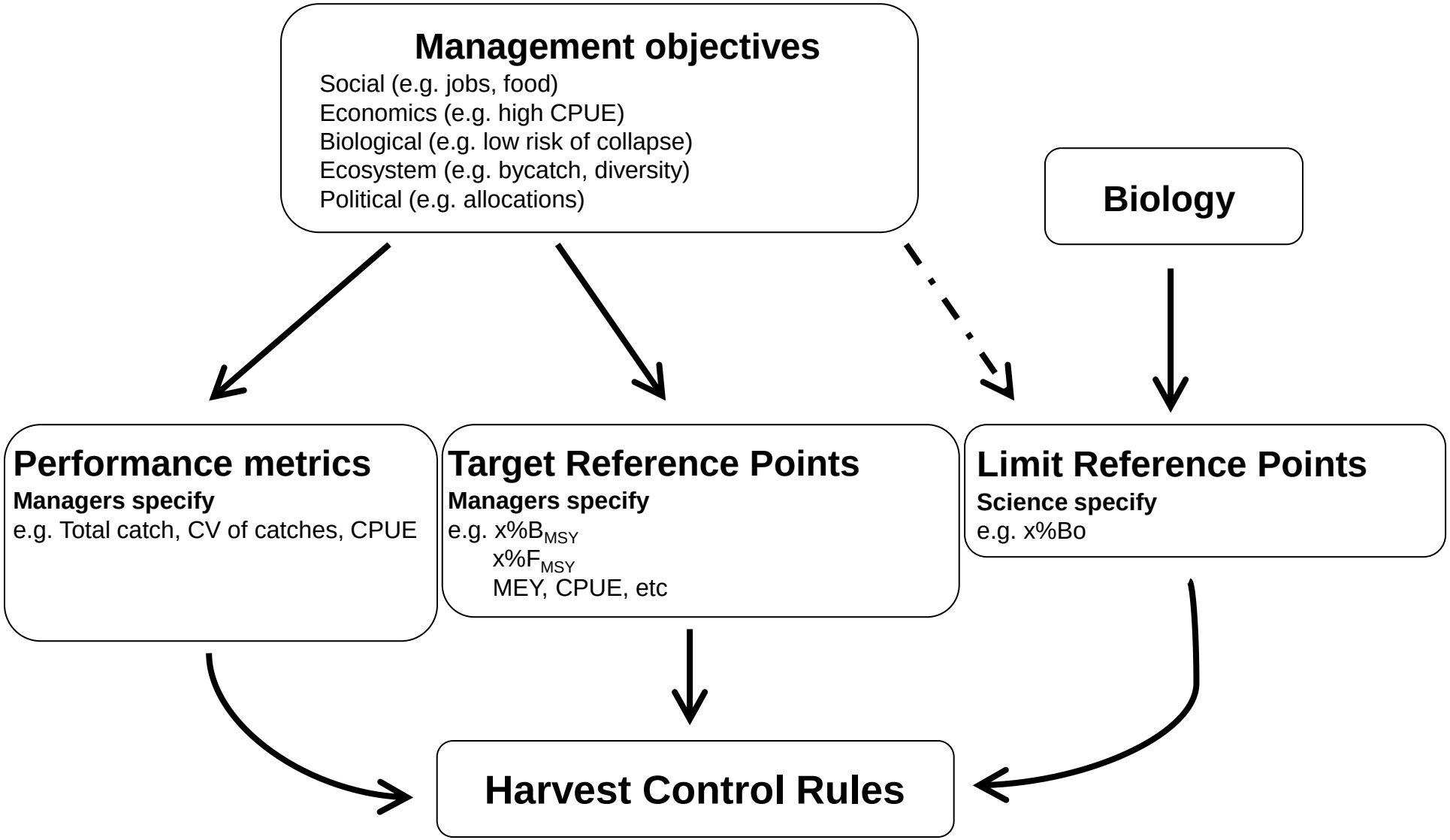

# Management Objectives

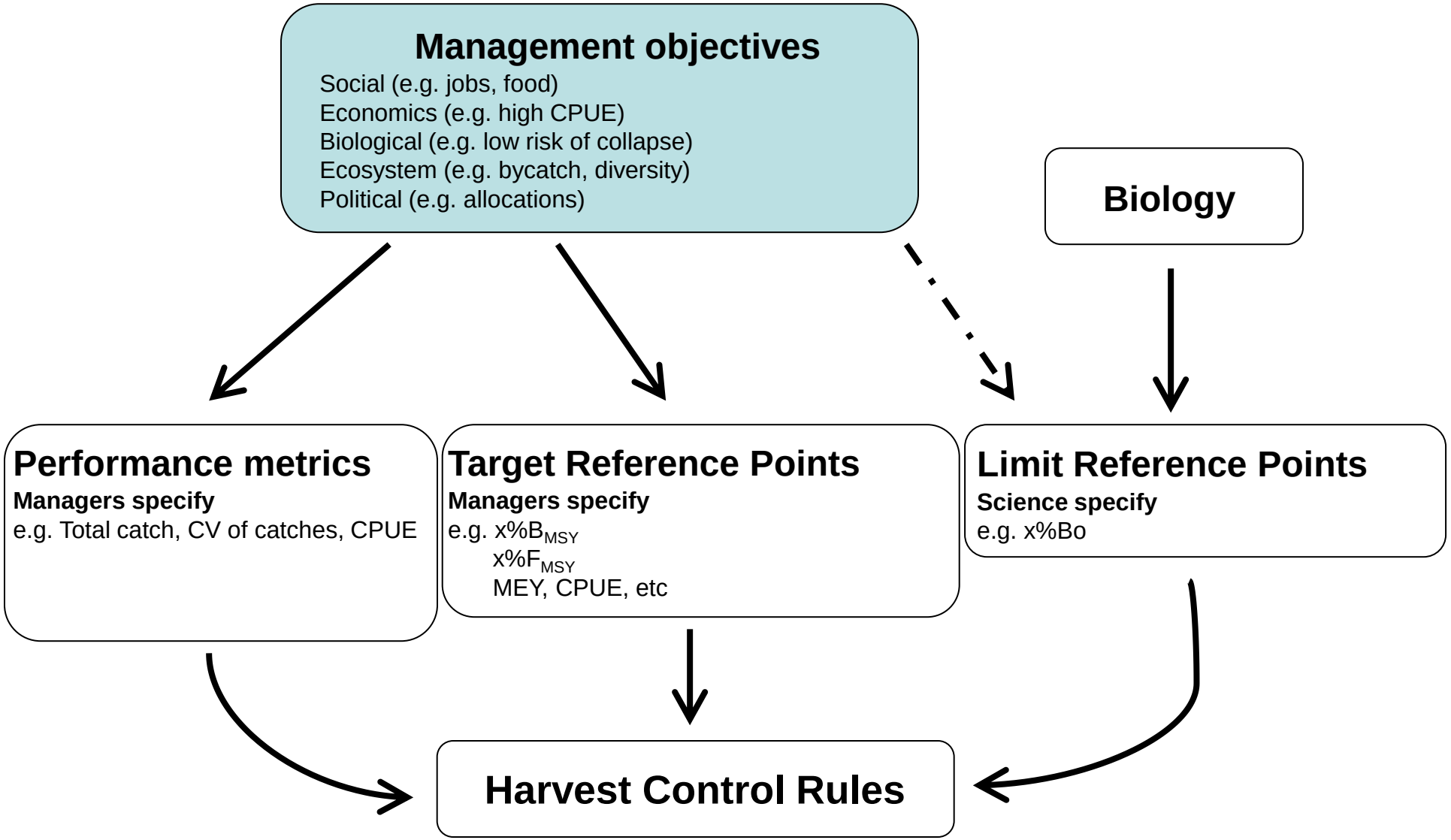
3rd IATTC Tropical Tuna MSE Workshop, *by videoconference*, December 08-09, 2022

