

**COMMON  
OCEANS  
PROGRAM**



Food and Agriculture  
Organization of the  
United Nations

# Tuna project



**Meeting on the Implementation of the Ecosystem  
Approach to Fisheries Management in tunaRFMOs:  
Advancing the Development of Ecosystem Indicators**  
SPC, Noumea, New Caledonia  
2-6 March 2026

# Why This Workshop Now? Building on 20+ Years of Ecosystem Indicator Science

## EAFM "elements" exist in tuna RFMOs

### Indicators available but underused

- mainly for descriptive purposes and monitoring one specific topic;
- not integrative, not decision-oriented thus implementation remains limited

### Need operational integration

### Translation to management is the bottleneck



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#### Meeting on the Implementation of the Ecosystem Approach to Fisheries Management in tunaRFMOs: Advancing the Development of Ecosystem Indicators

2 - 6 March 2026  
SPC Headquarters, Noumea (New Caledonia)

#### BACKGROUND

The Project "Sustainable Management of Tuna Fisheries and Biodiversity Conservation in the Areas Beyond National Jurisdiction" (Common Oceans Tuna Project) seeks to achieve responsible, efficient, and sustainable tuna production and biodiversity conservation in the face of a changing environment.

A key objective of the Common Oceans Tuna Project is to enhance the management of tuna fisheries by incorporating ecosystem and climate considerations into fisheries management advice. To achieve this, the Common Oceans Tuna Project is providing support for the implementation of the Ecosystem Approach to Fisheries Management (EAFM) in tuna RFMOs.

A key challenge in implementing EAFM lies in its practical application within the context of international tuna fisheries management. While progress within tuna RFMOs may appear limited, there are numerous examples where elements of EAFM have already been integrated into fisheries science and advisory practices. To further advance these efforts, there is a need to develop ecosystem, environmental, and climate indicators that can help operationalize EAFM in tuna RFMOs. Each tuna RFMO is currently working on developing ecosystem indicators and related tools (Fuller et al., 2024); however, collaboration and exchange among tuna RFMOs have so far been limited.

#### OBJECTIVES

This workshop aims to bring together tuna RFMO scientists, along with ecosystem scientists and experts, to review, discuss, and advance the development of ecosystem and environmental indicators (and related tools) for tuna ecosystems and fisheries, in support of the practical implementation of EAFM across tuna RFMOs.

The specific objectives are:

- To review progress on Ecosystem and Environmental Indicators to support the EAFM implementation in tuna RFMOs,
- To develop Ecosystem/Environmental Indicators to evaluate fishing/climate impacts (including the Green Band/Ecosystem Trait Index, [Fulton and Sainsbury 2025](#)): types of indicators, data requirements, estimation methods, selection

Review progress on ecosystem & environmental indicators

- Advance development of ecosystem/environmental Indicators to evaluate climate & fishing impact

- Identify challenges & practical solutions

- Discuss the selection of potential indicators (including ETI)

- Develop recommendations for tuna RFMOs

Move beyond dashboards

- Operationalize EAFM

- Strengthen science–management integration

- Deliver actionable recommendations for tuna RFMOs

# Operationalizing EAFM in Tuna RFMOs

Main outcomes, recommendations and future directions from the Workshop

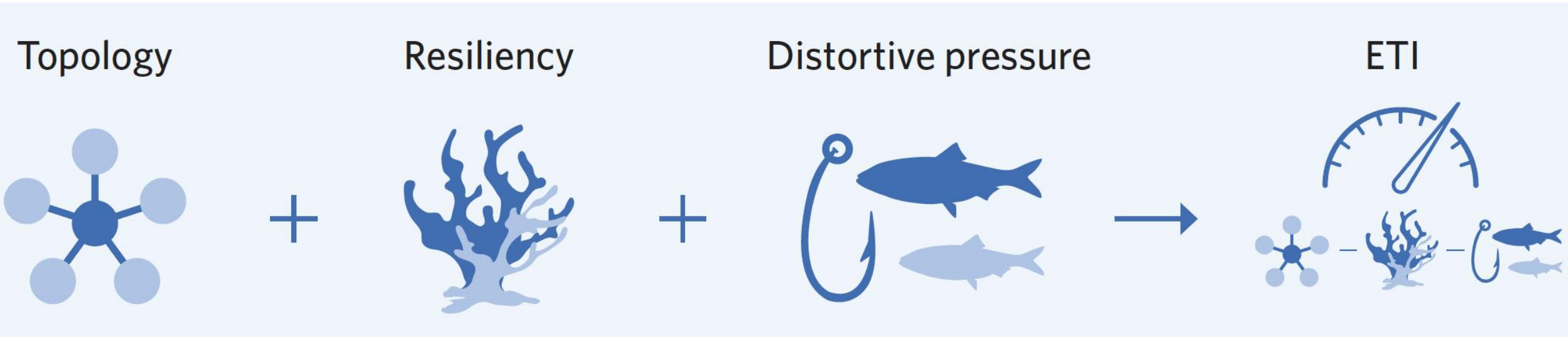
*Report currently being prepared*

- Mandate and governance limitations
- EAFM elements already exist through bycatch, FAD and ecosystem measures
  - Indicators are widely available but mostly descriptive
- Integration into management advice remains limited due to lack of operational baselines and reference points.
- Science–management communication remains a major bottleneck
  - Need for consistent and harmonized communication tool
- Need for operational pathways linking indicators to management actions
- Limited technical capacity, resources and competing RFMO priorities

- Adopt a small set of harmonized core indicators (3-5 indicators)
  - Include climate, bycatch and FAD-related indicators
- Indicators should be scientifically robust and policy relevant
- Develop ecocards and risk tables to classify environmental/ecosystem considerations
  - Provide concise executive summaries for Commissioners
- Standardize terminology and presentation across tuna RFMOs
- Improve communication of ecosystem considerations to managers

