Why SPAs (Marine Reserves) are Necessary for the Sustainable Management of Queen Conch in the Florida Keys (and elsewhere)

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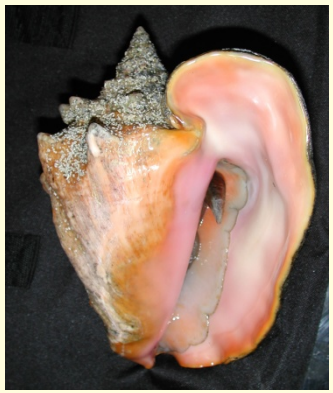
The Questions

How can Conch Biology Guide us to Develop Sustainable Management Approaches?

(traditional fishery methods, ecosystem-based methods such as MFRs)

Does Existing Zoning within FKNMS Protect Conch should a limited recreational fishery be opened?

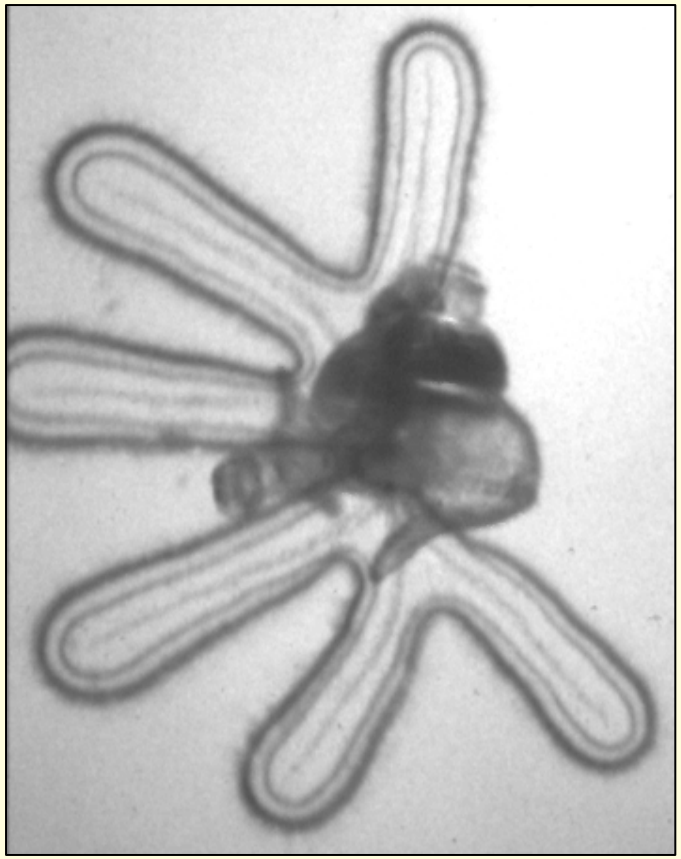


The Fishery has Been Closed Since 1986

The First Order of Business:

Where do the Larvae Come from?

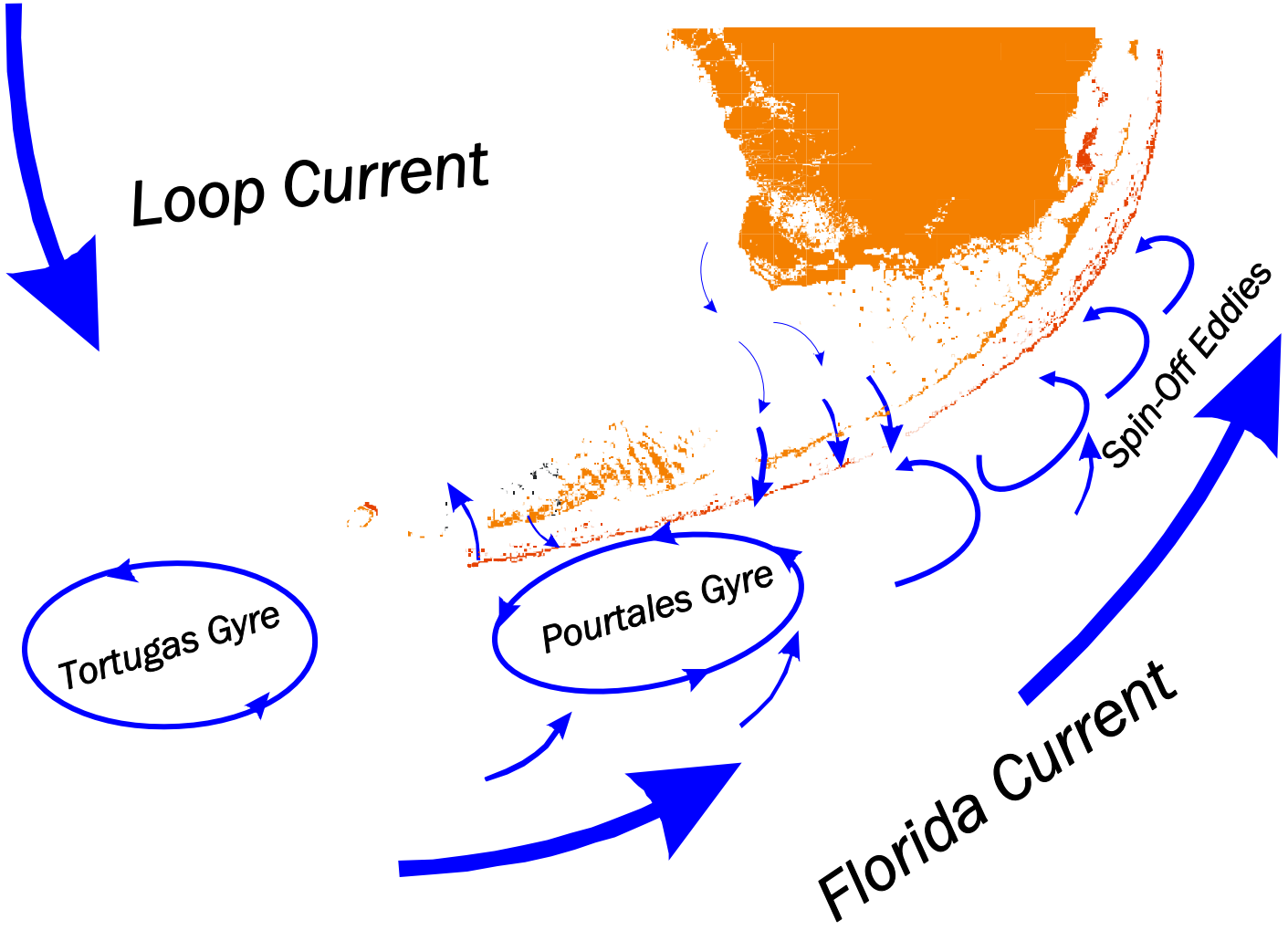
- Plankton Surveys
- Drift Vials

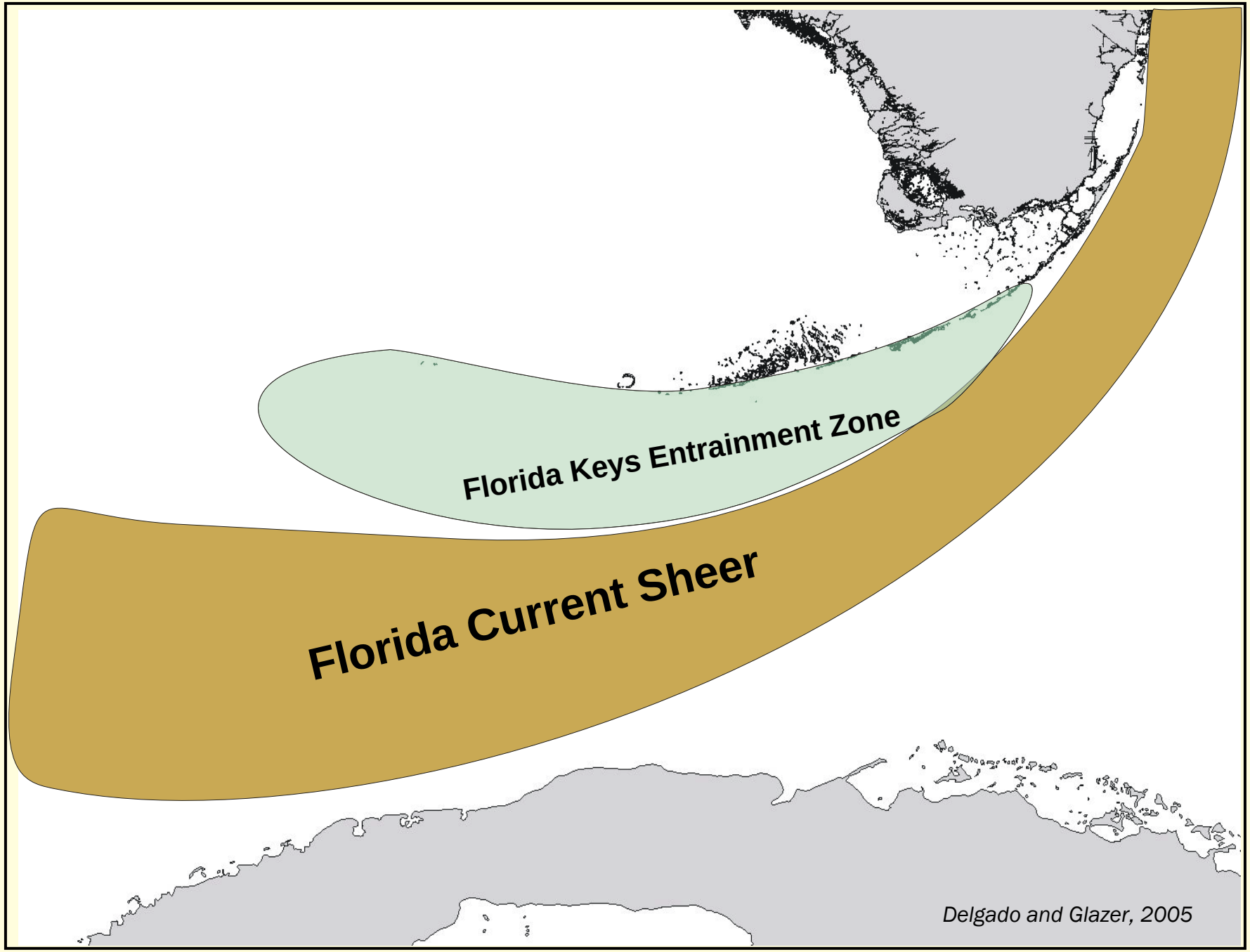


In Concert With:

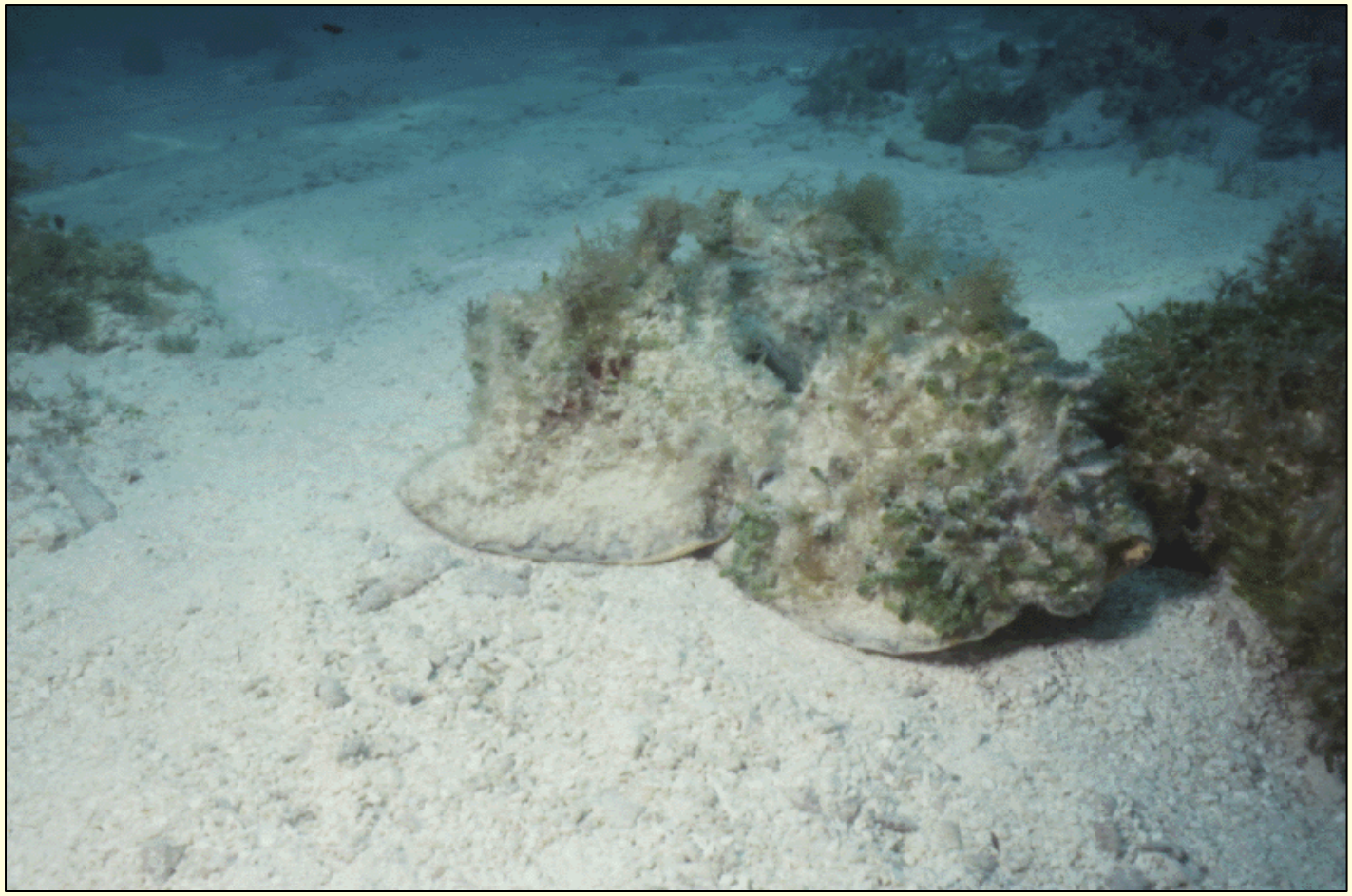
- Satellite Imagery
- Drifters
- Hydrodynamics
- Patterns in population recovery

