

# Monitoring Grouper Spawning Aggregations at Northeast Point, Glovers Reef Atoll, Belize

## BREAKING NEWS



**NASSAU GROUPEL NOW**

**CRITICALLY  
ENDANGERED**



**CR**

**EXTINCT  
IN THE WILD**

**EW**

**EXTINCT**

**EX**

**LEAST  
CONCERN**

**LC**

**NEAR  
THREATENED**

**NT**

**VULNERABLE**

**VU**

**ENDANGERED**

**EN**

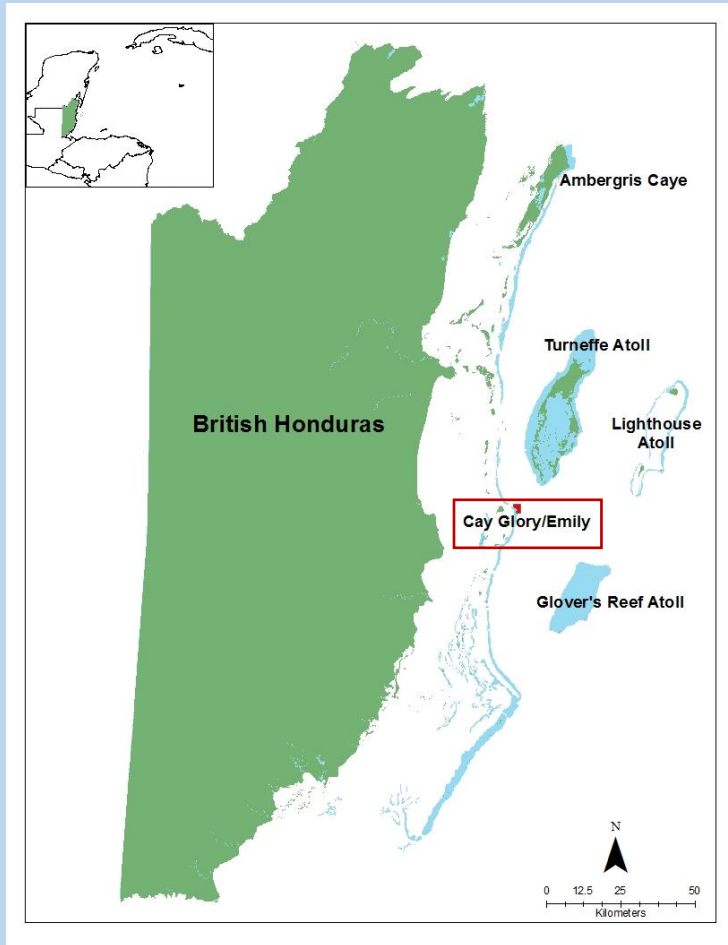
Graphic derived from IUCN Red List. Visit them at [www.iucnredlist.org](http://www.iucnredlist.org) for the full report.



# Spawning Aggregation Fisheries: Historical Context



1910's – 1960's



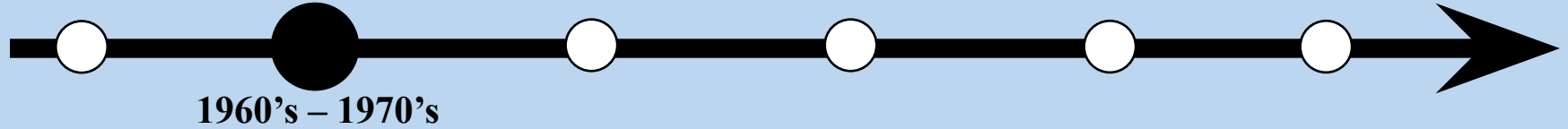
**1911** Introduction of Cuban “smack” boats

