ABUNDANCE AND DIVERSITY OF DEEP-SEA CRUSTACEANS OF BEAR SEAMOUNT, NEW ENGLAND SEAMOUNT CHAIN

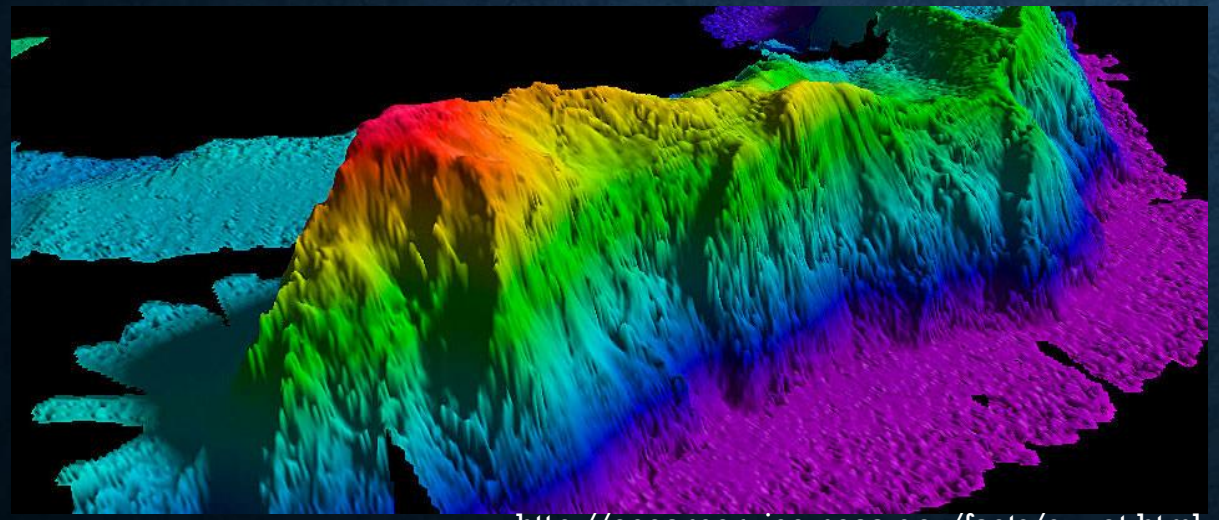
Valerie Miranda

Deep Sea Biology Laboratory

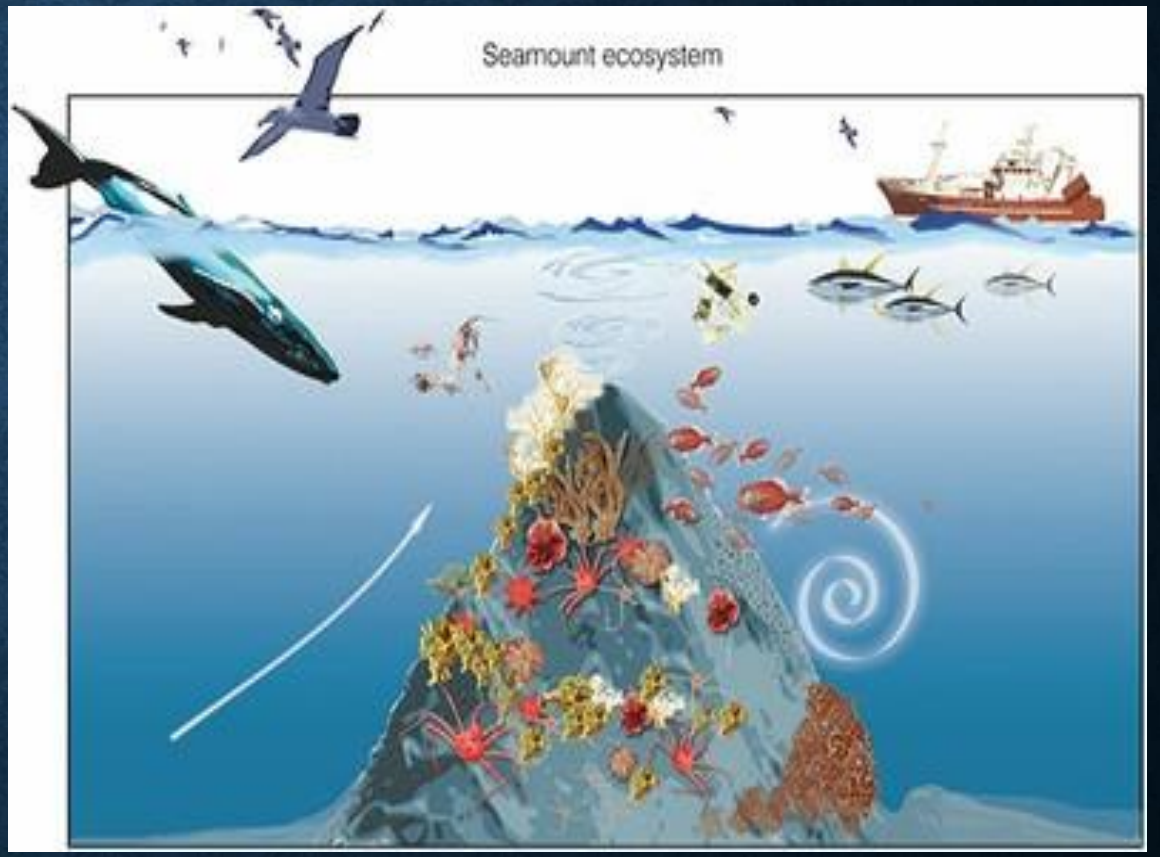
NOVA SOUTHEASTERN UNIVERSITY

SEAMOUNTS

- Enhanced currents
- Unique pelagic and benthic communities
- Important habitats
- Estimated >100,000 worldwide
- Vulnerable to exploitation



