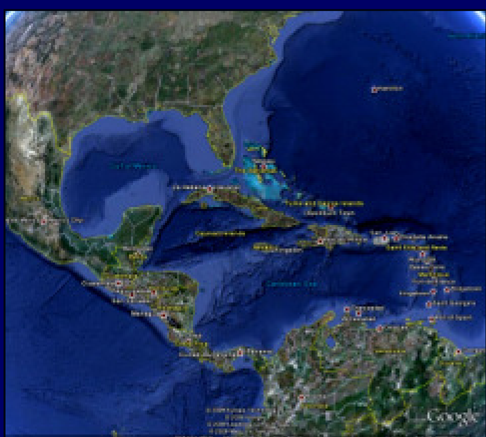
Gulf of Mexico's Shared Ecosystem and Shark Fisheries



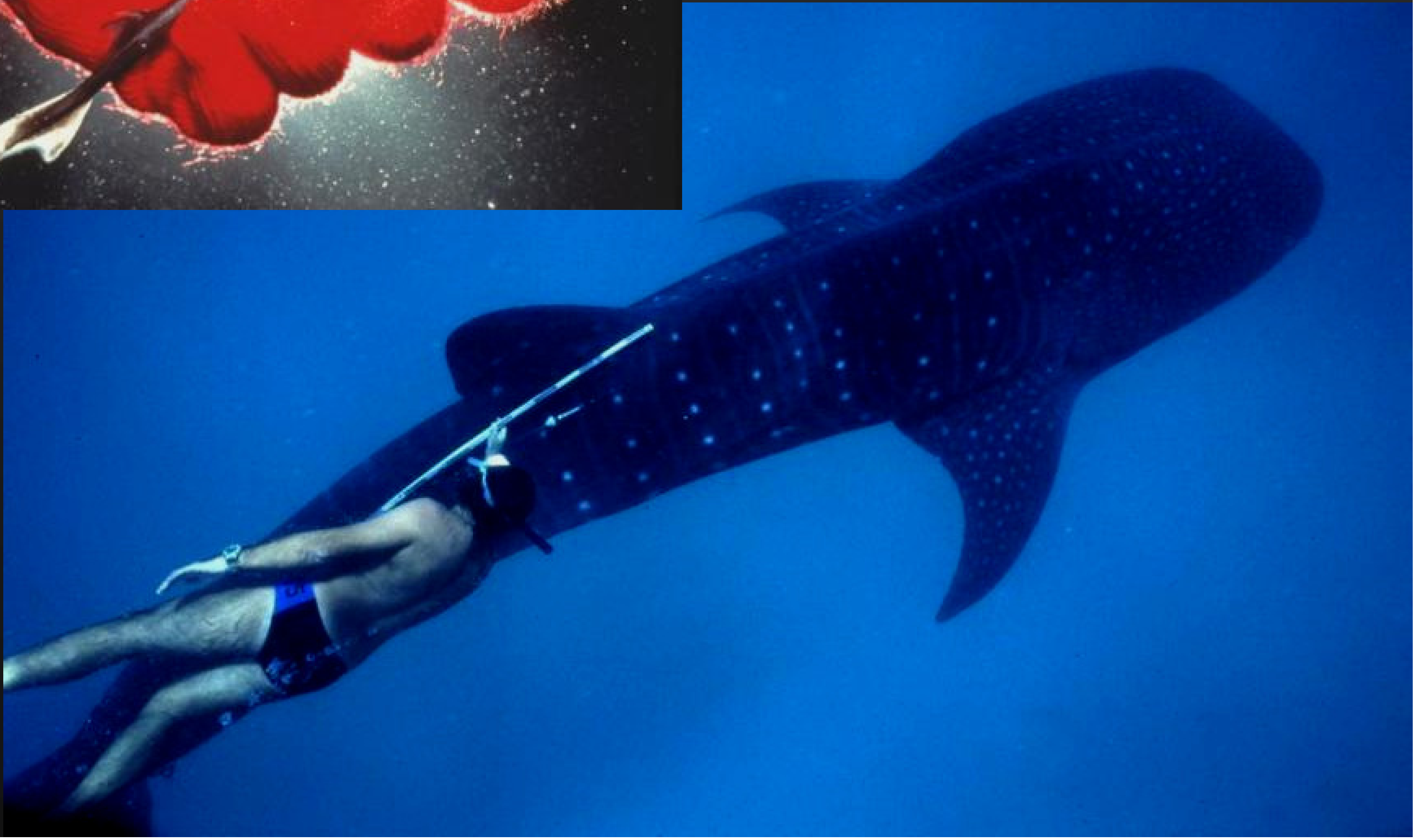
Robert E. Hueter, Ph.D.

Center for Shark Research
Mote Marine Laboratory
Sarasota, Florida USA

MOTE MARINE LABORATORY


Gulf of Mexico
Nassau
The Bahamas
La Habana (Havana)
Turks
Cuba
(Mexico City)
Cayman Islands

Shark Biodiversity in the Gulf of Mexico and Caribbean Sea



<u>ORDER HEXANCHIFORMES</u> (Cow and Frilled Sharks)

Chlamydoselachidae	*Chlamydoselachus anguineus*
Frilled Sharks	
Hexanchidae	*Heptranchias perlo*
Cow Sharks	*Hexanchus griseus*
	Hexanchus nakamurai (= *H. vitulus*)

<u>ORDER SQUALIFORMES</u> (Dogfish Sharks)

Squalidae	*Cirrhigaleus asper*
Dogfish Sharks	*Squalus acanthias*
	Squalus cubensis
	Squalus mitsukurii
Centrophoridae	*Centrophorus granulosus*
Gulper Sharks	*Centrophorus tesselatus*
	Deania profundorum
Etmopteridae	*Centroscyllium fabricii*
Lantern Sharks	*Etmopterus bigelowi*
	Etmopterus bullisi
	Etmopterus carteri
	Etmopterus gracilispinis
	Etmopterus hillianus
	Etmopterus perryi
	Etmopterus polli
	Etmopterus pusillus
	Etmopterus robinsi
	Etmopterus schultzi
	Etmopterus virens
Somniosidae	*Centroscymnus coelolepis*
Sleeper Sharks	*Centroscymnus owstoni*
	Somniosus rostratus
	Zameus squamulosus
Oxynotidae	*Oxynotus caribbaeus*
Roughsharks	
Dalatiidae	*Dalatias licha*
Kitefin sharks	*Isistius brasilensis*
	Isistius plutodus
	Squaliolus laticaudus

ORDER PRISTIOPHORIFORMES (Sawsharks)

Pristiophoridae Sawsharks	*Pristiophorus schroederi*

ORDER SQUATINIFORMES (Angelsharks)

Squatinidae Angelsharks	*Squatina dumeril*

ORDER ORECTOLOBIFORMES (Carpetsharks)

Ginglymostomidae Nurse Sharks	*Ginglymostoma cirratum*
Rhincodontidae Whale Shark	*Rhincodon typus*

ORDER LAMNIFORMES (Mackerel Sharks)

Odontaspididae Sandtiger Sharks	*Carcharias taurus* *Odontaspis ferox* *Odontaspis noronhai*
Pseudocarchariidae Crocodile Shark	*Pseudocarcharias kamoharai*
Mitsukurinidae Goblin Shark	*Mitsukurina owstoni*
Megachasmidae Megamouth Shark	*Megachasma pelagios*
Alopiidae Thresher Sharks	*Alopias superciliosus* *Alopias vulpinus*
Cetorhinidae Basking Shark	*Cetorhinus maximus*
Lamnidae Mackerel Sharks	*Carcharodon carcharias* *Isurus oxyrinchus* *Isurus paucus*

Dario Guitart Manday, 1966

ORDER CARCHARHINIFORMES (Ground Sharks)

Scyliorhinidae **Catsharks**	*Apristurus canutus* *Apristurus laurussoni* *Apristurus parvipinnis* *Apristurus riveri* *Galeus antillensis* *Galeus arae* *Galeus cadenati* *Galeus springeri* *Parmaturus campechiensis* *Schroederichthys maculatus* *Scyliorhinus boa* *Scyliorhinus haeckelii* *Scyliorhinus hesperius* *Scyliorhinus meadi* *Scyliorhinus retifer* *Scyliorhinus torrei*
Proscylliidae **Finback Catsharks**	*Eridacnis barbouri*
Triakidae **Houndsharks**	*Mustelus canis* *Mustelus higmani* *Mustelus minicanis* *Mustelus norrisi* *Mustelus sinusmexicanus*
Carcharhinidae **Requiem Sharks**	*Carcharhinus acronotus* *Carcharhinus altimus* *Carcharhinus brachyurus* *Carcharhinus brevipinna* *Carcharhinus falciformis* *Carcharhinus galapagensis* *Carcharhinus leucas* *Carcharhinus limbatus* *Carcharhinus longimanus* *Carcharhinus obscurus* *Carcharhinus perezi* *Carcharhinus plumbeus* *Carcharhinus porosus*

Carcharhinidae Requiem Sharks (CONTINUED)	*Carcharhinus signatus* *Galeocerdo cuvier* *Isogomphodon oxyrhynchus* *Negaprion brevirostris* *Prionace glauca* *Rhizoprionodon lalandei* *Rhizoprionodon porosus* *Rhizoprionodon terraenovae*
Sphyrnidae Hammerheads	*Sphyrna lewini* *Sphyrna media* *Sphyrna mokarran* *Sphyrna tiburo* *Sphyrna tudes* *Sphyrna zygaena*

