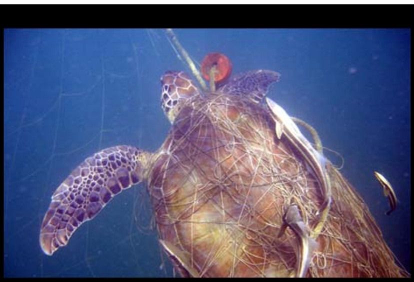


Green turtles in the Gulf of Venezuela

Gaby Montiel-Villalobos
Kate Rodríguez-Clark
Hector Barrios-Garrido
Alberto Abreu-Grobois, Rodrigo Lazo

WIDECAST AGM Baltimore, MD February 2, 2013

Instituto Venezolano de Investigaciones Científicas

- Ecology Center.

- Caracas. Research serving national needs.

My research

I. Zage

G. Guida

G. Hoffman

. Ceballos-Mago

- Conservation biology broadly, conservation genetics specifically.
- Common thread: Venezuelan species threatened by over-exploitation.
- Turtles, alas, included.

Gaby

Overview of PhD finished last fall

The Gulf of Venezuela (GV)

Maracaibo Lake

Chelonia mydas in the GV

- Most important feeding area in Venezuela?
- Many turtles, many sizes.
- Wuayuú traditional use.
- Some tag recaptures.

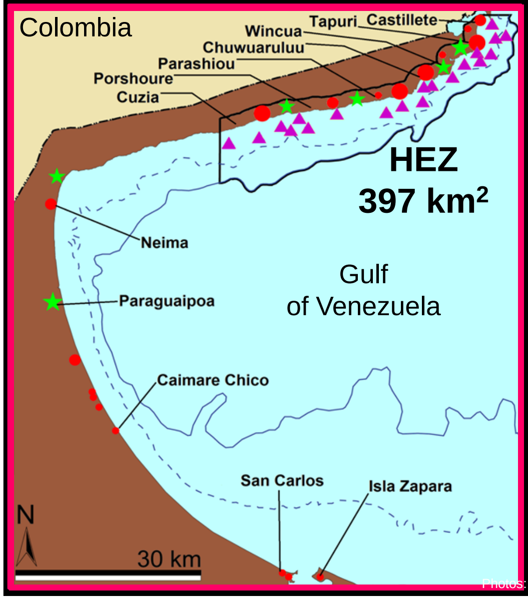
© M.Montiel-Villalobos

Photos: M.G. Montiel-Villalobos; H. Barrios-Garrido

Questions

1. Importance as a feeding area?
2. Relative turtle abundance and factors influencing it?
3. Size structure?
4. Impacts of harvest:
   - Selectivity?
   - Origins of turtles harvested?

Study area: High Extraction Zone



Carcasses (81%) ●

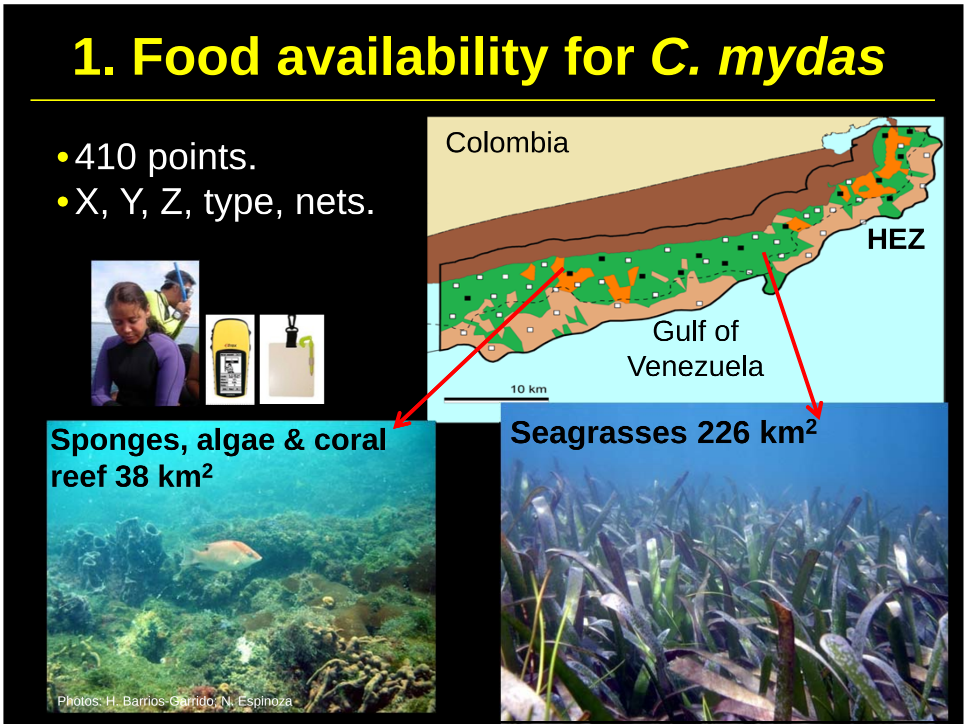
Indigenous ports (7/12)

