering and therefore
  - Low investment



# ITQs – The South East Trawl Fishery

- **Multi-species issues**
  - Bycatch of low TAC species (eg gemfish)
  - Increased discarding
  - Move to non-allocated fisheries (e.g. non-trawl or state waters)
    - Non-trawl included in ITQ system in 1998
  - Combined TAC / spatial management issues (e.g. blue warehou)

# Fisheries Management – South East Trawl

**By 2004:**

- declining economic performance in most sectors
- increasing number of overfished species
- increasing effort in several sectors, new grounds

**1. Things not working**

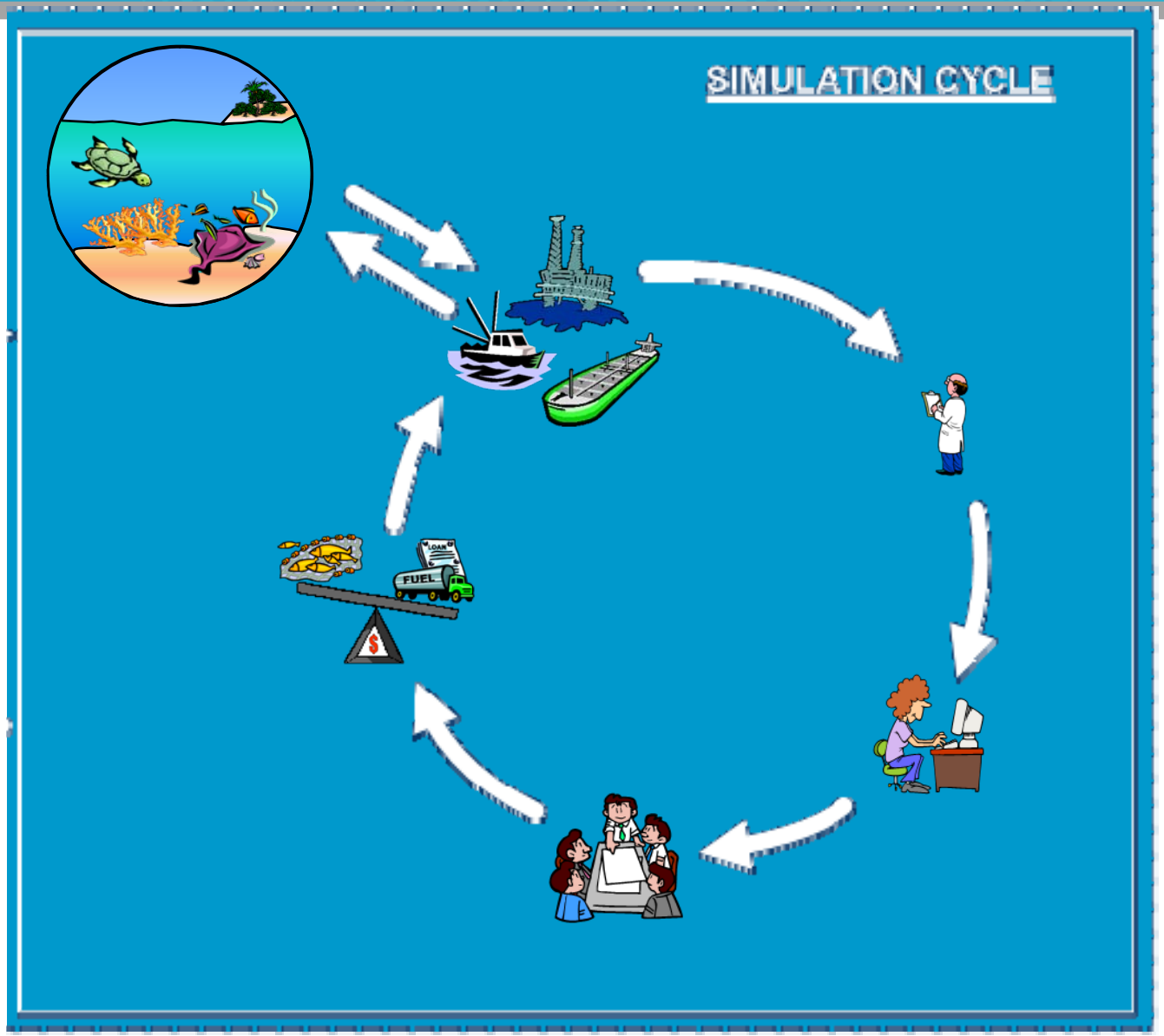
**2. Decisions in one sector influencing another (trawl, non-trawl) with little integration**

# AMS Project

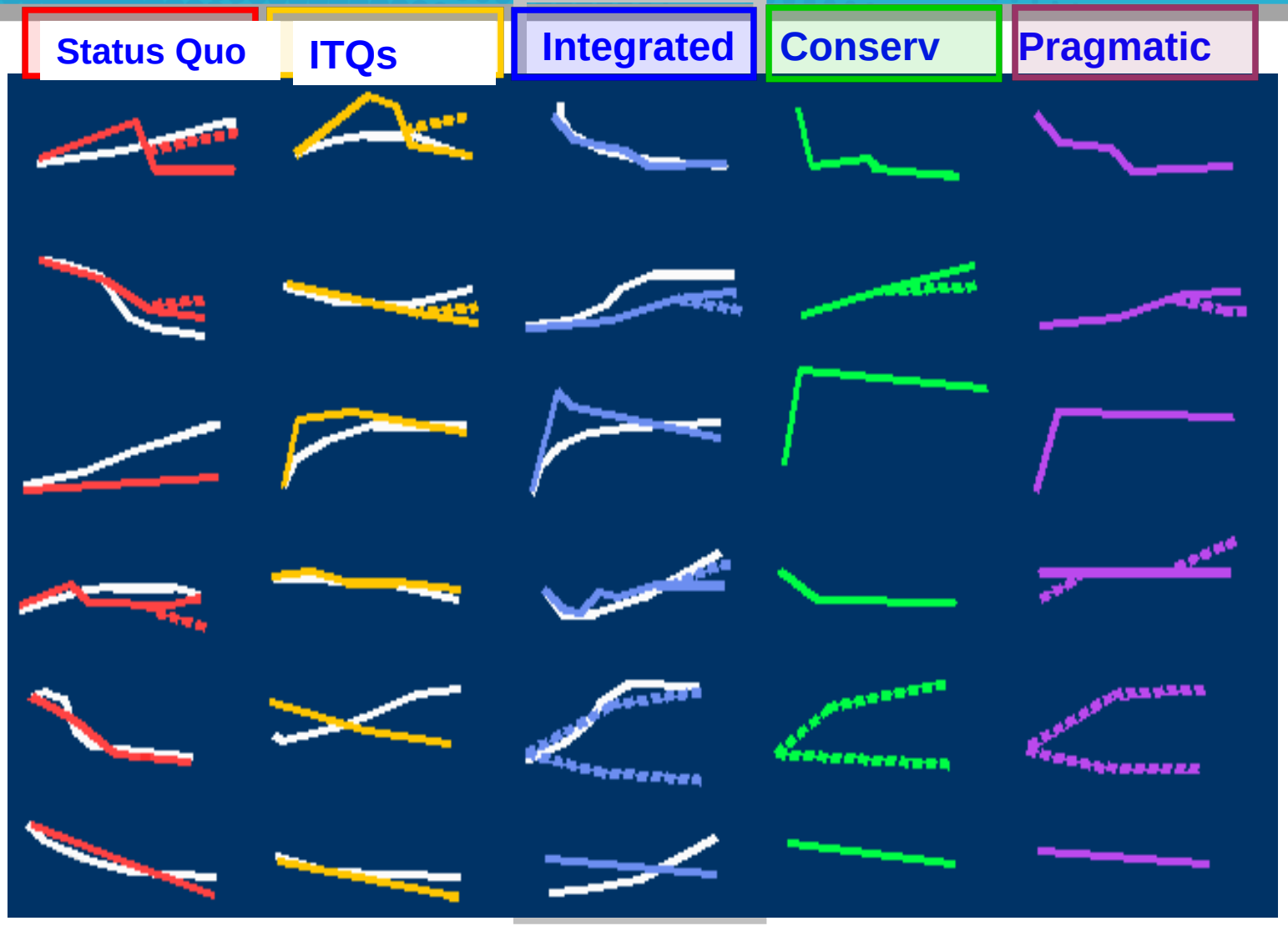
**In response, the Alternative Management Strategies Project was developed**

- **Joint CSIRO-AFMA Project**
- **Radically rethink management arrangements for SESSF**
- **Strategic approach – bring stakeholders along**
- **A model based assessment that includes:**
  - The biological system
  - The management system
  - Socio-economic components

# Atlantis Ecosystem Modelling Framework



# Results




- Effort
- CPUE
- Mgmt Costs
- Cash
- Populations
- Gulper Shark

## Conclusions from the AMS Project

- Results were used to secure agreement for a change to fisheries management strategies
- Need for Harvest Strategies, Closures
- Peak industry body supportive and sort government assistance for a “restructure” package to reduce economic impact and to smooth the transition to a sustainable fishery
- Securing Our Fishing Future (2005)
- By 2007 the fishery is closer to the ‘integrated management’ scenario than ‘status quo’ of 2003

