# Plan de trabajo de cambio climático (SAC-15-12)
# Climate change workplan (SAC-15-12)

**INTER-AMERICAN TROPICAL TUNA COMMISSION**

**SCIENTIFIC ADVISORY COMMITTEE**

**15TH MEETING**

**La Jolla, California (USA)**
**10-14 June 2024**

## DOCUMENT SAC 15-12

## A CLIMATE CHANGE WORKPLAN FOR THE IATTC

Dan Crear, Jon Lopez, Leanne Fuller and Alexandre Aires-da-Silva

# Calendario propuesto para el cambio climático
# Climate change proposed timeline

| Phase | Activities | 2024 | | | | 2025 | | | | 2026 | | | | 2027 | | | | 2028 | | | | 2029 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| 1) Planning | Review of and share available frameworks and tools | | | | | | | | | | | | | | | | | | | | | | | | |
| | Develop white paper of review and workplan proposal | | | | | | | | | | | | | | | | | | | | | | | | |
| | SAC/Comission Meeting: Share climate change resources and proposal with members | | | | | | | | | | | | | | | | | | | | | | | | |
| | Establish Terms of Reference (TOR) for climate change workshops | | | | | | | | | | | | | | | | | | | | | | | | |
| 2) Decide on scope and goals | Workshop to develop scope | | | | | | | | | | | | | | | | | | | | | | | | |
| | SAC/Comission Meeting: Share/adopt scope | | | | | | | | | | | | | | | | | | | | | | | | |
| 3) Develop framework | Workshop to develop framework | | | | | | | | | | | | | | | | | | | | | | | | |
| | SAC/Comission Meeting: Share/adopt framework | | | | | | | | | | | | | | | | | | | | | | | | |
| 4) Creating tools | Strategic tool development | | | | | | | | | | | | | | | | | | | | | | | | |
| | Workshop for sharing and developing strategic tools | | | | | | | | | | | | | | | | | | | | | | | | |
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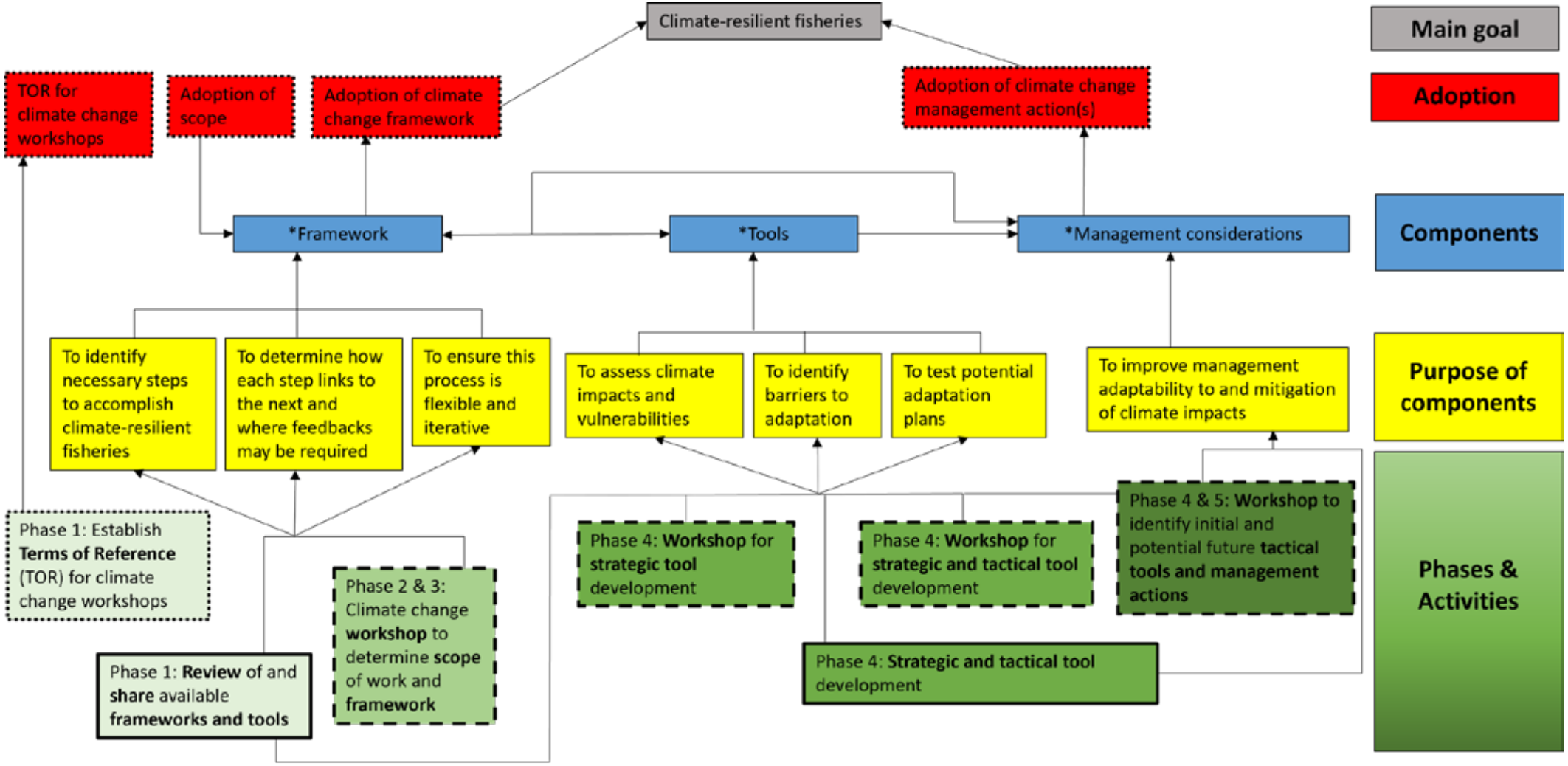
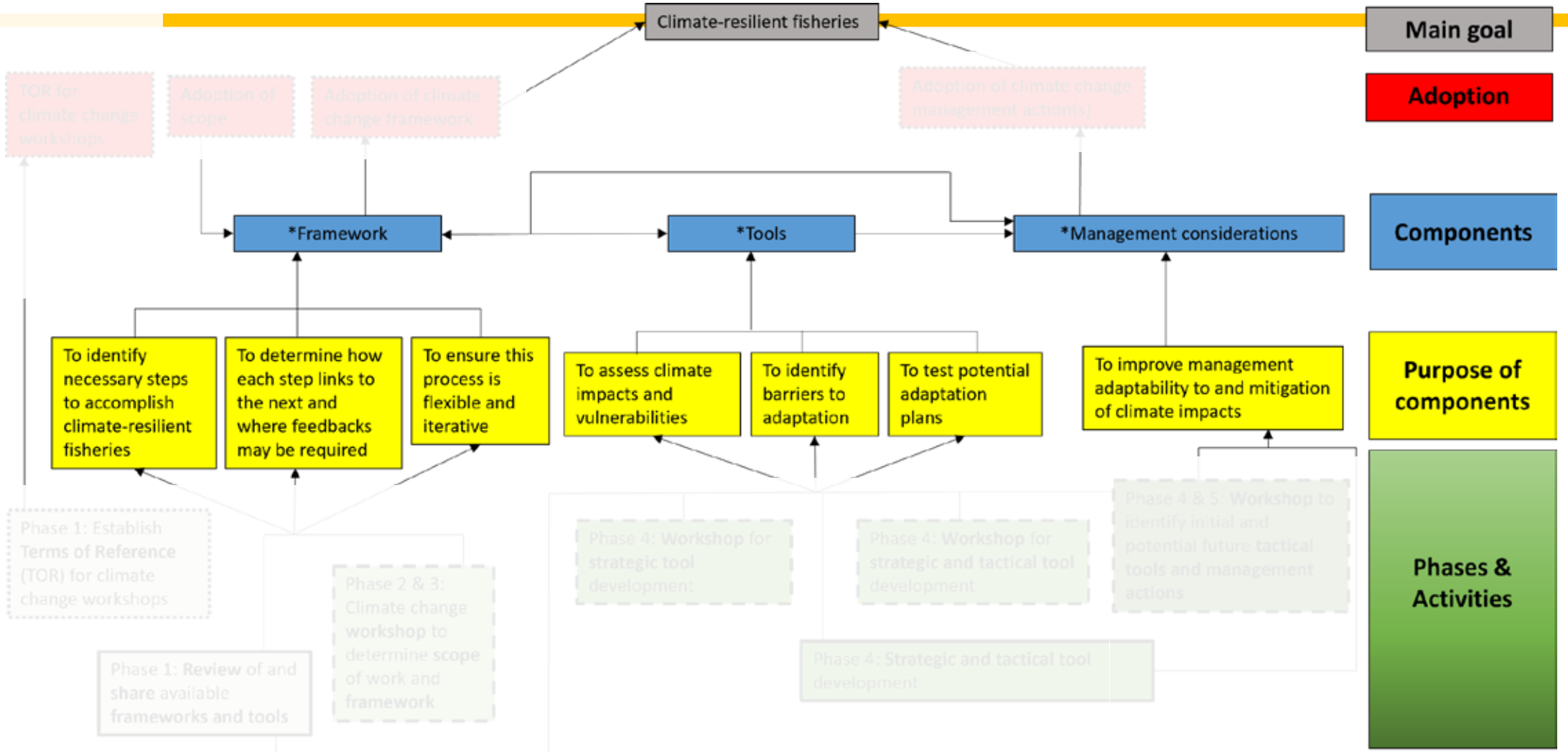
| Tool Implentation & Action | SAC/Comission Meeting: Recommend tool implementation/ management action | | | | | | | | | | | | | | | | | | | | | | | | |
| | Implementation | | | | | | | | | | | | | | | | | | | | | | | | |

