Ongoing efforts to operationalize the Ecosystem Approach to Fisheries Management (EAFM) in tuna Regional Fisheries Management Organizations (RFMOs) - practical tools and advisory products -

Maria José Juan-Jordá, Valerie Allain, Diego Alvarez-Berastegui, Eider Andonegi, Dan Crear, Martin Cryer, David Die, Leanne Fuller, Shane Griffiths, Laurie Kell, Jon Lopez, Simon Nicol, Joe Scutt Phillips, Hilario Murua

Objectives of this talk

- Summarize ongoing efforts on **ecosystem research, tools and products** aimed to support ecosystem-based advice in tuna RFMOs

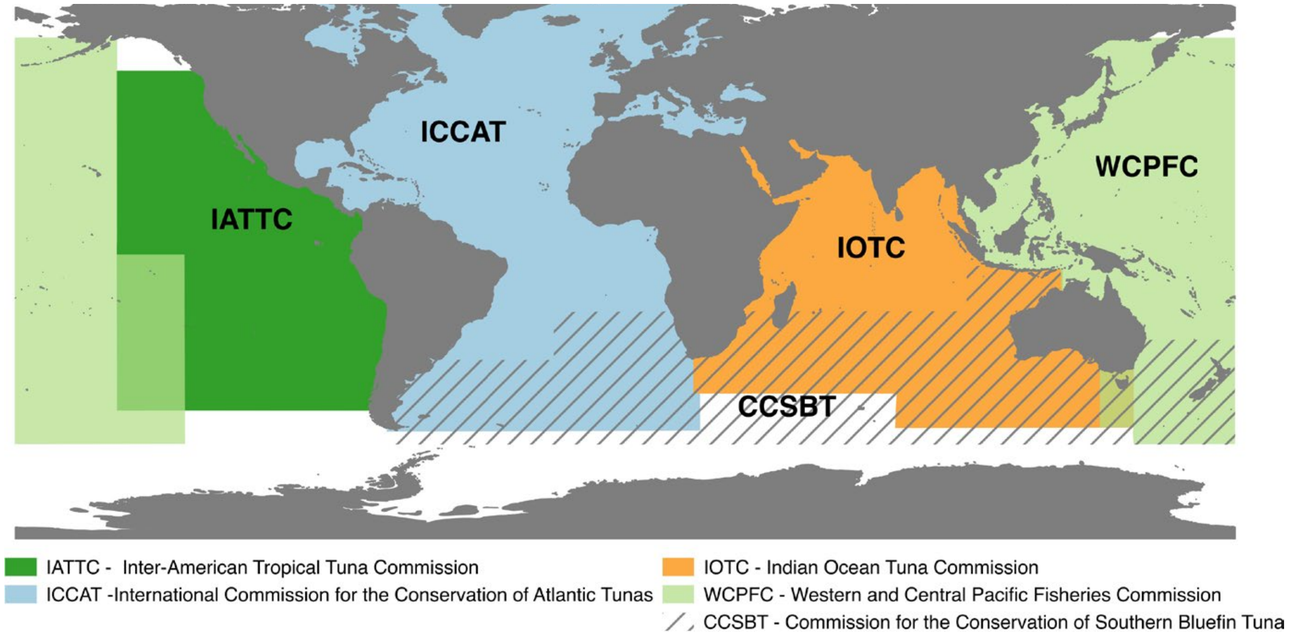
- Highlight:

  - Progress

  - Challenges

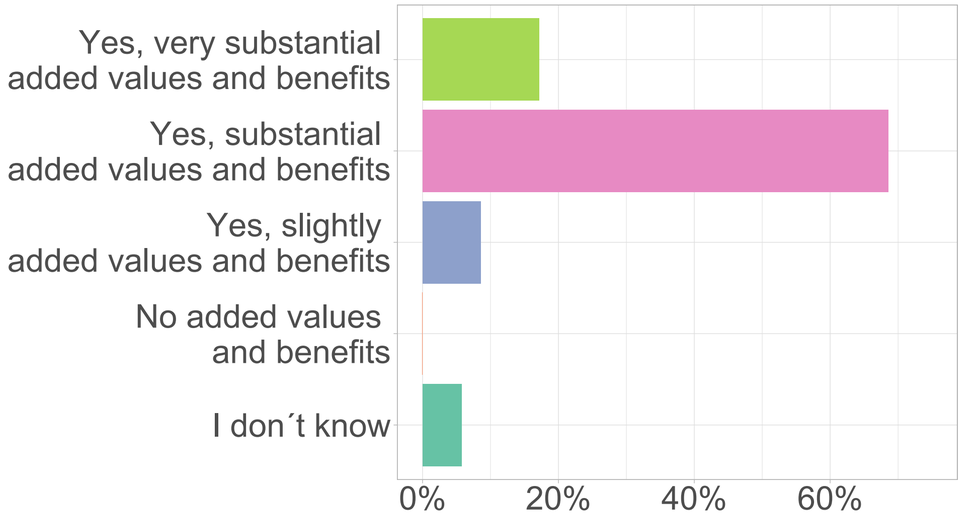
  - Opportunities

Tuna RFMOs

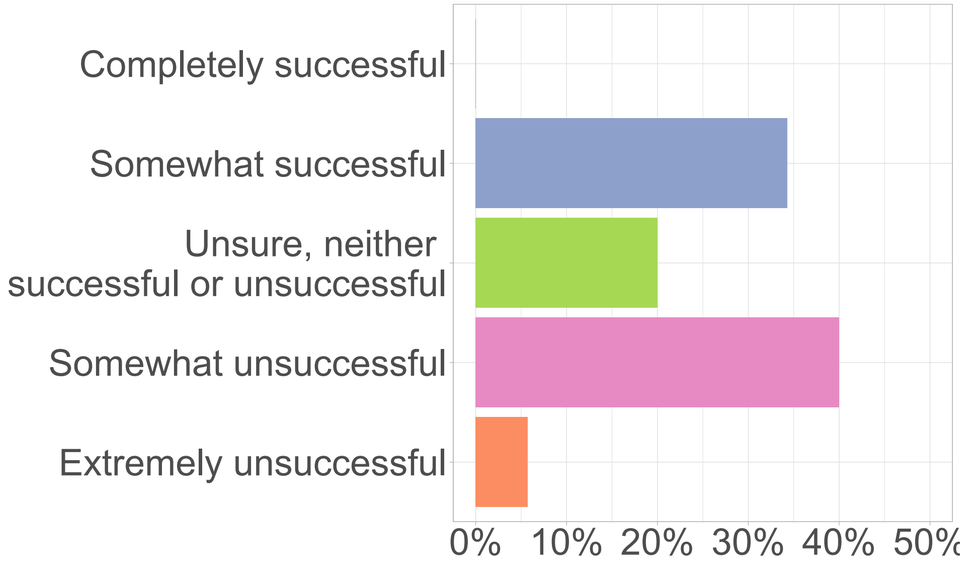


A quick reflexion

Will implementing the EAFM in tuna RFMOs bring substantial added values and benefits?



How successful do you consider the overall EAFM implementation is working in the tuna RFMOs?



Survey questions - 2nd joint tuna RFMO EAFM workshop (2019)

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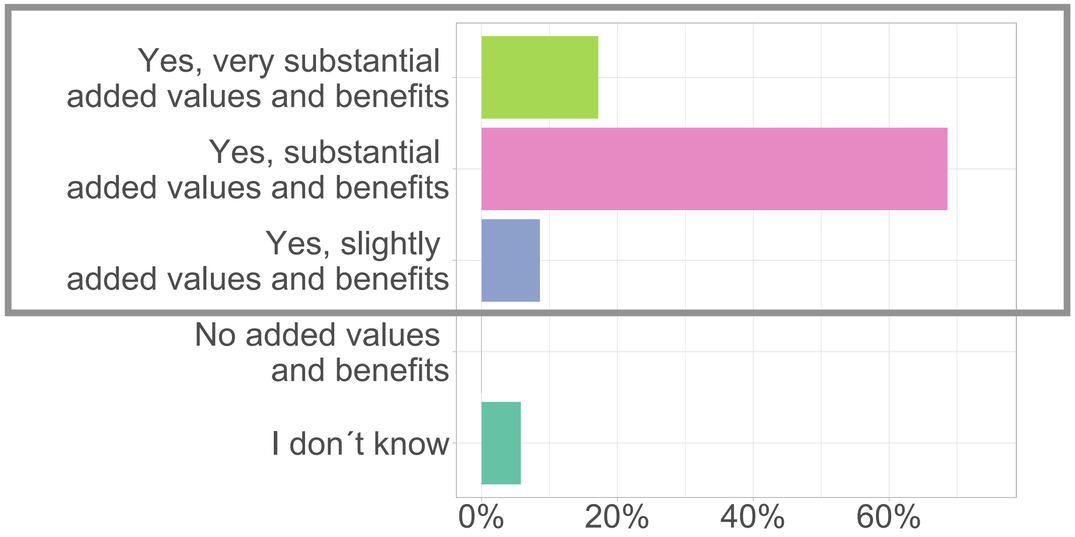

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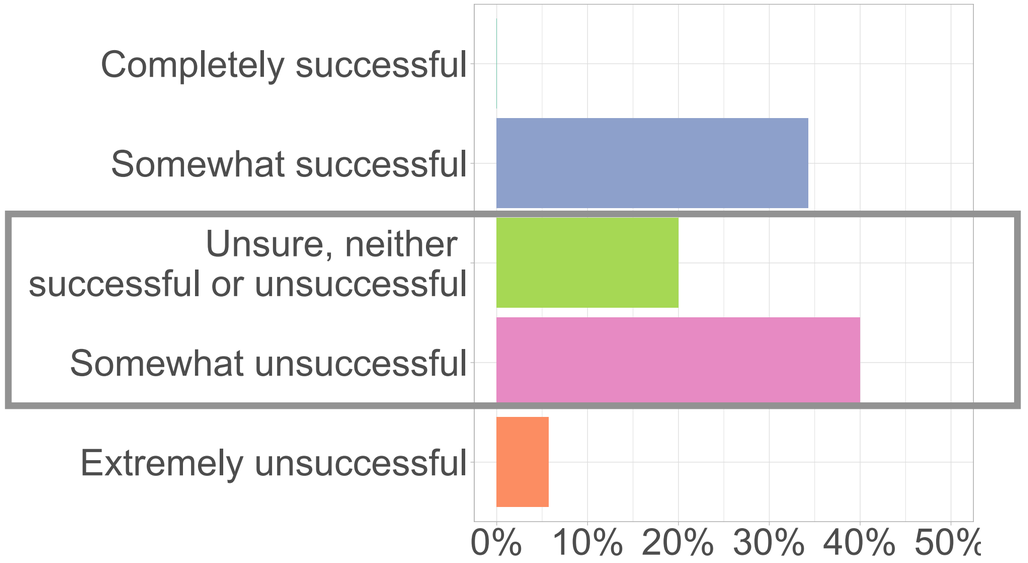