# Management strategies




Modified from Berger et al. 2012

# Management objectives




Modified from Berger et al. 2012

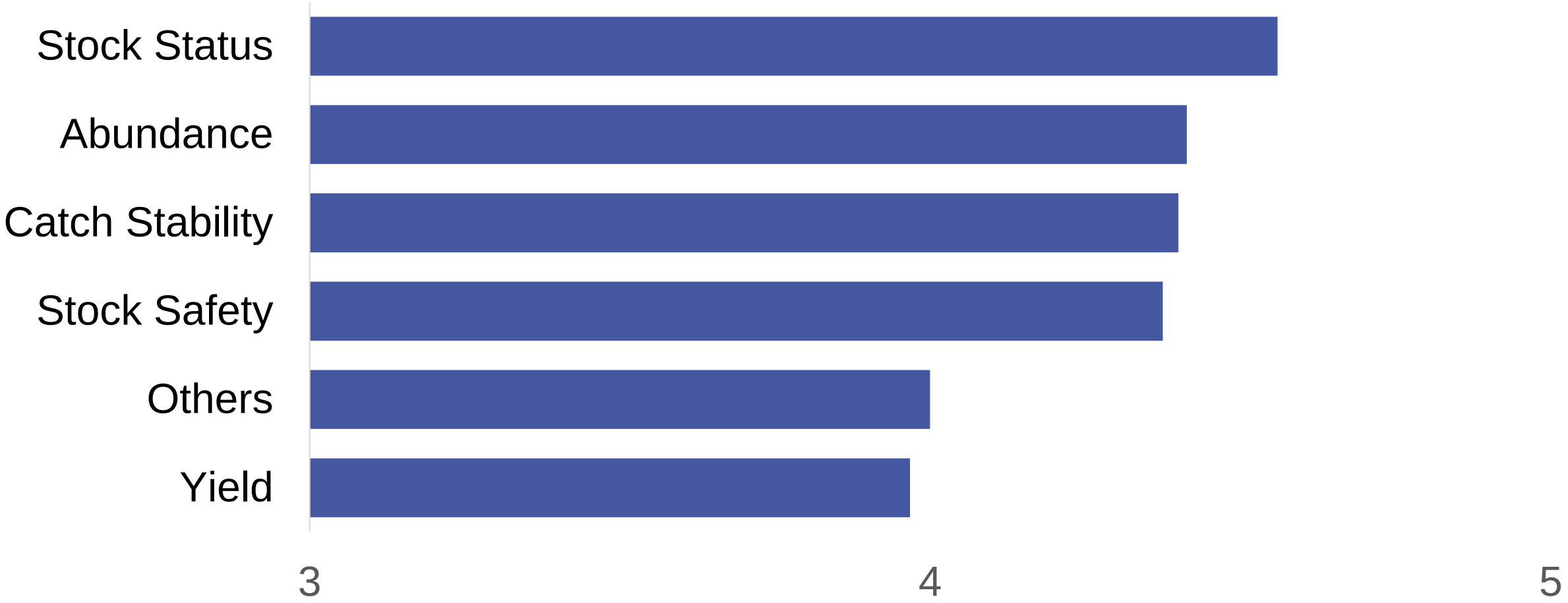
# Types of Management Objectives

- **Status:** To maximize the probability of maintaining the stock in the green zone of a fishery's Kobe plot (e.g., not overfished*, no overfishing*).
- **Safety:** To minimize the probability that the stock will fall below the biomass limit reference point or $B_{LIM}$.
- **Yield:** To maximize catch (or effort) across regions and/or fishing gears.
- **Abundance:** To maximize catch rates to enhance fishery profitability.
- **Stability:** To maximize stability in catches to reduce commercial uncertainty by minimizing variability in catch from year to year.

