



Marine Geomorphology as a Determinant for Essential Life Habitat: An Ecosystem Management Approach to Planning for Marine Reserve Networks

Session Organizers:

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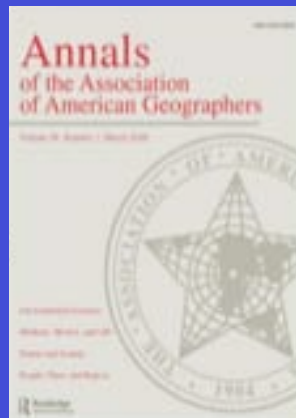
**Association of
American Geographers
Boston, MA
16 April 2008**

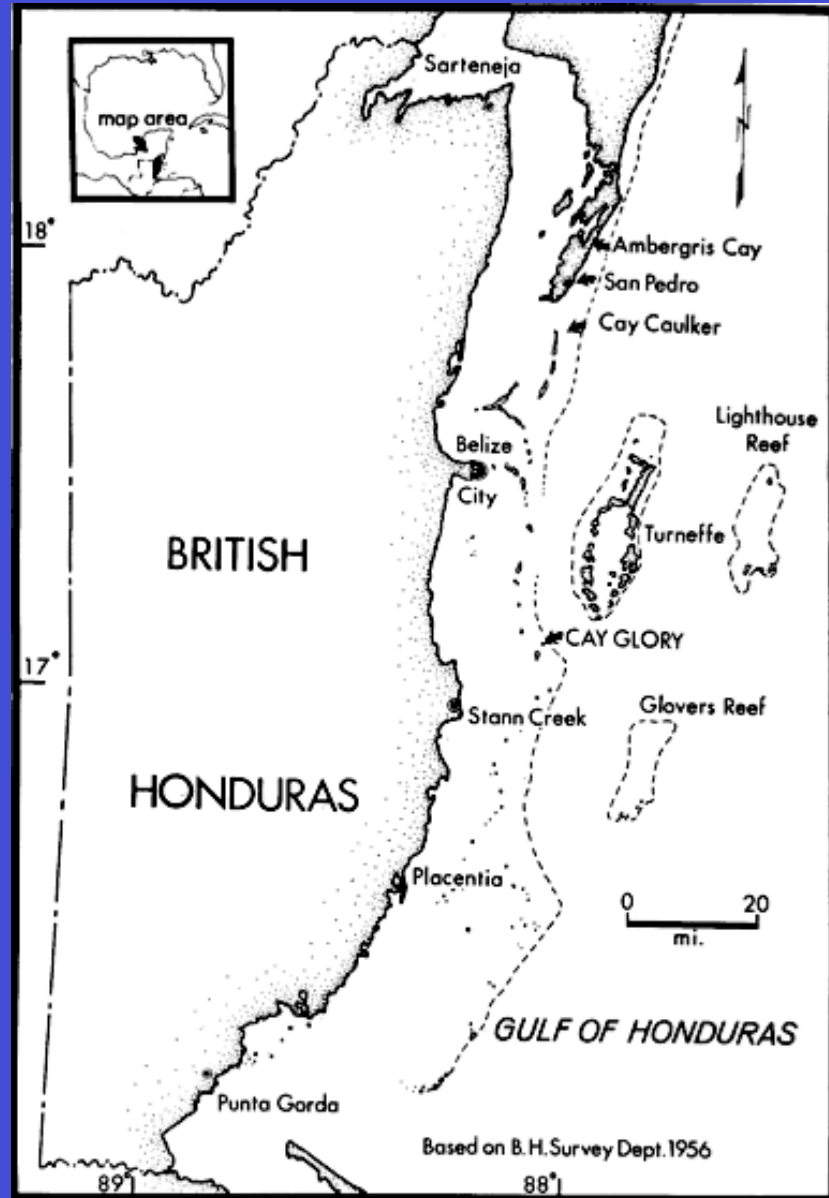
Building a marine reserve network in Belize based on spatio-temporal patterns of reef fish reproduction

Will Heyman
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Department of Geography

THE GROUPE FISHERY OF CAY GLORY, BRITISH HONDURAS

Alan K. Craig
1969





(Craig, 1969)



Caye Glory 1968

Harvest:
2 tons/day



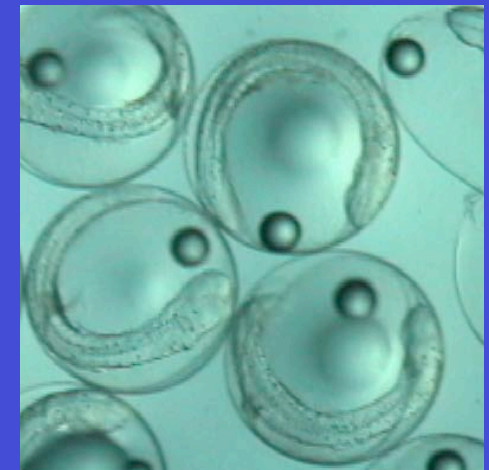
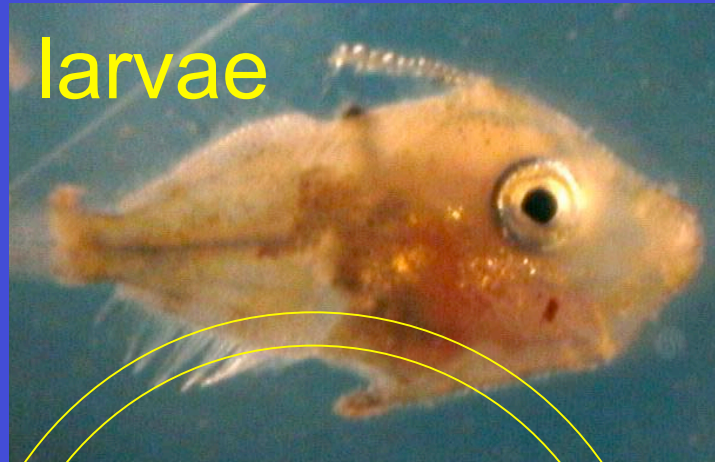
(Craig, 1969)