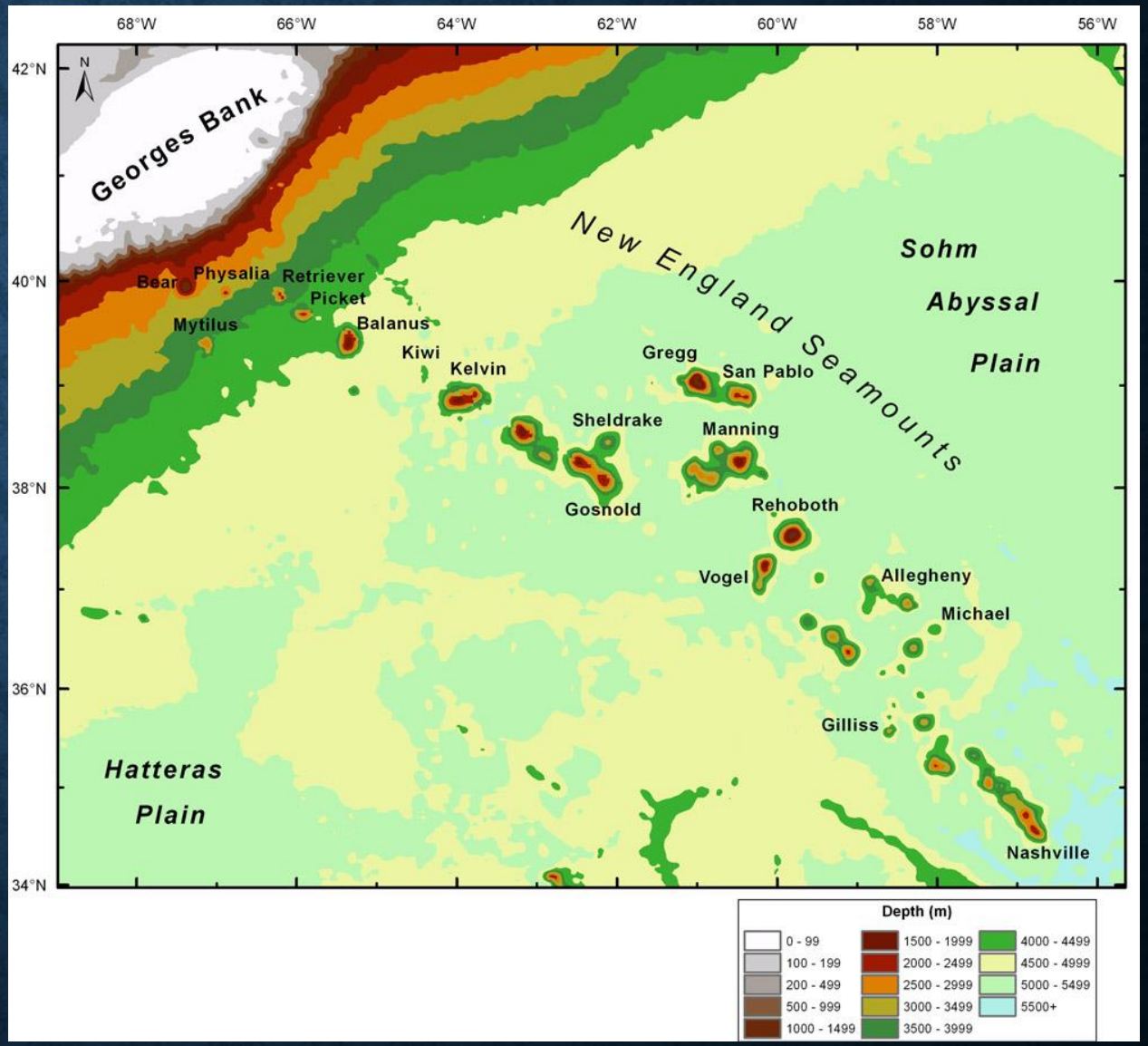
http://oceanservice.noaa.gov/facts/guyot.html



(Erika Mackay, National Institute of Water and Atmospheric Research)

NEW ENGLAND SEAMOUNT CHAIN

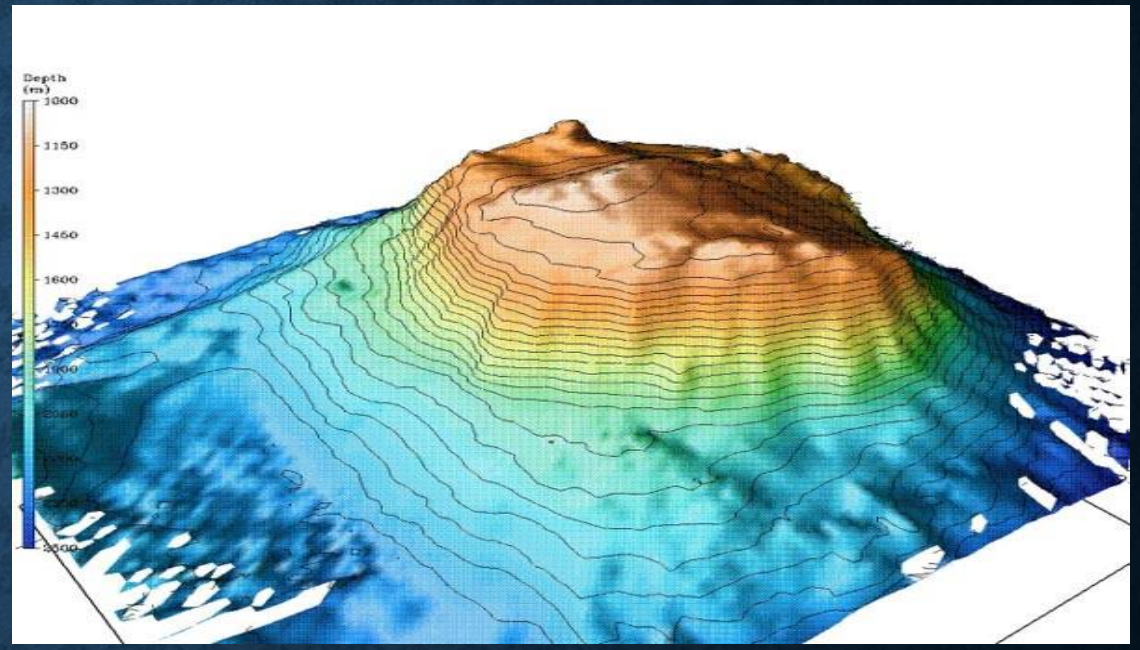
- Longest chain in N. Atlantic
- 30 extinct volcanoes
- 1200 km
- 40-60 width
- Summits from 900-2300m
- Hotspot activity



