



WORKSHOP PROCEEDINGS

Exploring Shark Fisheries and Tri-National Management in the Gulf of Mexico

Mote Marine Laboratory
Sarasota, Florida
September 29-October 1, 2010

Co-Sponsored by
Mote Marine Laboratory Center for Shark Research
and
Environmental Defense Fund Gulf and Southeast Oceans Program

Dear colleagues,

Thank you for participating in the workshop “Exploring Shark Fisheries and Tri-National Management in the Gulf of Mexico” in Sarasota, Florida, from September 29 to October 1, 2010. This workshop is one step in a joint Environmental Defense Fund – Mote Marine Laboratory effort to explore the potential for innovative collaboration to improve management of highly migratory sharks throughout the Gulf of Mexico. EDF and MML are exploring a new initiative to improve the direction of international shark fisheries management, and are seeking input and collaboration in the United States, Mexico and Cuba with government agencies, fishing industries, research institutions and academics, non-government organizations, and others interested in innovative approaches to marine conservation. In the near-term, we hope to work with all parties jointly to develop the concept, investigate the possibility for success, seek supporting resources, and collaborate on long-term planning. Success will depend on collaboration, from planning to implementation (see appendix 1 for a concept paper and discussion memorandum).

This shark fisheries workshop was held immediately following the [4th meeting of the Tri-National Initiative \(Tri-National Initiative for Marine Science and Conservation in the Gulf of Mexico and Western Caribbean\)](#) convened by Dr. David Guggenheim, director of 1planet1ocean and senior fellow with The Ocean Foundation, and several co-sponsors including EDF and MML. This workshop complements the work of this Initiative, and several participants from the three countries represented shark interests at both meetings. As a supplement to this Proceedings, the Tri-National Initiative’s “plan of action” on shark research and conservation is attached to provide an overview of the priorities and to complement the “next steps” identified at the workshop (see appendix 2).

Here are a few highlights of on-going efforts. MML, EDF and the University of Havana Marine Research Center are beginning a shark fishery characterization at four fishing ports in NW Cuba. Additionally, as part of the Tri-National Initiative, the University of Havana and The Ocean Foundation have initiated a [project assessing the status of marine ecosystems on Cuba’s northwest coast](#) to prepare a sound ecological baseline for this understudied area and to provide new insights in biological connectivity in the region. This project led to a current study by the University of Havana with MML on the sharks of this Cuban coast. At the same time, Mexico is actively enhancing its shark fisheries data collection system along its entire Gulf and Caribbean coast. In the U.S., the National Marine Fisheries Service’s Highly Migratory Species Division has published an [Advanced Notice of Proposed Rulemaking](#) and is holding public meetings requesting comments on potential changes to shark fishery regulations, including an initial exploration of the use of catch shares.

This document contains proceedings that summarize the next steps identified by participants and provides an overview of presentations of speakers from Cuba, Mexico and the U.S.

Copies may be downloaded free from the Internet at:
<http://www.edf.org>

Copies of this proceedings can be requested at:

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Austin, TX 78701

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(Photo: Robert Hueter, Mote Marine Laboratory)

“Exploring Shark Fisheries and Tri-National Management in the Gulf of Mexico”

Purpose

Bring together shark fishing interests from Cuba, Mexico and the U.S. to discuss key shark fishery concerns and opportunities in each country; explore catch share management case studies in the U.S. Gulf; and explore possible tri-national collaboration in Gulf of Mexico shark fisheries.

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WORKSHOP AGENDA

DAY 1 (September 29)

5:30pm – 7:00pm

Welcome & Introductions

DAY 2 (September 30)

8:30 am

Introduction

9:00 am - 9:30am

Gulf of Mexico's shared ecosystem and shark fisheries (Bob Hueter, Mote Marine Laboratory, Center for Shark Research)

9:30am - 11:00am

Gulf of Mexico shark fishery overview: fishing industry, status of stocks and ecological context, data collection & management systems, major markets and economic impacts

- Cuba (Rafael Tizol, Ministry of Food)
- Mexico (Jorge Luis Oviedo Perez, National Fisheries Institute)
- U.S. (LeAnn Southward-Hogan & Melanie King, National Marine Fisheries Service)

11:15am – 12:00pm

Catch share management: what it is and how it works (Frank Alcock, Mote Marine Laboratory, Center for Marine Policy)

- drivers for change – overfishing and economic decline
- compare and contrast conventional management and catch shares
- aligning society's conservation and economic fishery objectives
- application in diverse fisheries and regions

12:00pm – 1:00pm Lunch

1:00pm – 2:15pm

Case studies: U.S. Gulf of Mexico catch share management

- Red snapper fishery pre- and post-catch shares
 - o regulatory perspective (Andy Strelcheck, National Marine Fisheries Service)
 - o fishing industry perspective (David Krebs, Gulf of Mexico Reef Fish Shareholders' Alliance & Glen Brooks, Gulf Fishermen's Association.)
- Environmental perspective (Pam Baker, Environmental Defense Fund)
 - o progress on conservation goals

2:30p – 4:30p

Discussion: Exploring collaborative shark fishery management in the Gulf of Mexico

- Is collaboration important to rebuild and maintain healthy populations of highly migratory sharks?
- What do we understand about shark populations? What are the gaps in research, data and monitoring systems? How can the gaps be filled?
- What are the benefits and opportunities for collaboration? Are joint stock assessments possible? Is collaborative sharing of stocks feasible? Are compatible management systems realistic?
- What are the first steps?

DAY 3 (October 1st) Field Trip: shark research cruise (limited participation)

PRESENTER BIOGRAPHIES

Frank Alcock, *Director, Marine Policy Institute, Mote Marine Laboratory, Sarasota, Florida, USA*

Alcock is a political scientist whose research focuses on climate and energy politics, oceans governance, seafood markets and fisheries management. He teaches courses on world politics, international law, and sustainable development at New College in Sarasota, Florida. He has published works on global fisheries problems and science-policy relationships in environmental issue areas with an emphasis on marine policies. Alcock spent five years as an international policy analyst/economist at the U.S. Department of Energy.