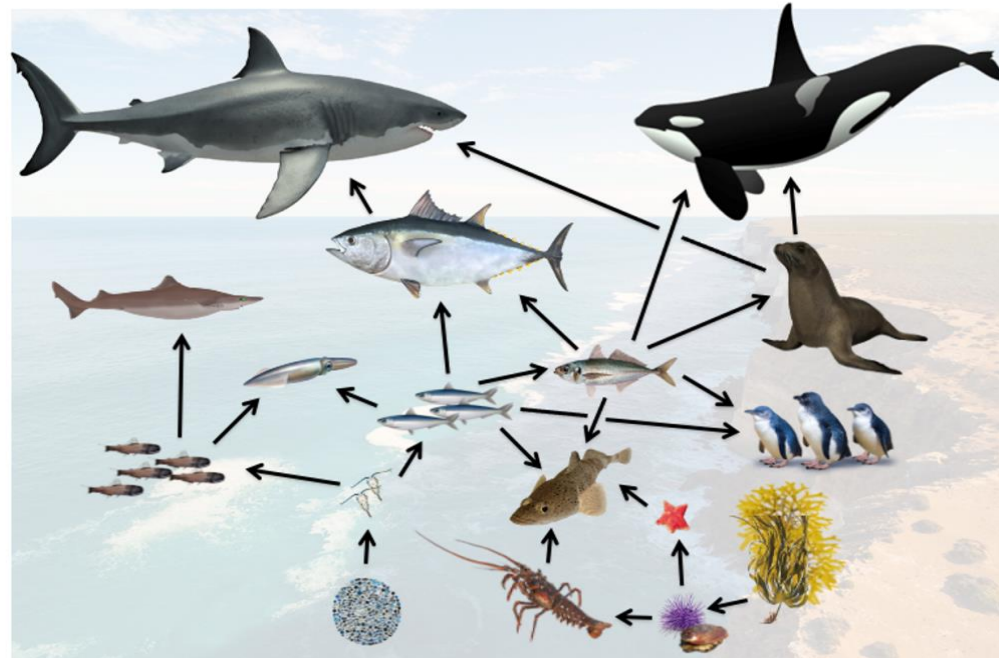
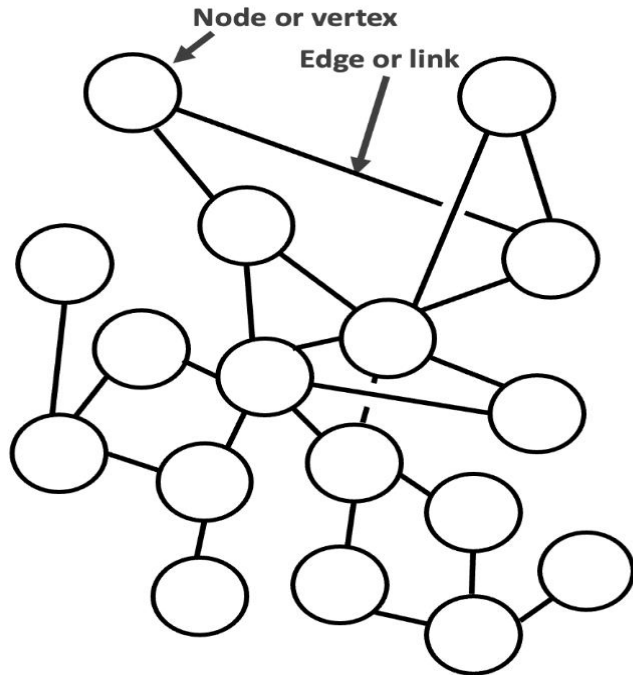
# Ecosystem Traits Index (ETI): Management Cue

**ETI provides an integrated measure of ecosystem structure and resilience**



$$\text{ETI} = \left\{ \begin{array}{l} \text{Species type} \\ \text{(target, byproduct,} \\ \text{bycatch, habitat,} \\ \text{vulnerable,} \\ \text{robust, hub)} \end{array} \right\} * \text{Ecosystem resiliency} * \text{Index of} \left\{ \begin{array}{l} \text{Green Band} \\ \text{biomass depletion} \end{array} \right\}$$

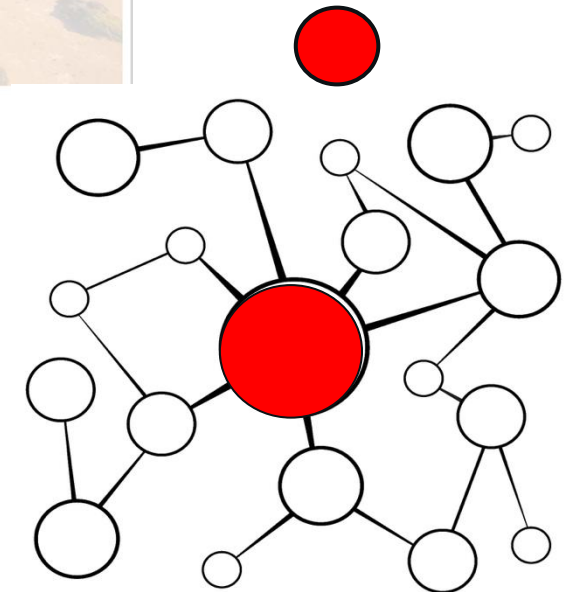
# TOPOLOGY - structure & key network connecting species



Use Criticality Analysis from engineering to identify:

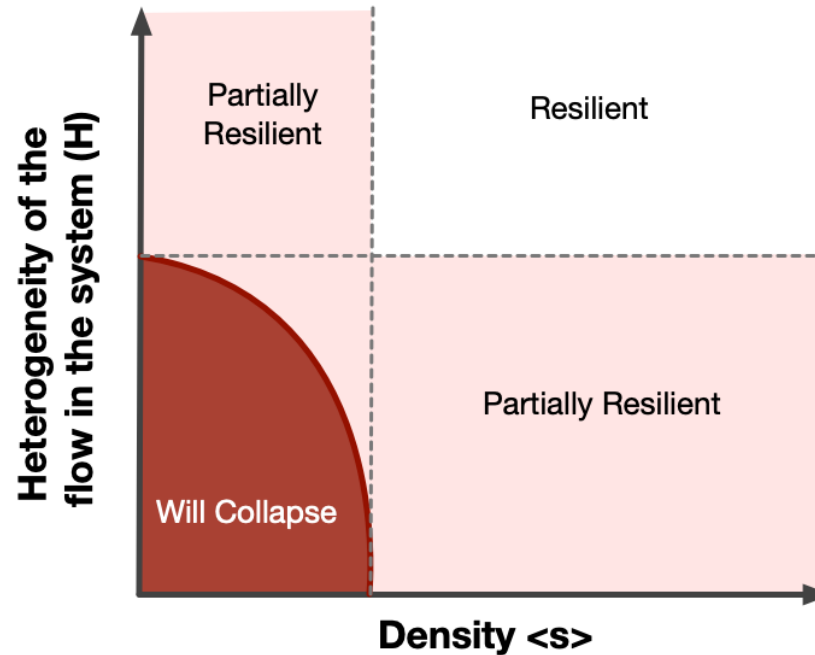
- highly connected species or taxonomic groups (often predators)
- Species, or taxonomic groups, supporting food-web structure (often key prey)

➤ Identify Ecologically Critical or “Hub species”



## Network flows and structure determine resilience

Heterogeneity of flow  
The variance across species of the number of food-web links, each weighted by its strength



Density of connections

The ratio of the actual direct links between species compared to the maximum if all species were connected

Source: Gao et al (2016),  
Fulton & Sainsbury (2025)

Note: 'collapse' means major ecosystem change

# FOOD WEB DISTORTION/GREEN BAND - effect of fishing on ecosystem food-webs

Measure of pressure on the system: What pressure can ecosystem structure deal with?

If fishing resulting in more pressure than predation (or different pattern) can "stress weak points in web"

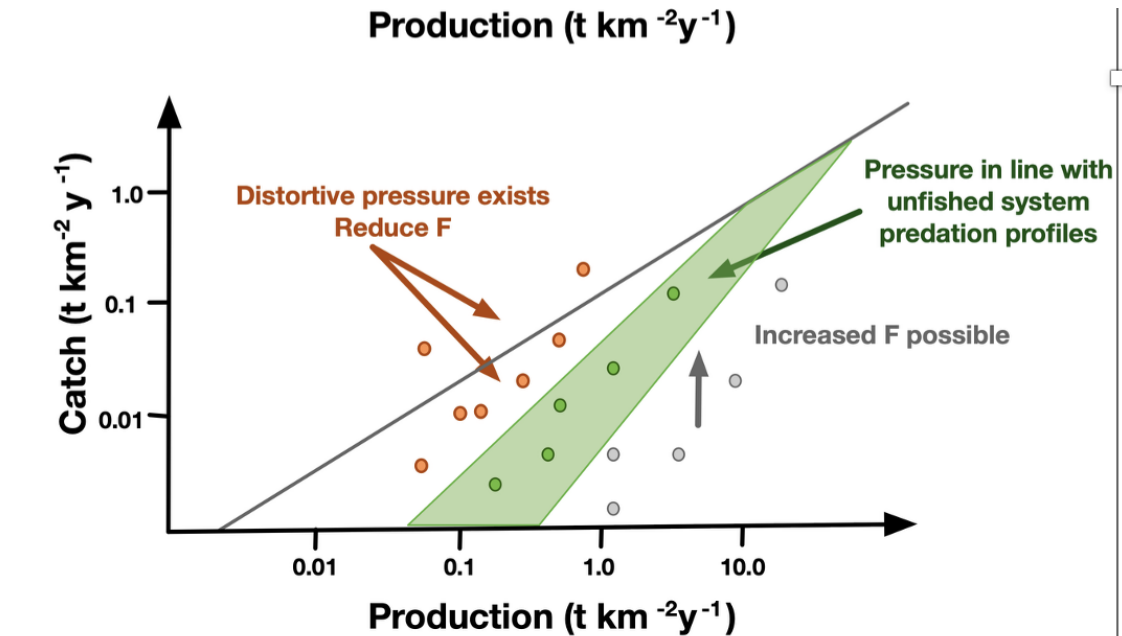
Targeting and fishing selectivity varies greatly between species, fisheries and through time

- species can have total mortalities that are not in the same ratios as in the unfished ecosystem

Aim is to:

- achieve ratios of mortality similar to the unfished ecosystem
- avoid overfishing
- catch no more than half of production

