

# Summary of Post-Cruise Debriefs

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**NDSF** NATIONAL  
DEEP SUBMERGENCE  
FACILITY



# Summary of 2023 *Sentry* Debriefs

- Chris German (WHOI), Vicinity of Endeavour Field, Juan de Fuca Ridge (*Sentry* on R/V *Atlantis*) 2023
- Tina Treude (UCLA), Santa Barbara Basin (*Alvin* + *Sentry* on R/V *Atlantis*) 2023
- Tim Battista and Charles Menza (NOAA), NRDA Mesophotic and Benthic Communities Restoration, Gulf of Mexico (*Sentry* on R/V *Nancy Foster*) 2023

# Sentry Debrief Highlights – Modes of Use

- German et al.
  - Mid-water (i.e. no DVL lock) tracking and sampling of Endeavour vent plumes >100 km distance combined with follow-on CTD sampling
  - Clean trace metal sample collection
  - Sentry operations incorporated shoreside plume and current modeling using realtime Sentry and ship data, allowing mid-mission changes
- Treude et al.
  - Photo transects of bacterial mats+ dual O<sub>2</sub> sensors (night program coupled with Alvin dives)
- Battista/Menza et al.
  - Map deep-sea habitats using multibeam, sidescan, and photography – transects run at both 70 m and 6 m altitudes for multibeam/sidescan and photography, respectively
  - Untended operations desired

# Sentry Debrief Highlights – Issues of Note 1

- German et al.
  - New SUPR sampler for clean trace metal water sampling
    - Precruise sensor integration communication difficult
    - Repeated failures at sea due to SUPR pump drawing too much current and burning out the electronics – solved by using a less capable power supply
    - ***Recommendation: Strive to test new user-supplied equipment on Sentry prior to expeditions***

# Sentry Debrief Highlights – Issues of Note 2

- German et al.
  - SAGE and METS methane sensors
    - Not rated deep enough for the desired operations into deeper waters away from the spreading center
    - Rated deep enough for the planned midwater Sentry transect depths, but not deep enough in the event that Sentry wound up on the seafloor.
    - This limited some of the operations
    - ***Recommendation: Better communicate the depth rating requirements for user supplied equipment***

# Sentry Debrief Highlights – Issues of Note 3

- Battista/Menza et al.
  - Overall found the pre-cruise process challenging, in part due to no prior experience with NDSF and working on a non-UNOLS ship
  - Expected a higher level of survey data processing by the Sentry team
    - Did not impede operations – just that the reality didn't meet expectations
    - ***Recommendation: Clearly communicate the level of data processing provided by the Sentry team at sea during pre-cruise planning – particularly for science parties outside the NSF-funded, UNOLS world***

# Sentry Debrief Highlights – Sentry Reliability

- The core vehicle was largely reliable, excepting:
  - Strobe flooded during Battista/Menza Gulf of Mexico surveys, costing four out of eight planned photo transects
  - Control surface (fin) failure cost a mission abort, and resulted in attended rather than unattended operations until the fix was validated (also during Battista/Menza Gulf of Mexico surveys).

# *Sentry* Debrief Highlights – Sentry Team

- The PI's consistently praised the skill, professionalism, hard work, and enthusiasm of the Sentry team members at sea.
- Expedition leaders were Matt Silvia & Sean Kelley, also explicitly mentioned were Justin Fujii, Zac Berkowitz, and Isaac Vandor.



# Sentry Debrief Highlights – “Culture of Innovation”

One PI pointed out they think that “constant vigilance” is needed to sustain a “culture of innovation with Sentry”.

The long term trend in Sentry use is towards new sensors and use cases, indicating that the science user community and NSF do view Sentry as a research platform.

It also remains true that innovation is difficult, particularly on autonomous platforms in the ocean, and particularly under the pressure to pull off cruise after cruise.