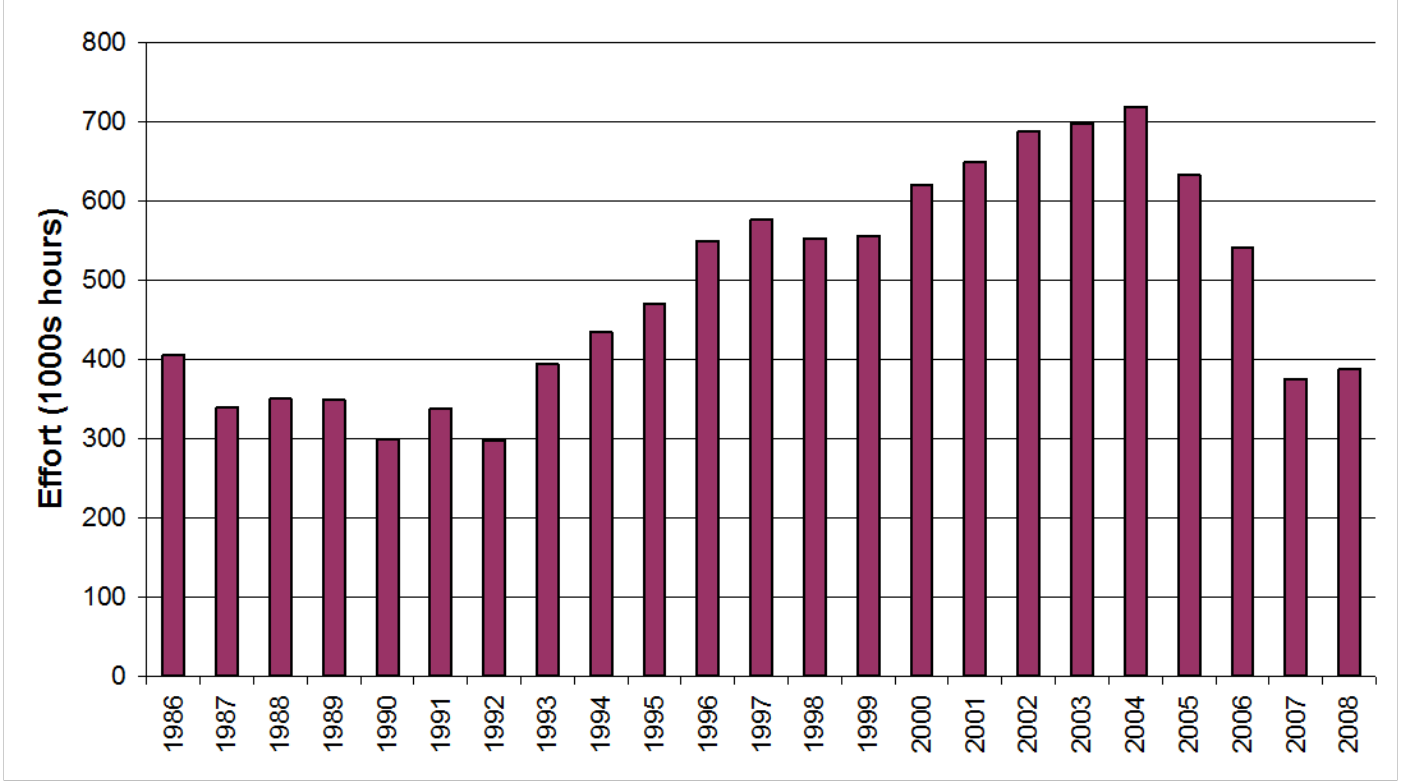
# Fisheries Management – South East Trawl

- **Ministerial Direction to AFMA to "rebuild overfished stocks and no more overfishing" (2005)**
  - Securing our Fishing Future Initiative (2005)
  - 3 key elements:
    - **1) *Buy-out*: AUS$150 million (€87 million) voluntary removal**
    - **2) *Harvest Strategy Policy* (HSP) development**
    - **3) *MPA*s**

# 1. Fisheries Management – Buy-out

## What has been the impact 2005-2007?

- Reduced effort, reduced number active operators



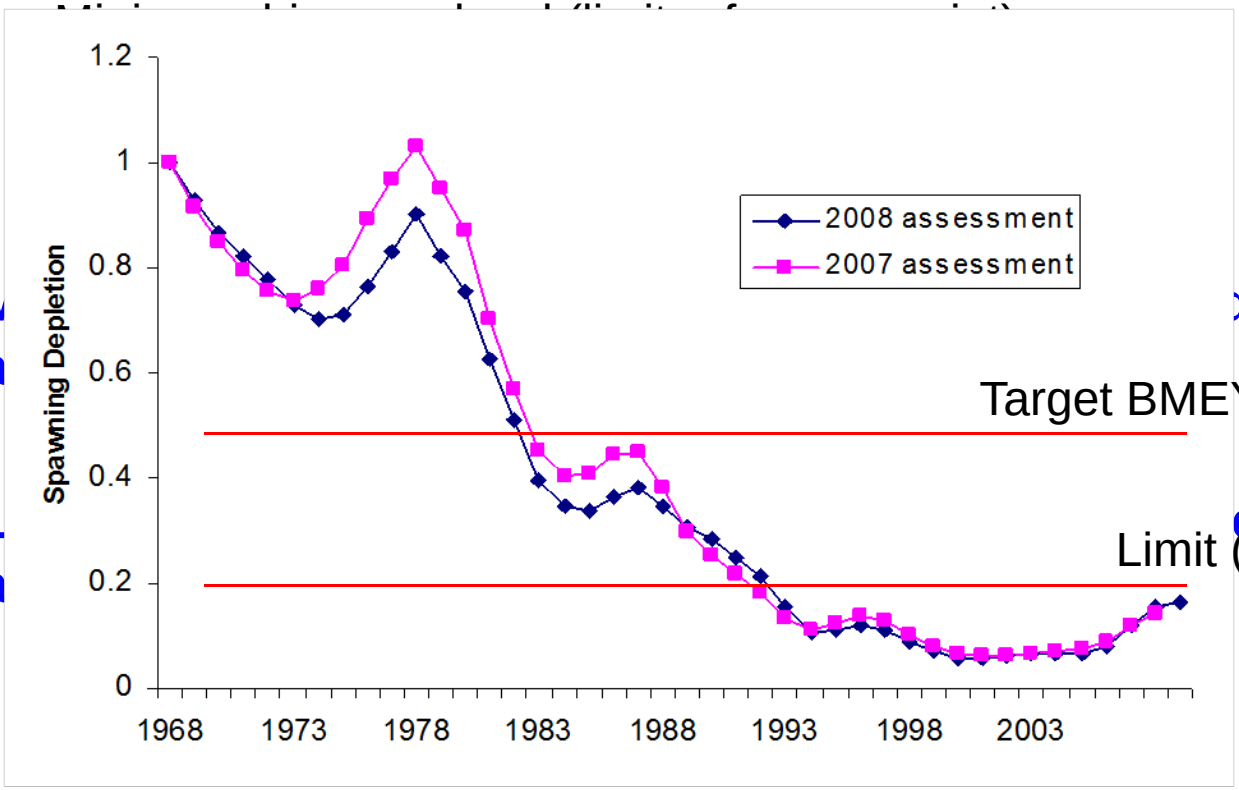
# 2. Fisheries Management – Harvest Strategy Policy

- ***Harvest strategy policy* development**
  - Formal Harvest control rules to control Catch and Effort
    - Acceptable risk levels, reference points, decision rules
  - All commercial species covered irrespective of quality of information
  - Threatened, endangered and protected (TEP) species interactions minimised
  - Manage the broader environmental impacts (ESD)
  - Target Biomass is that which provides Maximum Economic Yield

- **Adoption of federal Harvest Strategy Policy (2007)**

# 2. Fisheries Management – Harvest Strategy Policy

- **Precautionary elements**
  - Target exploitation rate and biomass
  - **M… …data a…**
  - **L… …cy) a…**



# 3. Fisheries Management – MPAs

- **AFMA is to:**
- Identify and implement any required spatial closures in fisheries;
- coordinated approach with other relevant agencies
- AFMA member of federal MPA Committee

# Fisheries Management – South East Trawl

- **Lessons learned in the South East Trawl**
- **Initially TACs too large**
  - **Did not reduce effort**
- **ITQs alone unlikely to meet all policy and management objectives**

# A Broader View: Fisheries as part of Ecosystems

- **Environment Protection and Biodiversity Conservation (EPBC) Act**
  - Implications for export of any commercial species
  - Strategic environmental impact assessment required for each federal fishery
  - Need to ensure fishery is managed in an ecologically sustainable manner