**1920s** Beginning of aggregation fishing at Cay Glory

**1950s** Annual grouper catches high as 45,359 kg

**1960s** Nassau grouper fished at a rate of 2 tons per day at Cay Glory

# Spawning Aggregation Fisheries: Historical Context



**1961**

**Nassau grouper was the most caught fish in British Honduras.**

Approx. 300 boats could be found at Cay Glory per day during Dec-Jan

**Late 1960s**

Introduction of spearguns - acute impact to large reef fish

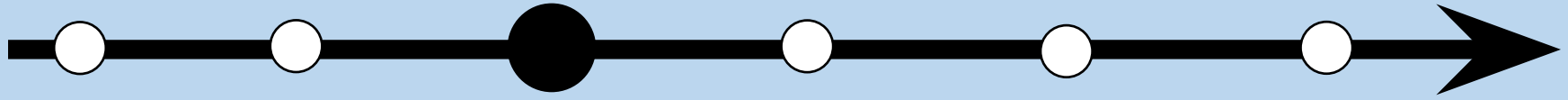


**1975**

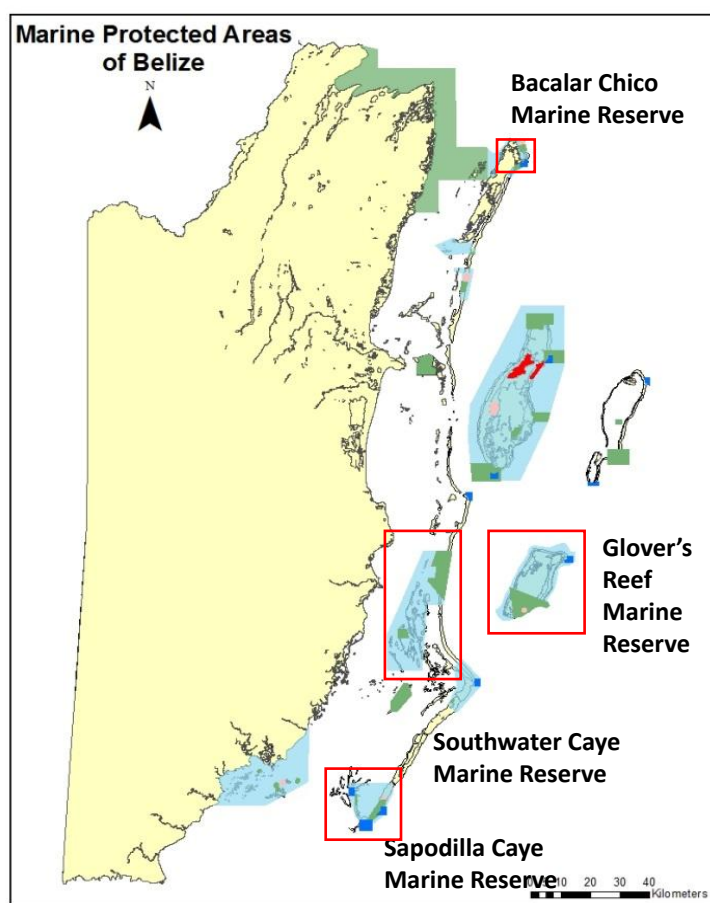
Nassau grouper count  
at NE Point,  
**approximately  
15,000**



# Spawning Aggregation Fisheries: Historical Context



1980s-1990s



## Reserve declarations



**1982**

**ban on fish pots/traps inside SPAGs (Belize SI-17)**

Caye Glory N = 15,000 (Carter 1988)

**1991**

Draft "Fishery Management Plan for Nassau Grouper" discussed with Fisheries Dept. (Carter & Marrow)

**1993**

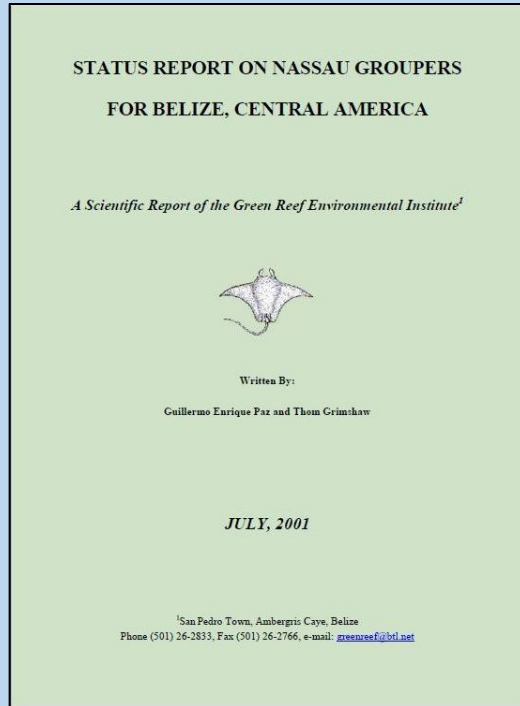
Glover's Reef Marine Reserve established

**1996**

Bacalar Chico, Sapodilla Cayes and SWCMR declared Marine reserves.

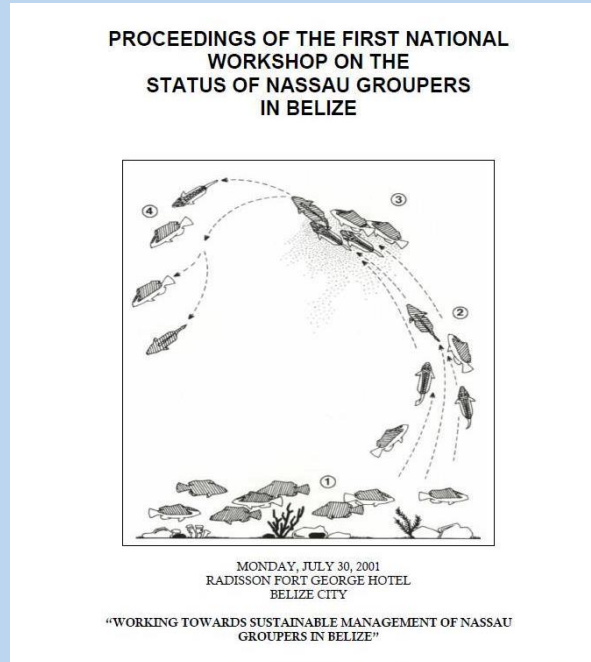
# Spawning Aggregation Fisheries: Historical Context

1999-2001



**1999**

Belize-wide survey & report for 8 sites (Paz, Green Reef Environmental Institute) finalized **2001**

