ADVANCED DIVER MAGAZINE

ISSUE 17 / 2004

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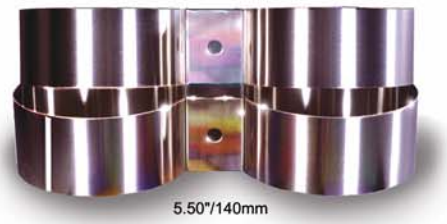

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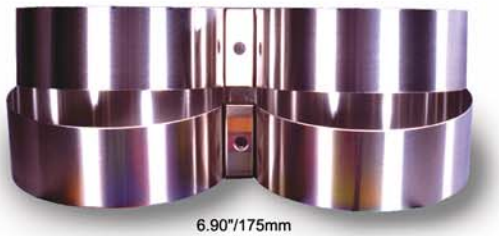

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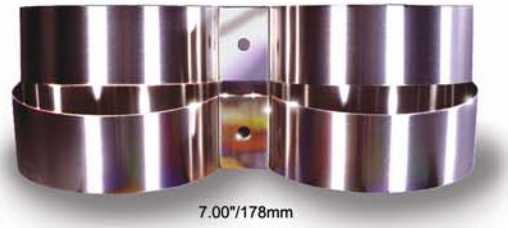

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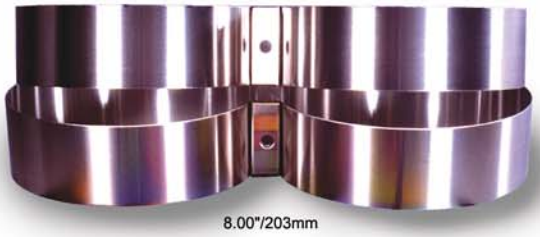

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Publisher's Notes

It's been a decade since I woke up one morning and decided I needed a new project to keep me busy. It was then when I started a dive magazine. Over the decade and 32 magazines later, we have seen many diving advancements from HID light technology and mixed gas computers, to decompression modeling, diver propulsion vehicles, and underwater communications.

Underwater photography has evolved with the ever increasing digital technology and the use of powerful HID floodlights instead of multiple strobes. High definition video is bringing the realism of our underwater world onto our 60-inch HD home entertainment centers. The first MacIntosh computer I used for the premier issue of Deeptech was an old MacII. Today that computer would not have the power to even turn on my new G5.

In these short ten years, we have advanced so much that technical diving has almost become the norm. Extreme dives below 400 feet and 7,000+-foot cave penetrations once thought almost impossible are being conducted on every continent.

But I see additional advancements in the near future like a greater acceptance of side mount gear configurations, more powerful and longer lasting batteries, and increased efficiency with LED light technology. Rebreathers have been around for decades, but I also see them making a huge jump into the mainstream of diving in the next decade.

Only time will tell and ADM will be here to cover it.

Curt Bowen / Publisher ADM

Photo by Steve Straatsma

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Issue 17 Cover
Photos by

Upper left: Jill Heinerth
Lower left: John Rawlings
Upper right: Vlada Dekina
Lower right: Jean Bruneau

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Dark Images

Photography in the Australian Aquifer

Text by Richard Harris
Images by Richard Harris and
Neville Skinner

The Southeastern region of South Australia is famous for many things: beautiful wines, lush farmlands, rich abalone, and Southern Rock lobster fisheries. But it's what lies beneath the surface of this corner of Australia that fascinates Adelaide based, amateur cave photographers Richard Harris and Neville Skinner.

Five hours drive from Adelaide (about the same from Melbourne) lies the expansive limestone karst plain of the Mt. Gambier region. The extinct volcanoes, Mt. Gambier and Mt. Schank, give testament to the violent forces that shaped this countryside only 5,000 years ago. Today, only the occasional bellowing cow and the hissing of high-pressure gas interrupts the tranquility of this landscape.

Beneath the lush pasture lays a subterranean world that non-cave divers can only dream about. Vast sink-holes (cenotes) and kilometers of phreatic cave dot the landscape (there are 429 recorded cave features in the region). The flat lying Tertiary Gambier limestone extends down to almost 300 meters below the land surface. Recently, divers from the Australian Speleological Federation-Cave Diving Group mapped The Shaft to 125 meters.

Donning dry suits, twin tanks, extra lights, and the important guideline reels while standing in a pine forest or a paddock full of dairy cattle feels somewhat out of place. There is no surf or current to contend with, just the odd cowpat that is a more frequent hazard. Access to the sites varies between a comfortable stroll down custom-built stairs in the middle of town at Engelbrechts Cave, to a 40-meter rappel into Hell's Hole that requires a climb back up a wire ladder.

Most sites are regulated by the Cave Divers Association of Australia (CDAA) and are rated in the degree of difficulty, training, and experience required. Cavern, sinkhole, cave, and penetration describe the 30 sites that are frequently dived in the area. As with all cave

Above left: Two divers drift near the surface of Kilsby's Sinkhole, waiting for nitrogen to be off gassed before completing their ascent. Divers will often extend their deco time or rest for a while on the surface, before attempting the arduous climb out of some sites.

Left: Cave explorer resting on the roof of Fossil Cave

diving, appropriate insurance is mandatory because of the potentially unforgiving nature of water filled caves.

Seven of my favorite sites are described below, all of which lie within a 30-minute drive from the town of Mt. Gambier.

Piccaninnie Ponds (sinkhole rating)

"Pics" is arguably the best known and most picturesque freshwater dive in the Southeast Karst province. Easy entry is provided from a custom built pier, and after a short swim across a shallow pond section, divers descend into a vertical chasm that is the stuff photographers' die for! Gin clear water and overhead sunlight create a visual effect that is the subject of countless posters and postcards. There is a 36.5-meter depth limit set by the government department that manages the site. Beyond this, a narrow silty slot is rumoured to continue down well past 70 meters. Sadly, a diver met his death here in 1974, a reminder of the potential risk of exceeding the prescribed limit. As you swim into the system, past the "Slot," you enter a beautiful cavern known as Cathedral, which is famous for the iridescent shimmer of filtered sunlight, which illuminates the limestone.

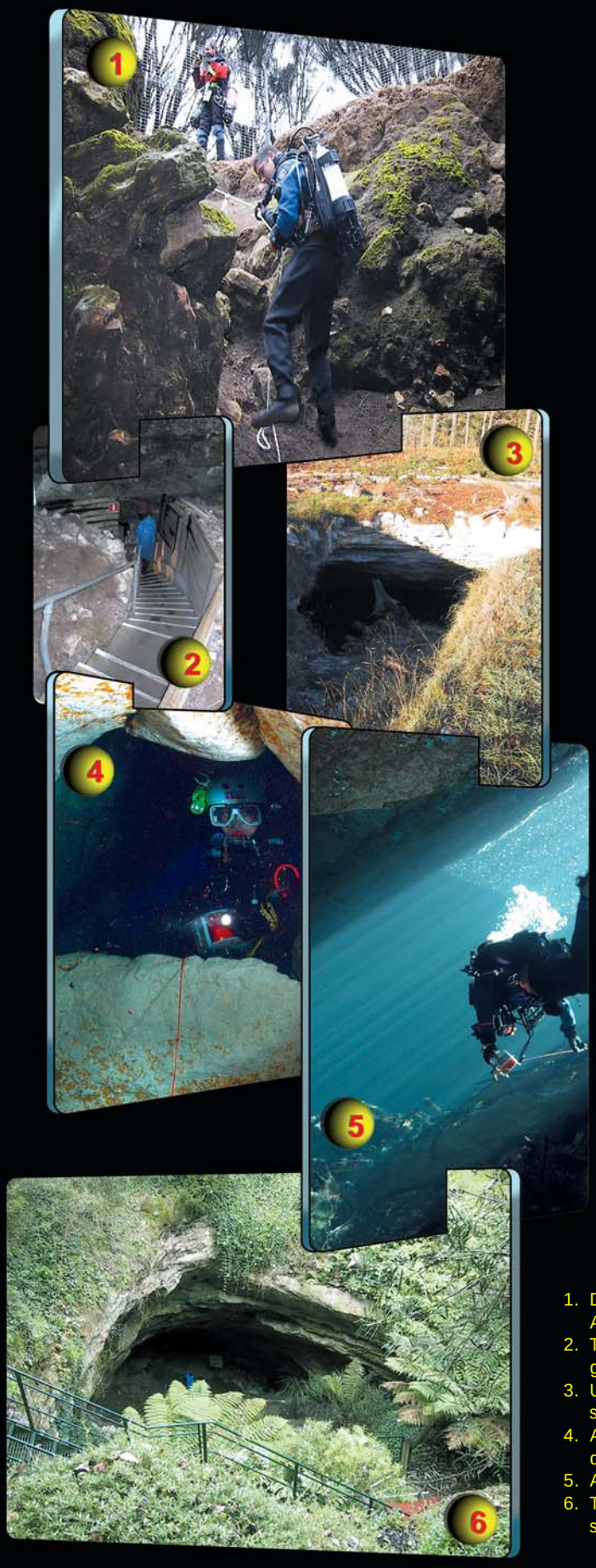
The Shaft (sinkhole rating)

A truly *gigantic* cenote, the tiny circular entrance in the middle of a grassy paddock belies the magnificent chamber below. The site was first discovered when a farmer's horse stumbled and stepped into the hole. Attempts were then made to fill the sinkhole with stones but to no avail. It was only when the first dives were done here that the futility of that gesture was realized, with comparisons often being made to the Melbourne Cricket Ground in terms of its size underwater. The hundreds of tons of rocks poured into the hole look like a tiny pimple on the rock cone when seen from one side of the site. In summer, sunlight shining down the one-meter wide entrance produces a collimated beam of light (The Shaft) down to the rock pile. The recent exploration to a depth of 125 meters using open-circuit trimix has confirmed the awesome proportions. The guestbook tells of the many famous visitors who have dived here including David Doubilet and Sheck Exley. It was also the site of Australia's worst cave diving accident, with four people losing their lives here in 1973. Hence, all dives are now done with an experienced guide. Entry is via rope or wire ladder from a tripod setup over the hole.

Above Right: The calm surface of this large pond gives no indication of the beauty that lies below. The "Slot" in Pics is rumoured to be still going at 80m of depth.

Far Right: Diver emerging into the giant subteranian room called the "Shaft".

Right: Entry to the "Shaft" is via a 3 foot circular hole in the middle of a paddock. Descending about 27 feet to the water, this sinkhole opens out into one of the most massive and beautiful sites in the world.



Kilsby's Sinkhole (sinkhole rating)

Named after the farmer who owns the land, the clarity of this 60-meter plus sinkhole and the sunlight patterns on the walls, makes this a photographic fantasy world. Used for weapons research in the past and now leased as a training site by the South Australian Police divers, a dive at Kilsby's is always on the "must do" list when in the area. The cave was closed for a period when two divers perished in 1969.

Allendale Cave (cave rated)

The tiny town of Allendale lies between Mt. Gambier and the coastal community of Pt. Macdonald. In the center of town, the main road splits around a small sinkhole that used to be a watering hole for the local bullock teams. Today, it provides an exhilarating, although brief, dive down a 45-degree slope to around 27 meters. The sock shaped sinkhole contains minor restrictions and true dark zones, so it is an excellent training ground as you progress through cave diving qualifications.

Fossil Cave and Pines Cave

(cave and cave/penetration rated respectively)

These sites are similar in their layout and their genesis. Classical sinkholes originally, one side of the caves has become choked, leaving the impression of a single slope running around the side of the rock cone. In the shallower areas, sunlight again plays its part in making the shutter release on our cameras go into overdrive. Further into the caves, rock collapses form interesting passageways requiring the use of guidelines and a good silt-free fining technique.