# Policy drivers – EPBC Act 1999

- **Strategic Assessment Objectives**

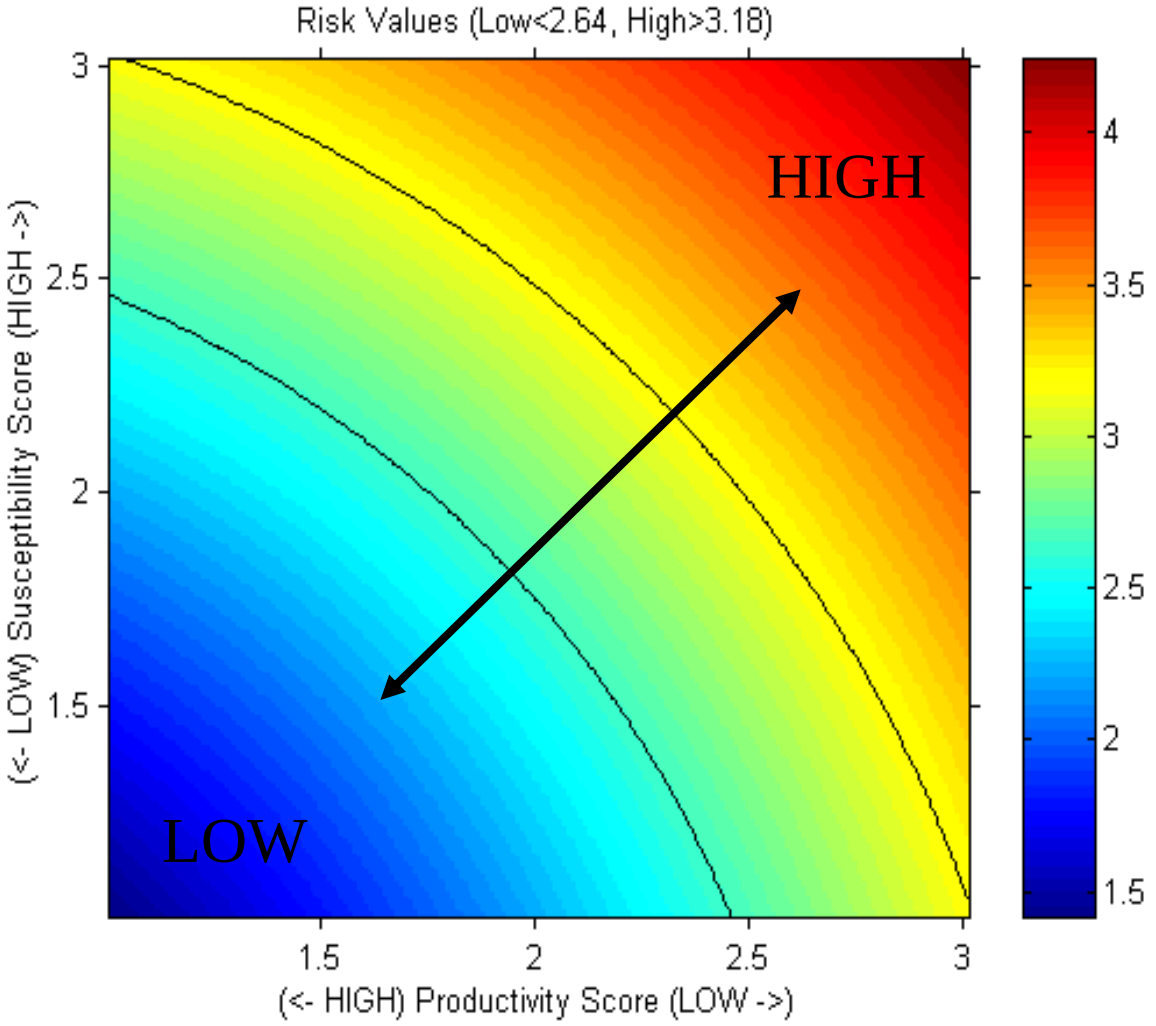
  1. Catch levels maintain ecologically viable stocks at an agreed point or range
  2. Where stock is below a defined reference point, the fishery must promote recovery within nominated time
  3. The fishery does not threaten bycatch species
  4. The fishery avoids mortality/injury to endangered, threatened or protected species or ecological communities

# Policy drivers – EPBC Act 1999

- **How do we show these objectives are met?**
  - No such methods existed at the time
  - Ecological Risk Assessment (ERA) for each fishery – (CSIRO/AFMA project)
    1. Describe potential fishery impacts (across species, habitats, communities)
    2. If impacts deemed high, consider productivity and susceptibility
    3. If still high, then full quantitative assessment
    - At any point, management intervention can mediate impact

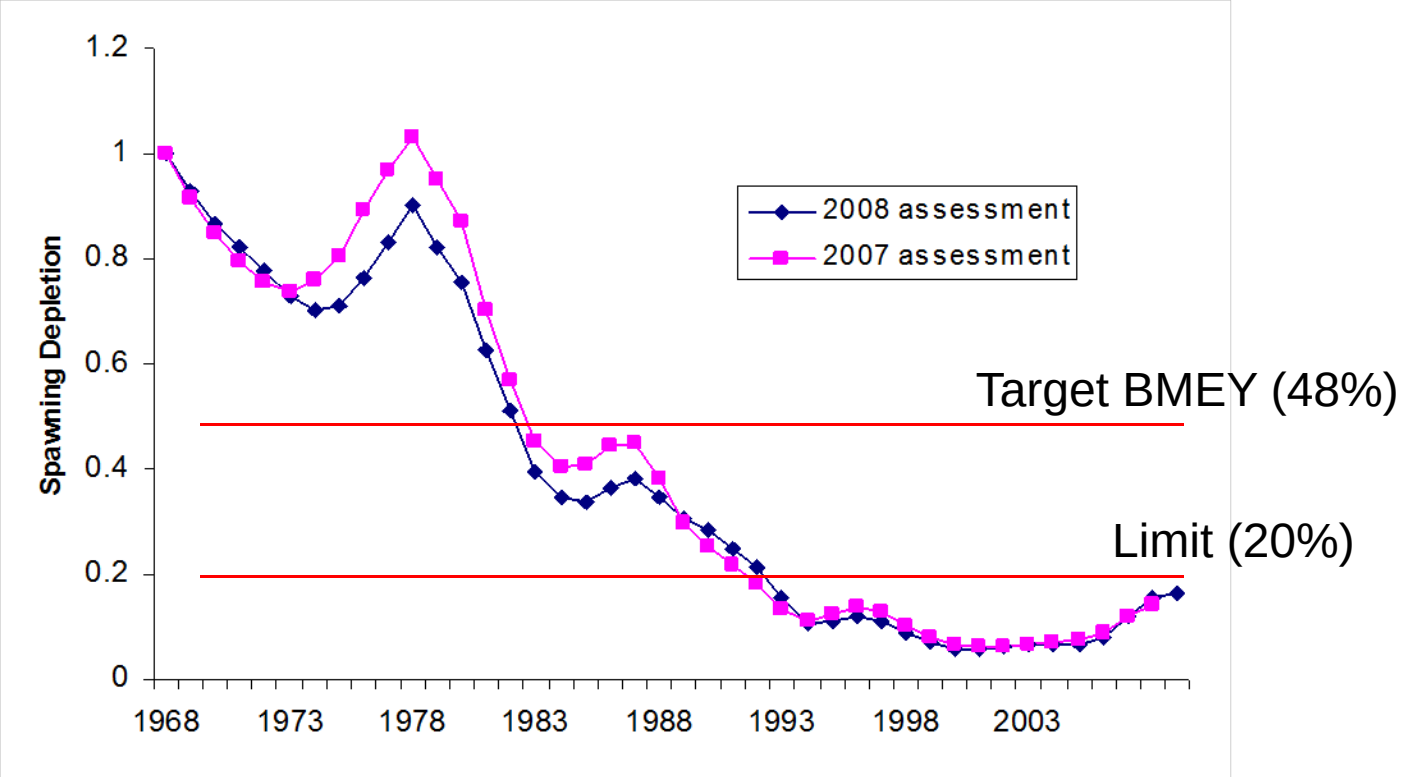
# ERA – Level 2 – Productivity Susceptibility

Have conducted PSA analyses for over 1800 species to date



# ERA – Level 3

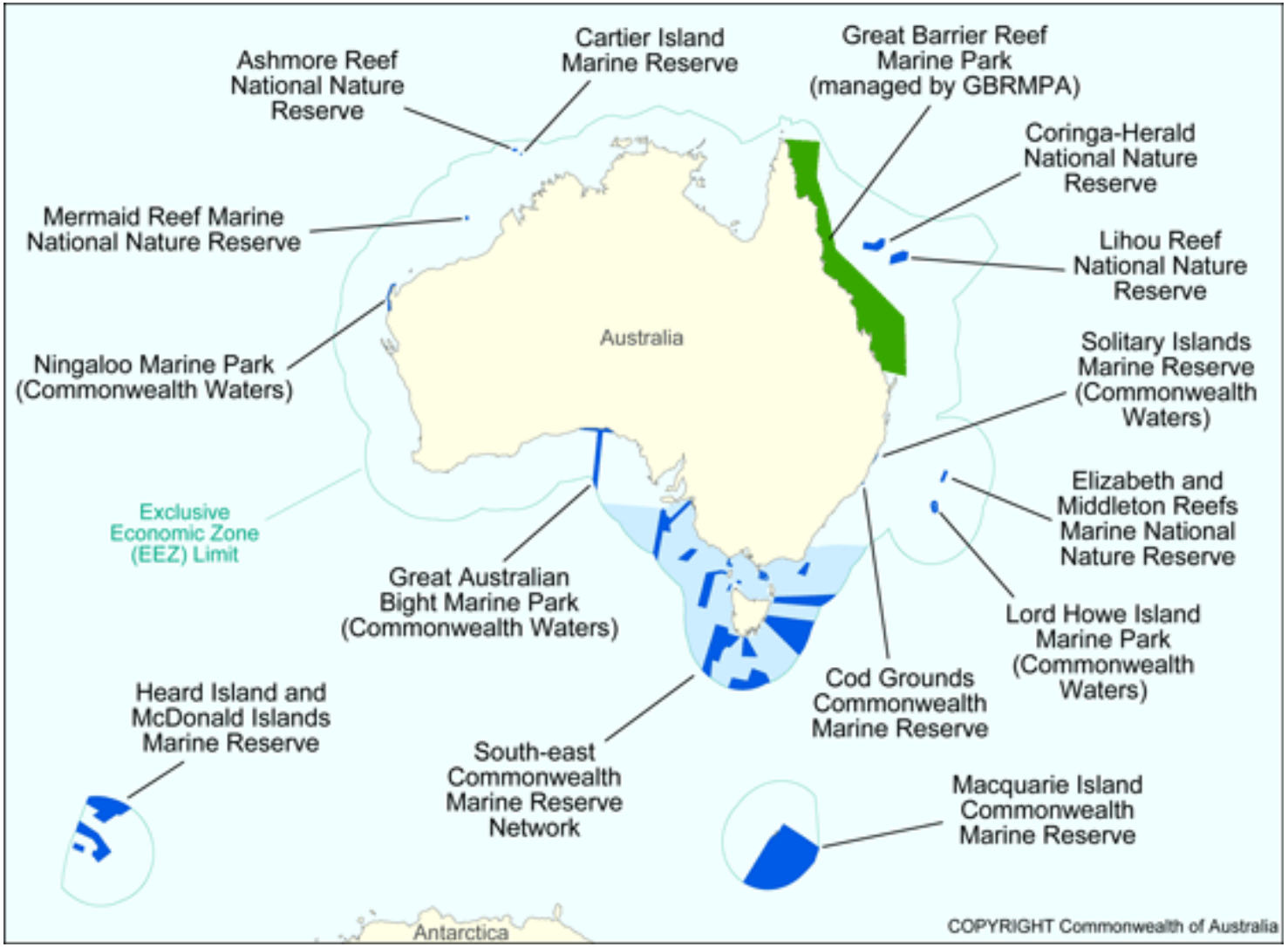
- **Full quantitative assessment**
  - Eg target species (Tier 1 under Harvest Strategy Policy)