Markets (4/6) ★

Permanent nets (20) ▲

Depth 10 m ---- 15 m —

Photos: M.G. Montiel-Villalobos; H. Barrios-Garrido; P. Barboza; N. Wildermman.



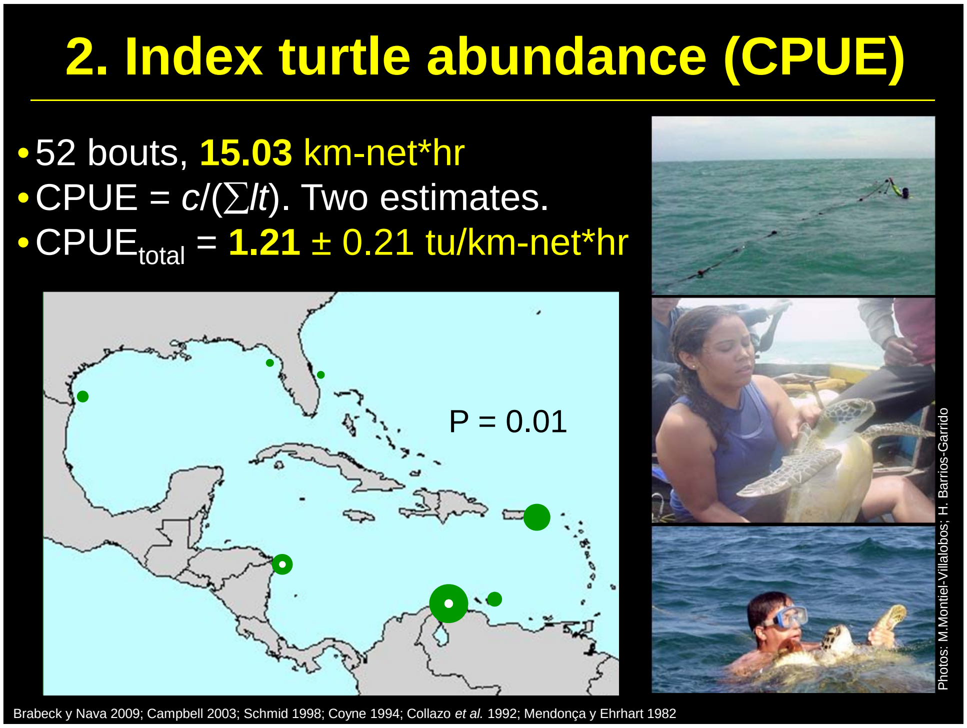
1. Food availability for *C. mydas*

- 410 points.
- X, Y, Z, type, nets.

