Sponge and Octocoral Endofauna of Gray's Reef National Marine Sanctuary

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Live-Bottom Habitat

- Colonized rock outcrops
- Estimated to be 30% of South Atlantic Bight
- Ecological Importance

http://www.graysreef.noaa.gov/pictures.html

Gray's Reef

- One of largest near-shore live-bottom habitats in SAB
- 32 kilometers east of Sapelo Island, Georgia
- Encompasses 58 km^2 of which 25% is live-bottom habitat

Epifauna of Gray's Reef

- Prevalence of sponges and octocorals
  - Small, invertebrate organisms living in association with these epifauna
- Sponges
  - Polychaetes, crustaceans, molluscs, echinoderms
- Octocorals
  - Amphipods, gastropods, bivalves

http://www.bio.georgiasouthern.edu/gr-inverts/

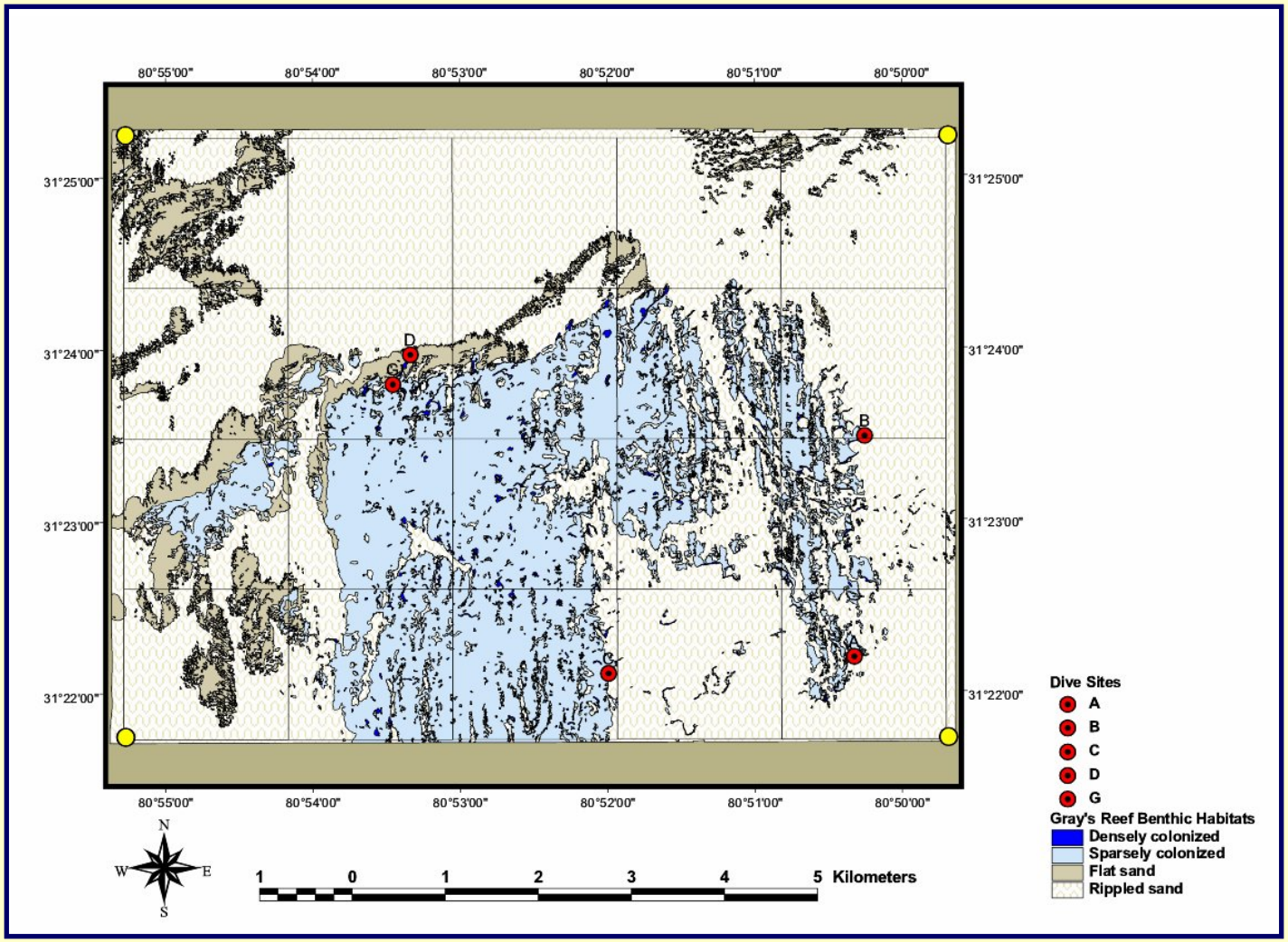
Endofauna of Gray's Reef

- Importance of endofaunal assemblage
  - To host epifauna
  - To other live-bottom residents
- GRNMS goals
  - To thoroughly characterize the sanctuaries resources
- Endofauna observed in Gray's Reef
  - Assemblages not yet characterized

Purpose of Study

- Primary Objective
  - Characterization of the assemblage of small invertebrate organisms associated with the sponge and octocoral epifauna of Gray's Reef
- Secondary Objective
  - Consider patterns of variation in these endofaunal assemblages: between the two host types and among the host species within each type

