Mote Marine Laboratory: Partnerships and Shark Research in Mexico

MOTE MARINE LABORATORY
www.mote.org

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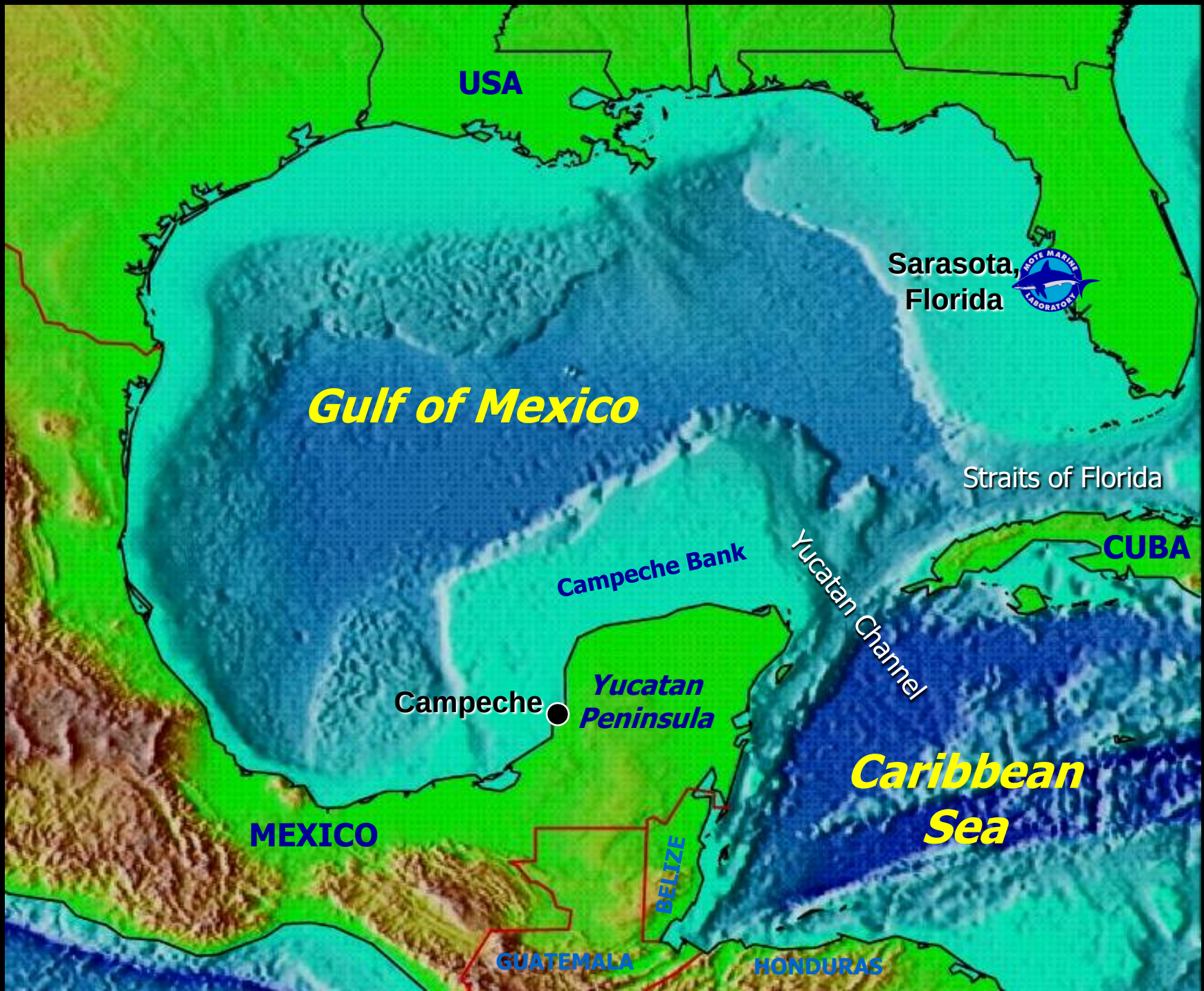
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Gulf of Mexico