Grouper spawning aggregation

Predictable but transient
aggregation for purpose of
reproduction



Reef Fish Life Cycle



juveniles



adults

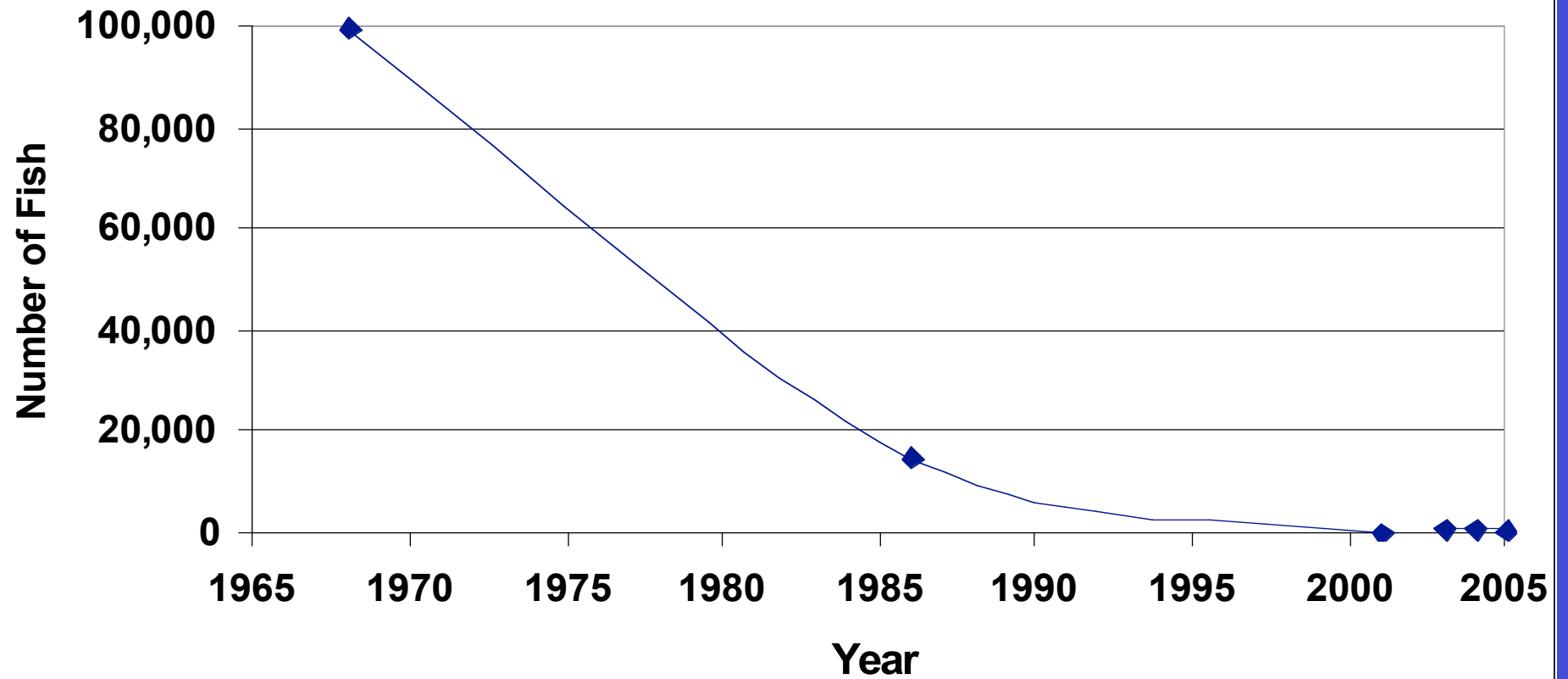


Caye Glory 2001

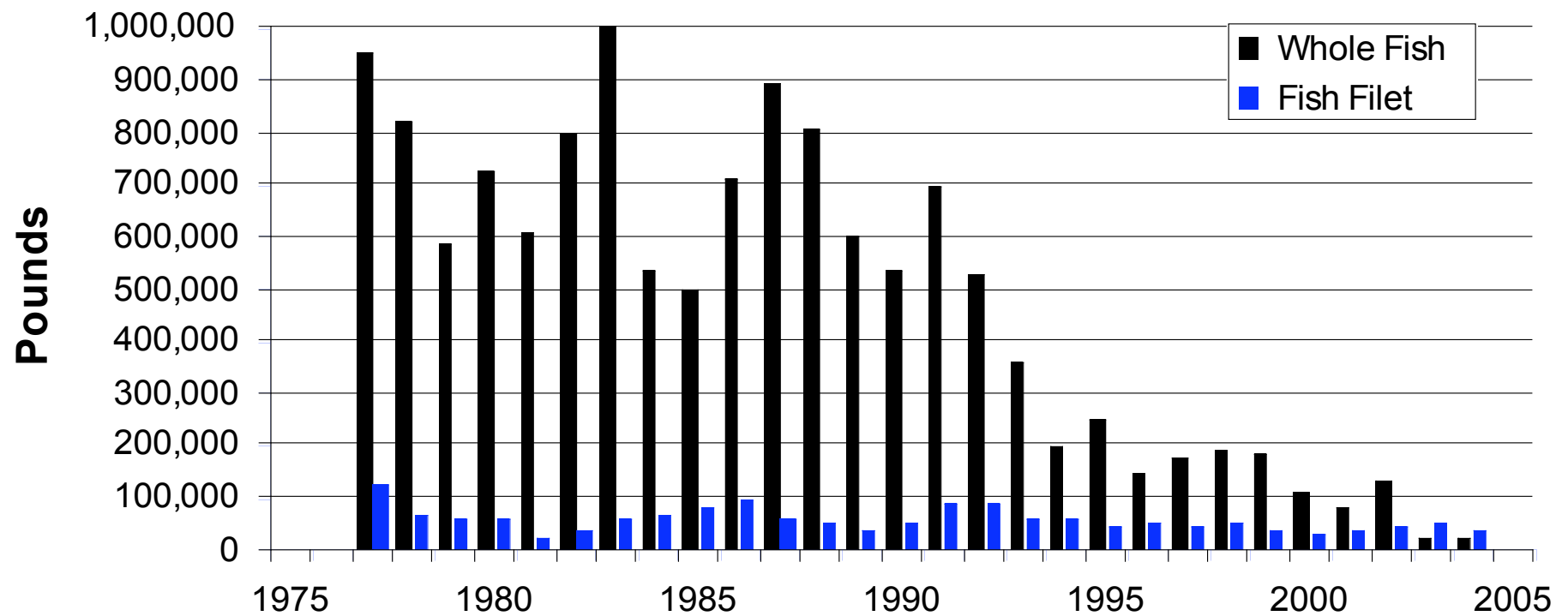
Harvest:
9 fish



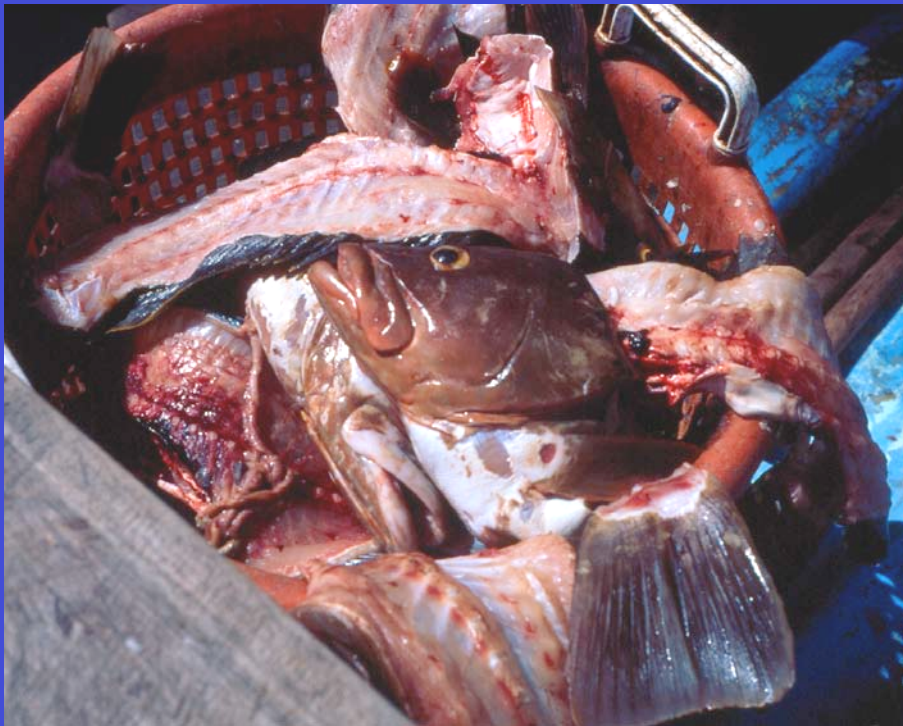
Nassau Grouper at Caye Glory



Belize Fish Export



Consistent with global
fisheries declines



Traditional fisheries management
approaches proven ineffective

Marine reserves networks proposed

Global extent of marine protected areas



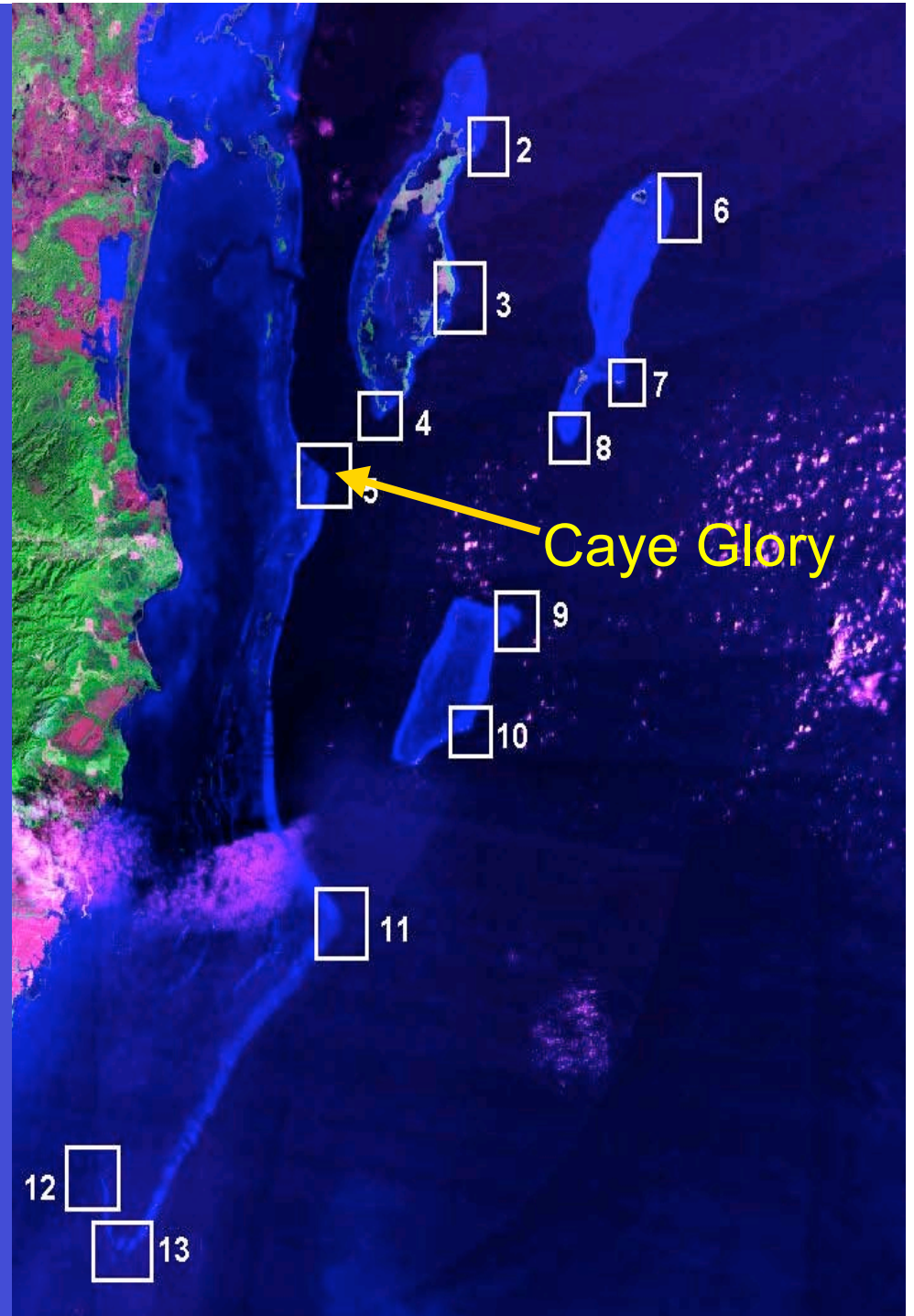
From: Roberts and Hawkins. 2000. *Fully protected marine reserves: a guide.*

But where should new reserves
be placed?

