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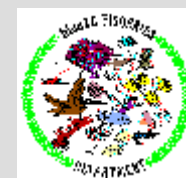
# Planning Approach to Fishing Threat Reduction and Adaptive Management



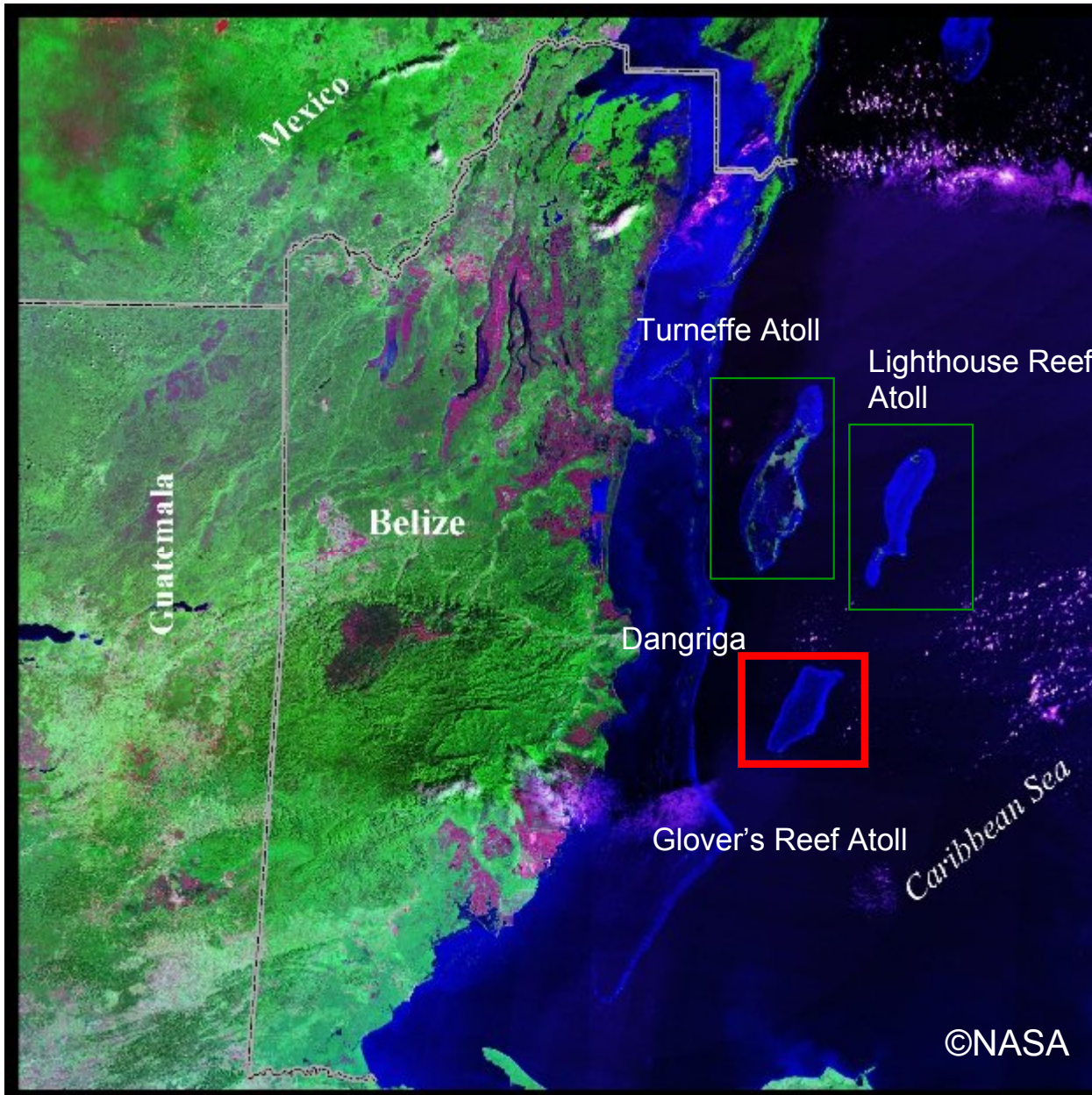
S.Hoare/WCS

## *Glover's Reef Living Seascape*

J. Gibson and R. Coleman



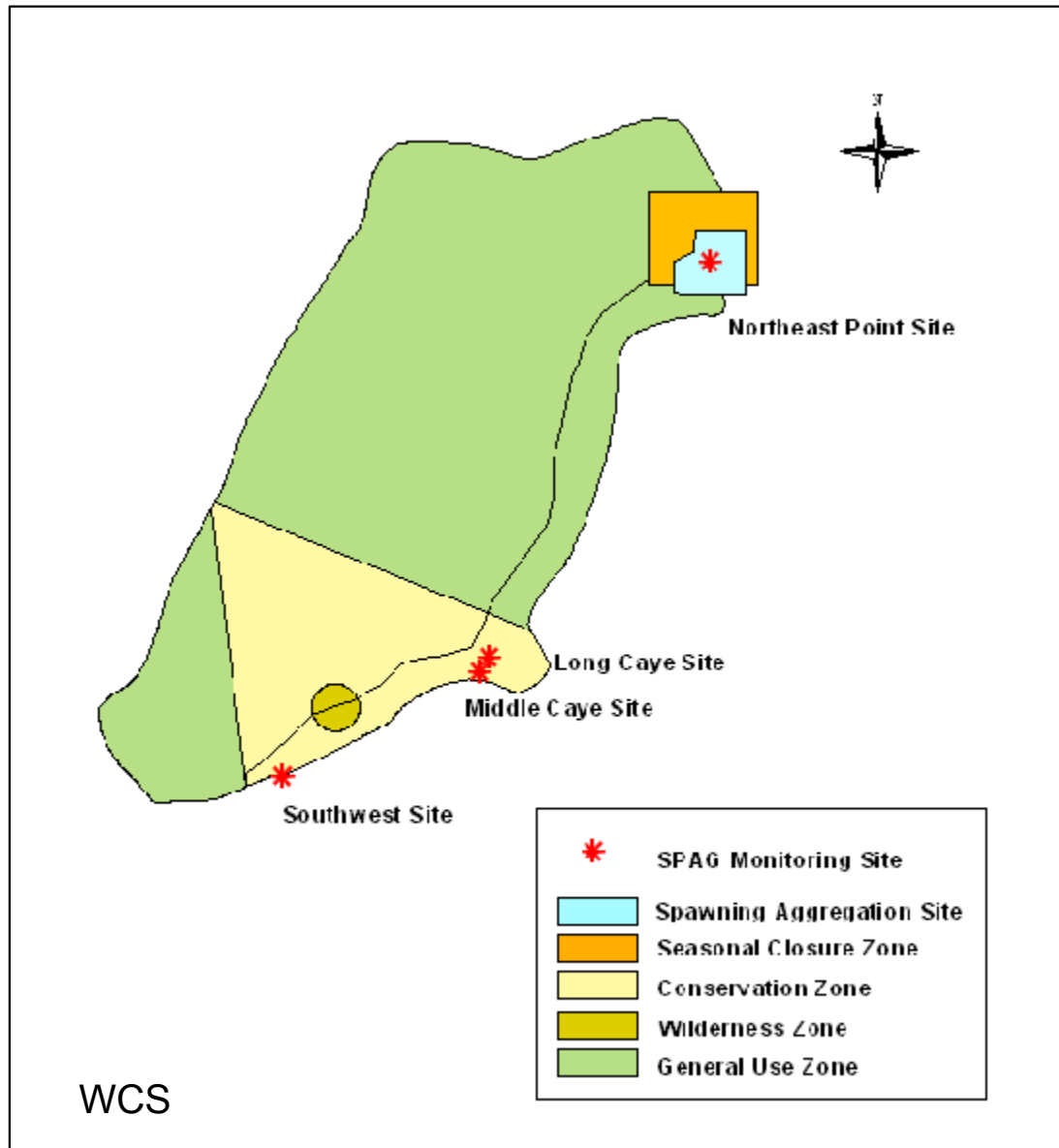
# Glover's Reef Seascape



## Glover's Reef Atoll

- One of four atolls in the Western Hemisphere, southern-most of 3 atolls in Belize
- Located 45 km east of mainland
- Area of 35,876 ha
- Atoll encompasses the Glover's Reef Marine Reserve
- Third largest marine protected area in Belize
- 1 of 7 MPAs that make up the Belize Barrier Reef World Heritage Site

