Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien
iotc ctoi

Tuna: Overfishing, Overfished and Understanding Risk

COMMON OCEANS

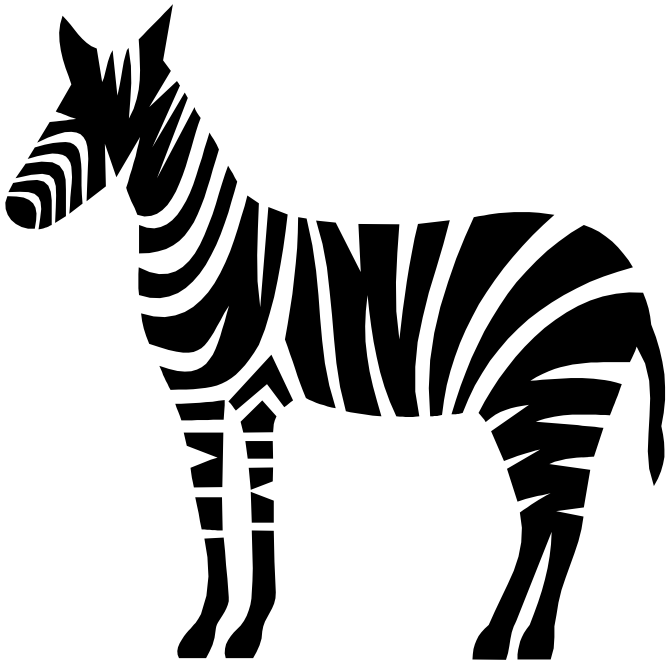
Overview

- Context and why this is important
- Defining Overfishing vs Overfished
- Understanding Risk and Putting Res 13/10 in context.
- Issues of tradeoffs

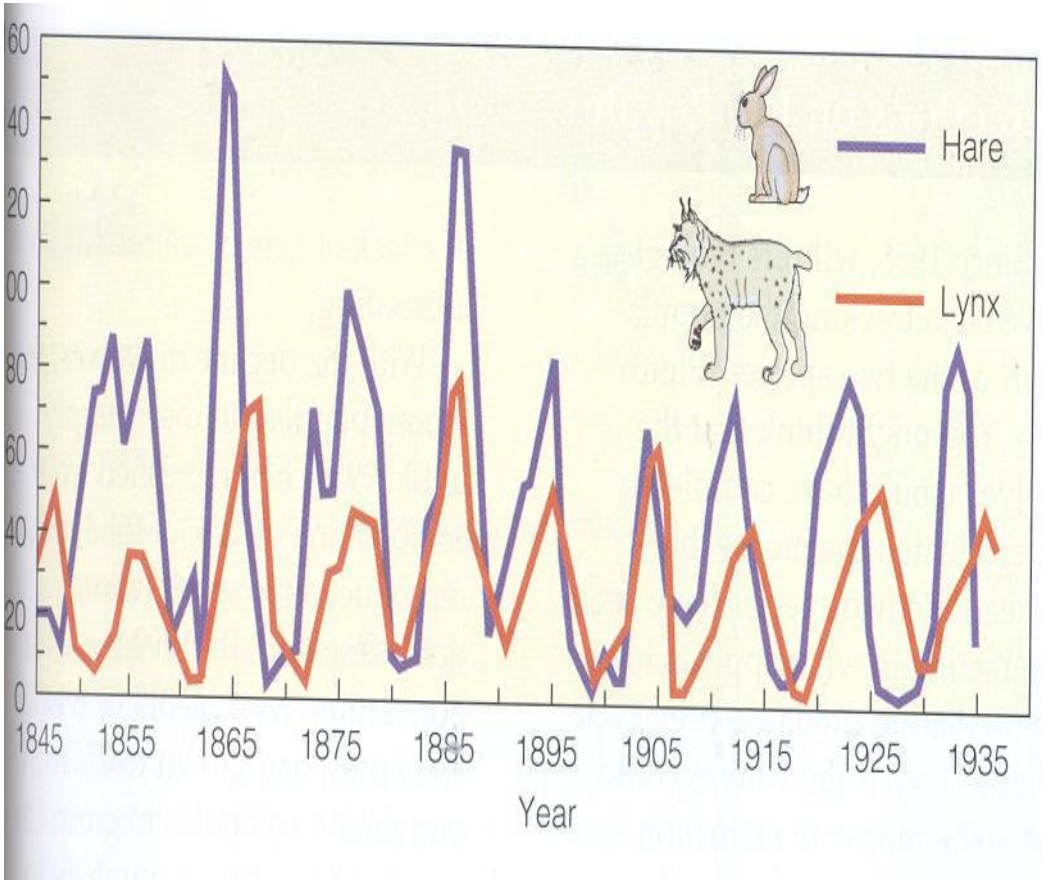
Kotiya (කොටියා)

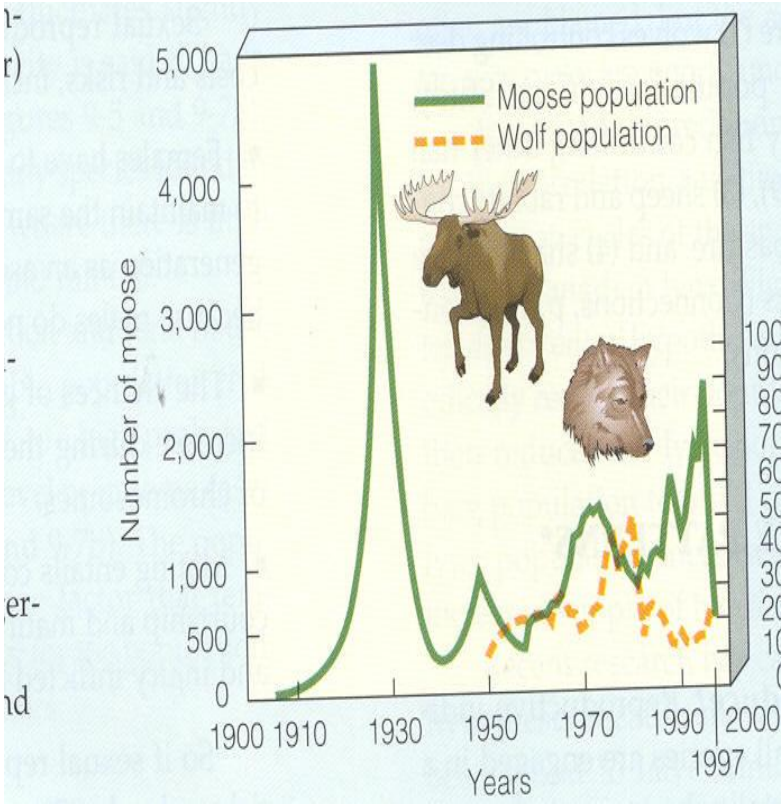
Basic Principles of Ecology

Eg. Two kinds of organisms, such as lions and zebras, are said to have a predator-prey relationship.



Cycle


Hare
Lynx
1845
1855
1865
1875
1885
1895
1905
1915
1925
1935
Year


Moose population
Wolf population
Number of moose
5,000
4,000
3,000
2,000
1,000
500
0
1900
1910
1930
1950
1970
1990
2000
1997
Years

Importance in Population Control/i.e. Role of the predator- I

- Predators usually kill the sick, weak or aged.
- This helps to let the rest of the prey have greater access to the available food supply.
- It also improves the genetic stock.

