

Biogeography of reef fish spawning aggregations in the Western Atlantic

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Florida Keys National Marine Sanctuary
Ecosystem Protection Working Group

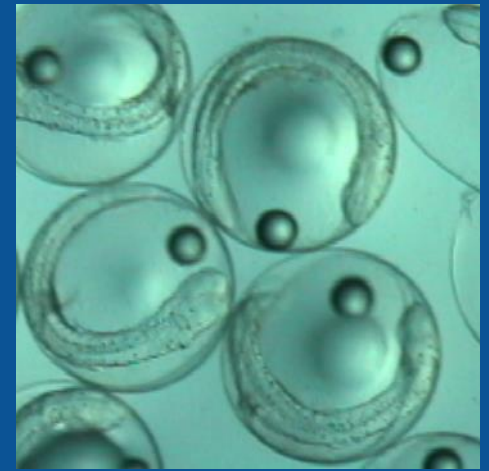
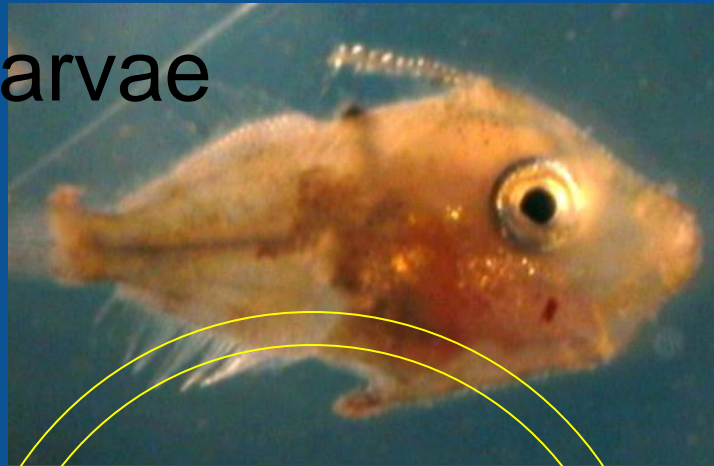
5 March 2014

Spawning Aggregation Definition

- Groups of conspecific fish at 3x densities for reproduction.
- Most groupers and snappers migrate to specific places at specific times to reproduce in “transient” aggregations
- Spawn Waltz

Reef Fish Life Cycle

larvae



eggs

juveniles



adults

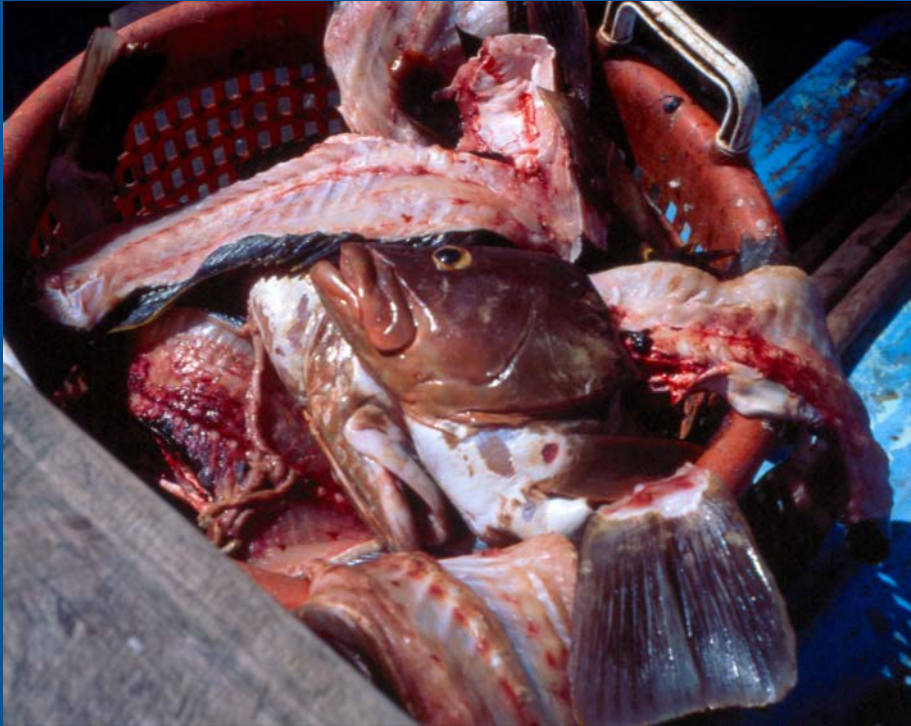


spawning
aggregation

Groupers and snappers aggregate to spawn

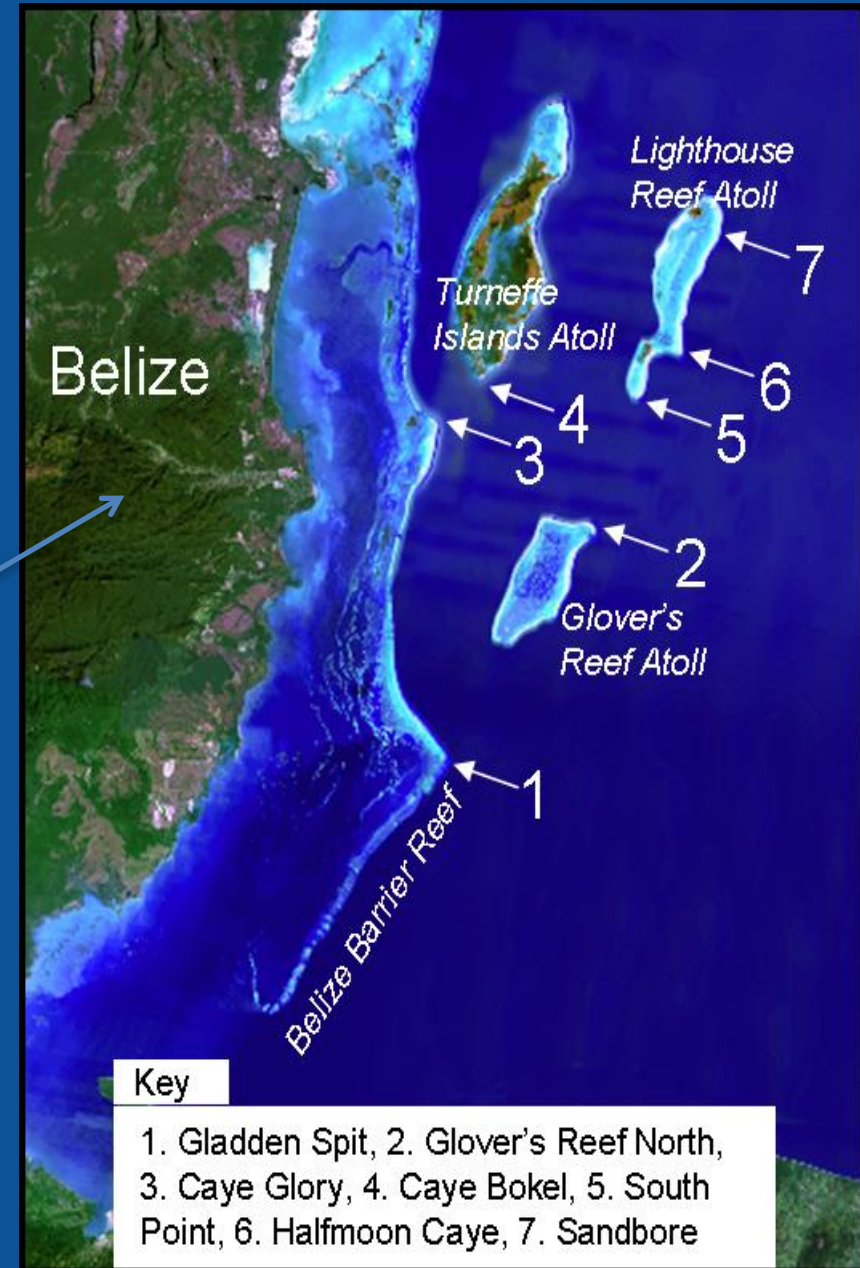
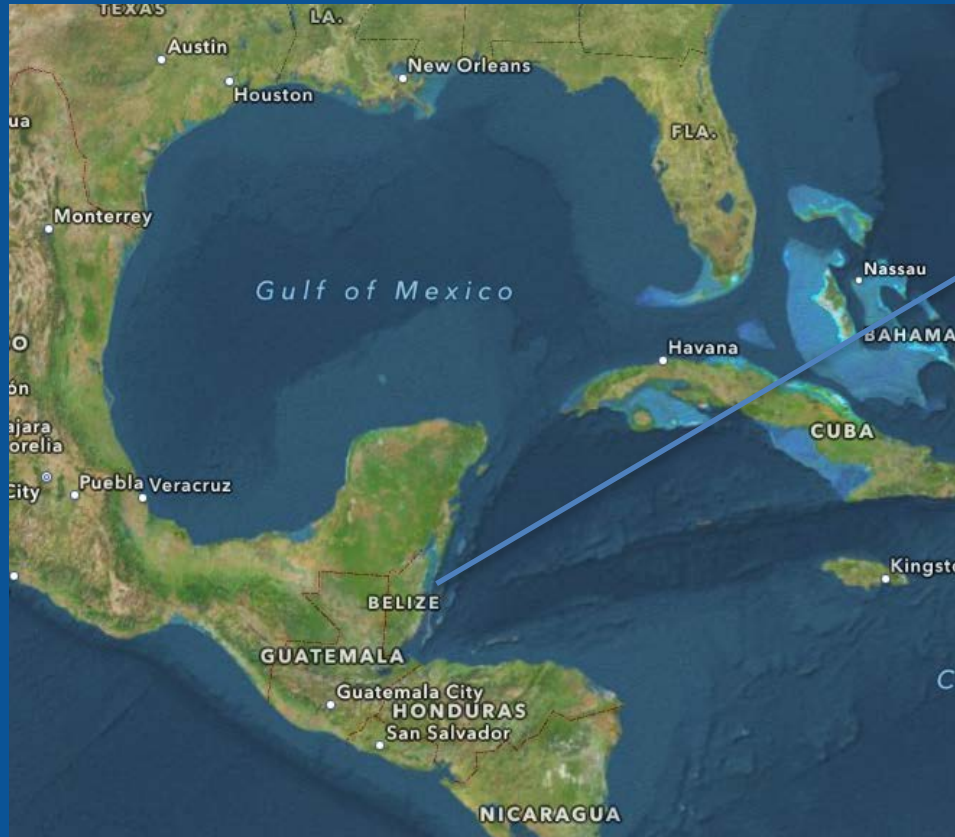