# Glover's Reef Marine Reserve



- Established as MPA in 1993
- Managed by Belize Fisheries Department with 4 reserve staff
- Reserve base is on Middle Caye owned by WCS who has been operating a research facility since 1996.

# Glover's Reef Marine Reserve



**Fishing**



**Tourism**



# Identify and Characterize Human Activities

- Threats assessment workshop with GRAC and other stakeholders in Feb 2004
- Prioritize and map current or potential threats affecting the Atoll and its wildlife
- Threats were listed under four main categories:
  - habitat loss
  - species depletion
  - pollution
  - introduction of non-native species



## Threats to Glover's

Over-fishing

Coral Bleaching

Coral damage by snorkelers and anchors

Nutrient and pesticide pollution from agricultural and aquaculture run-off

Other threats

Algal growth

Run-off from development such as untreated sewage

Land development

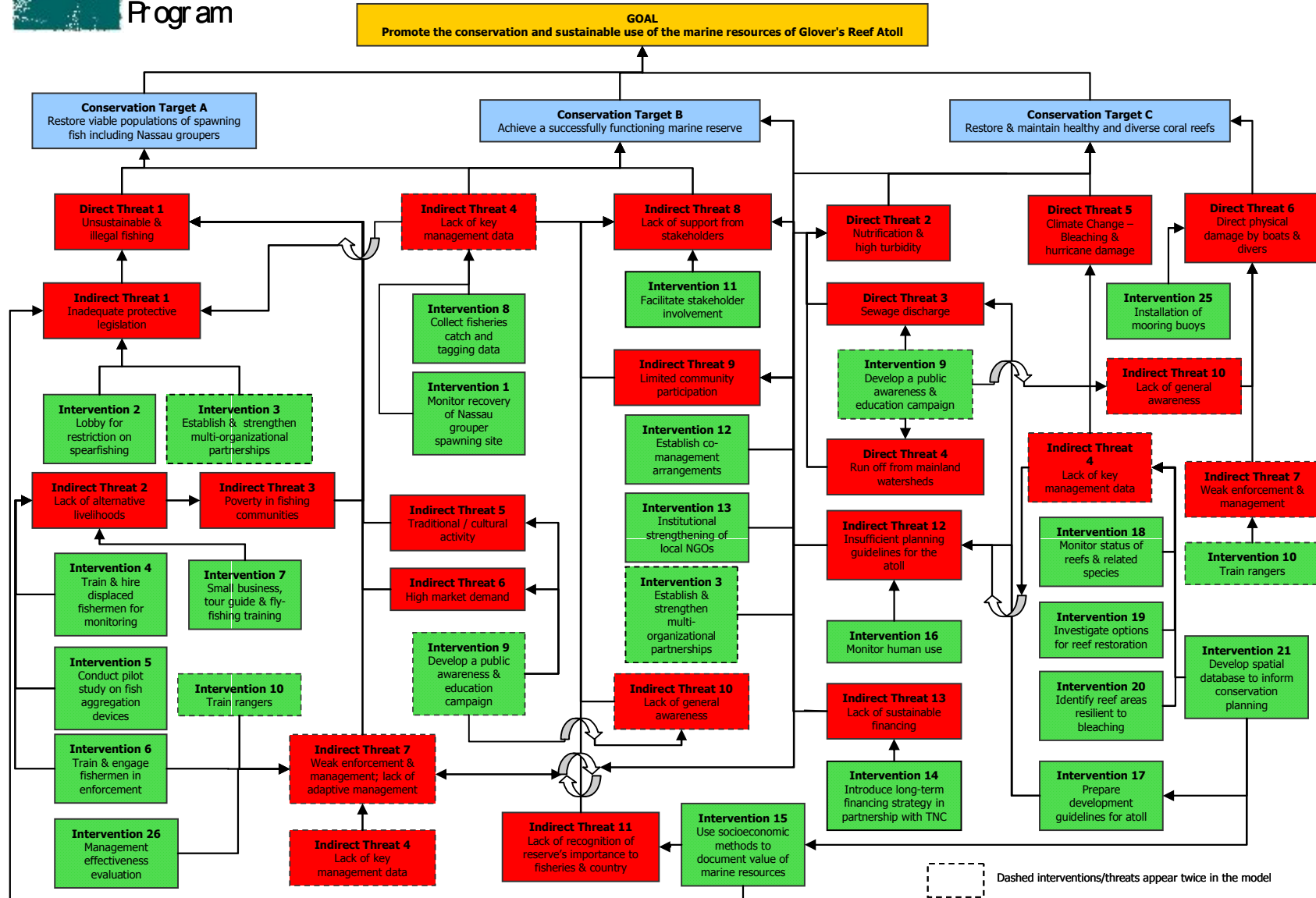
Turtle and bird nesting site damage through caye development