Engelbrechts East Cave (cave rated)

"Excuse me madam" you mutter as you lug your countless tons of dive gear through the middle of a tourist group taking a gentle stroll along the nicely laid out pathways of the large dry cave. "There goes another temporary Australian" she quips as you dip beneath the water and your lights disappear into the apparently impenetrable rockface! This cave is dark, narrow, and silty in areas, but surfacing in the 100 meter long dry cave at the other end makes it all worthwhile. More akin to the phreatic passages of Tank Cave (the local Holy Grail for penetration divers), Engelbrechts Cave can certainly test diving skills when taking photos at the same time.

This brief look can barely do justice to the myriad of dive spots in the area. At present (with occasional exceptions), diving in the sites described is regulated by the CDAA. This association was formed in 1973 in response to public reaction following the multiple diving fatalities in the region. The

1. Divers use a safety rope to lower themselves down the mud bank into Allendale Cave.
2. The path down to Engelbrechts Cave is shared by divers and tour groups alike.
3. Until the pine forest was recently cleared, the name of this cave made sense. Now it is known as "Stumps"!
4. A diver follows the line out of the back recesses of Pines Cave. Silt disturbed by the previous diver shows how quickly visibility can be lost.
5. A diver demonstrating perfect "trim" in the entrance to Pines Cave.
6. The overgrown entrance to Engelbrechts Cave lies in the middle of suburban Mt Gambier.

Deeper into Pines cave, the divers red drysuit contrasts nicely with the blue background. Sidemount tanks are becoming increasingly popular with Australian cave divers. Nikon D100 1/45 sec f4 16mm fisheye.

CDAA boasts high standards of training and safety and has successfully curbed this early spate of accidents in the region. The essential rules of cave diving were adopted from the late Sheck Exley's Blueprint for Survival, which has become the bible for cave divers worldwide. By following these basic principles and with good training, cave diving in Australia is now considered a very safe adventure sport. For Richard Harris and Neville Skinner, adding a camera to the recipe has made it a passion!

For qualified divers, permission to dive these sites can be organized by contacting the CDAA well ahead of your visit to South Australia. In many cases, visiting divers will be allocated an experienced "tour guide" to show them around the different sites.

CDAA: http://www.cavedivers.com.au/
Australian Speleological Federation: http://www.caves.org.au/
Richard Harris
http://users.bigpond.net.au/harry_online/
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LIFE ENDING SECONDS

3000 to ZERO in 72 Seconds

by Curt Bowen

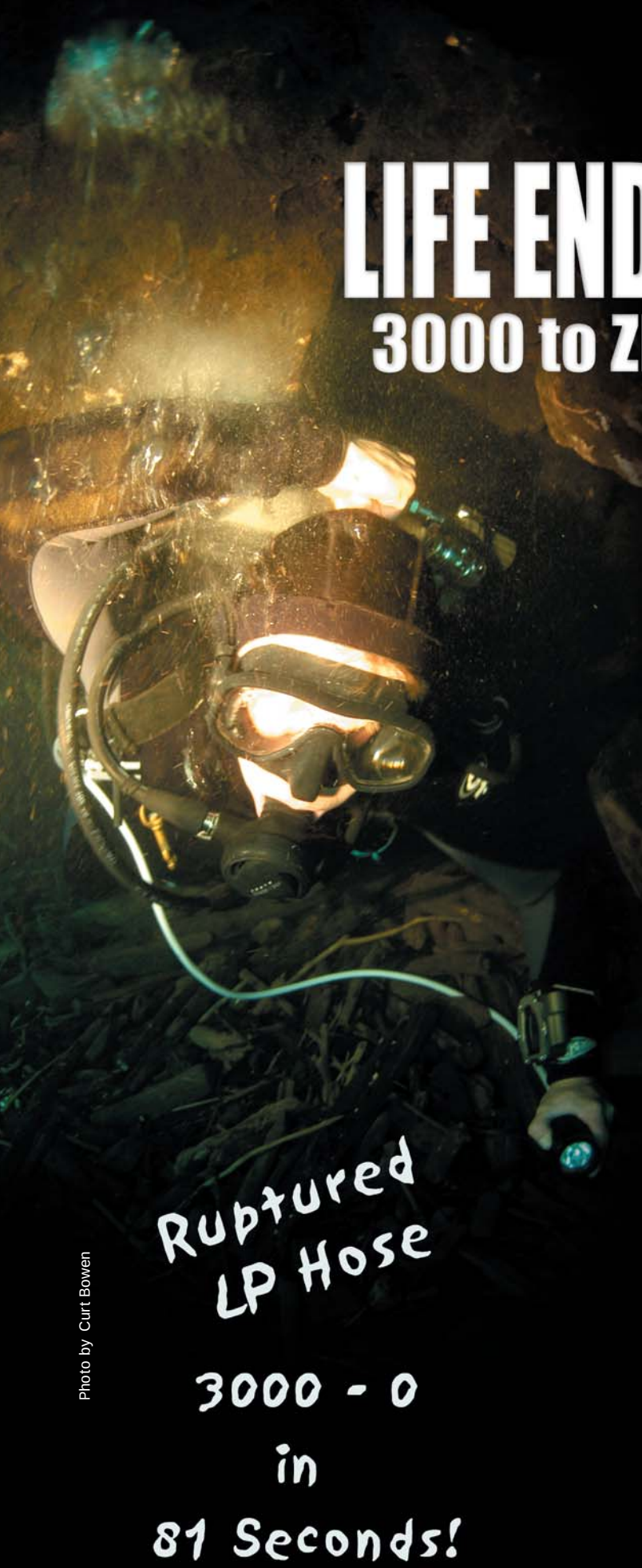


Photo by Curt Bowen

We train for equipment failures in our certification courses, practice our emergency drills, and conduct pre-dive safety inspections. We do all this in hopes that we may catch a problem before it happens or have the knowledge to remedy the situation at depth just incase one occurs. In all the preparation and drills, it always seems that an equipment failure happens at the worst time.

Advanced Diver Magazine looked into equipment failure one step further and conducted a series of tests at multiple depths in an attempt to calculate if increased depth can escalate a potential life threatening equipment failure. Afterwards, we posted the results on the technical diving forum, The Decostop (www.thedecostop.com), to see what the responses and suggestions from other technical divers would be.

The test

Four different equipment failures were simulated at four different preset depths and timed for their results. Each test included a full aluminum 80 cubic foot cylinder filled to 3000 psi. The test timed how long it would take to drain each aluminum 80 from 3000 psi to 0 psi.

The equipment failures tested

1. High-pressure hose failure. Simulated by putting a pre-cut high-pressure hose on a first stage regulator. The cylinder valve was fully opened at the predetermined depths, and the time it took to drain an 80 cubic foot cylinder was recorded.
2. Low-pressure hose failure. Simulated by putting a pre-cut low-pressure hose on a first stage regulator. The cylinder valve was fully opened at the predetermined depths, and the time it took to drain an 80 cubic foot cylinder was recorded.
3. Burst disk failure. Simulated by removing a burst disk from the cylinder valve at depth. The time it took to drain an 80 cubic foot cylinder was recorded.
4. Free-flow second stage regulator. Simulated by manually purging a high performance second stage at the predetermined depths until the cylinder was emptied. The time was recorded.

FREE FLOW REGULATOR

80 Cubic Feet in 90 Seconds

Depths Tests Conducted		
Depth Ft.	ATA	PSI
0	1	14.7
99	4	59
232	8	118

Equipment Failure Test Results

Test Conducted	Depth (ffw)	Time to Drain 3000 to 0 (seconds)	Cuft drained in 15 seconds
High Pressure Hose Failure	0 ffw 99 ffw 232 ffw	1320 seconds (22 min) 1320 seconds (same) 1320 seconds (same)	0.90 cuft
Low Pressure Hose Failure	0 ffw. 99 ffw. 232 ffw.	83 seconds 81 seconds 82 seconds	14.45 cuft
Failed Burst Disk	0 ffw 99 ffw 232 ffw	72 seconds 74 seconds 74 seconds	16.66 cuft
Free Flow Second Stage	0 ffw 99 ffw 232 ffw	255 seconds 155 seconds 91 seconds	4.7 cuft 7.74 cuft 13.18 cuft

This test (see above results) produced clear and precise results indicating that any major equipment failure, with the exception of a high pressure hose rupture, would result in a catastrophic gas volume loss in just a few seconds.

Applying this knowledge to real life situations.

The far right column in the chart above provides the amount of gas lost in cubic feet in 15 seconds. (The estimated time it takes for an unsuspected diver to fully analyze and shut down the failed regulator or isolation valve.) Of course with some situations, such as a ruptured burst disk or tank neck o-ring failure, all the volume in the affected cylinder will be lost.

The best reaction and solution to save the maximum amount of gas will vary according to the type of rig each diver is using from doubles with an isolation valve, independent doubles, and side mount cylinders. The ending consensus indicated that a good buddy team, especially for extreme technical diving and proper gear maintenance was of top priority.

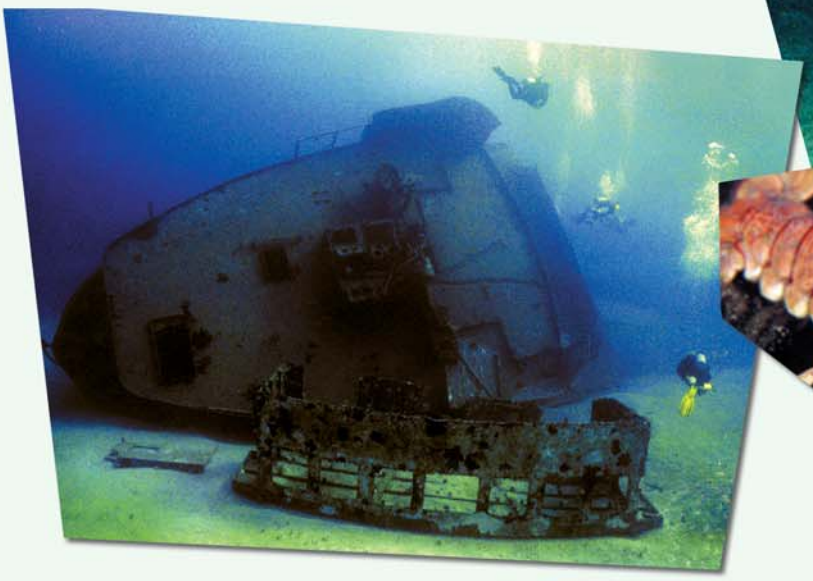
For the complete thread about equipment failures on “The Deco Stop” go to
http://www.thedecostop.com/forumsshowthread.php?t=5296&highlight=equipment+failure+test

Featured Photographer

Vlada Dekina

My first introduction to scuba was through my father who was an avid diver and a member of a very active dive club in the Far East of Russia. Every summer, the dive club members and their families spent the whole month in the scuba diving camp on the shores of the Sea of Japan. As all other kids in the camp, I grew up snorkeling and free-diving for hours at a time and listening to incredible scuba stories the divers would share at every meal. At the age of 14, my father finally let me try his scuba unit, which was the most wonderful experience, even in 15C water with no wetsuit.

Fast-forward ten years later and half the globe away from the Far East of Russia, I settled in Canada, finished graduate school, found a job, and finally got enough time and money to afford a trip to the Caribbean. Once there, I could not help but notice the dive shop in the hotel advertising the scuba course. My first thought was that the equipment really changed since my



father's single-hose, no BCD, reserve valve scuba unit. My second thought was "where do I sign up?" That was it—I went home a certified diver.

