

Aquarius Fact Sheet

Ownership, Operations and Acronyms

Aquarius is an undersea laboratory owned by the National Oceanic and Atmospheric Administration (NOAA). Aquarius is administered through NOAA's National Undersea Research Program (NURP). Aquarius is operated by the University of North Carolina at Wilmington's (UNCW) National Undersea Research Center (NURC). NURP supports six Undersea Research Centers throughout the United States, each of which has a unique geographic charter and specialized capability to support scientists who conduct research in support of coastal and ocean resource science and management.

Mission Summary

Aquarius is a national asset that supports scientists in their efforts to better understand our oceans and coastal resources. It offers scientists the advantage of being able to live and work on the seafloor for extended periods using a special technique called saturation diving. An open and competitive peer-review process is used to select proposals that are submitted to the program on an annual basis. Proposals target science and management issues of highest merit and relevance to NOAA, and in particular the Florida Keys National Marine Sanctuary. Over the course of more than 50 missions over 200 scientists participated directly in the program, representing over 90 organizations including universities from across the United States and several foreign countries.

Aquarius scientists work to understand our changing ocean and the condition of coral reefs. Coral reefs are threatened locally, regionally, and globally by increasing amounts of pollution, over-harvesting of fisheries, disease, and climate change. Science achievements from Aquarius include discoveries related to the damaging effects of ultraviolet light on coral reefs, geological studies that use fossil reefs to better understand the significance of present-day changes in coral reefs, research that is rewriting the book on how corals feed, growth studies of important sponges that uncovered surprising factors affecting their abundance and distribution, water quality studies to evaluate sources of pollution, and long-term studies of reefs to distinguish between changes caused by natural system variability and humans.

Construction and Early Operations

Aquarius was built in Victoria, Texas, in 1986 by Victoria Machine Works (VMW). Underwater operations first began in the United States Virgin Islands, in St. Croix's Salt River Canyon (now a national park and previously home to Hydrolab, the predecessor to Aquarius), in 1988. After 13 missions (and Hurricane Hugo), Aquarius was relocated to Wilmington, North Carolina where it was refurbished over an 18 month period by the National Undersea Research Center at the University of North Carolina at Wilmington. Aquarius remained in Wilmington until 1992 until it was deployed at its present location in the Florida Keys National Marine Sanctuary.

Present Location and Current Operations

In 1992, Aquarius was deployed nine miles southeast of Key Largo, Florida, three and a half miles off-shore, in the Florida Keys National Marine Sanctuary. It operates 62 feet beneath the surface at Conch Reef, a coral reef site characterized by spur and groove formations to depths of

over 100 feet. After conducting 20 missions, Aquarius was retrieved in 1996 due to funding constraints. New operating protocols were then developed, funding was restored, and Aquarius was refurbished at Harbor Branch Oceanographic Institution, FL, during 1997. In 1998, it was redeployed to the same site at Conch Reef and has since supported an additional 34 missions (as of August 2002). Aquarius has supported a total of 67 missions and a full schedule is planned through 2003. Certification of Aquarius operations is through the NOAA Dive Program. Engineering is certified by the American Bureau of Shipping. External oversight of operations is provided by an expert Technical Advisory Committee. Missions typically last ten days and aquanaut trainees undergo five days of specialized training before each mission starts. Missions are typically conducted on a monthly basis from April through November. From 1993 to 1996, Aquarius was operated from a large (100 feet long by 50 feet wide) manned barge, known as the MSB (Mobile Support Base), which was located immediately above the underwater laboratory. Offshore operations were supported during missions by staff who worked through 12 hour rotating shifts. As part of the refurbishment in 1997, the barge was replaced by a semi-autonomous (unmanned) Life Support Buoy, known as the LSB, provided by NOAA's National Data Buoy Center. The LSB is a large discus buoy, 30 feet in diameter. Topside support is now located at a shore-based complex.

Size and Configuration

Aquarius is a three-part system, including the LSB described above, a 120 ton baseplate, which provides a stable platform upon which Aquarius is mounted, and an 85 ton "habitat" (underwater laboratories are often referred to as habitats) that provides living and working space for a six person crew. The habitat itself is a 9 feet diameter by 43 feet long steel cylinder that can support operations to depths of 120 feet. The habitat includes a seawater interface in a nonpressurized "Wet Porch," and two pressure locks known as the Entry Lock and Main Lock, sized at 500 and 1400 cubic feet, respectively. Approximately 400 square feet of living and laboratory space is available for operations and science. The lab is equipped with computers networked to shore, Internet, telephones, radios, and video conferencing equipment.

Operating Environment

Aquarius is an ambient pressure habitat, which means that the interior atmospheric pressure is equal to the surrounding water pressure. Its main entrance in the Wet Porch remains open to the ocean and water is kept out by the equivalent air pressure inside, much like an air pocket inside an inverted glass prevents water from completely filling when immersed. The baseplate rests in approximately 62 feet of water, with the habitat mounted off the bottom at a depth of approximately 47 feet (tidal range at the site is between two and three feet). This operating depth is referred to as "hatch depth." The pressure of 47 feet of seawater is about 2.5 times greater than the atmospheric pressure found at sea level.

At this depth and pressure, visitors to Aquarius have only about 80 minutes to complete their stay and return to the surface before they risk experiencing decompression related illness. However, the mission inhabitants of Aquarius, known as "aquanauts," can stay indefinitely and have nearly unlimited bottom time during their scuba dives from Aquarius. At the end of a mission, aquanauts undergo a 17-hour decompression that is conducted within Aquarius itself, while on the bottom. At the end of decompression, Aquanauts exit Aquarius and scuba dive back to the surface.

Additional Information

The Aquarius website (www.uncwil.edu/nurc/aquarius) contains detailed information about current science projects and mission schedules. A virtual tour, lesson plans, archives, and a press room are also included. Web cameras operate during missions with cameras inside and outside Aquarius. Live broadcasts (webcasts and special videoconferencing opportunities) are frequently conducted that involve schools, museums, and aquariums across the country.

For more information, or if you are interested in hosting a live program, please contact Mark Ward, Aquarius Public Affairs (407) 254-0840, markeward@aol.com.