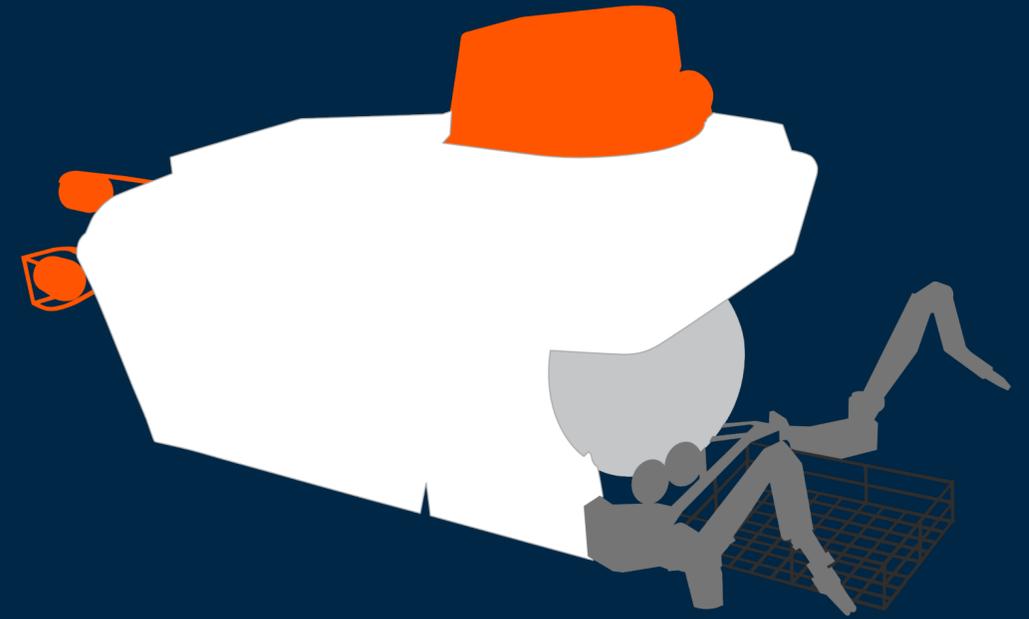


# ALVIN Upgrade & Science Verification Expedition Update



Adam Soule | URI-GSO | Ocean Exploration Cooperative Institute



# Alvin Overhaul & Upgrade

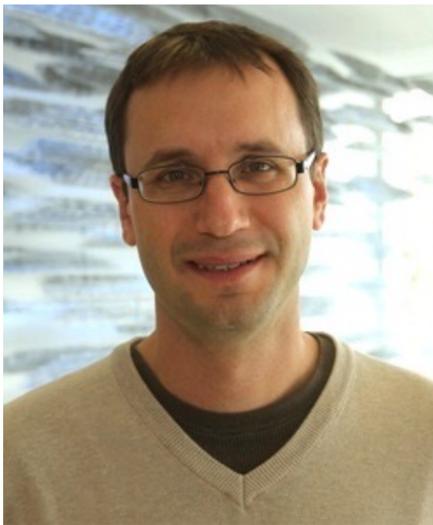
- Conducted complete sub overhaul (as planned every ~5 years)
- Upgraded several key components required to achieve 6500m depth rating
  - incl. Variable ballast system; Syntactic foam; Seawater pump; Frame
- Upgraded systems to improve vehicle performance
  - incl. Thrusters and motor controllers, cameras, data systems, power management.
- *Adjudicating design changes with NAVSEA took longer than expected leading to delay in departure of ~6 weeks.*

# Alvin Certification Dives

- Onshore testing (WHOI)
- Dockside testing (Bermuda) - *in progress*
- Progressive depth rating (Bermuda to Puerto Rico)
- Oct. 26 to Nov. 17