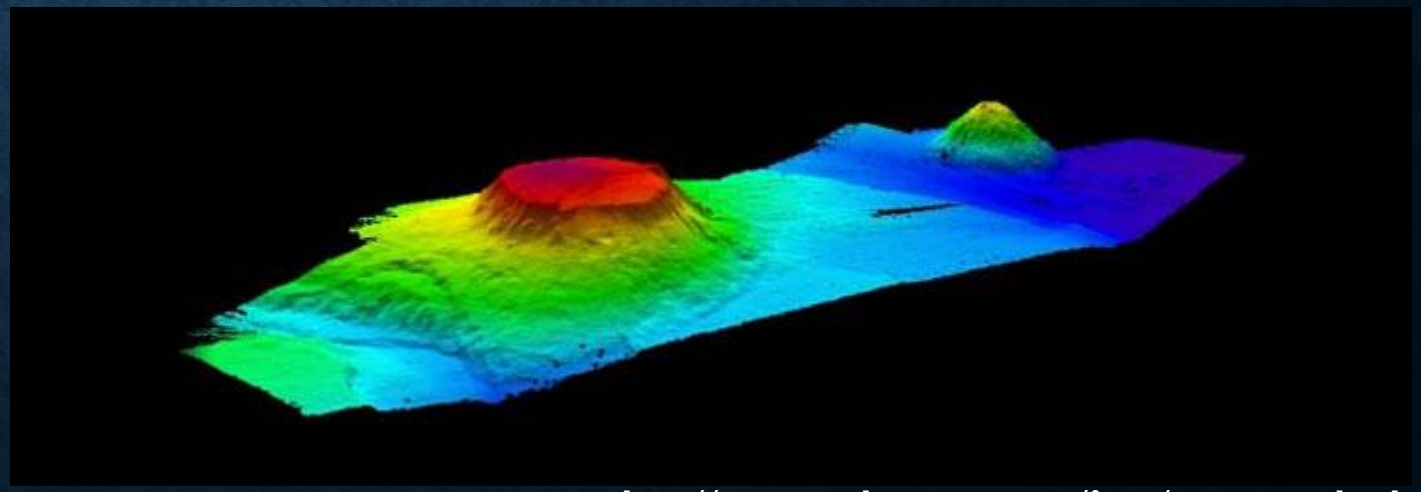
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Geophysical Data Center, 2006. 2-minute Gridded Global Relief Data (ETOPO2v2) http://www.ngdc.noaa.gov/mgg/fliers/06mgg01.html)

BEAR SEAMOUNT

- North West Atlantic Ocean (39° 55’ N; 67° 30’ W)
- 103 million years old
- Guyot
- Rises 2000-3000 m from seafloor
- Continental slope
- 1100 m below surface

