Pacific-Atlantic Sea Turtle Assessment (PASTA) Working Group Meeting

Report for PFRP meeting November 14-16, 2005
Honolulu, Hawaii

Molly Lutcavage
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Abigail McCarthy

PASTA

- PIs: Molly Lutcavage, Selina Heppell
- Steering committee:
  - David Kirby, Rebecca Lewison
  - Yonat Swimmer, Melissa Snover (NOAA PIFSC)
  - Abby McCarthy (grad student)

PASTA participants

Molly Lutcavage	Biology	University of New Hampshire
Selina Heppell	Life history	Oregon State University
David Kirby	Modeling	Oceanic Fisheries Programme, Secretariat of the Pacific Community
Rebecca Lewison	Bycatch	San Diego State University
Melissa Snover	Modeler	Pacific Islands Fisheries Science Center
Tomo Eguchi	Genetics	SW Fisheries Science Center
Martin Hall	Fisheries	Inter-American Tropical Tuna Commission
Jeanette Wyneken	Physiology	Florida Atlantic University
Simon Hoyle	Fisheries	Inter-American Tropical Tuna Commission
Jeffrey Seminoff	Coastal fisheries	SW Fisheries Science Center
Francisco Chavez	Oceanography	Monterey Bay Aquarium Research Institute
Francois Royer	Modeling	University of New Hampshire
Vince Saba	Biology	Virginia Institute of Marine Science
Kate Mansfield	Coastal fisheries	Virginia Institute of Marine Science
Yoshi Matsuzawa	Biology	Sea Turtle Association of Japan
Yonat Swimmer	Coastal fisheries	Pacific Islands Fisheries Science Center
Jay Vaughan	Biology	Oregon State University
Abby McCarthy	Oceanography	Oregon State University

Purpose

- To assemble a unique group of modelers, oceanographers, fisheries scientists and sea turtle biologists to develop a framework for comparative analysis of loggerhead and leatherback sea turtle populations in the north Atlantic and North Pacific.

- New people, new ideas, new synthesis!

