

# The origin of California leatherback sea turtles and trans-Pacific partnerships for recovery

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Scott R. Benson  
Marine Turtle Research Program -  
NOAA, Southwest Fisheries Science  
Center



*Kirsten Carlson*

# Leatherback Genetic Stocks - Pacific

(Dutton et al. 1999, 2007)

60°N

40°N

20°N

0°

20°S

40°S

60°S

Eastern Pacific

Western Pacific

Malaysia

80°E

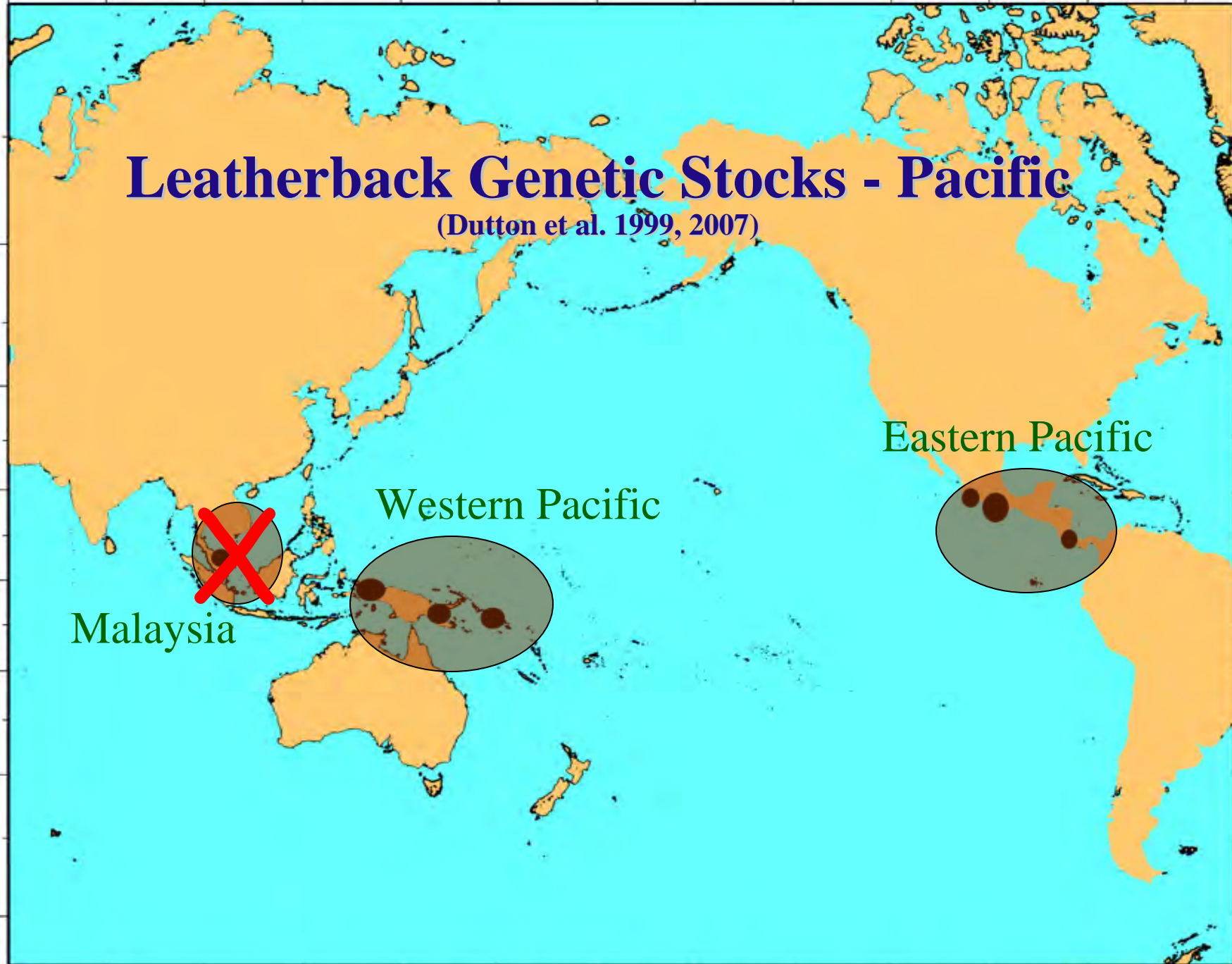
120°E

160°E

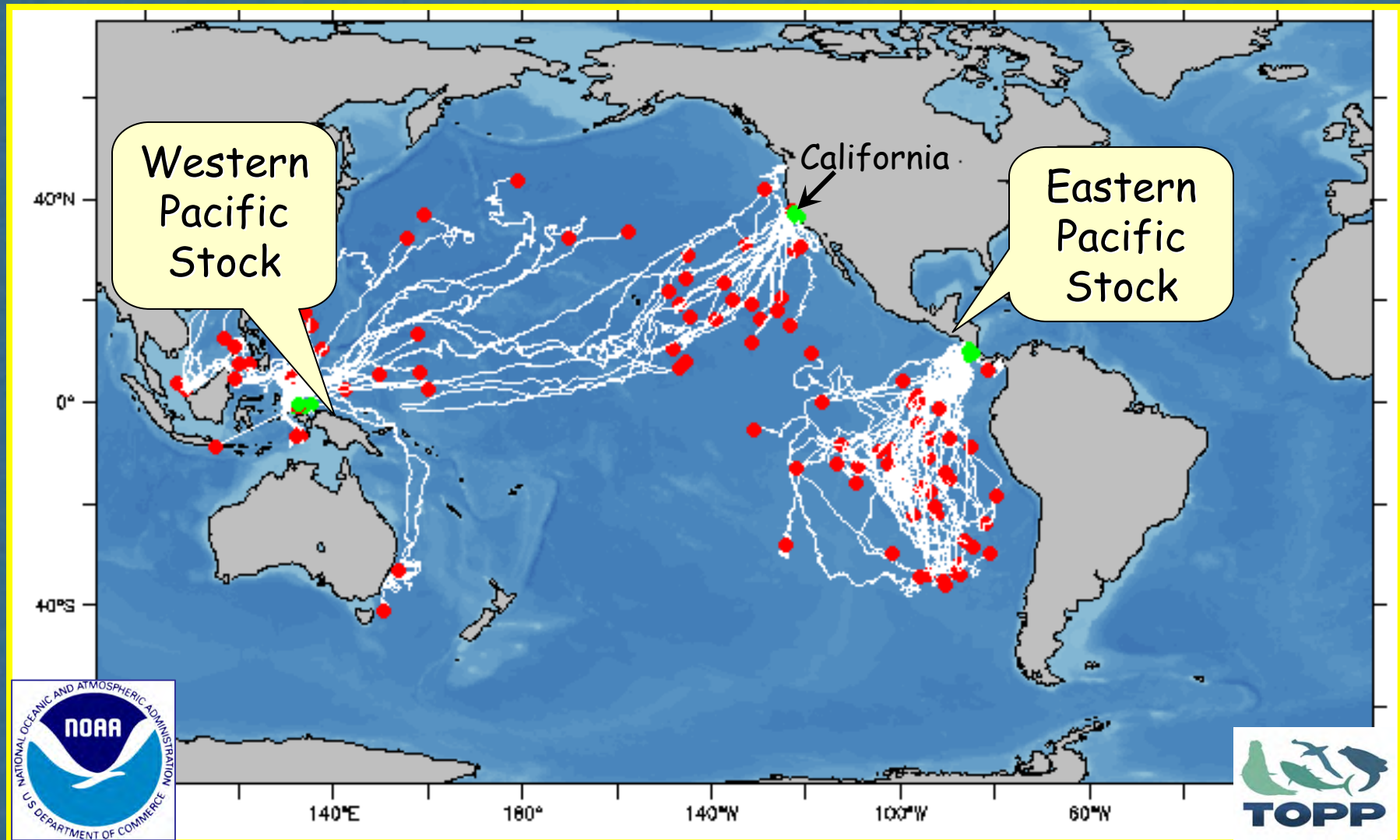
160°W

120°W

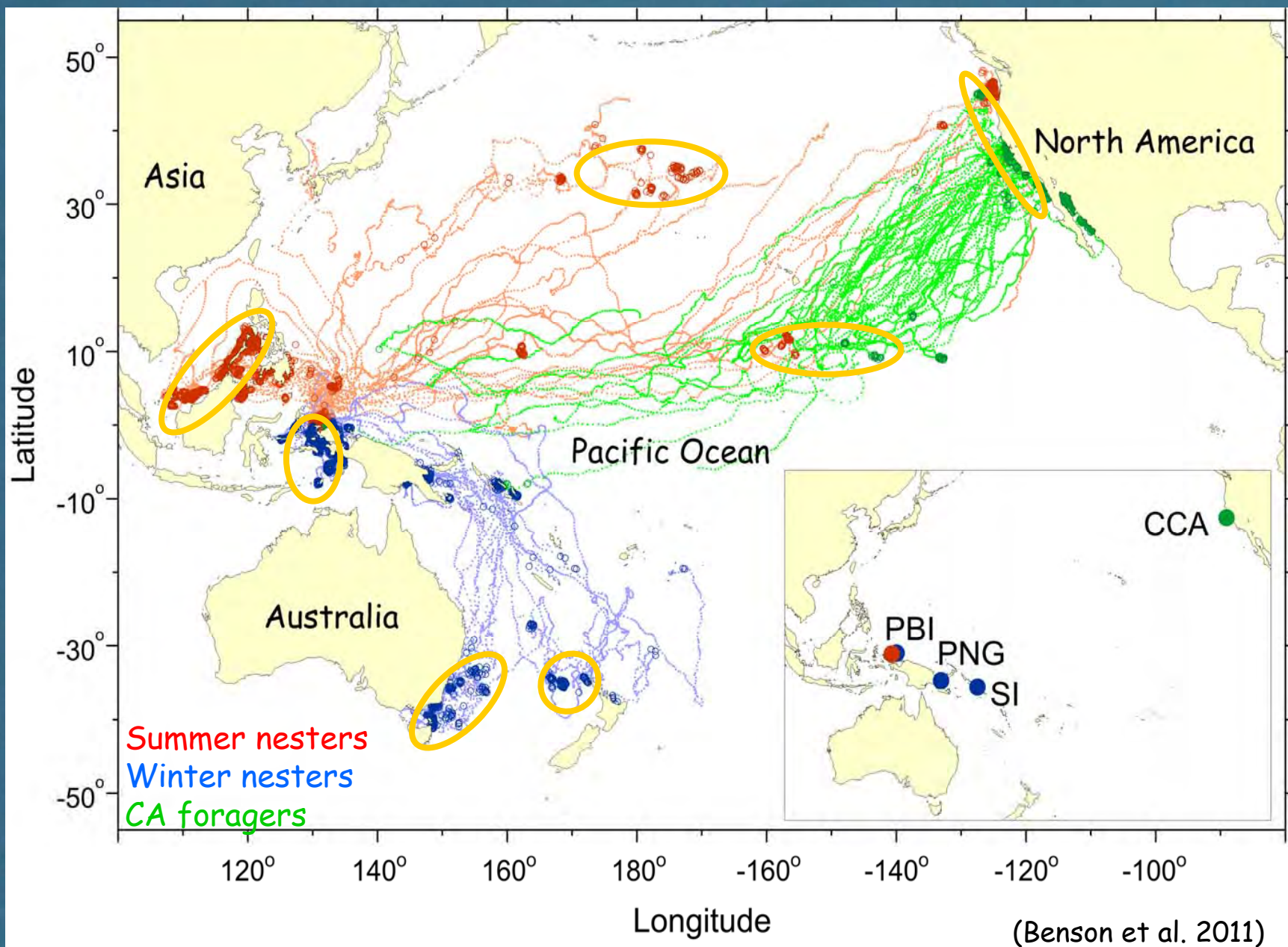
80°W



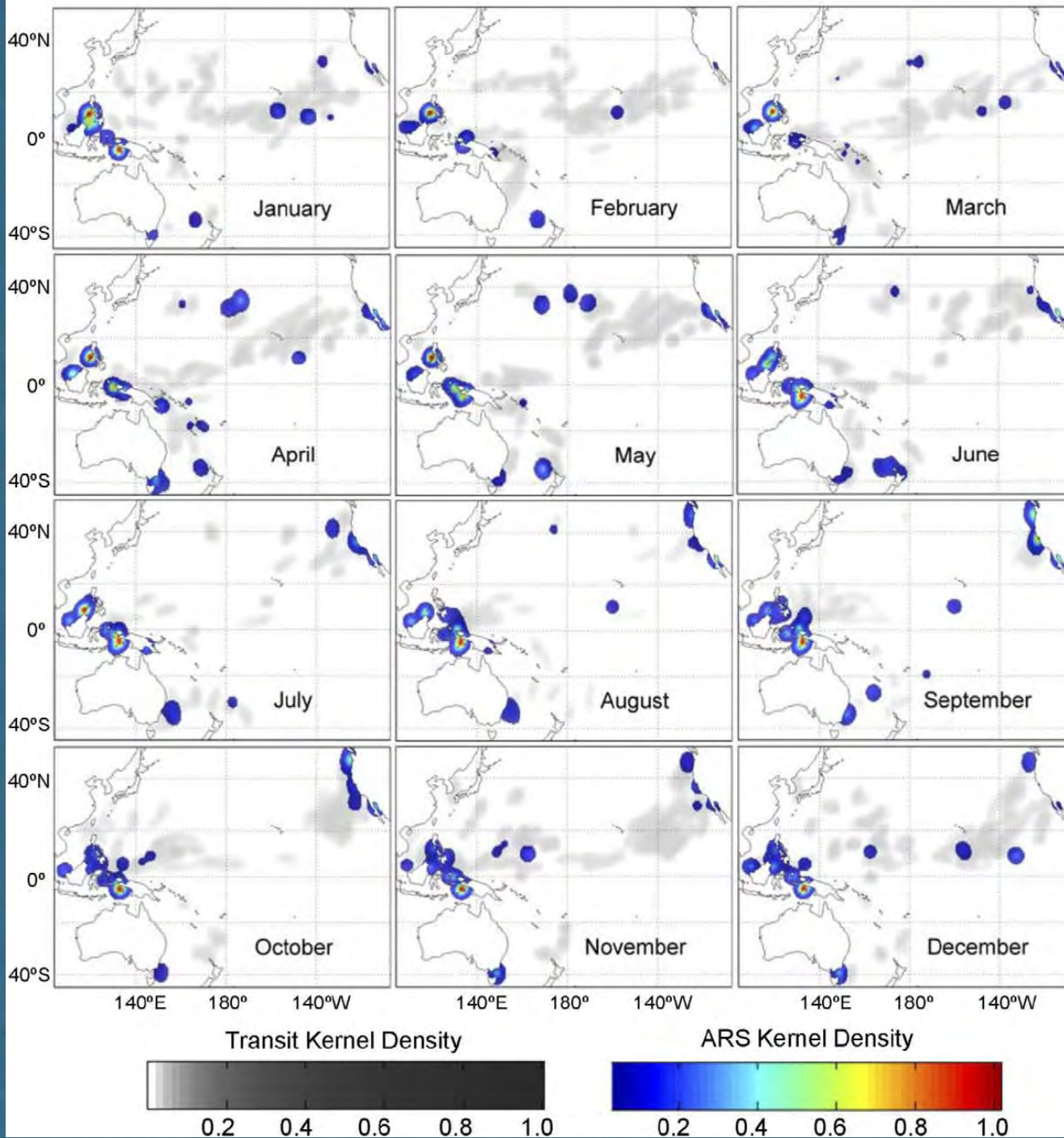
# Origin of California Leatherbacks: Papua Barat (Indonesia), Solomon Islands, Papua New Guinea