Study Location & Sample Sites



Mat Kendall (NOAA, CCMA, Silver Spring, MD) and Len Balthis (NOAA, CCEHBR, Charleston, SC)

Field Sampling

- Sample collection
  - May 2005
  - Diver collected
- Shipboard processing
  - Photograph epifauna
  - Epifauna volume
  - Fixation and storage of epifauna

Amy V. Uhrin, CCFHR (http://www.ccfhr.noaa.gov/stressors/landuse/pr2008/welcome.html)

Lab Processing

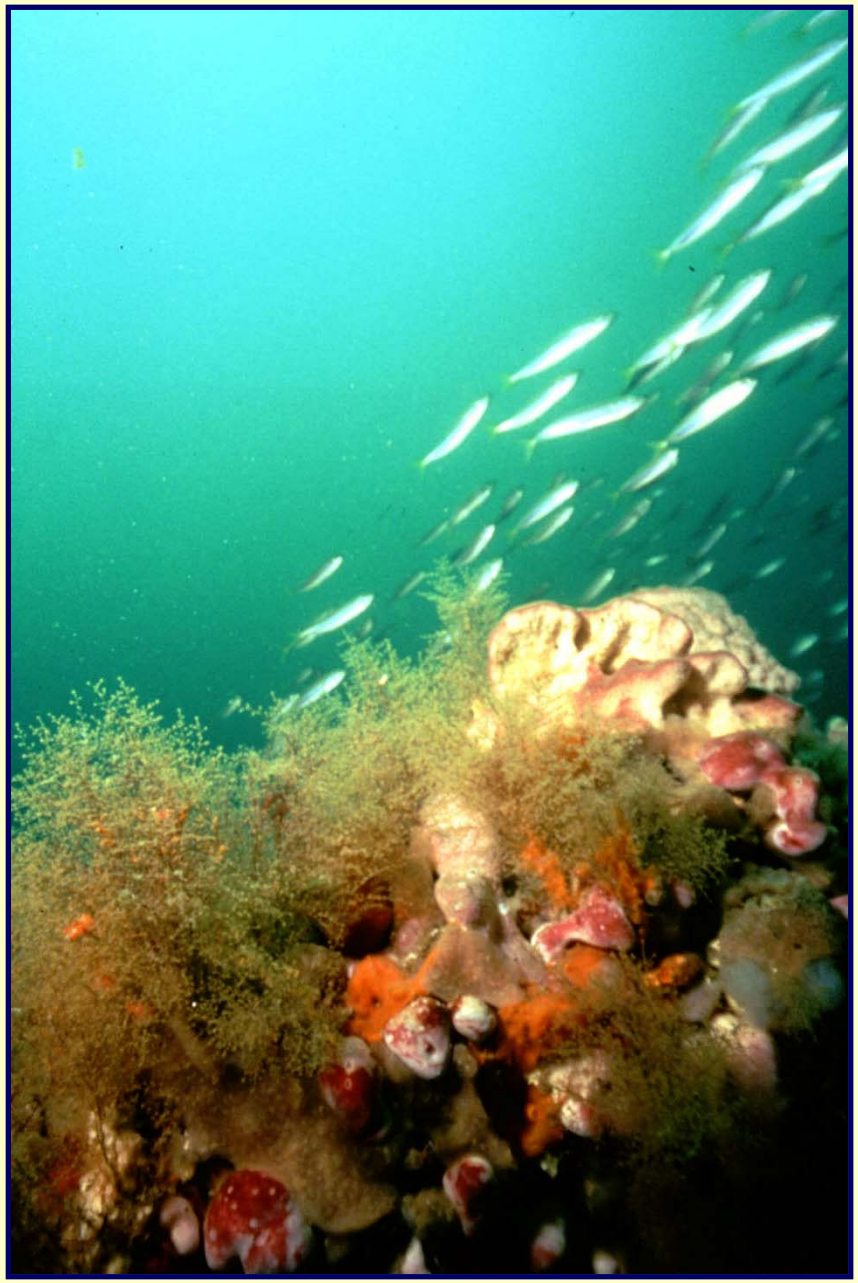
- In the Lab
  - Study modifications
  - Host identification and selection
  - Sorting of endofauna from host specimens
  - Endofauna identification and enumeration

