

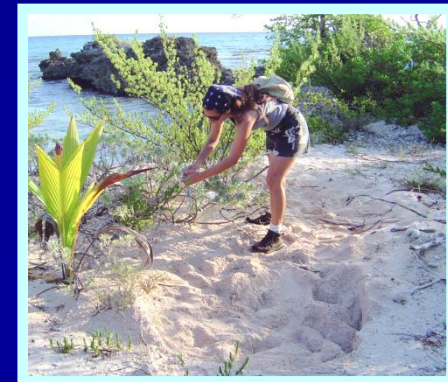
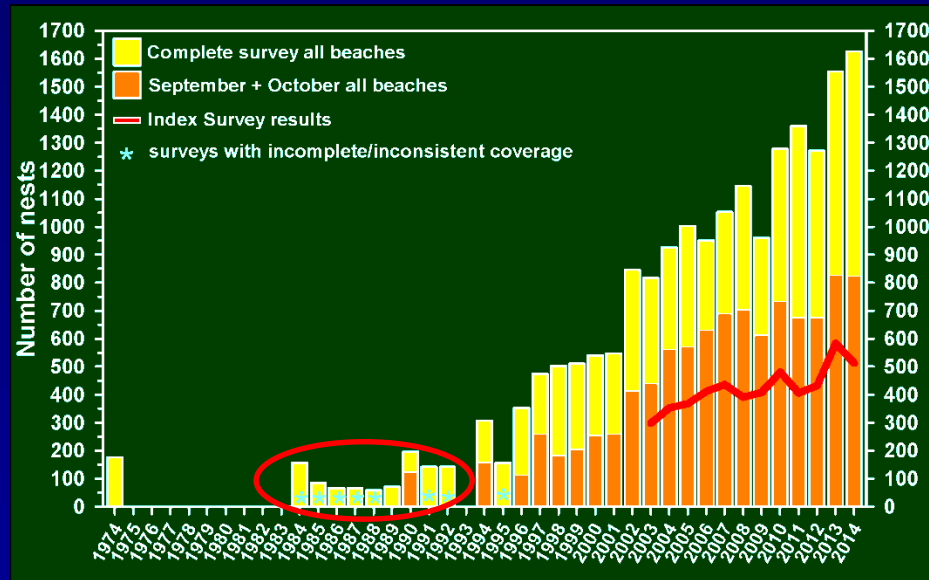
Twenty-three Years of In-Water Surveys at Mona Island and other Critical Habitats in Puerto Rico

Carlos E. Diez

2015 Annual General Meeting
Wider Caribbean Sea Turtle Conservation
Network (WIDECAST)

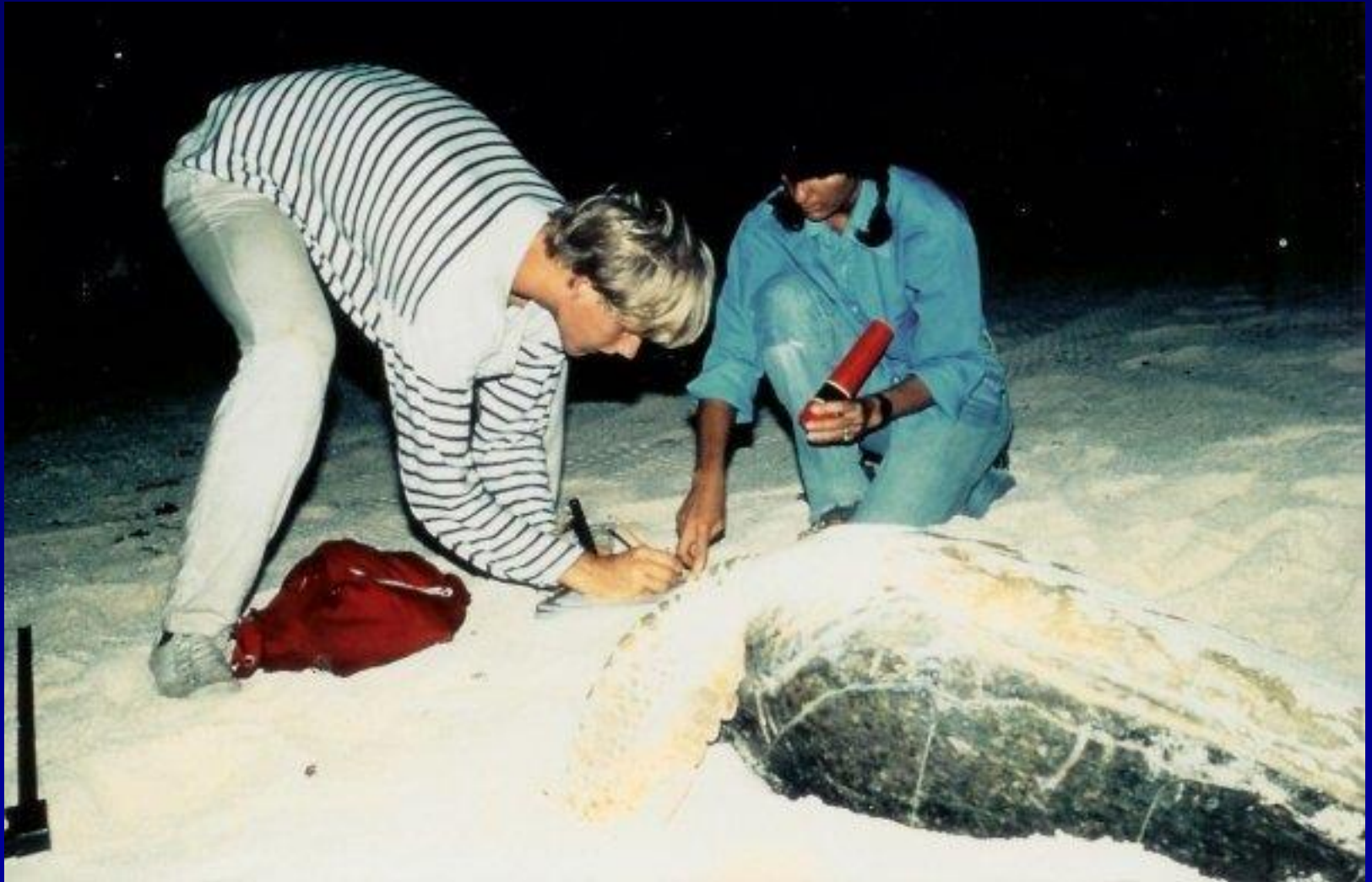


Isla de Mona



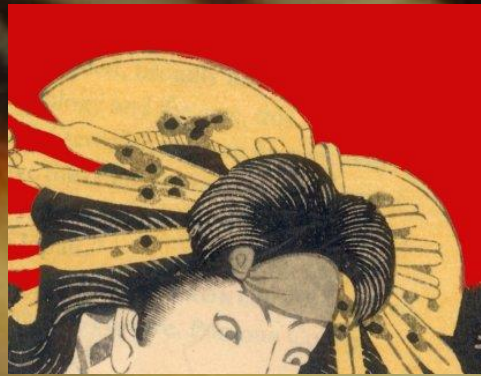


Isla de Mona, 1984



Isla de Mona, 1985

THREATS:





The beginning: 1992



Feeding Grounds

- Foraging
- Resting
- Breeding
- Transit



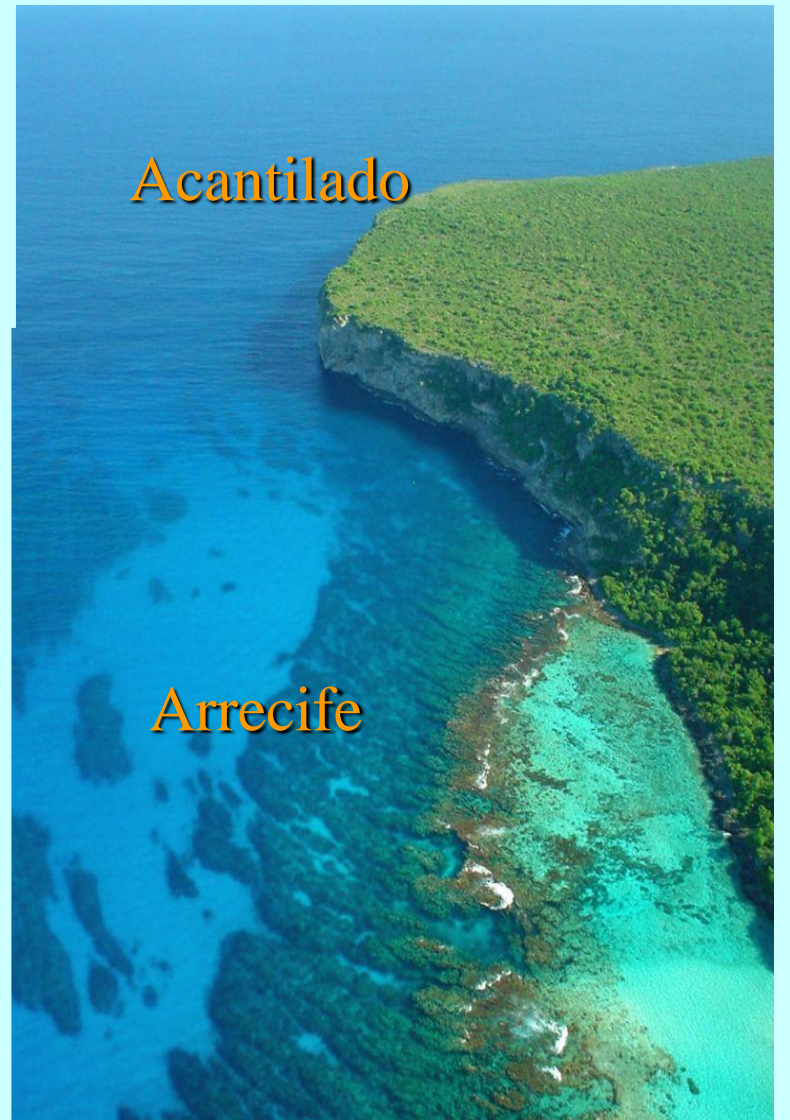
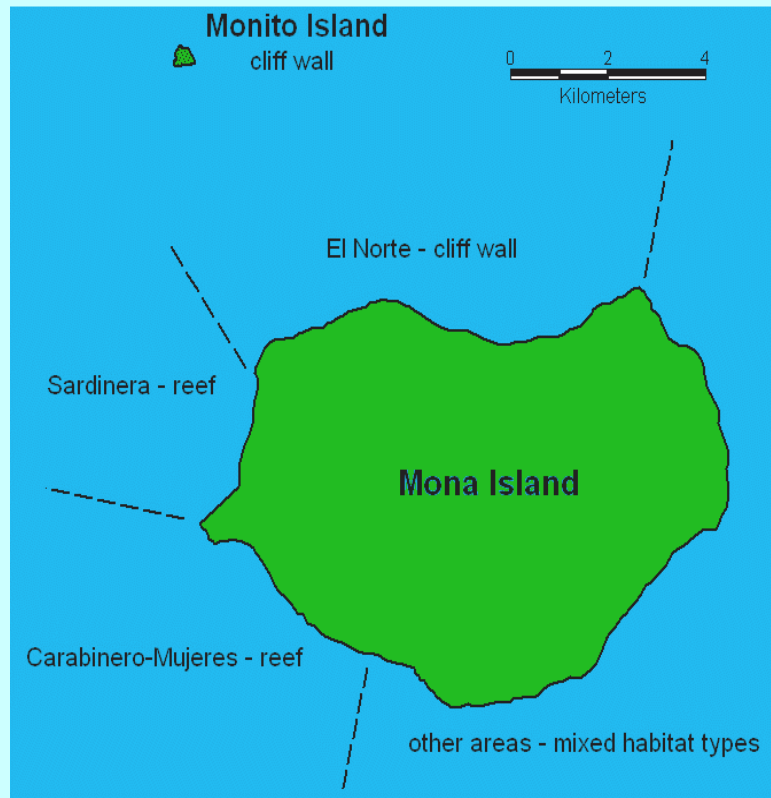


