

**INTER-AMERICAN TROPICAL TUNA COMMISSION**

**SCIENTIFIC ADVISORY COMMITTEE**

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**SAC-17 INF-V**

**SOUTH EPO SWORDFISH: STRATEGY FOR INTERNATIONAL COOPERATION**

This document reports the international cooperation strategic themes, research questions and projects identified during the regional workshop on “Data and Scientific Research on Swordfish (*Xiphias gladius*)” as key to advance the knowledge, strengthen stock assessments and support the management of swordfish fisheries in the south EPO. It also includes a preliminary project developed by the IATTC staff to initiate the implementation of the priority research areas identified by the participants.

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**SUMMARY**

A regional workshop on “Data and Scientific Research on Swordfish (*Xiphias gladius*)” took place in Santiago, Chile, from June 17 to 19, 2025. Representatives from countries in the region and international organizations met with the aim of advancing a common strategy for the monitoring, assessment, and sustainable management of swordfish (*Xiphias gladius*) in the Eastern Pacific Ocean (EPO). This document reports the research questions, suggested projects and international cooperation strategic themes identified by the participants as key to advance knowledge, strengthen stock assessments and support the management of swordfish fisheries in the south EPO within the mandate of the Antigua Convention.

**1. BACKGROUND**

The last benchmark stock assessment of swordfish in the south EPO included data up to 2019 ([SAC-14-15](#)) and showed some challenges. During the last decade of data included in the assessment catches averaged about 29,000 t a year, almost double those in the previous decade. Simultaneously, the indices of abundance showed a sharp increase, unexpectedly for a stock being exploited since the 1950’s. Four hypotheses were proposed to explain these trends, but neither the causes of the changes in relative abundance nor the suitability of the indices for stock monitoring are clear. Considerable uncertainty also

exists on stock structure and the locations of spawning areas. Historically, the main fisheries catching swordfish in the south EPO were those from Japan (longline) and Chile (longline and gillnets). However, in recent years (2017-2019) the main fisheries accounting for 72% of the catches in weight, are the Chilean gillnet fishery, the Spanish and Ecuadorian longline fisheries.

During the 15<sup>th</sup> Meeting of the Scientific Advisory Committee of the Inter-American Tropical Tuna Commission (IATTC), the delegations of Chile, Ecuador and the European Union agreed on the need to strengthen capacities in data collection to improve the monitoring of the swordfish fishery and to generate joint research, in collaboration with other scientists, to decrease uncertainty and contribute to strengthening the stock assessments carried out by the IATTC stock assessment program.

A regional workshop entitled "Workshop on Data and Scientific Research on Swordfish (*Xiphias gladius*)" was organized by the Governments of Chile in collaboration with Ecuador the European Union and took place from June 17 to 19, 2025 at the regional office of the FAO for Latin America and the Caribbean, Santiago, Chile (Appendix 1). The goals of the workshop were to promote the advancement of scientific knowledge and support the sustainable management of the swordfish fishery in the Eastern South Pacific Ocean. The workshop was attended in person by IATTC staff and representatives of Ecuador, Chile and the European Union, and virtually by Costa Rica, as well as invited scientists from those countries and the USA (Appendix 2). The meeting allowed for the identification of information gaps, the proposal of harmonization mechanisms, and the strengthening of scientific and technical cooperation.

This document reports the international cooperation strategic themes and the research questions/projects identified by the participants to help advance the knowledge, strengthen the stock assessments and support the management of swordfish fisheries in the south EPO within the mandate of the Antigua Convention.

## **2. INTERNATIONAL COOPERATION STRATEGIC THEMES FOR SOUTH EPO SWORDFISH**

Below are the main strategic themes discussed and agreed upon during the workshop, which should guide efforts toward collaborative management based on scientific evidence and the knowledge of fishing communities.

### **2.1. Data and monitoring**

#### **Harmonization of data collection and monitoring methods**

Differences in data collection and reporting methods hinder regional comparison and analysis.