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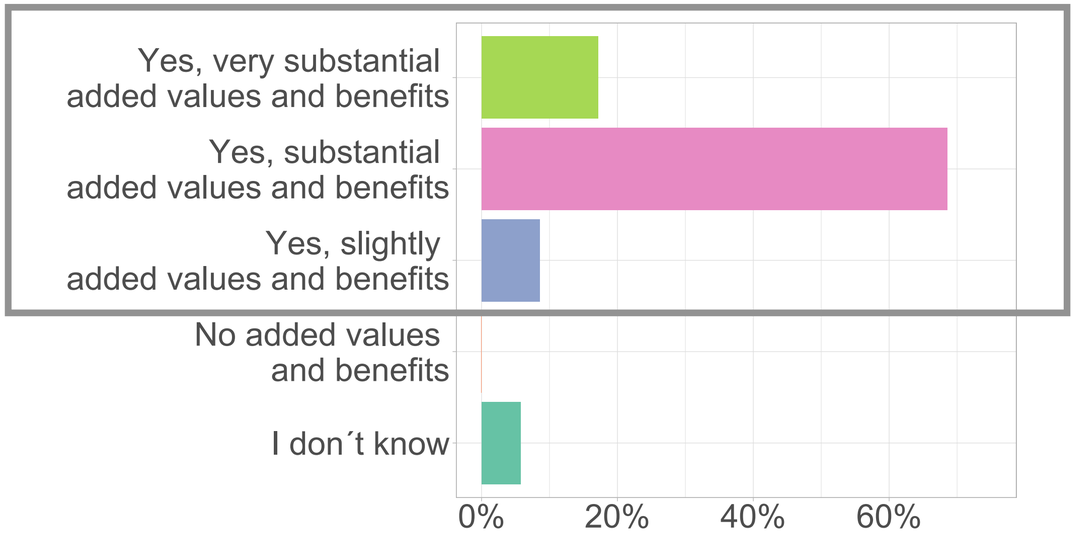

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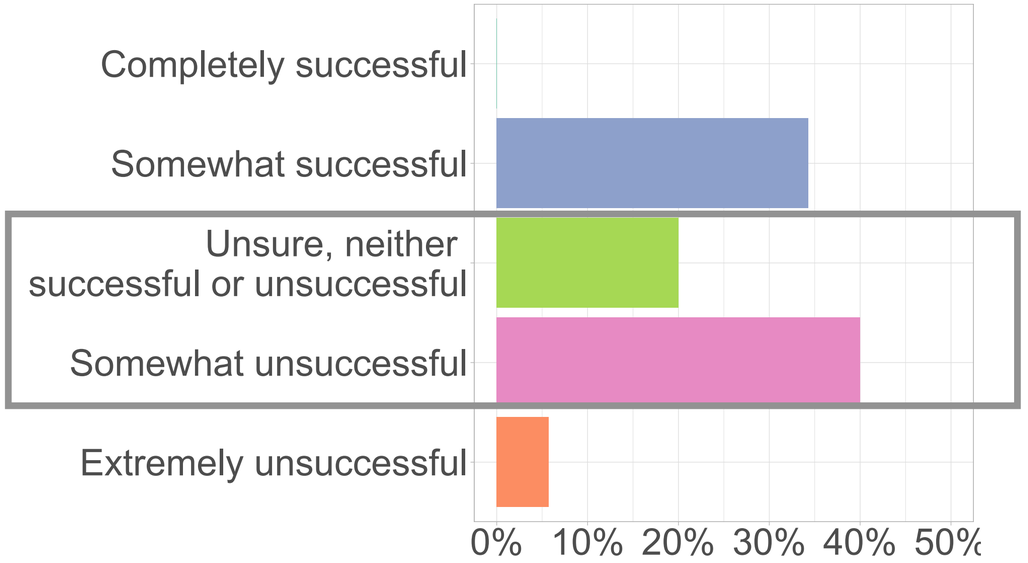


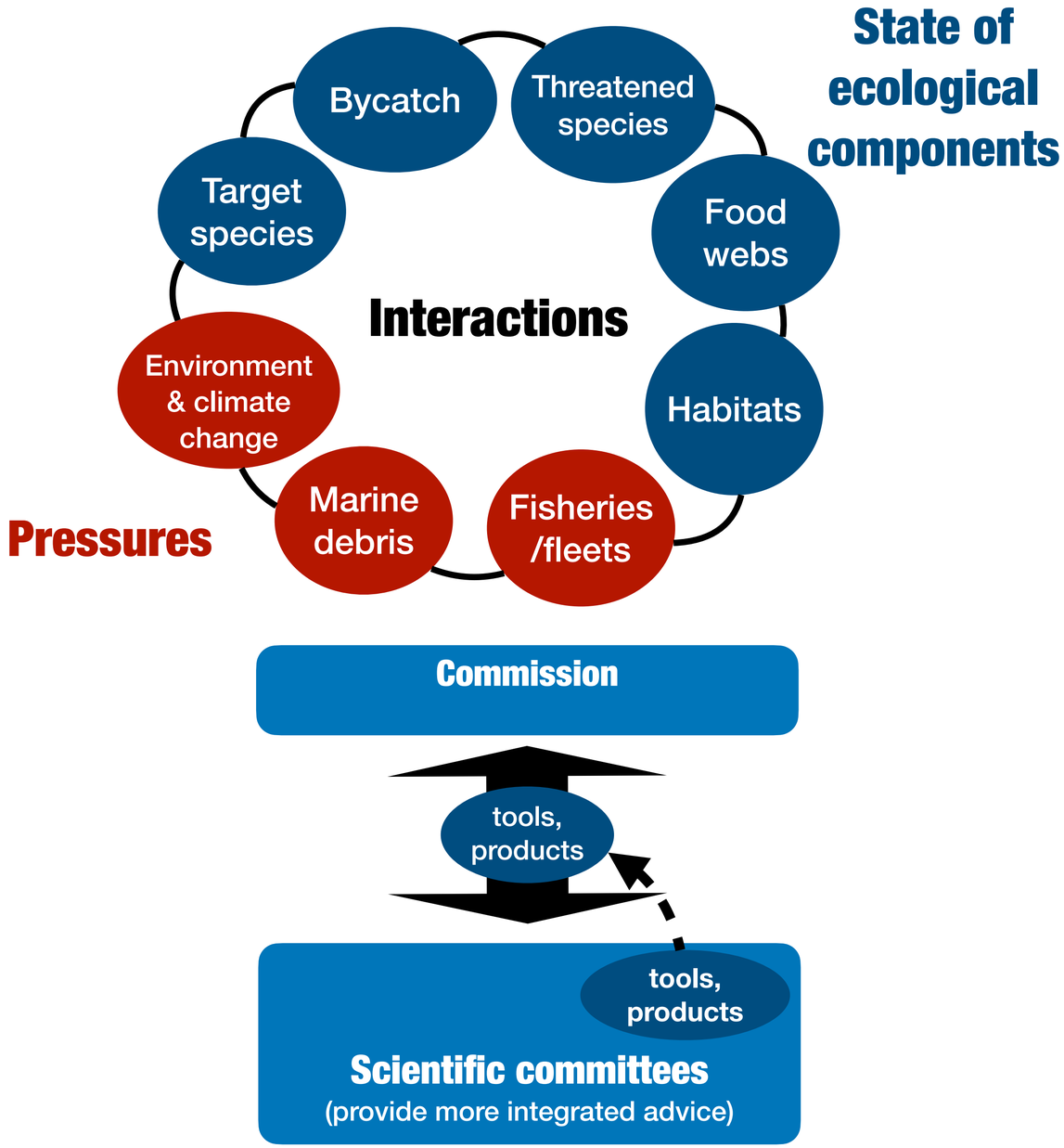
If this is correct,

What is it happening?

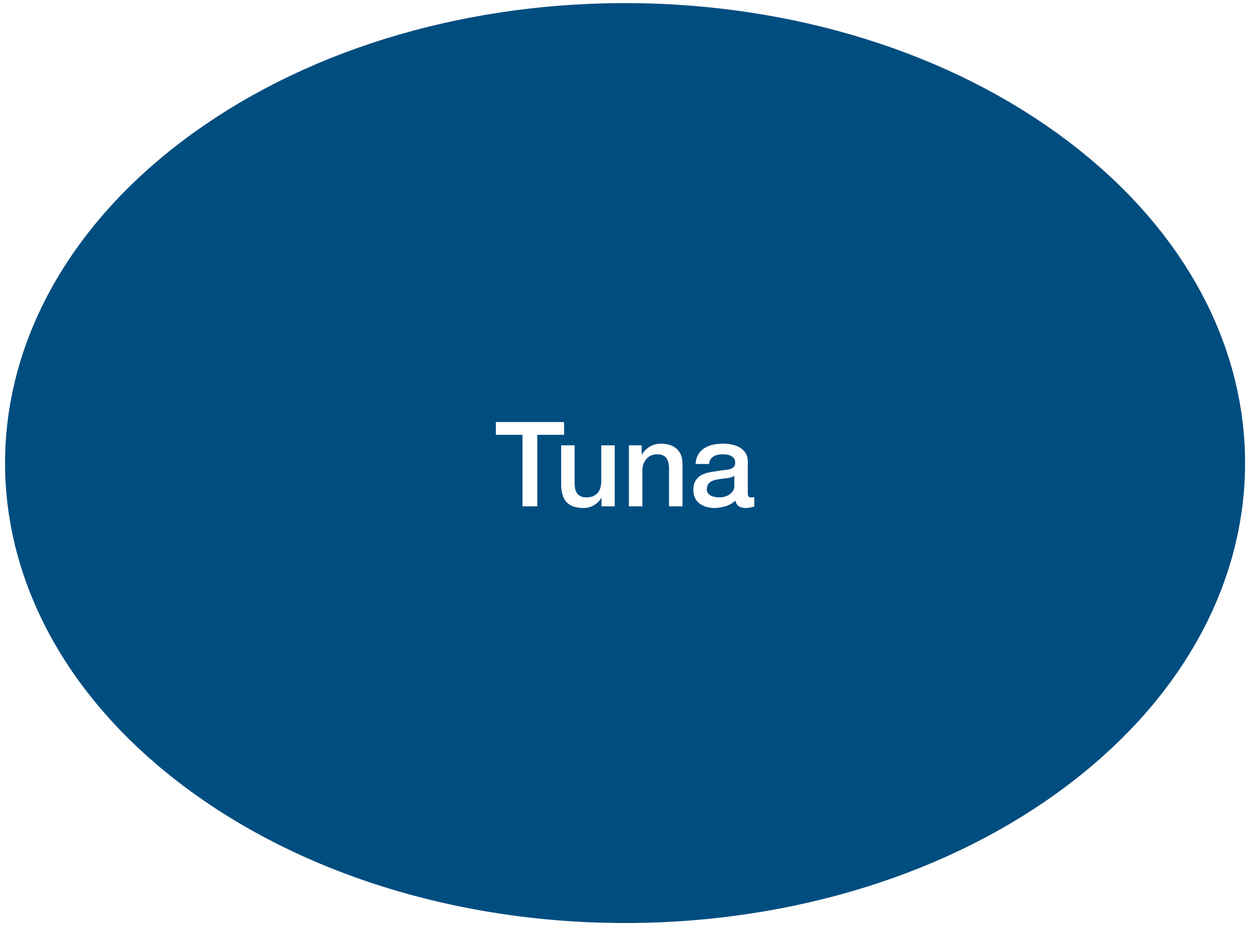
What are we doing wrong?

