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PROPOSED IATTC SHARK DATA COLLECTION AND RESEARCH PLAN: FOLLOW-UP ON PARAGRAPHS 15 AND 16 OF RESOLUTION C-25-08

Jon Lopez, Dan Ovando, Salvador Siu, Leanne Fuller, Dan Crear, Melanie Hutchinson, Marlon Román, Alexandre Aires da Silva

This document was produced by the IATTC staff in response to Resolution C-25-08, paragraphs 15 and 16, and is presented as a foundation for discussion within the EBWG, the SAC and the Commission, as appropriate

Contents

SUMMARY

This document presents a description of a proposed IATTC Shark Research Plan for 2026–2030, to be developed by the Scientific Staff in collaboration with the Scientific Advisory Committee (SAC) and the Permanent Working Group on Ecosystem and Bycatch (EBWG), as mandated by Resolution C-25-08, paragraph 16. The plan prioritizes research activities for the eight key shark species referred in paragraph 16: *Carcharhinus falciformis*, *C. longimanus*, *Sphyrna lewini*, *S. zygaena*, *S. mokarran*, *Alopias pelagicus*, *A. superciliosus*, and *Prionace glauca*. Consideration would need to be given, as appropriate, the other species listed in Annex 4 of Resolution C-25-08. This document details the shark research workplan outlined in the IATTC Strategic Science Plan 2026–2030 (IATTC-103-03a), and is organized

around four research pillars — data collection, stock assessment, assessment of impacts, and mitigation of impacts — including timelines and financial considerations for stock assessments and ecological risk assessments — noting that management strategy evaluations are not currently feasible in the IATTC given the absence of conventional stock assessments for these species — and identifies opportunities for collaboration with the Western and Central Pacific Fisheries Commission (WCPFC) for Pacific-wide stocks. In addition, this document addresses paragraph 15 of C-25-08 by setting out a proposal and considerations for standardized data collection program for sharks, including monitoring of small-scale, coastal fisheries (SAC-15-10). This document is presented as a foundation for discussion within the EBWG, the SAC and the Commission, as appropriate.

1. INTRODUCTION

Sharks are among the most vulnerable taxa[1] that interact with tuna and tuna-like fisheries in the eastern Pacific Ocean (EPO). Their life histories—characterized by slow growth, late maturity, low fecundity, and long gestation periods—make shark populations particularly susceptible to overexploitation. The IATTC has long recognized this vulnerability, and the Antigua Convention explicitly mandates the Commission to ensure the sustainability of non-target species associated with tuna fisheries.

The Commission has adopted a series of Resolutions addressing shark conservation and management, most recently Resolution C-25-08, which consolidated and strengthened prior measures. Paragraph 16 of C-25-08 directs the Scientific Staff, in collaboration with the SAC and EBWG, to develop and recommend a Shark Research Plan that prioritizes research on eight key species and includes timelines and financial considerations for stock assessments, ecological risk assessments (ERAs), and management strategy evaluations (MSEs). Paragraph 15 further directs the development of a standardized data collection program for sharks in fisheries managed by the Commission, including "the monitoring of shark catches in small scale, coastal fisheries" as identified in SAC-15-10.

This proposed Shark Research Plan is structured around the shark workplan incorporated in the IATTC Strategic Science Plan 2026–2030 (SSP; IATTC-103-03a), which organizes shark research under four pillars: data collection, stock assessment, assessment of impacts, and mitigation of impacts. A preliminary version of this plan was presented to the EBWG at its 3rd meeting in May 2025 (EBWG-03-5c.v-PRES) and was part of the material available for the Commission in its 103rd meeting in Panama in 2025 (IATTC-103-03a). For each research area, this document summarizes prior work completed to date, describes planned activities, and provides indicative timelines. It also shows how these components connect as an integrated approach to shark research and management.

The shark research plan is designed as an integrated framework in which the different components are interdependent (Figure 1). Two broad fleet categories are referred to throughout this document. For the

[1] Unless specified otherwise, including but not limited to citations to vulnerability assessments and any qualitative/quantitative scores (e.g. BYC-10 INF-B; SAC-13-11), the staff's definition of "vulnerable species" refers to the species that, in the sensu latu, and due to their low-productive life-history traits (i.e. K species in r/K selection theory), are more vulnerable to the impacts of fisheries and other anthropogenic activities on these species or their habitat and ecosystem. This includes the marine mammals, seabirds, sea turtles and the elasmobranchs.

purposes of this report, “Large-scale fisheries” refers to the purse-seine and longline fleets of all vessel sizes and gear configurations that fall within the standard IATTC data collection programs (e.g., Class 1–6 purse-seiners, tuna and tuna-like directed longliners). For the purposes of this report, “Small-scale fisheries” refers to the primarily coastal fleets sometimes described as “artisanal,” which operate across many dispersed landing sites, generally are not targeting tuna *per se*, or do so only seasonally, and have not been routinely covered by IATTC observer or port-sampling programs (e.g., covered by the ABNJ-1 and ABNJ-2 Common Oceans experimental programs). These two labels are used as operational shorthand in this plan and are not intended to prejudge the more detailed classification under development in SAC-17-07. These labels are also approximations, noting that the terms “large” and “small” have more to do with the scale of individual vessels, not the degree of impact; i.e., a “small-scale” fishery could have more catches of a given species than a “large-scale” fishery under this definition. Some CPC fleets consisting of vessels of different size and characteristics targeting sharks rather than tunas,— particularly those with larger-scale vessels, —may not fit cleanly into either category; data for these fleets should be obtained through CPC reporting as available.

Data collection (Section 2.1) provides the foundation for all downstream activities: fishery and biological data from small-scale and large-scale fisheries feed directly into stock assessments (Section 2.2) and ecological risk assessments (Section 2.3). Stock assessments—whether through close-kin mark-recapture (CKMR) or conventional models—produce estimates of population status that inform management advice. Assessment of impacts through ERAs, spatial management analyses, and ecosystem indicators provides a broader understanding of fishery effects on shark populations and helps prioritize both management action and mitigation research. On the mitigation side (Section 2.4), tools to reduce shark mortality operate at three stages of the fishing interaction: before (e.g., bycatch avoidance), during (e.g., gear technology), and after (e.g., handling and release practices). Supporting research on life history and telemetry (Section 2.5) underpins all of these activities by providing the biological parameters and movement data required by assessment models, spatial analyses, and mitigation tools alike (Figure 1).