Role of top predators-II

- Diversity (Paigne 1966) vs homogeneity in ecosystems.
- Top predators are replaced by the lower trophic levels, and equilibrium is reached at a newer levels.
- Keystone indicator of health of an ecosystem.

Sharks:

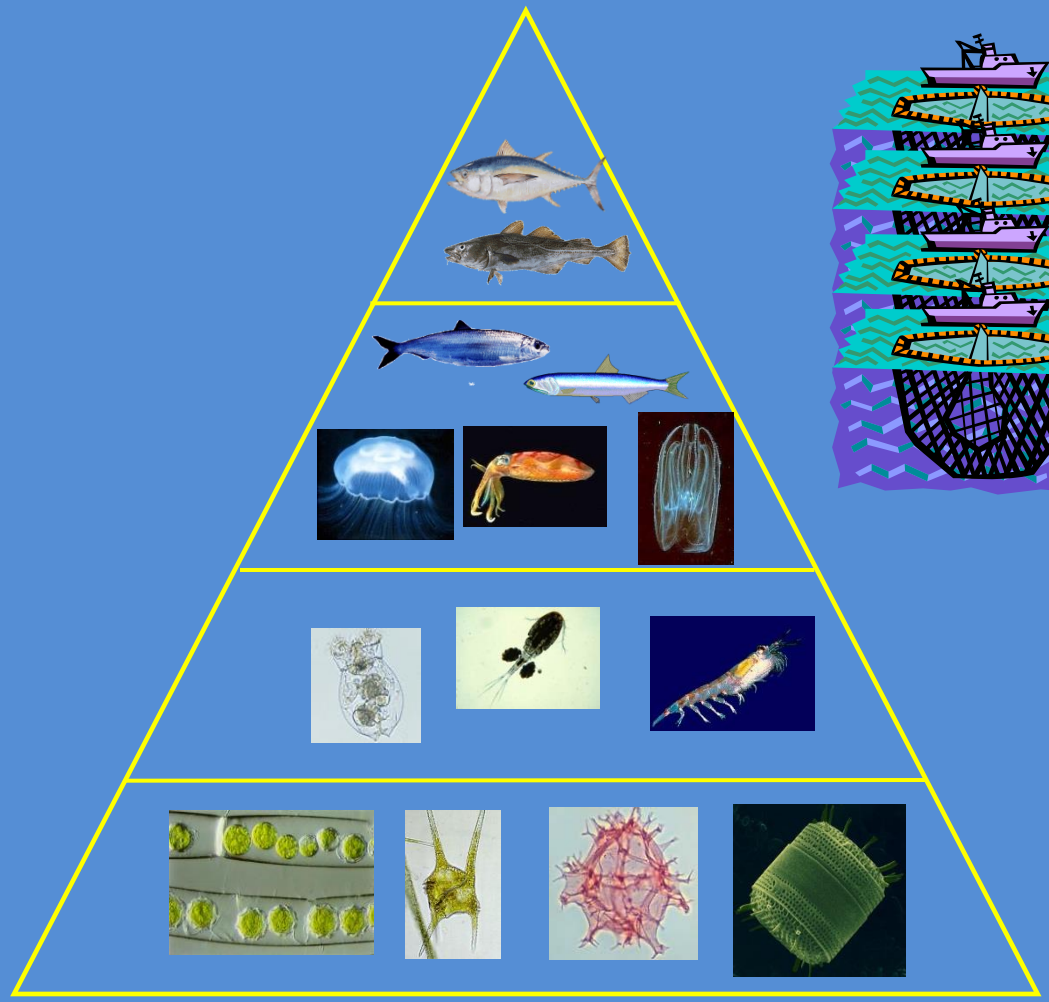
Focussed attention by NGO's and countries to ban shark fishing and minimize by-catch (PRIMARILY as they are a top predator, and a keystone indicator of ocean health)

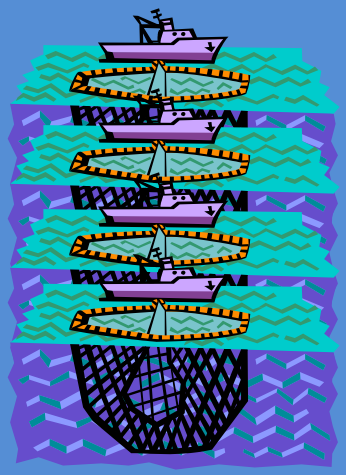
But….So are

Tuna….Wolves of the sea

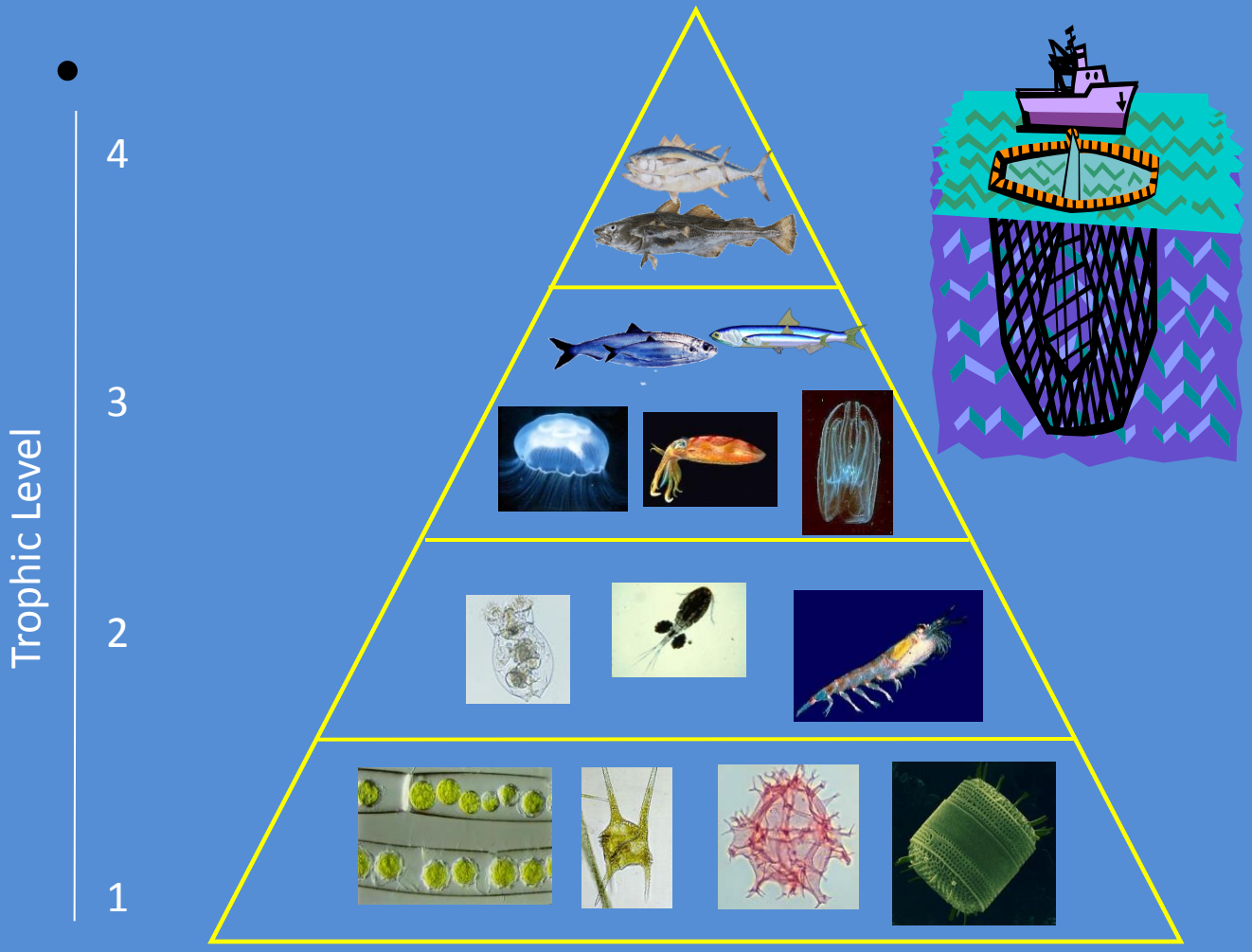
What we want to avoid?