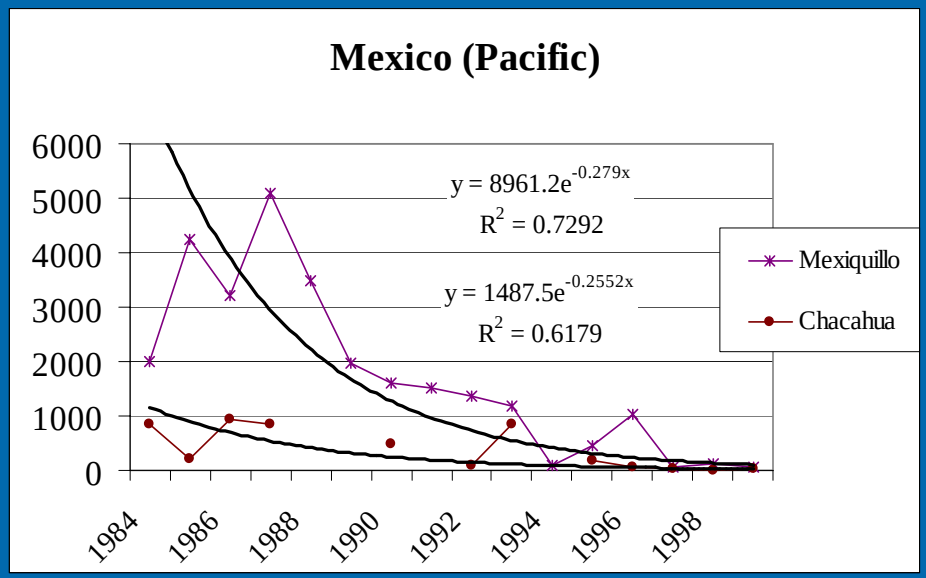
Goals of the project

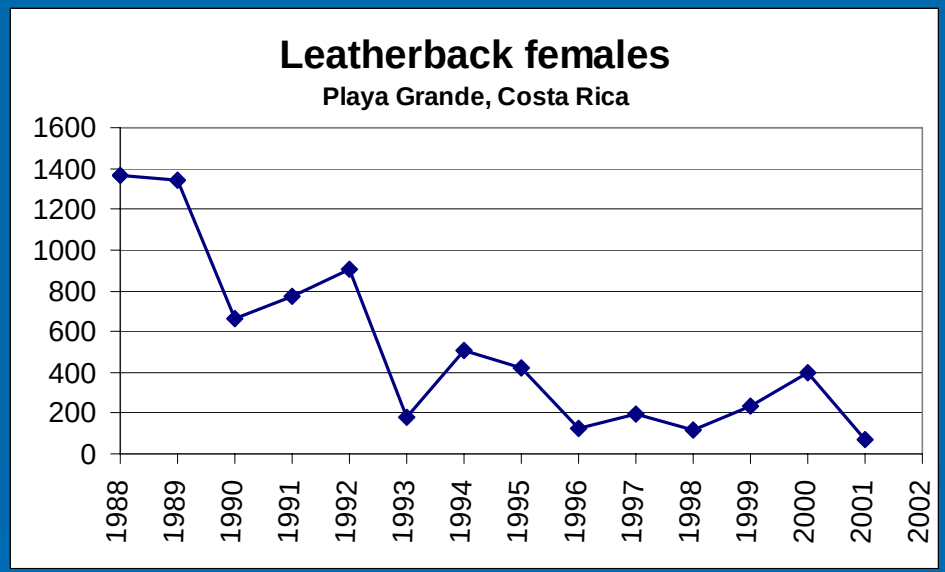
- Develop hypotheses to determine what drives sea turtle population dynamics and the relative role of human impacts on both ocean basin and species levels
- Design assessment tools to test those hypotheses
- Provide guidance for research, management and mitigation

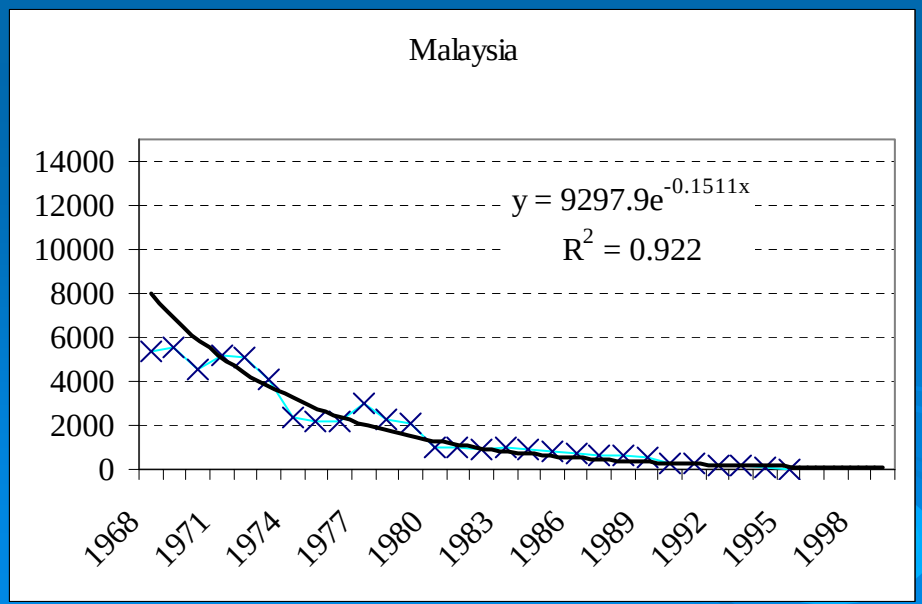
Why?

- Arguably, we should simply be promoting every possible means to reduce human impacts on declining populations of sea turtles, BUT
  - Elimination of impacts is not possible, nor likely necessary
  - Limited time, money for research and monitoring
  - Need to know “how much is enough”