http://www.entosupplies.com.au/

Results

- Host epifauna selected
- Endofaunal Assemblage
- Assemblage Structure

Results:
Host Epifauna

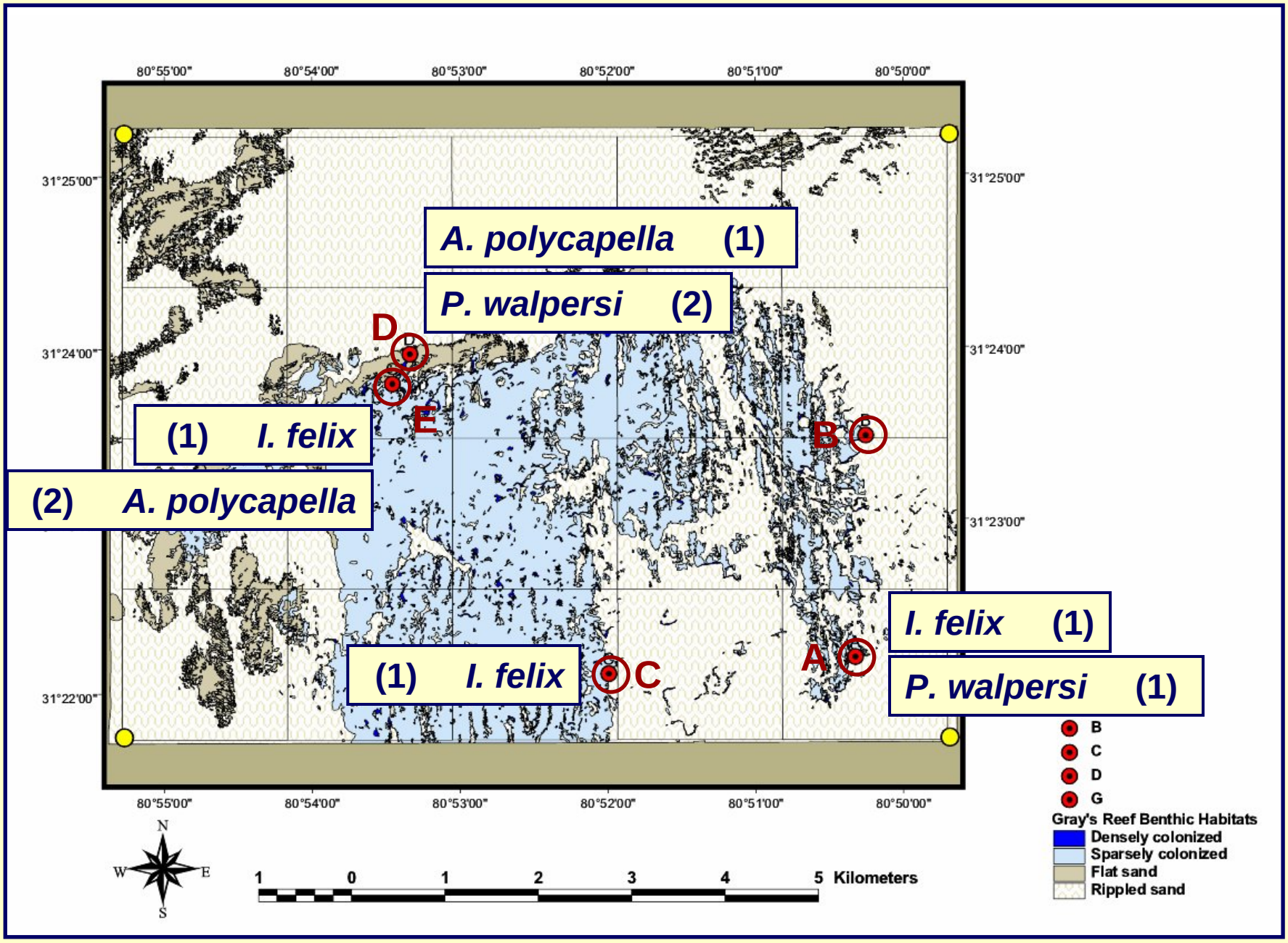


http://www.noaanews.noaa.gov/stories2008/20080320_grayreef.html

***Ircinia felix* (n = 3)**

***Axinella polycapella* (n = 3)**

***Ptilocaulis walpersi* (n = 3)**


80°55'00"
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80°52'00"
80°51'00"
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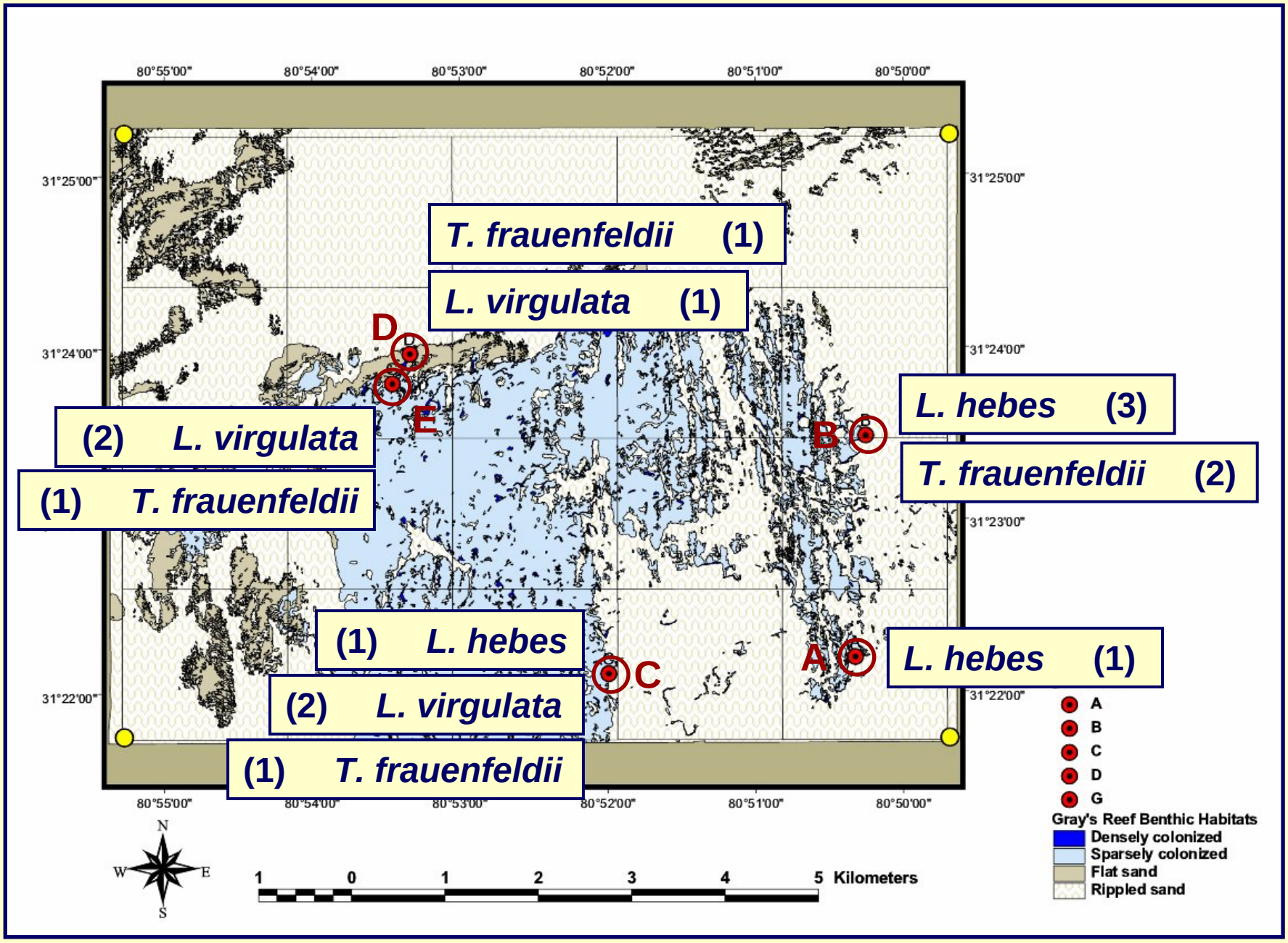
31°25'00"
31°24'00"
31°23'00"
31°22'00"
A. polycapella (1)
P. walpersi (2)
(1) I. felix
(2) A. polycapella
(1) I. felix
I. felix (1)
P. walpersi (1)
A
B
C
D
E
B
C
D
G
Gray's Reef Benthic Habitats
Densely colonized
Sparsely colonized
Flat sand
Rippled sand
N
S
E
W
1 0 1 2 3 4 5 Kilometers

Leptogorgia hebes **(n=5)**

Leptogorgia virgulata **(n = 5)**

Titanideum frauenfeldii **(n = 5)**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31°23'00"
31°22'00"
T. frauenfeldii (1)
L. virgulata (1)
D
E
(2) L. virgulata
(1) T. frauenfeldii
B
L. hebes (3)
T. frauenfeldii (2)
(1) L. hebes
C
(2) L. virgulata
(1) T. frauenfeldii
A
L. hebes (1)
A
B
C
D