Fishing Down Marine Food Webs : Sequential Collapse and Replacement





Fishing Down Food Webs: Sequential Addition



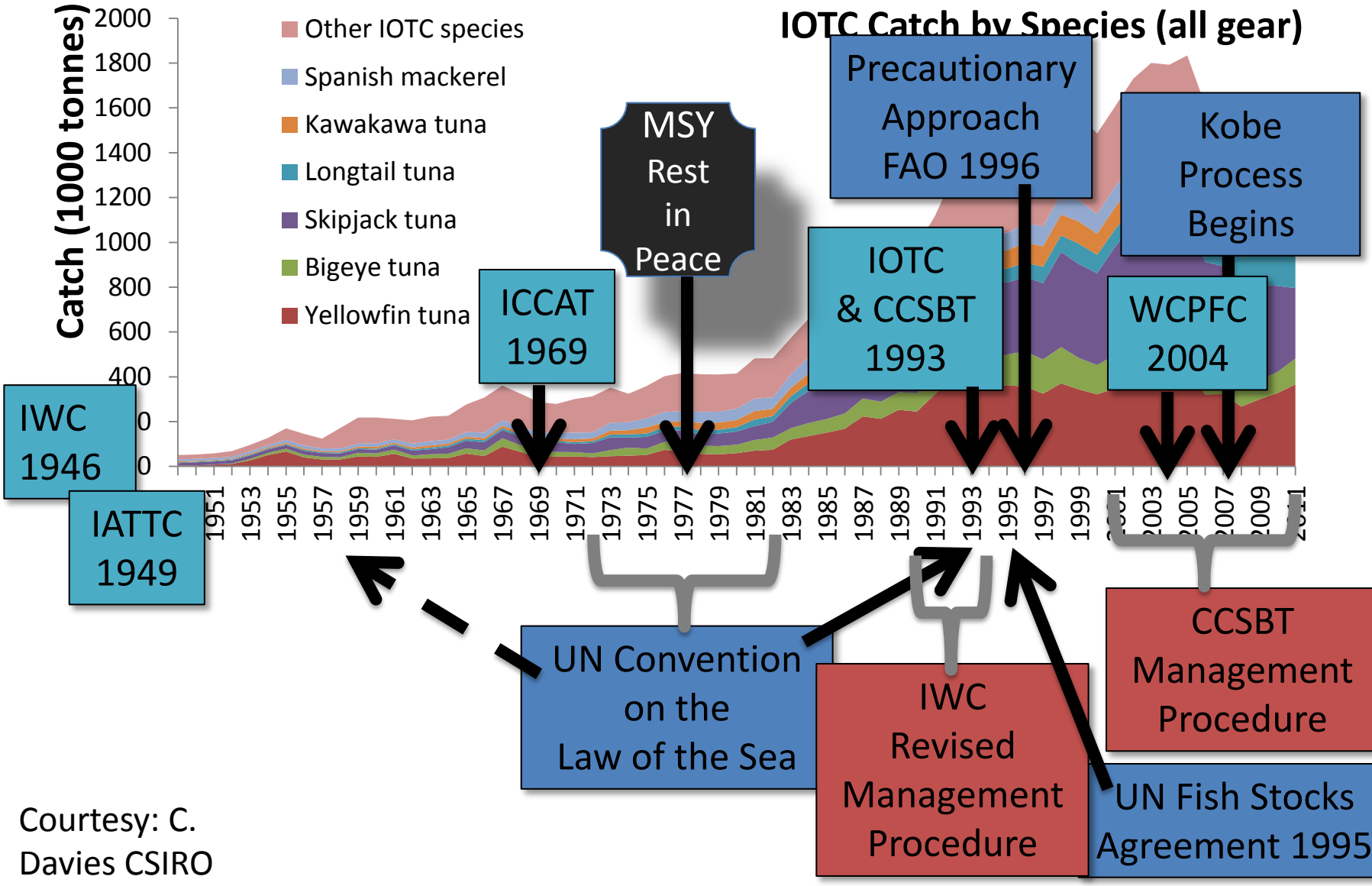
Why we are here?

Management Procedures are:

An Agreed basis for making management decisions in response to defined indicators. The components of which include:

- mechanisms, including data collection
- evaluation of trends and status and a decision rule, that aim to apply the precautionary approach to the management of fish stocks.

