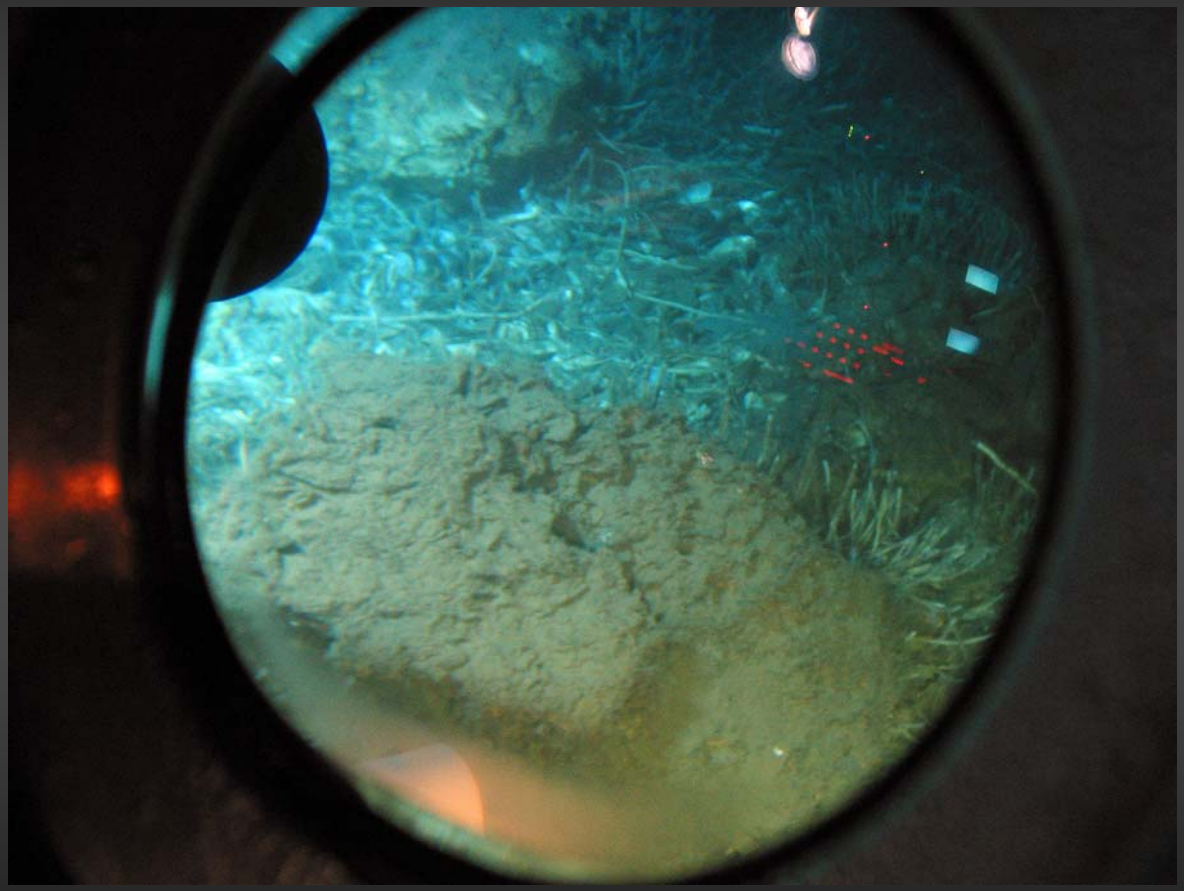
Preliminary Investigations of the Hard-Ground Communities Below 1000 M in the Northern Gulf of Mexico



Erik E. Cordes, Erin L. Becker, Stephanie Lessard-Pilon, Stephane Hourdez, and Charles R. Fisher

Pennsylvania State University

Macro- and Megafaunal Hardground Communities

- Chemosynthetic communities
  - sampling efficiency
  - biodiversity
  - biogeography
  - succession
- New hydrocarbon seep-related communities
- Other hardground communities
  - deep-water corals

Chemosynthetic Community Objectives

- characterize known and newly discovered communities
- document rare/unique species/communities
- determine depth range of community shift
- test succession hypotheses based on previous studies of upper slope communities

Animal Collections from May '06 Cruise

Site	*Depth*	*Bushmaster*	*Mussel Pot*	*Scoop, Grab, Core, Rock, Slurp*
MC853	1080		2	3
GC600	1175			5
MC640	1400		1	4
GC852	1410	2	2	9
KC243	1650		1	1
WR269	1910		1	4
AT340	2180	3	1	11
AC645	2200		4	4
AC601	2320	1		5
AC818	2750	1	1	4
TOTAL		**7**	**13***	**50**

