NOAA REPORT

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NOAA Team Studies Violent Midwest Storms

—By Jeanne G. Kouhestani

Ron Przybylinski was on duty at the NOAA weather forecast office in St. Louis, Mo., earlier this summer when a major thunderstorm system roared across the St. Louis area, its hurricane-force gusts of wind knocking over telephone poles and trees and ripping roofs off homes.

Przybylinski, the office's science and operations officer, was assisting forecasters in issuing warnings for a "bow echo" event, the same type of behemoth, bow-shaped Midwest thunderstorm system that NOAA, the National Center for Atmospheric Research, universities, the Naval Research Laboratory and other partners were researching from an operations center just miles away at Mid-America Airport, east of St. Louis.

The bow echo storm was so bad that the bow echo researchers had to evacuate to a tornado shelter in the basement of the Mid-America Airport terminal.

Przybylinski, who helped plan the study and was part of the science team, found it ironic that he helped issue the warnings to evacuate during this June 11 storm, one of the strongest bow-echo cases studied during the Bow Echo and MCV (mesoscale convective vortex) Experiment, or BAMEX for short, underway from May 20 to July 6.

Hundreds of miles away in Des

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Fisheries Team Searches for Disappearing White Abalone

—By Jim Milbury

The NOAA Ship *David Starr Jordan* set sail from Nimitz Marine Facility in San Diego, Calif., July 7 with a team of NOAA and California State University scientists onboard in an ongoing effort to save an endangered species from extinction.

The ship and crew set out to try to locate and eventually restore to its natural habitat white abalone, a marine snail once found numbering in the millions off the coastal waters of southern and Baja California.

Today, however, it is believed that only one percent of the original population, perhaps as few as 2,500 individuals, remains in the wild.

"We really need to know more about the available habitat and the remaining populations before we can even begin to start doing our planning for recovery," said John Butler, chief scientist on the cruise and in charge of the white abalone

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Melissa Neuman/NOAA

(left to right) NOAA Ship David Starr Jordan chief boatswain Jose Coito, John Wagner, senior biological technician at NOAA's Southwest Fisheries Science Center, and Anthony Cossio, biological technician at the center, secure the remotely operated vehicle Crocus to a crane so that it can be lifted over the side of the ship to search for white abalone.

BAMEX

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Moines, Iowa, the crews of two BAMEX research aircraft, NOAA's P-3 nicknamed "Kermit" and a Naval Research Lab P-3 carrying an NCAR radar, hunkered down to recover from their flights inside and around an earlier, equally violent storm that had produced prodigious amounts of lightning—lightning that had put 34 small holes in Kermit.

The third BAMEX aircraft, a high-altitude Lear 35a jet, operated by NCAR, was able to escape Mid-America safely by flying to Moline, Ill.

"The earlier system we were flying in looked like it was going to hit St. Louis [where the aircraft were based], so the aircraft diverted to Des Moines to recover," said David P. Jorgensen, research meteorologist at NOAA's National Severe Storms Laboratory in Boulder, Colo., who was the chief scientist aboard the NOAA P-3. "It's a good thing we did. The next storm system that hit St. Louis would have potentially damaged our aircraft. It would have been pretty embarrassing to be wiped out by the type of storm we were studying."

Though Kermit routinely flies into hurricanes, high winds and large hail can cause serious damage to the aircraft when it's on the ground and stationary.

Bow echo storms like the one that hit St. Louis can stretch more than 90 miles wide and carve paths of destruction more than 500 miles long. These storms generally form during late afternoon and can last through the night. As the storm grows, a downdraft of high winds from rain-cooled air pushes the storm into a bow-like configuration. Weak tornadoes may form along the bow or at either end, but the main threat is from straight-line winds that can gust to over 100 miles per hour.

In the first study of its kind in the Midwest in several decades, BAMEX aircraft mapped the development and life cycle of bow echo storms as they developed and moved across the Midwest and then died out. The study covered about a 450-nautical-mile radius of St. Louis—an area large enough to be struck almost daily by thunderstorm systems.