Context – historical development

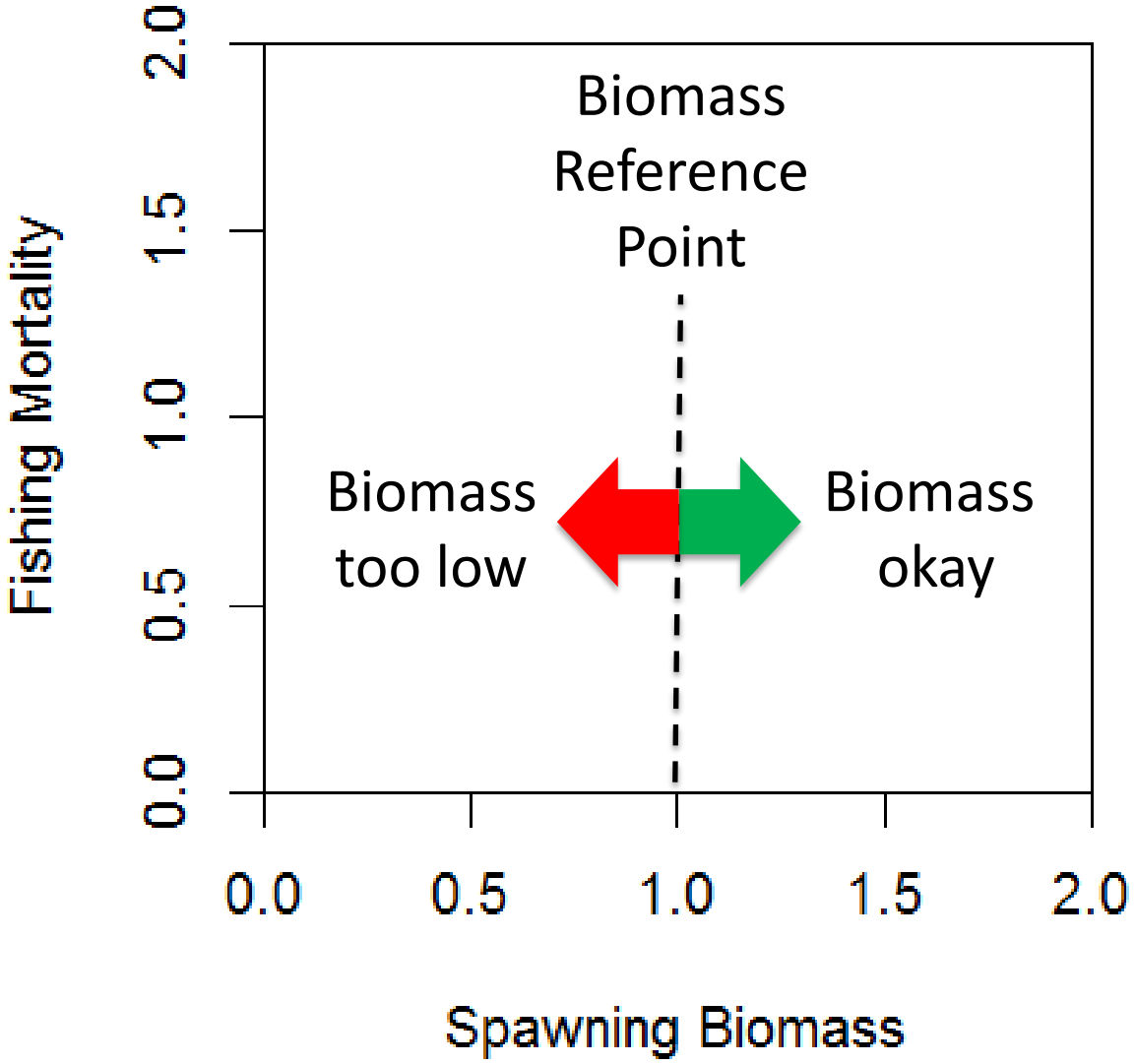


Courtesy: C. Davies CSIRO

The Kobe Process Introduces Phase Plots and Decision Matrices to Tuna RFMOs

The Kobe Plot

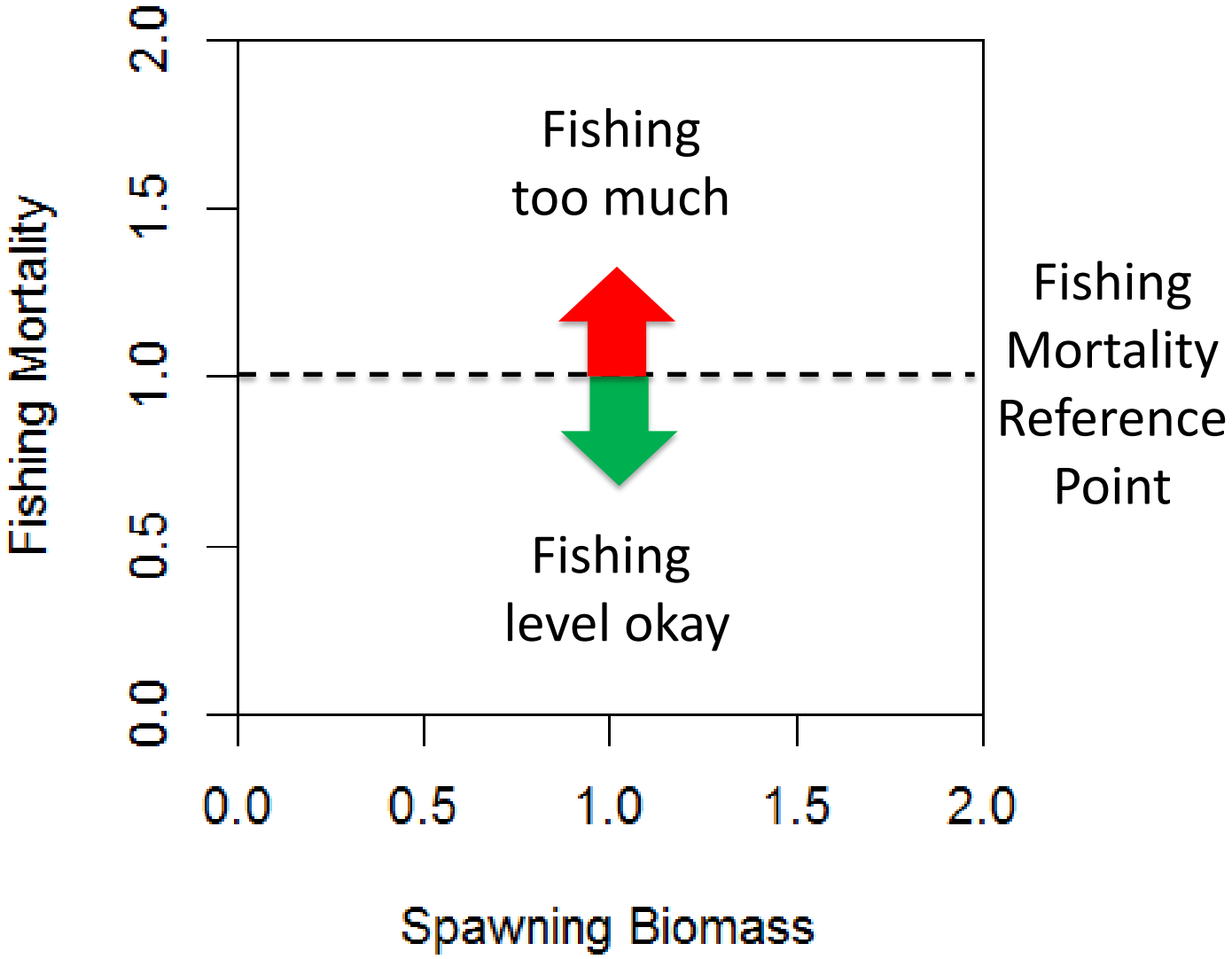
(a fishery summary)