# A Broader View: Fisheries as part of Ecosystems

- The Department of the Environment, Water, Heritage and the Arts (DEWHA) is responsible for the declaration and management of Marine Protected Areas in federal waters.
- Oceans Policy (1998) provides the framework for integrated ecosystem planning and management
  - Develop regional marine plans
  - Accelerate development of National System of MPAs

# A Broader View: Fisheries as part of Ecosystems

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# Conclusions

- **Large changes in federal Australian fisheries**
  - Development of fishery management plans
  - Formal harvest strategies
- **Increasing integration of fisheries with environmental regulations**
  - Assessments of the ecological impacts of fishing
  - Spatial management
- **So despite some pain, the fishery has responded to these changes**

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# Thank-you

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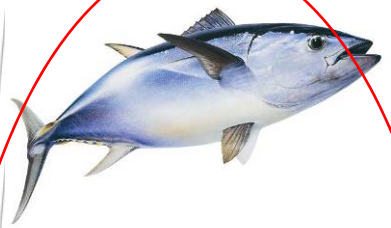
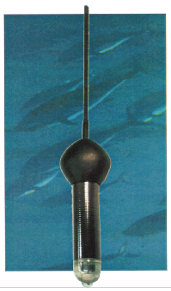
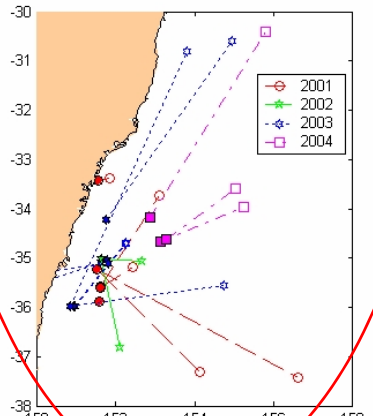
# Some further examples

# Dynamic spatial strategies

Southern bluefin tuna management





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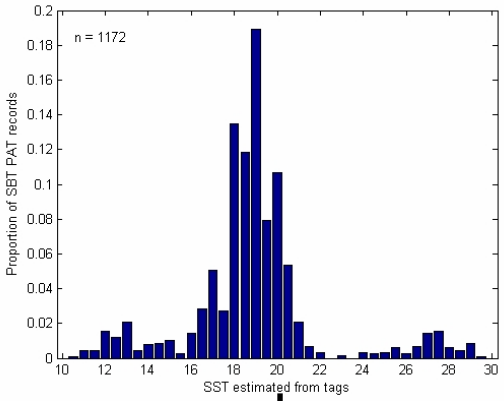
Habitat preferences

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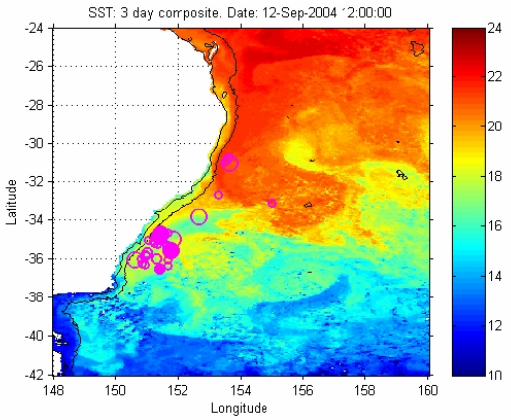
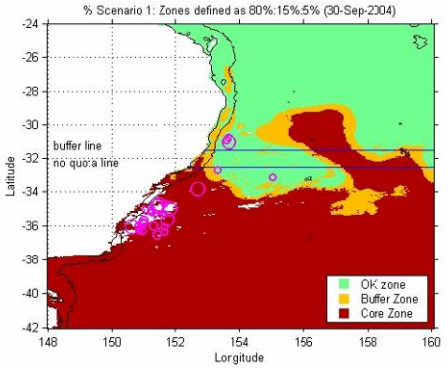
3D ocean info




Habitat prediction




Management decision

# Conclusion

- **A range of tools are required in the toolbox**
- **There are viable alternatives to full quantitative approaches**
- **Stakeholder involvement, understanding, and acceptance is critical**
- **A surprising level of agreement can be achieved across government, industry, conservation, and the sciences with application of relatively simple analytical tools**

# ERA – Scoping and Level 1

**Scoping**

- **fishery description, management objectives, lists of species, habitats and communities**

**Level 1**

- **5 ecological components assessed**
  - target species
  - byproduct and bycatch species
  - threatened, endangered and protected species
  - habitats
  - communities
- **if medium or high risk, proceed to Level 2 (or risk mitigation)**

# ERAEF overview

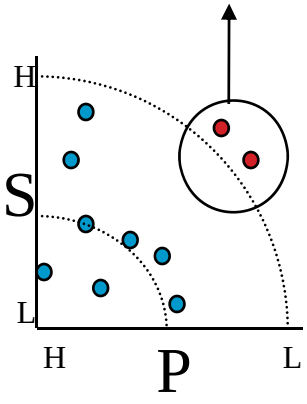
Level 3

e.g. stock assessment

e.g. PVA

e.g. Ecosim

Level 2

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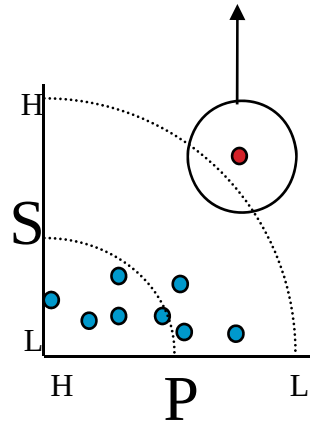


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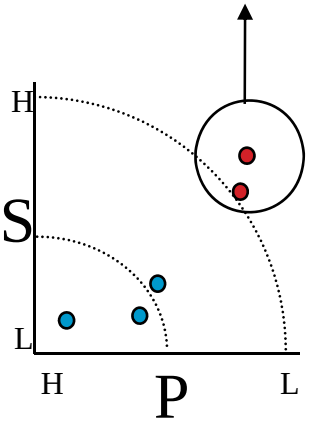
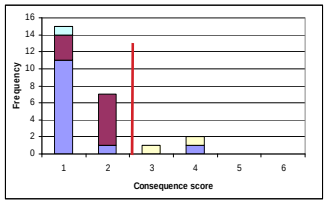
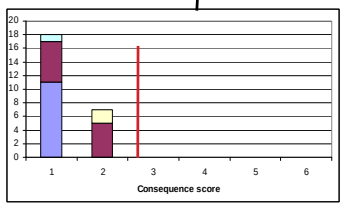


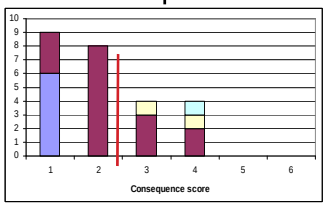

Level 1



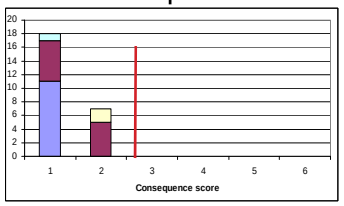

Target



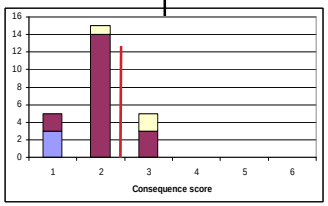

Bycatch




TEP




Habitats




Communities

Scoping

**Fishing Activities**

# EPBC and EBFM

- **In addition:**
- AFMA has legislative objectives to ensure exploitation is consistent with ESD and precautionary principle.
- Principles of ESD within the Fisheries Management Act (1991):
  - **Decision making integrates short and long-term economic, environmental, social and equity considerations**
  - **Inter-generational equity**
  - **Conservation of biological diversity**