##### Suggested actions:

- Define a common format for data collection (biological data, fishing effort, sizes, bycatch).
- Agree on protocols for logbooks (manual or electronic), mandatory minimum variables, and interoperable database structures.
- Coordinate the integration of electronic data and scientific observation, clearly distinguishing the purpose (research vs. enforcement).
- Harmonize not only what is measured but also how it is measured.
- Harmonize data storage (database design) and data submission for stock assessment.

#### **Observer coverage and scientific monitoring**

Low and unequal observer coverage among countries and fleet types, with logistical and financial limitations.

Suggested actions:

- Establish a minimum regional coverage level coordinated and differentiated by fleet type.
- Promote the supplementary use of electronic monitoring, with consensus methodologies for review and analysis.
- Share experiences from public-private programs supported by the IATTC (such as Transmarina in Ecuador).
- Evaluate incentives to reduce turnover and dropout rates among observers.

**Sampling design and representativeness**

Logistical limitations prevent access to certain fleet segments (especially artisanal).

Suggested actions:

- Evaluate whether the current sampling design adequately represents all active fleets.
- Analyze the repetition of sampled vessels and their impact on data representativeness.
- Propose methodological tunings or sampling designs according to fleet type and zone.

**Harmonization of protocols for collection and preservation of biological samples**

Differences exist in how samples (tissue, stomach, spines, otoliths, gonads, etc.) are collected, preserved, and stored for subsequent analysis. There is no metadata catalog for the existing samples.

Key actions:

- Agree on a regional protocol for sample collection, including:
  - o Sample type and quantity.
  - o Tools and extraction methods.
  - o Preservation (temperature, medium, labeling).
  - o Registration and traceability.
- Develop a metadata catalog for swordfish sample collections.
- Train technical personnel and observers to ensure the quality and comparability of biological and genetic data.

**Comparative characterization of fleets and fishing gear**

Presence of diverse fleets and fishing gear (longline, gillnet, and harpoon) operating in different areas of the south EPO, with varying levels of catchability and selectivity.

Suggested actions:

- Conduct a technical comparison of fleets, including capacity, gear type, operating areas, effort, and autonomy.
- Evaluate the impact of different gear types on selectivity, catchability, bycatch, and sustainability.
- Establish a regional fleet typology to facilitate joint analysis of fishing effort.
- Prepare a common report with standardized data: number of vessels, fleet types, landing levels, bycatch, and associated species.

- Generate a regional baseline diagnosis to guide management decisions and joint assessment.

### **Fisheries and biological indicators**

Stock assessments are the best tools to determine the state of the stock, but are done at low frequency. Indicators are useful to maintain continuous monitoring of the system.

#### Suggested actions:

- Spatiotemporal analysis of the catch and effort.
- Indicators using individual's characteristics such as length, total weight, eviscerated weight, gonad weight, gonadosomatic indices, condition factor, hepatosomatic indices, sex ratio, maturity stages, structure of eggs in gonads.
- Biochemical indicators: biological tissue samples (muscle, gonad, liver) by size and sex of lipids, proteins, carbohydrates and fatty acid profile.

### **Stomach content analysis**

Relevance: The diet of swordfish allows for evaluation of predator-prey interactions. One of the hypotheses in the stock assessment was that productivity had increased due to increase in prey availability.

#### Key Actions:

- Promote regional studies on stomach content.
- Evaluate the incorporation of this information into multispecies models.

## **2.2. Stock assessment**

### **Update of the conceptual model and include effect of oceanographic variables**

Improve understanding of distribution and biology of swordfish.

#### Key actions:

- Update the conceptual model of the fishery system, including new ecological and oceanographic knowledge.
- Evaluate regional oceanographic and environmental conditions (such as currents, temperature, oxygen) that affect distribution and abundance of swordfish.

### **Integration of local knowledge: artisanal and industrial fisheries**

Opportunity: Fishers possess key empirical knowledge that can improve conceptual models.

#### Key actions:

- Create permanent spaces (e.g., "Swordfish table") to incorporate the experience of artisanal and industrial fishers in understanding of the system, data and trend interpretation.
- Collect perceptions on changes in distribution, size, or abundance from the artisanal and industrial fishing sectors.

### **Sizes and spatial structure**

Differences in size are reported among individuals caught in different areas, suggesting possible spatial structure or segmentation by age/zone.