# Foraging habitat in diverse Large Marine Ecosystems



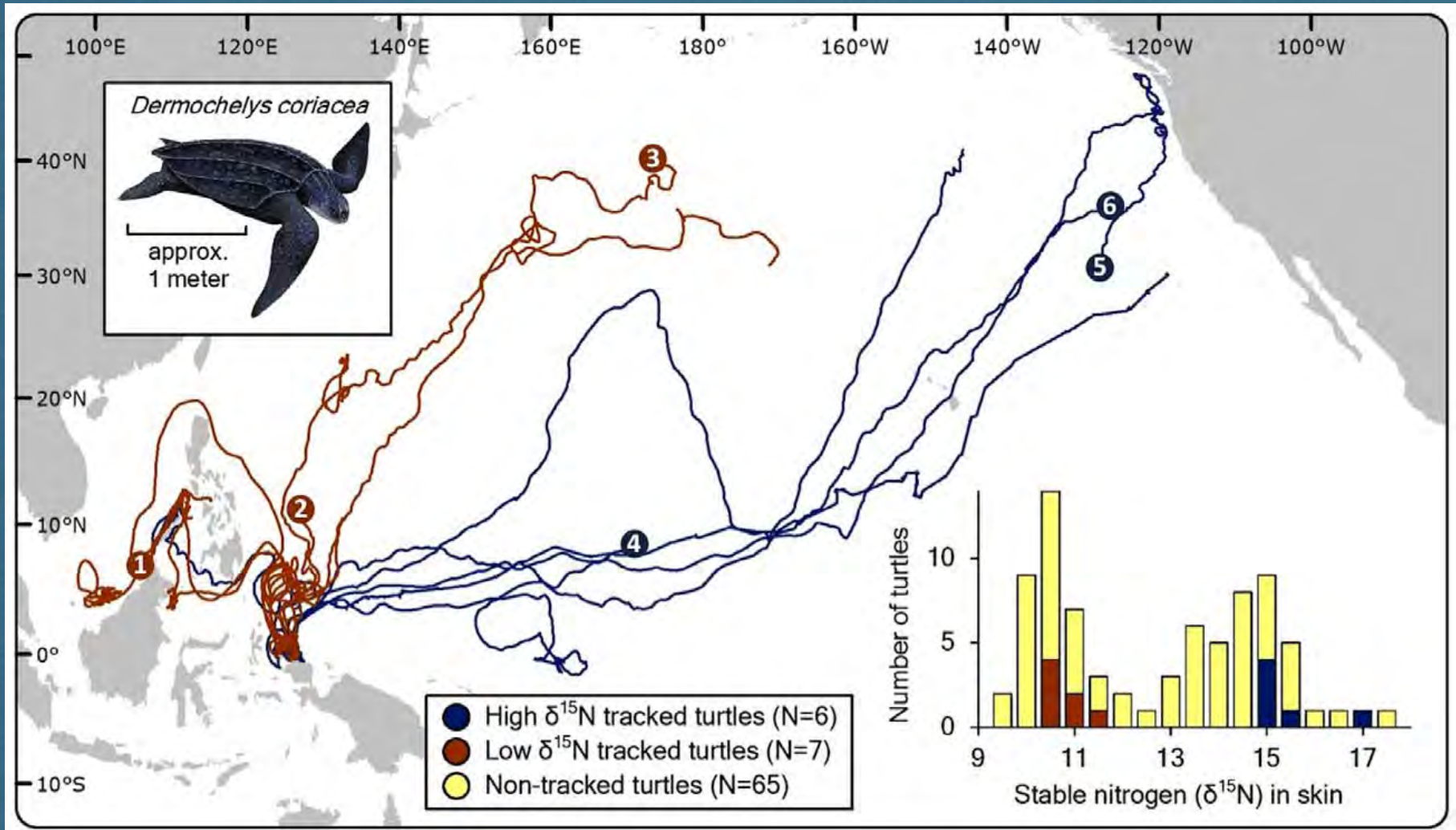
# Monthly high use areas



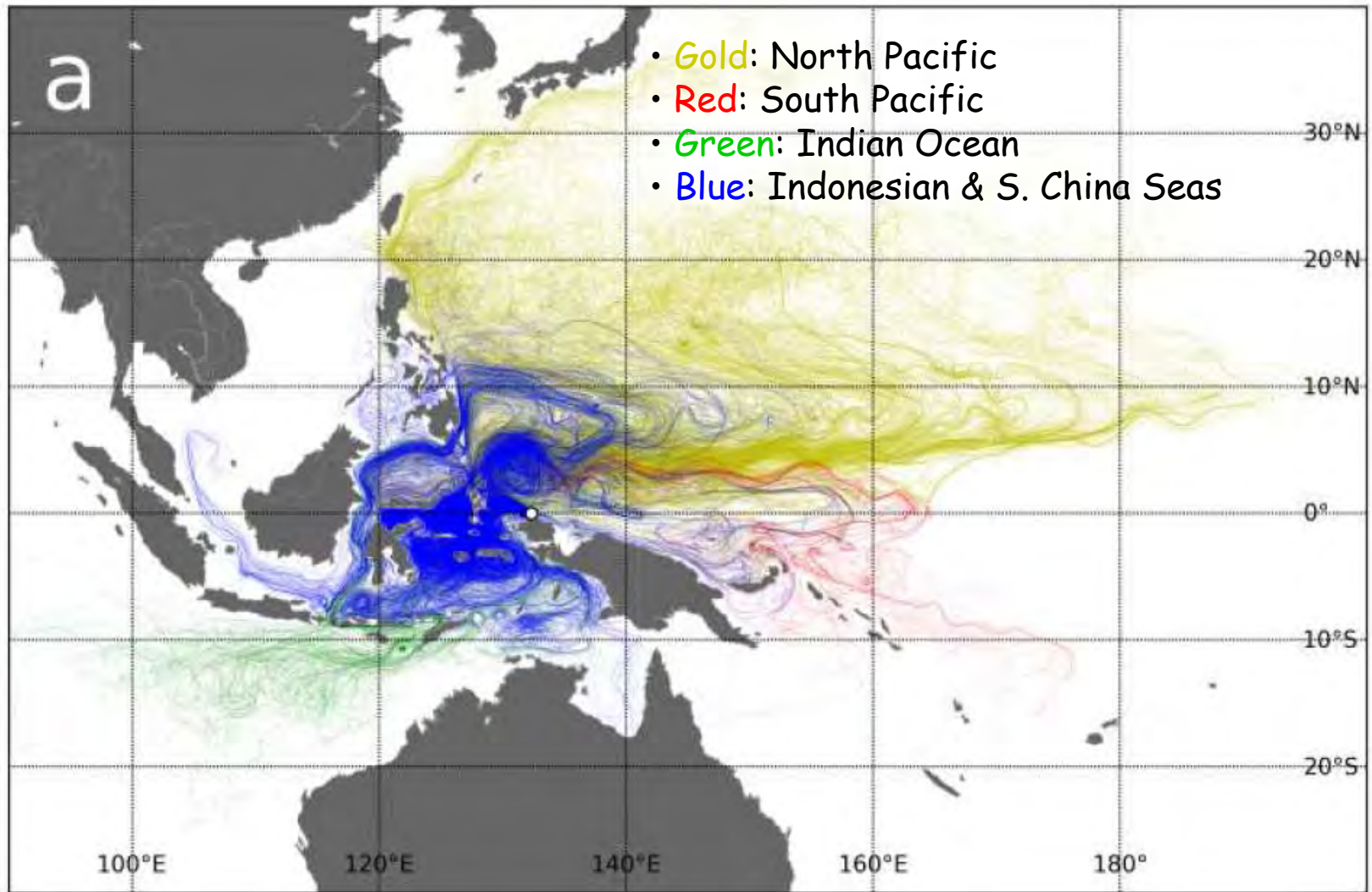
# Stable isotope and satellite telemetry studies:

Revealed movements, annual nesting beach composition, and fidelity to nesting and foraging areas