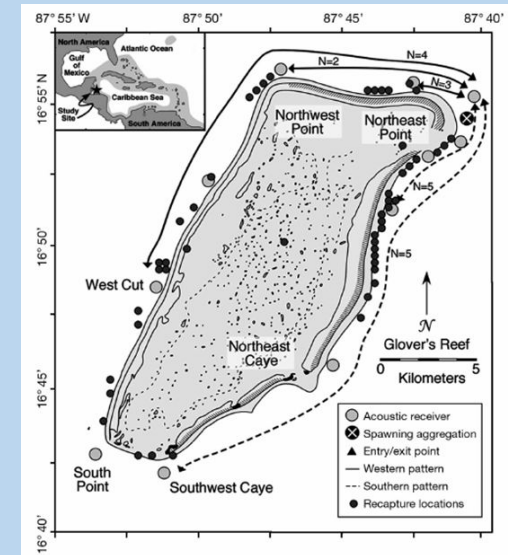


**2001**

First multi-organizational workshop (gov't, NGOs, fishers & academia – Carter, Sala, Paz, Gladding, Luckhurst & Heyman)

Rapid Decline of Nassau Grouper  
Spawning Aggregations in Belize:  
Fishery Management and  
Conservation Needs

**Sala et al. 2001**



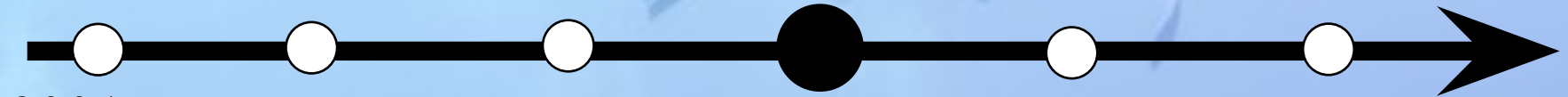
**Starr et al. 2007**

**2001**

First scientific studies of Glover's aggregation – population assessment and telemetry

# National Spawning Aggregation (SPAG) Working Group

## Dawn of Collaborative Efforts



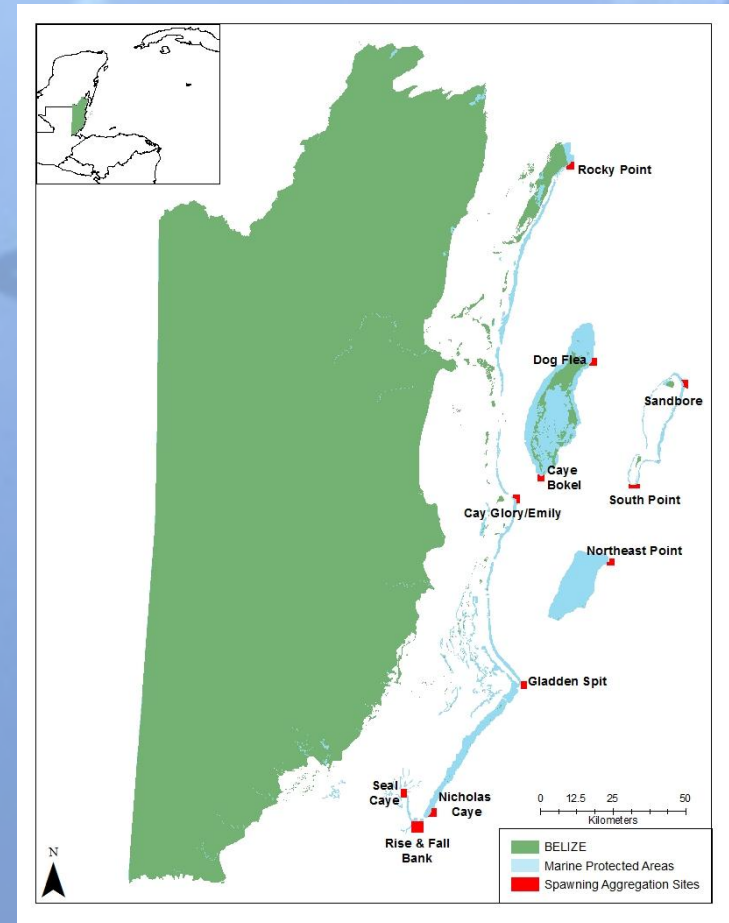
**2001**

- A national initiative to conserve Belize's Nassau Grouper emerged in late 2001

**2001-2002**

**2002**

- BNSAWG, led by WCS, formally established to introduce protective legislation
- **11 sites** fully protected year round
- **4 month closure** country wide (December 1st – March 31<sup>st</sup>)



