



Effectiveness of Different Levels of Management on 3 Marine Protected Areas in Southern Belize: Recent Trends & Looking to the Future

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APAMO Symposium, 23rd Sept 2011



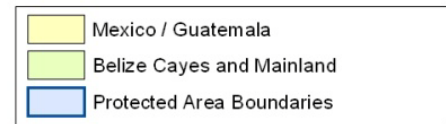
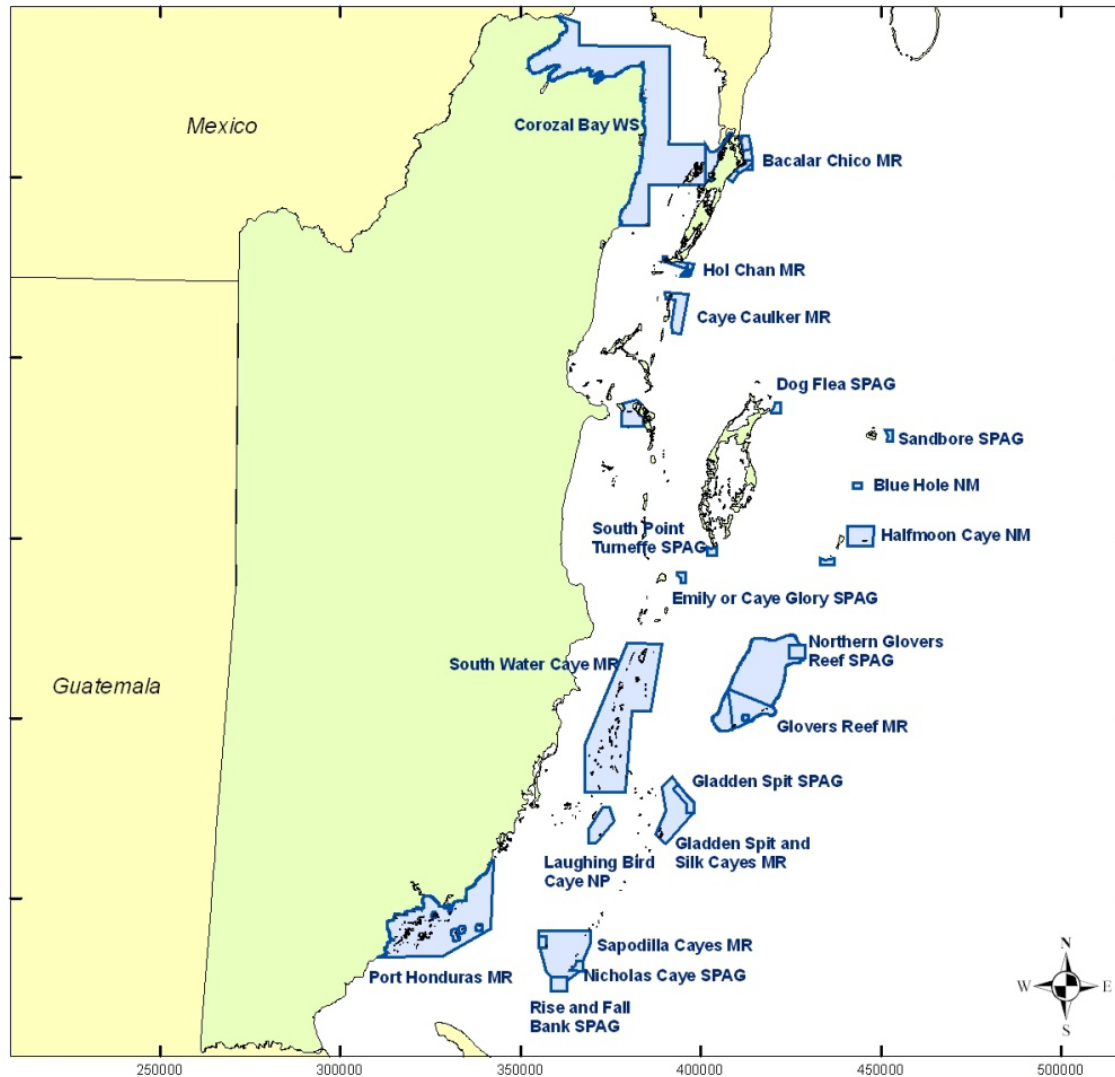
Marine Protected Areas in Belize