Sponges, algae & coral reef 38 km^2

Seagrasses 226 km^2

Photos: H. Barrios-Garrido; N. Espinoza



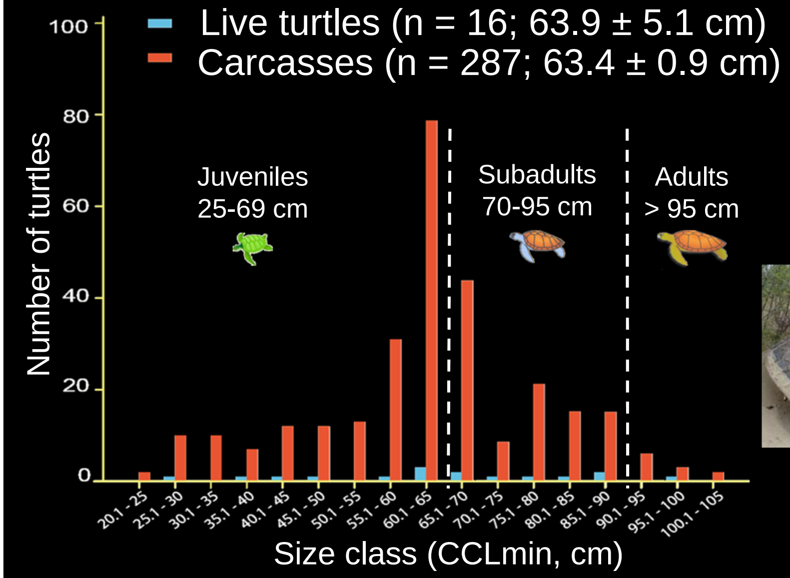
2. Index turtle abundance (CPUE)

- 52 bouts, **15.03** km-net*hr
- CPUE = $c/(\sum lt)$. Two estimates.
- $\text{CPUE}_{\text{total}}$ = **1.21** ± 0.21 tu/km-net*hr

Photos: M.Montiel-Villalobos; H. Barrios-Garrido

Brabeck y Nava 2009; Campbell 2003; Schmid 1998; Coyne 1994; Collazo *et al.* 1992; Mendonça y Ehrhart 1982

3. Size class structure



Photos: H. Barrios-Garrido; N. Espinoza

Campbell 2003; Bjorndal y Bolten 1988

4. Total annual catch & effort

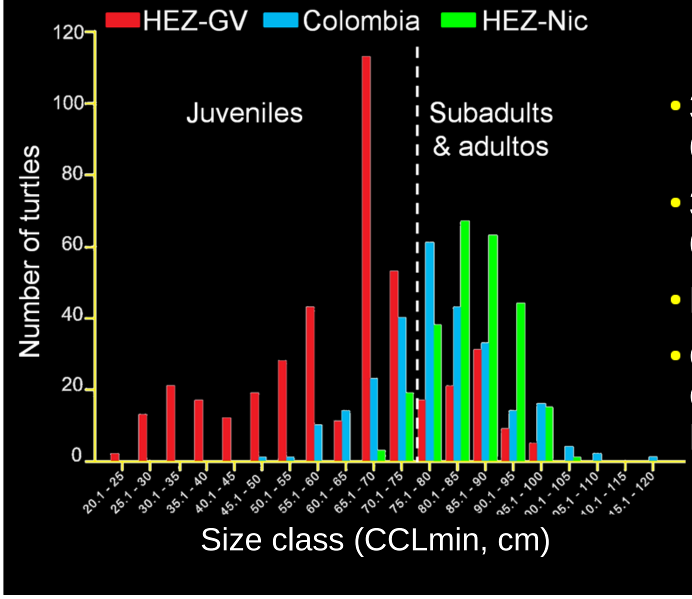
- Interviews: 37 fishers.
- Observations: 38 bouts (20 interviewees).

- # fishers = 103.
- # nets = 264 interv. vs. 142 obs.
- CPUE_i = 0.07 turtle/km-net*hr.
  CPUE_o = 0.08.

Total effort = 44,595 km-net*hr
Annual total catch 3,649 tu/y
vs.11,000 tu/y HEZ-Nicaragua
6,000 tu/y Colombia