**11 Protected SPAG Sites**

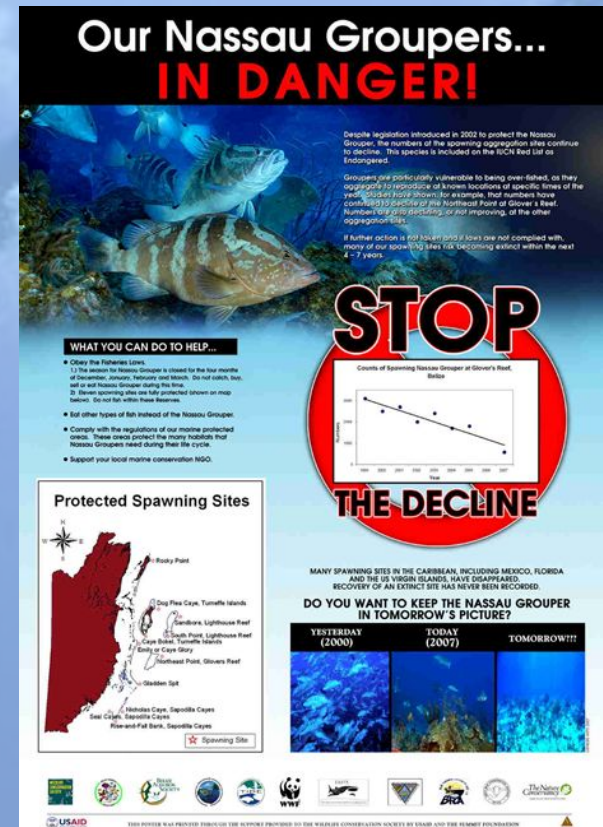


# National Spawning Aggregation (SPAG) Working Group

## Key Accomplishments

- Thirteen (13) fully protected FSA sites
- Special patrols at spawning sites
- Seasonal closure for Nassau Grouper
  - December – March
- Size Limits for Nassau Grouper
  - Minimum 20 inches/50 cm
  - Maximum 30 inches/76 cm
- Awareness campaigns (2006-2009 & ongoing)
  - Increase in public awareness from 45% - 90% re: identification & importance of SPAGs
  - Posters, radio, television
- Ongoing network meetings (quarterly) and trainings every few years
- Maintenance of national database & website

2003-2016



A horizontal timeline arrow pointing to the right. It features six white circles and one black circle. The black circle is positioned in the middle of the arrow and is labeled "2003-2016" below it.

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





# National Spawning Aggregation (SPAG) Working Group

## Abundance - Underwater Visual Survey



2003-2016



*Refresher course participants at Glover's Reef*

All species and behaviors:

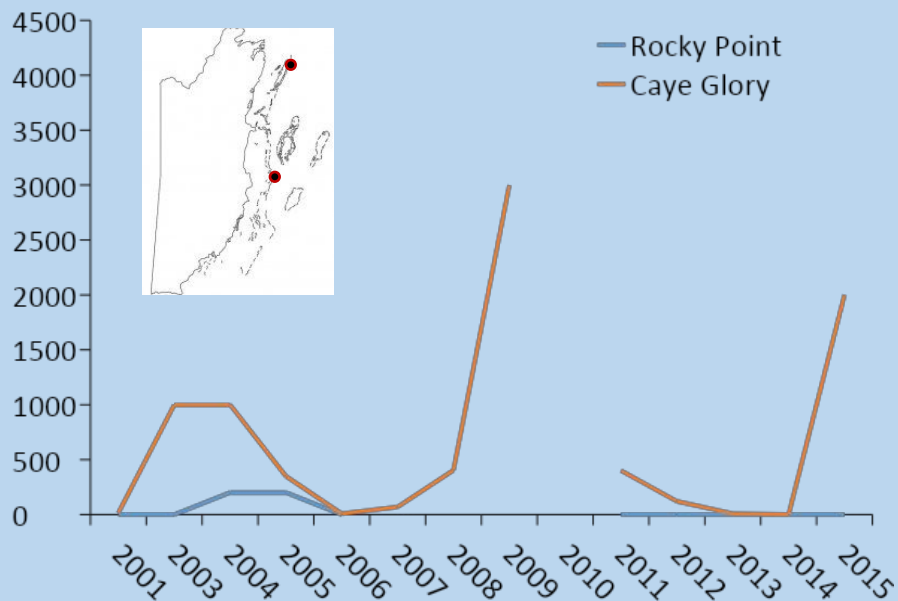
- Grouping
- Color Changes
- Gravid
- Spawning
- Fighting
- Bite Wounds
- Courtship



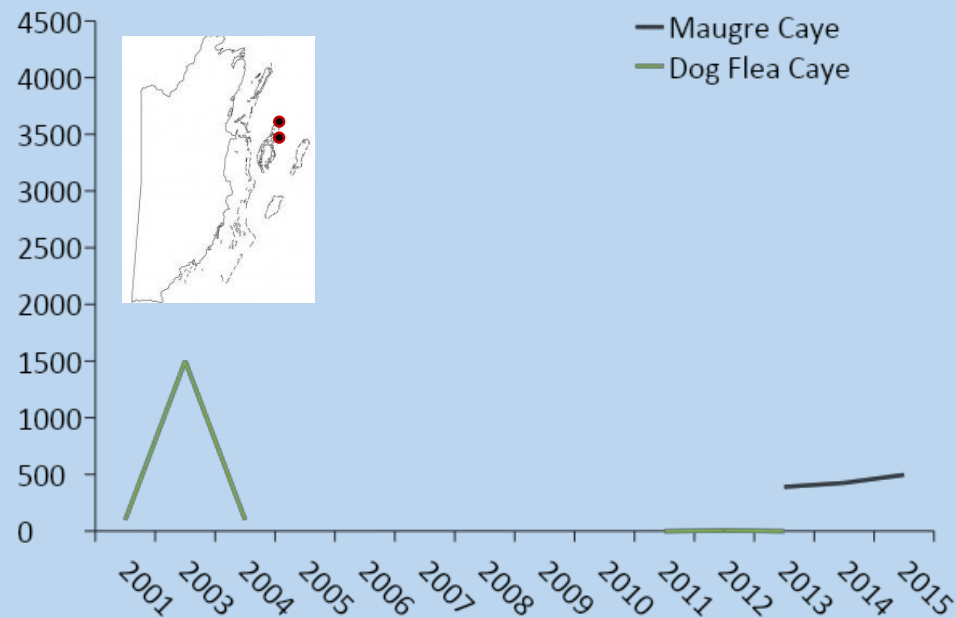
Methods were revised with Dr. Yvonne Sadovy in 2012. Each diver now provides a count and the average is reported to the SPAG working group.

