

**Deep Submergence Science Committee (DESSC)
and the
National Deep Submergence Science Facility (NDSF)**

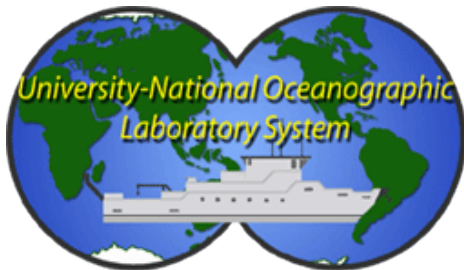
present

**A brief review of the deep
submergence vehicles
and
recent NDSF-DESSC activities**

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Advancing the capabilities of the deep submergence facility



Recent years have seen the rapid evolution of...

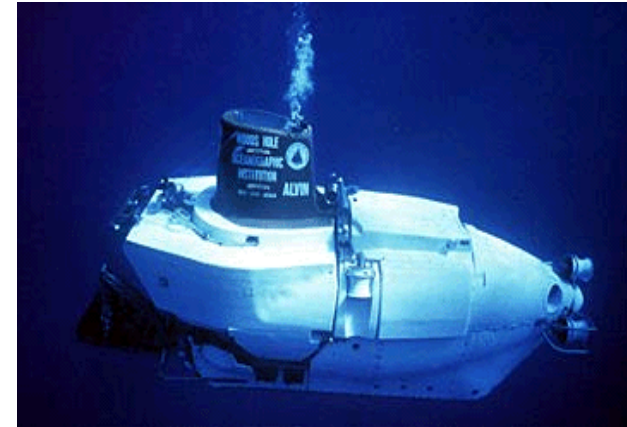
- Technology and applications
- Data production and archiving
- Management and personnel

...within the NDSF.

Here are some brief highlights of these changes, and some thoughts on where we are going.



The evolution of the DSV Alvin



- The *HOV Alvin* began its life with a steel sphere, a single manipulator, B&W imagery, LORAN, and the *R/V Lulu*
- Completed 60-100 dives a year

- Prior to refit, the *HOV Alvin* had a 4500m-rated titanium sphere, two manipulators, HD cameras and video, USBL, LBL, doppler, *R/V Atlantis*
- Completed up to 200 dives a year!



HOV Alvin upgrade



- **HOV Alvin upgrade**
- Equipped with a 6500m titanium sphere with five viewports, two manipulators, advanced HD imaging and storage, greater basket capacity, advanced nav and laser ranging
- Upgraded A-frame on the *RV Atlantis*
- *HOV Alvin* slated for sea trials in 2013; Science Verification Cruise (SVC) circa May 2013



*Old and new sphere, side by side.
Note different viewport layout*

4 Decades of DSL ROVs



AMUS 1970's

Jason Jr. on
Titanic 1986



Jason I
1989-2001

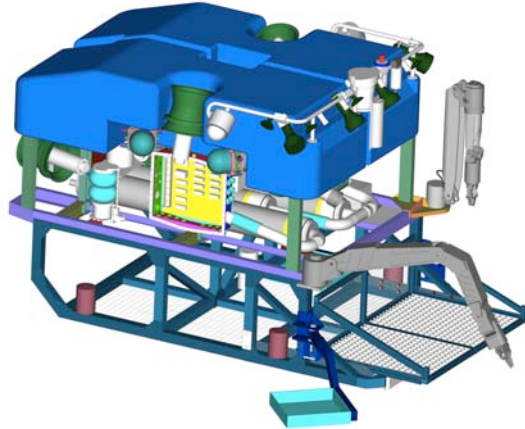


Jason II
2002 - today





The ROV Jason today



Today's Jason II is a 6500 m vehicle with dual swing arms, retractable basket and two manipulators



3X HD cameras with still recording
On 3X Pan and tilts with LED lighting



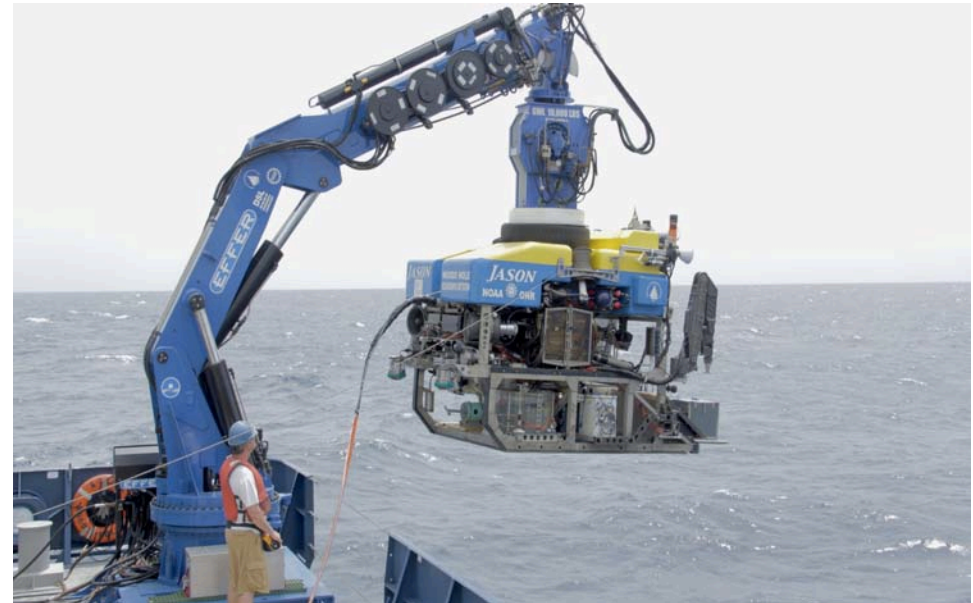
portable control "vans" allow several scientists to participate in the dive