Photos: M.G. Montiel-Villalobos; H. Barrios-Garrido

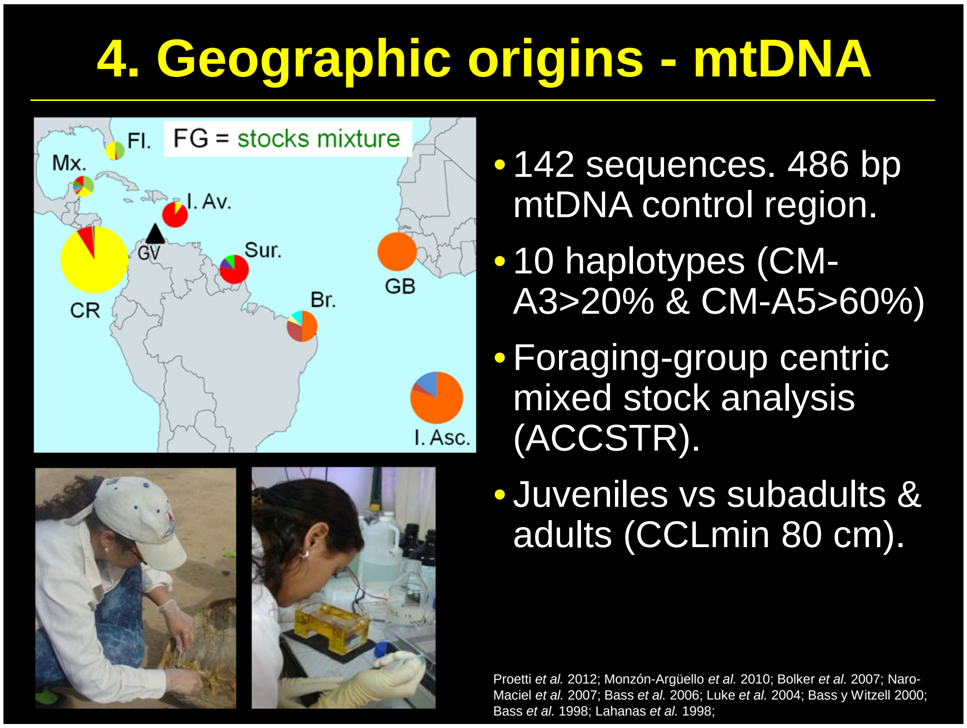
4. Catch selectivity



- 384 carcasses, 64% juveniles.
- 31 captures 65% juveniles.
- Not selective.
- Contrast with Colombia and Nicaragua.

4. Geographic origins - tags

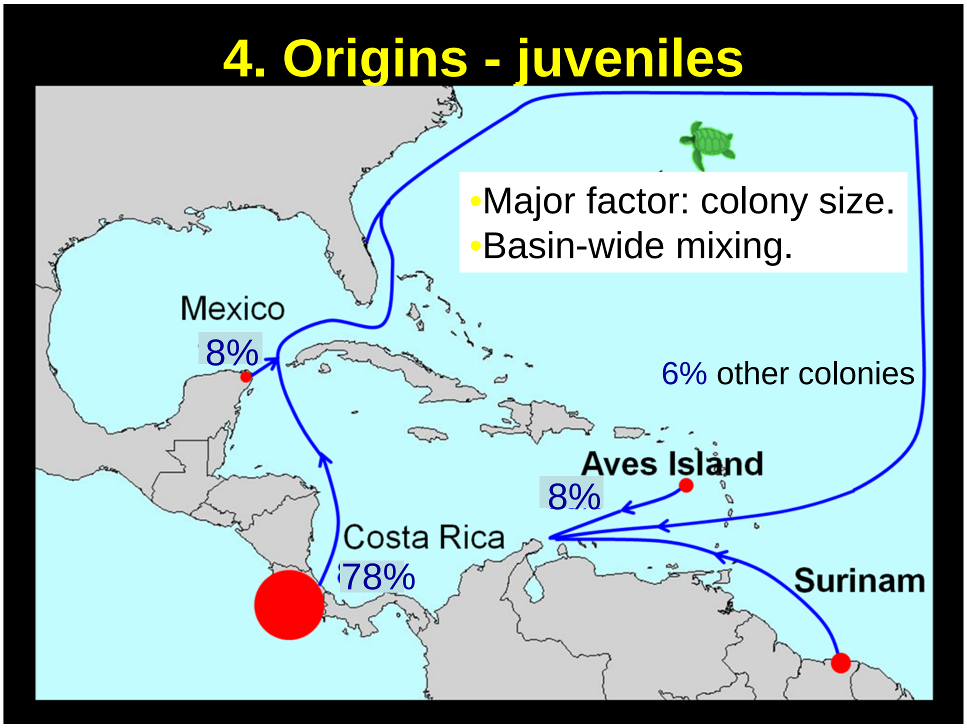
- 33 tags 1997 – 2011.
- Adult females from Costa Rica, Colombia and Aves Island.
- Juveniles from several Caribbean feeding areas.