BAMEX was jointly planned by scientists from several universities, NCAR and NOAA, with NOAA's National Weather Service, National Severe Storms Laboratory and Aircraft Operations Center playing critical roles in executing it.

"One of the main purposes for the operation was to improve forecasting for damaging winds, tornadoes and flash flooding by acquiring new data for numerical models," Przybylinski said. "The overall project was very successful. We collected a lot of good cases with damaging wind events, some of which spawned tornadoes."

Data were collected by the three aircraft as well as ground-based mobile units and weather balloons, which sampled the environment of the storms. Most of the ground crews came from NCAR and the University of Alabama at Huntsville.

The BAMEX operations center was staffed in eight-day shifts by forecasters and nowcasters from the National Severe Storms Lab and from various National Weather Service offices across the Midwest.

Their daily forecasts helped the science team decide whether and when to send aircraft and ground units into a particular storm. Nowcasts provided current weather information and one- and two-hour forecasts while the aircraft were in flight.

The Lear jet flew around the storm systems and deployed dropsondes, small instruments that measure the vertical profile of a storm as they parachute through

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David P. Jorgensen/NOAA

Aboard NOAA's P-3 aircraft over Dallas, Texas, P-3 navigator Lt. Devin R. Brakob explains the aircraft's flight route to Discovery Channel reporter Kate Morris.

Jeanne G. Kouhestani/NOAA

Tom McAllister.

Tim McAllister is the Team Member of the Month

–By Jeanne Kouhestani

Tim McAllister is a quiet, unassuming man of few words, a large presence in any room. But even his height—all six feet, seven inches of him—is dwarfed by his technical expertise and prodigious work output.

McAllister is the primary technical support contractor for NOAA Marine and Aviation Operations' SWATH (small waterplane twin hull) Acquisition Program. The planned SWATH ship will conduct hydrographic surveys in support of NOAA's nautical charting mission.

A naval architect and contractor from BMT Designers and Planners, McAllister has been a major player in taking the SWATH program from the acquisition strategy stage into requirements and feasibility studies and design specification. He has also crafted a technical statement of requirements that is as thick as a ream of paper—all in a short amount of time. The resulting request for proposals package for ship design and construction was issued July 17.

"Tim superbly fulfills the role of technical support contractor. He's the embodiment of all technical excellence and understands how to integrate it into the government acquisition program to get a state-of-the-art SWATH vessel," said Geoffrey Fuller, the NOAA acquisition manager for the SWATH program.

"When he joined us last September, he first did a feasibility study to make sure the requirements for the ship were reasonable, within the budget we had. Then in less than four months, he worked with the project team to prepare the statement of requirements and all the appendices that go with it. It's a sterling document that explains the kind of ship we're building, the data we'll use to evaluate the contract proposals and the method by which we will judge the proposals," Fuller said.

Fuller is delighted that McAllister has been selected as NOAA Team Member of the Month, and said no one deserves the honor more.

"I am continually amazed by the breadth of technical knowledge Tim brings to the program," Fuller said. "He doesn't say much. But if we do something that's incorrect technically, we'll know if we've gone beyond what's reasonable for the ship by a roll of his eyes, a look the other way. Behind that gesture is a wealth of knowledge and experience."

While this is not the first SWATH vessel NOAA has pursued, it is the first for which funds have been appropriated.

"We had to adjust requirements to meet the mission needs and cost cap, and then put together revised requirements for shipyards and designers to bid on. We worked together as a team to put together a request for proposal package that

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Michael Black/NOAA

Chris Landsea.

Chris Landsea Is the Employee of the Month

–By Erica Van Coverden

Chris Landsea, the August Employee of the Month, is one of NOAA's cadre of meteorologists who regularly fly into hurricanes to study and better understand them.

Landsea, a research meteorologist with the Hurricane Research Division of NOAA's Atlantic Oceanographic and Meteorological Laboratory in Miami, Fla., is particularly interested in hurricane climatology. "I really do enjoy coming to work," he said.

