

**Advances in Mexico's Atlantic Coast Shark  
Fisheries Data Collection and Monitoring**



**Campeche,  
Mexico**

**March 21-25, 2011**

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Dear colleagues,

Thanks for participating in the March 21-25, 2011 workshop on “Advances in Mexico’s Atlantic Coast Shark Fisheries Data Collection and Monitoring” in Campeche, Mexico. The meeting was conceived by the National Fisheries Institute (INAPESCA) and the Southern Border College (ECOSUR) during a September, 2010 meeting of the Tri-National Initiative for Marine Science and Conservation in the Gulf of Mexico and Western Caribbean in Sarasota, Florida (see Appendix 1). The workshop in Campeche was intended for participants to evaluate how to standardize shark fishery data collection, characterize the Mexican shark fisheries off the Gulf of Mexico coast, establish research priorities, and establish a research protocol between partners.

The workshop was an important step in the [Environmental Defense Fund – Mote Marine Laboratory effort](#) to advance Gulf-wide cooperation to improve the conservation of sharks and the economic performance of shark fisheries. Since many shark populations are migratory, cooperation among scientists, conservationists, industry, and fishery managers in the three Gulf countries is essential.

Participants included INAPESCA members of the National Shark Working Group and its representatives from the Mexican Gulf states, fishery experts from ECOSUR, students from the universities of Campeche and Veracruz, scientists and policy experts of EDF and Mote, and researchers from the University of Havana.

The workshop concluded with an agreement (recently approved by INAPESCA leadership) to jointly work to characterize the Mexican Gulf shark fisheries in a way that complements existing efforts. The central feature is replication and refinement (incorporating economic and management evaluation) of INAPESCA’s 1994 “Evaluación de las pesquerías de tiburón en el Golfo de México” to provide a comparison of the fishery over time and evaluation of current management strategies.



*(Photo: Daylin Muñoz)*  
Campeche processing facility. From right to left: Sandra Soriano, Abdón Cruz (back), and Leonardo Castillo (INAPESCA); Consuelo Aguilar (University of Havana); Pamela Baker (EDF); Robert Hueter (Mote); and Juan Carlos Pérez (ECOSUR).

This partnership also supports a shark fishery characterization pilot program in four Cuban fishing ports that is administered by the University of Havana and the Ministry of Food. It is [advancing management reforms in the U.S. Gulf shark fisheries](#) with industry and government.

This document contains proceedings that summarize the next steps and provides an overview of speaker presentations (see appendix 2 for access to the presentations).

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# WORKSHOP AGENDA

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## **DAY 1** (March 21)

8:00pm Welcome and Introduction: *Why are we here?*

## **DAY 2** (March 22)

### ***Session 1: Existing data and monitoring systems – challenges and opportunities***

- 9:00am Opening comments
- 9:30am INAPESCA National Shark Group - Mexico's shark fisheries: On-going work and future plans – Gulf of Mexico emphasis (Sandra Soriano).
- 10:30am Historical review of Gulf of Mexico shark fishery data and monitoring (Leonardo Castillo).
- 11:30am Current Gulf of Mexico shark data and fishery monitoring, and socio-economic research – strengths and needs (Leticia González and Roberto Escartín).
- 1:30am ECOSUR: shark fishery monitoring – emphasis on the dynamics of shark storage plants (Juan Carlos Pérez).
- 2:30 pm EDF: goals and achievements in the Gulf of Mexico and Gulf of California (Pam Baker and Daylin Muñoz).
- 3:30pm Mote Marine Laboratory: Partnerships and shark research in Mexico, including lessons from a Pacific shark fishery project (Robert Hueter).
- 4:30 pm University of Havana: Cuba's shark fisheries characterization pilot project (Consuelo Aguilar).

## **DAY 3** (March 23)

### ***Session 2: Planning meeting: Identify needs, objectives, methodology and opportunities for collaboration***

- Specific needs to systemize species-specific landings data for Gulf sharks
- Methodology for socio-economic data collection and analysis
- Discuss sample data collection forms for field trip

### ***Session 3: Collaboration mechanisms. Led by INAPESCA, ECOSUR, Mote, and EDF***

- Share collaboration mechanisms for each organization & institution
- Propose collaboration options

## **DAY 4** (March 24)

### ***Session 4: In-field case studies to test & refine procedures. Led by ECOSUR***

6:00am Tour fishing camps, storage plants & markets (Campeche and Seybaplaya).

### ***Session 5: Next Steps. Led by INAPESCA, ECOSUR, Mote, and EDF***

- Field trip observations and follow-up
- Analysis of data collection and methodology; what else is needed?
- Next steps. How can this project contribute?

## PRESENTERS AND PARTICIPANTS

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### Presenters

**Consuelo Aguilar-Betancourt**, *Researcher, Center for Marine Research (CIM), University of Havana, Cuba*

Dr. Aguilar is the head of CIM's Ecology Group. Her research focuses on marine fish, marine and coastal ecosystems, and human impacts. She leads projects on shark conservation and ecology with Mote Marine Laboratory, and a pilot shark fishery characterization project in four northwest Cuban ports with the Ministry of Food, Mote, and Environmental Defense Fund.

