DOCUMENT SAC-14 INF-M

IMPROVING DATA COLLECTION AND ASSESSMENT OF SHARK STOCKS IN THE EASTERN PACIFIC OCEAN: EXPANSION TO FISHERIES IN COASTAL STATES

An IATTC project in support of the FAO-GEF Project "*Sustainable Management of Tuna Fisheries and Biodiversity Conservation in the Areas Beyond National Jurisdiction*"

CONTENTS

SUMMARY

Sharks are caught in large numbers as either target or bycatch species by multi-species and multi-gear artisanal fisheries throughout eastern Pacific Ocean (EPO) coastal states. However, reliable fishery statistics, such as catch, effort, and composition data are scarce in these fisheries, which is problematic for stock assessment purposes.

To address this issue, the staff at IATTC has conducted extensive research since 2014 to develop a robust sampling methodology aimed at improving data collection for shark fisheries[1] in Central America. This region is believed to account for a significant portion of the EPO shark catch, making it a critical area for data collection improvements. This work, funded by the FAO-GEF ABNJ ("Tuna 1") project, IATTC Capacity Building Fund, and the European Union, was completed in December 2021.

Two research documents summarizing the results of the recent work conducted in Central America are presented at SAC-14. The first document presents revised estimates of the catch of silky and hammerhead sharks by artisanal fisheries in Central America (SAC-14 INF-L). The second document consists of a staff's proposal for a long-term sampling program for shark fisheries in Central America is available for consideration by IATTC members (SAC-14 INF-P). This program is part of the "shark research workplan" in the new proposed IATTC Strategic Science Plan (2025-2029; SAC-14-01a).

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[1] In the context of this proposal, "shark fishery" means any fishery in which sharks are taken, either as a target or bycatch species. It is recognized that these fisheries are multi-specific and interact with various species or groups of large pelagic fishes (e.g., tunas, billfishes, mahi-mahi and sharks). Although the primary focus will be on sharks, it is anticipated that the proposed program will be expanded to include other species to comply with various mandates under the Antigua Convention.

While recent advancements in shark data collection in Central America are promising, there is a need for similar improvements in other coastal states in the EPO where shark fisheries are well-developed. Developing from the second part of the FAO-GEF Common Oceans Program (ABNJ "Tuna 2" project), the IATTC has received additional support to improve the monitoring and assessment of shark stocks in the EPO. This funding will allow for the expansion of the work initially conducted in Central America to other IATTC CPCs, including Ecuador, Mexico, and Peru.

The planned activities and results of the project about to start in 2023 will ultimately contribute to the development and implementation of a regional shark fishery sampling program in the EPO. This program will provide data for various types of shark stock assessments at the IATTC, including the Ecological Assessment of Sustainable Impacts of Fisheries (EASI-Fish) approach (Griffiths et al. 2019, SAC-13-11, SAC-14-12), Close Kin Mark Recapture (CKMR, SAC-12-14) stock assessments for data-limited shark species, such as silky and hammerhead sharks, and conventional stock assessments.

1. BACKGROUND

The Antigua Convention mandates that the Inter-American Tropical Tuna Commission (IATTC) establish management measures for shark species associated with tuna fisheries in the eastern Pacific Ocean (EPO). However, reliable data and understanding of shark stocks is crucial for developing sound conservation recommendations and effective management measures. Unfortunately, developing stock assessments for sharks faces significant challenges, including the limited availability of reliable fishery statistics. One of the primary data gaps is the poor fishery statistics for artisanal fisheries in EPO coastal states, where sharks are caught in large numbers as target or bycatch species by multi-species and multi-gear artisanal fisheries. Despite this, there is a scarcity of reliable fishery statistics, such as catch, effort, and composition data, from these fisheries for stock assessment purposes.

To address this issue, since 2014, the staff at IATTC has conducted extensive research to develop a robust sampling methodology aimed at improving data collection for shark fisheries in Central America, an area believed to account for a significant portion of the EPO shark catch, making it a critical area for data collection improvements. After approximately seven years of research activities (2014-2021) in the region, this work, funded by the FAO-GEF Program (ABNJ "Tuna 1"), IATTC Capacity Building Fund, and the European Union, was completed in December 2021.

Several projects have been carried out since 2014 to develop the sampling methodology to obtain reliable data from artisanal[2] and commercial medium and advanced-scale fisheries that land sharks and rays throughout Central America. Phase 1 of this collaborative project between the IATTC and OSPESCA[3] was funded by the FAO-GEF Common Oceans program, specifically the *Sustainable Management of Tuna Fisheries and Biodiversity Conservation in the Areas Beyond National Jurisdiction* (ABNJ) Project. This project lasted from September 2014 to December 2018, during which time the foundations for a long-term regional data collection program for sharks were developed. The data available for these fisheries were identified and compiled, and recommendations for improving data collection were formulated. In addition, three workshops were conducted, on data collection, assessment methods for shark species, and designing a pilot sampling program.

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[2] In Central America, vessels that catch sharks, as target species or incidentally, can be broadly divided by size into two categories: smaller 'artisanal' vessels, generally called pangas, which are typically less than 10 meters length overall (LOA), with outboard motors and fiberglass hulls; and larger vessels, which are generally included in an 'industrial' category, although the number of categories, their names and cutoff points, vary among countries, as do the criteria for allocating vessels to categories (Table 1 in Metadata Report).

[3] Organización del Sector Pesquero y Acuícola del Istmo Centroamericano.

Following the success of Phase 1, Phase 2 of the project was funded from January 2018 to December 2019, with the aim of further developing and testing sampling designs in a pilot study that could be used as a framework for a regional program in Central America. The improvements made during Phase 2 included the development of sampling designs for estimating shark catches and species composition for artisanal fisheries, as well as the size composition of catches in the medium and advanced scale longline fleets in Costa Rica (Lennert-Cody *et al. 2022*). The success of the project led to additional funding by the European Union in 2020 to evaluate logistical challenges and modify catch and effort sampling designs as needed, as well as to develop protocols for biological sampling. Although the COVID-19 pandemic caused significant challenges, such as delayed initiation of field work and reduced survey days, data collection and analysis continued until December 2021.

Two research documents summarizing the results of the recent work conducted in Central America will be presented at the IATTC 14th Meeting of Scientific Advisory Committee in May 2023. The first document presents revised catch estimates and confirms that the catch of silky and hammerhead sharks by artisanal fisheries in Central America is significant and must be considered in stock assessments and management (SAC-14 INF-L). Although a long-term sampling program for shark fisheries in Central America has not been economically feasible so far (IATTC-98-02c), a new framework for such a program is available for consideration by IATTC members (SAC-14 INF-P). This program is part of the "shark research workplan" proposed in the IATTC Strategic Science Plan (2025-2029; SAC-14-01a), also presented at the meeting.

While there have been recent advancements in shark data collection in Central America, there is a need for similar improvements in other coastal states in the EPO where shark fisheries are well-developed, such as Ecuador (Martinez et al., 2015), Mexico (Bizarro et al., 2008; Smith et al., 2008), and Peru (Alfaro-Cordova et al., 2017; Gonzalez-Pestana et al., 2019). These countries have some form of shark fishery data collection, but the quality of the data and its value for stock assessments are limited and vary across states. Additionally, there is limited harmonization of shark data collection methods across EPO coastal nations, and no sampling designs for shark fisheries have been developed that consider the highly migratory and trans-boundary nature of these stocks within the vast EPO region of management interest for the IATTC.

As part of the second part of the ABNJ project ("Tuna 2"), the IATTC has received additional support from the FAO-GEF Program to improve the monitoring and assessment of shark stocks in the EPO. This funding allows for the expansion of the work initially conducted in Central America to other IATTC CPCs, including Ecuador, Mexico, and Peru.

