

NDSF

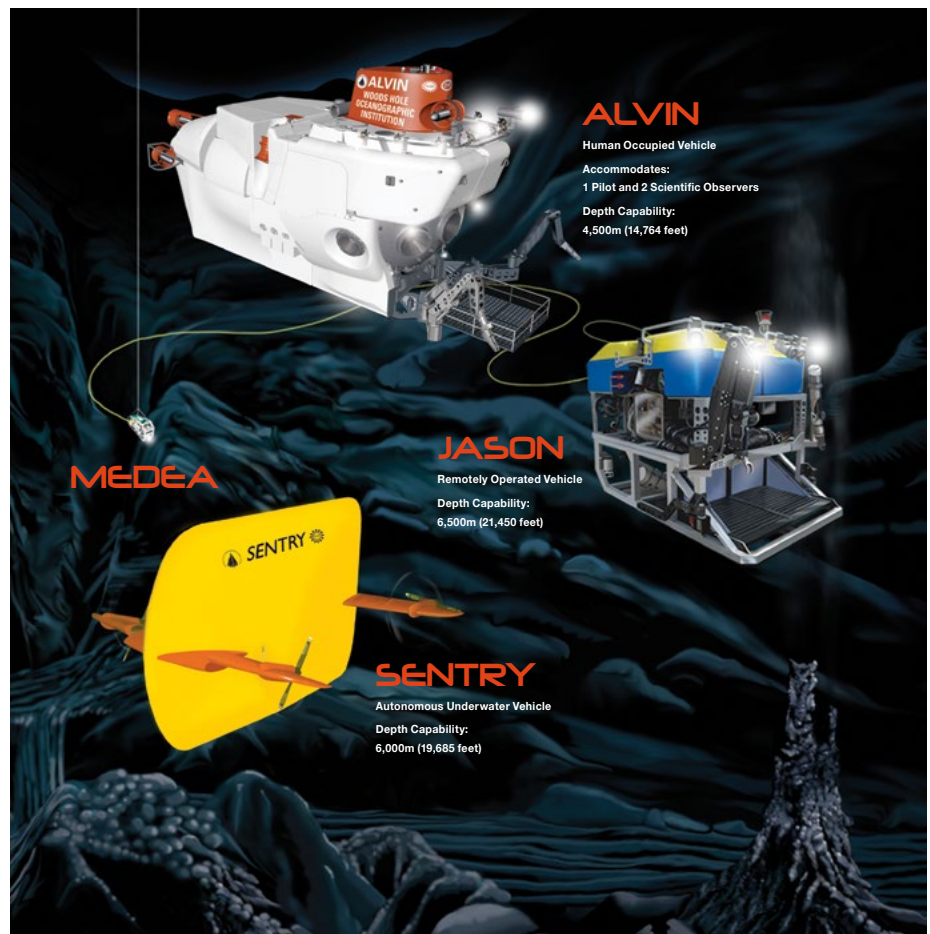


With more than 50% of Earth's surface covered by oceans deeper than 3000m, the National Deep Submergence Facility exists to support Earth, Ocean and Life scientists throughout the U.S. as they continue to explore these fascinating environments and learn more about the processes at work—throughout the oceanic water column and at and beneath the deep seafloor.

The NDSF currently provides operational support for three vehicles: the Human Occupied Vehicle (HOV) *Alvin*, the Remotely Operated Vehicle (ROV) *Jason*, and the Autonomous Underwater Vehicle (AUV) *Sentry*. All three vehicles are available to any scientist operating in the U.S.—when submitting a proposal for funding, any prospective PI should also complete a formal Ship Time Request* and check the boxes for whichever combination of vehicles they require.

The *Sentry* AUV, depth-rated to 6,000m, and the *Jason* ROV, rated to 6,500m, are reliable workhorses for the NDSF. HOV *Alvin*, the longest serving vehicle in the NDSF, has recently completed a major upgrade and returned to service. A new titanium personnel sphere with additional viewports was installed and a range of other improvements were implemented to augment the submersible's imaging, operability, payload and sampling capabilities.

While there is a wealth of information available on all three vehicles on the web, the Chief Scientist for Deep Submergence (CSDS) at WHOI works in parallel with the NDSF specifically to provide liaison between interested scientists throughout the U.S. and the engineers who operate the vehicles



E. Paul Oberlander, WHOI

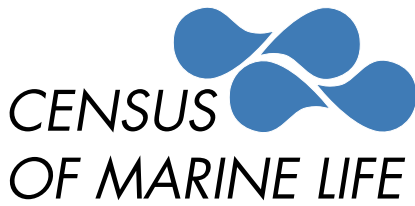
at WHOI. An important role of the CSDS is to monitor and help improve the performance of vehicles as they support funded research projects and also to provide advice to scientists from the very earliest stages of project planning—explaining the relative strengths and merits of individual vehicles and identifying capability gaps to be filled so that scientists can plan the most effective projects possible.

