

Committee on Resources

Subcommittee on Fisheries Conservation, Wildlife and Oceans

Testimony of Terrence Tysall, The Cambrian Foundation

Table of Contents

1.0 Introduction	3
2.0 Current Projects	3
2.1 The USS Monitor Survey	3
2.2 The Great Blue Hole Geologic Survey	3
2.3 The Solomon Islands National Museum Project	3
2.4 The SS City of Ainsworth Project	3
2.5 The Miskito Indian Project	3
2.6 The Trident Project	4
3.0 USS Monitor Historical Background	4
4.0 Site Description	5
5.0 Synopsis of 1998 Diving Operations	5
6.0 Curriculum Vitae	8

1.0 Introduction

Cambrian (kam' bre an) adj. *A period of the Paleozoic era occurring from 500 million to 600 million years ago. It is believed that life was wholly confined to the water during this period.*

The Cambrian Foundation is a private not for profit research organization. It was founded in 1994 for the purposes of conducting scientific research on, educating the public in regards to and preserving and exploring the aquatic realm. The Foundation became a member-based organization in January 1997.

2.0 Current Projects

2.1 The *USS Monitor* Survey.

The Cambrian Foundation has been conducting research operations in the Monitor National Marine Sanctuary since 1994. The 1997 expedition achieved the greatest success yet on the *Monitor*. A quote from the *Monitor* Sanctuary Manager says it all, "The Cambrian Foundation dive team has gathered more usable

data in one week than NOAA has since it began overseeing the site." The repeated success led to the most ambitious expedition in the sanctuary's history in 1998.

2.2 The Great Blue Hole Geologic Survey.

This expedition was another of which all the team members paid a great deal of the expenses to participate. The chief scientist on the expedition, Dr. Robert Dill, summed it up best by saying, "The Cambrian Foundation's expedition could very well be the most significant geologic research done in the last fifty years." It was because of the success of this project the Cambrian Foundation received it's first world wide television exposure through the SeaTek program on the Learning Channel.

2.3 The Solomon Islands National Museum project.

Foundation members are currently striving to improve the existing museum facilities on the island of Guadalcanal so that the Islanders are better able to preserve their unique culture, one of the oldest on earth, as well as the one of a kind natural history and maritime resources of the region. Other goals of this project are the creation of a submerged cultural resources management team comprised entirely of Solomon Islanders. It is also the wish of the Cambrian Foundation to assist the Naval Historical Center in protecting the historic World War II relics of the region.

2.4 The *SS City of Ainsworth* project.

A Cambrian Foundation dive team was the first to reach the wreck, one of Canada's most historic shipwrecks, in Kootenay Lake, British Columbia. Designated an Underwater Heritage Site in 1990, the wreck had never before been visited by free swimming divers.

2.5 The Miskito Indian project.

We continue to involve ourselves with Sub Ocean Safety organization in their mission to protect indigenous peoples around the world from unsafe greed oriented diving practices that result in an epidemic of decompression illness the world over.

2.6 The Trident project.

This ambitious endeavor will put two aquanauts on the sea floor for an entire year in an attempt to create a permanent human presence in the sea.

3.0 USS Monitor Historical Background

Ironclad ships had been built before by navies in Europe and the East, but never before had two met in battle. The *Virginia* was an adapted wooden ship, originally, the *USS Merrimack*. She was constructed in this manner out of necessity for time and money. The Union had started construction on an ironclad ship, the *USS Galena*, of similar design. However, when it was apparent that the Confederates would have their ironclad ship ready before the Union's, they started on a revolutionary project that would produce a ship that would influence all warship design in the future.

On March 8, 1862, the *CSS Virginia* (formally the *USS Merrimack*) steamed down the Elizabeth River to Hampton Roads where five large union ships were in blockade, the *USS Cumberland*, *USS Congress*, *USS Minnesota*, *USS Roanoke* and *USS St. Lawrence*. At the end of this day, two Union ships, the *USS*

Cumberland and *USS Congress*, were sunk, and the *USS Minnesota* was grounded and severely damaged. For fear of grounding themselves in the darkness of night, the *Virginia* pulled back to the safety of the Elizabeth River and Sewell's Point, where a battery of Confederate guns were placed. They planned to continue the battle the next day and the *Minnesota* should be easily taken before continuing the attack on the *USS Roanoke* and *USS St. Lawrence*.