The Oft-Cited Synthetic Model

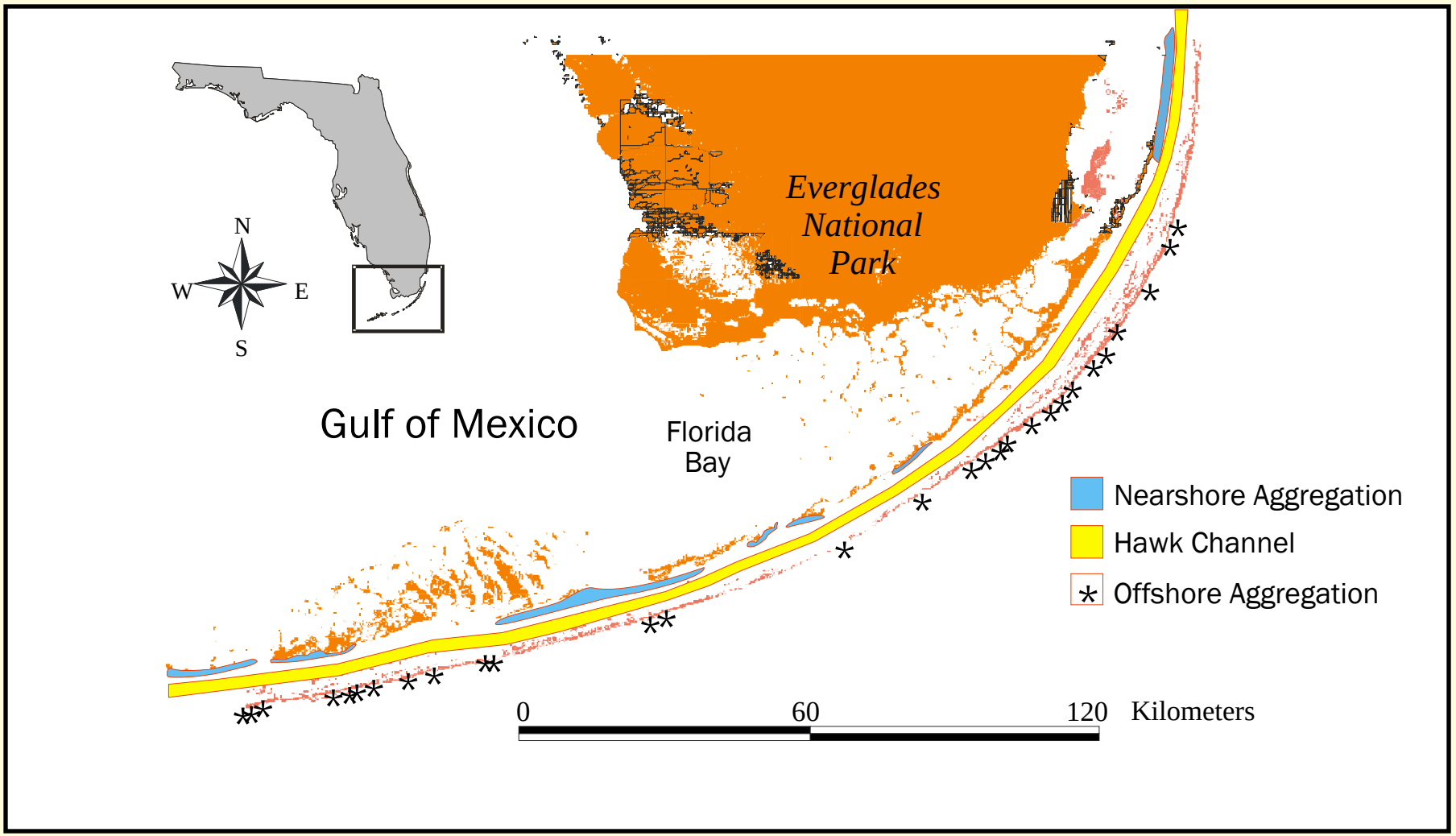



Florida Keys Entrainment Zone
Florida Current Sheer
Delgado and Glazer, 2005

Focus of Surveys on Reproductive Behavior

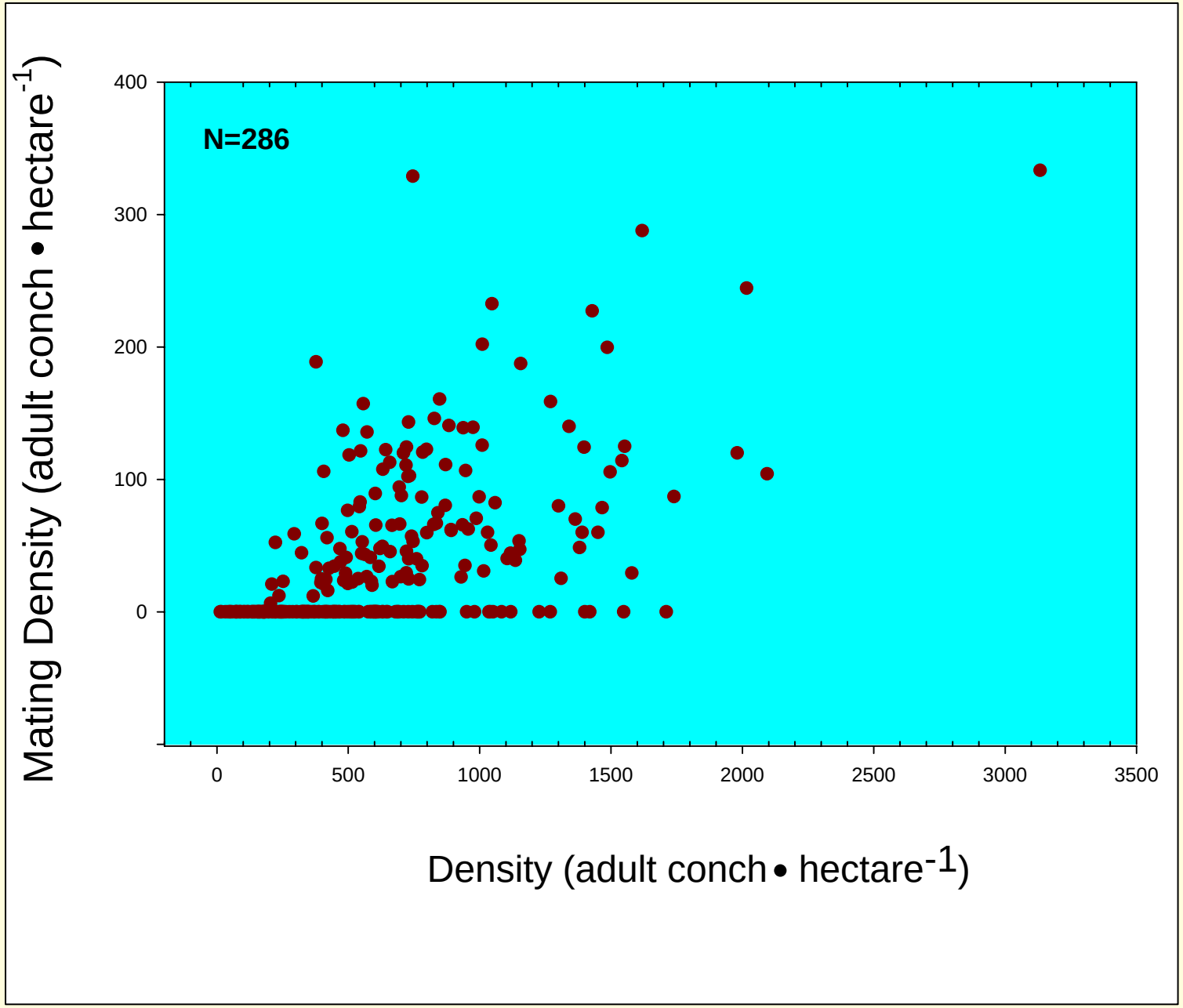


Conch Distribution

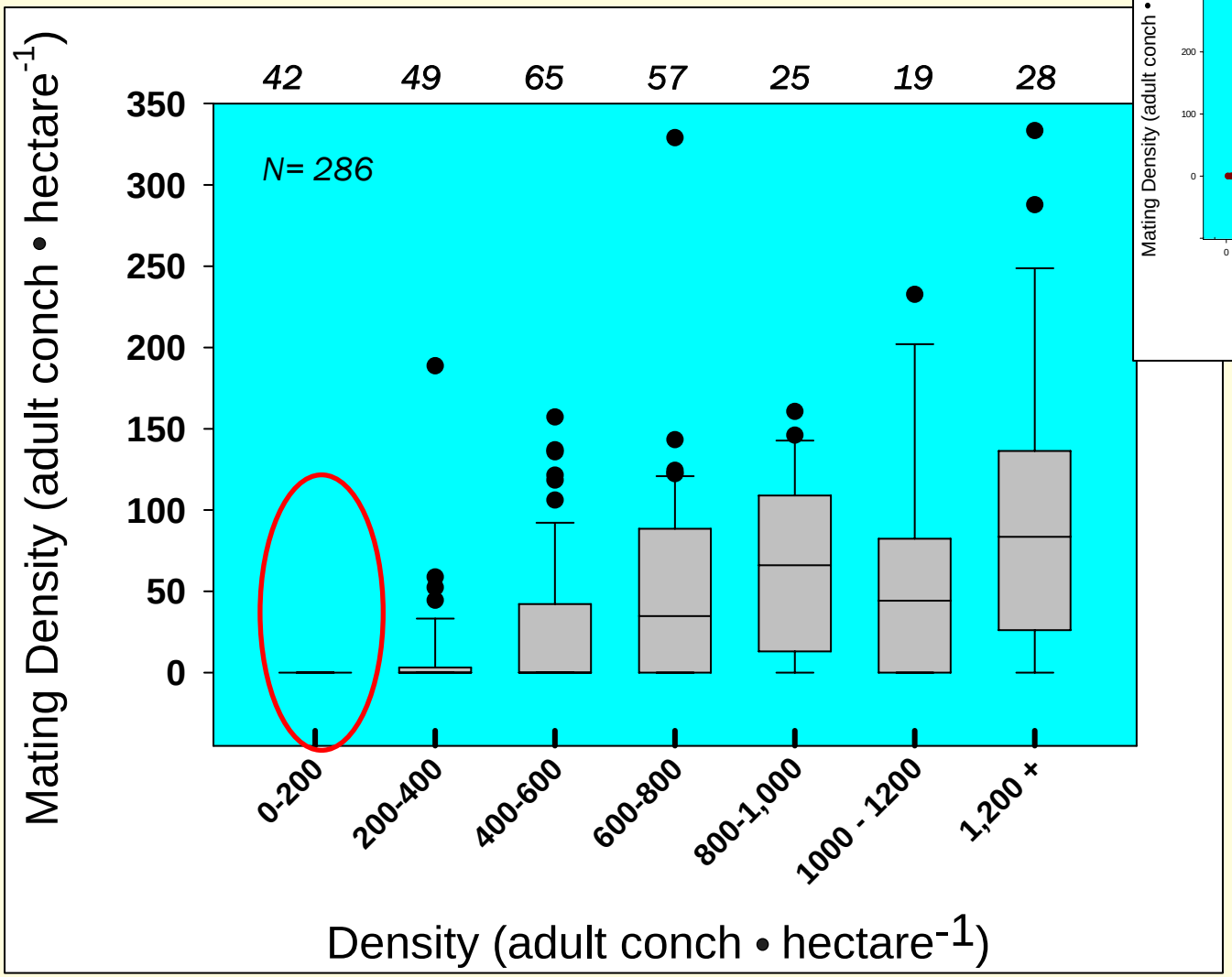


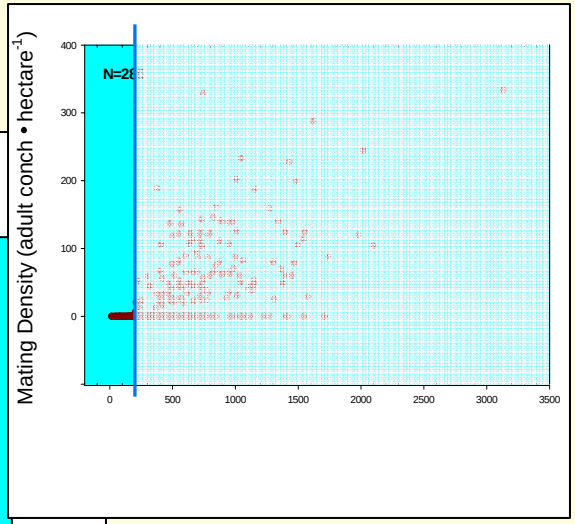
Surveying the Aggregations

- Density of Adults
- Density of Spawning Conch

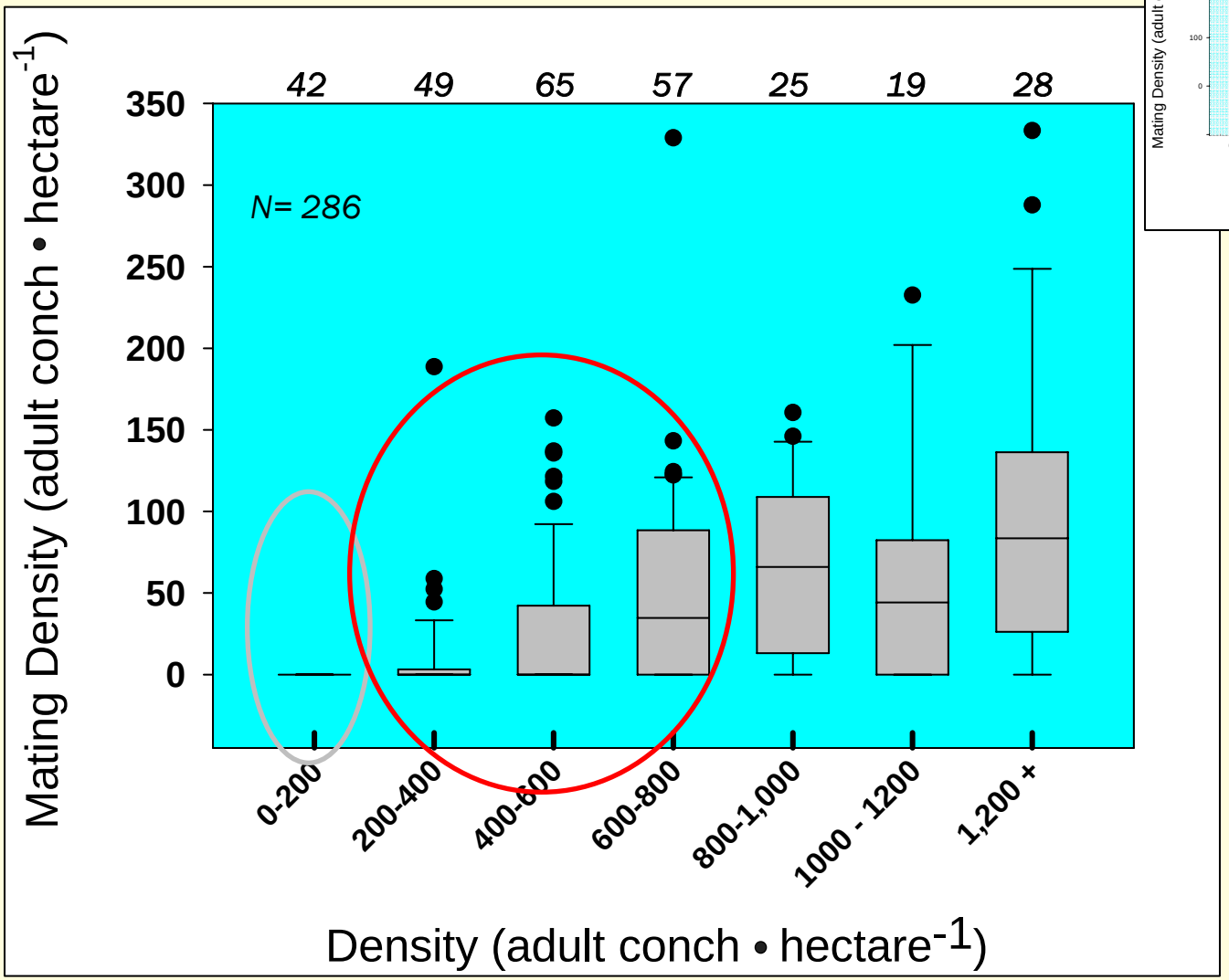

N=286
Mating Density (adult conch • hectare-1)
Density (adult conch • hectare-1)
400
300
200
100
0
0
500
1000
1500
2000
2500
3000
3500

