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

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SEAMOUNTS

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

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

http://oceanservice.noaa.gov/facts/guyot.html
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
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?
  • Abundance 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)

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

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

- **Benthesicymidae**
- **Eucopiidae**
- **Euphausiidae**
- **Gnathophausiidae**
- **Oplophoridae**
- **Pasiphaeidae**
- **Penaeidae**
- **Sergestidae**

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

- **Benthesicymidae**
- **Eucopiidae**
- **Euphausiidae**
- **Gnathophausiidae**
- **Oplophoridae**
- **Pasiphaeidae**
- **Penaeidae**
- **Sergestidae**

- **Above**
- **West**
- **East**
- **South**
- **North**

- **CPUE (10-4)**
- **Location using the IYGPT**
- **Location using the PMRT**

- **38%**
- **15%**
- **58%**
- **15.6%**
<table>
<thead>
<tr>
<th>Gear</th>
<th>Location</th>
<th>S</th>
<th>CPUE  ((10^{^2}))</th>
<th>H’</th>
<th>J’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>North</td>
<td>7</td>
<td>50</td>
<td>2.17</td>
<td>0.79</td>
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<tr>
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<td>South</td>
<td>14.5</td>
<td>152.50</td>
<td>1.55</td>
<td>0.83</td>
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<tr>
<td>IYGPT</td>
<td>East</td>
<td>11.33</td>
<td>140</td>
<td>1.46</td>
<td>0.62</td>
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<td></td>
<td>West</td>
<td>14.5</td>
<td>101.50</td>
<td>2.29</td>
<td>0.87</td>
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<tr>
<td></td>
<td>Above</td>
<td>9.5</td>
<td>155</td>
<td>1.44</td>
<td>0.63</td>
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</tr>
<tr>
<td></td>
<td>North</td>
<td>17</td>
<td>224.67</td>
<td>2.22</td>
<td>0.79</td>
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<td></td>
<td>South</td>
<td>10.2</td>
<td>596.6</td>
<td>1.73</td>
<td>0.76</td>
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<tr>
<td>PMRT</td>
<td>East</td>
<td>17.67</td>
<td>278.33</td>
<td>2.19</td>
<td>0.77</td>
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<tr>
<td></td>
<td>West</td>
<td>18.5</td>
<td>2971.5</td>
<td>1.47</td>
<td>0.50</td>
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<tr>
<td></td>
<td>Above</td>
<td>14.5</td>
<td>145.5</td>
<td>2.26</td>
<td>0.85</td>
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</tbody>
</table>
## ANOSIM PAIRWISE ANALYSIS

### Spring Stations (IYGPT)

<table>
<thead>
<tr>
<th>Groups</th>
<th>R Statistic</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>West, South</td>
<td>-0.143</td>
<td>0.667</td>
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<tr>
<td>West, East</td>
<td>-0.25</td>
<td>0.80</td>
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<tr>
<td>West, North</td>
<td>-0.5</td>
<td>0.100</td>
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<tr>
<td>West, Above</td>
<td>0.5</td>
<td>0.333</td>
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<tr>
<td><strong>South, East</strong></td>
<td><strong>0.333</strong></td>
<td><strong>0.057</strong></td>
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<tr>
<td>South, North</td>
<td>0.179</td>
<td>0.40</td>
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<tr>
<td>South, Above</td>
<td>0.357</td>
<td>0.20</td>
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<tr>
<td>East, North</td>
<td>-0.167</td>
<td>0.70</td>
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<tr>
<td>East, Above</td>
<td>0</td>
<td>0.40</td>
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</tbody>
</table>

### Fall Stations (PMRT)

<table>
<thead>
<tr>
<th>Groups</th>
<th>R Statistic</th>
<th>P value</th>
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</thead>
<tbody>
<tr>
<td>West, South</td>
<td>0.313</td>
<td>0.048</td>
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<tr>
<td>West, East</td>
<td>0.481</td>
<td>0.029</td>
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<tr>
<td><strong>West, North</strong></td>
<td><strong>0.704</strong></td>
<td><strong>0.029</strong></td>
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<td>West, Above</td>
<td>0.857</td>
<td>0.067</td>
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<td>South, East</td>
<td>0.005</td>
<td>0.50</td>
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<tr>
<td>South, North</td>
<td>-0.282</td>
<td>0.982</td>
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<tr>
<td>South, Above</td>
<td>-0.255</td>
<td>0.81</td>
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<tr>
<td>East, North</td>
<td>-0.074</td>
<td>0.70</td>
</tr>
<tr>
<td>East, Above</td>
<td>0.417</td>
<td>0.20</td>
</tr>
<tr>
<td>North, Above</td>
<td>0.167</td>
<td>0.50</td>
</tr>
</tbody>
</table>
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://crustiesfromseas.free.fr/illustration.php
QUESTIONS?