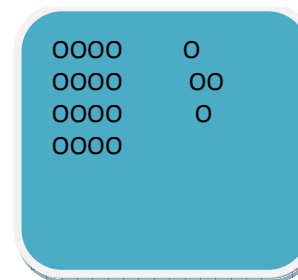




**Ecosystem Approach to Fisheries:  
Tools and Implementation**  
*A Training Course for Fisheries Practitioners*



# The EAF Implementation Process

## STEP 2

### Identification of Assets and Issues and their Priorities

#### 2.2 Prioritizing Issues Relevant to EAF – Risk Assessment



# Need for Prioritization

Many issues are often identified in Step 2.1, their importance varies and not all require explicit management and there is often not the resources to start managing everything

Conduct a prioritization process for each of the identified issues to determine the appropriate level of response

This is best started using one or more of the Risk Assessment Methods

# Outcomes

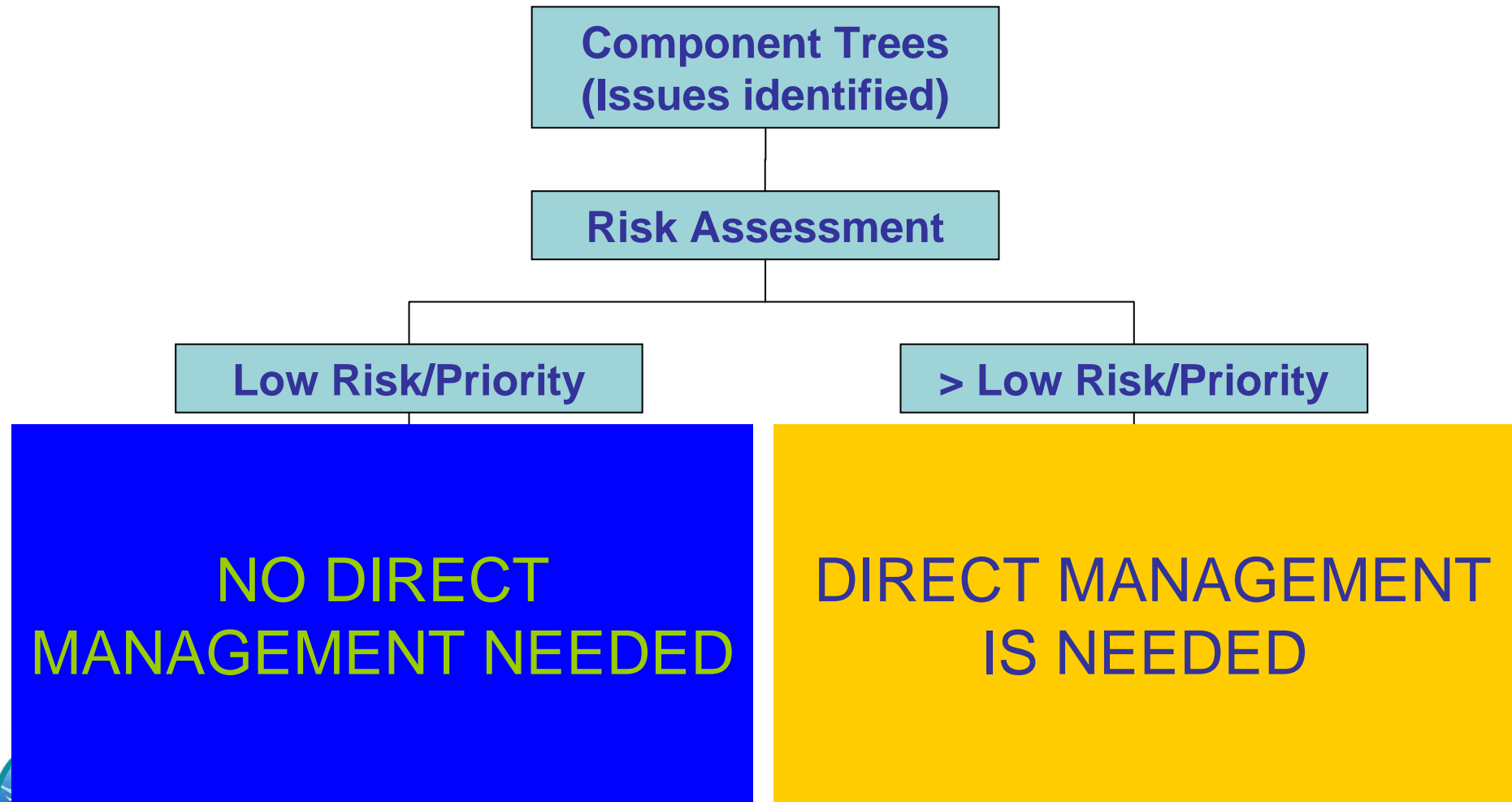
For issues that are not currently addressed directly:

- should you continue to do nothing or,
- do you really need to be doing something?

For issues that are currently being managed or investigated:

- Are you doing an appropriate amount;
- not doing enough
- or doing too much?

# Risk Assessment



# What is Risk?

Risk is now defined as:

*“the effect of **uncertainty** on meeting **objectives**”*

Or :

*“potential that a chosen action or activity (including the choice of inaction) will lead to a loss (an undesirable outcome)”*

Therefore to assess risk you need to know what objectives you want to achieve



# What does this mean for EAF?

For EAF, a risk assessment asks:

“What is the risk that the current fishery management system will not meet the agreed objectives for each of the identified issues?”

# Important!

- There is a fundamental difference between uncertainty and no knowledge
- There are few issues for which we have NO knowledge
- There are few (no) issues for which we have FULL certainty
- So a risk assessment can be done with whatever data or information you have.

# Risk Assessment

All fisheries management has Risk Assessment as a basis.

This has generally not been an explicit process

All life is risk management – you just don't realize it



# Exercise

- Write down 1 – 2 ‘risks’ that you dealt with today so nothing bad happened to you.
- Right down 1- 2 longer term issues that you actively try and minimise bad things happening

# What are you assessing?

- For each issue you need to assess the risk to each of the high level objectives (ecological, social, etc) relevant for the issue
- You need to determine whether you are 'happy' or not that the fishery will generate acceptable outcomes for each of the relevant objectives?

# Assigning Risk Levels

- There are a number of different risk assessment methods available for use in prioritizing issues.

**Easy** - Risk Categories

**Moderate** - Qualitative Assessment  
(Consequence x Likelihood)

**Hard** – Quantitative (probabilities)

- Which is the most appropriate in any one circumstance depends on the level of information available and the level of knowledge and training of the participants.