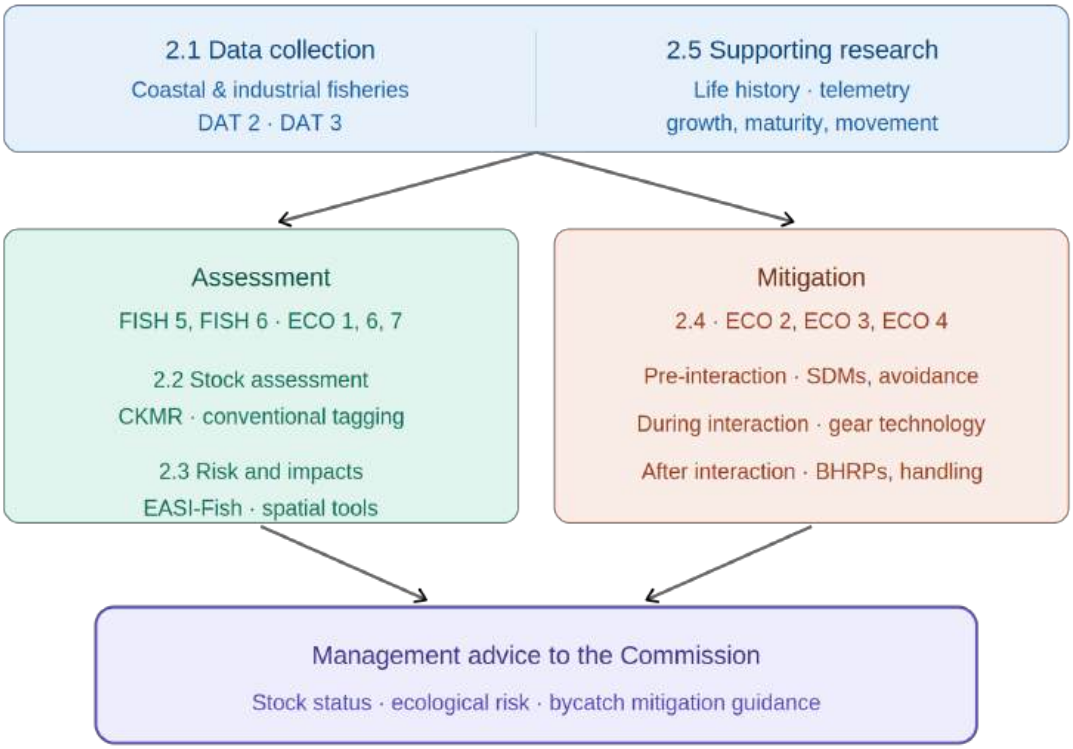

Figure 1. Schematic overview of the proposed IATTC Shark Research Plan, showing the relationships among research components. Data inputs — fishery data collection (Section 2.1) and supporting research on life history and telemetry (Section 2.5) — feed both analytical pillars. Assessment activities include stock assessment (Section 2.2) and assessment of impacts (Section 2.3); mitigation activities (Section 2.4) address pre-interaction, during-interaction, and after-interaction stages. Outputs from both pillars converge on management advice to the Commission, the principal product of the research plan. The codes within each component (e.g., FISH 5, ECO 6, DAT 3) refer to the SMART strategic goals included in the IATTC 2026–2030 Strategic Science Plan (SSP, IATTC-103-03a).

2. SHARK RESEARCH PLAN

The SSP shark workplan identifies 10 SMART strategic goals spanning data collection, stock assessment, assessment of impacts, and mitigation of impacts (IATTC-103-03a). Several of these goals establish cross-cutting scientific infrastructure — such as the spatial management toolbox and ecosystem-advice products — that supports shark research alongside other Commission priorities. The plan is designed as an integrated framework in which data collection improvements feed into assessment and mitigation activities, which in turn inform both management advice and the development of mitigation tools. The following sections describe each research area in detail, with references to the corresponding SSP Themes and Goals. The SSP organizes scientific activities under seven Themes, of which three frame the primary Goals of the shark research plan: DAT (Data Collection for Scientific Support of Management), FISH (Sustainable Fisheries), and ECO (Ecological Impacts of Fisheries: Assessment and Mitigation). A fourth theme, LH (Life History Studies for Scientific Support of Management), does not contain shark-

specific Goals in the SSP, but dedicated life-history research on the priority species is desirable for work under FISH and ECO and is therefore addressed within this plan as supporting research (Section 2.5). Within each Theme, the SSP defines strategic Goals, each broken down into one or more Targets. The shark-relevant Goals and Targets cited throughout this document are summarized in Table 1, and the full 2026–2030 chronogram for the shark workplan is reproduced in Appendix 1.

Table 1. SSP Goals and Targets addressed by the shark research plan (from IATTC-103-03a, Shark Workplan).

Code	Goal and associated relevant Targets	Section
DAT 2	*Goal:* Continue to support the IATTC in the development and implementation of an electronic monitoring system (EMS) for tuna fisheries in the EPO.	2.1.2
DAT 3	*Goal:* Complete the design and implement a standardized data collection program for shark species associated with fisheries managed by the Commission. *Targets:* (T1) Small-scale fisheries; (T2) Small purse-seiners (class 1–5); (T3) Longliners; (T4) Others (e.g., transshipment).[2]	2.1
FISH 5	*Goal:* Conduct a close-kin mark-recapture stock assessment for silky shark. *Targets:* (T1) Complete the CKMR development phase; (T2) Implement the CKMR program; (T3) Conduct the stock assessment; (T4) Explore applicability of the silky shark CKMR framework to other prioritized shark species.	2.2.1
FISH 6	*Goal:* Address Commission's request to conduct conventional stock assessments of prioritized species, as needed, through collaboration with external organizations (e.g., ISC, CPPS).	2.2.2
ECO 1	*Goal:* Conduct ERAs of EPO fisheries to identify and prioritize species at risk and evaluate the impact of different management scenarios. *Target:* Conduct ERAs for prioritized shark species in Resolution C-25-08.	2.3.1
ECO 2	*Goal:* Develop tools for Commission-managed fisheries to reduce fisheries interactions with prioritized bycatch species. *Targets:* species distribution models; spatio-temporal multi-species models; operationalize a first version of the tool.	2.4
ECO 3	*Goal:* In collaboration with industry, conduct scientific experiments to identify technologies that would reduce mortality of prioritized bycatch	2.4

[2] Target text is reproduced verbatim from the SSP (IATTC-103-03a). Within this plan, all fleets listed under T2–T4 fall within the "large-scale fisheries" category described in Section 2.1.2.