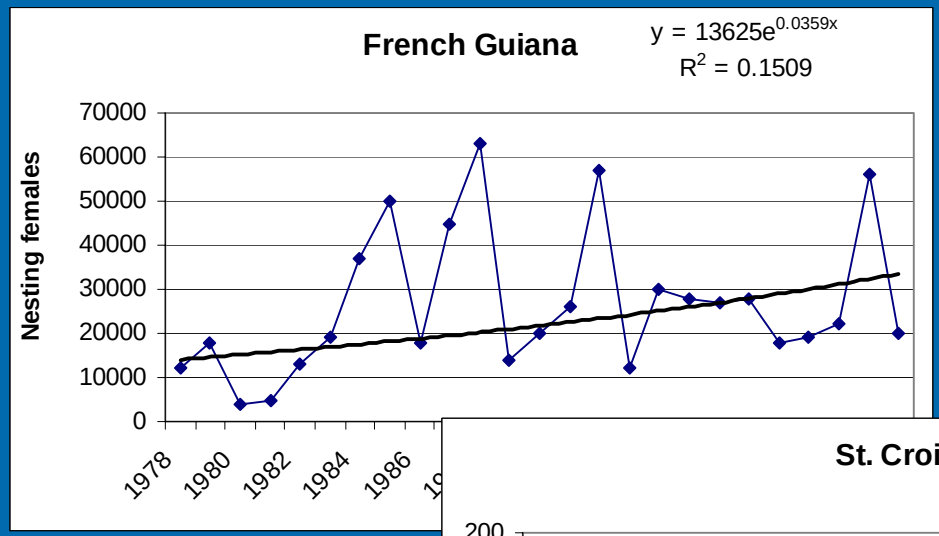
Long time series: leatherbacks, Pacific

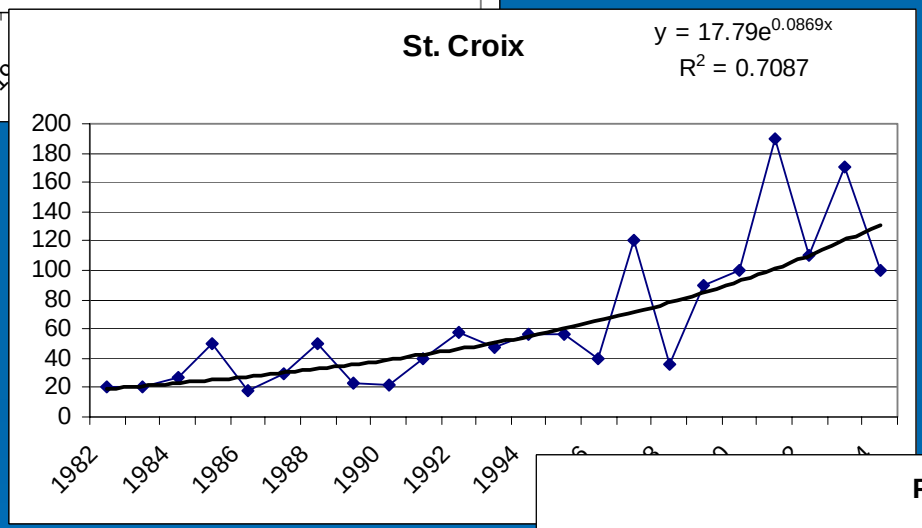


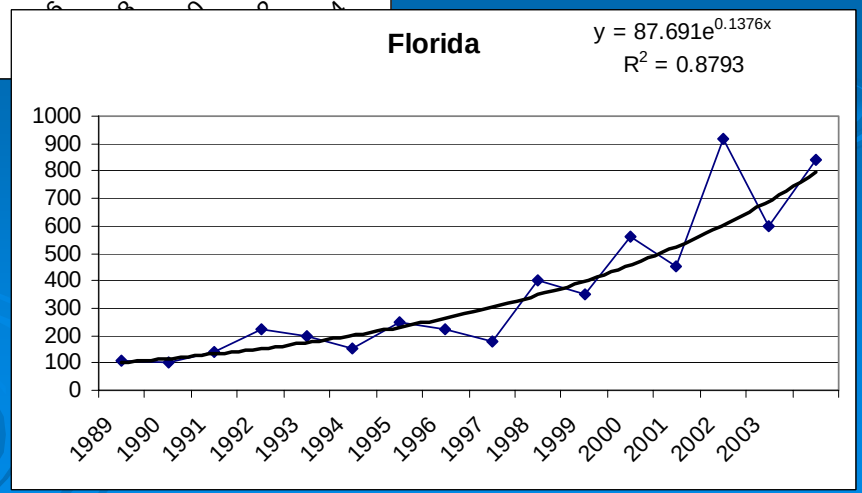




Leatherbacks in the Atlantic/ Caribbean







Objectives of this meeting

- Identify the likely impacts of human and natural stressors on sea turtle abundance, vital rates, distribution and size structure.
  - SYNTHESIS over broad spatial and temporal scales