4. Geographic origins - mtDNA

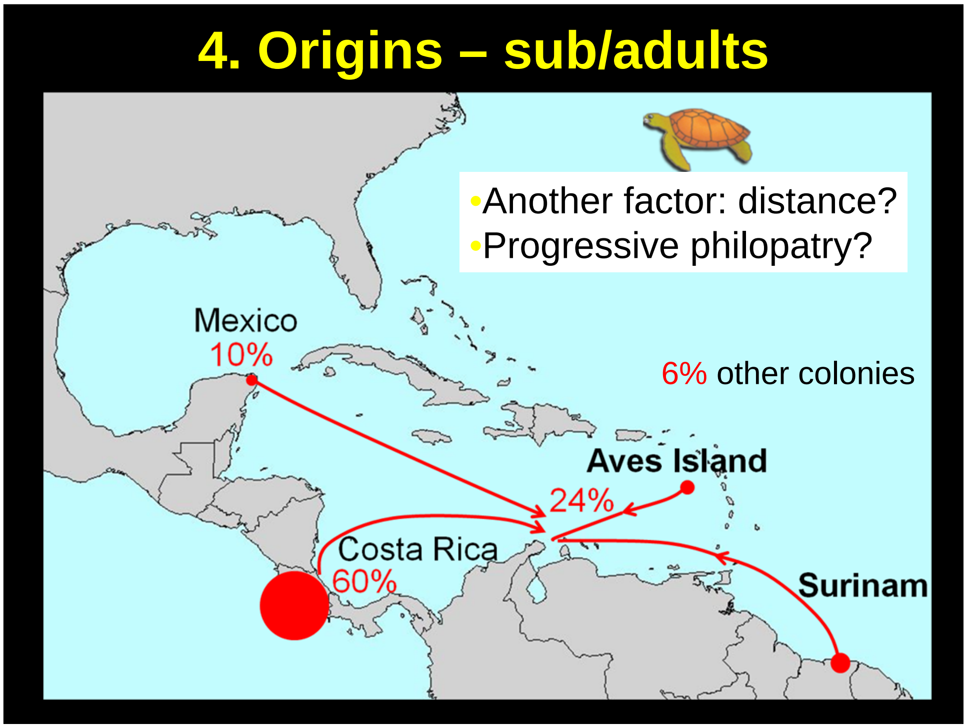
- 142 sequences. 486 bp mtDNA control region.
- 10 haplotypes (CM-A3>20% & CM-A5>60%)
- Foraging-group centric mixed stock analysis (ACCSTR).
- Juveniles vs subadults & adults (CCLmin 80 cm).

Proetti *et al.* 2012; Monzón-Argüello *et al.* 2010; Bolker *et al.* 2007; Naro-Maciel *et al.* 2007; Bass *et al.* 2006; Luke *et al.* 2004; Bass y Witzell 2000; Bass *et al.* 1998; Lahanas *et al.* 1998;