- Population of Belize is 300,000; lowest population density in CA
- Barrier Reef is longest in W. hemisphere and 2nd longest in world (280 km long, 1,400 km²); from Mexican border to Sapodilla Cayes (16°N)
- UNESCO World Heritage Site, declared in 1996
- Barrier reef complex: Barrier reef, lagoon patch reef, fringing reefs and offshore atolls
- Associated habitats: Mangroves, seagrass beds, estuaries and cayes
- Belize's reef resources (fisheries / tourism / shoreline protection) approx. US\$395 - \$559 million / year
- Effectively managed Marine Protected Areas (MPAs) can be used to regulate human activities, specifically addressing the threats of tourism, development and over-exploitation of commercial species
- Now 18 MPAs throughout the country, covering approx. 250,000 ha

- Southern Environmental Association (SEA) co-manages 3 Marine Protected Areas (MPAs) within the system-level management unit of the Southern Belize Reef Complex :
 1. Laughing Bird Caye National Park
 2. Gladden Spit and Silk Cayes Marine Reserve
 3. Sapodilla Cayes Marine Reserve



Marine Protected Areas of Belize



Projection: UTM Zone 16N
Datum: NAD 1927 Central
Date: April 7, 2009
GIS: Adam Lloyd



Laughing Bird Caye National Park (LBCNP)

- 18 km SE of Placencia, high pressure on resources from tourism
- Designated a National Park in 1991 and declared part of the Belize Barrier Reef UNESCO World Heritage Site 1996
- LBC sits on top of a unique and rare coral formation known as a “faro”, or continental shelf atoll
- Complete No-take Area (NTA). Only non-extractive activities (snorkelling / diving / kayaking etc.) allowed
- Park regulations well enforced: daily patrols and permanent ranger presence on the island
- Co-managed by SEA and Forest Department

