Reef Fish Visual Census Sampling Methodology

Natalia Zürcher
University of Miami

Photo: J. Luo
Objectives

- Field Methods
- RVC Behind the Sciences
- NEW Data Entry Program
- Q&A with divers

Photo: J. Luo
Multi-Agency Effort

- SEFCRI 2013: 354 PSUs
- FKEYS 2012: 429 PSUs
- DRTO 2012: 421 PSUs
**SEFCRI 2013**

<table>
<thead>
<tr>
<th>Agency</th>
<th>PSUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSUOC</td>
<td>198</td>
</tr>
<tr>
<td>NOAA-SEFSC</td>
<td>113</td>
</tr>
<tr>
<td>FDEP-CRCP</td>
<td>16</td>
</tr>
<tr>
<td>FWC-FWRI Tequesta</td>
<td>14</td>
</tr>
<tr>
<td>Miami-Dade Co. DERM</td>
<td>7</td>
</tr>
<tr>
<td>Broward Co. DERD</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total PSUs</strong></td>
<td><strong>354</strong></td>
</tr>
</tbody>
</table>
FKEYS 2012

- NOAA-SEFSC
- UM-RSMAS
- FWC-FWRI Marathon
- NPS-SFCN
- NPS-BNP

Total PSUs  429
DRTO 2012

- NOAA-SEFSC
- NOAA-PIFSC
- NOAA-BIOGEO
- UM-RSMAS
- FWC-FWRI Marathon
- NPS-SFCN
- NPS-BNP
- NPS-DRTO
- NSUOC
- REEF
- USF
- FIU

Total PSUs  421
Primary Stage Unit (PSU) and Secondary Stage Unit (SSU)
Field Methods: on the boat

- Field/Boat log – Supervisor’s Dive log
- WQ/Environmental log
- Scuba Gear
- APT, slate with underwater data sheet, pencils, camera, dive flag with GPS, dive computer, dive watch
### Field/Boat log

**DATE:** April 29, 2014

**DIVE MASTER:** Javech

**SUPERVISOR’S DIVE LOG-MV Aldo**

<table>
<thead>
<tr>
<th>Date</th>
<th>DOD</th>
<th>Site</th>
<th>Station</th>
<th>Team</th>
<th>Diver</th>
<th>O₂%</th>
<th>PSI IN</th>
<th>Planned Dive</th>
<th>Actual Dive</th>
</tr>
</thead>
<tbody>
<tr>
<td>04/29</td>
<td>1</td>
<td>1717</td>
<td>1</td>
<td>A</td>
<td>Zurcher</td>
<td></td>
<td>4</td>
<td></td>
<td>WP 1</td>
</tr>
<tr>
<td>04/29</td>
<td>1</td>
<td>1717</td>
<td>1</td>
<td>B</td>
<td>Blondeau</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>04/29</td>
<td>1</td>
<td>1717</td>
<td>2</td>
<td>A</td>
<td>Javech</td>
<td></td>
<td>5</td>
<td></td>
<td>WP 2</td>
</tr>
<tr>
<td>04/29</td>
<td>1</td>
<td>1717</td>
<td>2</td>
<td>B</td>
<td>Teare</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Field ID Numbers:
- **17171A – 17171B**
- **17172A – 17172B**
PSUs (site) and SSUs (station)
Navigate to PSU (site) coordinates (GPS waypoints)
✓ Look for Reef
→ Exceptions:
  Contiguous reef habitat structure: spur & groove or ledge
  Isolated reef structure: Pinnacle
MPA

Alternate sites
Field Methods
Diver Equipment

- SCUBA
- Underwater Camera
- Dive computer & Watch
- APT: All-Purpose Tool
- Surface buoy/flag & GPS
- GPS: on!
- Sync watch!
- Underwater Slate
- Data sheet
- Pencil

NOT Optional!!
At SSU (Station):

- Secure reel to bottom (not alive)
- Starting point to measure radius of cylinder (7.5m)
- Visual aid to measure visibility
- Point of reference (e.g. edge of cylinder)
- Point of return following data collection
PSUs (site) and SSUs (station)
Data Collection: Sample data