# New Policies in Australia (2005-2007)

- **Ministerial Direction to AFMA "rebuild overfished stocks and no more overfishing" (2005)**
- **Adoption of federal Harvest Strategy Policy (2006)**
- **AUS$220 million restructure package (2006)**
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- **Policy development ran ahead of the scientific tools and methods to support it**

# ITQs – The South East Trawl Fishery

- **Lack of confidence in the fishery**
  - Low investment
  - Running down the fishing business
  - Profitability hit by increase in fuel price
  - Increased import competition
  - Adjustment occurring but slow

# Fisheries Management – South East Trawl

## Conclusions from the AMS Project

- **Results were used to secure agreement for a change to fisheries management strategies**
- **Need for Harvest Strategies, Closures**
- **Peak industry body supportive and sort government assistance for a "restructure" package to reduce economic impact and to smooth the transition to a sustainable fishery**
- **Securing Our Fishing Future (2005)**
- **By 2007 the fishery is closer to the 'integrated management' scenario than 'status quo' of 2003**

# AMS Project

**In response, the Alternative Management Strategies Project was developed**

- **Joint CSIRO-AFMA Project**
- **Radically rethink management arrangements for SESSF**
- **Strategic approach – bring stakeholders along**
- **Management Strategy Evaluation approach (MSE)**

## Steps in MSE

1. specify objectives (ecological, economic, social)
2. develop performance measures (quantitative)
3. specify management options (4 scenarios)
4. predict consequences (expert judgement)
5. identify tradeoffs (decision table)

# AMS Project

## Alternative Management Strategies Project

**Two phases**

1. **Qualitative (consequences predicted from expert judgement)**
2. **Quantitative (consequences predicted from quantitative models - ATLANTIS)**

**Management options (10 in total), for example:**

1. **Status quo option (ineffective quota management)**
2. **Quotas on all species of value**
3. **Integrated management (gear controls, spatial management, quotas) – "Blue Sky"**

# Conclusions from Phase 1

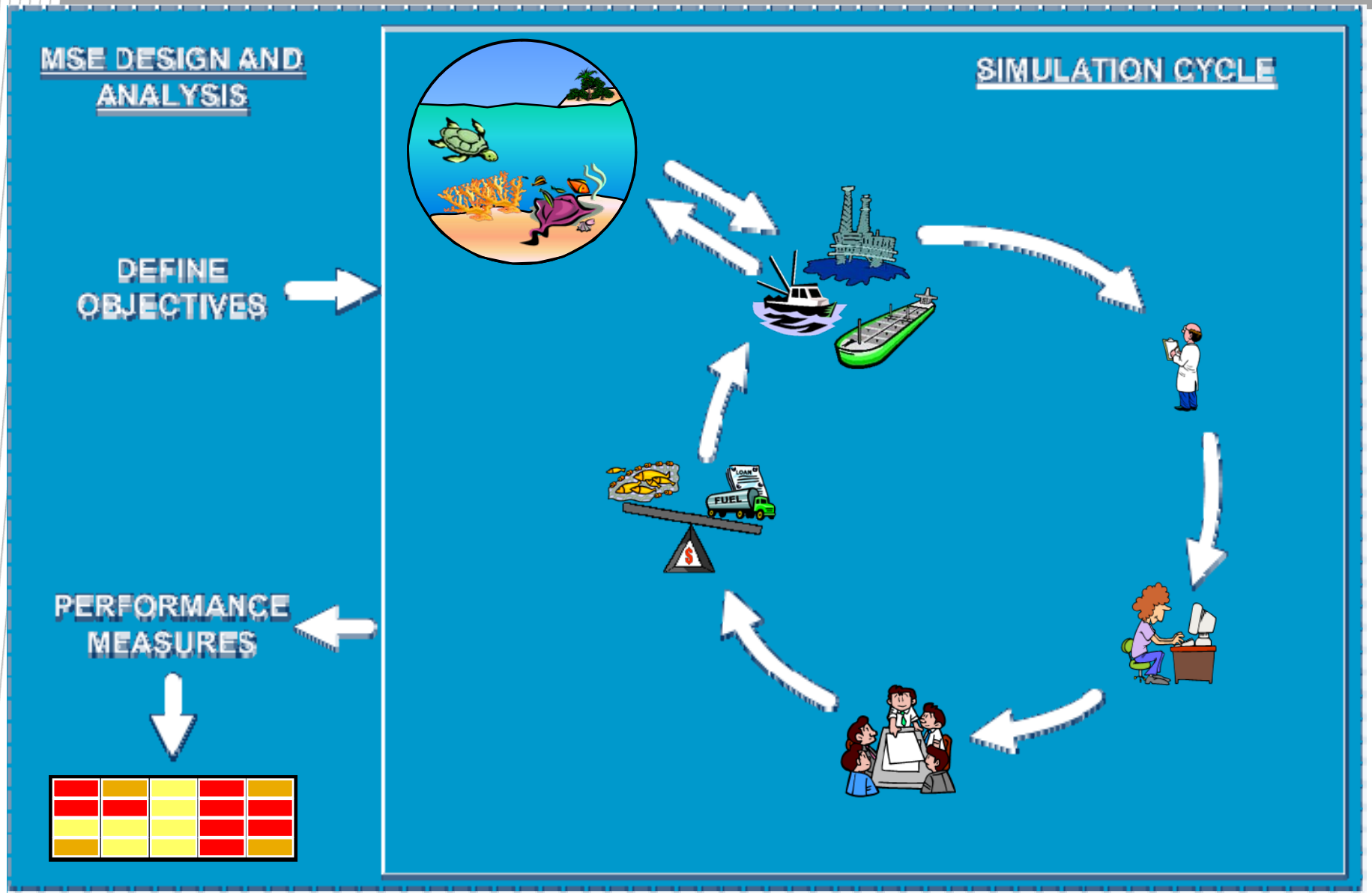
- Most economic and ecological indicators continue to deteriorate under most scenarios considered
- Integrated management - the best management scenario in the medium to longer term has severe short term economic pain

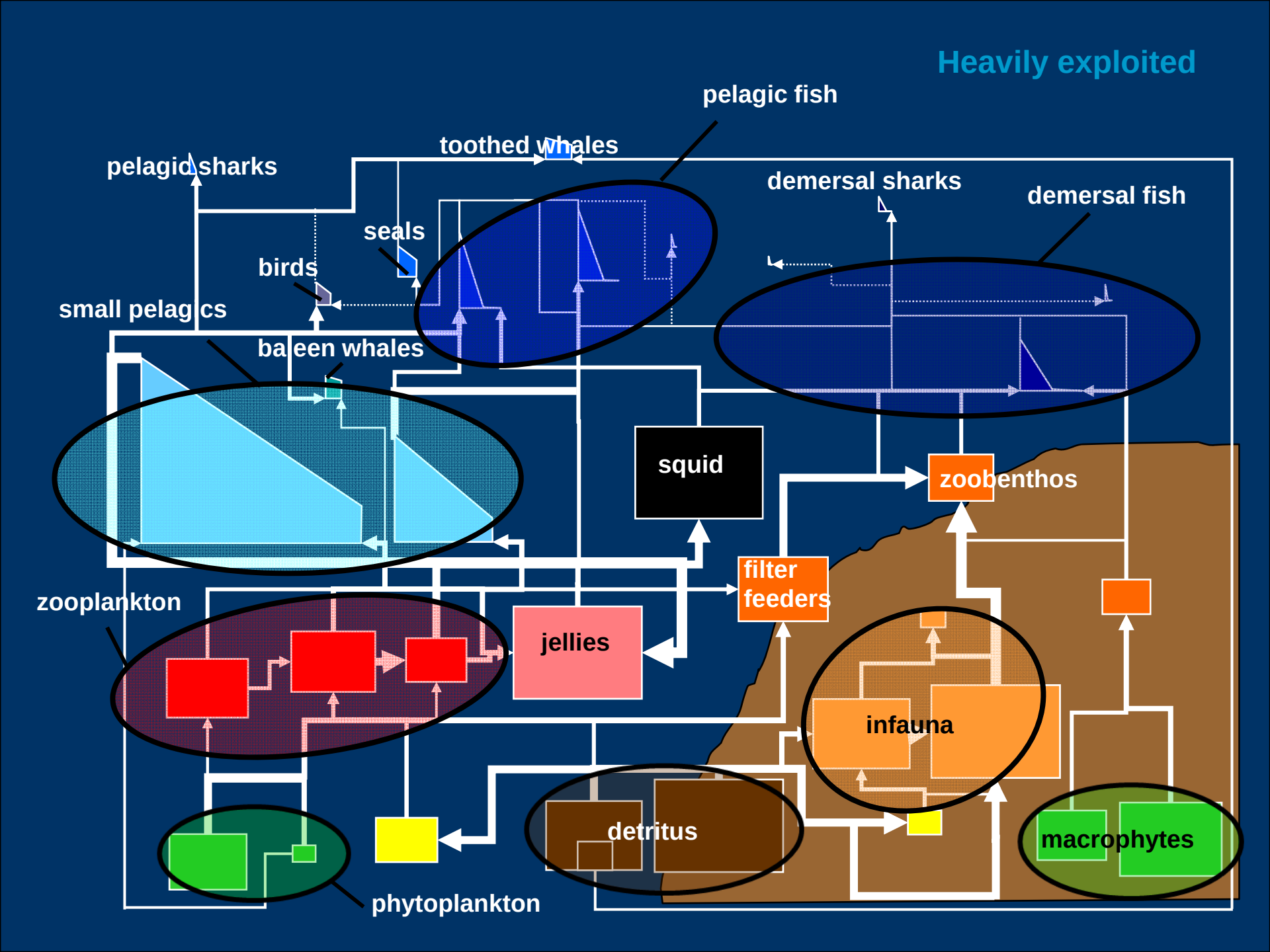
# Fisheries Management – South East Trawl