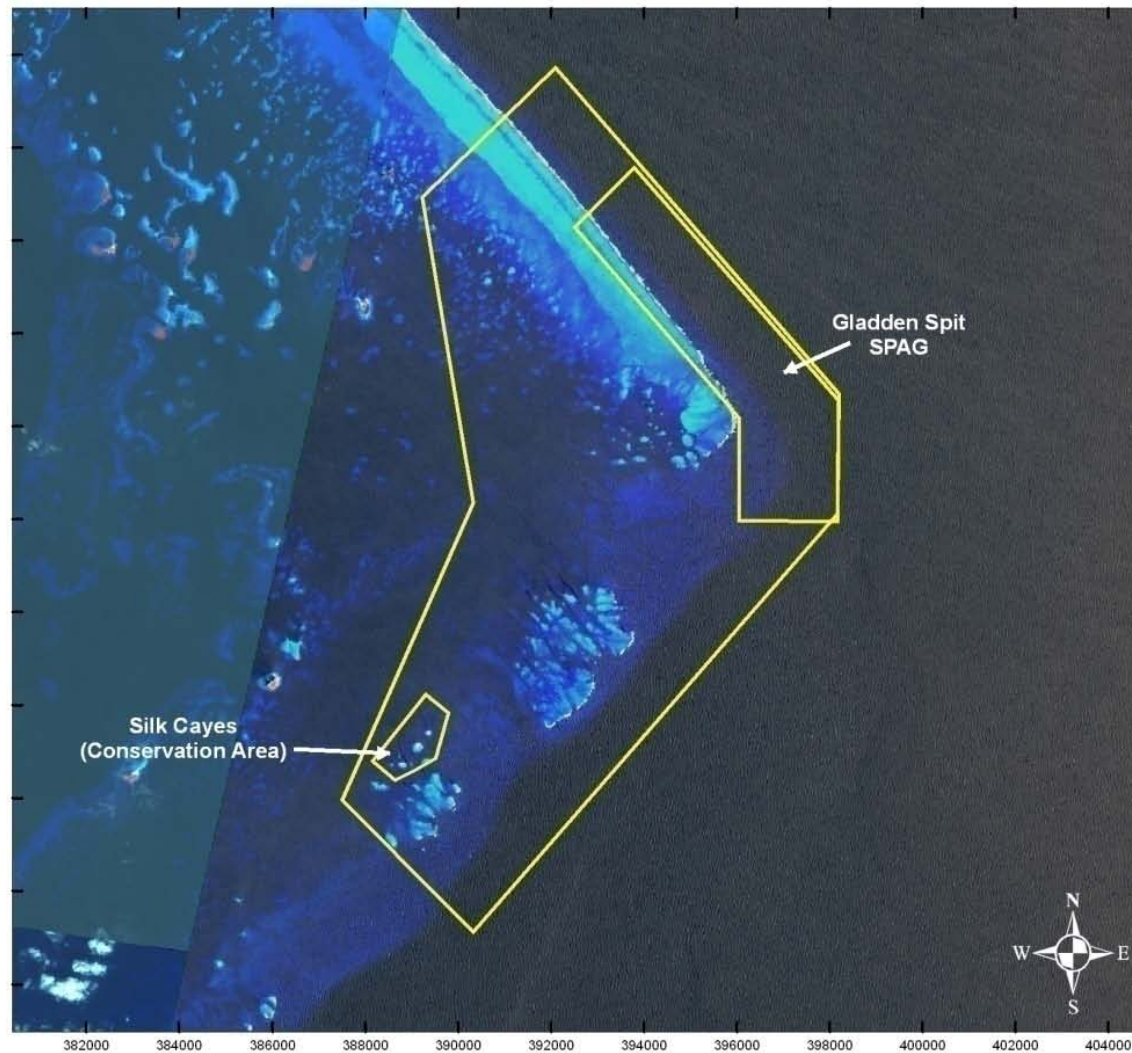


Gladden Spit and Silk Cayes Marine Reserve (GSSCMR)



- 36 km from Placencia
- Reserve established in 2000
- Highest priority spawning aggregation site in Belize: Approx. 30 species of fish, many are commercially important (snappers/groupers/jacks)
- Fish spawning attracts whale sharks – one of the most predictable congregations in the region
- Silk Cayes; popular tourist destination
- Reserve is a 10,500 hectare multi-use zone protected area
- Less than 2% around the Silk Cayes is a “No-Take Area”
- Co-managed by SEA and Fisheries Department

Gladden Spit and Silk Cayes Marine Reserve: Satellite Imagery



Satellite data source:
ASTER scene (2003 - 2004), c/o NASA/JPL via Emil Cherrington.

Marine Protected Areas

Multi Use Reserve
Area: 10,500 ha

NTA around Silk
Cayes (<2% of
total area)



0 2 4 6 8

Kilometers



Projection: UTM Zone 16N
Datum: NAD 1927
Date: May 6, 2010
GIS: Adam Lloyd



Sapodilla Cayes Marine Reserve (SCMR)

- Declared a UNESCO World Heritage Site, 1996
- Healthy coral reefs (up to 34% live coral cover) and unique location (southern extremity of Barrier Reef)
- Nassau Grouper spawning site
- 14 sand and mangrove cayes
- Important turtle nesting sites
- Visitation is very high during Easter and December
- Recent zoning scheme in place: Enforced from 2010
- Co-managed by SEA and Fisheries Department



ZONATION

General Use Zone:

Recreational use, research and fishing

Conservation Zone 1:

Recreational use, scuba, snorkel, catch & release fishing

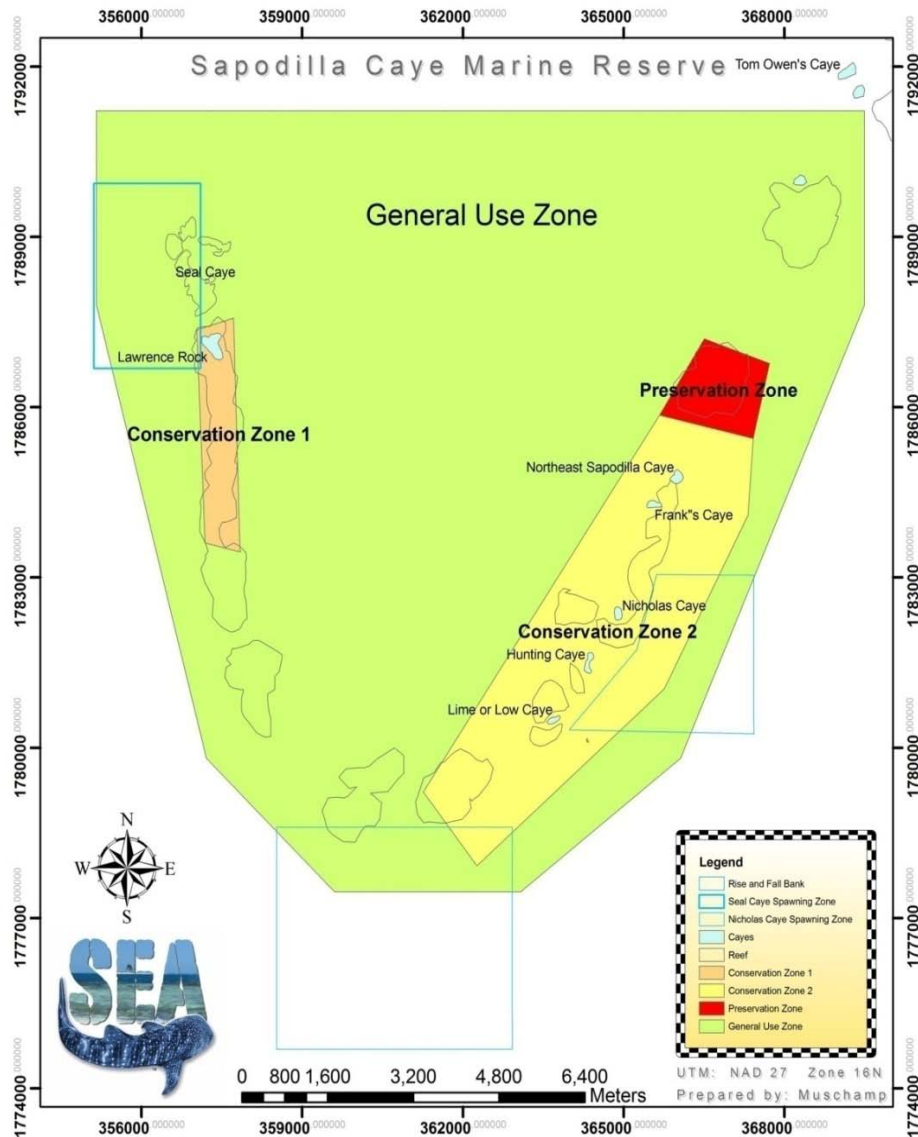
Conservation Zone 2:

Catch & release fishing, fishing with restricted gear

Preservation Zone:

Total protection

Total area: 125 km²



SEA's Monitoring



- Spawning aggregations monitored monthly at Gladden Spit (abundance, size and diversity)
- Commercial species (conch, lobster, finfish) monitored quarterly; abundance, size and diversity
- MBRS reef health (benthic cover and fish diversity, abundance and size). Conducted annually
- Coral bleaching monitored on an *ad hoc* basis (working with National Coral Reef Monitoring Network)
- Seagrass monitoring conducted quarterly
- Turtle monitoring during nesting (June-Oct)



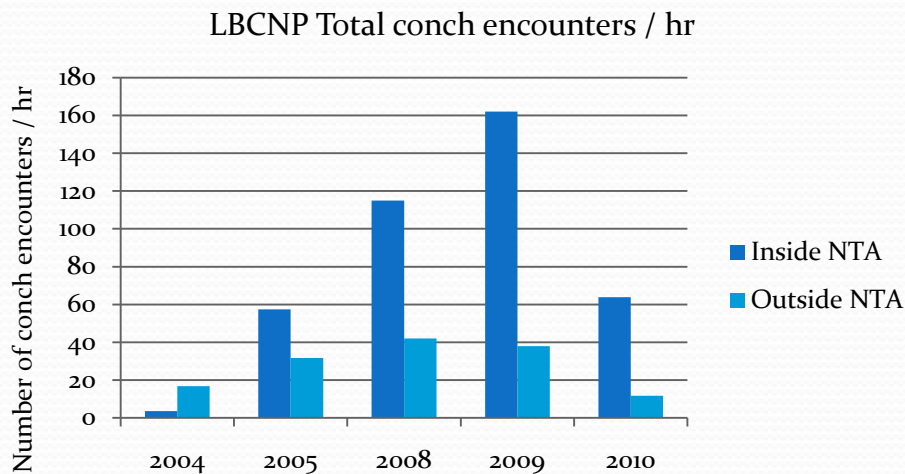
Why Monitor our Resources?