97 species in 24 families from 7 orders
in Gulf of Mexico & Caribbean Sea

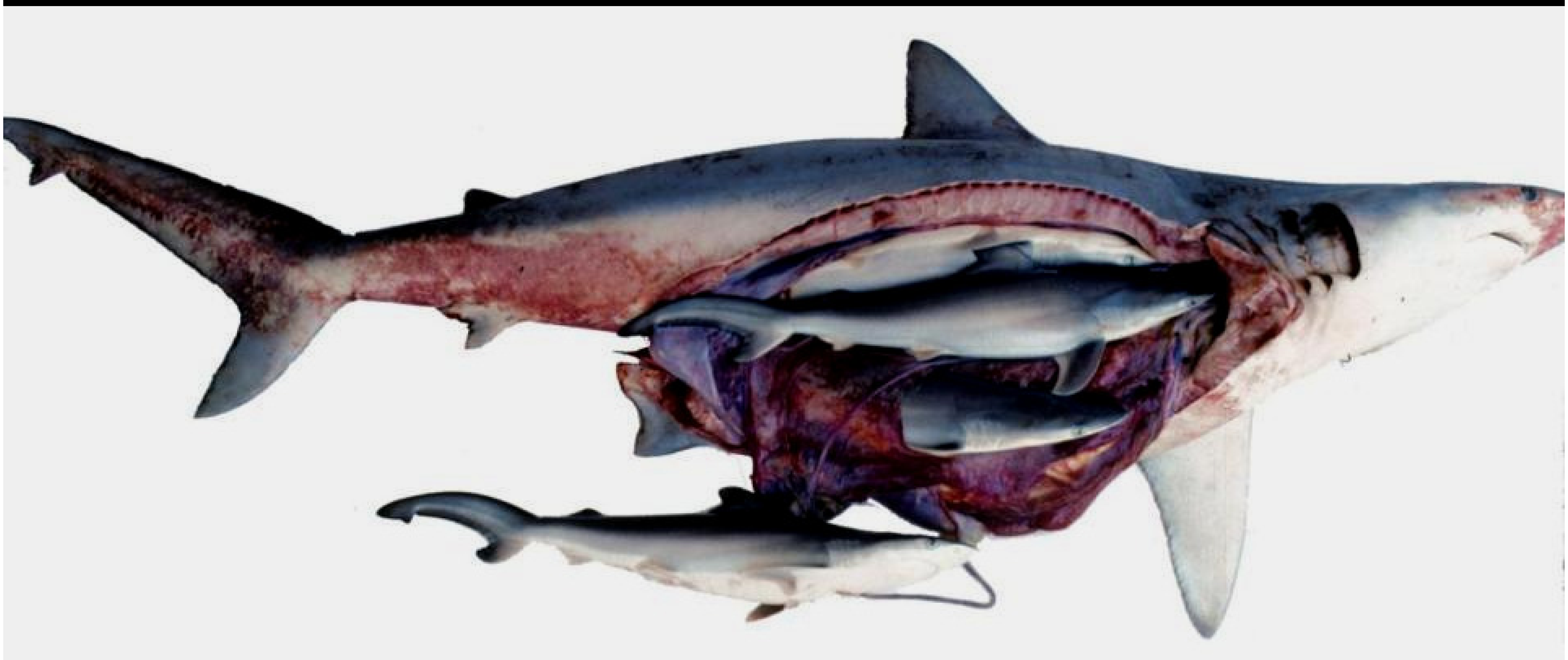
(Worldwide there are ~500 spp in 34 families in 8 orders)

Sharks' Use of Gulf & Caribbean Waters

(U.S., Mexico & Cuba)

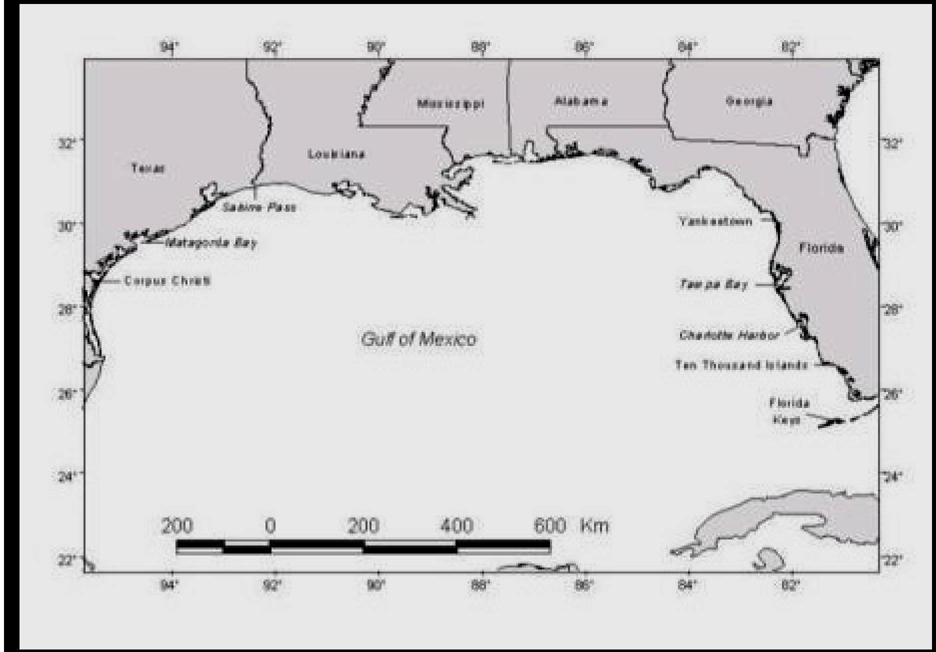
- Mating areas
- Nursery areas
- Feeding grounds