Additional Infrastructure



Additional fire-proofing
(just seeing if you're awake...)



↑
Today's Jason II
Has heavy capacity
radio controlled crane
With slew, and
motion arresting
To increase sea state capacity₇

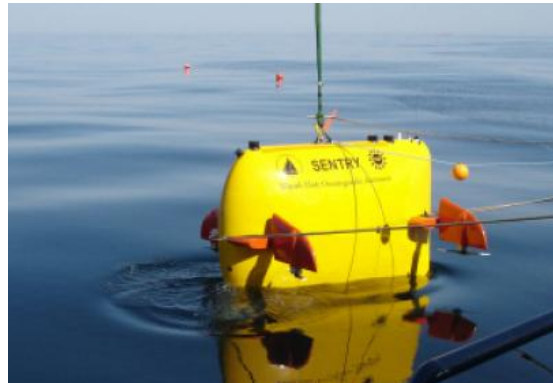


NDSF AUV Decadal Changes Performance and Endurance



ABE

- 0.65 m/s
- >25 hours survey time (10 hours typical)
- 10 - 16 hours turn around
- Low GB/dive of data max



Sentry

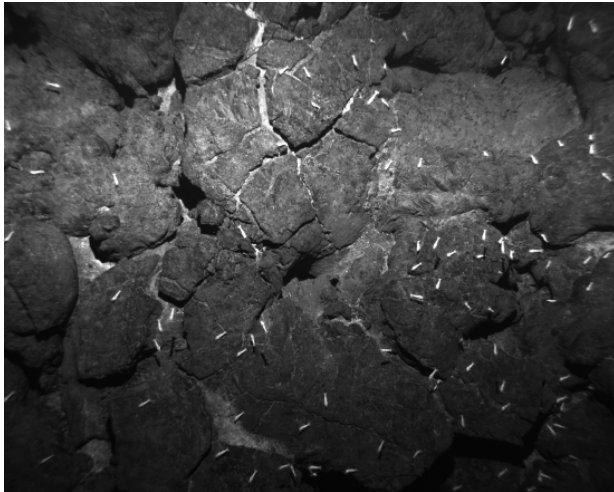
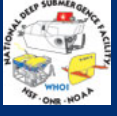
- Up to 1m/s
- > 40 hours survey time (18 hours typical)
- 10 – 16 hour turn around
- Up to 1TB of data per dive

Sentry 2014 & beyond

- Up to 1.5m/s
- > 60 hours survey time (>26 hours typical)
- < 3 hour turn around
- Up to 5TB of data per dive



NDSF AUV Mapping and Imaging



ABE

- First Scanning Sonar in 1999; first Multibeam in 2002
- First B&W digital camera in 2003
- Pictures every 5 seconds @ 5m

DeSSC Dec 12

Sentry

- 0.3m gridded multibeam pinging at 2Hz
- 1.4MP color camera
- Pictures every 3.3 seconds @ 5m

Sentry 2013 & beyond

- Dual frequency multibeam at 5Hz
- 11MP color camera; pictures every 3.3 seconds @15m
- Stereo image reconstructions

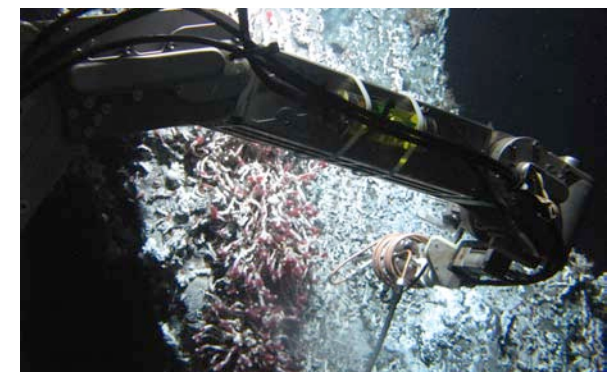
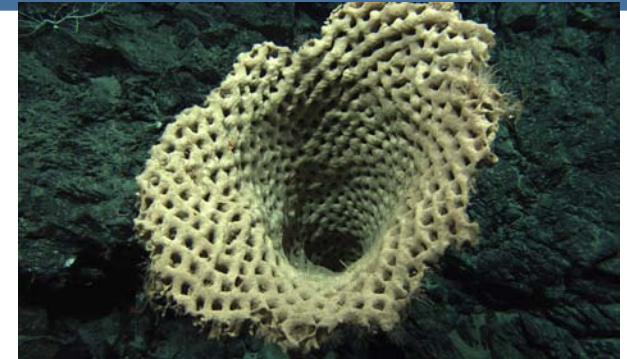