Pamela Baker, *Senior Policy Advisor, Gulf and Southeast Oceans, Environmental Defense Fund, Austin, Texas, USA*

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

Glen Brooks, *President, Gulf Fishermen's Association, St. Petersburg, Florida, USA*

Brooks is a fishing industry leader, serving as President of the Gulf Fishermen's Association and as a board member of the Gulf of Mexico Reef Fish Shareholders' Alliance. He has more than 20 years of fishing experience. Brooks recently started a new business, Gulf of Mexico Quota Inc., to improve the transparency and efficiency of trading of shares in the region's new individual fishing quota programs. He serves on several advisory panels of the Gulf of Mexico Fishery Management Council and participates in National Marine Fisheries Services research projects.

David Krebs, *President, Gulf of Mexico Reef Fish Shareholders' Alliance, Destin, Florida, USA*

Krebs is a long-time fisherman and industry leader who currently serves as President of the Gulf of Mexico Reef Fish Shareholders' Alliance. For more than 30 years, he has fished in the Gulf and other parts of the world. Krebs is owner of Ariel Seafoods which specializes in high quality, eco-friendly seafood. He played a leading role in implementing the Gulf region's first catch share program for the commercial red snapper fishery. He continues to work to improve fishery management in his role with the Alliance and by serving on several advisory panels of the Gulf of Mexico Fishery Management Council.

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

As Director of the Center for Shark Research, a national research center developed in cooperation with the National Marine Fisheries Service and other institutions, Hueter supervises research, educational projects, and international exchanges on issues dealing with sharks, skates, and rays. As manager of the center's Shark Biology Program, his current 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. Hueter also coordinates the National Shark Research Consortium, a coalition of four leading shark research programs in the U.S.

Melanie King, *Foreign Affairs Specialist, National Marine Fisheries Service, Silver Spring, Maryland, USA*

King is a Foreign Affairs Specialist in the National Marine Fishery Service Office of International Affairs. She works on issues related to the International Commission for the Conservation of Atlantic Tunas, including compliance, monitoring, control, and surveillance, IUU fishing, and species-specific issues. King is also involved in the "Kobe process" (an effort to coordinate and streamline the work of the five tuna regional fisheries management organizations), a working group to deter data buoy vandalism domestically and internationally, and Caribbean issues. King received her J.D. in 2008 from the University of Florida Levin College of Law.

Jorge Luis Oviedo Perez, *Direccion General de Investigacion Pesquera en el Atlantico, INAPESCA, Veracruz, Mexico*

Oviedo leads INAPESCA's current research project exploring the direct and incidental fisheries of sharks and rays in the Mexican Atlantic coast, including projects on "Obtaining biological and fishing data of elasmobranchs in handline, coastal trawling and longline fisheries in the state of Veracruz" and "Bycatch of elasmobranchs on the shrimp trawling fishery."

He also works in collaboration with the tuna fishery program to address the incidental catch of sharks and rays. In addition, Oviedo is a member of SAGARPA's working group in charge of reviewing the current fisheries regulations for elasmobranchs. He also works with INAPESCA's fisheries scientists on the research projects to set annual closed season for shark fisheries along both the Pacific and Atlantic coasts of Mexico.

LeAnn Southward-Hogan, *Fisheries Management Specialist, National Marine Fisheries, Silver Spring, Maryland, USA*
Southward-Hogan is the staff lead for issues related to the International Commission for the Conservation of Atlantic Tunas (ICCAT) in the Highly Migratory Species Division focused on domestic shark and swordfish management, international policy/trade, and other issues. She is intimately involved in international shark and swordfish policy, monitoring, control and surveillance issues, other Regional Fisheries Management Organizations, and IUU fishing issues. In addition to preparing for the annual ICCAT meeting, Southward-Hogan is involved in the "Future of the Atlantic Shark Fishery" rulemaking which is considering changes to the quota and/or permit structure as well as catch share programs such as limited access privileges, individual fishing quotas, and sectors for the U.S. Atlantic shark fishery.

Andy Strelcheck, *Limited Access Privilege Programs, National Marine Fisheries Service, St. Petersburg, Florida, USA*
Strelcheck is the Branch Chief of the Limited Access Privilege Programs/Data Management Branch for the National Marine Fisheries Service. He has over 10 years of research and management experience working with the commercial and recreational fishing industries. His branch is responsible for the development, implementation, and operation of catch share programs in the Gulf of Mexico and South Atlantic. He works with the Gulf of Mexico, South Atlantic, and Caribbean fishery management councils to provide data and statistical analyses in support of management policy decisions. Most recently he has been involved in the implementation of the Gulf of Mexico grouper-tilefish individual fishing quota program and management to end overfishing and rebuild reef fish in the Southeast Region.

Rafael Tizol, *Director, Fisheries Research Center, Ministry of Food, Cuba*

Tizol holds a PhD in Biological Sciences, with a major in aquaculture studies, from the Centro de Investigaciones Biológicas del Noroeste in La Paz, México. With 30 years of research and work experience in fisheries management, fish processing technology and aquaculture, Tizol is the Director of the Cuban Fisheries Research Center. He is also involved in aquaculture projects focused on shrimp and cobia among other species.