Sample Processing Onboard Ship

Foundation Species in Lower Slope Communities

Escarpia laminata
1410–3290 m

Bathymodiolus brooksi
1080–3290 m

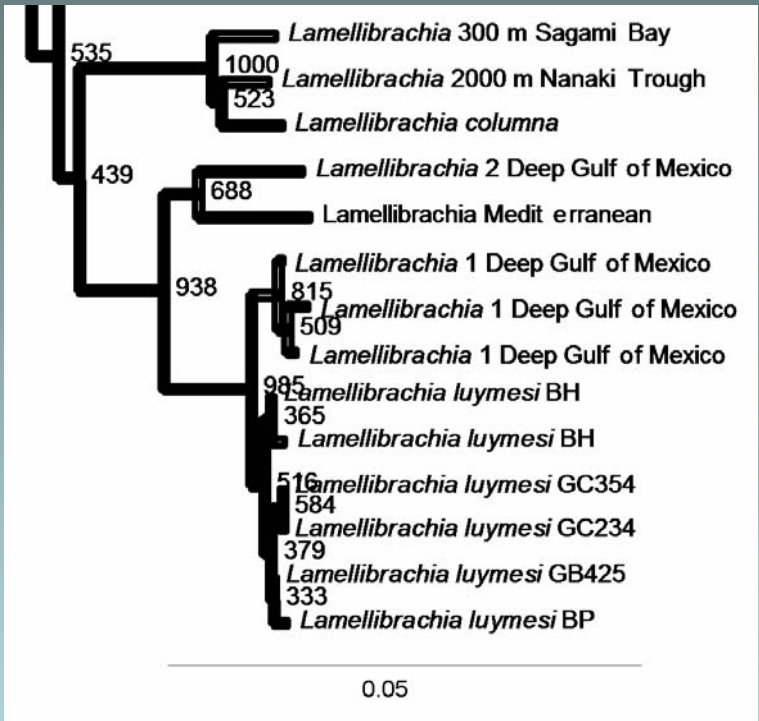
Bathymodiolus childressi
525–2220 m

Lamellibrachia sp. nov.
1175–2320 m

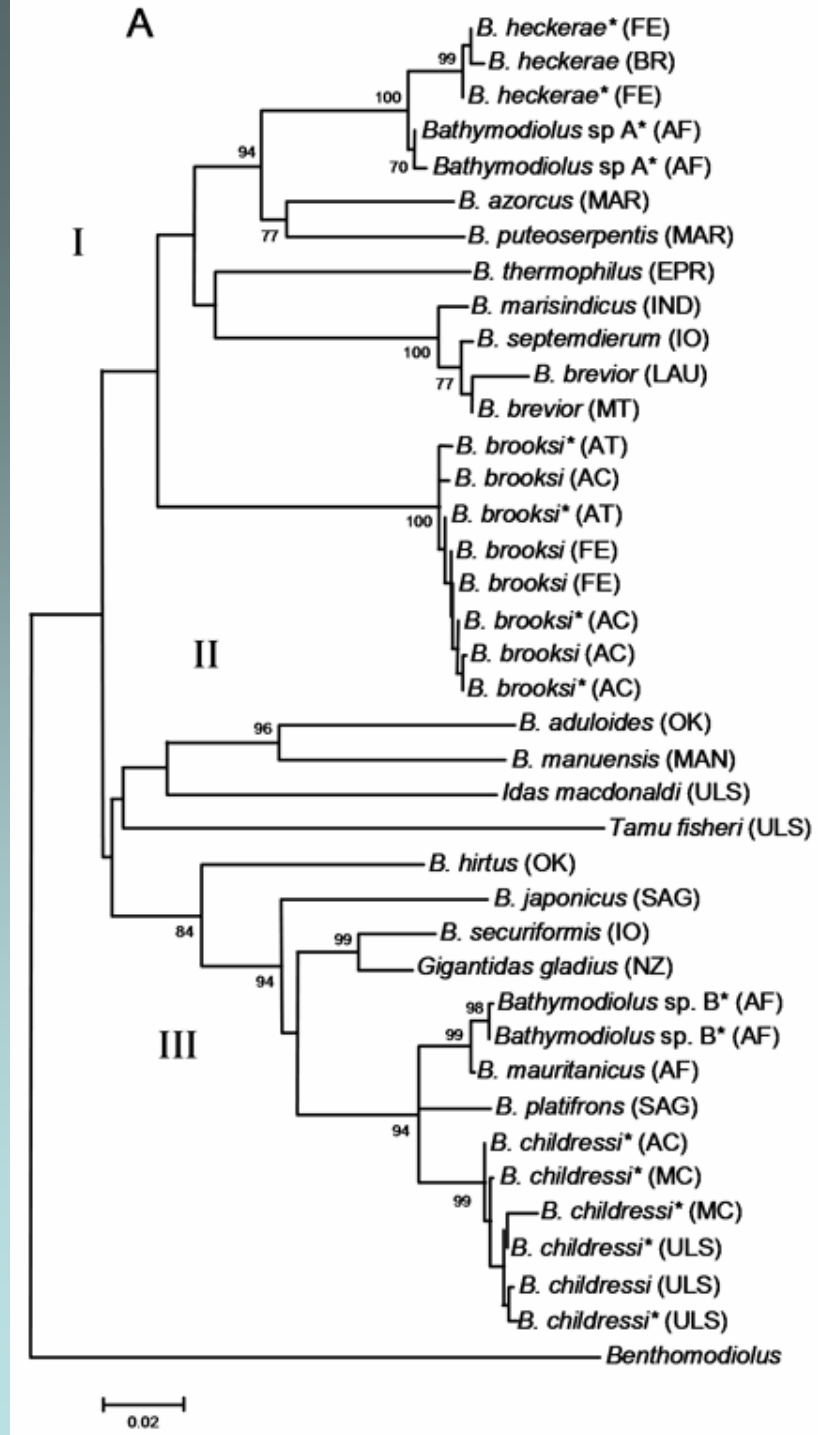
Calyptogena ponderosa
500–2750 m

Bathymodiolus heckerae
2180–3290 m

Phylogenetic Analyses of Mussels and Tubeworms



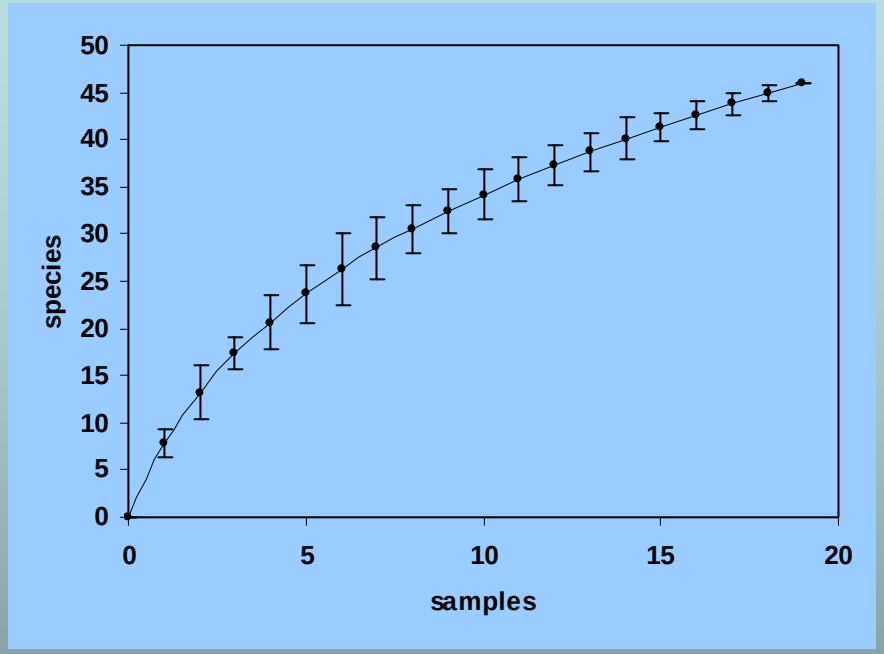
Portion of tree of all *Lamellibrachia* species
625 bp alignment of mtCOI sequence.

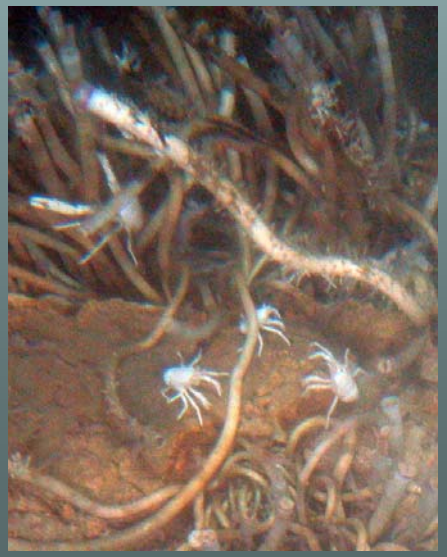


Tree of all *Bathymodiolus* species
510 bp alignment of mtCOI sequence.
Cordes et al. (in press) Deep-sea Research I