Code	Goal and associated relevant Targets	Section
	species.	
ECO 4	*Goal:* Complete the development of science-driven standardized best handling and release practices (BHRPs) for all vulnerable taxa and fisheries managed by the Commission, including training programs for onboard crew. *Target:* Sharks.	2.4
ECO 6	*Goal:* Develop a toolbox to inform the use of spatial management efforts by the Commission, including options proposed under the BBNJ Agreement. *Targets:* (T1) good practices for data, models, and evaluation; (T2) parameterize toolbox for spatial management models; (T3) improve understanding of species movement dynamics and stock structure; (T4) improve understanding of spatial fleet dynamics.	2.3.2, 2.5.2
ECO 7	*Goal:* Design and provide ecosystem-advice products to support operationalization of EAFM. *Targets:* implement the *Ecocard* workplan (ecoregions and indicators; pilot ecosystem-advice products; initialization of the Pacific Marine Specimen Bank).	2.3.3

2.1 Data collection (SSP Goals DAT 2, DAT 3)

Reliable data on shark catches, effort, and biological characteristics are the foundation of the research plan. Data collection activities are organized around two complementary areas: monitoring of shark catches in small-scale fisheries, and improvements to shark data collection in large-scale fisheries.

2.1.1 Small-scale fisheries

Small-scale fisheries throughout the EPO interact with sharks both as mixed target and bycatch species. Unlike large-scale fisheries, where observer programs systematically provide accurate well-structured data, small-scale fisheries operate across hundreds to thousands of landing sites with limited or no systematic monitoring. Prior research has demonstrated that shark catches from these fisheries may be substantial and that should not be ignored for shark assessments. Order-of-magnitude estimates for Central American artisanal fisheries (SAC-14 INF-L) indicated that catches of *C. falciformis* and *S. lewini* by artisanal fleets may exceed those of the large-scale longline and purse-seine fisheries operating offshore.

The IATTC has invested significant effort in developing the capacity to monitor these fisheries. Under the FAO-GEF Common Oceans ABNJ-Tuna 1 project, staff conducted three phases of collaborative research with Central American CPCs from 2014 to 2021. The first phase used satellite imagery to identify

potential landing sites; the second involved on-site verification and fisher recall surveys (SAC-11-13; Lennert-Cody et al. 2022); and the third deployed intercept surveys to collect catch composition, effort, and length data (SAC-14 INF-P). This work produced a validated sampling design using single-cluster systematic sampling approaches, order-of-magnitude catch estimates for key species, and a proposal for a long-term sampling program in Central America.

Building on the Central American experience, the Common Oceans ABNJ-Tuna 2 project extended this work to Ecuador, Mexico, and Peru (SAC-14 INF-M). Key outputs presented at SAC-16 include: identification and mapping of shark landing sites in these three countries (SAC-16 INF-W), which documented 16 primary sites in Ecuador believed to account for ~90% of national shark landings, 40 primary sites in Mexico, and 12 primary sites in Peru believed to cover 80% of national landings; and a comprehensive inventory of available shark fishery data sources and metadata across these countries (SAC-16 INF-V). The ABNJ-Tuna 2 project also assessed the feasibility of morphometric and biological sampling, as well as sampling designs for shark landings (SAC-17 INF-O; SAC-17 INF-P), including the viability of tissue collection for close-kin mark-recapture (CKMR) analyses at specific sites. The ABNJ-Tuna 2 project is in its final phase and will be completed by June 2027. Final data collection forms and protocols, together with preliminary catch estimates and sampling designs, will be made available to the Commission and its subsidiary bodies. SAC-15-10 synthesized the lessons learned from these projects and reviewed options for a shark data collection program covering all EPO fisheries. That document highlighted the challenges posed by the large number of landing sites, the dynamic targeting behavior of small-scale fishers, and the need to design sampling programs that serve multiple analytical objectives—from estimating total catches to providing samples suitable for CKMR.

Going forward, the goal is to complete the design and implement a standardized data collection program for sharks in small-scale fisheries across EPO coastal states, providing the operational foundation for meeting SSP objectives DAT 3, Target 1 (standardized data collection program for sharks in EPO small-scale fisheries) and FISH 5 (CKMR-based stock assessments), as established in the Strategic Science Plan (SSP) and Resolution C-25-08 (paragraphs 15 and 16). This program will build on the infrastructure, protocols, forms, and field networks and relationships established under ABNJ-Tuna 1 and 2 and will focus on generating continuous data on catch composition, effort, morphometrics, and biological sampling and parameters for the eight priority species (paragraph 16; Resolution C-25-08). Sampling intensity will depend on the number of species the Commission chooses to assess, prioritize, and fund, and on the acceptable level of estimation error. The sampling design will integrate the requirements of multiple downstream analyses, including order-of-magnitude catch estimation, EASI-Fish vulnerability assessments, and CKMR stock assessments. Per the SSP chronogram (Appendix 1), design development for this standardized program is targeted for completion by 2028, with full implementation progressing through 2030. Financial considerations associated to this item can be found in section 3.1 .