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CUBA
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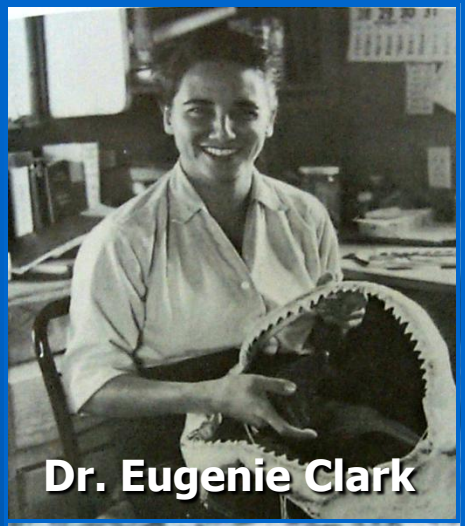
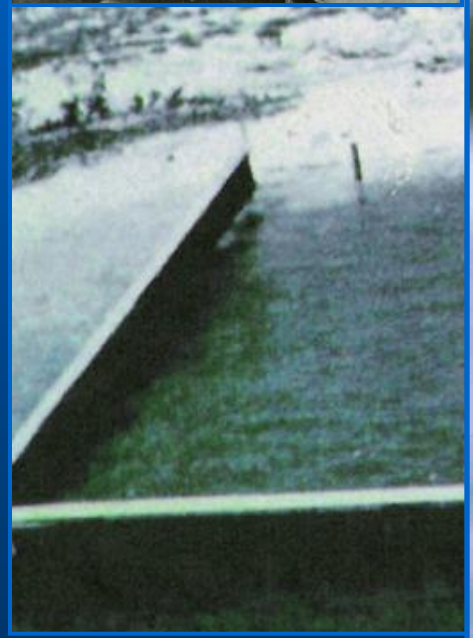
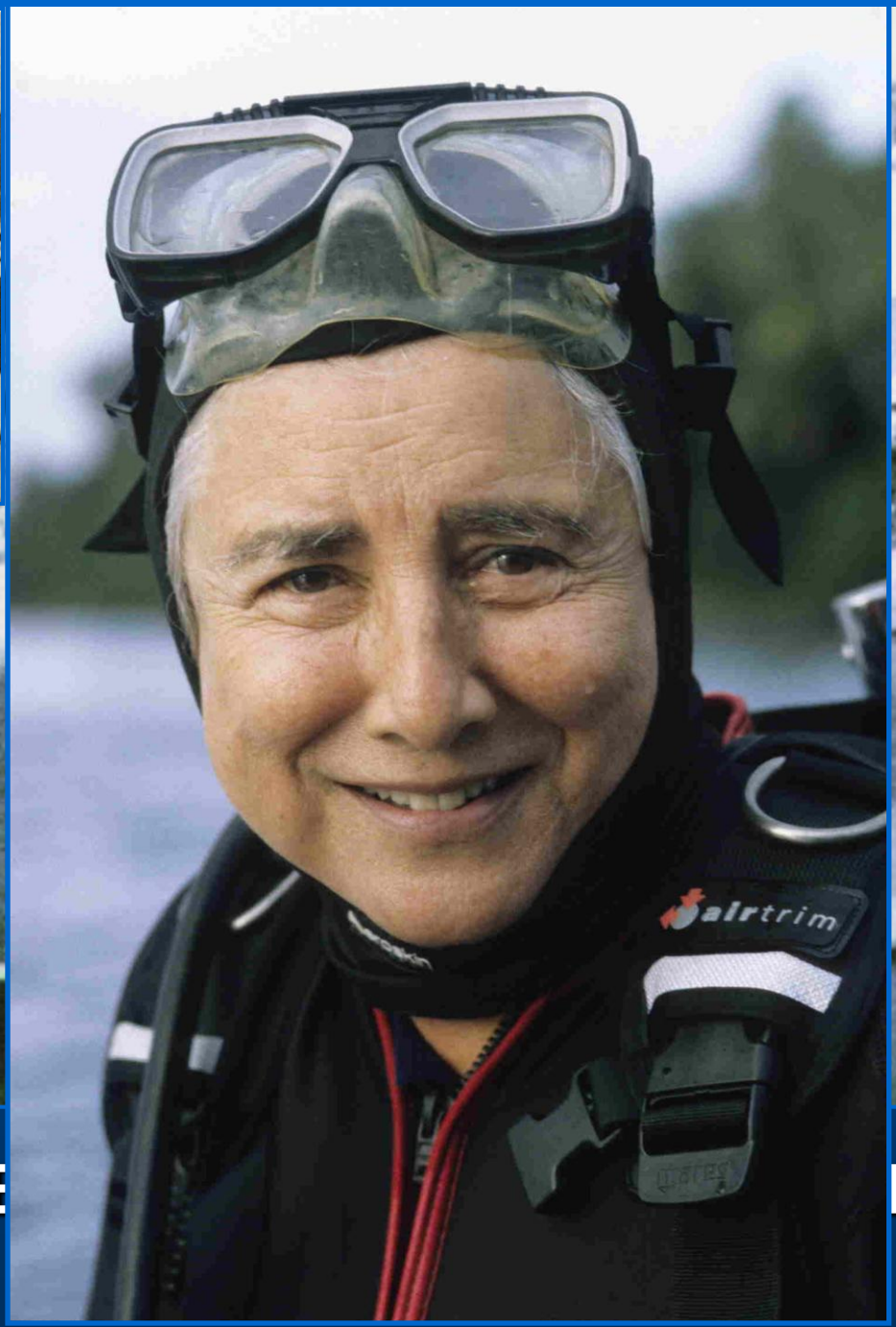
MEXICO
BELIZE
GUATEMALA
HONDURAS