G
Gray's Reef Benthic Habitats
Densely colonized
Sparsely colonized
Flat sand
Rippled sand
N
W
E
S
1 0 1 2 3 4 5 Kilometers

Results:
Endofaunal Assemblage

http://sanctuaries.noaa.gov/sos2006/graysreef.html

Endofaunal Assemblage

	Sponge Endofauna	Octocoral Endofauna	Overall Endofauna
Total Abundance			
Average Density			
# of Families			

Overall Endofauna

- Number of Families: 101
  - Compared to a range of 50 to 70 families
- Sponge families: 81
- Octocoral families: 71
- Importance of utilizing more than 1 host type

Overall Endofauna

- Densities
  - GRNMS endofauna 27 ind/cm^3
  - GRNMS infauna 0.004 to 0.503 ind/cm^3
  - Published endofauna 3.42 ind/cm^3
- Disproportionally abundant taxonomic groups in endofauna of both sponges and octocorals

Overall Endofauna: Dominants

Associate	Associate Taxon	Total Abundance	Percent of Total	Frequency of Occurrence	Density (per mL)
Haplosyllis spongicola	Polychaete	47942	36.304	11	12.1311
Family Caprellidae	Amphipod	26253	19.880	24	6.6430
Ericthonius	Amphipod	21931	16.607	23	5.5493
Caprella equilibra	Amphipod	17316	13.113	24	4.3816
Microjassa	Amphipod	8945	6.774	13	2.2634
Photis	Amphipod	1711	1.296	19	0.4329