2.1.2 Large-scale fisheries

Sharks are taken as bycatch in purse-seine and longline tuna fisheries operating in the EPO. Some of these fisheries are monitored through the IATTC and National Program observer programs, which

provide species-level catch and effort data. For example, the large-vessel (Class 6) purse-seine fishery provides the most comprehensive data in terms of bycatch species (IATTC Special Rpt. 25), since the 1992 Agreement on the Conservation of Dolphins (the La Jolla Agreement) has required an observer to be onboard for all trips for Class-6 vessels since 1993. Some smaller-class purse-seine vessels, mostly classes 3–5, have voluntarily established observer programs through the Tuna Conservation Group (TUNACONS) (see EB-04-01; WSDAT-02-01; WSDAT-02-02). The coverage levels for the large (Class-6) and small purse seines (Class 3-5) are currently 100% and 40-55%, respectively.

Additionally, Resolution C-19-08, mandates that at least 5% of the fishing effort made by its longline fishing vessels greater than 20 meters length overall carries a scientific observer. However, opportunities exist to improve shark data collection in these fisheries (see WSDAT-01-01), particularly for species caught as bycatch, since the current level of observer coverage is insufficient for even estimating total tuna catches (BYC-10 INF-D). Priorities include: determining protocols and viability for adding tasks to IATTC observer duties, such as collection of tissue samples for CKMR analyses or additional data needs (e.g., BHRPs); and supporting the development of electronic monitoring systems (EMS) that can complement or extend human observer coverage for shark data (SSP Goal DAT 2). These EMS activities also extend to small purse-seiners (classes 1–5) and transshipment operations (SSP Goal DAT 3, Targets 2–4), which represent additional sources of shark interaction data that are currently less well monitored.

Some shark data are also reported under Resolution C-03-05 (2003) and its corresponding specifications for data provision (see TASK I catch statistics of gross annual removals), although these data are considered incomplete and highly variable (e.g., see EB-04-01), with sharks often reported as broad aggregated taxonomic groups ("sharks") rather than fine-scale species-specific taxonomic resolution (e.g. "silky shark"; "*Carcharhinus falciformis*"). A series of data improvement workshops were recommended based on SAC-12-09 (see SAC-12-16, section B.3: General data provisions). The first workshop, focused on large-scale longline fisheries, was held to address these limitations (WSDAT-01-01), and recommendations based on participant feedback were provided in SAC-14 INF-Q, SAC-16 INF-O in 2023 and 2025, respectively.

2.1.3 General dynamics of fishery interactions with sharks

Understanding the dynamics of shark-fishery interactions—including gear selectivity for different species and life stages, the spatio-temporal distribution of fishing effort, and the relationship between fishing practices and shark catch rates—is essential for interpreting fishery data and parameterizing assessment models. The landing site identification and mapping work conducted under ABNJ-Tuna 1 and 2 (SAC-16 INF-W) provides fundamental information on the spatial structure of small-scale fisheries. Research under this component will also contribute to an improved understanding of fleet dynamics relevant to spatial management efforts (SSP Goal ECO 6, Target 4).

2.2 Stock assessment (SSP Goals FISH 5, FISH 6)

Stock assessment is central to science-based fisheries management. The research plan pursues two complementary approaches to assessing priority shark species: close-kin mark-recapture (CKMR) for species where conventional data are insufficient and/or CKMR may be cost effective, and conventional stock assessments where adequate data exist. These assessments will be conducted through collaboration with external organizations as appropriate. Risk assessments will depend on progress in the external review of IATTC's ERA tools and on implementation of the resulting recommendations. They will be led by IATTC staff in collaboration with CPC experts through the IATTC shark technical workshop process.

Table 2 summarizes the assessment approaches planned for each of the eight priority species, with indicative target dates for completion.

Table 2. Planned assessment approaches and indicative target completion dates for the eight priority shark species identified in Resolution C-25-08.

Species	CKMR	Conventional	Risk assessment*
Carcharhinus falciformis	2030	NA	Completed (SAC-14-12); update in 2027-2028
Carcharhinus longimanus	NA	NA	2029-2030
Sphyrna lewini	TBD	NA	Completed (SAC-14-12); update in 2027-2028
Sphyrna zygaena	NA	NA	Completed (SAC-14-12); update in 2027-2028
Sphyrna mokarran	NA	NA	Completed (SAC-14-12); update in 2027-2028
Alopias pelagicus	NA	2029 (TN)	2029-2030
Alopias superciliosus	NA	NA	2029-2030
Prionace glauca	NA	ISC: Expected update or benchmark assessment 2026-2027 North Pacific CPPS: 2026-2028 South eastern Pacific	

TBD – To be determined depending on results of silky CKMR assessment.

NA – Not applicable or possible

TN – Tentative, depending upon availability of conventional data. If not possible Risk Assessment will be conducted.

*Pending progress on external review of IATTC's ERA tools and implementation of recommendations

2.2.1 Close-kin mark-recapture

Conventional stock assessment models for EPO sharks have been hindered by fundamental limitations in catch and effort data, particularly the absence of reliable abundance indices and complete catch histories. The IATTC staff has previously attempted a stock assessment for silky shark, but the assessment model was not considered reliable for management advice due to these data constraints (SAC-05 INF-F). A subsequent Pacific-wide assessment of silky shark encountered similar data limitations and was likewise not adopted for management advice (Clarke et al. 2018). In response, the staff has pivoted the assessment strategy for *C. falciformis* toward CKMR, a genetics-based method that estimates absolute adult abundance and other population parameters by quantifying the rate at which close relatives (e.g., parent-offspring or half-sibling pairs) are found within population samples. CKMR provides an absolute abundance index without requiring traditional catch-per-unit-effort data and can integrate conventional fisheries data such as catch and length compositions when available.

The IATTC has an active pilot project underway to evaluate the feasibility of CKMR for silky shark. This feasibility study has included individual-based simulations to evaluate different population sizes, population structure scenarios, and sampling schemes to determine the number of kin pairs expected under various conditions (EBWG-03-PRES). Work is ongoing to develop a genetic panel for the species and establish sampling supplies and protocols for integration into observer and coastal sampling programs (SAC-17 INF-O). Preliminary results to date indicate that a CKMR assessment for silky shark is feasible in the EPO, and that the framework developed for silky shark could subsequently be extended to other prioritized species (e.g., *S. lewini*).