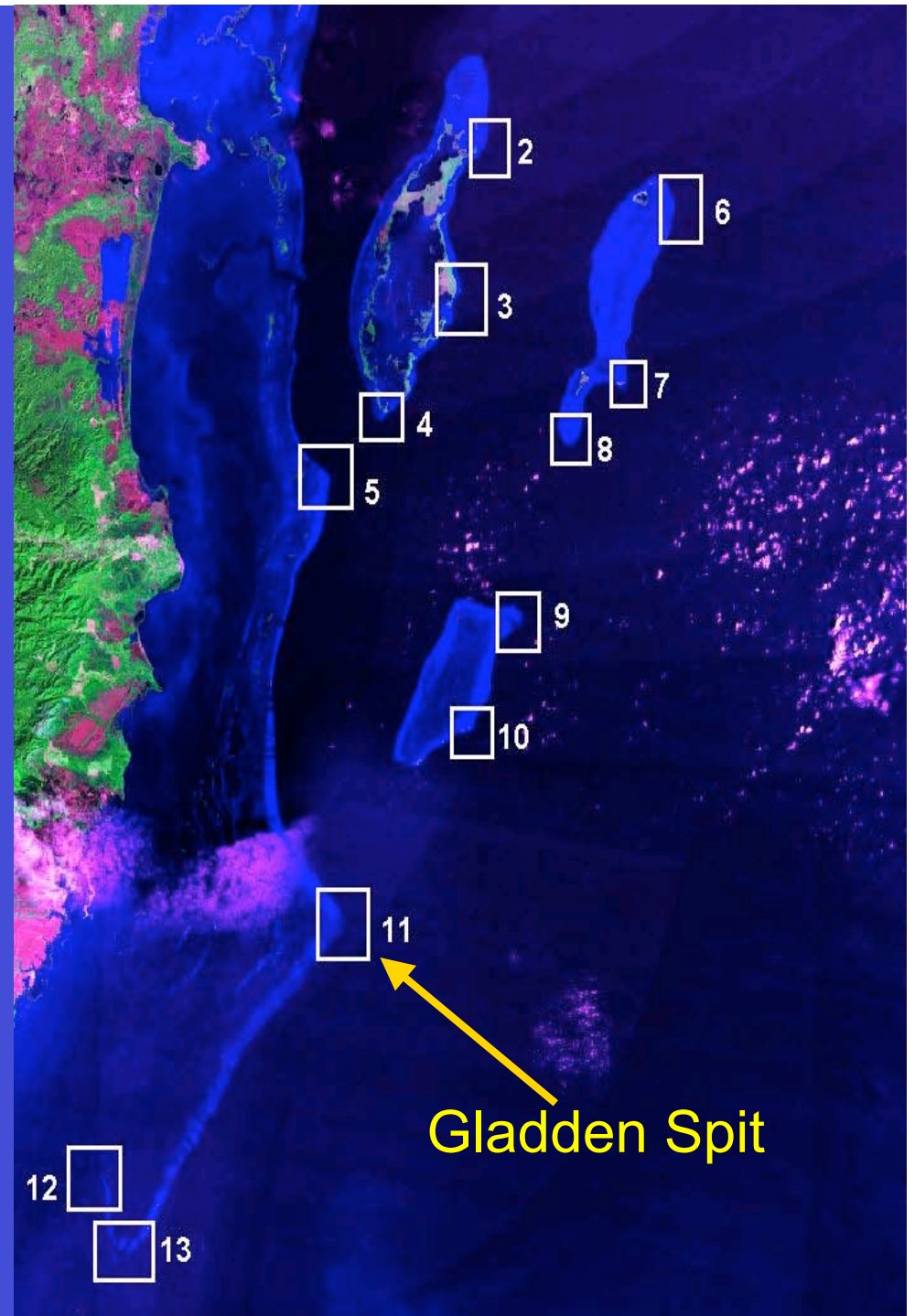
“critical life habitats”

An example from Belize

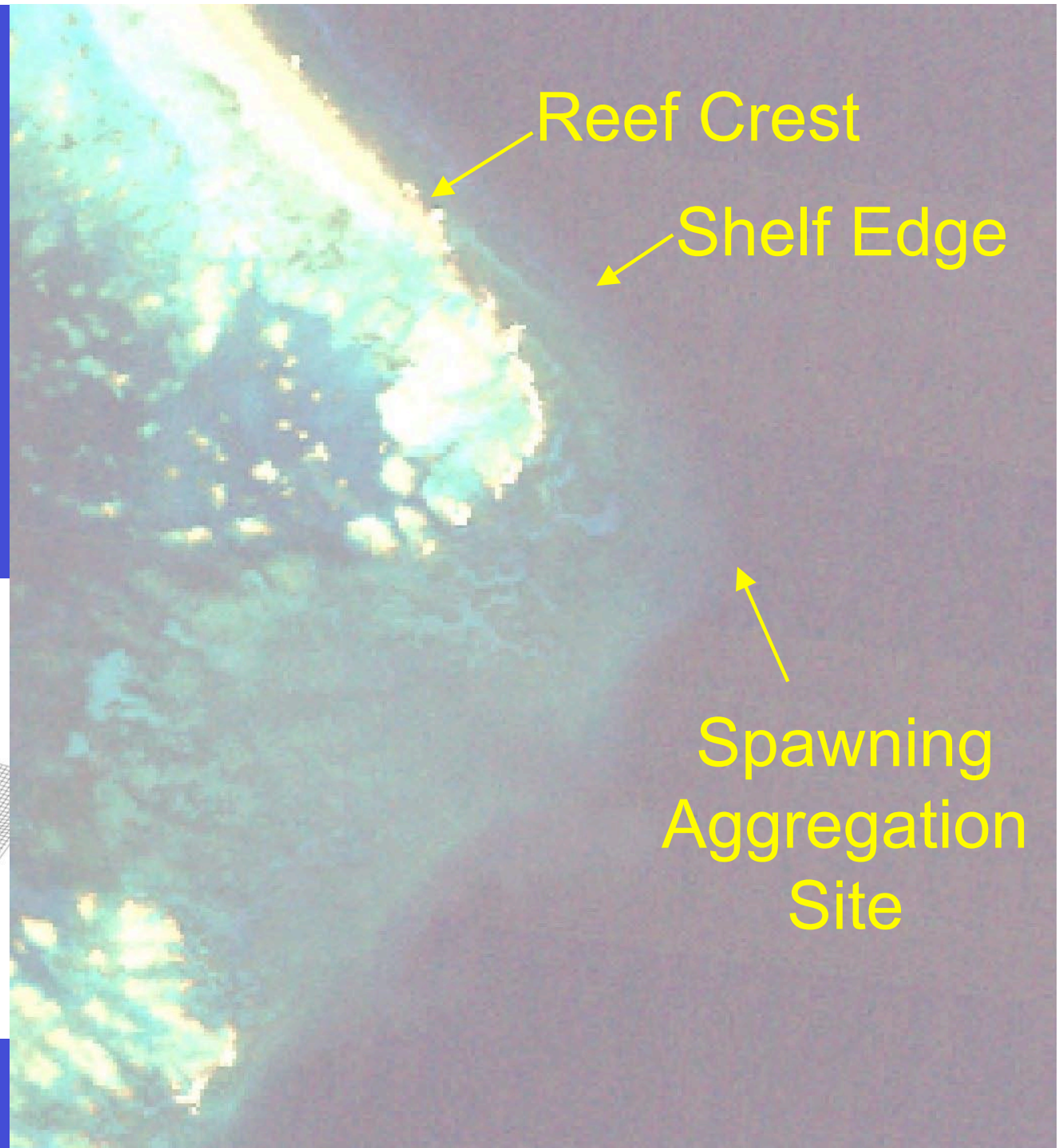
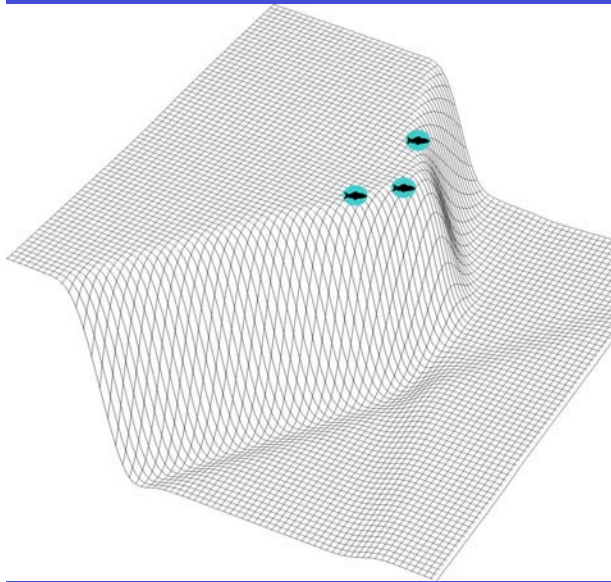
Caye Glory Reef Promontory Spawning Site

