INTER-AMERICAN TROPICAL TUNA COMMISSION

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DOCUMENT IATTC-102-02b

UNFUNDED PROJECTS

This document lists projects proposed by the IATTC scientific staff which are not yet funded. The staff's work plans for 2019-2024 and its current and planned research activities are listed in Document IATTC-102-02a, and its broader and longer-term goals are set out in Document IATTC-93-06a, *IATTC Strategic Science Plan*.

CONTENTS

A. INTRODUCTION

This document presents brief summaries of 5 research projects that the staff considers important, but lacks the resources, human, technical, or financial, to undertake. The summaries include, for each project, background information, a work plan, and a status report, as well as details of its relevance and purpose, external collaborators, duration, deliverables, and an indicative budget.

Research projects that are funded and/or under way are included in IATTC-102-02a; it also contains the staff's work plans, which include many of the projects listed in this document.

The staff's research activities are structured into the seven main areas of research, called *Themes*, of the proposed Strategic Science Plan (SSP; IATTC-93-06a). In addition to better accommodating a strategic planning approach, this new structure is intended to foster stronger collaboration among the different programs (recommendation 17 of the 2016 IATTC Performance Review), with researchers from different programs contributing to activities under a common *Theme*. The seven *Themes,* the strategic pillars of the SSP, are the following:

1. Data collection for scientific support of management
2. Life history studies for scientific support of management
3. Sustainable fisheries
4. Ecological impacts of fishing: assessment and mitigation
5. Interactions among the environment, ecosystem, and fisheries
6. Knowledge transfer and capacity building
7. Scientific excellence

Each *Theme* is divided into strategic *Goals*, and the principal tasks that will be carried out to achieve a particular goal within the SSP's five-year window are called *Targets* (IATTC-93-06a). The specific activities that the staff

will carry out in order to fulfil those tasks are called *Projects*, which are in some cases grouped into *Work Plans* aimed at achieving a broad objective not limited to a particular *Theme* or *Goal*.

The general *Themes*, and the more specific *Goals*, reflect what the staff considers to be its primary responsibilities, and form an integral part of the five-year SSP. The more focused *Targets*, and the concrete *Projects*, are generally of shorter duration, and operate on a biennial cycle. Whether any *Projects* are undertaken under a particular *Goal* or *Target* in any given period will depend on the staff's research priorities, the human, logistic, and financial resources available, and any specific instructions from the Commission.

B. UNFUNDED PROJECTS, BY THEME

INDEX

1. DATA COLLECTION FOR SCIENTIFIC SUPPORT OF MANAGEMENT

PROJECT B.3.b: Evolve the Enhanced Monitoring Program (EMP) infrastructure to support the collection of morphometric data to improve catch estimation and reduce uncertainty in tuna stock assessment and management.

THEME: 1. Data collection for scientific support of management.
GOAL: B. Conduct a review of current IATTC/AIDCP data collection programs, identify and prioritize opportunities to improve data quality and expand data types and coverage.
TARGET: B.3 Evaluate and improve the port sampling data collection program.
EXECUTION: Data collection, Biology, Ecosystem and Bycatch Programs.

Objectives	• Continue the current EMP work plan, which includes:
	  • Support the IVT management measure, sampling trips of individual vessels to provide an independent estimate of their BET catch per trip and a measure of the precision on that estimate.
	  • Model the relationship between EMP and observer well-level estimates of BET catch, which may lead better utilization of observer data in tuna research, such as development of spatio-temporal models for fleet-level species catch composition, in addition to improvements to trip-level BET catch estimation.
	• Implement simulation studies to identify modifications to IATTC's traditional port-sampling protocols that could reduce variance, and potentially bias, in the fleet-level species catch estimates.
	• Collect morphometric data from purse-seine and longline vessels to derive L-W and L-L relationships for tropical tuna species, which are used in tuna stock assessments and catch estimates.