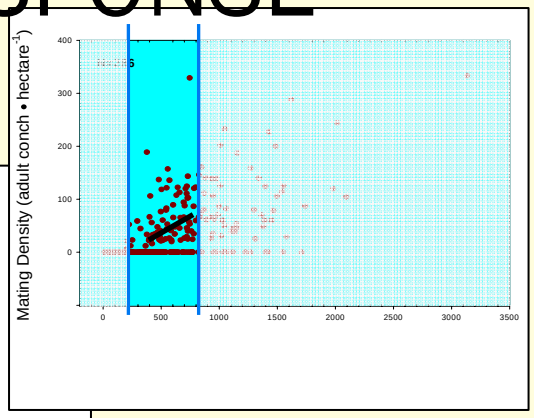
DEPENSATION AT LOW DENSITIES



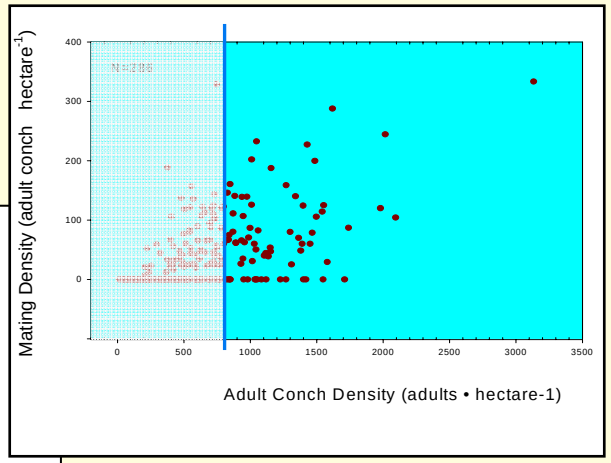


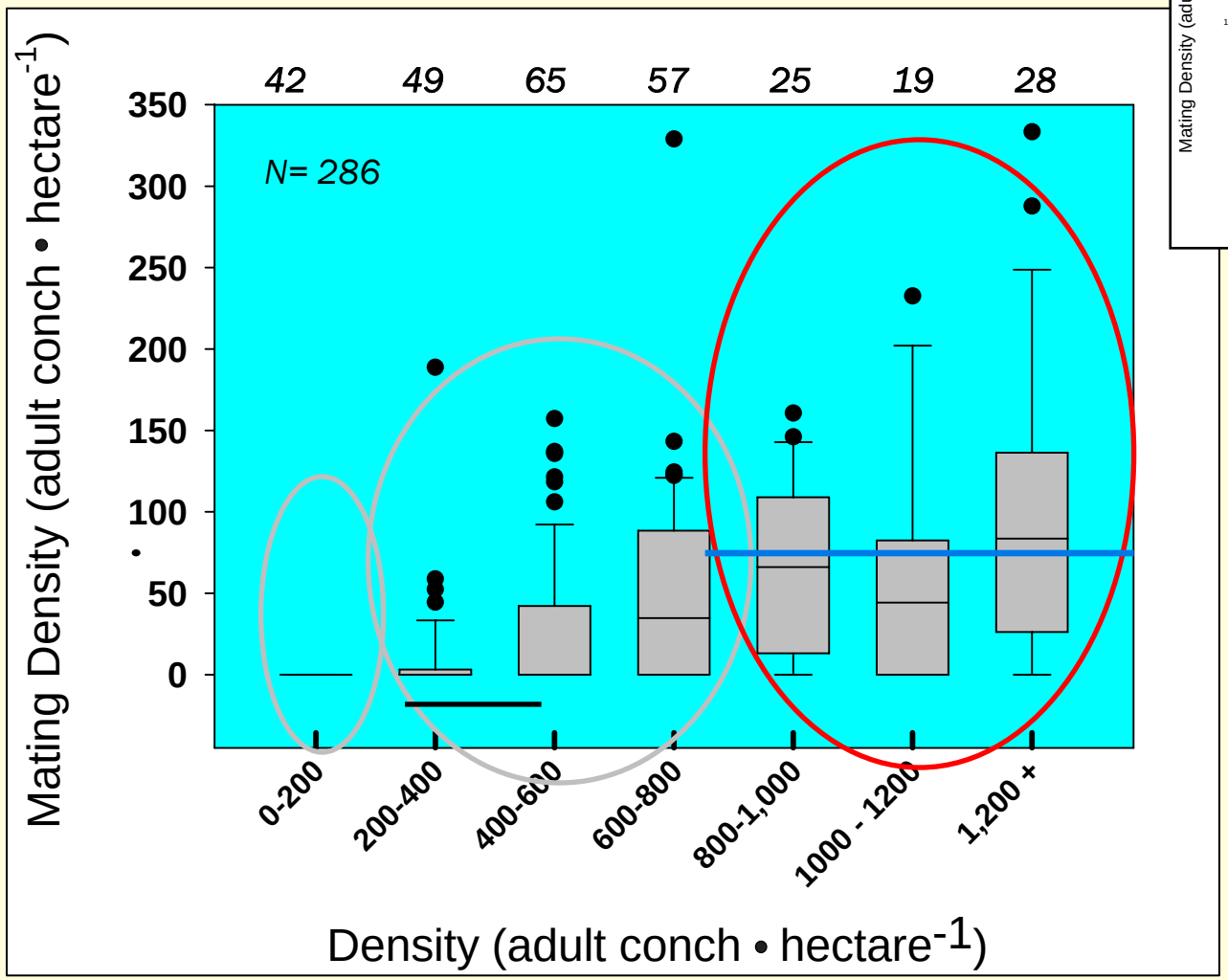
DENSITY DEPENDENT RESPONSE

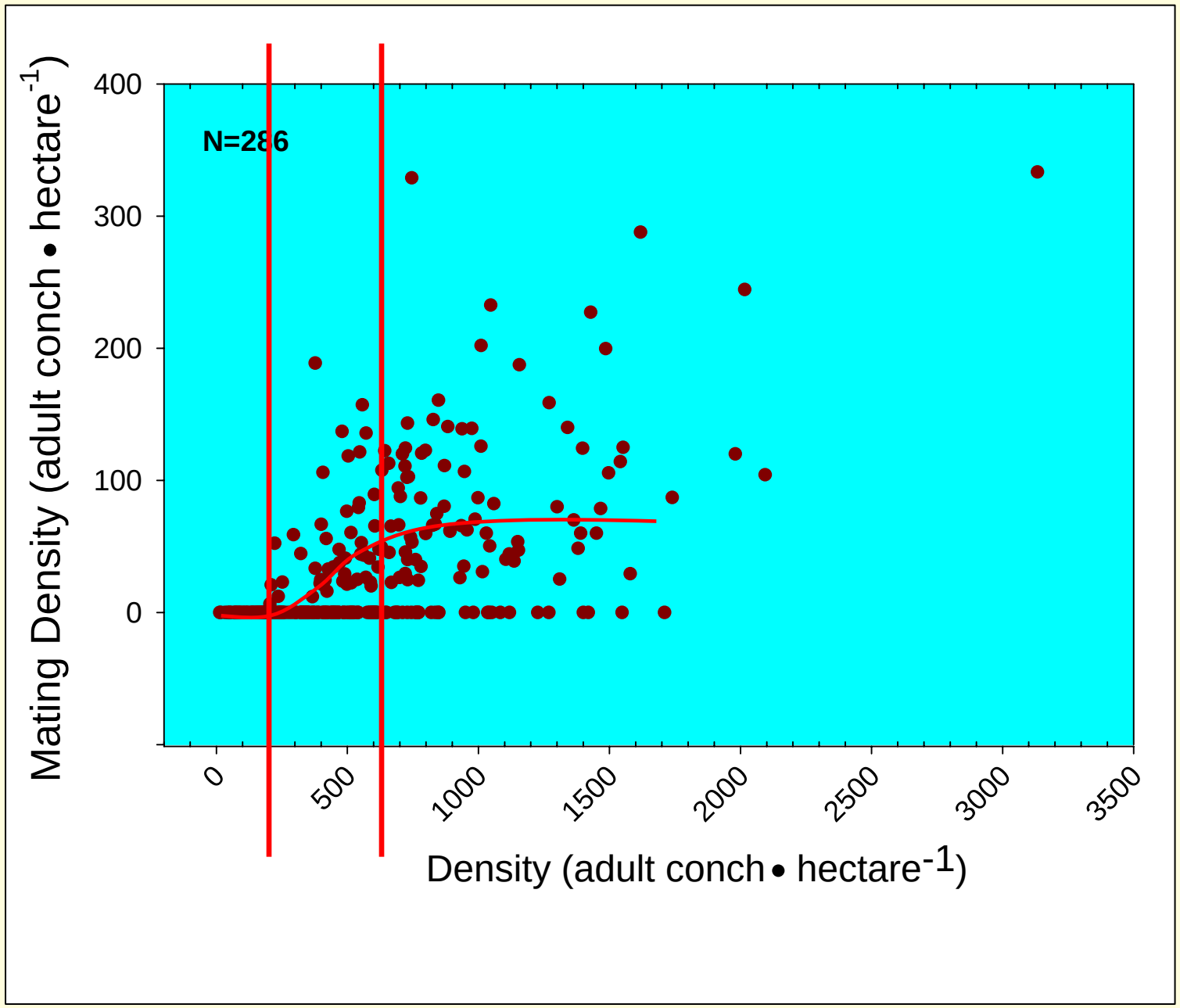


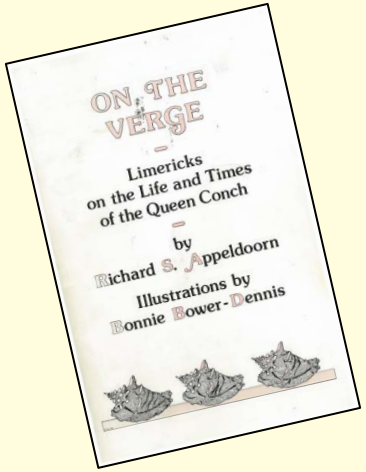


Equilibrium (unfished)

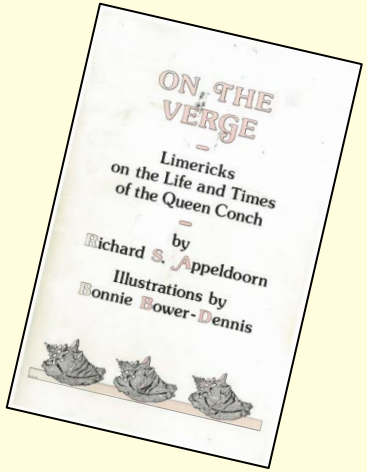





N=286
Mating Density (adult conch • hectare-1)
Density (adult conch • hectare-1)
400
300
200
100
0
0
500
1000
1500
2000
2500
3000
3500