Diver: Zurcher Blondeau
Buddy: Blondeau
Dive Start Time: 1001
Dive End Time: 1027
Date: 4/29/14
Sample Start Time: 1004
Field Number: 17171A
Data Manager: NOAA-Blondeau

Submerged Debris: Live Trap, Trap Debris, Fishing, Other

<table>
<thead>
<tr>
<th>Substrate Slope</th>
<th>Max depth</th>
<th>ft</th>
<th>Min depth</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max vertical Relief</td>
<td>Hard Relief</td>
<td>m</td>
<td>Soft Relief</td>
<td>m</td>
</tr>
<tr>
<td>Surface Relief Coverage %</td>
<td>&lt; 0.2 m</td>
<td>%</td>
<td>%</td>
<td>0.2-0.5 m</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Biotic Cover - Dominant Biological Cover %</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAND</td>
</tr>
<tr>
<td>&quot;Bare&quot;</td>
</tr>
<tr>
<td>Macro Algae</td>
</tr>
<tr>
<td>Sea grass</td>
</tr>
<tr>
<td>Sponge</td>
</tr>
<tr>
<td>Other 1</td>
</tr>
<tr>
<td>Other 1</td>
</tr>
<tr>
<td>Other 1</td>
</tr>
</tbody>
</table>

Underwater visibility: ____ ft
Water temperature: _______° F
Current: None, Mod., High

All information should be filled out by diver
## Data Collection: Fish data

<table>
<thead>
<tr>
<th>Species</th>
<th>N</th>
<th>Avg</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>OC SUR</td>
<td>10</td>
<td>11</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>YT SN</td>
<td>9</td>
<td>15</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>4 BUT</td>
<td>2</td>
<td>22</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>RB PAR</td>
<td>2</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>MUT SN</td>
<td>1</td>
<td>4</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>HOG</td>
<td>4</td>
<td>15</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>BI DA</td>
<td>25</td>
<td>4</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>STR PAR</td>
<td>12</td>
<td>6</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>RT PAR</td>
<td>3</td>
<td>25</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>WH GR</td>
<td>2</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GR SPP</td>
<td>15</td>
<td>7</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>FRE GR</td>
<td>10</td>
<td>14</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>NEW SPP1</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEW SPP2</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

~10 min

5 min
Things to remember while collecting fish data:

- Record **only new species** (abundance and minimum, average, and maximum lengths) after the initial five-minute observation period and until completing data collection.

- After five minutes have elapsed, collect data on the abundance (“N” column) and mean, minimum and maximum fork lengths (“Avg”, “Min” and “Max” columns) for each species.

  - Individual fork lengths: all groupers (including graysbys, coneys and hinds), snappers, and hogfish (*Lachnolaimus maximus*)

    → If ≤10 then record individuals **fork lengths** for all ≤10 individuals

    → If >10 then record abundance and average, minimum and maximum **fork lengths**
Bottom to Surface

15 m
Know Your Fish!

- **Black Seabass, *Centropristis striata***
- **Yellowmouth grouper, *Mycteroperca interstitialis***
- **Yellowmouth grouper juv., *Mycteroperca interstitialis***
- **Yellowfin grouper, *Mycteroperca venenosa***

Photos: N. Zürcher unless otherwise noted
Dog Snapper, *Lutjanus jocu*

Cubera Snapper, *Lutjanus cyanopterus*

Mutton Snapper, *Lutjanus analis*

Margate (white), *Haemulon album*
Sailors choice, *Haemulon parra*

Caesar grunt, *Haemulon carbonarium*

Lane snapper, *Lutjanus synagris*

Smallmouth grunt, *Haemulon chrysargyreum*
Spanish Grunt, *Haemulon macrostomum*

Striped Grunt, *Haemulon striatum*

Grunts (juveniles), *Haemulidae*

Bluestriped Grunt, *Haemulon sciurus*

Redband Parrotfish, *Sparisoma aurofrenatum*
White Grunt, *Haemulon plumierii*

Yellowtail Snapper, *Ocyurus chrysurus*

Yellow Goatfish, *Mulloidichthys martinicus*
Greenblotch Parrotfish (juvenile), *Sparisoma atomarium*

Clown Wrasse, *Halichoeres maculipinna*

Blue Parrotfish (juvenile), *Scarus coeruleus*

Yellowcheek Wrasse, *Halichoeres cyanocephalus*
Bluehead Wrasse, *Thalassoma bifasciatum*