- Compare those impacts and expected population dynamics for loggerhead and leatherback turtles in the Pacific and Atlantic
- Develop testable hypotheses for identifying the drivers of population change
  - Take advantage of differences in life history, management efforts, population trends and oceanographic conditions to eliminate some alternatives
- Identify assessment tools and data gaps required to test hypotheses

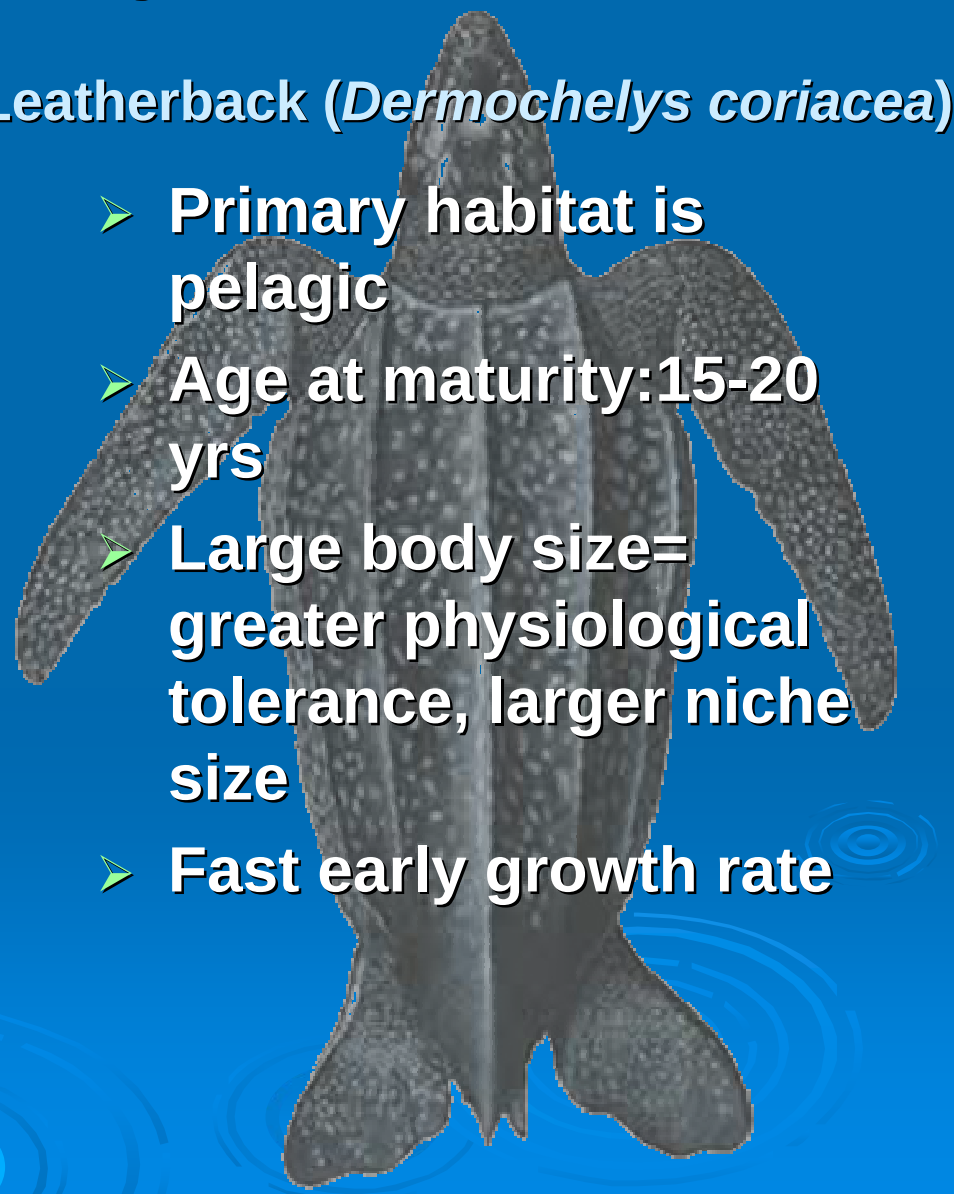
Species life-history differences

Loggerhead (*Caretta caretta*)