## Phase 2 - Atlantis

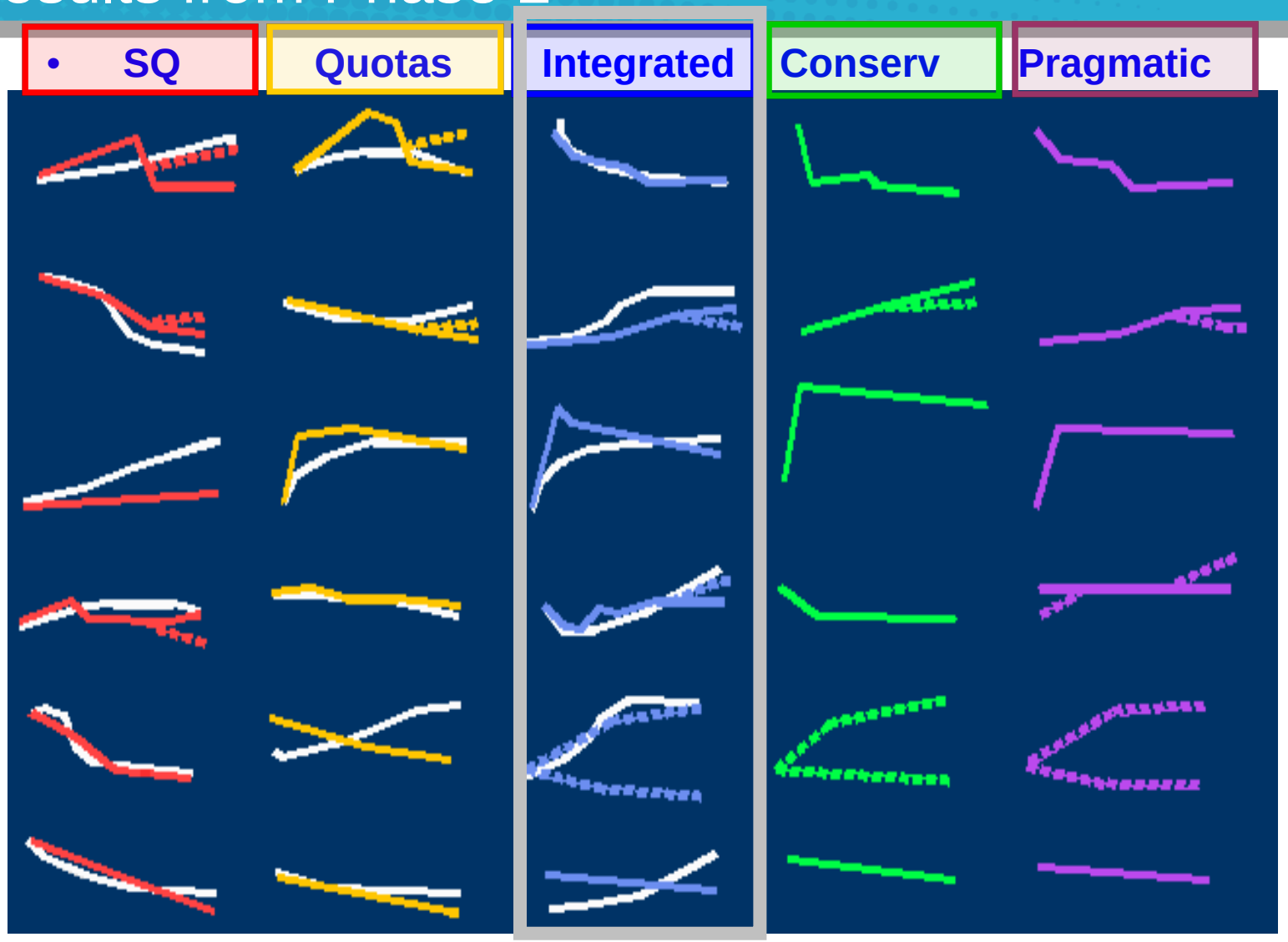
- **Biophysical model**
- **Socio-economic (various sectors including fisheries)**
- **Management and assessment (eg data collection)**
- **Decision making and management (eg quotas, zones, gear)**

# Phase 2 - Atlantis Ecosystem Modelling Framework




Heavily exploited
pelagic fish
toothed whales
pelagic sharks
demersal sharks
demersal fish
seals
birds
small pelagics
baleen whales
squid
zoobenthos
filter feeders
zooplankton
jellies
infauna
detritus
macrophytes
phytoplankton

# Results from Phase 2




- Effort
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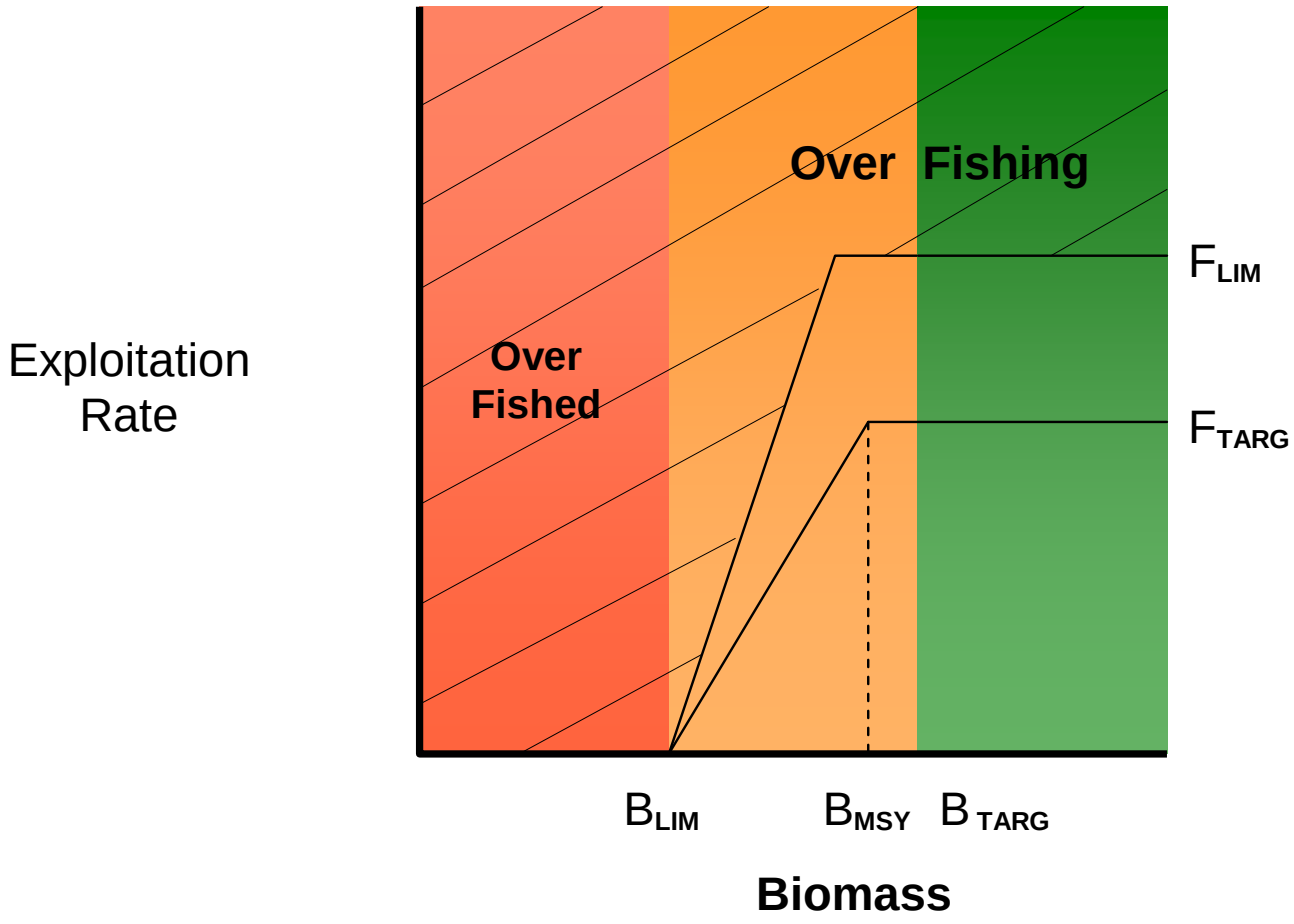
# Harvest Strategy Framework for the SETF

- **Example: Tiers 1 and 2**



# Harvest Strategy Framework for the SET

- **Adopted a 4 Tier system**
  - Tier 1: robust quantitative assessment
  - Tier 2: preliminary quantitative assessment
  - Tier 3: estimates of F from catch curves (age/length data)
  - Tier 4: trends in CPUE