#### Suggested actions:

- Develop a regional study on the population structure of swordfish (genetics, sizes, maturity, etc.).
- Coordinate sampling in key migration, feeding, and spawning areas.

### **Genetics/genomics and stock structure**

Genetic/genomic analyses allow distinguishing populations, evaluating connectivity, evaluate stock structure hypothesis, especially when paired with electronic tagging.

#### Key Actions:

- Implement standardized genetic/genomic identification protocols.
- Use genetic/genomic markers to resolve hypotheses about stock structure, migration, reproduction, and differential growth by sex.
- Compare genetically/genomically-derived stock structure with information derived from tagging data

### **Migratory movements and regional spatial dynamics**

Fragmented information on migratory route, connectivity and stock structure

#### Suggested actions:

- Design a regional tagging program with electronic (and/or satellite) tracking for swordfish.
- Agree on priority zones for oceanographic and biological monitoring (feeding, reproduction).

### **Advancement in genomic methods for abundance estimation (CKMR)**

Indices of abundance derived from fishery-dependent data may not be adequate for the stock. Close Kin Mark Recapture methods show promise to estimate population abundance of some exploited populations.

#### Key actions:

- Explore the use of CKMR (Close Kin Mark Recapture) as an emerging method for population abundance estimate independent of fisheries data.
- Explore the existent genomic collection in a pilot/feasibility study.

## **2.3. Management**

### **Regional swordfish management plan**

Need to advance toward a joint, integrative, and adaptive management plan.

#### Key actions:

- Design a regional management plan, considering measures by fleet type, gear, and zone.
- Include conservation and management measures, monitoring, and periodic reviews.
- Evaluate potential areas for joint management or coordinated temporary conservation measures.

### **Definition of Biological Reference Points (BRP)**

Harmonized BRP at the regional level, especially due to stock structure uncertainty.

#### Key Actions:

- Evaluate the possibility of aligning BRPs between RFMOs to facilitate joint management decisions.
- Use them as a basis for defining management measures.

### **Bycatch and non-target species (birds, marine mammals, turtles, sharks, and others)**

Bycatch, release practices, and lack of unified monitoring.

#### Suggested Actions:

- Standardize concepts of bycatch and associated fauna.
- Establish a common protocol for the release of non-target species and validation of best practices.
- Agree on observer coverage levels that allowed to adequately monitor bycatch levels using data collected by scientific observers.
- Develop a joint system to evaluate the impact of fleets on associated species.

### **Governance and regional coordination**

Differences in regulation, institutional structures, and separation of functions between science and enforcement in different countries.

#### Suggested actions:

- Establish a permanent multinational technical group for the coordination of scientific research.
- Align observer programs and data collection with IATTC standards.
- Discuss and harmonize the roles of scientific, enforcement, and private institutions in each country.

### **Transparency, access, and shared use of information**

Restrictions or gaps exist regarding what data can be shared and for what purposes.

#### Suggested actions:

- Agree on principles of open or controlled access to scientific data for regional research purposes.
- Establish multilateral mechanisms to share validated information (sizes, effort, associated species, among others).
- Promote mutual recognition of traceability systems, certificates, and sustainability standards.

### **Funding and sustainability of monitoring programs**

Some programs lack resources to process or analyze collected information.

#### Suggested Actions:

- Identify regional or international funding sources to support data processing and analysis.
- Promote technical-financial alliances between countries, the private sector, and multilateral organizations.
- Explore the use of artificial intelligence for automated analysis of images and electronic data.

## 2.4. Other

### Need for Chile's formalization in the IATTC

Chile is not yet a member of the IATTC, although it has expressed its intention to join the Commission since 2018.

#### Key action:

- Encourage the formal accession of Chile to the Antigua Convention in order to become a member to the IATTC, which would allow its full participation in scientific and regional management decision-making processes.

## 3. RESEARCH QUESTIONS AND PROPOSED PROJECTS

The participants were divided into two groups by their expertise and interests to discuss two subjects:

1. Research on population processes and strengthen of the swordfish sampling system.
2. Fishery-independent indicators, studies of migrations, genetics and close-kin mark-recapture

The participants were instructed to elaborate ideas for research projects on those subjects.