Species Associated with Lower Slope Seeps

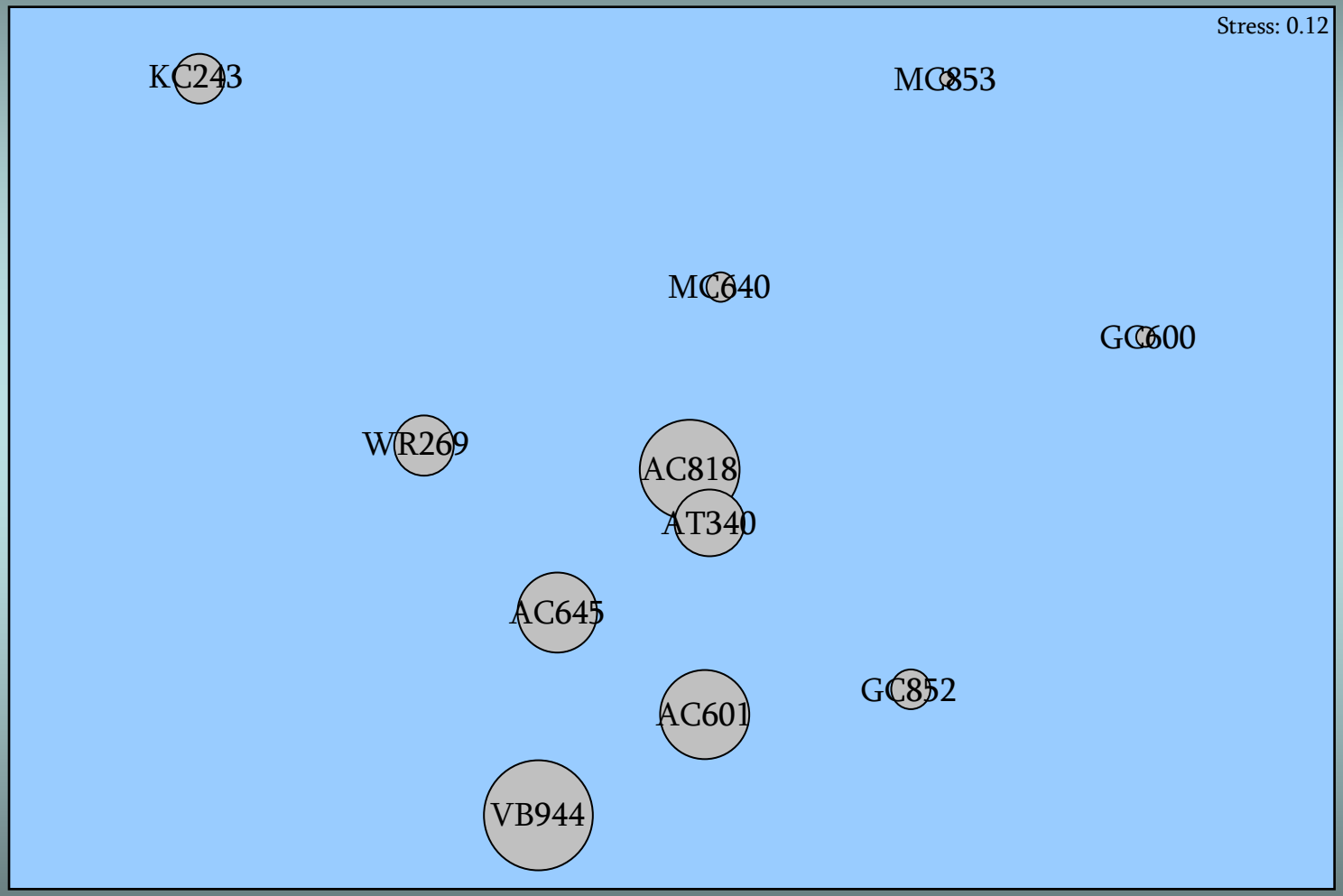
- 95 species in 70 samples total
- 46 species in 19 quantitative collections (3-15 per collection)
- most abundant
  - *Alvinocaris muricola*
  - *Munidopsis* sp.
  - *Ophioctenella acies*