Seminoff et al. 2012



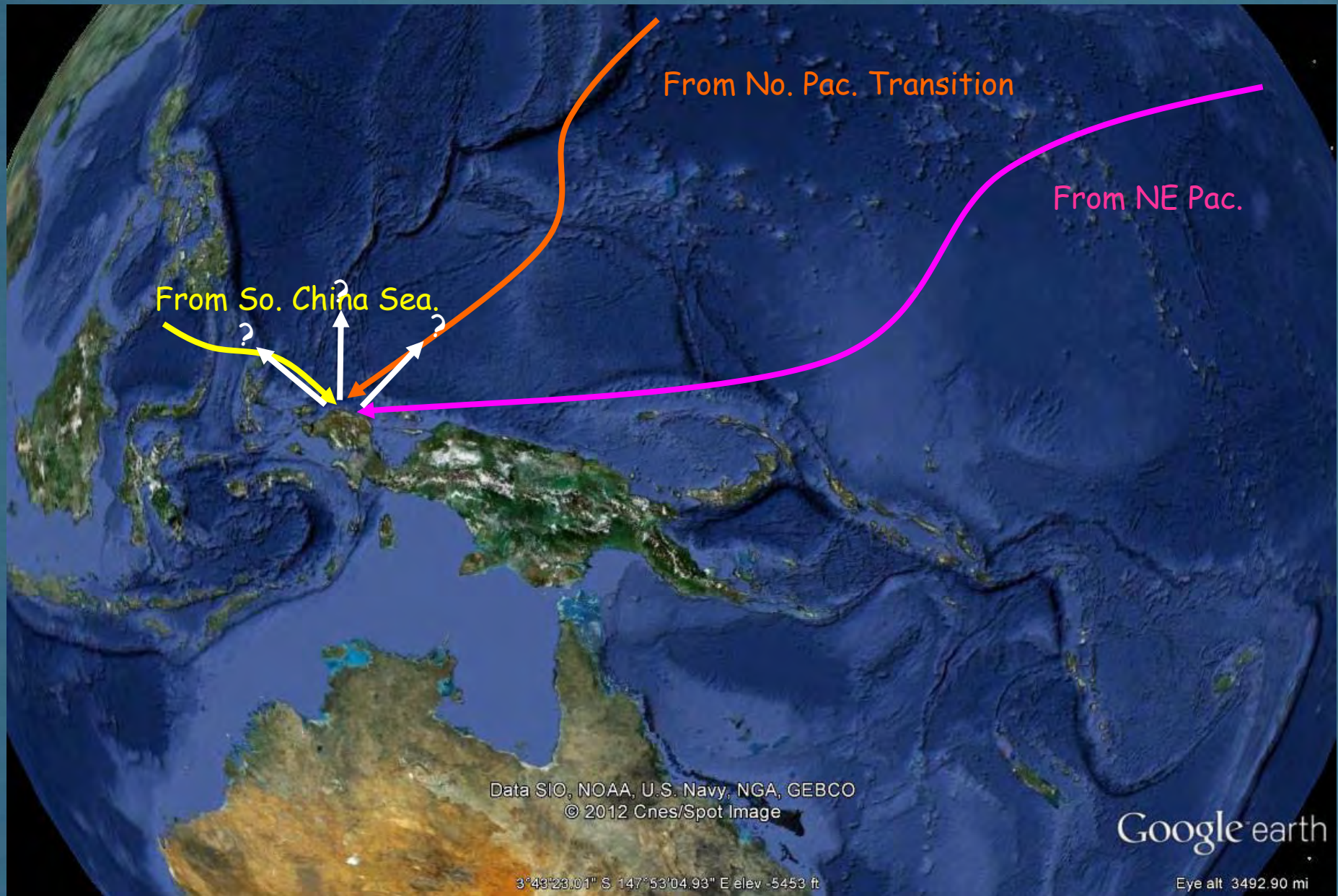
# Hatchling dispersal simulation



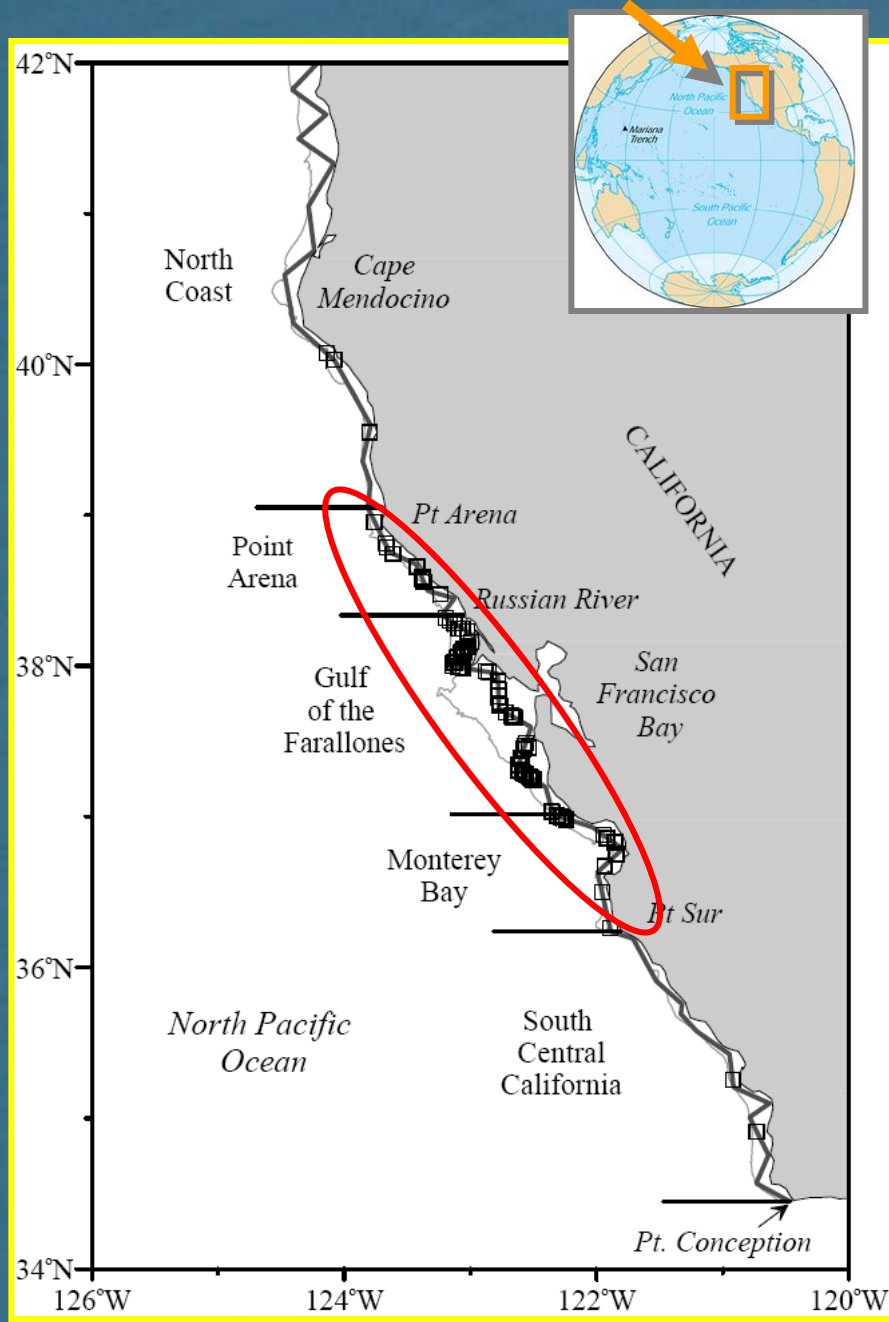
Gaspar et al. (2012)

One-year long trajectories of hatchlings released from Jamursba-Medi.  
The color of each track depends on the location of its end point.

# Learned migration hypothesis, dispersal, and recruitment









## Jelly energy density...



Greatest:

*Chrysaora* spp. - Sea nettles  
( $0.16 \pm 0.02$  kJ g<sup>-1</sup> WM)

Lowest:

*Aurelia* spp. - Moon jellies  
( $0.08 \pm 0.02$  kJ g<sup>-1</sup> WM)

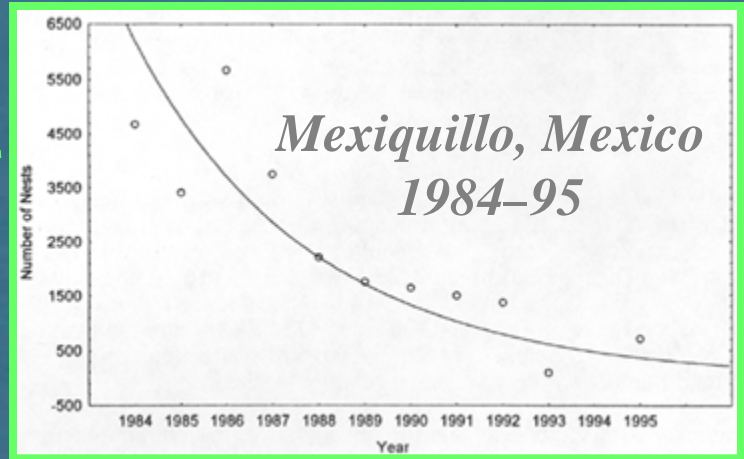
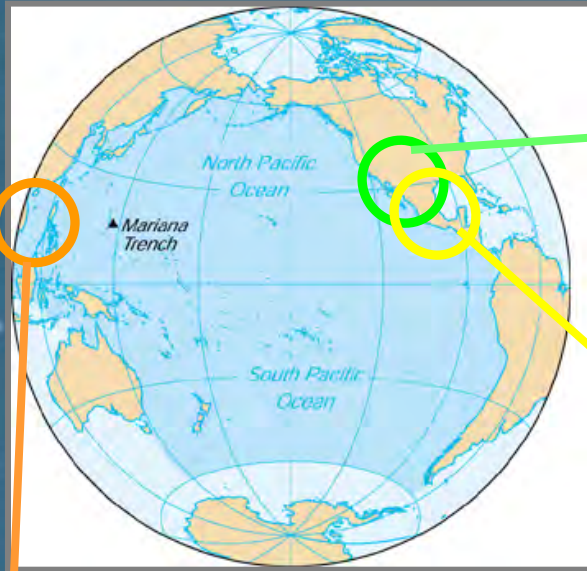
Adult leatherback...