Appendix 3 presents a preliminary project developed by the IATTC staff to initiate the implementation of the priority research areas identified by the participants

### 3.1. Research on population processes and improving swordfish sampling strategies

Project Objectives and actions:

1. Improve the collection, increase the coverage, and enhance the delivery of fisheries data:
  - 1.1. Identify and list available data (e.g., landing records, fishing logbooks): create a metadata catalog).
  - 1.2. Compare logbook forms.
  - 1.3. List the minimum data fields required for submission to the IATTC (and list fields that could be included in the future).
2. Improve abundance indices and enhance the understanding of trends:
  - 2.1. List the types of fisheries.
  - 2.2. Map the operational areas and seasons of the fisheries (including neighboring areas, the CPO, and Costa Rica).
  - 2.3. Document changes in technology, vessels, and other factors affecting fishing efficiency (including the years in which changes occurred, anecdotal accounts, changes in target species, prices, markets, and the modernization of vessels and fishing gear).
  - 2.4. Reconstruct historical data
  - 2.5. Develop a database to from fishing logbooks and incorporate size frequencies
  - 2.6. Improve CPUE standardization models to incorporate size data
  - 2.7. Evaluate the feasibility of developing a multi-fleet index (combining CPUE and size data from multiple fleets)
3. Swordfish reproduction studies and sex determination
  - 3.1. List available data (metadata)

- 3.2. Conduct exploratory analyses of size, CPUE and archival tagging data at fine spatial and temporal scales to detect signals of movement, reproductive activity, and recruitment
- 3.3. identify opportunities for biological sampling regarding sex, gonads, and genomics
- 3.4. Evaluate sample processing capabilities
- 3.5. Describe and harmonize biological sampling protocols for sex, gonads, and genomics
- 3.6. Develop a molecular test for rapid and cost-effective sex determination
- 3.7. Design a pilot sampling project
- 3.8. Implement the pilot project
- 3.9. Outline a 2-year regional sampling project by area, month, and fishery
- 3.10. Determine maturity stages in mega-spawning females, the maturity ogive by sex relative to size and age, and spawning areas and seasons
- 3.11. Determine sex ratio by size, age, and area
- 3.12. Compare life history patterns with other regions of the Pacific Ocean
- 3.13. List opportunities for larval sample trawls (Ecuador maintains a continuous larval sampling program)
- 3.14. Evaluate the feasibility of larval sampling
4. Age and Growth Studies
  - 4.1. List available data (metadata)
  - 4.2. Identify opportunities for biological sampling
  - 4.3. Evaluate sample processing capabilities
  - 4.4. Describe and harmonize sampling protocols for anal fins and otoliths
  - 4.5. Outline a pilot sampling project
  - 4.6. Execute the pilot project
  - 4.7. Outline a 2-year regional sampling project by area, month, and fishery
  - 4.8. Estimate age distribution within the fishery catch, by area and sex
  - 4.9. Derive growth curves
  - 4.10. Determine the length-weight relationship
5. Propose a medium- and long-term monitoring program for swordfish fisheries.
6. Storage of the regional biological collection.

### **3.2. FISHERY-INDEPENDENT INDICATORS, STUDIES OF MIGRATIONS, GENETICS AND CLOSE-KIN MARK-RECAPTURE**

#### **Research questions:**

- What are the population boundaries of swordfish in the Eastern Pacific?
- Where are the spawning grounds for the different populations?
- Are there spawning or feeding grounds shared among populations?
- Are there mixed-stock areas?
- Is there reproductive philopatry among females?
- Are there distinct movement patterns driven by environmental phenomena (e.g., El Niño)?
- Are the genomic data already collected useful for CKMR?