Background	The EMP is an enhanced port-sampling program mandated by Resolution C-21-04 as part of the Individual Vessel Threshold (IVT) program for bigeye tuna catches. The EMP provides estimates of BET catch per trip, with a margin of error, for trips of vessels sampled by the program. Data collected by the EMP have also provided important opportunities for research (SAC-15 INF-H), including studies to help maximize the scientific benefits of all data sources, not only for estimation of BET catch per trip, but also for the estimation of fleet-level species catch composition. The EMP provides the infrastructure and expertise to support the IATTC in meeting other current data collection requirements for the improvement of assessments identified by the October 2023 1st External Review of data used in stock assessments of tropical tuna in the EPO: 1) collection of morphometric data to update the morphometric relationships used in the stock assessments (noting these relationships are outdated by several decades); and, 2) collection of high-frequency species-composition sampling data for use in simulation studies to evaluate improvements to the traditional port-sampling protocol.
Relevance for management	Improve the conservation success of the IVT program. Improve research for tropical tuna species by: • Increasing the scope of science that can be conducted with existing purse-seine data sources; • Generating sources benefiting tuna stock assessments; • Facilitating improvements to the IATTC regular port-sampling protocol through generation of new data for research, and expansion of sampling.
Duration	2025 (1 year)

Work plan and status	• Continue the IVT program sampling protocol to derive trip-level estimates of BET catch from individual purse-seine vessels in Ecuador. • Collect morphometric data from tropical tunas during unloading of purse-seine and longline vessels, in Ecuador and Mexico. • Intensive within-well sampling of purse-seine wells with catch from one-set OBJ, NOA and DEL sets, in Ecuador and Mexico. • Conduct scientific research involving EMP and other data sources.
External collaborators	• CPCs • Fishing industry
Deliverables	• Estimates of BET catch per trip, and a measure of precision on those estimates, for select purse-seine vessels. • Maintenance of the IATTC webpage for CPCs that provides information on trip-level BET catch estimates from all sources, as available. This would include an IATTC staff Best Scientific Estimate (BSE) for every trip, if mandated under the new management measures. • A database of lengths, weights and conversions to facilitate development of L-W and L-L relationships for tropical tunas. • Reports to the SAC and the Commission. • Publications in peer-reviewed journals.
Budget (US$)	US$ 485,000.00

PROJECT C.2.c: Pilot study of electronic monitoring (EM) of the transshipment activities of carrier vessels, and improvement of EM records collecting on tuna transshipment weights		
THEME: Data collection **GOAL:** C. Improve quality and expand coverage of data-collection programs **TARGET:** C.2. Transshipment carrier vessels **EXECUTION**: Ecosystem and Bycatch Program, Policy Division		
Objectives	• To establish what EM data is capable of collecting aboard transshipment carrier vessels with as much precision as the observer with the use of EM equipment. • To improve the EM records collecting of tuna transshipment weights, by assessing the performance of sensor data connected to an electronic crane scale for refined tuna transshipment data collection for management purposes.	
Background	• EM has proven to be a valuable tool for monitoring activities and catches on board fishing vessels. • Unlike human observers, fishing activities and catches of fishing vessels can be uninterruptedly recorded by EM. • For fishery management based on science, is key to ensure the monitoring of all the transshipment activities by large-scale longline vessels in the Antigua Convention Area, including the control of their landings. • EM could record these transshipment activities and tuna weights with the same precision level as human observers. • Tests using Radio-frequency identification technologies (RFID) integrated to EM has yield promising results (e.g., the European Union grant agreement under the EMFAF, project number 840475 Exploring technologies for remote identification of FADs). • The use of RFID on crane electronic scales would provide accuracy on transshipment tuna weights' data.	
Relevance for management	• Transshipment activities recorded by EM would increase the effectiveness of the IATTC conservation and management measures pertaining to species covered by the Antigua Convention. • This effectiveness could also be achieved with tuna transshipment weights' data obtained with higher precision with the use of electronic scales.	
Duration	2025-2026 (2 years)	
Work plan and status	• 2025: Installing EM equipment and RFID crane scale on board the transshipment carrier vessel and EM records collection. • 2026: EM data analysis and statistical comparisons between EM data and the onboard data collected by the human observer, and final report.	
External collaborators	• The Nature Conservancy (TNC), MRAG, Fishing industry, EM service providers (SatLink and Digital Observer Services).	
Deliverables	• Reports for the SAC, the EMWG and the Commission, with recommendation of minimum data fields that can be reliably collected by EM on board transshipment vessels.	
Budget	EM equipment, installation and remote assistance costs	$64,700 USD
	EM records collection and EM analysis (for 180 days at sea)	$18,000 USD
	Miscellaneous costs @ 10%	$8,270 USD
	Financial contribution from TNC	-$25,000 USD
	Total	$65,970 USD