Main studies:

- Aggregation structure, dynamics and trends
- Habitat use
- Habitat characterization (e.g., food availability)
- Habitat quality (e.g., bacterial & chemical contamination)
- Migration patterns
- Molecular origin of the aggregations
- Health (e.g., prevalence of FP)



Case Study: Isla de Mona

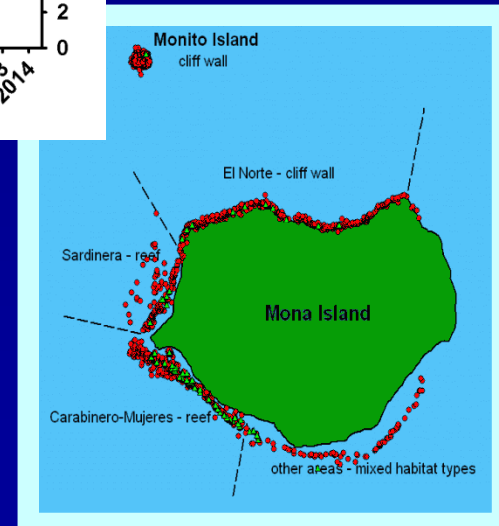
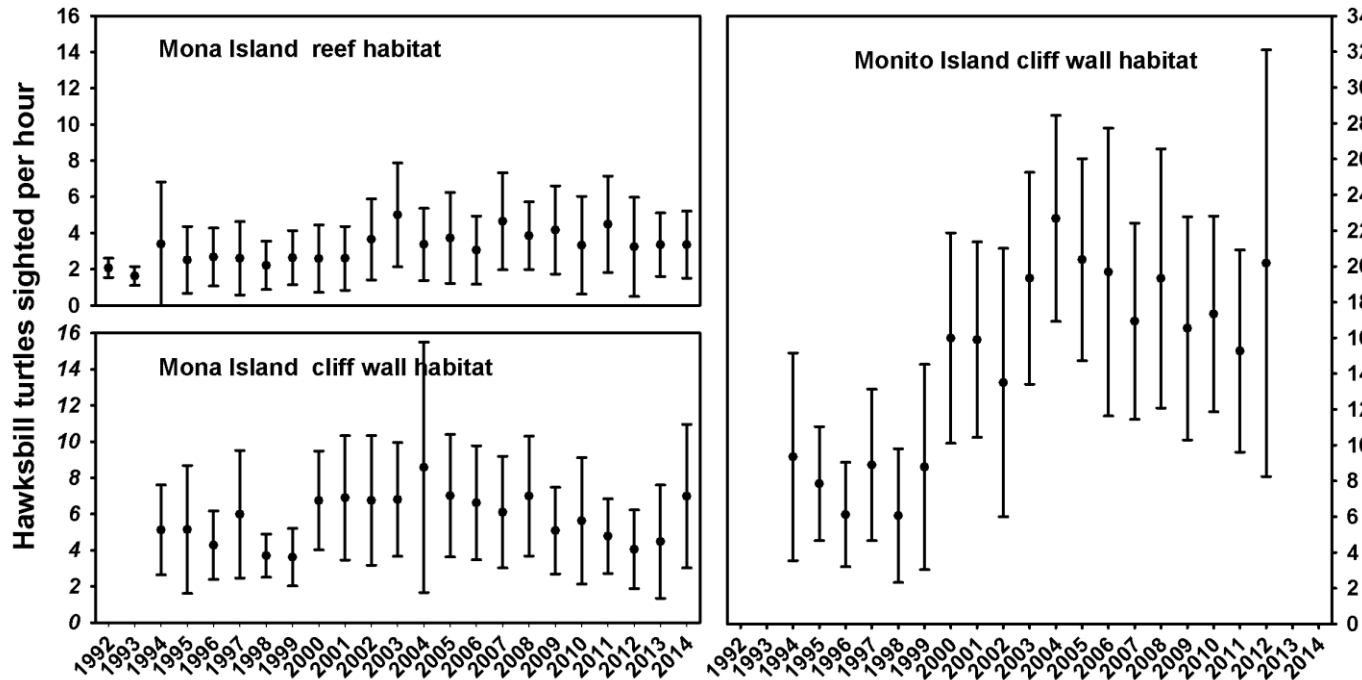


Methods:

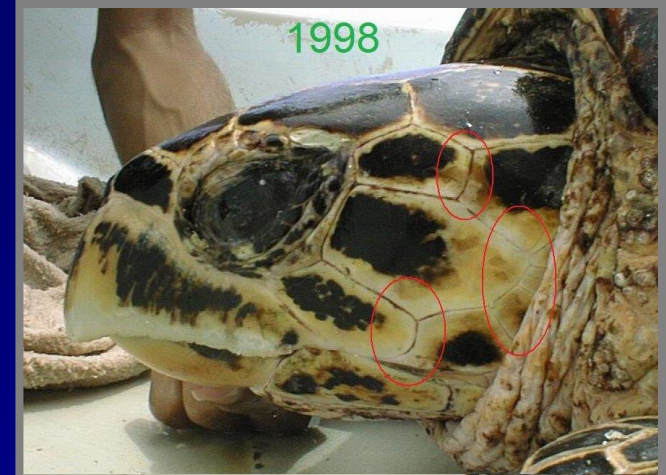
- Snorkeling
- Scuba



Capture Per Unit Effort (CPUE) for hawksbill turtles captured at different study sites at Mona Island (1992-2014)



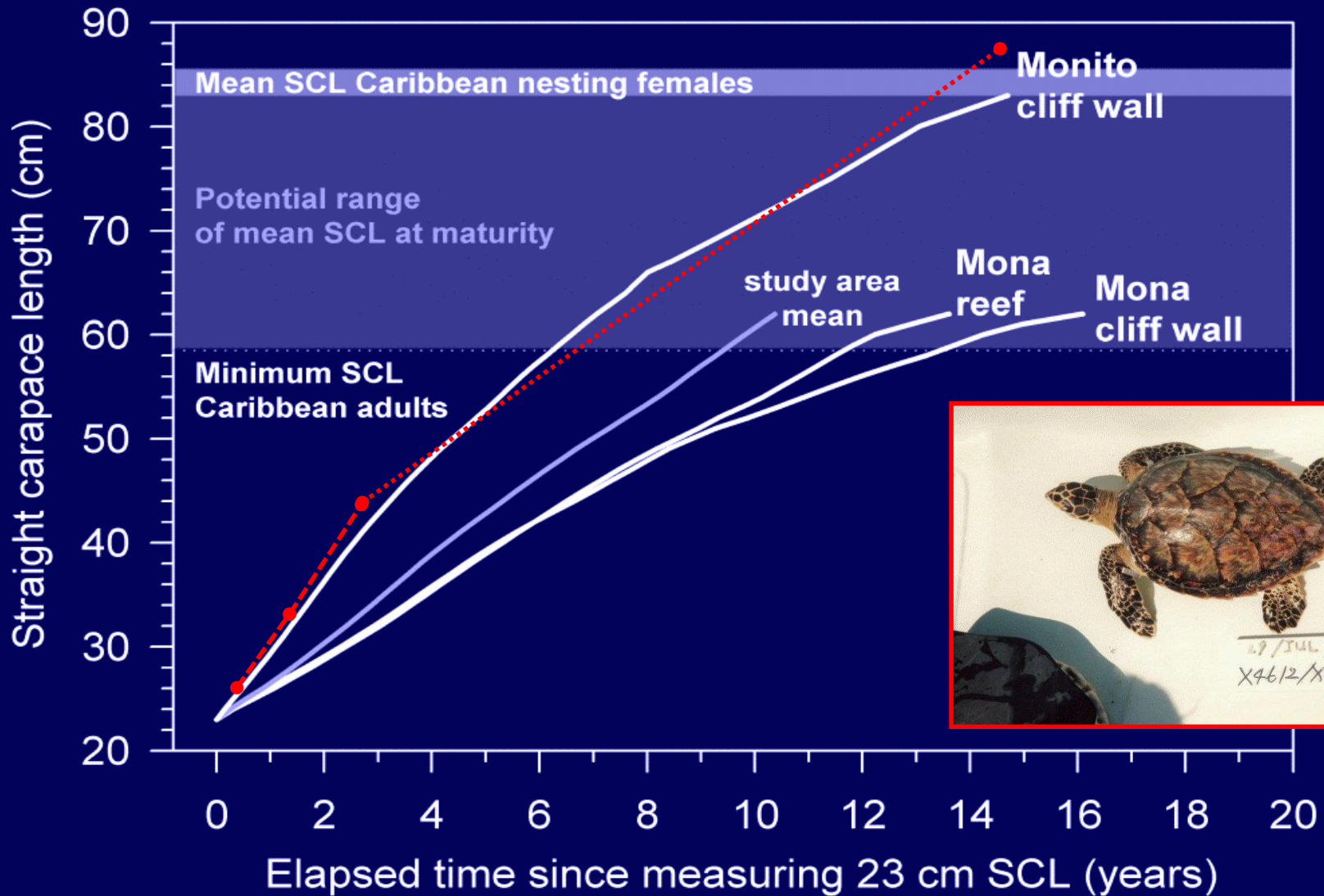
Tagging, morphometrics, photo ID



Van Dam, R. and Diez, C. E. (1998). Caribbean hawksbill turtle morphometrics. *Bulletin of Marine Science*, 62(1), 145–155.