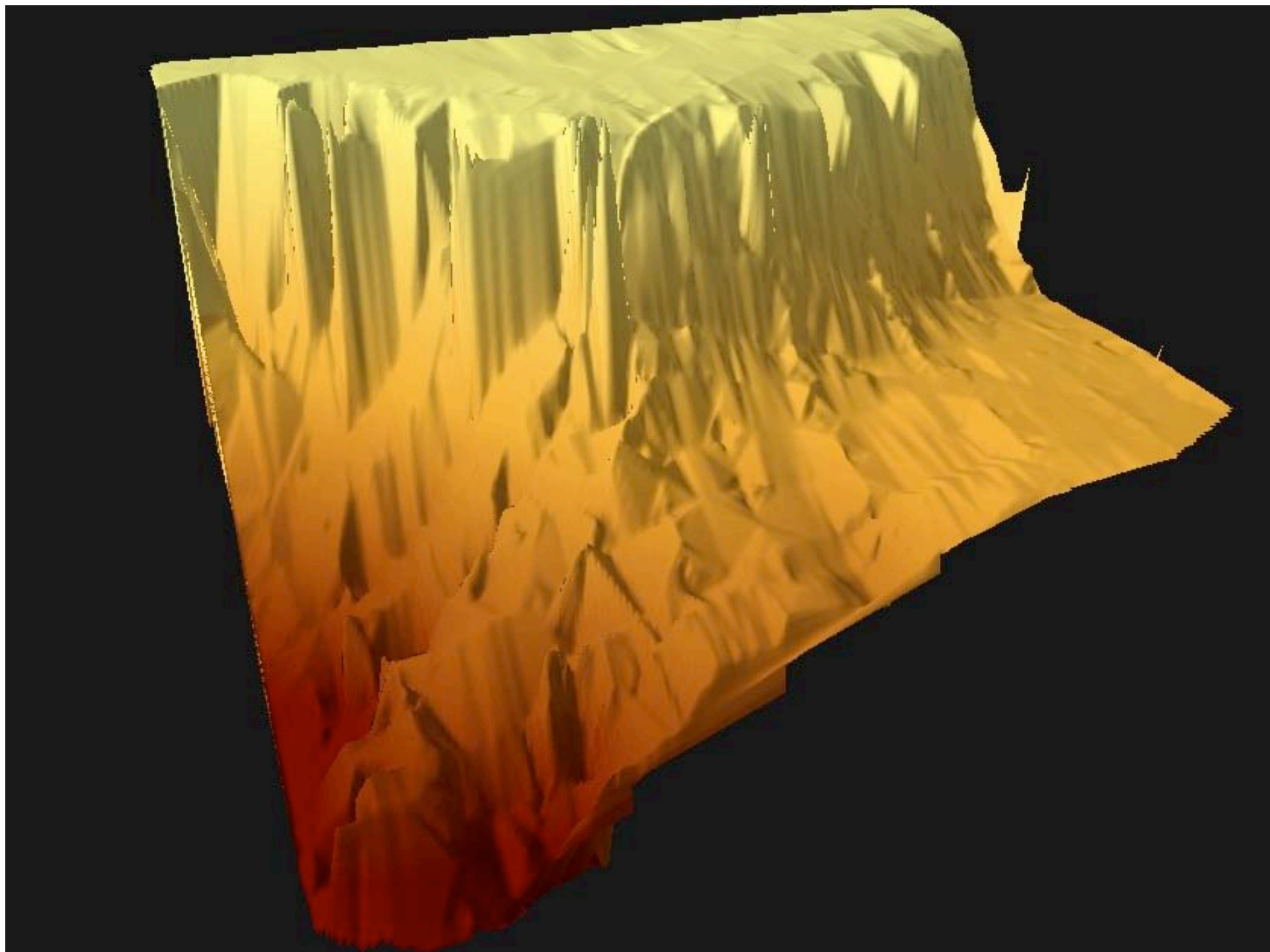


Gladden Spit Reef Promontory Spawning Site



**Gladden Spit
Reef
Promontory
Spawning Site**







Cubera snapper

Photo by Douglas Seifert

Nassau grouper



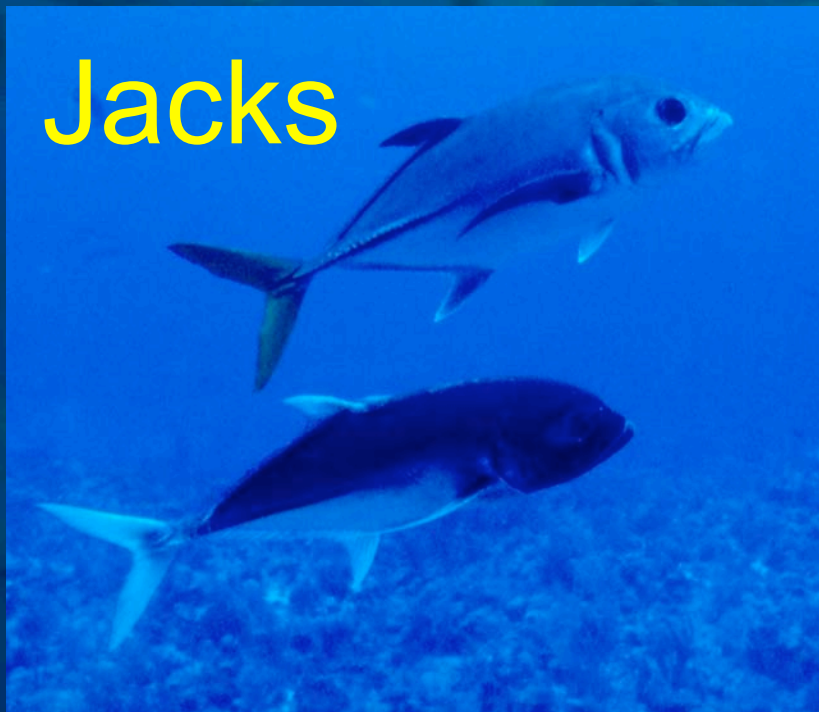
Dog snappers
spawning:
every month
of the year



Photo by Douglas Seifert

Permit

Jacks



White Margate



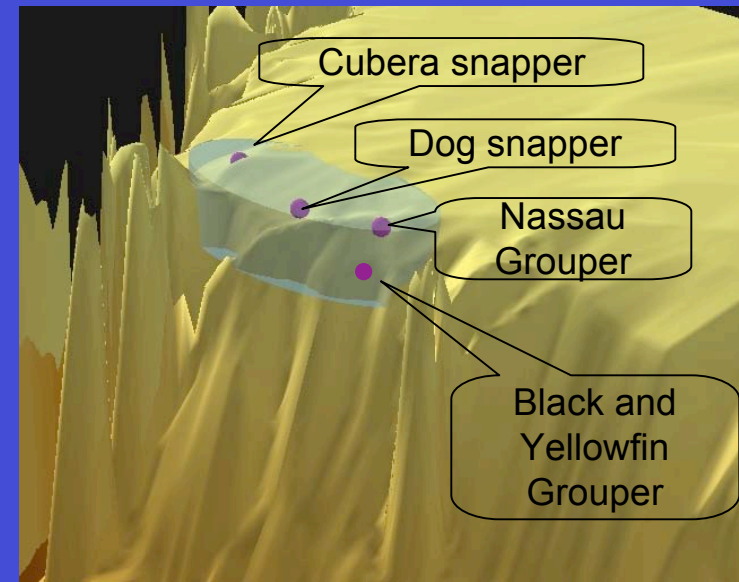
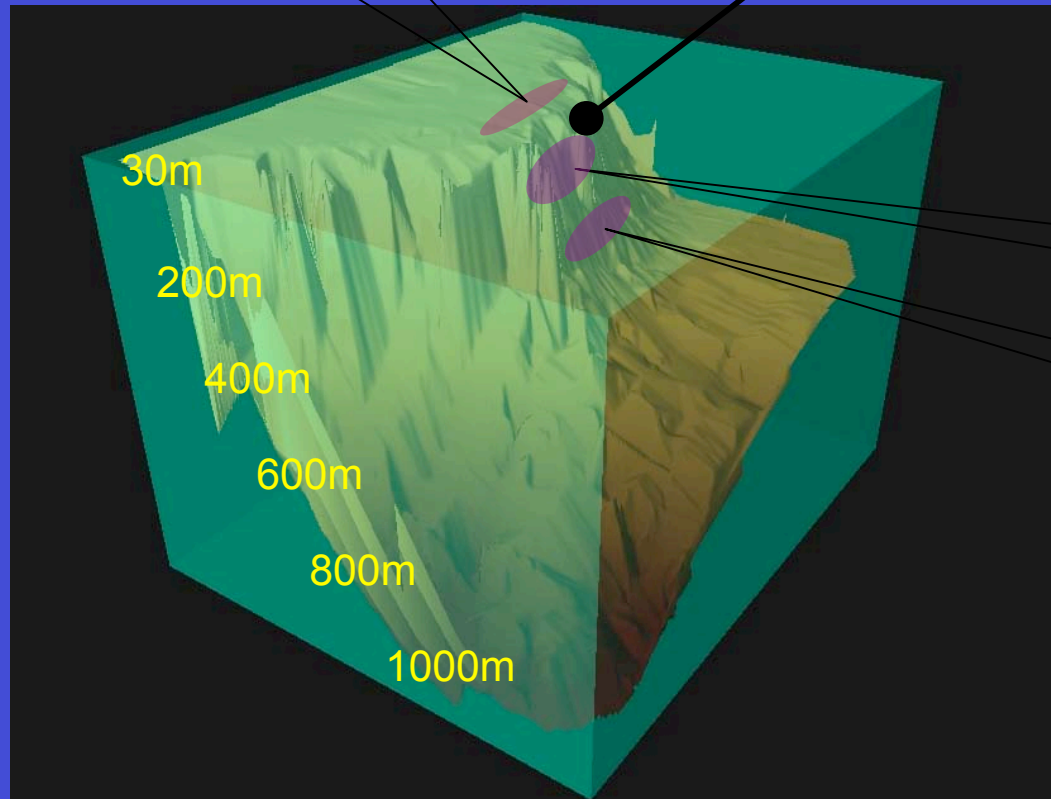
Gladden Spit serves as a multi-species spawning aggregation site