- **Primary habitat is life-stage specific**
- **Age at maturity: 25-30 years**
- **Smaller body size= susceptibility to cold shock, smaller niche size**
- **Slower early growth rate**

Leatherback (*Dermochelys coriacea*)

- **Primary habitat is pelagic**
- **Age at maturity:15-20 yrs**
- **Large body size= greater physiological tolerance, larger niche size**
- **Fast early growth rate**



http://tofino.ex.ac.uk/euroturtler.htm

STRESSORS

To nesting beaches:

- Egg/female harvest
- Coastal development, coastal human population growth
- Nest predation by native & introduced predators
- Catastrophic natural events, e.g. hurricanes

To pelagic habitat:

- Large-scale shifts in current/ wind patterns, temperature that may affect forage quality
- Marine debris aggregations, both direct and indirect
- Fishing, shifting gear types and location of effort

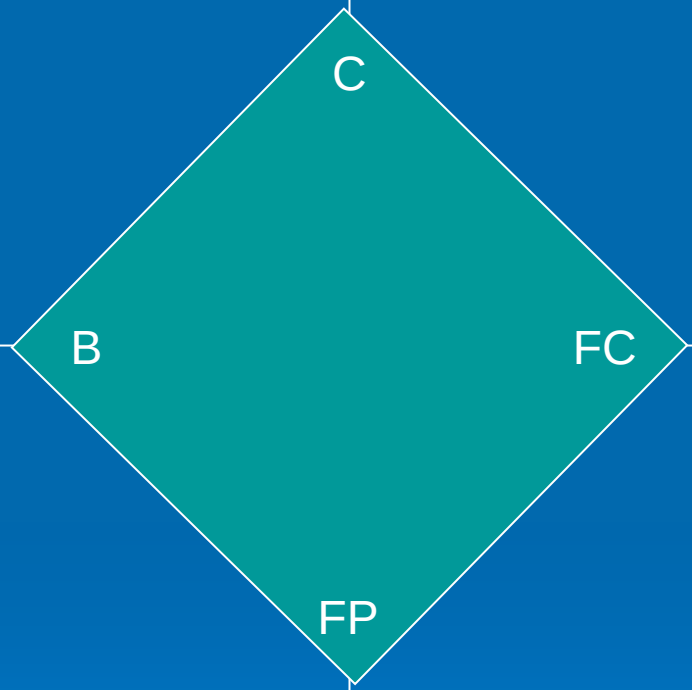
To coastal habitat:

- Fishing: gillnet, trawl, longline
- Entanglement
- Boat strikes
- Marine debris

Pacific Loggerhead

Atlantic Loggerhead

Climate change (Pelagic foraging areas)



Beach impacts (Egg & Adult harvest, development)

Fisheries - Coastal

Fisheries - Pelagic

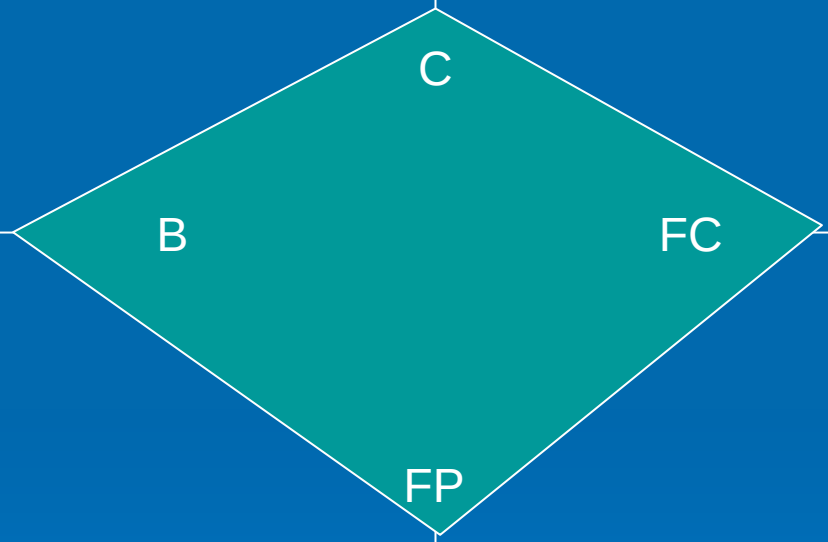
Pacific Leatherback

Atlantic Leatherback

Pacific Loggerhead

Climate change
(Pelagic foraging areas)