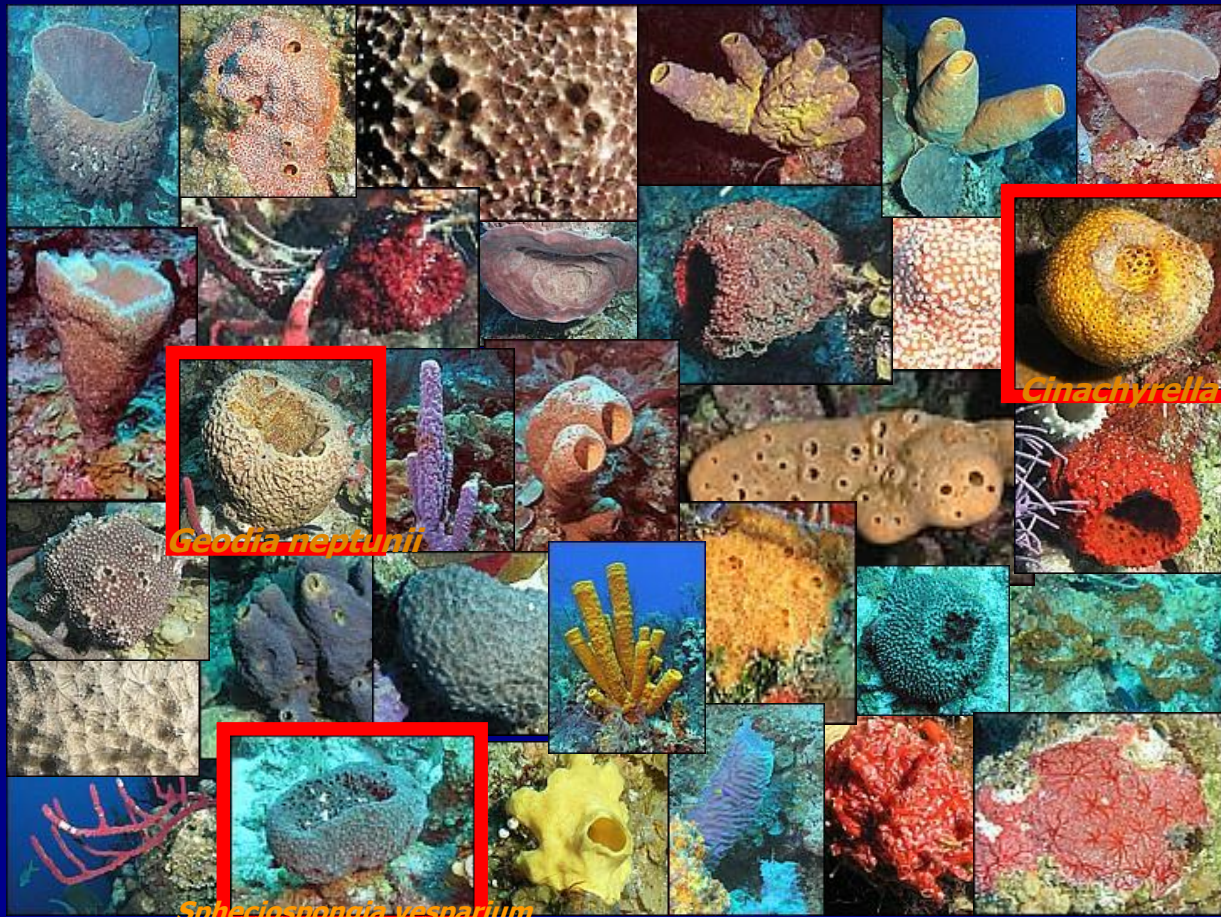
Van Dam, R. and Diez, C. (1999). Differential tag retention in Caribbean hawksbill turtles. *Chelonian Conservation and Biology*, 3(2), 225–229.

Somatic growth rates



Diez, C.E. & van Dam, R.P. (2002) Habitat effect on hawksbill turtle growth rates on feeding grounds at Mona and Monito Islands, Puerto Rico
 Diez, C. E. and van Dam, R. P. (2003). Sex Ratio of an Immature Hawksbill Seaturtle Aggregation at Mona Island, Puerto Rico.
 Ordoñez Espinosa, C; Meylan, A.B; Meylan, P, Peterson, I; Diez, C. E. & van Dam, R. P. Hawksbill Tagged as a Juvenile in
 Puerto Rico Found Nesting in Panama 15 Years Later. *Marine Turtle Newsletter* 127:25.

Diet



Cinachyrella sp.

Geodia neptunii

Spherospongia vesparium



Geodia neptuni



Ricordea florida

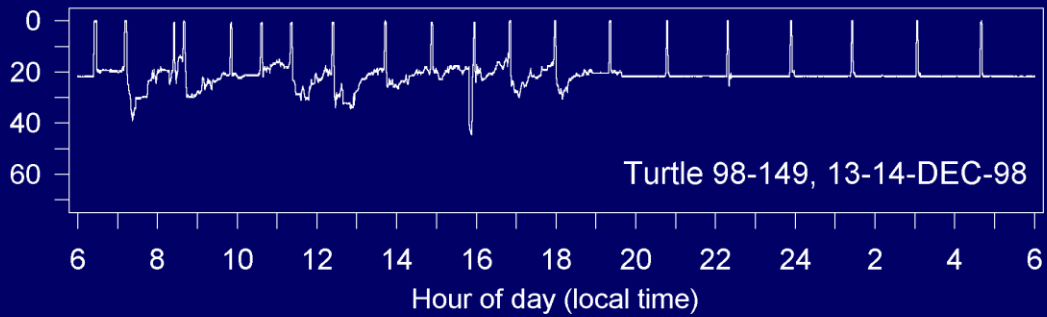
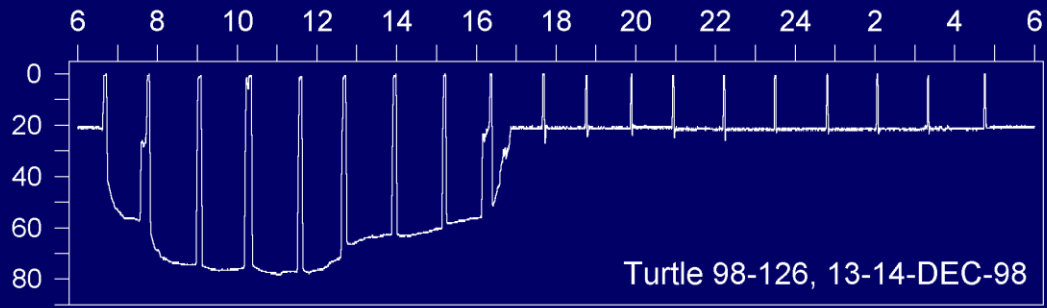


First time caught: 1993, last time caught: 2014

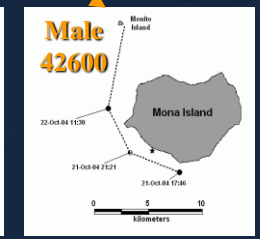
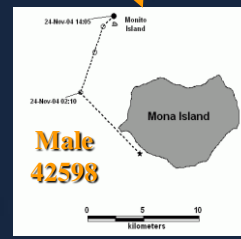
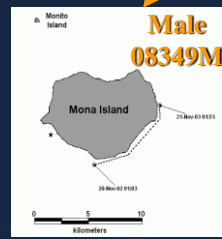
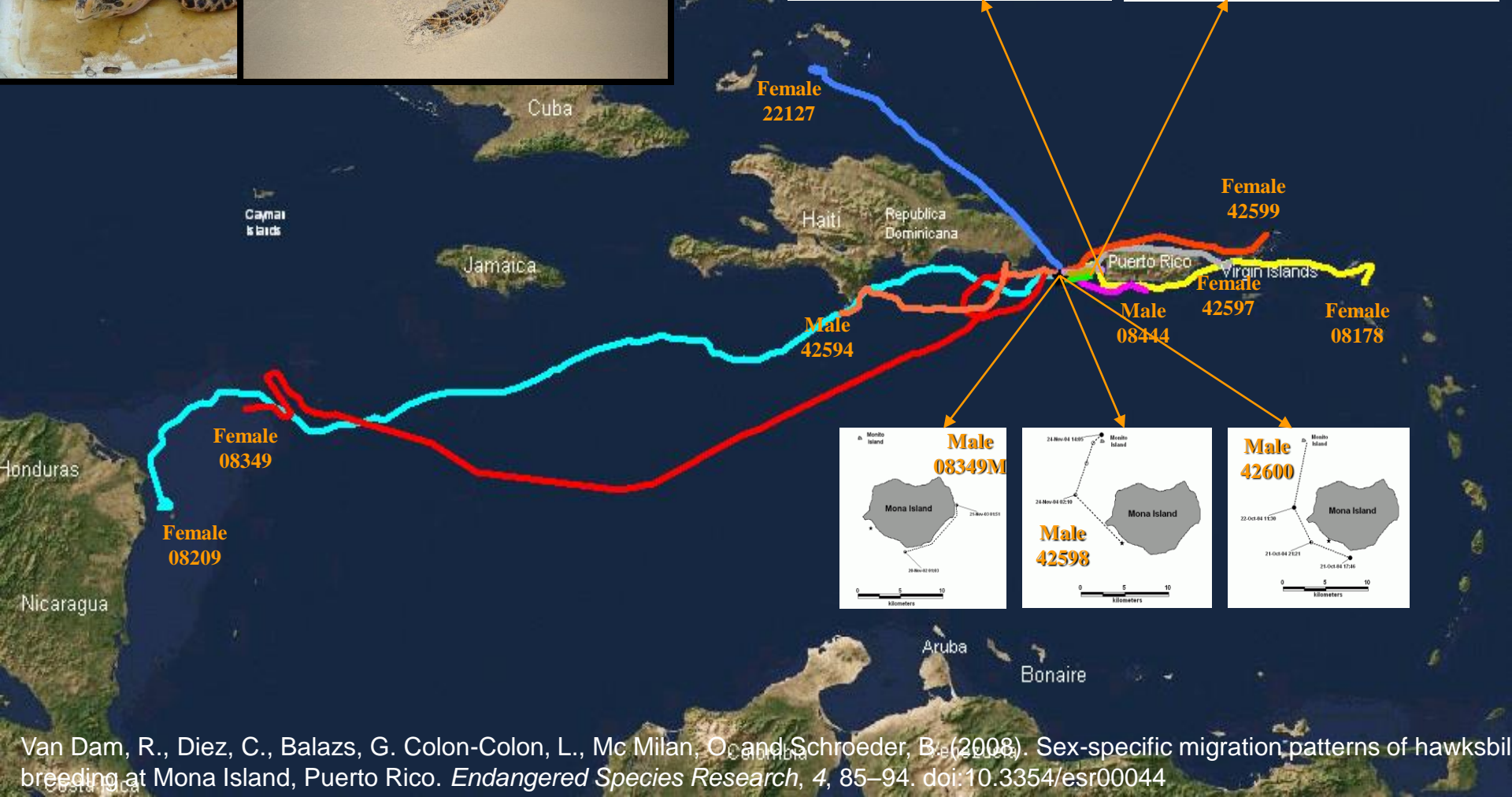
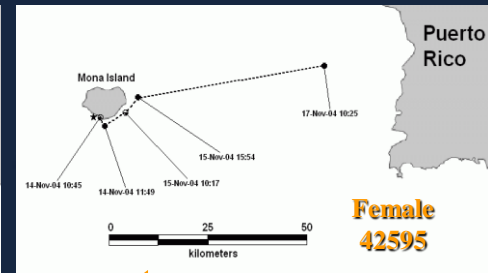
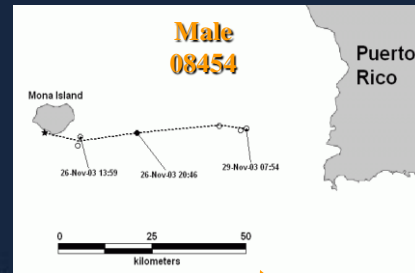
200 adult males tagged
1992 - 2014 (in 2003: 38)