How can the current approach be improved?

Main impediments to implement EAFM

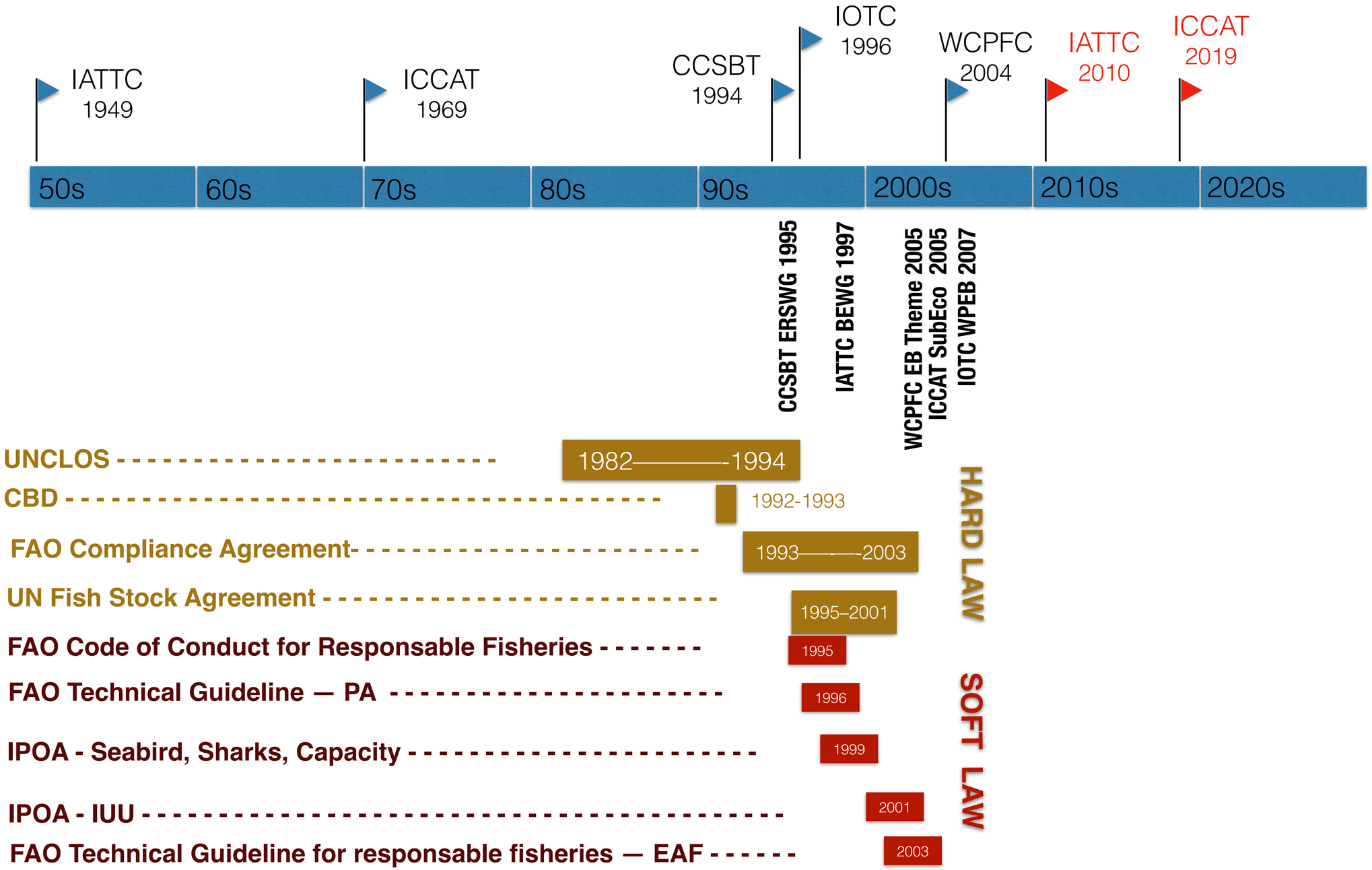


Traditionally a tuna RFMOs has focused on:



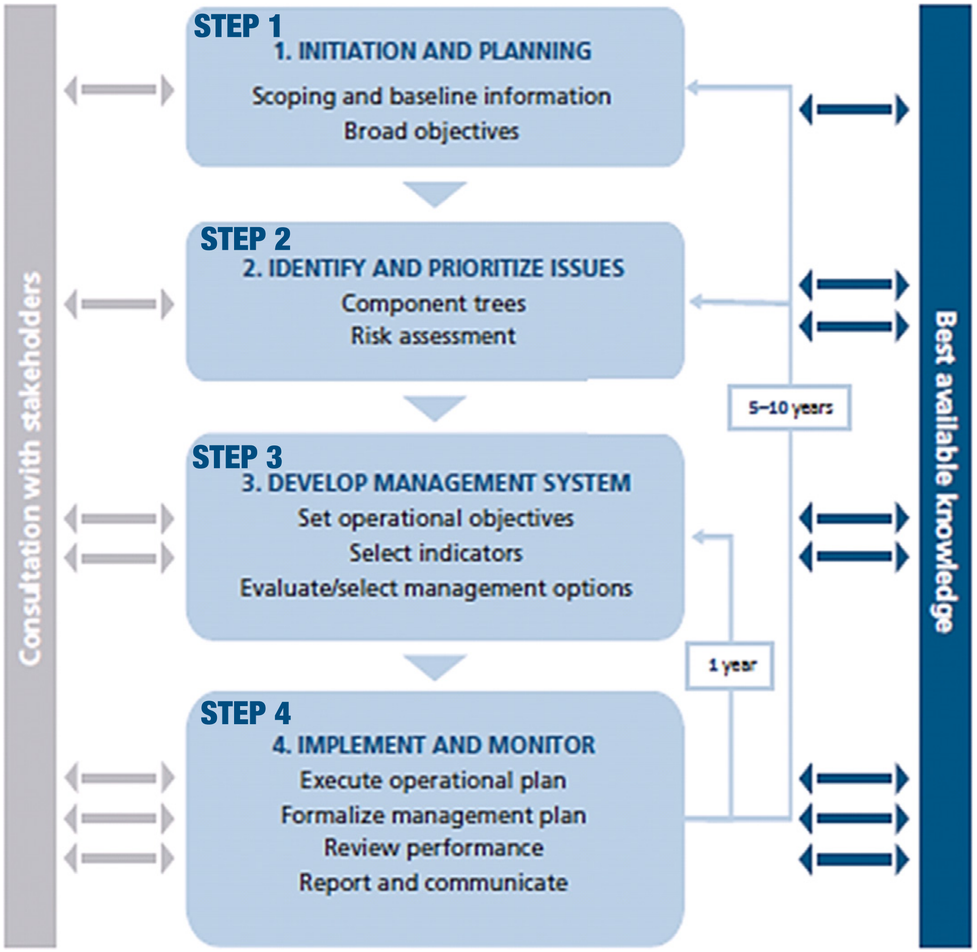
Lagging behind national efforts and other international institutions (ICES, NAFO) advising and implementing EAFM

Policy context - most ecosystem bycatch WGs created around 2005



A generic roadmap towards EAFM implementation

(Operational steps)



Source: FAO 2014. Bianchi et al 2016.

Ongoing efforts developing and testing traditional and emergent tools and advice products

(facilitating the integration of bycatch, ecosystem, climate, economics and social considerations in fisheries management advice)

Ecosystem models

EcoCards

Ecoregions

Risk assessments

Ecosystem status assessments

Climate models

Ecosystem fishery overviews

A generic roadmap towards EAFM implementation

(Operational steps)

DO WE HAVE A PLAN?

1. INITIATION & PLANNING

WHERE ARE WE NOW?
WHERE ARE WE GOING?

2. IDENTIFY AND PRIORITIZE ISSUES

HOW WILL WE GET THERE?

3. DEVELOP MANAGEMENT SYSTEM

HOW ARE WE DOING?

4. IMPLEMENT AND MONITOR

Source: FAO 2014. Bianchi et al 2016.

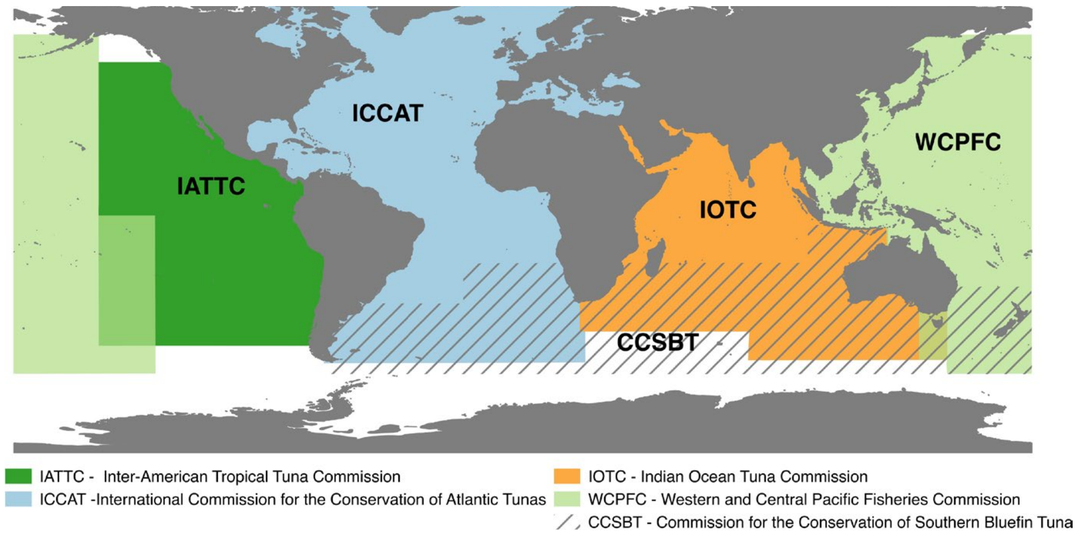
Traditional and emergent tools and advice products facilitating EAFM implementation in tuna RFMOs

Tools	Products
Ecoregions	
Ecological risk assessments	Ecosystem fisheries overviews/ecosystem considerations reports
Ecosystem and climate models	Ecosystem Report Cards and Ecosystem status assessments
	EAFM plans

DO WE HAVE A PLAN?