# Prioritization Methods

Calculating Risk is only part of the prioritization process. Where there are a number of high risks you often need to prioritize between these

- **Easy** – Use of votes/dots/“spending your dollar”
- **Moderate** – Multi criteria Analysis
- **Hard** - MSE (Multi Stakeholder Evaluation)

# How do you assess Risk?

- All risk assessments essentially involve the calculation of how big or bad are the potential **consequences** under the current management system and how **likely** is it that a certain level of consequence will actually occur
- The higher the likelihood that a ‘worse’ consequence may actually occur, the greater is the level of risk

# Consequence levels

Level	Description
<b>1 Minor</b>	<b>Minimal ‘impacts’ that are highly acceptable</b>
<b>2 Moderate</b>	<b>Maximum acceptable level of ‘impact’</b>
<b>3 Major</b>	<b>Above acceptable limit. Wide and long-term negative impacts</b>
<b>4 Extreme</b>	<b>Well above acceptable limit. Very serious, likely to require long restoration time to undo</b>

# Evaluating Likelihoods

Level	Description
1 - remote	Insignificant probability of the particular consequence occurring
2 – unlikely	Some evidence that the particular consequence level could occur
3 – possible	The consequence level may occur but this is still not likely.
4 – likely	The particular consequence level is expected to occur

# Calculating Risk

- The risk level is calculated by multiplying the consequence level with the corresponding likelihood level of it occurring.
- If more than one combination of consequence and likelihood is considered plausible, the combination with the highest risk score should be chosen (range 1-16)



# Qualitative Risk Assessment

This assessment concluded that it was unlikely that the fishery would generate a moderate level of consequence for the issue and the specific objective.

This would be a LOW RISK

	Likelihood	Consequence Level			
		1	2	3	4
Remote	1	1	2	3	4
Unlikely	2	2	4	6	8
Possible	3	3	6	9	12
Likely	4	4	8	12	16

# A Simpler Method of Calculation

Where there is little formal knowledge, or participants are not confident using more complex methods

A simple three level risk category process can be MORE appropriate and effective.

# Simple Risk Categories

**LOW** – levels of impacts are expected to remain low or the chance of a major impact are very small – highly likely to meet your objective even with no direct action

**MEDIUM** – Issue is at an acceptable level at the moment and should meet the objective but only if directly managed

**HIGH** – Major problems are already happening or will occur in the near future. Objectives will not be met unless additional actions are undertaken.

# Risk Levels

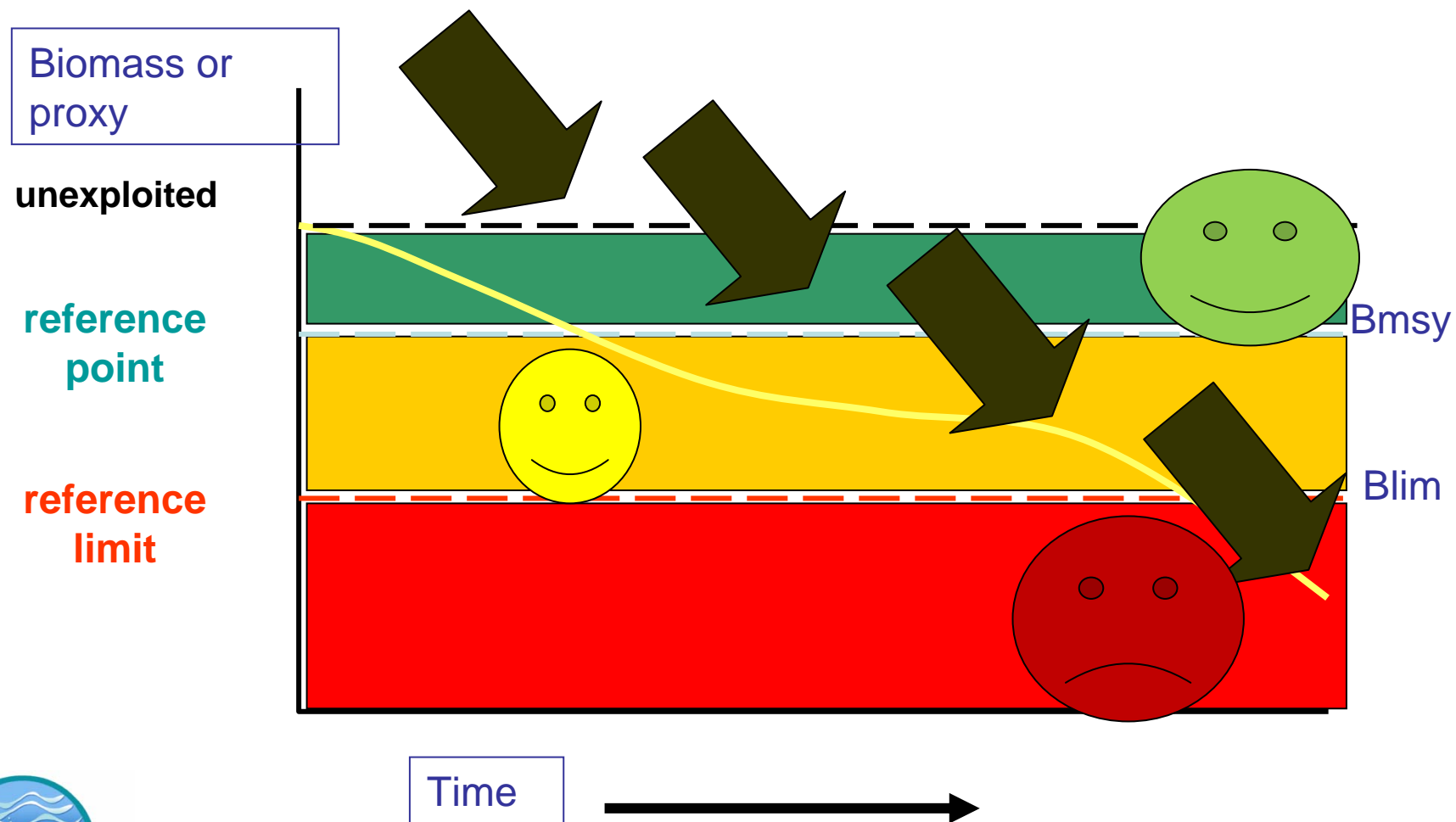
Risk Level	Risk Categories	Risk Scores (CXL)	Likely Management Response	Likely Reporting Requirements
Negligible	1	1-2	None	Brief Justification
Low		3-4	No Specific Management	Full Justification needed
Medium	2	6-8	Specific Management/Monitoring Needed	Full Performance Report
High	3	9-16	Increased management activities needed	Full Performance Report

# What is Acceptable?

- You need to be very clear what is considered to be acceptable outcomes for each of the objectives
- What is acceptable in one circumstance may not be elsewhere
- Be clear about when would you be happy, unhappy and really unhappy!
- These can often be described as levels on a graph



# Consequence Levels



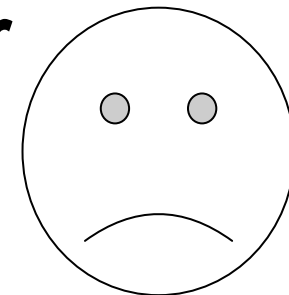
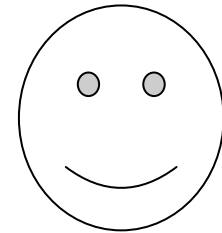
# Example