21 species from 9 families

spawning throughout the year

Gladden Spit: Oasis for reproduction

permit, crevalle,
yellow jack,
horse-eye



Cubera snapper

Dog snapper

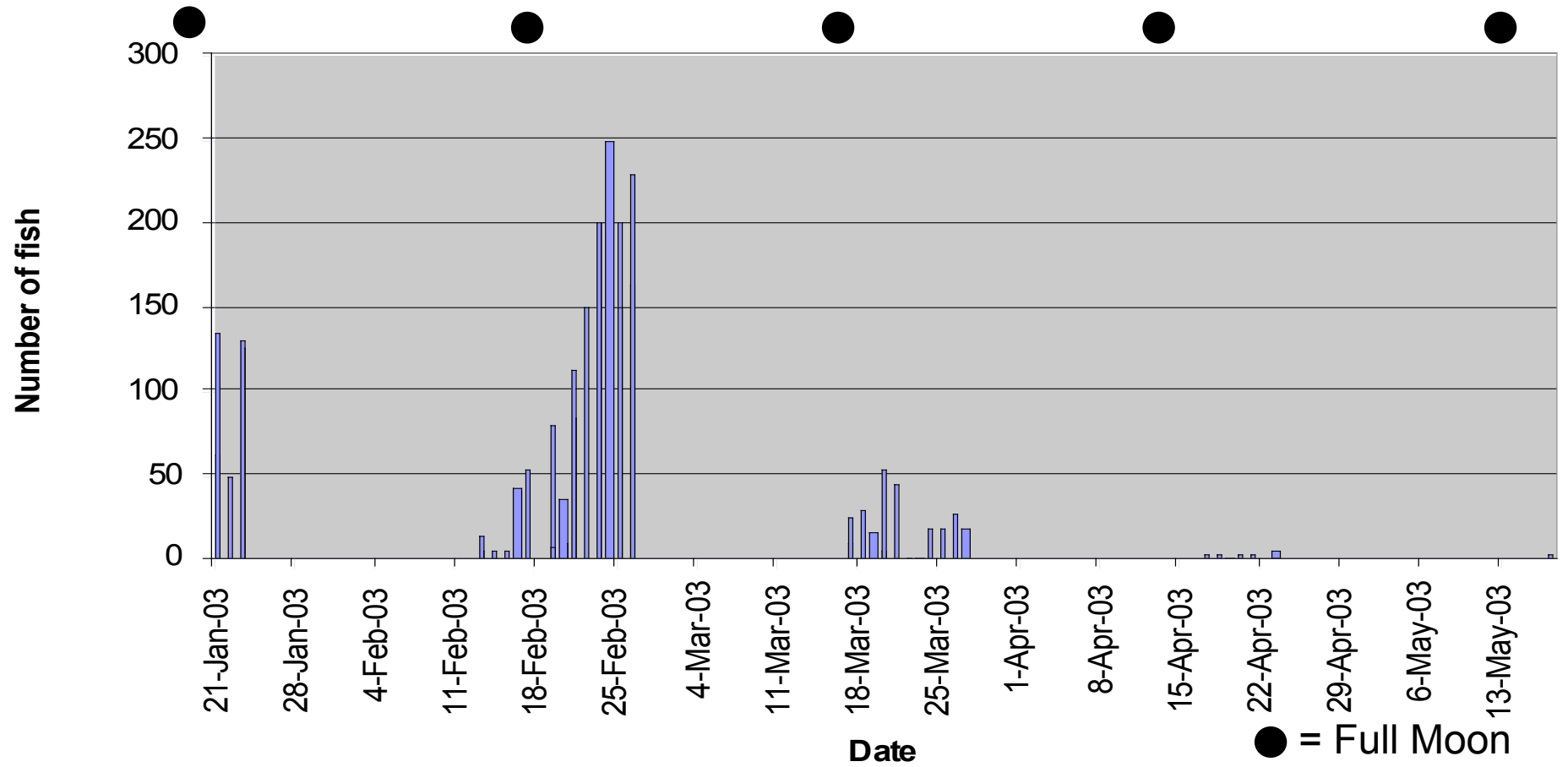
Nassau
Grouper

Black and
Yellowfin
Grouper

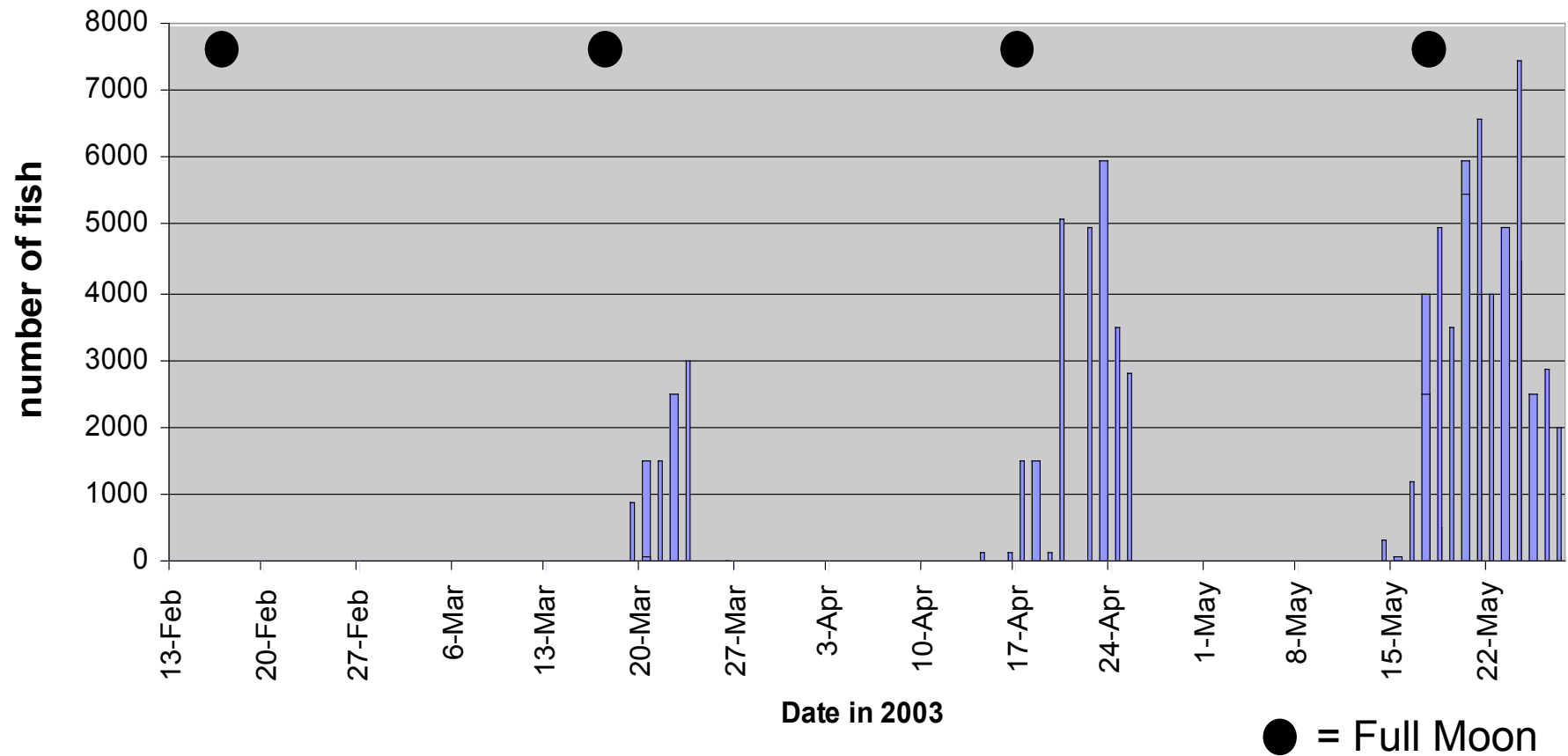
Yellow-eye snapper, queen silk
snapper, blackfin snapper

Black jacks, other
groupers "Jul"