LIST OF PARTICIPANTS

- **Consuelo Aguilar Bentacourt**, University of Havana (Cuba)
- **Gaspar Gonzalez**, University of Havana (Cuba)
- **Rafael Tizol**, Ministry of Food (Cuba)
- **Fabian Pina**, CITMA (Cuba)
- **Yureidy Cabrera**, University of Havana (Cuba)
- **Juan Carlos Perez Jimenez**, El Colegio de la Frontera Sur (México)
- **Jorge Luis Oviedo Perez**, INAPESCA (México)
- **Jaime Gonzalez Cano**, CONANP (México)
- **Alberto M. Vazquez de la Cerda**, Secretaria de Marina, Veracruz, (Mexico)
- **Frank Alcock**, Mote Marine Laboratory (USA)
- **Robert Hueter**, Mote Marine Laboratory (USA)
- **John Tyminski**, Mote Marine Laboratory (USA)
- **Jose Castro**, Mote Marine Laboratory/NOAA (USA)
- **Ken Leber**, Mote Marine Laboratory (USA)
- **Ernie Estevez**, Mote Marine Laboratory (USA)
- **Doug Rader**, Environmental Defense Fund (USA)
- **Daylin Muñoz**, Environmental Defense Fund (USA)
- **Dan Whittle**, Environmental Defense Fund (USA)
- **Pamela Baker**, Environmental Defense Fund (USA)
- **Leslie Valentine**, Environmental Defense Fund (USA)
- **David Krebs**, Gulf of Mexico Reef Fish Shareholders' Alliance (USA)
- **Glen and Donna Brooks**, Gulf Fishermen's Association (USA)
- **LeAnn Southward-Hogan**, National Marine Fisheries Service (USA)
- **Andy Strelcheck**, National Marine Fisheries Service (USA)
- **Melanie King**, National Marine Fisheries Service (USA)

The workshop participants acknowledged that collaboration is important to maintain healthy populations of highly migratory sharks in the Gulf. Jorge Luis Oviedo (Mexico) expressed this by saying, “The three countries do have the same interest in working together for the collaboration of the shark species. We need to acknowledge that we are exploiting a transboundary, shared resource, and we need regional research in order to manage these resources.” The participants noted that the potential for coordinated management between the countries will be a long-term challenge if it is possible. Until a coordinated system can be designed and implemented, it is important to improve sharing of data and information.

Several steps to advancing shark research, management and collaboration were identified:

1. Improve and standardize methodologies for collecting and analyzing data (e.g., landings).
 - In countries where shark landings are reported in groupings like “small” and “large” sharks, improve systems to collect species-specific information.
 - Explore the extent of the black market in each country as it can account for significant unreported landings.
 - Identify shark species of joint interest and highest priority. It was noted that *Rhizoprionodon* and *C. limbatus* are two priority species in Mexico.
2. Share data and other resources, and conduct joint research and stock assessments.
 - Find ways to share costs and seek joint funding, where appropriate.
 - Tagging (including satellite tags) is a priority to understand shark migrations and potential for collaborative management.
 - Explore whether the U.S. can incorporate data from Cuba and Mexico into its stock assessments. Can U.S. scientists in the assessment process make the data available to NMFS? Can a Mexican shark scientist be engaged in U.S. assessments, perhaps in the SEDAR process?
3. It was noted that options for allocation breakdowns between the countries should be discussed sooner rather than later, and that separate quotas could potentially be established.
4. Identify forms that can serve to bring together the shark interests, and continue to build relationships between the countries.
 - In the case of relations between the U.S. and Cuba, NGOs and academic and research institutions can help fill gaps.
 - Mexico is in a favorable position to cooperate with both the U.S. and Cuba. Explore MEXUS-Gulf since it is an established forum that may serve as a starting point.
 - There is a bi-lateral commission between Mexico and Cuba that operates similar to MEXUS at the vice-minister level. One focus is groupers. Explore whether sharks can be raised as a topic.

Note: The shark research and conservation workplan of the Tri-National Initiative (see appendix 2) includes additional details on upcoming actions.

Gulf of Mexico's Shared Ecosystem and Shark Fisheries

Robert Hueter
Center for Shark Research, Mote Marine Laboratory
Sarasota, FL, USA

Shark Biodiversity in the Gulf of Mexico and Caribbean Sea

Of the approximate 500 species of sharks (34 families in 8 orders) worldwide, 97 species (in 24 families from 7 orders) are present in the Gulf of Mexico and Caribbean Sea.

Sharks' Use of the Gulf of Mexico Waters (U.S., Mexico & Cuba)

- Nurse shark mating has been observed in Dry Tortugas, Florida Keys, one of the few places it is documented.
- Nurseries for at least 16 coastal shark species (e.g. *Carcharhiunus limbatus*) have been identified in the US Gulf of Mexico waters (e.g. Tampa Bay, Charlotte Bay, Ten Thousand Islands and in the Florida Keys).
- Tagging studies have shown natal philopatry in some cases. Shark pups migrate south along Florida's west coast in the fall from primary nurseries to spend winter in secondary nurseries. In the spring, juveniles migrate north. Excessive fishing in certain areas can cause localized depletion.
- Mote and Mexican government partners (INAPESCA) have conducted research on blacktip shark nurseries in Laguna Yalahau, Quintana Roo, Mexico.
- Mote and University of Havana partners have conducted research in Western Cuba on the northern and southern coasts, tagging juveniles including reef sharks, tiger sharks, lemon sharks, and nurse sharks.
- Gulf feeding grounds exhibit great productivity. Vast quantities of zooplankton and fish spawn off the Yucatan peninsula attract whale sharks. Viewing whale sharks is an important and growing economic activity.

Connectivity

Tagging studies show the connectivity of the Gulf. Tagging studies show the migration of sharks throughout the region including whale, sandbar, dusky, tiger and blacktip, shortfin mako, blue and night sharks.

Conservation

- Important studies point to possible large declines of sharks in the Northwest Atlantic, Gulf and Caribbean.
- There are signs of problems in the Gulf. Some shark species are declared "overfished", Cuba catches have fallen, and Mexico is among the top ten of all shark fishing nations.
- Why care about shark conservation?
 - Biological research and human health*
 - Classic vertebrate anatomy tool, and studies of advanced senses & reproduction
 - Anti-cancer properties, and source of therapeutic materials
 - Commercial and recreational industry*
 - Commercial & recreational fisheries
 - Diving & ecotourism, Aquariums
 - Ecological*
 - Top predators maintaining an ecological balance
 - Biological control of other species. For example: A decline in sharks around coral reefs result in an increase of mesopredators (such as groupers) that prey on herbivores. When the abundance of herbivores (e.g. parrotfishes) declines, algae (which they kept under control) overgrows the reef. A coral reef dominated by algae is less resilient and able to support reef life and provide benefits.