## Consequences

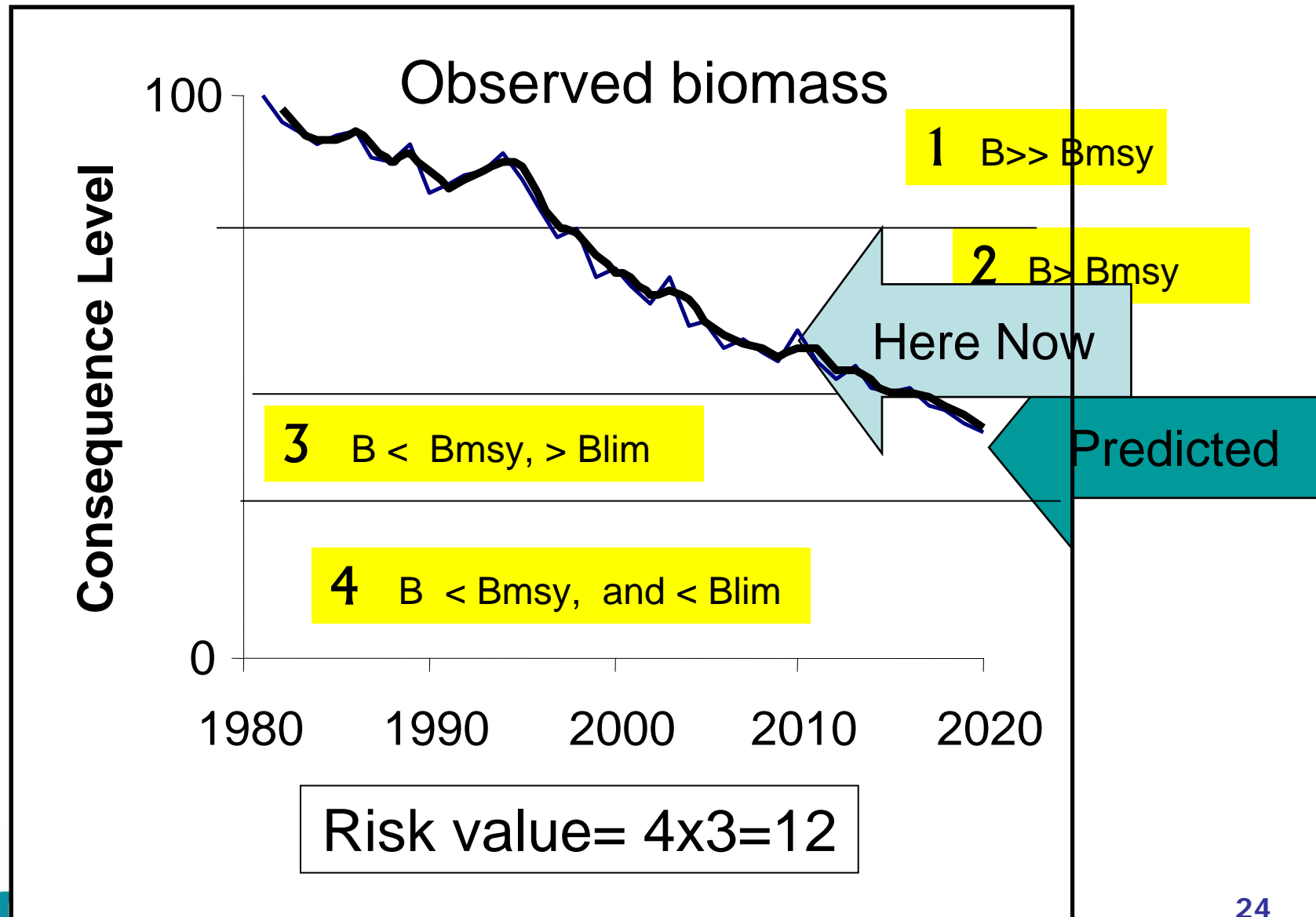
- **Level 1 –  $B \gg B_{msy}$ : Low**
- **Level 2 –  $B > B_{msy}$ : Moderate**

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- **Level 3 –  $B < B_{msy} > B_{lim}$ : Major**
- **Level 4 –  $B < B_{lim}$ : Extreme**



# EXAMPLE





		Consequence Level			
		Minor	Moderate	Major	Extreme
Likelihood		1	2	3	4
Remote	1	1	2	3	4
Unlikely	2	2	4	6	8
Possible	3	3	6	9	12
Likely	4	4	8	12	16



# Risk And Objectives

BUT if “Risk is the uncertainty of achieving your objectives”

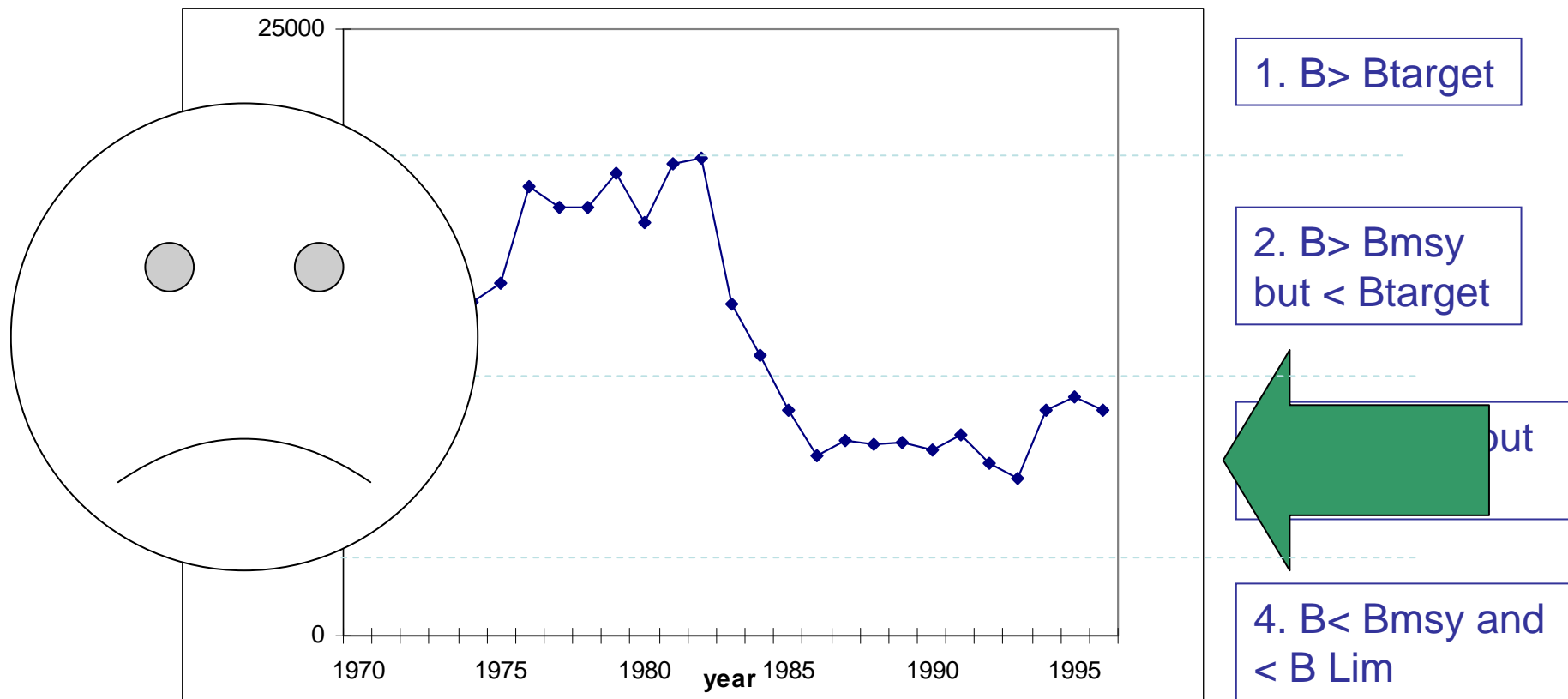
You need to determine which objectives you are using – the risk level for a certain situation may change depending upon what objectives are wanted

