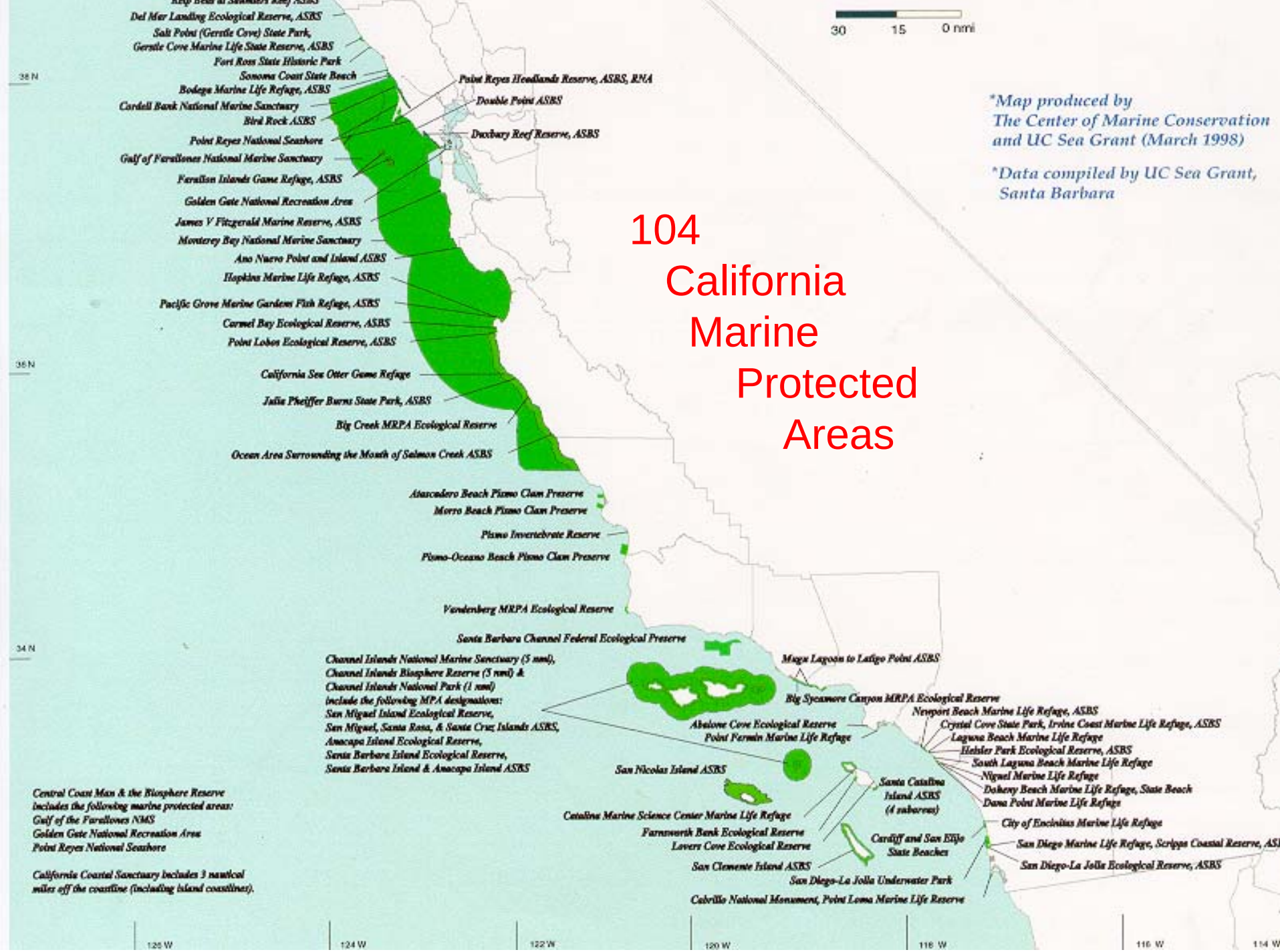
Marine Reserve Goals and Expectations

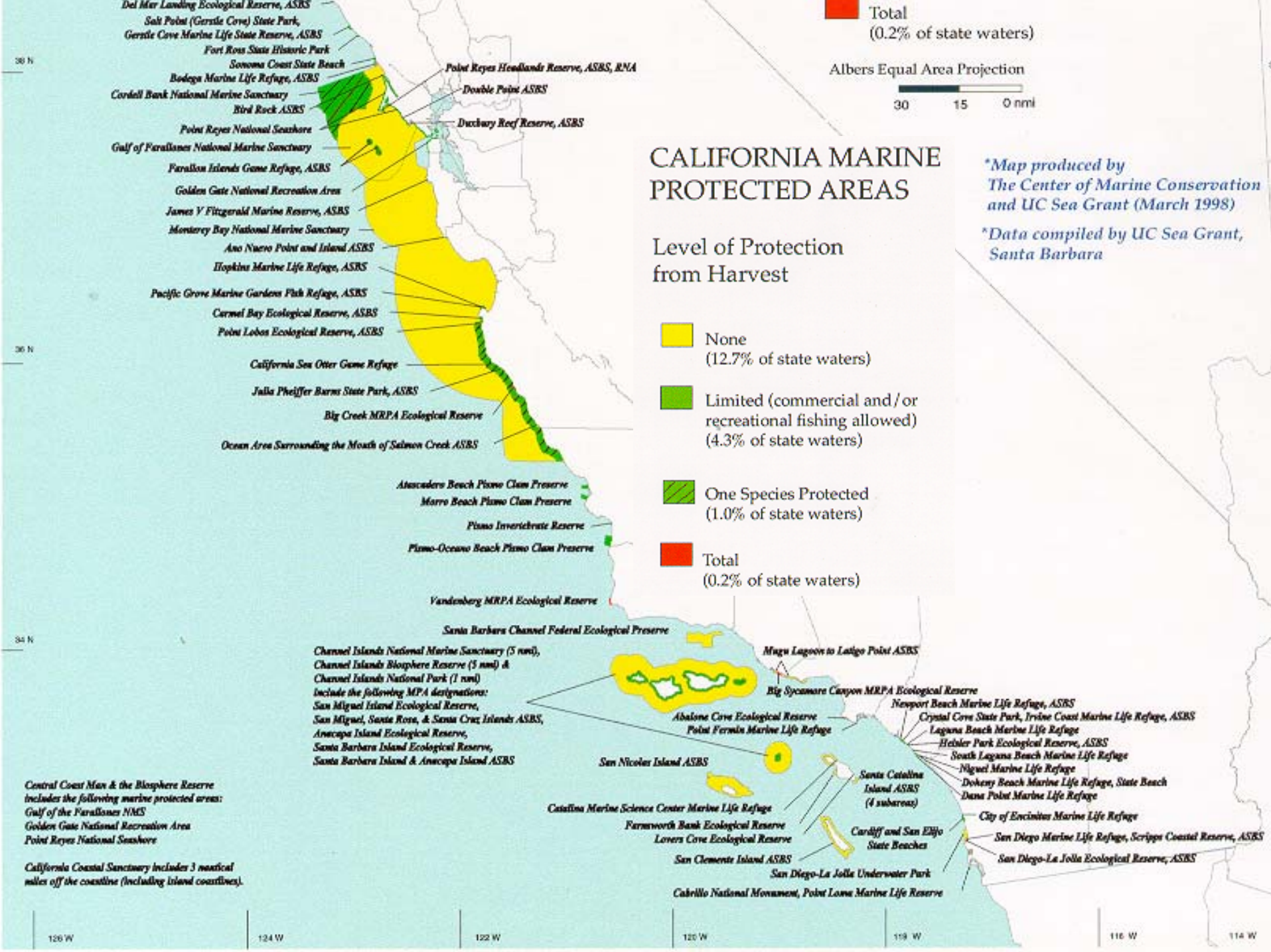
Jim Bohnsack

for
National Parks-Caribbean Marine Reserves Research and Monitoring Workshop, St John, USVI
July 2006

Boris' Very Rapid Indeed Surface Transect Point & Shoot Transect Assessment Method (BVRISTP&STAM

MARINE
PROTECTED
AREA


104
California
Marine
Protected
Areas
*Map produced by
The Center of Marine Conservation
and UC Sea Grant (March 1998)
*Data compiled by UC Sea Grant,
Santa Barbara
30 15 0 nmi
Del Mar Landing Ecological Reserve, ASBS
Salt Point (Gerstle Cove) State Park,
Gerstle Cove Marine Life State Reserve, ASBS
Fort Ross State Historic Park
Sonoma Coast State Beach
Bodega Marine Life Refuge, ASBS
Cordell Bank National Marine Sanctuary
Bird Rock ASBS
Point Reyes National Seashore
Gulf of Farallones National Marine Sanctuary
Farallon Islands Game Refuge, ASBS
Golden Gate National Recreation Area
James V Fitzgerald Marine Reserve, ASBS
Monterey Bay National Marine Sanctuary
Ano Nuevo Point and Island ASBS
Hopkins Marine Life Refuge, ASBS
Pacific Grove Marine Gardens Fish Refuge, ASBS
Carmel Bay Ecological Reserve, ASBS
Point Lobos Ecological Reserve, ASBS
California Sea Otter Game Refuge
Julia Pheiffer Burns State Park, ASBS
Big Creek MRPA Ecological Reserve
Ocean Area Surrounding the Mouth of Salmon Creek ASBS
Point Reyes Headlands Reserve, ASBS, RNA
Double Point ASBS
Duxbury Reef Reserve, ASBS
Atascadero Beach Pismo Clam Preserve
Morro Beach Pismo Clam Preserve
Pismo Invertebrate Reserve
Pismo-Oceano Beach Pismo Clam Preserve
Vandenberg MRPA Ecological Reserve
Santa Barbara Channel Federal Ecological Preserve
Channel Islands National Marine Sanctuary (5 nmi),
Channel Islands Biosphere Reserve (5 nmi) &
Channel Islands National Park (1 nmi)
include the following MPA designations:
San Miguel Island Ecological Reserve,
San Miguel, Santa Rosa, & Santa Cruz Islands ASBS,
Anacapa Island Ecological Reserve,
Santa Barbara Island Ecological Reserve,
Santa Barbara Island & Anacapa Island ASBS
Mugu Lagoon to Latigo Point ASBS
Big Sycamore Canyon MRPA Ecological Reserve
Newport Beach Marine Life Refuge, ASBS
Abalone Cove Ecological Reserve
Point Fermin Marine Life Refuge
Crystal Cove State Park, Irvine Coast Marine Life Refuge, ASBS
Laguna Beach Marine Life Refuge
Heisler Park Ecological Reserve, ASBS
South Laguna Beach Marine Life Refuge
Niguel Marine Life Refuge
Doheny Beach Marine Life Refuge, State Beach
Dana Point Marine Life Refuge
San Nicolas Island ASBS
Santa Catalina Island ASBS (4 subareas)
Catalina Marine Science Center Marine Life Refuge
Farnsworth Bank Ecological Reserve
Lovers Cove Ecological Reserve
Cardiff and San Elijo State Beaches
City of Encinitas Marine Life Refuge
San Diego Marine Life Refuge, Scripps Coastal Reserve, ASBS
San Diego-La Jolla Ecological Reserve, ASBS
San Clemente Island ASBS
San Diego-La Jolla Underwater Park
Cabrillo National Monument, Point Loma Marine Life Reserve
Central Coast Man & the Biosphere Reserve
includes the following marine protected areas:
Gulf of the Farallones NMS
Golden Gate National Recreation Area
Point Reyes National Seashore
California Coastal Sanctuary includes 3 nautical
miles off the coastline (including island coastlines).
38 N
36 N
34 N
126 W
124 W
122 W
120 W
118 W
116 W
114 W


CALIFORNIA MARINE PROTECTED AREAS
Level of Protection from Harvest
None (12.7% of state waters)
Limited (commercial and/or recreational fishing allowed) (4.3% of state waters)
One Species Protected (1.0% of state waters)
Total (0.2% of state waters)
Total (0.2% of state waters)
Albers Equal Area Projection
30 15 0 nmi
*Map produced by The Center of Marine Conservation and UC Sea Grant (March 1998)
*Data compiled by UC Sea Grant, Santa Barbara
Del Mar Landing Ecological Reserve, ASBS
Salt Point (Gerstle Cove) State Park,
Gerstle Cove Marine Life State Reserve, ASBS
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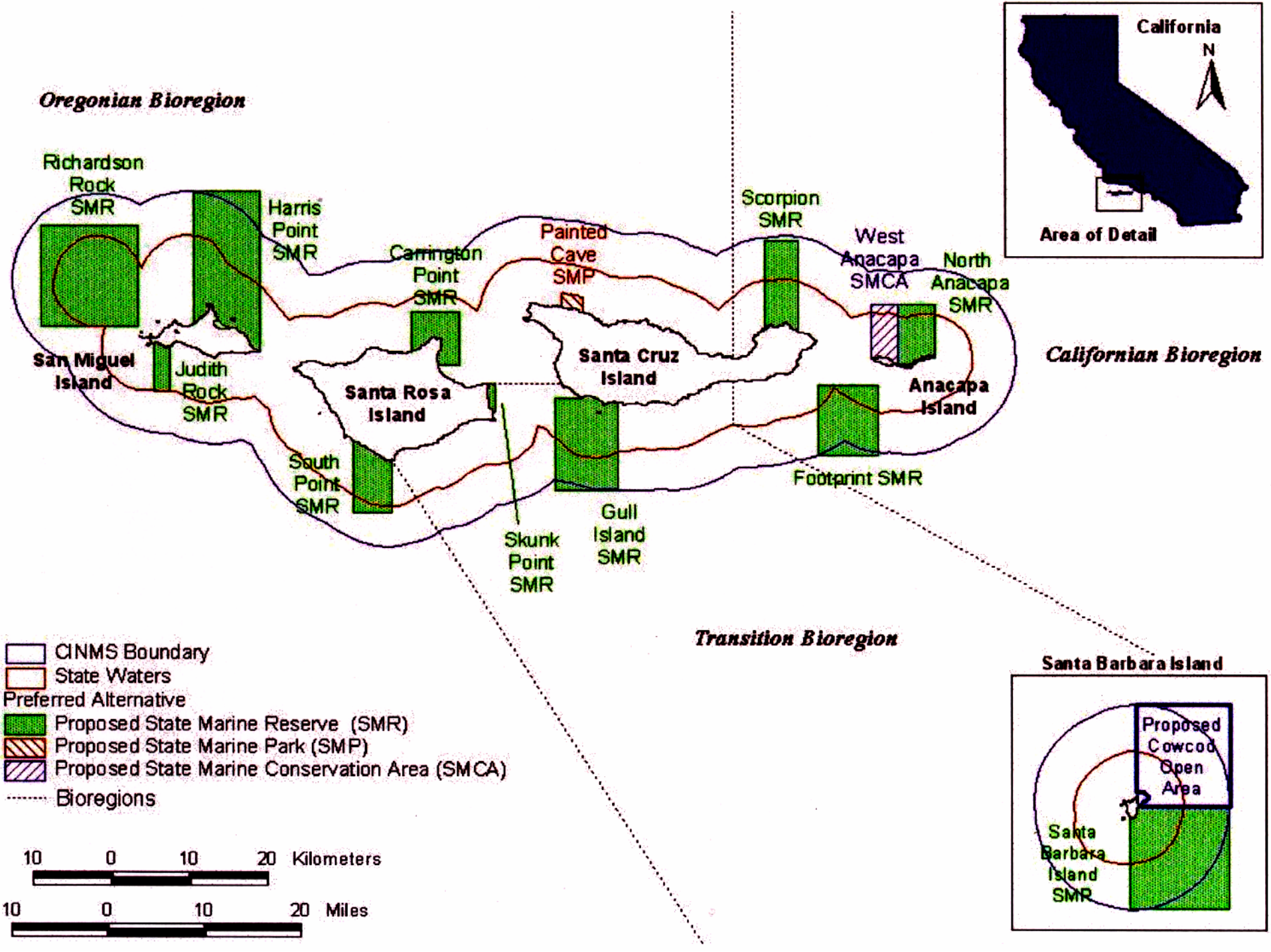
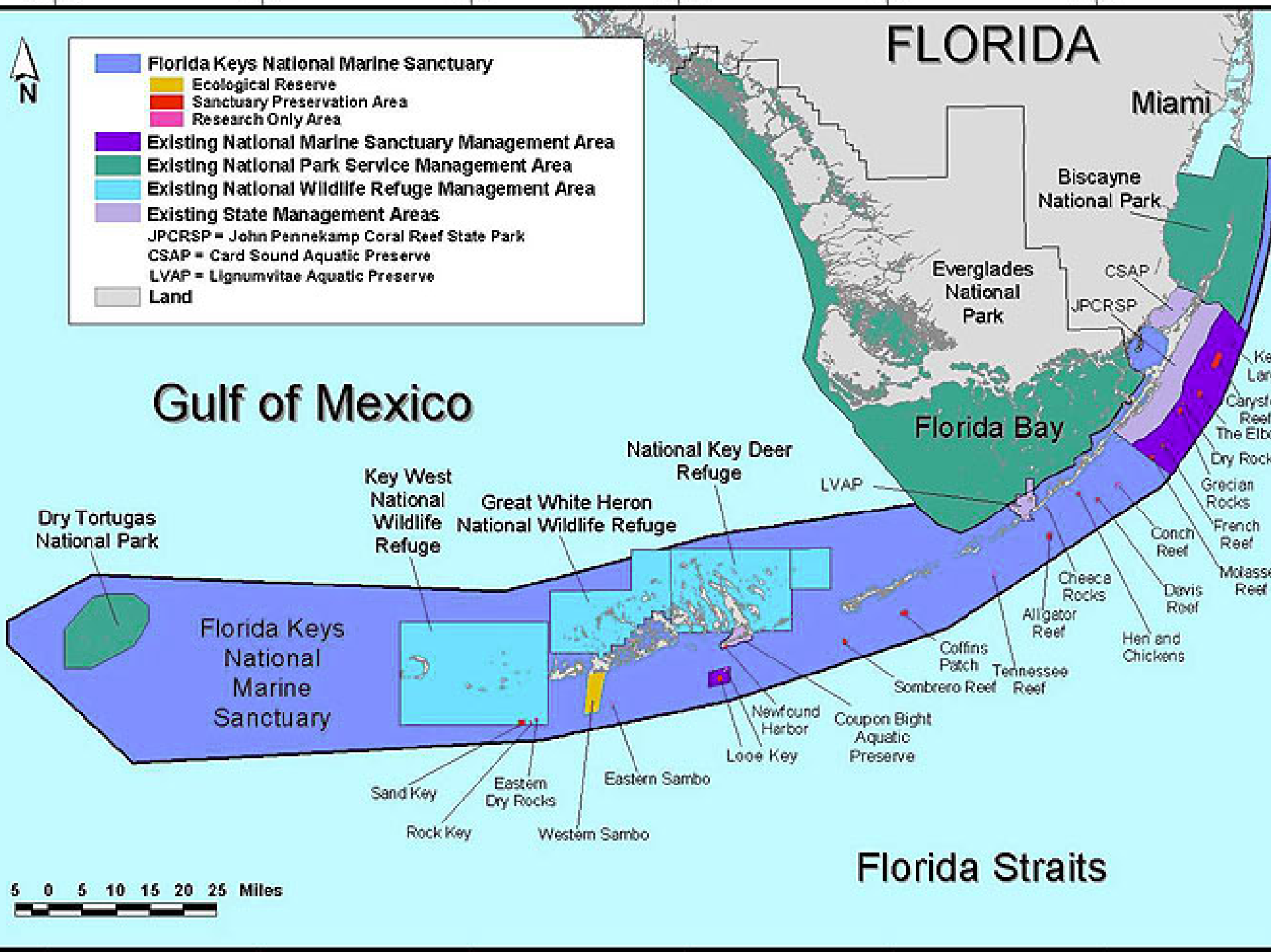
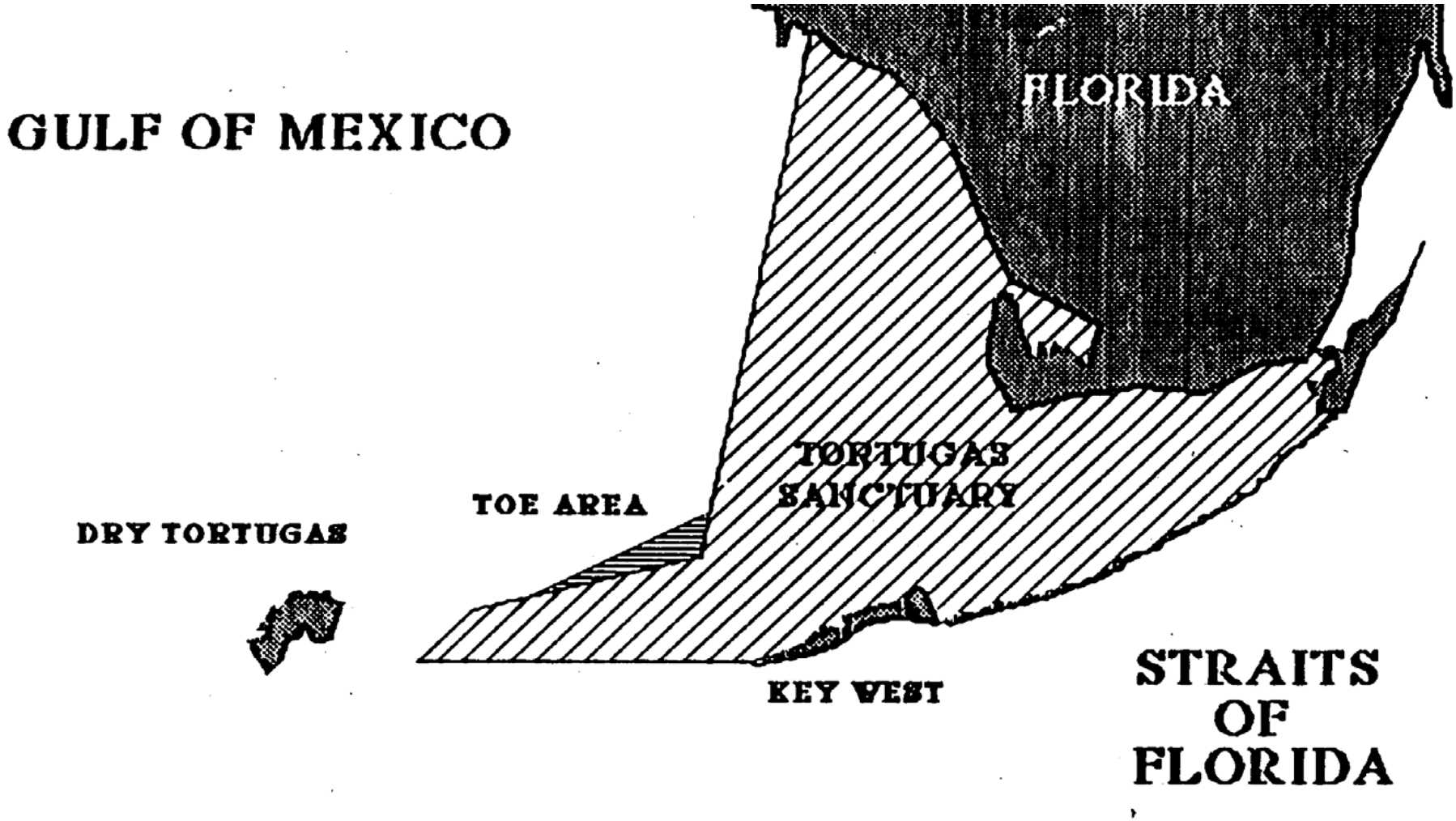
38 N
36 N
34 N
126 W
124 W
122 W
120 W
118 W
116 W
114 W