Landsea started his career with NOAA as a student intern during his 1982-83 high school years. At that time, he was working with the Hurricane Research Division, analyzing radar data. Landsea then completed his undergraduate degree in atmospheric sciences from UCLA and his masters and doctoral degrees in the same field from Colorado State University, where he studied with noted hurricane researcher William Gray before returning to Miami in 1994

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Focus On...

David Concannon/Explorer Consulting

Mir I, a manned submersible capable of diving to 6,500 meters, is launched from the R/V Akademik Keldysh to travel to a depth of 3,800 meters to investigate the wreck of Titanic.

Larry Daley/British Islands Tours

Capt. Craig McLean (right), director of NOAA's Office of Ocean Exploration, discusses the day's dive with Mir II pilot Genya Chernaiev from the Russian Academy of Sciences, which operates the Mir subs.

Return to *RMS Titanic*

—By Dane Konop

The British luxury liner *Titanic* sits broken in two off Newfoundland. Its massive, pointed bow lies mostly intact and slowly sinking into the sea floor mud. Its stern nearby is a jumbled, unrecognizable heap.

Just before midnight on April 14, 1912, on its maiden voyage, the reputedly unsinkable *Titanic* struck an iceberg and sank less than three hours later with the loss of over 1,500 passengers and crew.

At over two miles below the ocean surface, the *Titanic* wreck lay out of human reach until discovered in September 1985 in a joint U.S.-French expedition led by U.S. Navy researcher Robert Ballard.

In a ten-day cruise ending July 2, a NOAA-sponsored team returned to *Titanic* in two submersibles, operated by the Russian Academy of Sciences, to produce a new photo mosaic of the wreck and measure how rapidly the ship is disintegrating.

In 1986, Congress passed the *Titanic* Memorial Act, which instructed NOAA to develop guidelines for research, exploration and salvage at the site, according to Capt. Craig McLean, director of NOAA's Office of Ocean Exploration in Silver Spring, Md., who led the recent *Titanic* expedition.

Advances in diving technology have made it much easier to reach the wreck, making international protection of *Titanic* desirable.

"What we're focusing on now is the status of the site, some 20 years after its discovery, and on what is going to be the future of the site," McLean said. "Dr. Ballard's team did a thorough photo mosaic of the

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site [in 1986], and we'll be able to make some comparisons."

The NOAA team made two sets of dives on the bow and stern with the subs, each lasting ten to 12 hours.

Although there is only an occasional star fish or invertebrate at the *Titanic* site, "there's exceptional evidence of bacteriological activity—rusticles," McLean said.

Unlike shallow-water wrecks that are principally ravaged by currents, it is this microbial activity that is ever so slowly digesting and dismantling the *Titanic* wreck.

Titanic's bow filled with water before gliding to the bottom, sparing it the violent explosions of escaping air and other gasses that tore apart the stern as it sank.

"You can clearly see the form of the bow, the sides and skin of the ship with its port holes—some open, some closed," McLean said. "But when you work your way to the stern, it's a jumbled mass. What you see on the bottom is the virtual unzipping of lines of rivets [holding together] the skin of the ship and the deck of the ship."

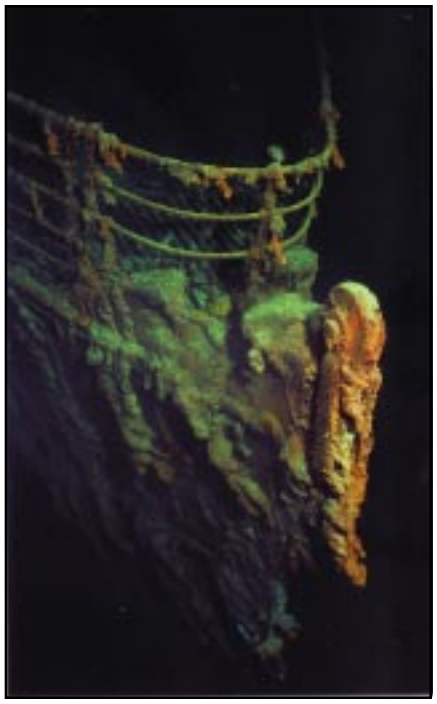
Lt. (j.g.) Jeremy Weirich, the mission chief scientist, said, "*Titanic* holds a special place in people's hearts, minds and imaginations, so it is appropriate to treat the wreck as a memorial site and to help regain its integrity. There's plenty of science information to be gained that can be applied to other deep sea research throughout the world."