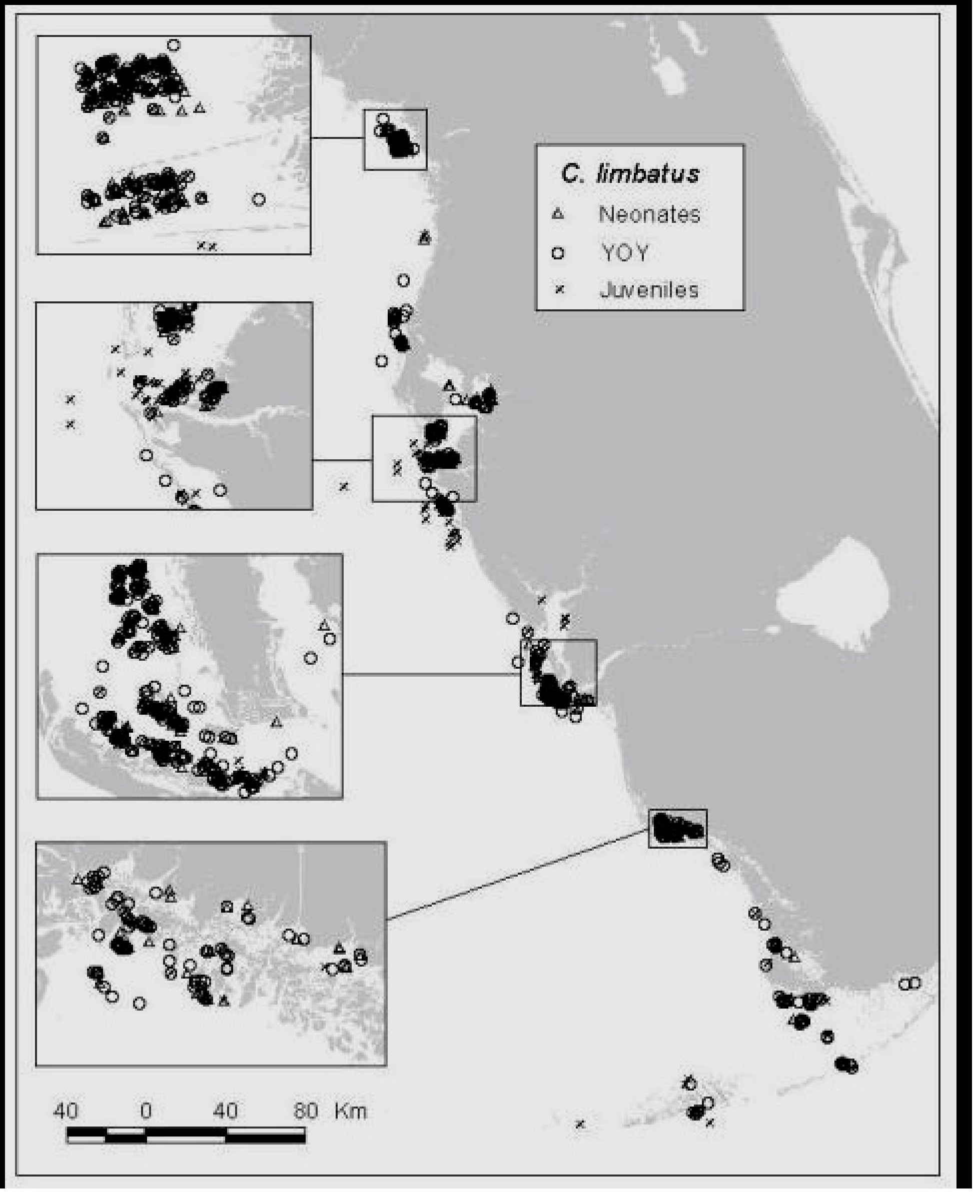
SHARK MATING AREAS



SHARK NURSERY AREAS

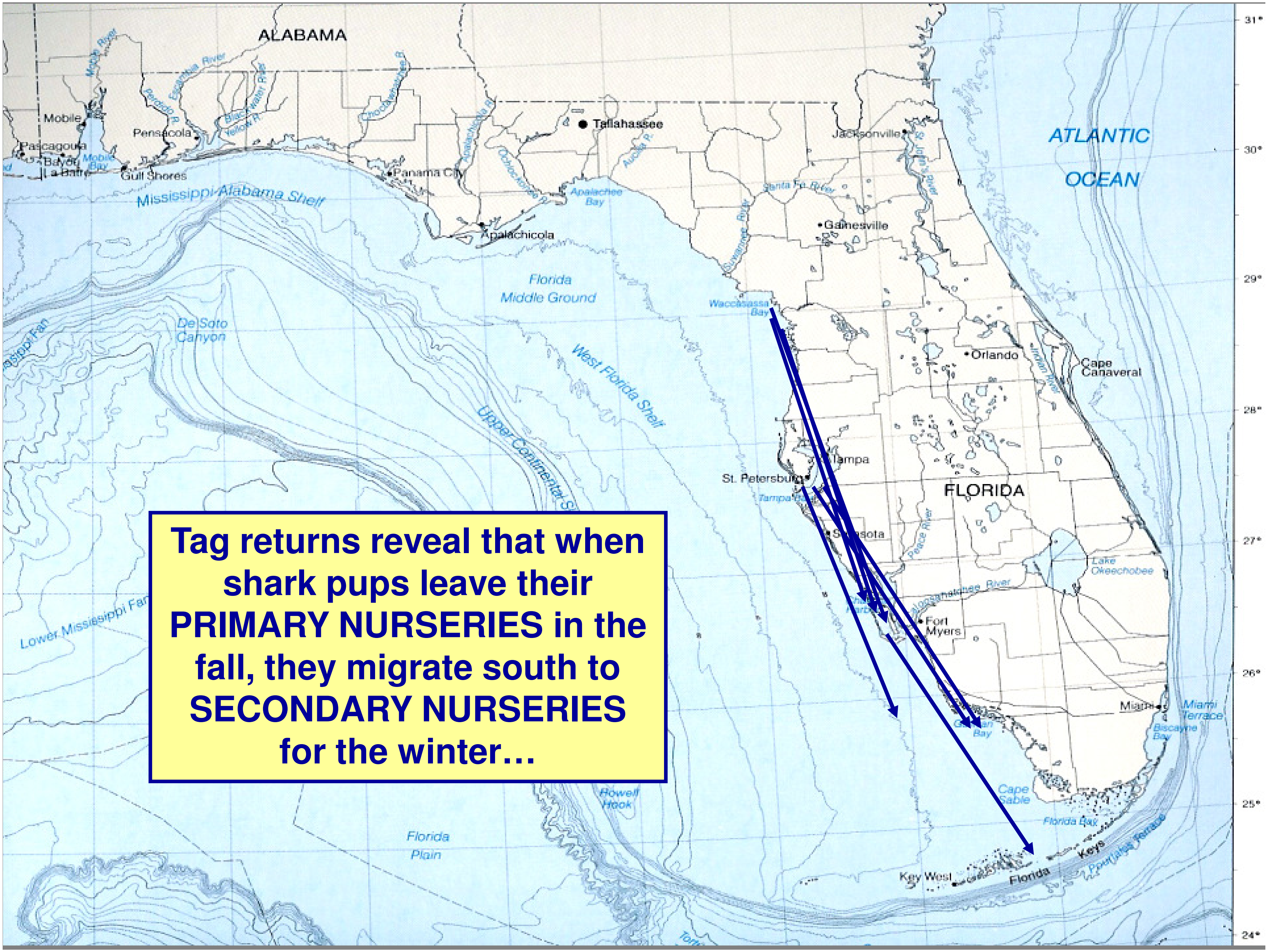
At least 16 coastal shark species have nurseries in U.S. GOM coastal waters



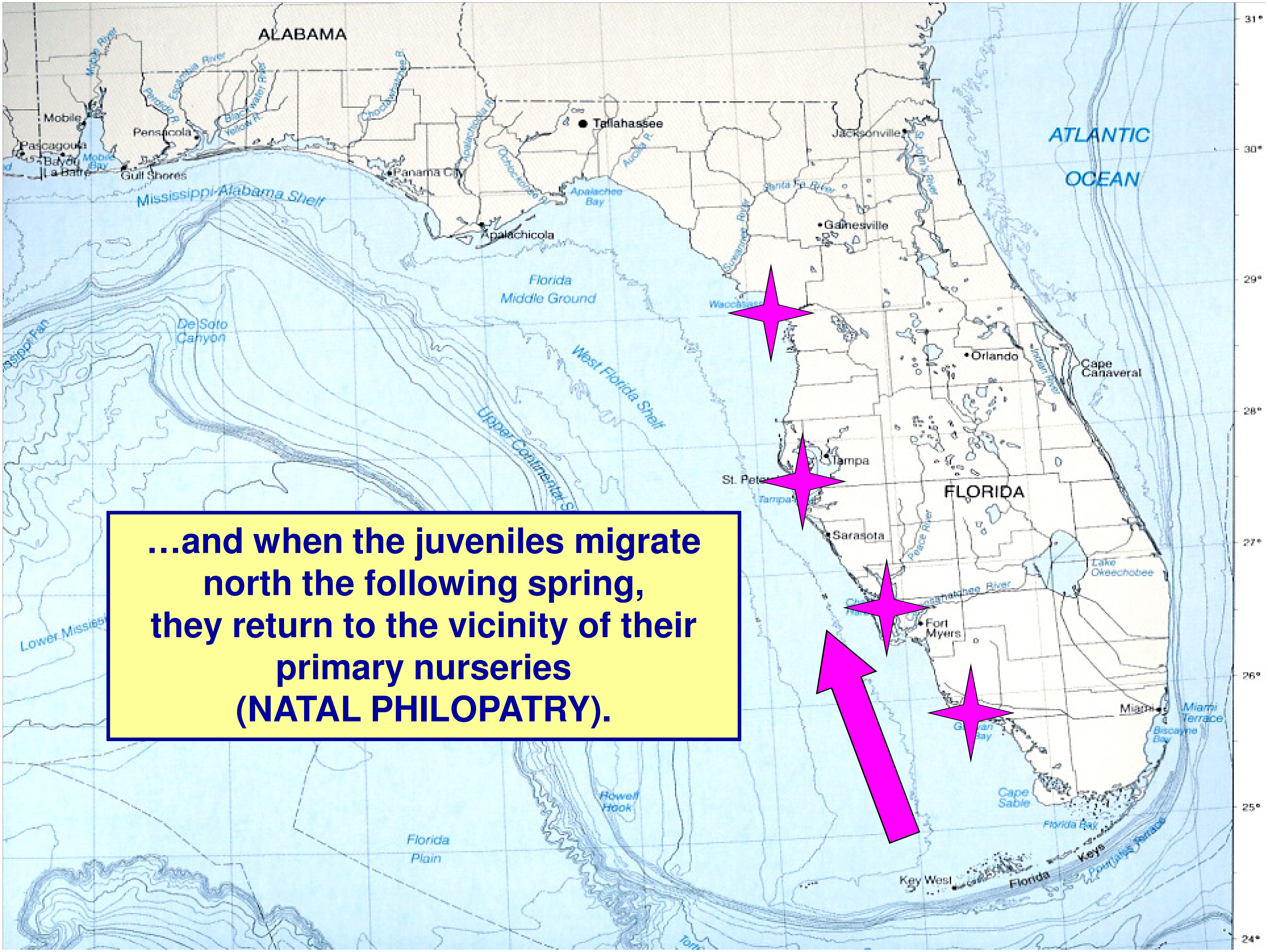


Hueter and Tyminski (2007) Species-specific distribution and habitat characteristics of shark nurseries in Gulf of Mexico waters off peninsular Florida and Texas. *American Fisheries Society Symposium* 50:193-223.



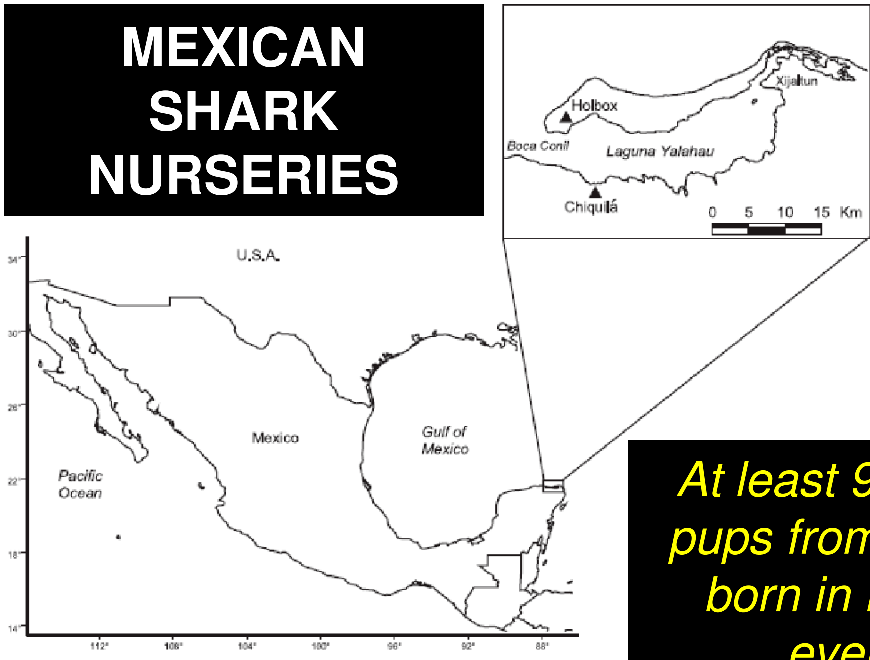