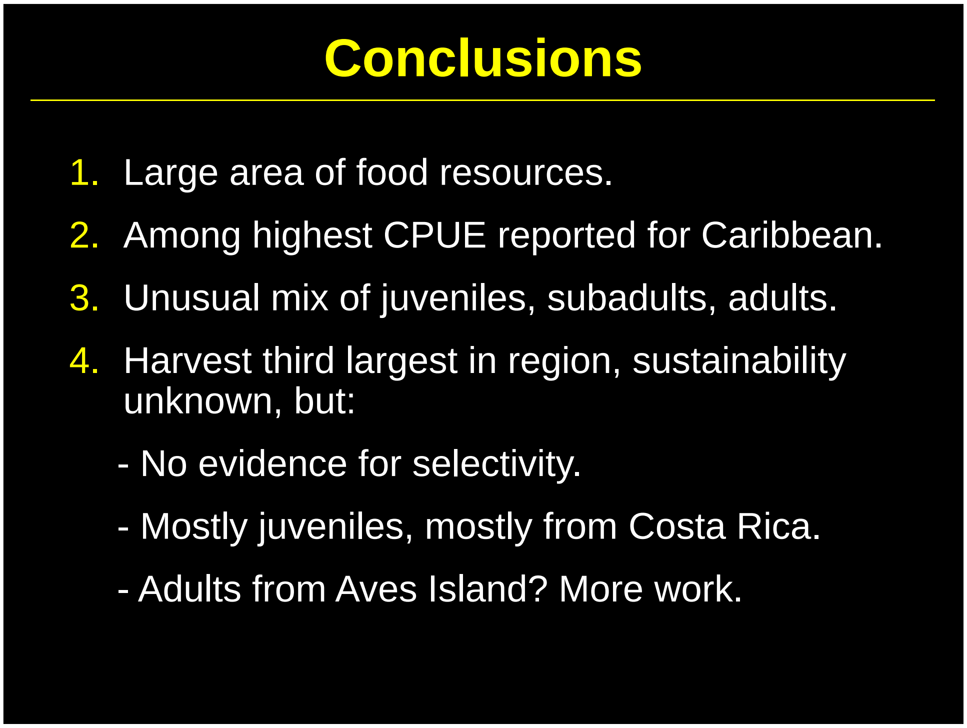
4. Origins - juveniles

- Major factor: colony size.
- Basin-wide mixing.



4. Origins – sub/adults

- Another factor: distance?
- Progressive philopatry?



Conclusions

1. Large area of food resources.
2. Among highest CPUE reported for Caribbean.
3. Unusual mix of juveniles, subadults, adults.
4. Harvest third largest in region, sustainability unknown, but:
    - No evidence for selectivity.
    - Mostly juveniles, mostly from Costa Rica.
    - Adults from Aves Island? More work.

Thanks

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DEL ZULIA

GTTM-GV

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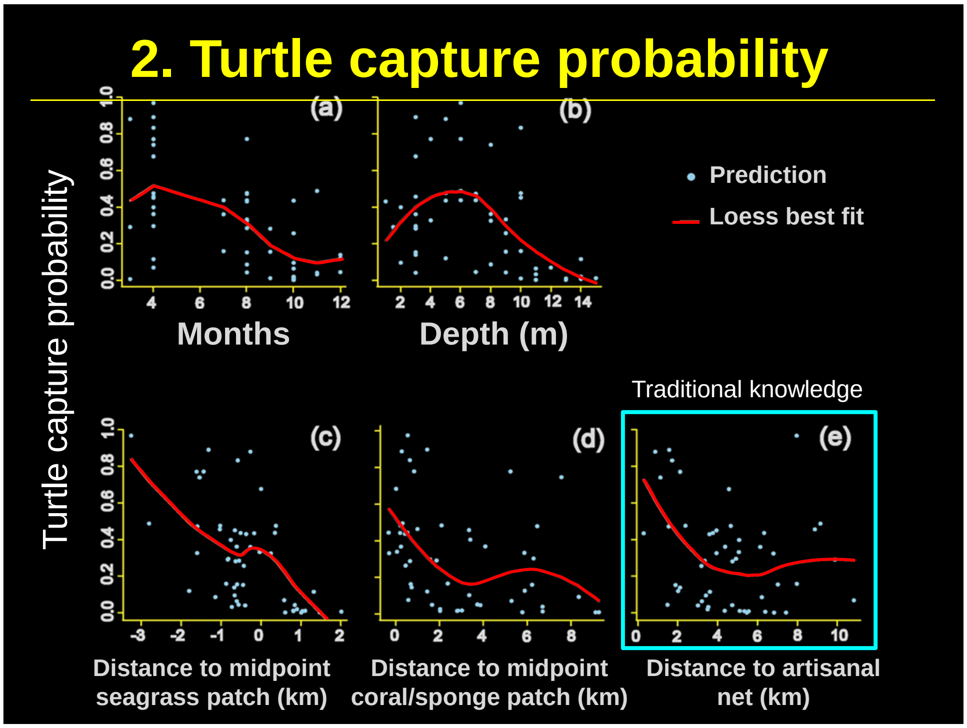
kmrodriguezclark@gmail.com