I was very lucky to have my first underwater photography experience in Cozumel. I was lucky a second time because my first underwater pictures turned out so good that I decided to buy my own camera system. Since then, the only dives I have done without a camera were the training dives.

Back in Canada, I realized that diving and photography had become more than a vacation pastime—I kept thinking of diving and dreaming of taking pictures every minute of the day. That was when I discovered the Great Lakes with years of maritime history and thousands of shipwrecks. The road from a resort certified diver to a Great Lakes diver, from a single tank to doubles, and from air to mixed gases was challenging and interesting, but the instructors and buddies that I met along the way made the experience worthwhile.

I currently reside in Toronto, Canada and try to dive every weekend somewhere in the Great Lakes. I also make one or two warm water trips per year. Several of the most recent warm locations included the Bay Islands, Red Sea, and Truk Lagoon. Shipwrecks are my favorite photo subject with little fishes and critters a close second.

Starting with a little Sea&Sea camera, my list of photo gear has grown a lot. I currently use a Nikonos V with a 15mm lens and dual Ikelite 200 strobes for most of my Great Lakes and other wreck photography. My second system is Nikon F100 in an Aquatica housing with a Nikkor 105 micro lens for macro photography and 17-35mm lens for wide angle.

Email: Vlada@wrecksandreefs.com

WRECK OF THE MS LUBRAFOL

by John Coffey and Matt Garvey

N 28°58'52" - W 80°11'21" D-180 fsw

As our teams passed through 60 fsw on our way to a target depth of 180 fsw, my mind wandered back to the previous year's dives in Scapa Flow. My bottom timer showed a temperature of 52 ℉, visibility was 10 feet, and a one-knot current was making the trip down the anchor line less than easy. This, however, was wreck diving off Florida's Central Atlantic Coast. Our objective was the wreck of the MS Lubrafol, a Panamanian-flagged oil tanker that was one of the many victims of the U-boats that hunted these waters in 1942.

The MS Lubrafol was a 7,138 ton tanker built in 1924 in England and was time-chartered to the U.S. War Shipping Administration in the spring of 1942. While en route from Aruba to New York, she was attacked in the pre-dawn hours on May 9, five miles east of Pompano Beach, Florida. The attacking submarine was a Type VII U-boat designated the U-564 and commanded by Reinhard Shuren. Although the two torpedoes fired by U-564 struck the Lubrafol, she did not sink immediately. The resulting fires fed by a cargo of 67,000 barrels of No. 2 fuel oil forced the crew to abandon ship. Eleven of the 44 crew members where killed. The survivors were rescued by the U.S. Coast Guard and taken to Boynton Beach, Florida. The burning tanker was carried north by the Gulf Stream and eventually sank at her present position of 42 miles ESE of New Smyrna Beach, Florida. During that first week of May 1942, Korvette Kapitain Shuren and the U-564 sank two additional ships (totaling 20,400 tons including the Lubrafol) and seriously damaging two others.

Top: Archive photo of the MS Lubrafol used with permission from the National Maritime Museum, London

Top: Archive photo of the MS Lubrafol
1 Jakub Rehacek examines the ships exposed propellers
2 Matt Garvey and Jakub Rehacek on the stern
3 Fuel oil continues to leak from the wreck
4 CCR team enters the wreck

As our two teams crossed the 100 fsw mark, the visibility improved dramatically to about 60 feet. The wreck lies on her port side oriented roughly south-to-north. The stern section, including one of the massive propellers, remains largely intact. A massive hole amidships beckons divers to explore the partially collapsed interior, but fuel oil has collected in the higher points of the interior and extreme caution must be exercised if divers chose to enter the wreck.

The bow quarter of the Lubrafol is largely a debris field, with sections of piping and deck equipment strewn about the ocean floor. Potholes are still intact in some of the collapsed forward sections. Throughout the dive, large schools of jacks circled the wreck and several enormous black groupers watched us warily from their homes in the holes and crevices formed by the debris.

This first dive was intended as a survey dive to choose among the many points of entry for exploration. The divers worked their way from bow to stern poking into the various cracks and holes trying to establish which holds and rooms would be the object of further exploration. As we came to the stern quarter and passed over the port rail, I was treated to the sight of the rudder and the large port screw and shaft in silhouette. Covered in growth and surrounded by jacks, I thought of the craft and courage of the merchant seaman during the early days of WWII.

Although both our teams were diving normoxic trimix, the open circuit (OC) divers (Dr. Allen Riggs and John Coffey) were equipped with double 95s and 40 cf bottles of EAN50 and oxygen. The closed circuit rebreather (CCR) team (Matt Garvey and Jakub Rehacek) were diving 1.3 ATA constant PO2, electronic CCR with a 40 cf bottle of bottom mix for bailout and a bottle of oxygen. Both OC and CCR profiles were computed using Phi Lee's *Decoweenie* software. Overall runtimes for the OC dives were 64 minutes for the first dive and 48 minutes for second dive along with a two-hour surface interval. The deeper decompression stops were brutal in 52 °F water. The shallower stops were a welcome relief with temperatures increasing to 62 °F and at 20 feet increasing to 80 F.

As we waited for the second group of divers to complete their decompression, we all were surprised at the heavy oil sheen visible on the ocean surface in the area around of the wreck. Globules of oil one to two inches in diameter were floating around the dive boat. We found it amazing that after 60 years, the wreck was still leaking fuel oil.

Captain J.B. expertly supported our dives with his comfortable and well-equipped 42-foot Newton custom *Sea Dog Diver*. Capable of 20+ knots, *Seadog Diver* carried us out the 42 miles from the River View Marina to the dive site in just over two hours. The custom trip was booked through Rick Coleman's *Sea Dog Dive Center* located next to the Riverview Hotel and Marina in New Smyrna Beach, Florida. They are a fully equipped technical shop providing nitrox and trimix fills.

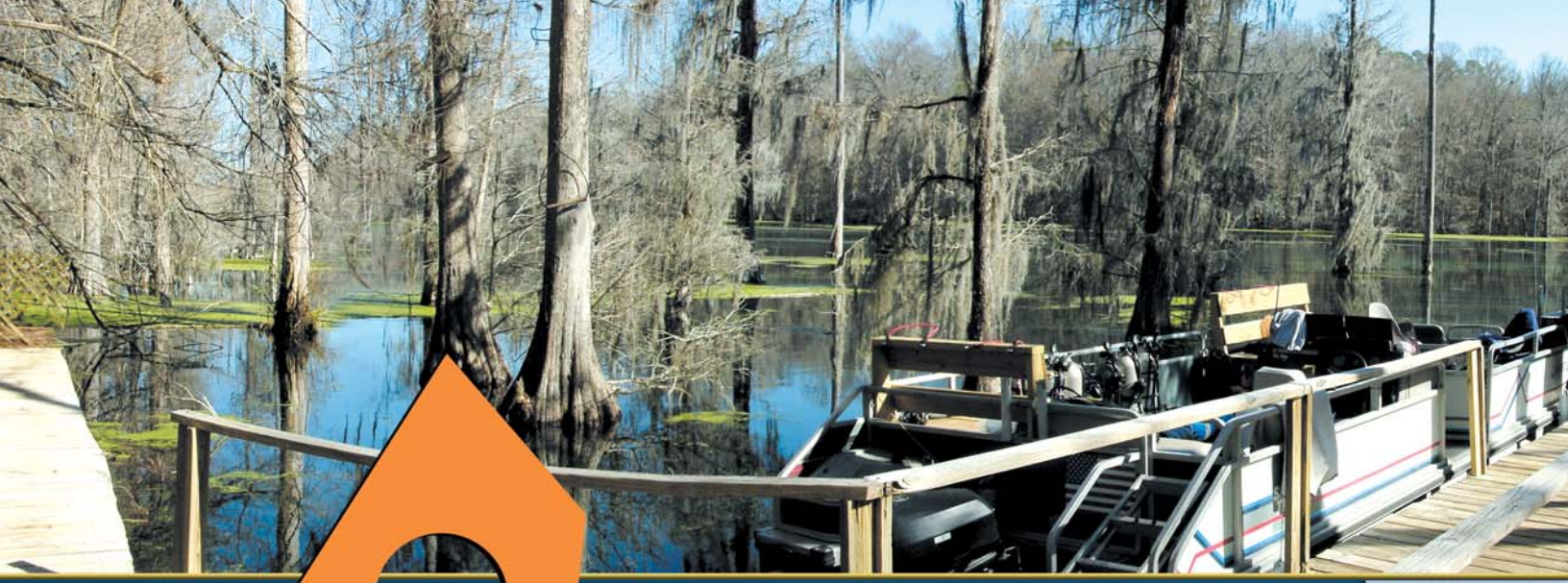
Underwater images acquired with a Nikon Coolpix 500 in a Light and Motion Tetra housing with auxiliary 19mm lens (images acquired at jpg fine). Topside photographs were shot using a Nikon F100 with Tokina ATX 28-80mm F2.8 on Fuji film.

The authors would like to thank Dr. Chris Jones in the UK for his assistance in researching the history of the MS Lubrafol.

Sea Dogs Dive Center
111 Flagler Ave.
New Smyrna Beach, Florida 32169
Ph: 386.424.1644 http://www.seadogdiver.com

Riverview Hotel
103 Flagler Ave.
New Smyrna Beach, Florida 32069
Ph: 904 428-5858

Top left - Allen Riggs swims over the debris field
Lower right - Allen Riggs at the 60-foot deco stop



Cave Diving on Merritts Mill Pond with Cave Adventurers

Jackson Blue • Hole in the Wall • Twin Cave • Shangri-La

Text by David Miner, photography by Jitka Hyniova & Curt Bowen

Merritts Mill Pond is over four miles of crystal clear water, beautiful cypress trees, and steep hills lining its banks. The Pond's beauty can only be measured in geological time periods because at times you feel as if you returned to the times of the dinosaurs when nature was untouched and unmarked by human existence. There are some homes on its banks and many other signs of human interaction, but Merritts Mill Pond is still an extremely beautiful place.