The SSP (Goal FISH 5) establishes a phased approach: complete the CKMR development phase (simulation testing, sampling protocol design, kinship assignment panel development); implement the CKMR sampling program; conduct the stock assessment (target 2030–2031); and explore the applicability of the silky shark CKMR framework to other prioritized species, beginning with *S. lewini*. Collection of CKMR tissue samples requires access to specimens in whole or eviscerated-whole condition, which constrains the sampling to specific landing sites. The feasibility study under ABNJ-Tuna 2 identified 11 sites across Ecuador, Mexico, and Peru where CKMR-compatible tissue collection was determined to be viable (SAC-17 INF-P). As of May 2026, several hundred silky shark tissue samples have been collected from Ecuador, Mexico, and Peru.

2.2.2 Conventional stock assessments

For species where adequate data and assessment infrastructure exist, the IATTC will continue to support conventional stock assessments through collaboration with external organizations (SSP Goal FISH 6). The IATTC participates actively in stock assessments conducted by the SHARKWG of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) for north Pacific blue shark (*Prionace glauca*) and shortfin mako shark (*Isurus oxyrinchus*). The SSP schedule of stock assessments includes benchmark assessments for north Pacific blue shark (2026-2027) and shortfin mako (2029) within the 2026–2030 period. Collaboration with the Comisión Permanente del Pacífico Sur (CPPS -regional) is in progress for the assessment of blue shark in the south EPO (and MOU was signed

between IATTC and CPPS); a workshop to establish a conceptual model for the stock shall take place still in 2026. Collaboration with SPRFMO and WCPFC-SPC (Pacific-wide) on relevant species is also envisaged, as needed.

2.3 Assessment of impacts (SSP Goals ECO 1, ECO 6, ECO 7)

Not all priority species can be assessed through formal stock assessment within the plan period. The research plan therefore employs a suite of complementary approaches to evaluate the impacts of EPO fisheries on shark populations.

2.3.1 Ecological risk assessments

The IATTC uses the Ecological Assessment of the Sustainable Impacts of Fisheries (EASI-Fish; Griffiths et al., 2019), a length-structured vulnerability assessment framework, to evaluate the relative vulnerability of shark species to fishing mortality and to test the potential efficacy of hypothetical conservation and management measures. Two shark EASI-Fish assessments have been completed to date: a general assessment covering 32 shark species caught in EPO pelagic fisheries (SAC-13-11), and a focused assessment for silky and hammerhead sharks that included scenario modeling of potential management measures (SAC-14-12). Both assessments identified silky and hammerhead sharks as among the shark species impacted by tuna fisheries in the EPO.

Under the SSP (Goal ECO 1), the staff will conduct updated ERAs for any of the eight priority species identified in C-25-08 for which other forms of assessment are not viable, as well as other vulnerable taxa as needed. These assessments will incorporate improved biological parameters and catch data as they become available through the data collection program or collaborations with CPC experts, and will serve as the primary assessment tool for species that cannot be assessed through CKMR or conventional methods within the plan period. IATTC staff are planning an external review of the ERA tools currently in use (2026-2027). Application of EASI-Fish, another version of it or other ERAs in the short to medium term will therefore depend on progress in implementing the review's recommendations.

2.3.2 Spatial management and the BBNJ agreement

The SSP establishes a goal to develop a toolbox for informing the Commission’s use of spatial management measures, including options proposed under the UN Agreement on Biodiversity Beyond National Jurisdiction (BBNJ; SSP Goal ECO 6). Specific targets include developing best practices for spatial management data and models, parameterizing spatial management model toolboxes, and improving understanding of species movement dynamics, stock structure, and fleet dynamics.

The shark research plan contributes to these objectives through multiple tracks. Telemetry studies of priority shark species will improve understanding of species distributions, movement rates, habitat use, and stock structure—information that is essential for evaluating area-based management measures. CKMR analyses will also provide information on effective population structure. Research on fishery dynamics will help characterize the spatio-temporal overlap between fishing effort, target species and

shark distributions. Together, these activities provide the scientific basis for evaluating spatial management scenarios, including those that may be proposed under the BBNJ agreement.

At the 103rd IATTC meeting in Panama, the staff presented a GEF project concept note (IATTC-103 INF-G) for a four-year multi-million-dollar Medium-Size Project titled "Advancing Area and Ecosystem Based Management to support enabling activities toward the implementation of the BBNJ Agreement in the Eastern Pacific Ocean", to be potentially implemented by FAO with IATTC as executing partner. The project is intended to support IATTC Members and Cooperating non-Members in advancing area- and ecosystem-based management consistent with the BBNJ Agreement.

2.3.3 Ecosystem-advice products

The SSP directs the staff to develop ecosystem-advice products to support operationalization of the Ecosystem Approach to Fisheries Management (EAFM; SSP Goal ECO 7; see also EB-02-02; EB-03-04; EB-04-03). Shark-relevant outputs include the development of ecoregion classifications and indicators, pilot ecosystem-advice products, and, ideally, initialization of a biological sampling program for prioritized species (unfunded project F.3.a; SAC-14 INF-J). Annual ecosystem consideration reports (e.g., see EB-04-01), which already include indicators on shark catches and related ecosystem elements, will continue until the transition toward formalized ecosystem-advice products is completed.

2.4 Mitigation of impacts (SSP Goals ECO 2, ECO 3, ECO 4)

Effective shark conservation requires not only assessment of population status but also practical tools and practices to mitigate fishing-related mortality. The SSP addresses mitigation across three stages of the fishing interaction: pre-interaction, during and after the interaction.

Pre-interaction: the staff is developing environmental-based bycatch avoidance tools—including species distribution models and spatio-temporal multi-species models—that could help fishers reduce encounters with sharks (SSP Goal ECO 2).

During interaction: the SSP includes goals for conducting scientific experiments, in collaboration with industry and regional research partners, to identify gear configurations and technologies that reduce shark mortality in both purse-seine and longline fisheries (SSP Goal ECO 3; EB-04-06).