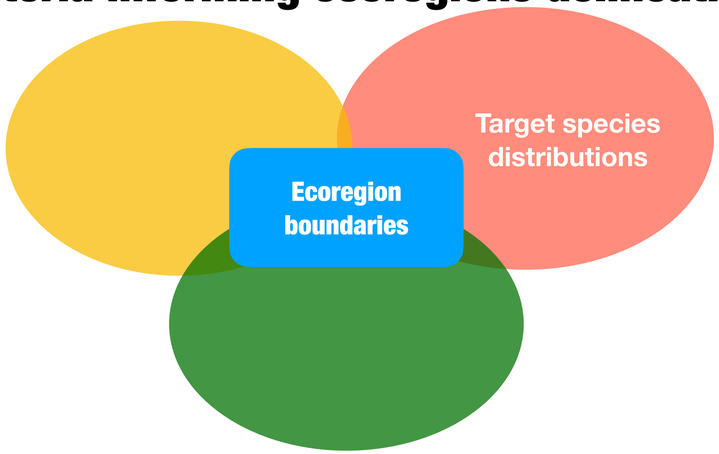
1. INITIATION & PLANNING

Ecoregion tool



- **Delineation of ecoregions**—ecologically meaningful and practical, spatial units—as a spatial framework to incentivize ecosystem planning, science and the development of advice products at the ecoregion level
- At **what spatial scale** should ecosystem tools and products be developed to effectively provide integrated advise?
- In 2017 we started to ask this question in **ICCAT and IOTC**
- **A process** started to identify spatial units - ecoregions
- **Framework to guide regionalization** (Purpose and potential uses, criteria to guide regionalization, methods, derivation of candidate ecoregions, validation)

Criteria informing ecoregions delineations



DO WE HAVE A PLAN?

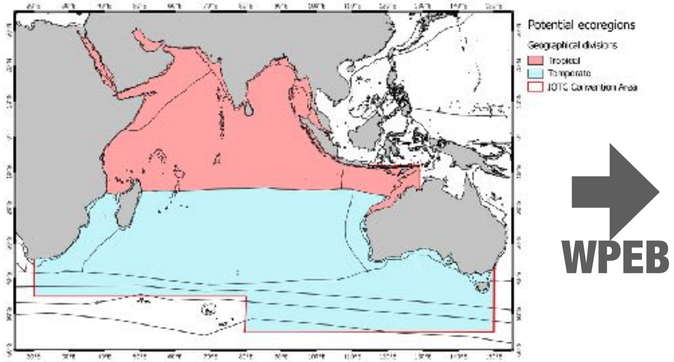
1. INITIATION & PLANNING

Ecoregion tool

IOTC WPEB

2017 MARE

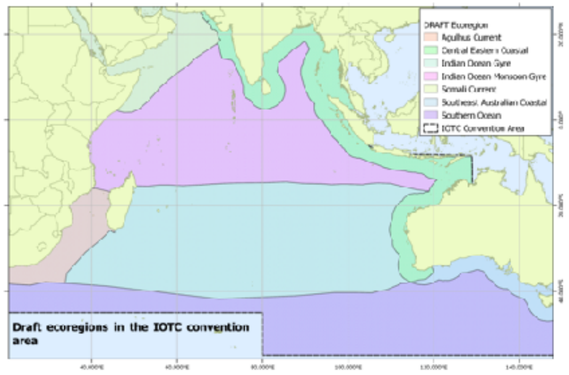
Preliminary ecoregion proposal



WPEB

2019 iotc etoi · FAO FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS · COMMON OCEANS

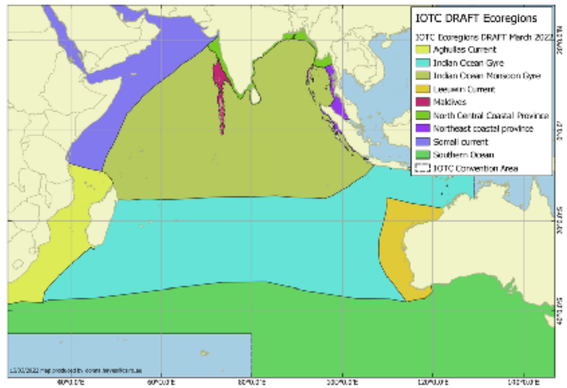
1st IOTC ecoregion workshop



WPEB

2022 iotc etoi · Fundación "la Caixa"

2nd IOTC ecoregion workshop

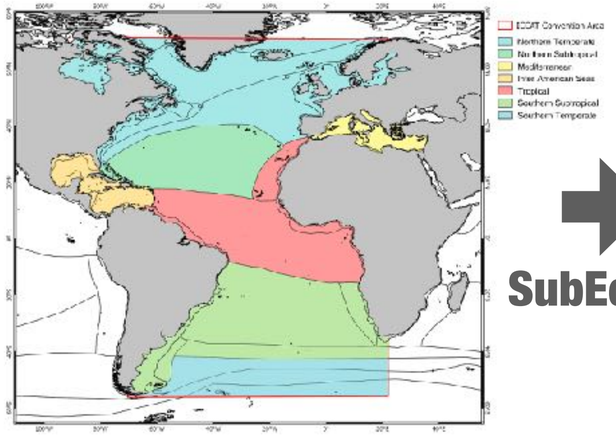


WPEB requested their validation and **pilot studies**

ICCAT SubEco

2017 MARE

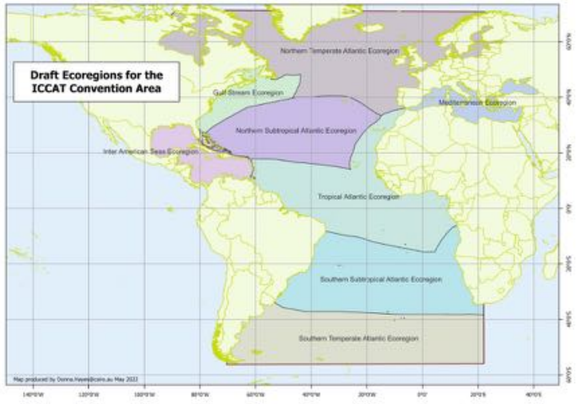
Preliminary ecoregion proposal



SubEco

2020-2022 ICCAT CICTA CICAA · Fundación "la Caixa"

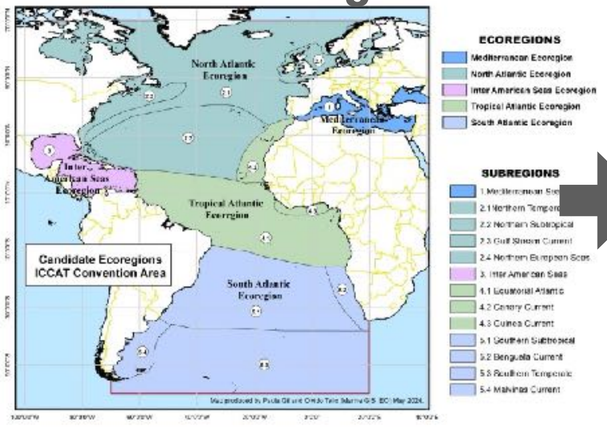
1st ICCAT ecoregion workshop



SubEco

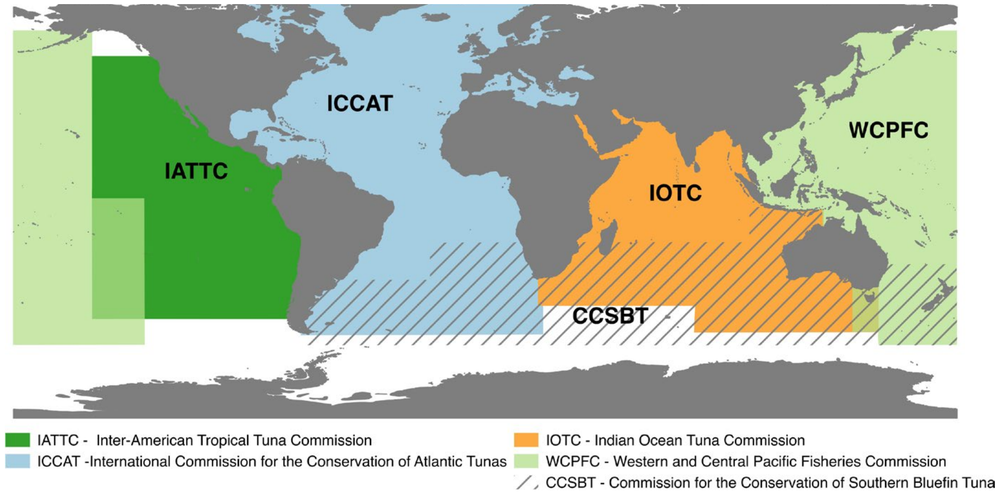
2022-2024 ICCAT CICTA CICAA

2nd ICCAT ecoregion workshop



SubEco requested their validation and **pilot studies**

Ecoregion tool



- Opportunities to learn from ICCAT and IOTC ecoregion process to inform processes in the other RFMOs

IATTC, WCPFC and CCSBT

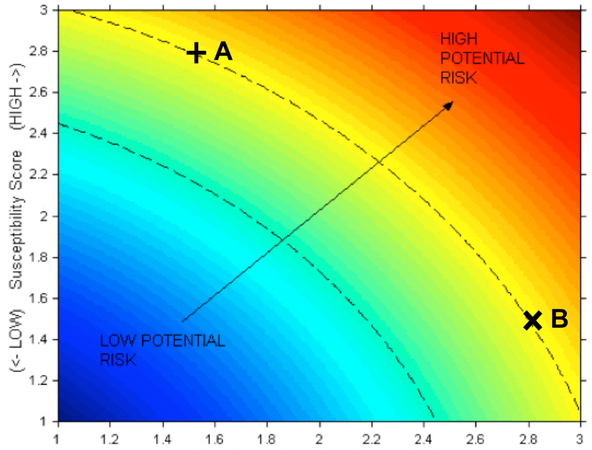
- No formal identification of ecoregions have been undertaken yet
- **IATTC** - Ongoing discussions and **plans** to potentially delineate ecoregions to support regional products like EcoCard
- **WCPCF** - Recognition that ecosystem and climate indicators being developed should be scalable across national, sub-regional and regional scales (without defining them explicitly)
- **CCSBT** - no discussions, yet this RFMO does not have a convention area

WHERE ARE WE NOW? WHERE ARE WE GOING?