Courtesy: C. Davies CSIRO

The Kobe Plot

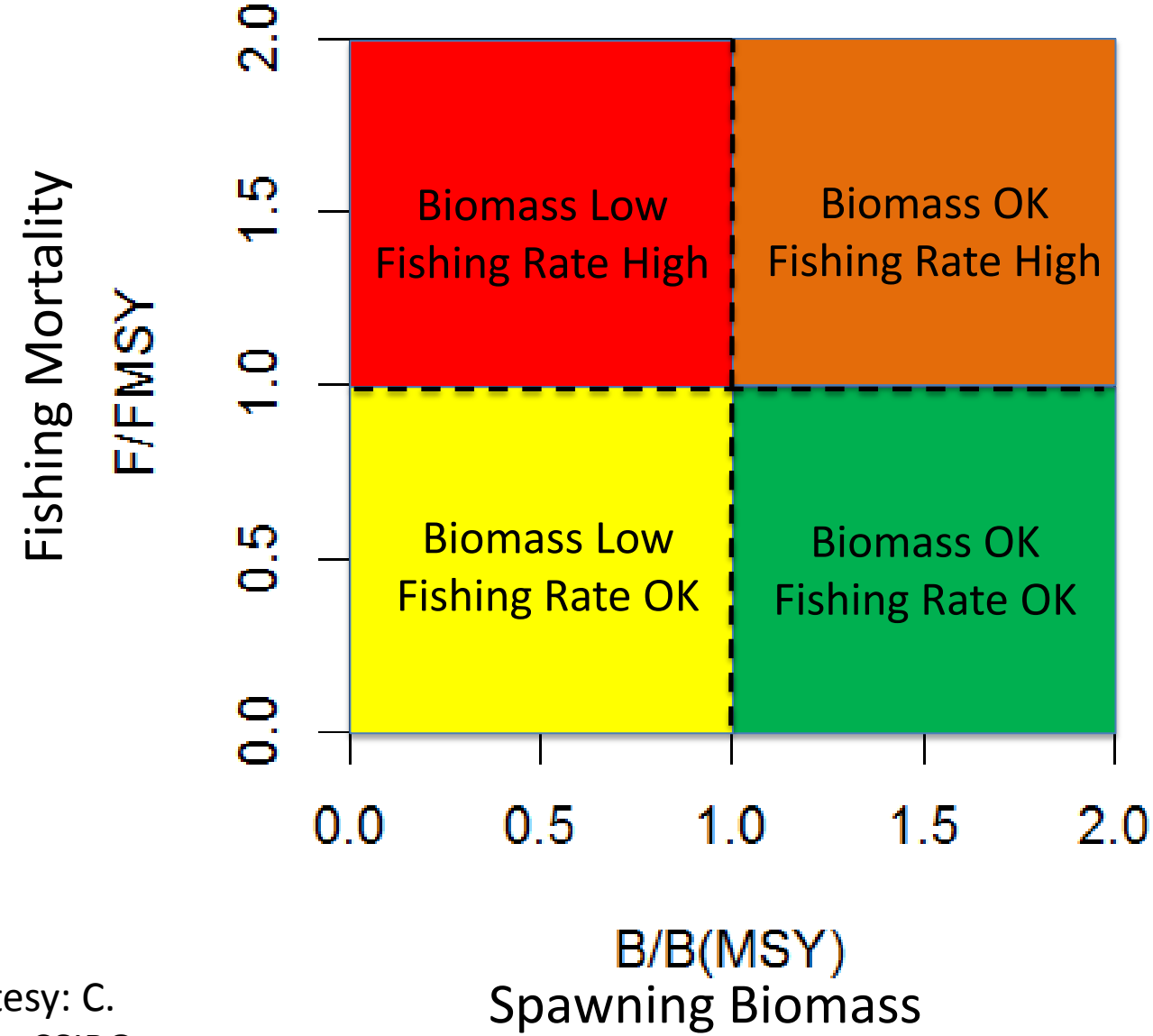
(a fishery summary)



Courtesy: C. Davies CSIRO

The Kobe Plot

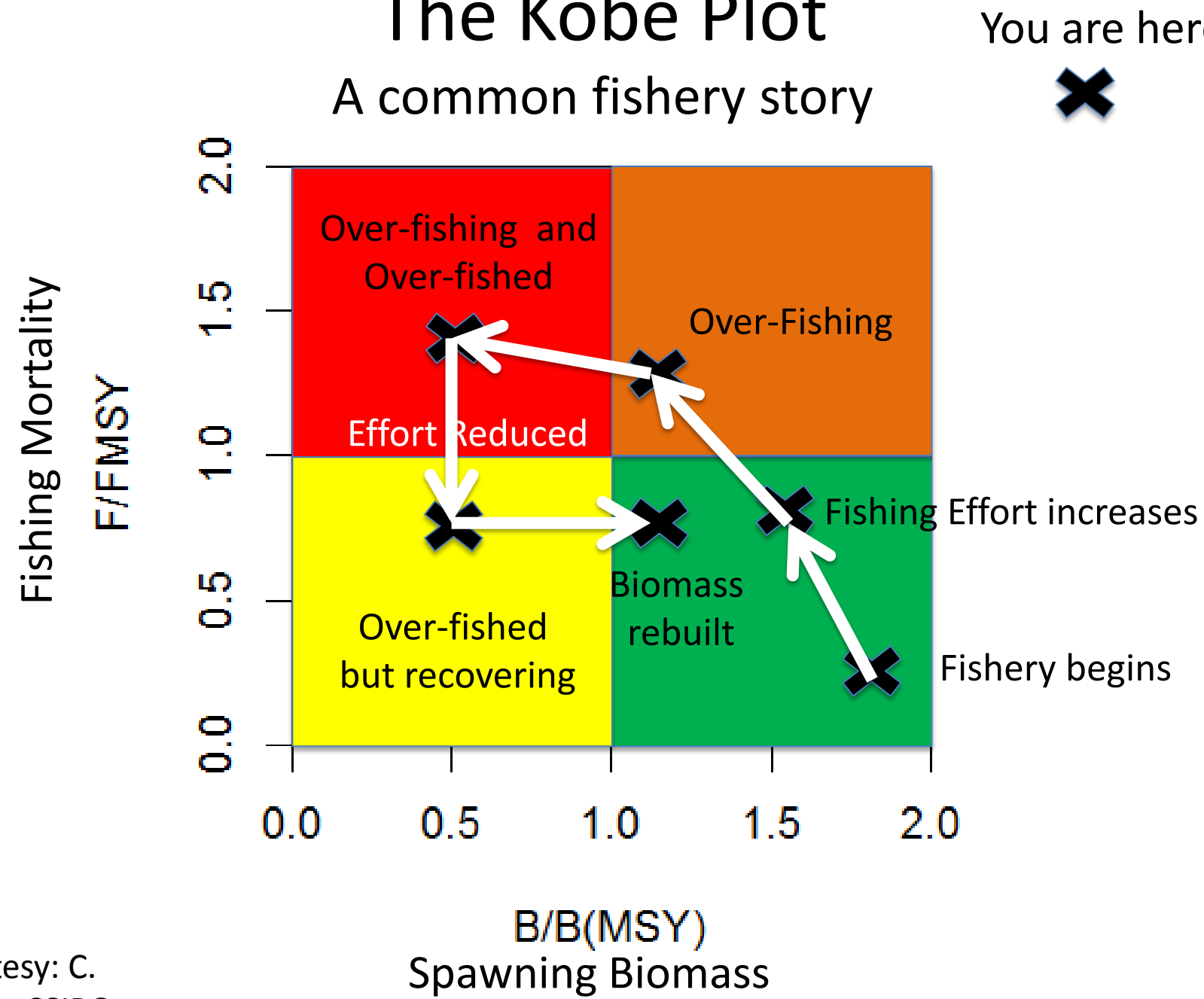
Where is your fishery now?