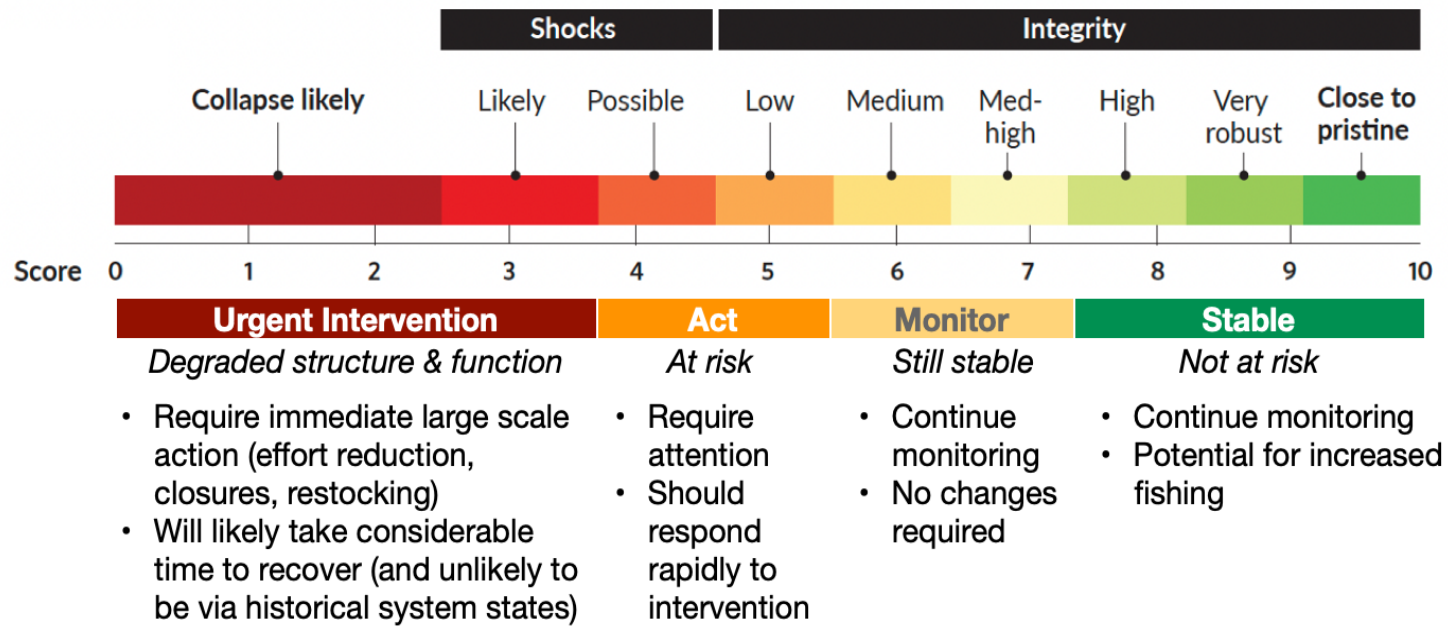
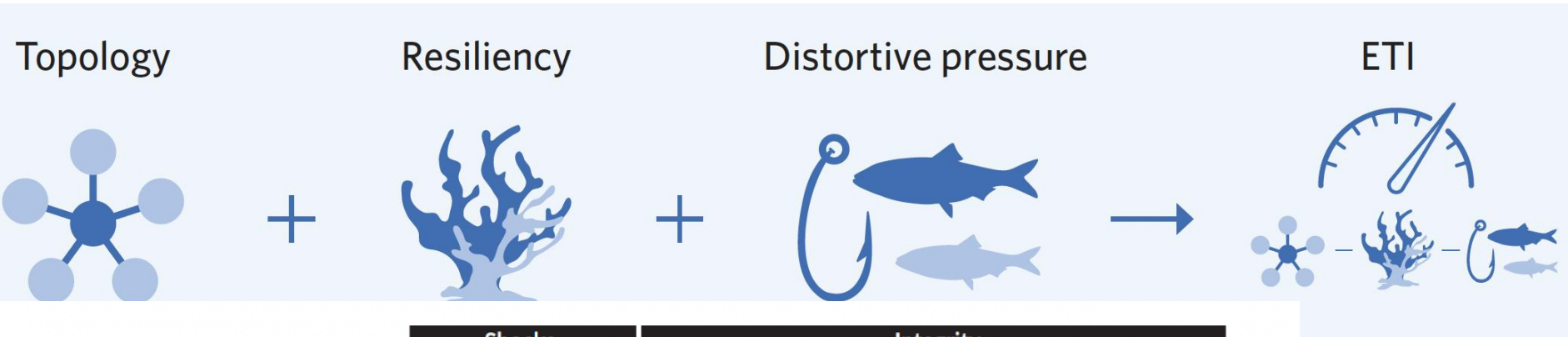
This gives the 'Green Band' for species and groups of species



Source: Fulton et al (2025)

# Ecosystem Traits Index (ETI): Management Cue

Possible to combine all the previous aspects to provide a system level indicator for guiding EAFM