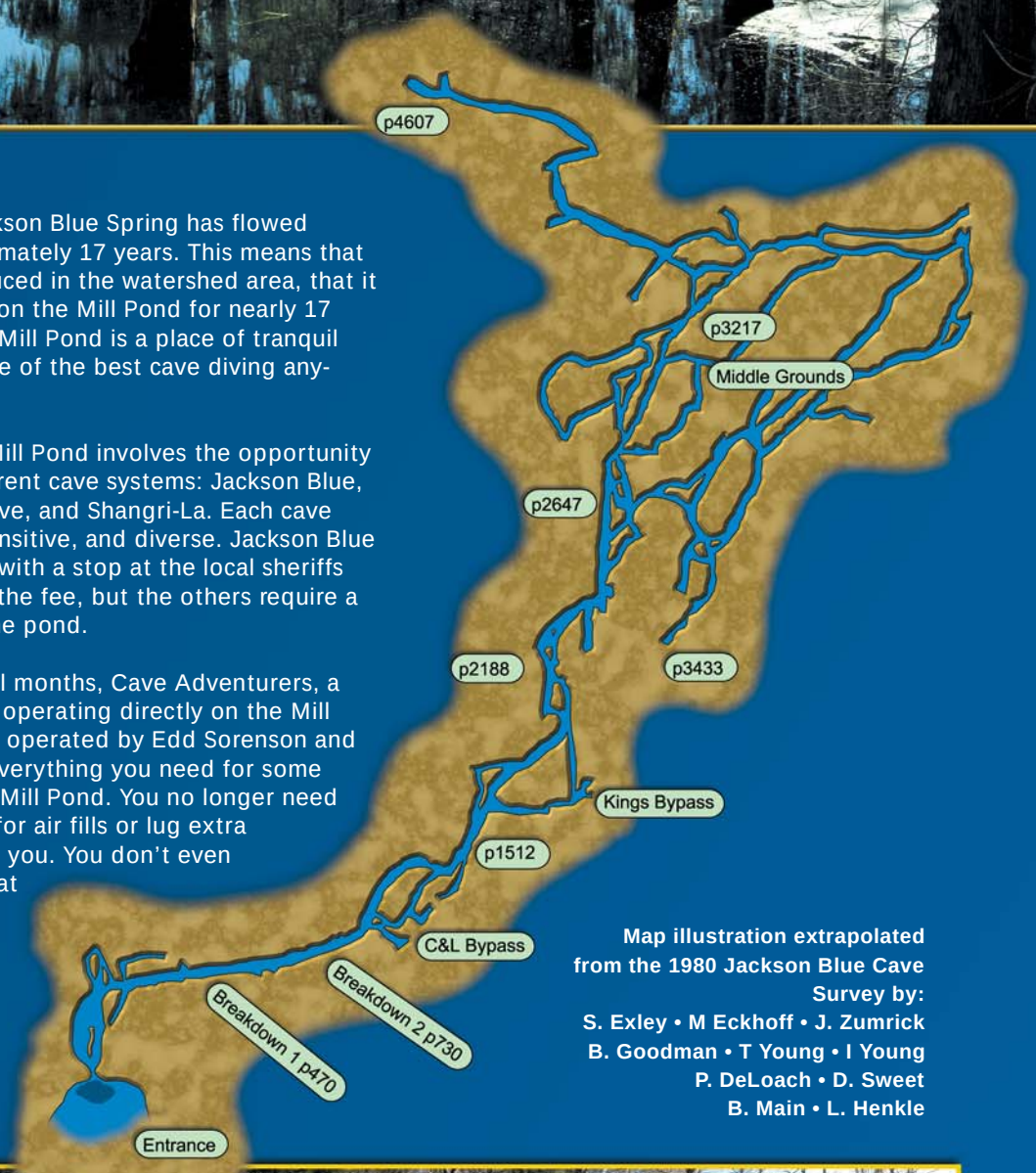
A man made damn at the southern end of the pond creates Merritts Mill Pond. Jackson Blue Spring, a first magnitude spring on the northern end of the pond, creates the lake effect from the thousands of gallons of water flowing out of the ground and being stopped by the damn. Sand, hydrilla, and cypress trees and stumps makeup the bottom of the pond and provide the vibrant white, green, and brown colors that contrast beautifully with the clear blue water.

The land that surrounds Jackson Blue Spring and the Mill Pond creating its watershed, which extends into Alabama, is approximately fifty percent agriculture and fifty percent forest, clay hills, and limestone at or near the surface. All of the springs on the Mill Pond are tributary to the Chipola River. Unfortunately, due to the amount of agriculture in the area, water tests at Jackson Blue Spring and the Mill Pond confirm the second highest concentration of nitrates of any first magnitude spring in Florida. It is estimated that the

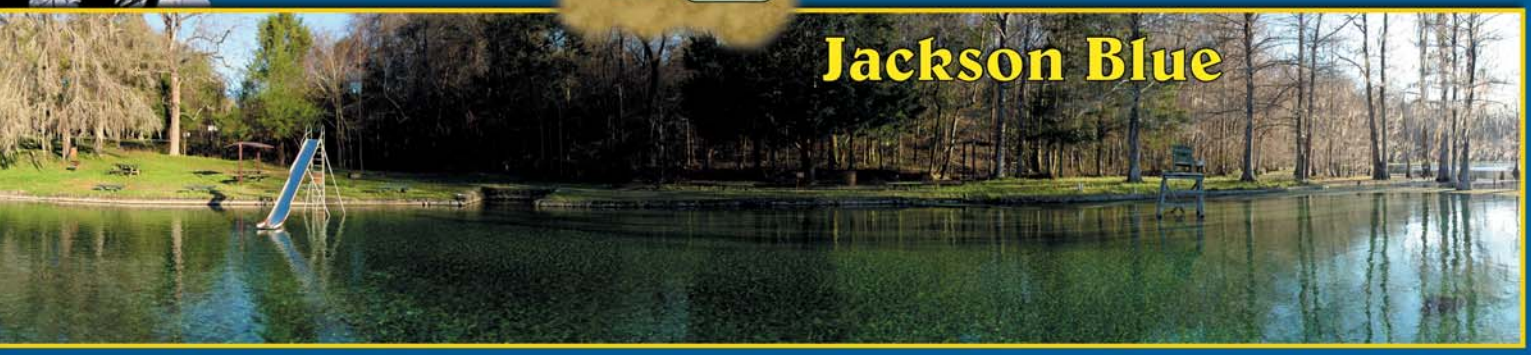
water flowing out of Jackson Blue Spring has flowed underground for approximately 17 years. This means that if nitrate intrusion is reduced in the watershed area, that it will not have any impact on the Mill Pond for nearly 17 years! Nevertheless, the Mill Pond is a place of tranquil beauty and home to some of the best cave diving anywhere.

Cave diving on the Mill Pond involves the opportunity of diving up to four different cave systems: Jackson Blue, Hole in the Wall, Twin Cave, and Shangri-La. Each cave system is unique, very sensitive, and diverse. Jackson Blue can be accessed by land with a stop at the local sheriffs office to sign in and pay the fee, but the others require a boat and a trip around the pond.

Over the past several months, Cave Adventurers, a new dive shop, has been operating directly on the Mill Pond. Cave Adventurers, operated by Edd Sorenson and Trevor Graybeal, offers everything you need for some great cave diving on the Mill Pond. You no longer need to travel back into town for air fills or lug extra sets of double tanks with you. You don't even need to tow your Jon boat anymore because they have two specially equipped pontoon boats for rent.



Map illustration extrapolated from the 1980 Jackson Blue Cave Survey by:
S. Exley • M Eckhoff • J. Zumrick
B. Goodman • T Young • I Young
P. DeLoach • D. Sweet
B. Main • L. Henkle



Left photo strip by: Becky Kagan

Edd's house backs up on the Mill Pond and his garage has been converted into a dive shop and air station. Both of the pontoon boats tie up to the extensive dock system behind Cave Adventurers making access to the different caves extremely easy and comfortable.

I had the pleasure of diving Jackson Blue and Hole in the Wall with Cave Adventurers in February and have to say they run a first class operation. They kept my tanks full (extremely full) with their continuous blend nitrox mixing station, toted my gear back and forth from the boats, which is up and down a steep hill behind Cave Adventurers, and even let me borrow a light when mine took a crap. They offer their friendship and hospitality to everyone and always make sure you have everything you need. Their knowledge of the cave systems is great, which is extremely valuable if you're diving on the Mill Pond for the first time.

Cave Adventurers offers air, nitrox, oxygen, and argon fills, rents double and single tanks, scooters, and has two great pontoon boats to get you to the dive site. They'll even let you demo gear they have in the shop; just ask and they'll set you up. The opening of Cave Adventurers brought convenience to cave diving on the Mill Pond, which once was much more difficult and time consuming.

As mentioned, the caves on the Mill Pond are vastly different, each offering their own unique experience. Each cave offers something different but is also very sensitive and delicate. The following is a brief description of each cave system.

Jackson Blue • Jackson Blue is the most extensive cave system on the Mill Pond and as mentioned, is a large first magnitude spring, which is responsible for most of the clear water making up the pond. The spring basin is approximately 250 feet in diameter and is up to 20 feet deep. The cave entrance is approximately 8 feet high and 30 feet wide. There are thousands of feet of surveyed tunnel and a gold "main" line that runs all the way to the Banana room, which is around 4,200 feet from the entrance. The cave walls are white limestone, and the water is crystal blue making for spectacular scenery. The cave water temperature is around 68 °F year round and visibility can easily be 100 feet or better. Maximum depth is around 90 feet.

Diving Jackson Blue can only be expressed in one word…fantastic. Whether swimming against the high flow and only seeing the first 500 to 1000 feet or scootering for thousands of feet deep into the cave, Jackson Blue has something for every cave diver. The beautiful white limestone walls, large breakdown, and large tunnels offer unsurpassed beauty and intrigue.

Diving note: Before diving Jackson Blue for the first time, especially if you're going to scooter, talk to Edd and Trevor at Cave Adventurers about the system. Research the map and plan your dive accordingly. Edd and Trevor know this system well. Use their knowledge. Jackson Blue is a beautiful and sensitive cave system and will only remain that way if you know and dive within your limits and ability. Respect the cave system.

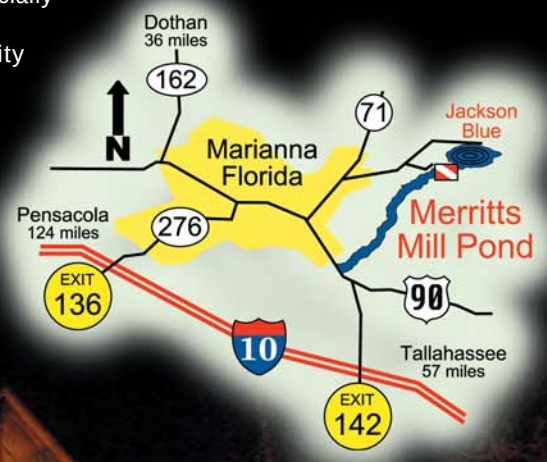
Trevor Graybeal

Edd Sorenson

Hole in the Wall • Hole in the Wall is a beautiful cave system located approximately 800 yards down stream from Jackson Blue. Hole in the Wall is a large cave system with big tunnels and white limestone. There is an upstream and downstream, but this is a low-flow cave system and sometimes can even siphon. Just inside the cave entrance is a chimney that leads to the upstream and downstream tunnels. Visibility is usually much less than in Jackson Blue and depths range from 60 to 100 feet. You must have a boat to dive Hole in the Wall.

Hole in the Wall is home to a very rare cave species called the Georgia blind salamander. The salamander only resides in several areas of the cave system and is very sensitive to environmental change.

Diving note: Before diving Hole in the Wall, especially for the first time, talk to Edd and Trevor at Cave Adventurers about the system. Due to the sensitivity of cave system and the presence of the rare blind salamander, it is recommended that you not dive this system unless you have completed at least 100 safe cave dives and have excellent buoyancy control. Scootering is not necessary due to the low-flow and is not recommended. Research the map and plan your dive accordingly. Hole in the Wall is a beautiful and sensitive cave system and will only remain that way if you know and dive within your limits and ability. Respect the cave system.



Twin Cave • Twin Cave is located approximately 300 yards downstream from Jackson Blue. Twin Cave is a low-flow system and is very silty, so excellent buoyancy control is a must. The cave water temperature is around 68 °F year round and maximum depth is around 105 feet. Visibility is usually very good. Twin Cave offers a couple fissure cracks, one at the entrance, that are beautiful and fun to drop through. Good technique is a must, as the cave is very unforgiving. You must have a boat to dive Twin Cave.

Shangri-La • Shangri-La is approximately 200 yards downstream from Jackson Blue. There are several vents/cracks, but the main spring is a beautiful little cave around five feet deep at the base of the limestone bluff. Shangri-La is just large enough to squeeze into and generally considered a side mount dive. Visibility is excellent and there is slight flow. The cavern is beautiful and makes for a nice dive itself. Once through the entrance, the cavern drops to about 25 feet deep and is approximately 15 by 20 feet in size. The cavern is very silty and requires excellent buoyancy control to keep from reducing visibility.