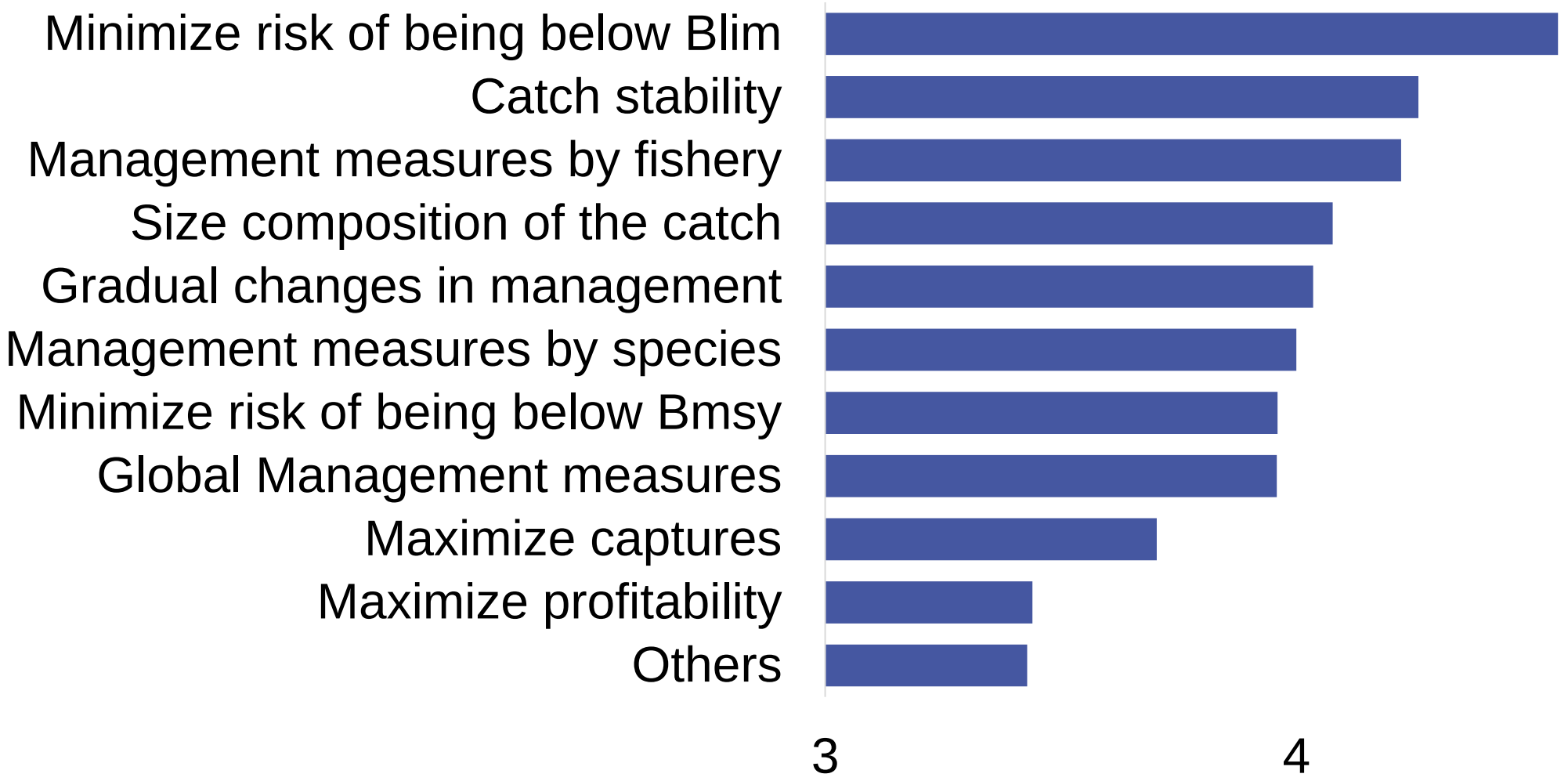
* "overfished", "overfishing" not used in IATTC stock status determination, because the Commission has not defined their threshold probabilities

Indian Ocean Tuna Commission, "Report of the 2nd IOTC Management Procedure Dialogue" (April 2015)

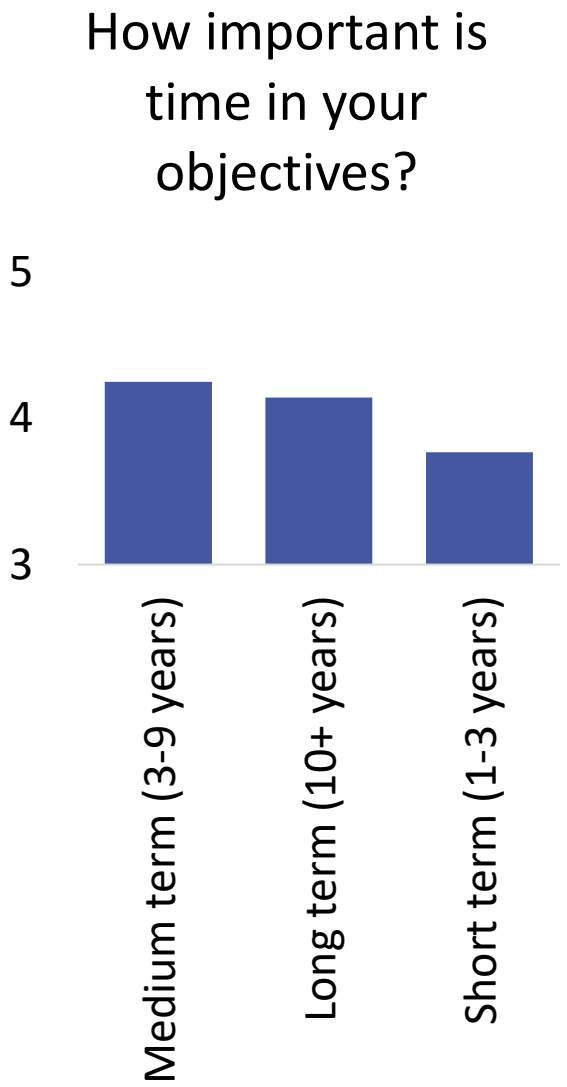
## What types of objectives are important to you?