# Diagrama del plan de trabajo sobre el cambio climático
# Climate change workplan diagram



# Plan de trabajo propuesto sobre el cambio climático
# Climate change proposed workplan



# Términos de referencia para los talleres de CC (IATTC-102-INF-B)
# Terms of reference for CC workshops (IATTC-102-INF-B)

**INTER-AMERICAN TROPICAL TUNA COMMISSION**

**102nd MEETING**

**Panama, Panama**
**02-06 September 2024**

## IATTC-102 INF-B

## TERMS OF REFERENCE FOR CLIMATE CHANGE WORKSHOPS

# TDR - Antecedentes
# TOR - Background

- La Resolución C-23-10 establece que el EBWG, el CCA y la Comisión:
  - Incluirán el cambio climático como punto de la agenda en futuras reuniones.
  - Considerarán la mejor información científica disponible sobre la relación entre el cambio climático, las especies objetivo, las especies no objetivo, y los ecosistemas en el OPO.
- En respuesta, el personal de la CIAT preparó SAC-15-12:
  - Llevó a cabo una revisión de las herramientas y marcos de trabajo para el clima desarrollados por otras organizaciones.
  - Desarrolló un plan de trabajo que promueve pesquerías atuneras resistentes al clima en el OPO que incluye múltiples talleres de partes interesadas y expertos
- Este documento (**SAC-15-12**), fue presentado durante el EBWG-02 y el SAC-15 y recibió un amplio apoyo.
- Como parte de la 1ª fase del plan de trabajo (i.e., Planificación), se establecerán los términos de referencia (TdR) para los talleres sobre cambio climático.
- **El primer taller para desarrollar los objetivos, el alcance y el marco de trabajo está previsto, provisionalmente, para principios de la primavera de 2025.**
- **Los talleres brindarán al personal la oportunidad de trabajar y debatir componentes importantes del plan de trabajo con las partes interesadas, los CPC y los expertos pertinentes.**

- Resolution C-23-10 states that the EBWG, SAC, and Commission will:
  - Include climate change as an agenda item in future annual meetings.
  - Consider the best scientific information available on the relationship between climate change, target species, non-target species, ecosystems in the EPO.
- In response, IATTC staff prepared SAC-15-12:
  - Conducted a review of climate-ready tools and frameworks developed my other organizations.
  - Developed a workplan that promotes climate-resilient tuna fisheries in the EPO which includes multiple stakeholder and expert workshops
- This document (**SAC-15-12**), was presented during the EBWG-02 and SAC-15 and received ample support.
- As part of the 1st phase of the workplan (i.e., Planning), terms of references (ToRs) for climate change workshops are to be established.
- **The first workshop to develop the goals, scope, and framework is planned, tentatively, for early Spring 2025.**
- **Workshops will bring opportunities for the staff to work and discuss important components of the workplan with relevant stakeholders, CPCs, and experts.**