**Pamela Baker**, *Strategic Conservation Initiatives, Gulf and Southeast Oceans Program, Environmental Defense Fund, Texas, USA*

Ms. Baker works with coastal communities, regulatory agencies, fishing industry, and research institutions to develop market-based solutions for improving fishery management and ocean conservation practices in the Gulf of Mexico. She specializes in catch share management systems (e.g., individual fishing quotas), protection of special marine habitats, and shark, reef fish, and shrimp fisheries.

**José Leonardo Castillo-Géniz** *Main Researcher "C", National Fisheries Institute, Regional Fisheries Research Center of Ensenada, Baja California, Mexico*

Since 1984, Dr. Castillo has researched shark fisheries and life histories of key fishery species with INAPESCA. From 1993-1999 and 2008-2010 he was the coordinator of the National Shark Program. He is now responsible for artisanal shark and ray fishery projects on the west coast of Baja California, such as a pilot study on sharks in the Sebastian Vizcaino Bay.

**Francisco Roberto Escartín Hernández**, *Economist, General Office of Fisheries Research in the Atlantic, National Fisheries Institute, Mexico City, Mexico*

He coordinates INAPESCA'S work group to develop methods to investigate social and economic aspects of fishing. He also supports studies on planning, evaluation and monitoring. He served as the Deputy Director of Social and Economic Studies for 15 years.

**Leticia González-Ocarranza**, *Marine Biologist, General Office of Fisheries Research in the Atlantic, National Fisheries Institute, Regional Center of Fisheries Research in Tampico, Tamaulipas, Mexico.*

Ms. González collaborates on numerous research projects dealing with elasmobranch fisheries in the states of Veracruz and Campeche, incidental elasmobranch catch in shrimp fisheries. She also updates records of fisheries resources including clam, tarpon, sharks and rays for the National Charter of Fisheries. Ms. González is a member of a work group developing closed season management for shark fisheries in the Pacific and the Gulf.

**Robert Hueter**, *Director, Center for Shark Research, Mote Marine Laboratory, Florida, USA*

Dr. Hueter supervises research, educational projects, and international exchanges on issues involving sharks, skates, and rays. His research focuses on the anatomy, physiology, behavior, ecology, and fisheries biology of sharks worldwide, especially in the Gulf of Mexico, Caribbean Sea, and Gulf of California. He also coordinates the National Shark Research Consortium, a coalition of four leading shark research programs in the U.S.

**Daylin Muñoz-Nuñez** *Fisheries Analyst, Oceans Program, Environmental Defense Fund, North Carolina, USA*

Ms. Muñoz works with fishermen, managers, scientists and economists to promote sustainable and responsible marine fishing practices. With EDF's Mexico team, she conducted stakeholder outreach on technical aspects of catch share management programs for the Mexican shrimp fishery in the Gulf of California. Muñoz is also involved in the tri-national conservation initiative between Mexico, Cuba and the U.S. to improve shark fishery management in the Gulf of Mexico.

**Juan Carlos Pérez-Jiménez**, *Associate Researcher "C", El Colegio de la Frontera Sur, Campeche, Mexico*

Dr. Pérez researches shark and ray biology, and those fisheries in the Gulf of Mexico. He coordinates the project Life History of Elasmobranchs present in the Campeche Bank (CONACYT, Basic Science, Period 2011-2013). Dr. Pérez belongs to the shark specialist group of the International Union for the Conservation of Nature.

**Sandra Rita Soriano-Velásquez**, *General Office of Fisheries Research in the South Pacific, National Fisheries Institute, Mexico City, Mexico*

For 15 years Ms. Soriano has led research on sharks to support alternatives to manage the fisheries sustainably in the Mexican Pacific. She is a member of the Specialist Advisors of the Scientific Authority of CITES, as well as the Technical Working Group No. 4 Shark Fisheries of the National Advisory Committee for Responsible Fisheries. Ms. Soriano has been an FAO International Consultant to coordinate the National Action Plans of OLDEPESCA countries. Currently she is the National Coordinator of the Shark Experts Group for INAPESCA.

### **Participants**

- **Sandra Soriano**, INAPESCA (Mexico)
- **Leonardo Castillo**, INAPESCA (Mexico)
- **Leticia González**, INAPESCA, CRIP-Tampico (Mexico)
- **Roberto Escartín**, INAPESCA (Mexico)
- **Isaac Rojas**, INAPESCA, CRIP-Campeche (Mexico)
- **Luis E. Martínez**, INAPESCA, CRIP-Campeche (Mexico)
- **Abdón Cruz**, INAPESCA, CRIP-Tampico (Mexico)
- **David De Anda**, INAPESCA, CRIP-Yucalpeten (Mexico)
- **Heber Zea**, Universidad Veracruzana (Mexico)
- **Miguel Seca**, INAPESCA, CRIP-Campeche (Mexico)
- **Jorge Vázquez**, INAPESCA, CRIP-Campeche (Mexico)
- **Juan Carlos Pérez**, ECOSUR (Mexico)
- **Iván Méndez**, ECOSUR (Mexico)
- **Elizabeth Cuevas**, ECOSUR (Mexico)
- **Nicte-Ha Cu Salazar**, ECOSUR (Mexico)
- **Edith Berthiaume**, ECOSUR (Mexico)
- **Manuel Mendoza**, ECOSUR (Mexico)
- **Chrystian Hernández**, ECOSUR (Mexico)
- **Arturo Álvarez**, ECOSUR (Mexico)
- **Consuelo Aguilar**, University of Havana (Cuba)
- **Gaspar González**, (guest professor) Universidad de Guadalajara (Cuba)
- **Robert Hueter**, Mote Marine Laboratory (USA)
- **Pamela Baker**, Environmental Defense Fund (USA)
- **Daylin Muñoz**, Environmental Defense Fund (USA)
- **Christopher Barron**, Environmental Defense Fund (USA)

## WORKSHOP OUTCOME

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The outcome of the workshop was a proposal for a cooperative effort among the parties to characterize and evaluate the shark fisheries in the Mexican Gulf. Since the workshop, the proposal has been approved by INAPESCA authorities and early planning is underway.