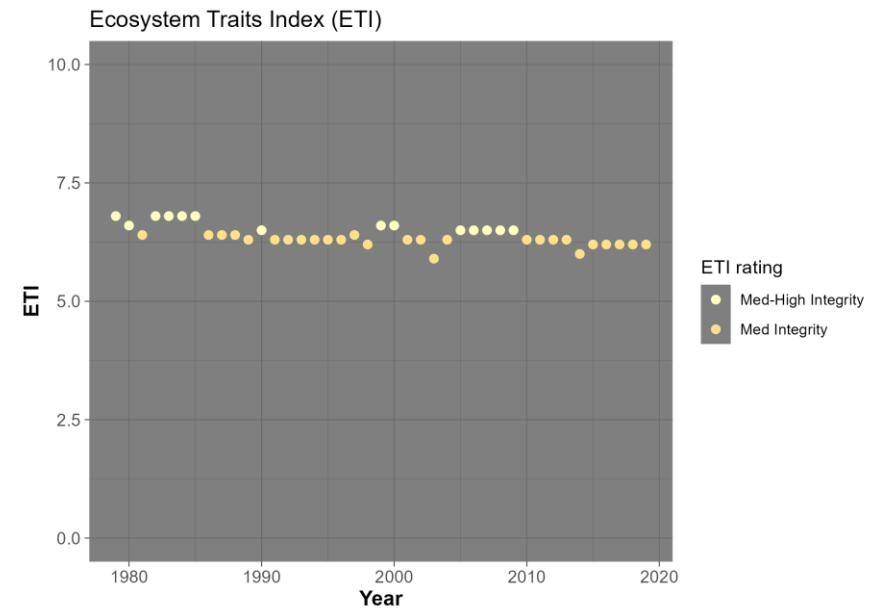
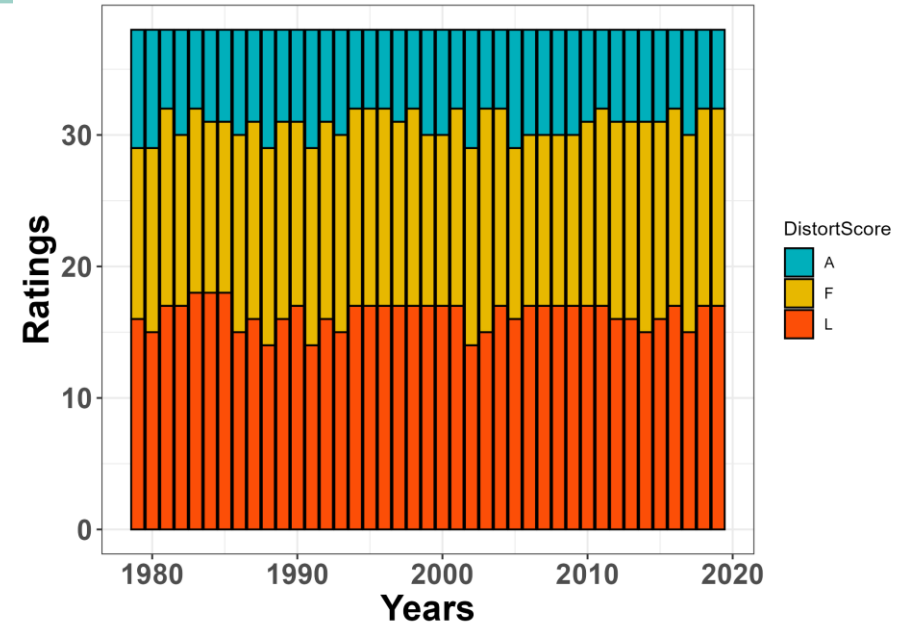
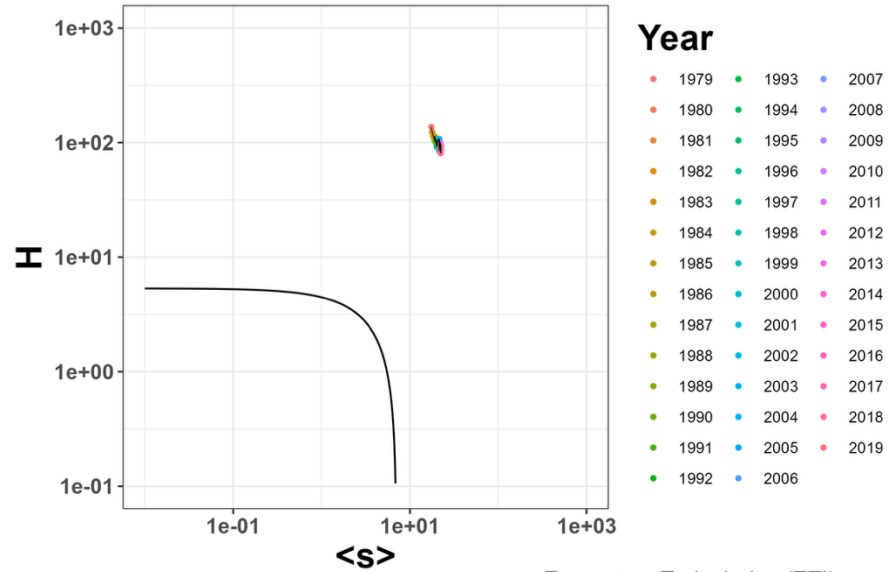