36 individuals recaptured
during 52 recap events
(same individuals caught in up
to 20 different survey years)

Typical 24-hr dive profiles

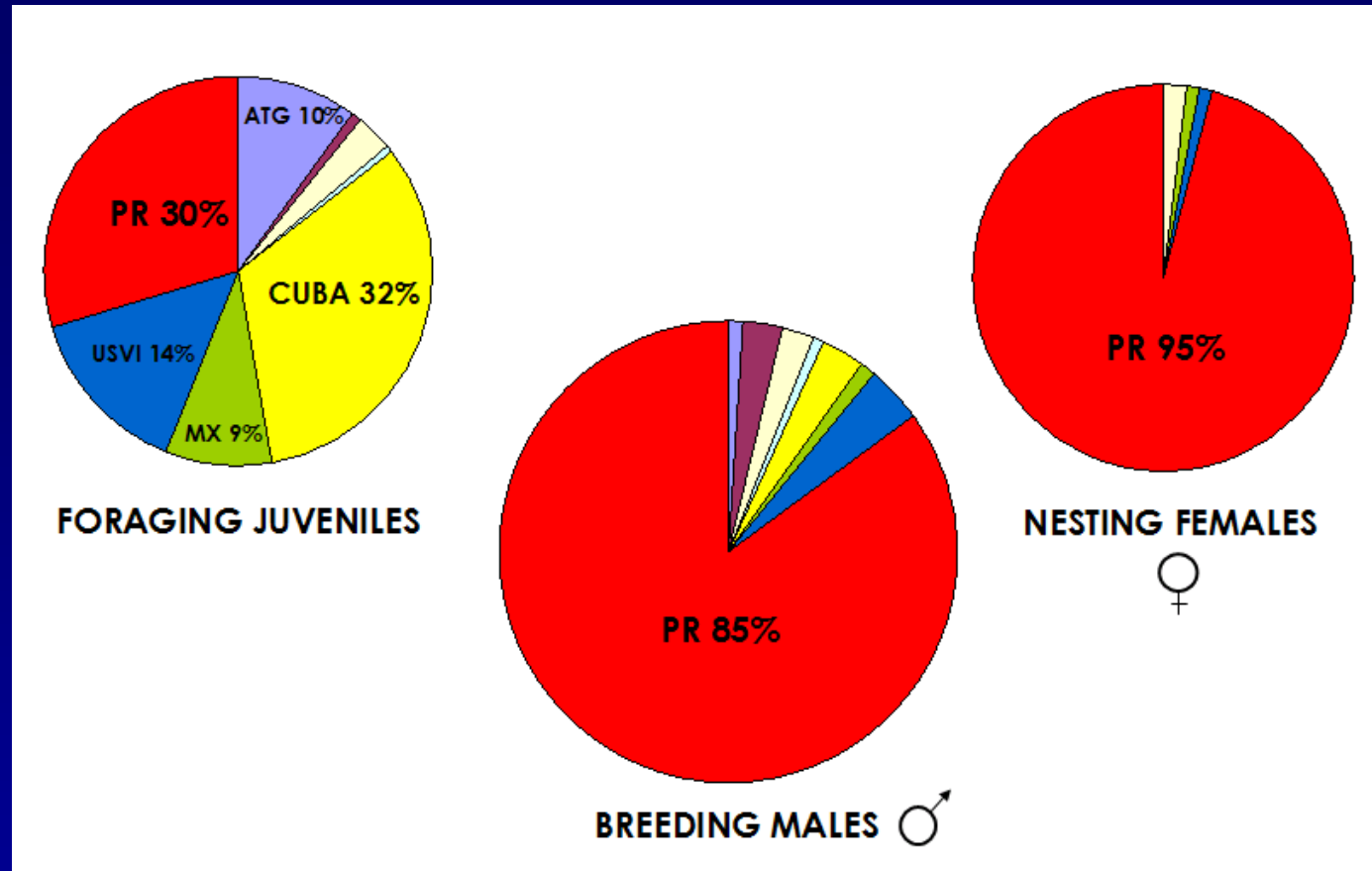


Satellite tracking



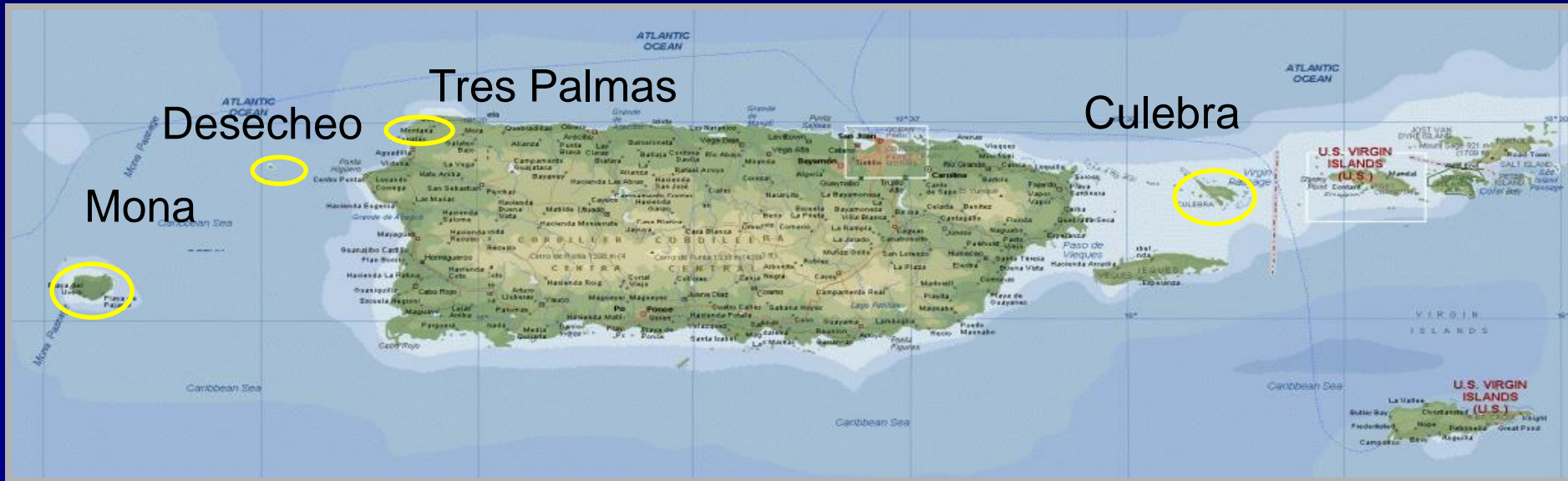
Van Dam, R., Diez, C., Balazs, G. Colon-Colon, L., Mc Milan, O. and Schroeder, B. (2008). Sex-specific migration patterns of hawksbill breeding at Mona Island, Puerto Rico. *Endangered Species Research*, 4, 85–94. doi:10.3354/esr00044

Molecular Studies



Contribution of the Mona Island nesting stock to the male and juvenile aggregations. The nesting population was also calculated for comparison purposes.