Atlantic Loggerhead



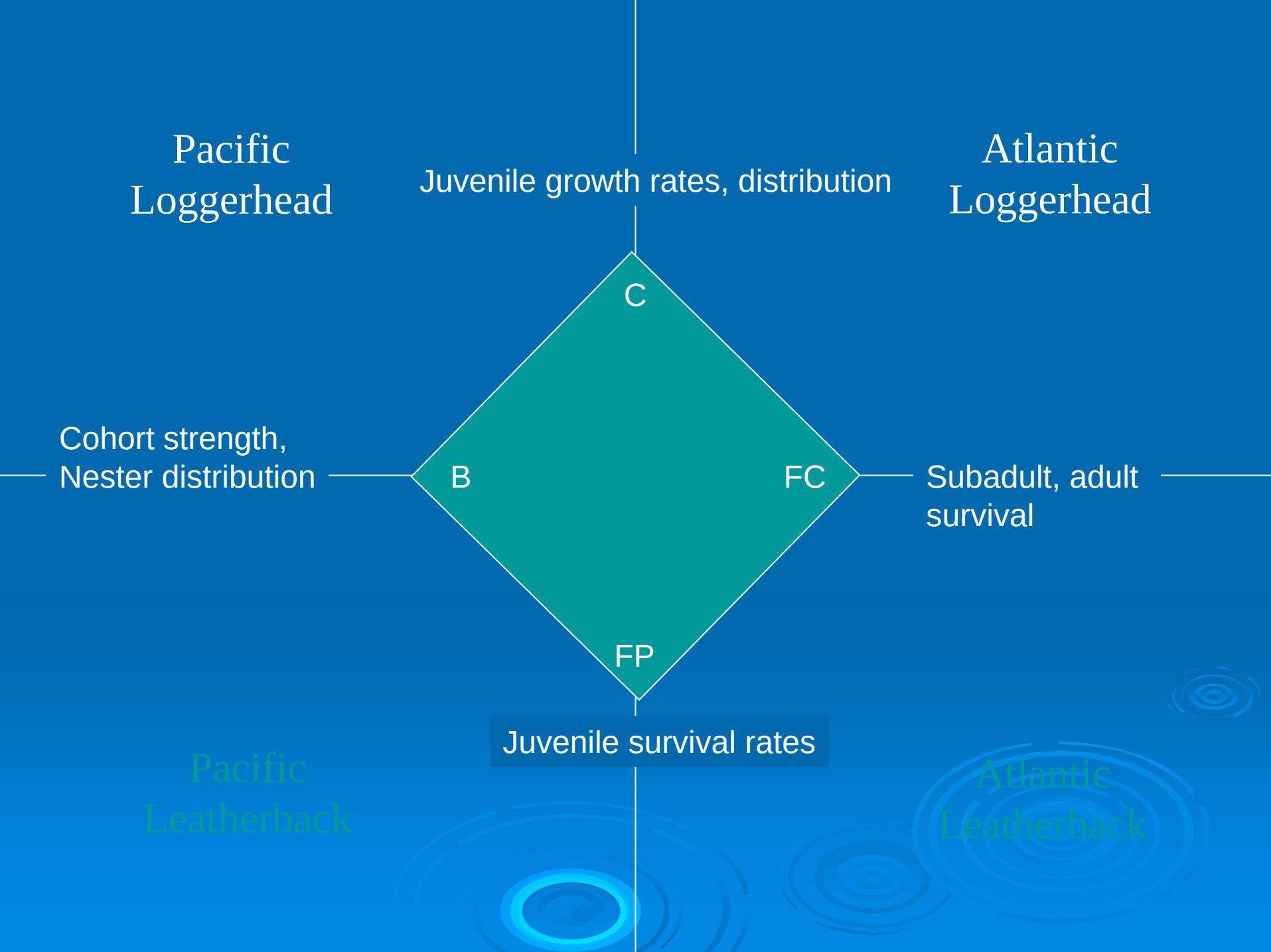
Beach impacts
(Egg & Adult harvest, development)