Sunshinefish, *Chromis insolata*

Yellowmouth Grouper (juvenile), *Mycteroperca interstitialis*

Spanish Hogfish, *Bodianus rufus*

Yellowhead Wrasse, *Halichoeres garnoti*

Striped Grunt, *Haemulon striatum*
Threespot Damselfish, *Stegastes planifrons*

Tan Hamlet, *Hypoplectrus sp.*
Beaugregory (juvenile), *Stegastes leucostictus*

Lantern Bass, *Serranus baldwini*

Blue Angelfish (juvenile), *Holacanthus bermudensis*

Harlequin Bass, *Serranus trigrinus*
Coney, *Cephalopholis fulva*

Red Grouper, *Epinephelus morio*
163 Striped parrotfish, *Scarus iseri*
## Know The Size of your Fish!

<table>
<thead>
<tr>
<th>Species</th>
<th>Latin</th>
<th>Common</th>
<th>N</th>
<th>Avg</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 LAC MAXI</td>
<td>Lachnolaimus maximus</td>
<td>Hogfish</td>
<td>1</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 LUT ANAL</td>
<td>Lutjanus analis</td>
<td>Mutton snapper</td>
<td>1</td>
<td>39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 MYC BONA</td>
<td>Mycteroperca bonaci</td>
<td>Black grouper</td>
<td>1</td>
<td>39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 LUT GRIS</td>
<td>Lutjanus griseus</td>
<td>Gray snapper</td>
<td>1</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 EPI MORI</td>
<td>Epinephelus morio</td>
<td>Red grouper</td>
<td>1</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 SPH BARR</td>
<td>Sphyraena barracuda</td>
<td>Great barracuda</td>
<td>1</td>
<td>57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 OCY CHRY</td>
<td>Ocyurus chrysurus</td>
<td>Yellowtail Snapper</td>
<td>1</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 LUT APOD</td>
<td>Lutjanus apodus</td>
<td>Schoolmaster</td>
<td>1</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 HAE AURO</td>
<td>Haemulon auroleineatum</td>
<td>Tomtate</td>
<td>1</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 HOL ADSC</td>
<td>Holocentrus adscensionis</td>
<td>Squirrelfish</td>
<td>1</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 CAL CALA</td>
<td>Calamus calamus</td>
<td>Saucereye porgy</td>
<td>1</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 BAL CAPR</td>
<td>Balistes capriscus</td>
<td>Gray triggerfish</td>
<td>1</td>
<td>21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Substrate Slope: Station depth, Max depth, Min depth, & Max dive depth

- Max Depth
- Min Depth
- Station Depth

Substrate Slope:
- If Slope: Max Depth > Station Depth > Min Depth
- If NO Slope: Max Depth = Station Depth = Min Depth

Max Dive Depth: Max depth on your dive gauge

Dive End Time:

<table>
<thead>
<tr>
<th>Substrate Slope</th>
<th>Max Dive Depth: 45 ft</th>
<th>Station Depth: 42 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max depth</td>
<td>45 ft</td>
<td></td>
</tr>
<tr>
<td>Min depth</td>
<td>40 ft</td>
<td></td>
</tr>
</tbody>
</table>
Max Vertical Relief & Surface Relief Coverage %: Hard & Soft

<table>
<thead>
<tr>
<th>Substrate Slope</th>
<th>ft</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max depth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min depth</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Max vertical Relief

<table>
<thead>
<tr>
<th>Hard Relief</th>
<th>1.2 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft Relief</td>
<td>1.1 m</td>
</tr>
</tbody>
</table>

Surface Relief Coverage %

<table>
<thead>
<tr>
<th></th>
<th>Hard</th>
<th>Avg. of Soft</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.2 m</td>
<td>40</td>
<td>40%</td>
</tr>
<tr>
<td>0.2-0.5 m</td>
<td>20</td>
<td>40%</td>
</tr>
<tr>
<td>0.5-1.0 m</td>
<td>25</td>
<td>15%</td>
</tr>
<tr>
<td>1.0-1.5 m</td>
<td>15</td>
<td>5%</td>
</tr>
<tr>
<td>&gt; 1.5 m</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Hard:
- Coral Structure
- Rocks
- Rubble
- Sand!