2. IDENTIFY AND PRIORITIZE ISSUES

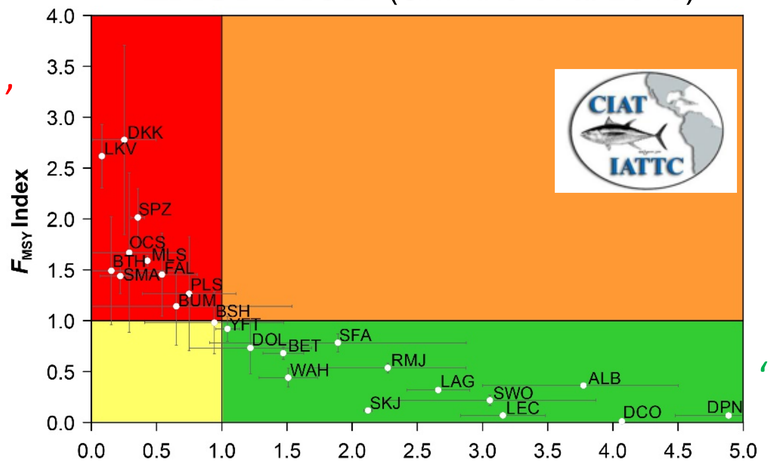
Ecological risk assessments - TOOL

Tradicional Ecological Risk Assessment (ERA) - PSA



Ecological Assessment for the Sustainable Impacts of Fisheries

EASI-Fish (Griffiths et al 2019)



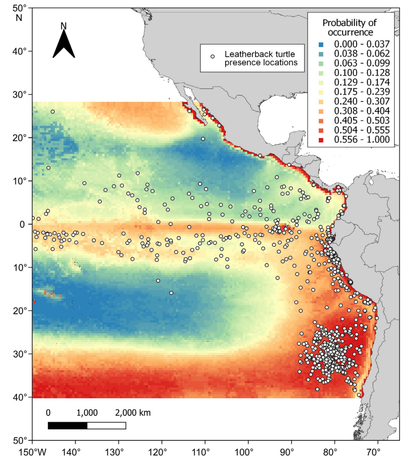
- **Ecological Risk Assessments (ERA-PSA)**
  - Prioritizing species vulnerable to tuna fisheries
  - **All tuna RFMOs have ERA-PSA** for individual vulnerable taxa groups and main fisheries
  - With **its limitations** (semi-quantitative, relative risks, no cumulative effects)
- **EASIFISH - spatially-explicit quantitative ERA tool (IATTC staff)**
  - Evaluate the **cumulative impacts** of multiple fisheries on data limited species
  - Determine species **vulnerability status** using established biological reference points
  - **Mitigation scenarios** - Alllow to evaluate the efficacy of different CMMs-bycatch mitigation method on the vulnerability status of the species

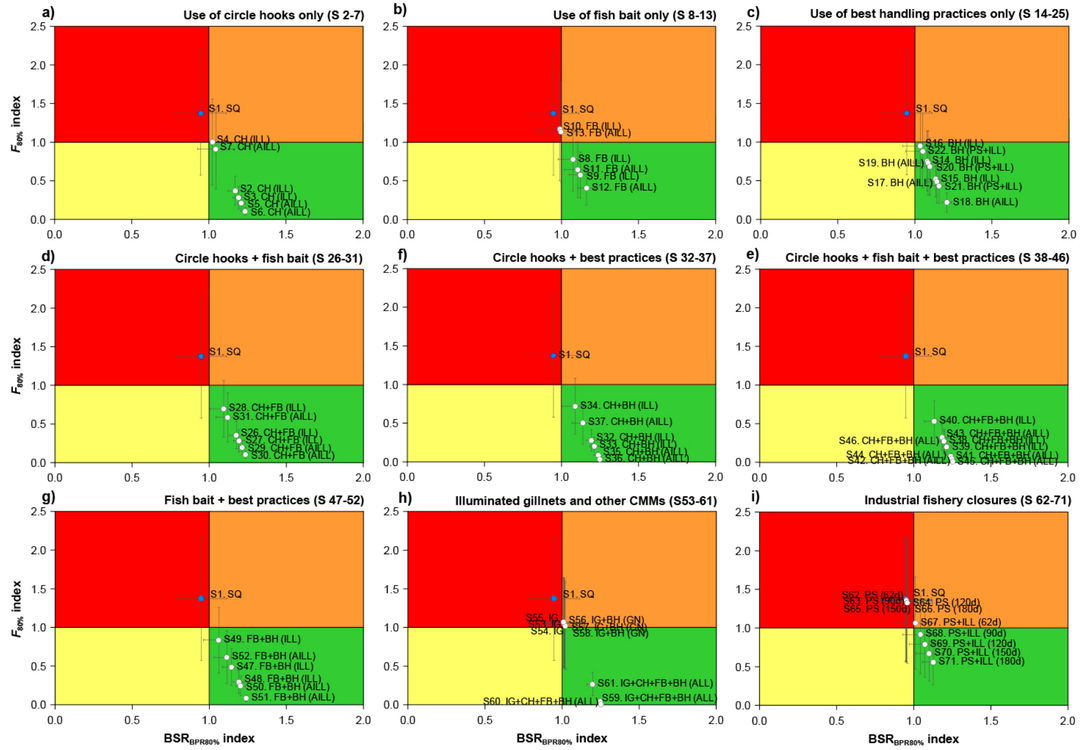
WHERE ARE WE NOW? WHERE ARE WE GOING?

2. IDENTIFY AND PRIORITIZE ISSUES

EASI-Fish

(Griffiths et al 2019)





Ecological risk assessments - TOOL

- **IATTC** - most active - developing SDMs and applying EASIFISH to several taxa/bycatch species (leatherback turtle, devil ray, 32 sharks, silky and hammerheads)
- **WCPFC** - active - developing SDMs and applying EASIFISH to 30+ shark and ray species
- **ICCAT** - active - EASIFISH applied to seabirds. Developing SDMs and applying EASIFISH for silky and devil rays (other species pending funding)
- **IOTC** - no active- plans - proposal stage (funding pending)
- **CCSBT** -Spatially Explicit Fisheries Risk Assessment (SEFRA)
- **Other types of risk assessments are underused** (ecosystem risk assessment, climate risk assessments etc…) to be applied in the context of tuna RFMOs

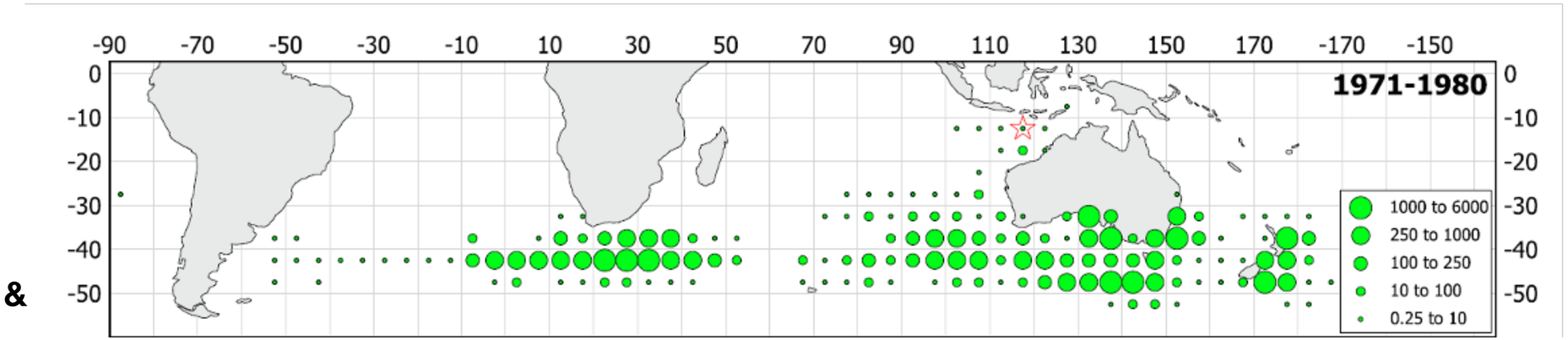
Ecological risk assessments - TOOL

CCSBT

- **Key issue:** interactions between SBT fisheries and seabirds. **Overall objective** to reduce or eliminate seabird bycatch-
- **Key action:** Adoption of **Multi-year Seabird Strategy** (2022, updated 2024) and **Action Plan**
- **Key tool : Spatially Explicit Fisheries Risk Assessment (SEFRA)** for seabirds (ongoing, most recently reviewed 2024).
  - **Fully quantitative method** to assess multiple species and fisheries simultaneously, **estimating total fatalities relative to biological reference points** as a function of spatial and temporal overlap of seabird distribution and fishing effort by fitting to observed captures.
- **Next steps:** finalize SEFRA risk assessment for seabirds for CCSBT Members' fisheries (2025), then **expand to a global (southern hemisphere) SEFRA for seabirds across all tuna RFMOs (early 2026).**

Southern bluefin tuna
Thunnus maccoyii

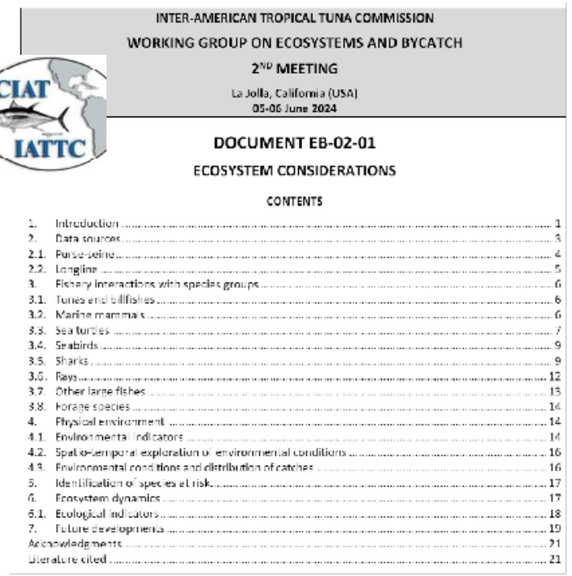
Albatross & petrels



WHERE ARE WE NOW? WHERE ARE WE GOING?