# Conceptual Model

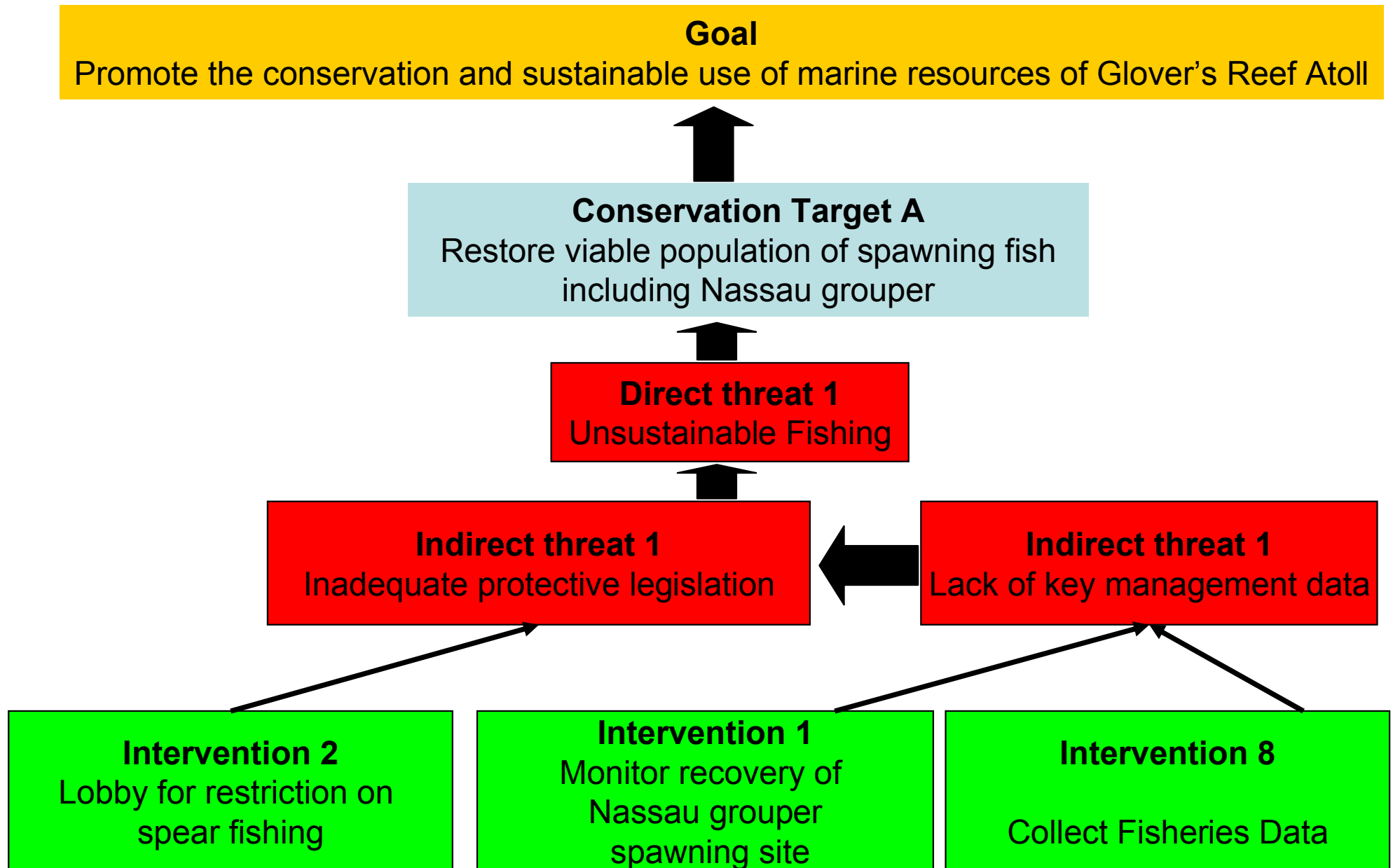


Living Landscapes Program

## Glover's Reef Atoll General Conceptual Model

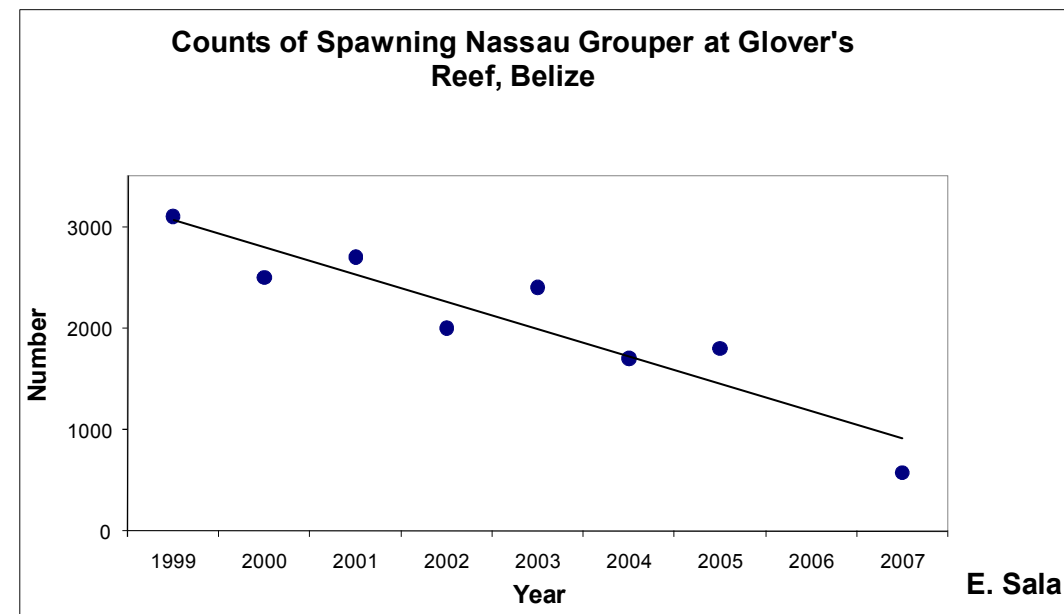


# Conceptual Model



# Nassau grouper

- Catch data program – very few Nassau grouper, 50% juveniles, taken mainly by spear fishing
- Easy targets for spear fishers who seek the “largest fish”
- Spawning aggregation – numbers continued to decline, despite protection of site
- Protection of spawning sites critical, but not sufficient