Similar Community Composition within Depth Range

Circle size represents relative depth

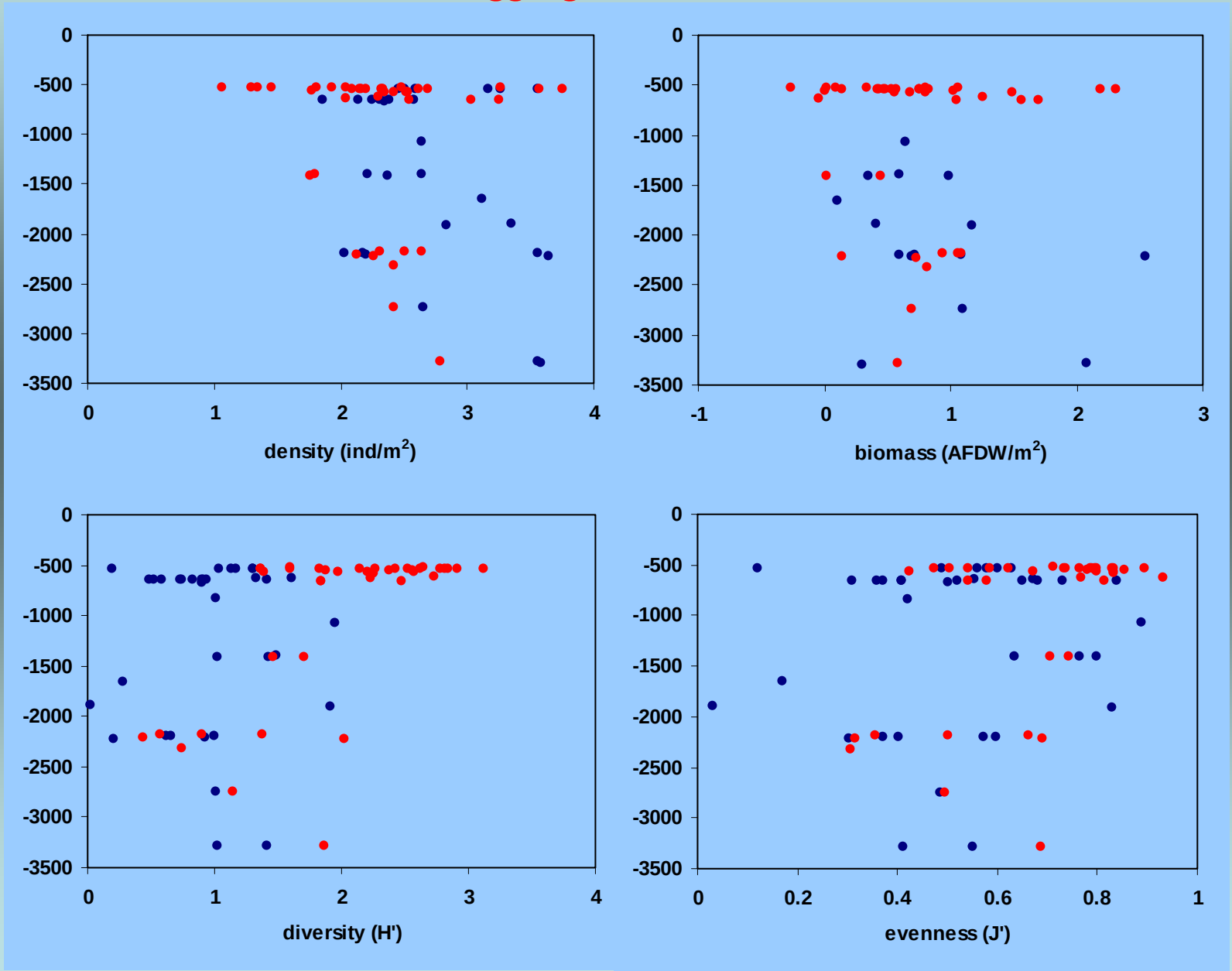


Mophospecies from Upper Slope Found in Lower Slope Collections

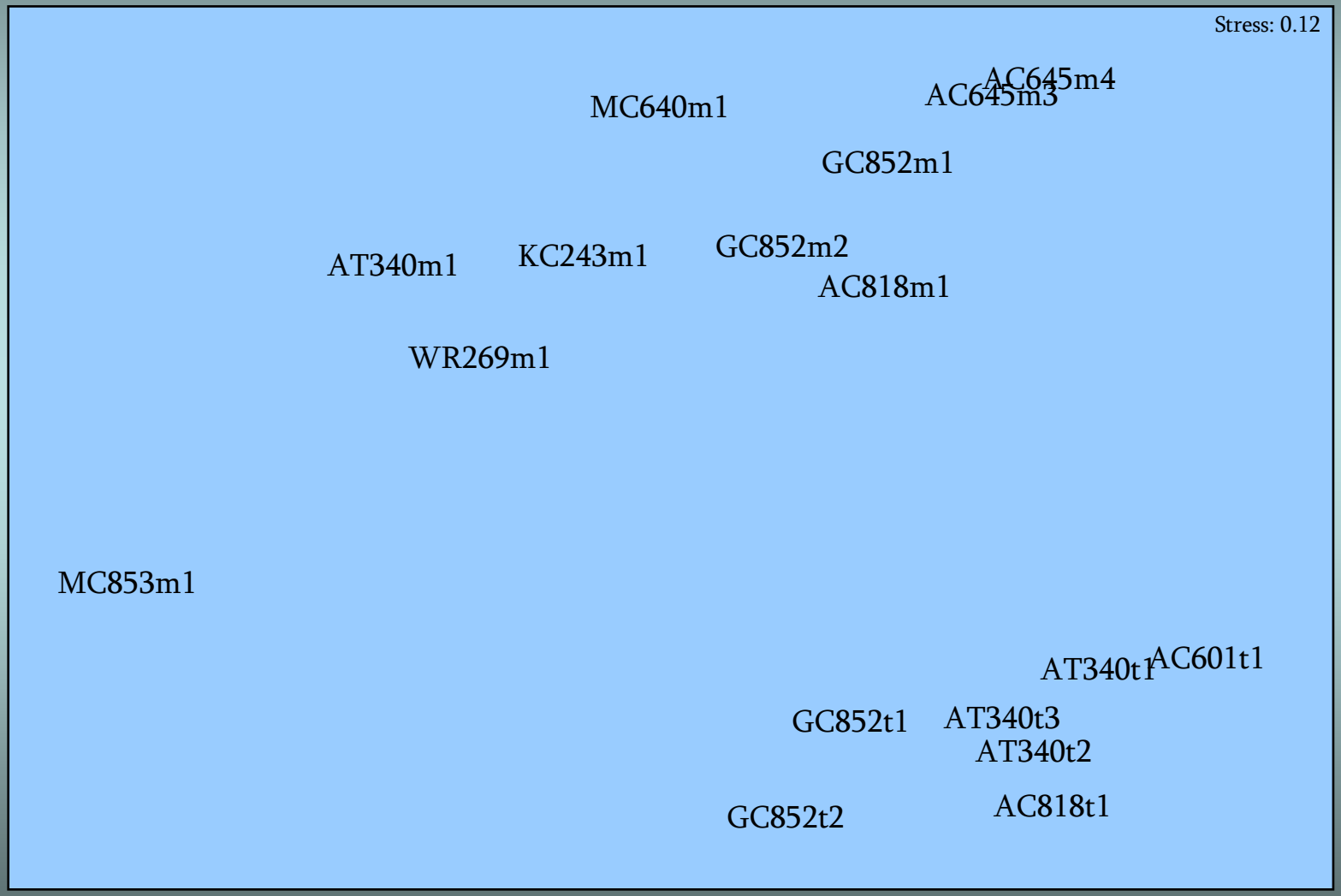
Species	Deepest Collection
Munidopsis sp. 1	GC600 1175 m
Cataegis meroglypta	GC852 1410 m