Fishermen know
where and when



Super productive fishing areas

Case Study: Belize spawning aggregations

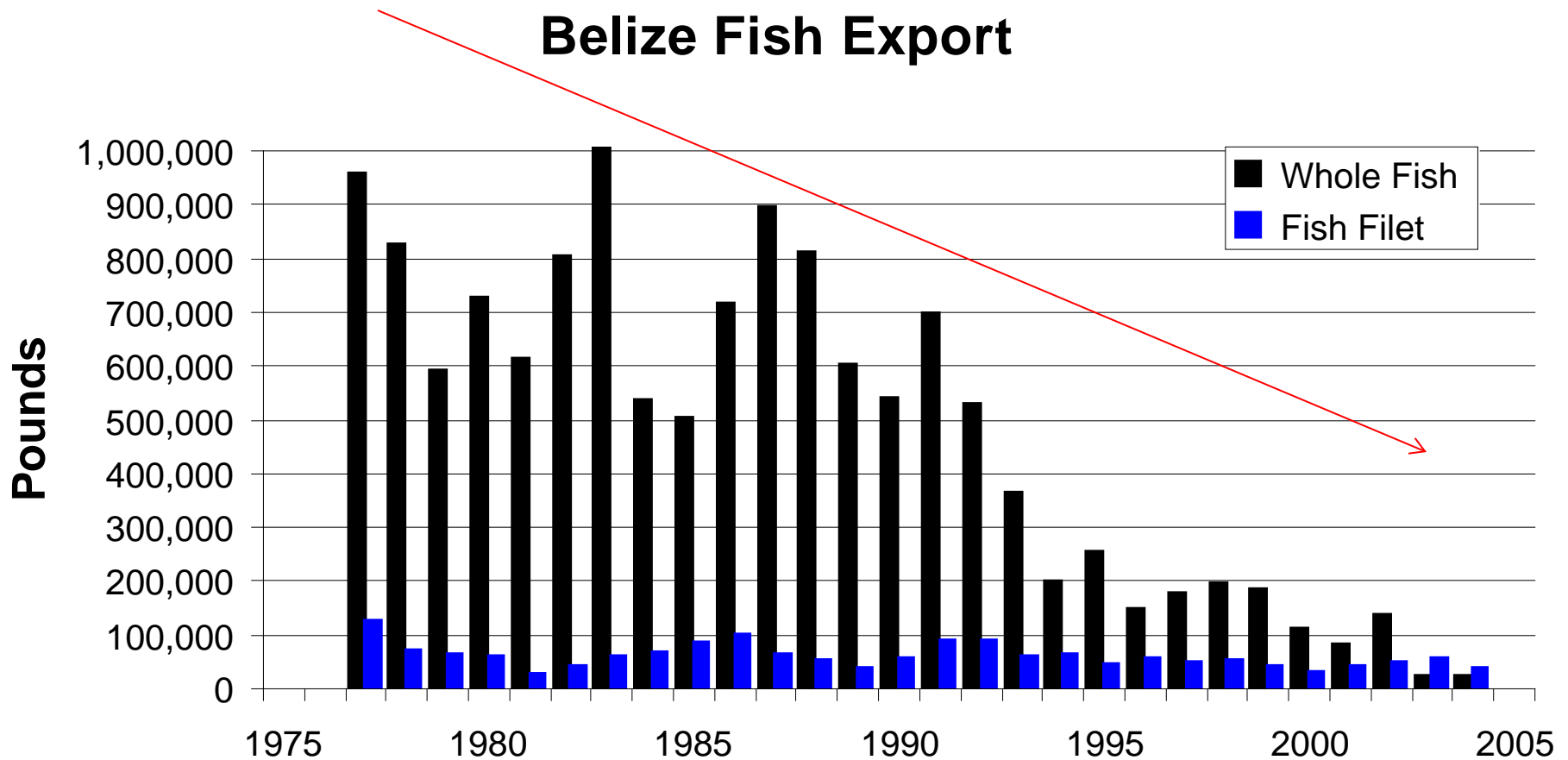


Case Study: Belize

- Fishermen noted declines in Nassau grouper
- Fishermen aware of spawning sites
- National Working Group formed
 - Shared national study at multiple sites
 - Shared training events
 - Heavy involvement of fishermen
- Economic alternatives for fishers
- High level ministerial political involvement
- National consciousness and approach



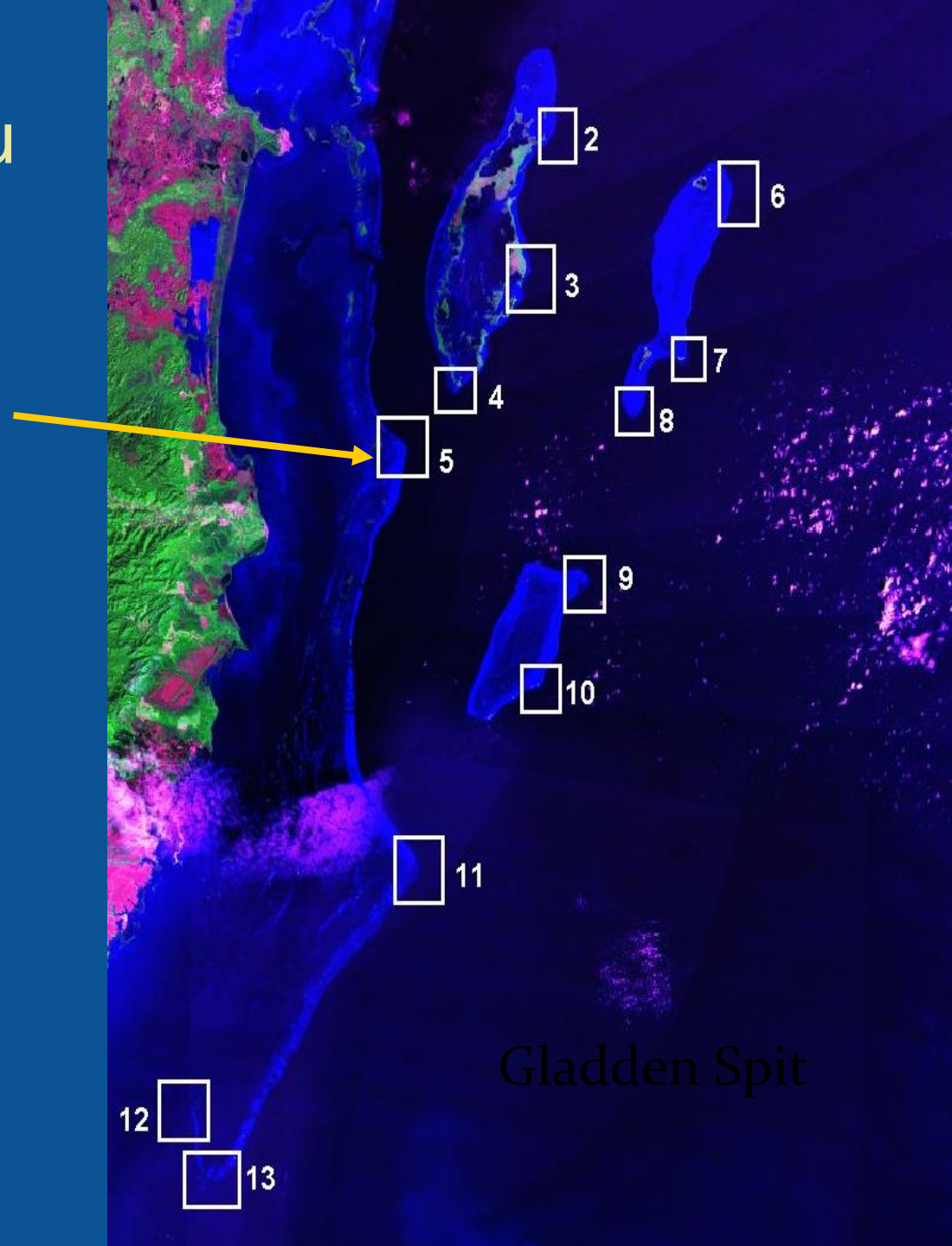
Fishermen Aware of Declines in Fisheries Resources especially Nassau grouper