Dr. Eugenie Clark

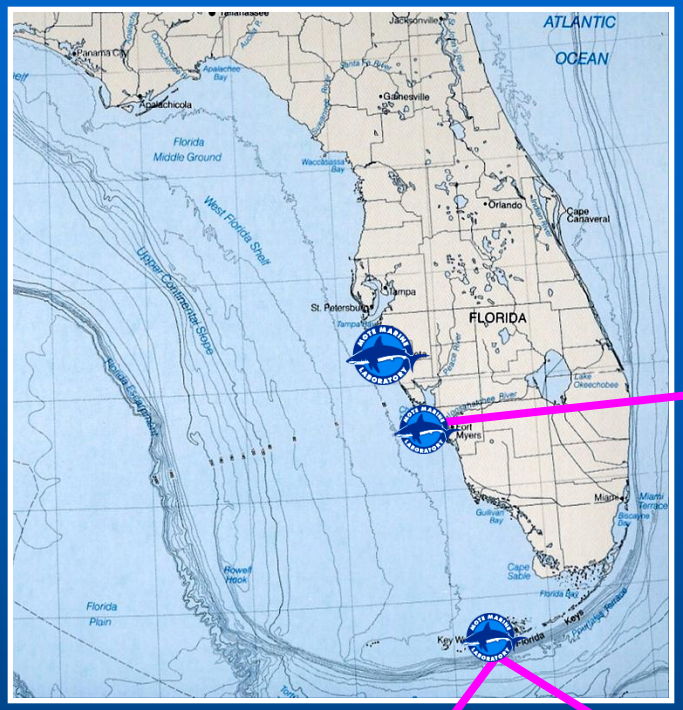


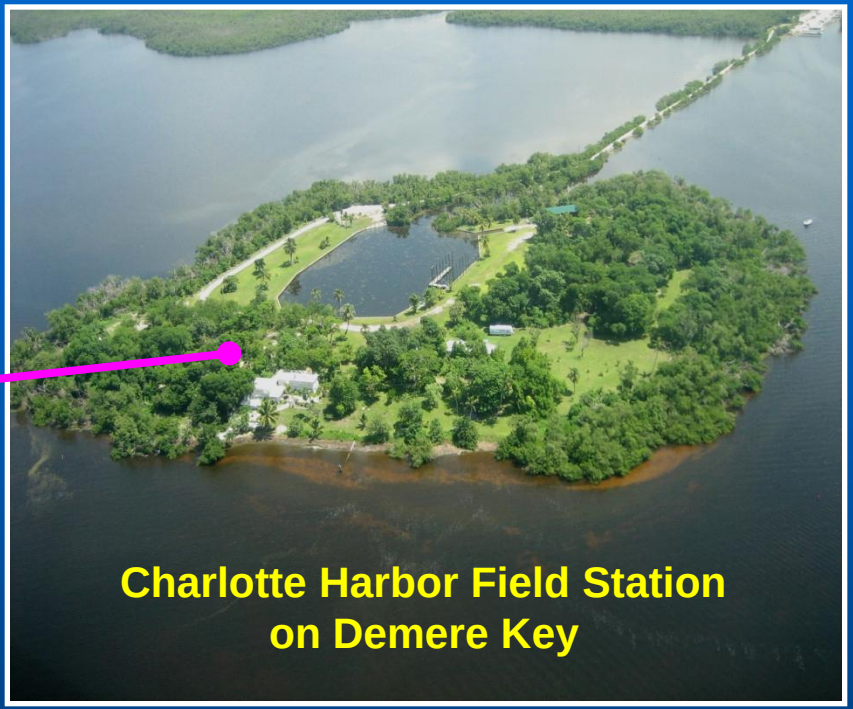


CAPE TORY

Mote's Sarasota campus today

Other Mote facilities





Charlotte Harbor Field Station
on Demere Key

Florida Keys Field Station
on Summerland Key

Mote Marine Laboratory

- 56 year-old independent, not-for-profit institution for marine research, education, and a public aquarium (350,000-400,000 visitors/yr)
- Not affiliated with any government agency
- Collaborative with universities but not part of any university
- ~180 employees including ~30 Ph.D. scientists
- ~$12-20 million annual budget, ~75% for research
- 7 research centers

MOTE MARINE LABORATORY MOTE AQUARIUM

MOTE RESEARCH

Ecotoxicology

Coastal Ecology

Fisheries Enhancement

Marine Mammal & Sea Turtle Research

Coral Reef Research

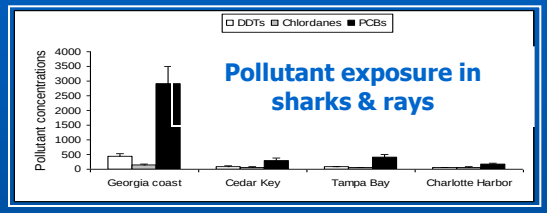
Aquaculture Research & Development

Shark Research

Mote Elasmobranch Research Programs

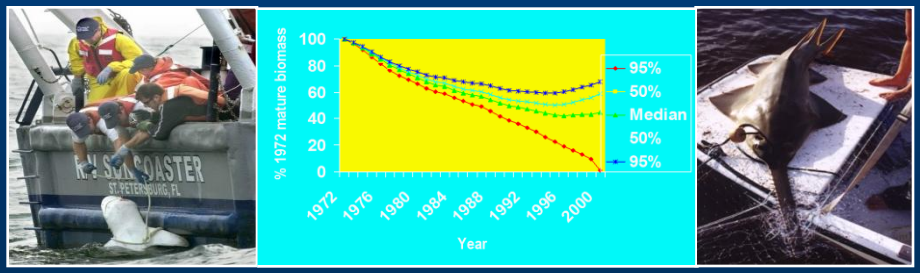
- ***Marine Biomedical Research & Immunology***

- ***Physiology & Environmental Biology***



- ***Behavior & Ecology***

- ***Fisheries & Conservation Biology***

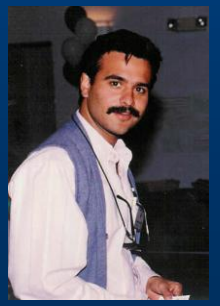


Recent history of Mote collaborative shark research and conservation with Mexico

- **1993:** International conference on *"Conservation and Management of Shark Populations in the Gulf of Mexico and Caribbean Region"*
  - Dr. Leonardo Castillo, Dr. Fernando Marquez, Rafael Velez and Dra. Maria Concepcion Rodriguez de la Cruz, INP; Raul Marin, Veracruz Aquarium
  - NOAA/NMFS announced implementation of first federal shark fisheries management plan in U.S.
  - Conference supported by NOAA/NMFS