2. IDENTIFY AND PRIORITIZE ISSUES

Ecosystem Considerations Reports - PRODUCT



INTER-AMERICAN TROPICAL TUNA COMMISSION

WORKING GROUP ON ECOSYSTEMS AND BYCATCH

2ND MEETING

La Jolla, California (USA)

05-06 June 2024

DOCUMENT EB-02-01

ECOSYSTEM CONSIDERATIONS

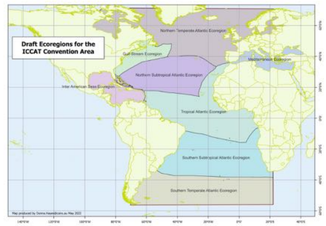
CONTENTS

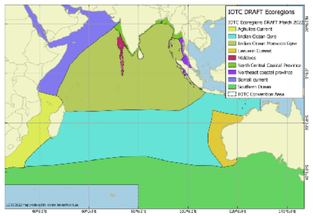
- **Ecosystem Considerations report, Overview and Status report, Ecosystem-Fishery Overview**
- Broadly **document and report** the scope of the fisheries in a region, their impacts and dynamics in the ecosystem, interactions with vulnerable taxa, etc
- **Increases the visibility** of ecosystem data and research
- To assist managers and scientists to **connect multiple elements**, look at the bigger picture
- Assist in the **identification of issues** and generation of hypothesis

Ecosystem Fishery Overview

SUMMARY of key signals (EcoCard)	ECOREGION DESCRIPTION	WHO IS FISHING *main countries- fleets main fisheries*	WHAT ARE WE FISHING *catches -landings and discars*
STATUS OF FISHERY RESOURCES *target species*	MIXED FISHERIES ADVISE *fisheries interactions species interactions*	FISHERIES MANAGEMENT *bycatch mitigation measures*	FISHERY MANAGEMENT PLANS
ENVIRONMENTAL & CLIMATE CHANGE EFFECTS	EFFECT OF FISHERIES ON THE ETP species & STATE OF ETP species *Shar/rays Seabirds Sea turtles Marine mammals*	EFFECT OF FISHERIES ON THE FOODWEB & STATE OF FOODWEB	SOCIO-ECONOMIC CONTEXT

IOTC WPEB20_24 **SCRS_2024_085**





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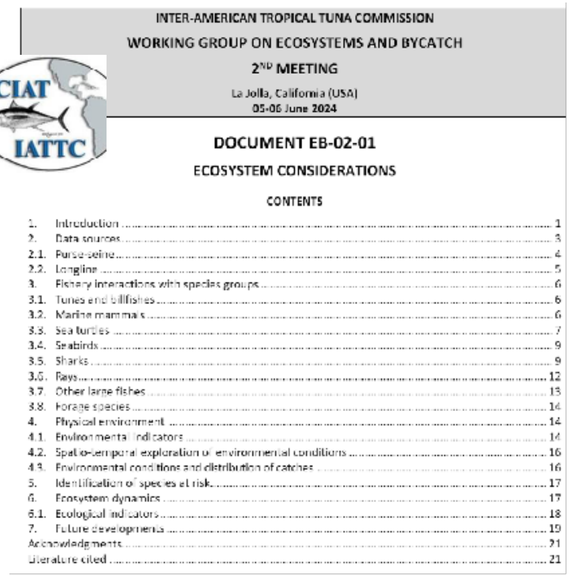

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CONTENTS

- **IATTC**
  - **Annual Ecosystem Considerations Report** (since 2003)
  - Has increased in length and intensity, no optimal for communicating ecosystem status
  - Now restructuring the EC report to improve communication into a practical EcoCard & Ecosystem status assessment (adopted a workplan in 2024)
- **WCPFC**
  - **Anual Overview and Status of Stocks** (since 2002)
  - Focuses on primary tuna stocks but also have an ecosystem and climate considerations sections
- **ICCAT and IOTC**
  - **Do not produce annual Ecosystem Considerations Reports**
  - A proposal to create **pilot Ecosystem-Fishery Overviews** for selected ecoregions (work underway)

Ecosystem Fishery Overview

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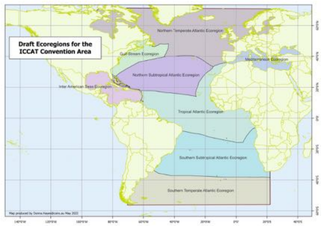
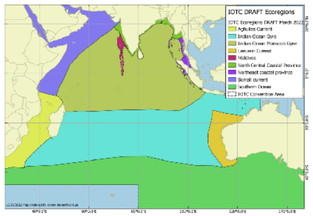




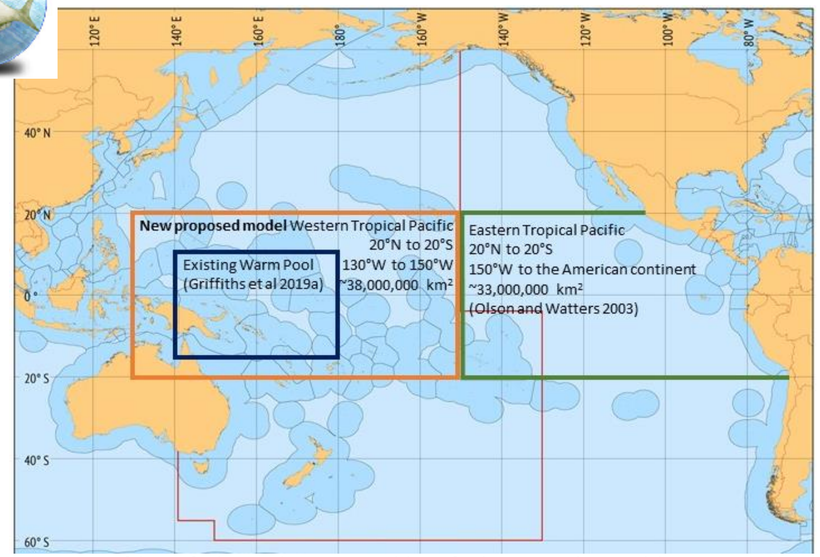
IOTC WPEB20_24 **SCRS_2024_085**

HOW WILL WE GET THERE?

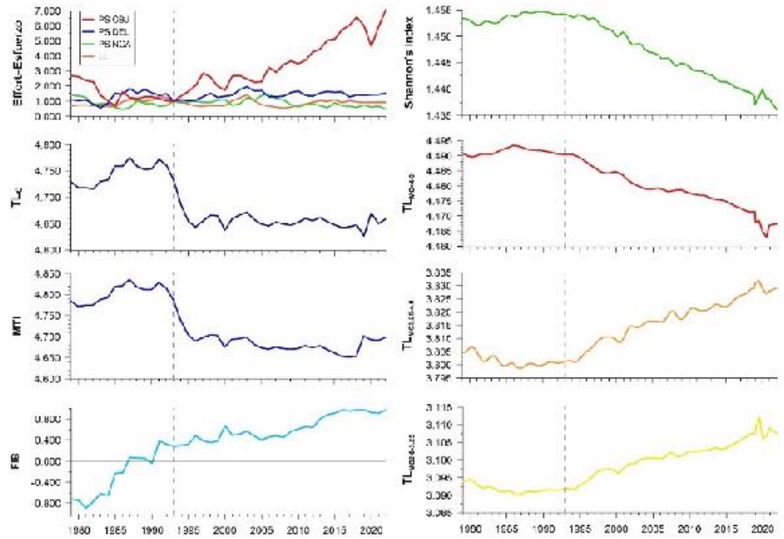
3. DEVELOP MANAGEMENT SYSTEM

Climate and ecosystem models - TOOLS

EwE - trophic mass-balance models



Ecological indicators



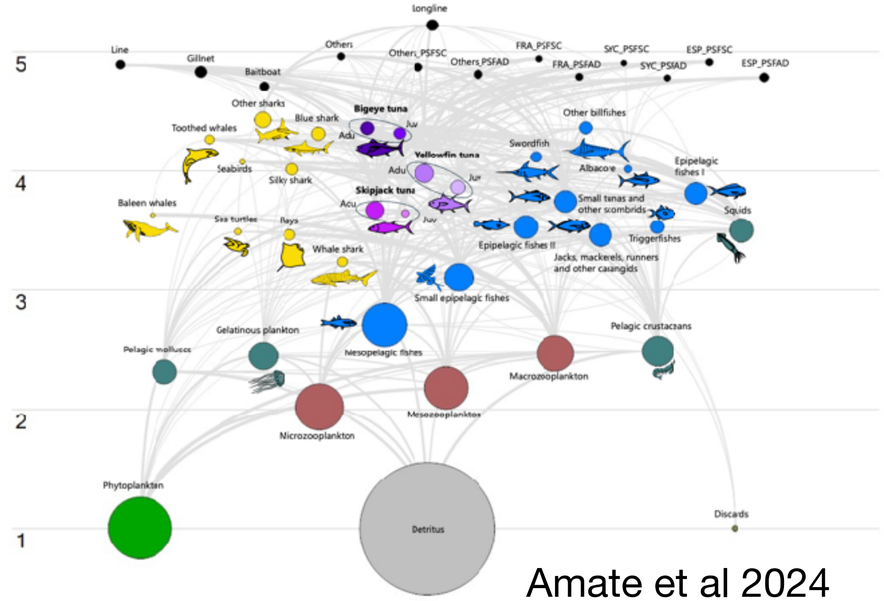
- Ecosystem/climate models to evaluate past/present/future effects of fishing and climate on ecosystem structure and function
- Potentially can provide **strategic and tactical advice**
- **Trophic mass-balance ecosystem models EwE**
  - **WCPFC** since 2002, multiple times updated, last update in 2021
  - **IATTC** since 2003, updated nearly annually since 2019
  - Produce **ecological indicators** which together inform on changes of the ecosystem over time
  - Model derived ecological indicators included in the IATTC EC Report /not in the WCPFC Report
  - Currently used as **surveillance indicators** not as operational indicators to activate management response

HOW WILL WE GET THERE?

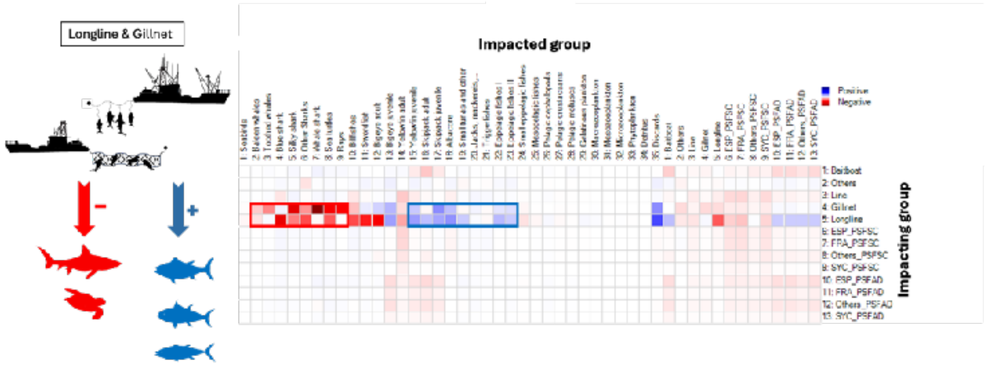
3. DEVELOP MANAGEMENT SYSTEM

Climate and ecosystem models - TOOLS

EwE - trophic mass balance models



Amate et al 2024



ICCAT and IOTC

- Very patchy/scarce modelling work (CPC driven)
- EwE model for the **North Atlantic Sargasso Sea/Gulf of Guinea** (not updated)
- Currently two EwE model underway in **Tropical Atlantic Ecoregion and Tropical Indian Ecoregions** to support management of tropical tuna species and associated ecosystems
- **Ongoing collaborations** with WCPFC-SPC and IATTC scientists to build the EwE models and generate similar ecosystem indicators
- **Project/CPC driven** - aspirations to sustaining as a long term activity and expand to other regions
- Proposal (funding pending) to develop EcoSpace/ APECOSM models

HOW WILL WE GET THERE?