# Possible EAF Values

- Sustainability – keeping biomass levels above  $B_{msy}$
- Viability – avoiding extinction for a species (i.e.  $B_{current}$  can be  $< B_{msy}$  but  $> B_{extinct}$ )
- Economic – optimise/maximise economic benefits
- Social - optimise social acceptability
- Food Security – maintain food levels to local populations
- Wastage – minimize wastage of catch

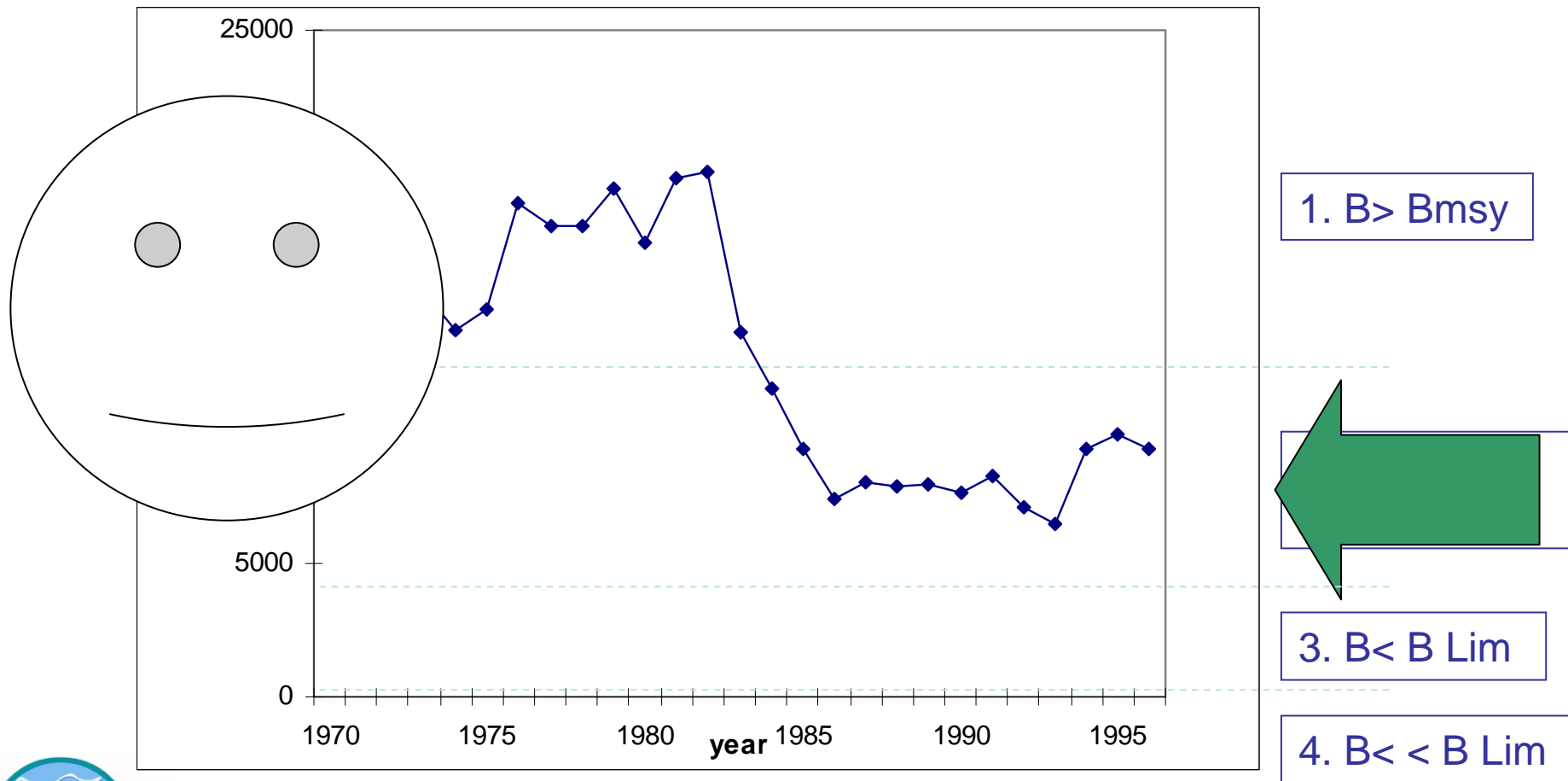


# Objective – have stocks return above the levels to generate MSY



Risk value=  $3 \times 4 = 12$

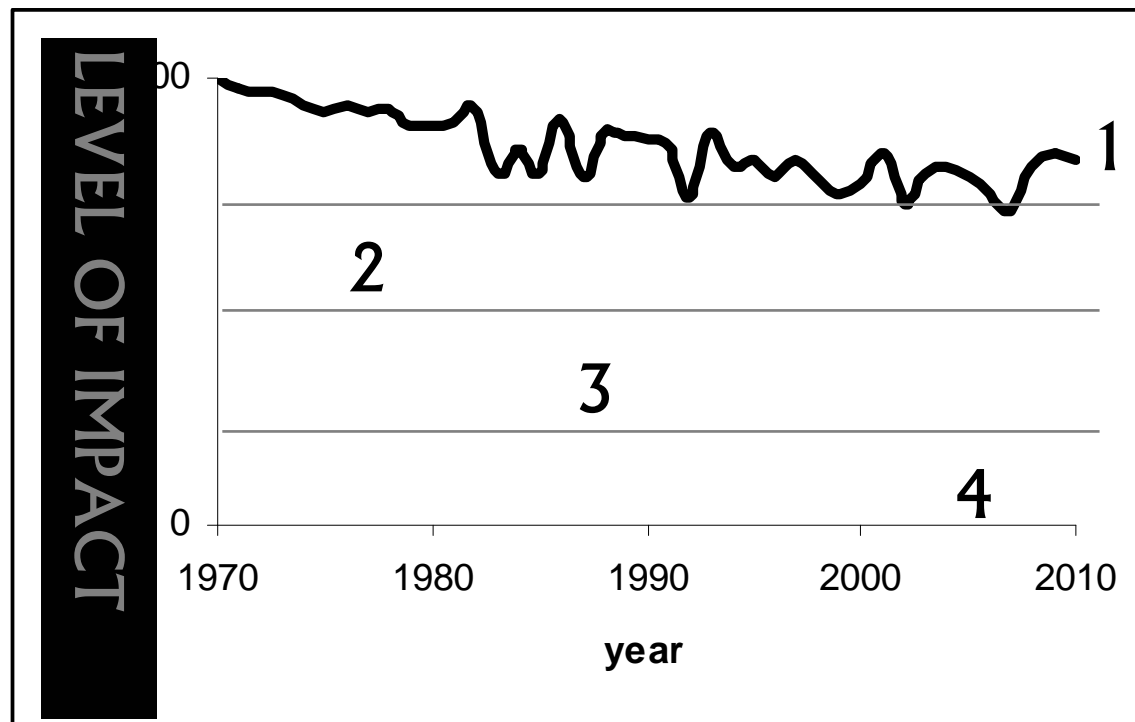
# Objective – Avoid recruitment overfishing