- How can we manage reef resources if we don't know what is there?
Baseline data. Times series
- Report to national working groups, to better assess the status of our resources within the bigger picture
- Guides effective enforcement: Highlights key areas of importance (biodiversity/fish stocks)
- How can we better protect our reefs for the future?
- Now looking to identify resilient areas of coral reef – better able to withstand climate change

Belize's Conch Fishery

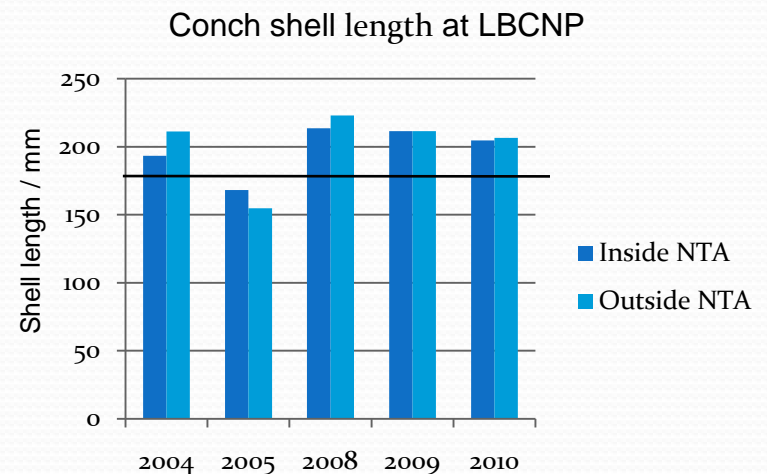


- Queen conch (*Strombus gigas*) inhabit shallow waters (< 30 m depth). Preferred habitat is seagrass / coral rubble / algal plains / sandy substrates
- Targeted fishery throughout Caribbean; once 2nd most valuable fishery in the region, generating US\$30 million (1992)
- Steady decline through extreme overfishing, driven by the demand for meat. Conch now protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) agreement
- Although not yet truly endangered, conch is “commercially threatened” in many parts of Caribbean
- Fisheries Department managing Belize's conch populations through closed season (July – September) and size restrictions



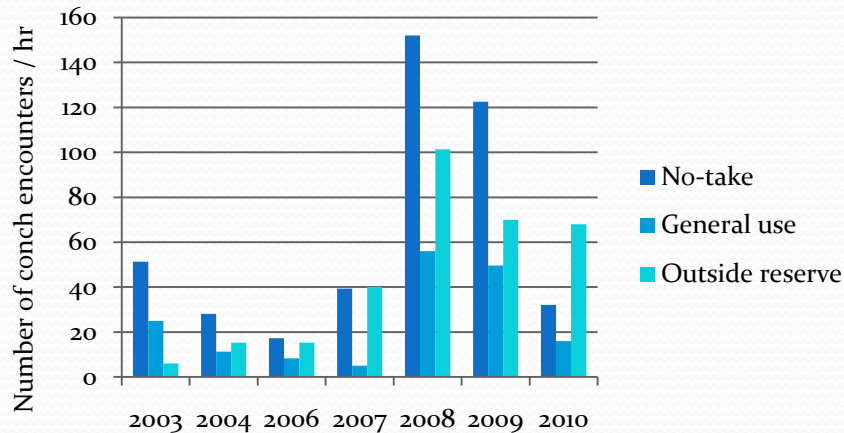
- Number of conch encounters increased 2004-2009, followed by decrease in 2010
- Since 2004, all years showed higher numbers inside the no-take area (ANOSIM; $P < 0.05$)
- 2009: 4 times as many conch inside reserve