Tag returns reveal that when shark pups leave their PRIMARY NURSERIES in the fall, they migrate south to SECONDARY NURSERIES for the winter…



…and when the juveniles migrate north the following spring, they return to the vicinity of their primary nurseries (NATAL PHILOPATRY).

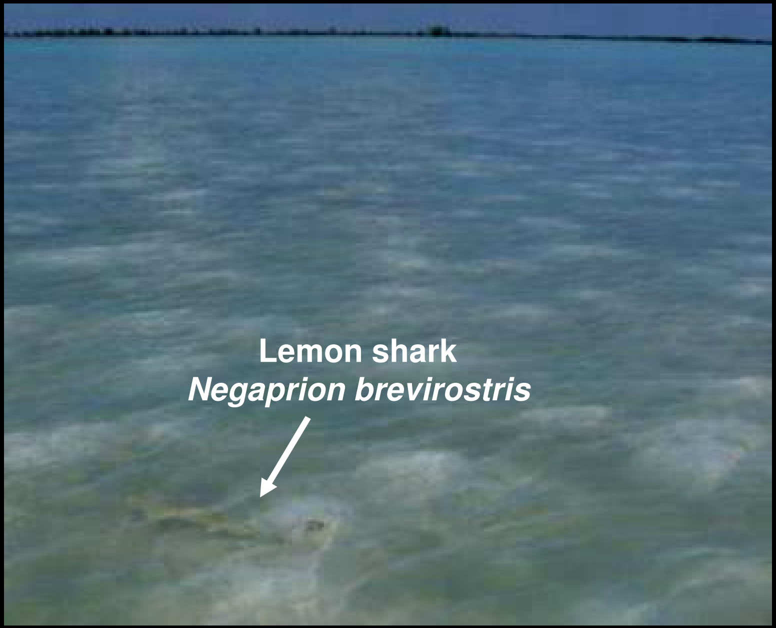
MEXICAN SHARK NURSERIES



At least 900 blacktip shark pups from 220 mothers are born in Laguna Yalahau every May/June

Hueter, Castillo-Géniz, Márquez-Farias and Tyminski (2007) The use of Laguna Yalahau, Quintana Roo, Mexico as a primary nursery for the blacktip shark. *American Fisheries Society Symposium* 50:345-364.