Results of the Surveys



Queen conch in sparse aggregations

Can't mate due to strong depensation

But when densities per sector

Exceed 200 per hectare

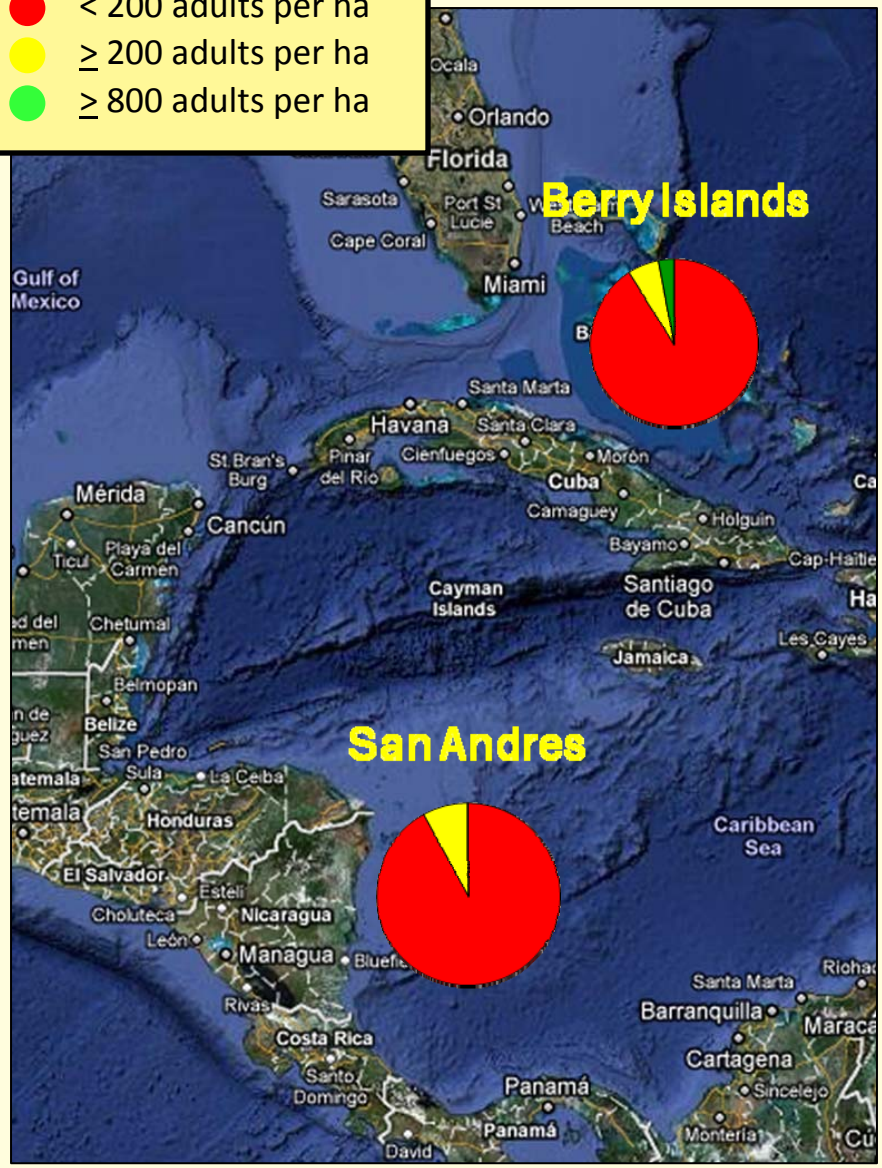
The conch resume normal relations

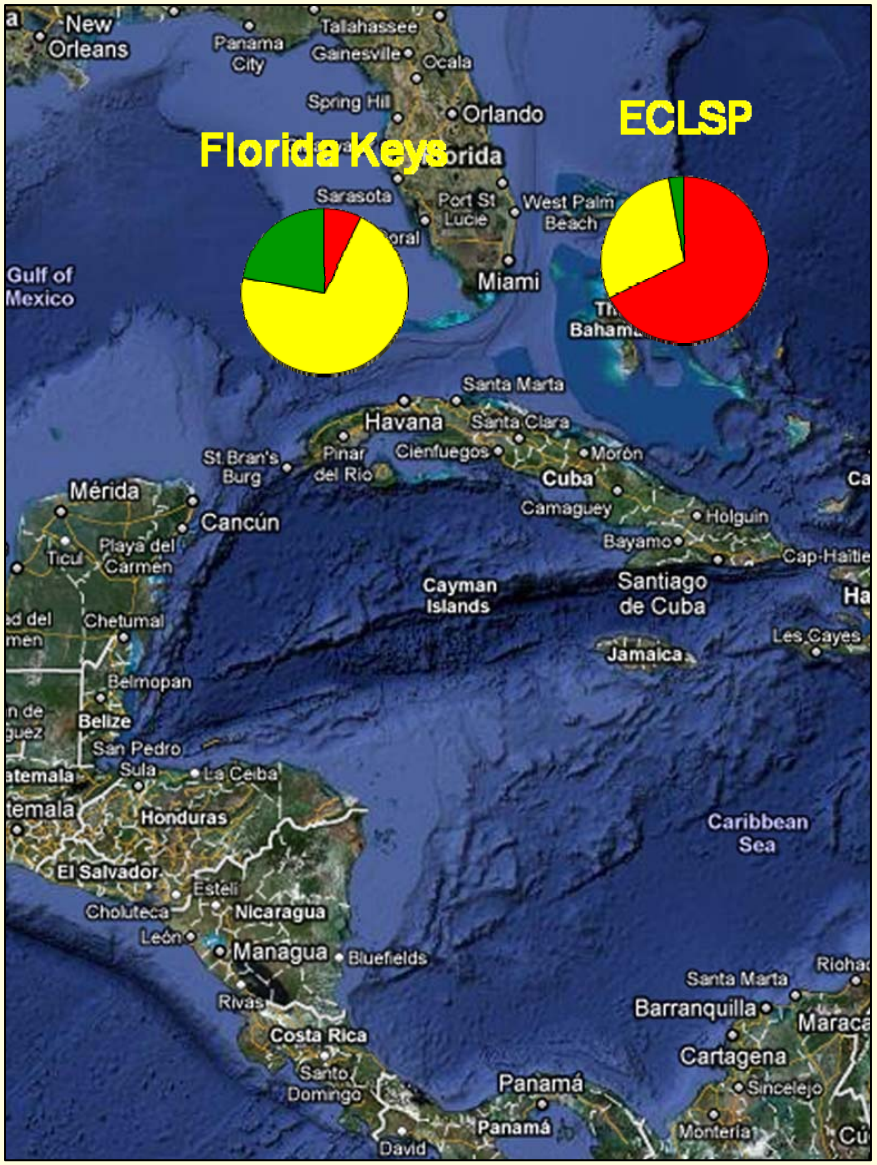
Densities of Queen Conch Aggregations

Fished

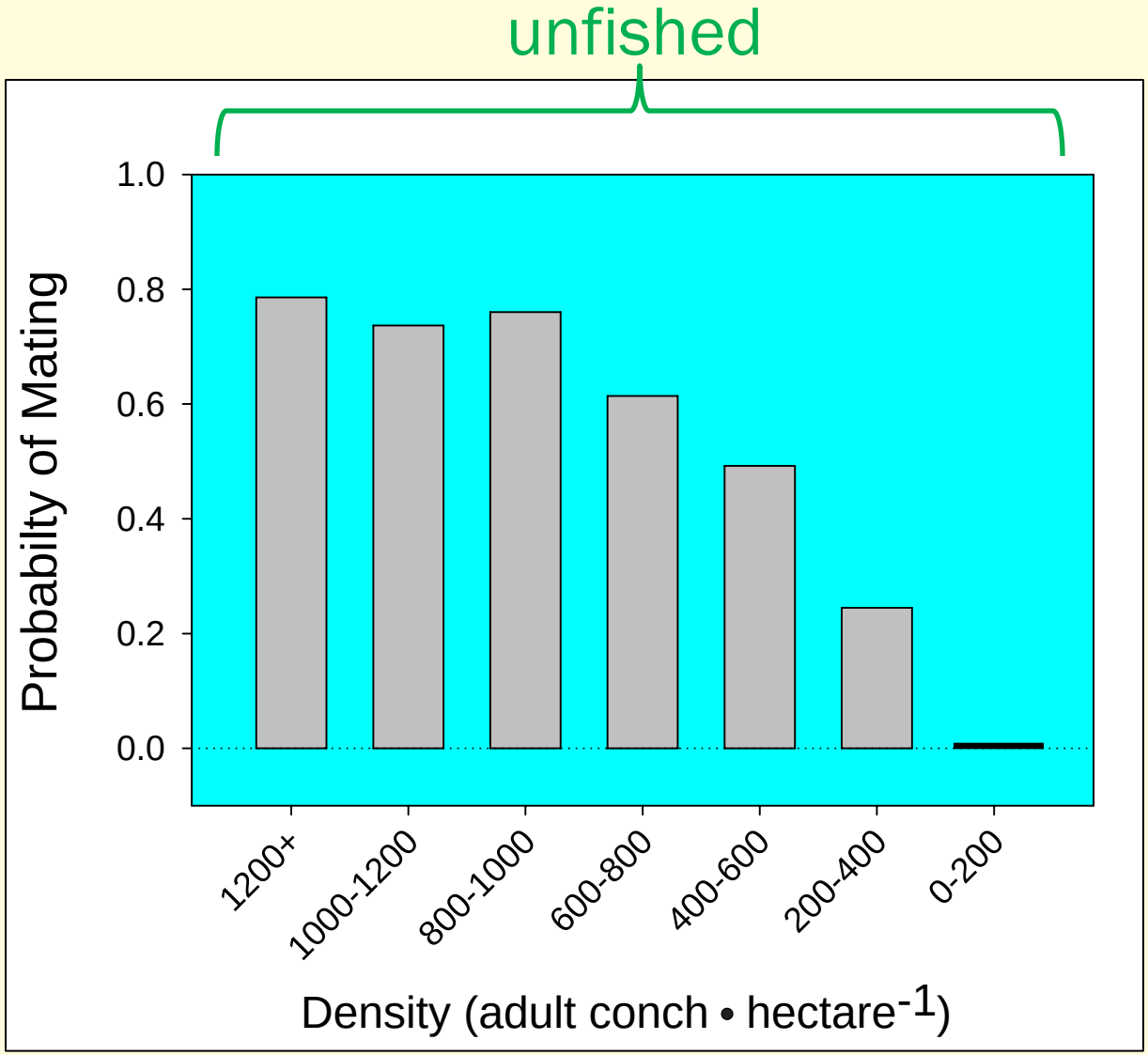
Unfished

- < 200 adults per ha
- ≥ 200 adults per ha
- ≥ 800 adults per ha

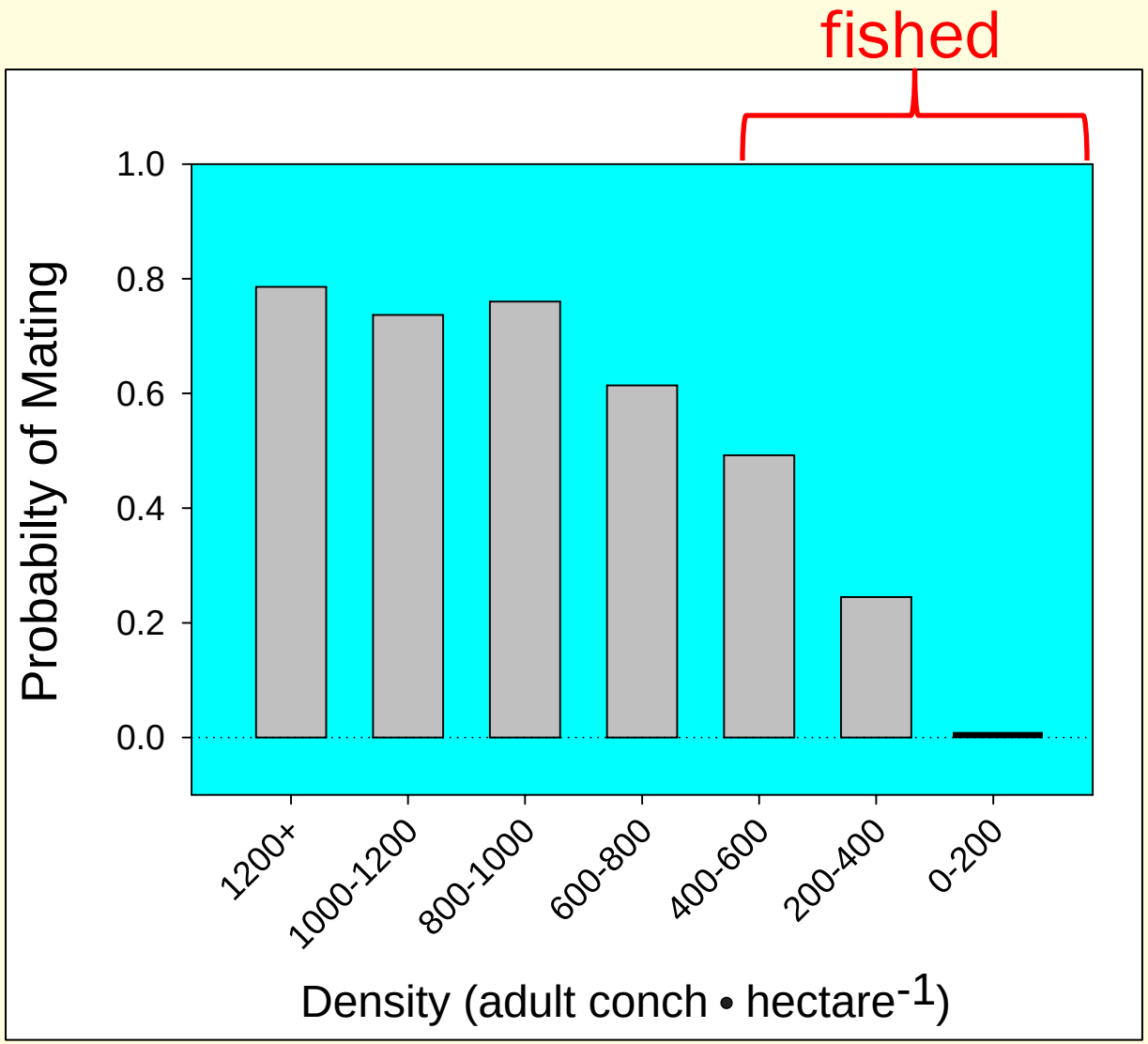




...Slippery Slope to Extinction



...Slippery Slope to Extinction



To Recap…

Conch must achieve at least 200 conch/ha for any reproduction to occur

There is a bonus relative to per capita reproductive encounters for densities between 200 conch/ha and 800 conch/ha