Caye Glory Nassau
grouper spawning
aggregation site

well-known by
fishers

“Christmas cash”



Caye Glory 1968

2 tons per day harvest



Fig. A.



Fig. B.



Fig. C.



Fig. D.



Fig. E.



Fig. F.

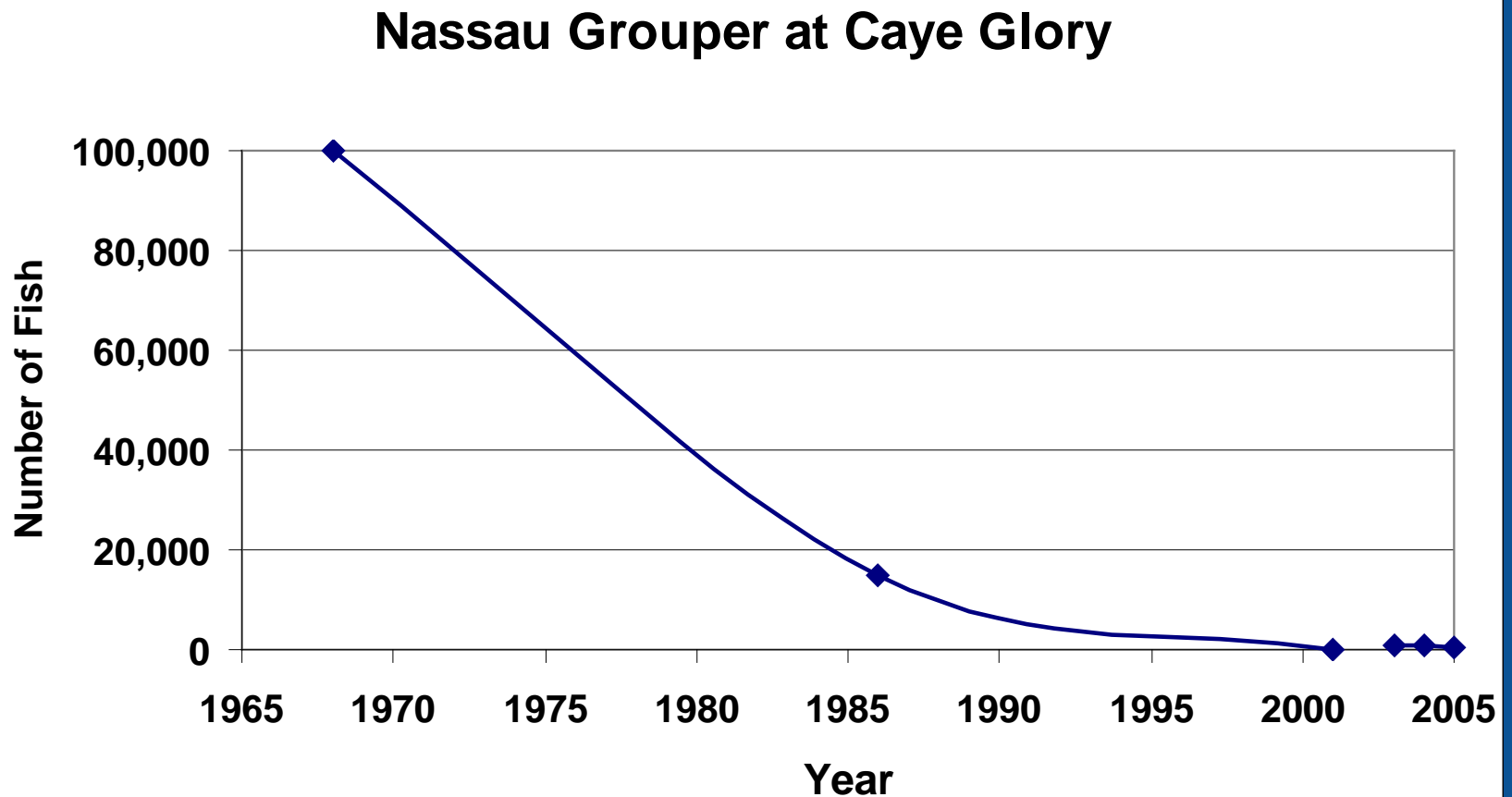
(Craig, 1969)