mmontielv@gmail.com



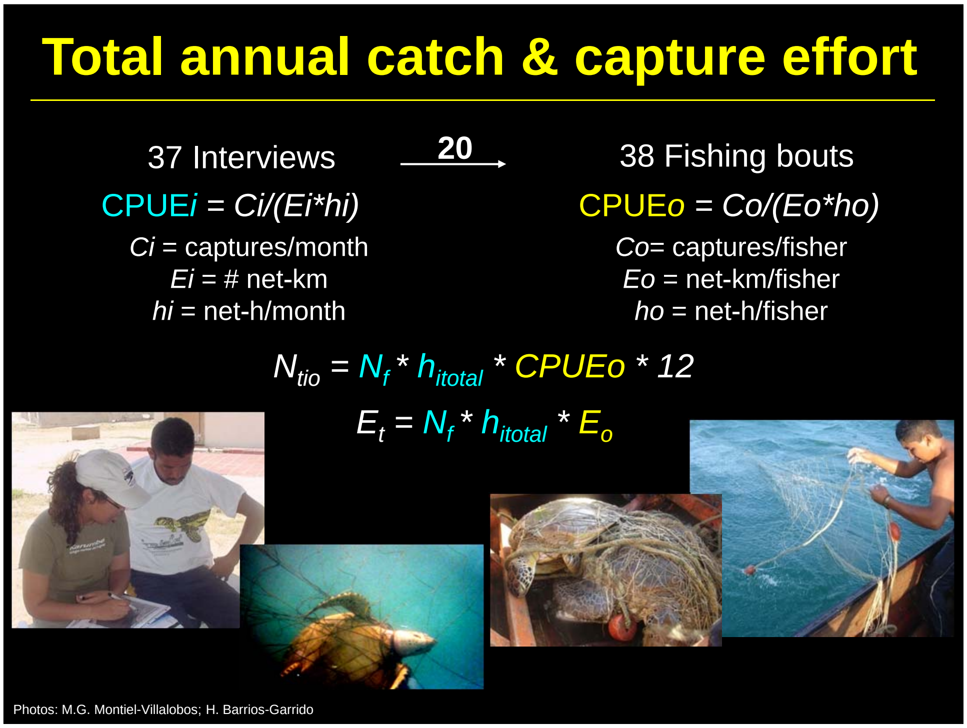
2. Turtle capture probability

Traditional knowledge

4. Catch selectivity & origin

- CCLmin (turtles caught, carcasses)
- Tags obtained opportunistically:
  - method, date & place of capture.
  - Outcome (consumed, sold, released).