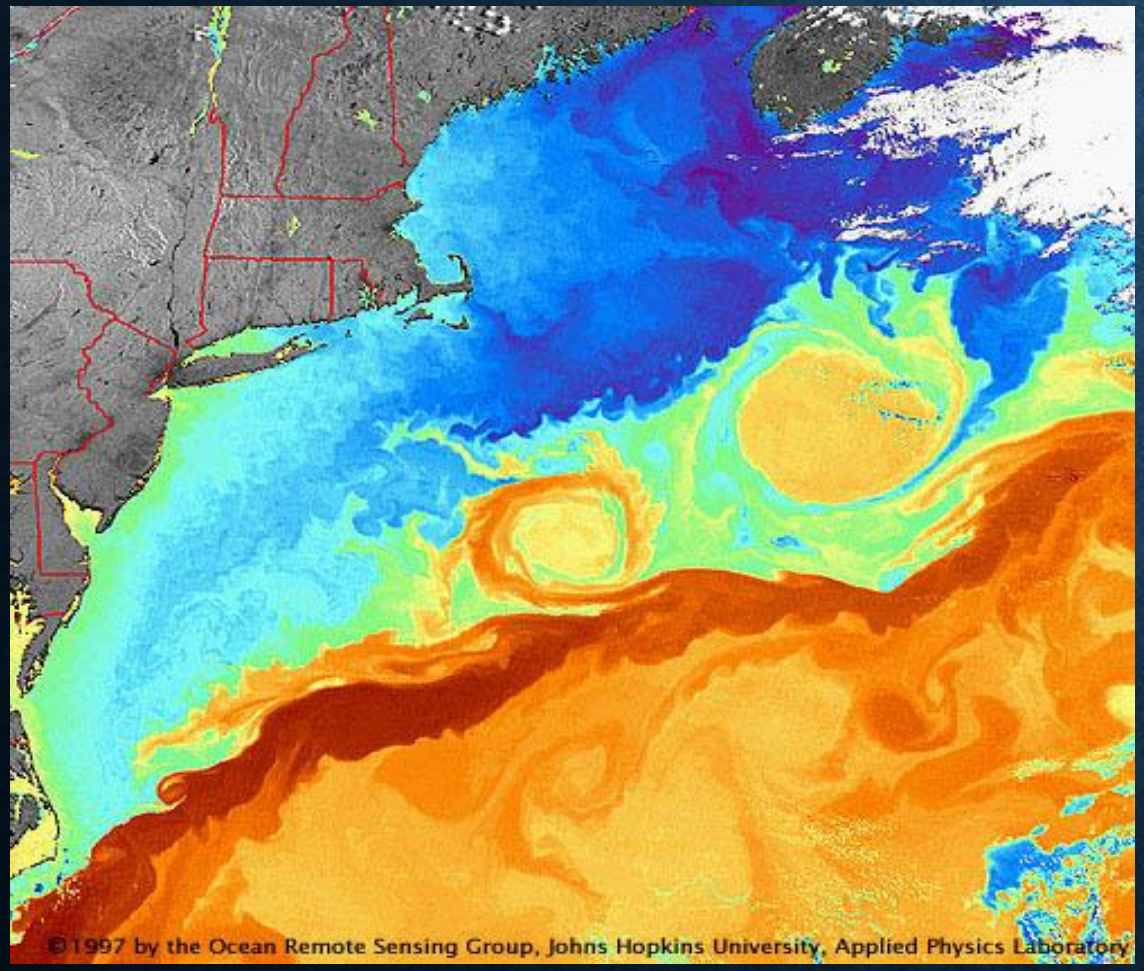


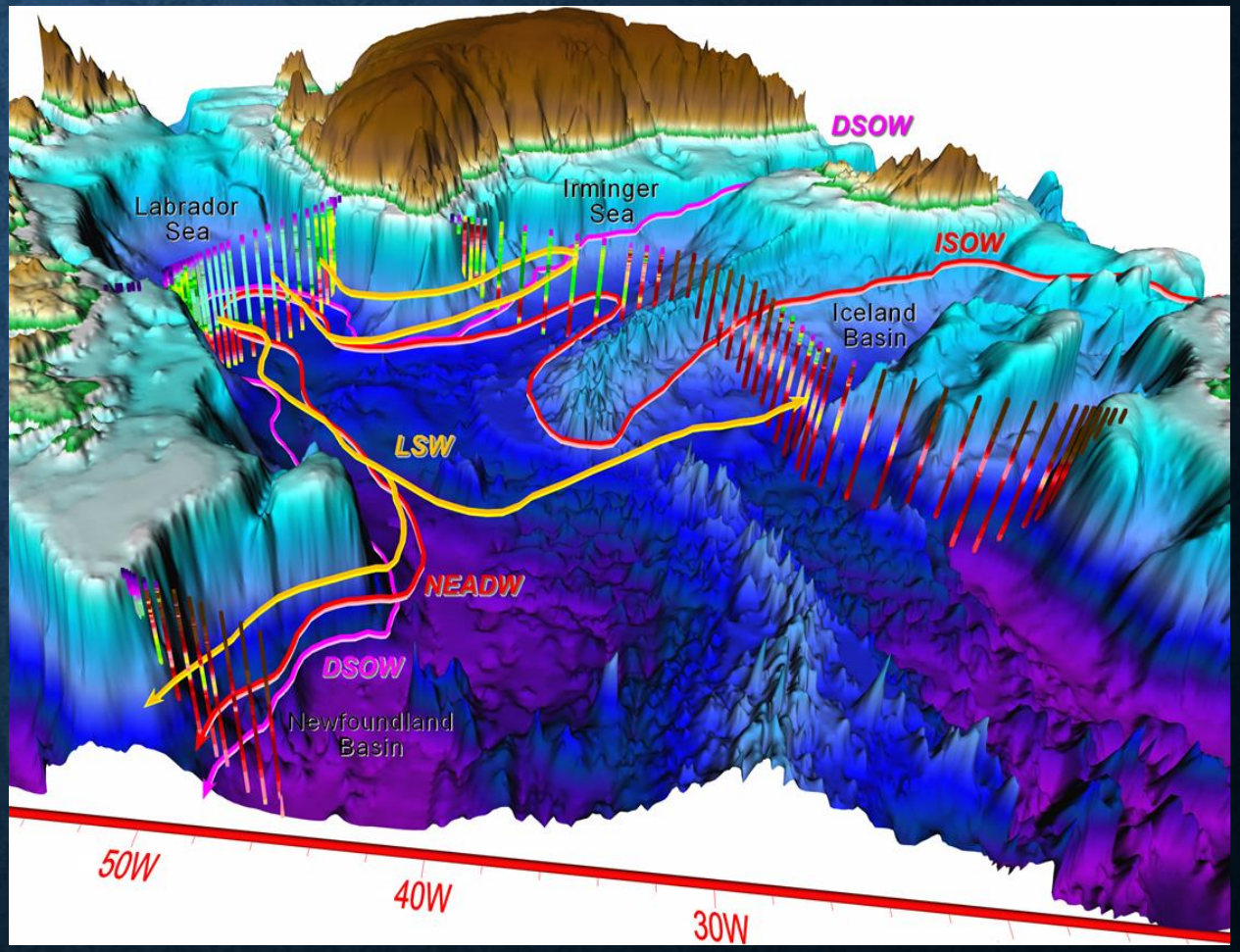
(Watling, 2004)