### PROPOSAL

**Purpose:** Improve understanding of Mexico's Gulf of Mexico shark fisheries to guide future research, conservation and fisheries management actions throughout the Gulf region (Tamaulipas, Veracruz, Tabasco, Campeche, Yucatan, Quintana Roo).

**Concept:** A diverse partnership of government, universities, independent research institutions, and conservation organizations works together to take an important step by replicating a 1994 INAPESCA comprehensive study, Evaluación de las pesquerías de tiburón en el Golfo de México, to provide a comparison of shark fishery changes in 1994 and 2012; including socio-economic and value chain characteristics of the shark fisheries.

**Goal:** Conduct a comprehensive updated fishery characterization of Mexico's Gulf of Mexico shark fishery.

#### Specific Objectives:

- Provide basic and essential information that guides future (middle, long-term) fishery management and conservation actions.
- Adapt and standardize existing methods to collect biological, harvest, fishing effort and socio-economic data to ensure historical and current data are comparable.
- Assess and document impacts of shark fishing today, and changes in the fishery from 1994 to 2012.
- Identify shark species that are most sustainable for fishing, and those most vulnerable.
- Assess the impacts of fishery management system and recommend solutions.
- Involve fishing communities and industry in project design and data collection.

#### Key Data:

- Categories of biological data include: species, sex, maturity, size, and others. Regional guide to identify shark species.
- Categories of harvest data include: total catch by species, gear, effort, CPUE, location and timing.
- Categories of socio-economic data include: total value of the catch, fishing expenses (fuel, etc.), community and living characteristics, employment opportunities, education, problems and needs related to fishing.
- Cost-benefit analysis and value chain analysis for main shark products.

**Expected results** (based on INAPESCA's existing objectives)

- To obtain key elements that will contribute to updating the information card on sharks of the Gulf of Mexico that is included in the Mexican Carta Nacional Pesquera.<sup>1</sup>
- To provide updated scientific information that serves as a base to support fishing regulations presented on the Official Mexican Standard fishing rule (NOM 029-PESC-2006) for "Responsible Fishery of Sharks, Rays and related species; specifications for its use."
- To write a chapter on shark fisheries on the Gulf of Mexico for the INAPESCA book "Sustainability and Responsible Fisheries in Mexico, Assessment and Management."
- Building capacity to assess shark populations on the Gulf of Mexico.
- To produce articles in scientific journals and book chapters.
- To provide scientific and technical support for international meetings.

**Partners:** INAPESCA, ECOSUR, EDF, Mote, University researchers and students (Tamaulipas, Tabasco, Nuevo Leon, Campeche, and Veracruz)

**Leadership:**

- INAPESCA: Sandra Rita Soriano-Velázquez (Coordinator of Shark National Program); José Leonardo Castillo-Géniz (Advisor); Jorge Luis Oviedo-Pérez (Gulf of Mexico Coordinator); Abdón Reynaldo Cruz-Jiménez (Tamaulipas); Jorge Luis Oviedo-Pérez, Leticia González-Ocaranza, Luis Enrique Martínez-Cruz (Veracruz, Tabasco, Campeche and Quintana Roo); David de Anda-Fuentes (Yucatán); Isaac Rojas-González (Stock Assessment); Roberto Escartín-Hernández (Socio-economic Analysis).
- ECOSUR: Juan Carlos Pérez-Jiménez (Campeche); Manuel Mendoza-Carranza (Tabasco)
- EDF: Pam Baker, Daylin Muñoz-Nuñez, and others
- Mote Marine Laboratory: Robert Hueter

**Actions and Timeline:**

Action	Partners	Time
Project proposal approval process	INAPESCA	April 2011
Initial research	ECOSUR, EDF	on-going
Research methodology, design, logistics, funding	INAPESCA, ECOSUR, EDF, Mote	Summer 2011
Training, monitoring and data collection	INAPESCA, ECOSUR, EDF, Mote	Fall 2011
Collaborative research begins	INAPESCA, EDF, MOTE, Universities	January 2012

<sup>1</sup> Carta Nacional Pesquera is Mexico's official report on the status and management of fisheries (SAGARPA, 2006, section 1).

### Shark fisheries in Mexico: Work in progress and plans for the future (emphasis on Gulf of Mexico)

Sandra Rita Soriano-Velásquez

**Overview:** Over the last 10 years, Mexico's annual shark catch was between 20,000 and 29,000 tons, ranking 7<sup>th</sup> in the world. Nearly 90% is landed on the Pacific Coast.

Shark fisheries contribute to jobs, income, development, and fisheries infrastructure growth. Sharks are a source of food, with more than 90% (excluding fins) consumed domestically.

Sharks are part of a multispecies fishery (e.g., with reef fish in the Gulf). An overall decline may be due to several factors including high catches from breeding areas, harvest of juveniles, high fuel costs, and shifts to other species (e.g., rays).