Risk value=  $2 \times 4 = 8$

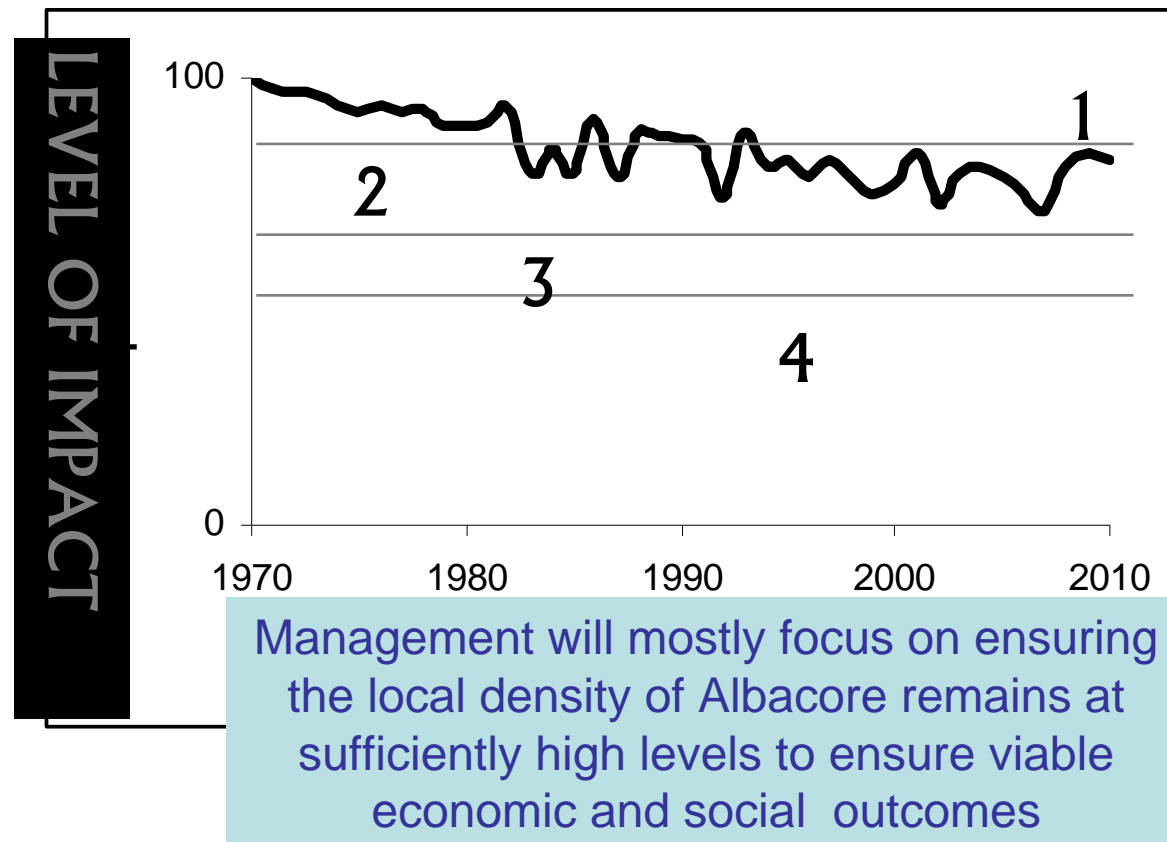
# Sustainability

Risk Score = C 1 x L 4 = 4 LOW RISK – No management



# Economic

Risk Score =  $C2 \times L4 = 6$  Moderate Risk – Management needed



# IMPLICATIONS

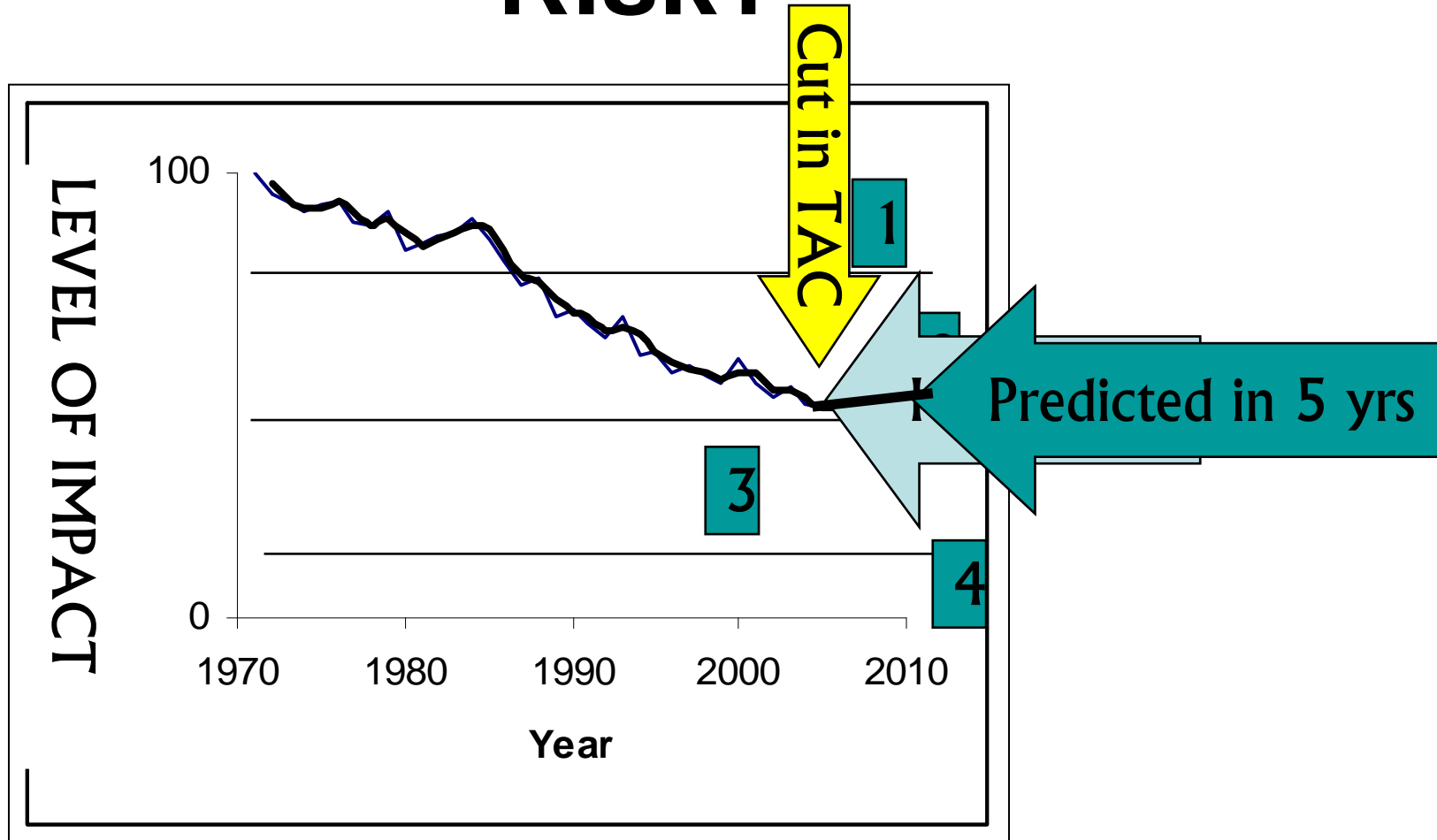
- So different objectives may result in a change in what levels of impact are associated with the four levels of consequence
- That is why there is often conflict among stakeholders – they can often be assessing different objectives. So what they think is acceptable is different