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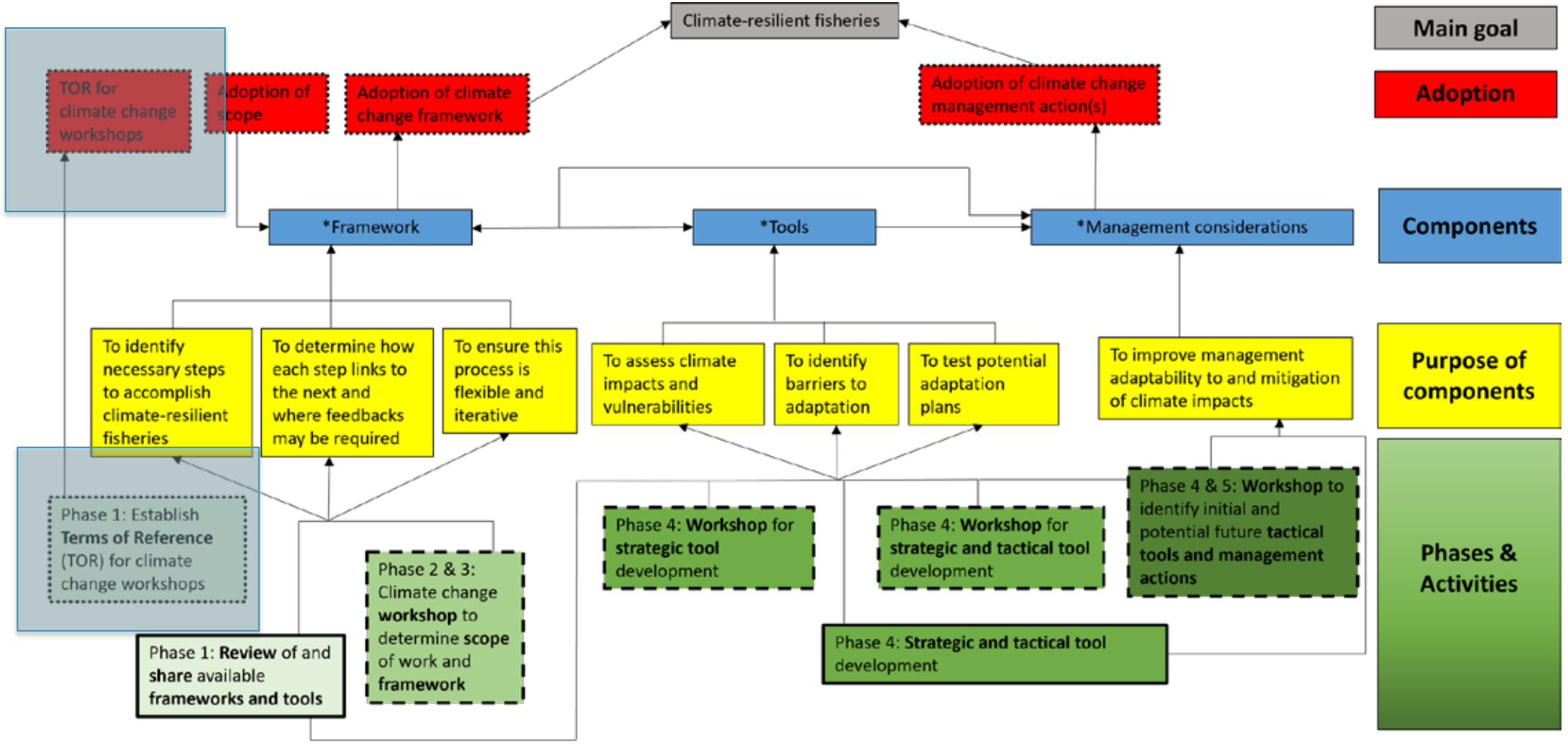

# Borrador de Términos de referencia para los talleres sobre cambio climático (IATTC-102-INF-B)
# Draft of Terms of references for climate change workshops (IATTC-102-INF-B)