Gives an overall ETI score

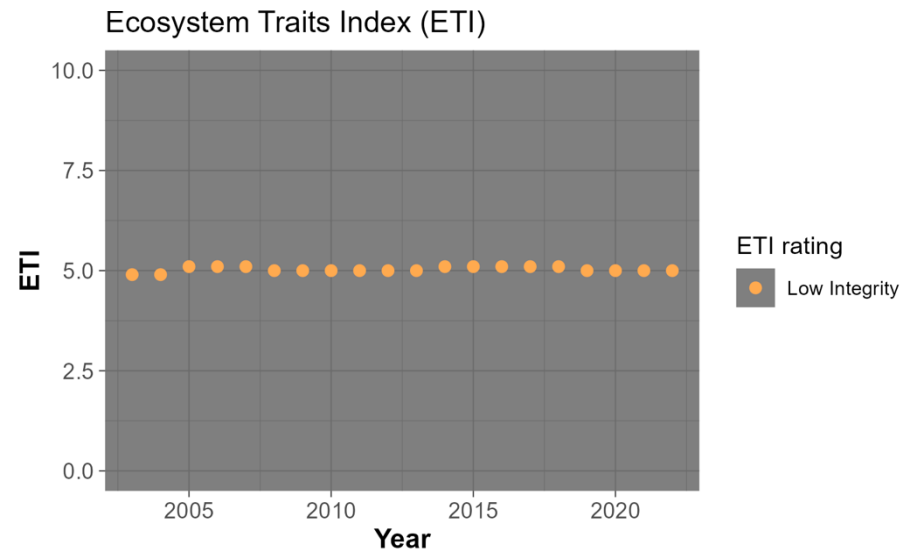
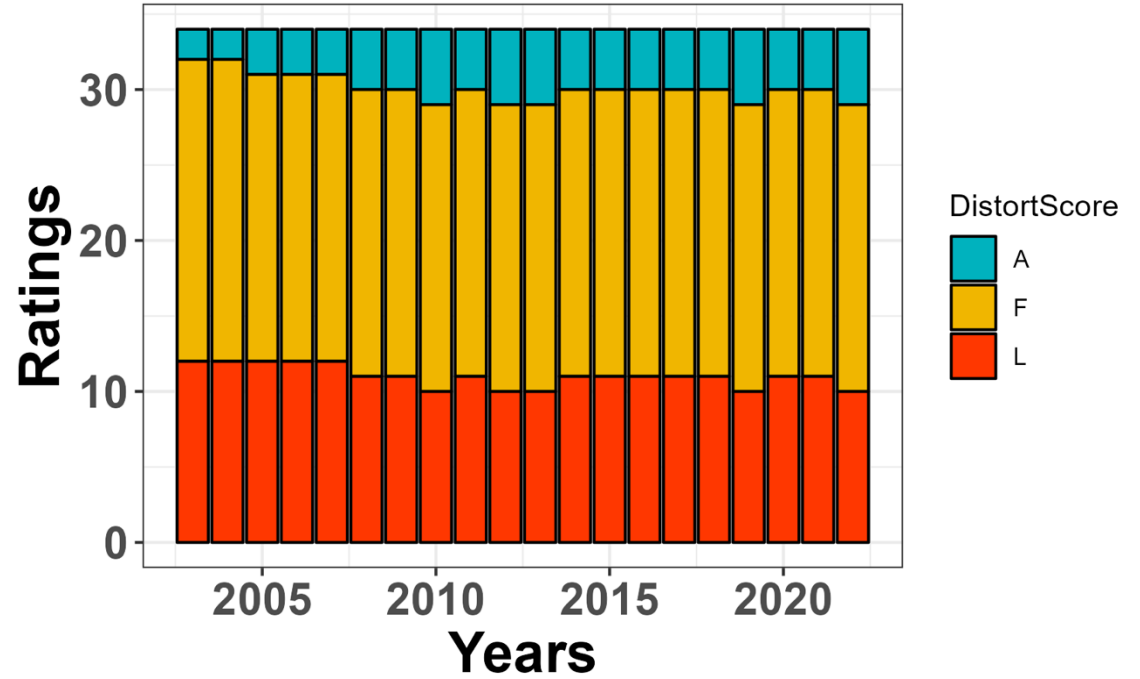
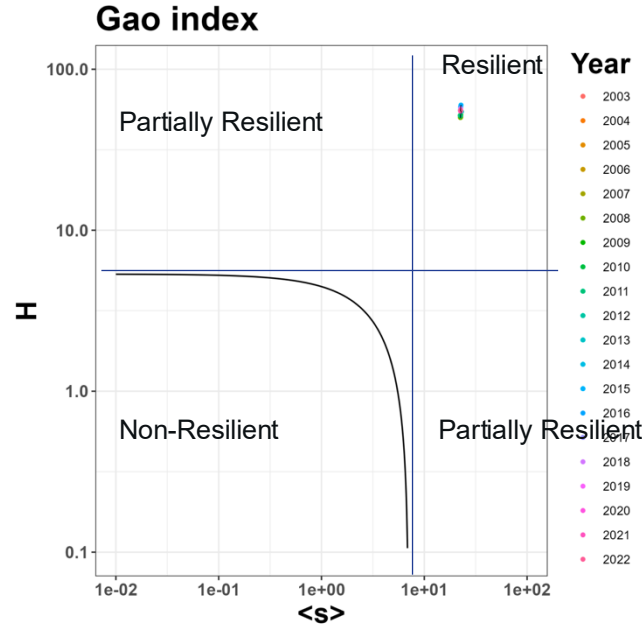
- ETI scores 0-10
- ecosystem interpretation
- fishery management interpretation

# VERY Preliminary ETI - IATTC

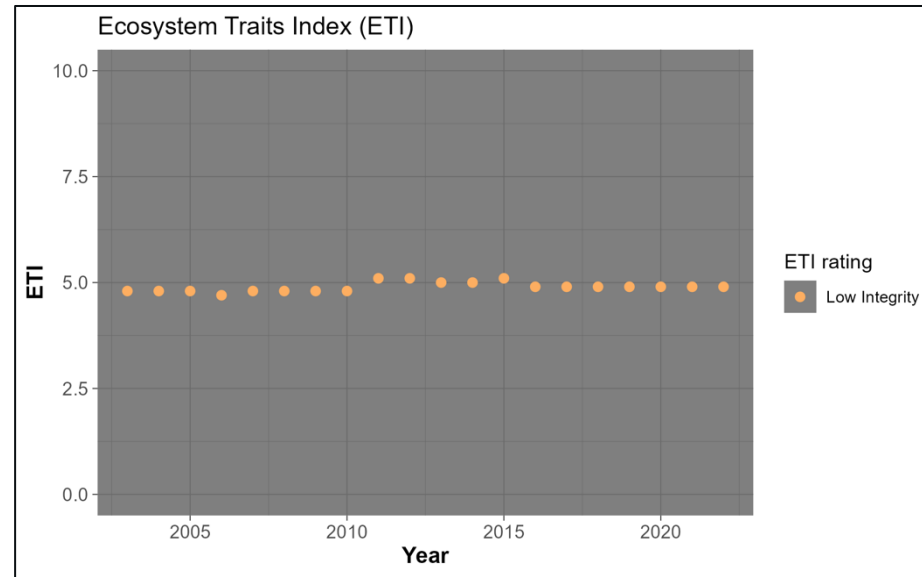
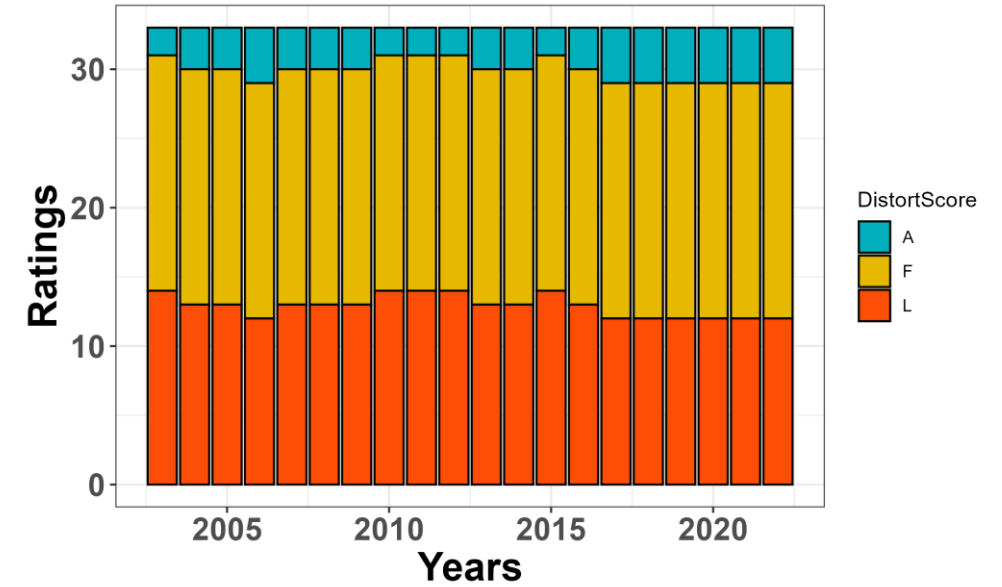
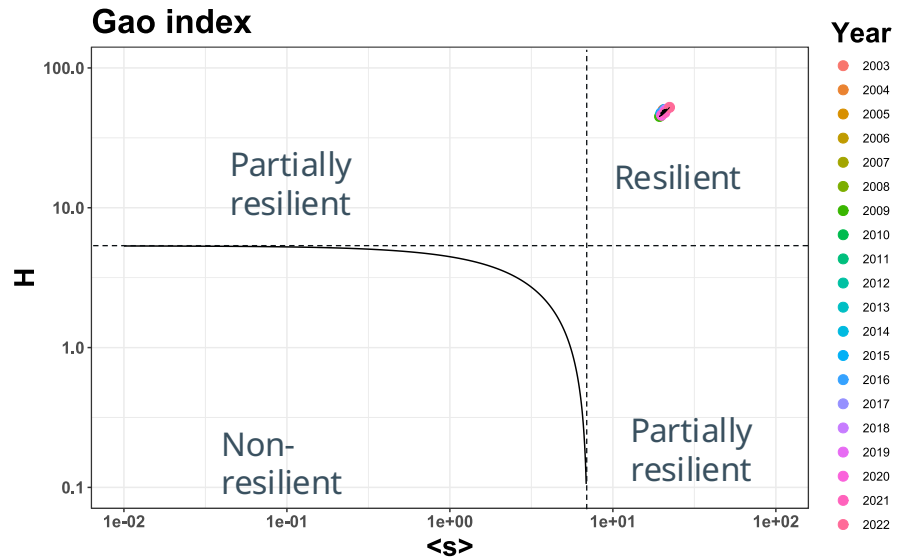
### Gao index