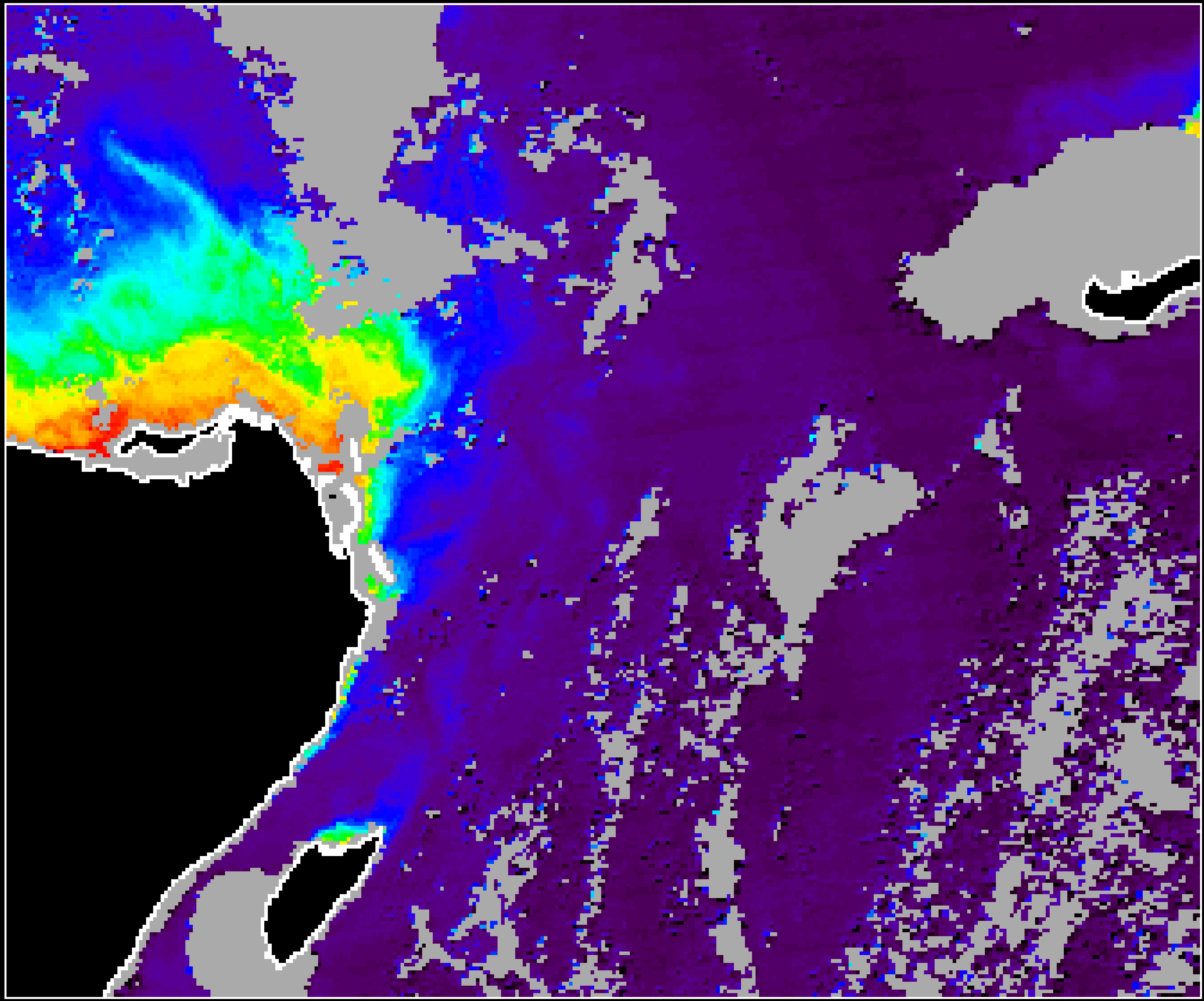
JUVENILE SHARKS IN CUBAN COASTAL WATERS



Coastal surveys with CIM, Universidad de la Habana


SHARK FEEDING AREAS

Chlorophyll Imagery – 16 August 2004



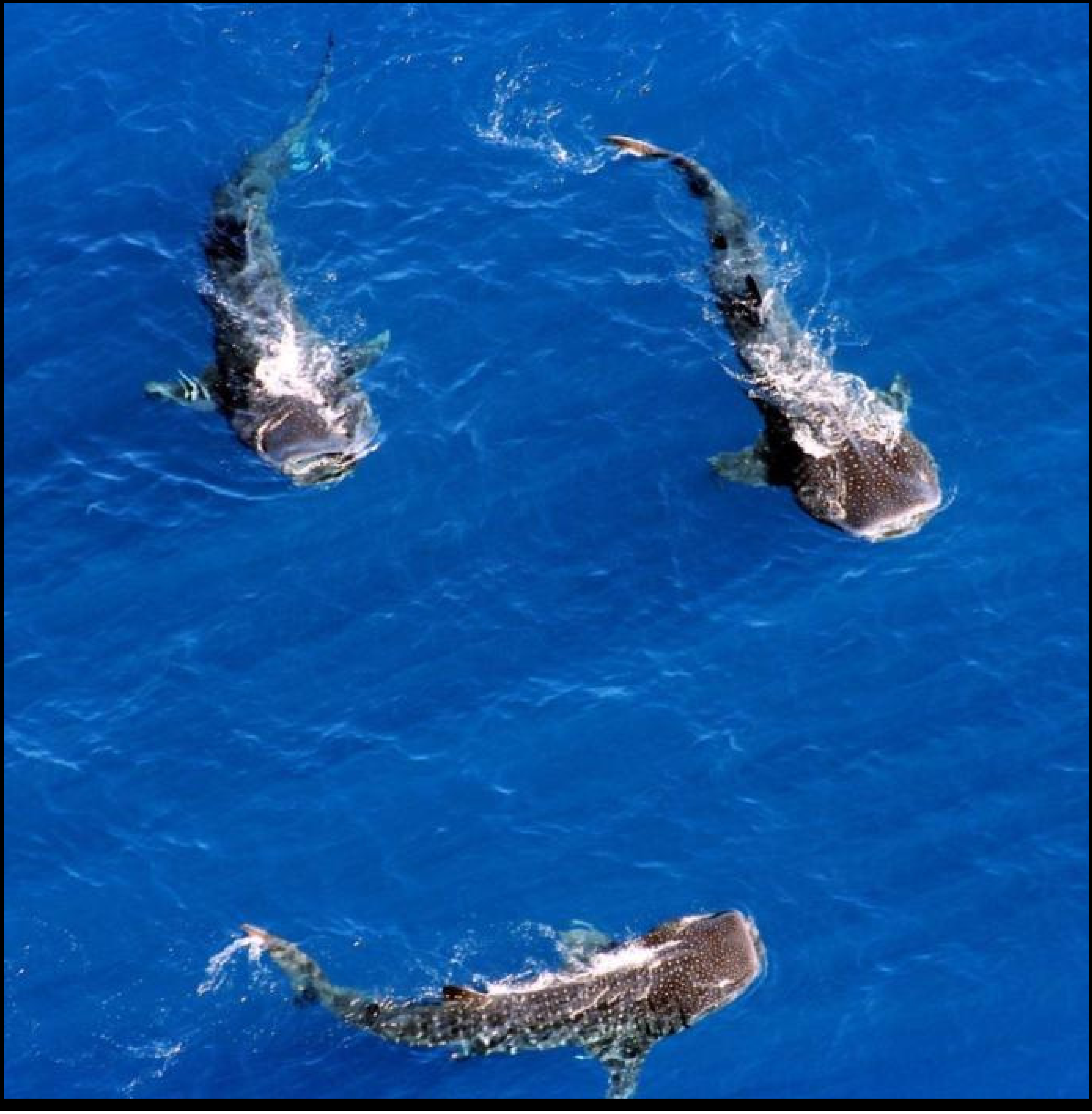
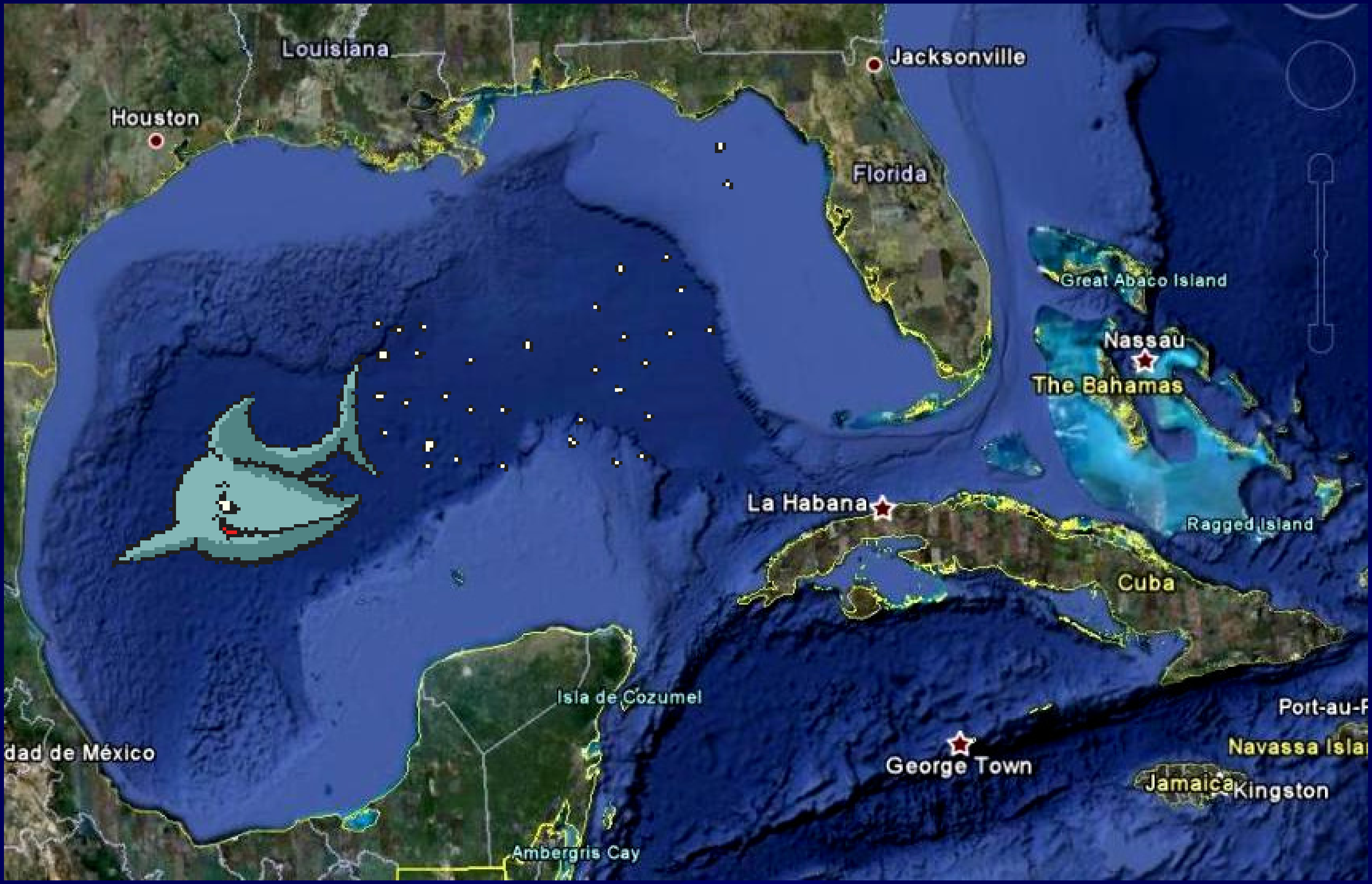
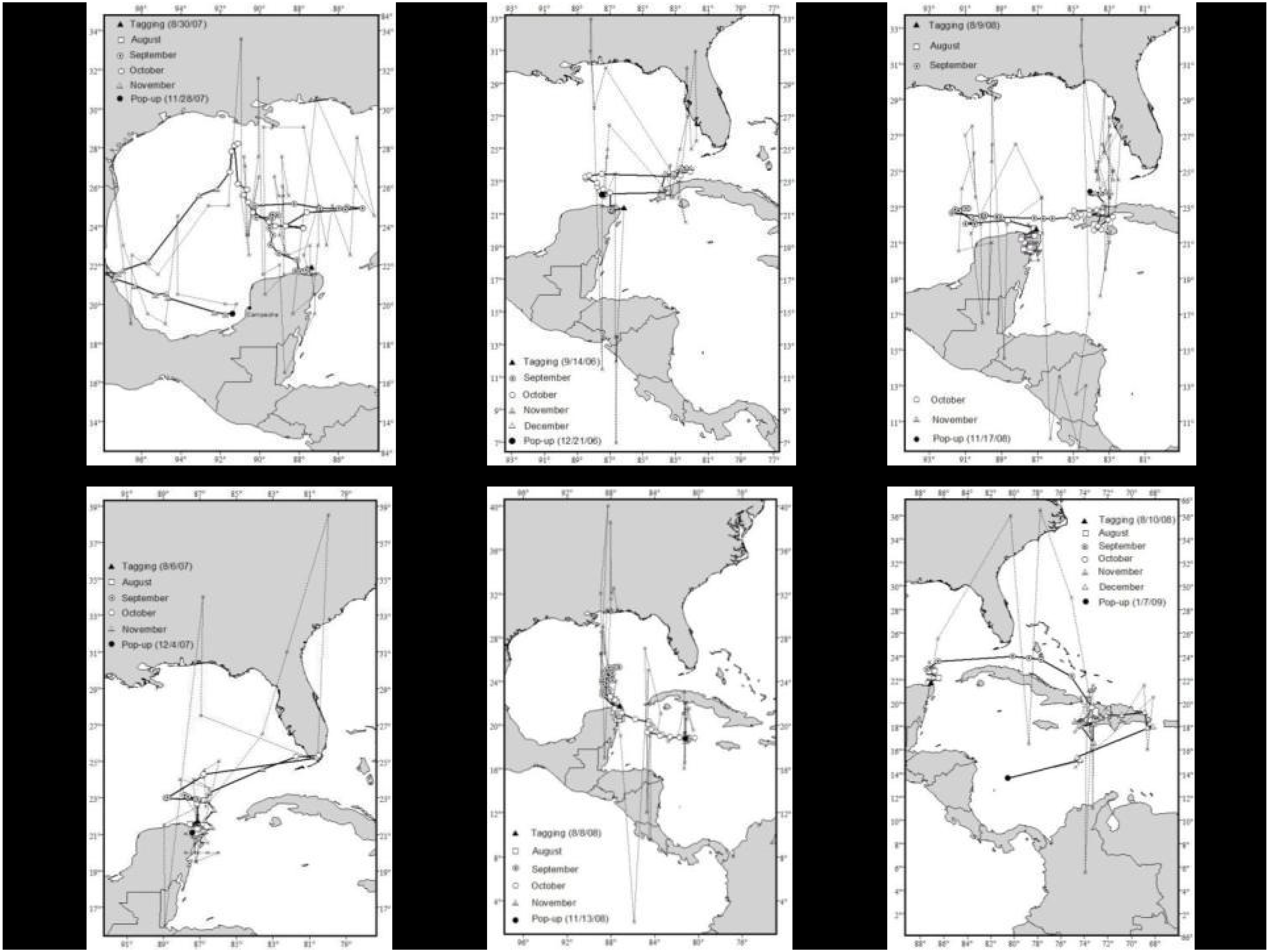