What the Confederates did not know was that the *USS Monitor* had arrived in the darkness and had taken up along side of the *Minnesota* to protect her. Unlike the *Virginia*, which was a modified wooden ship, the *Monitor* was a specially designed ironclad ship, designed by a Swedish-American engineer and inventor, John Ericsson, and was a marvel of ingenuity. She weighed 776 tons, was 172 feet long and 41 feet wide, drafted 11 feet 4 inches, had a 12 inch freeboard and carried a 360 degree rotating turret that housed only two 11 inch Dahlgren guns.

On the morning of March 9, 1862, the *Virginia* headed out to continue the battle that had begun the day before. Before she could get close to the *Minnesota*, however, the *Monitor* moved up and engaged the *Virginia*. The battle lasted for approximately 4 hours and at times the two ships fired upon each other at point blank range. At one point, the *Virginia* ran aground, but the *Monitor* could not finish her. Later in the battle, the *Virginia* put a shot into the pilothouse of the *Monitor* and blinded her captain, Lieutenant John L. Worden. The *Monitor*, it's captain wounded, steamed away from the battle. The Confederates believed that the *Monitor* was retreating. Lieutenant Samuel Dana Greene, the executive officer, assumed command with these instructions from the captain, "Gentleman, I leave it with you. Do what you think is best. I cannot see, but do not mind me. Save the *Minnesota* if you can." After attending to the captain, Greene turned the ship around to resume the battle. By the time this was accomplished, the *Virginia* had decided to return to Norfolk for repairs, and the Union believed that the *Virginia* was abandoning the fight. Both sides considered the battle to be a victory despite the fact that no other ships were taken or sunk, and the blockade was still intact.

The irony of this battle was that the *Monitor* was not supposed to be there that day, and had she not arrived, the Confederates would have surely sunk the remaining ships and broken the blockade. Had this happened, the British and French, who were observing the battle, might have sided with the Confederates and this probably would have changed the outcome of the war.

The two ships would not meet again in battle, and in fact, neither ship would see their first birthday. On May 11, 1862, after the fall of Norfolk to the Union, the *Virginia* had no place to run. She was run ashore by her captain, Josiah Tattnall who replaced the wounded Buchanan, and set ablaze to prevent the Union from capturing her. Captain Tattnall reported to the Confederate Secretary of the Navy, Stephen R. Mallory, "The *Virginia* no longer exists." On December 31, 1862, the *USS Monitor* sank in a storm, 16.1 miles south-southeast of Cape Hatteras, North Carolina while being towed by the *USS Rhode Island*. She was on her way to Beaufort, North Carolina to assist with the blockade there. The scene of man after man plunging to their deaths into the raging sea while trying to reach lifeboats caused a few of the crew to freeze on the top of her turret in terror. Boats from the *Rhode Island* continually risked their lives evacuating the crew from the ill-fated ironclad. The men lined the *Rhode Island's* rail to look for their ship, her lights alternately appearing and disappearing behind the monstrous waves. Finally, near one in the morning, her lights disappeared forever. Acting assistant paymaster William F. Keeler wrote, "The *Monitor* is no more."

The *Monitor* was discovered in 1973 in 230/240 feet of water, and on January 30, 1975, the site was designated as the nation's first marine sanctuary under Title III of the Marine Sanctuaries, Research, and Protection Act of 1972.

4.0 Site Description

The Monitor National Marine Sanctuary encompasses a vertical water column from the surface to the seabed and extending horizontally one nautical mile in diameter 16.1 nm SSE of Hatteras Light, North Carolina. The Monitor lies in 230 to 240 feet of water at coordinates 35° 00.121' N and 75° 24.375' W. The Monitor National Marine Sanctuary can be one of the most difficult research environments on the planet. The extreme depth of the site is merely one concern. Other environmental conditions include water temperatures ranging from 40°F to 75°F throughout the year and highly unpredictable currents. Currents can range from zero to several knots, with the prevailing direction of the current from the NE. The operational area and its conditions can be best summarized by referring to the area's historical name, "The Graveyard of the Atlantic."