Caye Glory 2001

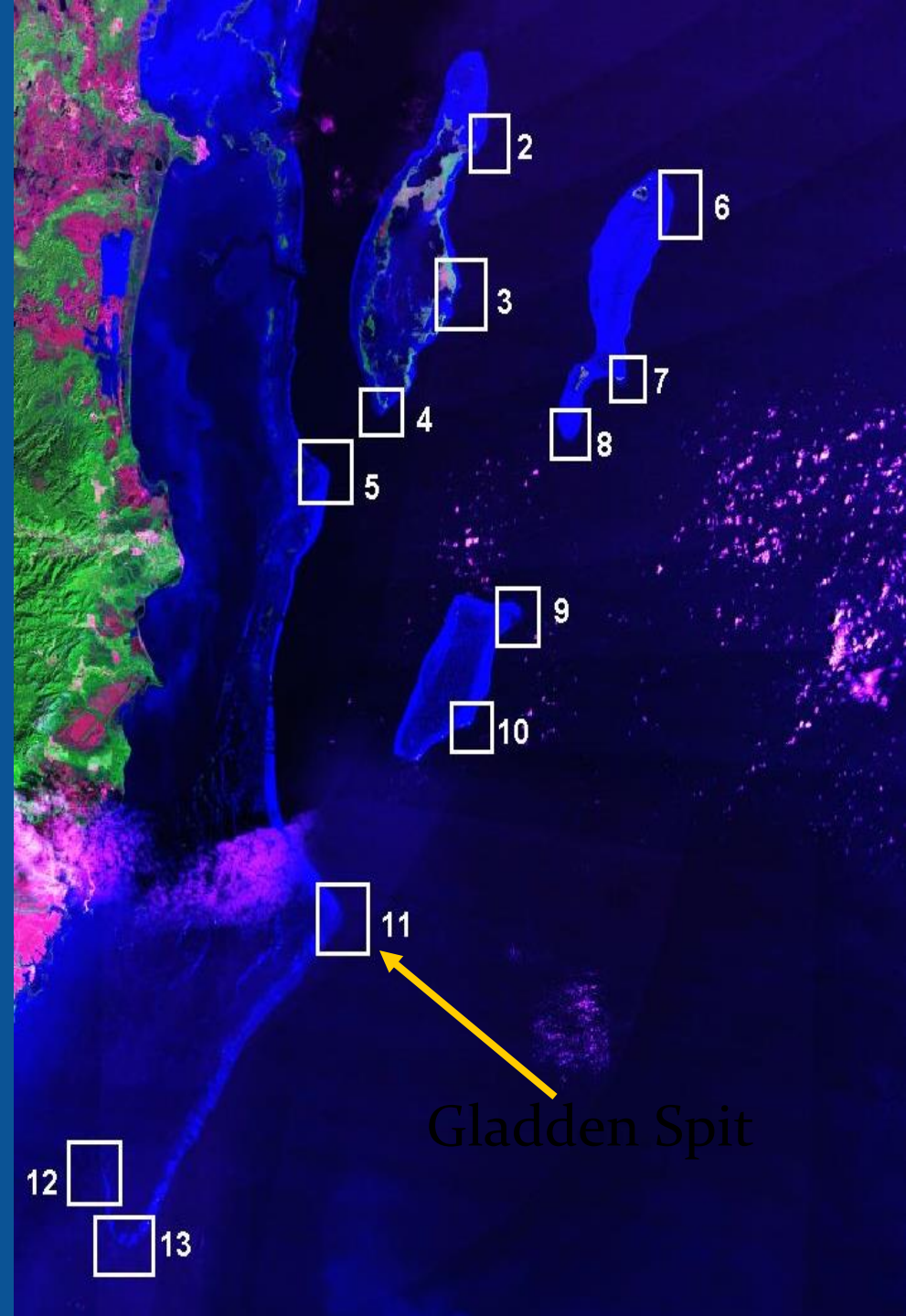
21 fish observed



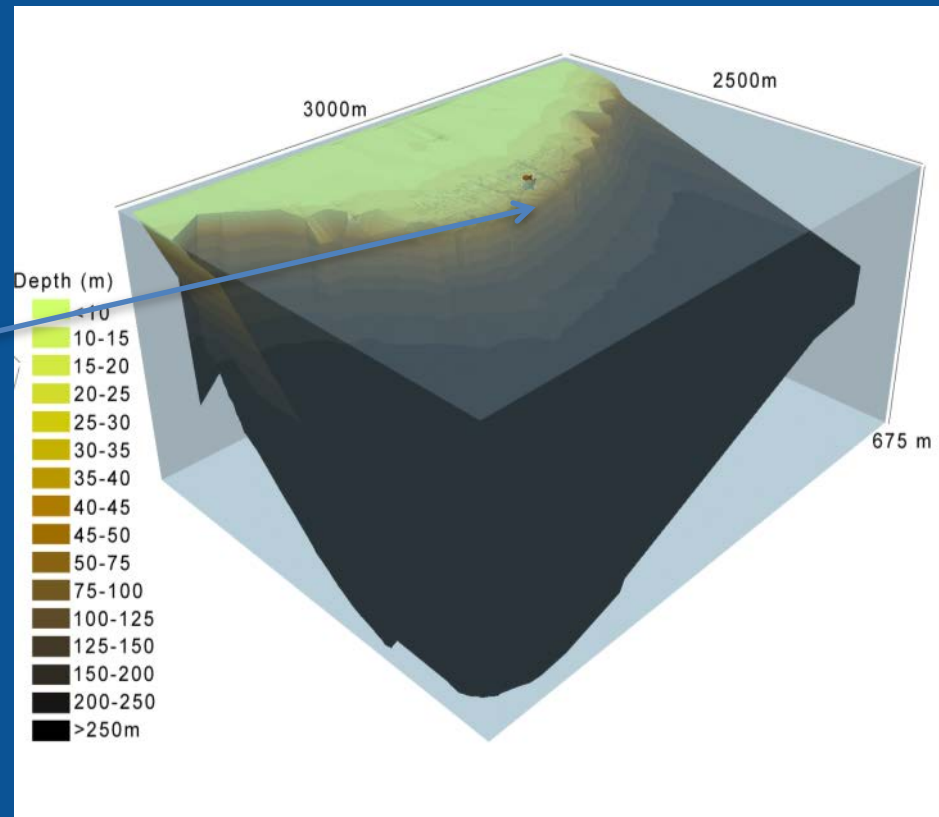
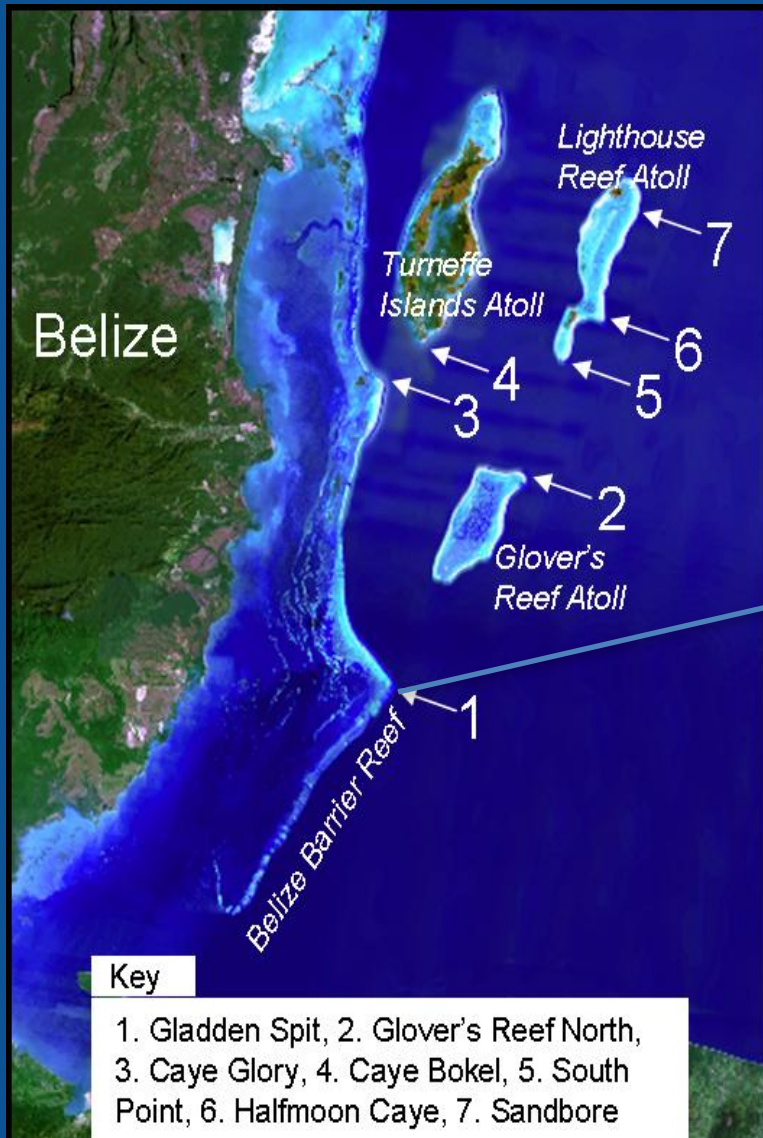
Nassau grouper spawning site at Caye Glory essentially destroyed



Gladden Spit mutton snapper spawning aggregation site revealed by fishers



Reef Promontory Spawning Sites in Belize

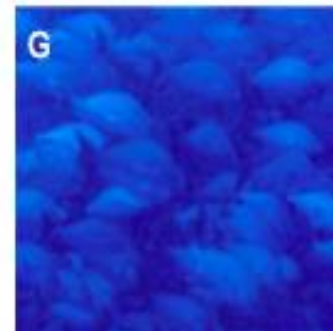
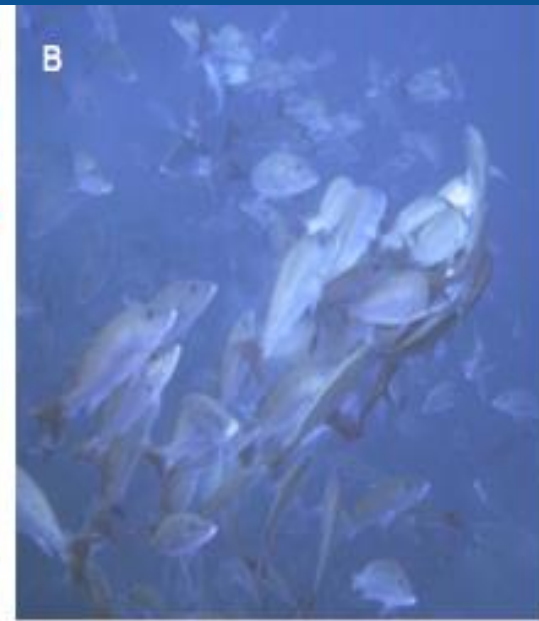