http://oceanexplorer.noaa.gov/facts/seamounts.html

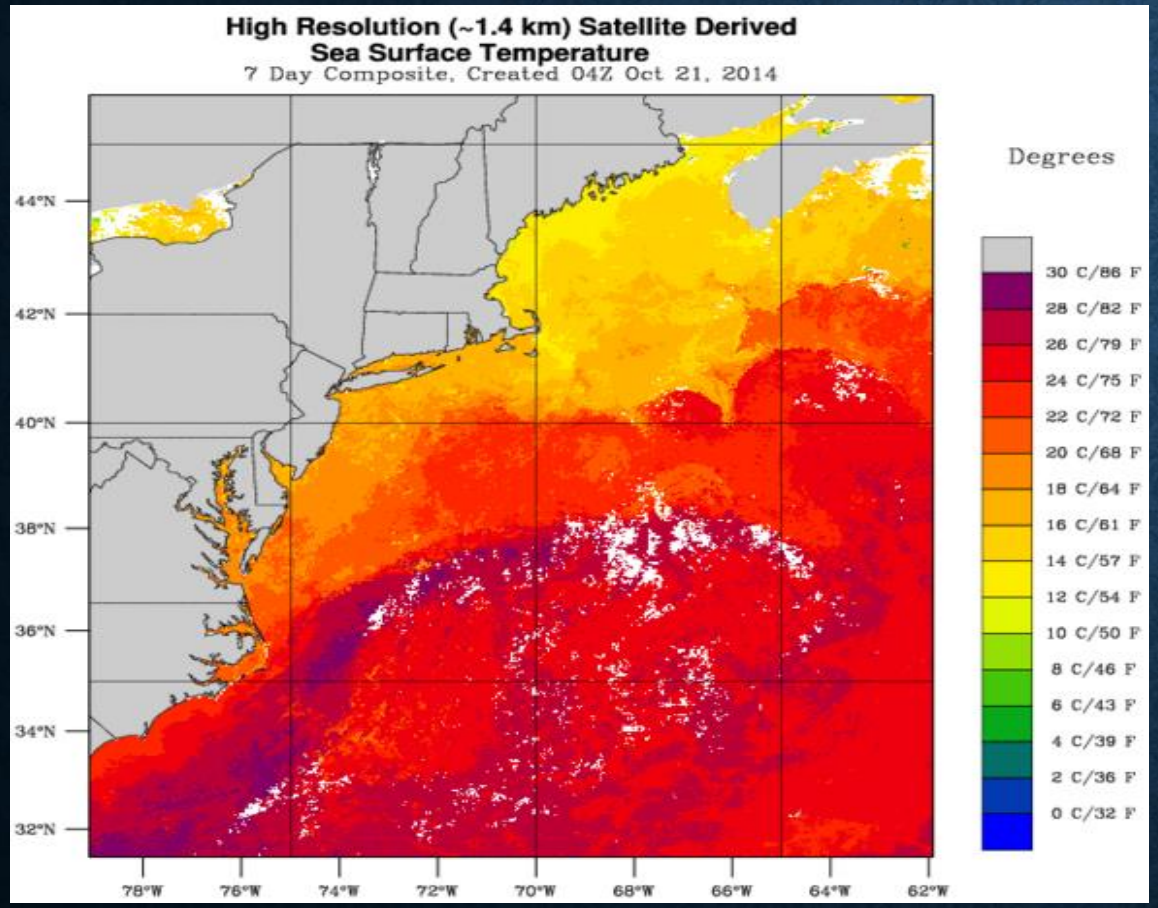
GULF STREAM AND DEEP WESTERN BOUNDARY CURRENT



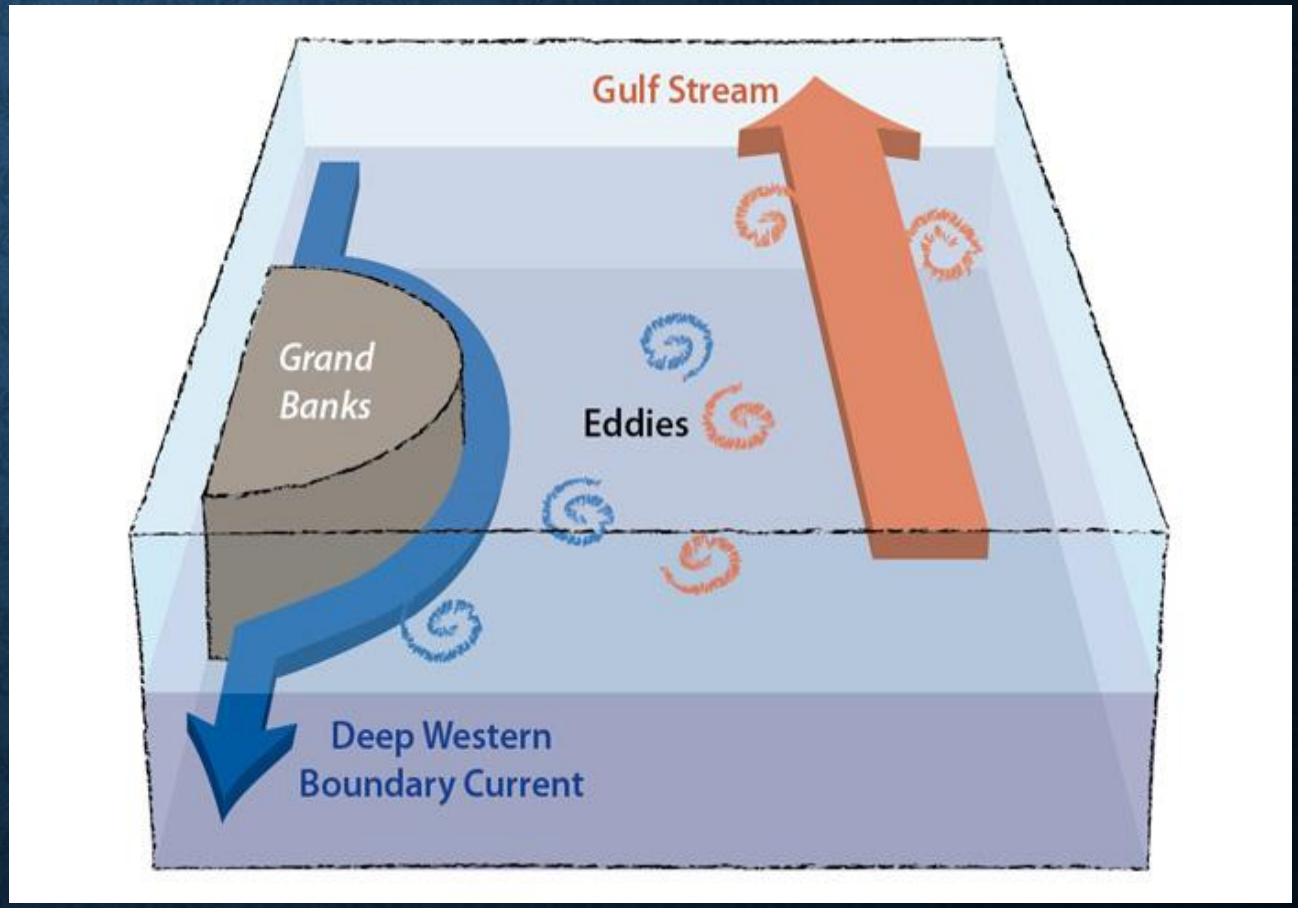


Bedford Institute of Technology

WARM-CORE RINGS



http://www.esrl.noaa.gov/psd/



www.whoi.edu

MOTIVATION

- Previous visits to Bear Seamount
  - Fish (Moore et al., 2003; 2004; 2008)
  - Corals (Auster et al. 2005)
  - Benthic species (Boyko, 2006)
- Bear Seamount crustacean population?
  - What pelagic species are there?
  - Abudance of each species?
  - Diversity at the seamount?
- Local biogeography
  - North, South, East, West or Summit