Other in-water study areas in critical habitats in Puerto Rico



Mona



Desecheo



Culebra

Case study: Culebra Island



Canal Luis
Peña
Marine
Reserve



Culebrita

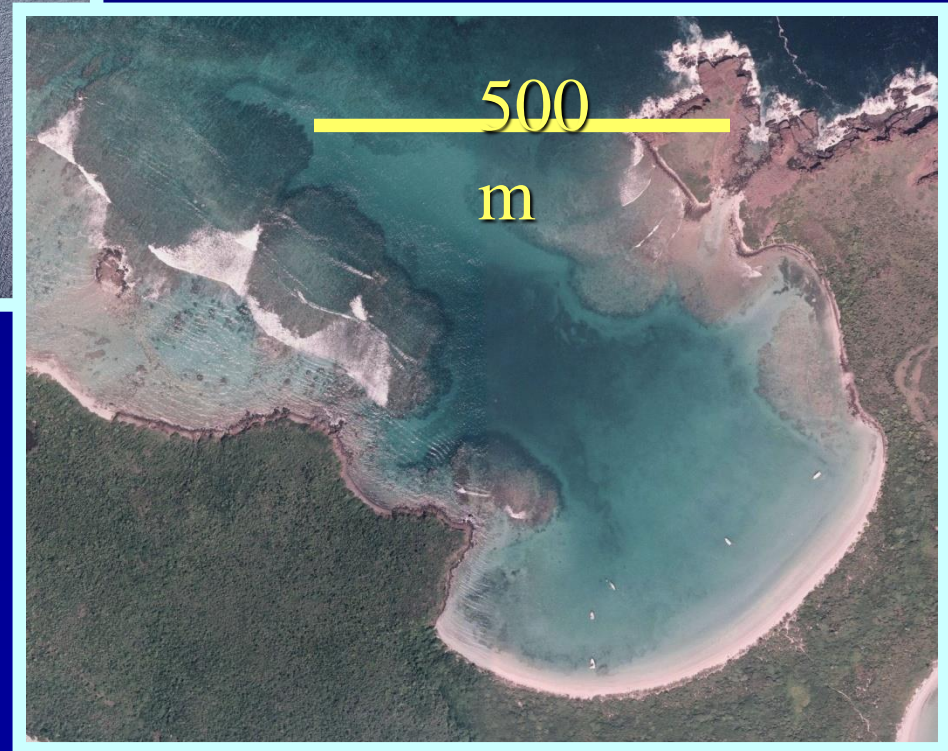
Manglar

Mosquito



Manglar study site

Culebrita study site

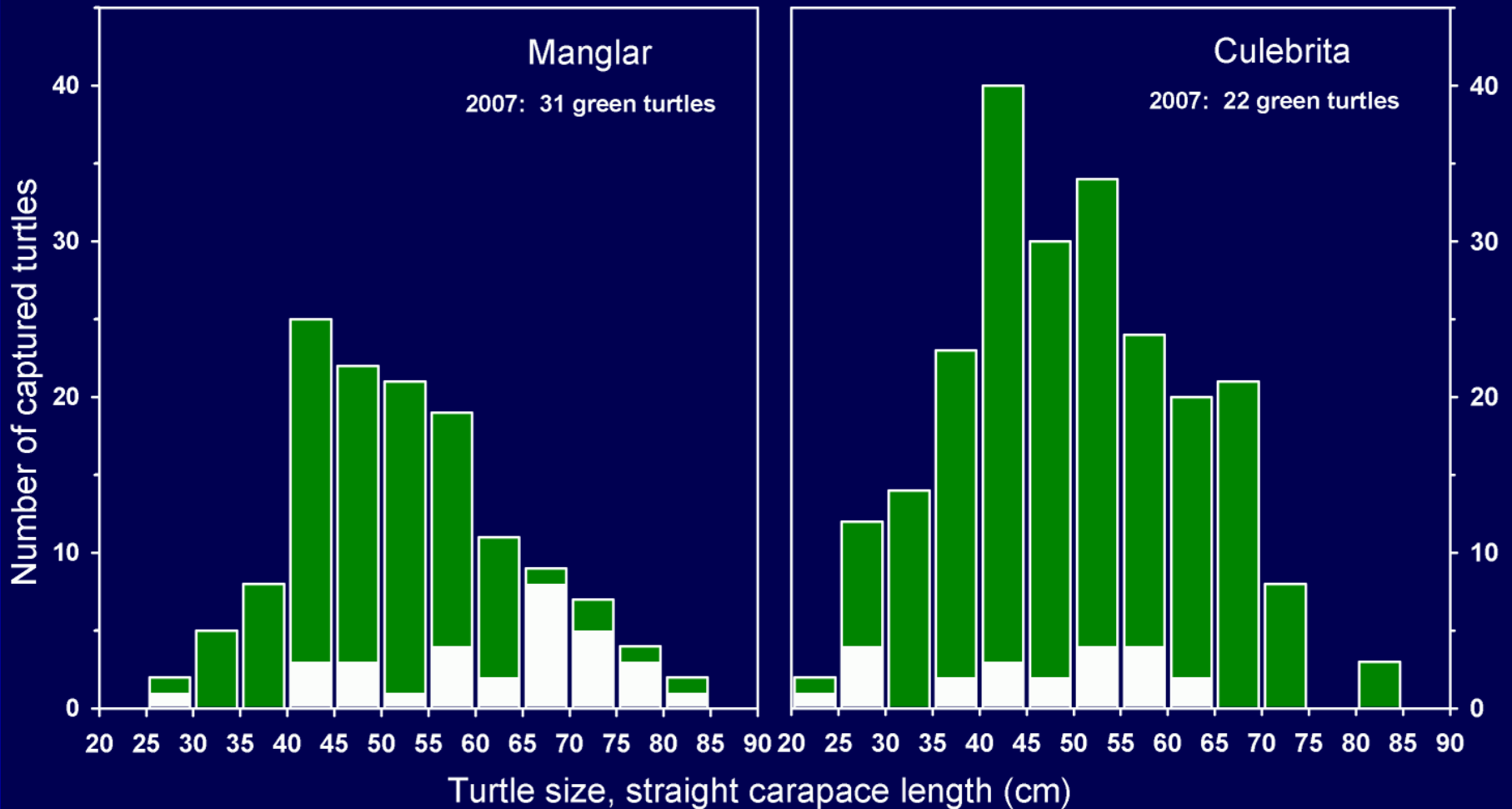


Turtle captures:

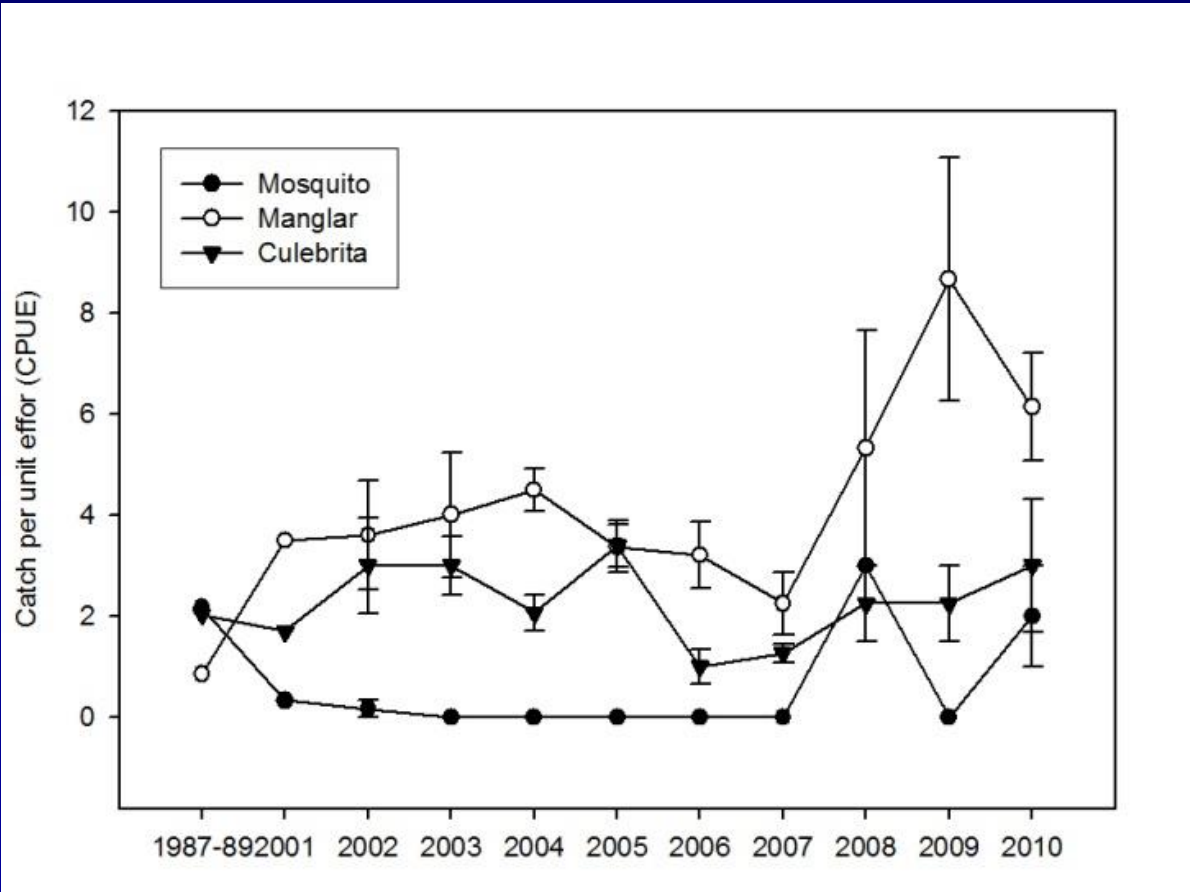
- net-assisted turtle capture
- turtles are tagged, measured, sampled & photographed



Size distribution of green turtles captured at Manglar & Culebrita study sites

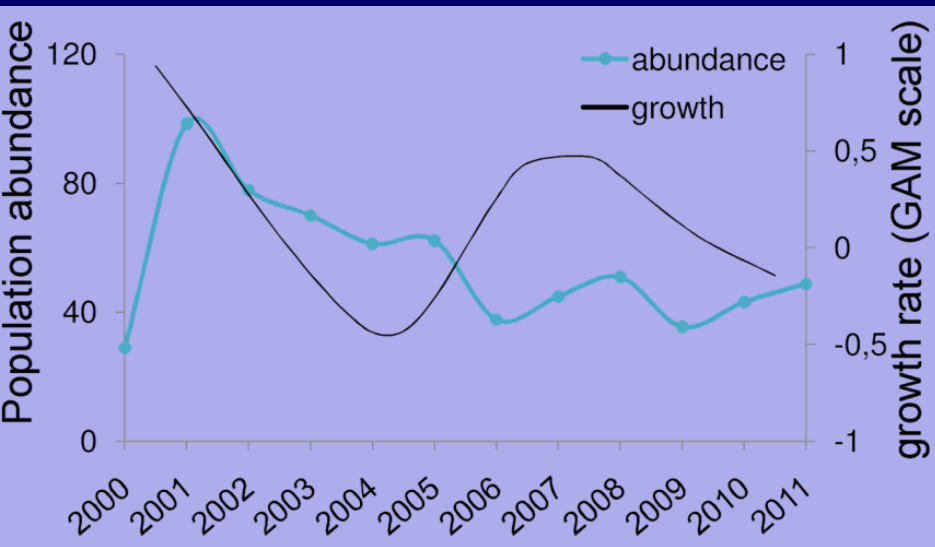


Capture per unit effort for green turtles at three study sites at Culebra Island (1987-89 and 2001-2010).