3. DEVELOP MANAGEMENT SYSTEM

Climate and ecosystem models - TOOLS

Modelling past and future history of tuna and fisheries with SEAPODYM

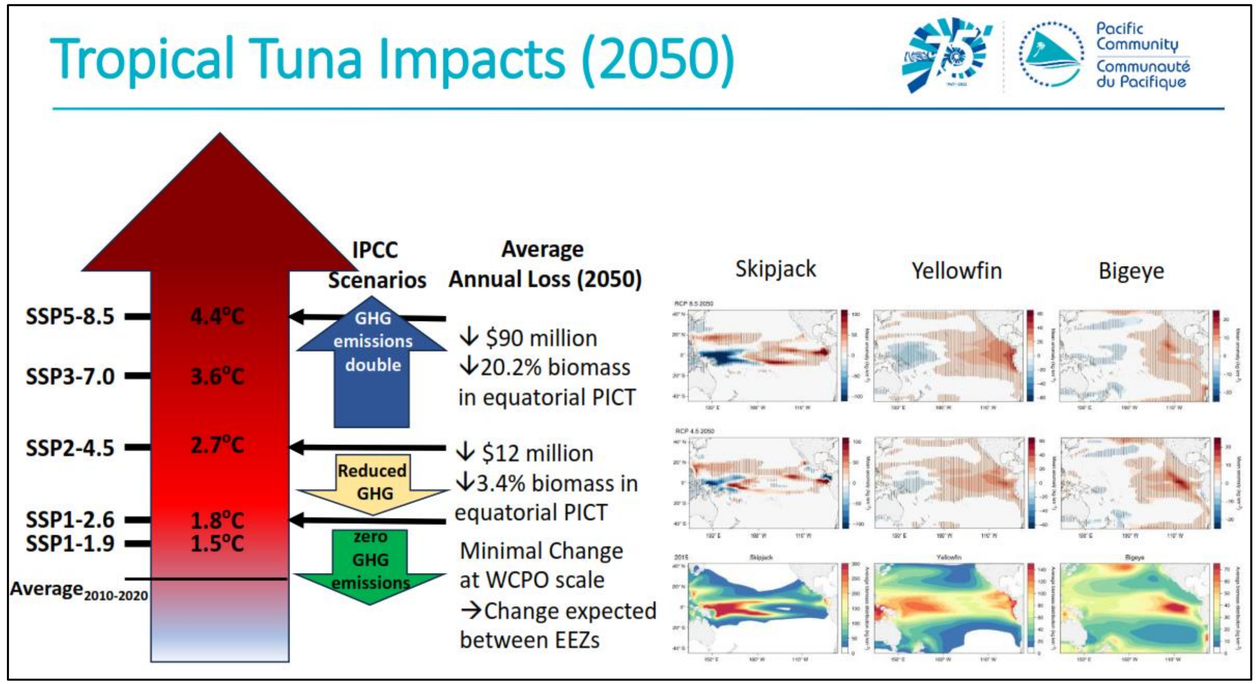


Figure 1. Five Intergovernmental Panel on Climate Change scenarios and the predicted potential effects, using the SEAPODYM model on the future biomass of tuna stocks in the WCPO. (Source: SPC. 2023)

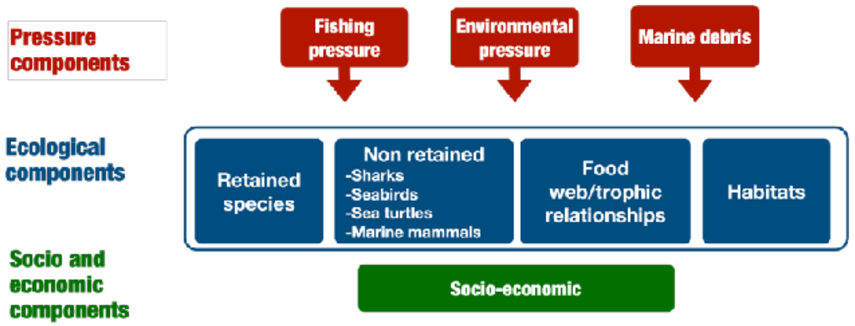
SEAPODYM

- Numerical model for investigating the **spatial and temporal distribution and abundance of tunas** under dynamic environmental scenarios and LMTL components
- **Since 1995 continuous developed** by SPC and CLS - applied tropical tunas and southern albacore at **Pacific-wide scale**
- **Use in the WCPFC** for advice and inform management decision
- **No used in IATTC** for advice
- WCPFC-SPC and IATTC ongoing discussions to collaborate (IATTC climate change workplan)
- **Common Oceans Project Activity** to apply it to tuna stocks in **ICCAT** Atlantic and **IOTC** Indian Oceans

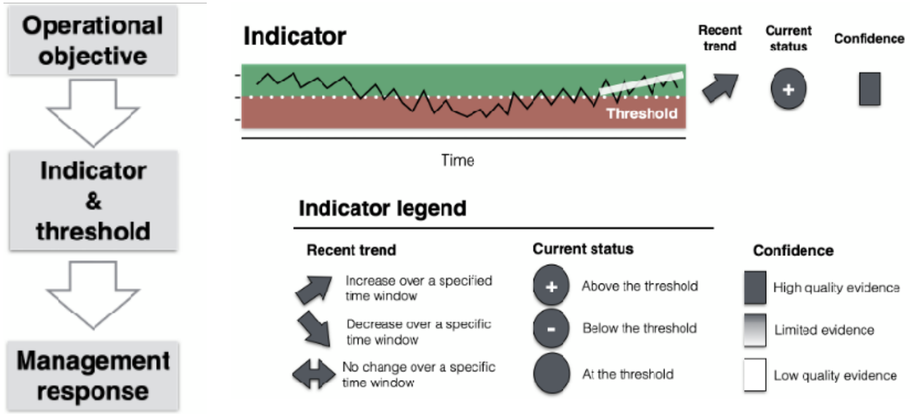
HOW WILL WE GET THERE?

3. DEVELOP MANAGEMENT SYSTEM

Conceptual framework



Operational framework



Ecosystem status assessments

EcoCard

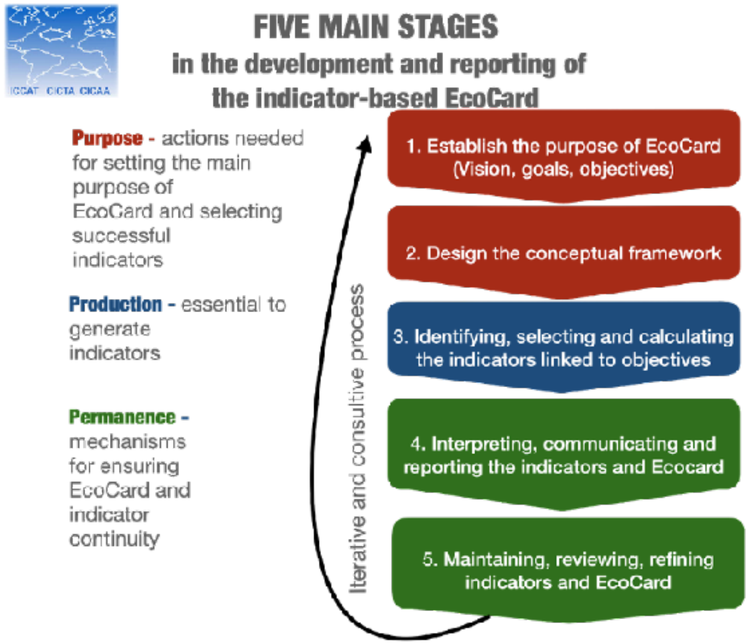
Ecosystem report cards and ecosystem status assessments - PRODUCTS

- Report on the **main pressures and the state** of the different components of ecosystems (and their linkages)
- Using a **selected set of relevant bycatch, ecosystem, climate indicators** (among others), chosen to “best” represent ecosystem status
- Linked to **objectives and thresholds** (when needed)
- **Highly visual communication tool**
- Associated **“Ecosystem Status Assessment”** to detail the full suite of indicators
- **EcoCard as a “snapshot”** to highlight key signals of the ecosystem in each region

HOW WILL WE GET THERE?

3. DEVELOP MANAGEMENT SYSTEM

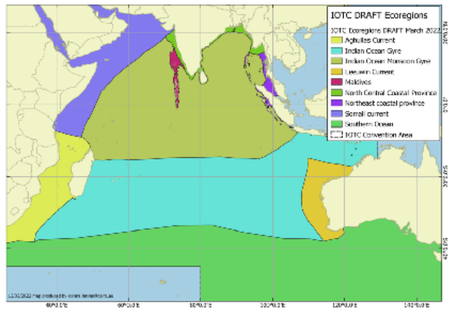
Ecosystem report cards and ecosystem status assessments - PRODUCTS

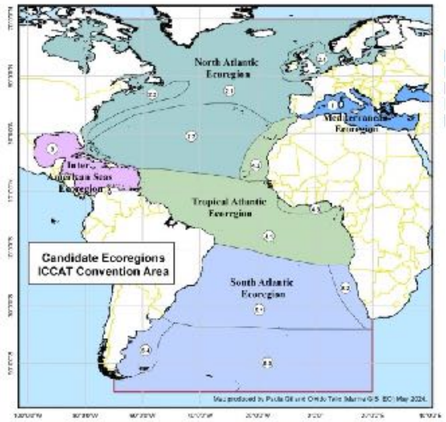


ICCAT and IOTC

- **Process started 2017** with guidelines (criteria select, calculate, assess, validate, interpret indicators)
- **Prototype EcoCard** presented to SC and Commission (small impact)
- Slow process due to complexity (intersessional EcoCard subgroup)
- **Pilot studies to regionalize the EcoCard**
  - **ICCAT:** Tropical Ecoregion, Mediterranean ecoregion, Inter-American Sea Ecoregion, Sargasso Sea
  - **IOTC:** Somali Current and tropical ecoregion

Pilot studies for selected ecoregions





HOW WILL WE GET THERE?