To dive the springs and cave systems on Merritts Mill Pond, visit Cave Adventurers website at www.caveadventurers.com or call them at (850) 482-6016

Photo: Becky Kagan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A TALE OF TWO SCHOONERS

by Robert and Jan Underhill

The Straits of Mackinac lie at the northern tip of Michigan's Lower Peninsula. The five-mile crossing between Mackinaw City on the lower peninsula and St. Ignace on the Upper Peninsula provide an imaginary line separating Lake Huron to the east from Lake Michigan on the west. The numerous islands, bays, and ports in the area provide a yachtsman's paradise during the summer months. But even during these relatively calm days of summer, boaters keep a wary eye on weather reports. The Straits have a well-deserved reputation for turning nasty quickly as weather fronts on Lake Michigan or Lake Huron move up into this natural funnel.

Commercial traffic through the Straits runs from early March, when the ice leaves the lakes, to late November or early December depending on how long the water stays open. In the 1800s and early 1900s, gale force winds during the early and late months claimed many schooners. Most were driven ashore or onto shallow reefs, but *two* sank in deeper water.

The William Young foundered in a storm on October 5, 1891. No lives were lost and it is reported that the sails and much of the gear was removed and placed in the boat by the crew before the ship sank. The Young was built in Ohio in 1863 and the ship's size of 139 x 26 x 12 suggest that the schooner was built as a "canaller." Before improvements in 1884, all ships navigating the Welland Canal at the east end of Lake Erie had to have a maximum length of 140 feet and a maximum width of 26-1/2 feet. The Young was rebuilt after a fire in 1889 and may have been converted to a tow barge at that time.

Many of the schooners in the late 1800s were no longer sailing. A process known as "cutting down" removed all of the upper masts and topsails. Regulation of that time required all of the schooner barges to have the lower sails and rigging for use in an emergency and to have a captain and crew.

At the time of the loss, the steamer Nashua was towing the Young. The Nashua was built in Ohio in 1868, and is reported to have been cut down to a steam barge in March of 1891. The Young was the second schooner lost on the trip up the lakes hauling a load of coal from Ashtabula to Racine Wisconsin. Earlier in the same trip, another schooner, the Thomas Parsons, foundered in Lake Erie in another storm. Both schooners sank without a loss of life, but the Nashua was not to be so lucky as it capsized on Lake Huron almost one year later on October 4, 1892, losing all fifteen crew members. The wreck was found floating upside down off Bayfield, Ontario. The Nashua was hauling a load of lumber from Georgian Bay to Toledo, Ohio and was very likely overloaded.

The wreck of the Young was discovered in 117 feet of water just east of the Mackinac Bridge in August of 2002. By Labor Day weekend of that summer, it had become the hottest dive in the Straits of Mackinac Underwater Preserve. The ship evidently sank bow first, splitting open the bow of the otherwise intact wreck. The deck around the bow slopes downward with chain from the windlass spilling out to both anchors lying on a pile of coal on the bottom. Because the coal fell out of the open bow area, it is possible to swim through the hold to the first hatch. No other penetration is possible, as the rest of the ship is completely filled. Evidently, all interior bulkheads and cabins were removed after the fire in 1889. The crew must have lived in a small deck cabin in the stern. The level of the coal in the ship, up to the hatch comings, makes it seem likely that the Young was considerably overloaded when it went down.

The wreck is missing much of the running rigging that you would expect to find on this type of schooner. A small mast in the sand next to the wreck is devoid of all blocks used for sail raising, boom-topping, etc. An intact wheel at the stern rules out divers stripping the wreck in the 1960s. So, it is possible that the ship was worked by one of the early hardhat operators shortly after sinking. The cargo of coal would not be

worth raising, but smaller and lighter items were often grabbed to make a fast profit in one day of diving. Small schooners of this type were very common on the Great Lakes during the late 1800s. Normally, identifying this type of wreck can be very difficult, but the Young still has its official registration number 26230 carved into the side of the main hatch.

The Young is a pretty friendly dive with the deck at around 100 feet and plenty of ambient light. Visibility can exceed 50 feet on a good day.

The Newell A Eddy was only three years old when it sank with all nine hands on April 20, 1893. Unlike the Young, the Eddy probably never worked as a sailing vessel. Built at the F.W. Wheeler yard in Bay City, Michigan, it was most likely designed to be towed behind the steamer Charles A. Eddy, which was built at the Detroit Dry Dock Co. one year earlier in 1889. The Newell Eddy was a large schooner barge, 242 x 40 x 16, built for the grain trade between the Midwest ports on the lower west side of Lake Michigan and Buffalo on the east side of Lake Erie. The Newell A. and the Charles A. were down-bound about ten miles below Cheboygan Light in Lake Huron at the eastern end of the Straits pushing into a gale out of the southeast when the towline between the vessels parted. Trouble with the steering prevented the Charles A. Eddy from retrieving the Newell A. Eddy, which was last reported drifting toward Bois Blanc Island. A search the next day found no trace of the missing schooner or the crew. A few days later the tug George W. Cuyler found the stern section of the schooner washed ashore on the east end of Bois Blanc Island.

It is hard to imagine with today's technology what it is like to have a ship and crew just disappear. But in the late 1800s, it was not unusual to have ships and crew simply go missing. Sailors at the time surmised that a heavy layer of ice on the sails and rigging prevented the captain, W.R. Barton, from raising sails, leaving him and his crew to drift before the storm. No trace of the ship or crew were ever found until 99 years later when a research vessel from the University of Michigan discovered the wreck in 165 feet of water just north of Raynolds Reef. It is probable that the Eddy drifted onto the reef, broke off its stern, and then drifted into deep water on the other side.

The wreck is upright with the two forward masts still standing. The tip of the main mast rises to about 50 feet below the surface. Diving the Eddy is considerably more difficult than the Young. The wreck is in an area of Lake Huron where currents can stir heavy silt on the lake floor reducing visibility to around three feet. The wreck is covered with this silt and little ambient light shines to the deck at approximately 140 feet. Because of the remote location, between the Upper and Lower Peninsulas east of Bois Blanc Island, the wreck is usually not tied with a buoy and has to be hooked.

I usually try to dive the wreck on a flat calm day. I set the hook out on about 120 feet of line so that I can catch the crow's nest on the main mast. I find it easier to tie in to the top of the masts in clear water, and then proceed down the mast onto the wreck. On rare occasions, it is possible to get 30 feet of cloudy visibility and keep it as long as you avoid excessive kicking while on the deck. The wreck's rigging is still mostly in place, with the booms, yards, blocks, and mast hoops that once held the canvas sails, now being rotted and gone around the masts. As of the summer of 2002, when I last looked, the brass capstan cover with the name of the ship is still on the capstan at the bow.

The Newell A. Eddy's towing steamer, the Charles A. Eddy fared much better than the Nashua. The ship is reported to have been abandoned and dismantled at Sturgeon Bay Wisconsin in 1918.

DEEP INTO THE APEX OF HELL

Text and Photography
by Curt Bowen and Steve Straatsma

Waves pounded the sides of the one hundred foot vessel, SeaFever, pitching her haul around as if she were a small cork adrift in the ocean. It was as if Poseidon himself wanted to keep the secrets of the Cay Sal Bank for himself. Cay Sal is a small group of rocks located north of Cuba. Mariners speak of the Cay Sal Bank as the "Apex of Hell," and we were right in the middle of it.

Onboard the SeaFever, a small group of explorers lured by the rumors of giant bottomless blue holes clung to their bunks as the seas flung the vessel around as if it was a plastic tugboat in a child's bathtub. Luckily, we had a secret weapon, not some new electronic wonder or mystical sea powers, but a seasoned old seadog captain.

At first glance, you could envision this short, stocky, red-faced man with a round belly right beside Black Beard himself. He was ill tempered but quick with a joke, a character straight from the pages of Herman Melville's, *Moby Dick*. He was known as Captain "Red."

With his legs spread apart and his toes digging into the pilothouse floor, Captain Red leaned back against the captain's chair to maintain balance and spun the ship's wheel back and forth for hours, masterfully maneuvering the SeaFever through the 8 to 10 foot raging seas and ultimately to our desired destination.

The Cay Sal Bank is located approximately 30 miles from Cuba's north central shore and forms a unique 50-mile wide limestone plateau. At one time, the Bank towered some 300 feet above the surrounding oceans. Millions of years of water and wind erosion weathered this limestone monolith, creating enormous pits, some almost a thousand feet across and hundreds and hundreds of feet deep. Today, the oceans have reclaimed the island's steep banks, flooded her flat plateau, leaving a few of its highest peaks just barely emerging from the never ending pounding of waves and wind.

Mystery becomes a mystery

Equipped with the latest technical diving equipment, the team of eleven divers came in search of discovery and adventure. The goal was to explore and document as many of these anomalies known as Blue Holes as possible. Mother nature had different ideas though and hampered the team by the never-ending pounding of the seas. Each day, the team scrambled on deck to prepare their life support systems for the day's diving.

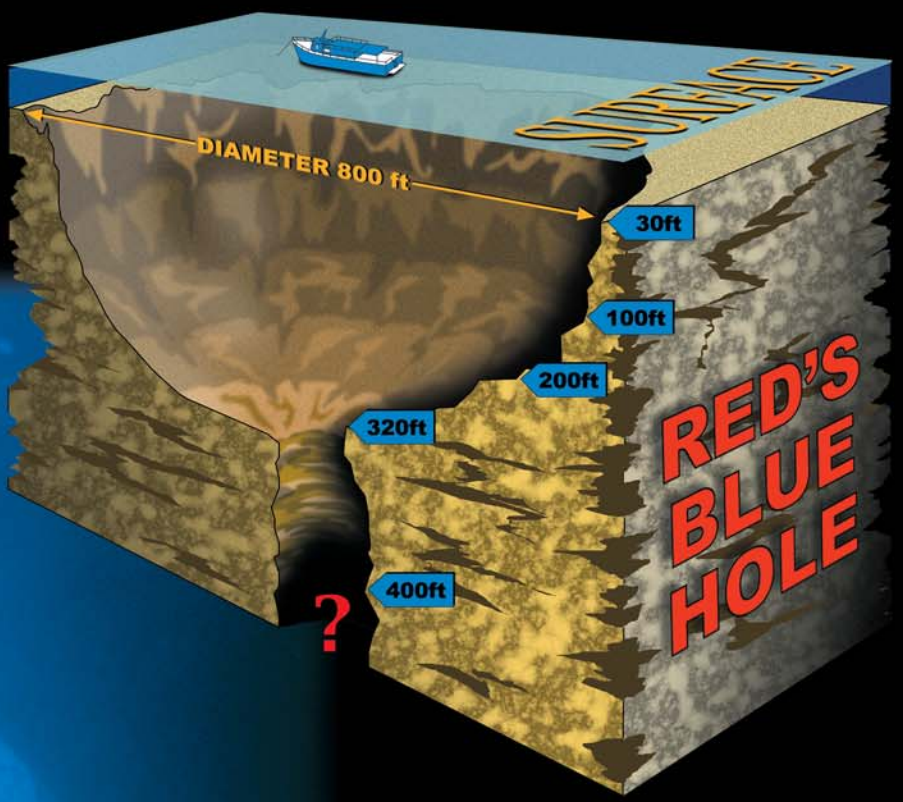
The first site "Red's Blue Hole" is a gigantic pit almost 800 feet across. From the boat, it appeared as a large deep blue circle that cut into the 30 foot surrounding depths. Swimming up to the edge, the hole was so massive that it looked like an ocean wall dropping straight down into the darkness below. An array of corals, sponges, and teaming sea life clung to its upper ridges. A multitude of sharks passed by curiously investigating and sizing up the newcomers to their domain.