5.0 Synopsis of 1998 Diving Operations

For the past 4 years (including this year), the Cambrian Foundation has put together scientific expeditions to the Monitor. These expeditions are typically one week in duration. However, this year we also participated in a one month long, historical joint effort with NOAA (National Oceanic and Atmospheric Administration), the US Navy and NURC at UNCW (National Undersea Research Center at the University of North Carolina at Wilmington). This was the first time a civilian organization was allowed to dive along side the Navy and NOAA divers off of their vessels.

During phase I of this project, the Navy, NOAA and the Cambrian Foundation were diving from the *Kellie Chouest*, a leased DSRV support vessel, 300 feet long, on a four point mooring directly over the *Monitor*. Phase II was conducted by NOAA, NURC and the Cambrian Foundation utilizing the NOAA vessel *Ferrell*, a 140 foot vessel anchored within about one quarter mile of the *Monitor*, and the 54 foot UNCW research vessel, *Cape Fear*. The overall objectives for this project were to collect data for an engineering study for stabilization and selective recovery efforts and to map, photograph, video and recover small artifacts that might be destroyed during the stabilization. Our objectives for both phases were to train some of the NOAA and NURC divers, to provide qualified personnel to the NOAA team, to help NOAA validate this new style of diving (untethered deep scuba diving) and to act as diving supervisors for the NOAA/NURC/Cambrian Foundation team.

The Navy's operation was separate from ours and was similar to how NOAA divers had conducted operations in the past. Their divers were lowered down over the port side of the *Kellie Chouest*, two at a time on a stage (a large, metal basket that can hold two standing divers), where they would step off the stage right next to the wreck and walk over to it. Their helmets were tied to the surface with an umbilical that contained a communications cable, a hot water line for their suits, a "pneumo" tube for determining depth and their gas supply line. Their longest bottom time was 37 minutes, and they consumed about 1000 cubic feet of bottom mix (heliox 14/86) on each dive. Also, they were doing surface decompression or "Sur-D" diving. This means that after about one hour of in water decompression, at their 40 foot stop, they would be quickly removed from the water, stripped from their gear and hurried into the chamber, where they would spend another hour and one half. In order to accomplish this type of diving, the Navy had at least 16 divers on the surface for two bottom divers - hoist operator, umbilical line tenders, gas supply technicians, communications operator, safety diver and tenders, chamber operator and tender and a dive supervisor. They spent the majority of their time working on the removal and recovery of the prop and shaft, but they also recovered two deck plates and a support beam.

In contrast, during phase I, our teams were lowered on the DSRV platform or did a giant stride into the water where they swam over to a downline that was affixed to the stern of the *Kellie Chouest*. During phase II, we did liveboat operations off the *Cape Fear* and used a downline attached to a large norwegian ball. The divers would swim down this line to near the wreck and then over to it. Being untethered, we were able to travel the entire length and width of the wreck to collect our data and artifacts. Our bottom times ranged from 15 to 40 minutes with between one and two and one half-hours of in water decompression utilizing EAN36 and O₂. The divers would consume around 150 cubic feet of bottom mix (trimix 18/50). Support for our bottom divers (we could have up to 10 in the water at one time) required 6 other personnel - two in water support divers, one standby diver, one safety diver, a chase boat operator and the dive supervisor. The support divers were diving air on their backs and would each carry one stage cylinder of EAN36 and one of O₂. The standby diver also had air on his back and two stage cylinders and was located in the chase boat (an Avon or Zodiac inflatable) while the safety diver was on deck with trimix on his back and two stage cylinders. We were able to place several markers, take engineering measurements and recover some small artifacts.

All of our separate diving expeditions on the *Monitor* require a permit from NOAA. There are two kinds of permits that NOAA can issue, a research permit or a special use permit. With the special use permit, divers are allowed to view the wreck, however, they can make no physical contact. A research permit is issued only after submitting a plan for the research activities to be done on site. NOAA and the North Carolina government must approve the permits. Terrence Tysall, president of the Cambrian Foundation, has held a research permit for four years that has allowed team members to dive the *Monitor*. John Broadwater, the Monitor National Marine Sanctuary manager for NOAA, assists each team. Over the last two years, the teams have placed and surveyed station markers to help track movement and deterioration of the wreck. The teams have also searched for and brought up artifacts while documenting the wreck with still photographs and video. And lastly, members have been involved in cleaning the wreck of garbage that had either drifted into the wreck or been left over materials from previous expeditions like PVC measuring tubes and measuring tape.