Hesciocaeca methanicola	AC645 2220 m
Tamu fisheri	AC601 2320 m
Glycera tesselata	AC601 2320 m
Lumbrineris sp.	AC818 2750 m
Nereis sp.	AC818 2750 m

Bathymetric Trends in Community Characteristics

tubeworm aggregations mussel beds



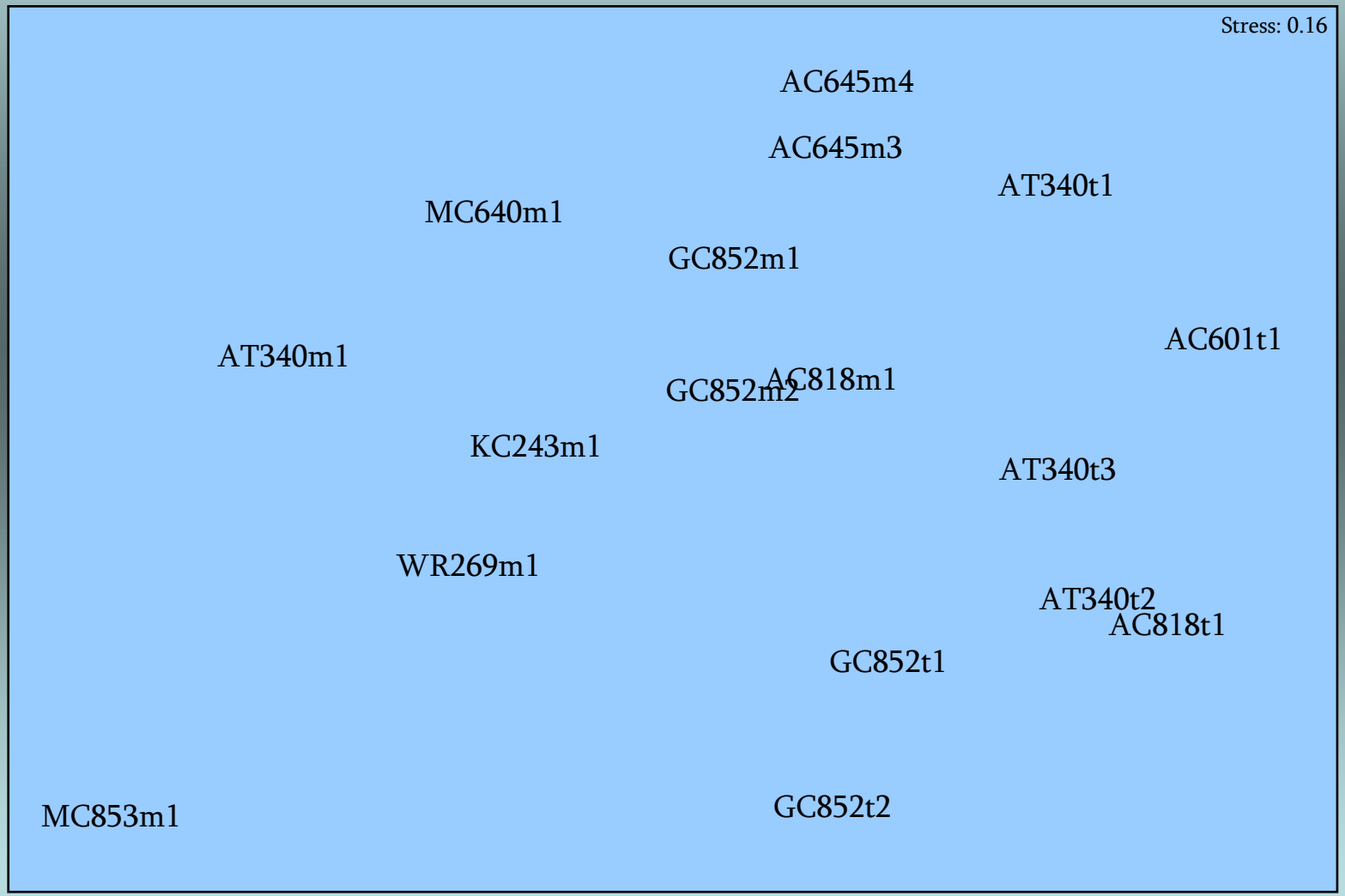
Tubeworm Aggregations and Mussel Beds Host Different Communities