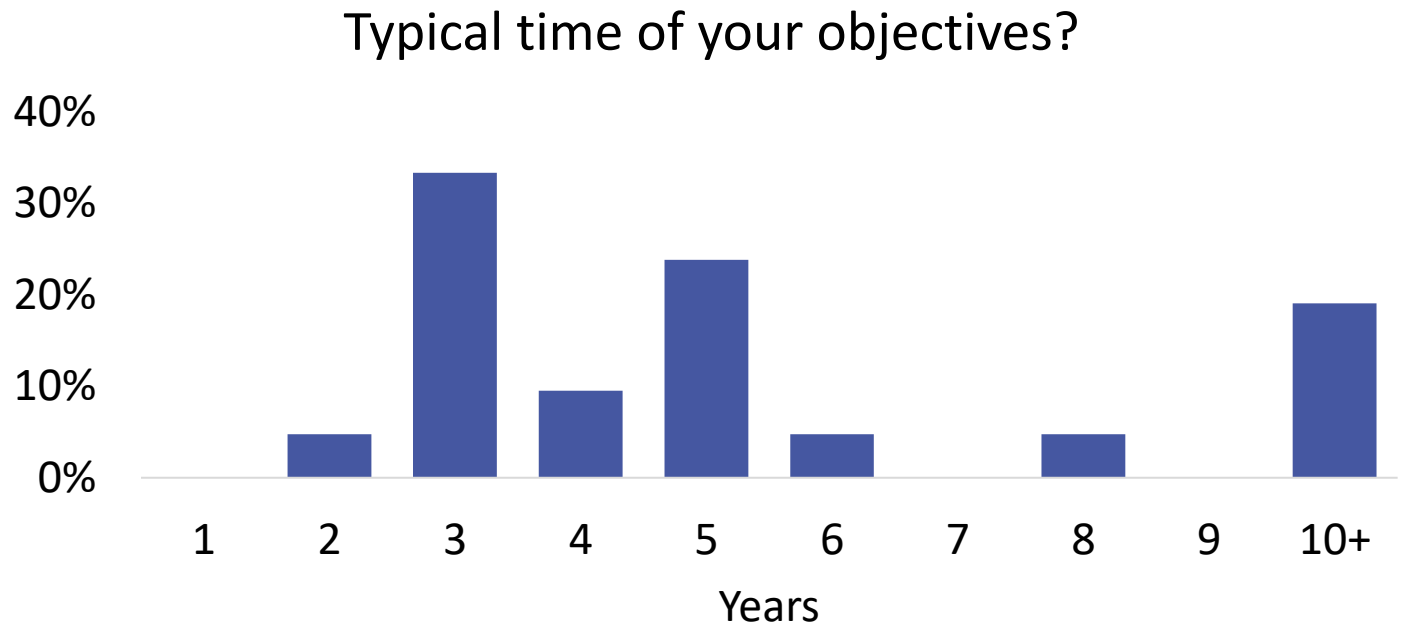


# Objectives and their importance



# 1st IATTC MSE Workshop, Dec 2019



# 1st IATTC MSE Workshop, Dec 2019

## Proposed Objectives (preliminary, to be refined in next workshops)

- Maintain stocks at healthy levels in the green sector of the Kobe plot (with a high probability)
- Maintain stocks at healthy levels in the green sector of the Kobe plot (50%)
- Minimize annual probability of falling below trigger/limit reference points (spawning biomass)
- Maintain catches by different fisheries above historical ranges
- Increase the maximum sustainable yield (MSY)
- Maximizing economic yield (MEY) in the long term
- Minimizing the bycatches of juvenile stages of non-target species
- Establish rebuilding plans by stock status and life-history of species
- Maintain viable fisheries in the long term (CPUE, all fisheries)
- Maintain low variability of catch or effort (e.g. 10%, consider asymmetry of change)
- Define emergency rules when faced with substantial changes
- Consider climate change