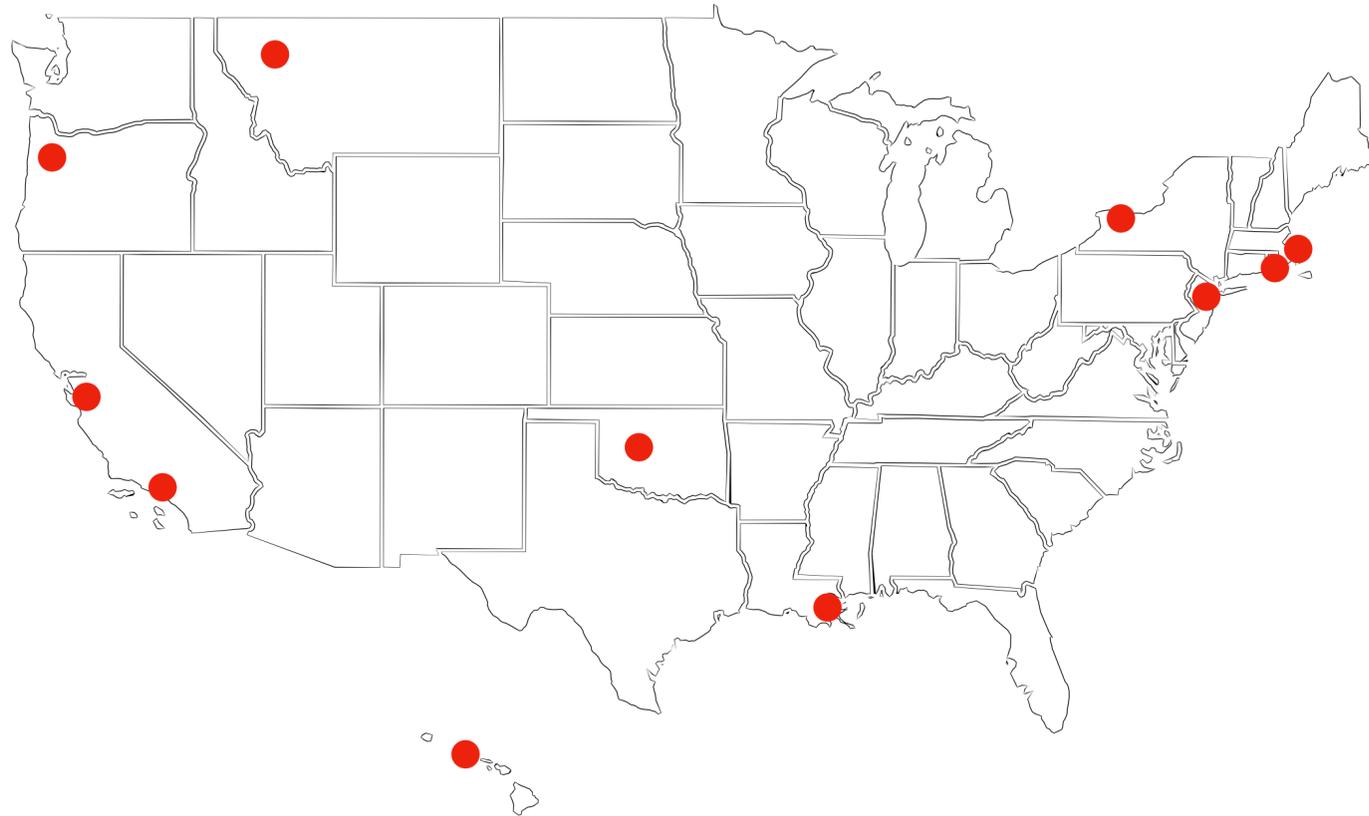


# Alvin SVE Team



# Alvin

## SVE Team



### By the numbers...

20 Total Scientists

12 Male / 8 Female

10 New Users

8 Early Career / 5 Senior / 3 Mid

3 Engineers

2 Science Communicators

2 Post Docs

1 Graduate Student

1 Native Puerto Rican

1 Puerto Rico Resident

# Alvin SVE

## Cruise Plan

Morehead  
City, NC  
(October  
28)

- Mobe in San Juan, PR (11/20)
- Depart San Juan (11/21 0800)
  - *10 dive days in PR Trench*
- Personnel offload in San Juan (12/01)
- Transit to Morehead City, NC (5 days)
- Arrive Morehead City, NC (12/07 0800)
- Demobe Morehead City (12/08)

Mid-Cayman SC



PR Trench

San Juan, Puerto Rico  
(November 21 to December 1)