Soft:
- Octocorals
- Algae
- Sponges

Photo: N. Zürcher
### Abiotic Footprint & Biotic Cover

- **Diver:** Zurcher
- **Buddy:** Blondeau
- **Date:** 4/29/14
- **Field Number:** 17171A
- **Data Manager:** NOAA-Blondeau

#### Substrate Slope
- **Max depth:** 45 ft
- **Min depth:** 40 ft
- **Max vertical Relief:** 1.2 m

#### Hard Relief
- **Surface Relief Coverage %**
  - < 0.2 m: 40% Hard, 40% Soft
  - 0.2-0.5 m: 30% Hard, 40% Soft
  - 0.5-1.0 m: 20% Hard, 15% Soft
  - > 1.5 m: 10% Hard, 5% Soft

#### Soft Relief
- **Surface Relief Coverage %**
  - < 0.2 m: 40% Hard, 40% Soft
  - 0.2-0.5 m: 30% Hard, 40% Soft
  - 0.5-1.0 m: 20% Hard, 15% Soft
  - > 1.5 m: 10% Hard, 5% Soft

#### Abiotic Footprint

<table>
<thead>
<tr>
<th>Substratum</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAND</td>
<td>20</td>
</tr>
<tr>
<td>HARD-B</td>
<td>80</td>
</tr>
<tr>
<td>RUBBLE</td>
<td></td>
</tr>
</tbody>
</table>

#### Biotic Cover - Dominant Biological Cover %

<table>
<thead>
<tr>
<th>Species</th>
<th>N</th>
<th>Avg</th>
<th>Min</th>
<th>Max</th>
<th>Species</th>
<th>N</th>
<th>Avg</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Bare&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Algae (&lt;1cm)</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macro Algae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Algae (&gt;1cm)</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea grass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Live Stony Coral</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sponge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Octocoral</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Other 1</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Other 1 Paly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Other 1</td>
<td>10</td>
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<td></td>
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<td>OTHER 1</td>
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<td></td>
<td>OTHER 1</td>
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<tr>
<td>TOTAL</td>
<td></td>
<td>100</td>
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</tbody>
</table>

- **Habitat type:**
  - Contiguous S&G
  - Rubble
  - Contiguous Other
  - (Matrix)
  - Isolated
  - (Sand)

- **Underwater visibility:** _____ ft
- **Water temperature:** _______ F
- **Current:** None Mod. High

---

All information should be filled out by diver
Abiotic Footprint AND Dominant Biological % cover are assessed from an AERIAL viewpoint
If only a dusting of sand covers hard-bottom, that area should be considered as hard-bottom.

Gorgonians are *only* found growing on hard-bottom.

Seagrass is *only* found growing on sand.
### Biotic cover on sand

**“Bare” includes sand covered by turf algae (<1 cm)**

<table>
<thead>
<tr>
<th>Biotic Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAND</td>
</tr>
<tr>
<td>&quot;Bare&quot;</td>
</tr>
<tr>
<td>Macro Algae</td>
</tr>
<tr>
<td>Sea grass</td>
</tr>
<tr>
<td>Sponge</td>
</tr>
<tr>
<td>Other 1</td>
</tr>
<tr>
<td>Other 1</td>
</tr>
<tr>
<td>TOTAL</td>
</tr>
</tbody>
</table>

![Image of underwater scene with scuba diver and fish]
Examples of common macroalgae found growing on sand

<table>
<thead>
<tr>
<th>Biotic Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAND</td>
</tr>
<tr>
<td>&quot;Bare&quot;</td>
</tr>
<tr>
<td><strong>Macro Algae</strong></td>
</tr>
<tr>
<td>Sea grass</td>
</tr>
<tr>
<td>Sponge</td>
</tr>
<tr>
<td>Other 1</td>
</tr>
<tr>
<td>Other 1</td>
</tr>
<tr>
<td>TOTAL</td>
</tr>
</tbody>
</table>

- *Halimeda incrassata*
- *Caulerpa sertularioides*
- *Penicillus pyriformis*

Photos from Humann and DeLoach 2002
Seagrass beds are found growing on sand, often in dense clusters. Blades of grass can be very thin and circular (*Syringodium*) or flat and wide (*Thalassia* or *Halophila*).
Most sponges grow on hardbottom but a few, like the example below, are found in seagrass beds.
Crustose algae is now included in the category "Algae (<1cm)"

<table>
<thead>
<tr>
<th>HARDBOTTOM</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algae (&lt;1cm)</td>
<td></td>
</tr>
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Examples of common crustose algae found on hardbottom
Crustose algae

Circled areas = crustose algae
Examples of common macroalgae (>1cm) found on hardbottom.