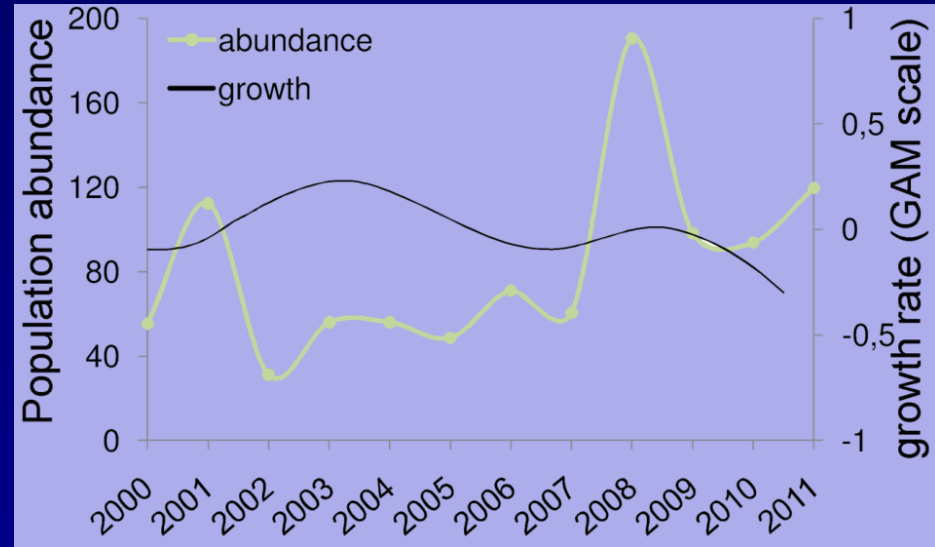


Population dynamics of immature green turtles, *Culebra*

Manglar

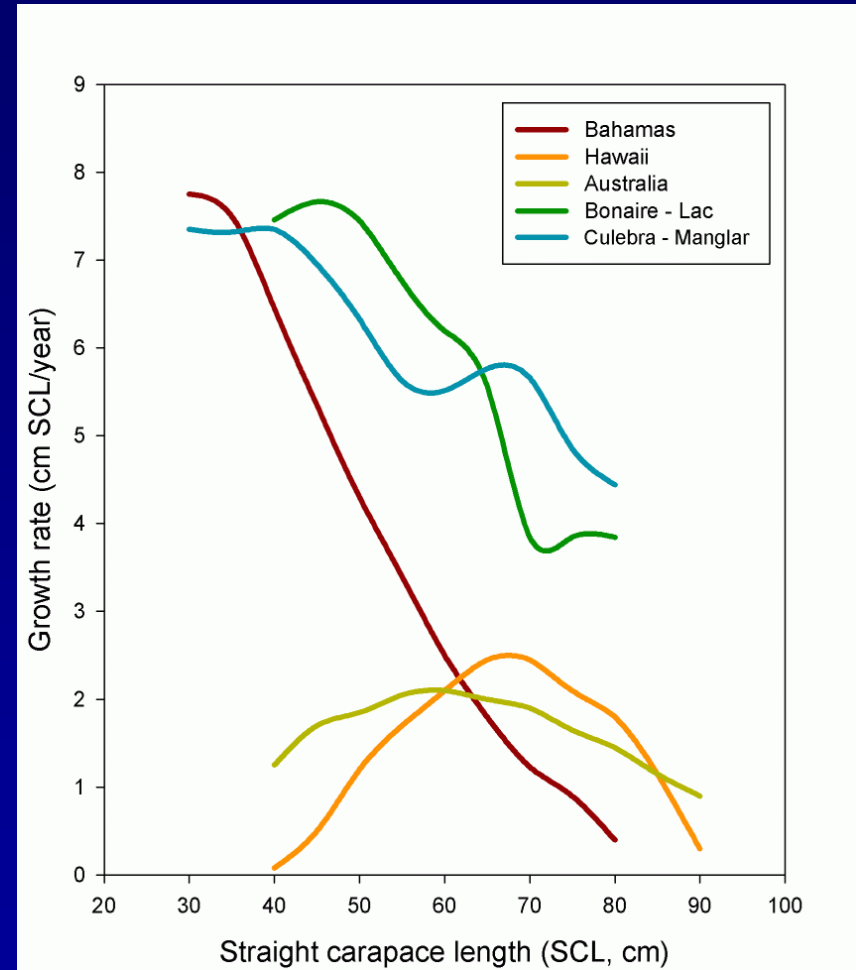
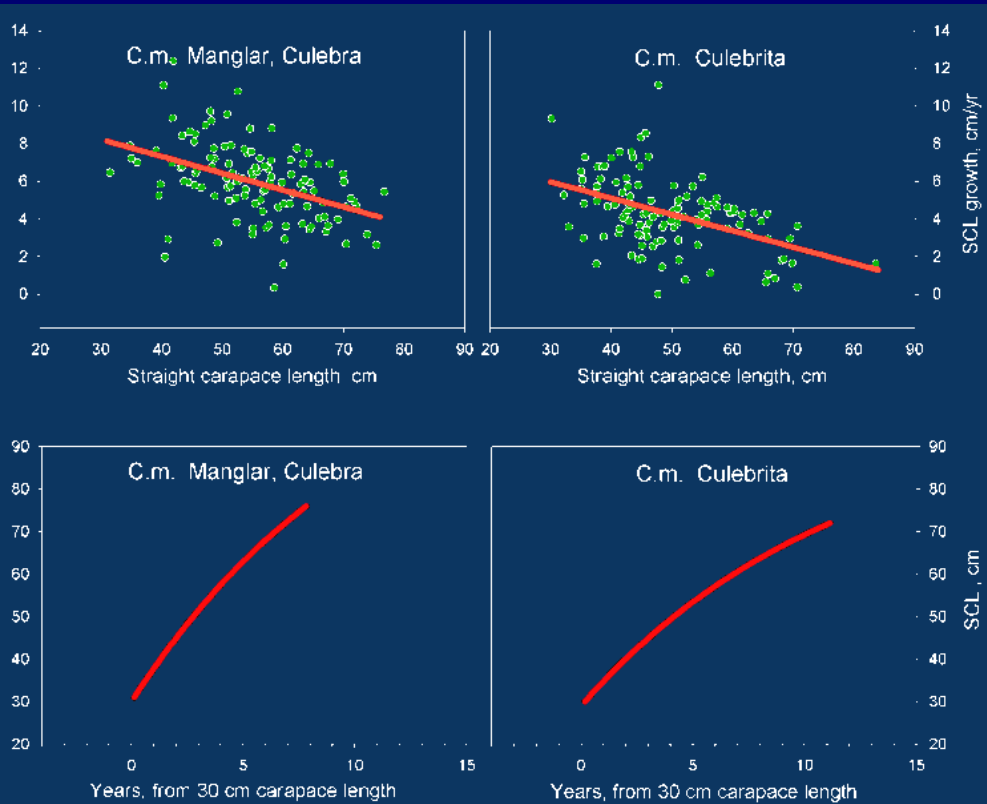


Culebrita



Population abundance at each foraging ground was estimated using recapture probabilities from a Cormack-Jolly-Seber model in a Horvitz-Thompson type estimation and compared with the sampling year specific growth rate function to test for density-dependent growth rates.