Shark Fisheries in Cuba

Rafael Tizol
Fisheries Research Center, Ministry of Food
Havana, Cuba

Administration

Sharks are harvested in fisheries carried out by state-owned commercial fishing enterprises under the direction of the Fisheries Research Center in the Ministry of Food. Many private (small-scale) fishermen -- unaffiliated with commercial fishing enterprises -- harvest sharks. Many also hold contracts to sell sharks to state-owned enterprises.

Potential Yield and Distribution of Catch

Continental shelf waters shallower than 200 m are estimated to have a potential to yield an annual shark harvest of between 1,160 – 1,530 tons. Currently, the highest catches of sharks are landed in the northeast (65.6%) and southeast (15.2%).

Historic Trends

Shark catches have declined from 1981 (3,000 tons) to 2004 (549 tons), with current landing levels at about 700 tons. The decline is attributed to a drop in the fishing effort. Cuba faced an economic crisis in the 1990s. As a result, subsidies for fuel and boat repairs were reduced for relatively low value species, including sharks, resulting in fewer fishing trips and less directed effort. The government prioritized subsidies to the most valuable fisheries, such as spiny lobster.

Fishing Gear

Until 1988, 60-70% of total catch of sharks in the directed fishery were caught using both nets and longlines. Currently, it is reported that nets are the only gear used to harvest sharks. Until 1988, 30-40% of shark landings were incidentally caught in other fisheries, mainly in the longline fishery targeting billfish, gillnets targeting king mackerel, and trawling nets targeting snappers and shrimp.

Important Shark Species

There are 23 shark species reported in the commercial landings. Among the most valuable are *Carcharhinus limbatus* (aletinegro), *C. longimanus* (galano), *Rhizoprionodon porosus* (cazon de playa), *C. leucas* (cabeza de batea), *Galeocerdo cuvier* (alecrín), *Ginglymostoma cirratum* (gata) and others.

Shark Products

- Meat as a domestic food source (in recent years, shark meat has gained acceptance)
- Jaws, skin and teeth sold in the tourism industry
- Shark liver oil as a health supplement on international markets
- Cartilage as a partial treatment for certain diseases
- Fins exported to the Asian market (desire to grow this market – if the shark harvest is increased to 1,500 tons, then fin production could be increased to 60 tons (fresh; 24 t dried)
- Sharks are considered to be underutilized because of poor organization and management of the harvesting, processing and storage of shark products.

Shark Fisheries in Mexico (Atlantic coast)

Jorge Luis Oviedo
National Fisheries Institute
Veracruz, Mexico

Shark Fisheries Management Structure

There are 38 Fishery Offices that collect sharks landings data from 185 sites from Tamaulipas to Quintana Roo.

Historical Catch Trends

Veracruz and Tamaulipas report the highest shark landings. Shark catches have declined by 29% from 1998 to 2007. Populations of large sharks were the first ones to show a decline.

Shark Fishery Characteristics

- The shark fishery is part of a large, seasonal, and diverse multi-species fishery that also harvests groupers, snappers, and other species.
- The fleet is artisanal and uses both nets and longline gear to harvest sharks and other fish. There are 1,813 fishing vessels, 1,750 nets, 2,028 longlines, and 7,378 fishermen documented in the region.
- There are 40 shark species reported in the commercial landings. Among the most important are *Rhizoprionodon terraenovae* (cazon de ley), *Sphyrna tiburo* (cazon cabeza de pala), *Carcharhinus limbatus* (puntas negras), *C. acronotus* (cazon canguay), *Sphyrma lewini* (tiburón martillo), *C. leucas* (tiburón toro), and *C. falciformis* (tiburón sedoso).

Sharks as Bycatch

- Shrimp trawl fleet: 7% of the catch is elasmobranchs (mainly *Raja tejana* and *Gymnura micrura*)
- Tuna longline fleet: 1.4% (by number of animals) of the catch is sharks. In 2006, 662 sharks were recorded, including small sharks (“cazones”), three species of blacktips, and shortfin mako.
- Artisanal fleet: unquantified

Status and Challenges

- Multispecies fishery with 110 species (40 sharks, 10 rays and 60 bony fish).
- Catches include elasmobranchs of all sizes and stages of development; about 50% are immature.
- *R. terraenovae* is at its maximum sustainable level, and 90% of the catch is immature.
- The exact number of fishing units targeting sharks is unknown.
- Lack of historical series of fishing effort and catch per unit of effort.
- Official data categorized in three major groups (sharks, cazones and rays), rather than species.
- Interactions between various fishing gears and temporal and spatial interactions between the shark fishery and other artisanal fisheries.

Steps forward

- Identification of species and catch composition
- Increasing knowledge of the spatial and temporal distribution of the species
- Identifying critical habitats, migrations, and life cycle of key species
- Identifying the most vulnerable species that require special protection
- Characterization of the fishing units and distribution of the fishing fleet
- Completion of a “National Action Plan” for the management and conservation of sharks and rays
- Implementation of an OFFICIAL MEXICAN NORM (NOM-029) for responsible use of sharks and rays

Atlantic Shark Fisheries in U.S.A (Gulf of Mexico)

LeAnn Southward-Hogan
Highly Migratory Species Management Division
National Marine Fisheries Service
Silver Spring, MD, USA

Shark Fisheries Management

- The Magnuson-Stevens Fishery Conservation and Management Act is the guiding legislation for managing sharks and all fisheries in U.S. federal waters.
- NMFS conducts stock assessments for sharks it manages, and the International Commission for the Conservation of Atlantic Tuna has assessed shortfin mako, blue and porbeagle sharks.