After interaction: the Commission has directed the development of science-driven best handling and release practices (BHRPs) for sharks (SAC-15-11; SAC-16-10. Resolution C-25-08) and other vulnerable taxa (EB-02-03; SSP Goal ECO 4). The IATTC is conducting research on handling and releasing techniques that minimize harm to sharks caught during fishing operations while ensuring crew and observer safety, including a pilot study on the use of specific bycatch release devices (SAC-17 INF-K, C-25-08 paragraph 14). To advance this BHRPs work, the staff has developed two unfunded project proposals (IATTC-103-03c): project M.1.f, which would evaluate the effects of lifting sharks by the tail using shark Velcro and harnesses, and project Q.3.a, which would develop training and outreach materials to support fleet-wide implementation of BHRPs for vulnerable taxa.

2.5 Supporting research

2.5.1 Life history

All assessment approaches—whether CKMR, EASI-Fish, or conventional stock assessments—depend on accurate biological parameters including growth rates, natural mortality, maturity schedules, fecundity, and length-weight relationships. Resolution C-25-08, paragraph 19(b), calls on CPCs to improve knowledge of key biological and ecological parameters, life-history traits, and behavioral characteristics of priority shark species. The staff has prepared an unfunded project proposal (unfunded project F.3.a; SAC-14 INF-J) that includes a dedicated component for biological sampling that could be the basis to initiate life history research on the eight priority species. This includes supporting basic research on growth, fecundity, maturity, diet, and species distribution, as well as the development of morphometric conversion factors (e.g., trunk length to total length, trunk weight to total weight) that are necessary for integrating data from fisheries where sharks are landed in different processed forms. Morphometric data collection has been integrated into the ABNJ-Tuna 2 field protocols, as well as opportunistic port-sampling in the main tuna ports, and standardized measurement approaches using validated ichthyometer designs have been developed.

2.5.2 Telemetry

The IATTC has a long history of telemetry research (studies on the movement and behavior dynamics using electronic tags of relevant species). The shark research plan includes tagging studies of priority species to improve understanding of species distributions, movement patterns, habitat use, and post-release survival. Telemetry data contribute to multiple research goals: informing species distribution models for bycatch avoidance tools (SSP Goal ECO 2), assessing the efficacy of BHRPs and other conservation measures, improving understanding of stock structure for CKMR and other assessments (SSP Goal ECO 6, Target 3), and evaluating the effectiveness of spatial management measures, including area-based measures that may be developed through the BBNJ process.

2.5.3 Conceptual Models

Conceptual models are a key tool in the effective assessment of marine species. The purpose of a conceptual model is to “model what to model”, documenting the key life history and fishery processes that affect the dynamics of the species in question (Minte-Vera et al. 2024). Conceptual models help ensure that the planned data collection program and stock assessment modeling approach are appropriate for the species in question. The IATTC staff collaborated on a recent conceptual model for silky sharks in the EPO, Talwar et al. (2025). This conceptual model has been crucial in the planning of CKMR projects for silky sharks. Part of the Shark Research Plan calls for assessment of hammerhead sharks (likely by CKMR) following successful completion of the silky shark CKMR project. This process would be greatly aided by completion of a conceptual model for hammerhead sharks in the EPO, in the manner of Talwar et al. (2025). This would likely entail at least part-time support for a consultant.

3. TIMELINES AND FINANCIAL CONSIDERATIONS

Resolution C-25-08, paragraph 16, requires the Shark Research Plan to include timelines and financial considerations for stock assessments, ecological risk assessments, and management strategy evaluations (MSE). However, MSEs are unlikely to be conducted for sharks in the near term, as, in the IATTC, they depend on conventional stock assessments, which are not currently available for these species. The timing for these activities is defined in the SSP shark workplan chronogram (IATTC-103-03a), which is reproduced in full in Appendix 1; Goal and Target numbering has been added there to match the in-text citations and the definitions in Table 1. Table 3 below re-presents some of the key activities organized by research area, mirroring the structure of Section 2 of this document.

Table 3. Indicative timeline of research activities under the IATTC Shark Research Plan, 2026–2030, aligned with the SSP chronogram (Appendix 1).

Research area	Key activities	Period
Data collection: small-scale fisheries	Design and implement standardized program	2026–2030
Data collection: large-scale fisheries	Review observer forms and protocols, EMS integration	2026–2030
CKMR: development phase	Simulations, panel development, sampling protocols	2026–2028
CKMR: implementation	Full-scale sampling program	2028–2030
CKMR: stock assessment (silky shark)	Conduct assessment	2030–2031
CKMR: expansion to other species	Apply framework to *S. lewini* and others	2029–2030+
Conventional assessments (ISC/CPPS)	Blue shark, shortfin mako benchmarks	2026–2030
ERAs (e.g., EASI-Fish)	Tool improvements, updated assessments for priority species (e.g., threshers, whitetip, silky, hammerheads)	2026–2030
Spatial management toolbox	Models and best practices, species movement, fleet dynamics	2026–2030
Gear technology experiments	Understanding gear selectivity for bycatch mitigation	2026-2030
Bycatch avoidance tools	SDM library, multi-species models, tool development	2026-2030
BHRPs	Standardized science-based practices for all fisheries	2026–2028
Life history research	Biological parameters for priority species	2026–2030
Telemetry	Tagging studies for priority species	2026–2030

3.1 Financial Considerations

Although many tasks in this shark research plan can be carried out within existing resources, several components require additional financial resources beyond the IATTC's current operating budget. Budget estimates for the shark data collection program in small-scale fisheries and for the silky shark CKMR stock assessment — the main tools needed to conduct reliable shark assessments, a key priority of the shark research plan — are detailed in SAC-17 INF-E and below. The ABNJ-Tuna 2 project, which has provided critical infrastructure for the coastal data collection program (a key desirable component mentioned in paragraph 15 of Resolution C-25-08), is scheduled to conclude in 2026–2027; sustaining and expanding this work will require identification of long-term funding mechanisms, including potential Commission budget lines, CPC co-funding, and external donor support.