- Maintenance costs:  $2.2 \times 10^4$  kJ day<sup>-1</sup>

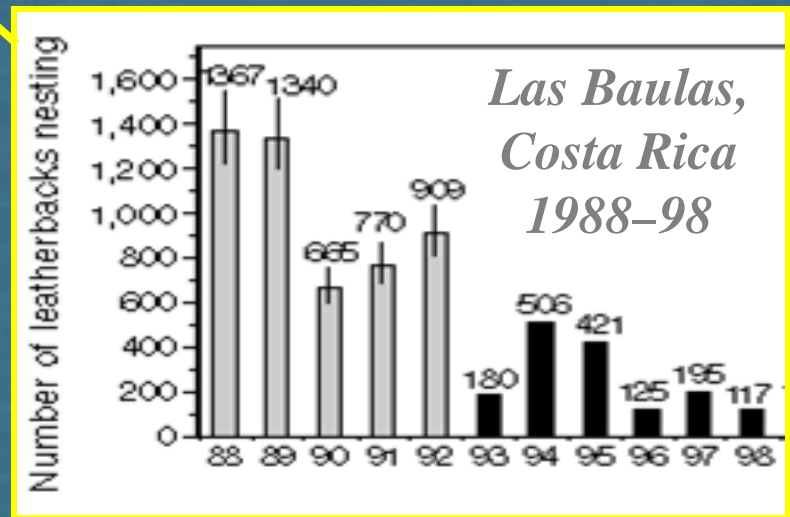
Must consume...

- 100 to 275 kg of sea jellies per day (depending on prey items)
- 25% to 68% of their body mass in sea jellies daily to meet maintenance costs.

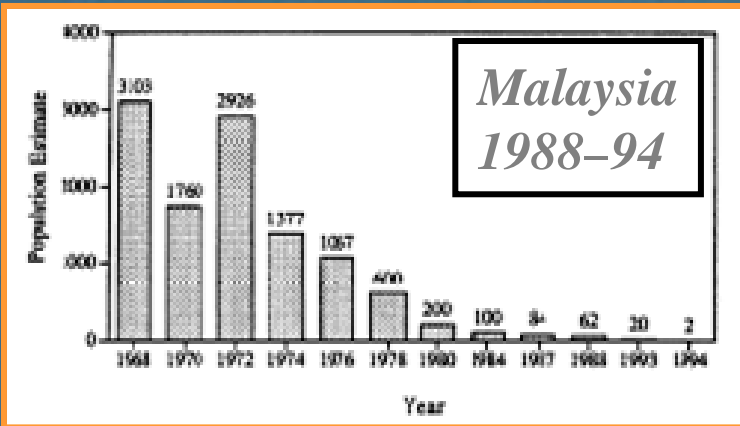
# Decline of Pacific Leatherback Turtles



*Source: Sarti et al. 1996*



*Source: Spotila et al. 2000*



*Source: Spotila et al. 1996*

# Extirpation of Pacific Leatherbacks?

- 1980: 91,000 adult females
- 1995: 6,500 adult females
- 2000: 3,490 adult females

## Eastern Pacific

1995: 4638

2000: 1690

Spotila et al. 1996; 2000

## Western Pacific

2004:

~ 2700-4500

Dutton et al. 2007



# Threats to **endangered** leatherback turtles

Fishery by-catch



Egg harvesting



Egg predation



Beach erosion



# Jamursba-Medi

# Wermon



# Culture and Village Lifestyle



# Local monitoring and protection



## Funding

- NOAA Fisheries - Protected Resources Program
- US Fish and Wildlife Service
- International Seafood Sustainability Foundation