#### **Objectives:**

General Objective:

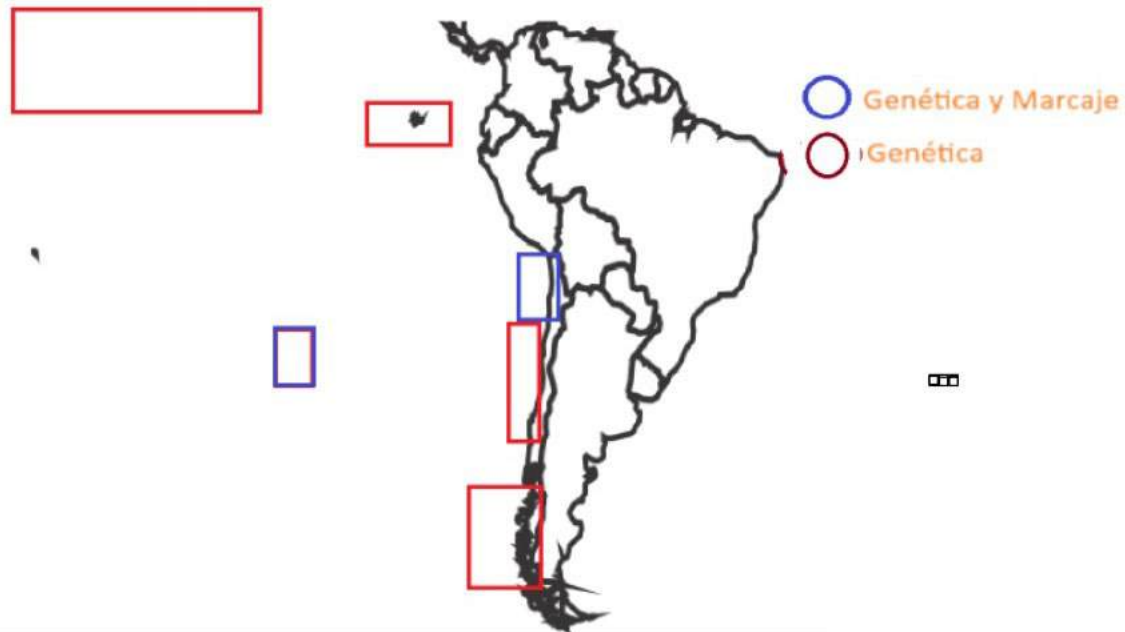
Define the population boundaries of the swordfish in the tropical and S EPO.

**Specific Objectives and activities:**

1. Evaluate movement strategies (vertical and horizontal) of mature swordfish regionally.
  - 1.1. Tagging of adult individuals with satellite tags in both new and previously studied areas.
2. Determine population structure and membership at the regional level (assessing whether or not it corresponds to a single population unit)
  - 2.1. Develop a standardized protocol for genetic/genomic sample collection.
  - 2.2. Standardize sample quality across different tissue types and preservation methods.
  - 2.3. Compare historical and current samples collected from the same locations (e.g., Northern Chile).
  - 2.4. Include new sampling areas: IP (artisanal fisheries) and the Equatorial Tropical Pacific (via a Spanish research vessel).
  - 2.5. Compare individuals of different sexes.
3. Identify spawning and nursery areas:
  - 3.1. Collect larval samples year-round in the waters surrounding Rapa Nui (via a prospecting cruise).
  - 3.2. Derive maturity ogives by sampling location.
  - 3.3. Validate of genetic sex markers and development of a field method.
4. Population abundance estimate:
  - 4.1. Conduct an exploratory CKMR analysis using SNPs previously sequenced in California.

The areas (and of interest for sampling for genetics/genomics and tagging are (Figure 1):

- Tropical equatorial Pacific (genetics) – Year round
- North of Chile (genetics and tagging) – October - November
- Central Chile (genetics) – July
- South Chile (genetics) – January to March
- Rapa Nui (genetics and tagging) – December to March
- 120-135°N – 0-10°N – Year round
- 7-8°N – 139-146°W – There are already 131 samples collected (Table 1) but new samples are needed to identify the origin of this more oceanic group and their movements. Substantial catches of swordfish occur in this area which is not formally accounted for in any stock assessments.



**FIGURA 1.** Areas of interest for genetic sampling and tagging of south EPO swordfish to investigate stock structure hypotheses and test the feasibility of CKMR to estimate the size of the stock.