# Summary of July-Sept. 2023 *Jason* Debriefs

Zumberge: TN-419

Huber: TN-420

Orcutt: TN-421

Kelley: TN-422 OO1 RCA

# Jason Debriefs Overview

- A lot of praise for the Jason team overall: “*professional and cooperative*”. “*outstanding, friendly, approachable, experienced, and capable*”.
- Integration of user-provided equipment onto the vehicle generally went very well.
- Scientists appreciated that Jason data is provided quickly and easy to access on the shared ship drives
- All cruises benefited from high-speed bandwidth with remote participation, outreach/education, and trouble-shooting issues.
- A few cruises in this period were impacted by continued issues with the winch and the manipulator arms.

# Pre-cruise Planning - Recommendations

Sealog customization done on the cruise was not offered up.

- **Recommendation:** *Make Sealog customization part of pre-cruise planning*

Though the Jason team is typically part of overall cruise-planning calls with the ship, a dedicated meeting with just Jason team was not part of pre-cruise planning in all cases but would be appreciated.

- **Recommendation:** *Make sure all cruises have at least one dedicated pre-cruise planning meeting with just Jason team*

Process of acquiring and providing maps for Jason navigation not clear

- **Recommendation:**
  - *Clear instructions for chief scientists about what maps they need to provide and in what format. Even better would be instructions or advice for new users about how to identify and access appropriate maps.*

# Operations - Recommendations

Sometimes when operation had been done previously or instruments/equipment used before, issues arose because both scientists and Jason team assumed everything was set or didn't need discussion.

- **Recommendation:** *Even if an instrument has been used or activity has been done before with Jason, both Jason team and science party should not make assumptions and should instead make sure to include detailed planning discussions to confirm and check that everything is in place for smooth operations.*

Jason team does not provide dive reports or situation reports as a standard activity. This is difficult for record keeping, especially if chief scientists needs to communicate with funding agency or others about any issues that impacted science outcomes.

- **Recommendation:** *Jason team should develop a standard dive or situation report that documents technical issues and other information to share with science party and funding agencies.*

# Operations - Recommendations (continued)

In some cases, chain of command for communication between science party, Jason team, and ship was not clear. E.g., not clear who needed to notify bridge of certain activities or schedule changes.

- **Recommendation:** *The chain of communication needs to be very direct and clear, clarifying who (Jason team or science party) is in charge of what.*

It was noted that the lack of Wifi in the Jason van made it difficult for science party to communicate, as many science parties are beginning to rely on WhatsApp for critical real-time communication.

- **Recommendation:** *Wifi access for the science party in the van should be standard.*

# Summary of 2023 *Alvin* Debriefs

Fornari, Galápagos Platform (Alvin) March-April 2023

Treude, Santa Barbara basin (Alvin/Sentry) June-July 2023

Levin, Southern California (Alvin) July 2023

Lapham, Hydrate Ridge (Alvin) August 2023

# Alvin Debrief Highlights

- Many new users were able to dive for the first time
- Two of four cruises extensively used elevators with Alvin, increasing its capacity to use more equipment on each dive
- A new sonar mounted on the front of basket was “so good that we could see animals with it.” The sonar was also excellent at locating instruments on the seafloor.
- Users appreciated a new 10-minute video introduction to Sealog and the AIS



# Alvin Debrief Highlights

- Expanded bandwidth improved ship-to-shore communication.
  - Facilitated rapid changes to dive location when necessitated by weather.
  - Mission-critical shore-based scientists were in touch via email and zoom daily.

# Alvin Debrief Highlights

- Overall, PIs were pleased with the engagement of the Alvin team, their positive, professional demeanor, teamwork, and willingness to help
  - Expedition leader Randy Holt has the “trust of the team.” He communicates well with the officers, crew, and science party.
  - The pilots, including new pilot Nick Osadcia, are helpful on board and under water. They are “very engaged with streamlining operations and making things better for the future.” “They want to get the best samples, safely.”
  - Alvin data manager Joe Garcia is “terrific and a great asset to the group and the science team.”

# Pre-cruise and Mobilization

- Pre-cruise planning was generally useful
- Planning included discussions of setting up routine workflows as well as generation of new ideas
- Pressure tests of one new piece of equipment (e.g., in Germany) were well-coordinated with the Alvin team
- However, another instrument was insufficiently tested for Alvin. It was used on the CTD after several weeks of consideration during the cruise. Communication of pressure test expectations between science, marine techs, and Alvin teams is essential.