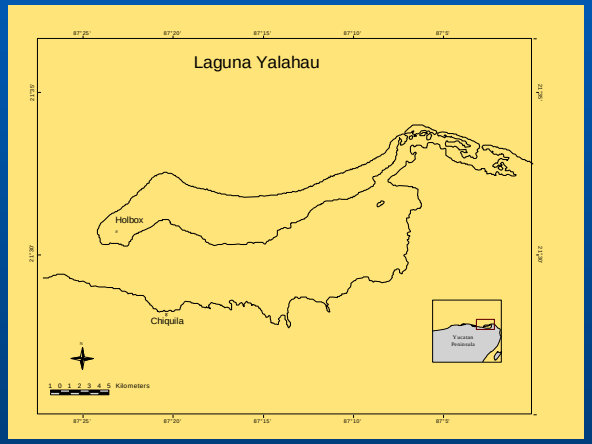
- **1994:** Visits to Gulf of Mexico and Caribbean coasts to sample shark fisheries (beginning of Dr. Leonardo Castillo's *"Programa Tiburon"*) and locate site for collaborative shark nursery studies, with INP (Dr. Leonardo Castillo and Dr. Fernando Marquez)

Instituto Nacional de Pesca



Dr. Fernando Marquez in his younger days (1993)

- **1995-2001:** Laguna Yalahau studies of blacktip shark nursery
  - Collaboration with INP (Dr. Leonardo Castillo and Dr. Fernando Marquez) and local fishermen
  - Supported by NOAA/NMFS
  - Official project of MEXUS-Golfo
  - Publication: *Hueter, Castillo-Geniz, Marquez-Farias and Tyminski, 2007* plus several population genetics papers by Heist et al.



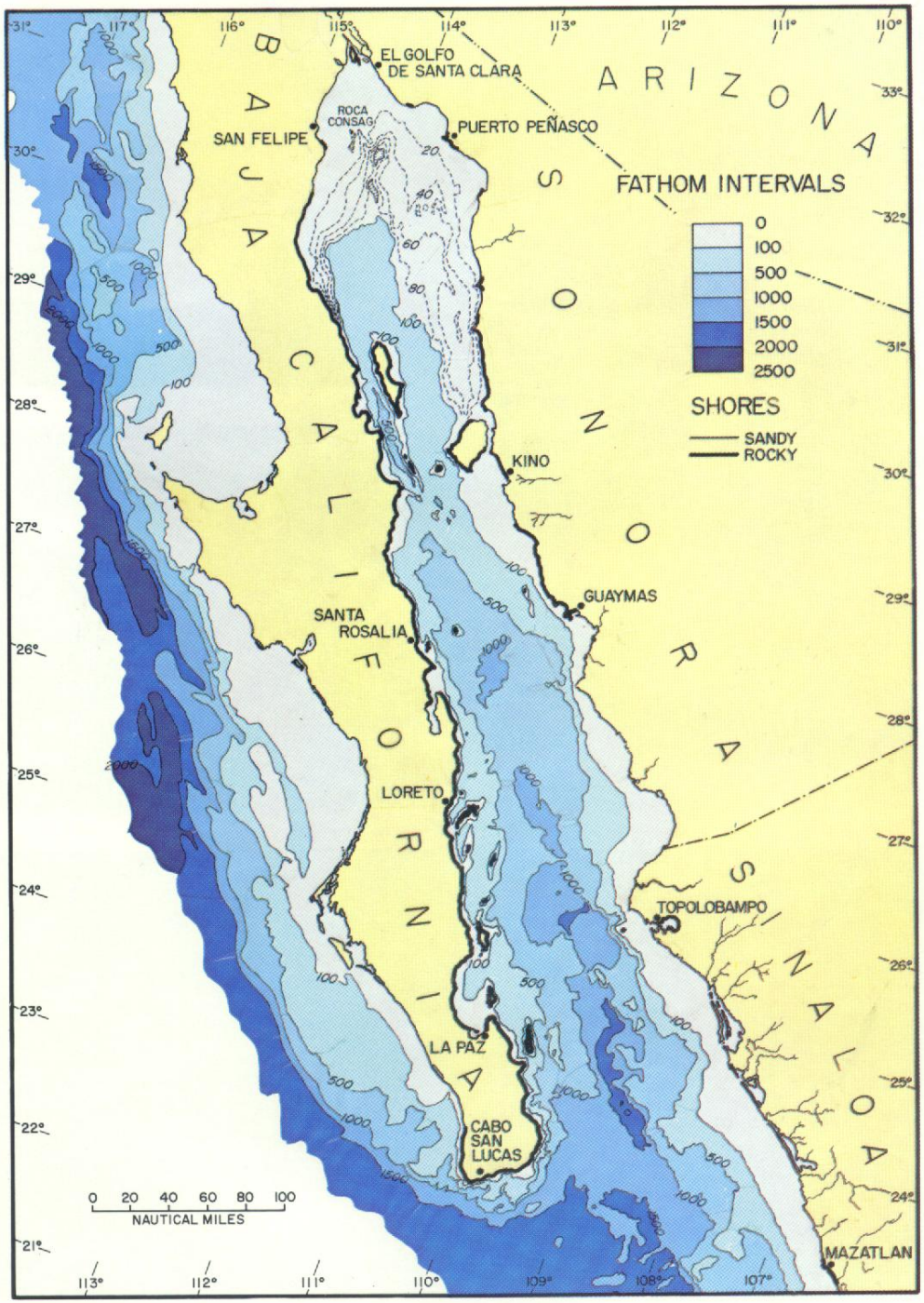
- **1998-2002:** Gulf of California research project to assess elasmobranch landings in artisanal fisheries in Sonora, Sinaloa, Baja California and Baja California Sur
  - Collaboration with INP (Dr. Leonardo Castillo and Dr. Fernando Marquez), Moss Landing Marine Laboratories (Dr. Gregor Cailliet, Joe Bizzarro, Wade Smith) and UABCS (Dr. Carlos Villavicencio) plus many associates and students (including Dr. Juan Carlos Perez when he was a student!)
  - Supported by 12 different sources including 6 private foundations, especially David and Lucile Packard Foundation
  - Project of MEXUS-Pacifico(?)
  - At least 8 publications so far