- Size of conch has shown little variation over the past 3 years at LBCNP
- Very similar sizes displayed inside and outside the park
- Except for in 2005, the average size of all conch within and outside LBCNP was well over the legal catch size limit



Horizontal line shows 178 mm legal catch size

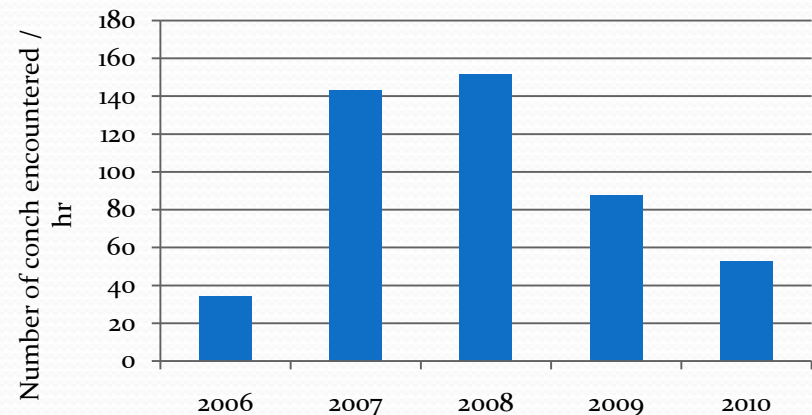
GSSCMR Total conch encounters / hr



- Number of conch encountered in GSSCMR highest in the no-take area in all years except 2007 and 2010
- In all years except 2003, general use zone had lowest number of conch encounters

- SCMR showed an increase then decrease in the number of conch encountered
- 2007 and 2008 showed the highest number encountered
- Decrease by half 2008-2009 and a further decrease by 2010