# Abundance – Underwater Visual Survey (2001 – 2015)

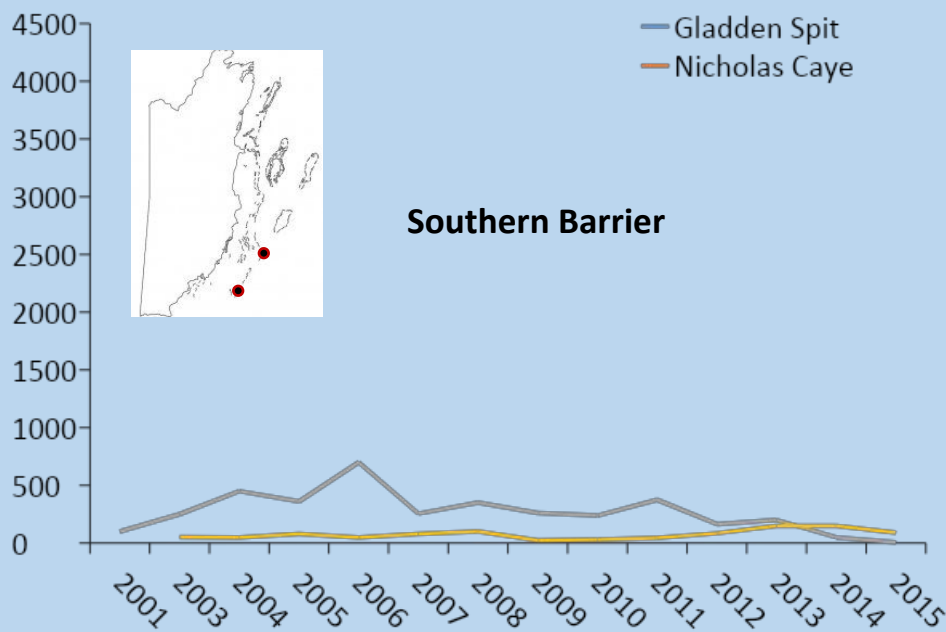
## Northern Barrier



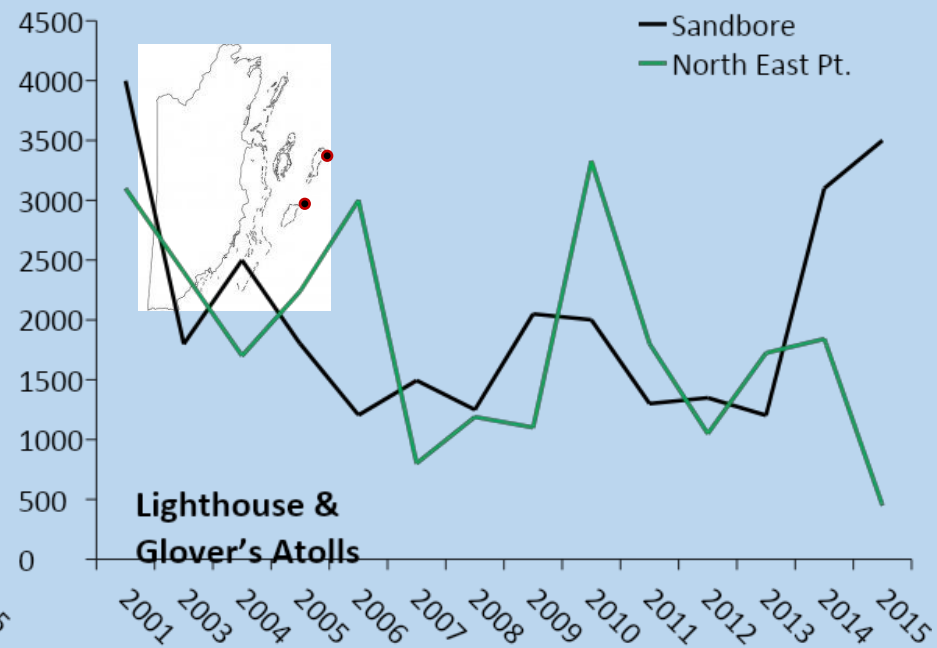
## Turneffe Atoll



## Southern Barrier



## Lighthouse & Glover's Atolls

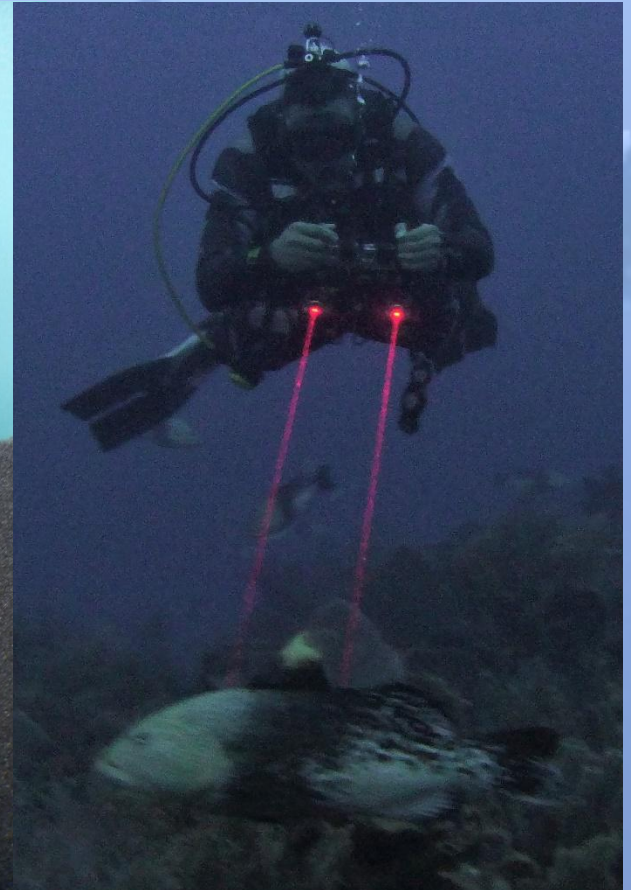




# 2017 – Introduction of Laser Calliper Methodology by