Oregonian Bioregion
Richardson Rock SMR
Harris Point SMR
San Miguel Island
Judith Rock SMR
Carrington Point SMR
Santa Rosa Island
South Point SMR
Skunk Point SMR
Painted Cave SMP
Santa Cruz Island
Gull Island SMR
Transition Bioregion
Scorpion SMR
West Anacapa SMCA
North Anacapa SMR
Anacapa Island
Footprint SMR
Californian Bioregion
California
N
Area of Detail
Santa Barbara Island
Proposed Cowcod Open Area
Santa Barbara Island SMR
CINMS Boundary
State Waters
Preferred Alternative
Proposed State Marine Reserve (SMR)
Proposed State Marine Park (SMP)
Proposed State Marine Conservation Area (SMCA)
Bioregions
10 0 10 20 Kilometers
10 0 10 20 Miles


N
Florida Keys National Marine Sanctuary
Ecological Reserve
Sanctuary Preservation Area
Research Only Area
Existing National Marine Sanctuary Management Area
Existing National Park Service Management Area
Existing National Wildlife Refuge Management Area
Existing State Management Areas
JPCRSP = John Pennekamp Coral Reef State Park
CSAP = Card Sound Aquatic Preserve
LVAP = Lignumvitae Aquatic Preserve
Land
FLORIDA
Miami
Biscayne National Park
Everglades National Park
CSAP
JPCRSP
Florida Bay
Gulf of Mexico
National Key Deer Refuge
Key West National Wildlife Refuge
Great White Heron National Wildlife Refuge
LVAP
Dry Tortugas National Park
Florida Keys National Marine Sanctuary
Grecian Rocks
French Reef
Conch Reef
Davis Reef
Molasses Reef
Cheeca Rocks
Alligator Reef
Hen and Chickens
Coffins Patch
Tennessee Reef
Sombrero Reef
Newfound Harbor
Coupon Bight Aquatic Preserve
Looe Key
Eastern Sambo
Western Sambo
Sand Key
Eastern Dry Rocks
Rock Key
Florida Straits
5 0 5 10 15 20 25 Miles


GULF OF MEXICO
FLORIDA
TORTUGAS SANCTUARY
TOE AREA
DRY TORTUGAS
KEY WEST
STRAITS OF FLORIDA

IN THE BLEACHERS
NO FISHING
BEYOND
THIS POINT
MOORE
JdsMOORE@AOL.Com

South Atlantic Snapper/Grouper Complex

“The concept of marine reserves is simple:

If protected from human interference, nature will take care of itself ”

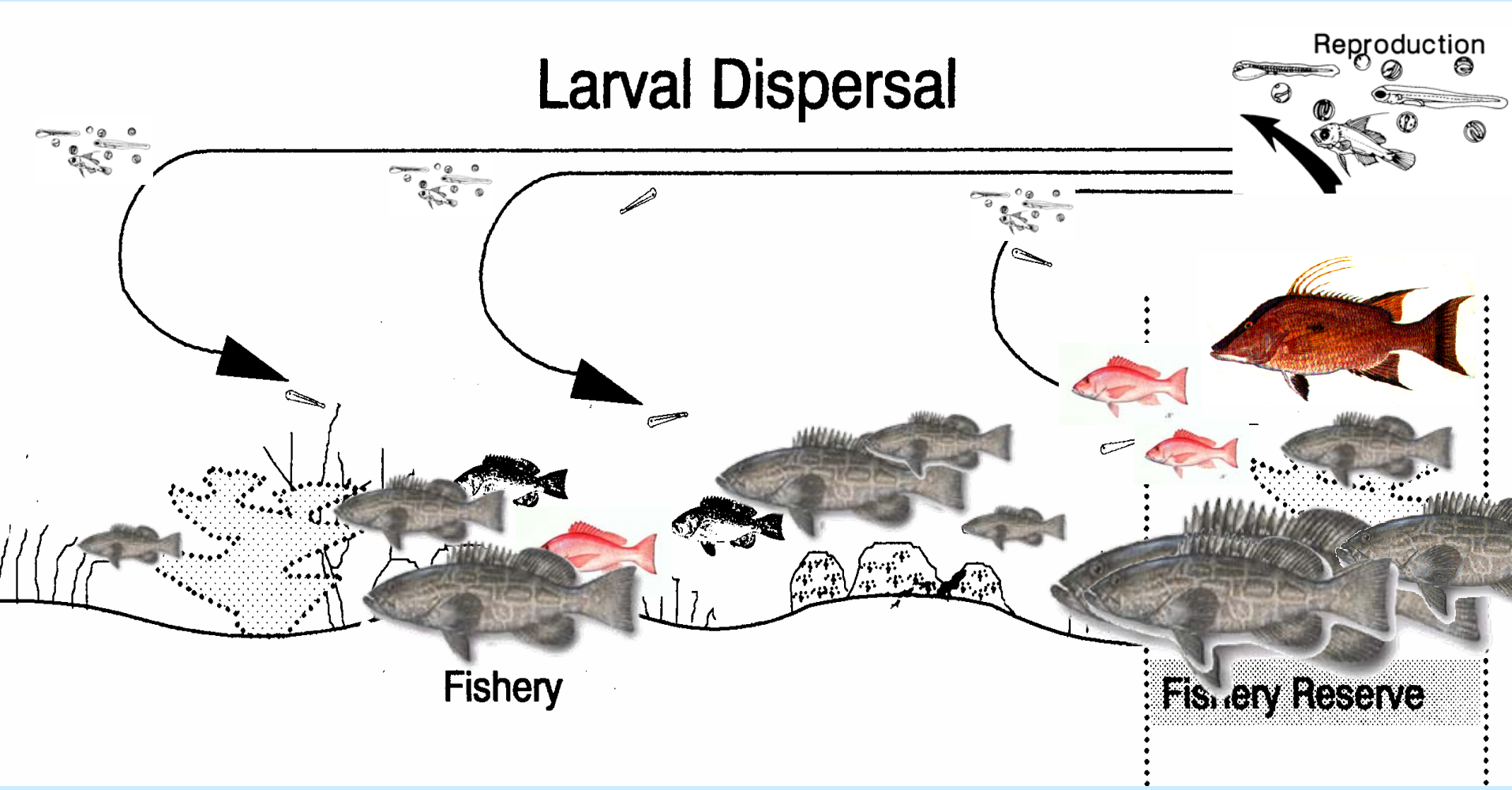
No-Take Marine Reserves and Ecosystem-Based Management

UNIQUE FEATURES:

Objective Criteria: "No Extraction"
Simplicity
High Level of Ecosystem Protection
Potential for Ecosystem Integrity
Provide Reference / Control Sites
Rare in Marine Ecosystems – High Interest
Precautionary Management
Accepted Use in Terrestrial Environments

Spillover

Reproduction & Dispersal



Colonization & Growth

Abundance

Diversity

Benefits of Marine Reserves

- Protect Ecosystem Structure and Function
  - (Goods and Services)

- Provide Fishery Benefits
- Increase Scientific Understanding of Marine Ecosystems
- Increase Public Education & Appreciation
- Enhance Non-Extractive Economic Benefits

Major Fishery Benefits

- More big fish = More offspring = More fish
- Export of fish to fishing grounds (spillover)
- Protect genetic quality
- More difficult to overfish
- Insurance: More rapid recovery in case of stock collapse from natural or human disaster
- More stable landings

Problems ?

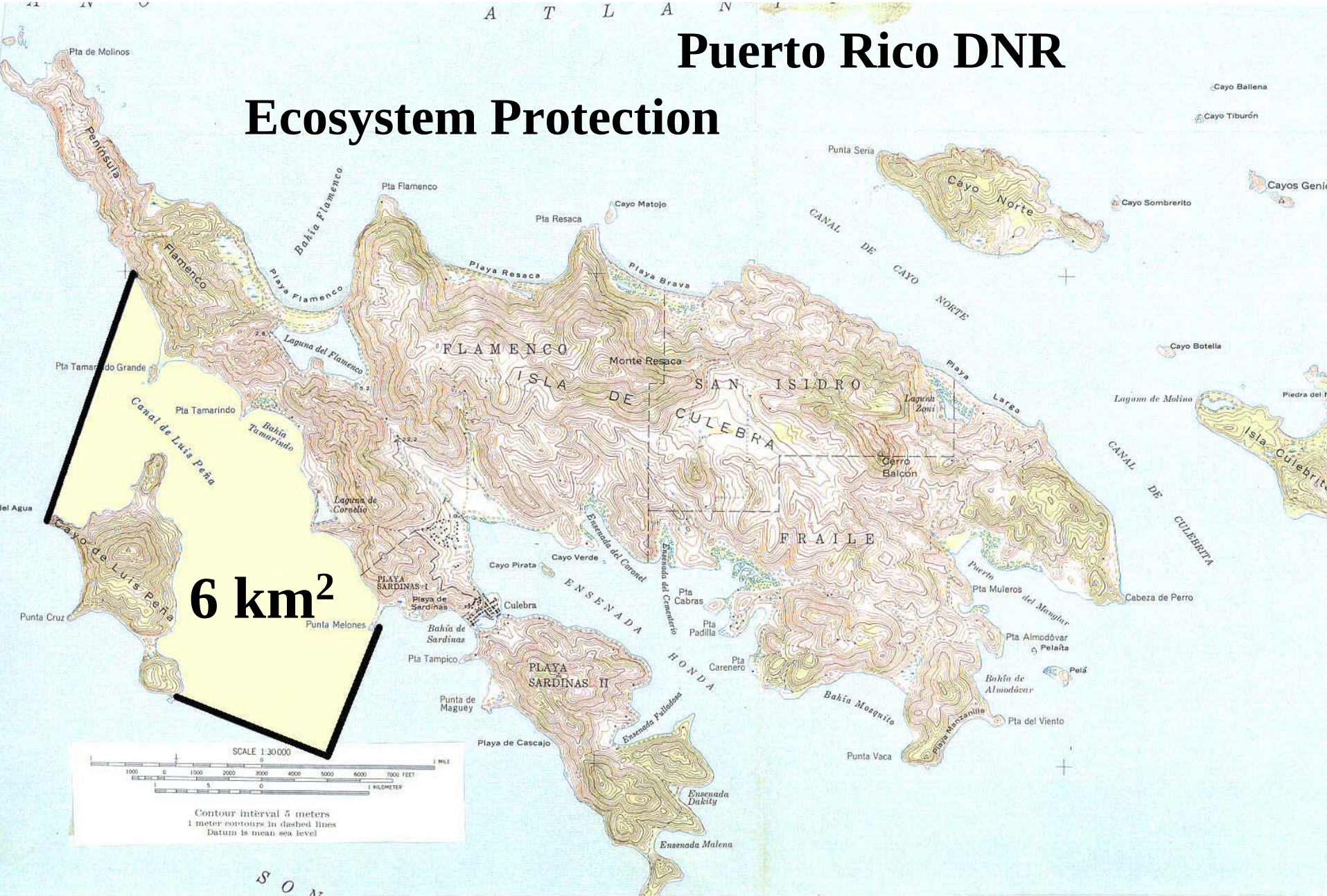
- **How Many?**
- **What size?**
- **Total area? (20-30% minimum)**
- **Location? (NIMBY)**
- **Fishing Displacement? (Crowding)**
- **Highly migratory species?**
- **Uncertainty?**
- **Fencing the range**
- **Acceptance / Compliance / Enforcement?**