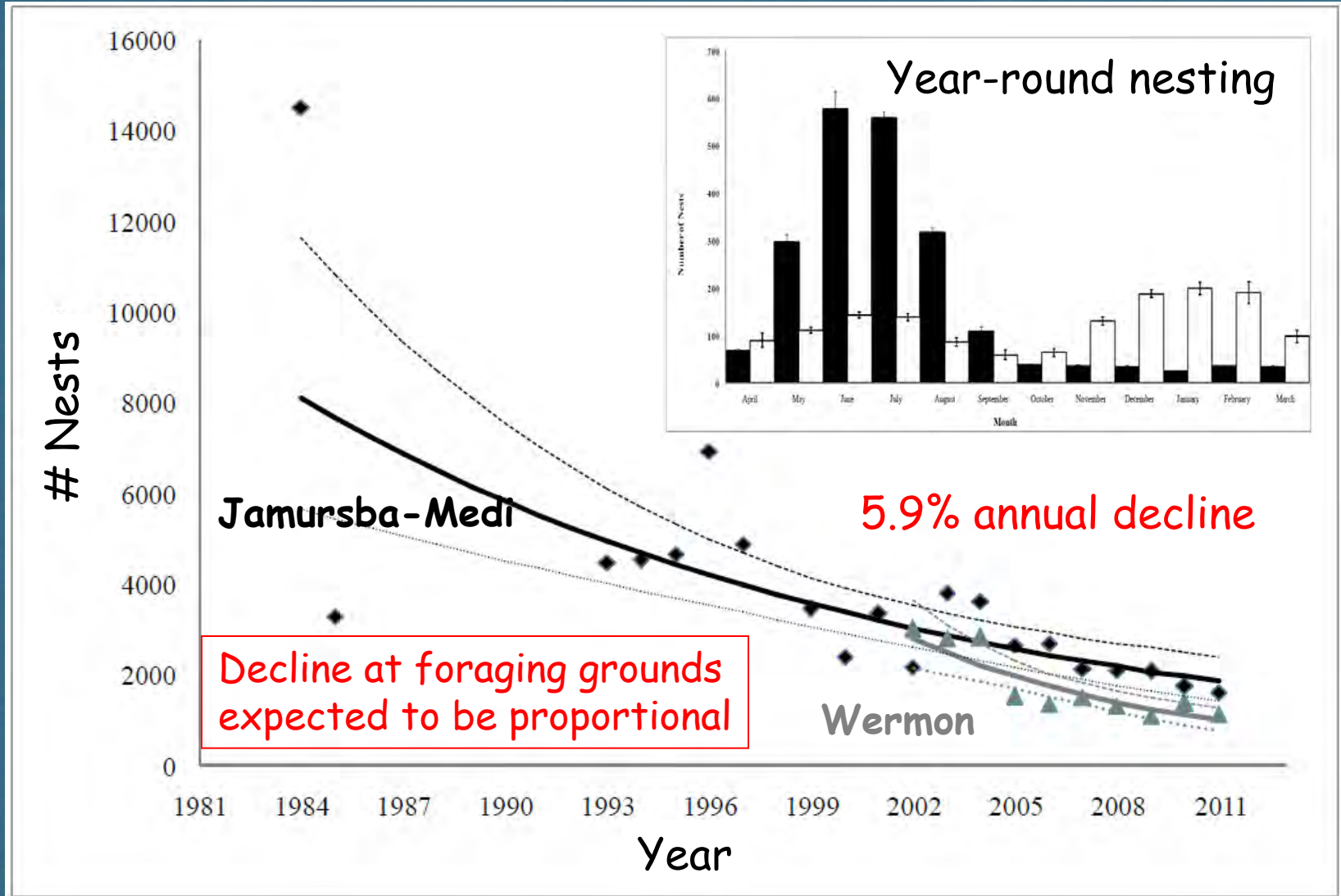


Feral pig fence



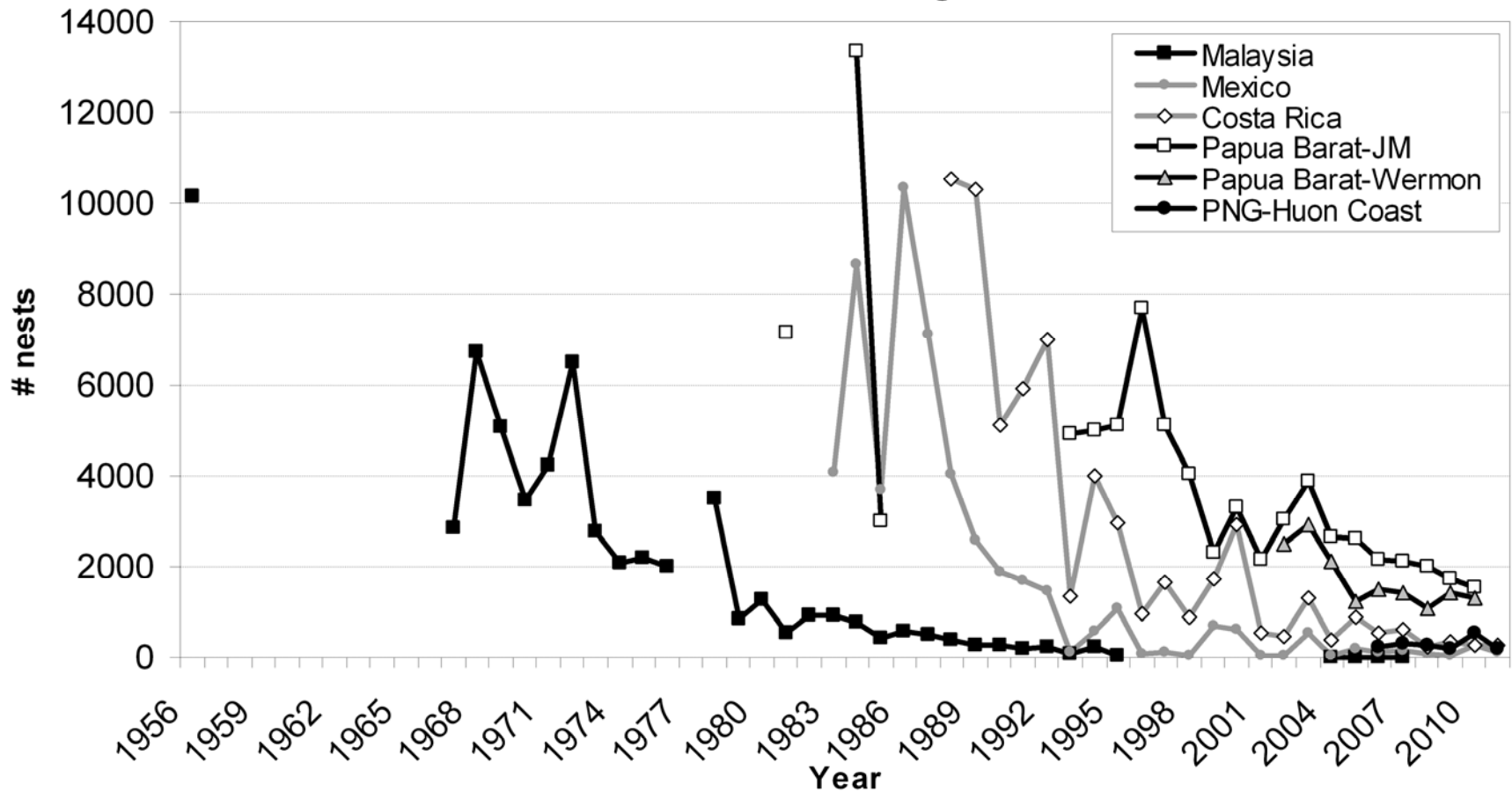


# North Bird's Head peninsula nesting (Papua Barat, Indonesia)



# Pacific Trends

Pacific leatherback nesting trends



# Nesting beach challenges & solutions



**Problem:** Large-scale nest loss and low hatching success

- Cyclical tidal erosion
- Pig predation
- Hatching failure due to elevated sand temperatures at specific sections of beaches

**Progress** (State University of Papua):

- Methods developed to mitigate nest failure on an experimental scale
  - Seek to implement methods and initiate egg relocations to increase hatchling production.
  - Need support and trust from the local communities adjacent to the nesting beaches

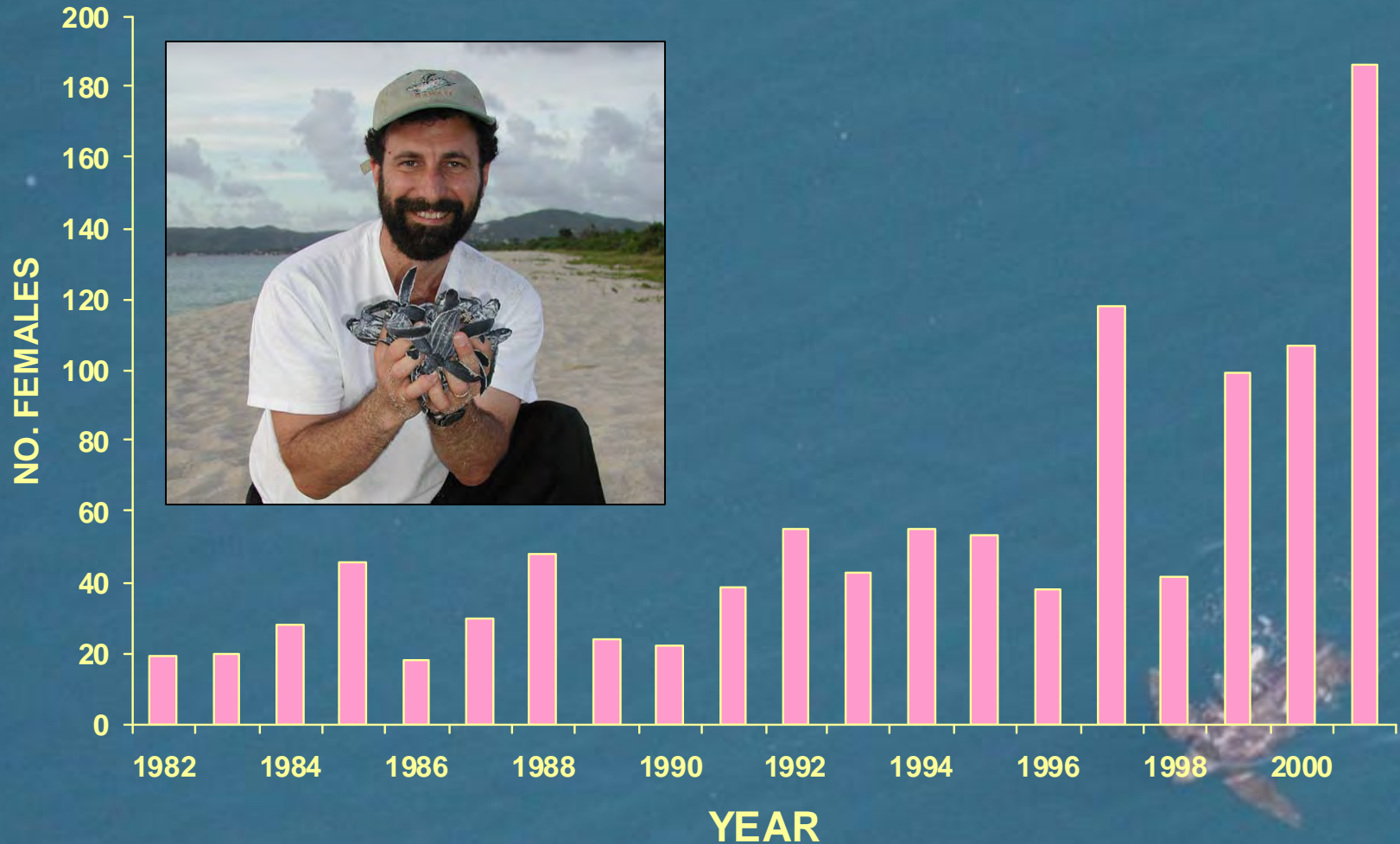
**Solution:** Engage local communities in work to deliver community benefits and conservation outcomes.

Project activities:

1. Establish in situ beach hatcheries at protected sites on Jamursba-Medi.
2. Move "doomed" clutches to hatcheries to increase hatchling production.
3. Contract local communities to support egg relocation, hatchery maintenance and implement conservation measures.