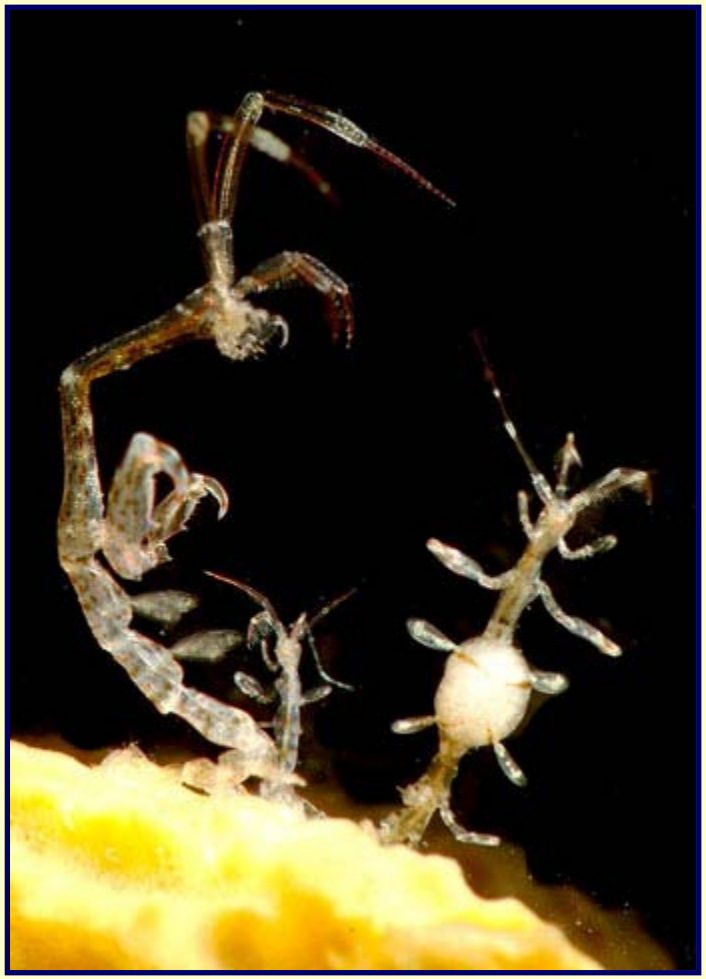
Those endofauna composing > 1% of the total assemblage

Haplosyllis spongicola

- Parasitic polychaete
- Impact on host
- High densities in hosts

http://wetpixel.com/forums/lofiversion/index.php/t22642.html

Family Caprellidae



http://nathistoc.bio.uci.edu/crustacea/Amphipoda/Caprella.htm

- Frequent associate
- Seasonal population fluctuations
- More abundant on octocorals

Endofaunal Assemblage

- *Haplosyllis* and Caprellidae were the dominant endofauna present
- Many other taxonomic groups represented on both the sponges and the octocorals

Sponge Endofauna: Dominants

Host	Associate	Abundance	Percent of Total	Frequency	Density
All Sponges	Haplosyllis	47940	63.66	9	17.30
	Ericthonius	14657	19.46	8	5.29
n = 9	Caprellidae	3783	5.02	9	1.37
	Caprella equilibra	2523	3.35	9	0.91
	Actiniaria A	1039	1.38	4	0.37
	Photis	950	1.26	7	0.34
	Microjassa	906	1.20	4	0.33
	Vitrinellidae	809	1.07	3	0.29
I.felix	*Haplosyllis*	39469	83.73	3	23.49
	Ericthonius	3949	8.38	3	2.35
n = 3	Actiniaria A	1038	2.20	3	0.62
	Vitrinellidae	809	1.72	3	0.48
P.walpersi	*Ericthonius*	10704	41.35	3	18.46
	Haplosyllis	6493	25.08	3	11.19
n = 3	Caprellidae	3644	14.08	3	6.28
	Caprella equilibra	2255	8.71	3	3.89
	Microjassa	905	3.50	3	1.56
	Photis	750	2.90	3	1.29
	Gammaropsis	389	1.50	3	0.67
A.polycapella	*Haplosyllis*	1978	84.82	3	3.87
	Caprella equilibra	220	9.43	3	0.43
n = 3	Caprellidae	83	3.56	3	0.16

Octocoral Endofauna: Dominants

Host	Associate	Abundance	Percent of Total	Frequency	Density
All Octocorals	Caprellidae	22470	39.59	15	19.03
	Caprella equilibra	14793	26.07	15	12.53
n = 15	Microjassa	8039	14.17	9	6.81
	Ericthonius	7274	12.82	15	6.16
	Conopea galeata	901	1.59	11	0.76
	Photis	761	1.34	12	0.64
L.hebes	Caprellidae	18331	42.70	5	31.34
	Caprella equilibra	8949	20.84	5	15.30
n = 5	*Microjassa*	7911	18.43	5	13.52
	Ericthonius	5356	12.48	5	9.16
	Conopea galeata	788	1.84	5	1.35
L.virgulata	*Caprella equilibra*	5365	43.20	5	11.92
	Caprellidae	3381	27.22	5	7.51
n = 5	*Ericthonius*	1875	15.10	5	4.17
	Photis	582	4.69	4	1.29
	Gammaropsis	358	2.88	3	0.80
	Nemata	323	2.60	4	0.72
T.frauenfeldii	Caprellidae	758	52.42	5	5.19
	Caprella equilibra	479	33.13	5	3.28
n = 5	*Microjassa*	100	6.92	2	0.68
	Ericthonius	43	2.97	5	0.29
	Tritoniidae	21	1.45	5	0.14

Results:
Assemblage Structure

http://www.bio.georgiasouthern.edu/gr-inverts/

Assemblage Structure

- Statistical comparisons of response variables
  - Density
  - Taxonomic richness
  - Diversity
- Between the two host groups (sponges vs. octocorals)
  - *t*-Tests
- Between the species within each group
  - ANOVA or Kruskal-Wallis
  - Tukey's HSD