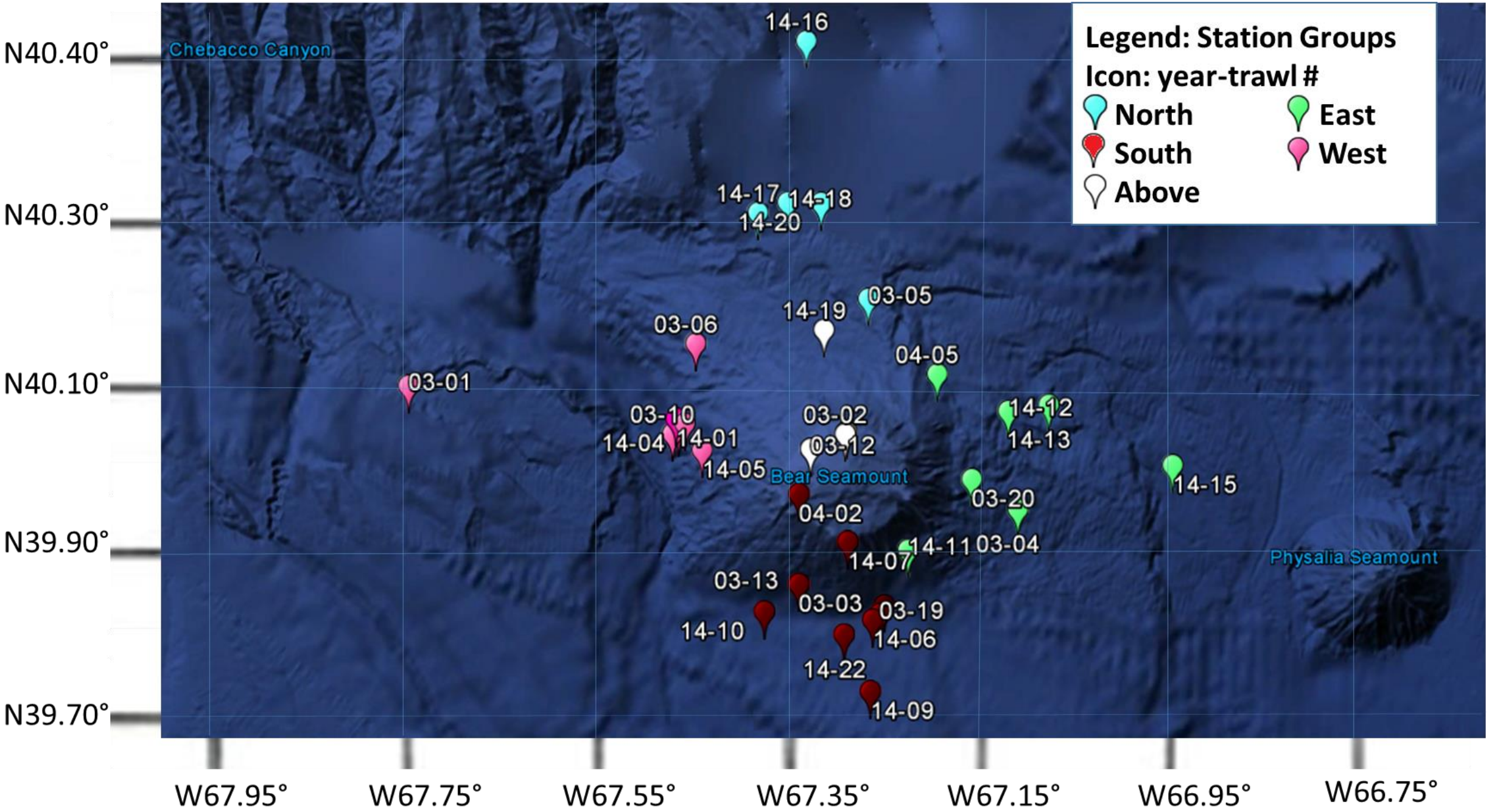
Vessel and Gear

- NOAA RV *Delaware II* (155 ft.)
- May 13-23, 2003
- June 2-11, 2004
- International Young Gadoid Pelagic Trawl (IYGPT)

http://www.moc.noaa.gov/de/index.html

- NOAA RV *Pisces* (200 ft.)
- October 14-26, 2014
- Polytron Midwater Rope Trawl (PMRT)