**Government authority:** INAPESCA, in the Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA), is responsible for scientific and technological research.

INAPESCA's research is the basis for fishery regulations and plans (e.g., National Fishing Charter, National Action Plan for the Management and Conservation of Sharks and Related Species, and the Book on Sustainability and Responsible Fisheries). For sharks, regulations mainly focus on closed seasons and areas to protect juvenile and reproductive stages, licenses to control effort, and circle hooks to help reduce bycatch.

The General Law of Sustainable Fishery and Aquaculture (2007) (Ley General de Pesca y Acuicultura Sustentables) regulates the use of living marine resources. Fishery management plans and regulations are implemented through the National Fishing Charter (CNP: Carta Nacional de Pesca).

With authority under the CNP, and the National Plan of Action for the Conservation and Management of Sharks, Rays and Similar Species in Mexico (NPOA-Sharks,) INAPESCA and the management agency CONAPESCA implemented NOM 029-PESC-2006 (NOM: Norma Oficial Mexicana) called "Responsible Fishery of Sharks and Rays; specifications for use." NOM 029-PESC-2006 regulates harvesting, designates prohibited species (e.g., great white (*C. carcharias*), whale (*R. typus*) and basking sharks (*C. maximus*), and manta rays (*M. birostris*)), specifies fishing zones and seasons, authorizes gears, and requires permit holders to report data. It promotes full use of catch by prohibiting finning. The goals are to maintain sharks at sustainable levels and reduce incidental catch of sea turtles and marine mammals.

In the field, INAPESCA surveys fisheries at landing sites. In the Pacific, INAPESCA works with fishermen from the offshore and medium size vessel fleets to collect data on-board. Priorities are biological data including species composition, biometric measures, abundance, sexual maturity, and catch per unit effort. Species ID is hindered when sharks are landed already cut. (This is not common in the Gulf.) Fishermen are required to report catch, vessel and fishing characteristics, fuel use and other details for each trip.

Monitoring and data systems are well-developed for Pacific shark fisheries, and INAPESCA recommends that these serve as a model for the Gulf of Mexico to standardize data collection.

Challenges include poor enforcement, lack of compliance, and inaccurate logbook reporting. Fishermen complain logbook forms are too complex. In response, CONAPESCA and INAPESCA prepared a shark ID guide, and are working to create a friendlier format.

# Historical review of Gulf of Mexico shark fishery data and monitoring

Leonardo Castillo

## Background

From 1992 to 1996 INAPESCA, led by Leonardo Castillo, conducted a research project called Evaluación de las pesquerías de tiburón en el Golfo de México. The purpose was to define and propose measures to ensure sustainable harvest of sharks. Fishery characteristics and biological data were collected.

Sampling occurred daily and weekly from November 1993 to December 1994, and covered primary fishing camps (identified by volume).

Key results included:

- Fishing vessels: small boats (pangas) with outboard engines and medium size vessels with fixed engines
- Number of vessels: sampled 901, approximately 96% were pangas
- Seasonality: October 1994 showed highest CPUE for all species and areas combined (27/trip).
- Species composition: Sharpnose (*R. terraenovae*) (46%), bonnethead (*S. tiburo*) (15%), and blacktip (*C. limbatus*) (11%) were most abundant by number
- High CPUE for blacktip sharks late in the year attributable to annual migration from US
- Sharpnose and bonnethead were the most abundant monthly and annually on the Campeche Bank; annual distribution of blacktips is influenced by temperature change
- Campeche had the highest landings and effort, followed by Veracruz and Tamaulipas
- Catch composition is multispecific
- Sharks landed varied in sizes and maturity stages (e.g., new born, juveniles, pregnant females) different gears from in varying locations and habitats; high numbers of immature sharks from gillnets in shallow nurseries
- Regulatory outcomes included a moratorium on new permits to reduce effort and the NOM-029-PESC-2006 published in 2007.

## Recommendations for future studies to build on the 1994 research:

- Learn more about the location of fishing grounds
- Collect socio-economic data to understand the value chain and incentives that influence behavior; involve the Ministry of Economy and Commerce
- Work with the permit holders, processing plants, and fishermen
- Gain the trust of fishermen

# Current Gulf of Mexico Shark Data and Fishery Monitoring, Strengths and Needs

Leticia González Ocarranza

## Background

Research is mandated in NOM-029-PESC-2006 and the NPOA-sharks. INAPESCA's research is used to establish regulations.

### Crucial information collected to assess, manage and conserve

- Biological data (size, weight, sex, growth rate, migrations, habitats and feeding habits)
- Fisheries data (catch composition, CPUE, fishing season and zones, bycatch)

Data are collected at main landing sites on gear, location, depth and time of set, size and number of vessels, expenses (fuel, ice, bait, crew) and ex-vessel prices.

The data forms are based on those by Leonardo Castillo (see previous presentation).

INAPESCA interacts informally with fishermen to create trust. They try not to interfere. They help offload boats and record data while fishermen clean the catch.

The main ports sampled are: Tamiahua, Casitas, Playa Zapote, Anton Lizardo, Allende, Playa Linda, Tabasco, Campeche, and Yucalpeten.

The boats are fiberglass, about 7.6m in length, have outboard motors from 75 to 110 horsepower, stay at-sea for up to three days, and have navigation aids (e.g., GPS and sonar fishfinders).