Dropping into the darkness, the walls became barren and sandy with an occasional twisting black coral strand. At 200 feet deep, the floor sloped gradually inwards towards the center. Descending deeper across the sand chute, the team

Top Left: Silhouette of diver ascending from an exploration dive into Anguilla Hole.

Bottom Left: Explorers Brett Hemphill, Dave Miner, and Steve Straatsma scooter over the edge at Riches Well.

Bottom Right: The first divers ever to descend beyond 300 feet into Red's Hole are captured on film at 215 feet as they pass Curt Bowen's camera.



sank through multiple layers of colder water separated by fine cloud layers. Ahead loomed a large black circle on the cave floor. With eyes dilated by the darkness and light beams slicing through the water, the bottom dropped away leaving the explorers suspended at a depth of 330 feet. Below, a 110-foot wide shaft with vertical white limestone walls plummeted into the abyss. With 100-foot visibility and the use of powerful HID lights, the team illuminated the shaft to well below 400 feet with no apparent change in size or any sign of a bottom.

Red's hole's depth eluded the initial exploration, leaving a mystery in an even bigger mystery.

Fish Bowl Bottom

With the seas still raging, Captain Red placed the SeaFever behind some protected rocky islands in an attempt to lessen the rocking of the boat. The crew and team of explorers still had to cling to their bunks for a night of restless sleep.

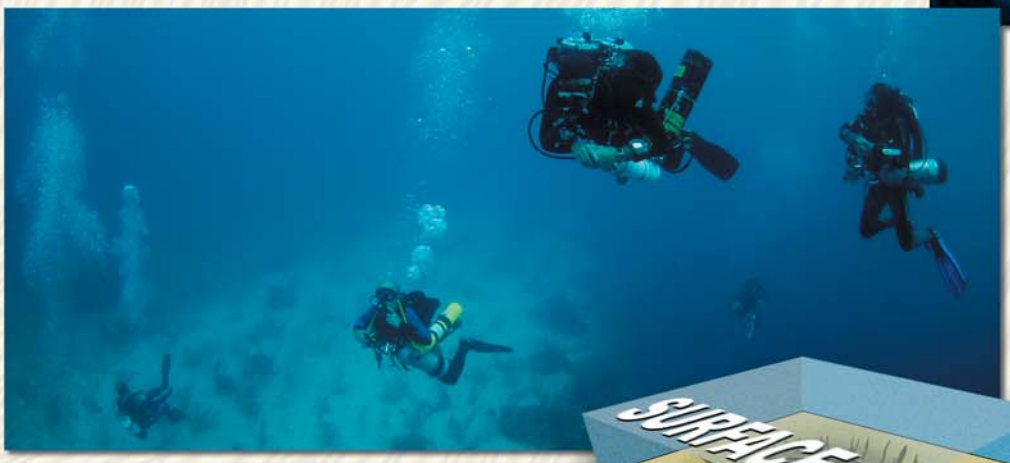
The rising sun brought a new hope of discovery and a slightly subsiding sea. Captain Red maneuvered the vessel over a true wonder of nature, an immense void almost a thousand feet across that plummeted into the limestone floor below the boat. Known as Black Hole, its true depths eluded the sonar because of the cold-water layers prematurely bouncing back the signals before they could reach the true bottom. Again, the walls dropped sharply into a deep blue void to a sloping sand floor at 210 feet. The slope continued downwards towards the middle of the sink and created a giant fish bowl shape with a maximum depth of 275 feet. Due to the immensity of this site, the team could have easily missed something, leaving Black Hole for future explorers.

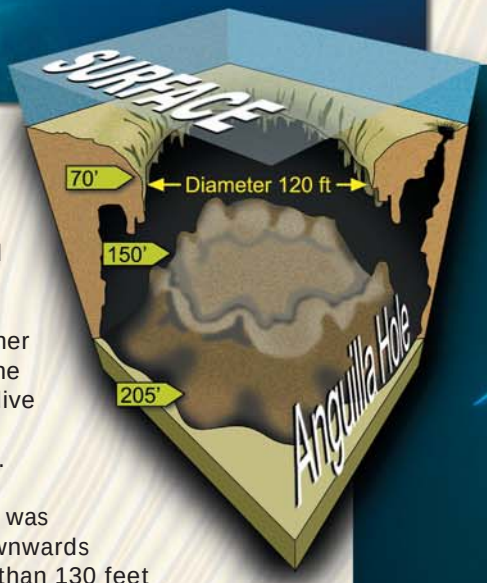
Above left: Artistic illustration of Black Hole, Cay Sal Banks
Left: Explorer Eric Osking takes photos of the ancient stalactites that have formed around Rich's Blue Hole
Below: The MV Sea Fever docked in Bimini
Right upper: Brett Hemphill prepares for a scooter recon trip into Anguilla Hole
Right center: Decompression after the 330 foot dive into Red's Hole
Right center 2: Yes, you will need oxygen!
Right lower: Rusty Farst examines the ancient water run off lines along the upper rim of Rich's Blue Hole

Stalactite Circled Rim

The afternoon brought reduced seas and lighter winds. This made balancing drinking glasses and lunch plates around the ships lounge tables much easier. Excited talk about the first two discoveries abounded with tales of close shark encounters, beautiful sea life, great photo opportunities, and the remarkable deep dark pits.

Later in the day, captain Red and his crew positioned the SeaFever above Rich's Well, another pit not more than five miles from the first two. Smaller in diameter, this hole took on a different shape than the first two encountered. The lip sloped gently into the pit with obvious ancient signs of water runs that cut deep into the limestone rock. Just below the entrance, giant stalactites stretched their fingers downwards creating a scene like massive icicles on a frozen waterfall. The walls cut back far behind the stalactites creating an immense overhang. Exploring deep into the darkness, the team circumnavigated the entire hole in search of a deep pit or possible horizontal water solution passages. None were found and a maximum depth of 211 feet was recorded. Even though no passage or pits were discovered, the beauty of the massive stalactites and surrounding sea life makes an incredible dive site for both technical and recreational divers.

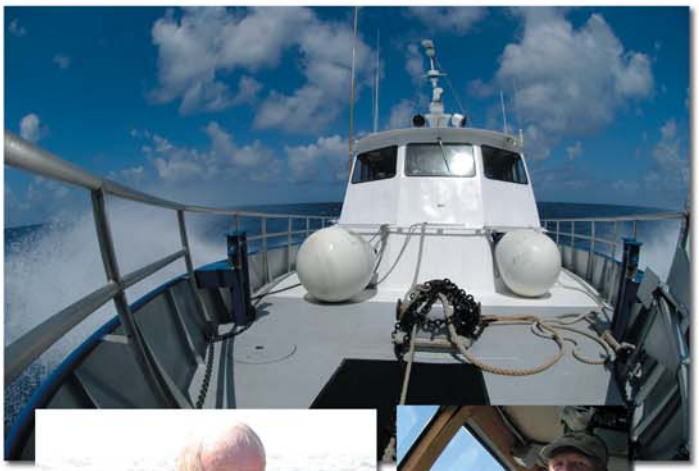




Conch Grave Yard and Solution Holes

A well needed nights sleep came as the winds died down and the ship gently swayed side to side just offshore of Anguilla Cay. The breakfast bell rang at seven a.m. when bad news came from the Captain. The good weather was not going to hold through the day, and the team would only have time for one morning dive having to steam for the protected shores and harbor of Bimini a hundred miles to the north.

The last hole we dove on the expedition was known as Anguilla Hole. It sloped gently downwards to a deep pit at 65 feet. Because it was less than 130 feet across, the entire blue hole's circumference could be seen at one time. Again, the team encountered large stalactites and undercut ledges. The sand floor started at 150 feet and sloped deeper into the undercut sides. Giant piles, fifteen feet tall, of dead conch shells went all the way around the sink directly under the upper rim. For thousands of



years, conchs have accidentally slipped over the sides of this hole only to meet their doom atop thousands of other conchs before them.

Several ancient water solution tubes were found around the perimeter of the blue hole. We explored these solution tubes by squeezing down through them and into the undercut rim behind the stalactites. A maximum depth of 205 feet was discovered with no pits or horizontal cave passage. Because of its beauty, this site also makes an incredible dive for both technical and recreational divers.

Once onboard, sadly we had to cut our expedition short due to the incoming higher winds and seas. After strapping down our equipment, Captain Red turned the SeaFever north and headed for the safety of Bimini's harbor.

Expedition Team Members:
Curt Bowen • David Miner • (c) Brett Hemphill • (b) Steve Straatsma
(a) Tamara Thomson • Rusty Farst • Dr. Thomas Iliffe • Eric Osking
(f) Tom Johnson • (d) Jay Wells • Gary Ashburn

Seafever Crew: (e) Captain Michael "Red" Salmon • Ike Bullock
Robert Guarino • Ellie Marks • Rick Gifford • Erinn Anderson.

GPS COORDINATES		
Red Hole	23 53.377	079 47.529
Black Hole	23 58.853	079 48.355
Rich's Hole	24 04.534	079 53.924
Anguilla Hole	23 35.445	079 37.248
Unexplored Blue Holes		
Shark Hole	23 54.775	79 50.095
New Hole	23 55.576	79 47.731

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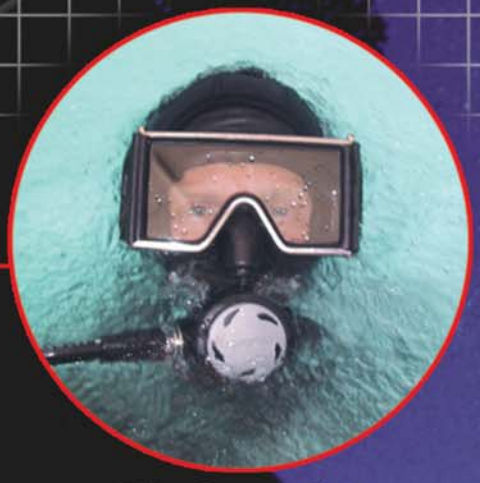