Sponge vs. Octocoral Endofauna

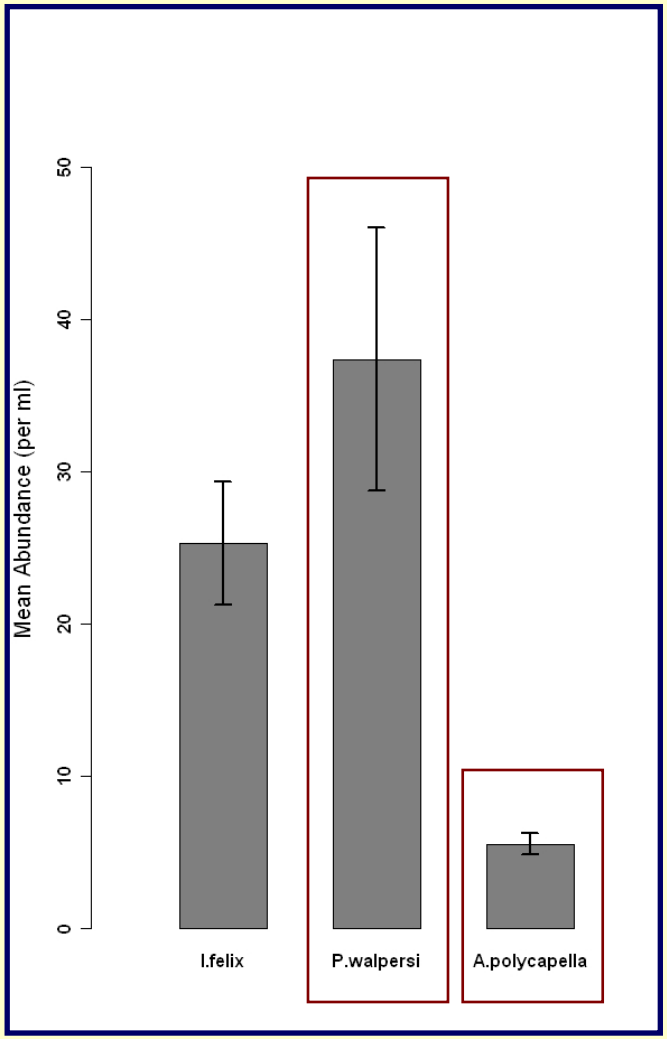
	Density	S	H’
p-value	0.5260	0.1265	0.5584
Significance	NS	NS	NS