Use of circle hooks is required for all bottom longliners.

The incidental catch of sharks in the tuna and shrimp fleets is monitored.

## Challenges

- Shortage of resources to sample all landing sites
- Difficult to monitor the large number of fishing vessels and landings sites
- Some places are not safe for researchers or outsiders
- Some fishermen are reluctant to share data

# Current Gulf of Mexico Fisheries Socio-Economic Research, Strengths and Needs

Roberto Escartin

In 2007, the federal law first required consideration of socio-economic studies. INAPESCA employs two economists who have developed research and analytical guidelines for assessment of artisanal fisheries. These have been used to begin to understand fishing communities and coastal towns. A methodology for financial analysis (valuation) has also been developed.

New methodologies were needed because the National Institute of Statistics and Geography (INEGI), responsible for studying human populations, focuses on urban localities and not rural fishing towns.

INAPESCA has studied the octopus fishery, one of the most important in the Gulf. They focused on the production, working relationships, cost structure and illegal fishing. They sampled 15% of the sector, and state that the results may reflect the characteristics of other artisanal fisheries. Some of the results included:

- Overall, artisanal Gulf fisheries are “stagnant.” Shark catch in Campeche declined from 1989 to 2009, while octopus has grown, indicating that fishermen are likely moving between fisheries.
- Most fishermen are older; younger people are less attracted to fishing as a career.
- The octopus fishery alone in high season provides adequate income. At other times, fishermen supplement income working as mechanics, electricians, cooks, and in construction.
- Main “production groups” are classified as fishermen, permit holders, enterprises, fishing cooperatives and fishermen representatives.
- Distribution of revenue: The permit owner deducts costs (e.g., fuel, ice, bait) from the revenue. Of the remainder, one third goes to maintain equipment and fishermen divide the rest. These agreements are generally informal “honor agreements.”
- Cost analysis: It is difficult to calculate the fixed costs (e.g. investment, depreciation of fishing gear) because of the multispecific character of the fishery. Fishermen do not have historical records, and most equipment and gear has been used for over five years. Employed fishermen account for 31% of variable costs.
- Illegal Fishing: 40% of the interviewees were considered “illegal” fishermen, defined as those operating without permits. A single permit holder (e.g. a processing plant owner and cooperatives, etc.) may support several such fishermen by leasing boats and fishing gear to them, and buying their catch. Illegal fishermen represent lower than average labor costs.

Since there is limited socio-economic expertise within INAPESCA, it is recommended that additional assistance come from the National Autonomous University of Mexico or other institutions to study the socio-economic aspects of these fisheries.

# Shark Fishery Monitoring: Emphasis on the Dynamics of Shark Storage Plants

Juan Carlos Pérez

## Current status of elasmobranch fisheries on the Campeche Bank

After reaching a peak in 1993 (4,500 tons), shark catches in Campeche show a gradual decline to 500 tons in 2008. This trend is also observed in a qualitative frequency analysis in the southeastern Gulf fisheries. For example: blacktip sharks (*C. limbatus*) showed very high landings in the 1980s and 1990s, and lower landings in the 2000s. Dusky sharks (*C. Obscurus*) showed medium catches in 1980s, low in 1990s, and have not been recorded in the 2000s.

One reason for the decline is the large harvest of neonates and juveniles of large species (e.g., silky sharks (*C. falciformis*), sandbar sharks (*C. plumbeus*), tiger sharks (*G. cuvier*) and scalloped hammerhead sharks (*S. lewini*) since the 1980s. This is a major concern because, according to the latest IUCN Conservation Status Report, these are classified as endangered, vulnerable or near threatened. The fisheries targeting them have declined with the shark populations.

Fishermen have also reported a gradual decline of their catches of small sharks (e.g. Atlantic sharpnose (*R. terraenovae*) and bonnethead (*S. tiburo*) sharks) which may indicate a decline in their populations.

## Monitoring the dynamic of shark storage plants (“bodegas”)

ECOSUR conducts fishery and biological data collection at the landing sites and at the storage plants called “bodegas” where sharks and other fish are processed, stored and sold.

Bodegas are the central business around which the artisanal shark fisheries in the Gulf are organized. Many owners hold permits and have many fishermen working under them (not holding individual permits). They supply fishermen with equipment, fuel and other goods. Other fishermen working under their own permits also sell catch to them. Bodegas set the price and thus influence fishing behavior through market incentives.

## Recommendations:

- Work with INAPESCA to standardize data collection on biological parameters to assess the status of shark populations.
- Share ECOSUR’s interview format to collect information from storage plants and create a network to monitor them beyond Campeche.

# Progress and promise in U.S. Gulf of Mexico fisheries

Pamela Baker

## U.S. Gulf of Mexico case study

The presentation presented the history of management of the Gulf of Mexico commercial red snapper fishery, and compared and contrasted it with the current evolution of the Gulf's commercial large coastal shark fishery. From the 1990s through 2006, the red snapper fishery was managed with "derby" regulation – a total landings quota and closure when the quota was filled. As the fishing race intensified and the season declined to fewer than two months, regulators tried to slow landings with high minimum size limits, trip limits, and mini-seasons.