Fisheries - Coastal

Fisheries - Pelagic

Pacific Leatherback

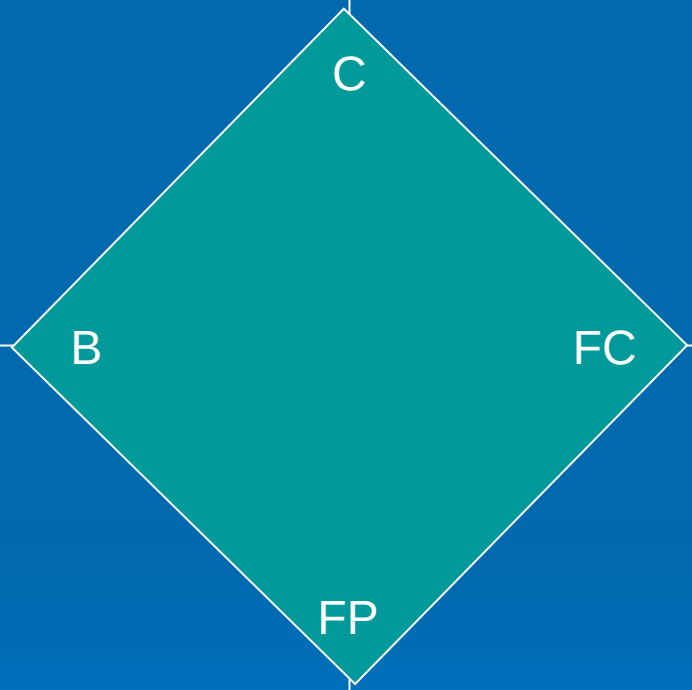
Atlantic Leatherback


Pacific Loggerhead
Juvenile growth rates, distribution
Atlantic Loggerhead
C
Cohort strength, Nester distribution
B
FC
Subadult, adult survival
FP
Juvenile survival rates
Pacific Leatherback
Atlantic Leatherback