Fishing Sectors, Gear and Markets

- Commercial vessels use bottom longline gear (most) and gillnets, and mainly target large coastal sharks (e.g., blacktip, bull, lemon, hammerheads) during short (< 1 day) trips. Vessels also work in other fisheries, e.g., reef fish.
- Recreational anglers target small sharks in shallower waters, and large and pelagic sharks in deeper waters.
- Gulf of Mexico shark markets vary with seasons and species availability. Fins are the most valuable with an ex-vessel price per pound of over \$18 in 2008. Pelagic shark meat has an ex-vessel price is about \$1.26 per pound (2008) and large and small coastal sharks are worth \$0.60 and \$0.54 per pound (2008), respectively.

Species, Status, and Management

- There are 39 species in three management units: pelagic sharks (e.g. *Isurus oxyrinchus* and *Carcharhinus longimanus*), small coastal sharks (SCS) (e.g. *Rhizoprionodon terraenovae* and *Carcharhinus acronotus*) and large coastal sharks (LCS) (e.g. *Carcharhinus limbatus*, *Carcharhinus leucas* and *Galeocerdo cuvier*). 19 species, including whale and white sharks, are prohibited from harvest.
- The status of most LCS is unknown, although Gulf blacktips are healthy. Three of four SCS are healthy in the Gulf. Sandbar, dusky and blacknose sharks are overfished with overfishing occurring. Shortfin makos are undergoing overfishing and approaching an overfished condition.
- Commercial and recreational fishermen hold transferable limited access permits, and fish dealers hold permits. Directed permits allow targeting of sharks with relatively high trip limits. Incidental permits have smaller trip limits.
- Annual quotas are set on a species or complex level, and are applied to the Atlantic, Gulf, or Caribbean regions. Fishing seasons close when 80% of the quota is filled.
- Gears include pelagic & bottom longlines, gillnets, rod & reel, handline, and bandit (vertical) gear. Corrodible, non-stainless steel hooks are required for pelagic and bottom longlines, and circle hooks are required on pelagic longline vessels.
- Fins must be attached through offloading. In the recreational fishery, heads must also be attached.
- Federally permitted shark dealers report on a bi-weekly basis, and Atlantic dealers must attend shark i.d. workshops.
- Randomly selected fishermen report in logbooks within 48 hours of a trip.
- Recreational fishermen must participate in surveys when requested.

Shark Research Fishery

In 2008, NMFS implemented a sandbar shark research fishery to allow continued landings, on a small scale, to support an on-going sandbar and LCS fishery and long-term research. About 10 fishermen a year are allotted permits to participate and collect data including reproductive age of sandbars and size distribution of LCS.

U.S. Participation in the International Management of Sharks

Melanie King
NOAA Fisheries Office of International Affairs
Silver Spring, MD, USA

- Globally, sharks are managed through the United Nations and its relevant bodies, as well as other organizations.
- The International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks) was adopted by the Food and Agriculture Organization, of which the US, Mexico, and Cuba are members. The IPOA-Sharks requires to nations to implement National Plans of Action on the Conservation and Management of Sharks (NPOA-Sharks), collect data, and sustainably manage sharks. The US and Mexico have adopted NPOA-Sharks.
- The Convention on Migratory Species (CMS), to which the US and Cuba are signatories and which is concluded under the aegis of the United Nations Environment Program, promotes concerted action among the Range States of many of these species for species threatened with extinction or which would significantly benefit from international cooperation. This year's negotiations concluded for the Global Memorandum of Understanding (MOU) on the conservation and sustainable use of migratory sharks under the framework of the CMS. It has been signed by 11 countries, including the US, and currently covers white (*Carcharodon carcharias*), basking (*Cetorhinus maximus*), whale (*Rhincodon typus*), porbeagle (*Lamna nasus*), shortfin mako (*Isurus oxyrinchus*), longfin mako (*Isurus paucus*) sharks, and the Northern Hemisphere population of spiny dogfish (*Squalus acanthias*).
- The Convention on the International Trade in Endangered Species of Wild Flora and Fauna (CITES) considers trade measures on species for which commercial trade threatens their survival. The March 2010 CITES meeting saw an unprecedented number of proposals on marine species; however, none were adopted. While some members expressed the view that nations and Regional Fishery Management Organizations (RFMOs) are more appropriate to manage marine species than CITES, the US considers CITES to be an effective management tool that can compliment RFMO management to ensure sustainability.
- Sharks have also been discussed during the Kobe Process, a series of joint meetings of the five global tuna RFMOs. Mexico and the US have both participated in this process, which has called for the establishment of precautionary, science-based conservation and management measures for sharks taken in fisheries within the convention areas of each tuna RFMO. The convention area of the International Commission for the Conservation of Atlantic Tunas (ICCAT) covers the Atlantic and Caribbean, and ICCAT collects data on all species that interact with Atlantic tuna and tuna-like fisheries, including sharks. Several measures have been adopted on the management of sharks, including thresher sharks (*Alopias* spp.), porbeagle sharks (*Lamna nasus*), and shortfin mako sharks (*Isurus oxyrinchus*).
- Despite the actions taken in these organizations, lack of data is a problem globally and there are still gaps in the international management of sharks across the Atlantic.
- The MexUS bilateral framework between the US and Mexico would be an appropriate venue to discuss research and management of sharks bilaterally.
- The NMFS Office of International Affairs has participated in capacity building projects in the Latin American region and elsewhere, including workshops on species identification, data collection, observer trainings, enforcement trainings, bycatch mitigation techniques, and safe handling techniques. These projects have the potential to increase the capacity of developing countries to implement existing requirements regarding shark data collection, conservation, and management.