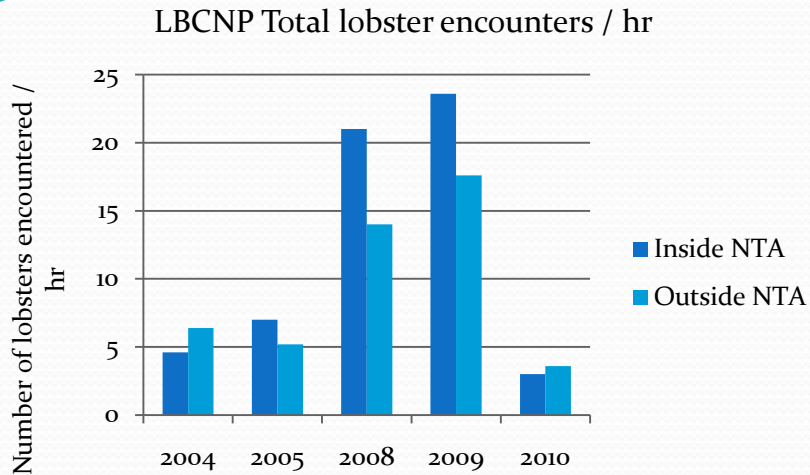
SCMR Total conch encounters / hr



Belize's Lobster Fishery

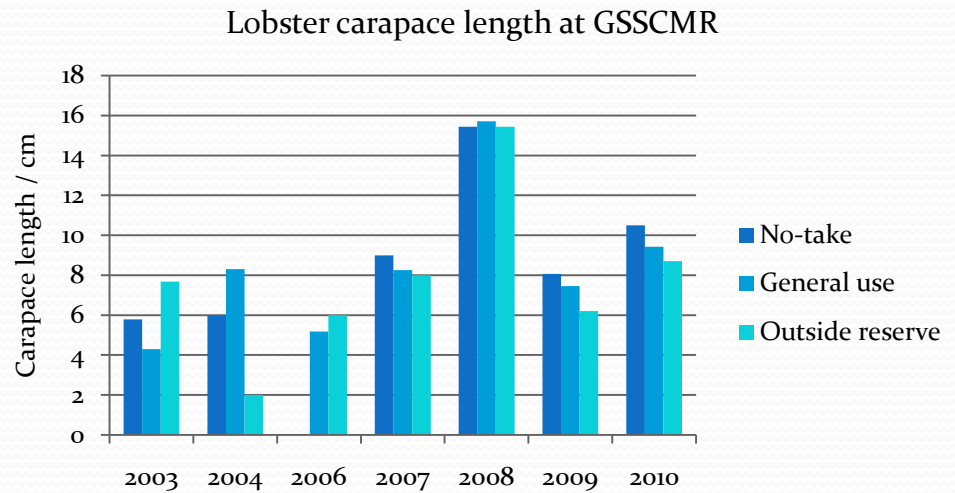


- Caribbean spiny lobster (*Panulirus argus*) distributed throughout shallow waters (occasionally to 90 m) of Caribbean, Gulf of Mexico and western Atlantic
- Fertilised eggs carried on females to the edge of the reef, often several km away
- Larvae are planktonic for 6 to 10 months, allowing wide distribution
- Caribbean spiny lobster is a targeted fishery throughout its range. In Belize generates approximately US\$9 million annually
- Fisheries Department managing Belize's lobster populations through closed season (February - June) and size restrictions



- 2008 and 2009, and to lesser extent in 2005, lobster encounters at LBCNP were more frequent inside the reserve compared to outside
- 2004 and 2010: more encounters outside the reserve
- 2010: lowest number of encounters across the time series

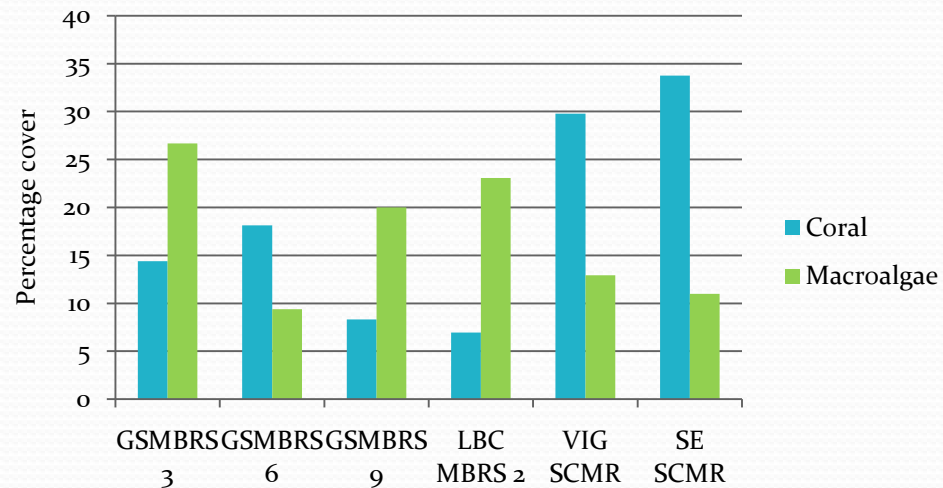
- GSSCMR: 2007, 2009 and 2010 showed the same trend. Largest lobsters found inside the NTA, followed by the general use zone
- Largest lobsters observed in 2008, almost twice the size of the previous and successive year
- 2008: Results almost identical across the 3 zones