Photo by Oscar Reyes

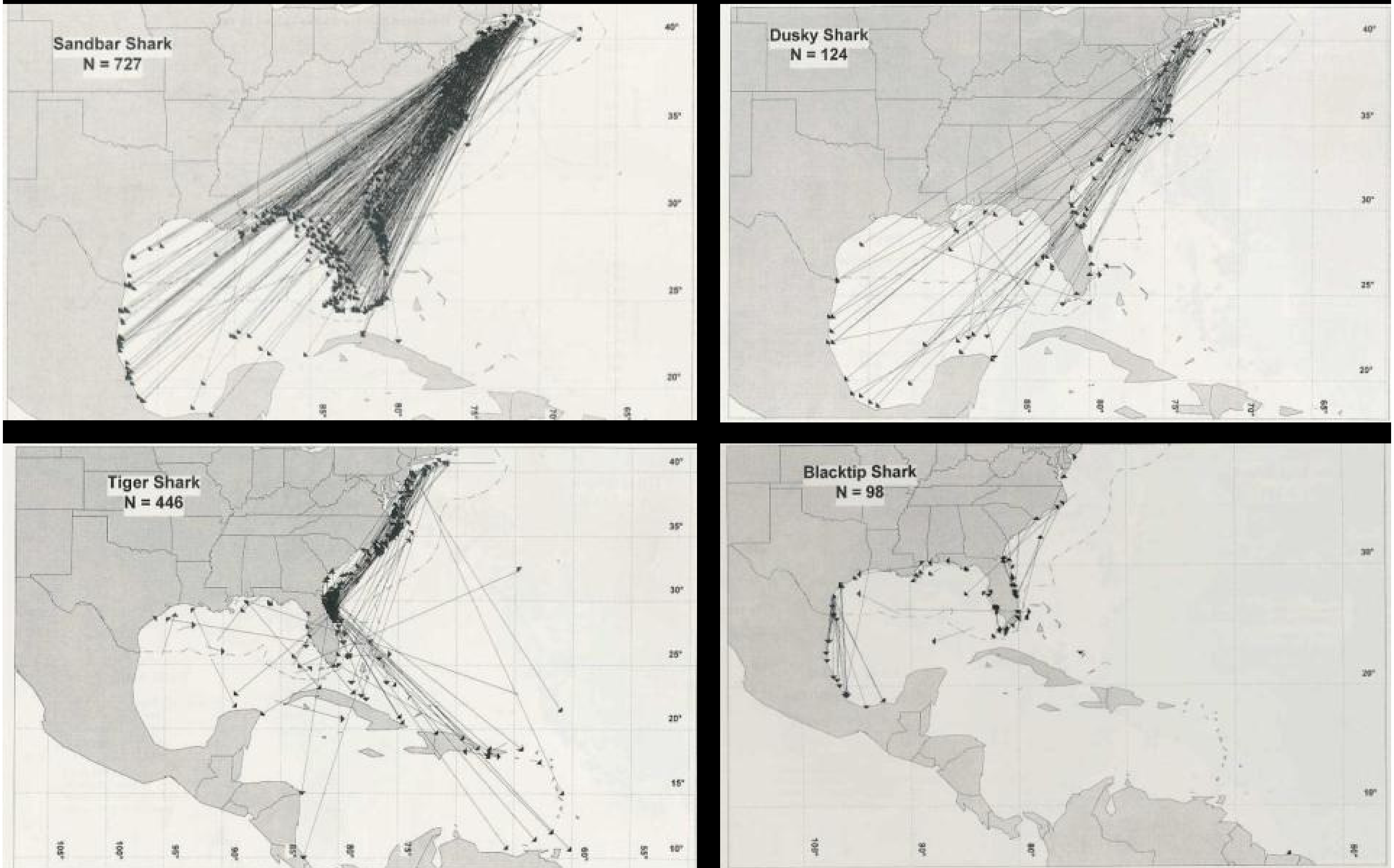
Connectivity



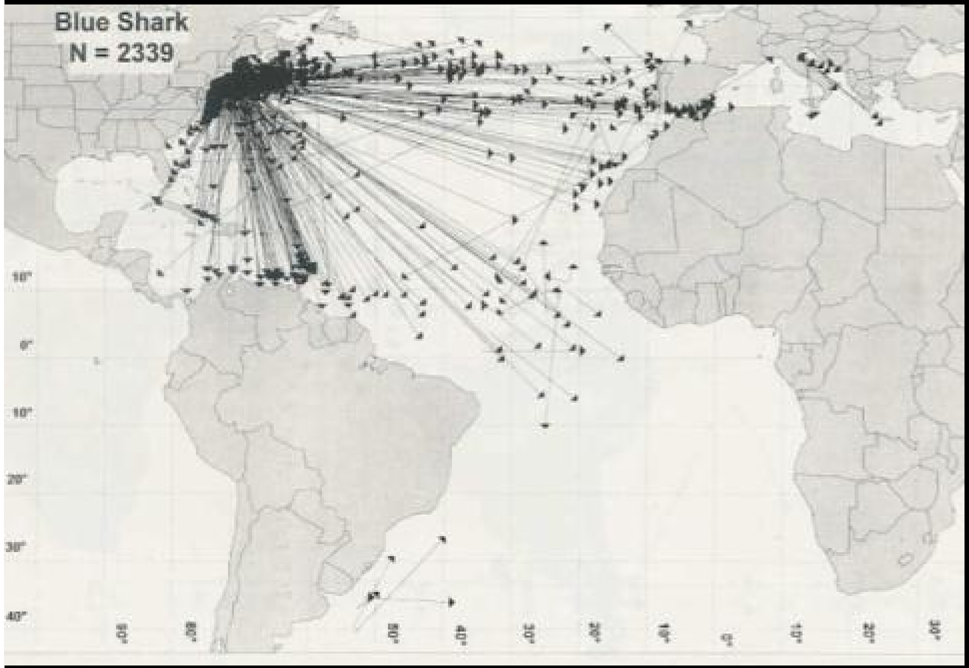


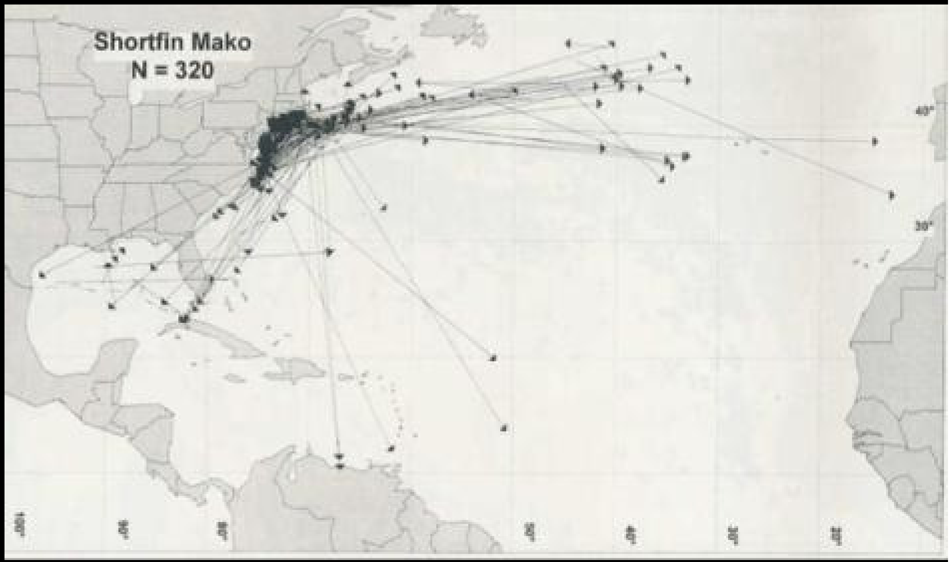
Tagging (8/30/07)
August
September
October
November
Pop-up (11/28/07)
Campeche
Tagging (9/14/06)
September
October
November
December
Pop-up (12/21/06)
Tagging (8/9/08)
August
September
October
November
Pop-up (11/17/08)
Tagging (8/6/07)
August
September
October
November
Pop-up (12/4/07)
Tagging (8/8/08)
August
September
October
November
Pop-up (11/13/08)
Tagging (8/10/08)
August
September
October
November
December
Pop-up (1/7/09)

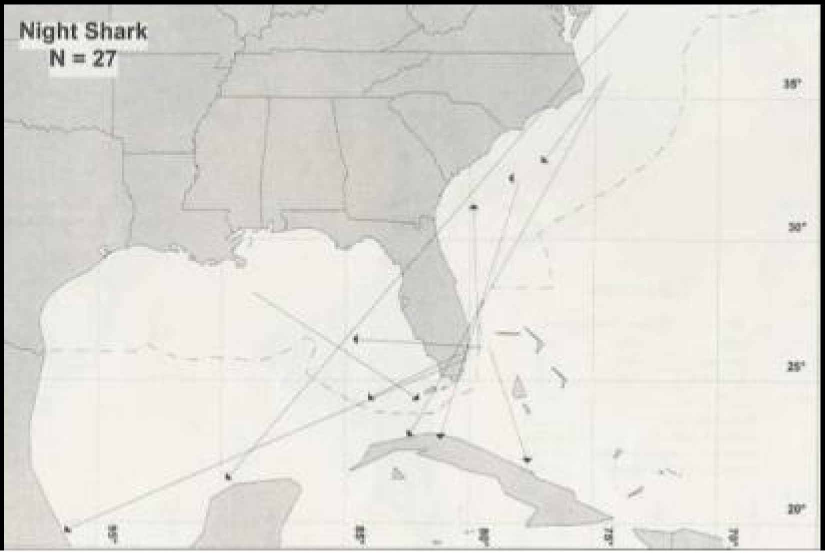
U.S. National Marine Fisheries Service (NMFS) conventional tag returns from large coastal sharks



U.S. National Marine Fisheries Service (NMFS) conventional tag returns from pelagic sharks



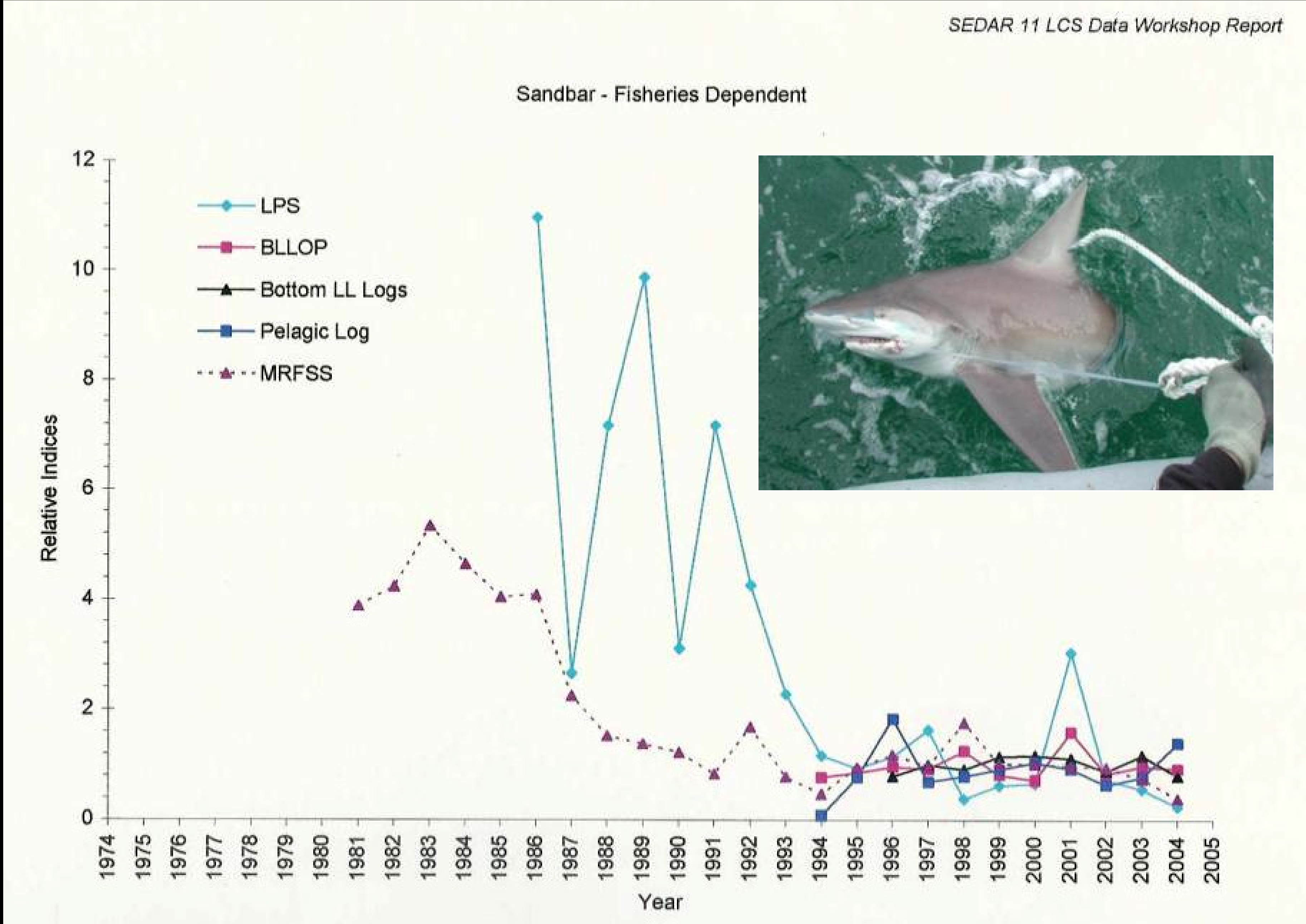




Kohler, Casey and Turner (1998) NMFS Cooperative Shark Tagging Program, 1962-93: An Atlas of Shark Tag and Recapture Data. *Marine Fisheries Review* 60(2)1-87.