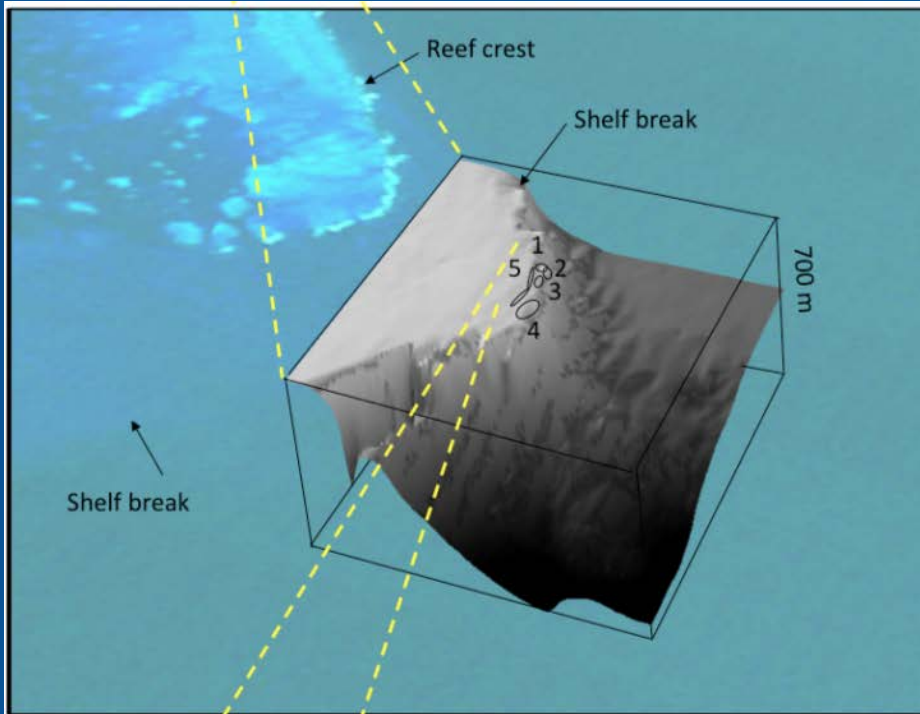
CHARACTERIZATION OF TRANSIENT MULTI-SPECIES REEF FISH SPAWNING AGGREGATIONS AT GLADDEN SPIT, BELIZE

William D. Heyman and Björn Kjerfve

Gladden Spit: Multi-species spawning aggregation site

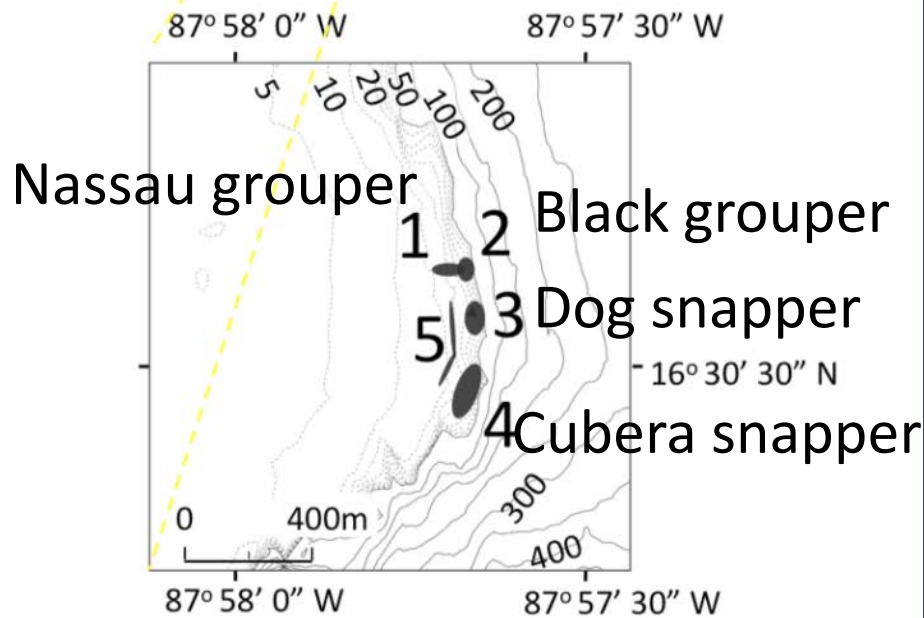
Characterized over 3 years with intensive fisher involvement





Peter called it
GLADDING Spit

<http://bit.ly/gladden2013>

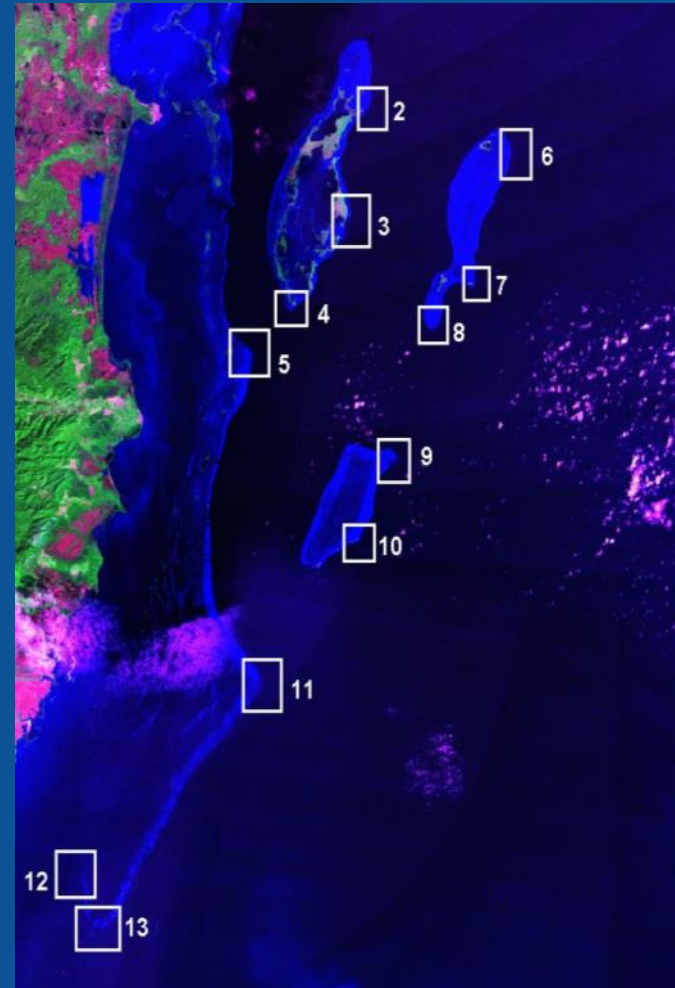


Shared Monitoring Protocol: used in national study

Reef Fish Spawning Aggregation Monitoring Protocol for the Meso-American Reef and the Wider Caribbean Version 2.0

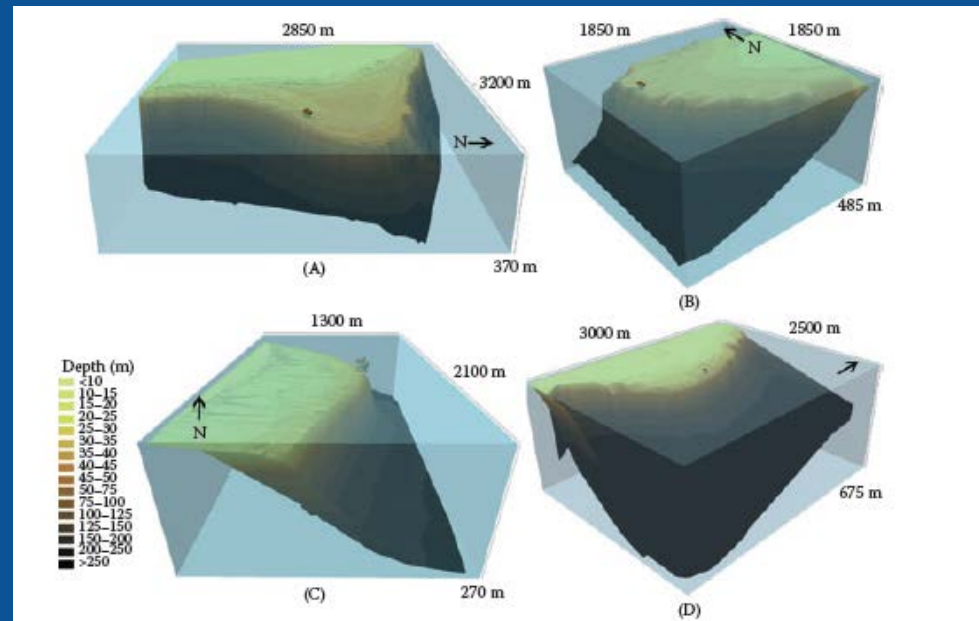


DRAFT DATE: 4 July 2004



Hypothesis: Multi-species reef fish spawning aggregations occur at:

- Reef promontories (convex bending reef)
- Adjacent to shelf edges
- 15 – 60 m depth
- Top of dropoff into deep waters (> 200 m)