- **2003-present:** Conservation research project on whale sharks off Quintana Roo
  - Collaboration with CONANP and INAPESCA (Rafael de la Parra and Dr. Jaime Gonzalez) and Georgia Aquarium
  - Supported by Georgia Aquarium, NOAA/NMFS and other private foundations
  - Not a project of MEXUS-Golfo
  - 5 publications have appeared or are in preparation so far



- **2009-present:** Trinational (Mexico-Cuba-US) ve in marine science and conservation of Mexico and western Caribbean Sea

- **2009-present:** EDF project



The Gulf of California Project

- ~ 1,100 km long x 160 km wide
  ~ 3,000 km of coastline
- High biodiversity
- High fisheries yield
- Largest amount of sharks and rays landed in Mexico,
  ~ 10,000 tons/year

Project Objectives

1. Locate and survey all artisanal fishing camps along the Gulf of California coast over a two-year period (1998-99).

2. Collect camp characteristics and general catch and effort data for all camps in high and low fishing seasons.

3. Determine catch composition and shark/ray catch per unit of effort (CPUE) for camps targeting sharks and rays.

4. Implement tagging program to assess distribution of shark nursery areas and species dependence on the Gulf of California, and conduct other basic biological studies.

5. Identify shark and ray species at risk in the fishery.

6. Produce recommendations for conservation and management of shark and ray fisheries in the Gulf.

17 camps

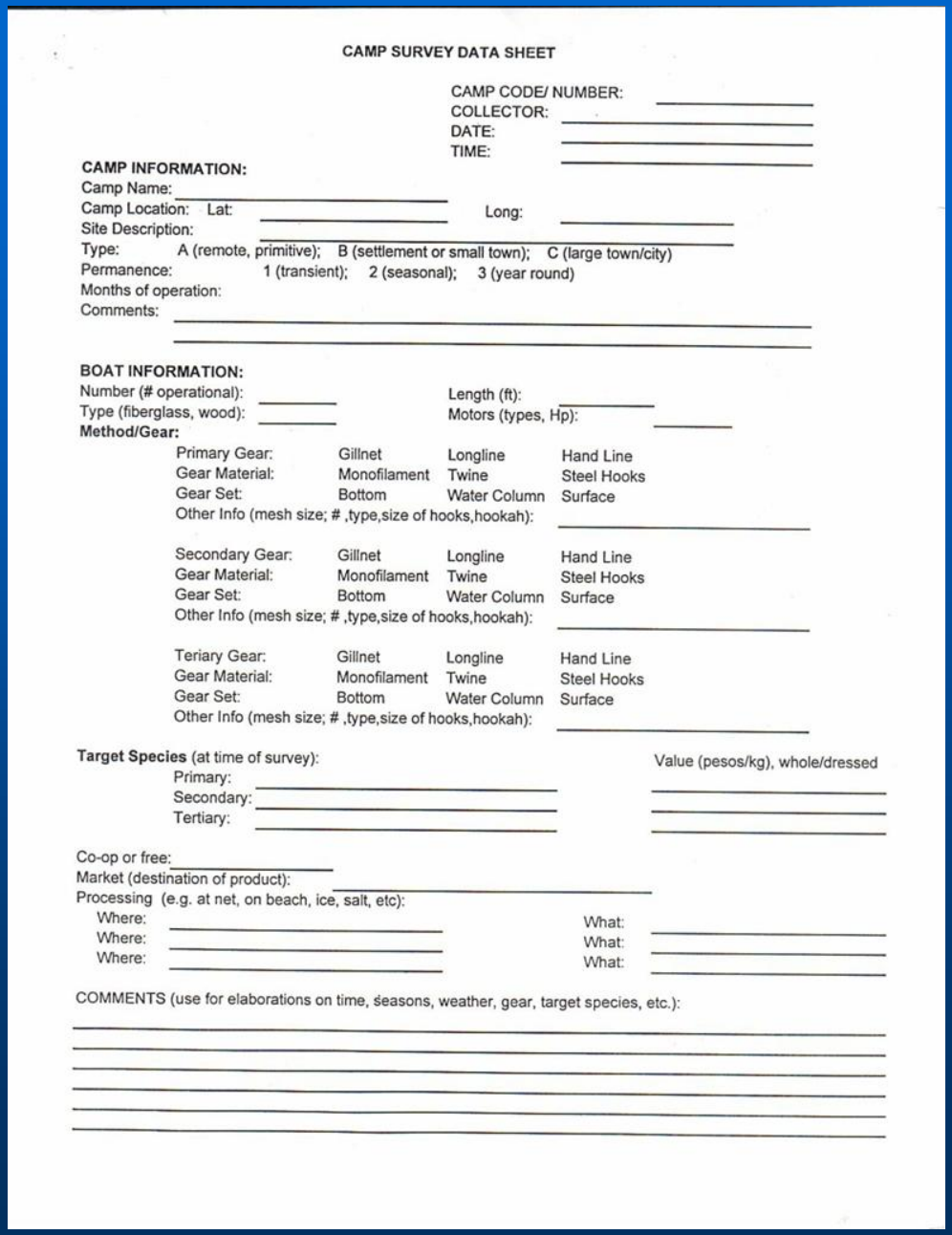
19 camps

28 camps

83 camps


NEW
YORK

Camp Survey Data Sheets



CAMP SURVEY DATA SHEET

CAMP CODE/ NUMBER: _____
COLLECTOR: _____
DATE: _____
TIME: _____

CAMP INFORMATION:
Camp Name: _____
Camp Location: Lat: _____ Long: _____
Site Description: _____
Type: A (remote, primitive); B (settlement or small town); C (large town/city)
Permanence: 1 (transient); 2 (seasonal); 3 (year round)
Months of operation:
Comments: _____

BOAT INFORMATION:
Number (# operational): _____ Length (ft): _____
Type (fiberglass, wood): _____ Motors (types, Hp): _____
Method/Gear:

Primary Gear:	Gillnet	Longline	Hand Line
Gear Material:	Monofilament	Twine	Steel Hooks
Gear Set:	Bottom	Water Column	Surface

Other Info (mesh size; # ,type,size of hooks,hookah): _____

Secondary Gear:	Gillnet	Longline	Hand Line
Gear Material:	Monofilament	Twine	Steel Hooks
Gear Set:	Bottom	Water Column	Surface

Other Info (mesh size; # ,type,size of hooks,hookah): _____

Teriary Gear:	Gillnet	Longline	Hand Line
Gear Material:	Monofilament	Twine	Steel Hooks
Gear Set:	Bottom	Water Column	Surface

Other Info (mesh size; # ,type,size of hooks,hookah): _____

Target Species (at time of survey): Value (pesos/kg), whole/dressed
Primary: _____
Secondary: _____
Tertiary: _____

Co-op or free: _____
Market (destination of product): _____
Processing (e.g. at net, on beach, ice, salt, etc):
Where: _____ What: _____
Where: _____ What: _____
Where: _____ What: _____

COMMENTS (use for elaborations on time, seasons, weather, gear, target species, etc.):