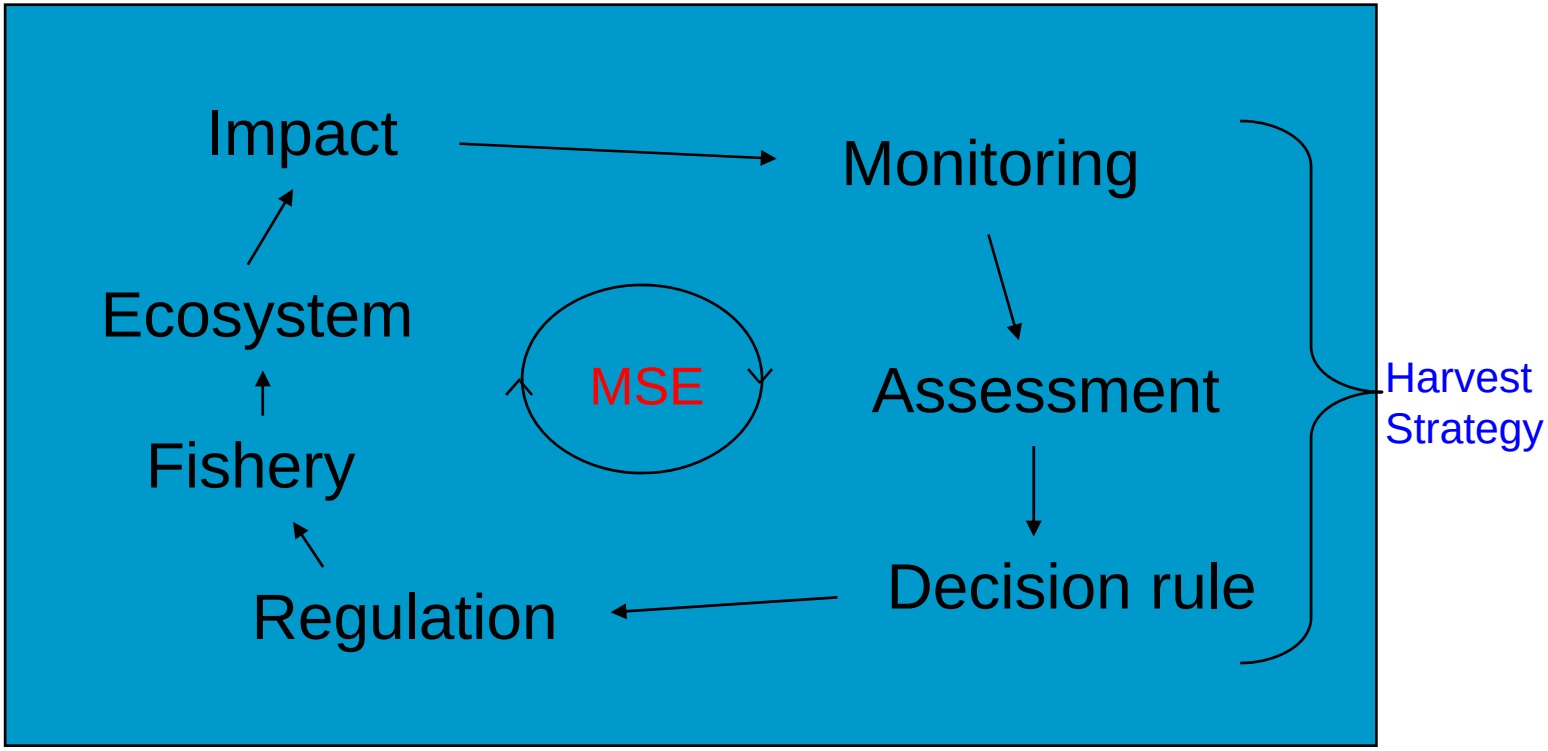
- **Tier rules produce RBC (recommended biological catch) → TAC**

# Harvest Strategy Policy – South East Fishery

- **34 stocks/species under quota management by 2005**
- **A third of these with quantitative assessments**
- **7 stocks classified as overfished**
- **Despite considerable modelling work, reference points, etc, no agreement on decision rules for setting TACs**
- **Requirement that harvest strategies including formal decision rules be implemented by 2005**

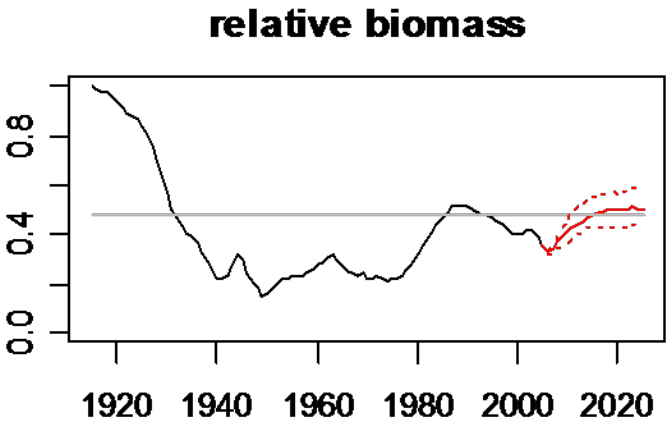
# Harvest Strategy Framework - tested

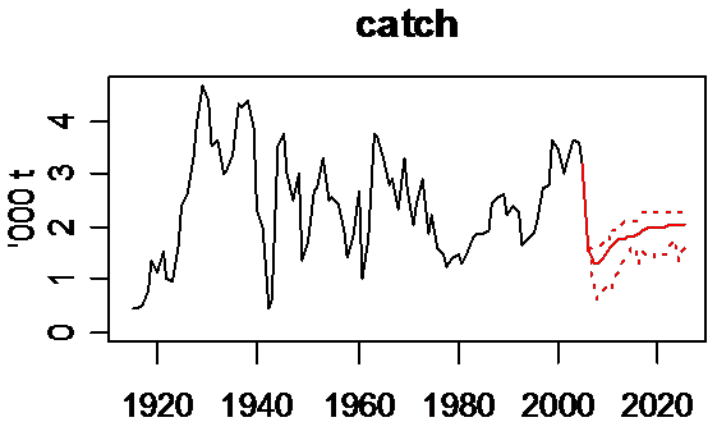
- Management strategy evaluation = MSE



# Fisheries Management – South East Trawl

- **Simulation tested Harvest control rules**



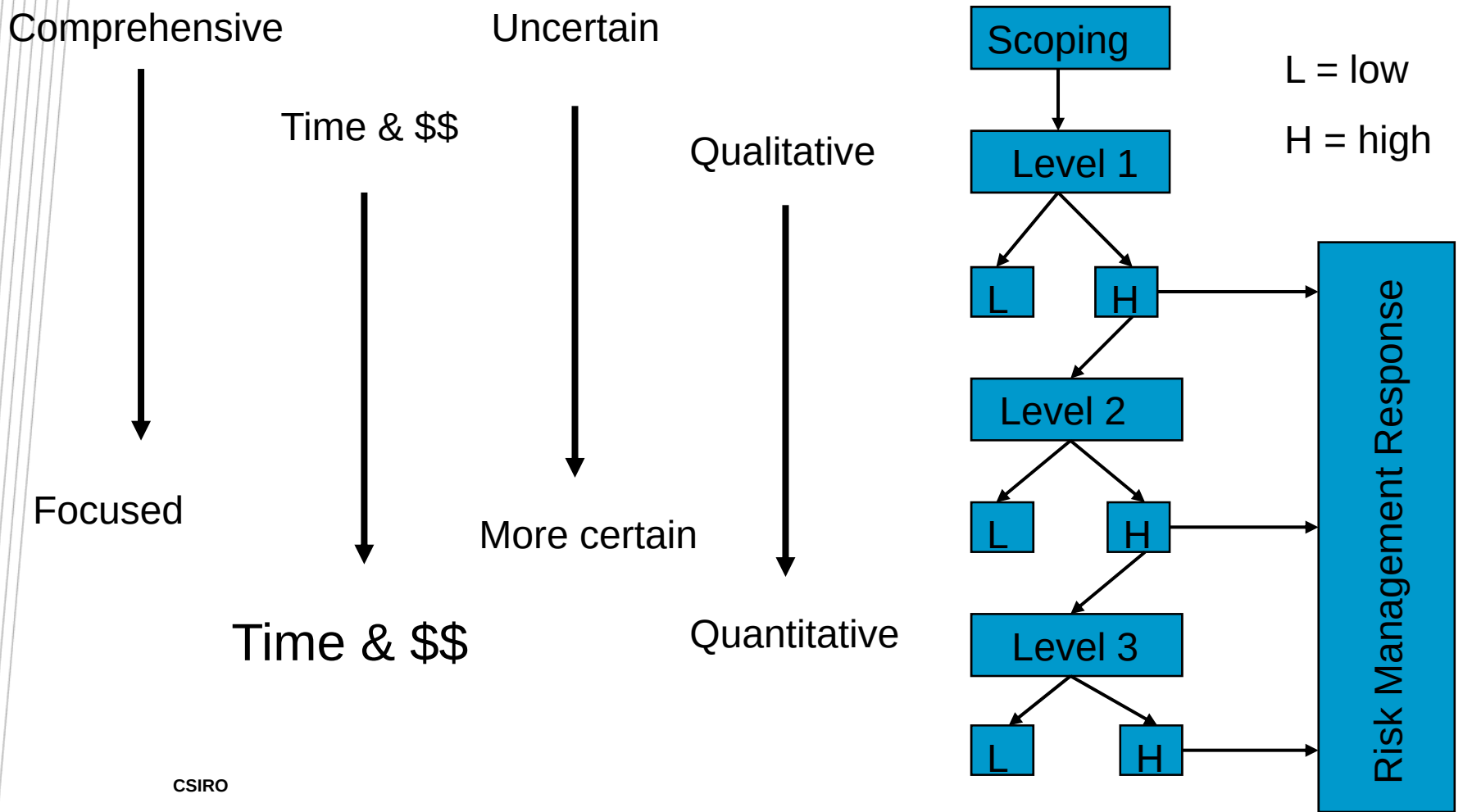
# Criteria for Ecological Risk Assessment