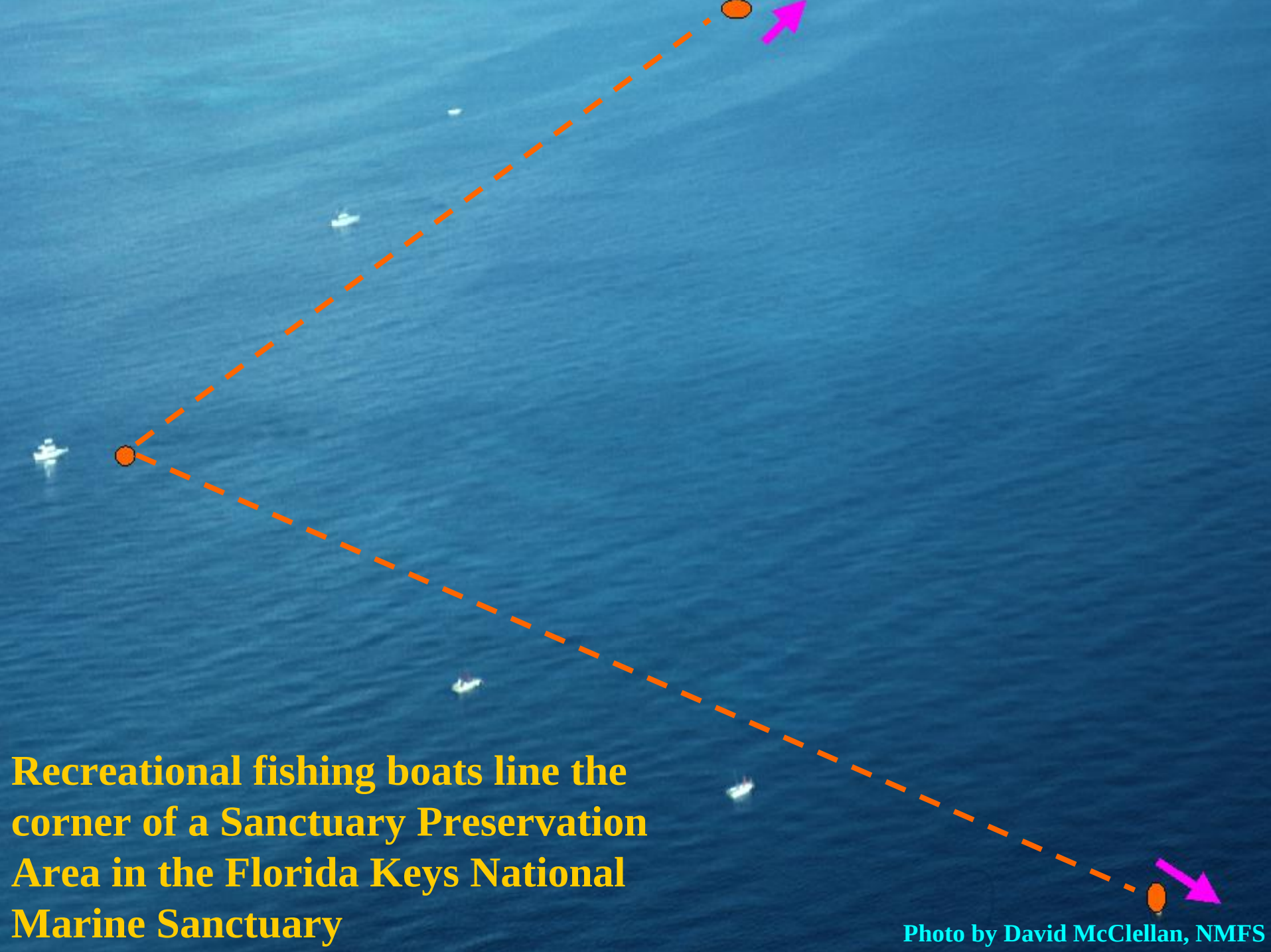
- **1999**

Louis Pina Channel Reserve

Puerto Rico DNR

Ecosystem Protection



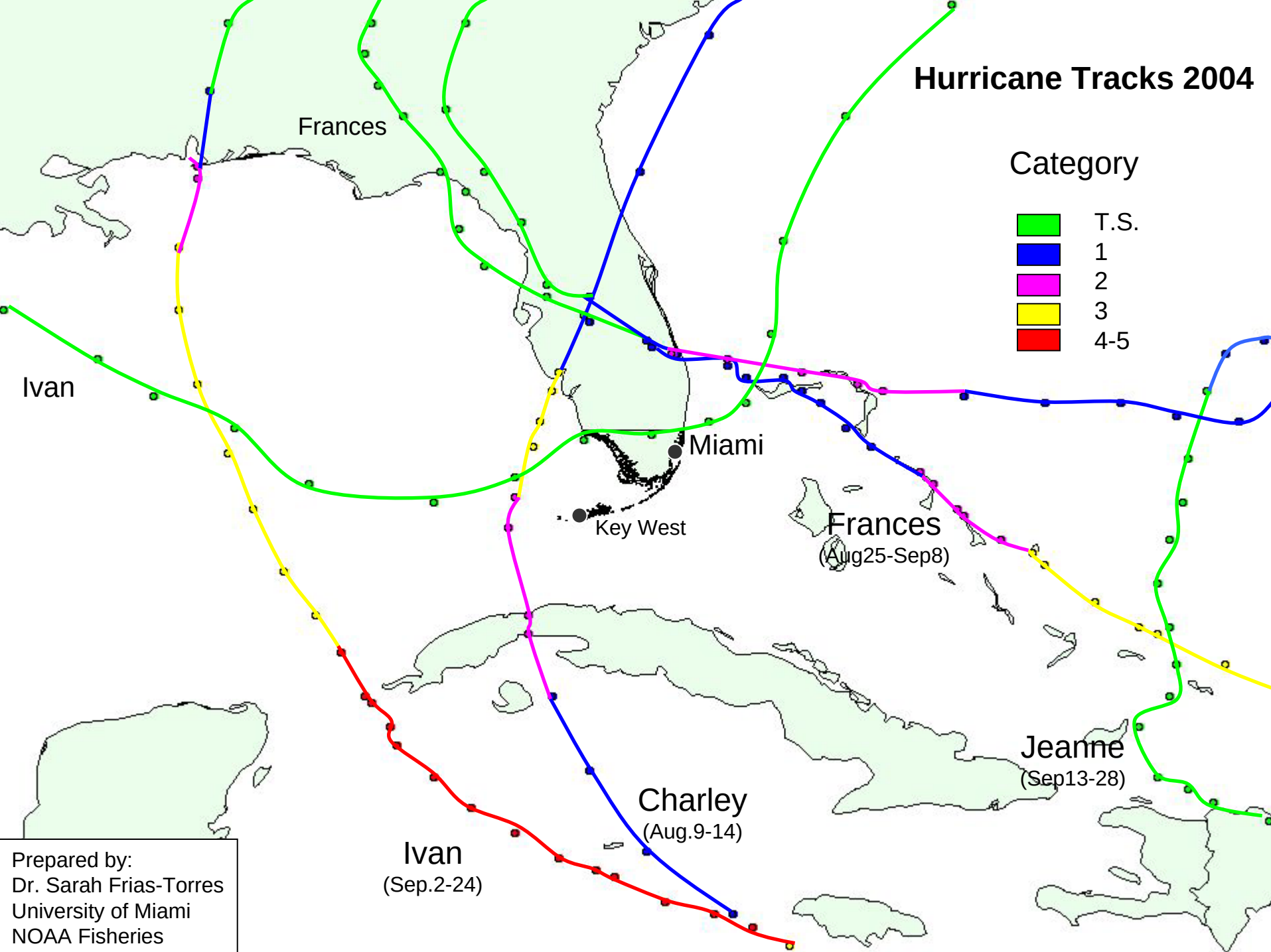


Recreational fishing boats line the corner of a Sanctuary Preservation Area in the Florida Keys National Marine Sanctuary

Photo by David McClellan, NMFS

Looe Key Reef 1983
Acropora

Hurricane Rita regional imagery, 2005.09.20 at 1915Z. Centerpoint Latitude: 24:09:02N Longitude: 81:48:04W.



Prepared by:
Dr. Sarah Frias-Torres
University of Miami
NOAA Fisheries

Hurricane Tracks 2005
Katrina
Dennis
Wilma
(Oct. 15-25)
Category
T.S.
1
2
3
4-5
Rita
Miami
Key West
Katrina
(Aug. 25-30)
Rita
(Sep.17-24)
Wilma
Dennis
(Jul. 2-13)
Prepared by:
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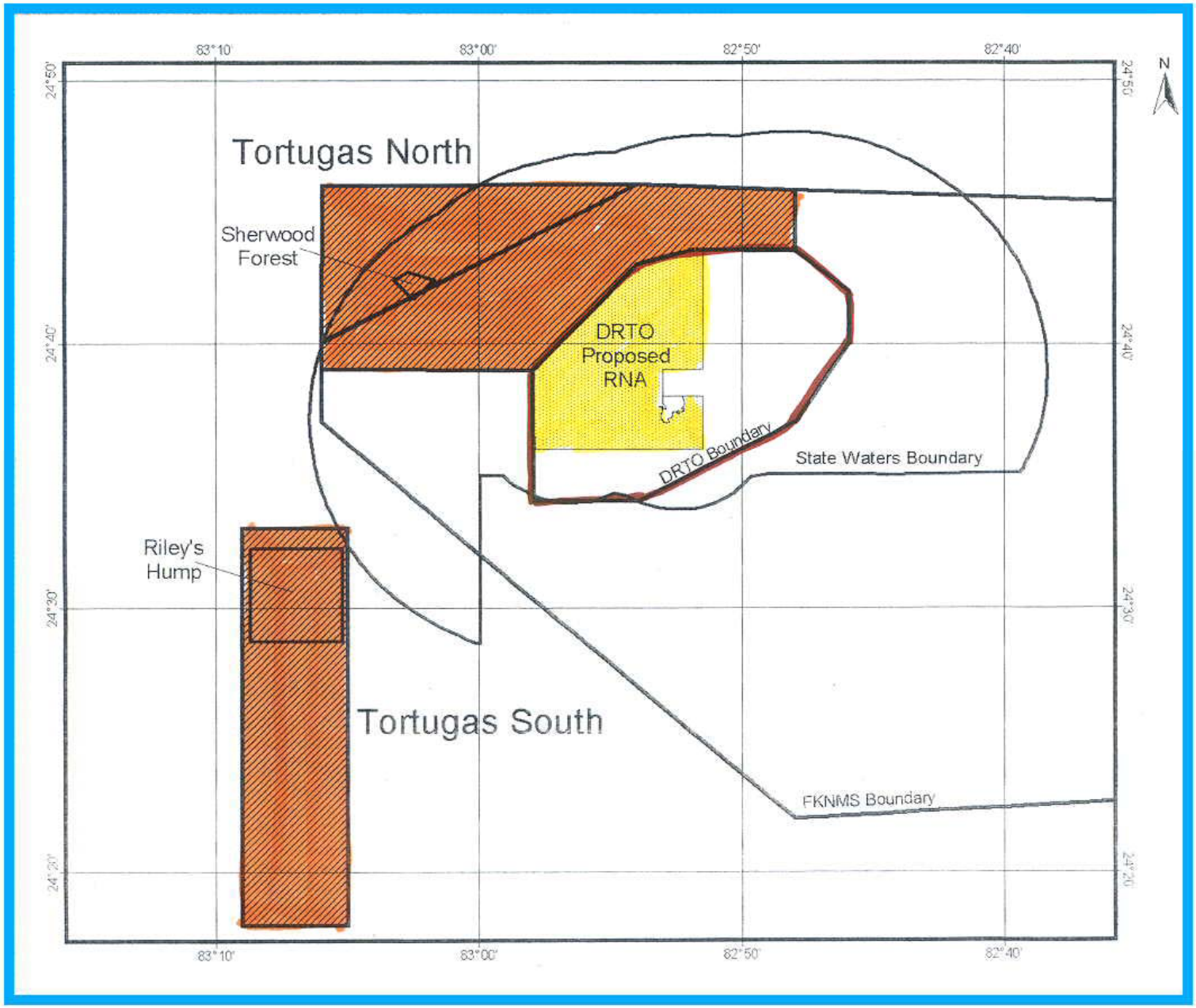
University of Miami
NOAA Fisheries