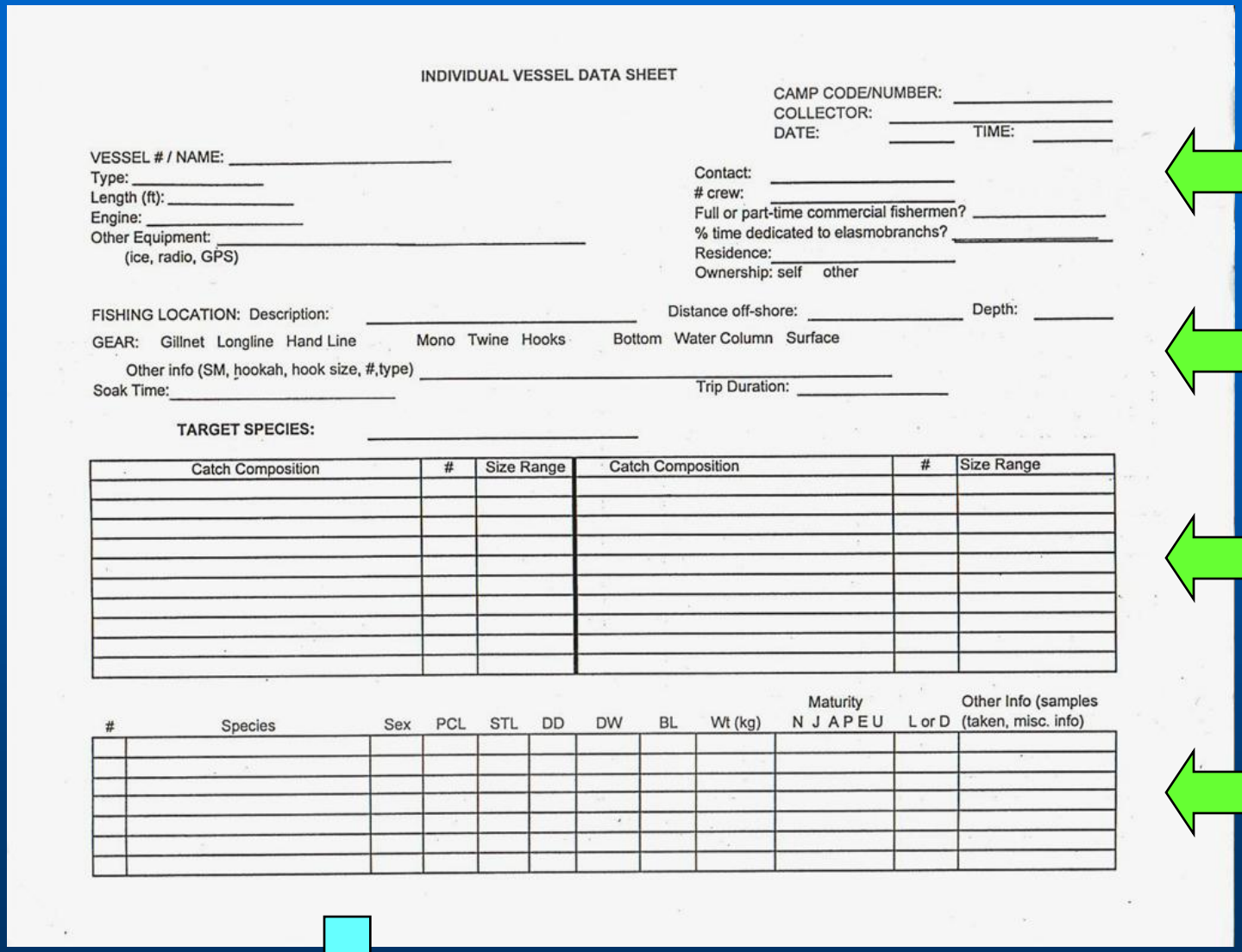
General camp characteristics

Boat and gear types

Target species

Economic data

Panga Survey Data Sheet



INDIVIDUAL VESSEL DATA SHEET

CAMP CODE/NUMBER: _____
COLLECTOR: _____
DATE: _____ TIME: _____

VESSEL # / NAME: _____
Type: _____
Length (ft): _____
Engine: _____
Other Equipment: _____
(ice, radio, GPS)

Contact: _____
crew: _____
Full or part-time commercial fishermen? _____
% time dedicated to elasmobranchs? _____
Residence: _____
Ownership: self other

FISHING LOCATION: Description: _____ Distance off-shore: _____ Depth: _____

GEAR: Gillnet Longline Hand Line Mono Twine Hooks Bottom Water Column Surface

Other info (SM, hookah, hook size, #,type) _____
Soak Time: _____ Trip Duration: _____

TARGET SPECIES: _____

Catch Composition	#	Size Range	Catch Composition	#	Size Range

#	Species	Sex	PCL	STL	DD	DW	BL	Wt (kg)	Maturity N J A P E U	L or D	Other Info (samples (taken, misc. info)

Boat characteristics

Fishing method and location

Catch composition

Individual shark/ray data

Excel → **Access**

Project Results

- Fishing camps ranged from remote/primitive camps to large towns/cities and from transient to year-round operation.
- Gillnets were the predominant gear type but longlines and handlines also were used.
- 147 camps with a minimum of 4,000 active pangas (and as many as 5,500) were found, most of which target sharks and rays at some level.
- 455 sampling days resulted in direct observation of 165,937 sharks and rays in the catch, of which 14,422 (9%) were measured by researchers.

30 Shark Species

3 Threshers *(Alopias pelagicus, A. superciliosus, A. vulpinus)*

Bignose *(Carcharhinus altimus)*

Silky *(C. falciformis)*

Galapagos *(C. galapagensis)*

Bull *(C. leucas)*

Blacktip *(C. limbatus)*

Oceanic whitetip *(C. longimanus)*

Dusky *(C. obscurus)*

Smalltail *(C. porosus)*

Swell *(Cephaloscyllium ventriosum)*

Prickly *(Echinorhinus cookei)*

Tiger *(Galeocerdo cuvier)*

2 Horns *(Heterodontus francisci, H. mexicanus)*

Sixgill *(Hexanchus griseus)*

Shortfin mako *(Isurus oxyrinchus)*

2 Smoothhounds *(Mustelus henlei, M.* spp.*)*

Whitenose *(Nasolamia velox)*

Lemon *(Negaprion brevirostris)*

Sevengill *(Notorhynchus cepedianus)*

Sandtiger *(Odontaspis ferox)*

Blue *(Prionace glauca)*

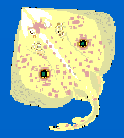
Pacific sharpnose *(Rhizoprionodon longurio)*