http://www.moc.noaa.gov/pc/

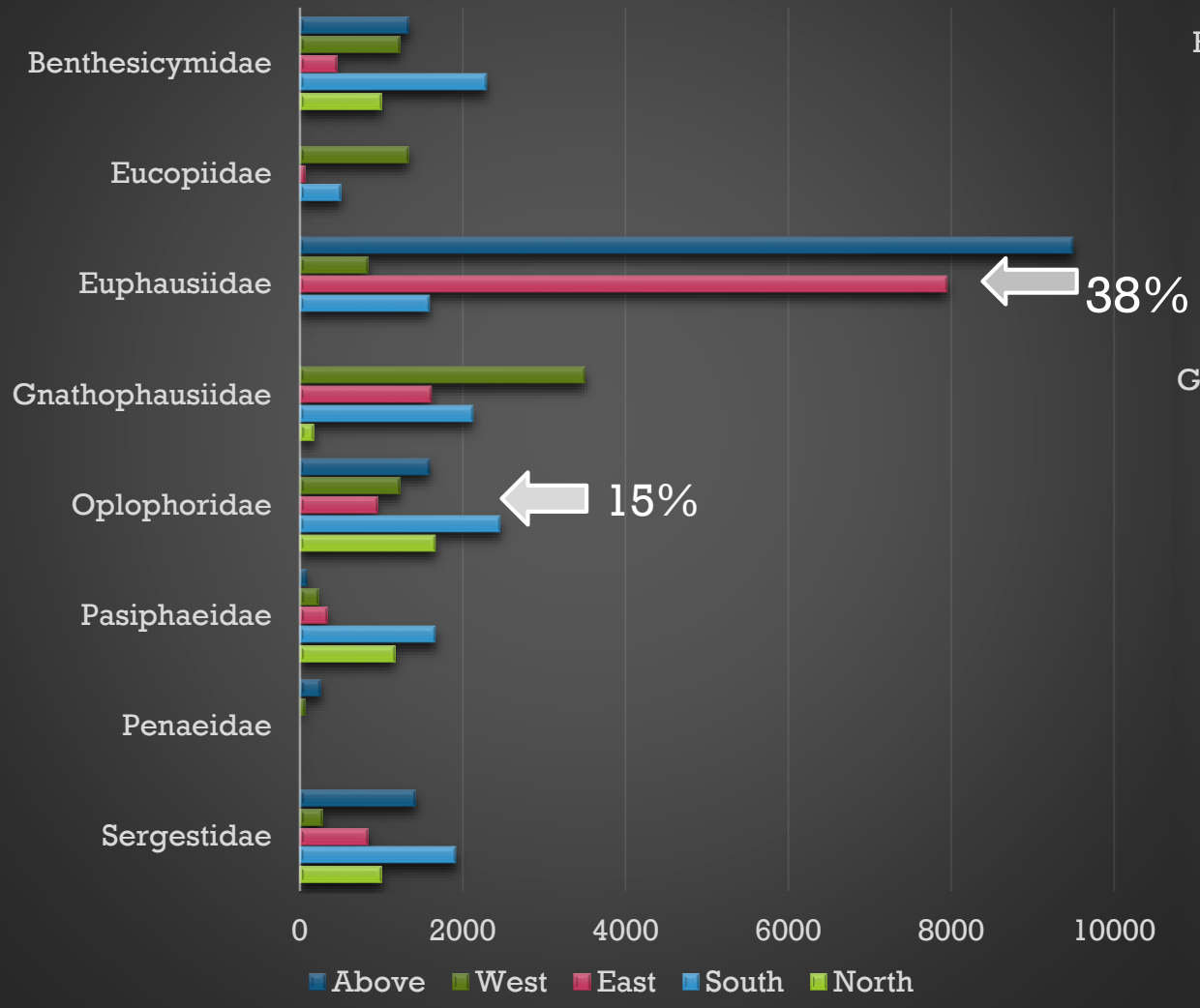

Legend: Station Groups
Icon: year-trawl #
North
East
South
West
Above
Chebacco Canyon
Bear Seamount
Physalia Seamount
14-16
14-17
14-18
14-20
03-05
14-19
03-06
04-05
03-01
03-10
03-02
14-12
14-04
14-01
03-12
14-13
14-05
14-15
03-20
04-02
14-11
03-04
14-07
03-13
03-03
03-19
14-10
14-06
14-22
14-09
N40.40°
N40.30°
N40.10°
N39.90°
N39.70°
W67.95°
W67.75°
W67.55°
W67.35°
W67.15°
W66.95°
W66.75°