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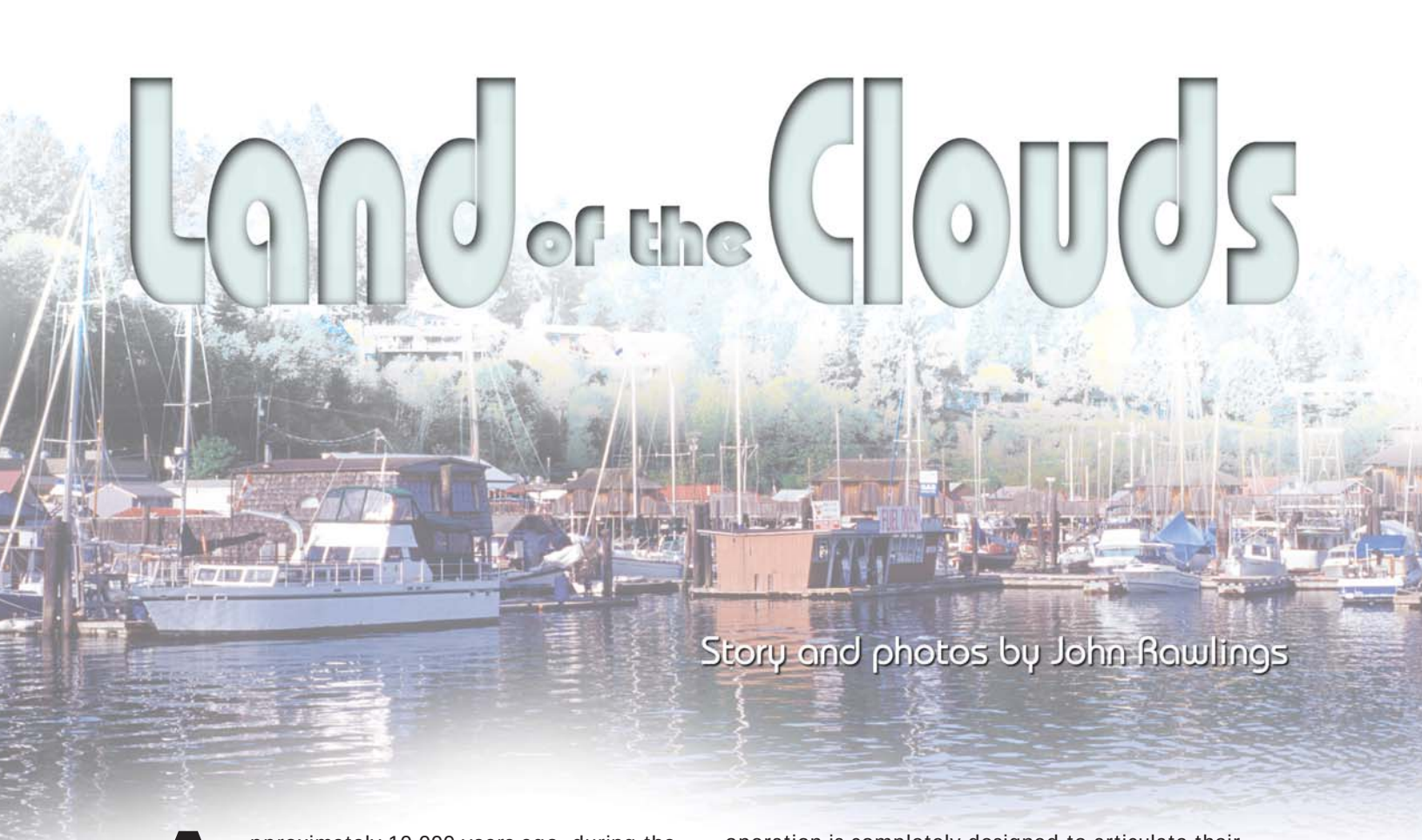
Land of the Clouds



Story and photos by John Rawlings

Approximately 10,000 years ago, during the last Ice Age, vast glaciers molded and shaped the contours of what is now North America. As the great ice sheets receded, water levels rose and what had once been deep slices carved by the glaciers became bays and inlets fed by the waters of the Northern Pacific. One such area affected was the southeastern corner of Vancouver Island in British Columbia. Sheltered by both the mountains of the central island and those of the neighboring Olympic Peninsula in Washington, the area receives far less rain than does the western coast of the island and also receives the warmth provided by the Japanese current. This gives it a pleasant, almost Mediterranean-like climate that has attracted people from a variety of cultures over the intervening centuries. It is now known as "Cowichan," a word meaning "Land Warmed by the Sun" in the language of the local First Nations tribes. It is also commonly referred to as "The Warm Land." I, however, will forever remember it as the "Land of the Clouds."

My interest in diving the Cowichan area sprang from meeting an enthusiastic young couple at DEMA in 2003. Nicole and Steve Paras-Charlton are beginning an exciting venture — they have combined a bed and breakfast with dive charters to some of the most unique dive sites on earth. They have christened their venture the Relax Zen Dive Inn. Located north of the city of Victoria, dive sites in Cowichan Bay, Sansum Narrows, and Saanich Inlet open up from their B&B like an expanding fan. As I spoke with them, they literally bubbled with excitement about the dive opportunities as well as the spiritual aspects of their business. Zen inspired, their operation is completely designed to articulate their mission of peace and respect for our bodies, which they firmly believe can be transferred into peace and respect for our oceans. Struck by their enthusiasm and hugely interested in sites that I had not dived before, I began to make plans. I was also intrigued with the spiritual aspects of the operation, particularly the Zen breathing techniques and how I might be able to incorporate them into my diving….although (ahem) I must admit that the possibility of full spa treatments after diving was also extremely attractive! April 2004 found me winding my way northward along with my buddy, Joe Militello, an underwater videographer who was just itching to film some new locations for an upcoming production.

Steve is just beginning to explore their huge area and has found many potentially great sites that he has yet to dive. Our primary mission on this trip, however, was not exploration; it was diving Saanich Inlet and photographing the beautiful cloud sponges found there. In the past, I have seen small isolated clumps of these sponges, but the conglomeration of cloud sponges in Saanich Inlet is world famous and we were eager to film them.

Cloud sponges, *Aphrocallistes vastus,* are "glass" sponges, a class of sponge typically found only in deep water. They are referred to as glass sponges because they have extremely sharp glass-like spicules made of silica that support the sponge structure. These silica spicules are sharp as glass and can be extremely irritating to the skin. Like fine glass, however, the spicules are extremely fragile and can be easily damaged with the slightest touch or careless kick of a fin.

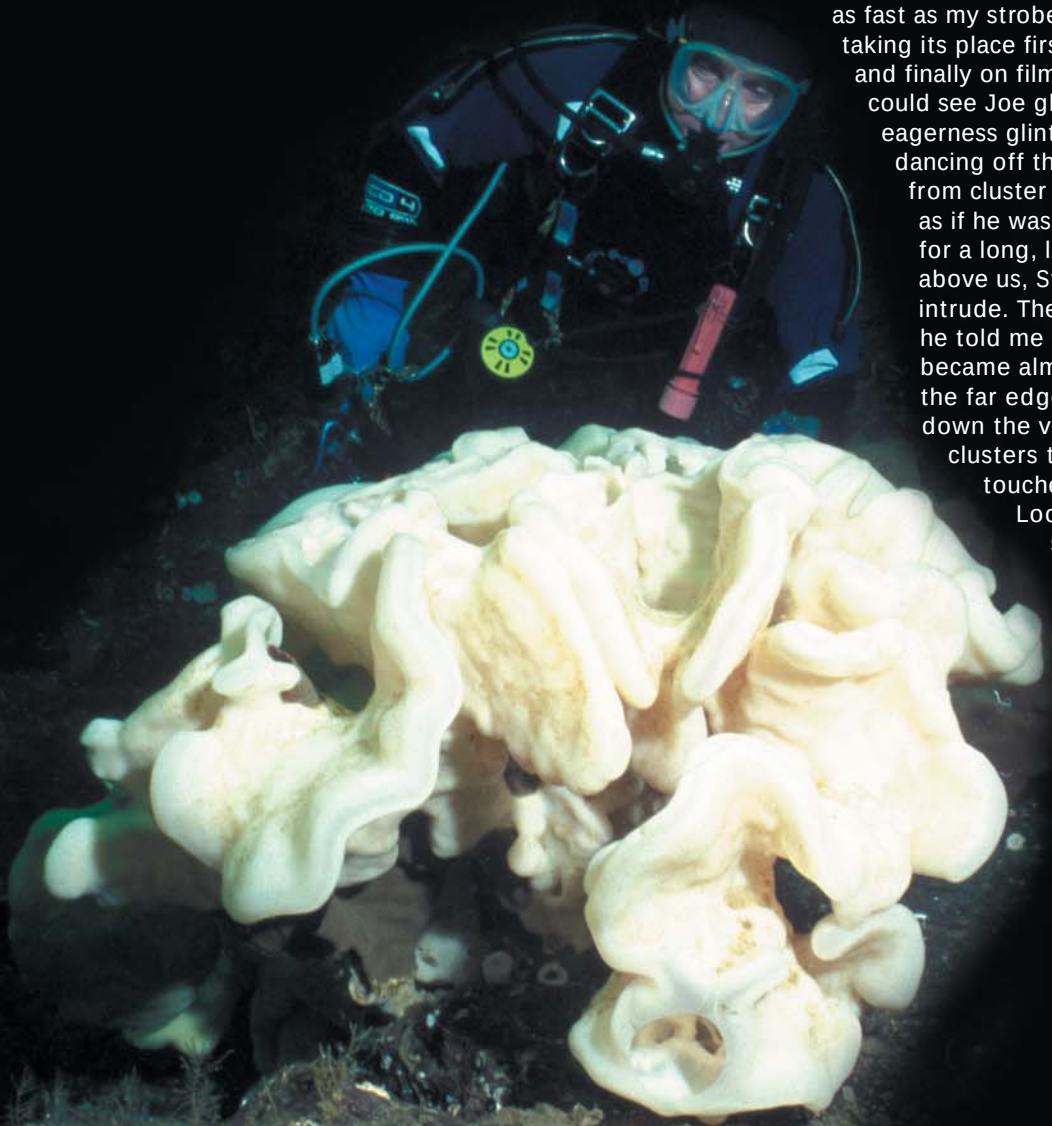
Cloud sponges can be found from the Bering Sea to Mexico, usually in extremely deep water. In the waters of British Columbia, however, they can be found at shallower depths, beginning at some sites around 80 FSW. The species is typically found in areas of minimal current, such as inlets, although I personally have found examples on wrecks and walls out in the Strait of Georgia. They take their common name from their cloud-like appearance. Puffy and convoluted, they often display huge tubular branches protruding in all directions from within a cluster, almost like the "nest" from the 70's science fiction film "Alien," only FAR more benevolent and friendly! Their favored habitat is steep rock walls and ledges and in such locations they can be found in huge assemblages. The color of these sponges ranges from "white as fresh snow" to "jack-o-lantern orange," with every color variation in between. Smaller, young sponge clusters often abound and appear to have an extremely fast growth rate, while older large clusters can be found that approach the size of a Volkswagen Beetle! The large sponge clusters are thought to be hundreds of years old, and the myriad shapes they have assumed defy description.

Our first dive in Saanich Inlet was at a site called Christmas Point. As we tied off on the mooring buoy, I looked at the line descending into the water — it was clearly going to be a good day for visibility! Mooring buoys have been placed at several sites throughout the inlet so that boats can tie off without fear of dragging an anchor or line through the delicate cloud sponges far below, a disaster that has occurred in the past.

After quick verification of camera equipment, each of the team members strode off the stern of the "Zen Diver" and began the descent into the bright green depths below. The moment my mask dipped below water I gasped in astonishment — I could literally see our first team member, Mike Kalina, descending the line over 60 feet below me. The water itself was as clear as glass with only thousands of tiny jellies marring the view. The jellies disappeared as we dropped deeper, however, and the visibility was astonishing as we descended past the vertical rock walls. Within seconds, I noticed a huge ledge jutting out that appeared to have a group of ghostly shapes standing on it as if in formation. Descending further, I soon realized that this was a spot that Steve and Mike had told us about, called "the balcony." A flat rocky surface spanning dozens of square yards, the "balcony" hosts a number of large cloud sponge clusters that from a distance had appeared like ghostly apparitions.

Grinning into my mouthpiece, I slowly drifted over the clusters of cloud sponges, taking care not to touch them or kick in their vicinity. My "trigger-finger" worked as fast as my strobe would recycle, image after image taking its place first in my mind, next in my viewfinder, and finally on film. From out of the corner of my eye, I could see Joe gliding over a series of sponges, the eagerness glinting in his eyes and his video lights dancing off their surfaces. Mike worked his way from cluster to cluster, seeming to greet each one as if he was encountering an old friend not seen for a long, long time. Taking it all in from slightly above us, Steve watched from afar so as not to intrude. The serenity of the scene was such that he told me later that the sponges themselves became almost an afterthought. I dropped over the far edge of the balcony and slowly sank down the vertical wall past still more sponge clusters that appeared like ghosts until touched with the beam of my light.