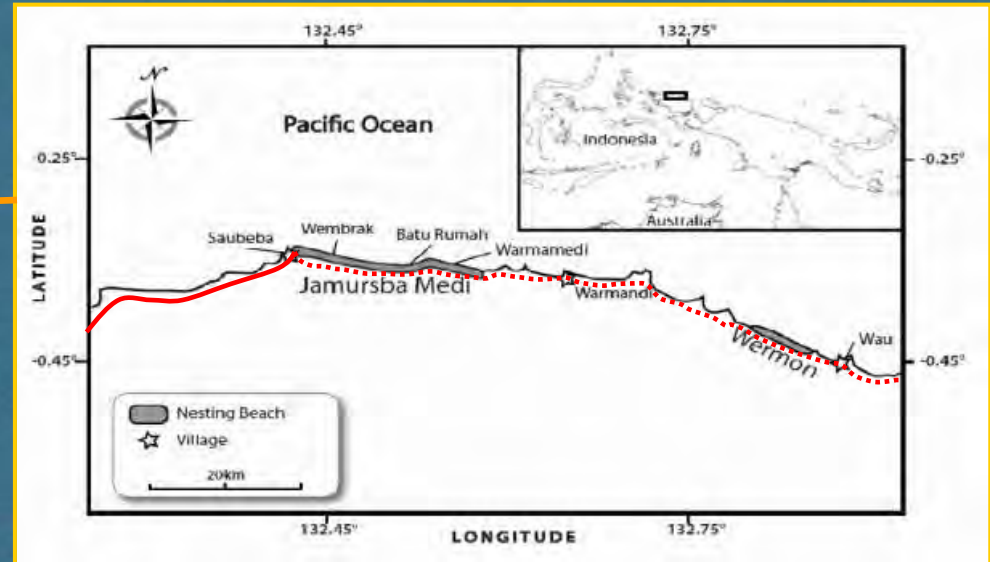


# Number of leatherbacks nesting annually at Sandy Point, St. Croix, USVI 1982-2001



## Abun Marine Protected Area

## Bird's Head Seascape



**Trans-Papua Highway (under construction)**  
Designed to provide easy access to the Papuan rainforest for logging and mining companies



Post-Courier, Thursday February 28, 2002

**FOCUS**

# Villagers benefit from conservation



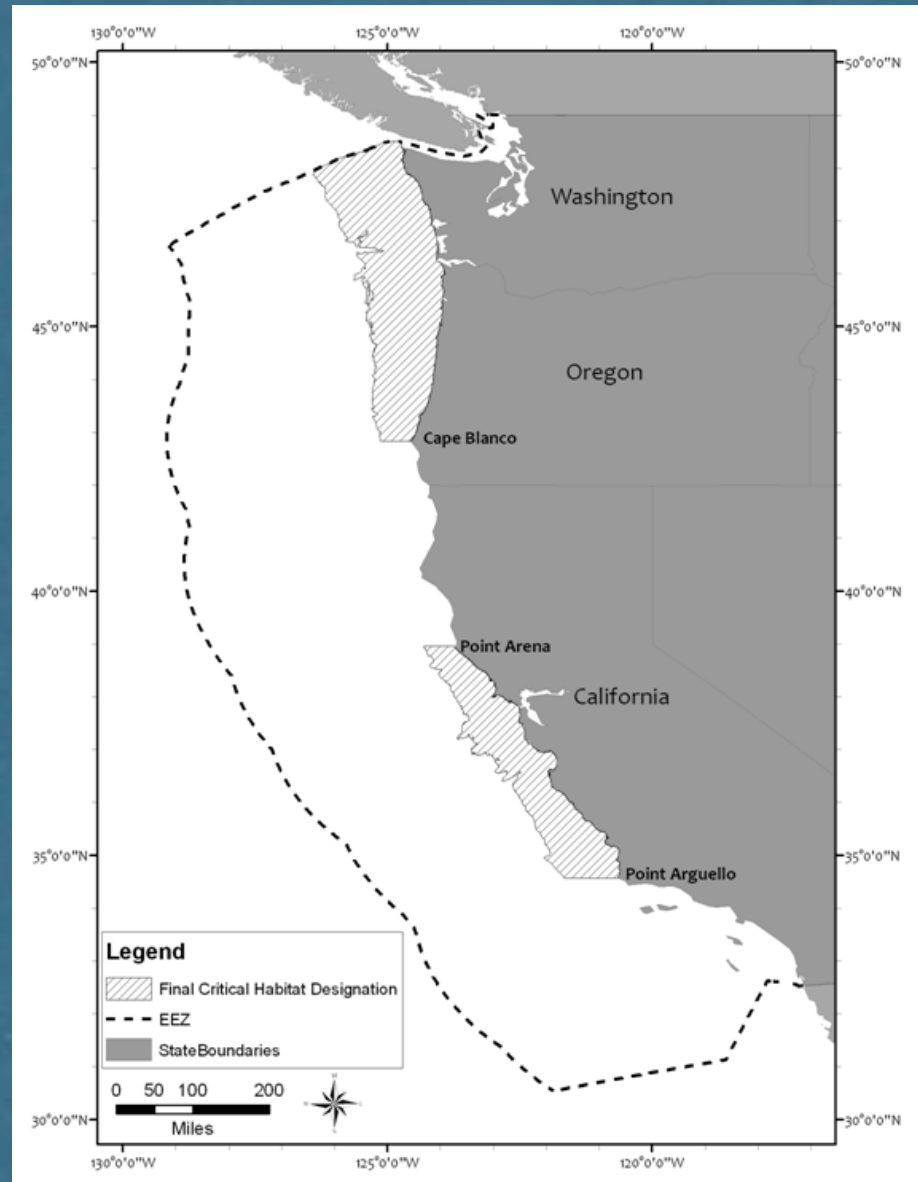
# Leatherback turtle critical habitat designated Jan 2012 (US west coast)

Critical habitat is defined under the Endangered Species Act as:

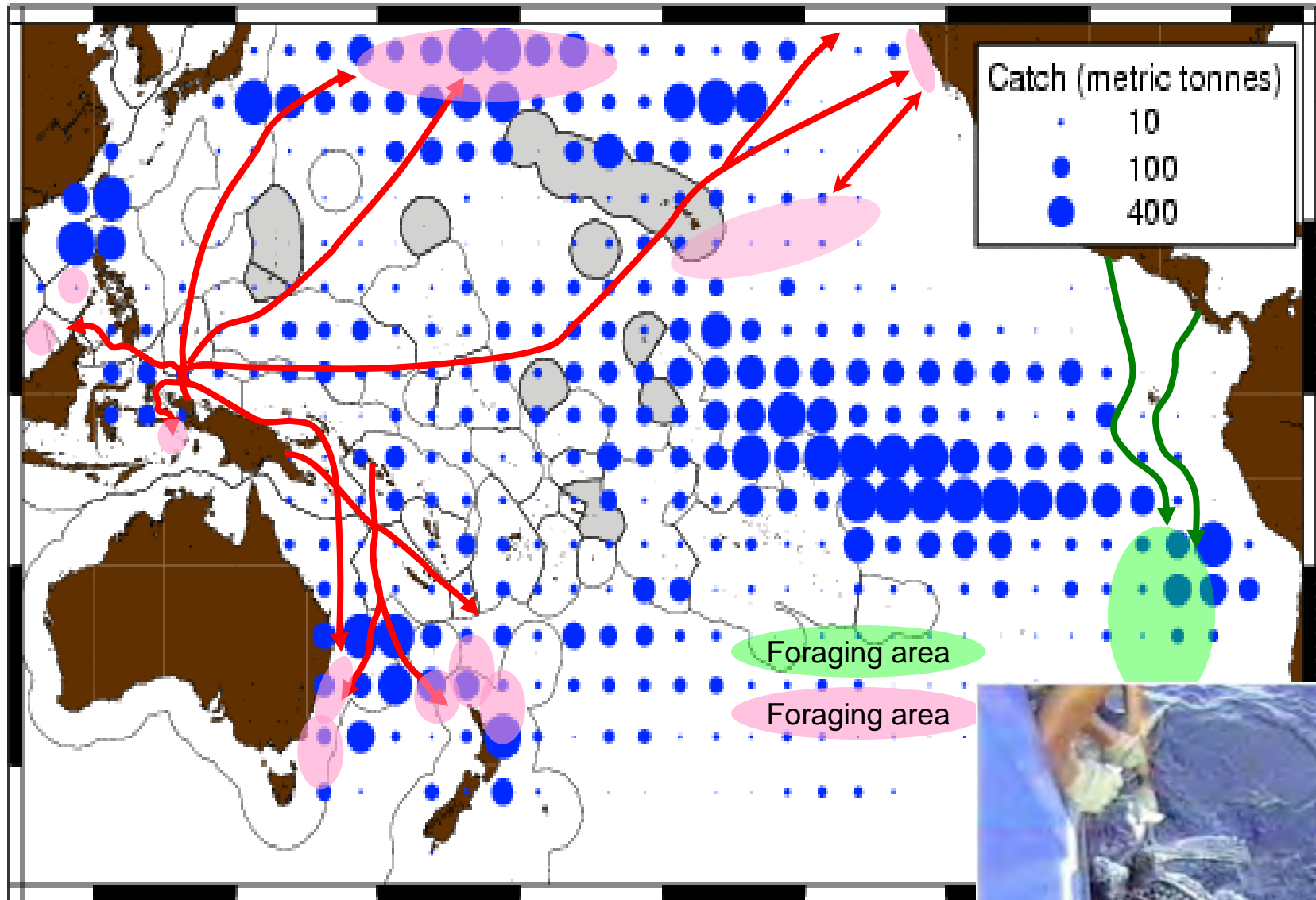
"(1) the specific areas within the geographical area occupied by the species, at the time it is listed... on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection

Physical and biological features ("Primary Constituent Elements") essential to Pacific leatherbacks off the U.S. West Coast:

"prey species, primarily scyphomedusae of the order Semaestomeae (Chrysaora, Aurelia, Phacellophora, and Cyanea), of sufficient condition, distribution, diversity, abundance and density to support individual as well as population growth, reproduction, and development."