Spawning aggregation monitoring training including fishermen



Mapping Spawning Sites



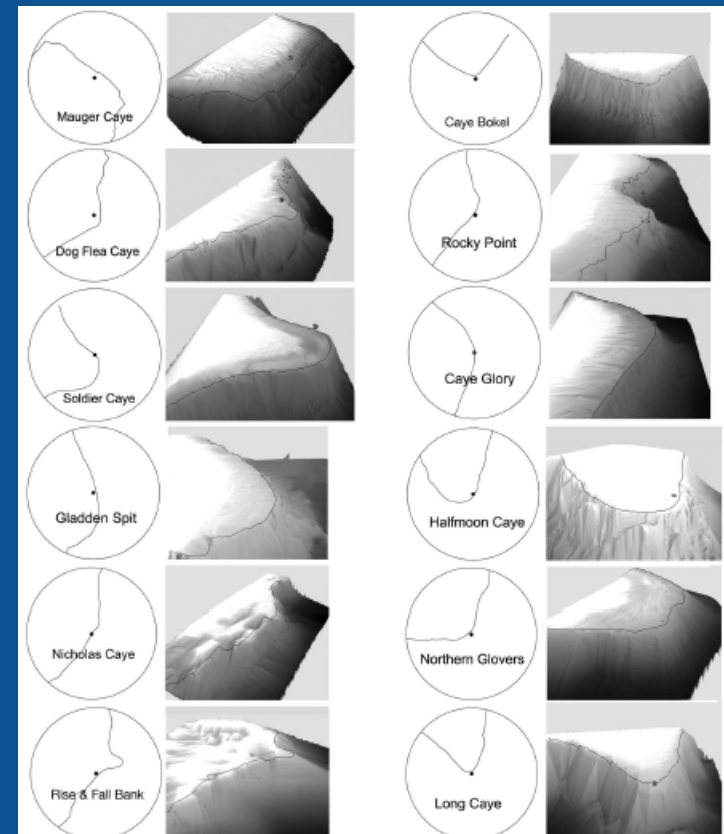
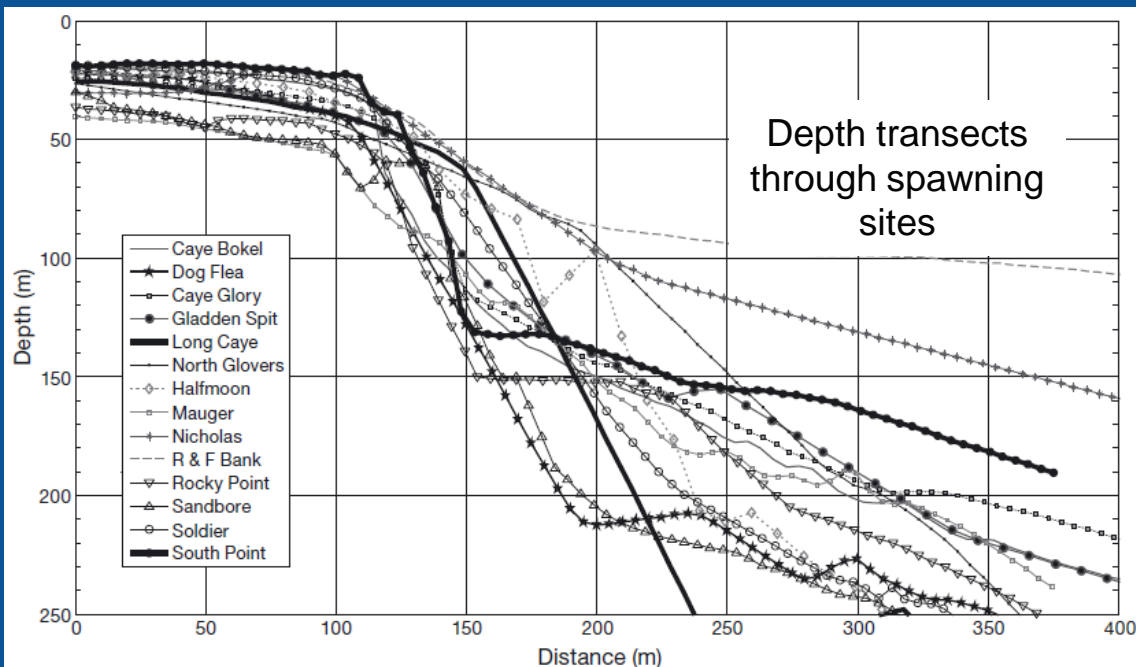
Sea bottom geomorphology of multi-species spawning aggregation sites in Belize

Shinichi Kobara*, William D. Heyman

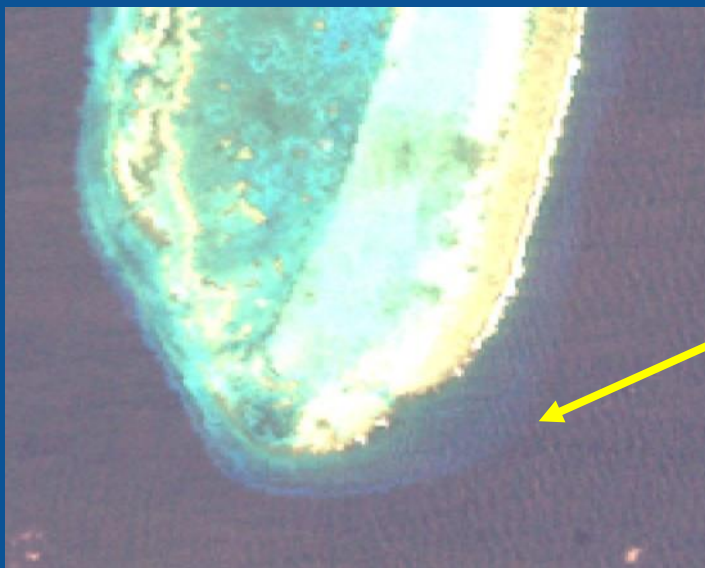
Department of Geography, Texas A&M University, College Station, Texas 77843-3147, USA

14 sites in Belize
reef promontories
multi-species aggregations

<http://gcoosmaps.tamu.edu/webviewer/viewer.html?3dWebScene=../webscenes/belizefsa3d.3w>