Catch Share Management: What it is and How it Works

Frank Alcock
Marine Policy Institute, Mote Marine Laboratory
Sarasota, FL, USA

- **What do stakeholders care about?**
 - Ecological sustainability
 - Economic efficiency & profitability
 - Distribution & equity
- **Fisheries Management Tools**
 - Technology Restrictions
 - Spatial (Area) Restrictions
 - Effort Restrictions
 - Catch Restrictions (TACs)
- **Harvesting Sector Profitability**
 - Quantity/Volume/TAC share
 - Price/Quality
 - Cost (Capital & Operating)
- **Catch Shares**
 - TAC is divided in advance and allocated to sectors, communities, or individual fishing entities
 - Incentives change
 - Significant impacts on efficiency, conservation and distribution
- **Catch Shares – Distributive Impacts**
 - Access
 - Allocation
 - Bargaining Power
- **Catch Shares – Applicability**
 - Viable under a broad range of conditions but not all conditions
 - Prerequisite: capacity to monitor and enforce TAC shares
 - Payoffs for participation need to exceed those for non-participation
- **Catch Shares – Design Elements**
 - Ownership Eligibility
 - Initial Allocation
 - Transfer Rules
- **What do stakeholders care about?**
 - Conclude by emphasizing the strength of catch shares on sustainability and efficiency criteria but acknowledge the challenges on issues of distribution.

Red snapper pre- and post- catch share management (Individual Fishing Quotas)

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Background

Red snapper are long-lived fish (50+ years) and found throughout the Gulf of Mexico. They are heavily targeted by the commercial and recreational sectors, and captured as bycatch in the shrimp trawl fishery. The population has been federally classified as “undergoing overfishing” for more than two decades, and “overfished” for longer. Under the current rebuilding program, the Gulf red snapper population is projected to rebuild to a healthy level by 2032.

Pre-IFQ regulations (1992-2006)

Pre-IFQ (“individual fishing quota”) regulations, collectively called “derby” management, included an annual fleet quota, limited access permit with daily trip limit, seasonal closures, and a minimum size limit. The outcomes were short seasons, a race to fish (sometimes in poor weather conditions), reduced economic efficiency, market gluts and lower ex-vessel prices, and high regulatory discards. Quota overages occurred in 9 out of 17 years and the average annual fishing season lasted 88 days. From accidental catches of fish smaller than the minimum size limit and during the closed season, over a million fish were discarded most years.

IFQ management (2007-present)

In 2007, derby management was replaced with an IFQ management program and other steps including reducing the minimum size limit and eliminating trip limits and season closures. Initial IFQ shares were allocated to individual fishermen based on their long-term history of landings. The objectives of the IFQ program are to: reduce overcapitalization; eliminate derby fishing conditions (safety at sea, market gluts); reduce regulatory discards; enhance law enforcement; and provide other benefits.

Under IFQs, enforcement and monitoring includes: a vessel monitoring system on each vessel; call-in and call-out notification; verification of sufficient IFQ allocation before landing; offloading to dealers with an IFQ endorsement; and dock-side web-based reporting. An online IFQ system allows for real-time tracking of landings, rapid transfers of fish between fishermen, promotes enforcement, and is secure.

Results

Since implementation of the IFQ program, the ex-vessel price has climbed by about 25 percent and the fishery is open year-round. Regulatory discards of red snapper have dropped by about 70 percent by number of fish (compared to the average 5 prior years) from IFQ rules and reduction of the minimum size limit. The quota has not been exceeded. The number of shareholders has declined by about 21 percent, from 546 to 429. The number of days away from port has declined by about one-third. In addition, a cost recovery fee is collected from industry to help cover costs of enforcement.

On-going challenges identified

- Remaining regulatory discards
- Gulf oil disaster
- High share and allocation prices,
- Quota reductions
- Data quality and reporting compliance.

Highlights of the Gulf IFQ System

Glen Brooks
Gulf Fishermen's Association
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Red Snapper Bycatch in the Grouper Fishery

Before the snapper IFQ, our grouper fleet could not land snapper due to the 10 day monthly season. Grouper fishermen could not plan a 14 to 18 day trip, retain snapper, and risk not landing in the 10 day window. The fines outweighed the money they may have made. So the standard was to not keep any snapper! With the red snapper IFQ program, most of the fleet keeps red snapper they catch which is about 10% of their grouper catch.

When the Grouper Fishery was Still a Derby

The grouper fishery was overcapitalized with too many fishermen. It was a bigger disaster when displaced fishermen from the swordfish, tuna and shark fisheries bought up latent permits. We had about 1,400 permits, and about 700 latent permits. We were always so close to being shut down for filling our yearly quotas. At one point, when a few displaced fishermen bought latent permits and entered our fishery, we suffered two years of early year-end closures.

We implemented trip limits to try to help. They basically knocked out all the big players in the grouper fishery. They did help stabilize the fishery and price. They also let the fishermen that were able to stay in the fishery work year-round again. Most of the fishing fleet thought this type of fishery management was O.K. to the point we did not need to look at IFQ's.

Implementing and IFQ Program

But, most fishermen did not keep up with the science of the fishery, and did not realize the trouble that gag grouper was in. Gag grouper were being extremely overfished by the recreational sector which in turn directly affects the commercial quota. With gag grouper quotas that are going to be drastically cut we would be facing early closures again in our derby style grouper fishery – if we didn't already have an IFQ program for grouper started in January 2010. Filling the low gag grouper quota early in the year would have triggered a complete shut down in the shallow water grouper fishery.

In an emergency action to protect gag grouper from being overfished any further, the Gulf council will stop the recreational sector from fishing for gag in 2011. Normally, it would have been the same for the commercial sector, except with the IFQ now in place. The gag catches in the commercial grouper fishery under IFQs can be controlled and 100% accountable in real time for what's landed.

Since Gulf fishermen were allowed to vote for or against a grouper IFQ, we educated them on these issues, and the pros and cons of an IFQ. When it came time to vote, the IFQ passed with overwhelming support from the fishermen.