Beyond the small-scale fisheries program and the CKMR work detailed below, several additional unfunded project proposals support the activities described in Section 2 and will require external resources to advance; note that further proposals may be developed as the research plan is implemented and new needs are identified by the staff or the Commission. These include the two BHRPs-related proposals introduced in Section 2.4 (IATTC-103-03c): project M.1.f, which would evaluate the effects of lifting sharks by the tail using shark Velcro and harnesses, and project Q.3.a, which would develop training and outreach materials to support fleet-wide implementation of BHRPs for vulnerable taxa. They also include project F.3.a (SAC-14 INF-J), introduced in Section 2.5.1, which would initiate the biological-sampling component required to advance life-history research on the eight priority shark species. Project F.2.b (IATTC-103-03c), introduced in Section 2.5.3, would develop a conceptual model for hammerhead sharks, a foundational step for the proposed hammerhead CKMR assessment. A large-scale telemetry proposal (currently a GEF concept note, IATTC-103-INF-G) is also in preparation to address movement and stock-structure data gaps for several priority species. Table 4 summarizes these proposals alongside the CKMR and small-scale fisheries sampling budgets (referred to as the integrated shark assessment and sampling program), indicating the research areas each supports and the approximate funding requested.

Table 4. Summary of unfunded project proposals supporting the Shark Research Plan, with the research areas they cover and approximate funding requested. CKMR and small-scale fisheries sampling figures (integrated shark assessment and sampling program) correspond to the indicative tiers presented in Table 5.

Project/task	Research areas covered (Section 2)	Approximate funding requested	Reference
Integrated shark Assessment and Sampling Program (3-year)	2.2.1 Close-kin mark-recapture; 2.2.2 Conventional stock assessments. 2.1.1 Small-scale fisheries; 2.2.1 CKMR (tissue sampling); 2.5.1 Life	~USD 0.6–2.9M (3-year total, tiered) Further details on table 5 and section 3.1.1 below	SAC-17 INF-E; Table 5 of SAC-17-09

	history		
M.1.f – Shark Velcro and harness lifting study	2.4 Mitigation of impacts	USD $184,686 (pilot study to assess practicality prior to full-scale implementation)	IATTC-103-03c; SAC-17 INF-E
Q.3.a – BHRPs training and outreach materials	2.4 Mitigation of impacts	USD $176,000	IATTC-103-03c; SAC-17 INF-E
F.3.a – Biological sampling	2.1.2 Large-scale fisheries (morphometrics); 2.5.1 Life history	Phase 1: feasibility US$140,000	SAC-14 INF-J; IATTC-103-03c; SAC-17 INF-E
Large-scale telemetry program in support of BBNJ and other research and management needs (GEF concept)	2.5.2 Telemetry; 2.3 Assessment of impacts	External (GEF concept note)	IATTC-103-INF-G; SAC-17 INF-E
F.2.b - Hammerhead conceptual model development	2.5.3 – Conceptual Models; foundational for CKMR	$USD 100,000	IATTC-103-03c; SAC-17 INF-E

3.1.1 Integrated Shark Assessment and Sampling Program

Reliable shark assessments are a key priority of this research plan, and the two main tools required to deliver them — the small-scale fisheries data collection program (paragraph 15, C-25-08) and the CKMR-based stock assessments (paragraph 16, C-25-08)— are operationally inseparable. The staff has therefore combined them into a single integrated shark assessment and sampling program, which is costed and described jointly below. Approximate financial considerations for the proposed three-year integrated shark assessment and sampling program are presented at three budget tiers that differ in the scope of small-scale fisheries coverage, with the associated corresponding risks. All tiers assume completion of the pilot CKMR phases already funded and underway (e.g. development of the kinship assignment panel), and assume zero continuation of ABNJ-Tuna funding — the small-scale sampling components described here would commence after the conclusion of ABNJ-Tuna 2 (i.e., 2027-2028). Costs cover collection of representative tissue samples (target ~5,000 per year) from EPO silky shark catches and processing through the CKMR pipeline (kinship assignment primarily), temporary support of a researcher/consultant, and, where applicable, small-scale fisheries field sampling. The CKMR program is focused on silky shark; biological data (tissue, morphometrics, life history) from other priority species will be collected opportunistically as encountered during sampling. However, the integrated shark

assessment and sampling program would act as the foundation for future CKMR assessments on other key priority shark species (paragraph 16; Res. C-25-08). These estimates do not include the costs of current full-time IATTC staff that would be working on this program.

Tier	Description	Approximate 3-Year Cost	Benefits & Risks
Tier 1: Large-Scale Sampling Only	Tissue samples collected only from the existing IATTC observer program covering the large-scale fleet. No coastal small-scale sampling. Primary costs: tissue collection, kinship assignment, observer support, support of a temporary researcher/consultant.	$600,000	Most affordable. Principal risk: if meaningful stock structure exists around the coast, a CKMR assessment built only on large-scale samples **may fail**. No updated artisanal catch estimates — reliant on prior ABNJ 1-2 estimates of small-scale silky shark catches for fishing mortality over time. No opportunity to develop sampling infrastructure for small-scale fisheries that may be more critical for future species (e.g. hammerheads) or CPC-specific needs. Due to these risks, the staff does not recommend this option.
Tier 2: Large-scale sampling and targeted small-scale sampling	Large-scale sampling as in Tier 1, plus three years of targeted small-scale sampling: approximately 20 sampling technicians, four local coordinators and five technician support, distributed across the 9 countries that participated in ABNJ-Tuna 1 and 2, stationed at a subset of primary landing sites per country (e.g., the CKMR-viable sites identified in SAC-17 INF-P). Technicians collect tissue samples for silkies, opportunistic samples for hammerheads, and morphometric and biological data, including genetic samples, on other priority species encountered — they remain at core sites rather than circulating to estimate catch across the full landings network.	$2,400,000	Including coastal samples enables CKMR to better characterize the known contribution of coastal ecosystems to population dynamics, and materially reduces the stock-structure risk identified under Tier 1. Maintains operational continuity of the ABNJ field network at the CKMR-viable sites. Artisanal catch estimates remain reliant on prior ABNJ 1-2 estimates rather than being refreshed, risk if models turn out to be sensitive to incorrect estimates of small-scale catches. Additional