# How does management affect Risk?

- When assessing the risk you include what management arrangements are already in place – or are about to be put in place
- The whole purpose of implementing management is to reduce risk
- If you assess an issue assuming there is no management, risk should be higher than when your management is included or it is not doing anything

# How does management affect Risk?



# Risk Assessment

		Consequence Level			
		Minor	Moderate	Major	Extreme
Likelihood		1	2	3	4
Remote	1	1	2	3	4
Unlikely	2	2	4	6	8
Possible	3	3	6	9	12
Likely	4	4	8	12	16

# Output from the Risk Assessment

The actual risk assessment is not just the scores generated during the assessment process but needs to include the appropriate level of documentation/justification for the categories selected

# Applying a Risk Assessment Process?

**Need to evaluate the risk values for all the issues identified in Step 2.1:**

- **target species and important retained species**
- **bycatch species**
- **species of conservation or special concern**
- **habitat issues**
- **ecosystem/trophic level issues**
- **social and economic issues**
- **governance**

# Exercise

- What are main items to consider in doing a risk assessment on a target species?

# Target Species

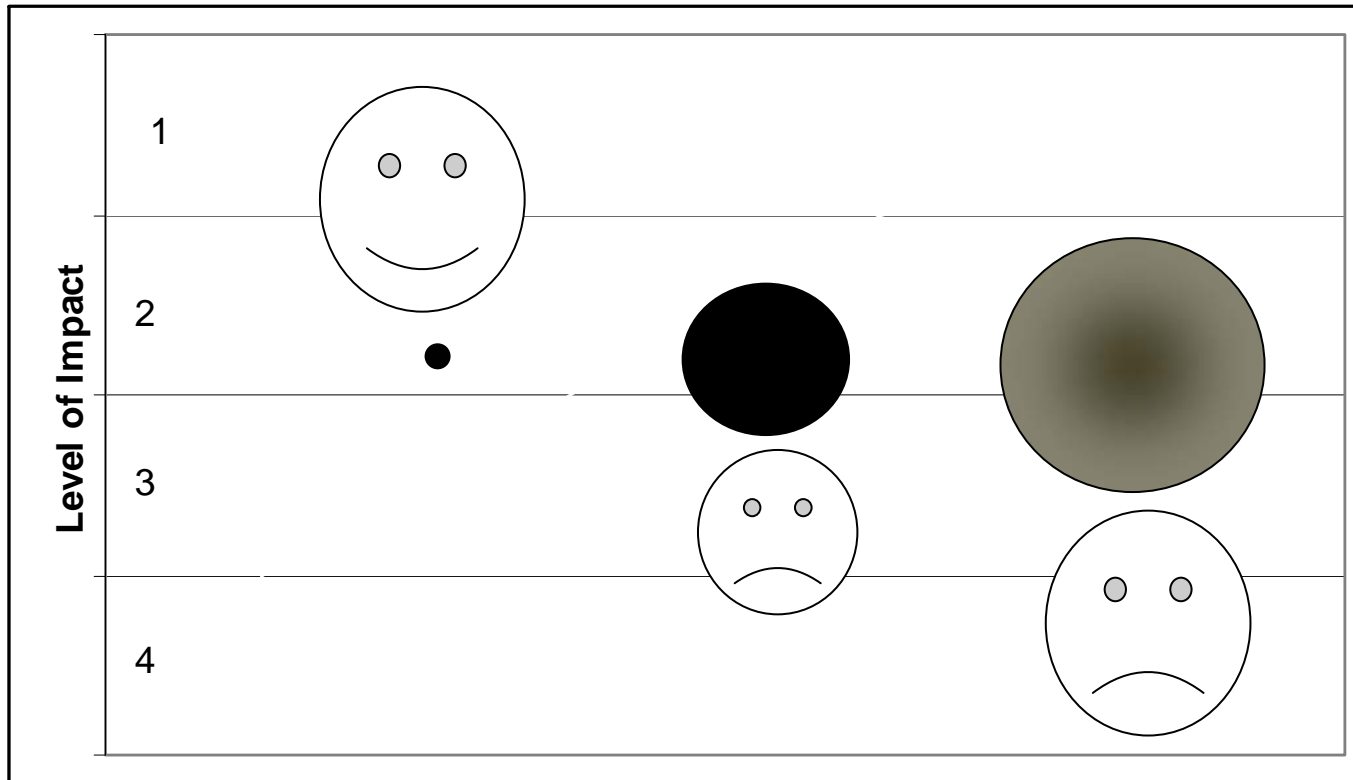
Three common objectives for stock sustainability of target species are to:

- “*maintain spawning biomass at least above the level where it is likely not to result in recruitment overfishing*” .
- “*maintain the biomass above the level that will generate MSY*”.
- “*maintain the biomass above the level that will generate MEY*”.

What are the objectives you are trying to achieve for your target species?

What describes the four levels of consequence?