Pacific Loggerhead

Atlantic Loggerhead

Juvenile growth rates, distribution
Remigration interval



Cohort strength,
Nester distribution,
Adult female survival

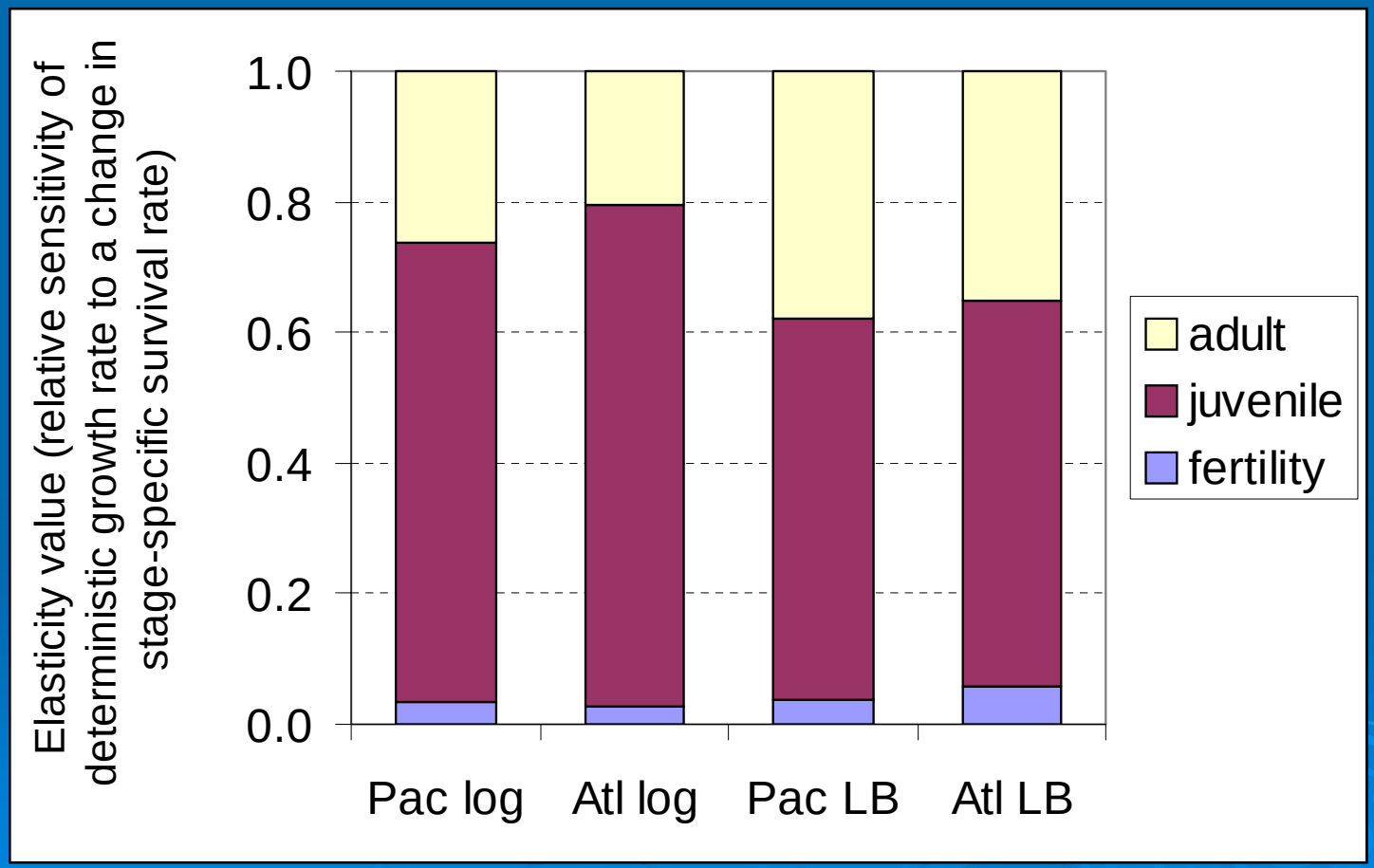
Adult female survival

Subadult, adult survival rates

Pacific Leatherback

Atlantic Leatherback

	Pac log	Atl log	Pac LB	Atl LB
age at maturity	20	30	15	10
female hatchlings per year	35	52.5	48	66
population trend	0.95	1	0.82	1.03
adult survival	0.85	0.9	0.75	0.9



Pacific Basin

- Higher density of pelagic hooks (4.4 hooks/ km^2), more hooks total (718 million) but lower CPUE of turtles
- Higher concentration of fishing near nesting beaches
- Less bycatch management/ monitoring
- Larger basin, longer migration lengths
- More variation in nesting beach productivity
- Lower adult female recapture rate
- More nesting beach development for both loggerheads and leatherbacks
- Greater climate change impacts, which may lead to->
  - Higher variability in forage availability
  - Longer re-migration interval for leatherbacks

Fisheries in Atlantic Basin

- Lower density of pelagic hooks than Pacific (3.4 hooks/ km2), fewer hooks (316 million hooks), but higher CPUE of turtles
- More bycatch management and monitoring than Pacific
- More nests for both species and higher number of eggs per nest than in Pacific
- Larger female body size for both species
- More variable migration patterns for leatherbacks
- More reproduction per season (more nests) for leatherbacks
- Better nesting beach data for both species

On-going work - Turtles

- Map nesting beach trends over time, both for long time scales and seasonal
- Map tracking data for both species in both basins, begin to address questions of foraging areas/ migration routes/ hot spots on a large scale. How have “hot spots” changed over long time-scales?
- Investigate age and sex structure of different stocks, build age-structured population models to address differences between Pacific and Atlantic
- IBMs for both species in both basins

Future work- Habitat

- Determine location and level of effort of coastal fisheries, especially subsistence fisheries
- Create a broad-scale hazard map, including threat level of individual hazards (dredging, development, trawl fisheries, etc.)
- Create habitat definitions and quality ratings for pelagic habitat, compare quality and quantity of habitat in both ocean basins.