COLLECTION/ SORTING/ IDENTIFICATION

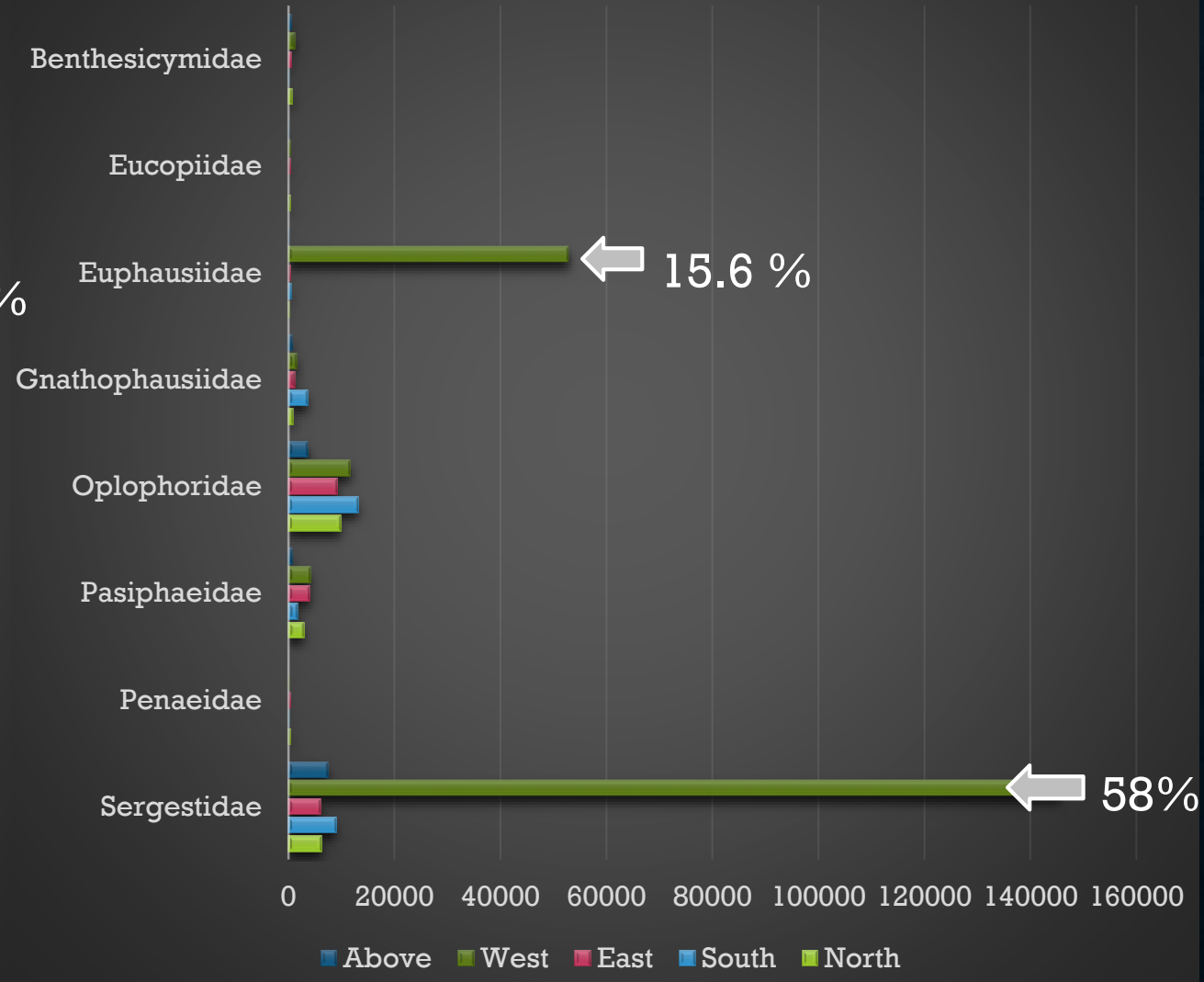
ANALYSIS

- Compare stations against own respective gear type
  - CPUE (N/min)
  - Shannon Weiner diversity (H')
  - Species richness (S)
  - Species evenness (J')
- Multivariate statistical analysis
- Primer (v.7, Clarke, 2015)
  - Bray-Curtis Similarity Indices
  - Non-metric Multidimensional Scaling Plots
  - Cluster Analysis
  - Similarity Profiles (SIMPROF; 999 $p<0.05$)
  - Analysis of Similarity (ANOSIM; 999 $p<0.05$)
    - Pairwise dissimilarities

CPUE (10-4) of Families by Location using the IYGPT



CPUE (10-4) of Families by Location using the PMRT



AVERAGE DIVERSITY INDICES

Gear	Location	S	CPUE (10^{-2})	H'	J'
	North	7	50	2.17	0.79
	South	14.5	152.50	1.55	0.83
IYGPT	East	11.33	140	1.46	0.62
	West	14.5	101.50	2.29	0.87
	Above	9.5	155	1.44	0.63
	North	17	224.67	2.22	0.79
	South	10.2	596.6	1.73	0.76
PMRT	East	17.67	278.33	2.19	0.77
	West	18.5	2971.5	1.47	0.50
	Above	14.5	145.5	2.26	0.85

ANOSIM PAIRWISE ANALYSIS

Spring Stations (IYGPT)

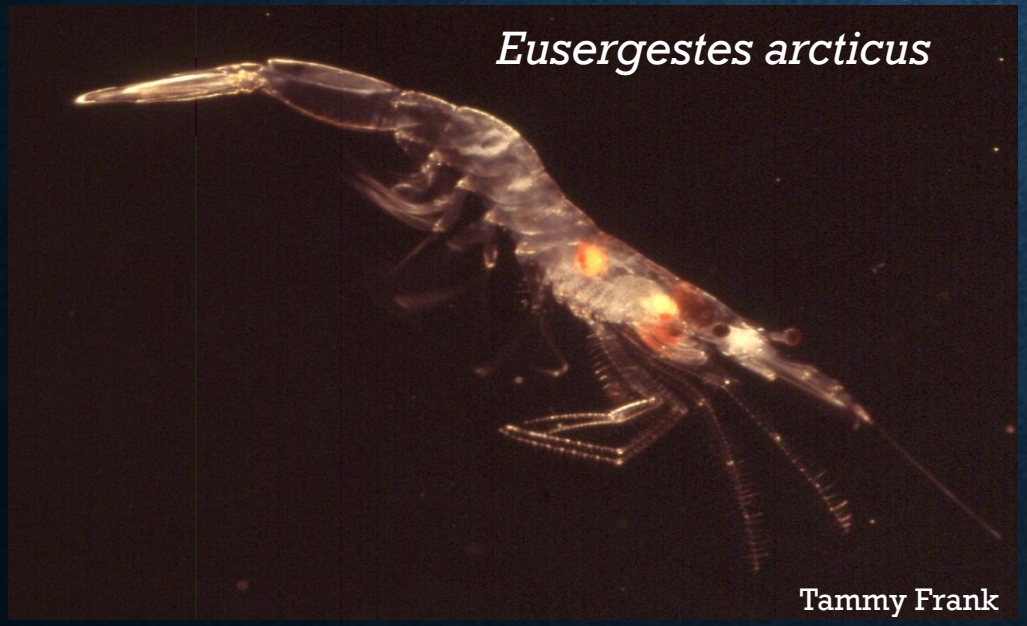
Groups	R Statistic	P value
West, South	-0.143	0.667
West, East	-0.25	0.80
West, North	-0.5	0.100
West, Above	0.5	0.333
South, East	**0.333**	**0.057**
South, North	0.179	0.40
South, Above	0.357	0.20
East, North	-0.167	0.70
East, Above	0	0.40

Fall Stations (PMRT)

Groups	R Statistic	P value
West, South	**0.313**	**0.048**
West, East	**0.481**	**0.029**
West, North	**0.704**	**0.029**
West, Above	0.857	0.067
South, East	0.005	0.50
South, North	-0.282	0.982
South, Above	-0.255	0.81
East, North	-0.074	0.70
East, Above	0.417	0.20
North, Above	0.167	0.50

CONCLUSION

- Decapoda and Euphausiacea were the most speciose orders
- CPUE's dominated by mid-to-higher latitude species such as *Eusergestes arcticus* and *Meganyctiphanes norvegica*



CONCLUSION (CONT.)

- West side was significantly different in species present and CPUE in the Polytron Rope Trawl
  - We hypothesize that warm core rings increase CPUE's on west side due to frontal concentrations.
- Diversity was found highest at the west and summit stations

SIGNIFICANCE

- Baseline data on pelagic crustaceans at Bear Seamount
- 66 species identified in 35 midwater trawl stations from surface to 2238m
- Biophysical coupling hypothesized for species accumulation
- Two species are new records for the NW Atlantic.
  - *Pasiphaea hoplocerca* (NE Atlantic) and *Pasiphaea merriami* (GOM)
  - May have traveled by means of currents and or nearby seamounts as hypothesized by Hubbs (1959) and Moore (2004) for fish

http://www.boldsystems.org/index.php

http://crustiesfroverseas.free.fr/illustration.php

QUESTIONS?