# Impact of Uncertainty

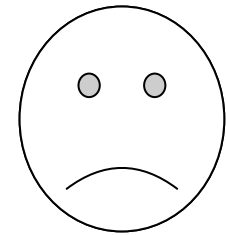
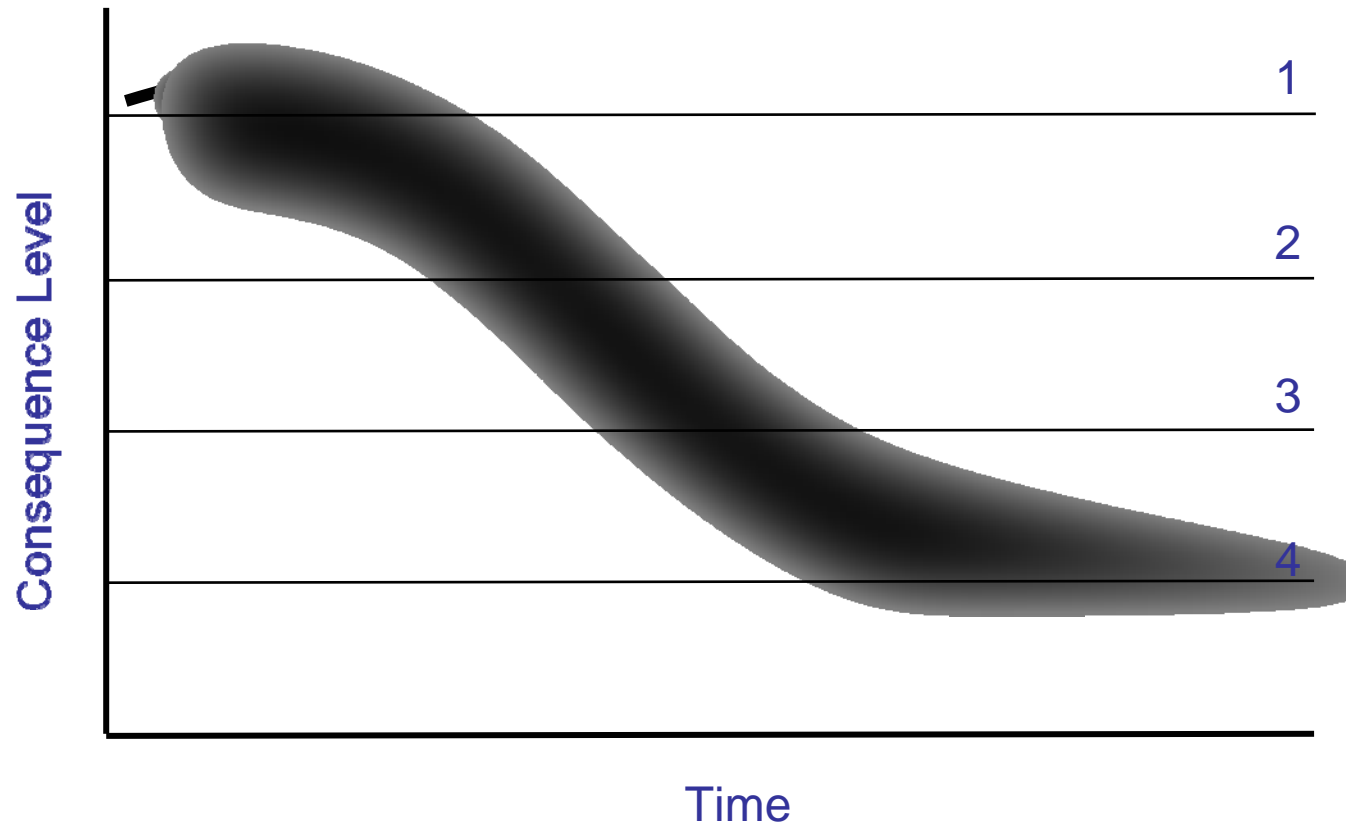


Low uncertainty C2 L4  
Moderate uncertainty - C3 L3  
High uncertainty C3 L4.



# Where is the stock now?

## Where is it going?



Line width can represent the degree of uncertainty,  
The shading represents different likelihood levels

# Retained Species

## **Assessing the risk for each target species/stock or group should integrate:**

- All removals by all sectors including discards of undersized individuals
- Use any catch history or catch rate information
- Recognize species biological characteristics dynamics
- Use the distribution of species v area fished
- Are there similar examples of this type of species that can inform?
- What are the effectiveness of current management arrangements?

# Exercise

- Work out the possible set of C x L for case study fishery given the data provided?
- How does the set of possible scores change as more data is added?

		Consequence Levels			
Likelihood Levels		Minor	Moderate	Major	Extreme
		1	2	3	4
Remote	1	1	2	3	4
Unlikely	2	2	4	6	8
Possible	3	3	6	9	12
Likely	4	4	8	12	16

# Asset/Objective – Impact List

<b>Asset/Outcome</b>	: Name of the asset/outcome		
<b>Objectives</b> What are the objectives for this asset? There may only be one objective	<b>Objective</b>	<b>Objective:</b>	<b>Objective:</b>
<b>OVERALL RISK LEVEL for each objective</b> (Negligible – High) Should reflect the 'sum' of the individual impacts below	<b>Risk Level</b>	<b>Risk level</b>	<b>Risk Level</b>
CONTRIBUTING IMPACTS/ THREATS			
FISHING ACTIVITIES/ GOVERNANCE SYSTEM			
Effort/Catch level			
Gear size			
Gear type			
Area of operation			
Illegal Fishing			
Management plan implementation			
<i>Add all other relevant identified impacts</i>			
EXTERNAL DRIVERS			
Fuel Price			
Cost of labour			
Pollution			
Climate			
Political Will			
<i>Add others where needed</i>			

Use the Asset – Impact list to help determine the overall level of risk to each stock/species/ group given that the overall risk should be reflected by how many relevant impacts or threats were identified and how severe they are

## FINAL POINTS BEFORE BEGINNING ASSESSMENTS

1. Do not confuse uncertainty with likelihood – uncertainty affects likelihood
2. RATING EVERYTHING THE SAME WILL NOT ASSIST GENERATE GOOD OUTCOMES
3. SCORES NEED TO BE JUSTIFIED -This assists the next step of planning
4. SCORES CAN BE CONDITIONAL – it is rated this because of 'X', if 'X' is found to be incorrect – then score goes to Y

# Exercise

- How do you think that different stakeholders will try and influence the outcomes of the analyses?
- What can you do to limit the level of undue influence?

# NON-TARGET (BYPRODUCT) SPECIES

- To maintain appropriate levels of biomass of bycatch species to minimize any significant impact on their dynamics and the broader ecosystem
- General bycatch – Use the target species objective
- Special or Protected Species – “To keep the level of capture of this species at acceptable levels” This may include social based ideas of acceptability



# Non Retained Species

**Assessing the risk of having this fishery for each component should integrate/incorporate**

- Only the species affected by the fishery being examined
- The relative impact of this fishery compared to distribution of species and other impacts
- The biological characteristics and dynamics of the species captured
- The current knowledge and understanding available on these issues and current management arrangements

# General Ecosystem

**Assessing the risk for each of these components should:**

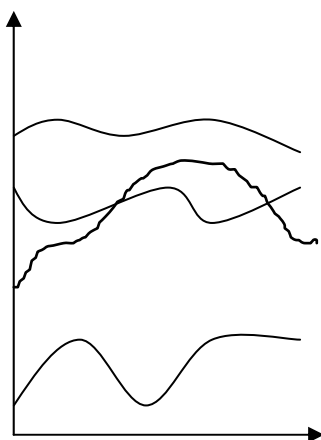
- Isolate the relative impact of this fishery compared to the scope of the ecosystems and habitats involved.
- Assess the impact of current knowledge and understanding available on these issues and current management

# Ecosystem Structure

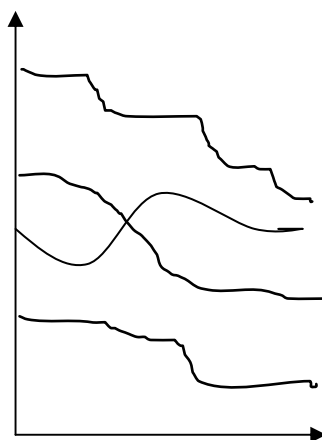
Default objective '*To maintain any impact on the wider ecosystem by fishing to be within acceptable levels*'.