Wildlife Conservation Society



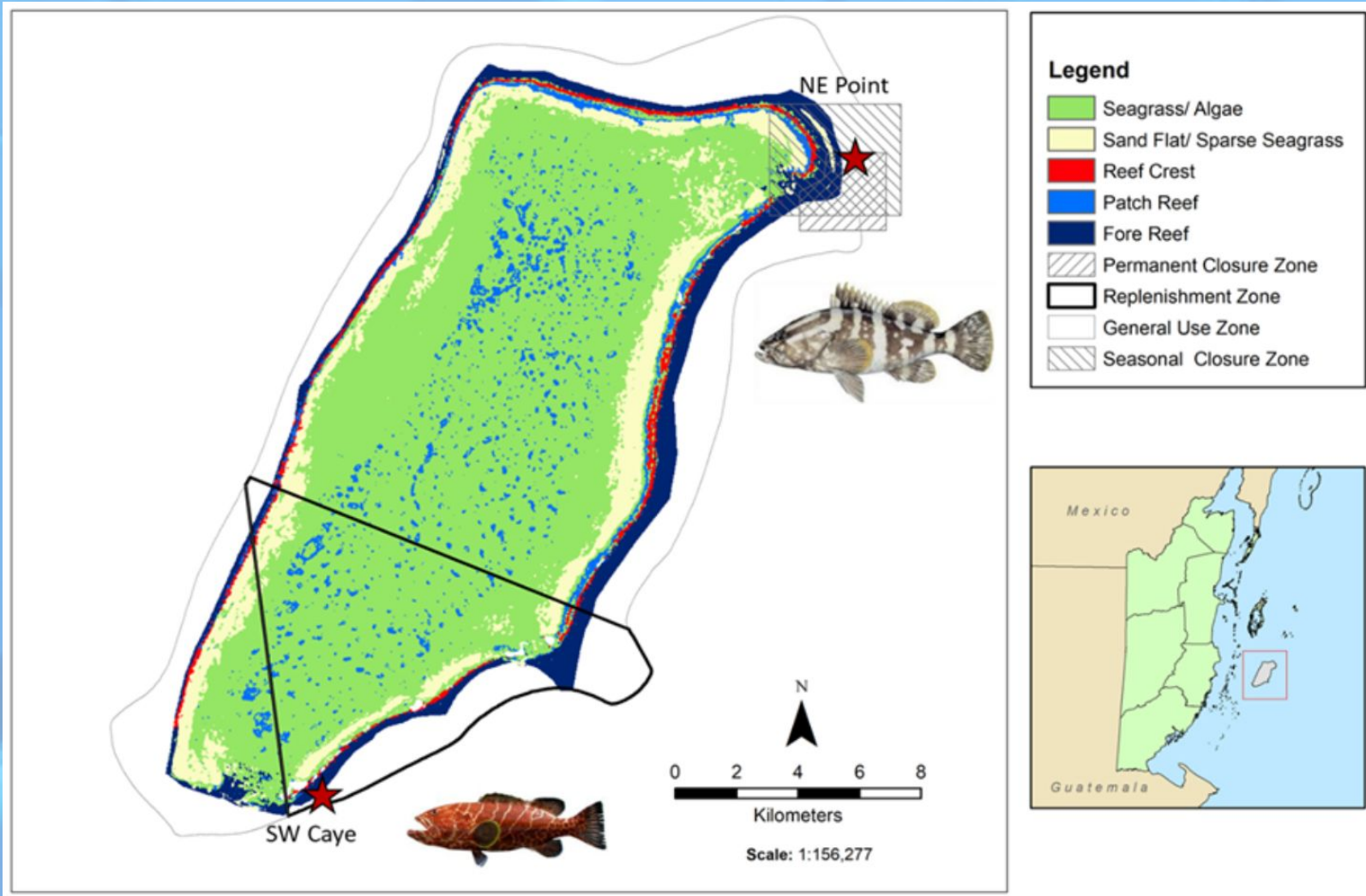
*Laser caliper array with two submersible GoPros and twin submersible lasers fitted to a tray with handles. The fixed distance between the lasers (calibrated to 18cm) allows fish length to be estimated with high accuracy from video footage.*  
© A. Tewfik/WCS