# Discussion 2nd IATTC MSE Workshop, 2021

## Proposed Objectives by Category (preliminary, to be refined)

- Maintain stocks at healthy levels in the green sector of the Kobe plot (with a high probability)
- Maintain stocks at healthy levels in the green sector of the Kobe plot (50%)
- Minimize annual probability of falling below trigger/limit reference points (spawning biomass)
- Maintain catches by different fisheries above historical ranges
- Increase the maximum sustainable yield (MSY)
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- Define emergency rules when faced with substantial changes
- Consider climate change

# Discussion 2nd IATTC MSE Workshop, 2021

## Objectives on **Status** and **Safety** of the Stocks (preliminary)

- Maintain stocks at healthy levels in the green sector of the Kobe plot (with a high probability)
- Maintain stocks at healthy levels in the green sector of the Kobe plot (50%)
- Minimize annual probability of falling below trigger/limit reference points (spawning biomass)
- Maintain catches by different fisheries above historical ranges
- Increase the maximum sustainable yield (MSY)
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- Maintain low variability of catch or effort (e.g. 10%, consider asymmetry of change)
- Define emergency rules when faced with substantial changes
- Consider climate change

# Discussion 2nd IATTC MSE Workshop, 2021

## Proposed objectives on Yield and Abundance (preliminary)

- Maintain stocks at healthy levels in the green sector of the Kobe plot (with a high probability)
- Maintain stocks at healthy levels in the green sector of the Kobe plot (50%)
- Minimize annual probability of falling below trigger/limit reference points (spawning biomass)
- Maintain catches by different fisheries above historical ranges
- Increase the maximum sustainable yield (MSY)
- Maximizing economic yield (MEY) in the long term
- Minimizing the bycatches of juvenile stages of non-target species
- Establish rebuilding plans by stock status and life-history of species
- Maintain viable fisheries in the long term (CPUE, all fisheries)
- Maintain low variability of catch or effort (e.g. 10%, consider asymmetry of change)
- Define emergency rules when faced with substantial changes
- Consider climate change

# Discussion 2nd IATTC MSE Workshop, 2021

## Proposed objectives on **Stability** (preliminary)

- Maintain stocks at healthy levels in the green sector of the Kobe plot (with a high probability)
- Maintain stocks at healthy levels in the green sector of the Kobe plot (50%)
- Minimize annual probability of falling below trigger/limit reference points (spawning biomass)
- Maintain catches by different fisheries above historical ranges
- Increase the maximum sustainable yield (MSY)
- Maximizing economic yield (MEY) in the long term
- Minimizing the bycatches of juvenile stages of non-target species
- Establish rebuilding plans by stock status and life-history of species
- Maintain viable fisheries in the long term (CPUE, all fisheries)
- Maintain low variability of catch or effort (e.g. 10%, consider asymmetry of change)
- Define emergency rules when faced with substantial changes
- Consider climate change

# Discussion 2nd IATTC MSE Workshop, 2021

## Proposed **Other** (preliminary)

- Maintain stocks at healthy levels in the green sector of the Kobe plot (with a high probability)
- Maintain stocks at healthy levels in the green sector of the Kobe plot (50%)
- Minimize annual probability of falling below trigger/limit reference points (spawning biomass)
- Maintain catches by different fisheries above historical ranges
- Increase the maximum sustainable yield (MSY)
- Maximizing economic yield (MEY) in the long term
- Minimizing the bycatches of juvenile stages of non-target species
- Establish rebuilding plans by stock status and life-history of species
- Maintain viable fisheries in the long term (CPUE, all fisheries)
- Maintain low variability of catch or effort (e.g. 10%, consider asymmetry of change)
- Define emergency rules when faced with substantial changes
- Consider climate change

# Discussion 2nd IATTC MSE Workshop, 2021

## Objectives on **Status** and **Safety** of the Stocks (preliminary)

- Maintain stocks at healthy levels in the green sector of the Kobe plot (with a high probability)
- Maintain stocks at healthy levels in the green sector of the Kobe plot (50%)
- Minimize annual probability of falling below trigger/limit reference points (spawning biomass)