Courtesy: C. Davies CSIRO

The Kobe Plot

A common fishery story



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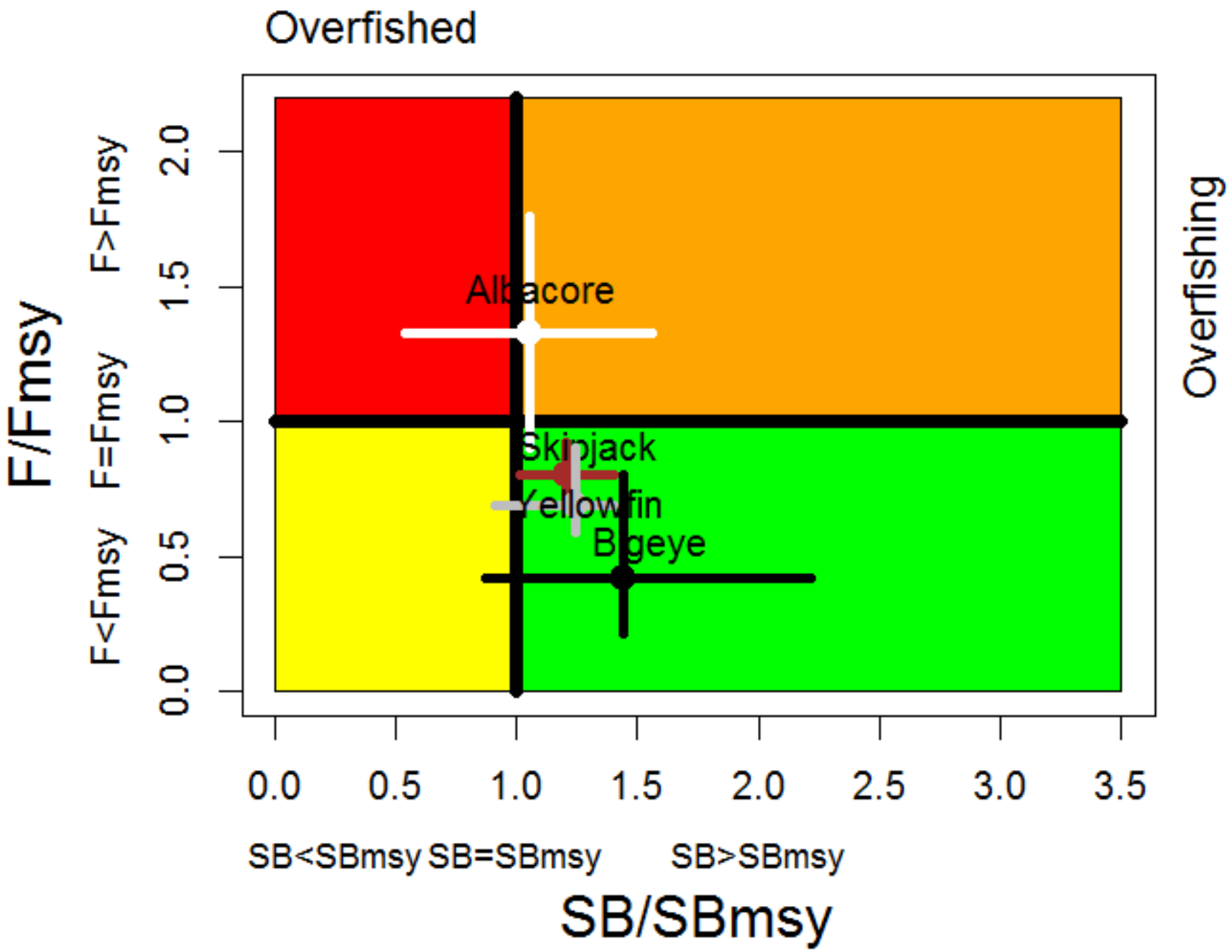

Overfished
Overfishing
F/Fmsy
F>Fmsy
F=Fmsy
F<Fmsy
0.0
0.5
1.0
1.5
2.0
Albacore
Skipjack
Yellowfin
Bigeye
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
SB<SBmsy
SB=SBmsy
SB>SBmsy
SB/SBmsy

Background-Point 4 in Resolution 13/10

In addition the IOTC Scientific Committee shall develop and assess potential harvest control rules (HCRs) to be applied, considering the status of the stocks against the reference points assessed in paragraph 3 for albacore, bigeye tuna, skipjack tuna, yellowfin tuna and swordfish. Based on the results of the MSE and considering the guidelines set forth in the UNFSA and in Article V of the IOTC Agreement, the IOTC Scientific Committee will recommend to the Commission HCRs for these tuna and tuna-like species, which among other factors, taking account of the following objectives:

a) For stocks which assessed status will match with the lower right (green) quadrant of the Kobe Plot, aim at maintaining the stocks in a **high probability** within this quadrant;

b) For stocks which assessed status will match with the upper right (orange) quadrant of the Kobe Plot, aim at ending overfishing with a **high probability** in as **short a period as possible;**

c) For stocks which assessed status will match with the lower left (yellow) quadrant of the Kobe plot, **aim at rebuilding these stocks in as short a period as possible**;

d) For stocks which assessed status will match with the upper left quadrant (red), aim at ending overfishing with **a high probability and at rebuilding the biomass of these stocks in as short a period as possible**.

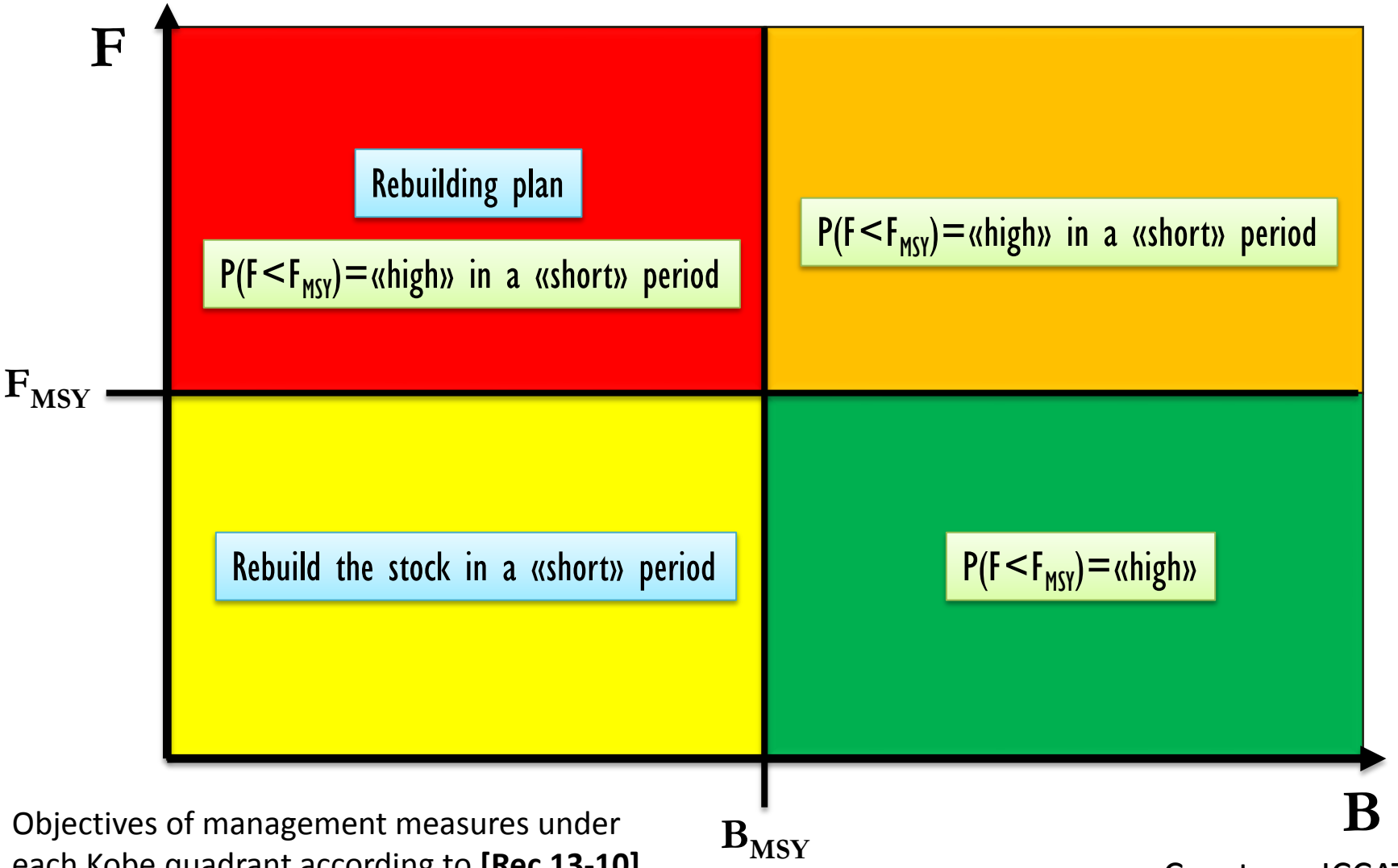
Objectives

- Green Zone with **high probability**
- In case of not green zone, come back as quick as possible with high probability.