2 Hammerheads *(Sphyrna lewini, S. zygaena)*

Angel *(Squatina californica)*

Leopard *(Triakis semifasciata)*

24 Ray and Skate Species



Spotted eagle *(Aetobatus narinari)*

3 Stingrays *(Dasyatis dipterura, D. longus, D. violacea)*

2 Butterflys *(Gymnura crebripunctata, G. marmorata)*

Manta *(Manta birostris)*

3 Devils *(Mobula japanica, M. munkiana, M. thurstoni)*

2 Bats *(Myliobatis californica, M. longirostris)*

Electric *(Narcine entemedor)*

4 Guitarfish *(Rhinobatos glaucostigma, R. leucorhynchus, R. productus; Zapteryx exasperata)*

Cownose *(Rhinoptera steindachneri)*

4 Round stingrays *(Urobatis halleri, U. maculatus; Urotrygon chilensis, U. rogersi)*

2 Skates *(Raja inornata, R. velezi)*

High biodiversity of elasmobranchs in the Gulf of California

Neonate/YOY *Sphyrna lewini*

Hexanchidae		Rhinobatidae	
Hexanchus griseus	*	*Rhinobatos glaucostigma*	**
Notorynchidae		*Rhinobatos leucorhynchus*	*
Notorynchus cepedianus	*	*Rhinobatos productus*	***
Echinorhinidae		*Zapteryx exasperata*	**
Echinorhinus cookei	*	Narcinidae	
Squatinidae		*Narcine entemedor*	**
Squatina californica	**	Rajidae	
Heterodontidae		*Raja inornata*	*
Heterodontus francisci	*	*Raja velezi*	**
Heterodontus mexicanus	**	Urolophidae	
Odontaspididae		*Urobatis halleri*	*
Odontaspis ferox	*	*Urobatis maculatus*	*
Alopiidae		*Urotrygon chilensis*	*
Alopias pelagicus	**	*Urotryogon rogersi*	*
Alopias superciliosus	*	Dasyatidae	
Alopias vulpinus	*	*Dasyatis dipterura*	***
Lamnidae		*Dasyatis longus*	**
Isurus oxyrinchus	*	*Dasyatis violacea*	*
Scyliorhinidae		Gymnuridae	
Cephaloscyllium ventriosum	*	*Gymnura crebripunctata*	**
Triakidae		*Gymnura marmorata*	***
Mustelus henlei	***	Myliobatidae	
Mustelus spp.	***	*Aetobatus narinari*	*
Triakis semifasciata	*	*Myliobatis californica*	***
Carcharhinidae		*Myliobatis longirostris*	**
Carcharhinus altimus	*	Rhinopteridae	
Carcharhinus falciformis	**	*Rhinoptera steindachneri*	***
Carcharhinus galapagensis	*	Mobulidae	
Carcharhinus leucas	*	*Manta birostris*	*
Carcharhinus limbatus	**	*Mobula japanica*	**
Carcharhinus longimanus	*	*Mobula munkiana*	**
Carcharhinus obscurus	*	*Mobula thurstoni*	*
Carcharhinus porosus	*		
Galeocerdo cuvier	*		
Nasolamia velox	**		
Negaprion brevirostris	*		
Prionace glauca	*		
Rhizoprionodon longurio	***		
Sphyrnidae			
Sphyrna lewini	***		
Sphyrna zygaena	***		

SPECIES WITH JUVENILES DOCUMENTED IN CATCH (42)

Hexanchidae		Rhinobatidae	
Hexanchus griseus	*	*Rhinobatos glaucostigma*	**
Notorynchidae		*Rhinobatos leucorhynchus*	*
Notorynchus cepedianus	*	*Rhinobatos productus*	***
Echinorhinidae		*Zapteryx exasperata*	**
Echinorhinus cookei	*	Narcinidae	
Squatinidae		*Narcine entemedor*	**
Squatina californica	**	Rajidae	
Heterodontidae		*Raja inornata*	*
Heterodontus francisci	*	*Raja velezi*	**
Heterodontus mexicanus	**	Urolophidae	
Odontaspididae		*Urobatis halleri*	*
Odontaspis ferox	*	*Urobatis maculatus*	*
Alopiidae		*Urotrygon chilensis*	*
Alopias pelagicus	**	*Urotryogon rogersi*	*
Alopias superciliosus	*	Dasyatidae	
Alopias vulpinus	*	*Dasyatis dipterura*	***
Lamnidae		*Dasyatis longus*	**
Isurus oxyrinchus	*	*Dasyatis violacea*	*
Scyliorhinidae		Gymnuridae	