Somatic growth rates Manglar & Culebrita study sites





Sonic receiver buoy

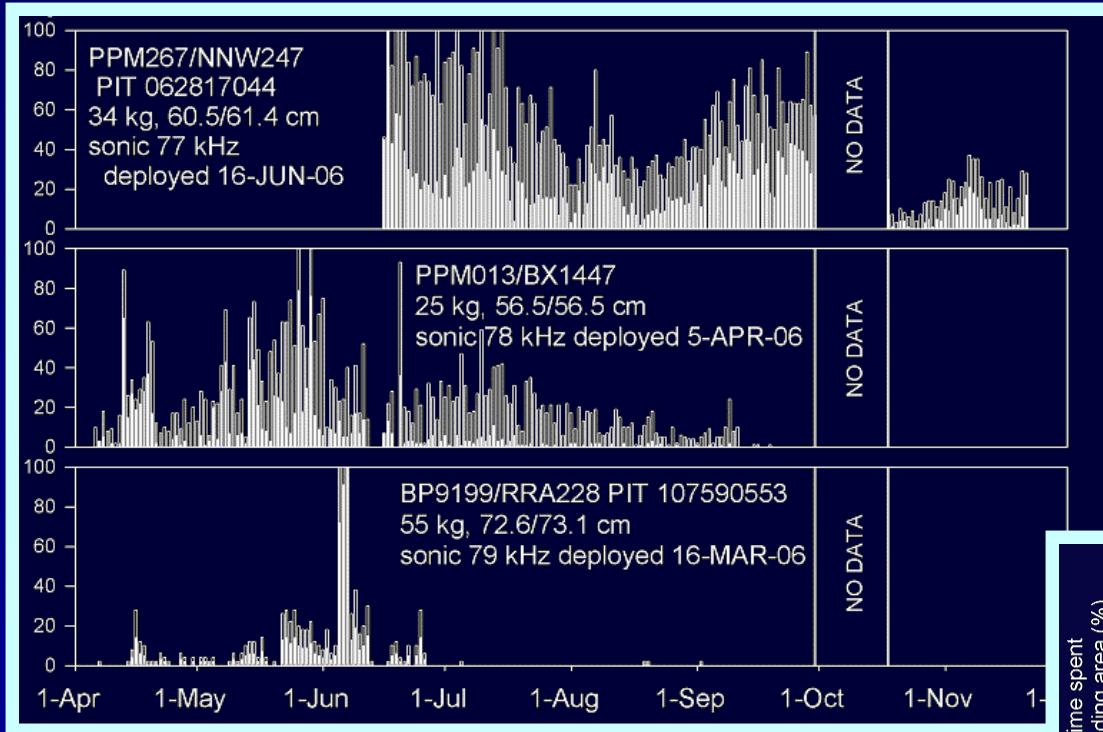


Sonic tag

Sonic tracking behavioral study
Manglar study site

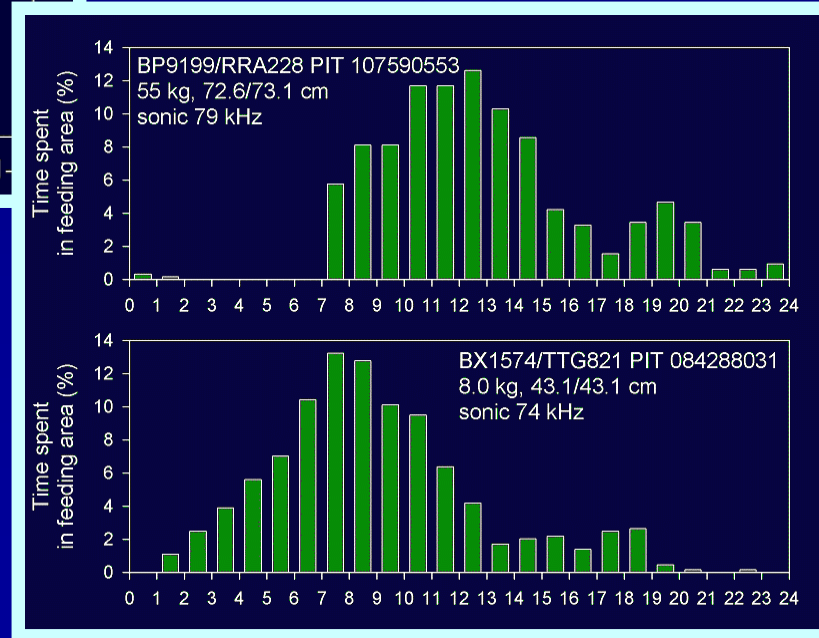
Sonic tracking behavioral study

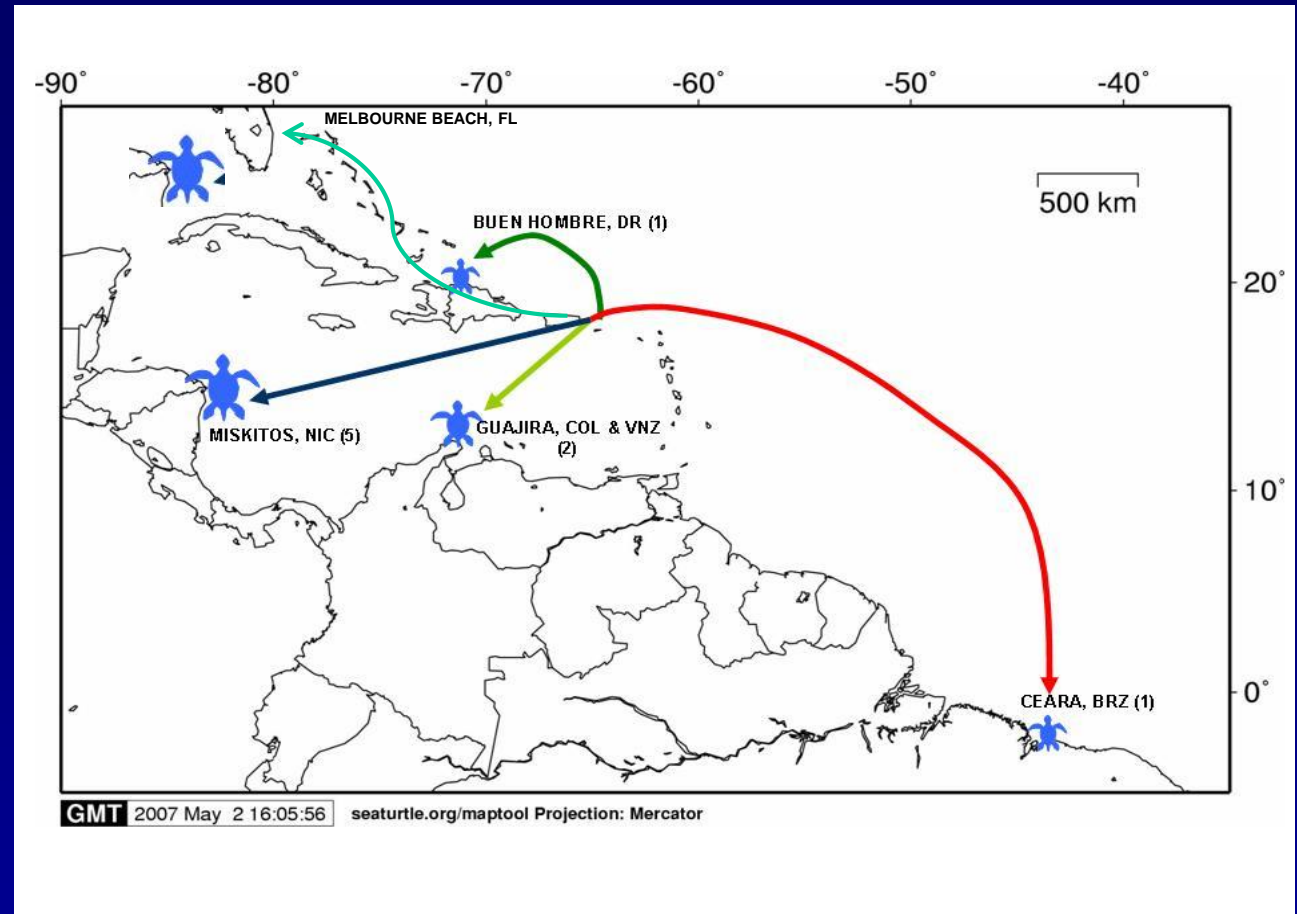
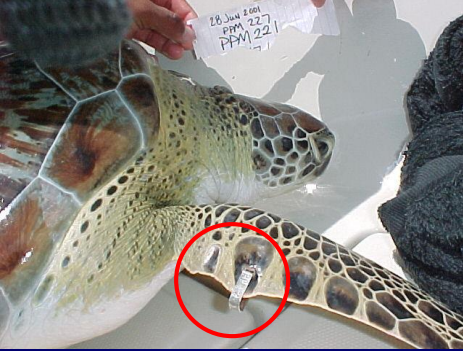
Manglar study site



Timeline presence in foraging habitat

Hourly presence in foraging habitat



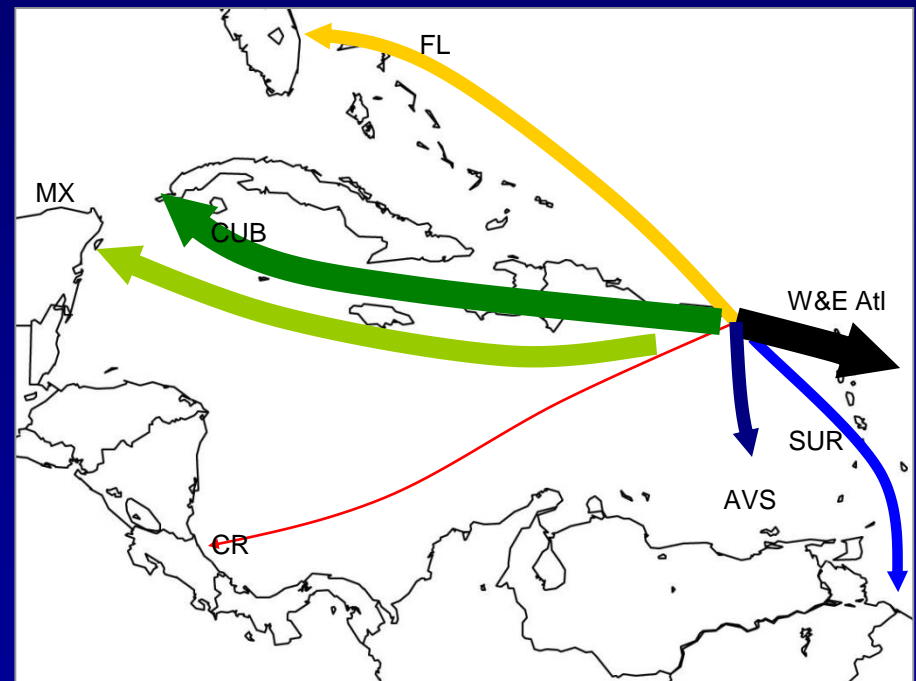
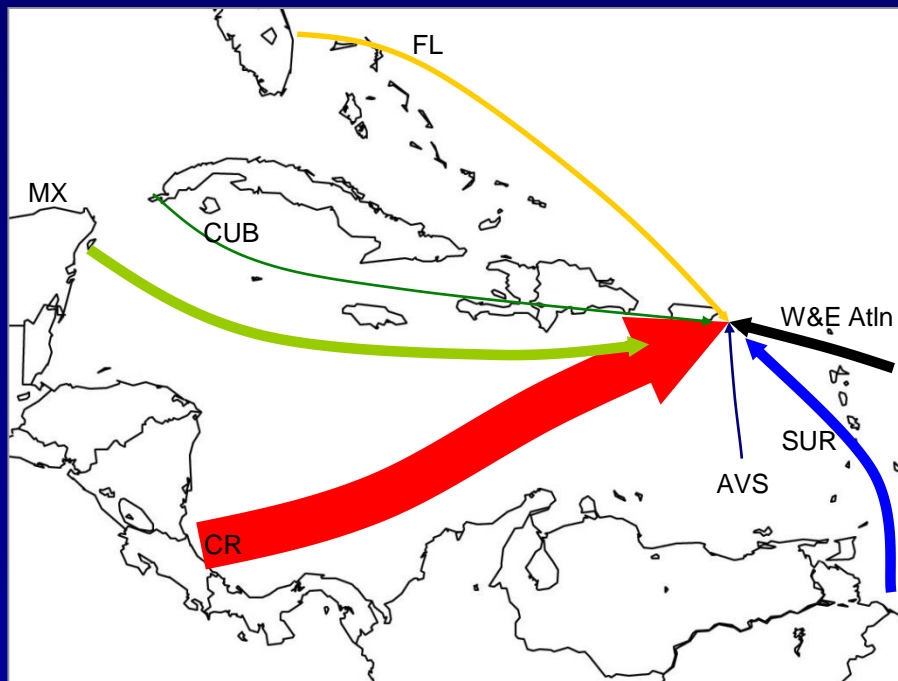


Long-distance tag recoveries for green turtles captured at Culebra Island.