# Distribution of longline catches of swordfish in the Pacific reported for 2004 and movements of western and eastern Pacific leatherback turtles 2005-2008





# Challenges to a holistic approach

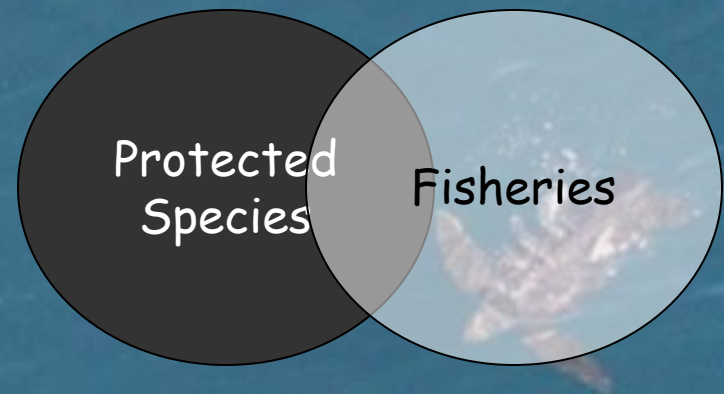
The United States is second only to China in the amount of seafood it imports. NOAA's latest figures showed that 91 percent of the 4.7 billion pounds of seafood consumed in the United States in 2011 was imported.

## Policy challenges:

- Diverse laws in U.S., high seas, other nations.
- Economics (e.g. artisanal vs. industrial fishing)
- Monitoring & enforcement issues

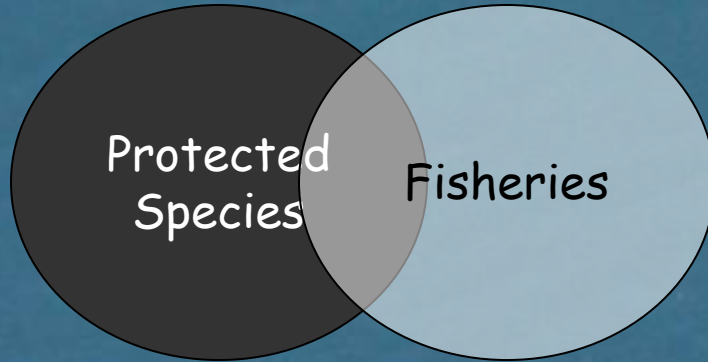
## Ecological challenges:

- Turtles and fisheries may occupy the same (or overlapping) habitats



# Alternatives & Solutions

- Support and improve implementation of the provisions of MSRA that seek to reduce IUU bycatch and enhance sustainability of fisheries Pacific-wide.
- Identify method of separating turtles and fisheries in time or 3-D space



**How?** Examine habitat use patterns of turtles, target species, and fishermen

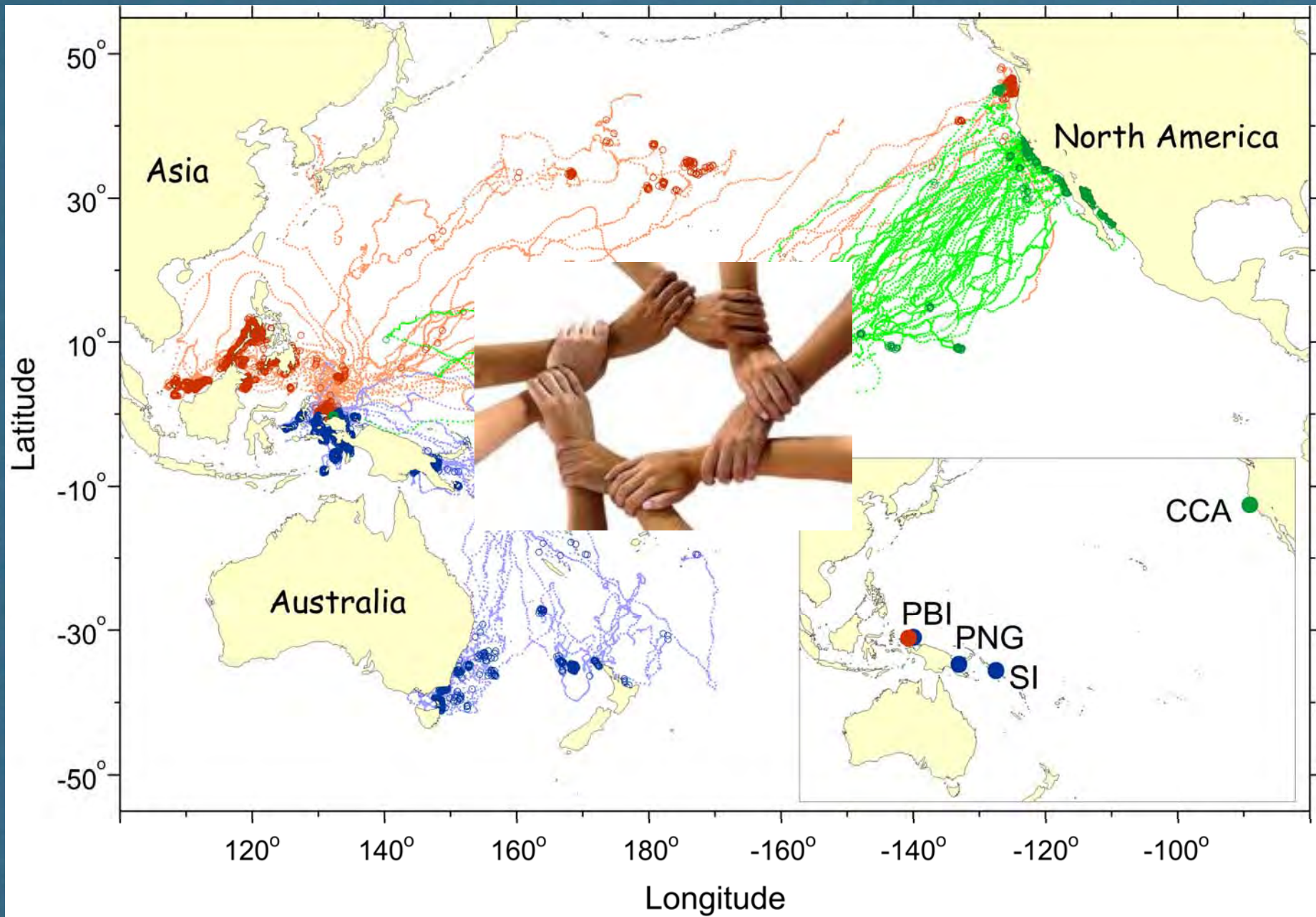
- Fine-scale habitat-use, e.g. depth, temperature,  $O_2$ , fronts
  - Animal and human behavior, e.g. day/night, proximity to ports, market conditions, vessel constraints, weather factors
- Telemetry, fishery data, inter-disciplinary process studies ...



"Just a flesh wound"



Apologies to  
Monty Python



# Summary

A holistic approach to leatherback conservation includes:

- (1) effective beach conservation to protect nesting females, their eggs, and critical breeding habitat to maximize hatchling production
- (2) enhancement of at-sea survival of juveniles and adults at critical foraging areas and as they move into different developmental habitats by dealing with large-scale, commercial fishing fleets
- (3) reduction of subsistence, small-scale and artisanal coastal fishers' takes of turtles

- Ocean ambassadors - connect us to the rest of the Pacific Basin
- Requires international and local support throughout the Pacific





## What can be done to restore Pacific turtle populations?

The Bellagio Blueprint for Action on Pacific Sea Turtles



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PACIFIC  
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