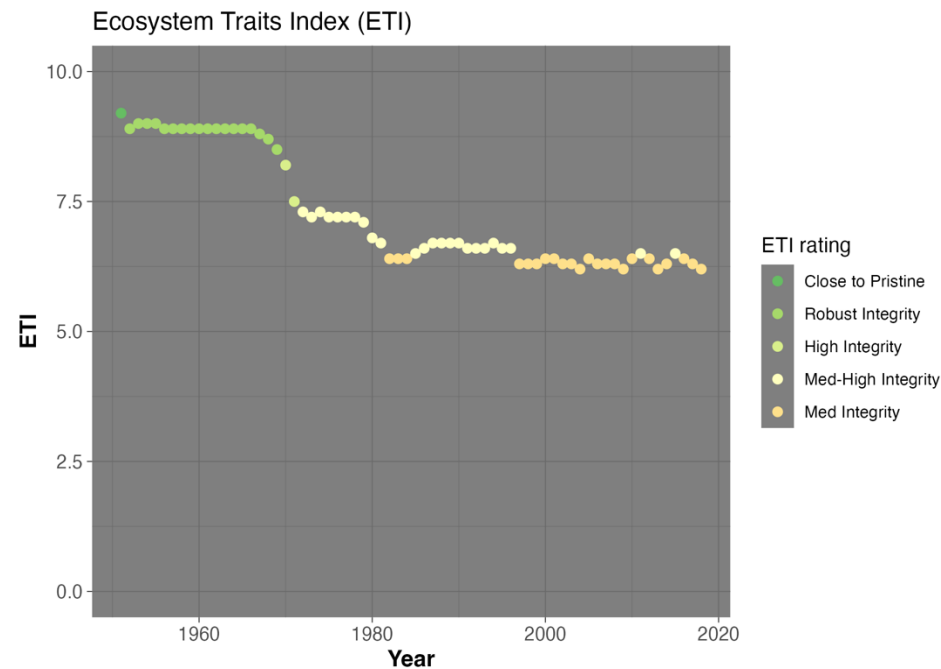
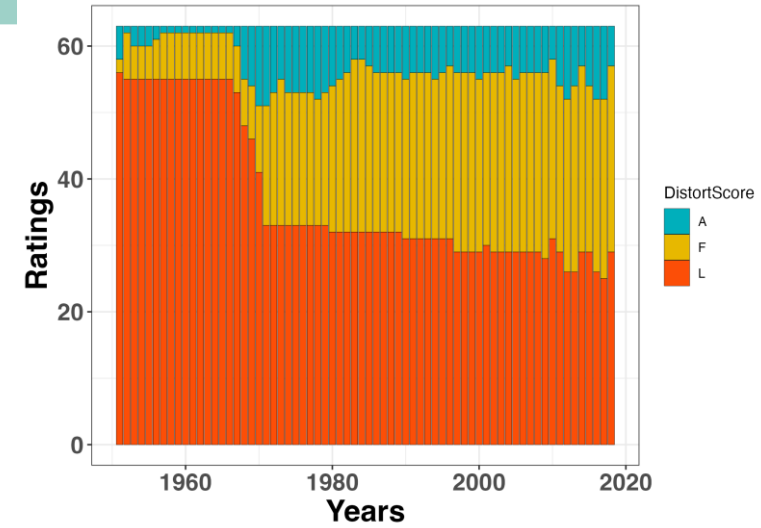
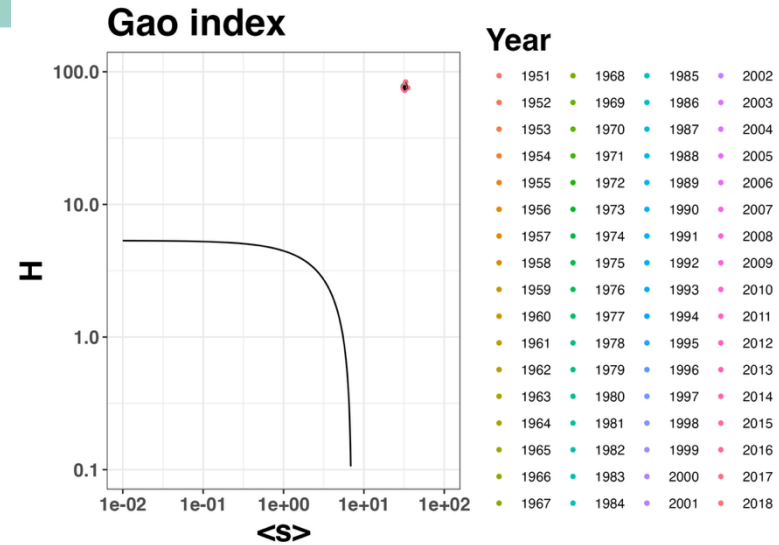
# VERY Preliminary ETI - ICCAT