An unfished population can be expected to approach or exceed 800 conch/ha

Conclusions – Question 1

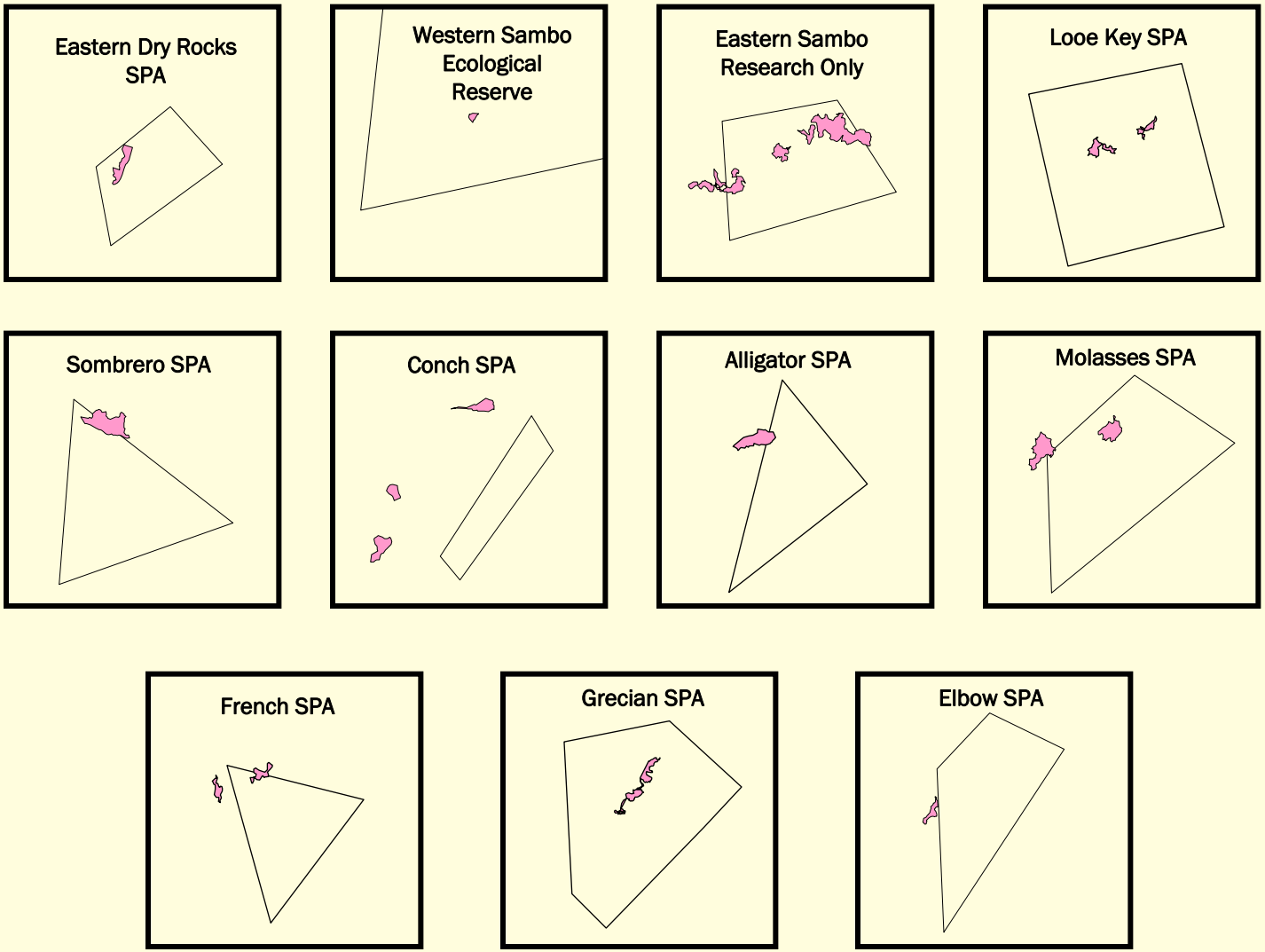
- It's All About Density – Management of Conch Must Focus on Density

  - Any open fishery will likely reduce Most Adult Aggregation Densities to < 200 per hectare

- therefore…No-Take Marine Fishery Reserves are Absolutely Essential for Sustainable Management of Conch in Florida AND Elsewhere
- Relatively Sedentary, Dioecious Species (e.g., Urchins, Abalone) also Likely Benefit Greatly from Reserves

Question 2: Guided by These Principles, Does Existing Zoning in FKNMS Protect Conch Within a Hypothetical Scenario of a Recreational Fishery?

Are the SPAs as Currently Designed (a) Large Enough and, (b) Correctly Placed if a Limited Recreational Conch Fishery Opens?



Conclusions – Question 2

Caveat: …if a recreational fishery opens

- The SPAs as Currently Designed ARE Large Enough

- …but, in many cases, the SPAs are Not Well-Placed for Florida's Conch Conservation so They Would Need to be Resized or Adjusted