Need to get agreement about what is acceptable level of change to determine what should be the four levels in the consequence tables

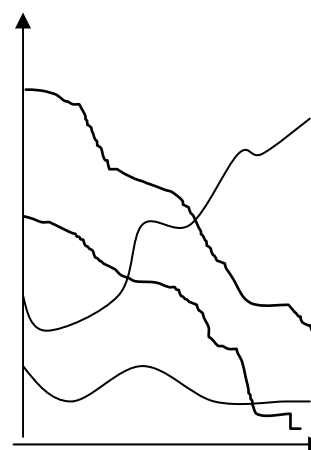
# CONSEQUENCE SCENARIOS FOR ECOSYSTEM CHANGES



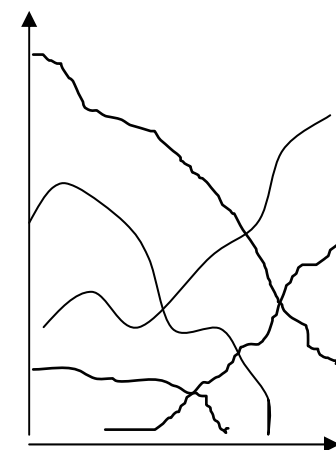
1. Minor  
Changes in  
dominance



2 Some major  
changes but  
no loss of  
biodiversity



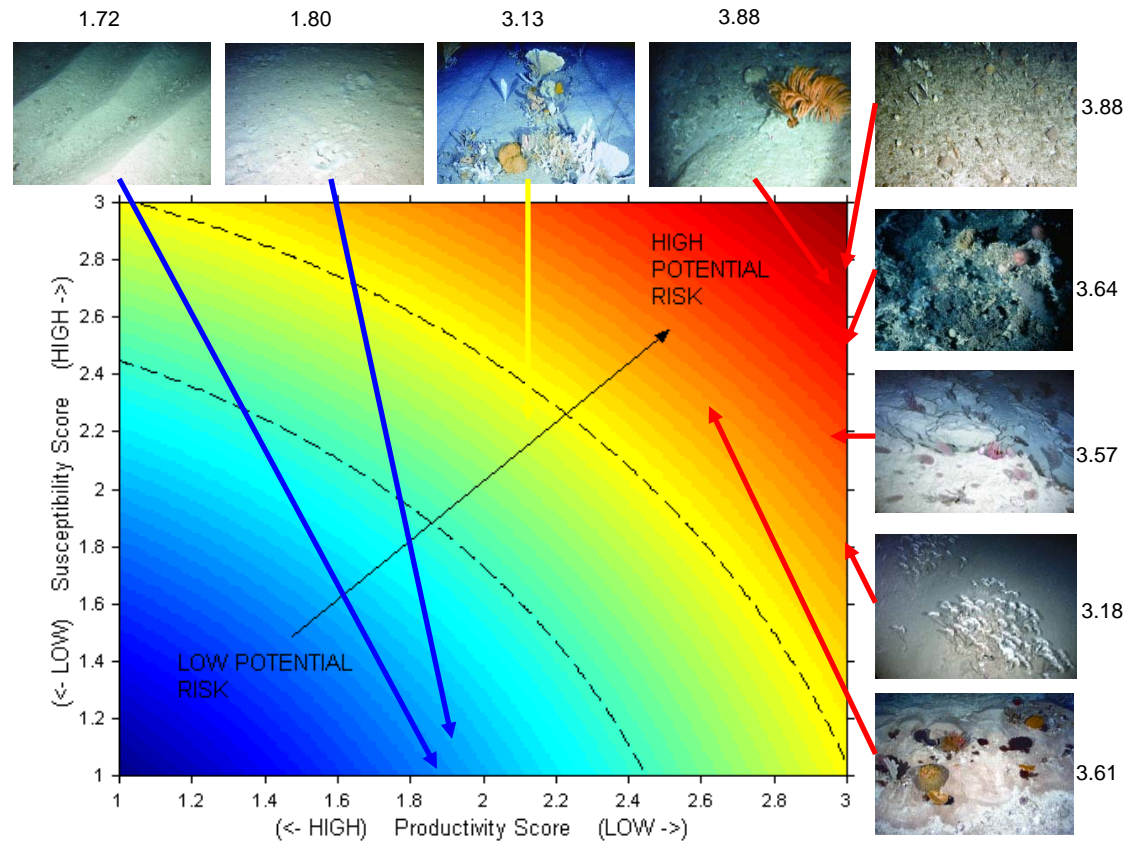
3. Some losses  
and gains of  
components



4. Total Regime  
Shift

# Calculating consequences of bottom trawling to seabed habitats

- Susceptibility and productivity scores for various seabed habitats and bottom trawling
- Use of geological surrogates, scientific surveys and fisher knowledge



# Prioritization

Having completed a risk assessment on each of the issues and their objectives you may still need to prioritize which of the high risk issues you need to address and which of the threats and impacts are causing the most problems.

This can be assisted by:

- examining all the risks and threats to sum across the various issues.
- undertaking a vote on which are the most important high risk issues to work on first

# Asset Impact matrix

	ASSET/OUTCOME	Retained Species - Target	Retained Species – By product	Habitat	Ecosystem	Protected Species	Economic Outcomes Industry	Social Outcomes Industry	Community outcomes	Level of Overall Significance (Low - High) Should assist determine where action is best taken
	OVERALL RELATIVE RISK LEVEL									
IMPACTS/ THREATS										
FISHING ACTIVITIES/ SYSTEM	Effort/Catch level									
	Gear size									
	Gear type									
	Area of operation									
	Illegal Fishing									
	Management plans									
EXTERNAL DRIVERS	Fuel Price									
	Cost of labour									
	Pollution									
	Climate									
	Political Will									

This can sum up the relative level of problems caused by each of the impacts/threats

# Vote Based Priorities – Sticky Dots

- Each participant will be given a limited allocation of ‘money’ that they can use to spend on the issues they think are most important
- You can use all of your votes on one issue if you like or spread them across as many as you can
- This will be done by giving you a list of the highest risk issues
- Place one or more dots next to the issues you think should receive additional attention based on how relatively important you think they are





# Importance

- Another method to prioritize issues is to determine the importance of each one.
- This can easily be confused with the Consequence level within Risk, but is different
- Consequence is a measure of the potential impact of an issue
- Importance is a qualitative determination of how much the issue matters to the stakeholders
- Consequence and Importance are linked but can differ greatly (eg with cultural values)

## 2.2 Toolbox

Tools and information sources	Selection criteria						
	Difficulty	Cost	Capacity	Know.	Participation	Time	Robust.
Informal Vote Ranking	Easy	L	L	L	H	S	L-H
Risk Ranking	Easy	L	L-M	L	H	S	L-M
Meta analyses	Easy	L-M	L	H	L	S-M	M
Qualitative Risk Analysis (CxL)	Moderate	L-M	L-M	L	M	S	M
Qualitative Risk Analysis	Moderate – hard	M	M	M	L	M	M
Semi-quantitative	Moderate – Hard	M	M	M	L	M	L-M
MCDA	Moderate	L-M	M	L-M	L-M	S-M	M
Quantitative Risk Analysis	Hard	H	H	H	L	L	L-H

L= Low or Long; H= High; M= Medium, S=Short

# Step 2 Products

- All relevant issues for the fishery have been identified
- All stakeholders were involved in the process
- Issues were prioritized using risk assessment
- The EAF management plan can now be developed and will deal efficiently with relevant issues.



# Case Study

- Review the preliminary risk assessment carried out in 2007
- If necessary, redo the risk assessment
- From the issues that you agreed on in 2.1, what are their priorities