Some examples of recent projects that have made use of NDSF vehicles in pursuit of the goals of various major national and international research programs are listed overleaf. But equally as frequently, NDSF vehicles are funded to support one-off curiosity-driven projects funded through grants to one or more individual PIs.

*Ship Time Request: www.unols.org

To learn more about the NDSF and using the vehicles, please contact:
Chief Scientist for Deep Submergence • csds@whoi.edu

Recent examples of NDSF vehicle use in support of major research programs



Census of Marine Life: Graduate Student Andrew Thurber and Prof. Lisa Levin (both at Scripps Institution of Oceanography) each led expeditions using NDSF vehicles in 2010, one using the AUV *ABE* (predecessor to *Sentry*) and the other using the HOV *Alvin* to investigate benthic communities along the active ocean margins of Chile and Costa Rica. As well as the discovery of new chemosynthetic habitats (including novel “hybrid” systems as well as more conventional hydrothermal vents and cold seeps), both expeditions resulted in the discovery of “new” species previously unknown to science.



International Ocean Drilling Project: Prof. Andrew Fisher (University of California, Santa Cruz) and Prof. James Cowen (University of Hawai‘i at Manoa) have been making extensive use of the HOV *Alvin* and ROV *Jason* to conduct time-series studies of bore-hole sites in the NE Pacific along the flanks of the Juan de Fuca Ridge and on-axis at Middle Valley. Their work has involved emplacement and servicing of equipment, download of physical sensor data, and time-series biogeochemical and microbial sampling with the most recent visits completed in late June 2010, immediately prior to IODP Expedition 327.



Margins: In May 2009, Dr. Joe Resing (NOAA-Pacific Marine Environmental Laboratory and University of Washington) led a rapid-response cruise funded by NSF and used the ROV *Jason* in the NE Lau Basin (SW Pacific) to dive at two sites of recent and active volcanic eruptions. Less than 24 hours after leaving port and within the first few hours of *Jason* arriving at the seabed the team witnessed pillow lava eruption and extrusion—a volcanic process that had never been witnessed at the deep seabed before even though it represents one of the fundamental aspects of the formation of ocean crust.



Ocean Exploration: NOAA’s Ocean Exploration program has made extensive use of the ROV *Jason* to locate numerous sites of hydrothermal activity and even active volcanic eruption along the Marianas Arc (Drs. R. Embley & W. Chadwick, NOAA-PMEL). Dr. Tim Shank (WHOI) has used the HOV *Alvin* and AUV *ABE* (predecessor to *Sentry*) to locate new vents on the Galapagos Rift and in the Southern Atlantic Ocean. Most recently, NOAA’s OER program has supported an ongoing project led by Profs. Chuck Fisher (Pennsylvania State University) and Erik Cordes (Temple University) using the *Jason* ROV to investigate deep water coral and cold seep sites in the northern Gulf of Mexico, both close to and distant from the site of the *Deep Water Horizon*.



Ocean Observatory Initiative: Profs. John Delaney and Deborah Kelley (both University of Washington), Dr. Robert Collier (Oregon State University) and colleagues have used the AUV *Sentry* and ROV *Jason* to conduct essential seafloor surveys, making high-resolution multibeam bathymetric maps and obtaining extensive photographic coverage of the seafloor offshore from the Pacific Northwest to plan for cable installation and placement of nodes and junction boxes in support of the Regional Cabled Network and Coastal components of OOI.



Ridge 2000: The Ridge 2000 program has made extensive use of NDSF vehicles throughout the past decade. In the Lau Basin (SW Pacific), Dr. Meg Tivey (WHOI) and colleagues used the ROV *Jason* to undertake first dives on new hydrothermal vents located by the AUV *ABE*. The HOV *Alvin* has been used to conduct numerous time-series studies on the East Pacific Rise (9°50’N) and the Juan de Fuca Ridge. Most recently, Dr. Scott Nooner (Lamont Doherty Earth Observatory) has used *Alvin* and *Jason* to investigate deformation at and close to mid-ocean ridges, conducting time-series studies of pressure measurements at “benchmark” sites on the East Pacific Rise and Juan de Fuca Ridge.