IFQ Trading and Swapping

As I said earlier, we now keep all the snapper we catch. It is not because someone gave us the allocation. We have the flexibility to purchase or trade IFQ shares or allocation amongst other fishery participants to balance our quotas to what we are catching, therefore reducing our overall bycatch in the entire Gulf.

Catch Shares-An Environmental Perspective

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What is a catch share?¹

A catch share program allocates a secure privilege to harvest a specified amount of a fishery's total catch to an individual or group (groups can be community-based). Under a catch share program, managers establish a fishery-wide catch limit, assign portions of the catch, or shares, to participants and hold participants directly accountable to stay within the catch limit.

Catch shares are fundamentally different from other fisheries management approaches and have generally been implemented after a variety of other approaches are insufficient at meeting specific goals. Most commercial fisheries start as open access where anyone who puts in the effort is allowed to catch fish. As competition increases, managers often limit access through licensing of participants.

When licenses do not effectively control fishing effort and catches, managers implement more and more effort-based regulations to control catches. Examples of these regulations include limitations on the amount of catch allowed per trip, the size of vessel, fishing days and more. In many cases, these management efforts have not succeeded in maintaining stable fish populations or in promoting profitable, safe fisheries. As an alternative, over the past four decades many fisheries worldwide have implemented catch share programs.

By allocating participants a secure share of the catch, catch share programs give participants a long-term stake in the fishery and tie their current behavior to future outcomes. This security provides a stewardship incentive for fishermen, which was previously missing or too uncertain to influence his/her behavior toward long-term conservation. Catch share programs align the business interests of fishermen with the long-term sustainability of the stock, and they provide more stability and predictability within a fishing year and over time.

Furthermore, catch share fishermen are held accountable for their share of the catch. They are simply not allowed to catch more than their share. And, if participants do exceed their shares, they must lease or buy additional shares in order to cover their overage, or they are subjected to a penalty, which could include revocation of the privilege or stiff fines. By contrast, traditional fisheries management holds fishermen accountable to regulations that are not directly tied to the catch and do not necessarily limit the catch.

These differences among the various fisheries management systems are summarized on the following tables by taking the lessons learned from three U.S. fisheries. The regulations implemented in an open access or derby fishery to manage catch and fishing effort produce negative or mixed outcomes for the environment, business, livelihoods and management. On the other hand catch shares have proven to create incentives to increase seafood quality, stewardship and potential for cooperation between fishermen and fisheries managers.

For a more comprehensive overview and road map of catch share design, implementation and case studies please visit the Catch Shares Design Center (<http://www.edf.org/catchsharesdesigncenter>).

¹ Section from Bonzon *et al.* (2010): Catch Shares Design Manual. Available from http://www.edf.org/documents/11387_catch-share-design-manual.pdf

Lessons from three U.S. Fisheries (Gulf of Mexico shrimp and red snapper, and Alaska halibut)

Management System Classification			
	Open-Catch (Open Access)	Derby (Race to Fish)	Catch Shares
Regulations to manage catch and/ or effort	No total catch limit set Permit required Not applicable Accounting – fleet level Fishing closures Trip/gear/size limits to lengthen fishing season Data / monitoring	Total catch limit Permit required Total catch limit allocated to fleet Accounting – fleet Fishing closures Trip/gear/size limits to lengthen fishing season Data / monitoring	Total catch limit Permit required Total catch limit allocated– individuals & community Accounting - individual, community level No closures – fish is hold / obtain/trade quota Limits to extend season not needed Data / monitoring
Incentive Created	Build capacity to fish as hard as possible in open season, regardless of value	Race to catch as many fish as possible before fishing closes, regardless of value	Mindful fishing to increase value and meet personal/business and market needs

(Note: increase ↑; decrease ↓; glut: to flood the market with goods so that supply exceeds demand)

Outcomes	Open Catch (Open Access)	Derby (Race to Fish)	Catch Shares
Environment			
total catch limit compliance	-----	(variable)	↑
bycatch waste	(variable)	↓	↑
data/monitoring success	(variable)	(variable)	↑
stewardship behavior	↓	↓	↑
status of fish population	↓	(variable)	↑
Markets/food stability			
supply & availability	↑ (short term) ↓ (long-term)	↓ (alternate glut & scarcity)	↑ (meet market needs)
quality	(variable)	↓	↑
Business/livelihood			
catch per unit effort	↑	(variable)	↑
ex-vessel fish price	(variable)	↓	↑ (rise & stabilize)
fuel cost	↑	↑	↓
vessel costs	↑	↑	↓
labor / jobs	(variable)	many part-time jobs	fewer part-time and more full-time jobs
efficiency / profit / value	↓ (profits dissipated)	↓	↑
Management/political			
Compliance with regulations	↓ (incentives to cheat)	↓ (incentives to cheat)	↑ (increased self-enforcement)
management process	↓ (on-going conflict)	↓ (on-going conflict)	↑ (potential for cooperation)

IMPROVING THE HEALTH OF THE GULF OF MEXICO ECOSYSTEM: PROTECTING TRANSBOUNDARY SHARKS USING INNOVATIVE CATCH SHARE MANAGEMENT

Concept Paper and Discussion Memorandum

September 2010 Update

Environmental Defense Fund and Mote Marine Laboratory are exploring a new initiative to help improve the direction of international shark fisheries management. With this paper, we are seeking input and collaboration in the United States, Mexico and Cuba with government agencies, fishing industries, research institutions and academics, non-government organizations, and others interested in innovative approaches to marine conservation. In the near-term, we hope to work with all parties jointly to develop the concept, investigate the possibility for success, seek supporting resources, and collaborate on long-term planning. Success will depend on collaboration, from planning to implementation.

Problem

The harvesting of ocean fish globally supports millions of jobs, generates billions in economic activity, and provides an important food source for hundreds of millions of people. Healthy fish populations also play an invaluable role in marine ecosystems, from predator to prey and from shaping coral reefs to sculpting the seafloor. Unfortunately, many of the world's fish stocks are overexploited, creating widespread negative consequences. Scientists identify overfishing as the single most important threat to the oceans. At the same time, economists estimate that 75 percent of fisheries globally are poorly managed and underperforming, with a difference between the potential and actual net benefits estimated to be \$50 billion each year.