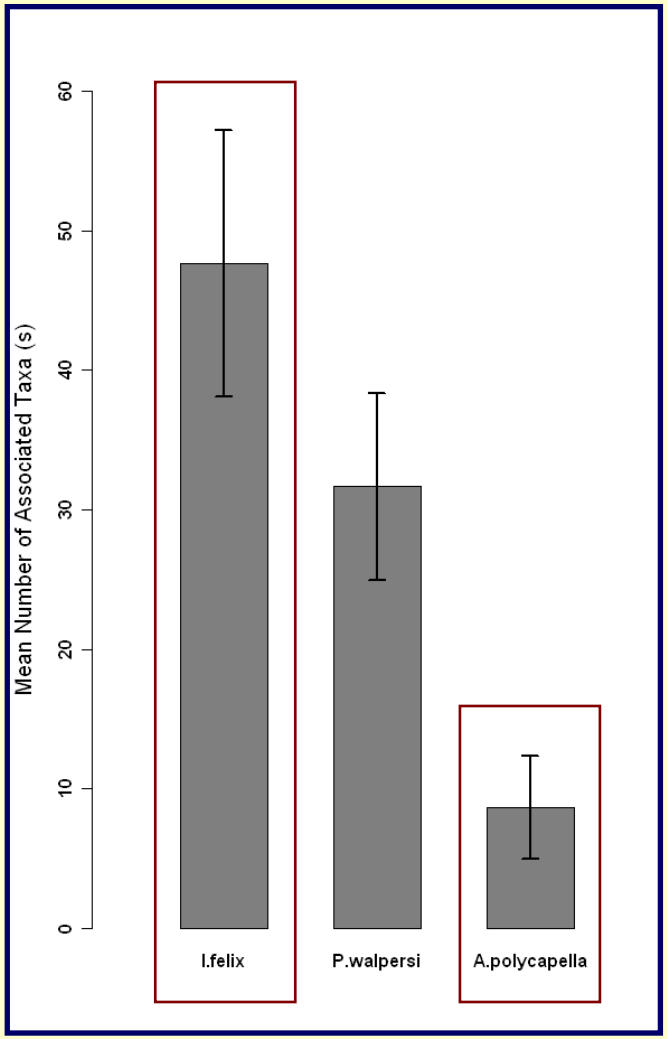
Significant at $\alpha \leq 0.05$

Sponge Hosts			
	Density	S	H’
p-value	0.0179	0.0219	0.1775
Significance	S	S	NS

Significant at $\alpha \leq 0.05$

Variation Between Sponges



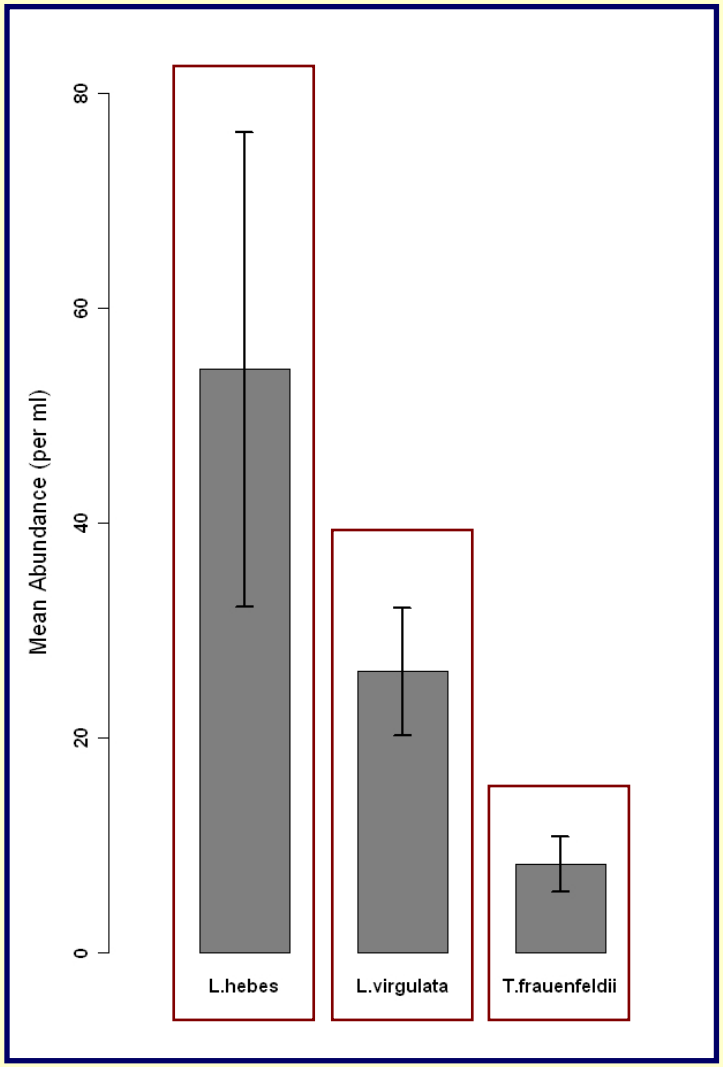


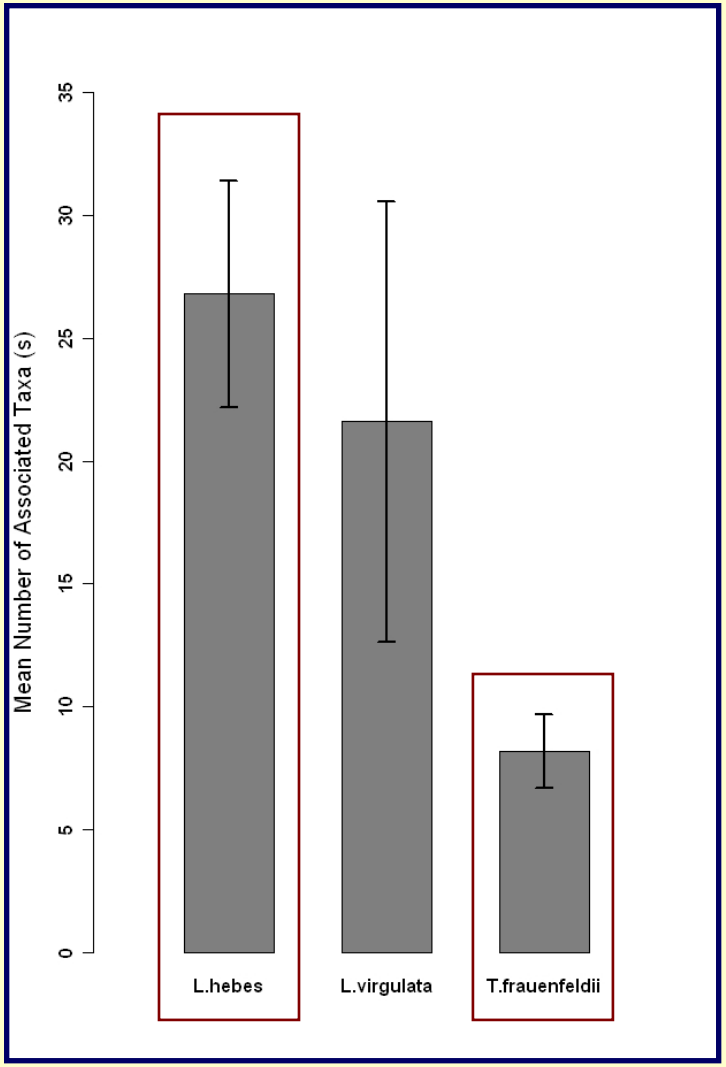
Sponge Hosts			
	Density	S	H’
p-value	0.0179	0.0219	0.1775
Significance	S	S	NS

Octocoral Hosts			
	Density	S	H’
p-value	0.0092*	0.0117*	0.2808**
Significance	S	S	NS

