Climate-resilient fisheries: Available tools and a proposed workplan for IATTC

Dan Crear, Jon Lopez, Leanne Fuller
1. The IATTC scientific staff will highlight and consider the best scientific information available on the relationships between climate change, target stocks, non-target species, and species belonging to the same ecosystem or associated with the target stocks.”

2. The scientific staff shall incorporate in the next edition of the science strategic plan the issue of climate change and its impact on target species, non-target species, and the EPO ecosystem in general.

3. The Commission in 2024 and annually thereafter shall include climate change as an agenda item at the ordinary annual meeting of the IATTC.

Aim: to develop a workplan and framework to investigate these effects
Climate change proposed workplan

Main goal: Adoption of climate change management action(s)

Components:
- Climate-resilient fisheries
  - Framework
    - To identify necessary steps to accomplish climate-resilient fisheries
    - To determine how each step links to the next and where feedbacks may be required
    - To ensure this process is flexible and iterative
  - Tools
    - To assess climate impacts and vulnerabilities
    - To test potential adaptation plans
    - To identify barriers to adaptation
    - To ensure adaptability to and mitigation of climate impacts
  - Management considerations

Phases & Activities:
- Phase 1: Establish Terms of Reference (TOR) for climate change workshops
  - Phase 1: Review of and share available frameworks and tools
- Phase 2 & 3: Climate change workshop to determine scope of work and framework
- Phase 4: Workshop for strategic tool development
- Phase 5: Workshop to identify initial and potential future tactical tools and management actions

Purpose of components:
- Phase 4 & 5: Workshop to identify initial and potential future tactical tools and management actions

Legend: box boundary definitions
- Involving the IATTC scientific staff
- Involving the IATTC scientific staff, Commission, and stakeholders
- Involving the Commission
Climate change proposed workplan

Main goal

Adoption

Components

Purpose of components

Phases & Activities

Legend: box boundary definitions
- Involving the IATTC scientific staff
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- Involving the Commission

**Framework**

- To identify necessary steps to accomplish climate-resilient fisheries
- To determine how each step links to the next and where feedbacks may be required
- To ensure this process is flexible and iterative

**Tools**

- To assess climate impacts and vulnerabilities
- To identify barriers to adaptation
- To test potential adaptation plans

**Management considerations**

- To improve management adaptability to and mitigation of climate impacts

**Climate-resilient fisheries**

- Adoption of climate change framework
- Adoption of climate change management action(s)

**TOR for climate change workshops**

Phase 1: Establish Terms of Reference (TOR) for climate change workshops

Phase 2 & 3: Climate change workshop to determine scope of work and framework

Phase 1: Review of and share available frameworks and tools

Phase 4: Workshop for strategic tool development

Phase 4 & 5: Workshop to identify initial and potential future tactical tools and management actions

Phase 4: Strategic and tactical tool development
Tools

- Oceanographic & climate data
- Species distribution models
- Climate-informed stock assessments
- Climate vulnerability assessments (CVA)
- Climate change scenario planning
- Indicators
- Flexible management systems
- Management strategy evaluation
Tools: Climate Vulnerability Assessments

Very high, High, Moderate, Low

- **Very High**
  - Atlantic bonnethead shark
  - Caribbean reef shark
  - Dusky shark
  - Oceanic whitetip shark

- **High**
  - Blacktip shark
  - Bluefin tuna
  - Pilotfish shark
  - Shortfin mako shark
  - Sandbar shark
  - Atlantic sailfish
  - Great hammerhead
  - White marlin
  - Blue marlin
  - Gulf of Mexico bonnethead shark
  - Nurse shark
  - Scalloped hammerhead
  - Silky shark
  - Whale shark
  - Finsnout shark
  - Lemon shark
  - Sand tiger shark
  - Smooth hammerhead

- **Moderate**
  - Angel shark
  - Atlantic blacknose shark - Gulf of Mexico
  - Atlantic blacktip shark
  - Atlantic sharpnose shark - Atlantic
  - Atlantic sharpnose shark - Gulf of Mexico
  - Atlantic smooth dogfish - Atlantic
  - Bigeye thresher shark
  - Thresher shark
  - Bull shark
  - Night shark
  - Yellowfin tuna
  - Atlantic blacknose shark - Atlantic
  - Bluefin tuna
  - Spinner shark
  - Sharpnose sevengill shark
  - Tiger shark
  - Gulf of Mexico blacktip shark
  - Longfin mako shark

- **Low**
  - Blue shark
  - Skipjack tuna
  - North Atlantic swordfish
  - Albacore tuna
  - Bigeye tuna
  - White shark

Pita et al. 2021
Tools: Flexible management systems

- Multispecies longline fishery
- Southern bluefin habitat preference
- Habitat nowcasts/3 zones
- Updated every 2 weeks

- Seasonal forecasts 3-4 months out

Mismatches caused by climate change

Assessed abundance & actual abundance
- Climate-informed stock assessment
- Dynamic harvest control rules

Location of harvesters & stock
- Support new entrants by lowering barriers to entry
- Recognize small-scale fishers are less mobile and flexible

Right holders & active fishers
- Support access by active fishers
- Restrictions on who can own quotas

Management objectives & realities
- Use multiple management instruments

Hobday et al. 2006, 2011
Frameworks

**FISHE's**

*Fulton et al. 2020*

*Stein et al. 2014*

*Boyce et al. 2023*
Framework

- Species distribution models/range shifts
- Climate, Ecosystem, and Social Indicators
- Ecosystem Status Reports
- Climate integrated stock assessments

- Climate integrated stock assessments
- Climate informed reference points
- Modify harvest control rules
- Revise spatial and temporal management tools (i.e., dynamic closed areas, quota allocation, fishing seasons)
- Flexible management and permit systems
- Tools to help fishermen adjust to change
- Access rights: Transboundary stock management
Management considerations

- Climate integrated stock assessments
- Climate informed reference points
- Modify harvest control rules
- Revise spatial and temporal management tools (i.e., dynamic closed areas, quota allocation, fishing seasons)
- Flexible management and permit systems
- Tools to help fishermen adjust to change
- Access rights: Transboundary stock management
Climate change proposed workplan

Main goal: Adoption

Components:
- Climate-resilient fisheries
  - Adoption of scope
  - Adoption of climate change framework
  - Adoption of climate change management actions
- *Framework
  - To identify necessary steps to accomplish climate-resilient fisheries
  - To determine how each step links to the next and where feedbacks may be required
- *Tools
  - To ensure this process is flexible and iterative
  - To assess climate impacts and vulnerabilities
  - To identify barriers to adaptation
- *Management considerations
  - To test potential adaptation plans
  - To improve management adaptability to and mitigation of climate impacts

Purpose of components:

Phases & Activities:
- Phase 1: Establish Terms of Reference (TOR) for climate change workshops
- Phase 2 & 3: Climate change workshop to determine scope of work and framework
- Phase 4: Workshop for strategic tool development
- Phase 4: Workshop for strategic and tactical tool development
- Phase 4 & 5: Workshop to identify initial and potential future tactical tools and management actions
- Phase 4: Strategic and tactical tool development

Legend: box boundary definitions
- Involving the IATTC scientific staff
- Involving the IATTC, scientific staff, Commission, and stakeholders
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Questions