# Pre-cruise and Mobilization

- Scientists appreciated meeting with the expedition leader to plan their cruise. It would also be helpful to meet with the pilots that are sailing, when possible.
- Scientists request greater emphasis on the basket payload limit in air (400 lbs) during pre-cruise discussions, as well as limitations on materials (e.g., no glass allowed)

# Operations: Vehicle performance

- Vehicle performed well, dove at every opportunity when weather permitted.
- Three of four cruises got all dives that were planned. One of these cruises had an extra ½ day dive, while another gained 4 extra dives beyond expectations.
- One cruise only dove 30% of their planned dives. The lost dives were due to weather, not vehicle performance. One dive was largely unsuccessful for science due to poor visibility caused by swarming fish.

# Operations: Vehicle performance

- Bottom times were perceived as short by science observers (5-6 hours). Several cruises used elevators often. Efficiency of the pilots helped compensate for short bottom times.
- Three dives were shortened due to: a ground, a suction sampler problem, and a call to aid in a search for a missing airplane

# Operations: NDSF-provided equipment

- 4K cameras on the sub produced great imagery when the observers could control them.
- The iPads used to control the cameras often freeze. Frequently - often at least once per dive - the only solution was a complete system re-set. Such a re-set necessitated a call to top lab and retracing of troubleshooting steps. A hard reset reduces time spent on science. Sometimes the cameras remained inoperable.
- Users suggest returning to manual pan/tilt, focus, and zoom controls for cameras.
- However, most users like using the iPads for event logging in Sealog. Event logger (SeaLog) and dive review (SeaPlay) were used successfully on all cruises. The digital log helped streamline post-dive review, dive summaries and cruise reports.

# Operations: NDSF-provided equipment

- The HD cameras can behave erratically. One dive experienced a ground on an HD cam, but overall they worked fine when the iPads worked.
- Automatic frame grabber worked well. However, one cruise could not retrieve screen grabs taken by observers.
- Go Pros provided a perspective (wider view) of entire dive, especially when mounted on the brow. Starboard manipulator Go Pro also captured interesting shots.



# Operations: NDSF-provided equipment

- The port manipulator had some problems on several dives on one cruise. On one dive it could not be fixed, but the pilots were able to complete science objectives with the right manipulator.
- The slurp worked well when used, including modifying the inlet with a mesh on one cruise, to ‘pick up’ delicate samples and place them in bio quivers.
- Elevator also worked well.

# Operations: User-provided equipment

- Methane gas sampler worked well
- *Gaia instrument* lacked pressure certifications and was not used on Alvin
- Scientists brought out an FDOM sensor, but it caused a grounding problem and had to be turned off
- Quivers for collecting corals, MISO cameras, and the sheath “slide gate” for the slurp all worked well
- Science provided benthic chambers that were successfully deployed on elevators by Alvin team

# General Recommendations

- There is a need for focused discussions on pressure cert requirements during pre-cruise – as well as prioritizing follow-up communication
- Likewise, emphasizing ‘off limits’ materials for equipment fabrication will be helpful
- Calculating expected basket weights pre-cruise will ensure the weight limit is not exceeded by the desired basket set-up
- There is an opportunity to produce short video introductions of Alvin-supplied equipment, such as majors samplers, and camera and light placement and tips for effective use. The training video developed for AIS/Sealog control is a successful model to follow.

# General Recommendations (cont.)

- Scientists suggest adding Seaflog to a trial iPad, or computer, to allow users to get familiar with the interface before diving. Especially helpful for shallow sites with short descents.
- One team felt that pre-dive training was difficult to juggle during a short port call and transit. Suggestion was made to factor in port stop and transit duration to enable time for the required training.
- Improved network pipeline to the main lab for Alvin data access is vital. Data transfer is very slow and difficult to achieve in time, even for experienced scientists.
- Better communication between the Captain, SSSG, the bosun, the science party, and Alvin ops will help demobilization, especially the craning of big equipment go more smoothly.
- A forward looking echosounder on Alvin would be helpful for looking for bubbles.