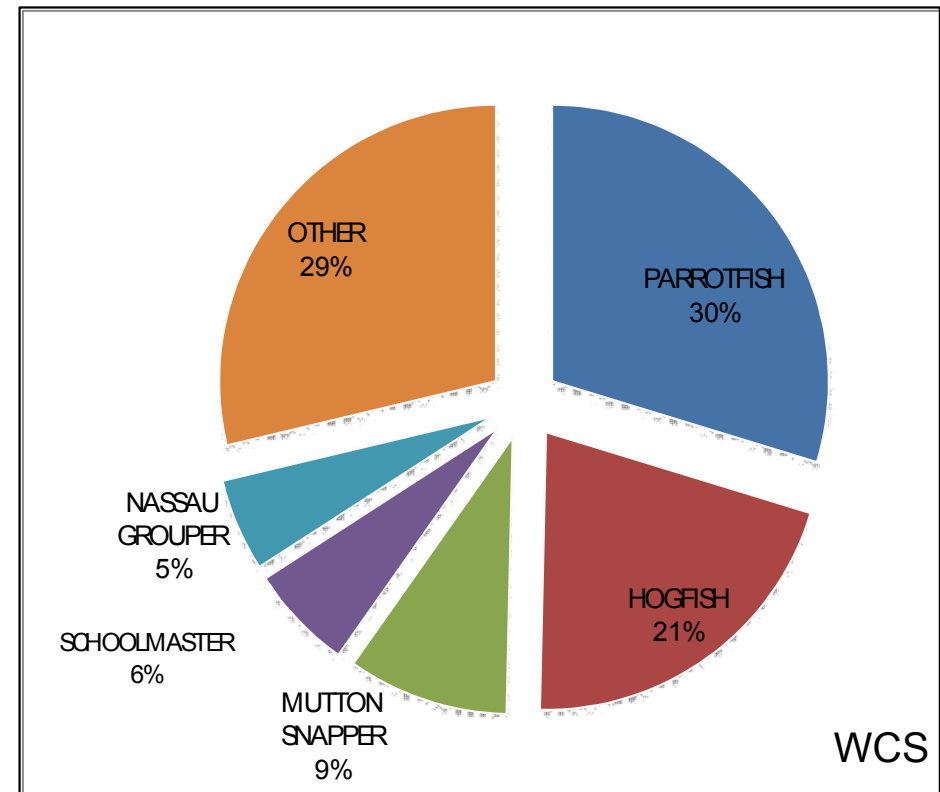
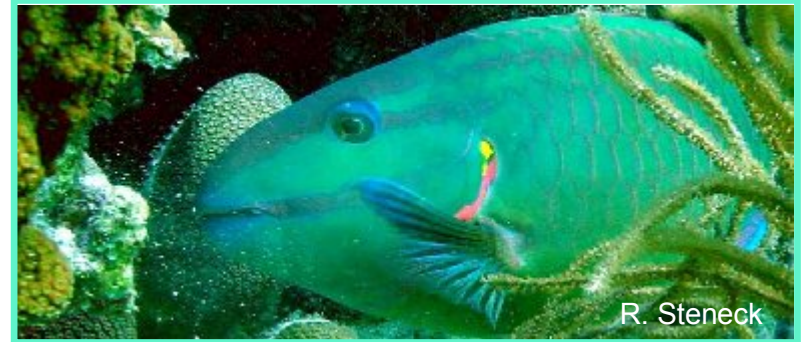




# Trend in Catch

Fisheries Catch Data showed:

- Parrotfish is the most commonly caught group of species
- 40% of reefs in Belize now have more than 40% macroalgae cover; a healthy reef should have less than 20%
- Over-fishing, particularly of herbivores such as parrotfish, is one cause



# New Legislation Passed

- **Nassau grouper**

- Ban on spearfishing
- Protect “Big Mammas” by setting minimum and maximum size limits
- Fish must be landed “whole”

- **Parrotfish**

- Ban spearfishing in marine reserves
- Full protection of parrotfish



# Monitoring Impacts – Adapting Management

- Fisheries Catch
- Counts of Nassau grouper at Spawning Aggregation Site
- LAMP-Counts of Parrotfish
- Coral Cover

