
To examine the Washington continental shelf for the presence of glass sponge reefs.

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Washington Sea Grant
and
The College of Ocean and Fisheries Sciences, UW.

THE AREA OF THE SHELF BREAK, OFF-SHORE GRAYS HARBOR, WASHINGTON, DEPTH ABOUT 160 METERS.
We had clues that there were sponges on the margin near Grays Harbor;
from fishing trawls that had recovered the same species of glass sponges that were present at the Georgia Strait reefs.
Side-scan sonar image of sponge reef site: dark areas are old reefs. Labels S are sponge sites.
Mound fields in area where we have observed glass sponges.

White areas are hard/flat sand,

**Dark areas are** (rough/soft reflectors) **reef**
Specific 2008 Cruise Goals

1. Identify areas of the reefs that had live sponge populations.

2. Take some high resolution pictures of the sponges, so we could write our next proposal…

3. Sample some live sponge tissue for carbon isotope analyses, to see if there is a relationship between methane venting and glass sponge reefs.

4. Determine if there were active methane bubble plumes venting from the seafloor at/near the sponge site.

We did all of these things on the first day…

Moral – successful oceanographic cruises depend partly on luck; but mostly depend on having really good people to help you on the cruise.
Preparing the ROV in Westport, WA

Bubble Catcher

Sample grab, with sponge
Launching Remotely Operated Vehicle over methane plume site, 40 miles off-shore from Grays Harbor, Washington.
Glass sponge (species H. calyx) sitting on glacial erratic at 160 meters depth on the Washington outer continental shelf.
QUESTION from 2007 cruise – are these fish trawling scars? Are the reefs being destroyed by the fishing fleet?
12 khz data over gouges, which contain glacial erratics.

ROV images of glacial erratics in iceberg gouges
How does that work?

When you have icebergs that are thicker than the water depth, their movement **gouges trenches** in the margin sediments (or in the existing sponge reefs).
During the last Glacial Period, sea level was about 125 meters below present day sea level. And the depth of the Grays Canyon reefs is only 160 meters.

Iceberg gouges in the Atlantic margin sediments, off New Jersey coast.
SO – the surprising answer is – if the trenches in the sponge reefs are (probably) iceberg gouges from the last glacial period, and if glass sponges can’t grow in shallow water due to competition with diatoms (for silica);

Then the Grays Canyon glass sponge reefs are A LOT OLDER than we ever thought, and may date back to the Last Interglacial Period: the Eemian (125,000 yrs BP).

Or older…
But the sponges are quite happy living on top of the glacial erratics from the Last Glacial Maximum.
3.5 KHZ PASS OVER POCKMARK, showing structural control of fluid/gas flux

METHANE GAS IN SEDIMENTS

We assumed these were methane bubbles

500 meters
On our 4th dive, we took the ROV on a traverse through the acoustic ‘fog’ overlying the pockmark, expecting to see large methane bubble plumes.

We went from here… to here

500 meters
Krill swarm near methane bubble plume
Samples of these annoying animals were identified as *Thysanoessa spinifera* (J. Keister, pers.comm.) and they were sent to the WHOI carbon isotope lab for analysis - to see if they are getting food from the methane.

So now the question is – how common is this phenomena on the Washington margin?
Sediment layers with methane gas

Fault and gas up-welling zone

3.5 kHz seismic image over methane vent area

Krill swarm with bubble stream

This site is 4 miles distant from the previous site.

bubble stream over fault

Sediment layers with methane gas

Fault and gas up-welling zone
METHANE PLUMES, from 3.5 khz data

FISHING HOT SPOTS, E. CLARKE, NMFS, pers. comm.
3.5 KHz survey over glass sponge reef, with methane bubble plumes.
Can emissions of methane from the sub-seafloor support a chemosynthetic ecosystem on the Washington margin?

[a hypothesis]
MAJOR QUESTIONS – arising

1. We have methane plumes with, and without krill swarms, and other sites (Oregon, Santa Barbara) with methane plumes don’t have krill swarms. Why?

2. Are krill and glass sponges really using the methane as a food/energy source? Completely, partially, not at all?

3. If the krill are using the (non-seasonal) methane emissions, does that impact their behavior?

4. Are the methane plumes the reason that the WA margin has such high productivity?

5. What else is going on just over the shelf edge, where methane hydrates are stable at 500 meters depth? Entirely new ecosystems?