In review of the U.S. fishery goals, the derby fishery performed very poorly across the board. The fishery goals are:

- Conservation – rebuild and maintain stocks
- Economic – viable fishing and seafood businesses
- Governance – efficient and effective monitoring and enforcement

Under derby management, the dockside price of red snapper declined and markets were lost to imports; fishing costs escalated; millions of red snapper were discarded dead; enforcement was difficult and illegal fishing was common; and the quota continued to fall as the fishery suffered.

In 2007, new management was implemented for red snapper under a plan of "individual fishing quotas." Instead of racing, fishermen are allocated a share of the total allowable catch. Individual fishermen manage their share to reduce harvest costs, improve quality and seek higher value markets, and seek to conserve the fish population for the long term. To expand a business, a fisherman buys shares from others who want to fish less or retire.

Fishing is now year-round, quality and market timing are improved and dockside prices are higher and stable while the fishery is rebuilding, the annual quota is climbing, and illegal fishing has declined and enforcement has improved.

Currently, the Gulf large coastal sharks are managed in the same manner as the red snapper fishery prior to 2007. Unfortunately, the performance is also the same with declining stocks and high discarding, falling dockside prices, and difficult enforcement and monitoring.

The presentation suggests that the shark fishery could benefit with new management under an individual fishing quota plan, just as the red snapper fishery has benefited..

# EDF Goals and Progress in the Gulf of California

Daylin Muñoz-Nuñez

In 2008, a partnership began between WWF, INAPESCA, and Noroeste Sustentable (NOS) to improve the sustainability of fisheries in the Gulf of California. EDF was invited to advise on “market-based” fisheries management called catch shares like individual fishing quotas and territorial use rights.

**What is catch share management?** It is fisheries management based on assigning the total catch limit to each "economic entity" (e. g. fishermen, cooperatives, etc.) as a privilege to harvest a designated share (percentage) of the catch. Catch shares end open access derbies and racing. Participants are accountable for their share. Catch shares promote conservation and sustainability because they allow fishermen to focus on quality and reduce harvest costs instead of focusing on racing and high quantity – thereby boosting the value of the fishery.

**Project:** In 2009, EDF worked with Mexico's National Commission for Fishing and Aquaculture (CONAPESCA) and others to transform the management of the fisheries in the Gulf of California. The partners started by designing and implementing a catch shares program for the shrimp fishery — Mexico's most important fishery — in Sinaloa state, one of the prime shrimping grounds in the region.

## Progress to date

EDF engaged government officials, fishing leaders and fishermen in peer-to-peer exchanges in British Columbia to learn about the successful Canadian transition from derby management to catch share programs. Outreach to Sinaloa fishing cooperatives involved the communities.

Working with the stakeholders, CONAPESCA initiated efforts to better track fishing operations, particularly identifying the participants and where they fish. CONAPESCA identified the legal fishing vessels with electronic chips and legible registration numbers. Photo ID fishing licenses were updated.

INAPESCA set a Total Allowable Catch (TAC), and CONAPESCA allocated a percentage of the TAC to each cooperative based on catch history and number of vessels. A 3<sup>rd</sup> party contractor monitored daily landings of each cooperative providing a more accurate record of fisheries production. The partnership determined the need for expanded monitoring and enforcement. However while resources limited 3<sup>rd</sup> party monitoring services, the partnership supported fishermen development of community-based inspection and monitoring programs.

Currently, EDF is creating new partnerships to improve the management of other fisheries in the Gulf of California (e.g. corvina, geoducks, clams and finfish). Now catch shares complement other management measures such as marine sanctuaries and closed seasons for breeding and juvenile fish.

## Challenges and Needs

The catch shares program for the artisanal shrimp fishery in Sinaloa is still a work in progress and solutions to challenges are being explored:

- Develop a culture of compliance, and more inspection and monitoring;
- Record the catch from small-scale fishing fleets;
- Conduct stock assessments in fisheries with limited data;
- Reduce conflict between the industrial and artisanal shrimp sectors;
- Establish a legal framework to transfer quota shares among fishery cooperatives.

# Partnerships and Shark Research in Mexico, Lessons from a Pacific Shark Fishery Project

Robert Hueter

## Mote's recent collaborations involving Mexico

- 1993: International conference on "Conservation and Management of Shark Populations in the Gulf of Mexico and Caribbean Region," Mote, NOAA, INAPESCA
- 1994: Participate in Dr. Leonardo Castillo's "Programa Tiburón", and identify sites for nursery studies.
- 1995-2001: Laguna Yalahau studies of blacktip shark (*C. limbatus*) nursery; MEXUS-Gulf
- 1998-2002: Gulf of California work to assess landings in artisanal fisheries in Sonora, Sinaloa, Baja California and Baja California Sur; INAPESCA, Moss Landing Marine Laboratories and UABCS.
- 2003-present: Whale sharks (*R. typus*) off Quintana Roo; CONANP, INAPESCA, Georgia Aquarium
- 2009-present: Tri-national (Mexico-Cuba-US) initiative in marine science and conservation of the Gulf of Mexico and western Caribbean Sea
- 2009-present: tri-national shark conservation; Mote, EDF

## The Gulf of California Project

- Locate and survey all artisanal fishing camps from 1998-99
- Collect catch and effort data in high and low fishing seasons
- Determine catch composition and catch per unit of effort
- Implement tagging program to assess distribution of shark nursery areas and species dependence
- Identify species at risk
- Develop recommendations for conservation and management

## Lessons from Gulf of California

- Standardize methods and data forms, be prepared for large amounts of data
- Do not underestimate the logistics, e.g. traveling to ports
- Designate individuals (e.g., students) to be based at ports to collect data throughout the fishing season
- Be careful in species identifications – do not make "snap judgments"
- Be critical to understand the proportion of the fishery sampled to estimate total catch
- Make friends with fishermen and PESCO officers; gain trust and do not discuss regulations
- Ensure that partners have the capacity and resources to fulfill expectations
- Take measures to ensure that funds are used appropriately
- Report results promptly and comprehensively; transfer information to appropriate agencies

# Cuba's Shark Fisheries Characterization Pilot Project

Consuelo Aguilar Betancourt

The key shark fishery studies in Cuba were conducted in the 1960s and 1970s by Dario Guitart. Since then little information has been made available.