TORTUGAS ECOLOGIC RESERVE



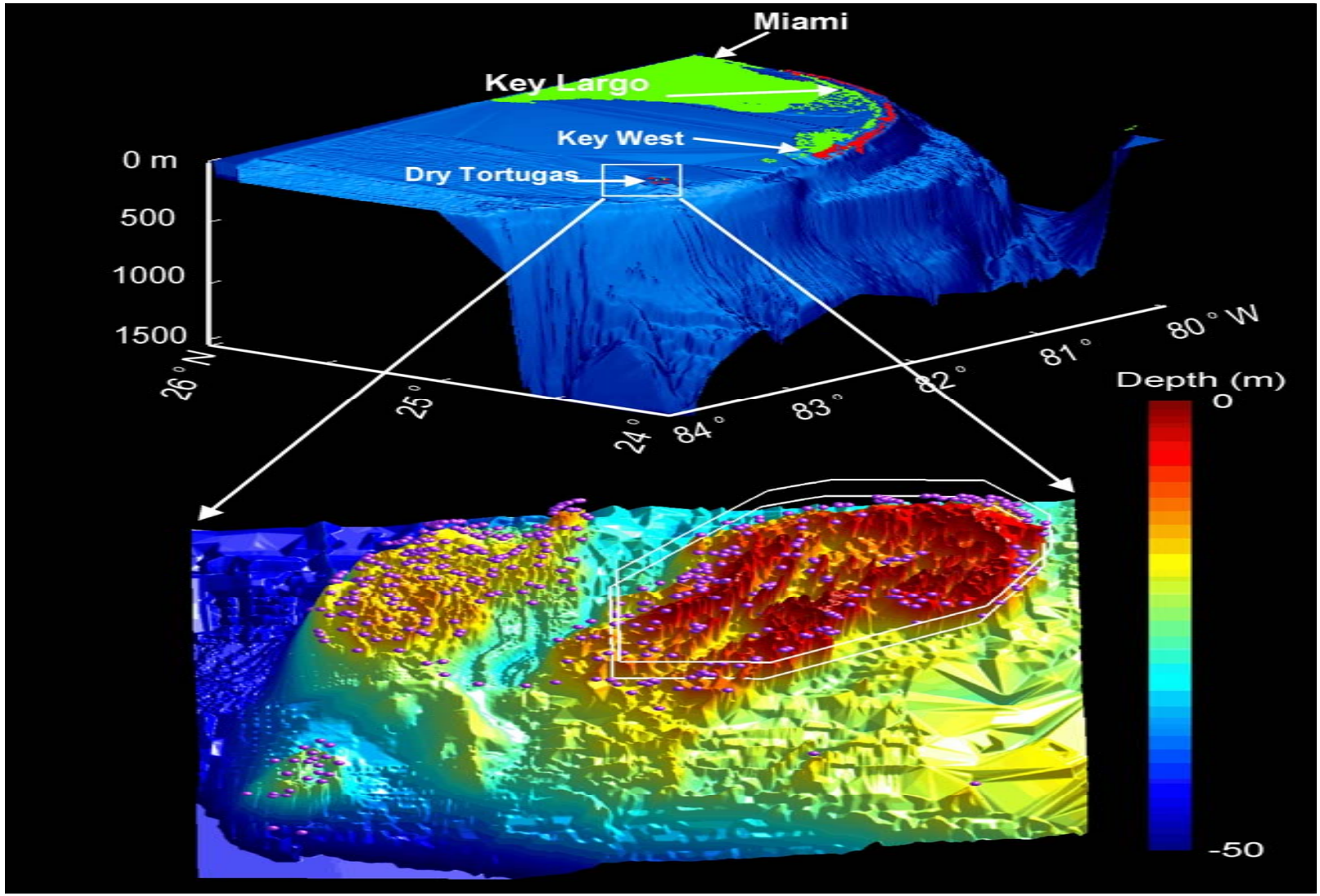
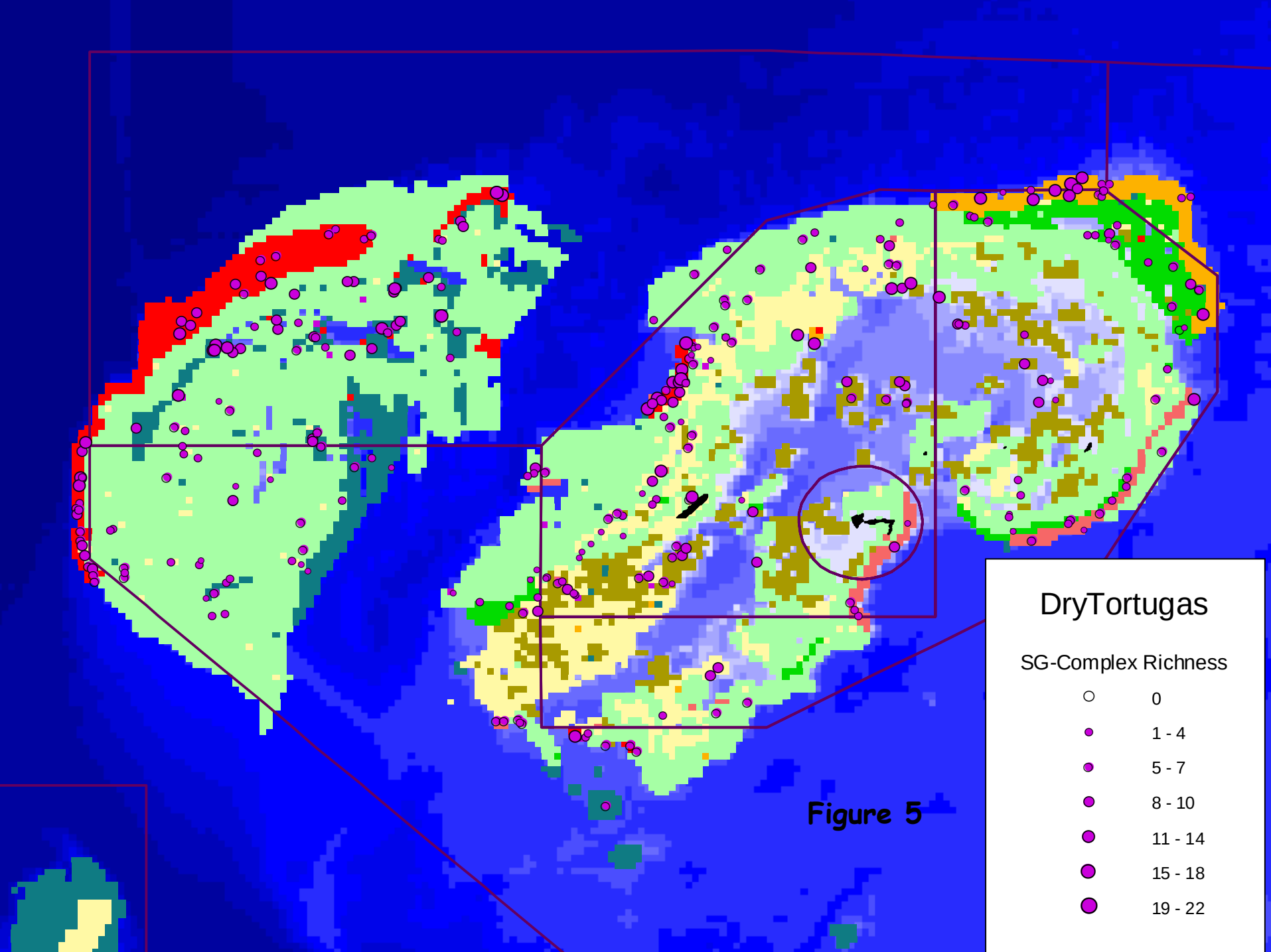
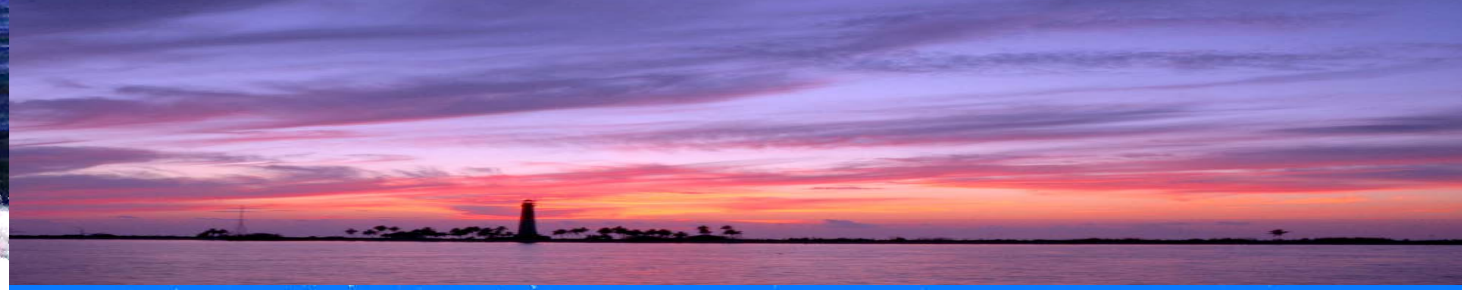
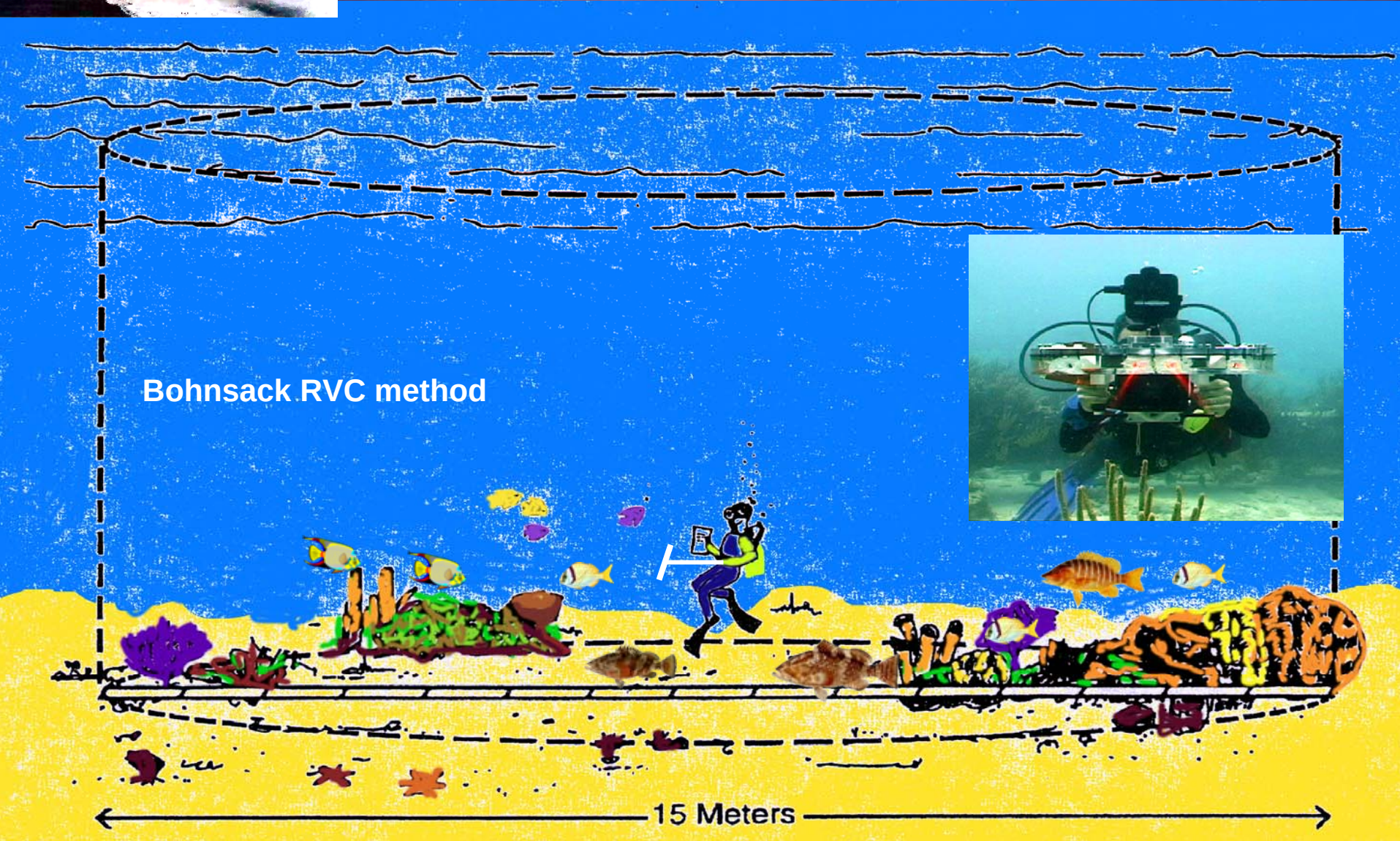
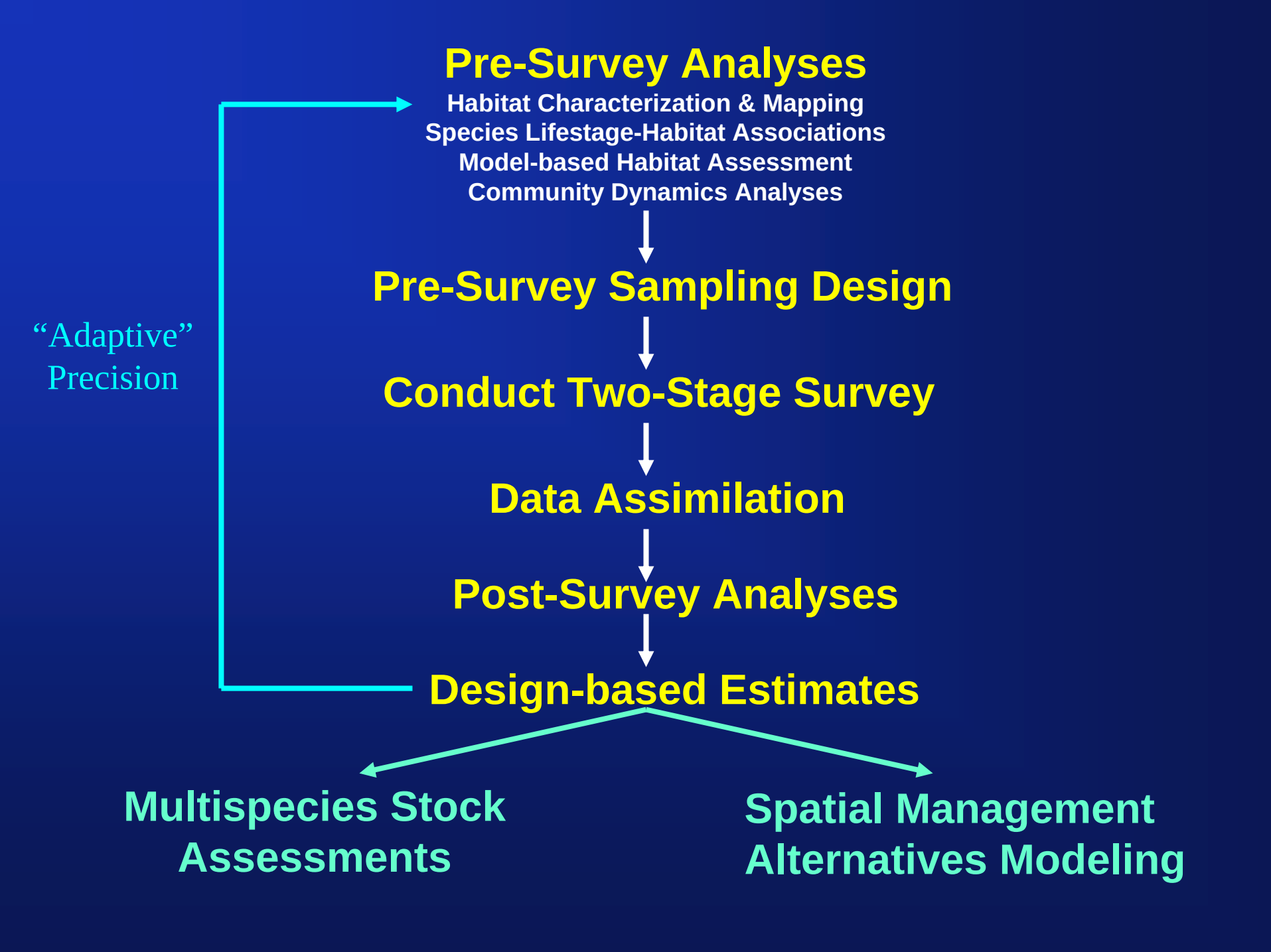


Figure 1.1 - Three-dimensional maps of the Florida Keys coral reef ecosystem showing: (A) South Florida and the coral reef tract (red) from Key Biscayne to the Dry Tortugas; and (B) the bathymetry of the Tortugas region showing Dry Tortugas National Park, Tortugas Bank and Riley's Hump where the purple balls represent primary sampling units from the millenial RVC and reef habitat surveys.

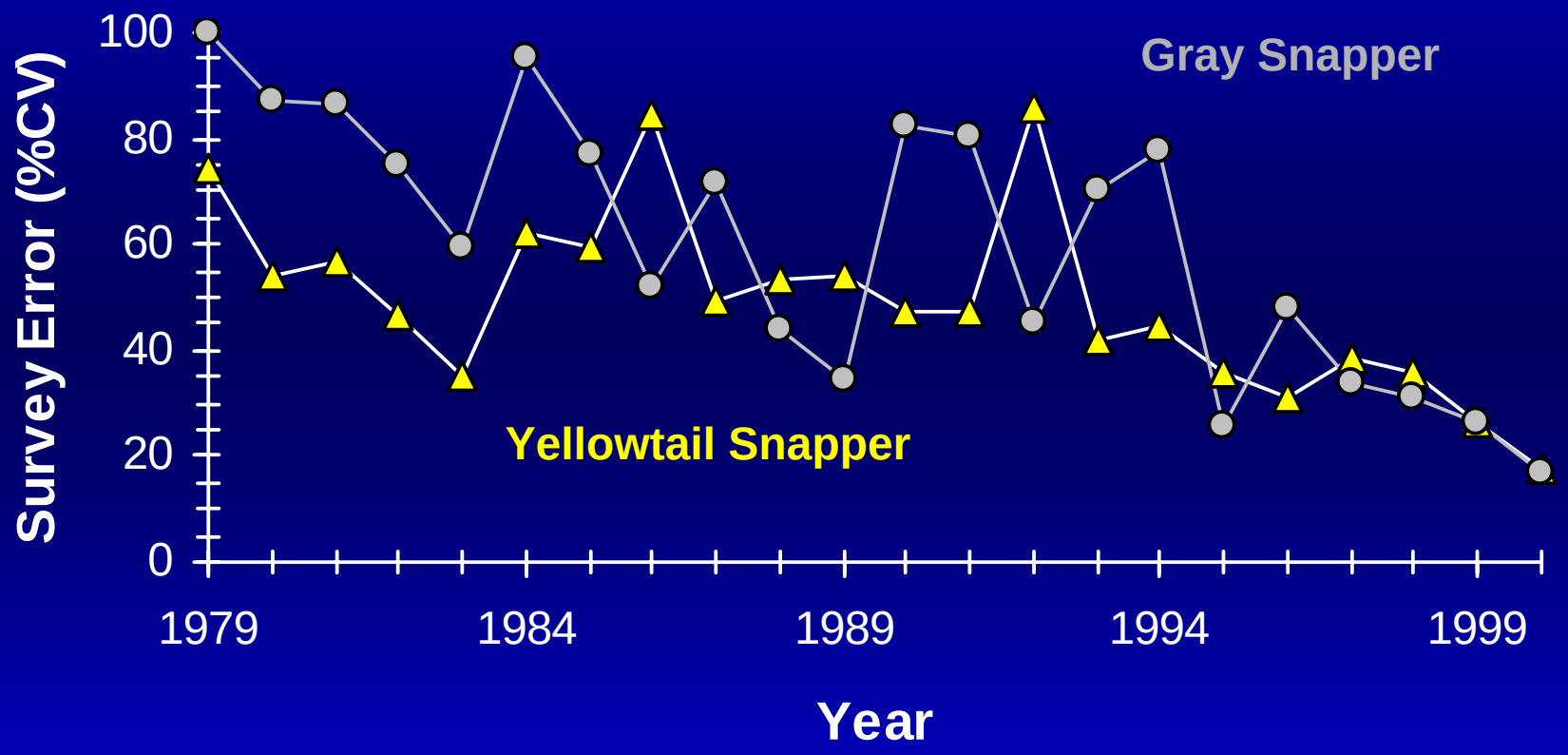

DryTortugas
SG-Complex Richness
0
1 - 4
5 - 7
8 - 10
11 - 14
15 - 18
19 - 22
Figure 5

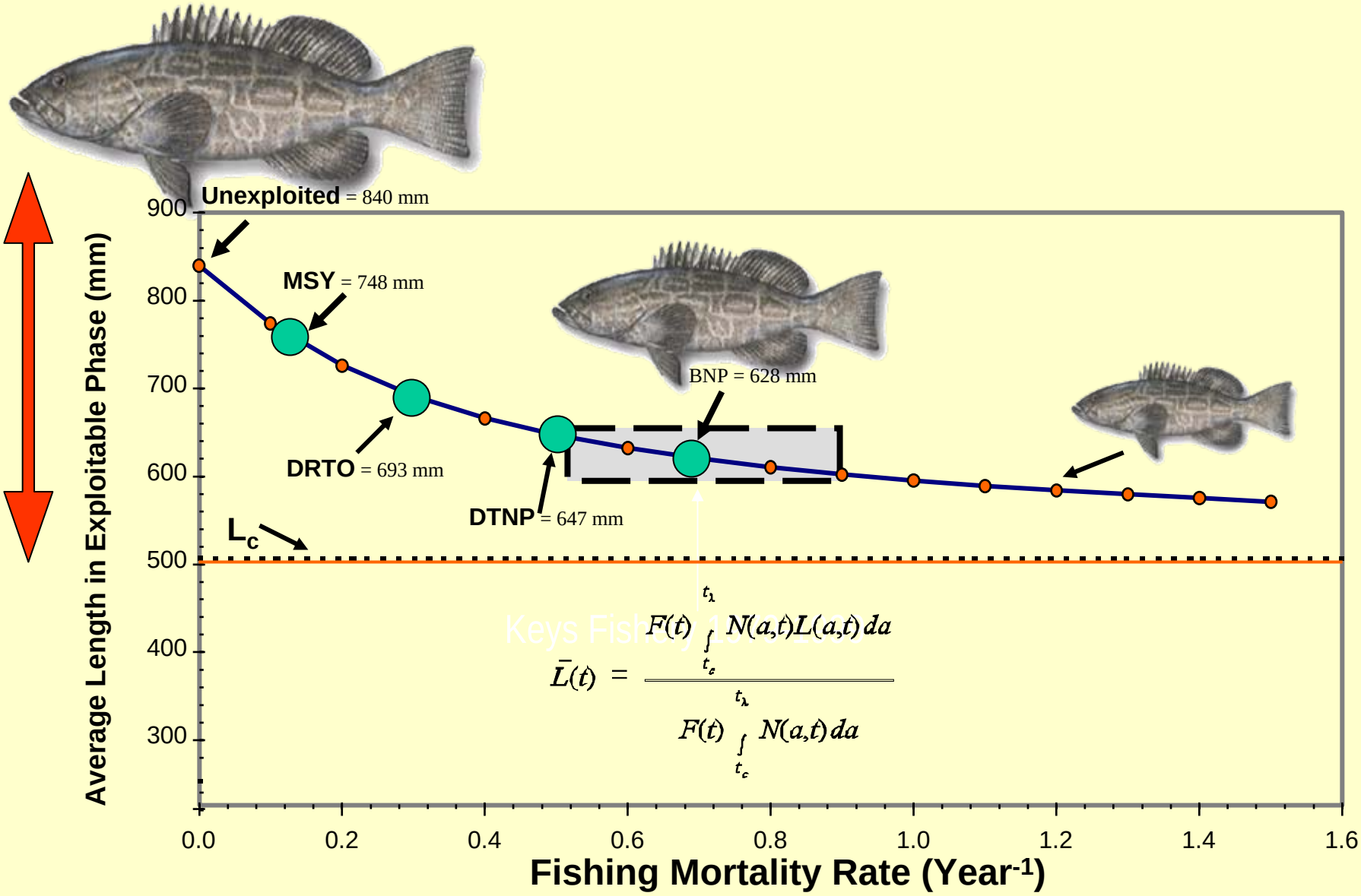



Bohnsack RVC method
15 Meters

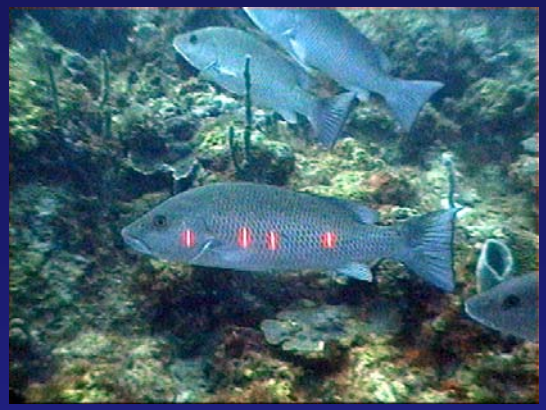

Pre-Survey Analyses
Habitat Characterization & Mapping
Species Lifestage-Habitat Associations
Model-based Habitat Assessment
Community Dynamics Analyses
Pre-Survey Sampling Design
Conduct Two-Stage Survey
Data Assimilation
Post-Survey Analyses
Design-based Estimates
"Adaptive" Precision
Multispecies Stock Assessments
Spatial Management Alternatives Modeling