2. LIFE-HISTORY STUDIES FOR SCIENTIFIC SUPPORT OF MANAGEMENT

PROJECT F2.b: Developing conceptual models for hammerhead sharks in support of assessment and mitigation of ecological impacts.	
THEME: Life-history studies for scientific support of management **GOAL:** F. Obtain key life history information for assessment and mitigation of ecological impacts on prioritized species **TARGET:** F.2. Conduct life-history studies of shark species **EXECUTION**: Ecosystem and Bycatch Program	
Objectives	• Develop a comprehensive set of conceptual models for three hammerhead shark species (*Sphyrna lewini, S. zygaena* and *S. mokarran)* to support close kin mark-recapture (CKMR),vulnerability and stock assessments, and ecological studies. • Generate a database of best available biological data to be used for relevant projects (e.g., CKMR, population-stock structure, ERA, reproduction, trophic ecology, length-weight relationships, habitat use, climate impacts). • Obtain information on the stock structure of hammerheads to improve sampling designs in various EPO fisheries.
Background	• Fisheries bycatch is of concern for sharks, whose populations are often sensitive to fishing impacts due to their low biological productivity. • A recent ecological risk assessment conducted by the staff using EASI-Fish (SAC-14-12) listed hammerheads as "most vulnerable", which are also considered data-poor. • Conceptual models of ecology and population structure have been a useful foundation for assessing stocks of target species (e.g., Xu et al., 2023), and, more recently, bycatch species in the EPO (e.g., Silky Shark; EB-02-05.c.2, Talwar et al. 2024). • No conceptual models exist for hammerhead sharks in the EPO, but have been the focus of similar research elsewhere (e.g., Chin et al., 2017). A holistic understanding of species biology and population structure is needed to inform future research and sampling programs, such as for CKMR assessments, including landings surveys of sharks commonly caught by small-scale coastal artisanal fleets in the EPO. • In recognition of the importance of hammerhead sharks for the IATTC (i.e., key shark species in Res. C-23-07) and the clear need for renewed science and management attention for this family, the SAC recommended conceptual models be developed for hammerheads. • The Inter-American Tropical Tuna Commission (IATTC) staff aim to build upon collaborations with The Nature Conservancy (TNC) and Scripps Institution of Oceanography (SIO) to develop a regional synthesis of available datasets and literature sources to inform potential future management actions for three species (*Sphyrna lewini, S. zygaena* and *S. mokarran)*.
Relevance for management	• Evidence of structure in EPO shark stocks (e.g., silky shark, shortfin mako, blue shark) has been shown from tagging studies, biological and morphometric analyses, while complementary genetic work, and future CKMR assessments, and ecological studies will be executed accounting for identified stock structure.

	• Conducting stock-structure analyses for key shark species (i.e., hammerheads, C-23-07) would improve fisheries management and conservation based on scientific advice and help to prioritize future research needs/projects, develop efficient sampling designs for CKMR and various EPO fisheries. • Compilation and analysis of morphometric measurements and biological data will provide information to refine key life history and strategy information and develop improved assessment and ecological models for key shark species (i.e., hammerheads), supporting scientific-based decision making.
Duration	• 24 months
Work plan and status	• Assemble, integrate, and analyze datasets covering hammerhead shark population genetics, horizontal movements, life history information, large-scale (offshore) fishery data, and small-scale (nearshore) fishery data, ultimately representing the single most comprehensive science product for hammerhead sharks regionally. • In collaboration with external partners, develop conceptual models based on Talwar et al. 2024, as recommended by the SAC. These can be used to guide future conservation and management efforts, such as establishment of spatial management boundaries, informing stock assessment, supporting CKMR efforts, and the evaluation of other relevant measures.
External collaborators	• Scripps Institution of Oceanography, The Nature Conservancy
Deliverables	• Annual updates to the EBWG and the SAC, including documents and presentations. • Comprehensive conceptual models of three hammerhead species (*Sphyrna lewini, S. zygaena* and *S. mokarran*) to improve CKMR, stock assessments and ecological models. • Associated comprehensive database of biological data for the species, including, where possible, various length and weight types and conversions, L-W relationships, growth curves and maturity ogives, etc.
Budget (US$)	• US$100,000

PROJECT F3.a: Evaluate the feasibility of developing a sampling program to improve morphometric relationships and collect biological samples for the principal tuna and other priority species.	
THEME: Life-history studies for scientific support of management **GOAL:** F. Obtain key life history information for assessment and mitigation of ecological impacts on prioritized species **TARGET:** F.3. Conduct life-history studies of prioritized species **EXECUTION**: Biology, Stock Assessment, Ecosystem and Bycatch, and Data Programs	
Objectives	• Obtain morphometric relationships and biological samples for tunas, billfishes and prioritized bycatch species through a hierarchical, phased-based approach to sample various EPO fisheries. • Identify the most efficient point in the fishing process by which at-sea sampling can be executed by observers and/or other collaborators. • Develop a comprehensive database of multiple length and weight measurements and conversions to improve stock assessments and ecological studies. • Develop a database of biological samples to be analyzed for dedicated projects (e.g., CKMR, population-stock structure, age-growth, reproduction, trophic ecology) for inclusion in, and improvement of, stock assessments and ecological studies. • Utilize the enhanced monitoring program infrastructure to collect biological samples which are otherwise challenging to obtain at sea.
Background	• Length-weight (L-W) and processed to whole weight relationships are critical components to stock and ecological assessments and catch estimations • Relationships are outdated by several decades for tunas, no longer represent the spatial extent of fisheries or the dominant fishing method (e.g., FAD sets), and may also be biased due to processing (e.g., sampling frozen vs. fresh tunas) • Relationships are non-existent or inadequate for bycatch (e.g., SAC-13-11, SAC-09-12, IATTC Special Report 25) • Relationships may vary by species, fishery (e.g., PS vs. LL), region or year; dynamic ocean conditions may also influence growth and foraging success • Different types of measurements may be required depending on the analysis (e.g., $W=a*L^b$; length type: total length in cm; weight type: whole weight in kg but available L-W relationship may use fork length and processed weight) • Biological sampling is needed to characterize growth, reproduction, longevity, natural mortality, feeding dynamics in stock assessments and ecological models • Routine biological sampling provides means for monitoring fishing and climate impacts, but sampling for tunas and bycatch has been limited to dedicated projects
Relevance for management	• Evidence of structure in EPO tuna stocks has been shown from extensive tagging studies, meristic and morphometric analyses, and genetic work, and future assessments will be executed accounting for putative stock structure.

	• Conducting stock-structure analyses for bycatch species would also be beneficial for improved fisheries management based on scientific advice. • Changes in catch estimations can initiate a response in management rendering improvements to conversion factors an essential component for providing better catch estimations. • Collection of morphometric measurements and biological samples (e.g., tissues, otoliths, stomachs), will provide information to refine key life history information and to develop improved models for tunas and prioritized bycatch species, thereby advancing scientific advice for decision making.
Duration	• Phase dependent: 2024–2030 (6-years in total, see work plan)
Work plan and status	• Proposed, phased work plan described in Table 2, SAC-14 INF-J • Phase 1 – feasibility study (planning): January–May 2025 • Phase 1 – feasibility study (implementation): June 2025–May 2026 • Phase 2 – pilot study (implementation): June 2026–May 2027 • Phase 3 – EPO-wide, statistically robust sampling: January 2027–May 2030
External collaborators	• CPCs, Fishing industry, SPC-WCPFC, other potential stakeholders (see Tables 1 and 2 in SAC-14 INF-J)
Deliverables	• Annual updates to the SAC • Comprehensive database of various length and weight types and conversions for tunas, billfishes and prioritized bycatch species for EPO fisheries, allowing scientists to develop project-specific L-W relationships, improve catch estimations, model outcomes and management advice • Comprehensive database of biological samples analyzed for dedicated projects to improve stock assessments and ecological models.
Budget (US$)	• Phase 1: feasibility US$140,000