# Alvin SVE

## Tools & Technology

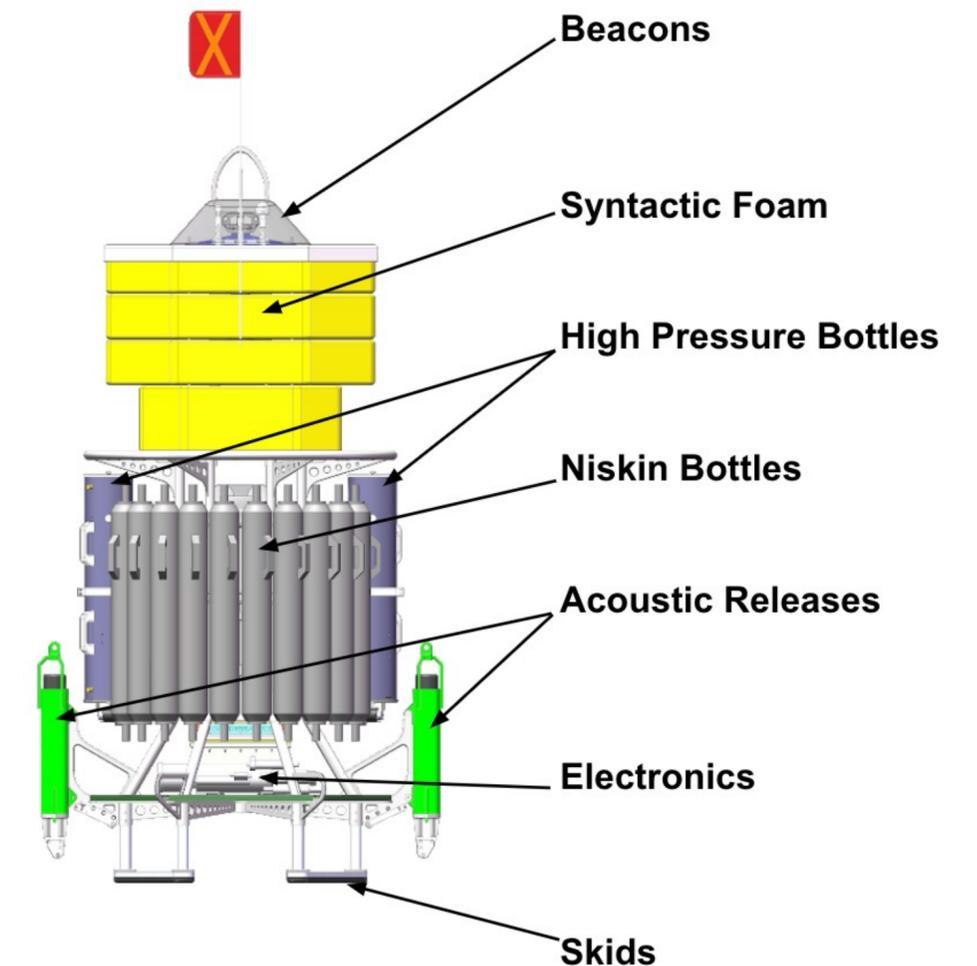


### Alvin systems to be tested:

Imaging (still/video), Navigation, Event Logging, Data Transfer, Sample collection/storage, Dive Ops (extended day).

### Augmenting technology:

Deep Autonomous Profiler (DAP) CTD and lander will extend observations and sampling to hadal depths (eDNA, passive acoustics, baited camera)