Survey Precision for Adult Population Size

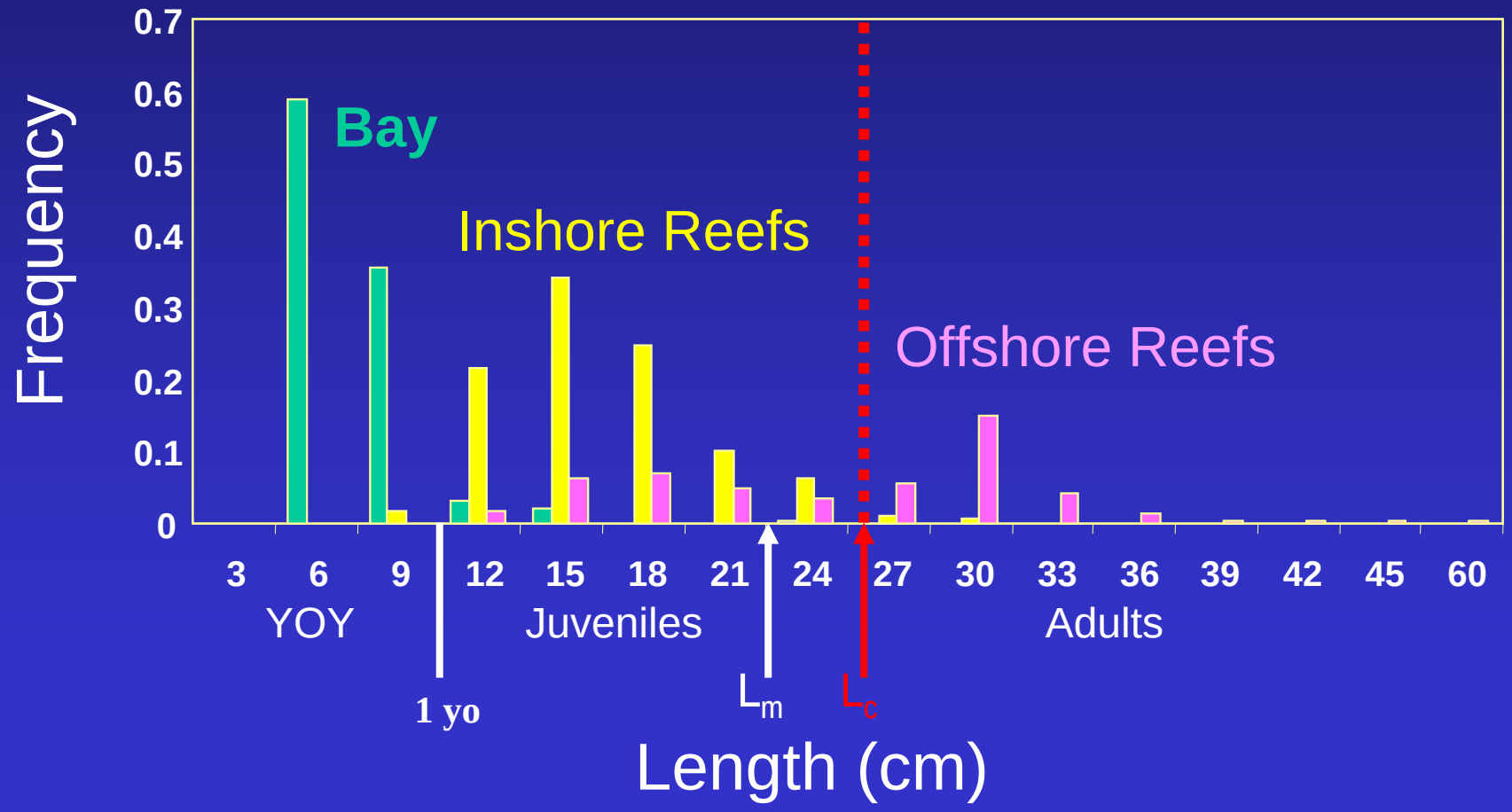




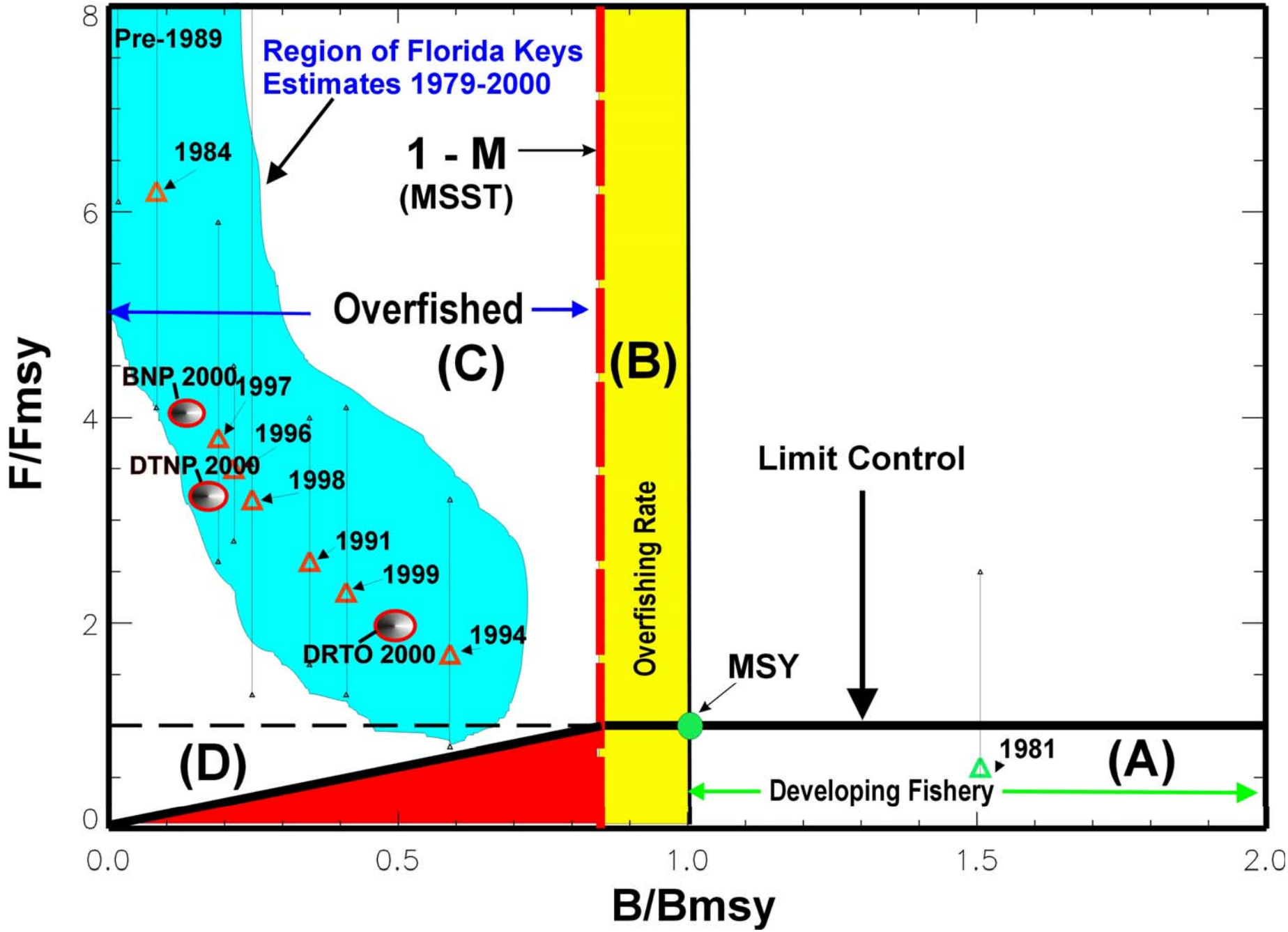
Keys Fishery 15 8 2008

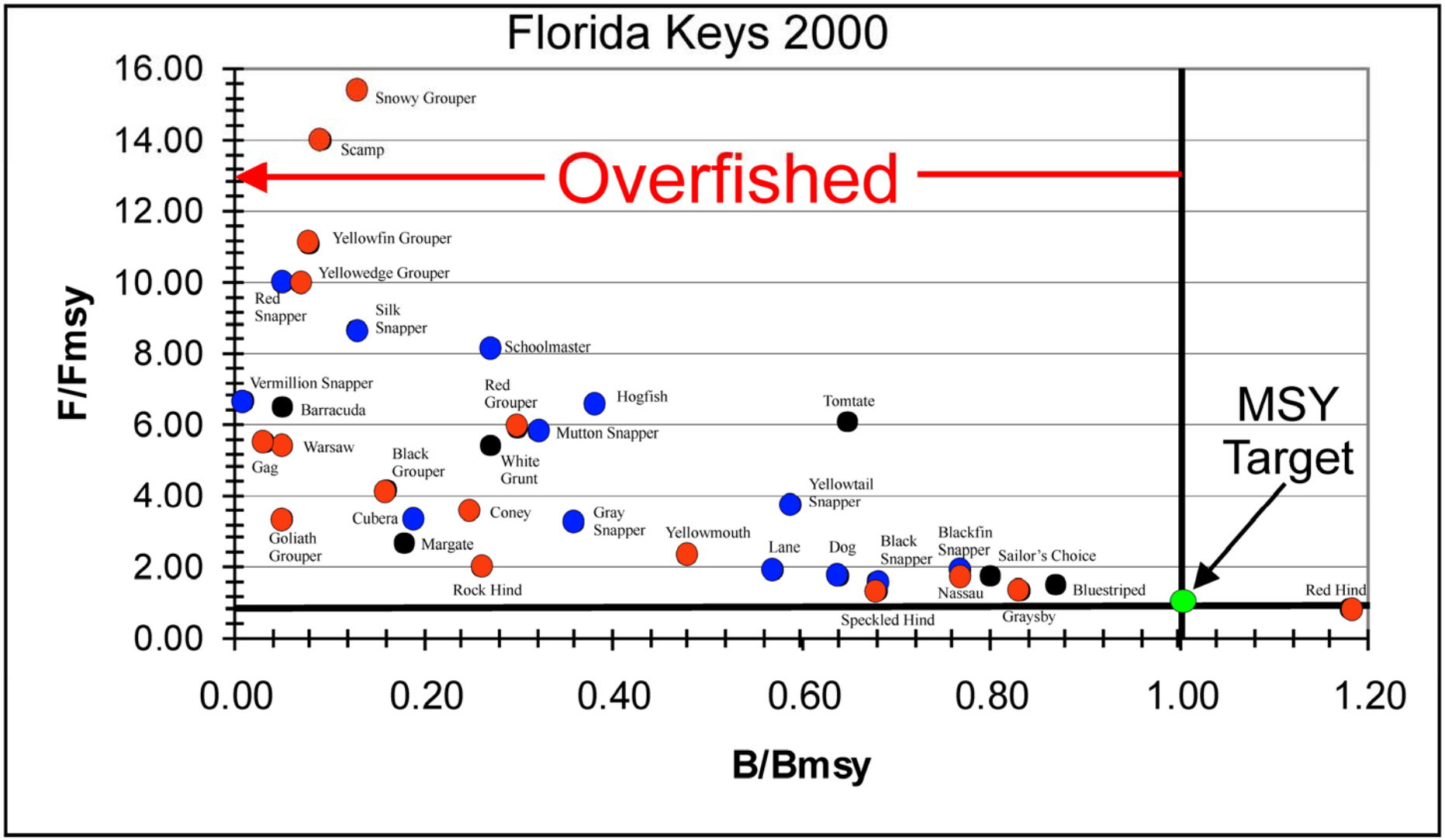


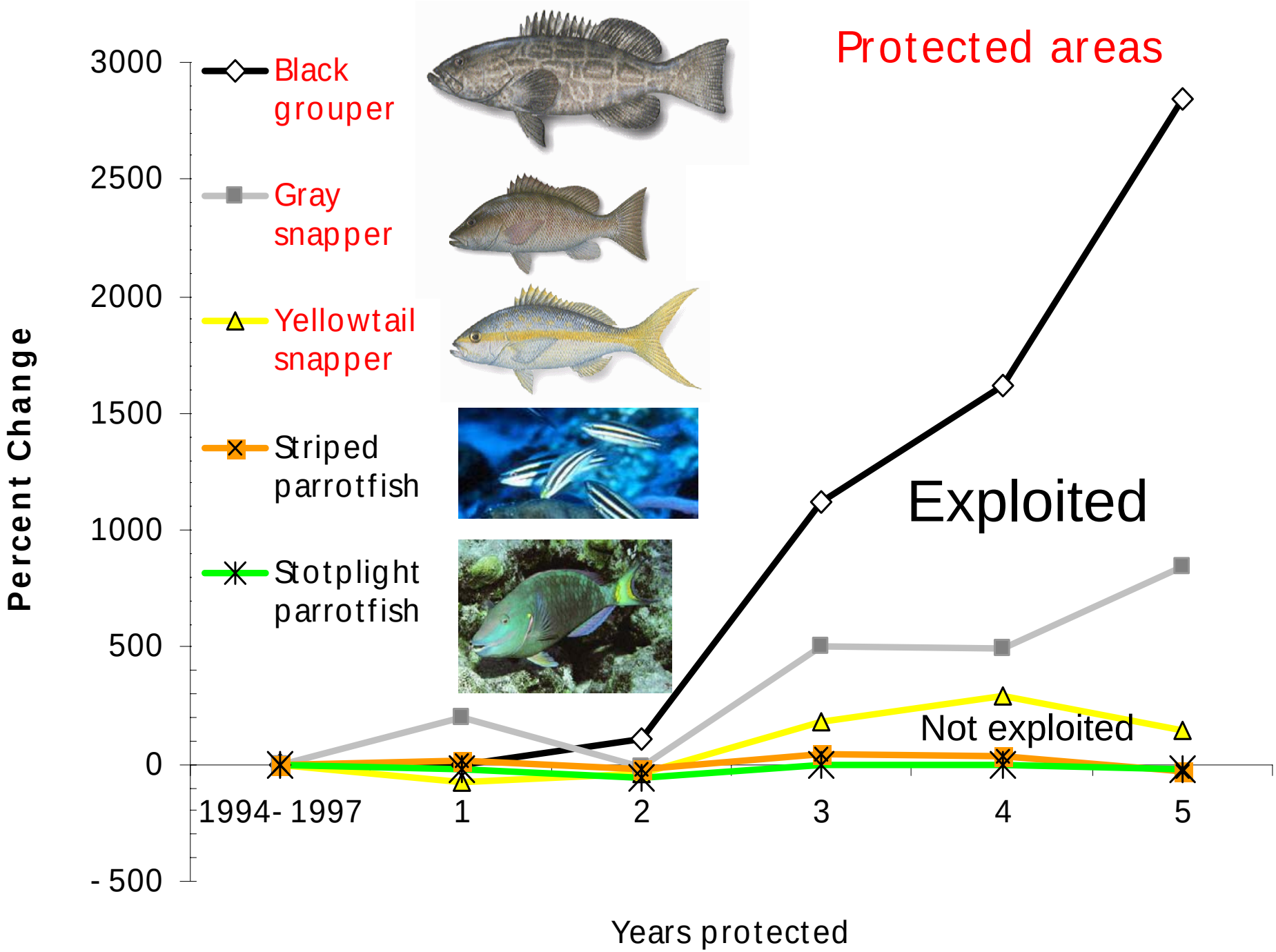
Gray Snapper

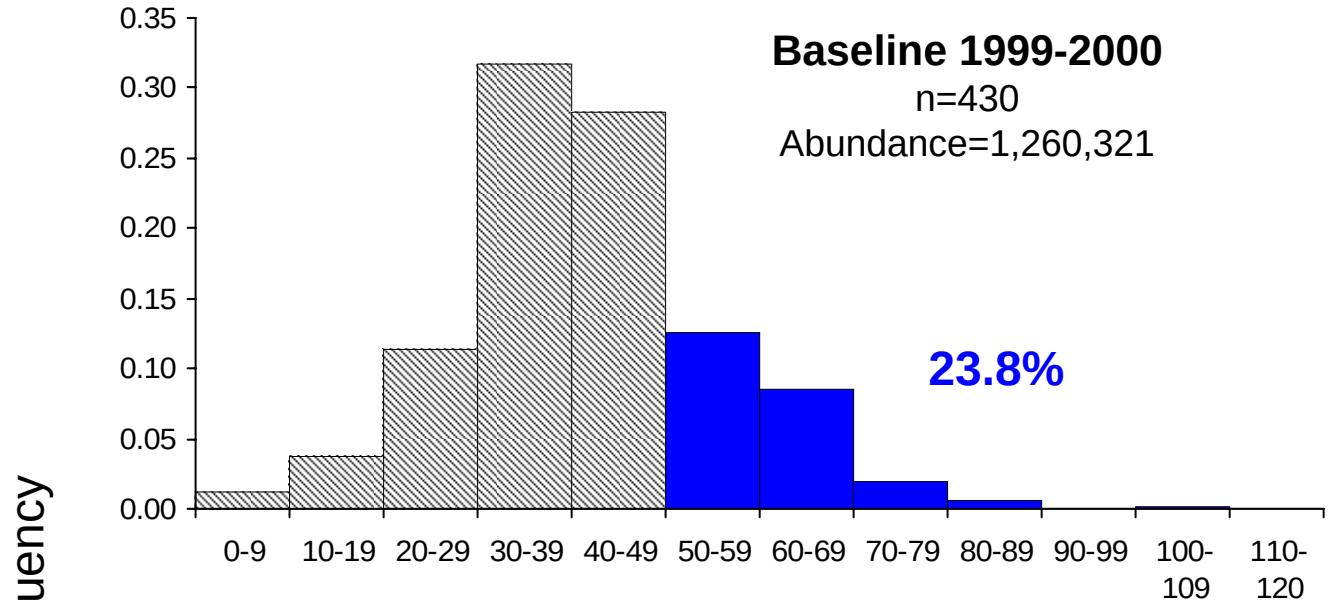


Black Grouper

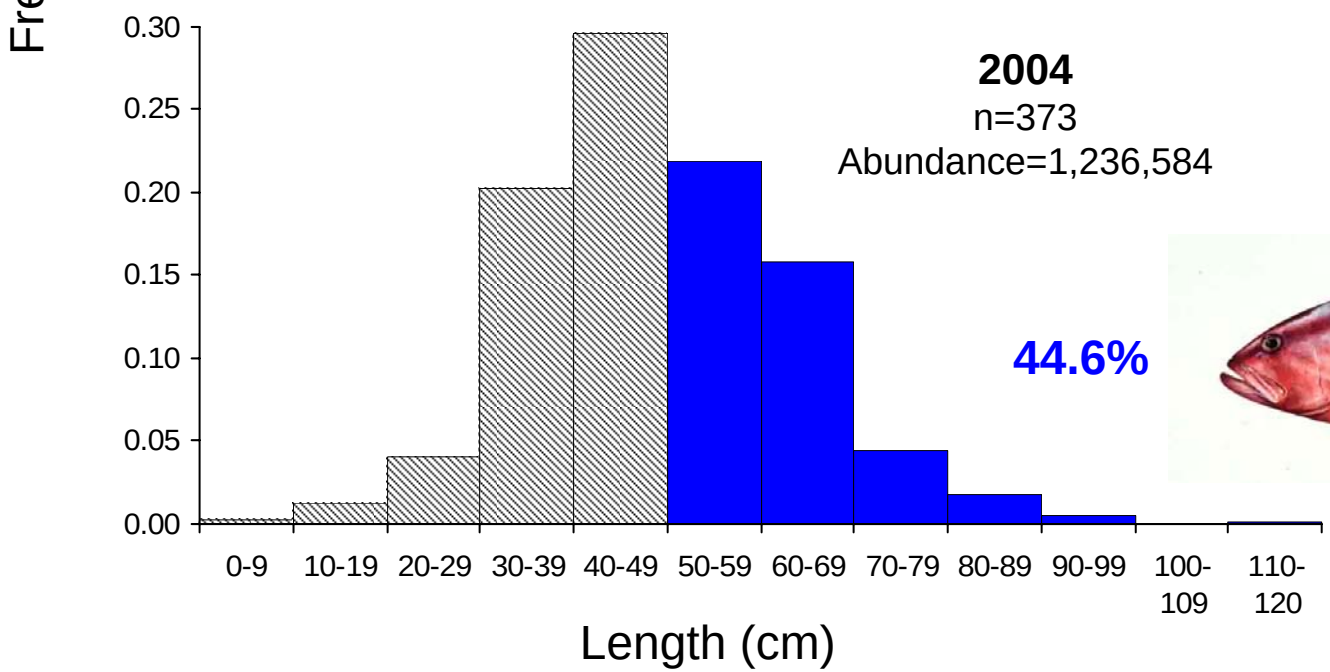


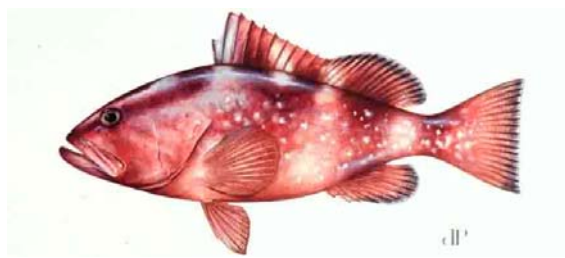

Florida Keys 2000
Overfished
MSY
Target
F/Fmsy
B/Bmsy
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Snowy Grouper
Scamp
Yellowfin Grouper
Yellowedge Grouper
Red Snapper
Silk Snapper
Schoolmaster
Vermillion Snapper
Barracuda
Red Grouper
Hogfish
Tomtate
Mutton Snapper
Warsaw
Gag
Black Grouper
White Grunt
Yellowtail Snapper
Cubera
Coney
Gray Snapper
Goliath Grouper
Margate
Yellowmouth
Lane
Dog
Black Snapper
Blackfin Snapper
Sailor's Choice
Rock Hind
Nassau
Bluestriped
Red Hind
Speckled Hind
Graysby

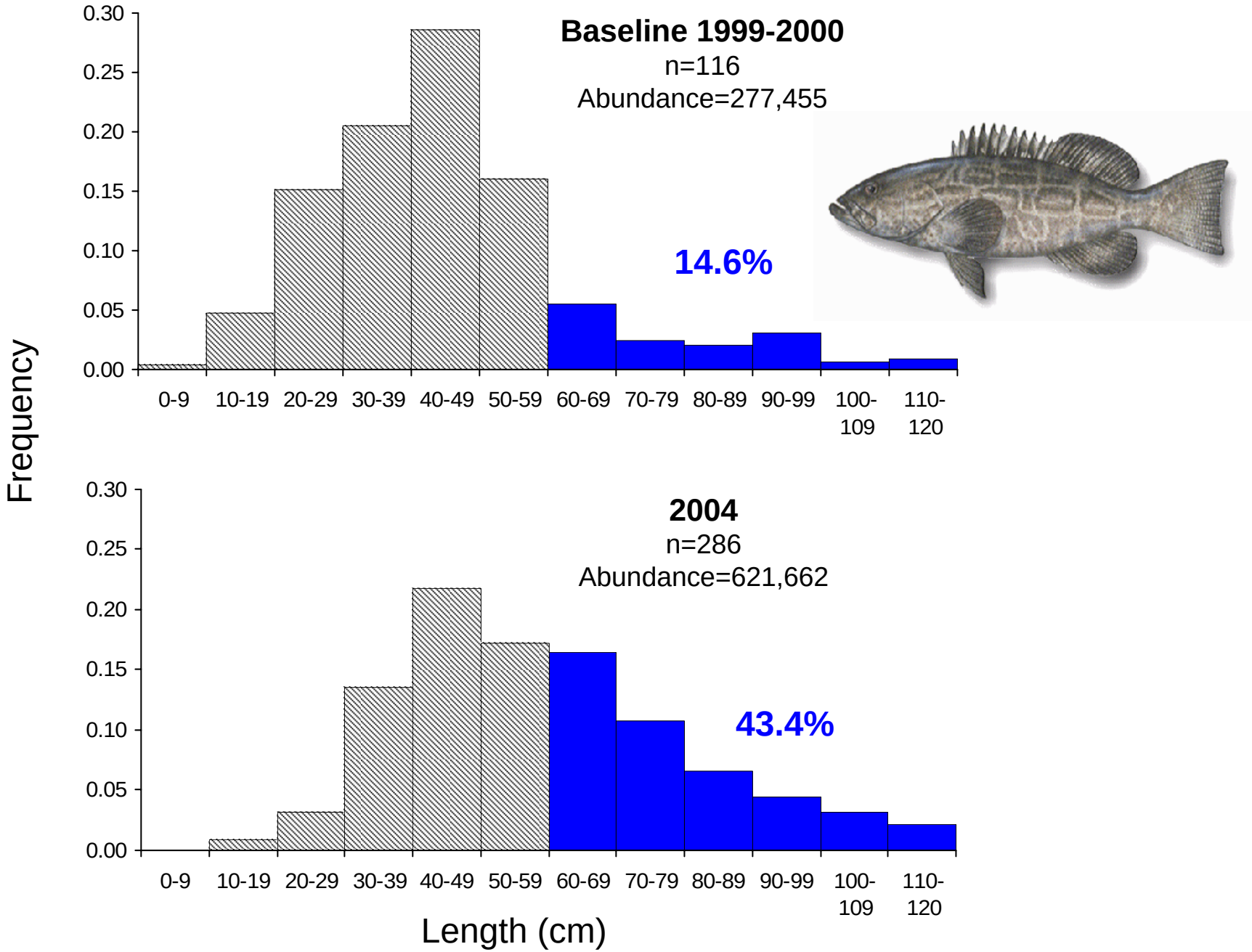

Protected areas
Black grouper
Gray snapper
Yellowtail snapper
Striped parrotfish
Stotplight parrotfish
Exploited
Not exploited