*A surveyor/camera operator casting the laser points onto the lateral surface of a spawning male tiger grouper. Sediment in the water has made the beams visible.*  
© A. Tewfik/WCS

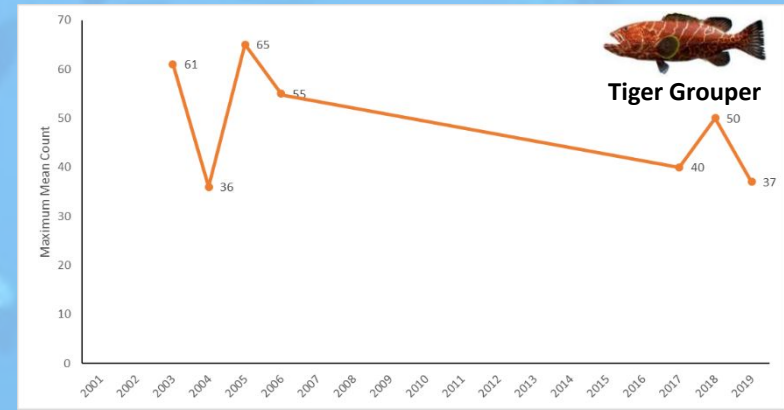
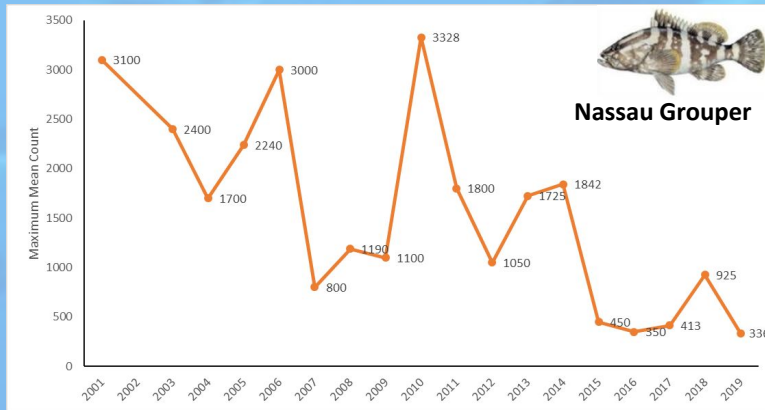


# Glovers Reef Marine Reserve – Two Focal Sites

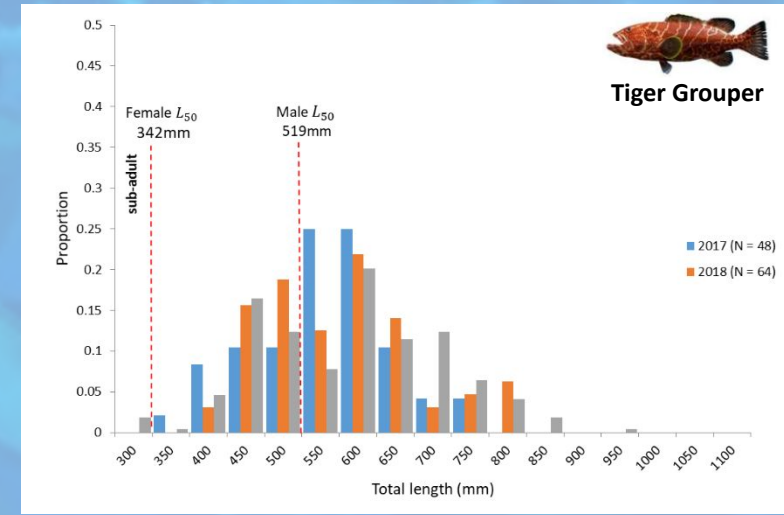
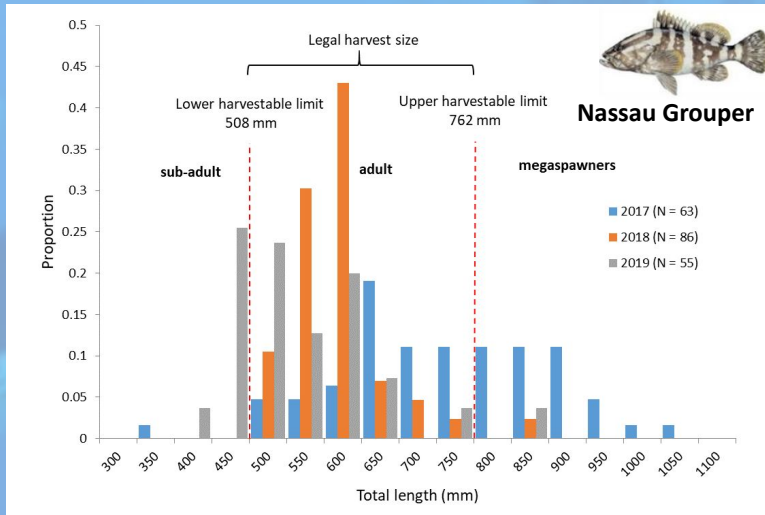