2. OBJECTIVES OF THE PROJECT

The new IATTC FAO-GEF project aims to expand the successful work accomplished during ABNJ "Tuna 1" in Central America to the remaining three nations in the EPO where shark fisheries are well developed, namely Ecuador, Mexico, and Peru. The planned activities and results of the project will ultimately contribute to the development and implementation of a regional shark fishery sampling program in the EPO, providing data for various types of shark stock assessments at the IATTC.

1. Short term (1-5 years): The IATTC staff has recently developed the Ecological Assessment of Sustainable Impacts of Fisheries (EASI-Fish) approach, which allows for the approximate quantitative ranking of relative vulnerability of data-poor species using concepts based on conventional biological reference points (BRPs) (Griffiths et al., 2019). EASI-Fish vulnerability assessments of sharks in the EPO are already underway with the limited data currently available (SAC-13-11, SAC-14-12), and these will be improved as new data is collected.

2. Medium term (5-10 years): The IATTC staff proposes using Close Kin Mark Recapture (CKMR), in combination with catch estimates, as a stock assessment tool for data-limited shark species in the EPO, such as silky and hammerhead sharks (SAC-12-14; Project H.7.f). There is also a need to

update morphometric relationships and collect biological samples for prioritized shark species in the EPO ([SAC-14 INF-J](#)). Improving data collection programs for shark fisheries in the EPO could provide a sampling platform for the data required for these new studies. Therefore, activities will be initiated to investigate the feasibility and develop sampling designs for CKMR analysis, update morphometric relationships, and collect biological samples for prioritized shark species in the EPO.

3. Long-term (10-20 years): The collection of high-quality fishery data such as catch, effort, composition, and biology are crucial for developing accurate conventional stock assessments of shark populations in the EPO. A regional sampling program, once implemented and maintained by EPO coastal states in the long-term, can provide the necessary time series of data required for these assessments. The estimates from CKMR in (2) can be used to improve the conventional assessments and make them feasible within a shorter timeframe.

3. PROPOSED WORKPLAN

The project will be conducted in close coordination between IATTC staff and the national authorities of the IATTC members involved (support is available for Ecuador, Mexico and Peru). IATTC will provide a local team consisting of a project coordinator and 1-2 sampling technicians to develop the proposed tasks in each country, in close coordination with national authorities. Collaboration and involvement in the project team of other organizations, such as NGOs and universities, already conducting shark fishery research projects in these countries, is encouraged as appropriate.

Table 1 below shows a breakdown of the specific objectives (tasks and sub-tasks) under the current proposal for the IATTC ABNJ 2 EPO's shark fishery data improvement project, and the 3-year long chronogram of activities planned.

TABLE 1. Planned tasks, sub-tasks and chronogram under the IATTC ABJN 2 project.

Activities	2022		2023				2024				2025				2026	
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
TASK 1 – Identify available data sources																
1. Identify shark fishery data sources available in participating CPCs (Metadata report)			█	█	█	█										
TASK 2 – Determine landing sites for shark catches																
2.1. Joint annual workshops with sampling technicians from participating CPCs (1 inception workshop, 2 progress workshops)						█				█				█		
2.1 Identify and map all sites where shark catches are potentially landed along the coastlines of participating CPCs							█	█								
2.2 Verify selected mapped landing sites *in situ*, and collect data on site characteristics and the level of fishing activity, and catch composition									█	█	█	█				
TASK 3 – Develop feasibility studies and proposed sampling designs for shark data collection																
Task 3.1. Conduct feasibility study to collect samples for updating morphometric relationships and biological samples for prioritized shark species									█	█	█	█				
Task 3.2. Develop proposed sampling designs to collect fishery-dependent data for conventional stock assessments										█	█	█	█			
Task 3.3. Initiate feasibility study and development of sampling designs for CKMR for prioritized shark species												█	█	█		
Final analyses and project report															█	