Larry Daley/British Island Tours

Mir II is launched over the side of the R/V Akademik Keldysh.

Laura Rear/NOAA

(left to right) Canadian microbiologist Lori Johnston, chief submersible pilot Anatoly Sagalevitch and NOAA marine archaeologist Lt. (j.g.) Jeremy Weirich prepare to climb into Mir I for a dive to Titanic, while a member of the sub tender crew looks on.



NOAA

An external camera mounted on Mir I captures a view of Titanic's bow sitting serenely on the sea floor.

White Abalone

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recovery team at NOAA's Southwest Fisheries Science Center.

"This is a case of an animal clearly on the brink of extinction, and developing a sound recovery plan for them will be quite a challenge," said Melissa Neuman, NOAA Fisheries' recovery coordinator for white abalone, who is responsible along with the recovery team for putting together the program to keep these animals from disappearing.

"While we have an idea of how many still live in the wild, we have only a general notion of where they're located and what the animal's habitat requirements are," Neuman said.

Researchers began mounting research cruises to locate white abalone in July 2002.

"This is a case of an animal clearly on the brink of extinction, and developing a sound recovery plan for them will be quite a challenge," said Melissa Neuman, NOAA Fisheries' recovery coordinator for white abalone.

The plan is to develop a more accurate estimation of the total population, map potential habitat locations, remove some animals to breed in captivity and develop a plan to transplant them back into the wild.

Finding these rare creatures in nature is no easy task because their average size is about six inches in diameter. Since they live in waters 70 to 200 feet deep and tend to blend into their surroundings, the team used some very sophisticated equipment that work in conjunction with one another—a multibeam bathymetry sonar to determine depth and a remotely operated submersible with video cameras.

The multibeam sonar hangs below the ship's keel on a pipe mounted to the vessel. It scanned the area from 50 to 200 meters wide below the vessel, producing high-resolution, three-dimensional maps of the ocean floor.

"It's as though you drained the water out of the ocean and you can look right straight down and see the sea floor," said California State University associate professor Rikk Kvitek, the operator of the multibeam. "You can see all the rocks and crannies and cracks and crevices and where the sand planes are and the slopes and the shelves."

The map generated by the multibeam sonar is then used to guide the submersible to view areas where white abalone might reside. The sub, called a remotely operated vehicle or ROV for short, became the researchers eyes in depths too great for scuba divers to operate.

"This is a really neat marriage of technology," Neuman said. "Getting the ROV together with the multibeam worked really well because you could map the habitat the evening before and then navigate the ROV during the day using the map you already generated."

The operations center of the ship was abuzz throughout the July cruise. Scientists and crew members took 45-minute rotations piloting the ROV with joysticks, directing and focusing the cameras and concentrating on the video monitor for anything that remotely looked like an abalone.

Team members found the work tedious and physically demanding, but also very enjoyable.

"Way cool," was how Chuck Oliver of the Southwest Fisheries Science Center described his experience piloting the ROV. "It's like being under water without being cold and wet," he said.

White abalone are just one of eight species of abalone found off the West Coast. Other, more commonly known species of abalone are blacks, greens, reds and pinks. But unlike their cousins, white abalone live at depths that had kept them safe from most predators, especially humans.

"What makes white abalone unique is that it likes deeper, calmer water," Butler said.