When entering a National Marine Sanctuary, boats are not allowed to anchor. There is, however, a subsurface marker buoy floating and attached near the wreck. An additional downline was placed closer to the wreck, attached to a large anchor in the sand near the turret. The boat captain motored to near the buoys and estimated the current. Each day, a crewmember snorkeled or dove to the new buoy and attached a 100-foot line with a large Norwegian ball on one end and 30 pounds of weight near the other end. The weight carried the line down the buoy line and brought this line parallel to the main buoy line. The divers used this line during their ascent. The divers all had to be completely suited up, with mask, fins, doubles and stage cylinders. At a prearranged signal, the divers went over both sides of the boat, one after another, like paratroopers leaving an airplane. The divers drifted into the buoy line while descending and pulled themselves down that line hand over hand to the bottom. Most of the divers were using trimix on the bottom. The Cambrian Foundation core dive team typically used bottom mixes with higher than normal ENDS on the *Monitor* as training for more demanding expeditions that the Foundation conducts. Bottom times were typically 25 to 30 minutes, which when using EANx and/or O₂ for decompression, had the divers out of the water in 100 to 120 minutes of run time.

Ascents were made up the buoy line to the separate float ball line that had been attached. When the last diver had reached this line, it was unhooked, and the divers drifted with this float as a reference. The boat simply followed the float and picked up the divers as they came to the surface.

The permit allows for no more than 12 divers on the wreck at one time, however, we rarely put more than 10 in the water at a time. On each of the last two expeditions, the conditions on the first day have not been favorable to dive the *Monitor* and we have done a tune up dive on a nearby wreck. In 1997, the sea conditions were exceptionally rough all week but we had good visibility and current conditions on the bottom. However, this year, we had more favorable sea conditions, but the visibility on the bottom was usually around 10 feet. Last year twenty-four station markers were placed and secured, and measurements between these points were obtained. We attempted to verify some of these measurements again this year. This survey data is invaluable in tracking the deterioration of the wreck and greatly assists divers in retrieval of artifacts. When artifacts are found, they must be located where they are on a site map and are usually drawn and photographed prior to retrieval. Determining direction and distance from two or more separate station markers, an artifact can be triangulated to its exact location. Some of the artifacts recovered on these expeditions were a broken lid to a small container, the top of a broken glass bottle, an intact glass bottle of hair restorative, a brass rifle stock butt and the officer's head (toilet). The head is significant because it was the first below waterline marine flush toilet. Excellent digital video of the current state of the wreck and the location of the station markers was obtained in 1997, however, because of the poor visibility this year, we did not get any good video or still photographs. Lastly, a tremendous amount of trash was removed from the wreck last year. This consisted of nets, long line fishing line, soft drink cans, a coffee mug, an old shoe, PVC pipe and fiberglass measuring tape.

The work that we have been able to do on the *Monitor* has been very rewarding - knowing that certain artifacts have been preserved and can now be seen by people that would not have had the opportunity before. We hope that our work will continue on the *Monitor*, working with NOAA on larger scale projects as well as on smaller expeditions designed for our members.

6.0 Curriculum Vitae

Terrence N. Tysall

Education:

Currently majoring in Biological Oceanography specializing in marine mammal behavior and Aquatic Exploration at Goddard College

Relevant Employment:

- 1985 - 1990 US Navy active duty and reserve - stationed at RTC San Diego, CA, Fleet Anti-Submarine Warfare Training Center Pacific, Naval Special Warfare Center/Basic
- Underwater Demolition/Seal Training, Seal Team 5 TAD
- 1988 Marine mammal handler and trainer for ZooVet Busch Gardens, Tampa, FL
- 1988 - 1991 Special projects coordinator, diving safety officer and marine mammal trainer for the Dolphin Research Center, Grassy Key, FL
- 1991 - 1992 Instructor and Manager Dan's Scuba, Clearwater, FL
- 1992 - 1994 Director of Technical Instruction Hal Watts Mr. Scuba, Orlando, FL
- 1994 - 1996 Owner Orlando Diving Center, Orlando, FL
- 1994 - Founder and President of the Cambrian Foundation, Winter Park, FL

Scientific Expeditions:

- 1989 MRDF/US Navy Vital Capacity Habitat Study
- 1990 MRDF/US Navy Vital Capacity Habitat Study
- MRDF/ US Navy Doppler Habitat Study
- 1991 Gulf Coast Speleology Survey University South Florida
- Wakula Springs SIO2 Project Florida State University Diving Program
- 1992 Die Polder Survey Florida Speleological Researchers
- Yucatan Cave Survey
- Gulf Offshore Speleology Survey University South Florida
- Deep Wreck Survey Palm Beach County
- Apopka Springs Survey Project
- 1993 Key Caulker Speleological Survey
- Andrea Doria Project
- USS Monitor Expedition
- Yucatan Survey Project
- 1994 Yucatan Survey Project
- USS Monitor Expedition
- 1995 Key Caulker/Great Blue Hole Exploration
- SS Edmund Fitzgerald Expedition
- USS Monitor Expedition
- USS Atlanta Expedition
- 1996 USS Monitor Expedition
- Nemesis Survey Project
- 1997 Solomon Islands Project
- Great Blue Hole of Belize
- USS Monitor Expedition
- Yucatan Exploration Project
- SS City of Ainsworth Project
- 1998 Solomon Islands Project
- USS Monitor Expeditions
- Monk Seal Forage Study

Diving History:

- 24 years diving experience
- 5000+ logged dives / 5000+ hours
- 2000+ Cave or Cavern dives
- 530 ffw deepest wreck dive
- 600 fsw deepest open water dive
- 485 fsw deepest cave dive

Diving Certifications:

- 1974 - 84 Initial diving experience with 110 logged dives
- 1984 NASDS/SSI Open Water
- NASDS/SSI Night Diver
- NASDS/SSI Advanced Open Water
- NASDS/SSI Deep Diver
- NASDS/SSI Rescue Diver

- NASDS/SSI Underwater Navigation
- NASDS/SSI Equipment Specialist
- NSS-CDS/NACD Cavern
- NSS-CDS/NACD Basic Cave
- 1985 SSI Wreck Diver
- US Navy Scuba
- US Navy LAR V
- US Navy MK 16
- 1989 IANTD Nitrox
- IANTD Deep Air
- IANTD Advanced Deep Air
- IANTD Technical Deep Air
- IANTD Technical Nitrox
- 1990 IANTD/Deep Inc. Trimix

Professional Diving Certifications:

- 1987 US Navy Scuba Instructor
- LAR V Instructor
- US Navy Dive Supervisor
- 1988 SSI Dive Control Specialist
- SSI Assistant Instructor
- SSI Open Water Instructor
- SSI Advanced Open Water Instructor
- SSI Specialty Instructor
- Deep Night Cavern Navigator
- SSI Dive Control Specialist Instructor
- PSA Deep Instructor
- IANTD Nitrox Instructor
- 1989 Red Cross Lifesaving Instructor
- 1990 Aquanaut MRDF
- 1992 NSS-CDS Cavern Instructor
- NACD Cavern Instructor
- IANTD Deep Air Instructor
- IANTD Advanced Deep Air Instructor
- IANTD Technical Nitrox Instructor
- IANTD Technical Deep Air Instructor
- IANTD Trimix Instructor
- IANTD Overhead Environment Instructor
- IANTD Cave Instructor
- NACD Cave Instructor
- 1993 NSS-CDS Full Cave Instructor
- NSS-CDS Instructor Sponsor
- NACD Instructor Trainer
- IANTD Instructor Trainer
- DAN Instructor Trainer
- SSI Instructor Trainer/Evaluator

- NAUI Instructor Trainer
- 1994 TDI Extended Range Instructor
- TDI Trimix Instructor
- TDI Instructor Trainer
- 1997 TDI Rebreather Instructor Trainer

Affiliations and Awards

- Scuba Schools International
- National Association of Scuba Diving Schools
- International Association of Nitrox and Technical Divers
- Technical Diving International
- Professional Scuba Association
- US Deep Diving Team, Florida Director
- National Association of Underwater Instructors, Technical Advisory Board
- Divers Alert Network, Research Advisor
- National Speleological Society Cave Diving Section, Training Committee
- National Association of Cave Diving, Training Committee
- Florida Speleological Researchers, Director
- League of the New Worlds, Board of Advisors
- Deep Tech Magazine, Board of Advisors
- Cambrian Foundation, Founder and President
- Abe Davis Award
- International Cave Diving Safety Award
- NACD Wakula Awards

###