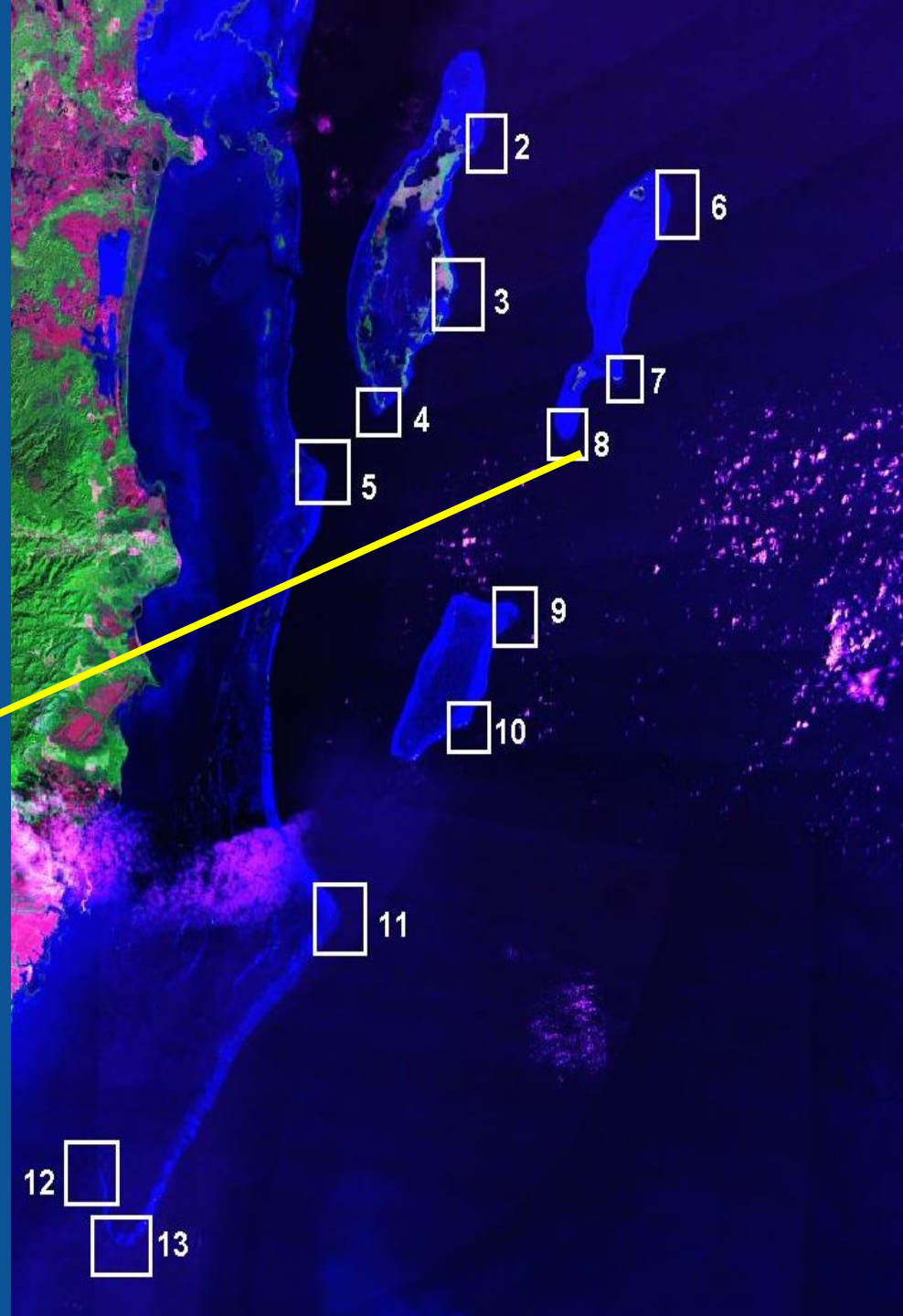


Predict and Verify: Lighthouse Reef, Belize



Predicted spawning
aggregation site

20 species of snappers,
groupers and jacks



Fishermen from Belize urge action throughout the Caribbean at GCFI



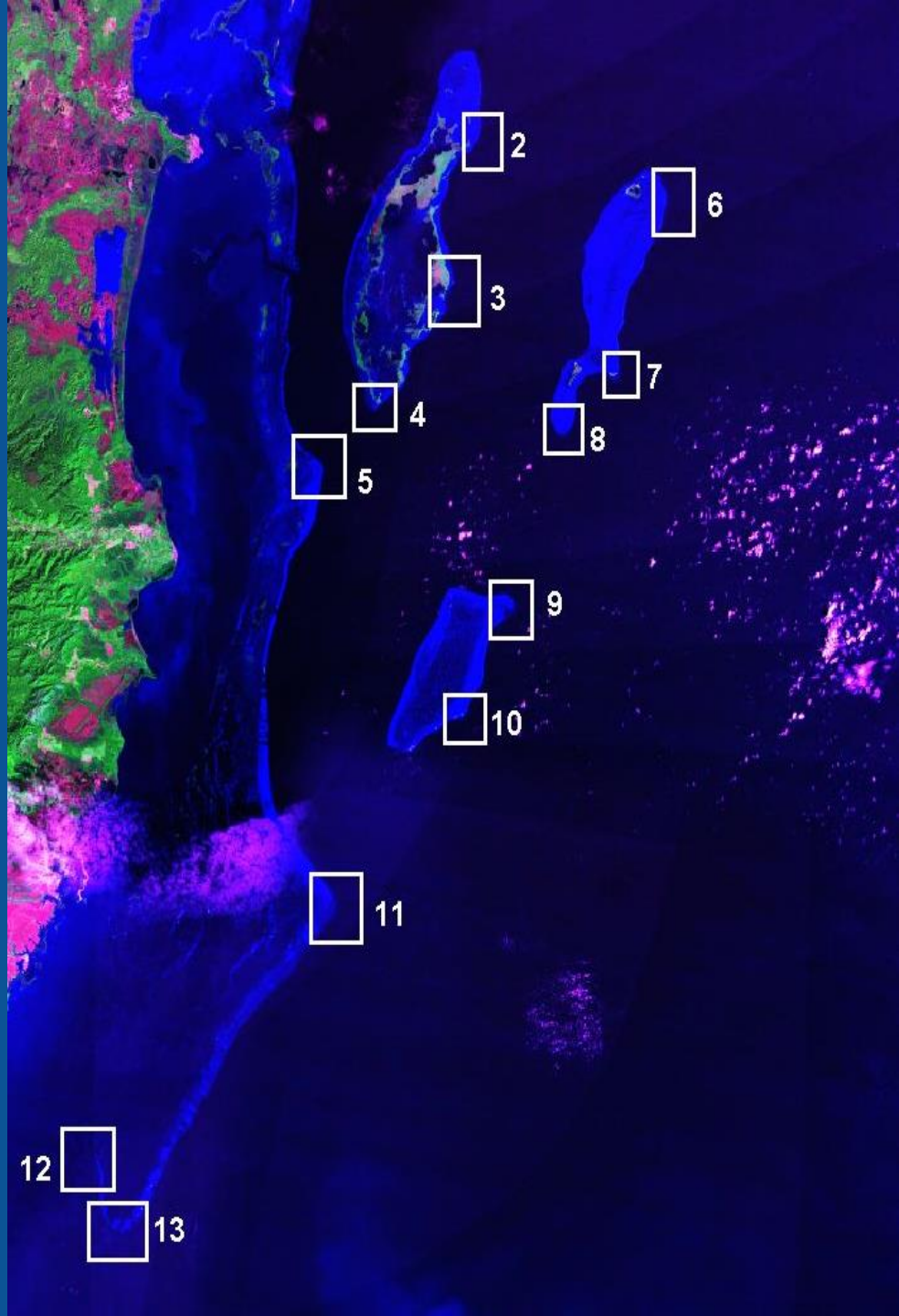
Fishermen take results to the Minister



National consciousness

Minister declared
11 new marine
reserves in 2003

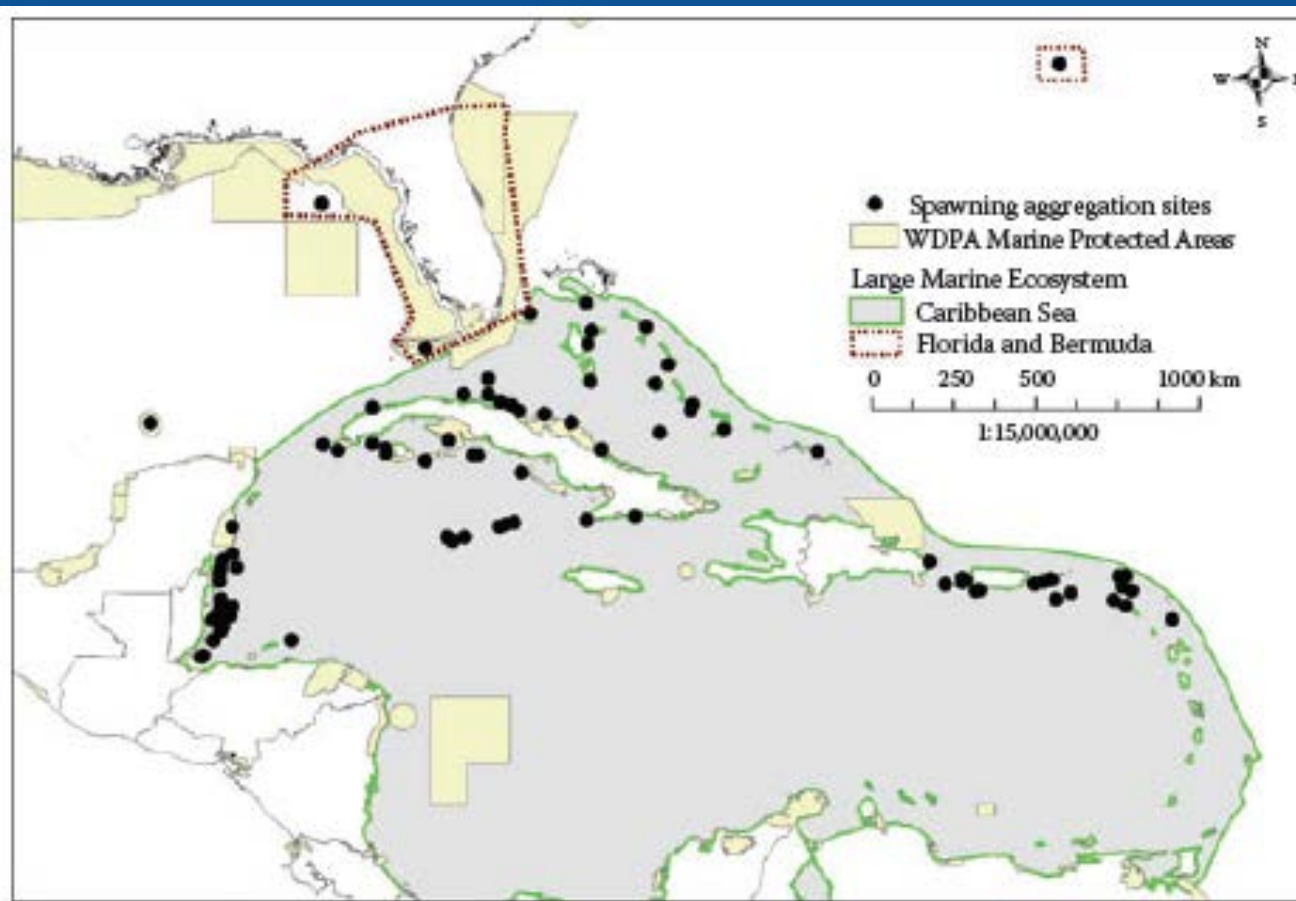
Evidence of Nassau
grouper recovery



BIOGEOGRAPHY OF TRANSIENT REEF-FISH SPAWNING AGGREGATIONS IN THE CARIBBEAN: A SYNTHESIS FOR FUTURE RESEARCH AND MANAGEMENT