Differences Between Tubeworm and Mussel Communities Driven by Commensal(?) Species

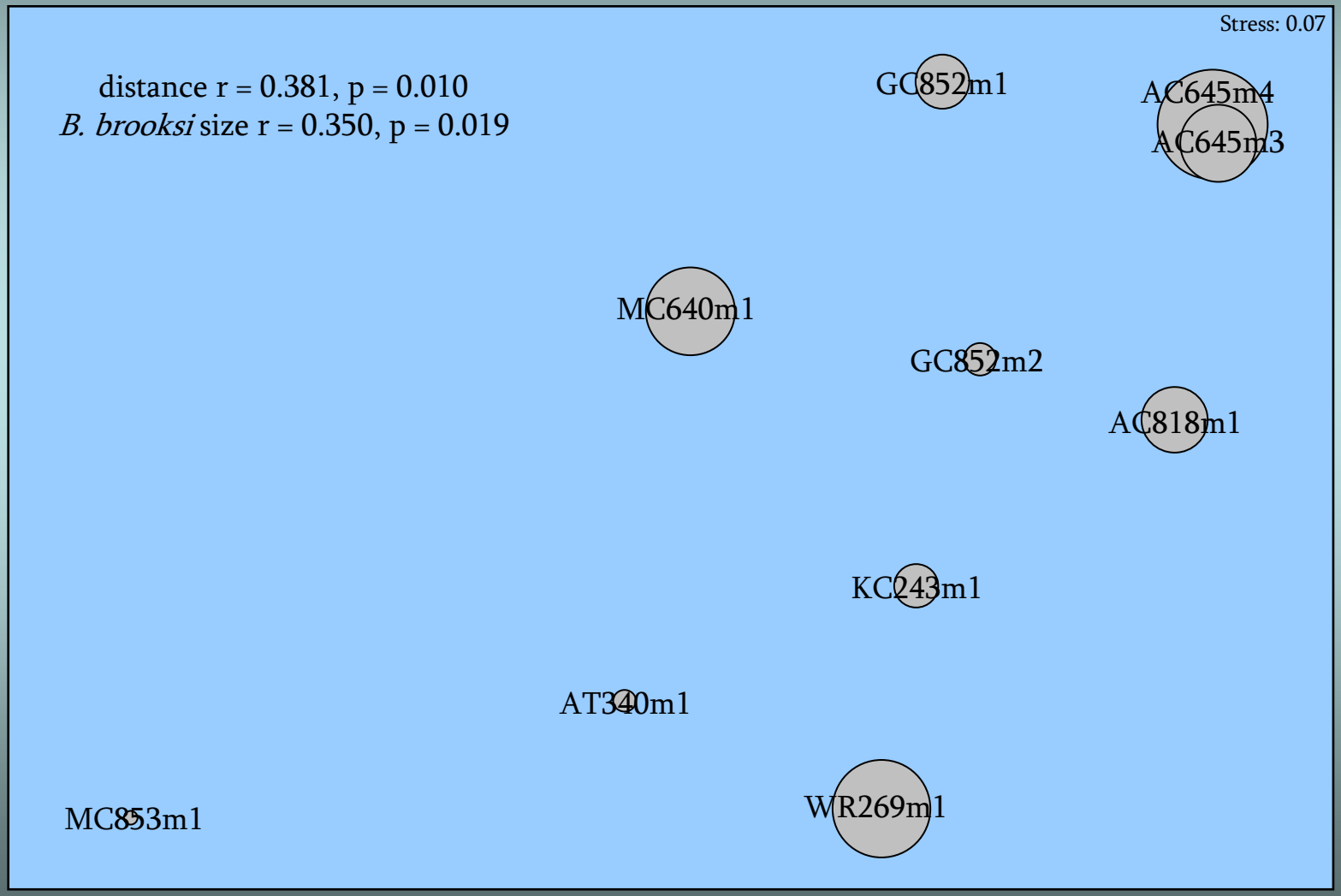
Still Different without Commensals

Primarily due to *O. acies* abundance in mussel beds



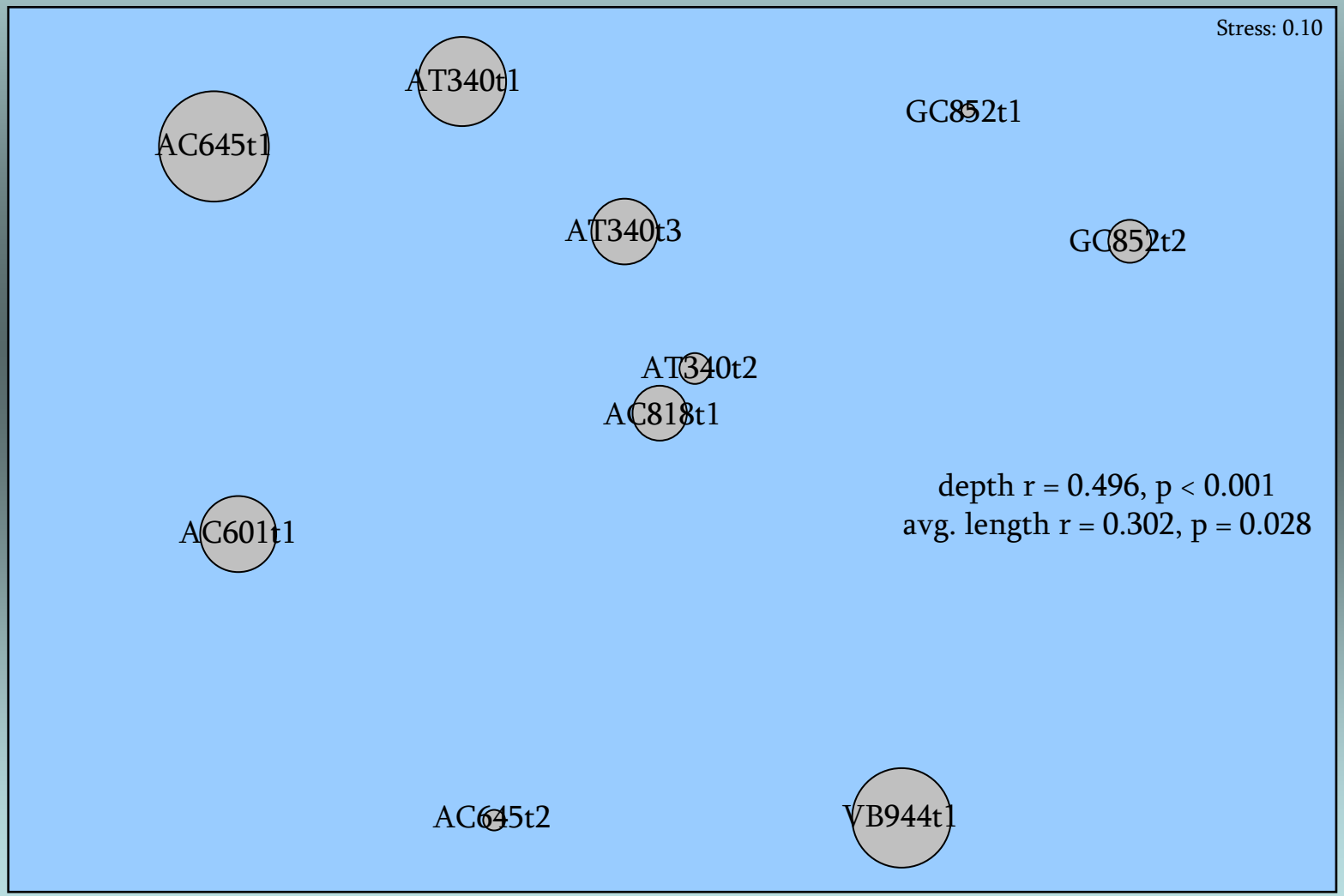
Location and Size of *B. brooksi* Affect Community Similarity

Circle size represents average *B. brooksi* shell length



Similarity in Tubeworm-Associated Fauna Correlated with Depth and Average Length of *E. laminata*