3. DEVELOP MANAGEMENT SYSTEM

Ecosystem report cards and ecosystem status assessments - PRODUCTS

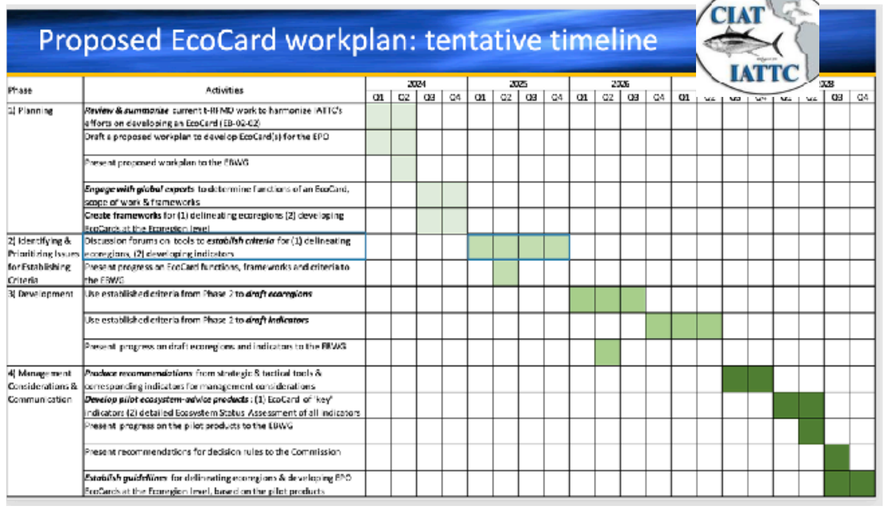
Report Card 1. Environment Indicators

Indicator	Description	Notes	Time-series
Sea Surface Temperature Anomalies (ANNEX 1 - A.1)			
Annual SST Anomaly	Mean annual SST anomaly (°C) across WCPO area	• Derived from ocean models • WCPO area western limit of 130°E • Anomaly from mean temperature 1993-2021	
	Mean annual SST anomaly (°C) across WCPO equatorial zone	• Derived from ocean models • Equatorial zone 5°S-5°N • Anomaly from mean temperature 1993-2021	
Nov-Apr Warm-pool SST Anomaly	Mean annual SST anomaly (°C) within warm-pool extent	• Derived from ocean models • Warm-pool defined by mean Nov-Apr temperature >29°C	
Warm-pool Indices (ANNEX 1 - A.2)			
Mean Size of Warm-pool	Approximate size of warm-pool in millions of km²	• Derived from ocean models • Warm-pool defined by mean Nov-Apr temperature >29°C	
Eastern Limit of Warm-pool Boundary	Longitude of strongest sea surface salinity boundary	• Derived from ocean models • Boundary defined as largest change over 10° distance	
Mean Warm-pool Mixed Layer Depth	Mean depth (m) of the mixed layer within warm-pool	• Derived from ocean models • Layer over which water temperature is homogenous	

5 indicative of El values < -0.5 Niña indicative of more , < 0 indicative of vents m1993-2021

SPC Secretariat of the Pacific Community

Western and Central Pacific Fisheries Commission



WCPFC

- 2016 a **general work plan** towards designing and testing ecosystem indicators
- 2019 and 2020 a **selection criteria and list of potential indicators**
- 2022 **initial report** to show examples of potential indicators to the SC to get authorization to develop them, then anual updates, co-production workshops

IATTC

- **Transitioning to EcoCard concept** and has endorsed its **own workplan**
  - **Development of framework** to identify main drivers/ pressures and ecosystem elements to monitor and spatial extent (e.g. ecoregions)
  - **Development of guidelines** (criteria select, calculate, assess, validate, interpret indicators)
  - **Development of advise product** (EcoCard plus Ecosystem Status Assessment)

A generic roadmap towards EAFM implementation

(Operational steps)

DO WE HAVE A PLAN?

1. INITIATION & PLANNING

WHERE ARE WE NOW?
WHERE ARE WE GOING?

2. IDENTIFY AND PRIORITIZE ISSUES

HOW WILL WE GET THERE?

3. DEVELOP MANAGEMENT SYSTEM

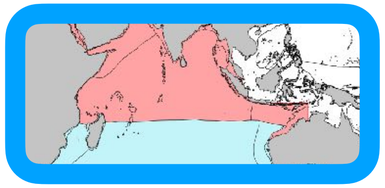
HOW ARE WE DOING?

4. IMPLEMENT AND MONITOR

Source: FAO 2014. Bianchi et al 2016.

Traditional and emergent tools and advice products facilitating EAFM implementation in tuna RFMOs

Tools and products

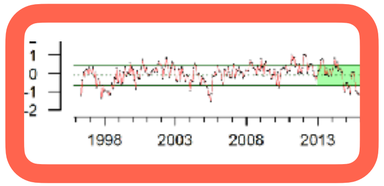


Ecoregions

Ecosystem models

?

Ecological risk assessment



EcoCard

A generic roadmap towards EAFM implementation

(Operational steps)

DO WE HAVE A PLAN?

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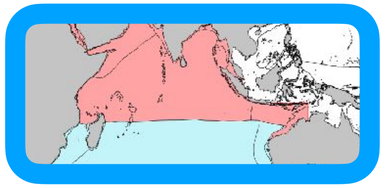
Traditional and emergent tools and advice products facilitating EAFM implementation in tuna RFMOs

Tools and products

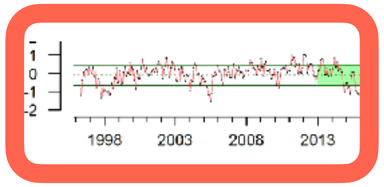


Ecoregions

EAFM plans

Ecological risk assessment

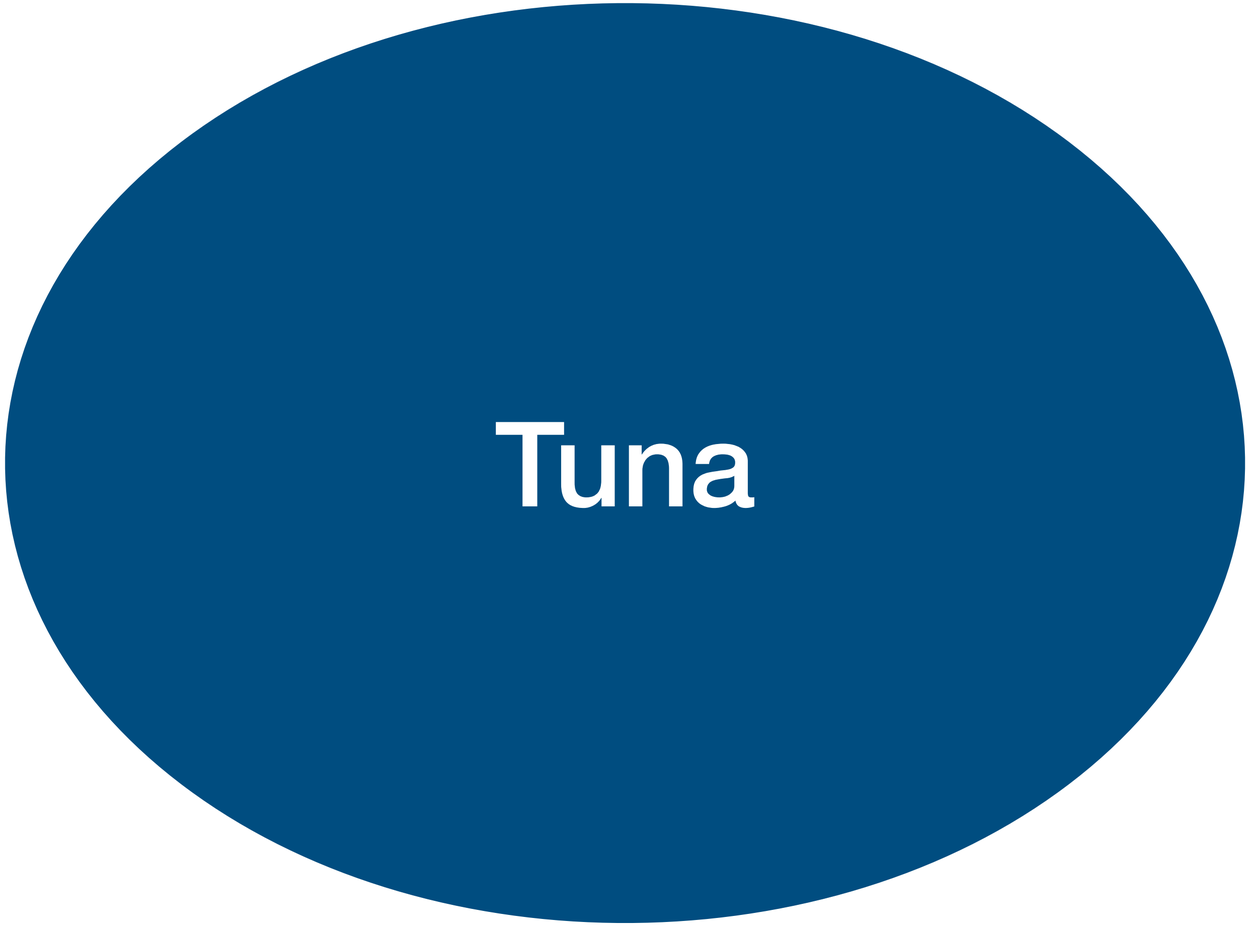
Ecosystem models

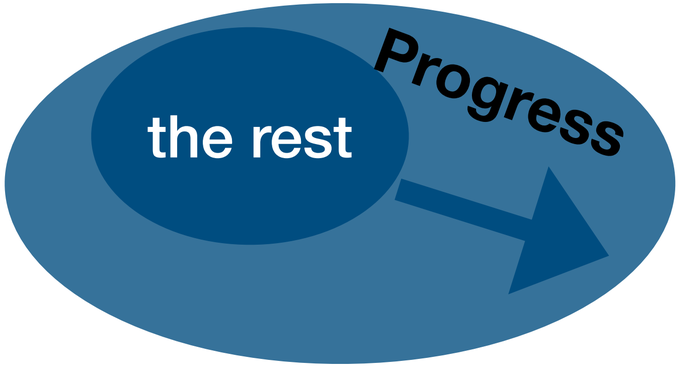


EcoCard

- These tools and product need to be connected and guided by a clear vision, objectives, and co-produced with stakeholder involvement and feedback

Traditionally a tuna RFMOs has focused on:





Tuna RFMOs are making progress,
yet slow and patchy

Key messages

- All tunas RFMOs have committed to operationalize EAFM
- Both **traditional and emergent tools and products** are being developed to more effectively integrate bycatch, ecosystem and climate considerations into fisheries advice for decisions making
- Their **stage of development varies** across tuna RFMOs (early stages to advance stages)
- They **differ in complexity and data requirements**
- They have **specific purposes** - important to have tools covering all the steps of the EAFM road map to support strategic and tactical advise
- It is **timely to harmonize efforts** across tuna RFMOS to adapt and standardize tools and ecosystem-advice products (Common Oceans Project - a great platform)
- **Regular feedback and engagement with the Commission** and relevant stakeholders from the outset are crucial (learning from MSE process)

Thanks!

Valerie Allain, Diego Alvarez-Berastegui, Eider Andonegi Dan Crear, Martin Cryer, David Die, Leanne Fuller, Shane Griffiths, Laurie Kell, Jon Lopez, Simon Nicol, Joe Scutt Phillips, Hilario Murua