**FIGURA 1.** Áreas de interés para el muestreo genético y el marcaje del pez espada del sur del OPO, con el fin de investigar las hipótesis sobre la estructura del stock y evaluar la viabilidad del CKMR para estimar el tamaño del stock.

The Project should take place in two phases:

Phase 1: Genetic sampling / Defining the population / Samples already collected (1,500 specimens, Table 1) / Exploratory CKMR analysis using previously sequenced SNPs

Phase 2: tagging / post-hoc sample reassignment

The main costs for this project would be the tags (Minipat and Argos), the boats, the shipping of genetic material and the genetic analysis

**TABLE 1.** Catalog of swordfish tissue samples that are already part of the Dr. Alvarado-Bremer laboratory collection (Texas A&M University at Galveston)

**TABLA 1.** Catálogo de muestras de tejido de pez espada que ya forman parte de la colección del laboratorio de Dr. Alvarado-Bremer (Universidad A&M de Texas en Galveston).

Region	Number of samples	Locations	Seasons/ Years
NWPO	525 (509 adults and 16 juveniles)	Japan (N=46); Guam (N=16); Midway (N=295); Taiwan (N=172)	Q1, Q2, Q3, Q4 1992, 1998-99, 2010
NCPO (HAW)	600 (444 adults and 156 juveniles)	Hawaiian islands (USA)	Q1,Q2, Q3, Q4 1997-2002
NEPO	907 adults	California (USA) ; Baja California and Mazatlan (Mexico)	Q1, Q2, Q3, Q4 1990, 1992, 1997-2000

Region	Number of samples	Locations	Seasons/ Years
CPO (EQUATORIAL)	241 (210 juveniles and 31 adults)	0-10°N and 0-10°S; 130-170°W	Q1, Q2, Q3, Q4 1999-2003
SEPO -ECUADOR	550 adults	Off Manta, Galapagos Islands and Isla de plata	Q1, Q2, Q3, Q4 1997-1999; 2004-2005
SEPO-CHILE	527 adults	26-36°S; 74-81°W;	Q1, Q2, Q3, Q4
SWPO	122 (79 adults and 43 juveniles)	Eastern Australia and French Polynesia	Q1, Q2, Q3, Q4

#### 4. CONCLUSION

The workshop represented a significant milestone on the path toward integrated and effective fisheries management of swordfish in the south EPO. The diversity of experiences, technical capacities, and national contexts translated into a common agenda for regional cooperation, focused on data collection standardization, methodological harmonization, integration of local knowledge, and institutional strengthening. The participation of various stakeholders (scientific institutions, fisheries authorities, industrial and artisanal fleets, and multilateral organizations) will be key to implementing these actions and maintaining their continuity over time.

The accession of Chile to de Antigua Convention, as a key fishing fleet, to become a formal IATTC member is important for technical and regulatory coherence of regional decisions. Facilitation of this process in a timely manner is encouraged.

The strategic themes presented here reflect a collective commitment to improve the quality of scientific information, expand monitoring coverage, and advance toward sustainable, adaptive, and equitable management of the resource. The themes should be considered regionally when elaborating a management plan for swordfish in the south EPO and locally when constructing fisheries improvement projects. The exploration of funding sources to achieve the various objectives should be done. The sustainability of the swordfish fisheries, as a shared resource of high ecological and economic value, will depend on the joint commitment for transforming these proposals into concrete policies, based on science and a regional approach.

## APPENDIX 1. AGENDA

Tuesday, June 17, 2025, 08:30 a.m. to 6:00 p.m.

08:30-09:00 • Registration of attendees

09:00-09:45 • Welcome

FAO: Javier Villanueva, Principal Fisheries and Aquaculture Officer

CIAT: John Lopez, Head of the Ecosystems and Incidental Catch Program

SSPA: Juan Santibañez, Head of the Fisheries and Aquaculture Development Division

IFOP: Gonzalo Pereira, Executive Director of the Fisheries Development Institute

- Presentation of delegations (CIAT / ECU / UE / CHL)
- Approval of agenda

### **Fisheries characterization of the swordfish (*Xiphias gladius*), in the Southeastern Pacific Ocean**

09:45-10:40 • Characterization of vessels or boats, fishing gear, capture zones, fishing effort, and landing statistics in the Southeastern Pacific Ocean.