- Many Aggregations are Not in Close Association with SPAs

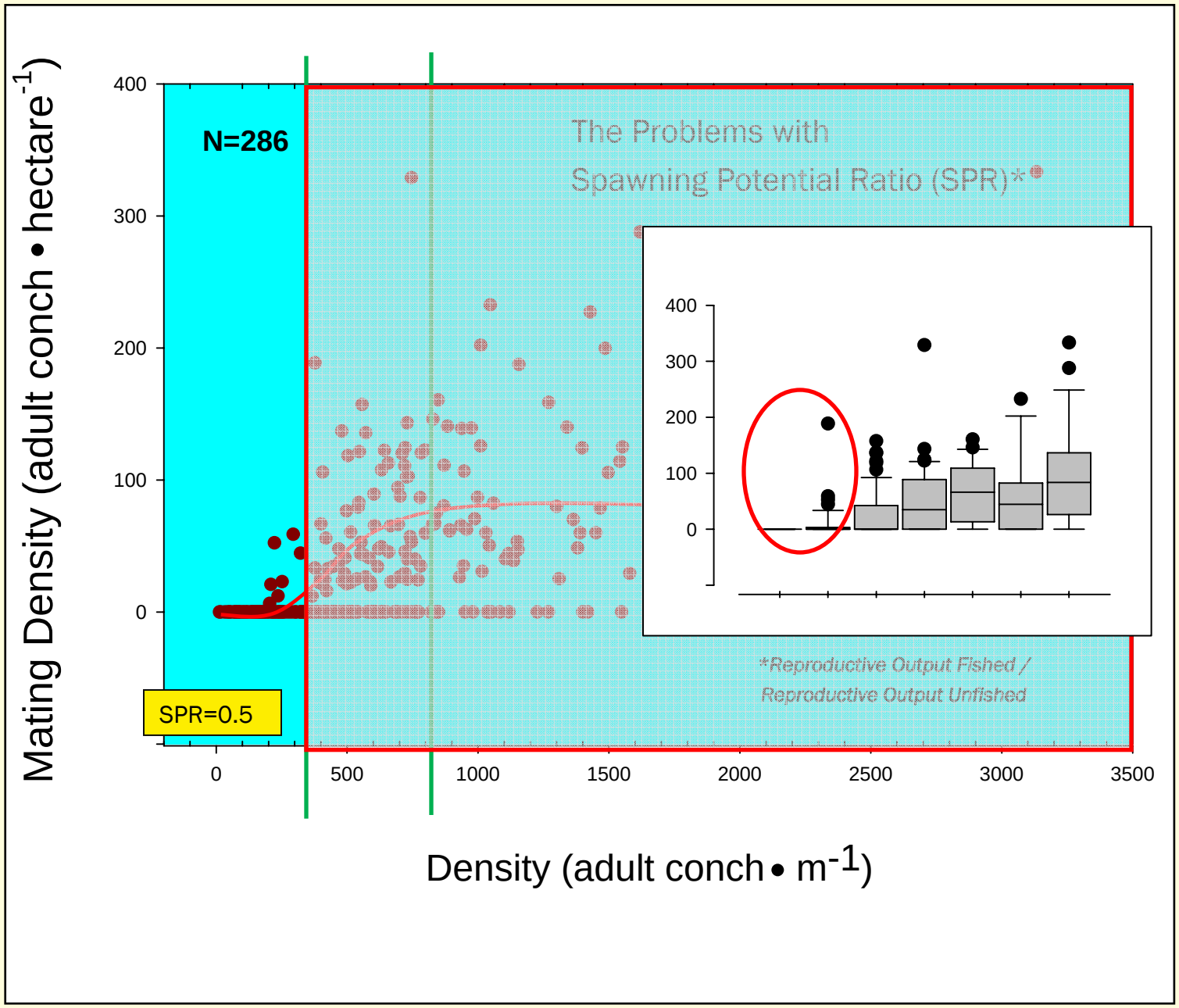
Thanks to

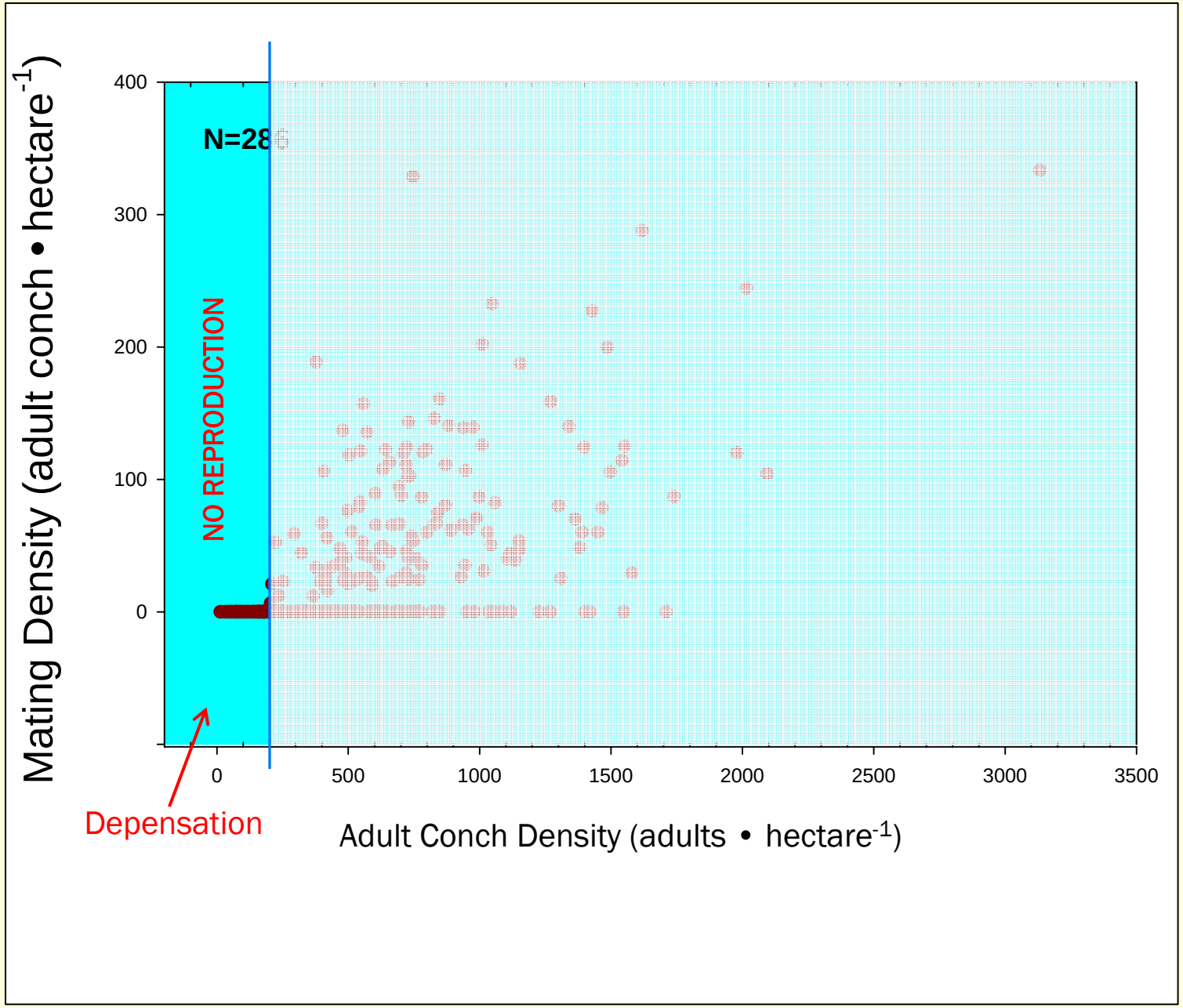
The many volunteers and employees who worked on this project over the last 15 years and

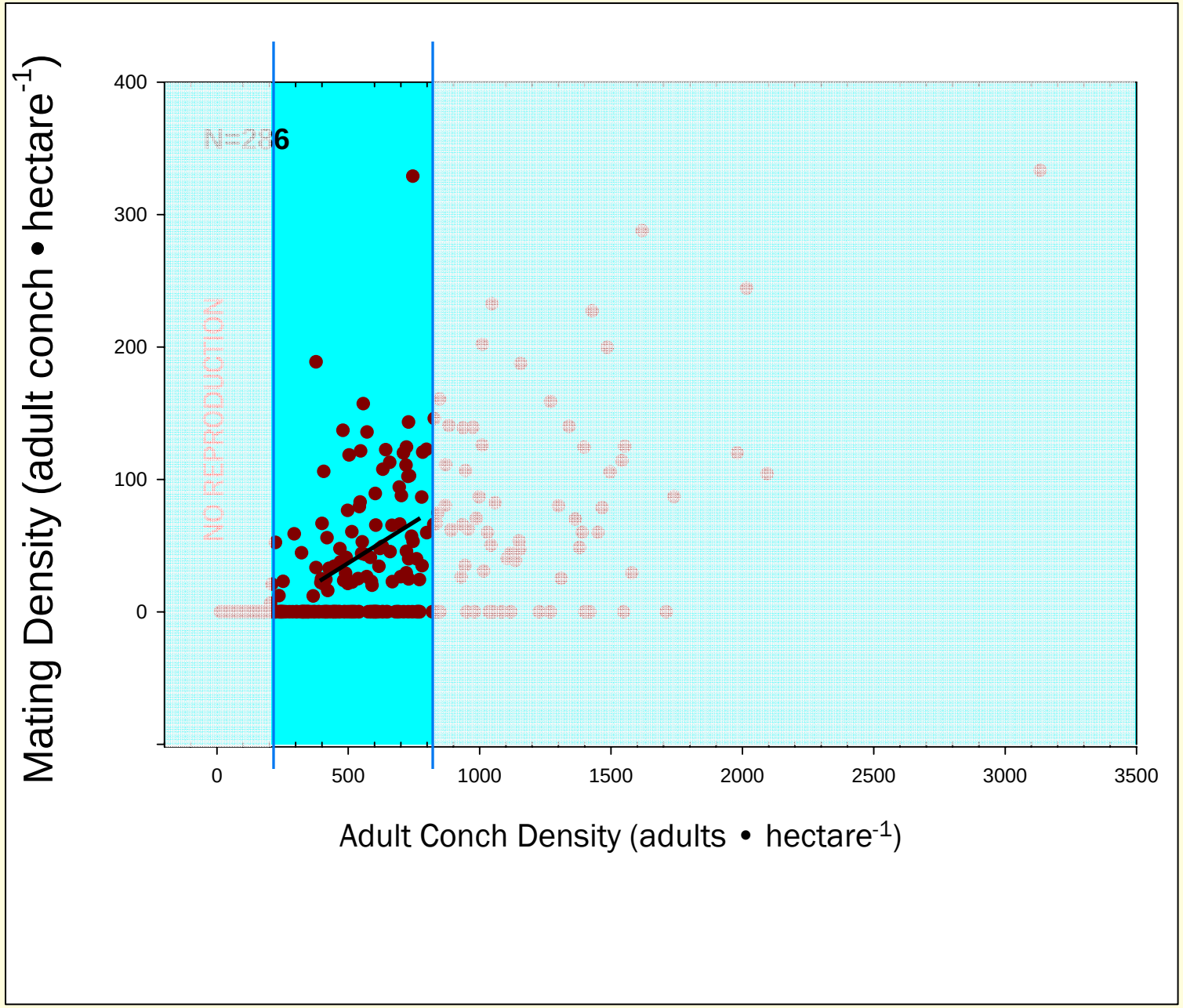
- Florida Fish and Wildlife Conservation Commission Fish and Wildlife Research Institute
- The University of Florida Institute of Food and Agricultural Sciences Environmental Statistics
- NOAA
- The Nature Conservancy of the Florida Keys.