NDSF vehicles facilitate the advancement of science



The vehicles continue to play a major role in advancing science

- **Discovering new ecosystems**
 - New microbial life
 - Characterizing the subsurface biosphere
- **Advancing geological/geochemical research**
 - Facilitate the development of new sensors
- **Complement to ocean observing systems**
 - Extend the observational footprint
 - Support the infrastructure
 - Respond to events

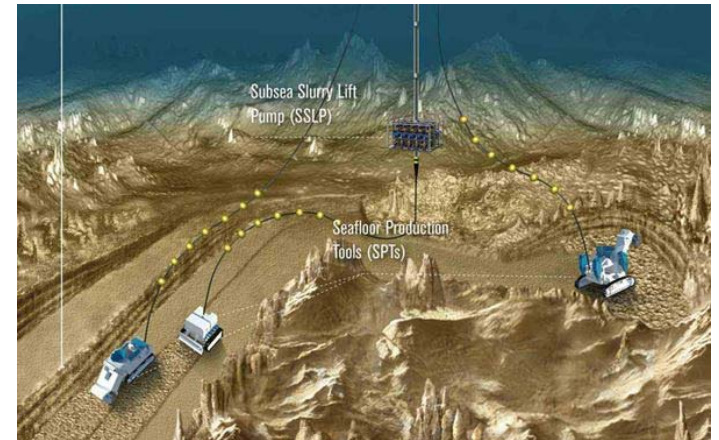




Societally-relevant science contributions

BP oil spill

- All three assets were involved
- **Climate change research**
 - arctic research
 - ocean acidification
- **Characterizing natural resources**
 - future seafloor mining
- **An inspiration for science and technology**
 - A homecourt advantage.





Reaching out to the broader public



Among the greatest benefits of our efforts

- An inspiration for science and technology





The dialogue between NDSF and DESSC



NDSF-DESSC activities

- Recent years, aimed to address some long-standing questions, and to pre-emptively begin addressing other issues
 - NDSF policies
 - *photo attribution*
 - *video copyright*
 - NDSF personnel
 - *ensuring an adequate operator base*
 - Increasing our user base through outreach
 - *Early Career Scientist and Student Opportunities*
 - Emerging Topics



The dialogue between NDSF and DESSC



Attribution

Long standing concerns about photo attribution and copyright put to rest
WHOI personnel are developing a simple, shipboard database to insure appropriate attribution.

NDSF personnel

Concerns about NDSF personnel, e.g. training programs, ensuring redundancy in personnel

The NSDF has and continues to address these issues through better training, clearer communication



The dialogue between NDSF and DESSC



Establishing a broader user base and disseminating information

There has been a ~30% shortfall in demand for NDSF vehicles

A decrease in proposal pressure from experienced PIs

A (mis)perception that ship- and sub time are the limiting factors

Educating and encouraging young scientists to get engaged in deep sea research

Introduction to UNOLS and the NDSF through early career programs

Guidance and mentoring year-round

Encouragement to submit proposals to use the assets to conduct cutting-edge science, including climate change and arctic-centric research



Student/early career scientist program @ the DeSSC Fall Meetings (AGU 2011 & 2012)



Purpose

- *To engage students/early career scientists in DeSSC*
- *To provide mentoring and guidance on applying for/use of NDSF*
- *To partner students with seasoned mentors*

Plan

- Financial support from NSF to offset costs of DeSSC participation
- Broadcasted program; students applied for support
 - *2011: 34 successful applicants*
 - *2012: 37 successful applicants*
- Participants will contribute to DeSSC
- Continuing to refine program to partner participants with more seasoned mentors



Expanding the dialogue between the NDSF and the scientific community

1) Data management and archiving

DESSC ad hoc committee is examining the issue

2) Enhanced internet access on board global ships

may be a cost-effective means of data analyses while at sea

3) Outreach

Continuing early career program; partnering with FIC E&O

Partnering with the Inner Space Center (URI-GSO)

Fall DESSC meeting webinar??

4) DESSC coordination with OOSC

How do we facilitate conversation?



OUTREACH



OUTREACH



OUTREACH



HOV Alvin: Science Verification Cruise

- *Objective: Provide assessment of vehicle capabilities before resuming regular operations*
- *Engage early career scientists in this activity*
- *Use the SVC as a catalyst for engaging the broadest possible community in HOV Alvin use (e.g. proposal requests)*



Alvin sphere mockup allowed users to provide feedback on ergonomics



HOV Alvin will be assessed by experienced and new users during a 2.5 week expedition in 2013