1. Los Talleres **proponen discutir** (sin excluir otros temas):
   a. Alcance y objetivos de los trabajos
   b. Marco trabajo para la pesca resiliente al clima
   c. Identificación y desarrollo de herramientas estratégicas
   d. Identificación y desarrollo de herramientas tácticas, incluyendo acciones de gestión
2. **Organizados y facilitados** por el personal de la CIAT.
3. Celebrados por **videoconferencia o en persona**.
4. **Abiertos a la participación de las partes interesadas pertinentes** (científicos, gestores pesqueros, industria pesquera, ONG, expertos).
5. **Facilitar un proceso estructurado** para que la Comisión considere las actividades y fases del plan de trabajo y su implementación.
6. **Mejorar la comunicación y fomentar el entendimiento mutuo** en asuntos relacionados con la evaluación y mitigación de los efectos del cambio climático y la promoción de pesquerías resistentes al clima.
7. El **EBWG y el CCA** revisarán los resultados de los talleres y proporcionarán información adicional según sea necesario.
8. Las **conclusiones y recomendaciones** alcanzadas serán **presentadas** en la reunión anual de la **Comisión**, para su consideración y aprobación según proceda
9. El personal de la CIAT presentará un informe de cada Taller al CCA y posteriormente a la Comisión, que podrá incluir **actualizaciones y un resumen de los avances** realizados hasta la fecha

1. The Workshops will **set out to achieve** (not excluding others):
   a. Scope and goals of work
   b. Climate-resilient fisheries framework
   c. Strategic tool identification and development
   d. Tactical tool identification and development, including management action
2. **Organized and facilitated** by IATTC staff
3. Held by **videoconference or in person**
4. **Open to participation of relevant stakeholders** (scientists, fishery managers, fishing industry, NGOs, global experts)
5. **Facilitate a structured process** for the Commission to consider activities and phases of the workplan and its implementation
6. **Enhance communication and foster mutual understanding** on matters related to the assessment and mitigation of climate change effects and the promotion of climate-resilient fisheries
7. The **EBWG and the SAC** will review the outcomes from the workshops and provide additional feedback as needed
8. Any **conclusions and recommendations** reached will be **presented** at the annual meeting of the **Commission**, for its consideration and endorsement as appropriate
9. The IATTC staff shall present a report for each Workshop to the SAC and subsequently to the Commission, which may include **updates, and a summary of the progress** made so far

# Laboratorio de Achotines y cambio climático: Estudios sobre los efectos del cambio climático en los atunes

# Achotines Lab and Climate Change: Studies on Climate Change Effects on Tunas

Since 2011, the Early Life History Group has conducted studies of the **effects of climate change on the pre-recruit life stages of YFT**. This research has utilized a combination of **experimental and modeling studies** conducted mostly at the Achotines Laboratory.

The studies have focused on the effects of **ocean warming, ocean acidification and hypoxia** on the **survival, growth, physiology and behavior of egg and larval stages of YFT**.

## Publications resulting from this research include:


Heuer, R.M., Y. Wang, C. Pasparakis, W. Zhang, V. Scholey, D. Margulies and M. Grosell. 2023. **Effects of elevated CO2 on metabolic rate and nitrogenous waste handling in the early life stages of yellowfin tuna (*Thunnus albacares*).** Comparative Biochemistry and Physiology, Part A 280: 111398. https://doi.org/10.1016/j.cbpa.2023.111398

Wexler, J.B., D. Margulies, V. Scholey, C. E. Lennert-Cody, D. Bromhead, S. Nicol, S. D. Hoyle, M. Stein, J. E. Williamson, J. Havenhand 2023. **The effect of ocean acidification on otolith morphology in larvae of a tropical, epipelagic fish species, yellowfin tuna (*Thunnus albacares*)**. Journal of Experimental Marine Biology and Ecology 10.1016. https://doi.org/10.1016/j.jembe.2023.151949

Nicol, S., P. Lehodey, I. Senina, D. Bromhead, A. Frommel, J. Hampton, J. Havenhand, D. Margulies, P. Munday, V. Scholey, J. Williamson, and N. Smith. 2022. **Ocean futures for the world's largest yellowfin tuna population under the combined effects of ocean warming and acidification.** Frontiers in Marine Science 9: 816772. https://doi.org/10.3389/fmars.2022.816772