*Glovers Reef Marine Reserve (GRMR), showing predominant habitats and locations of focal FSA sites. Northeast Point is a mixed aggregation site couched within a permanent closure zone for protection of breeding Nassau Grouper. Tiger Bank is located within the GRMR's no-take (replenishment) zone near to Southwest Caye, and is a single species tiger grouper FSA site.*

# Abundance and Size Monitoring Time-series



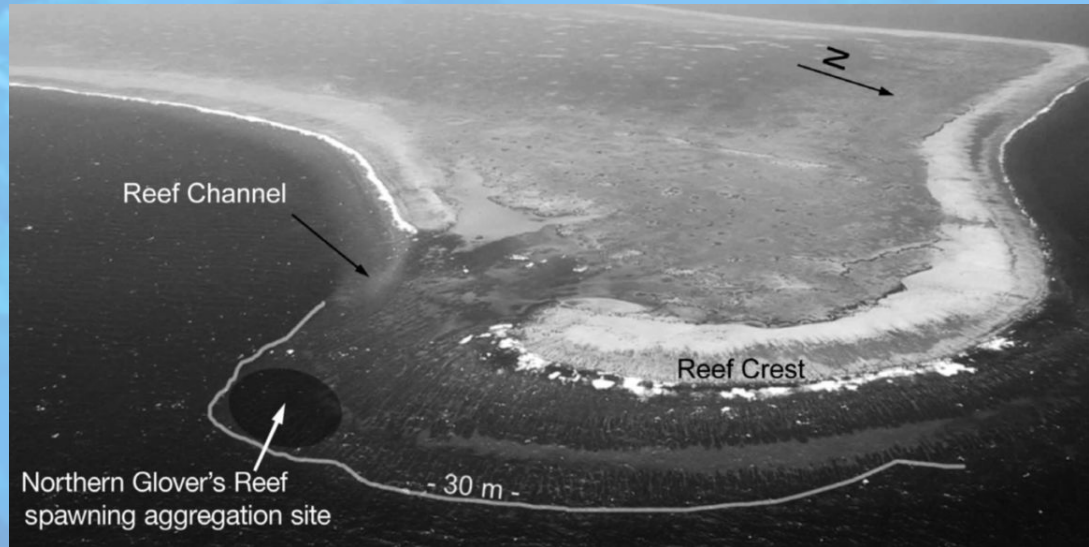
Maximum average counts of Nassau grouper recorded at Northeast Point, and maximum average counts of Tiger grouper recorded at Tiger Bank during the same time period. Counts from 2003-2004 derived from Starr et al. (2018). Starr et al. also noted a maximum count of 111 fish in 2005.



Proportional distribution by size (total length, mm) of the gonochoristic Nassau grouper and protogynous tiger groupers. 2019 data will be revisited.



# Fishing Pressure vs Management Level



Aerial photo of Northern Glover's Reef Atoll (Kobara & Heyman 2010)





# Northeast Point, Evidence of Illegal Fishing



Anchor brought up on Feb 1<sup>st</sup>  
2012. **Photo: A. Eck**



Anchor brought up on Feb 2<sup>nd</sup>  
2013 **Photo: V. Burns**



Special patrol to combat illegal fishing  
(2008 onwards) **Photo: J. Maaz**



Hooked fish - January 2015  
**Photo: A. Tewfik**

# Glovers Reef FSA/SPAG Monitoring

## Conclusions - 2019



- Breeding populations at Tiger bank exhibit relatively stable abundance and size.
- **Nassau Grouper** at North East Point **continue to decline** in number and size **despite extensive list of management measures**.
- Regular illegal, unreported and unregulated fishing pressure at GRMR negatively impacts populations of breeding Nassau Groupers.
- The existence of barriers to movement (i.e. deep water) and strong spawning site fidelity (Starr et al, 2007) potentially make offshore (i.e. atolls) sites more vulnerable to the effects of overfishing than those on the main barrier reef (Burns and Tewfik 2016).
- The efficacy of surveillance and enforcement must be increased to deter IUU fishing, which will contribute to the erosion of Nassau grouper and associated fish populations, loss of associated livelihoods and potential loss of critical biodiversity.



# Proposed Future Work

## Glover's Atoll/WCS

- New telemetry data, update from Starr et al. 2007
- Exploration of bio-acoustic research
- Resource economics of grouper fishery
- Investigation of mutton snapper aggregation
- Correlations between PR, FR and SPAG numbers for Nassau (Historical)



## Belize SPAG Working Group

- Regular refresher courses
- Mainstreaming laser calliper method
- Increasing involvement of fisherfolk
- Joint efforts to seek funding for improvement of FSA monitoring and enforcement





# Thank You!

Email: [mphillips@wcs.org](mailto:mphillips@wcs.org)



## Working Group Members:



## Funders:

