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

Dan Crear, Jon Lopez, Leanne Fuller
Background

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

Components:

Climate-resilient fisheries
- Adoption of climate change management action(s)
- Adoption of climate change framework

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

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 workshops 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

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**

**Framework**
- TOR for climate change workshops
- Adaptation of scope
- Adoption of climate change framework

**Tools**
- To identify necessary steps to accomplish climate-resilient fisheries
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**Purpose of components**

**Phases & Activities**

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

<table>
<thead>
<tr>
<th>Climate Exposure</th>
<th>Biological Sensitivity</th>
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<tbody>
<tr>
<td><strong>Very High</strong></td>
<td>High</td>
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<td>Atlantic bonnethead shark</td>
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<td>Caribbean reef shark</td>
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<td>Dusky shark</td>
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<td>Oceanic whitetip shark</td>
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<td>Sandbar shark</td>
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<td>Atlantic sailfish</td>
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<td>Croaker hammerhead</td>
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<td>White marlin</td>
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<td>Gulf of Mexico bonnethead shark</td>
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<td>Nurse shark</td>
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<td>Scalloped hammerhead</td>
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<td>Sand tiger shark</td>
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<td>Smooth hammerhead</td>
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<td>Basking shark</td>
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<td>Bluefin tuna</td>
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<td>Porbeagle shark</td>
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<td>Shortfin mako shark</td>
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| **High**         | Moderate               |
|                  | Atlantic blacknose shark - Gulf of Mexico |
|                  | Atlantic blacktip shark |
|                  | Atlantic sharpnose shark - Atlantic |
|                  | Atlantic sharpnose shark - Gulf of Mexico - Atlantic |
|                  | Smooth dogfish - Atlantic |
|                  | Angel shark             |
|                  | Blue shark              |
|                  | Skipjack tuna           |
|                  | North Atlantic swordfish |
|                  | Albacore tuna           |
|                  | Bigeye tuna             |
|                  | White shark             |

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

| **Low**          |                       |
|                  |                       |
|                  |                       |
|                  |                       |

**Species Vulnerability**

- **Exposure**
  - Climate temperature
  - Saturation of carbon dioxide
  - Precipitation
  - Salinity
  - pH
  - Dissolved oxygen
  - Current
  - Near-field loss

- **Susceptibility**
  - Habitat specificity
  - Feeding capacity
  - Breeding capacity
  - Maturity
  - Temperature
  - Sex expression
  - Other threats
  - Adaptation

**Risk**

- Weather cycle
- Climatic change
- Exposure
- Near-field loss
- Adaptation

- **Risk of very high exposure**

**Map of Fishery Risk**
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

Hobday et al. 2006, 2011

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
Frameworks

Fulton et al. 2020

Stein et al. 2014

FISHE’s (https://fishe.edf.org/)

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

- Scenario Planning
  - Management Strategy Evaluation

- Species distribution models/range shifts
- Climate, Ecosystem, and Social Indicators
- Ecosystem Status Reports
- Climate Vulnerability Assessments (on species and habitats)
- Scenario Planning
  - Risk Assessments
Climate change proposed workplan

**Components**

- **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
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- **Tools**
  - To assess climate impacts and vulnerabilities
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- **Management considerations**
  - To improve management adaptability to and mitigation of climate impacts

**Phases & Activities**

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- Phase 5: Strategic and tactical tool development

**Purpose of components**

- To improve management adaptability to and mitigation of climate impacts

**Legend: box boundary definitions**

- Involving the IATTC scientific staff
- Involving the IATTC scientific staff, Commission, and stakeholders
- Involving the Commission

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**Main goal**

- Adoption of climate-resilient fisheries
  - Adoption of climate change management actions

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**Adoption**

- TO for climate change workshops
- Adoption of scope
- Adoption of climate change framework
Management considerations

- Climate integrated stock assessments
- Climate informed reference points
- Modify harvest control rules
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Climate-resilient fisheries

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TOR for climate change workshops
Adaptation of scope
Adoption of climate change framework
Adoption of climate change management actions
## Proposed Timeframe

<table>
<thead>
<tr>
<th>Phase</th>
<th>Activities</th>
<th>2024</th>
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<td><strong>1) Planning</strong></td>
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<td>SAC/Comission Meeting: Share climate change resources and proposal with members</td>
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<td><strong>3) Develop framework</strong></td>
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<td><strong>4) Creating tools</strong></td>
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Questions