Photos: H. Barrios-Garrido



Total annual catch & capture effort

37 Interviews $\xrightarrow{20}$ 38 Fishing bouts

$CPUEi = Ci/(Ei*hi)$

Ci = captures/month
Ei = # net-km
hi = net-h/month

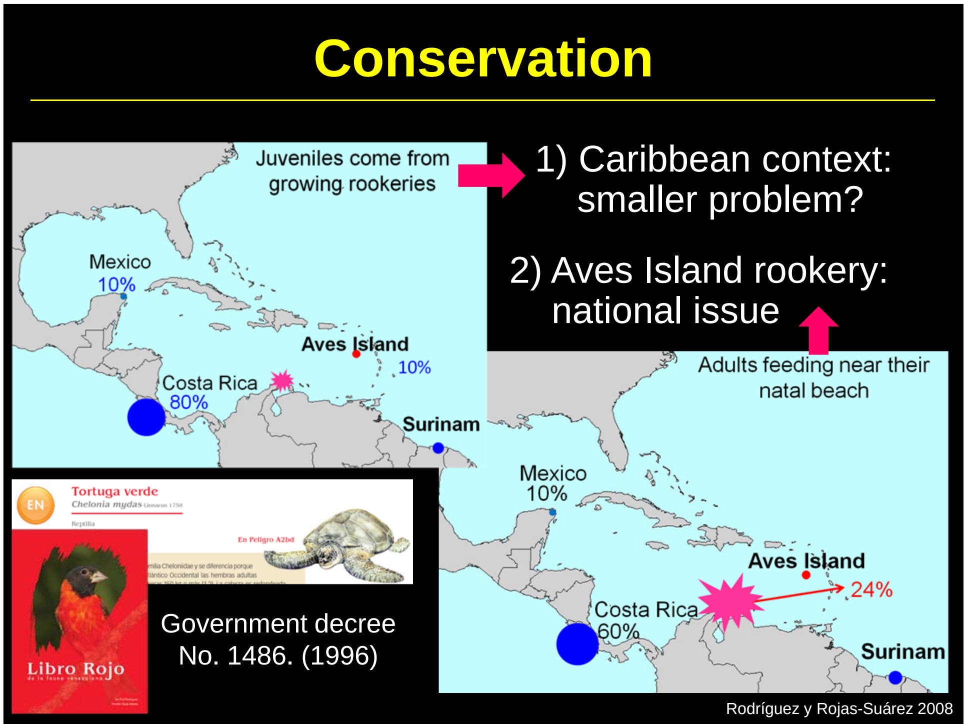
$CPUEo = Co/(Eo*ho)$

Co= captures/fisher
Eo = net-km/fisher
ho = net-h/fisher

$$N_{tio} = N_f * h_{itotal} * CPUEo * 12$$

$$E_t = N_f * h_{itotal} * E_o$$

Photos: M.G. Montiel-Villalobos; H. Barrios-Garrido



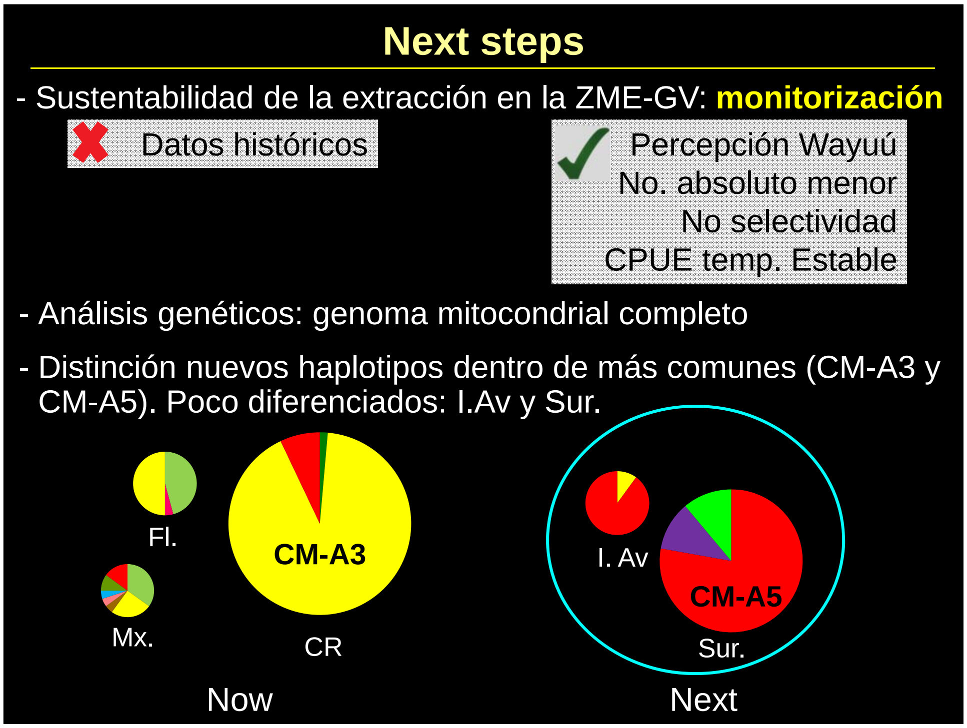
Conservation

1) Caribbean context: smaller problem?

2) Aves Island rookery: national issue

Government decree No. 1486. (1996)

Rodríguez y Rojas-Suárez 2008



Next steps

- Sustentabilidad de la extracción en la ZME-GV: **monitorización**

✗ Datos históricos

✓ Percepción Wayuú
No. absoluto menor
No selectividad
CPUE temp. Estable

- Análisis genéticos: genoma mitocondrial completo
- Distinción nuevos haplotipos dentro de más comunes (CM-A3 y CM-A5). Poco diferenciados: I.Av y Sur.