Other Priorities (Social)

- Employment/stability of catch
- Maximum Economic Yield Vs Maximum Sustainable Yield.
- Expanding Fleet Capacity/ Opportunity (Industry)
- Conserving stocks for Intrinsic Benefits (Enviros)

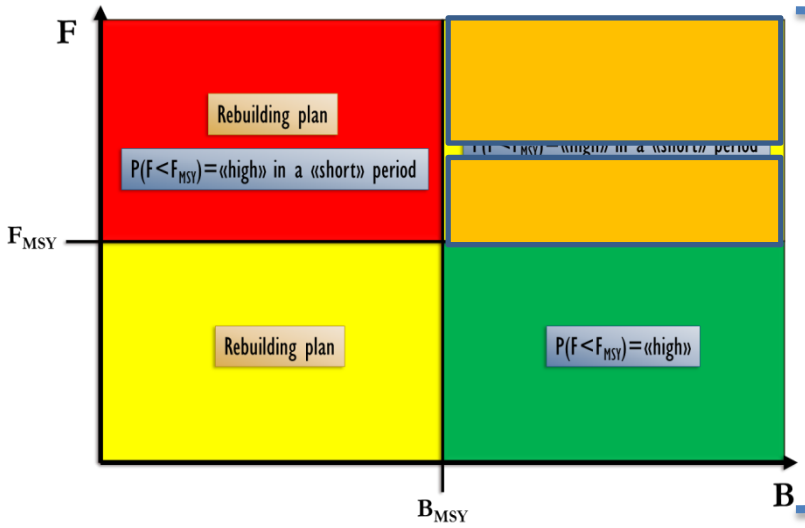
Harvest Control Rules (HCR) -Objectives



Objectives of management measures under each Kobe quadrant according to **[Rec 13-10]**

Courtesy: ICCAT

Harvest Control Rules (HCR)

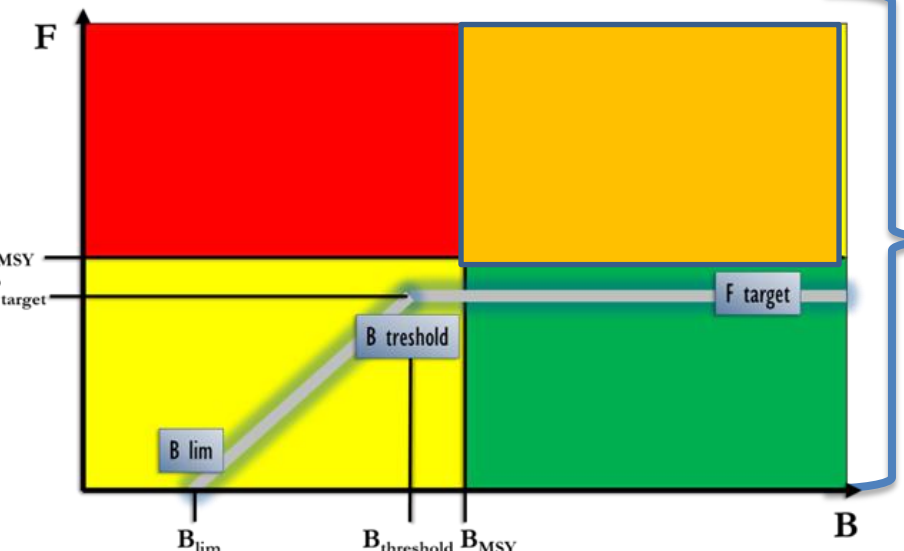


HIGH probability

IPCC: 80%
Canada: 75%
MSC: 70%-80%

SHORT period

USA: 10 years or 1.5 generations
Australia: 10 years + 1 generation
MSC: 2 generations



F target

[0.7, 0.75, 0.8, 0.85, 0.9 and 1] x F_{MSY}

B threshold

[0.6, 0.8 and 1] x B_{MSY}

B lim

$0.4B_{MSY}$

Courtesy: ICCAT

Inherently this involves a risk: Biomass/Minimizing Risk (Probability)

Spawning Biomass has been low for some years:

Are these low Sp Biomass due to a passing weakness in year class strengths, and no additional action should be taken?

Or

Is this the start of overfishing, and additional action is warranted?

Defining Risk

- **You're a farmer who's just brought in his crop of soy beans. Do you sell now, or store the beans for sale later. You run a risk that the price will rise later if you sell now, and you run a risk of falling prices if you store the grain.**

- **You're an equities investor holding some stock. Do you sell or continue holding? You too run a risk that price will rise later if you sell now, and you too run a risk if you hold now and the share price falls.**

- **You're owner of a fishing boat business, booking clients for the upcoming season. Do you add an extra boat and crew to increase catch? You run a risk of having too many clients if regulations unexpectedly reduce harvest. You also run a risk of having too few clients if regulations are unexpectedly relaxed.**

Defining Risk/Probability

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The Day to day terminologies of risk