Fishermen report a decline in their shark catches, and the trend is observed in landings in the northwest region from 1960 to 2004. The causes are unknown, but may be due to declining populations.

This pilot project is run by researchers and students from the Marine Research Center at the University of Havana. It provides an opportunity to document shark fisheries in the current socio-economic context.

The project collects biological and fishery data at four ports (3 fishing bases for artisanal/private fishermen: Playa, Plaza and Cojimar; one commercial port: Cabañas). The bases are monitored three times per week and the commercial port is visited each time a boat returns from a 20 day trip. UH students and researchers were trained to ID sharks during a workshop with Mote Marine Lab and EDF. Together they created data collection sheets, and a new ID guide is being prepared. Cameras are available to document sharks difficult to identify, especially if they are landed without the head or cut into pieces.

Preliminary data (Oct 2010-Mar 2011) show that catch composition varies between the bases and commercial port. The base fishermen use short longlines in deep waters and commercial boats use nets in shallow waters inside the platform. Oceanic species like longfin (*I. paucus*) and shortfin (*I. oxyrinchus*) makos, silkies (*C. falciformis*), and white tips (*C. longimanus*) are more frequently caught among base fishermen. Commercial landings are characterized by coastal species like Caribbean reef (*C. perezii*), bull (*C. leucas*), and great hammerhead (*S. mokarran*) sharks.

Although not required by government, fishermen have participated in this study and have been supportive.

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# TRI-NATIONAL INITIATIVE FOR MARINE SCIENCE AND CONSERVATION IN THE GULF OF MEXICO AND WESTERN CARIBBEAN Plan of Action

## Shark Research and Conservation

Activities of the Tri-National Initiative working group are designed to enhance fundamental knowledge of the shark fauna of the Gulf & Caribbean and to respond to fisheries management and public requests for information, with the goal of effecting policy and decision-making in issues concerning shark populations and fisheries in the region.

### Research & Conservation Priorities

Because of their slow growth rate, slow rate of reproduction, and the long period required for sexual maturity, sharks have proven to be especially vulnerable to fishing and other human impacts. Recent studies have indicated severe declines of top predators, including sharks, in ocean ecosystems over the past 50 years. In the Gulf of Mexico, some studies have suggested a reduction of as high as 99 percent in species such as the oceanic whitetip shark since the 1950s. As many species of sharks are highly migratory, studying sharks in Cuban, Mexican and US waters will help improve understanding of interconnections in the Gulf and Caribbean. Priorities include (not in rank order):

1. **Shark Landings Data:** Conduct sampling of commercial and sport shark landings to update species composition and characteristics of individuals landed (size, sex, fecundity, etc.) in Cuba and Mexico in a standardized fashion to US landings data programs; analyze landings data on regional, species-specific scales for stock assessment
2. **Shark Sampling and Tagging:** Conduct research expeditions for oceanic and coastal shark sampling and tagging for studies of shark migration, connectedness among countries, and stock identification
3. **Whale Shark Studies:** Conduct research expeditions to study whale shark populations in Cuban waters, tagging, etc., expanding upon ongoing studies in Mexican and US waters
4. **Increase Shark Collections:** Build collection of biological material (teeth, embryos, organs, embalmed specimens) for teaching and educational purposes at the University of Havana.
5. **Effects of Climate Change on Shark Populations.** Determine the impacts of climate change on the biology and human utilization of sharks in the Gulf of Mexico and Caribbean Sea.
6. **Specific Management Strategies to Address Overfishing of Sharks.** Improve conservation of sharks with coordinated management of shark fisheries in Cuba, Mexico and the US.
7. **Additional Collaborations in Shark Research:** Continue and further develop existing (e.g., CIM-INAPESCA-Mote) collaboration in shark ecology and conservation research with consideration of the following:
  - a. **MEXUS<sup>2</sup>:** Consider MEXUS (US-Mexico) approach to cooperative research, both as a model for collaboration and a resource itself for tri-national engagement.

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<sup>2</sup> There is no formal instrument establishing MEXUS, the United States-Mexico Fisheries Cooperation Program. The US National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), and the predecessor agency to the Mexican Secretaría de Medio Ambiente,

- b. **Broaden Studies to Other Pelagic Species:** Using sharks as a starting point, broaden studies to other highly migratory pelagic species (billfish, tuna, etc.), including tagging studies, towards the ability to address broader questions including distribution patterns resulting from temperature changes, regional interconnectivity, fishing impacts, etc.
- c. **Institutional Exchanges:** Explore opportunities for Cuba-Mexico-US institutional exchanges, including bringing Cuban and Mexican scientists and/or students to Mote Marine Laboratory, US students to CIM and Jardines de la Reina, etc.
- d. **Integrated Ocean Observing System:** Develop the infrastructure for doing long-term tracking studies on shark migration integrated with oceanographic measurements, for predictive analysis of shark population biology.