PROJECT E4.b: Continuation of the Regional tuna tagging program (RTTP) and implementation of opportunistic tagging studies to advance management objectives	
THEME: Life-history studies for scientific support of management **GOAL:** E. Collect mark-recapture data on the principal tuna species, other non-target finfish, and sharks which are management priorities **TARGET:** E4. Conduct tagging studies to advance knowledge of movements, exploitation rates, behavior, growth, natural mortality, stock structure, and to derive estimates of absolute abundance. **EXECUTION**: Biology, Stock Assessment, and Ecosystem and Bycatch Programs	
Objectives	• Conduct a directed tagging cruise (charter) throughout the range of the operational tuna fishery in the eastern Pacific Ocean. • Evaluate alternative approaches to achieve tag release goals (industry FADs, different baiting areas, sea cages, etc…) • Oxy-Tetracycline (OTC) marking to conduct age validation experiments on tuna, billfish, and sharks. • Evaluate efficacy of, and implement, opportunistic tagging projects with industry partners to further advance scientific objectives. • Evolve the spatio-temporal tagging model (SAC-14-INF-E) to improve estimates of absolute abundance, noting the model is dependent on current mark-recapture data. • Continue to use current, reliable mark-recapture data to derive estimates of natural mortality for inclusion in stock assessments. • Challenges to aging SKJ tuna using hard parts has prompted IATTC to use tagging data to derive estimates of age and growth (SAC-14-INF-J), and therefore the need to continue collecting mark-recapture data throughout fisheries' spatial extent. • Describe YFT and dolphin associations using archival and acoustic (receiver) tags. • Continue, and possibly expand, tag recovery programs, including the tag recovery specialists network. • Develop, and extend, integrated growth models for YFT, SKJ, and BET using both hard-part and continued aggregation of tagging data across space and time.
Background	• Tagging data provides insight into stock structure, mixing rates, exploitation, and fishery interactions. • A novel spatio-temporal tagging model was developed and provides estimates of absolute abundance, however, high quality, recent tagging data is required. • Using well described methodologies, natural mortality can be derived from tagging data. • Spatial variability in growth may exist; collecting mark-recapture data across the range of tunas, to use concurrently with hard part ageing methods, will provide insight into this variability and will support the implementation of spatially explicit stock assessments. • Using modern tag technologies (archival tags) can provide insight into the YFT – Dolphin associations, which may allow IATTC to promote alternative management strategies. • Key biological information for billfish and sharks are lacking and through tagging, OTC marking, and the recovery of marked animals information on movements, stock structure, age, and growth can be acquired.

Relevance for management	• Improved understanding of stock structure, mixing rates, exploitation, and fishery interaction, which will improve assessments and support robust management recommendations. • Spatio-temporal tagging models can provide estimates of absolute abundance for BET, YFT, and SKJ. • Tagging data is used to estimate natural mortality for inclusion in stock assessment models. • Spatial variability in growth may exist; collecting mark-recapture data to concurrently use with hard part methodologies will provide insight into this variability and improve stock assessments. • Using modern tag technologies can provide insight into the YFT – Dolphin relationship, which may allow IATTC to promote alternative management strategies. • As a capacity building strategy, collaborate with CPCs to obtain data and samples collected from releases of billfish and sharks to develop hypotheses of stock structure and develop and validate ageing protocols for use in stock and ecological assessments.
Duration	• 2025–2028 (3-years in total) • Tagging charter(s) to occur in 2026 • Data acquisition through 2028
Work plan and status	• 2025 – Cruise plan(s), experimental design, collaborator planning • 2025 – Implement opportunistic tagging programs • 2026 – Tagging cruise • 2026 – 2028 - Tag recoveries, analyses • 2027 – 2028 – Paper preparation and incorporation of key parameters derived from tagging data and independent abundance estimates from spatio-temporal tagging models into stock assessments
External collaborators	• CPCs, Fishing industry, SPC-WCPFC, other potential stakeholders
Deliverables	• Annual updates to the SAC • Continued evolution of the comprehensive tagging database for mark-recapture data for tunas, sharks, and billfish. • Continued evolution of the comprehensive tagging database for archival tag data for tunas, sharks, and billfish. • Improved stock assessments for principal tuna species, other fishes and sharks, which interact with purse-seine and longline fisheries. • Improved life history information for tuna and non-tuna species captured in purse-seine and longline fisheries. • Analyses of archival and acoustic tag data to identify specificities of the tuna-dolphin relationship. • Extend the validated increment deposition rates for YFT and BET and explore alternative ageing methodologies based on the results which will accelerate the investigations of spatial variability in age at length.
Budget (US$)	US$ 1,868,000

3. SUSTAINABLE FISHERIES

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4. ECOLOGICAL IMPACTS OF FISHERIES: ASSESSMENT AND MITIGATION

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5. INTERACTIONS AMONG THE ENVIRONMENT, THE ECOSYSTEM, AND FISHERIES

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6. KNOWLEDGE TRANSFER AND CAPACITY BUILDING

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7. SCIENTIFIC EXCELLENCE