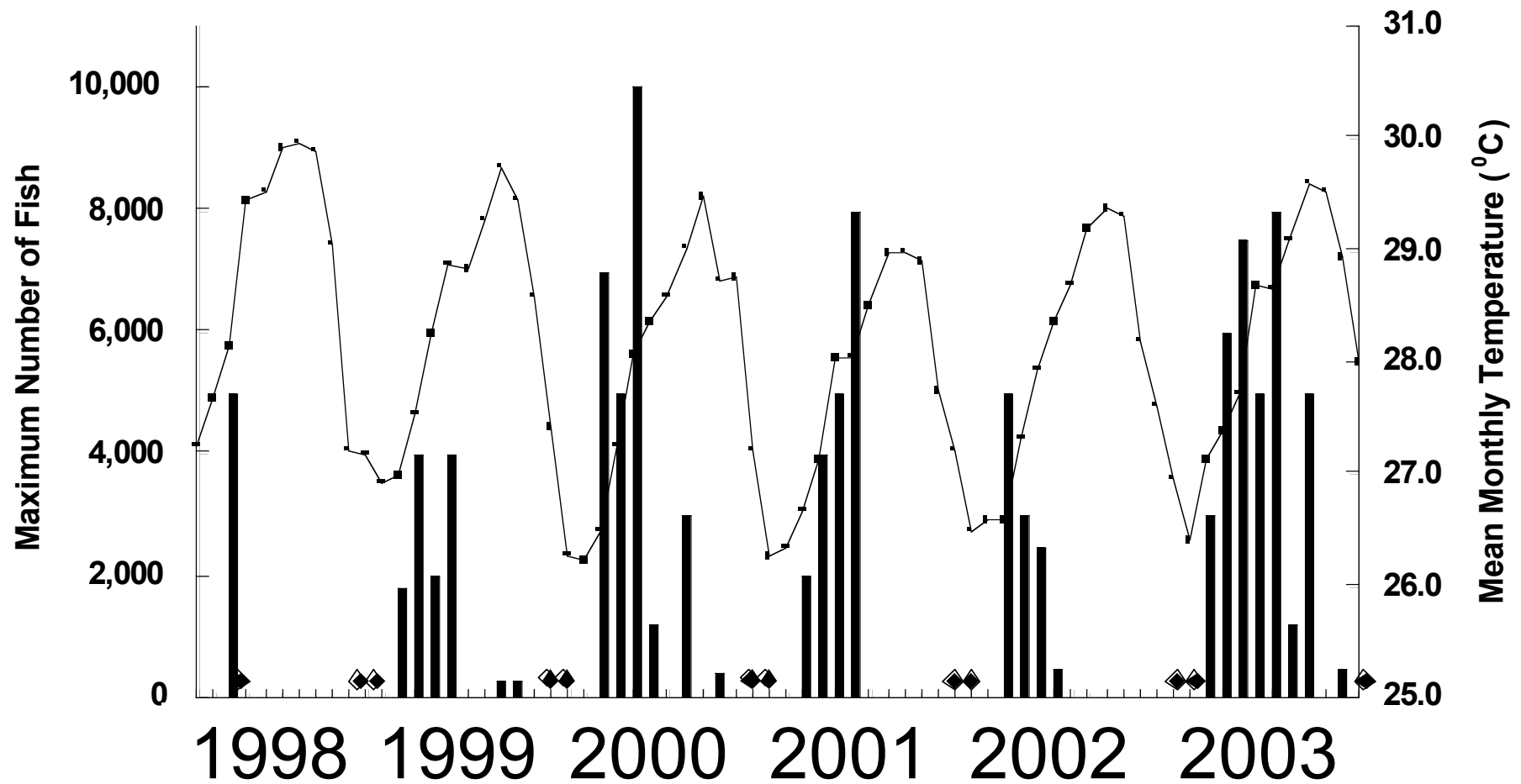
Nassau grouper at Gladden Spit



Cubera Snapper at Gladden Spit

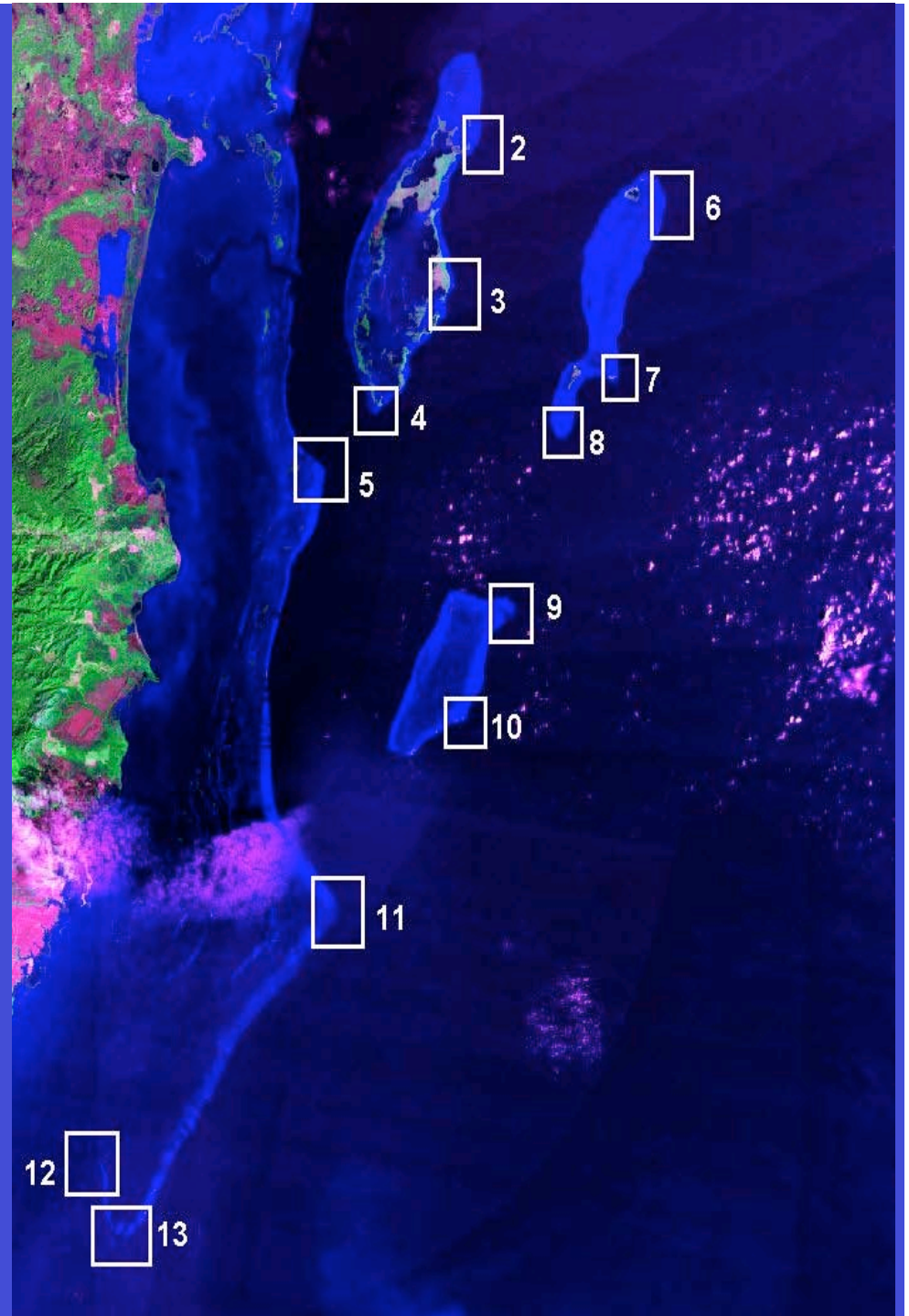


Yearly



Where else do spawning aggregations occur?

National study at reef promontories involving fishers



Hypothesis: Transient, multi-species reef fish spawning aggregations occur at:

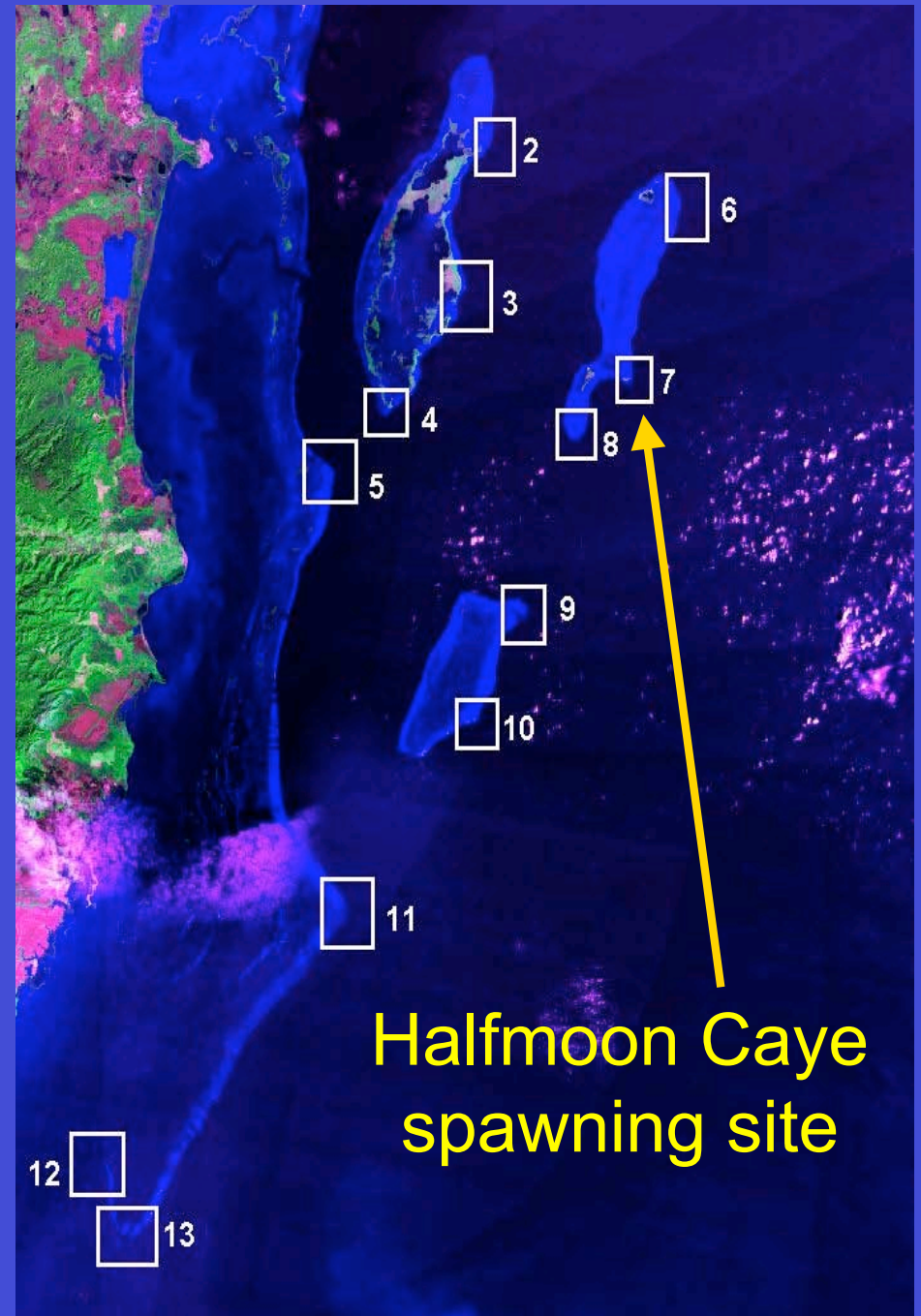
- Reef promontories (inflections on the reef)
- Shelf edge
- 30 – 50 m depth
- Top of dropoff into deep waters (> 500 m)
- Windward facing

Evaluated hypothesis using:

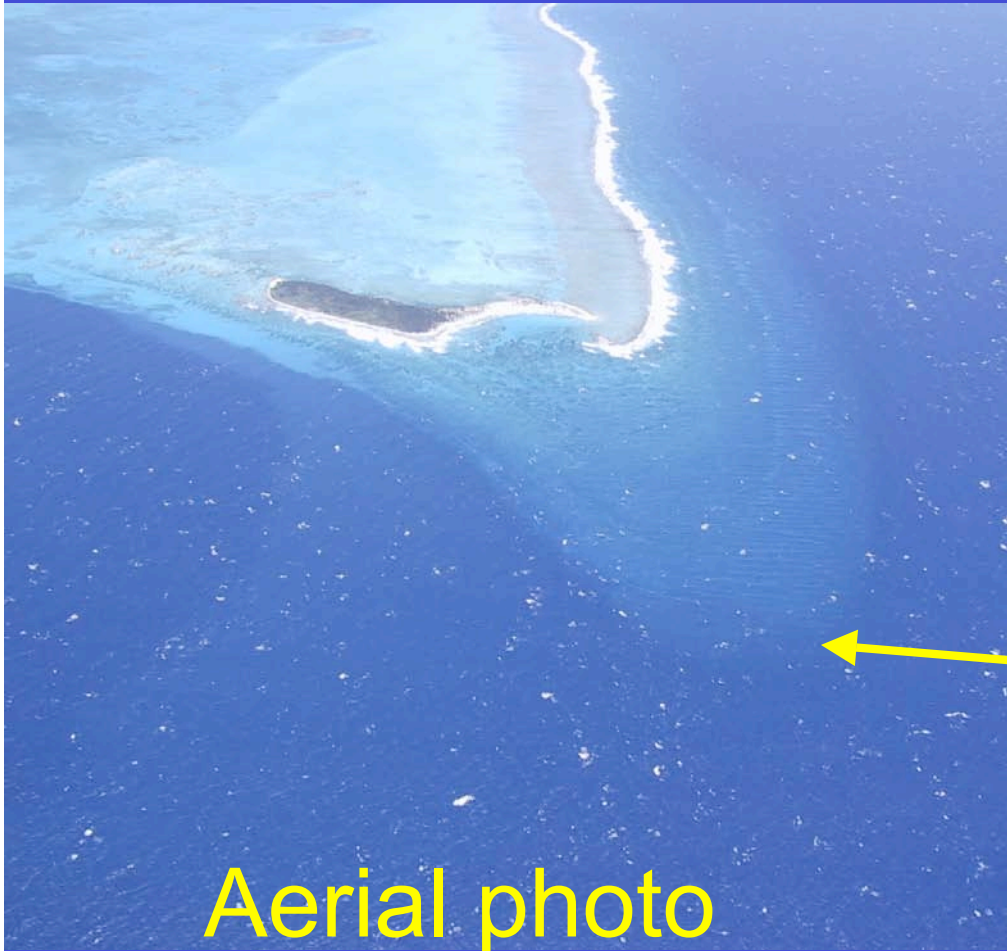
- Underwater visual counts
- Reef mapping - see Kobara, next talk