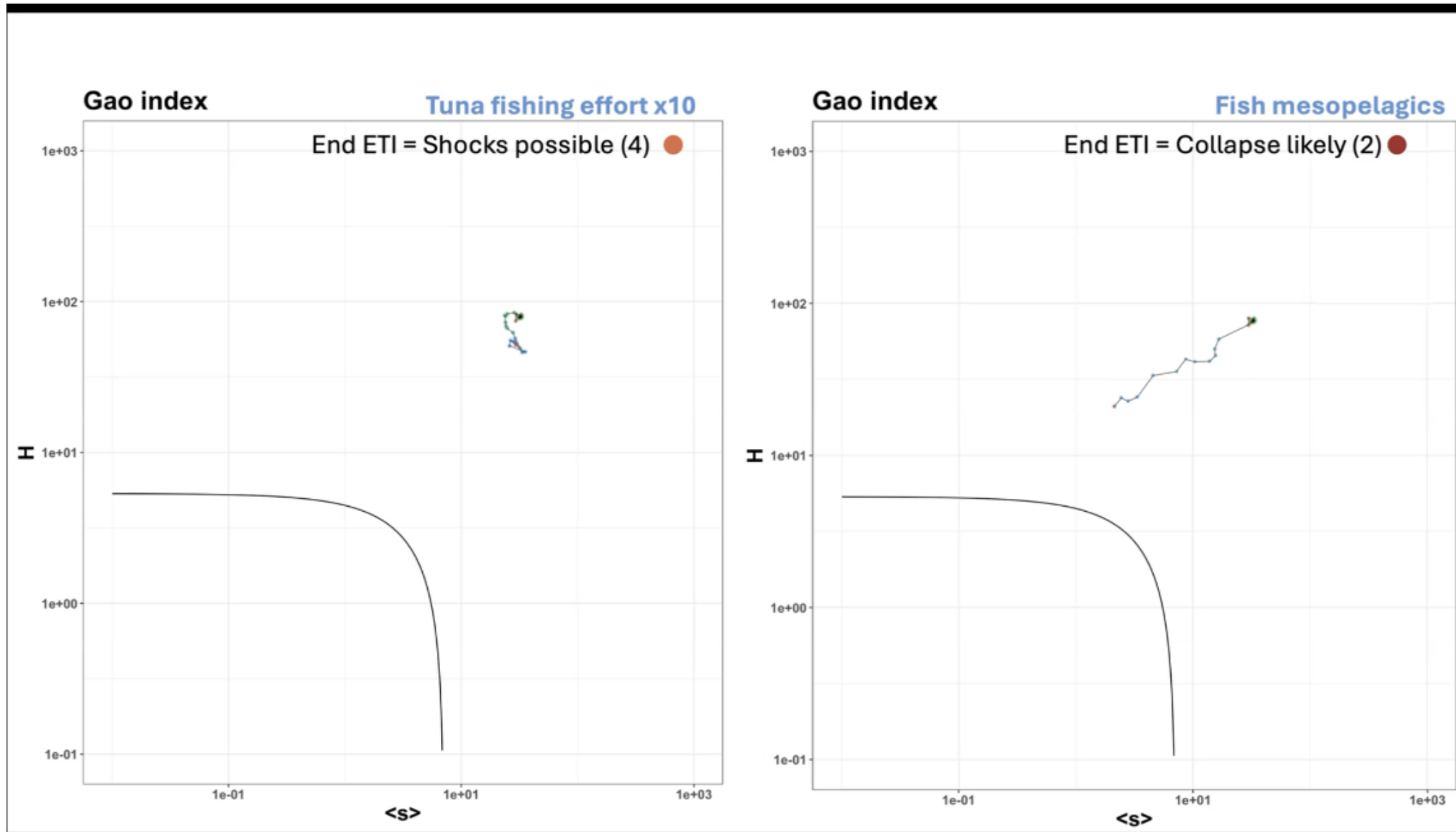
# VERY Preliminary ETI - IOTC



# VERY Preliminary ETI – WCPO Warm Pool



# VERY Preliminary ETI – WCPO Warm Pool



## Priority Actions (2026–2027)

- Pilot harmonized ecosystem indicators across tuna RFMOs to move from descriptive monitoring toward operational management use
- Develop ecocards, risk tables, and executive summaries for RFMO advice
- Advance ETI validation and communication products
- Strengthen cross-RFMO collaboration improving shared repositories, workflows and methodologies
- Propose pathways for Commission reporting and uptake
- Organize follow-up workshop in 2027

EAFM implementation is not constrained by science. It is primarily impacted by institutional integration

Indicators must become operational, interpretable and management-relevant

A layered framework combining simple and integrated indicators is recommended

Cross-RFMO communication and collaboration is essential for successful implementation