Percent Change
3000
2500
2000
1500
1000
500
0
- 500
1994- 1997
1
2
3
4
5
Years protected


Baseline 1999-2000
n=430
Abundance=1,260,321
23.8%
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0-9
10-19
20-29
30-39
40-49
50-59
60-69
70-79
80-89
90-99
100-109
110-120

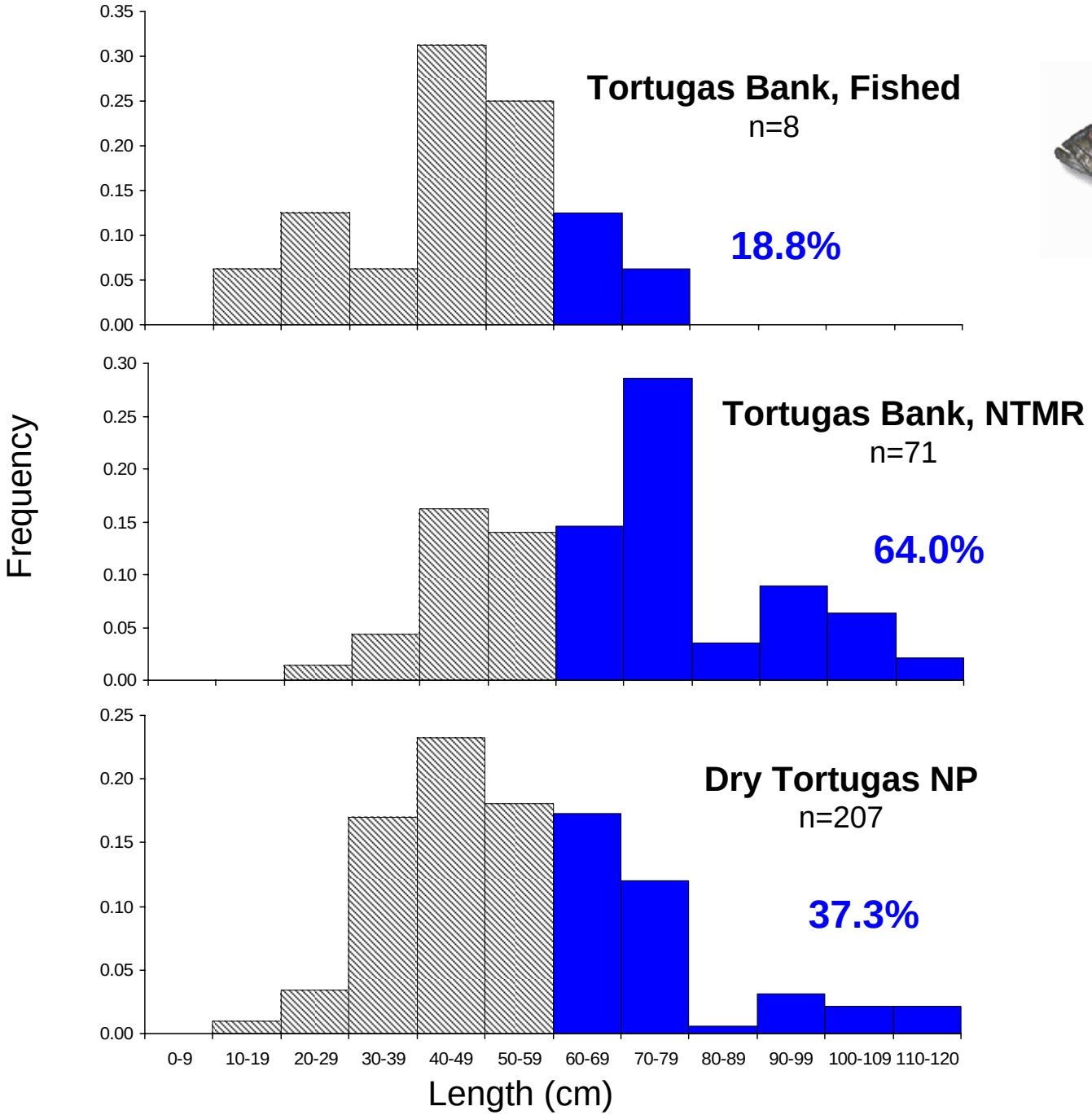
Red Grouper


2004
n=373
Abundance=1,236,584
44.6%
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0-9
10-19
20-29
30-39
40-49
50-59
60-69
70-79
80-89
90-99
100-109
110-120
Frequency
Length (cm)




Baseline 1999-2000
n=116
Abundance=277,455
14.6%
2004
n=286
Abundance=621,662
43.4%
Frequency
Length (cm)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0-9
10-19
20-29
30-39
40-49
50-59
60-69
70-79
80-89
90-99
100-109
110-120

2004


Tortugas Bank, Fished
n=8
18.8%
Tortugas Bank, NTMR
n=71
64.0%
Dry Tortugas NP
n=207
37.3%
Frequency
Length (cm)
0-9
10-19
20-29
30-39
40-49
50-59
60-69
70-79
80-89
90-99
100-109
110-120

27 4:42PM

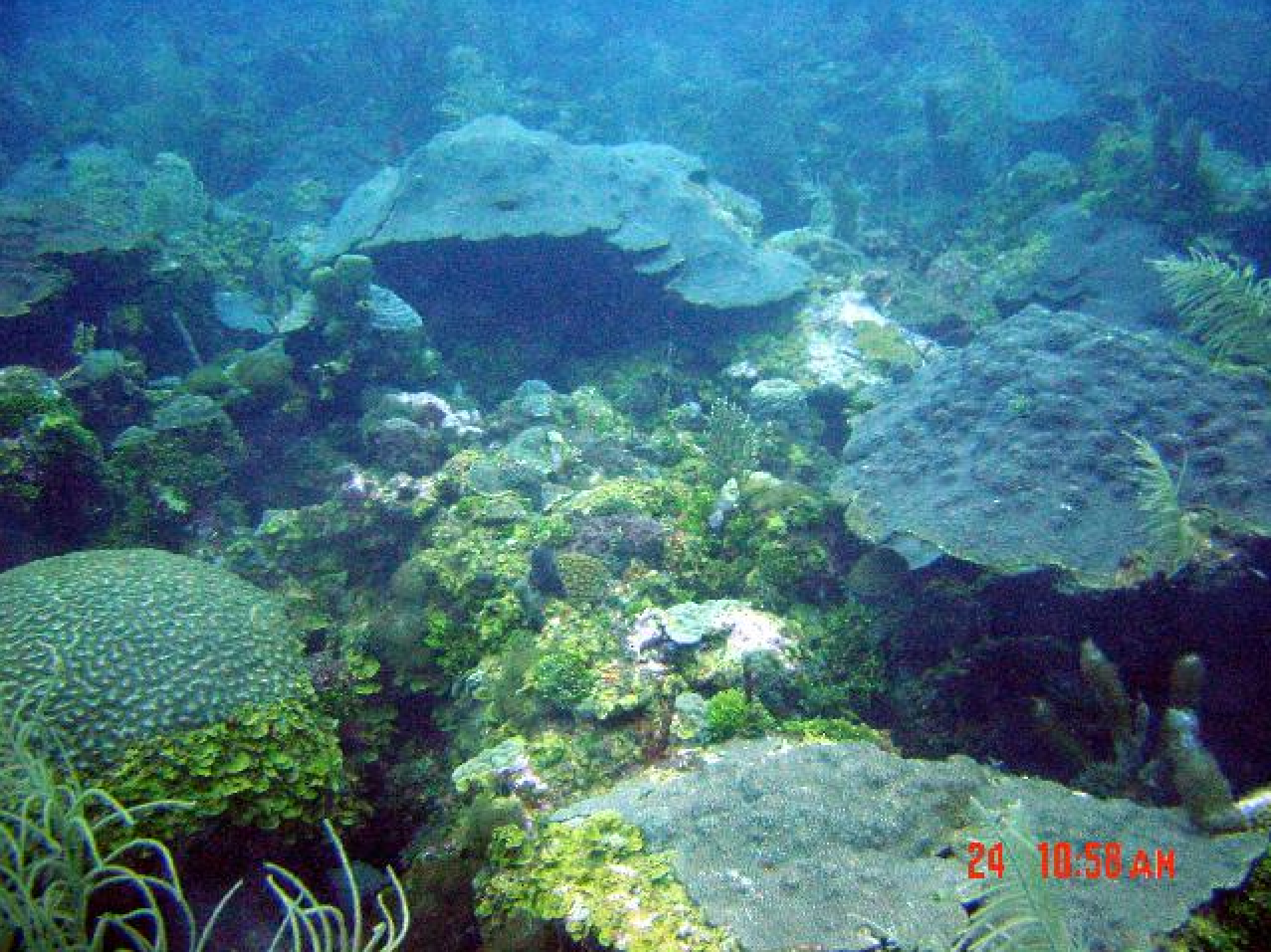
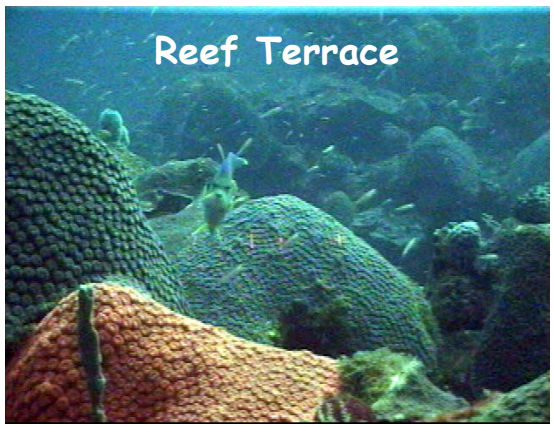
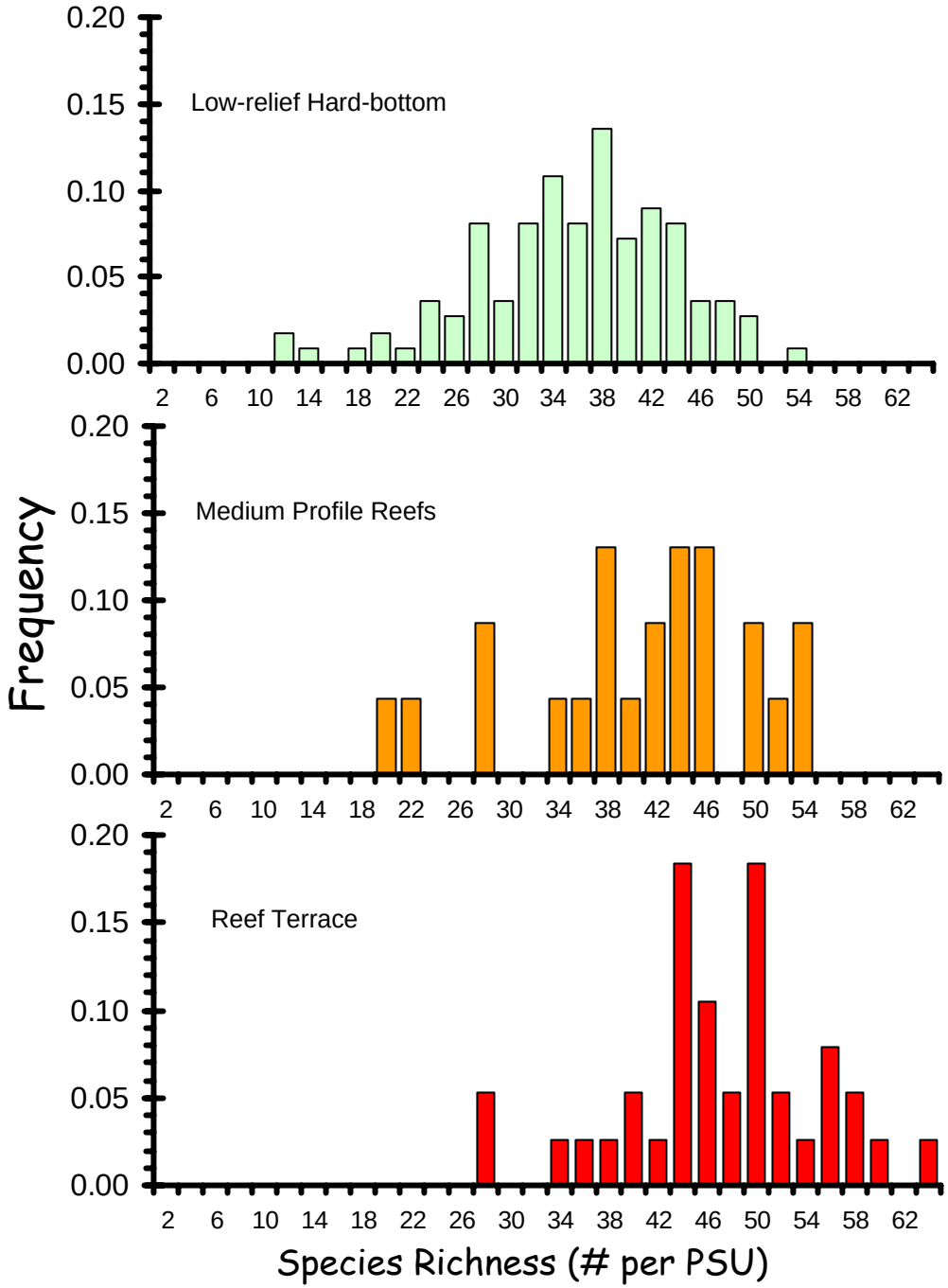