- **Comprehensive**
- **Scientifically defensible**
- **Make use of existing data and information**
- **Precautionary given uncertainty**
- **Cost effective**
- **Flexible (apply to all types of fisheries)**
- **Transparent**
- **Understandable to stakeholders**
- **Help inform management response**

- **No such methods existed!**

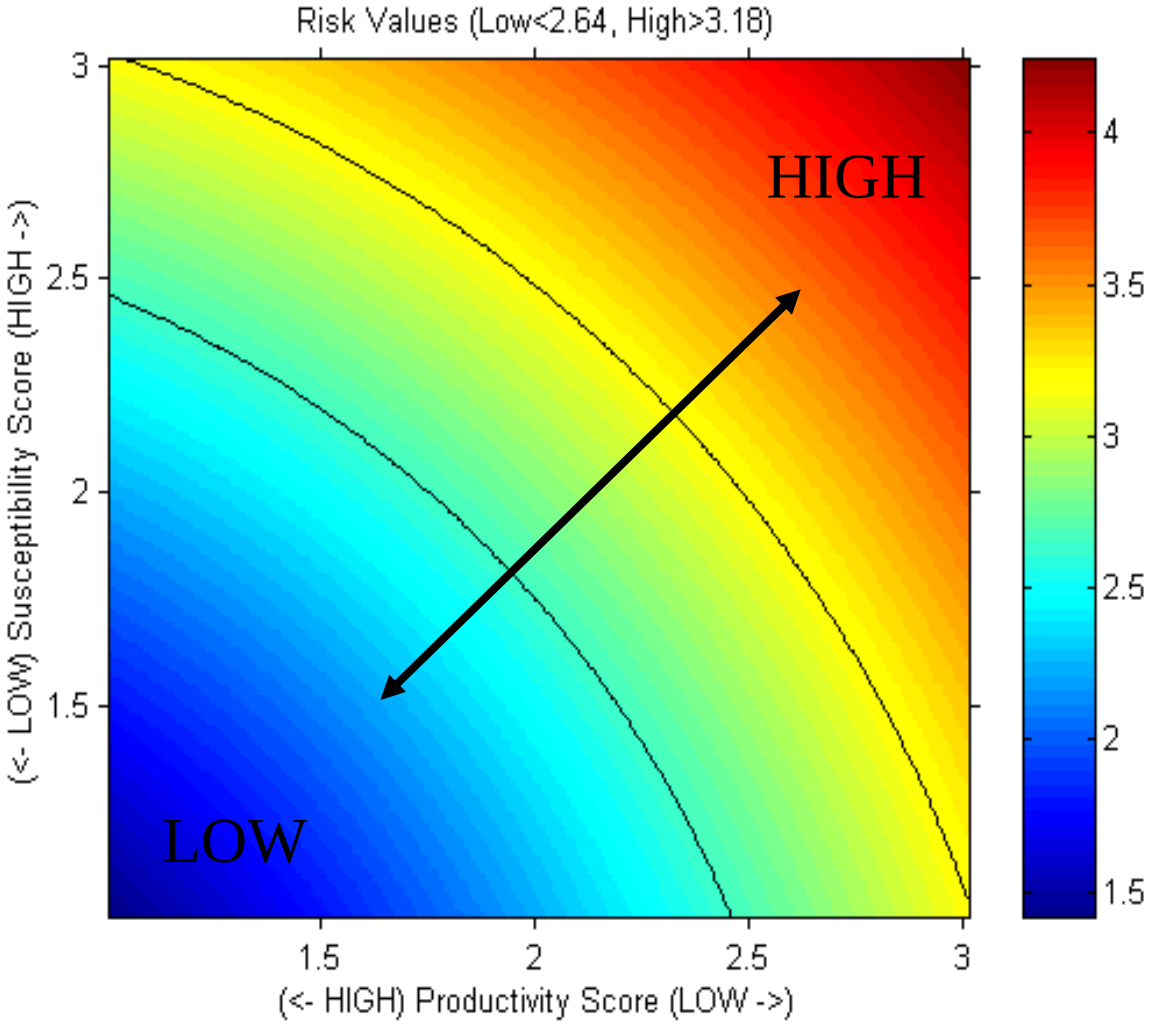
# Ecological Risk Assessment

**Requirement to assess impacts of fishing on all components of ecological systems, including species, habitats and communities**



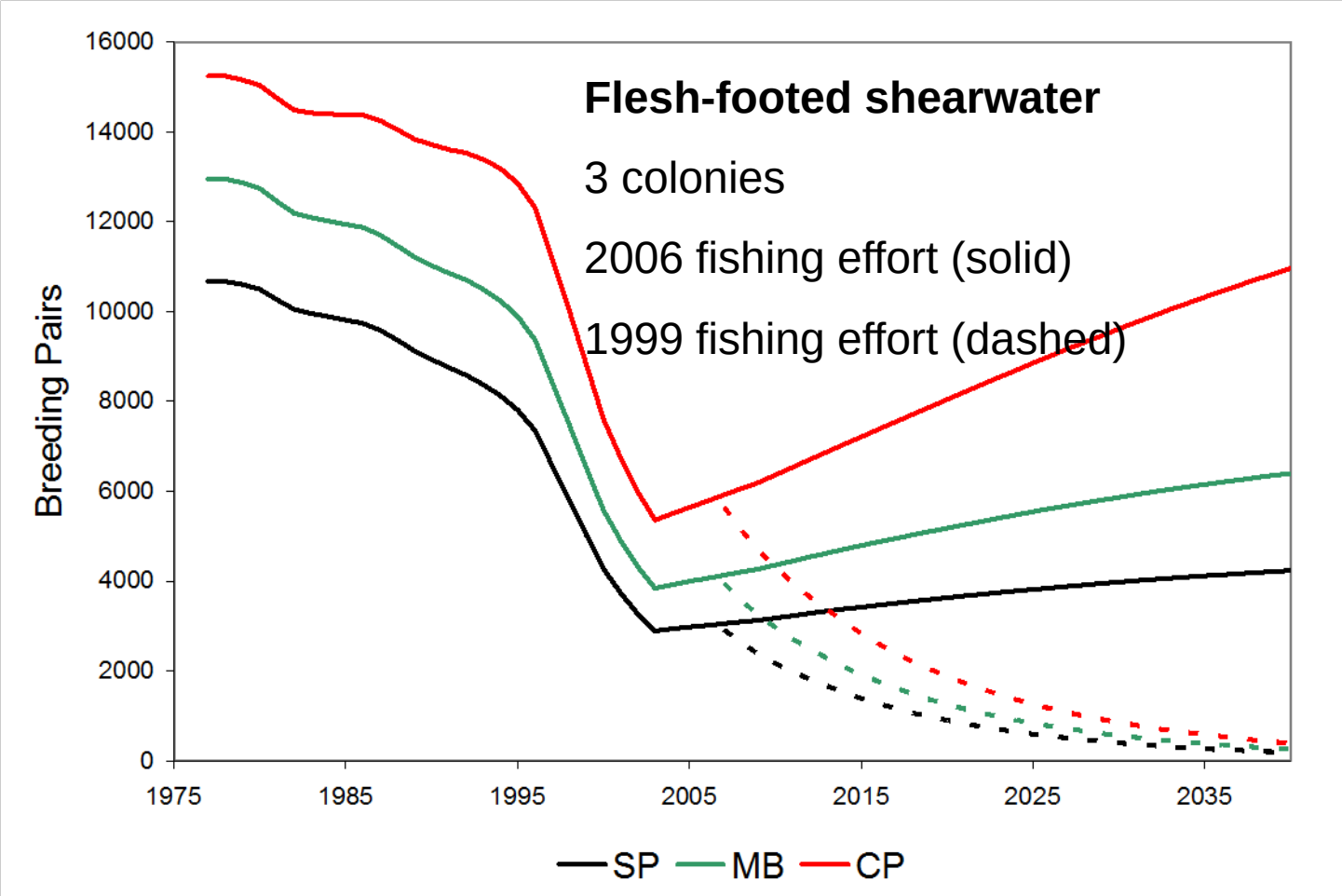
# ERA – Level 2 - PSA

Have conducted PSA analyses for over 1800 species to date



# ERA – Level 3

- **Full quantitative assessment**



# Ecosystem-based management

- **Strategic Assessment Objectives**

  1. Catch levels maintain ecologically viable stocks at an agreed point or range
  2. Where stock is below a defined reference point, the fishery must promote recovery within nominated time
  3. The fishery does not threaten bycatch species
  4. The fishery avoids mortality/injury to endangered, threatened or protected species or ecological communities

# Ecosystem-based management

- **How do we show these objectives are met?**
  - Ecological Risk Management/Assessment (ERM/ERA) for each fishery – Hobday (2001)
  - Process for assessing and addressing fishery impacts
  - ERA is a key tool in support of EBFM
  - CSIRO and AFMA joint project to develop and apply ERA methods