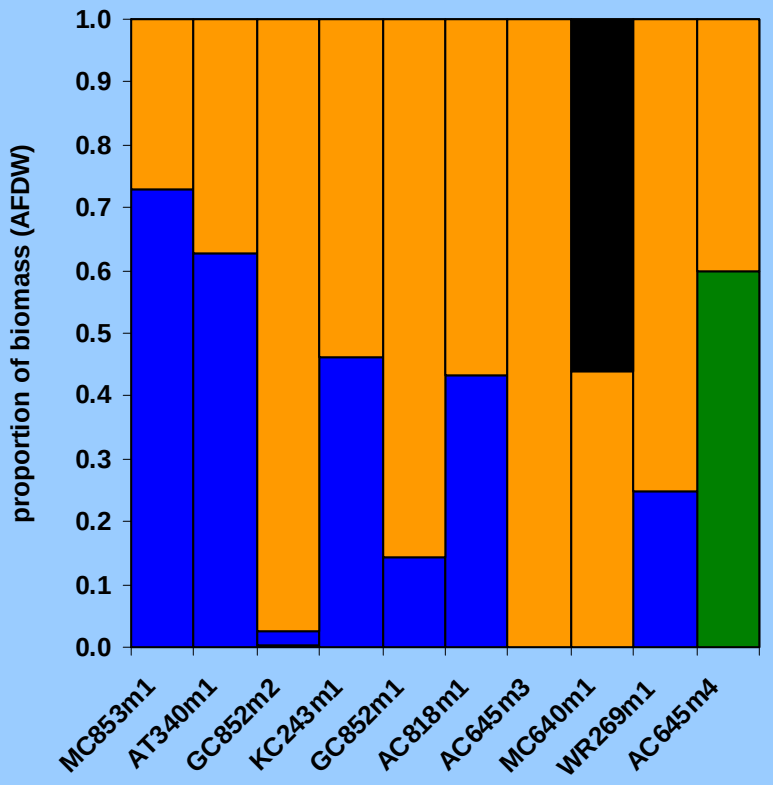
Circle size represents average length

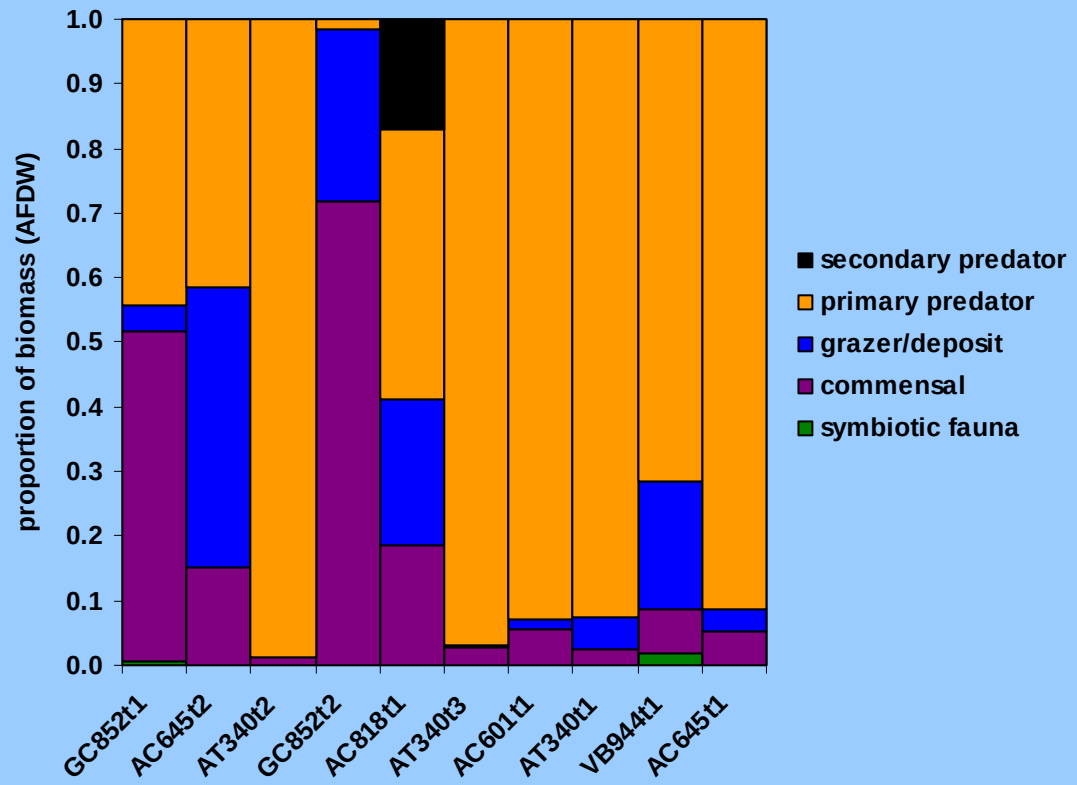


Biomass of Associates Dominated by *Alvinocaris muricola*

mussel pot collections
mussels 99.3% overall biomass

bushmaster collections
tubeworms 97.4% overall biomass





increasing mussel shell or tubeworm tube length →

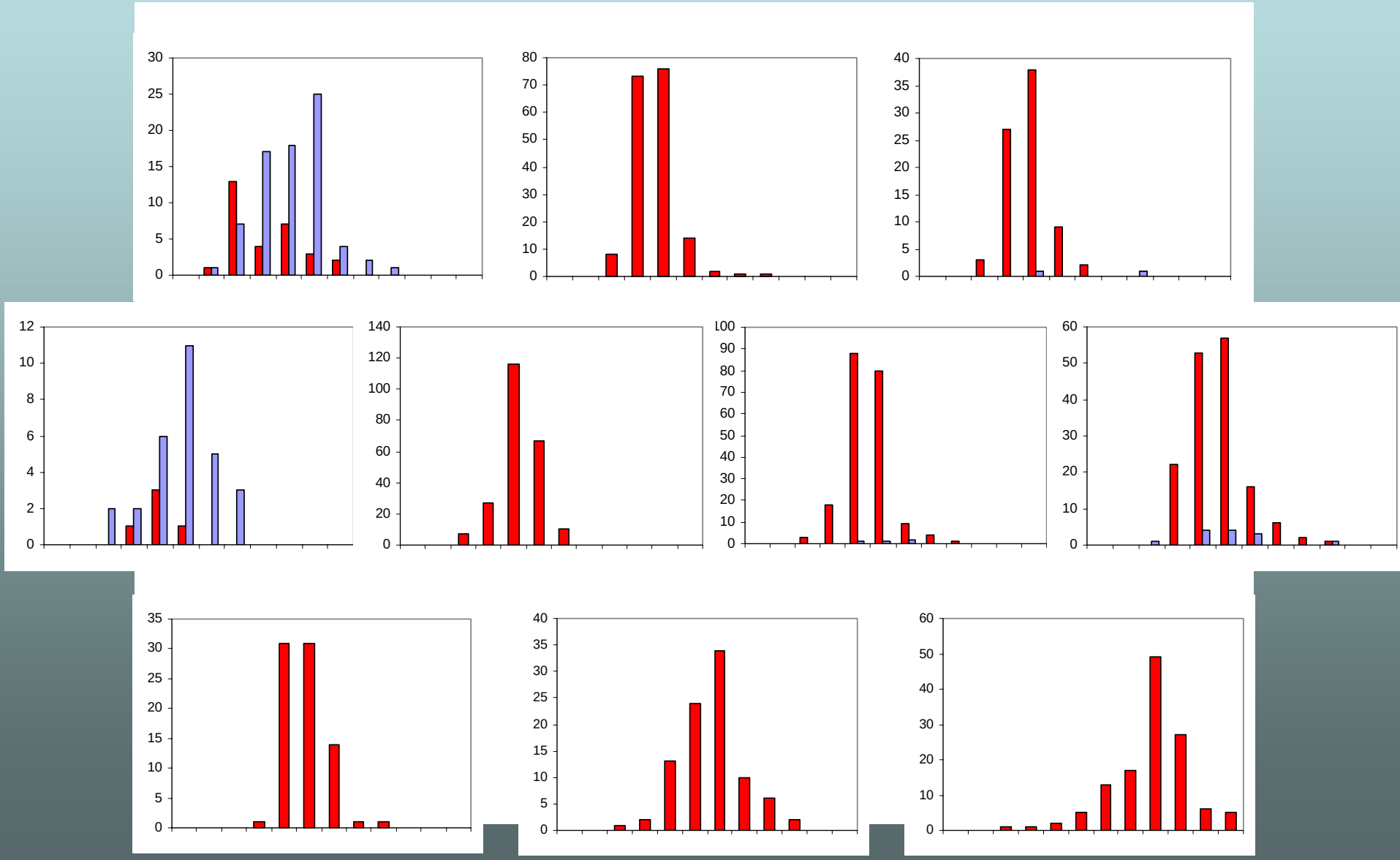
Alvinocaris muricola 51.8%
Ophioctenella acies 8.9%
Chirodota heheva 6.5%

Alvinocaris muricola 58.7%
Heteromystides sp. 13.4%
Munidopsis sp. 7.6%

Size-Frequency of Tubeworms Suggests Lack of Ongoing Recruitment in Collected Aggregations