### **Action Area 1: Research cruises for coastal and pelagic shark sampling and tagging**

#### Near-Term Activities

- Juvenile shark tagging program to study nursery areas and migration in Mexican coastal waters (established by 2012; estimated costs \$20,000)
- Whale shark research cruises on Cuba's north coast (2011; \$75,000)
- Whale shark and other species research trips in Jardines de la Reina on south coast (2011; \$75,000)
- Satellite tagging of whale sharks off Yucatan peninsula (2011; \$75,000)
- Oil spill research cruises over next two years to include Cuban and Mexican scientists (2011; \$10,000)

#### Long-Term Activities

- Tri-national research cruise Cuba-Mexico waters with Cuba-Mex-US crew to study shark abundance, migration and connectivity (2013)

### **Action Area 2: Shore-based sampling of commercial and recreational landings (directed and bycatch) of sharks in Cuba and Mexico**

#### Near-Term Activities

- Shark fisheries assessment and species identification workshop, Campeche, Mexico (March 2011; \$20,000)
- Landings monitoring program in 3 Mexican Gulf states (2011; \$80,000) and quantifying sharks in shrimp trawl bycatch (2011; \$20,000)
- Pilot project to quantify fisheries landings of sharks by species on Cuba's northwest coast (2010; \$40,000)

#### Long-Term Activities

- Landings data collection program along all of Cuba's north coast (2013); expand to south coast of Cuba (2014)
- Expand landings program to all of Mexico's Gulf of Mexico coast (2015)

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Recursos Naturales, y Pesca (SEMARNAP) informally agreed in 1983 to meet annually to review the broad range of issues involved in the bilateral fisheries relationship. There are three memoranda of understanding (MOU) since agreed to by NMFS and SEMARNAP (now SEMARNAT, Secretaria de Medio Ambiente y Recursos Naturales) to formalize different aspects of the fisheries relationship: (1) MEXUS-Gulf research program, (2) MEXUS-Pacífico research program, and (3) information exchange.

### **Action Area 3: Fostering of coordinated tri-national management of shark fishery resources in the Gulf of Mexico**

#### Near-Term Activities

- Meeting with Mexico's CONAPESCA to develop approaches for coordinated management of shark fisheries (2011; \$5,000)
- Shark fisheries management workshops in Cuba, Mexico and US (2011; \$30,000)
- Production of white paper on shark fisheries and management in Gulf of Mexico (2011; \$50,000)

#### Long-Term Activities

- Explore existing bilateral agreements to establish coordinated management system in Gulf of Mexico (2013)
- Foster joint (Cuba-Mexico-US) stock assessments of sharks in the Gulf (2012)

### **Action Area 4: Determination of critical coastal habitats for sharks, especially mapping and biological studies of shark nursery areas**

#### Near-Term Activities

- Explore Cuba's northwest coast inshore for nursery areas for shark species and implement small shark tagging program (2011; \$40,000)
- Explore Cuba's south coast (Ciénaga de Zapata, Jardines de la Reina, Cayos de Ana María) for presence of juvenile sharks; implement tagging program (2012; \$60,000)
- Include Mexican and Cuban scientists and students in ongoing studies of Florida nursery areas (2011; \$20,000)
- Integrate information from nursery area studies to Marine Protected Areas working group in Cuba and Mexico – annual workshops (2011; \$20,000)
- Work to help implement broader protection for juvenile sharks in US federal and state waters through EFH framework (2012; \$30,000)

#### Long-Term Activities

- Define shark nursery areas in Cuban and Mexican coastal waters and implement protection for juvenile sharks (2014)

### **Action Area 5: Research on feasibility and issues related to shark feeding/diving operations in Mexican Caribbean and in Cuba**

#### Near-Term Activities

- Investigate the shark feeding operations along Riviera Maya (Mexico) and in Jardines de la Reina (Cuba); tag sharks for site fidelity and migratory studies (2011; \$60,000)

#### Long-Term Activities

- Advise dive industry in Mexico and Cuba; advise government agencies on need for regulations

### PRESENTATIONS

- [Mexico's Shark Fisheries: On-Going Work and Future Plans – Gulf of Mexico Emphasis](#) Sandra Rita Soriano-Velásquez
- [Historical Review of Gulf of Mexico Shark Fishery Data and Monitoring](#) Leonardo Castillo
- [Current Gulf of Mexico Shark Data and Fishery Monitoring – Strengths And Needs](#) Leticia González Ocarranza
- [Current Gulf of Mexico Fisheries Socio-Economic Research – Strengths and Needs](#) Roberto Escartín
- [Shark Fishery Monitoring – Emphasis on the Dynamics of Shark Storage Plants](#) Juan Carlos Pérez
- [EDF Goals and Achievements in the U.S. Gulf of Mexico](#) Pamela Baker
- [EDF Goals and Achievements in the Gulf of California](#) Daylin Muñoz-Nuñez
- [Mote Marine Laboratory: Partnerships and Shark Research in Mexico, Including Lessons from a Pacific Shark Fishery Project](#) Robert Hueter
- [Cuba's Shark Fisheries Characterization Pilot Project](#) Consuelo Aguilar Betancourt