- **Green calcareous**
  - Halimeda opuntia

- **Red calcareous**
  - Amphiroa rigid

- **Green fleshy**
  - Humann & DeLorach

**HARDBOTTOM**

<table>
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<th>Category</th>
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Examples of common macroalgae (>1cm) found on hardbottom

- Padina jamaicensis
- Dictyota sp.
- Sargassum sp.
- Turbinaria sp.

Brown fleshy
**NOTE:** Hard Live Coral and Octocoral are found only on "Hardbottom"
Massive Morphotypes

Examples of common stony corals found on hardbottom:

- Montastraea faveolata
- Diploria strigosa
- Dendrogyra cylindrus

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Examples of common stony corals found on hardbottom

Platy, leafy morphotypes

Montastrea faveolata

Agaricia agaricites

Diana Schmitt
Examples of common stony corals found on hardbottom

*Porites furcata*

*Madracis mirabilis*

Finger morphotypes
Branching morphotypes

Close-up of a small encrusting *A. palmata*
Note the white growing edge and distinct corallites
Black Coral
(Order: Antipatharia)

Black corals go under “live stony coral” even though they may look like gorgonians.
Gorgonian branches have polyps while black coral branches typically have tentacles, which gives them a “pine needle” appearance.
Examples of common octocorals found on hardbottom

Sea fans

Sea rods

Sea plumes

Encrusting

Pseudopterogorgia spp.

Erythropodium caribaeorum
Encrusting octocorals

For encrusting octocorals, look for polyps, tentacles, and soft edges. These two species are the most common encrusting gorgonians.

Photos from: Humann & DeLoach 2002
Sponges

HARDBOTTOM

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100%

Humann & DeLoach
Cliona langae
(encrusting sponge)

Sponges vs. Hard corals

1.2m
Sponges vs. Hard corals

**Cliona langae**

**Cliona delitrix**

*Encrusting sponges:*
- *Cliona delitrix*: look for osculum
- *Cliona langae*: Is smooth and since it is a sponge there will be no polyps or tentacles
Sponges vs. Octocorals

To differentiate between sponges and octocorals, look for pores on sponges and polyps on octocorals.
## HARDBOTTOM

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**Anemones**

**Stichodactyla helianthus**

**Zooanthids**

**Palythoa caribaeorum**

**Tunicates**

**Trididemum solidum**
Hard corals vs. Zooanthids

WHITE ENCRUSTING ZOANTHID
Palythoa caribaeorum

ORDER: Zoanthids
Zoanthidea

SIZE: Disc 1/4 - 1/2 in.
DEPTH: 10 - 40 ft.

White Encrusting Zoanthid
Polyps closed.

From: Reef Creature Identification, by Humann & DeLoach (2002)
The polyps of the hard coral *Montastraea cavernosa* (above) and the zooanthid *Palythoa caribaeorum* (two photos left) look very similar.
**Montastraea cavernosa**

*M. cavernosa*: usually darker in color (unless bleaching). When polyp is open, the mouth is a light color. When touched, is hard and slimy.

**Palythoa caribaeorum**

*Palythoa*: pale in color. When polyp is open, mouth is hollow and deep. When touched, is squishy and rubbery.
Palythoa can cover large areas on Florida reefs, so be aware of what it looks like!!
It is NOT live coral, it should go under “Other”
Location: Off of Loggerhead Key, Dry Tortugas

Live coral

Palythoa
Look for irregularities of palythoa tissue

Live coral
(Montastraea cavernosa)

Palythoa
Temperature and visibility are measured at the bottom.