Conservation

U.S. SHARK FISHERIES



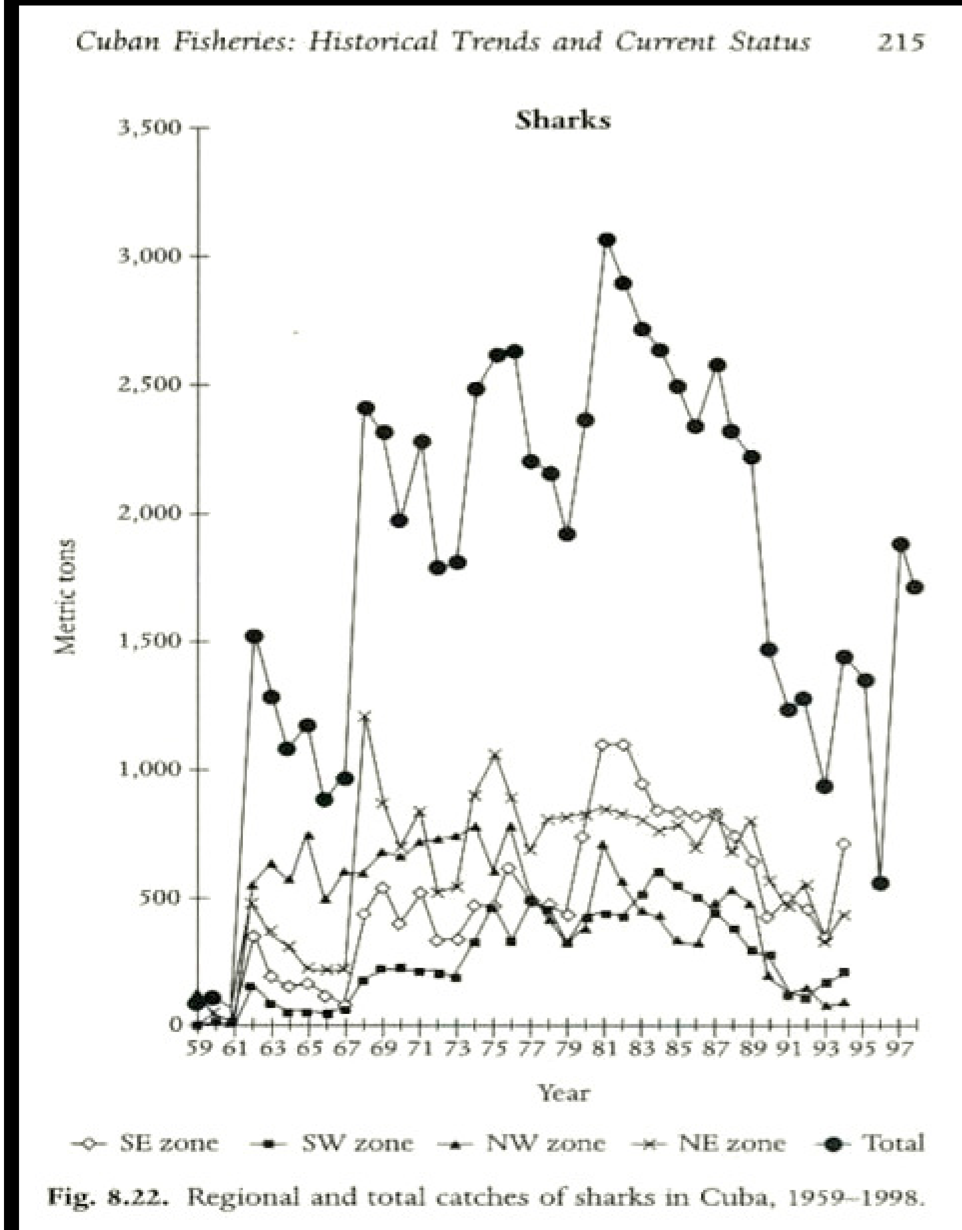


Fig. 8.22. Regional and total catches of sharks in Cuba, 1959–1998.

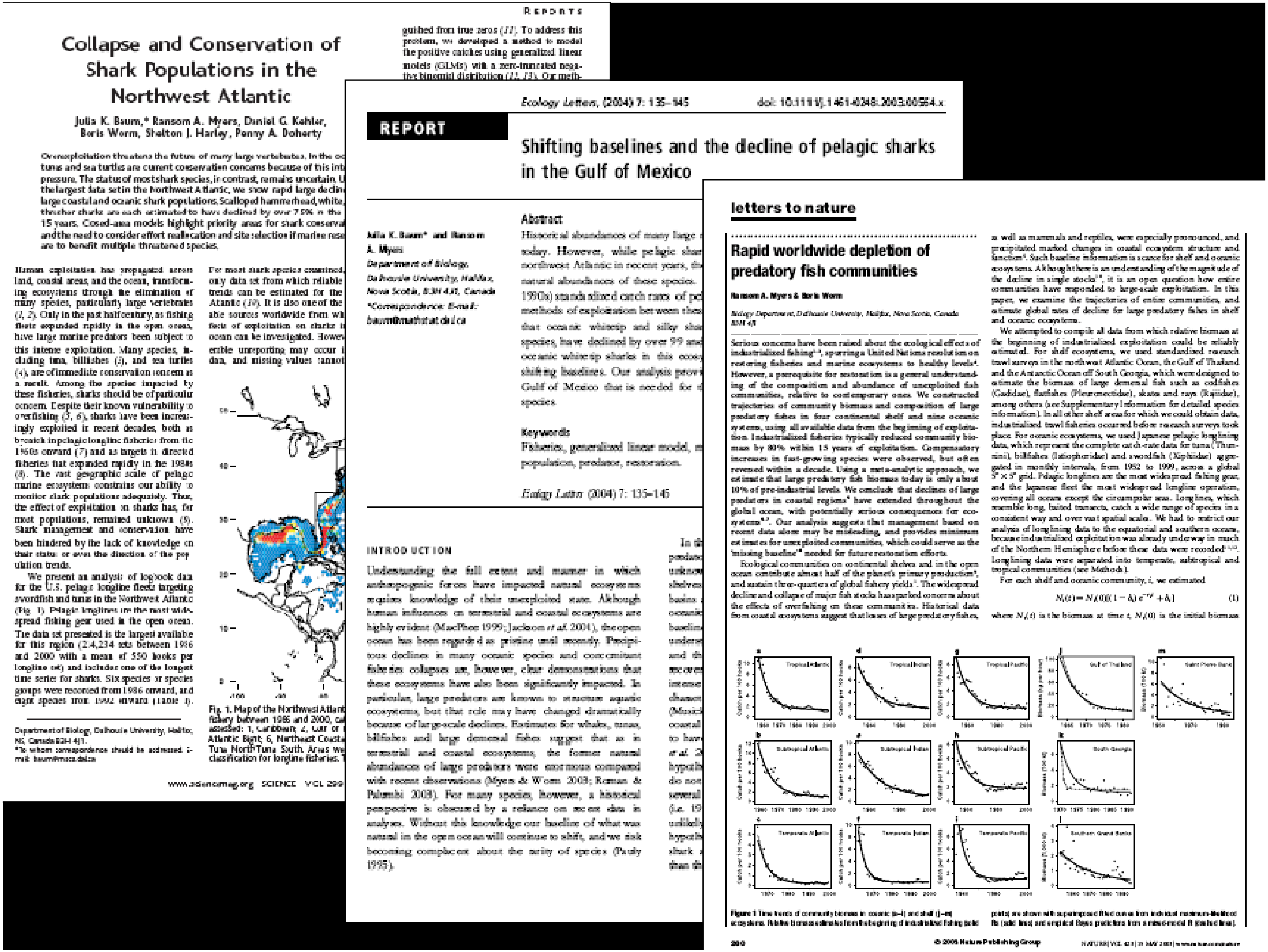
CUBAN SHARK FISHERIES

MEAN ANNUAL CATCH (in metric tons) and PROPORTION OF TOTAL FINFISH CATCH

	1981-1985		1986-1990		1991-1995	
	mt	%	mt	%	mt	%
Sharks	2,767.8	10.8	2,187.0	7.7	1,247.2	5.7
Rays	1,801.9	7.0	2,942.1	10.3	1,819.1	8.2

Claro, Lindeman and Parenti, eds. (2001)
Ecology of the Marine Fishes of Cuba.

Mexican shark fisheries consistently rank in the top ten of all shark-fishing nations



REPORTS

Collapse and Conservation of Shark Populations in the Northwest Atlantic

Julia K. Baum,* Ransom A. Myers, Daniel G. Kehler, Boris Worm, Shelton J. Harley, Penny A. Doherty

Fig. 1. Map of the Northwest Atlantic

www.sciencemag.org SCIENCE VOL 299

Ecology Letters, (2004) 7: 135–145 doi: 10.1111/j.1461-0248.2003.00564.x

REPORT

Shifting baselines and the decline of pelagic sharks in the Gulf of Mexico

Julia K. Baum* and Ransom A. Myers
Department of Biology, Dalhousie University, Halifax, Nova Scotia, B3H 4J1, Canada
*Correspondence: E-mail: baum@mathstat.dal.ca

Abstract

Keywords
Fisheries, generalized linear model, population, predator, restoration.

Ecology Letters (2004) 7: 135–145

INTRODUCTION

Understanding the full extent and manner in which anthropogenic forces have impacted natural ecosystems requires knowledge of their unexploited state. Although human influences on terrestrial and coastal ecosystems are highly evident (MacPhee 1999; Jackson *et al.* 2001), the open ocean has been regarded as pristine until recently. Precipitous declines in many oceanic species and concomitant fisheries collapses are, however, clear demonstrations that these ecosystems have also been significantly impacted. In particular, large predators are known to structure aquatic ecosystems, but that role may have changed dramatically because of large-scale declines. Estimates for whales, tunas, billfishes and large demersal fishes suggest that as in terrestrial and coastal ecosystems, the former natural abundances of large predators were enormous compared with recent observations (Myers & Worm 2003; Roman & Palumbi 2003). For many species, however, a historical perspective is obscured by a reliance on recent data in analyses. Without this knowledge our baseline of what was natural in the open ocean will continue to shift, and we risk becoming complacent about the rarity of species (Pauly 1995).

letters to nature

Rapid worldwide depletion of predatory fish communities

Ransom A. Myers & Boris Worm

Figure 1 Time trends of community biomass in oceanic (a–i) and shelf (j–m) ecosystems.