24 10:58 AM

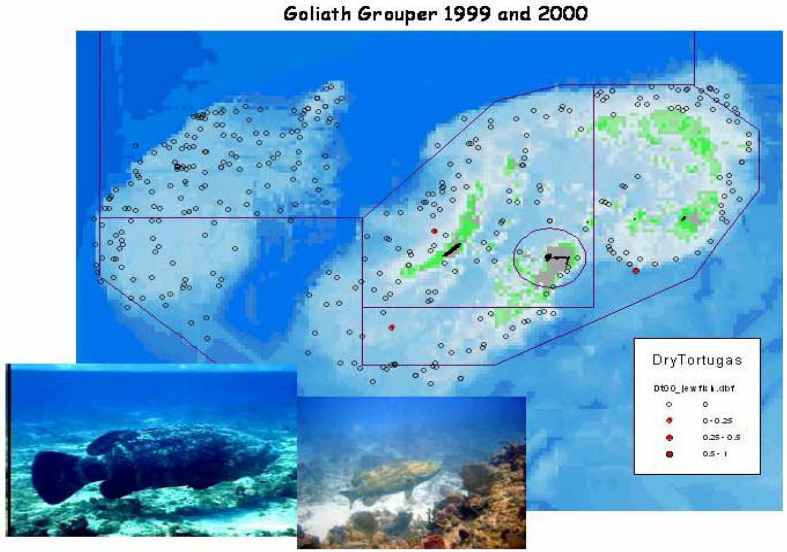
Figure 4

Low-relief hard-bottom

Medium Profile Reefs


Reef Terrace


Low-relief Hard-bottom
Medium Profile Reefs
Reef Terrace
Frequency
0.20
0.15
0.10
0.05
0.00
2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62
Species Richness (# per PSU)



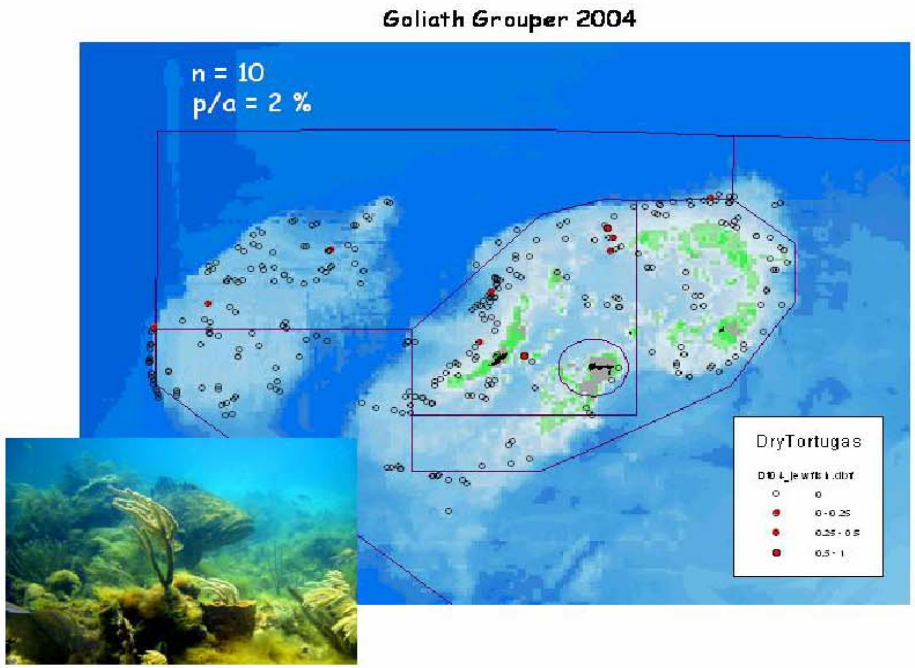
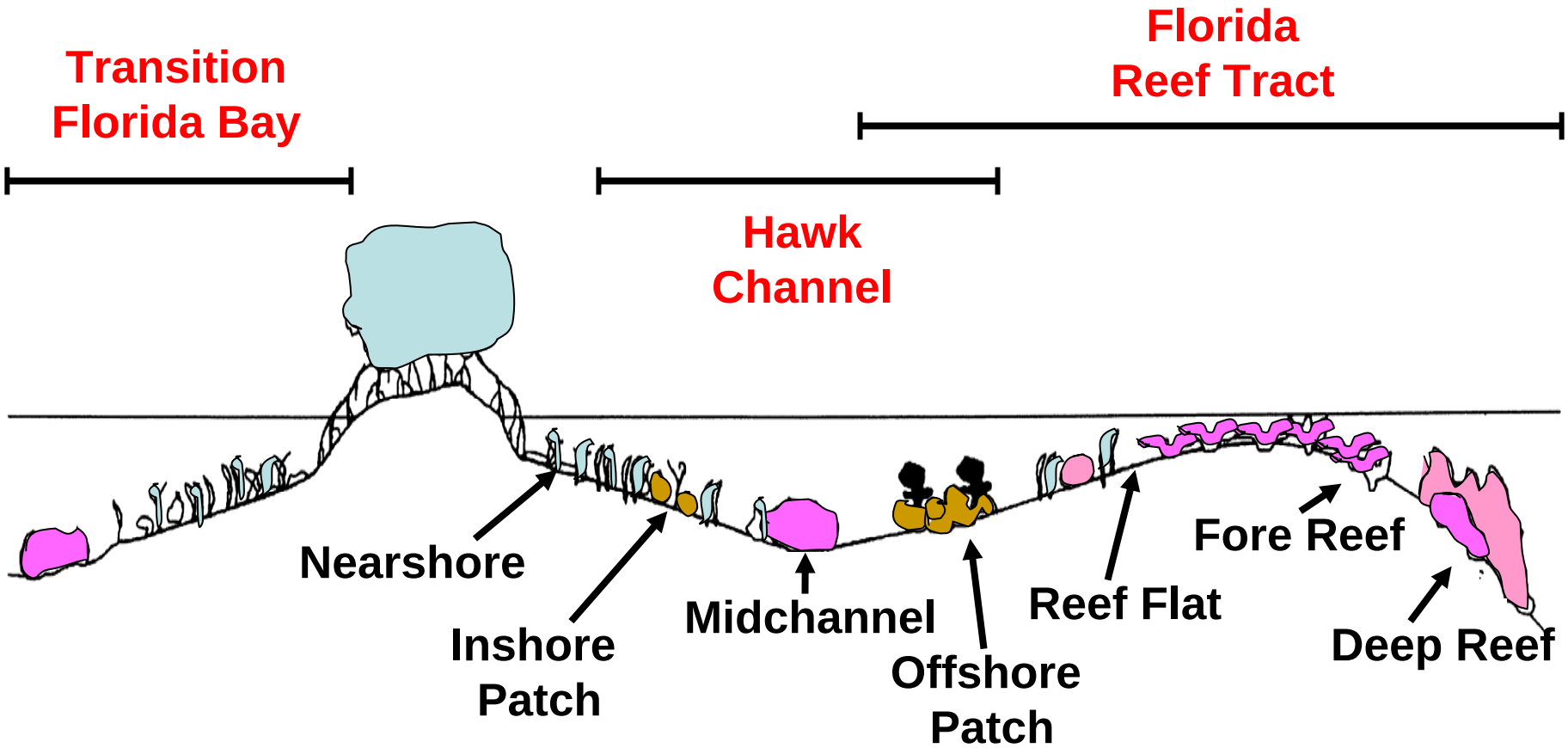
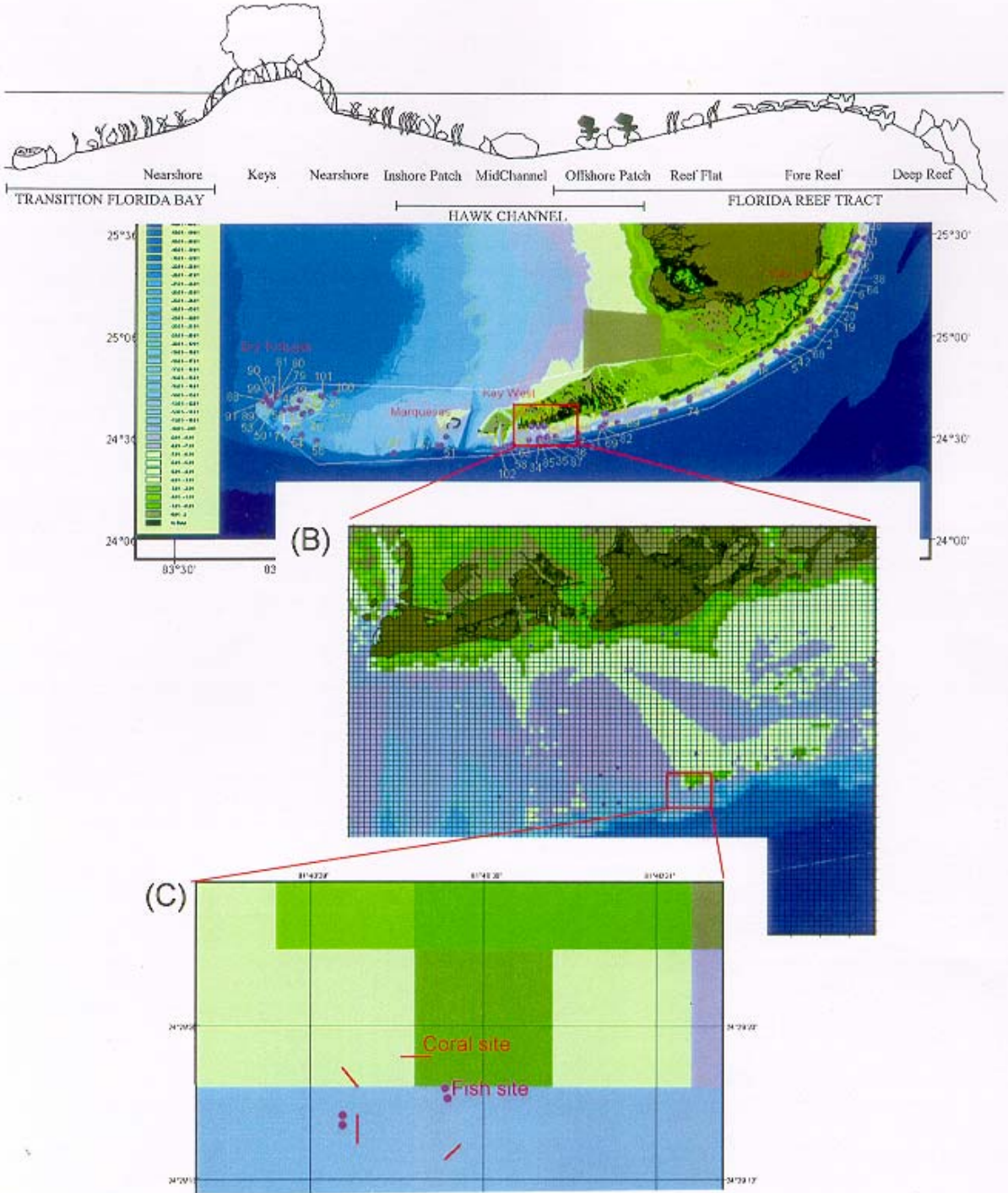
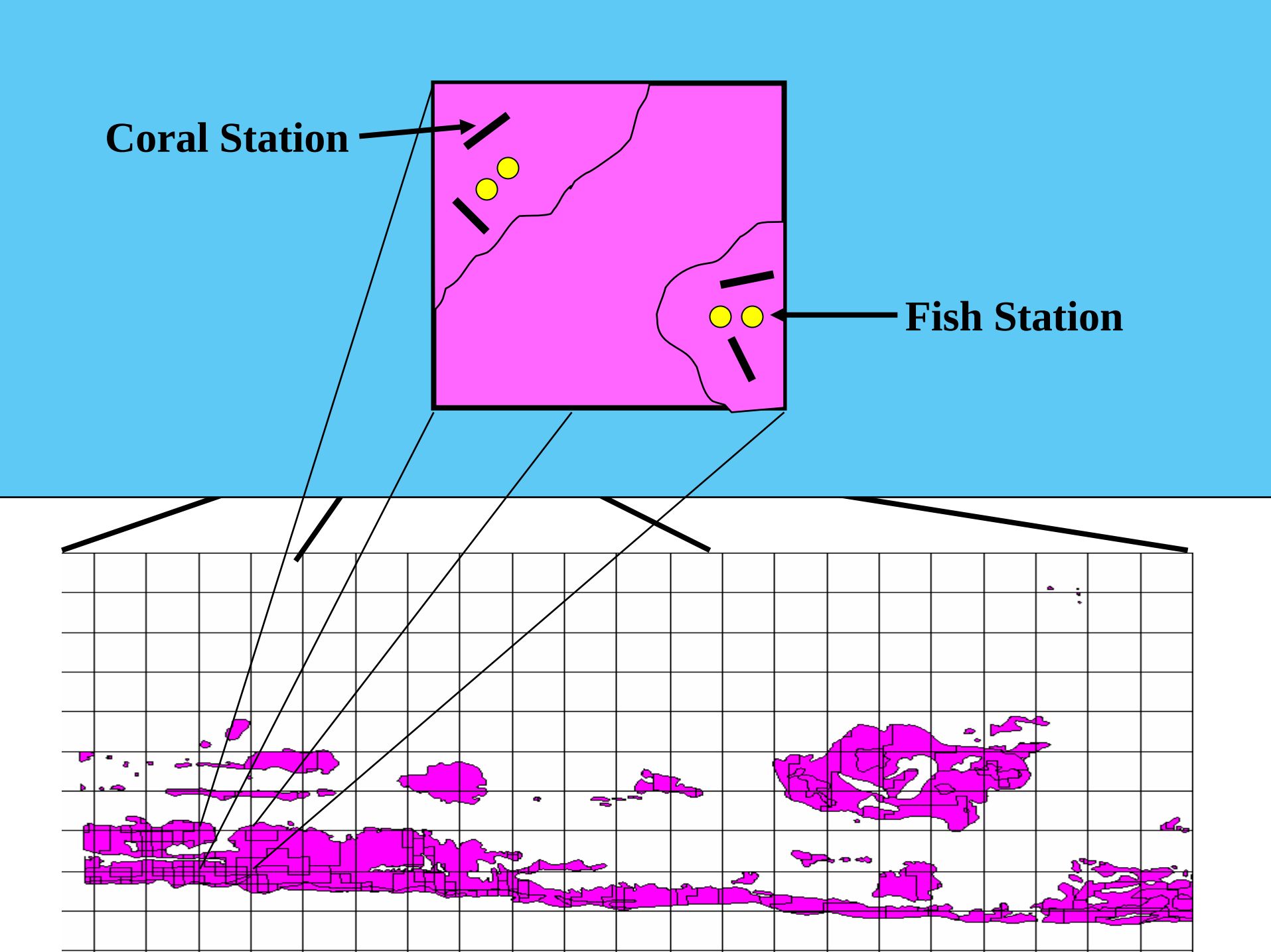


Figure 4.11.- Spatial distribution of goliath grouper determined by the Tortugas reef fish monitoring survey: (top) 1999 and 2000 surveys; and, (bottom) 2004 survey.