Cephaloscyllium ventriosum	*	*Gymnura crebripunctata*	**
Triakidae		*Gymnura marmorata*	***
Mustelus henlei	***	Myliobatidae	
Mustelus spp.	***	*Aetobatus narinari*	*
Triakis semifasciata	*	*Myliobatis californica*	***
Carcharhinidae		*Myliobatis longirostris*	**
Carcharhinus altimus	*	Rhinopteridae	
Carcharhinus falciformis	**	*Rhinoptera steindachneri*	***
Carcharhinus galapagensis	*	Mobulidae	
Carcharhinus leucas	*	*Manta birostris*	*
Carcharhinus limbatus	**	*Mobula japanica*	**
Carcharhinus longimanus	*	*Mobula munkiana*	**
Carcharhinus obscurus	*	*Mobula thurstoni*	*
Carcharhinus porosus	*		
Galeocerdo cuvier	*		
Nasolamia velox	**		
Negaprion brevirostris	*		
Prionace glauca	*		
Rhizoprionodon longurio	***		
Sphyrnidae			
Sphyrna lewini	***		
Sphyrna zygaena	***		

SPECIES WITH PREGNANT FEMALES DOCUMENTED IN CATCH (28)

Gulf of California Project Conclusions

1998-99

1. **Species diversity of the elasmobranch catch was high, with at least 54 species comprising 30 sharks, 22 rays and 2 skates.**

2. **The catch of sharks and rays shifted seasonally throughout the Gulf with latitudinal similarities, i.e. Baja California and Sonora were similar and Baja California Sur and Sinaloa were similar in catch patterns.**

3. **Juvenile sharks and rays were common in the catch, both as neonates and older juveniles.**

4. **Pregnant females were common in the catch, especially in the large sharks and rays in summer.**

5. **The peak of the large shark (*tiburones*) season was summer, but there was less targeting of large sharks in later years.**

Gulf of California Project Conclusions

1998-99

6. Rays (*rayas, mantarayas*) and small sharks (*cazones*) were an important component of the catch much of the year, especially spring/summer, with **rays becoming much more important in later years**.

7. **Utilization of the catch** by the fishermen was high, with no observable bycatch discards. Meat, fins and other products were harvested from all elasmobranch catch.

8. Based on historical information, **size and abundance of sharks and rays appeared to be declining** in the Gulf.

9. **Local stock depletions** may have occurred for some species.

Lessons from Gulf of California Project

Lessons from Gulf of California Project

- Standardize all methods and data forms
- Be prepared for large amounts of data
- Do not underestimate the logistics, e.g. traveling to ports
- Designating individuals (e.g. students) based at important ports to collect data throughout the fishing season is a good approach
- Be absolutely sure of species identifications – do not make “snap judgments”
- It is critical to know what proportion of the fishery is being sampled to be able to estimate total catch in the fishery

Lessons from Gulf of California Project

- Make friends with the fishermen and PESCA officers, gain their trust, do not discuss regulations
- Ensure that all partners can take on the project and have the capacity and resources to fulfill expectations
- Take measures to ensure that funds are used appropriately for the project
- Report project results promptly and comprehensively
- Transfer resulting information to appropriate agencies