Geomorphometric Analysis of Nassau Grouper Spa\n\n\n\nhttp://www.landbigfish.com/fish/fish.cfm?ID=58


Shin Kobara and William D. Heyman
Texas A&M University
Spawning aggregations (SPAGs)

- Nassau grouper
  - The most well-studied reef fish species
  - declining
  - critically endangered species.

- The primary reason for decline
  - Over-fishing of its highly synchronized and site specific spawning aggregations.
  - They come back same place every year for spawning.
<table>
<thead>
<tr>
<th></th>
<th>Resident</th>
<th>Transient</th>
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<tbody>
<tr>
<td>Frequency</td>
<td>occur regularly; often daily</td>
<td>occur infrequently; at specific times of the year</td>
</tr>
<tr>
<td>Portion of reproductive effort</td>
<td>single aggregation constitutes minor portion of annual reproductive effort</td>
<td>single aggregation constitutes major portion of annual reproductive effort</td>
</tr>
<tr>
<td>Migration distance</td>
<td>migrate relatively short distance</td>
<td>migrate relatively large distance</td>
</tr>
<tr>
<td>Duration of aggregation</td>
<td>aggregation is ephemeral, lasting only a few hours or less</td>
<td>aggregation persists for several days</td>
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<tr>
<td>General size of aggregating species</td>
<td>species are relatively small to medium sized representatives of their respective families</td>
<td>species are relatively large sized representatives of their respective families</td>
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<tr>
<td>Type of food habits</td>
<td>species feed low on the food chain</td>
<td>species feed high on the food chain</td>
</tr>
<tr>
<td>Modes of spawning</td>
<td>only group spawning has been observed</td>
<td>group and pair spawning have been observed</td>
</tr>
</tbody>
</table>

Domeier and Colin 1997
Spawning Type

- Pair-Spawning (Red hind)
- Group Spawning (Cubera, Dog, Mutton Snappers)
  - Mass spawning is a form of group spawning
    - consists of the great majority to all of the individuals within an aggregation spawning simultaneously, as a single unit (Domeier and Colin, 1997).

Nassau grouper is a transient reef fish and a group spawning species
Study areas

- Cayman Islands
- Belize
- Mexico
- Florida
- Cuba
- The Bahamas
Transient Reef Fish (including Nassau Grouper) Spawning Aggregation Sites in Belize.
Nassau grouper Spawning Aggregation Sites in Belize.
Nassau grouper Spawning Aggregation Sites in Belize.

WHY those places?

LANDSAT-based outer reef (Shelf edge lines)

Source: Univ. of South Florida
The Millennium Coral Reef Map Project.
Geomorphology
Need to understand geospatial characteristics

Only a limited understanding of the general location of SPAG sites

→ limits their inclusion in marine protected areas
Shape analysis

- Possible spawning aggregation sites.
Belize (2)
Distances toward SPAG sites

Meters

Dog Flea Caye  Cay Bokel (Elbow)  Sandbore Caye  Halfmoon Caye  North Golvers Caye  Middle Caye  Ambergris Caye  Emily Rockfish  Gladden spit  Rise and Fall bank

From Inflection P.  From shelf edge
Methodology

Airmar M260 Transducer
200 kHz: 6 ° cone angle
50 kHz: 12 ° cone angle
The Cayman Islands

All groupers SPAG sites are currently protected.
Horizontal curves of shelf-edges (Meter)
Distances from SPAG sites

- GC_Sw points
- GC_East End
- LC_West End
- LC_West End
- LC_East End
- CB_East End

Meters

From Inflection P.  From shelf edge
Vertical profiles at SPAG sites

SPAG

Depth (m)

Cayman Brac East
Little Cayman East
LC West
Grand Cayman East
GC West

(m)
Grand Cayman SPAG Sites
Summary

- All spawning aggregation sites in Belize & the Cayman Islands were located
  - within 120 m from the satellite-based shelf edges
  - and 550 m of turning points in the shelf break.

- With one exception (Rise and Fall Bank, Belize), all 14 Nassau grouper SPAG sites were located near inflection points of convex-shaped seaward extending reefs.
Summary

- All Nassau grouper SPAG sites in the Cayman Islands were located on the steep drop offs.

Geomorphometric conditions of SPAG sites in Cayman
- Bottom depth at SPAG sites is 25–45m (80–150 ft)
- Convex-shape (reef promontory)
- Steep drop-off
- Proximity to deep water
Next step

- Is there any place that has similar Geomorphometric feature in the Cayman Islands?
  - **YES.** → the west end of the Cayman Brac
    - Spawning aggregation is not confirmed yet.
    - But the department of the environment has already designed the designated area for no fishing for Nassau groupers in 2003 and during every alternate year after and only line fishing is permitted in open season by Caymanians.
Acknowledgment

- Department of Environment, the Cayman Islands
- Department of Fisheries, Belize
Thank you
Questions?