When more accessible abalone stocks became depleted from human consumption in the 1960s, the white abalone became vulnerable for the first time to commercial and recreational divers because advances in compressed air diving technology allowed humans to work at the greater depths where white abalone live.

Intense commercial harvesting of white abalone began in 1969. Just three years later in 1972, landings of white abalone peaked at 143,000 pounds. In 1978 the number plummeted to less than 5,000 pounds.

The species has not recovered, even after conservation efforts were attempted.

NOAA Fisheries placed the white abalone on the endangered species list in May of 2001, giving it greater protection and a funding mechanism to begin a recovery program.

Despite the heightened protection, white abalone remain in a precarious position.

The severe reduction of their numbers has negatively affected their ability to reproduce. White abalone are "broadcast spawners," casting eggs and sperm into the water column at the same time for

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White Abalone

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fertilization. If there is not a reproductive partner close by, fertilization will not take place, even though one female can release as many as 10 million eggs at one time.

By the end of the six-day cruise, the recovery team had identified and recorded the location of 19 white abalone and a large area of habitat that appeared to be excellent for future generations.

What worries researchers is that all but four of the 19 live animals were solitary individuals, living more than two meters from their nearest neighbor, making fertilization in the wild much less probable.

There were also no young animals, and 116 empty shells from past generations lay eerily on the ocean floor.

While not encouraging news, Neuman remains positive.

"We have a really good team of people who are working on a multifaceted recovery program," she said, "one that involves the continued monitoring of the wild population, a captive propagation and enhancement program and an outreach plan that will raise public awareness."

The scientists carefully recorded the location of the abalone so that they can return and retrieve specimens at a later date, a job that requires human divers experienced at working at great depths to gently remove abalone from the rocks.

Other locations known to support large populations of white abalone in the past will be mapped and counted in 2004.

With an assist from scientists and a little luck, the white abalone will breed in captivity and their offspring will be reintroduced into the wild in just a few years.

BAMEX

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the atmosphere.

The two P-3s were equipped with Doppler radars to measure wind fields and precipitation.

The Navy P-3 flew in front of the storm line. Kermit, the NOAA P3, flew behind the line. Their combined Doppler data gave scientists a complete view of the storm.

According to James McFadden, program manager for NOAA's heavy aircraft at the Aircraft Operations Center in Tampa, Fla., the BAMEX flights were more dangerous than flights into a hurricane. He should know; as a meteorologist he's flown through more than 400 hurricanes over the past 30 years.

"In a hurricane, you know what you have to do. You fly in, then fly out," McFadden said. "I found these storms more difficult to fly in and a little scarier because we were flying close to the severe weather line and flying where we were susceptible to being hit by lightning. Lightning is worse than flying into hurricanes in my book. There is a bright flash and noise when you're not expecting it, like a stun grenade going off. My stomach jumped up into my throat," he said.

McFadden said they needed to maintain enough distance from severe weather to maintain safety, but still get close enough to make measurements. It was tricky because most flights were at night, and for Kermit, which flew inside the clouds, visibility was zero.

"We flew within five miles of the severe weather, but had to make sure we stayed far enough away not to get sucked up into the clouds," McFadden said. "We were very, very careful. Every day before the flight, the last thing we preached was safety. Everyone was looking over everyone else's shoulders to make sure everything was all right."

Jorgensen said, "It was quite a team effort between Kermit's chief scientist, navigator, flight director and aircraft commander to get the aircraft safely through the system. We had to rely on the radars and our instincts to design the proper flight pattern around the storms. We all had to put our heads together in a short time to determine what to do in the next 10 minutes. To make the Doppler work, we had to get very close to hazardous areas, at night, with lightning, large hail and turbulence a constant threat. It was the best example of team effort I've ever experienced."

The aircraft flew 18 periods in which outstanding data were collected, Jorgensen said.

National Severe Storms Lab researchers, who are using the data to do collaborative modeling work with NCAR researchers, have begun analyzing data from ten or 11 outstanding cases of bow-echo development.

Team effort was the most-cited ingredient for success of this seven-week project.