Cross-Shelf Habitat Classification




Nearshore
Keys
Nearshore
Inshore Patch
MidChannel
Offshore Patch
Reef Flat
Fore Reef
Deep Reef
TRANSITION FLORIDA BAY
HAWK CHANNEL
FLORIDA REEF TRACT
Key West
Marquesas
(B)
(C)
Coral site
Fish site


Coral Station
Fish Station

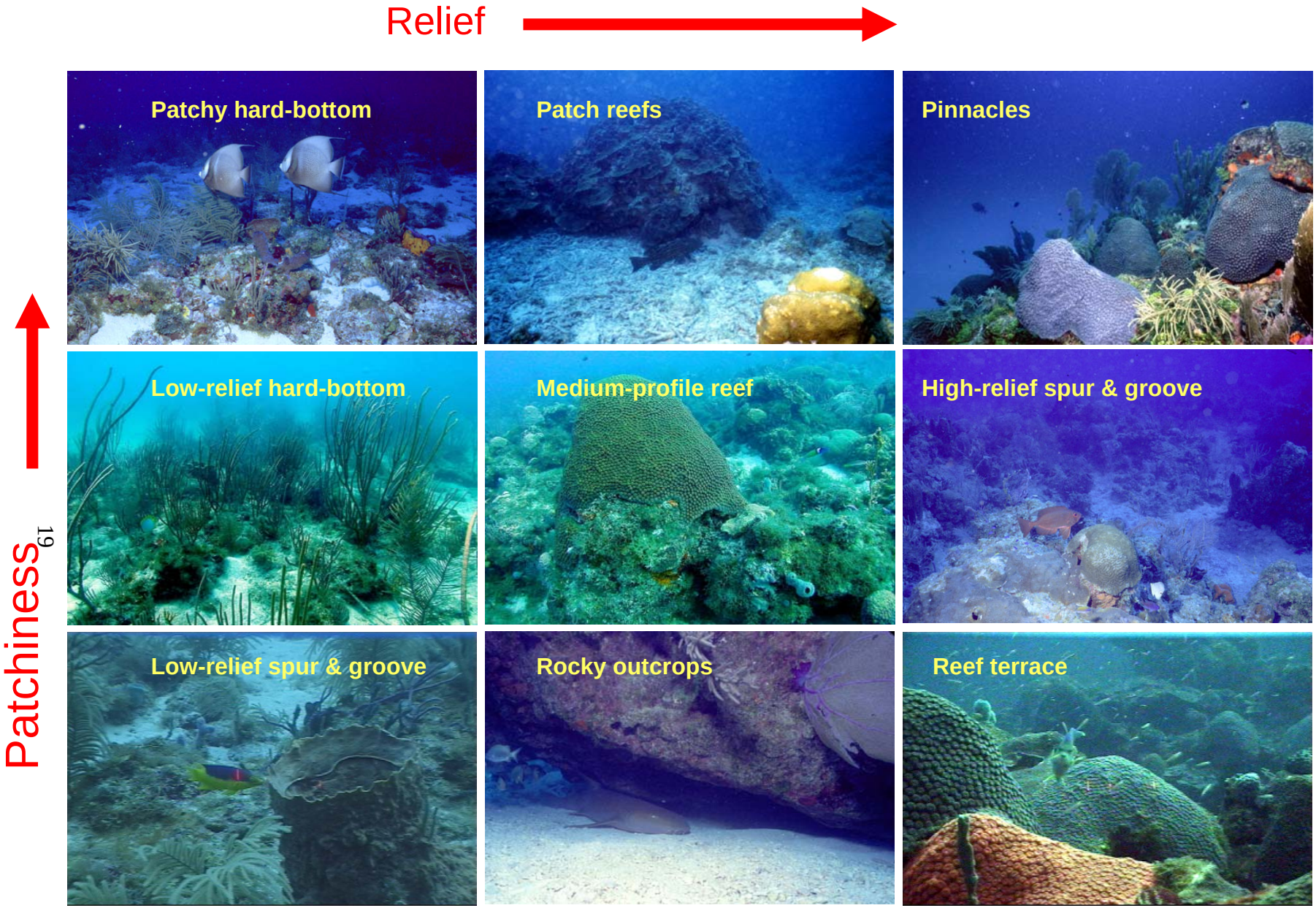
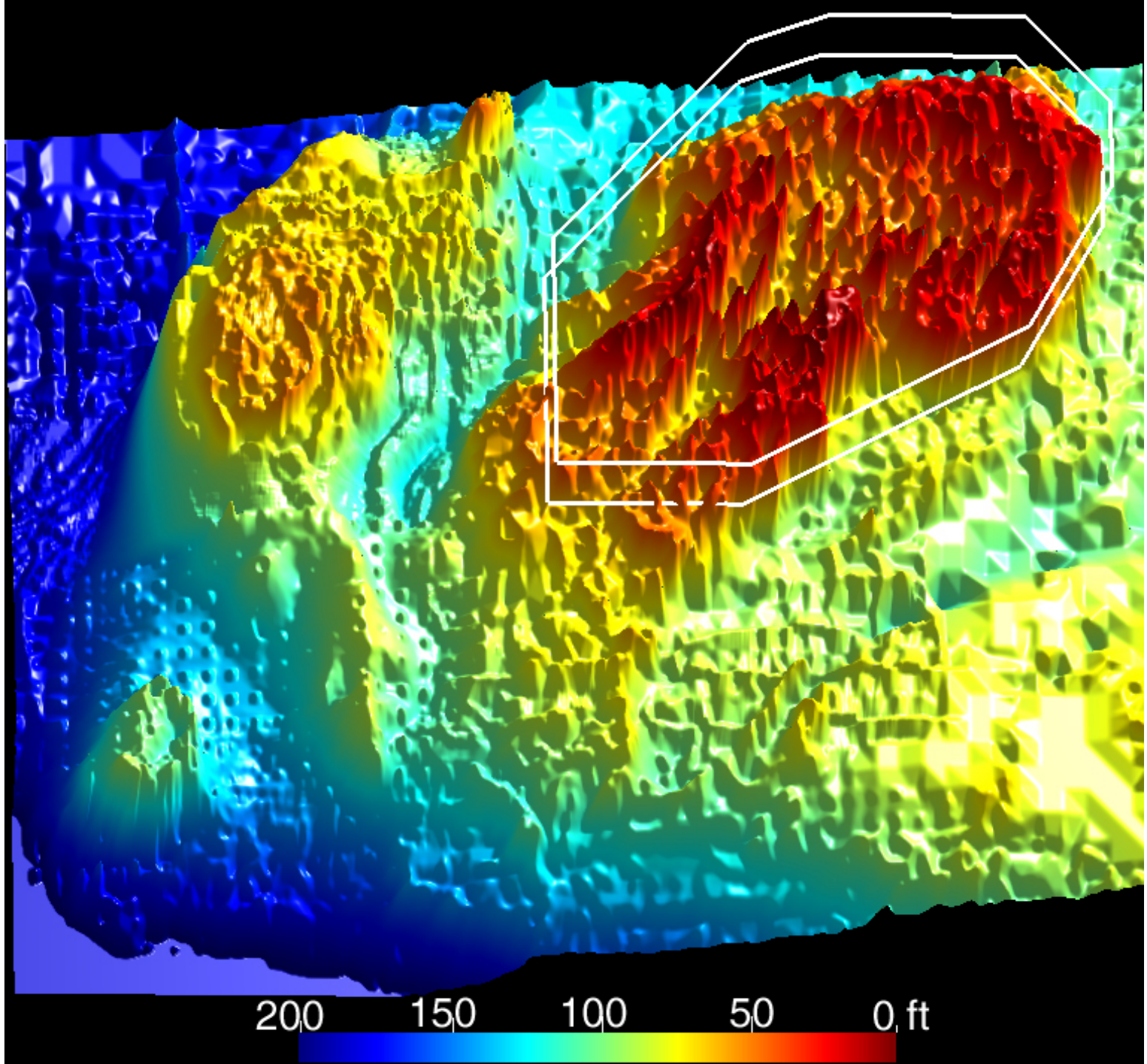


Figure 2.6 – Photographs depicting the benthic classification scheme of hard-bottom and coral reef habitats for the Tortugas region including the Dry Tortugas National Park and western Florida Keys National Marine Sanctuary.


200
150
100
50
0 ft

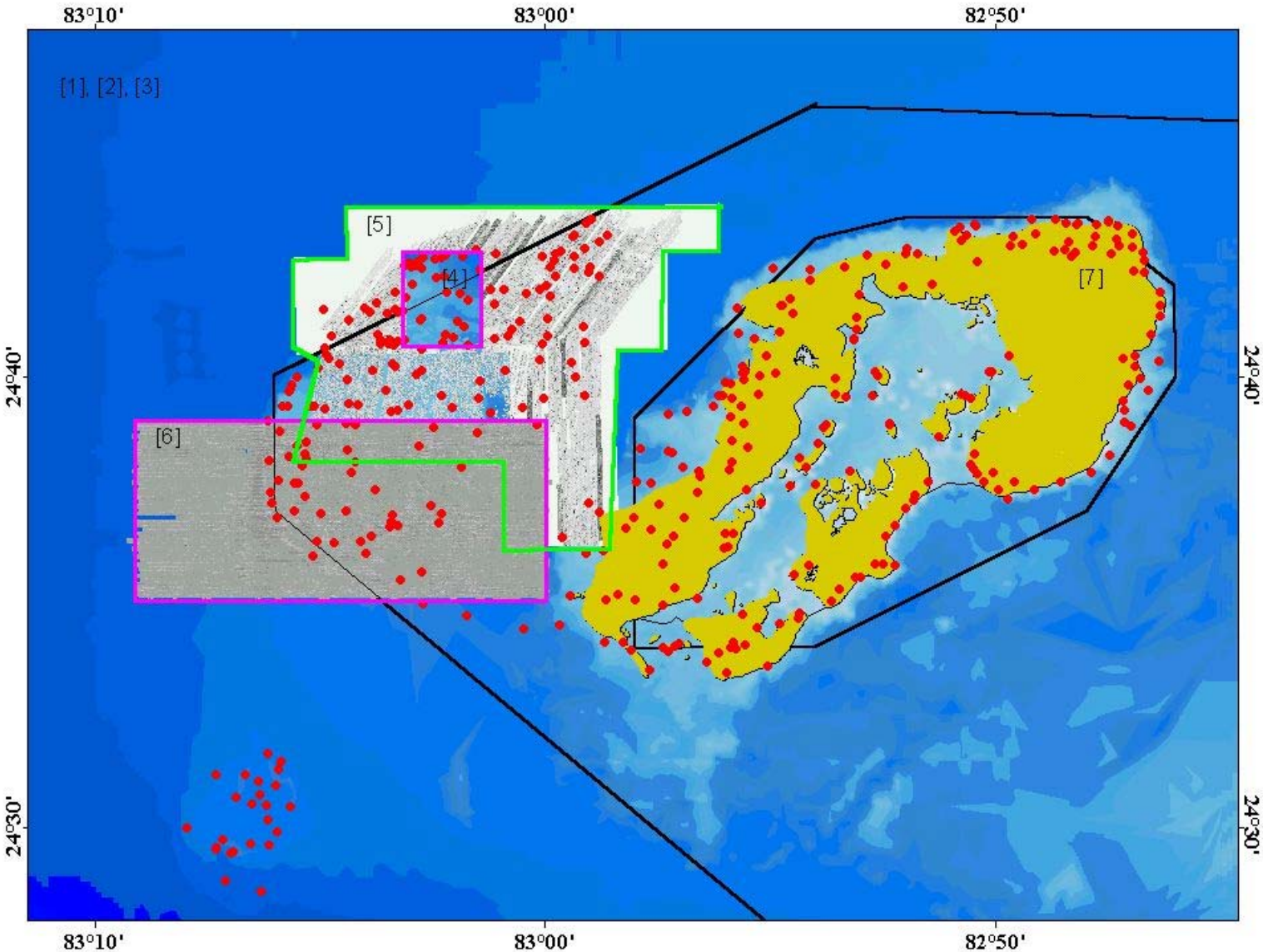


Figure 2.2 - Graphical depiction of georeferenced data sources used to characterize marine habitats in the Tortugas region. See text for further explanation.

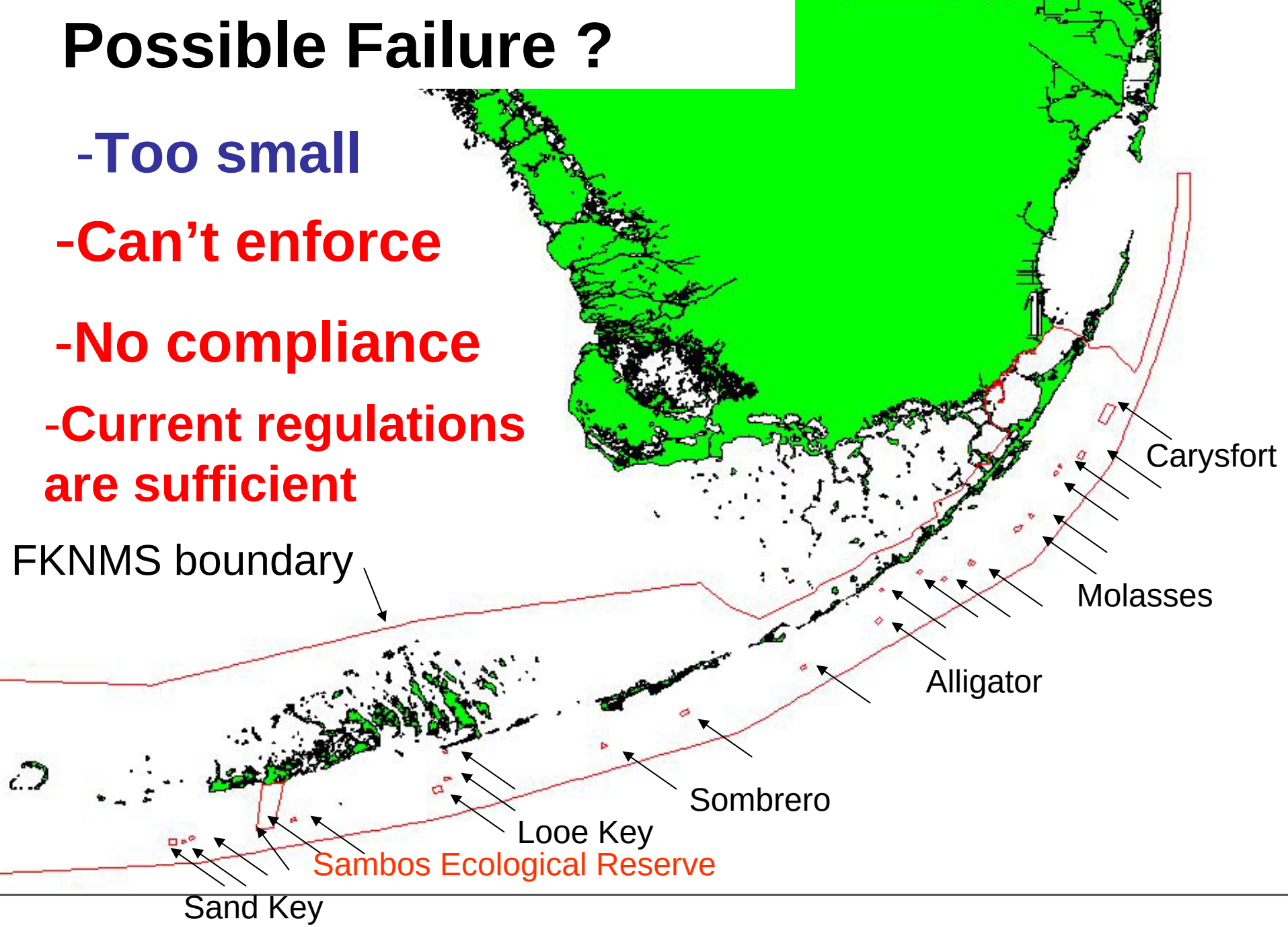
Possible Failure ?

-Too small

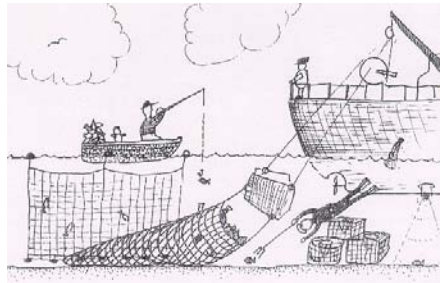
-Can't enforce

-No compliance

-Current regulations are sufficient



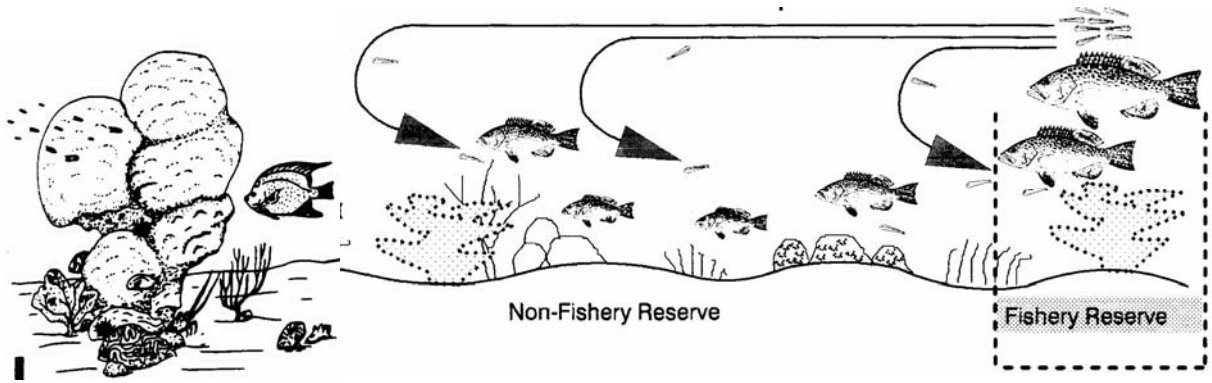
Marine Ecosystem Model



Ecosystem Goods & Services

Human Dimension

Ecosystem Structure & Function



Biotic Dimension

Physical Dimension

(Geology, Oceanography, Climate)

- Impacts

+ Restoration