Heuer, R.M., Y. Wang, C. Pasparakis, V. Scholey, D. Margulies and M. Grosell. 2020. **Effects of elevated CO2 on yellowfin tuna (*Thunnus albacares*) early life stage respiration and ammonia excretion.** Journal of the Federation of American Societies for Experimental Biology 34(S1): 1-1. https://doi.org/10.1096/fasebj.2020.34.s1.09653

Frommel, A.Y., D. Margulies, J.B. Wexler, M.S. Stein, V.P. Scholey, J.E. Williamson, D. Bromhead, S. Nicol, and J. Havenhand. 2016. **Ocean acidification has lethal and sub-lethal effects on larval development of yellowfin tuna, *Thunnus albacares*.** J. Exp. Mar. Biol. Ecol. 482: 18-24. https://doi.org/10.1016/j.jembe.2016.04.008

Margulies, D., V. P. Scholey, J. B. Wexler, and M. S. Stein. 2016**. Research on the reproductive biology and early life history of yellowfin tuna *Thunnus albacares* in Panama.** Pages 77-144 In: Advances in Tuna Aquaculture, D. Benetti, G. Partridge, and A. Buentello (editors), Elsevier-Academic Press.

Bromhead, D., V. Scholey, S. Nicol, D. Margulies, J. Wexler, M. Stein, S. Hoyle, C. Lennert-Cody, J. Williamson, J. Havenhand, T. Ilyina, and P. Lehodey. 2015. **The potential impact of ocean acidification upon eggs and larvae of yellowfin tuna (*Thunnus albacares*).** Deep Sea Res. Part II, Top. Stud. Oceanogr.113: 268-279. https://doi.org/10.1016/j.dsr2.2014.03.019

Scholey, V., D. Bromhead, D. Margulies, S. Nicol, J. Wexler, M. Santiago, J.E. Williamson, S. Hoyle, P. Schlegel, J. Havenhand, T. Ilyina, and P. Lehodey. 2012. **Novel research into the impacts of ocean acidification upon tropical tuna.** Pelagic Fisheries Research Program Newsletter 16(1): 1-8.

Wexler, J.B., D. Margulies, and V.P. Scholey. 2011. **Temperature and dissolved oxygen requirements for survival of yellowfin tuna, *Thunnus albacares*, larvae.** J. Exp. Mar. Biol. Ecol. 404: 63-72

# Laboratorio de Achotines: Futuras investigaciones sobre los efectos del cambio climático en los atunes
# Achotines Lab: Future Research Related to Climate Change Effects on Tunas

The IATTC Early Life History Group, in collaboration with the Ecosystem and Bycatch, and Stock Assessment Groups, is developing a **long-term research plan to investigate the effects of climate change on tunas**.

The studies will investigate the **effects of climate change on the survival, growth, physiology, behavior and genetics of pre-recruit, juvenile or adult stages of tunas**. Experimental results will be used to inform physical-biological interaction models to describe the effects of climate change on tunas.

## Specific Topics of Study:

### Effects of Ocean Warming on Larval YFT and PBF

- Ongoing studies, initiated in 2024, of the effects of thermally-limiting water temperatures ( > 28°C) on the larvae of YFT and PBF (in collaboration with Kindai U)
- Possible interactive studies of the effects of ocean warming and ocean acidification on pre-recruit life stages of YFT (extending the experimental and modeling work of Nicol et al. 2022)

### Effects of Ocean Acidification on Pre-Recruit Life Stages of YFT

- Extending the published work of the IATTC, in collaboration with academic colleagues, to investigate more-specific effects of ocean acidification on the survival, growth, physiology and genetics of late-larval and early-juvenile YFT
- Utilizing these experimental results to parameterize physical-biological interaction models for ocean acidification effects

### Effects of Hypoxia on Larval and Early-Juvenile Stages of YFT

- Extending published work of the IATTC to investigate the effects of hypoxia (which usually accompanies ocean warming and acidification) on the larval and early-juvenile stages of YFT