Overfishing is the result of systemic problems in fisheries policies traced to a "tragedy of the commons." Under traditional regulations, fishermen have incentives to "race to fish" to outcompete others before a fishing season ends or a stock is depleted. Racing compels fishermen to boost harvesting capacity with more powerful vessels and high-tech gear, only to catch fewer fish over time. When fisheries are exhausted and restrictions continually tightened, fishermen's incentives are to work around rules, advocate higher catch limits, and seek subsidies. These problems create a spiral of excessive harvests and reduced stocks, and can result in a collapse of fish populations and wide-spread economic hardship.

Not surprisingly, the management of sharks is no exception. In the Gulf of Mexico (and other parts of the world), sharks are an important food and income source, and they are top predators critical for healthy marine ecosystems. Sharks migrate across the region's political boundaries, and with today's management fragmented between three countries, sustaining and rebuilding shark stocks are difficult, maybe even impossible for some species. In the Gulf today, scientists are documenting population declines, management in the U.S. Gulf is resulting in a race to fish, illegal fishing at the U.S.-Mexico border is an important concern, and Cuba may seek to expand its shark fisheries.

Solution

Fortunately, regulators, scientists, economists and industry are increasingly highlighting the results of new management systems called "catch shares" – more productive fisheries, less ecosystem harm, and new opportunities to improve economic outcomes. Catch shares allocate secure privileges to harvest a sustainable amount of fish to each fisherman or community, and allow them to trade shares. Instead of racing and overcapitalizing, fishing businesses seek the most efficient and least costly way to fish and focus on improving quality and enhancing the environment. Fishermen's operations align with conservation because the value of their fish shares depends on

the health of stocks. Catch shares are increasingly used to manage a variety of fisheries within many nations' boundaries, including Mexico and the U.S.

While successes are growing in the national waters of several countries, there is little progress in some of the largest and most vulnerable fisheries in the world – those populations that migrate across political boundaries and are shared by two or more countries. These transboundary oceanic fishes are called “highly migratory species” and include sharks, as well as tuna and swordfish. Improving management and conservation of the Gulf’s highly migratory sharks are the focus of this proposal. Certainly, there are important challenges to working on sharks at the multi-national level, including weak international governance institutions, limited science, and varying goals among countries. In spite of these, the potential environmental and economic gains are substantial and make the effort worthwhile. The project’s initial outreach to government officials, universities, and industry representatives has been positive.

Concept & Strategies

The Gulf of Mexico is an excellent region to demonstrate multi-national management for highly migratory shark fisheries. Clearly, significant governance complexities exist, but with just three countries (Mexico, Cuba, and the U.S.), collaboration is a realistic possibility. Each of the countries has significant scientific and regulatory capacity. Gulf-wide cooperation is already underway – including the “Tri-national Initiative for Marine Science and Conservation of the Gulf of Mexico” – and shark research and conservation are identified as priorities.

Unlike many parts of the ocean where dozens of countries lay claim to international waters, most Gulf waters are contained within the three countries’ Exclusive Economic Zones, with just a few small high-seas areas falling outside their jurisdictions. In addition, the countries have jurisdiction over sharks since they are not actively managed under the International Convention for the Conservation of Atlantic Tunas or other international agreements (although bycatch of sharks in other highly migratory fisheries will be considered).

Certainly, collaboration is essential, and should include fisheries and natural resource agencies and state departments, the fishing industry, academic institutions, and non-governmental organizations. Early on, essential research, data collection, and monitoring and enforcement needs must be identified and addressed. And, initially, we anticipate that a few sharks may be selected for the management model. For example, sandbar and dusky sharks are classified as “overfished” in the U.S., while blacktip sharks are not overfished but undergo significant migrations between the countries. We anticipate the need for institutional capacity building that combines elements of top-level coordination and effective efforts to build management designs and institutions from the bottom-up within the three countries.

Each of the countries has special ecological characteristics, and unique social and economic priorities. Thus, management will need to meet the individual needs of the countries and have potential for in-country conservation and economic gains. At the same time, they can be designed to complement each other and be coordinated under tri-national governance to benefit from shared research, data, monitoring and enforcement resources, and potential expansion of harvesting and marketing opportunities.

Potential Outcomes

A successful model can have important outcomes. It will demonstrate how management can help rebuild and sustain shark populations that, in turn, enhance marine ecosystems and benefit coastal economies. Since highly migratory species conservation is a global problem, the model will have widespread applications beyond sharks for other important fisheries. Experience with Gulf tri-national collaboration will lay the foundation for improving management of other shared fisheries, including valuable snappers and groupers. It will also demonstrate how catch share management can work for, and be coordinated among, developed and developing countries with diverse government systems.



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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 this working group of the Trinational Initiative 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. **MEXUS²:** Consider MEXUS (US-Mexico) approach to cooperative research, both as a model for collaboration and a resource itself for trinational engagement.

² 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, 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)

- 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

- Trinational 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)

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 trinational 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

Appendix 3 PRESENTATIONS

- [GULF OF MEXICO'S SHARED ECOSYSTEM AND SHARK FISHERIES](#)
- GULF OF MEXICO SHARK FISHERY OVERVIEW:
 - [Cuba](#)
 - [Mexico](#)
 - [U.S. & International Management](#)
- [CATCH SHARE MANAGEMENT: WHAT IT IS AND HOW IT WORKS](#)
- U.S. GULF OF MEXICO'S RED SNAPPER FISHERY PRE- AND POST-CATCH SHARES :
 - [Regulatory perspective](#)
 - [Fishing industry perspective](#)
- [CATCH SHARES-AN ENVIRONMENTAL PERSPECTIVE](#)