# Discussion 2nd IATTC MSE Workshop, 2021

## Objectives on **Status** and **Safety** of the Stocks (preliminary)

- Maintain stocks at healthy levels in the green sector of the Kobe plot (MSY)
  - *With a probability greater than 75% over 20 years*
  - *With a probability of 50%*
- Minimize annual probability of falling below trigger/limit reference points (spawning biomass)
  - What trigger reference points? More to discuss during HCR presentation
    - More proposed by US by e-mail and mentioned during session
  - What limit reference points? Define actions when crossing RPs as part of HCRs
    - *Current IATTC's: 7.7% of virgin spawning biomass, less than 10%*
    - *More precautionary limit level, less than 5%*
- Other objectives on Status and Safety of Stocks?
  - …

# Discussion 2nd IATTC MSE Workshop, 2021

## Proposed objectives on Yield and Abundance (preliminary)

- Maintain catches by different fisheries above historical ranges (Changes in capacity considerations)
  - What range of years?
  - What fisheries? Caps?
- Increase the maximum sustainable yield (MSY)
  - Species-specific MSY
  - What combination of gears? What reference years?
- Minimizing the bycatches of juvenile stages (sizes-ages) of non-target species (BET-YFT)
  - What combination of gears? What reference years?
- Maintain viable fisheries in the long term (CPUE, all fisheries) (Depend on economics)
  - Use proxies such as CPUE reference levels, reference years? Short-term Long-term

- Other objectives on Yield and Abundance?
  - …

# Discussion 2nd IATTC MSE Workshop, 2021

## Proposed objectives on **Stability** (preliminary)

- Maintain low annual variability of allowed catch or effort (include Effort)
  - *Changes in catch limit* (Effort, Days of closure) *between management periods should be less than 20%*
    - *10% effort?, 20% capture?*
  - *Changes in catch limit* (Effort, Days of closure) *between management periods should be less than 10% (note differences between effort and catch %)*
  - *Gradual changes in catch limit* (Effort, Days of closure)
  - *Consider asymmetry of changes (precautionary)*
    - *How asymmetric?*
  - *Consider different time span of management periods and associated variability in Catch or Effort*

# Discussion 2nd IATTC MSE Workshop, 2021

## Proposed **Other** (preliminary)

- Maximizing economic yield (MEY) in the long term
  - Current MSE framework does not include economics (proxies?, Future work?)
- Establish rebuilding plans by stock status and life-history of species
  - See specification of alternative HCRs
- Define emergency rules when faced with substantial changes
  - See specification of alternative HCRs
- Consider climate change
  - See specification of MSE Operating models (Future work?)

# Management objectives, performance indicators for EPO BET MSE

| OBJECTIVE | Quantity | Performance Indicators |
|---|---|---|
| **Safety**<br>*Maintain stock above limit reference points* | *Equilibrium virgin spawning biomass* $SB_0$<br>• *< 10% probability SB below 7.7% of* $SB_0$<br>• *< 5% probability SB below 7.7% of* $SB_0$<br>< 10% P SB < SBmsy<br>Flim (< 5% *P* F > Fmsy) | Ratio of $SB_{yr}$ over $SB_0$<br>Probability calculated over projected 30 years<br>(All years, any year by replicates) |
| **Status**<br>Maintain stock in green quadrant of Kobe plot | SB≧ dynamic $SB_{MSY}$ and $F<F_{MSY}$<br>• *50% probability (too low?)*<br>• *60% probability*<br>• *75% probability*<br>• *80% probability (too high?)* | % of simulated runs falling in Kobe's green quadrant<br>Probability calculated over projected 30 years |
| **Stability**<br>Maintain low variability of catch and effort limits, gradual changes in management measures.<br>Caps at 10% (effort), 15% (catch)<br>Min. change (X%) | Standard deviation of annual catch, effort<br><br>Average interannual proportional change (catch, effort) | % change in catch and/or effort between years<br>Calculated over projected 3, 15 and 30 years |
| **Yield/Abundance**<br>Maintain catches/effort/CPUE above historical ranges | Average catch/effort/CPUE by fishery (PS and LL)<br>• *1994-2019 (since FAD expansion)*<br>• *2017-2019 (latest status quo)* | Ratio of projected 3, 15 and 30-year average catch/effort/CPUE by fishery over historical period |
| **Status quo**<br>Maintain the stock at levels near the (2017-2019) status quo | Spawning biomass, Index (LL CPUE) | Ratio of projected 3, 15 and 30-year average SB, Index (LL CPUE) over status quo period (2017-2019) |

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# Questions?