McFadden sent a thank you e-mail to his aircraft team, saying, "Everyone from day 1 who contributed to the success of this project deserves a pat on the back and more. To the maintenance guys who kept Kermit running and in great shape, to the [Science and Engineering Division] techs who kept the radars, microphysics probes and other sensors operating almost flawlessly, to the Ops guys who were able to get us the airspace we needed when we needed it and who did such a fantastic job of flying the missions, to the flight directors who did such a grand job of directing the missions, to the supply rep who did her job and more so well, I certainly want to offer my thanks for such a well done job."

Landsea

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to work at the Hurricane Research Division.

Landsea's most recent accomplishments have been his team role in producing NOAA's hurricane season forecast and an extensive analysis and update of HURDAT, the long-term database and record of all Atlantic hurricanes.

"Chris picked up a project that was considered incidental for many years and made a full fledged research project out of it," said Hurricane Research Division director Frank Marks. "He worked closely with the insurance community to develop and use this database for purposes beyond meteorology to benefit both industry and other general usage areas not previously considered. It has become more than an historical record; we have now developed many new applications for this database from understanding seasonal hurricane variability to reassessing insurance rates."

The insurance industry studies the hurricane database to gain a sense of the regional differences in the frequency, strength, and variation in hurricane activity, which are reflected in what insurance rates people pay.

"Hopefully this leads to people paying an appropriate and accurate rate. It also allows us to look at climate records and ask if hurricanes are getting more frequent or more intense and how this pattern changes over the years," Landsea said.

"I really enjoy working on a wide variety of activities, from the HURDAT to the Joint Hurricane Testbed, where I get to help administer some of the programs that assist forecasters in analysis and predictions," he said. "I also enjoy the chance to help in the annual hurricane field program and fly into storms. That's a lot of fun. I've learned a bit of expertise in processing dropsondes on the hurricane hunter airplanes and can participate that way," said Landsea, who has flown in 12 hurricanes in his career with NOAA.

"Chris is one of our big success stories, and I've seen him mature into a top notch scientist," Marks said. "He is the leader in our workgroup in terms of seasonal hurricane activity. He is instrumental in working with the National Centers for Environmental Prediction on the NOAA seasonal forecast. He deserves credit for developing this concept and getting all the different groups of NOAA to work together and produce the forecast every year."

Howie Friedman, who has also worked with Landsea during his entire career at the Hurricane Research Division, said, "Chris unselfishly devotes himself to his work. His collaborative efforts include many colleagues, from students he has mentored from high school through college to co-workers in his workgroup and beyond. He has the uncanny ability to communicate hurricane science to wide ranges of audiences, from third graders to technical audiences to Congress."

Landsea said he loves working at the Atlantic Oceanographic and Meteorological Laboratory.

"Our lab has a beautiful location on Virginia Key, such a wonderful set-up," Landsea said. "We have oceanographers on one floor, meteorologists on the next floor and University of Miami faculty situated right across the street. It has been a wonderful way to do collaborative research with a wide variety of people. Playing beach volleyball a few days after work isn't a bad way to wrap up the work week either!" Landsea said with a smile.

McAllister

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makes sense and is legal," McAllister said.

McAllister has been a naval architect for about 24 years, and worked for two ship yards before joining BMT 10 years ago.

He grew up in Seattle, Wash., on Puget Sound, where his family had a couple of small boats. While in high school he discovered an aptitude for engineering and an interest in naval architecture. He went to the University of Michigan, one of only a few universities in the nation that offered a program in naval architecture.

"I had no doubt that it was what I wanted to do," McAllister said. "In college I focused on ship structural design because it was more interesting to me than pipes and pumps and other things that go into a boat."

McAllister willl be with NOAA until the vessel design contract is completed sometime in 2005. During that time, he'll play a key role in evaluating and judging the proposals for the contract award and will serve as a technical consultant during the design phase.

"He's just been wonderful," Fuller said. "I'd keep him here forever if I could."

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