SHINICHI KOBARA¹, WILLIAM D. HEYMAN²,
SIMON J. PITTMAN^{3,5} & RICHARD S. NEMETH⁴

108 confirmed
sites



Fishers know where/when aggregations are



They need to be involved (and compensated) in the research, conservation, management, and tourism at spawning aggregations



2004 - Don DeMaria



2013 - Eddie Toomer



2008 - Jaime Medina



2011 - Martha Gongora Garcia



2010 - Angelica Maria Mendez Parham



2006 - Jack Young



2005 - Eloy Cuevas



2012 - Casimiro Newball



2006 - Ceylon Clayton



2005 - Harvey Robinson



2008 - Torbio Mata



2007 - Claudio Agustin Gonzalez



2009 - Andres Moldenado



2009 - Mitchell Lay



2005 - Anderson Kinch

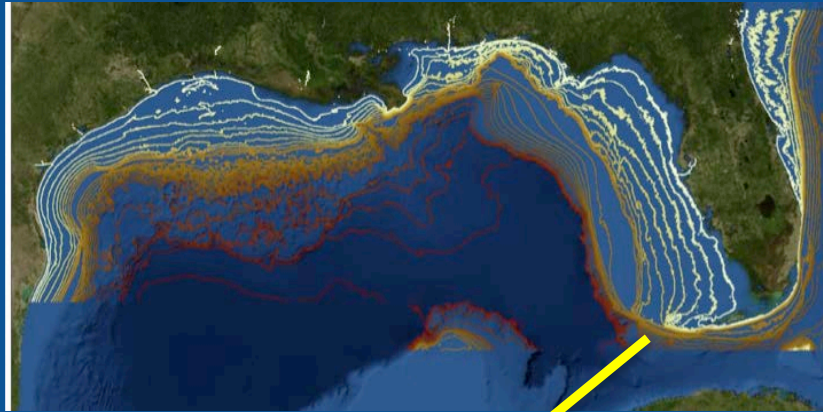


2009 - Ruben Penott



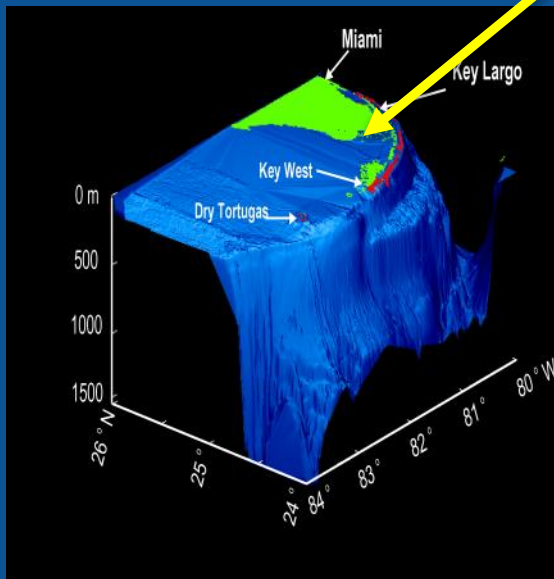
2007 - Linwood Outerbridge

Riley's Hump, Dry Tortugas: Multi-species spawning aggregation



Peter Gladding identified
Riley's called Gladden
"Gladding Spit"

<http://www.gcfi.org/GMA/GladdingMemorialAward.php>



Preliminary evidence of increased spawning aggregations of mutton snapper (*Lutjanus analis*) at Riley's Hump two years after establishment of the Tortugas South Ecological Reserve

Michael L. Burton
Kenneth J. Brennan
Roldan C. Muñoz
Richard. O. Parker Jr.

Banco Chinchoro Biosphere Reserve, Mexico



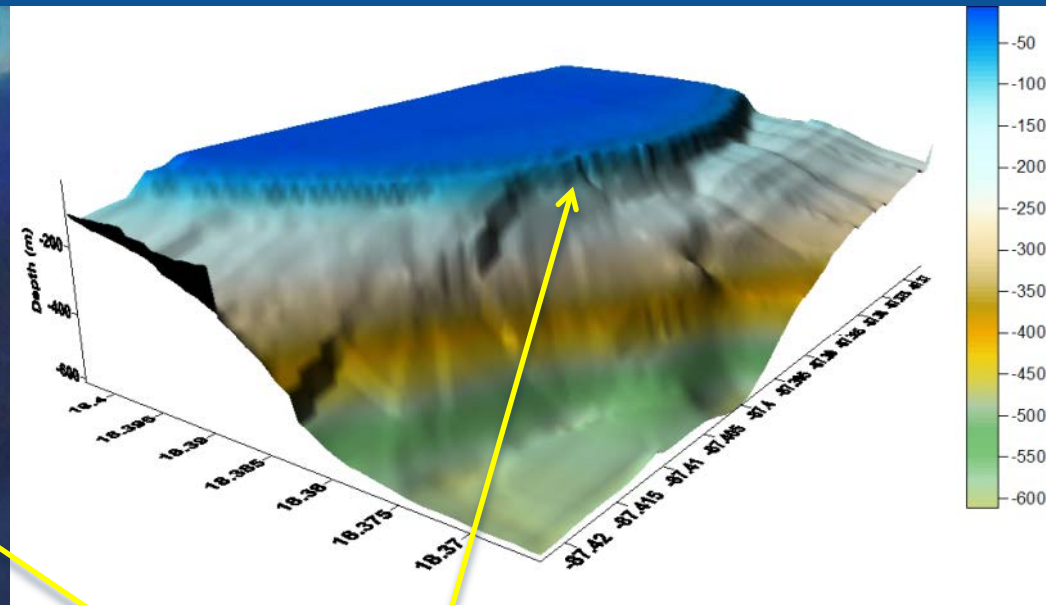
Aggregation Monitoring Training



Bancho Chinchoro



Fishing



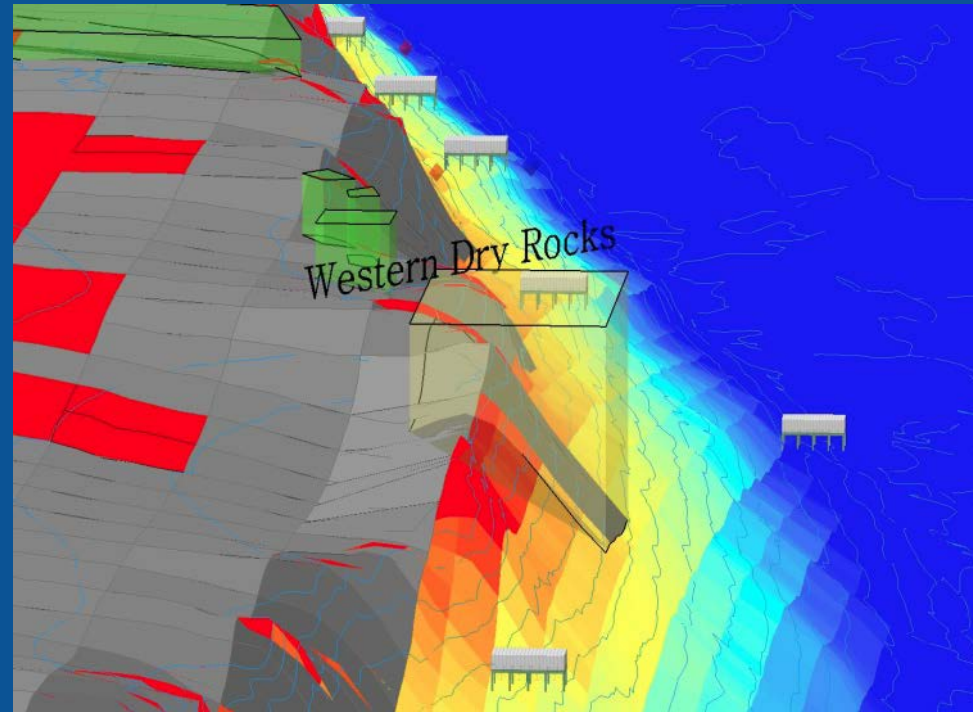
Spawning Aggregation

Vision for the Future

- Network of managed multi-species spawning sites
- Shared monitoring data and experiences - exchanges
- Fishermen involved in monitoring and management
- Benefits
 - Support commercial and recreational fisheries
 - Conserve threatened and endangered species
 - Support healthy ecosystem— feeding and breeding oases
 - Provide exciting dive sites for ecotourism
 - Better stock assessments

FKNMS: Ecosystem Protection

- MPA Expert Workgroup Recommendations
- Western Dry Rocks
- Spawning Aggregations
 - Black grouper, mutton
 - Snapper and other sp.



FKNMS: other spawning areas?

- “the elbow”
- Warsaw hole?

Co-creation of knowledge for management

Fishers' knowledge + Scientific study =

New knowledge that people agree and ACT on