Tier	Description	Approximate 3-Year Cost	Benefits & Risks
	Primary costs: tissue collection, kinship assignment, observer support, support of a temporary researcher/consultant, plus small-scale sampling program staff (≈65%), DSA (≈31%), and travel (≈4%).		operational risks: sample sizes may be insufficient for biological parameters in less frequent species; extended timeline to deliver expected outputs relative to a more heavily staffed program. On balance, the staff recommends this option for the current cycle.
Tier 3: Large-scale sampling and comprehensive sampling of small-scale fisheries	Large-scale sampling as in Tier 1, plus three years of small-scale sampling structured as two years at the Tier 2 minimum level (≈20 technicians) followed by one year at an expanded comprehensive level: approximately 33 sampling technicians plus four local coordinators in ABNJ-2 countries, with coverage extended to the primary landing sites identified in, for example, SAC-16 INF-W (i.e., 6 in Ecuador, 4 in Colombia, 8 in Mexico, 8 in Peru, plus 16 for Central America countries), plus selected secondary sites in each country. The expanded comprehensive year adds dedicated catch sampling, producing updated total-catch and size-composition estimates for that year only, plus strengthened logistics (vehicles, measuring equipment, coolers, sample storage) and data quality assurance.	$2,900,000	Produces one year of updated catch and size-composition data from small-scale coastal fisheries, which would be needed for a fully specified CKMR assessment. The expanded comprehensive year also gives better statistical power for national-level catch estimates and improved biological representativeness across more of the priority shark species. Principal risk: cost. The value of information of one year of catch data is uncertain — potentially high if catch data prove necessary for the assessment to perform well, but the marginal benefit over Tier 2 is otherwise expected to be modest. Therefore, staff recommends Tier 2 over Tier 3.

4. COLLABORATION WITH WCPFC

Resolution C-25-08, paragraph 16, directs the Shark Research Plan to identify opportunities for collaboration with the Western and Central Pacific Fisheries Commission (WCPFC) for Pacific-wide stocks. Several priority species have distributions that span both the EPO and the WCPO, making coordinated research essential.

Blue shark (*P. glauca*) in the south EPO will be assessed in collaboration with CPPS and will include WCPFC and other relevant collaborators due to uncertainty in stock boundaries. Blue shark (*P. glauca*) and shortfin mako (*I. oxyrinchus*) in the north Pacific are assessed through the ISC, which serves both the IATTC and WCPFC. The IATTC will continue its active participation in ISC stock assessments for these species. Coordination with the WCPFC on CKMR sampling and analysis could allow for co-development of methods, and allow for collaborative assessment if any shared stocks are identified through ongoing stock structure research. As the IATTC's CKMR program matures, opportunities for joint sampling design and data sharing with WCPFC should be explored. More broadly, collaboration on harmonized data collection standards, shared biological parameter estimates, and coordinated ecological risk assessments would benefit the management of all Pacific-wide shark stocks.

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APPENDIX 1. SSP shark research workplan chronogram, 2026–2030

Reproduced from IATTC-103-03a (Strategic Science Plan 2026–2030), page 10. A Code column has been added to support cross-referencing with in-text citations and with Table 1; all other content, including the shading pattern, is as in the source.

Themes cited below: DAT — Data Collection for Scientific Support of Management; FISH — Sustainable Fisheries; ECO — Ecological Impacts of Fisheries: Assessment and Mitigation.

Code			Tentative chronogram				
			2026	2027	2028	2029	2030
Data collection							
DAT 3	**Goal**	**Complete the design and implement a standardized data collection program for shark species associated with fisheries managed by the Commission**					
DAT 3, T1	Target	Small-scale coastal fisheries					
DAT 2	**Goal**	**Continue to support the IATTC in the development and implementation of an EMS for tuna fisheries in the EPO**					
Assessment							
Stock assessment							
FISH 5	**Goal**	**Conduct a close-kin mark-recapture stock assessment for silky shark**					
FISH 5, T1	Target	Complete the CKMR development phase.					
FISH 5, T2	Target	Implement the CKMR program.					
FISH 5, T3	Target	Conduct the stock assessment.					
FISH 5, T4	Target	Explore the applicability of silky shark CKMR framework to other prioritized shark species					
FISH 6	**Goal**	**Address Commission's request to conduct conventional stock assessments of prioritized species, as needed, through collaboration with external organizations**					
FISH 6, T1	Target	Prioritized shark species in Resolution C-24-05 (e.g., ISC, CCPS)					
Assessment of impacts							
ECO 1	**Goal**	**Conduct ERAs of EPO fisheries to identify and prioritize species at risk and evaluate the impact of different management scenarios**					
ECO 1, T1	Target	Conduct ERAs for prioritized shark species in Resolution C-24-05					
ECO 6	**Goal**	**Develop a toolbox to inform the use of spatial management efforts by the Commission, including options proposed under the BBNJ**					
ECO 6, T1	Target	Develop good practices for data, models, and evaluation					
ECO 6, T2	Target	Develop and parameterize a toolbox for spatial management models					
ECO 6, T3	Target	Improve understanding on species movement					

		dynamics and stock structure					
ECO 6, T4	Target	Improve understanding on spatial fleet dynamics					
ECO 7	**Goal**	**Design and provide ecosystem-advice products to support operationalization of EAFM**					
ECO 7, T1	Target	Identify and establish criteria for ecoregions and indicators					
ECO 7, T2	Target	Develop ecoregions and indicators					
ECO 7, T3	Target	Establish guidelines and develop pilot ecosystem-advice products					
ECO 7, T4	Target	Initialization of the Pacific Marine Specimen Bank for prioritized species					
Mitigation of impacts							
ECO 2	**Goal**	**Develop tools for the Commission-managed fisheries to reduce fisheries interactions with prioritized bycatch species**					
ECO 2, T1	Target	Develop a library of species distribution models for prioritized bycatch species.					
ECO 2, T2	Target	Develop spatio-temporal environmental multi-species models for bycatch avoidance.					
ECO 2, T3	Target	Test and operationalize a first version of the tool (e.g., eco-informatics)					
ECO 3	**Goal**	**In collaboration with the industry, conduct scientific experiments to identify technologies that would reduce mortality of prioritized bycatch species**					
ECO 4	**Goal**	**Complete the development of science-driven standardized best handling and release practices for all vulnerable taxa and fisheries managed by the Commission, including training programs for onboard crew**					
ECO 4, T1	Target	Sharks					