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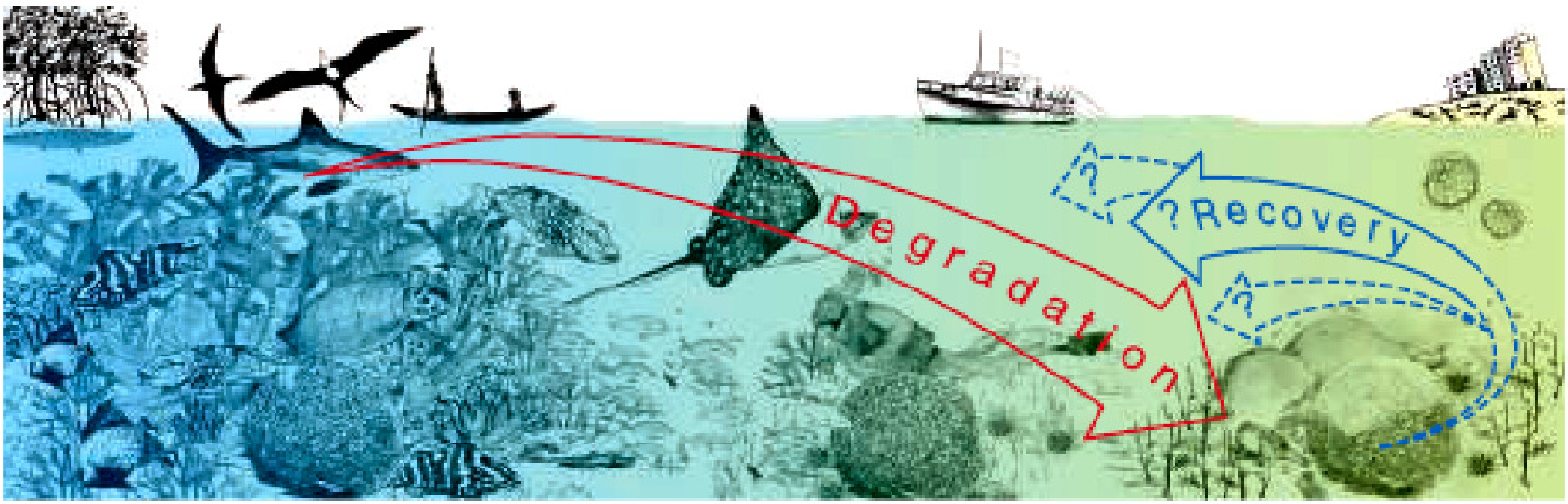
Why care about shark conservation?

- ***BIOLOGICAL RESEARCH & HUMAN HEALTH***
  - **Classic vertebrate anatomy tool**
  - **Studies of advanced senses & reproduction**
  - **Anti-cancer properties**
  - **Source of therapeutic materials**

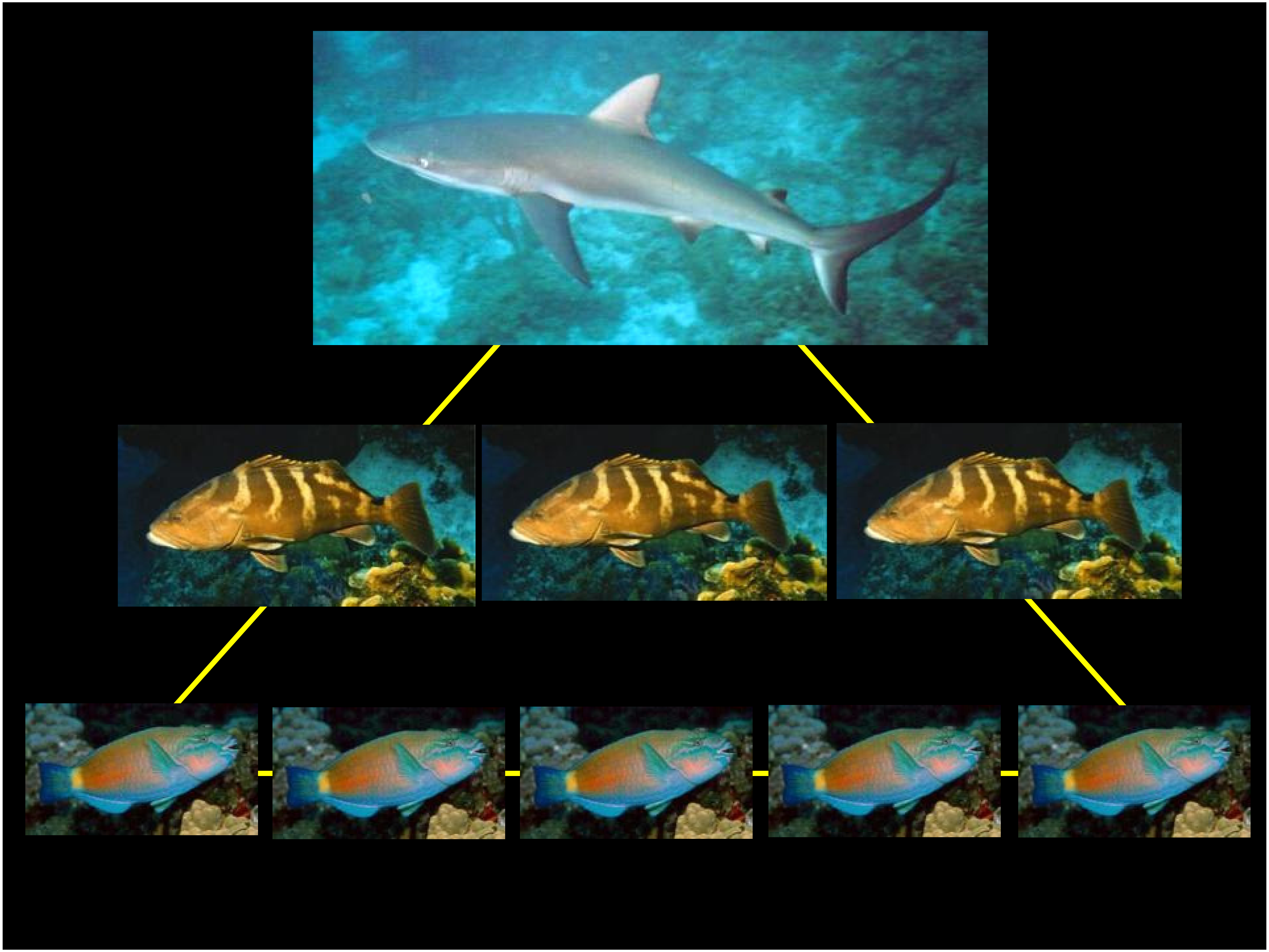
- ***COMMERCIAL & RECREATIONAL INDUSTRY***
  - **Commercial & recreational fisheries**
  - **Diving & ecotourism**
  - **Aquariums**

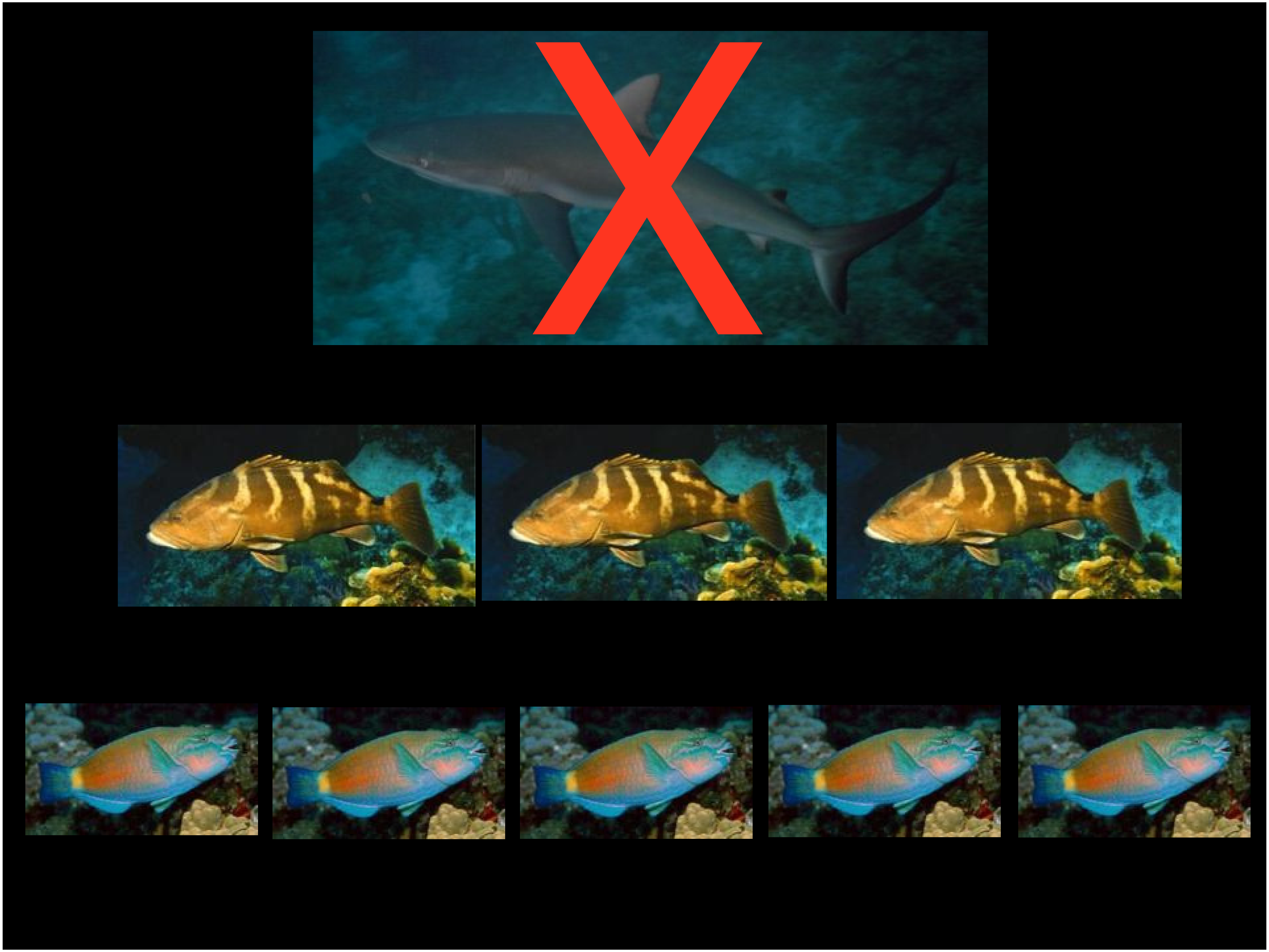
- ***ECOLOGICAL***
  - **Top predators → Ecological balance**
  - **Biological control of other species**



The slippery slope of coral reef decline through time.

Pandolfi et al. (2005) Are U.S. coral reefs on the slippery slope to slime? *Science* 307:1725-1726.





"It appears that ecosystems such as Caribbean coral reefs need sharks to ensure the stability of the entire system."

Enric Sala, Center for Marine Biodiversity and Conservation, Scripps Institution of Oceanography


Muchas gracias!
MOTE MARINE LABORATORY