Patricio, A., Velez-Zuazo, X., Diez, C., van Dam, R. and Sabat, A. 2011. (2011). Survival probability of immature green turtles in two foraging grounds at Culebra, Puerto Rico. *Marine Ecology Progress Series*, 440, 217–227. doi:10.3354/meps09337

GENETIC STRUCTURE AND ORIGIN OF A GREEN TURTLE FORAGING AGGREGATION

Origin of green turtle juveniles after genetic analysis using Mixstock (Bolker et. al. 2007)



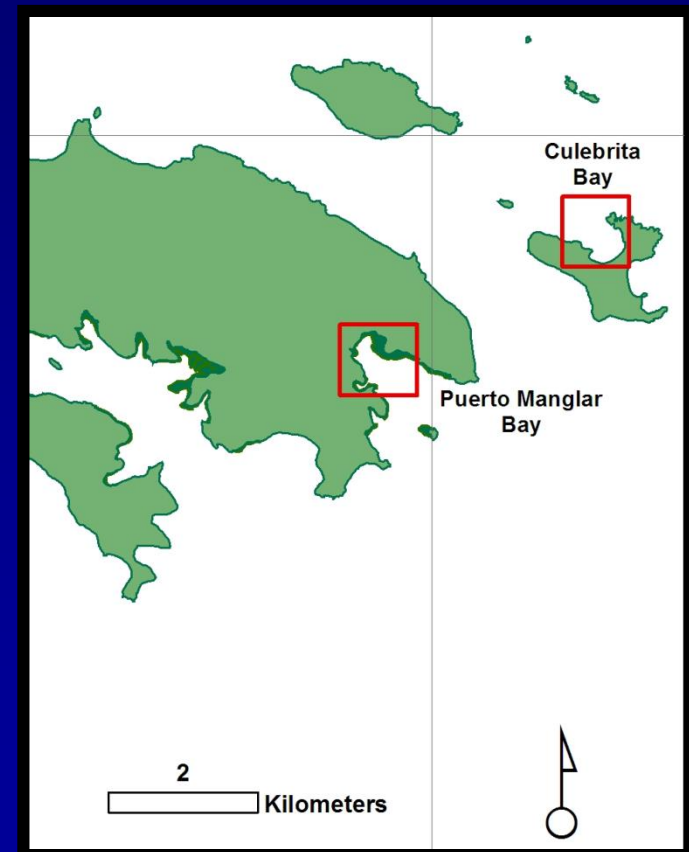
Most likely contribution of the Culebra feeding ground to adult recruitment in the Caribbean and Atlantic estimated by genetic analysis using many-to-many approach using Mixstock

Fibropapillomatosis prevalence in Manglar study site

-57% FP prevalence (2001-2005)

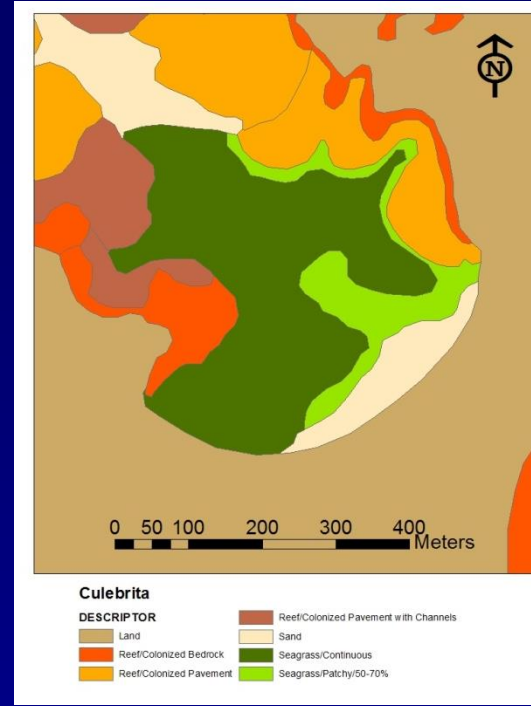
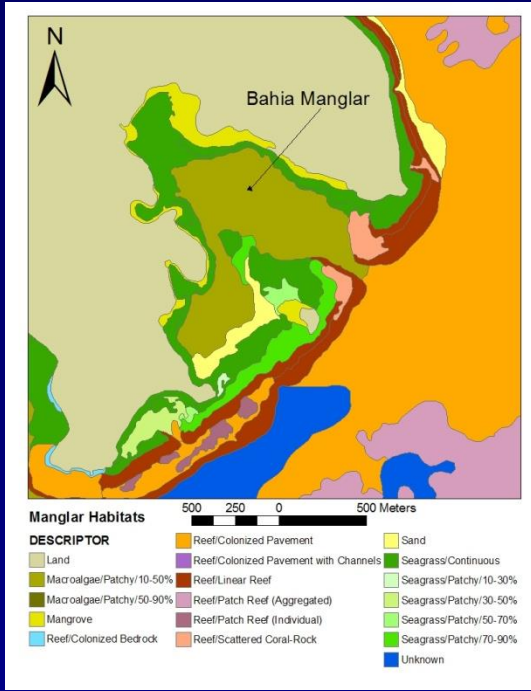
-30% FP prevalence (2006-2007)

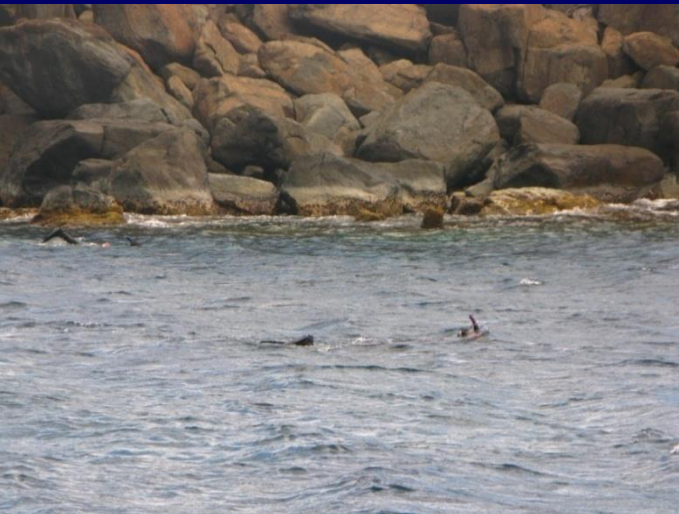
-absent at Culebrita study site





Habitat Characterization





Rincon-Diaz, P., Diez, C., van Dam, R. and Sabat, A. (2011). Foraging Selectivity of the Hawksbill Sea Turtle (*Eretmochelys imbricata*) in the Culebra Archipelago, *Journal of Herpetology*, 45(3), 277–282. doi:10.1670/10-120.1

Rincon-Diaz, P., Diez, C., van Dam, R. and Sabat, A. (2011). Effect of Food Availability on the Abundance of Juvenile Hawksbill Sea Turtles (*Eretmochelys imbricata*) in Inshore Aggregation Areas of the Culebra Archipelago, Puerto Rico Effect of Food Availability on the Abundance of Juvenile Hawksbill Sea Turtles. *Chelonian Conservation and Biology*, 10(2), 213–221.

Continuous rugosity (food and shelter)



Local Threats



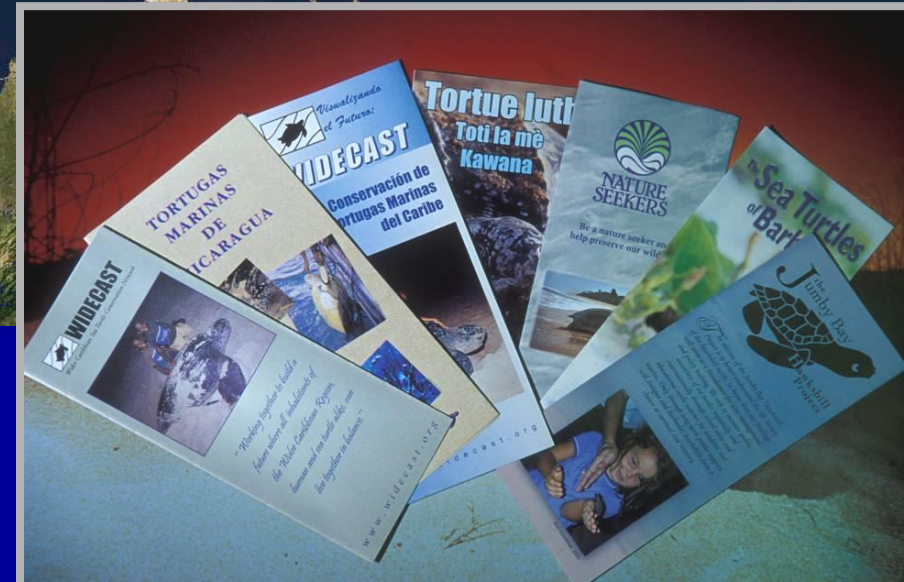


Outreach and workshops



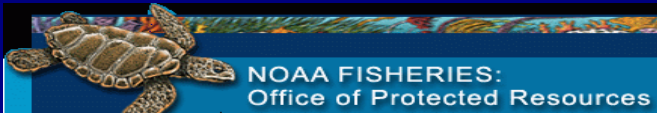
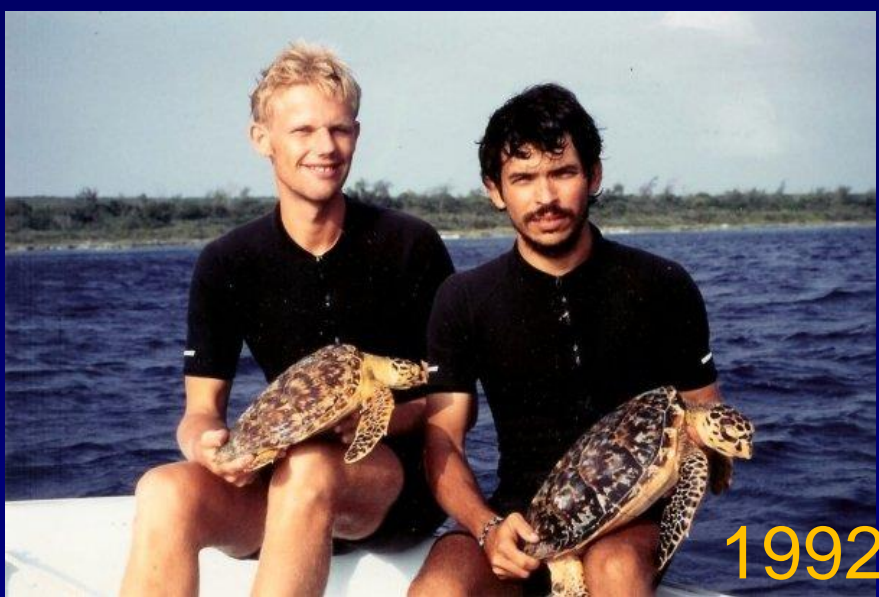
RECOMMENDATIONS:

LOCAL AND REGIONAL CONSERVATION STRATEGIES





Y aquellos de quienes no tenemos fotos pero que ya se las tomaremos



Nicholas Mrosovsky, 1934-2015