Significant at $\alpha \leq 0.05$

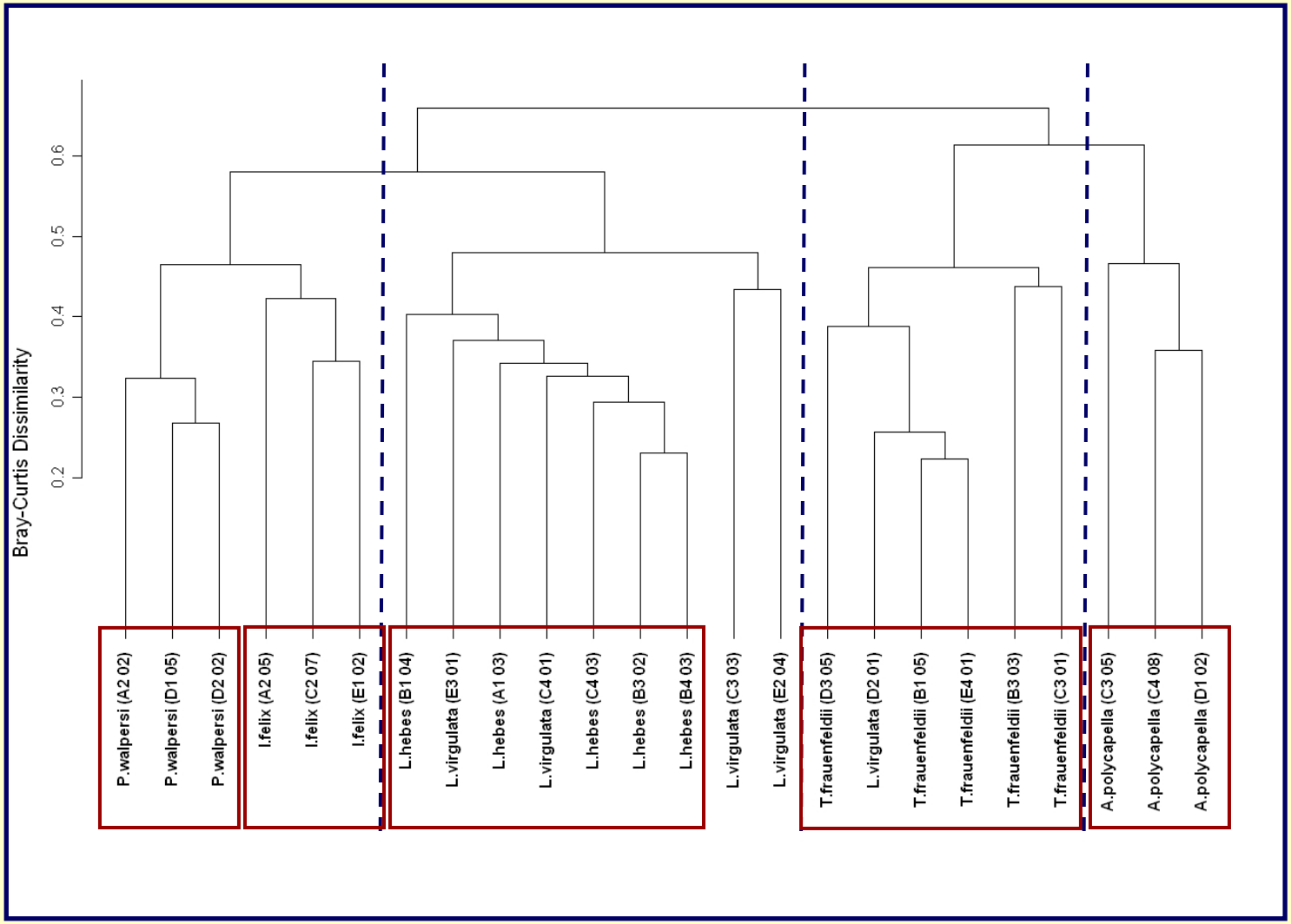
Variation Between Octocorals





Alessandra Score

Cluster Analysis



Assemblage Structure

- Variables influencing endofaunal groupings
  - Location and depth of host origin
  - Chemistry of secondary metabolites
  - Morphology and complexity
- Examples from cluster analysis

Influence of Host Morphology

- *Ircinia felix*
  - Lobate structure:

    Extensive internal tissue and canals suitable for polychaetes

- *Ptilocaulis walpersi*
  - Internal structure is again suitable to polychaetes
  - Also upright and branching, appealing to amphipods

Influence of Host Morphology

- *Leptogorgia hebes & Leptogorgia virgulata*
  - Two species are structurally similar
  - Reflected in cluster group

Conclusions

- High abundance and taxonomic richness of endofaunal assemblage
- Assemblage distinctions
  - Between the two host types and among species within each type
  - Possibly a result of morphological variations among the hosts
- Importance of each invertebrate epifauna as a host to part of this substantial endofaunal assemblage

Acknowledgements

- Thesis Committee
  - Dr. Jeff Hyland (major advisor)
  - Dr. Len Balthis
  - Stacie Crowe
  - Dr. Erik Sotka
- Len Balthis, Maggie Holbrook, Samantha Ryan
- CEP lab (Present and Past)
- Gray's Reef National Marine Sanctuary
- Dave Owens, Shelly Brew, and Craig Plante
- Funding:
  - College of Charleston TA
  - GRNMS
  - NOAA, CCEHBR
- Family and friends

http://www.bio.georgiasouthern.edu/gr-inverts/