- Weather - Probability
- Sports - Odds
- Gambling – Bets

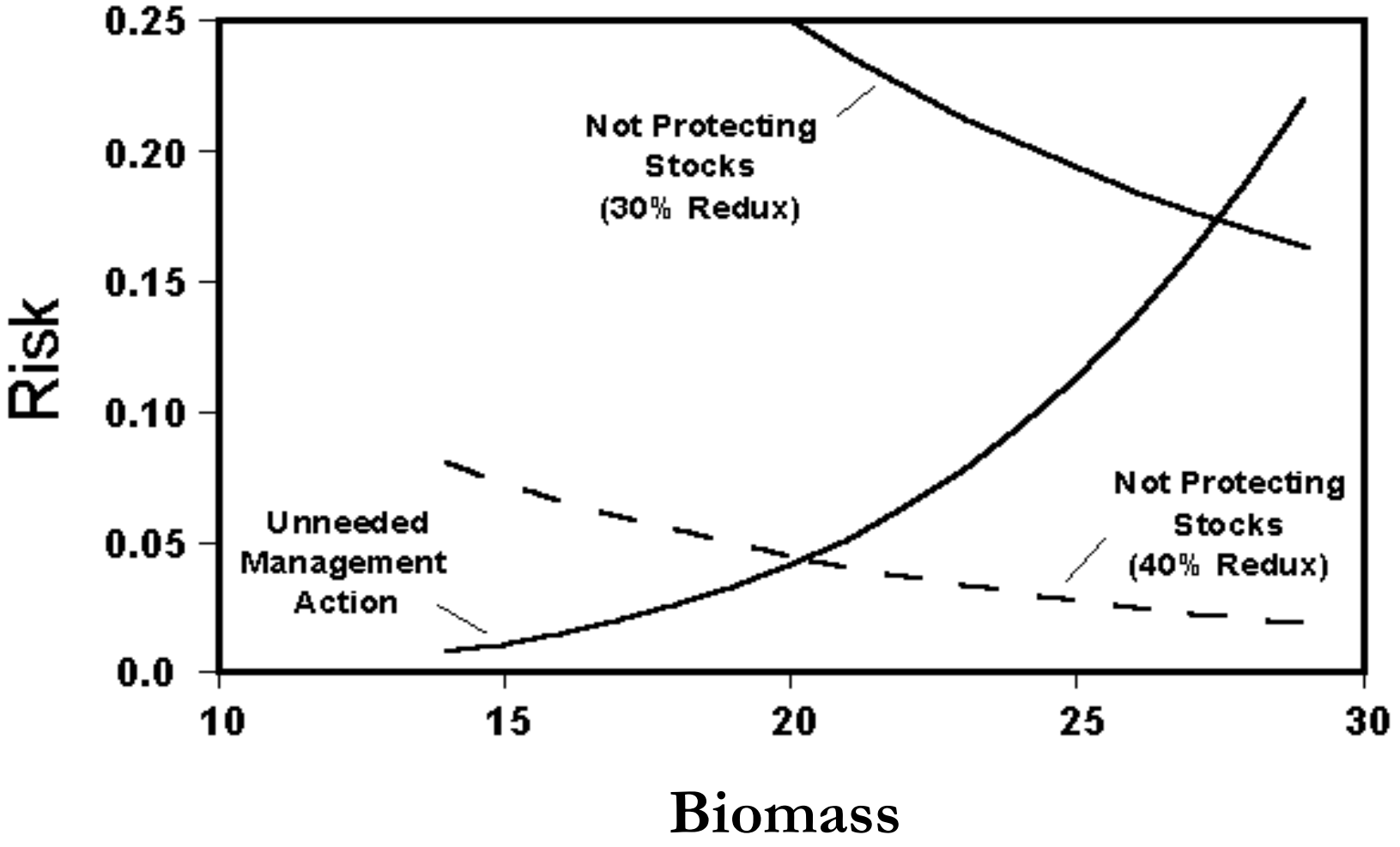
Adverse events- Low probability

- Weather – Hurricanes/Cyclones
- Sports – Australia wins the World Cup Football
  Ireland wins World Cup Cricket

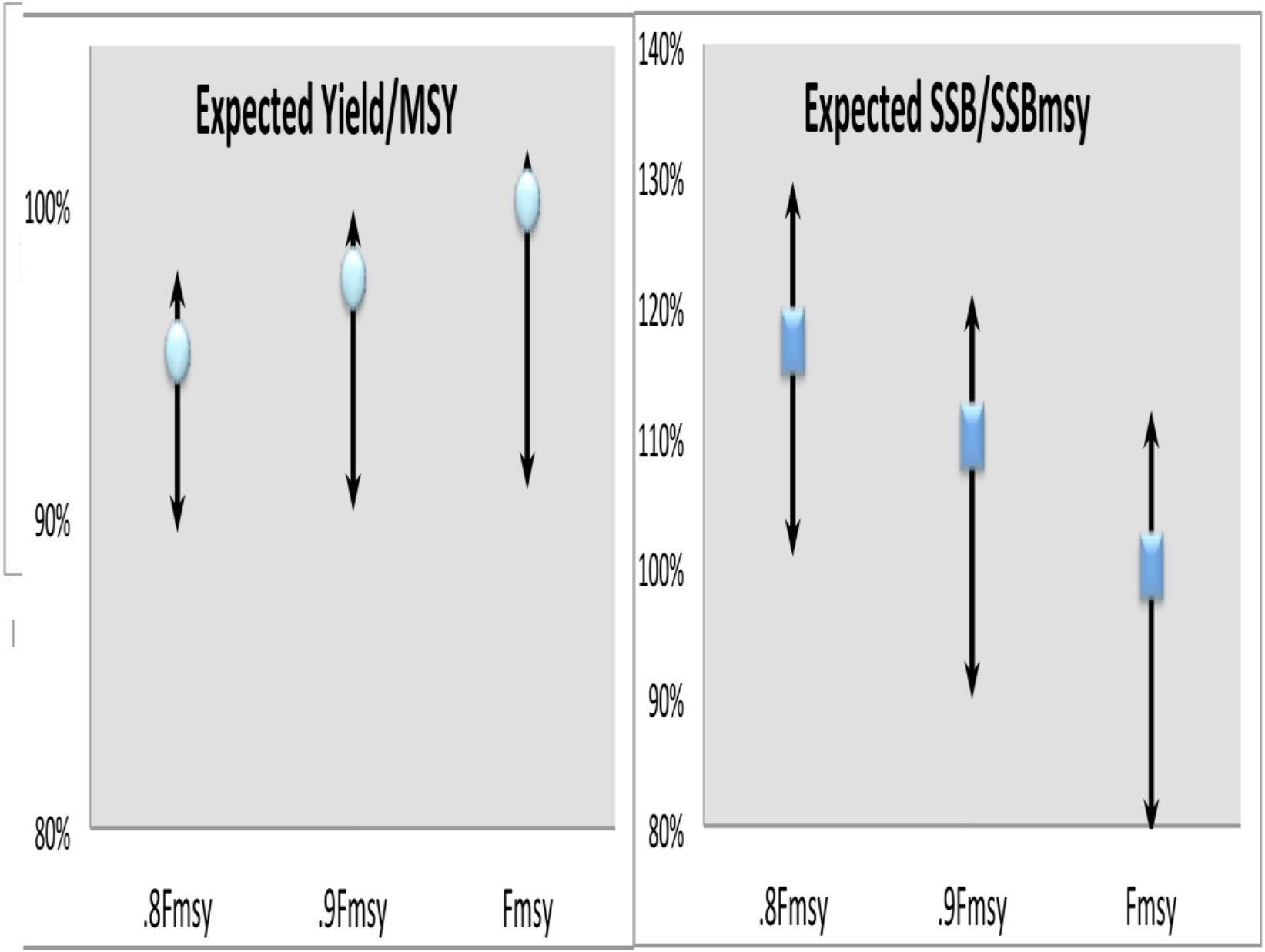
You're a Fisheries Manager and Spawning Biomass has been low….

Risk for the fisheries manager is the probability of making the wrong decision:

- **Unnecessarily Restricting Fisheries when fishing is optimal; or**
- **Not Protecting Stocks when they are overfished.**


0.25
0.20
0.15
0.10
0.05
0.0
Risk
10
15
20
25
30
Biomass
Not Protecting
Stocks
(30% Redux)
Not Protecting
Stocks
(40% Redux)
Unneeded
Management
Action

Tradeoffs – Catch Vs Sp. Biomass



IOTC Interim Reference Points Resolution 13/10

Stock	Target Reference Point	Limit Reference Point
Albacore	B_{MSY}; F_{MSY}	$B_{LIM} = 0.40\ B_{MSY}$; $F_{LIM} = 1.40\ F_{MSY}$
Bigeye tuna	B_{MSY}; F_{MSY}	$B_{LIM} = 0.50\ B_{MSY}$; $F_{LIM} = 1.30\ F_{MSY}$
Skipjack tuna	B_{MSY}; F_{MSY}	$B_{LIM} = 0.40\ B_{MSY}$; $F_{LIM} = 1.50\ F_{MSY}$
Yellowfin tuna	B_{MSY}; F_{MSY}	$B_{LIM} = 0.40\ B_{MSY}$; $F_{LIM} = 1.40\ F_{MSY}$
Swordfish	B_{MSY}; F_{MSY}	$B_{LIM} = 0.40\ B_{MSY}$; $F_{LIM} = 1.40\ F_{MSY}$

Inherently what you need to decide

- Balance long-term yield to long-term stock biomass.
- In case of adverse conditions, evaluate how long it may take to recover.

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