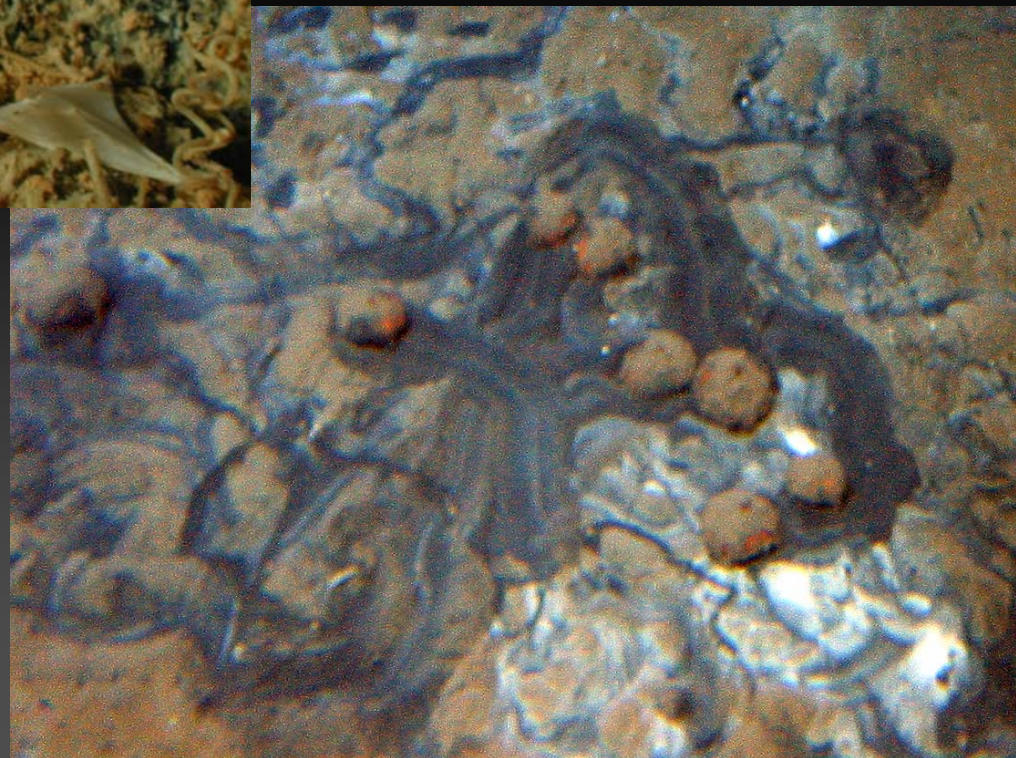
Lamellibrachia: 18.2 to 87.1 cm

Escarpia: 10.8 to 116.9 cm



Pogonophoran fields

WR269 1950m

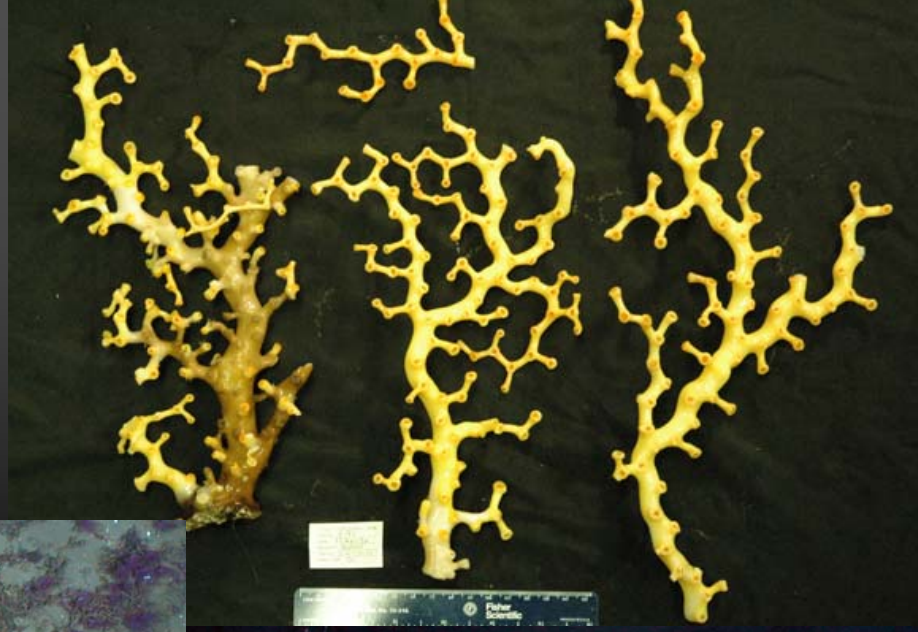


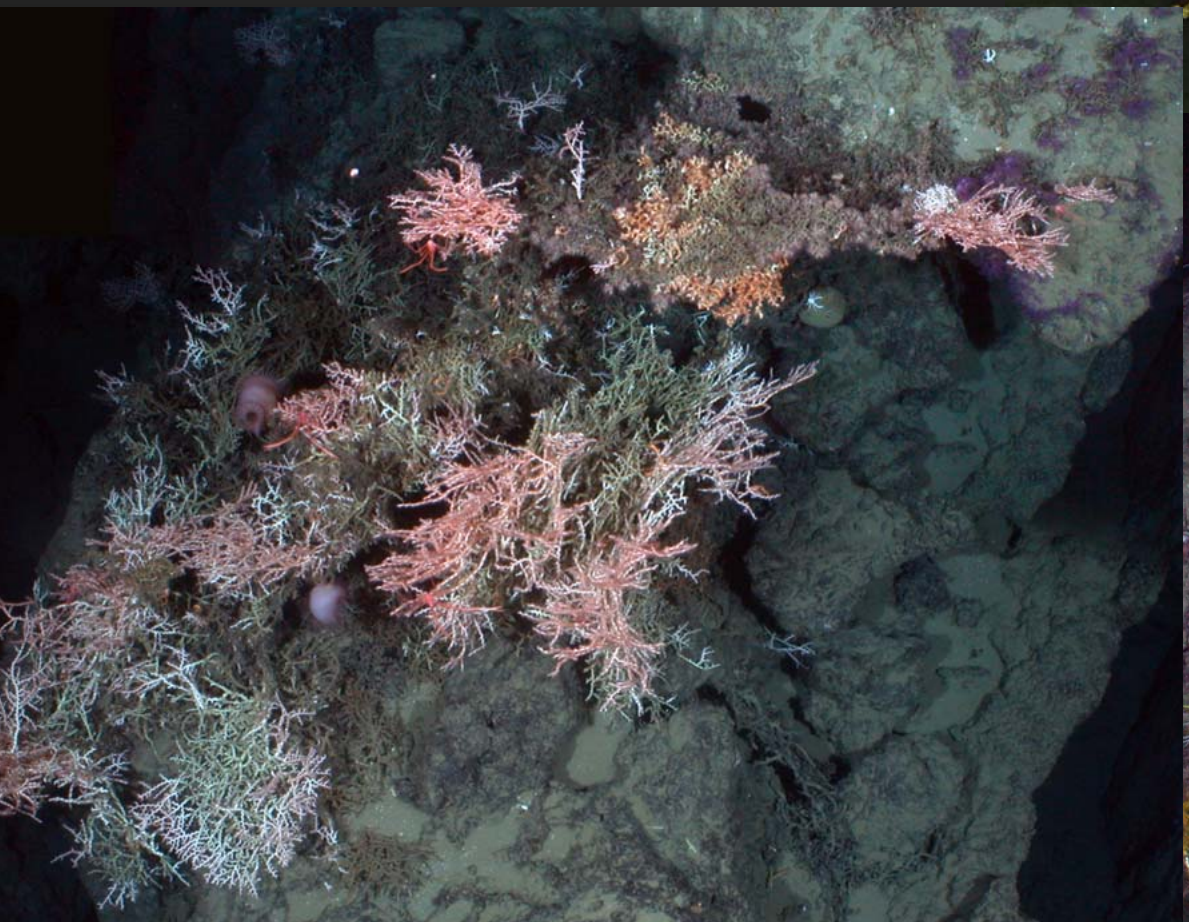
Urchin trails

AT340 2220m

Additional Hard-Bottom Communities

GC852 1410 m





Preliminary Findings from Hardground Communities

- sampled 10 sites
  - 5 with multiple quantitative collections
  - 95 species, still going up
- sites group mainly by depth
  - but some successional trends
- a few species from upper slope
  - low abundance
  - no foundation species
- new community types
- single coral community so far

Acknowledgments

Stephane Hourdez
Monika Bright
Guy Telesnicki
Jeremy Potter
Liz Goehring
Cindy Peterson
Matt Kupchik
Jill Petersen
Cheryl Morrison
Bernie Bernard
Jim Brooks
and the rest of the team …

Alvin pilots and Atlantis crew

Greg Boland
Bill Shedd
MMS and OE