Presented by: CHILE

10:40-11:00 Coffee break

11:00-11:55 • Characterization of vessels or boats, fishing gear, capture zones, fishing effort, and landing statistics in the Southeastern Pacific Ocean.

Presented by: ECUADOR (2 presentations)

11:55-12:50 • Characterization of vessels or boats, fishing gear, capture zones, fishing effort, and landing statistics in the Southeastern Pacific Ocean.

Presented by: EUROPEAN UNION

12:50-13:00 • Official photo of the event

13:00-14:30 Lunch

### **Description of the monitoring and control systems for fisheries, sampling systems for scientific purposes, and fisheries data management<sup>1</sup>**

14:30-15:30 • Description of the monitoring and control systems for fisheries, sampling systems for scientific purposes, and fisheries data management in the Southeastern Pacific Ocean.

Presented by: CHILE (2 presentations)

15:30-16:30 • Description of the monitoring and control systems for fisheries, sampling systems for scientific purposes, and fisheries data management in the Southeastern Pacific Ocean.

Presented by: ECUADOR

16:30-16:50 Coffee break

16:50-17:45 • Description of the monitoring and control systems for fisheries, sampling systems for scientific purposes, and fisheries data management in the Southeastern Pacific Ocean.

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<sup>1</sup>Includes inspection methods, catch records in port and on board (observers/electronic systems), management measures, logbook formats used, biological records (e.g., length, weight, sex, gonad), database structure, entry systems, validation, use and storage of data, and delivery of information to external entities (e.g., CIAT).

Wednesday, June 18, 2025, 9:00 a.m. to 6:00 p.m.

**Biological and ecological scientific studies of swordfish<sup>2</sup>**

09:00-10:00 • Synthesis of scientific studies on biological and ecological aspects of swordfish in the Southeastern Pacific Ocean.

Presented by: ECUADOR (2 presentations)

10:00-11:00 • Synthesis of scientific studies on biological and ecological aspects of swordfish in the Southeastern Pacific Ocean.

Presented by: EUROPEAN UNION

11:00-11:20 Coffee break

11:20-12:30 • Synthesis of scientific studies on biological and ecological aspects of swordfish in the Southeastern Pacific Ocean.

Presented by: CHILE (3 presentations)

12:30-13:00 Plenary session

13:00-14:30 Lunch

TOPIC Methodologies for population studies in swordfish<sup>3</sup>

14:30-15:15 • Presentation of the CKMR method (Close Kin Mark Recapture) and its sampling design: opportunities and challenges for its implementation in swordfish.

Presented by: John Swenson, CIAT, United States.

15:15-16:00 • Determination of population units of swordfish in the Southeastern Pacific Ocean through population genetics.

Presented by: Jaime Alvarado-Bremer, Texas A&M University at Galveston.

16:00-16:20 Coffee break

16:20-17:05 • Marking studies in swordfish for the Pacific Ocean.

Presented by: Chugey Sepúlveda and Patricia Zarate. Pflieger Institute of Environmental Research, Oceanside California and Fisheries Development Institute (IFOP).

17:05-18:00 Conclusions

Thursday, June 19, 2025, 9:00 a.m. to 6:00 p.m.

**Priorities on scientific research on swordfish in the Southeastern Pacific Ocean<sup>4</sup>**

09:00-10:00 • Swordfish fisheries in Costa Rica

Presented by: INCOPESCA – Alexander Salas

10:00-11:00 • Stock assessment of swordfish in the South Pacific Ocean. Research needs.

Presented by: CIAT – Carolina Minte-Vera

11:00-11:20 Coffee break

11:20-13:00 • Break-out groups: Priority scientific research to develop a coordinated approach for the swordfish fishery in the Southeastern Pacific Ocean.

13:00-14:30 Lunch

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<sup>2</sup> Refers to population processes, reproduction, recruitment, growth, marking and recapture, trophic ecology, relative abundance, mortality, distribution and abundance, as well as its variability.