## Dive Sites (PR Trench)

### North Trench

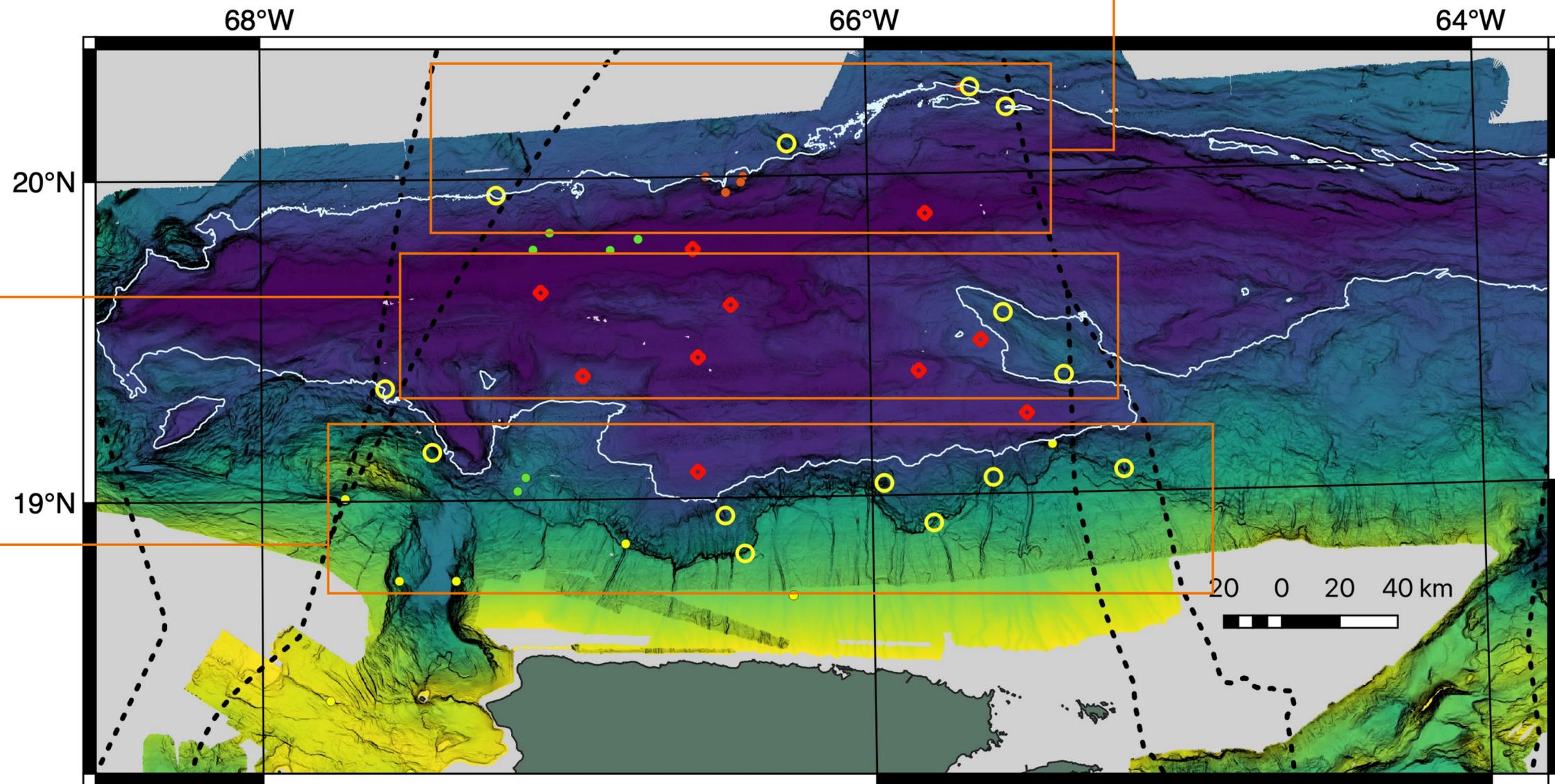
Fault exposures revealing lower crust and upper mantle with serpentinization/alteration. Hard substrate for sessile fauna.

### Trench Axis

Potential mud volcano. 'Main ridge' structure. Deep sediments.

### South Trench

Edge of carbonate platform. Sites of large landslides. Potential methane or freshwater seeps.



# Alvin SVE

## Science Teams

- Geology/Chemistry
- Microbiology
- Macrobiology
- Engagement (Science Comms)

# Alvin SVE

## Verification Teams

- Imaging
- Navigation & Maneuverability
- Data
- Conops (e.g., extended dive days, sub-to-ship comms).

## Remote Participation

- High ship-to-shore bandwidth
- Research community participation in post-dive and dive-planning meetings (via Zoom)
- Daily live briefings (via Facebook & YouTube)
- Remote engagement with classrooms, science centers, media
  - *SUNY Genesee - Communicating Science*
  - *Hawaii Pacific University - Marine Biology*
- Lectures for classes taught by science party

# Alvin SVE

## Media

- **WIRED** (<https://www.wired.com/story/the-oldest-crewed-deep-sea-submarine-just-got-a-big-makeover/>)
- **PBS: Changing Seas** (<https://www.youtube.com/watch?v=2H3a1oMDkRE>)
- **Seeker** (<https://www.youtube.com/watch?v=-QhLmOh6uAU>)
- **Cape Cod Times** (<https://www.capecodtimes.com/story/news/2021/10/27/woods-hole-research-sub-alvin-50-million-dollar-upgrade-ocean-floor-sea-trials/6090066001/>)
- **NDSF Blog** (<https://ndsf.whoi.edu/news-media/>)