Recent Trends: Reef Health

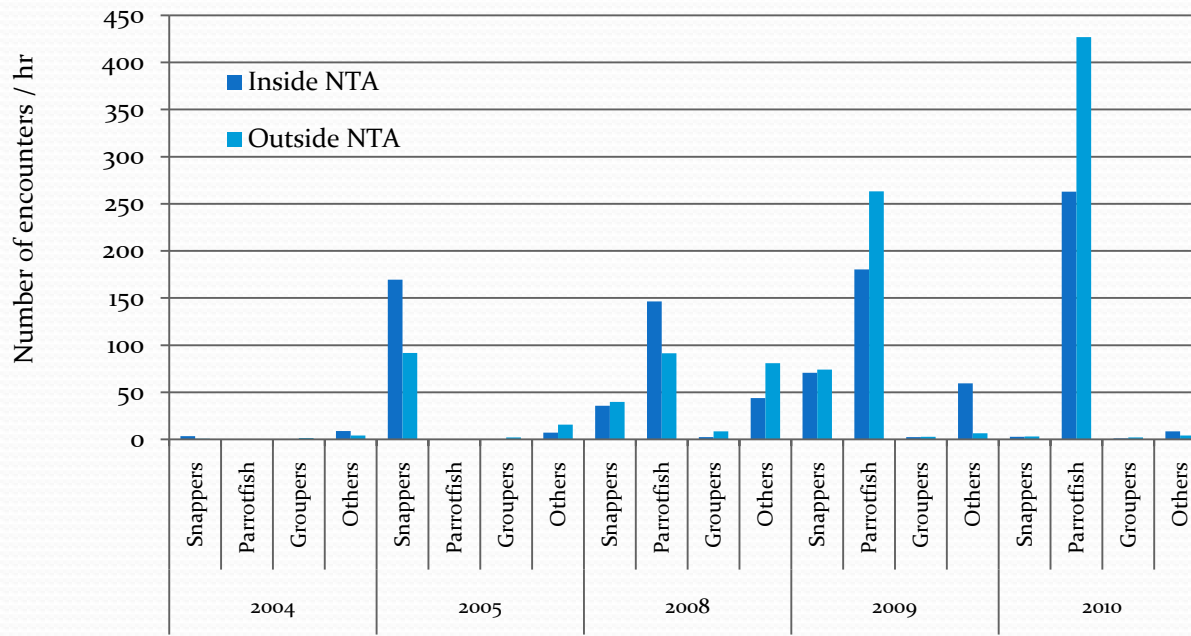
- Measure reef health by relationship between % hard corals and % macroalgae
- GSMBRS 3 and GSMBRS 6 (10 m depth) show opposite trends. One displayed nearly twice as much MA compared to coral, the other showed twice as much coral
- GSSCMR 9 (at 2 m depth): > twice the amount of macroalgae compared to coral
- LBCNP: > 3 times MA compared to coral
- Sapodilla Cayes: highest coral cover (up to 34%). Here, coral cover 3 x MA

Coral and Macroalgal Cover across 3 parks, 2010



Recent Trends: Finfish

- All 3 parks showed same trends
- Very low numbers of snappers and groupers by 2010
- Increase in number of parrotfish in recent years due to fishing ban (since 2009)
- Parrotfish graze algae that can overgrow corals and prevent coral recruitment



Number of commercially important fish at LBCNP

Present Status:

Conclusions / Recommendations

- No-take Area at LBCNP is working, at least in terms of conch population
- Decrease in numbers of conch/lobster/finfish at all sites in 2010. Increased fishing pressure?
- Perceptions of fishermen. Greater stock outside reserve at GSSCMR; preferentially fishermen use 'general use' zone
- No-take Area at GSSCMR too small ($< 2\%$ of total reserve area) to create spill-over effect: Potential to increase area of NTA
- Very low numbers of commercial finfish at all sites: Unlikely to change due to fishing pressure remaining stable/increasing. Potential for managed access scheme?
- Increased number of parrotfish in recent years. Potential for restoring balance in reef ecosystem (algal grazing) and aiding potential reef health

Future Threats

- In addition to continued threat of increased fishing pressure and coastal/caye development, management strategies must consider

CLIMATE CHANGE:

- Increased SST (Sea Surface Temperature)
- Sea Level Rise
- Ocean Acidification
- Increased frequency / intensity of storms



SEA's Future Management Strategies

- Some sites better adapted to climate change than others e.g.
 1. Sites near deep-water upwellings at GSSCMR and SCMR
 2. Greater coral diversity and % cover at SCMR
 3. Lagoon corals at LBCNP better adapted to higher temperatures
 4. Shaded west facing reef-slopes
- Work with national and international partners on climate change strategies
- Increase stakeholder awareness of climate change and increasing reef resilience through reducing stressors
- Strengthen coastal protection through participation in and support of coastal zone development planning for southern Belize
- Lobby for national strategies to address increased unemployment in the fishery and tourism industries due to climate change impacts and look at alternative livelihoods

Thank You!

Southern Environmental Association (SEA) would like to thank the Oak Foundation and TNC for funding SEA's scientific monitoring and enforcement activities over the years and The Summit Foundation for funding enforcement activities. SEA acknowledges all personnel that have contributed to SEA's research and enforcement activities over the years.