Water current is estimated by divers for each paired survey; categories as follows: None (none), Mod. (diver is able to stay in same position with a gentle kick), High (diver struggles to stay in same position).
Habitat Types

**Target habitats:**
1. Isolated reef structure(s)
   e.g., patch reefs, rocky outcrops, pinnacle

2. Contiguous reef structure – Spur & Groove formation
   e.g., low or high relief S&G

3. Contiguous reef structure – Other
   e.g., contiguous hard-bottom, reef terrace, ledge

4. Rubble

**Non-target habitats:**
5. Sand

Target Habitat Types

Isolated Reef Structure

Contiguous Reef - Spur & Groove

Contiguous Reef - Other

Reef Rubble

One diver per team takes 4 habitat photos
- Talk to your buddy
- Talk to your buddy
- Talk to your buddy
- Talk to your team
- Talk to your team
- Talk to your team

**Complete Data Sheet**

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*Data Sheet with various entries and observations.*
Questions?
CARANGIDAE

*S. rivoliana*
Almaco Jack

*E. bipinnulata*
Rainbow Runner

*S. dumerili*
Greater Amberjack

*D. punctatus*
Round Scad

*D. macarellus*
Mackerel Scad

*S. crumenophthalmus*
Bigeye Scad
**Diplodus argenteus**
Silver Porgy

**Diplodus holbrooki**
Spottail Pinfish
SCOMBRIDAE

- **S. cavalla**
  - King Mackerel

- **S. regalis**
  - Cero

- **S. maculatus**
  - Spanish Mackerel

- **E. alletteratus**
  - Little Tunny

- **A. solandri**
  - Wahoo
Scomberomorus regalis
Cero
ATHERINIDAE

*Menidia menidia*  
Atlantic Silverside

*Menidia beryllina*  
Inland Silverside

*Hypoatherina heringtonensis*  
Reef Silverside
CLUPEIDAE

Herrings, Shads, and Sardines
ENGRAULIDAE

Anchovies

www.chesapeakebay.net

news.stanford.edu
**Chromis multilineata**
Brown Chromis

**Chromis cyanea**
Blue Chromis

C. scotti
Chromis scotti
Purple Reeffish

Chromis enchrysura
Yellowtail Reeffish

Chromis insolata
Sunshinefish
*Cephalopholis cruentata*
Graysby

*Epinephelus adscensionis*
Rock Hind

*Epinephelus guttatus*
Red Hind
**Mycteroperca bonaci**  
Black Grouper

**Mycteroperca microlepis**  
Gag
Parasphyraenops incisus
Bantam Bass
**Sparisoma sp.**
Unidentified juvenile parrotfish

**Sparisoma atomarium**
Greenblotch Parrotfish

**Sparisoma radians**
Bucktooth Parrotfish
Cryptotomus roseus
Bluelip Parrotfish
Halichoeres garnoti
Yellowhead Wrasse

Thalassoma bifasciatum
Bluehead Wrasse

Halichoeres cyanocephalus
Yellowcheek Wrasse

www.fishdb.co.uk
**Halichoeres bivitattus**  
Slippery Dick

**Halichoeres maculipinna**  
Clown Wrasse
Halichoeres poeyi
Blackear Wrasse

Halichoeres caudalis
Painted Wrasse
Dactyloscopus volitans
Flying Gurnard
TRIGLIDAE

*Prionotus roseus*
Bluespotted Searobin

*Prionotus scitulus*
Leopard Searobin

*Prionotus ophyras*
Bandtail Searobin
Chilomycterus schoepfi
Striped Burrfish

Diodon holocanthus
Balloonfish

Diodon hystrix
Porcupinefish

Chilomycterus schoepfi
Striped Burrfish

Chilomycterus reticulatus
Spotfin Burrfish
**Rhinesomus triqueter**
Smooth Trunkfish

**Lactophrys bicaudalis**
Spotted Trunkfish

**Lactophrys trigonus**
Trunkfish
Balistes vetula
Queen Triggerfish

Balistes capriscus
Grey Triggerfish
**Canthidermis sufflamen**  
Ocean Triggerfish

**Balistes capriscus**  
Gray Triggerfish
**Aluterus monoceros**
Orange Filefish

**Aluterus scriptus**
Scrawled Filefish
*Equetus lanceolatus*
Jackknife Fish

*Equetus punctatus*
Spotted Drum

*Pareques acuminatus*
Highhat