<sup>3</sup> Presentations coordinated by CIAT staff, La Jolla, California. The presentation duration is 30 minutes, with 15 minutes for questions and answers

**Agreements for the study of swordfish in the Southeastern Pacific Ocean region**

14:30-15:30 • Delimitation of agreements to define and execute priority scientific research related to the evaluation and fisheries management of swordfish in the Southeastern Pacific Ocean.

16:00-16:20 Coffee break

16:20-17:15 • Declaration of requirements associated with scientific management (e.g., personnel, infrastructure, financing) for the implementation of the evaluation and fisheries management of swordfish in the Southeastern Pacific Ocean.

17:15-18:00 Conclusions

## APPENDIX 2. LIST OF PARTICIPANTS

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### APPENDIX 3. PROPOSED INITIAL PROJECT

<b>PROJECT H.7.e: South EPO swordfish monitoring and research – new phase</b>	
<p><b>THEME:</b> Sustainable fisheries</p> <p><b>GOAL:</b> H. Research and development of stock assessment models and their assumptions</p> <p><b>TARGET:</b> H.7. Other assessments</p> <p><b>EXECUTION:</b> Stock Assessment, Biology Data collection and Database unit</p>	
<b>Objectives</b>	<p>Strengthening the regional capacities for data collection and monitoring of swordfish</p> <p>Conduct a pilot project to:</p> <ul style="list-style-type: none"> <li>• Derive a maturity ogive describing the reproductive biology of swordfish in south EPO. Use information to infer about potential spawning areas.</li> <li>• Attempt to elucidate stock structure and derives a conceptual model for the stock.</li> <li>• Determine the feasibility (through simulations and available data) of using alternative methods to estimate abundance of the stock.</li> </ul>
<b>Background</b>	<ul style="list-style-type: none"> <li>• The south EPO swordfish benchmark assessment was finalized in 2023.</li> <li>• There is uncertainty in stock structure. Recent genomic and tagging evidence for North Pacific Swordfish indicate that stock mixing may occur in the feeding areas, similar patterns may occur in South EPO, which need to be investigated.</li> <li>• The stock needs to be monitored due to the simultaneous increase in catches and fisheries CPUE-derived indices of abundance. Several hypotheses may explain this pattern; it is not clear which one is more likely. There are anecdotal accounts that longline fleets are using ring traps in addition to hooks, which may increase the longline catchability substantially. The effect of this innovation on the indices of abundance of swordfish is unknown and alternative methods to obtain indices of abundance should be explored.</li> <li>• A regional workshop regarding collaborative work on south EPO swordfish took place in June 2025 in Chile which identified priorities for research that included the need for: (1) exchange of scientific and technical protocols among countries to standardize the data collection for the stock, (2) collaborative reproductive biology studies to define the spawning grounds for the south EPO swordfish using the available sampling opportunities, (3) implementation of a genomic-electronic tagging study to decrease stock structure uncertainty and refine the conceptual model for the stock, (4) evaluation of the potential for use of close-kin mark recapture methods to estimate abundance.</li> </ul>
<b>Relevance for management</b>	<p>The stock assessment is needed to provide scientific advice for the management of swordfish fisheries</p>
<b>Duration</b>	<p>2026-2030</p>
<b>Workplan and</b>	<ul style="list-style-type: none"> <li>• Meetings among the collaborations to identify capacities, roles,</li> </ul>

<b>status</b>	opportunities for sampling and tag deployment, and harmonization with similar projects across the Pacific Ocean <ul style="list-style-type: none"> <li>• Simulation studies to identify feasibility of CKMR</li> <li>• Elaboration of biological sampling protocols and teaching material for observers and port samplers</li> <li>• Implementation of pilot sampling program/tag deployment</li> </ul>
<b>External collaborators</b>	Scientists from Chile, USA, Ecuador, European Union, Peru, Costa Rica, Japan, Korea, Chinese Taipei, China and the Pacific Community (SPC), WCPFC, Fishing industry
<b>Deliverables</b>	Documents for SAC
<b>Budget (US\$) (seed money)</b>	150,000 [this amount would not cover all that needs to be done, but could start the pilot project]