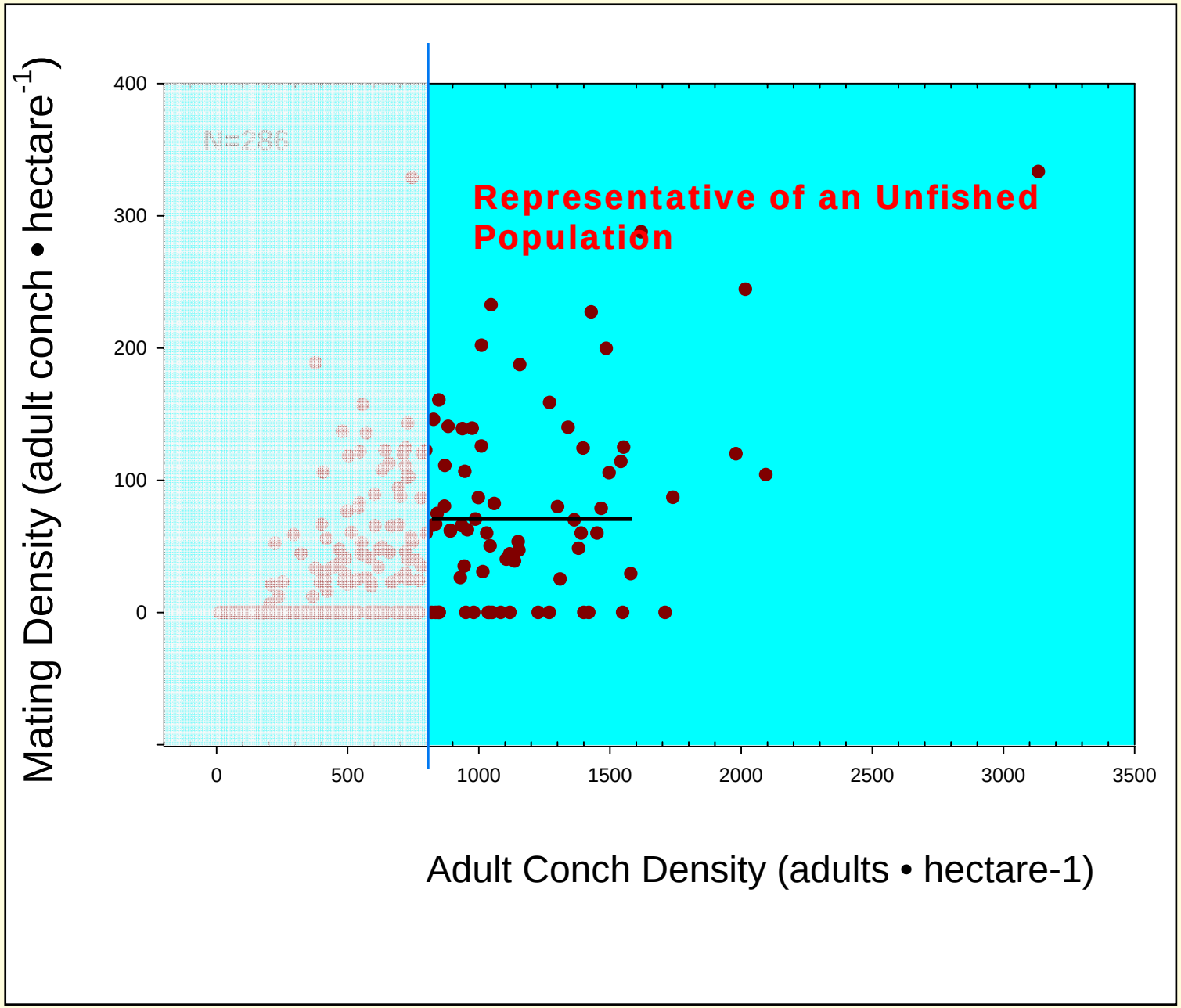

The Conch Republic
Thanks You For Visiting.
THE FLORIDA KEYS & KEY WEST
LEGO

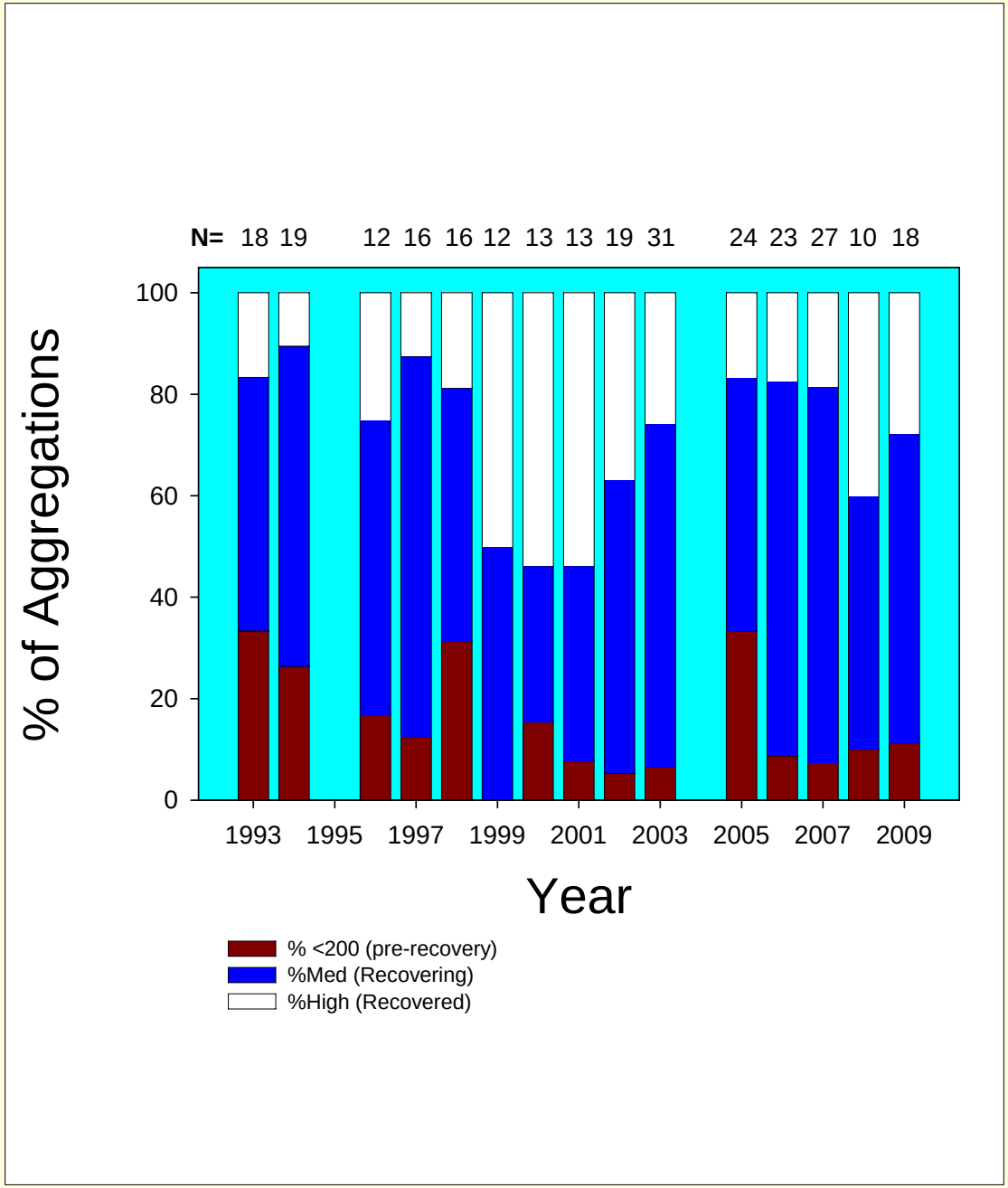
Q1. What if We Used a Traditional Fisheries Approach?



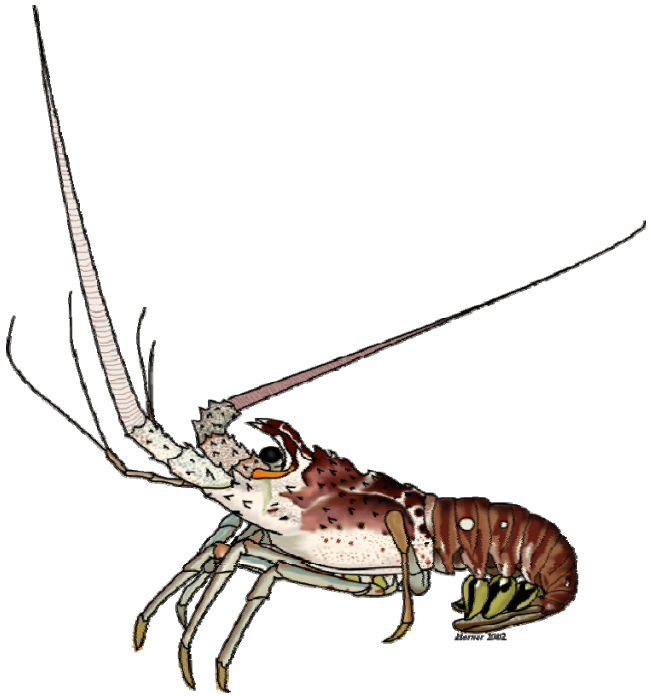

Mating Density (adult conch • hectare-1)
400
300
200
100
0
N=28
NO REPRODUCTION
0
500
1000
1500
2000
2500
3000
3500
Depensation
Adult Conch Density (adults • hectare-1)

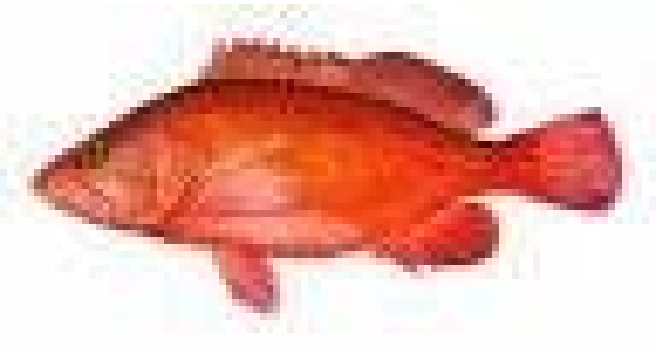

Mating Density (adult conch • hectare-1)
400
300
200
100
0
N = 286
NO REPRODUCTION
0
500
1000
1500
2000
2500
3000
3500
Adult Conch Density (adults • hectare-1)


Mating Density (adult conch • hectare-1)
400
300
200
100
0
0
500
1000
1500
2000
2500
3000
3500
Representative of an Unfished Population
Adult Conch Density (adults • hectare-1)

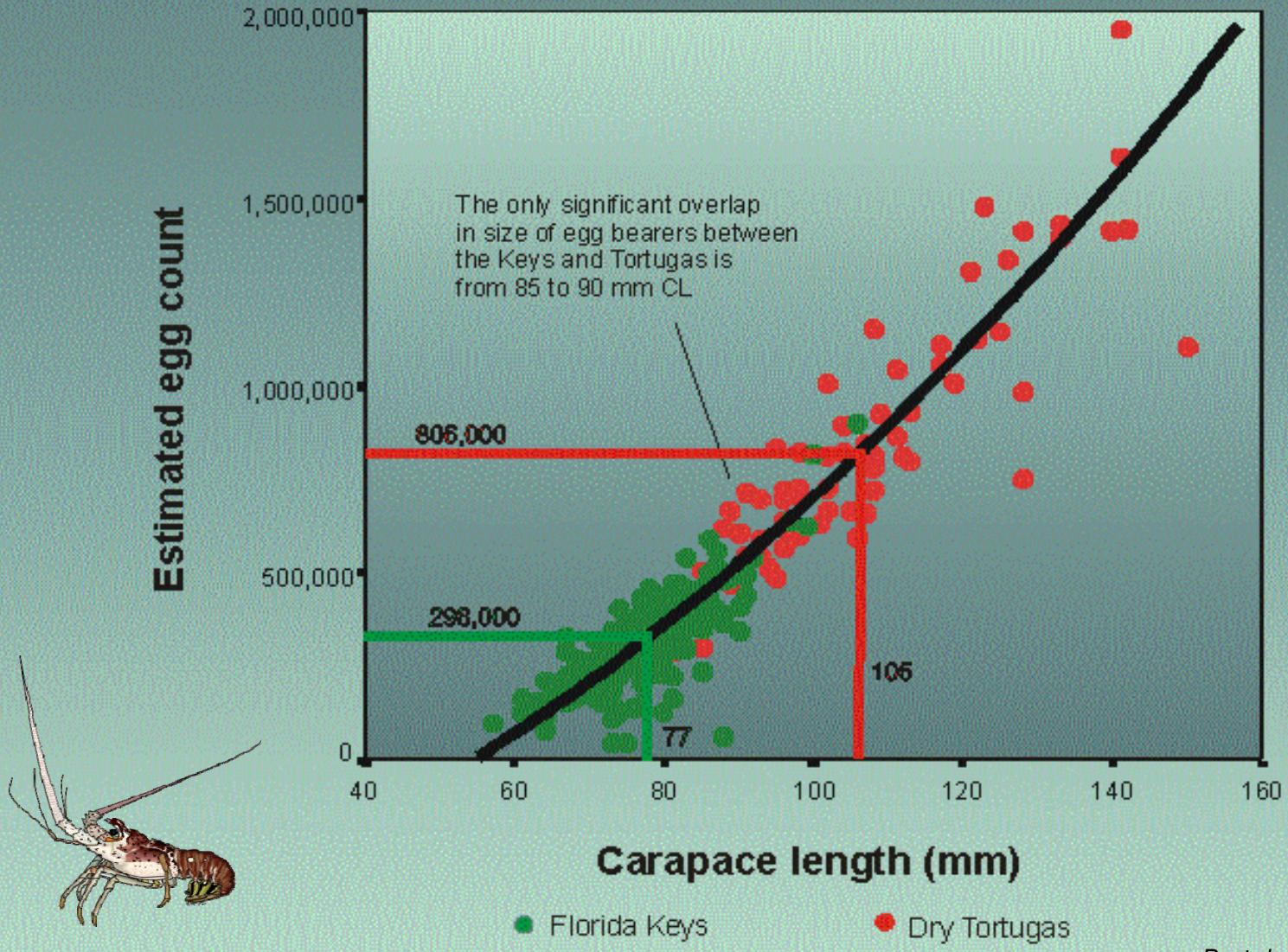

N= 18 19 12 16 16 12 13 13 19 31 24 23 27 10 18
100
80
60
40
20
0
% of Aggregations
1993 1995 1997 1999 2001 2003 2005 2007 2009
Year
% <200 (pre-recovery)
%Med (Recovering)
%High (Recovered)

Extending the Concept



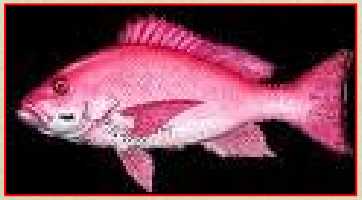


Egg count by carapace length for Florida Keys fishery and Dry Tortugas sanctuary lobsters



Bertelsen et al. 2001

Red Snapper (*Lutjanus campechanus*)



one, 61 cm 12.5 kg female produced as many eggs as **212** females 42 cm 1.12kg!!! *Grimes 1987*