Lighthouse Reef Atoll

Half Moon Caye



Half Moon Caye



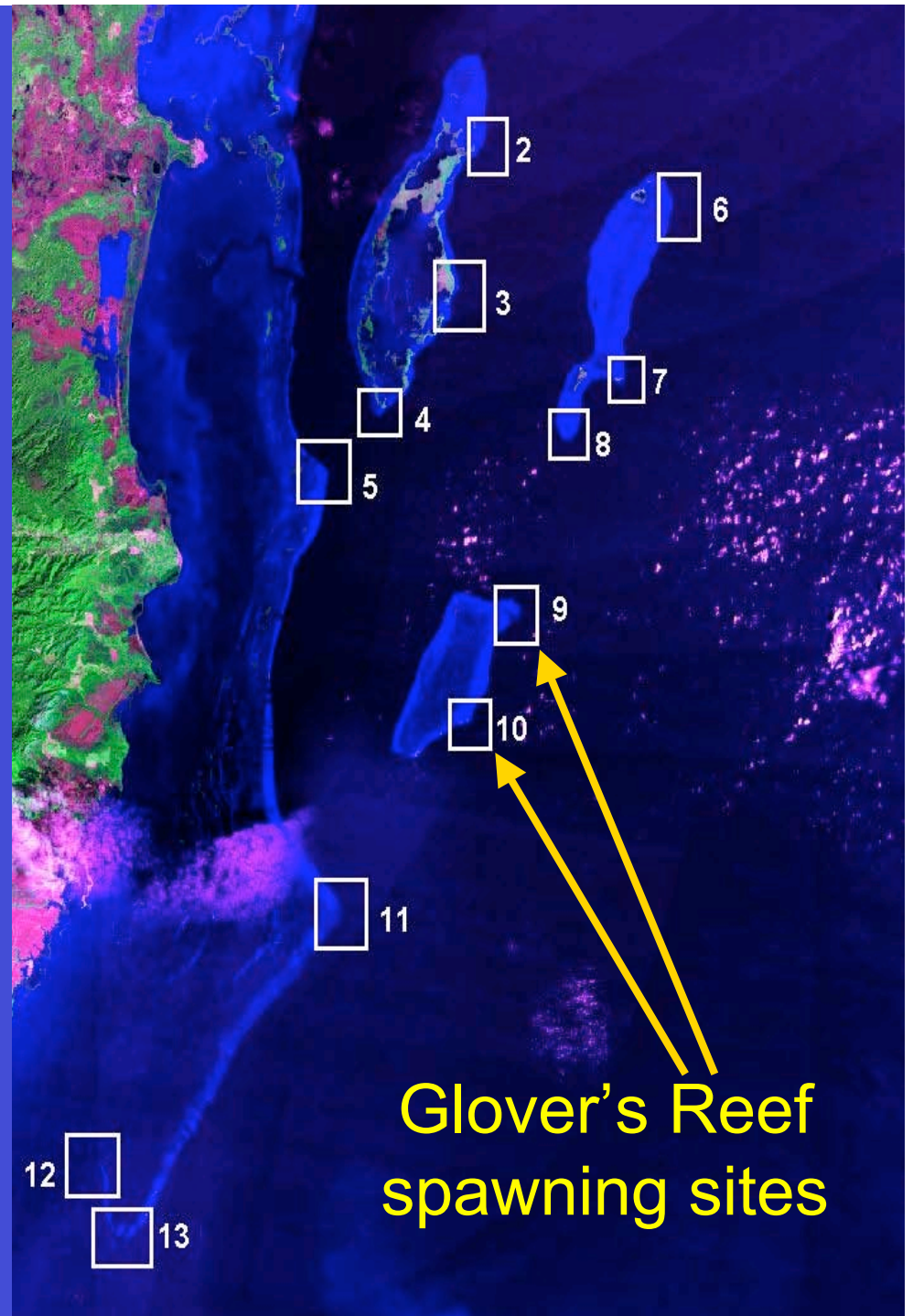
Half Moon Caye's Reef - East Wall



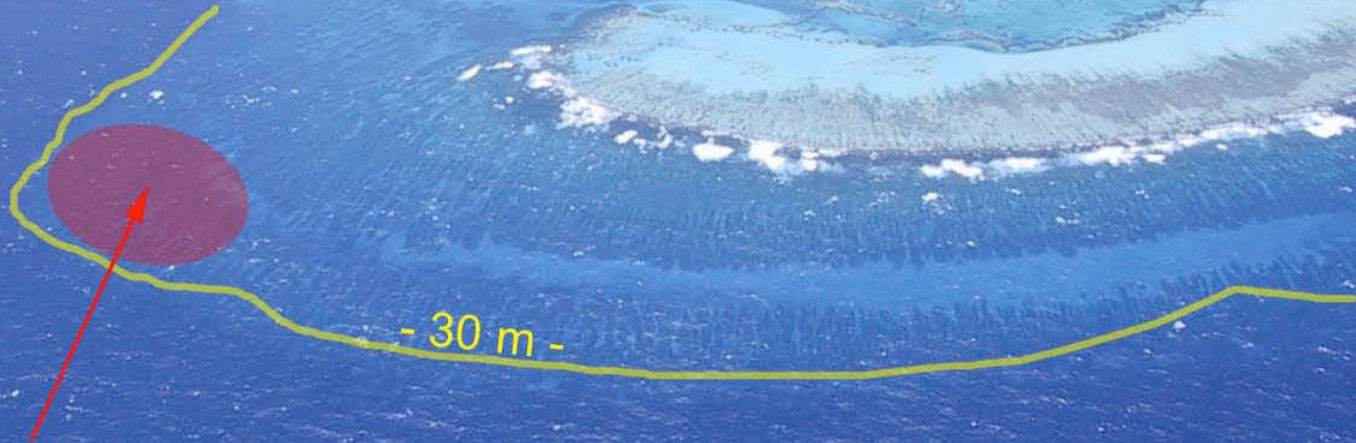
20 species
spawning

Glover's Reef Atoll

Northeast Point and Middle Caye



Glover's Reef – Northeast Point

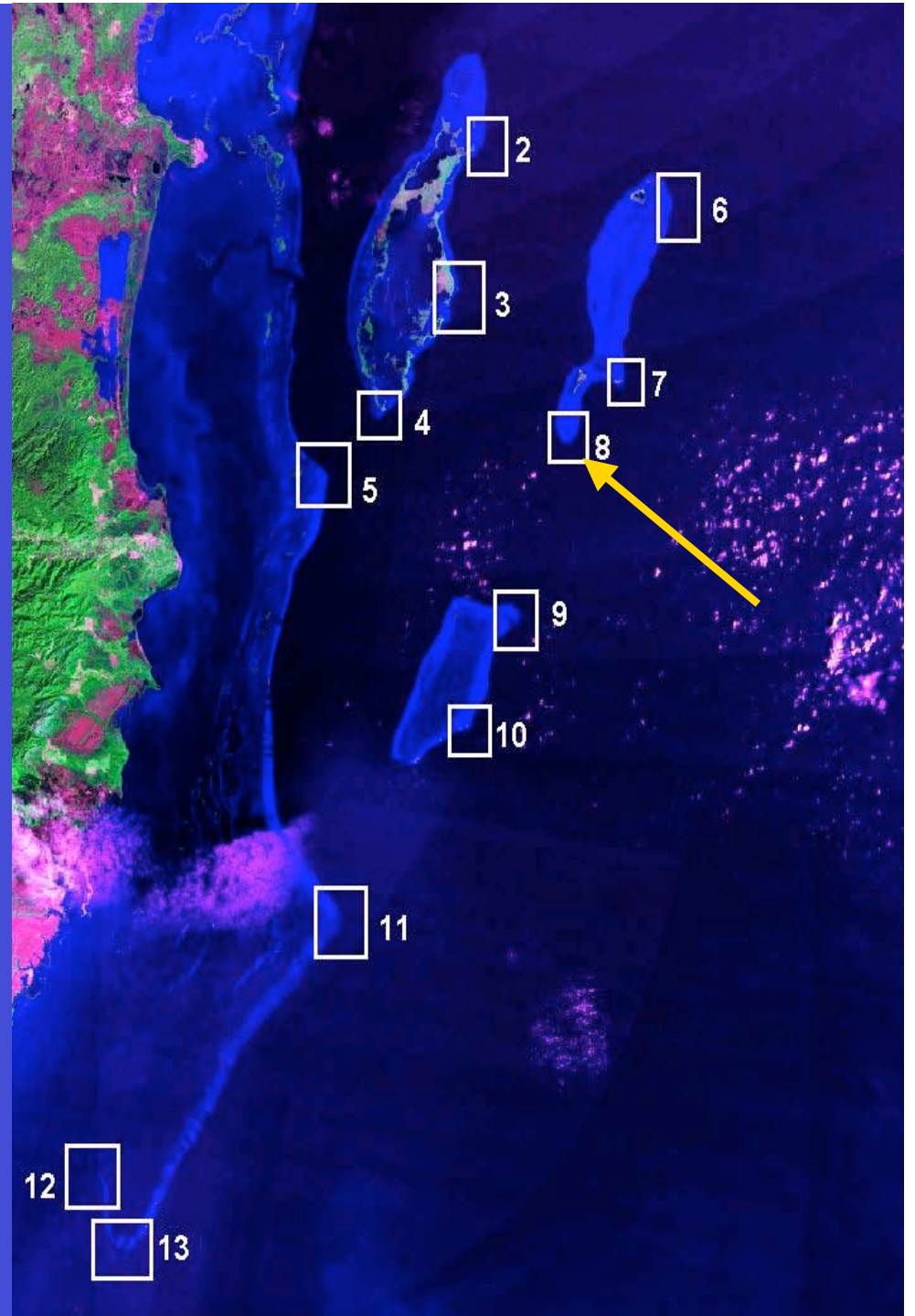


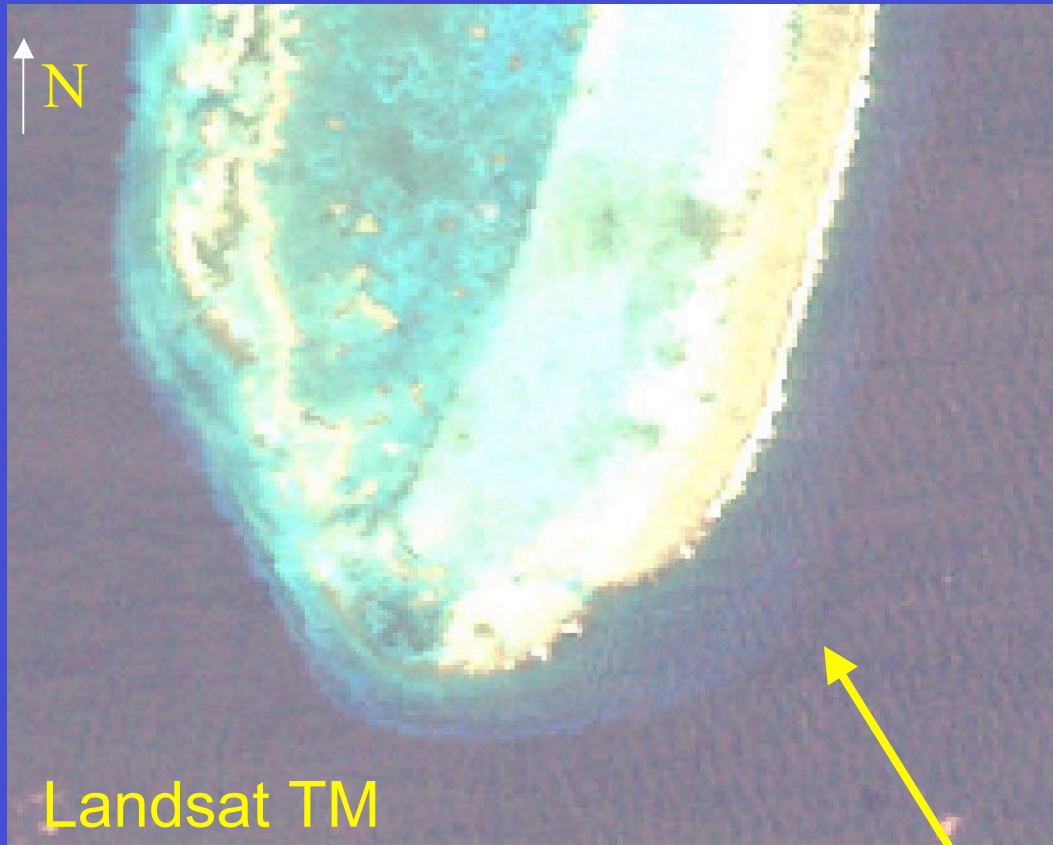
Multi-species spawning site

Glover's Reef – Middle Caye



Predicting new sites





South Point Lighthouse Reef Atoll

Predicted spawning
aggregation site



18 species spawning

Reef promontories as Marine Oases

Breeding
Feeding



Photo by Douglas Seifert

Fisheries Minister declared

1. 11 new year-round,
no-take reserves at
multi-species SPAGs
2. Closed season for
Nassau grouper
(December-March)

November 2002