Looking upward from 140 FSW, I could still silhouette the sponges with the bright green of the sunshine filtering down from above, adding intense color to the scene. Slowly moving upward, I was astonished that from 100 FSW I could see the boat hull on the surface above, amazing for a dive in the Pacific Northwest. During my stops, I had strong feelings that I had just passed through a spiritual presence of some kind, of which I had been a part, yet not a part of.



The engines of the Zen Diver rumbled as we turned northward, with the excited conversations of the divers pulsating almost as loudly throughout the vessel. Passing a small islet, I noticed that it was covered with Harbor Seals, many pausing in their naps to look up sleepily as we passed. The rays of the sun glistened off the water as we motored past and slowly the seals' heads sank back down into their dreamy sleep — the loud humans were gone and serenity once again ruled this portion of the inlet.

Farther north in the inlet, we arrived at McCurdy Point for our second wall dive. Again, we were delighted when the visibility here proved to be around 70 FSW. Colorful cup corals, nudibranchs, and sea stars dotted the rocky walls, and rockfish and perch began to follow us about. As Mike and I drifted along, each of us taking shots of opportunity as they arose, we noticed that Joe was no longer with us. Scanning around, we saw a stream of bubbles coming from over a lip of a wall crag that we had not yet looked over. With a few short kicks, we were over the edge and looking down at Joe, grinning like a fiend and filming a gorgeous collection of cloud sponges pointing outward from the wall like inflated fat fingers. Discovering this group of sponges well into our dive made for a short stay. Upon climbing aboard the boat and waiting for Mike to complete his final stop, I noticed an otter slipping into the water from shore and pausing to dance in Mike's bubbles — an interlude that faded away even as he surfaced, and the otter disappearing as if he had never been.

The following day we dived at another site in the inlet known for cloud sponges, Senanus Island. It was here, especially, that we saw another aspect of the sponges — they host a huge variety of other species that live in, on, and around the sponges themselves. Another local diver, James Dranchuk, joined our team and together he and Mike lead us to two different levels of the same rocky reef. On previous dives, we had seen other species associated with the cloud sponges, but it was here that this relationship stood out. Juvenile and adult Quillback rockfish, *Sebastes maliger*, were everywhere — here, a pair were hovering near the base of a sponge, there, a single adult nestled at the top of a sponge as if on a throne, and over there, a juvenile quillback peering out at us from inside one of the tubes as if seeking sanctuary.

Decorator crabs abounded, their long thin legs walking gracefully across the surface of the sponges seeking nooks and crannies to escape from the glare of our lights. On one sponge, James found a small group of Spiny Lithode Crabs, *Acantholithodes hispidus*. These crabs, also known as "Red Fur Crabs," have what appear to be a furry body and possess bright red claws. They also scurried about to avoid us, but refused to leave the body of their host, and eventually finding a spot within two tubes to escape our unwanted attention. Later, as James and I hung on our last deco stop, I entertained myself with images of these colorful crabs scurrying around the protruding tubes of the delicate sponges.

This was an image that I kept with me later that evening back at the inn. That night in the spa room, quiet Japanese instrumental music played softly as I lay face down on a cloud-like mattress. Nicole performed her magic on my tired, sore muscles — Aromatherapy, Reflexology, back and neck massage, along with a foot oil massage. With the beauty of the images of cloud sponges held deep in my mind, it wasn't long before I was feeling like I was drifting on clouds myself! There really ARE some advantages to working for this magazine!

Steve and Nicole Paras-Charlton can be contacted toll-free at 1-866-ZEN-DIVE (936-3483) or at their website www.relaxzendive.com**.**

IDENTITY CRISIS

Finding a Name for the "Middle Grounds Wreck"

by Michael C. Barnette
Author, Shipwrecks of the Sunshine State

Descending through the tranquil waters of the Gulf of Mexico, my first indication that I was approaching the shipwreck was the legion of amberjack that rushed upwards to greet me. As I dropped below the thermocline, the clear blue surface water gradually transformed into a hazy curtain with a muted green hue. However, water clarity on the bottom was still respectable, with about 40 feet of visibility. As my eyes struggled to make out any recognizable lines on the bottom, I soon observed the unmistakable structure of a towering engine and large double boilers. Was this the lost steamer *Heidelberg*?

Divers originally visited the "Middle Grounds Wreck," so named due to the wreck's proximity to the Florida Middle Grounds in the Gulf of Mexico, in 1981. Resting in 130 feet of water, the virgin wreck was teeming with marine life. While divers pursued the abundant grouper, snapper, and amberjack that flourished around the scattered wreckage, few, if any, paid any attention to the wreck itself. While the location of the wreck was rather remote—over 80 miles offshore—the wreck has since been regularly visited by divers. Almost 25 years have elapsed since the wreck entertained its first visitors, and yet, the "Middle Grounds Wreck" was still unidentified. That was until now.

A friend who also shared my passion for shipwreck research and exploration originally turned me on to the wreck of the Heidelberg. The story of the *Heidelberg* was intriguing: built in 1852 at a New York shipyard, the 174-foot long steamer ran aground south of Miami in November 1859 en route from New York to New Orleans. Successfully salvaged, the steamer was taken to Key West so that the United States District Court could determine the appropriate award for the salvors. Shortly thereafter, the *Heidelberg* departed for New Orleans to be repaired and put back into service. Unfortunately, the steamer would never reach its destination. On December 22, 1859, after encountering a winter squall off the central west coast of Florida, the steamer *Heidelberg* was abandoned and left, ultimately, to founder and sink. While 17 passengers, one mate, and the insurance underwriter survived a harrowing night at sea in one of the lifeboats before being rescued by the ship *Maritana*, the *Heidelberg's* captain and nine of her crew were never seen again.

Above right: Mike Pizzio recovers a portion of the binnacle. Photo by Jim Rozzi.

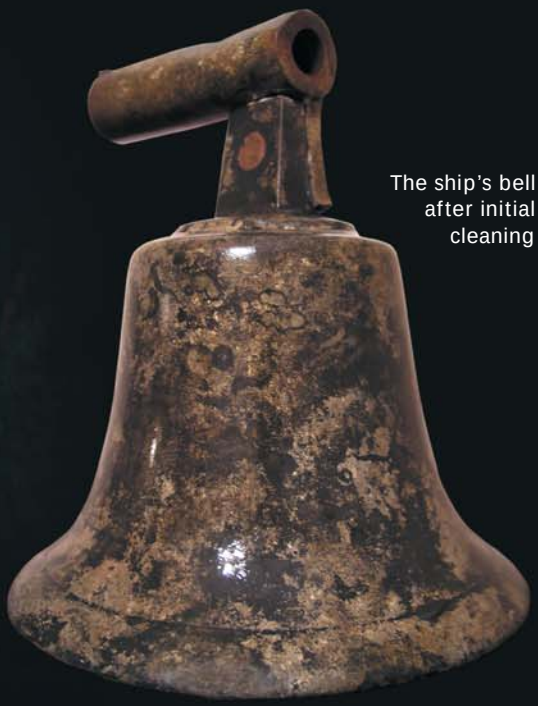
Before venturing out to the wreck, I tried to gather as much information on the unidentified "Middle Grounds Wreck" as I could. Unfortunately, as spearfishermen are typically preoccupied with pursuing their quarry, reliable information on the wreck's characteristics and architecture were hard to come by. However, I was lucky enough to meet one diver who provided a couple of valuable clues to the wreck's identity. He first visited the site in 1981, when the wreck was still relatively unknown. On one of his first dives, he observed brass portholes and other loose artifacts strewn across the seabed. More importantly, he happened to find and recover two brass letters that were resting on the sandy seabed underneath the bow. Those letters, presumably from the bow nameplate, were an "*I*" and an "*L*."

This information was very beneficial and helped to support the theory that the "Middle Grounds Wreck" may indeed be the *Heidelberg*. Planned charters to the wreck in the waning days of 2003 resulted in constant frustration, as the weather continually cancelled our trips. The spring of 2004 was equally as frustrating, as the wind seemed to strengthen as we approached the dates for our scheduled excursions. Delays only fueled our fire to explore and identify the unknown wreck.

Finally, my attempts to reach the wreck were rewarded in May 2004. As the wreck came into view on that first descent, I looked for the shipwreck that my imagination had crafted over the past several months. Once on the bottom, I eagerly swam forward to the bow, documenting the site with my camera. The entire wreck had a very prominent list to starboard; while the lean of the engine did not seem to exceed 40 degrees, the small remainder of the bow careened over more than 65 degrees. Just aft of the bow, the remains of the bridge lay scattered on the seabed. I was startled to see the binnacle and other prized brass artifacts still residing in plain view. With my time limited, I turned aft and headed for the stern, noting prominent features and continually firing away with my camera. Portholes were obscenely obvious amongst the wreckage. Towards the terminus of the wreck, the detached fantail with its exposed steering quadrant still maintained some of its integrity, while the remainder of hull and structure were largely flattened and spread out in the sand. The entire dive passed in a blur, and on the ride back to the dock, I worked to put all the pieces together.

In discussing my observations with colleagues and reviewing the images taken of the shipwreck, a few discrepancies emerged. The *Heidelberg* was constructed with three decks and had a square stern. The amount of wreckage within the shipwreck's perimeter did not seem sufficient for three decks' worth of material, and the rounded fantail of the "Middle Grounds Wreck" did not match that of the square stern of the *Heidelberg*. Most troubling was that the hull of the "Middle Grounds

The author with the shipwreck's bell moments after discovery: Photo by Jim Rozzi.

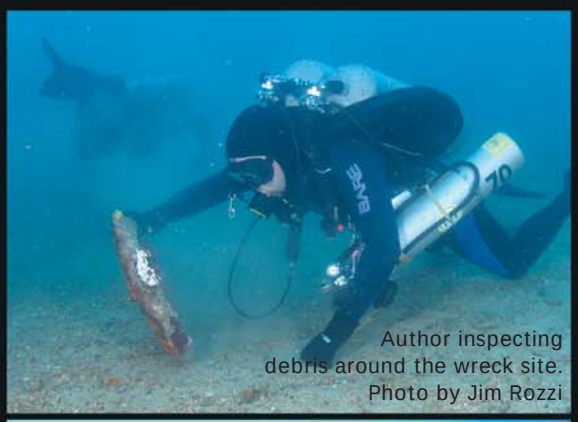


The ship's bell after initial cleaning

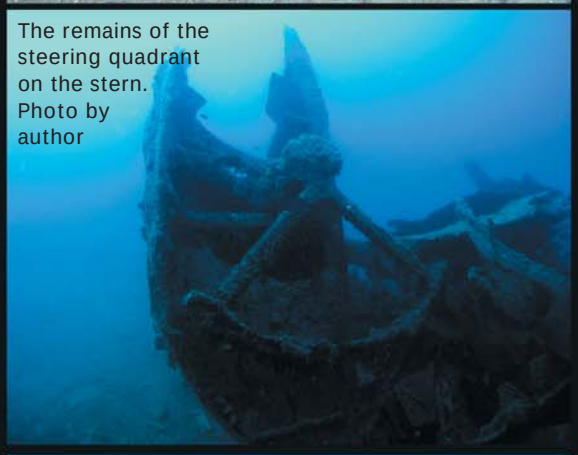
Wreck" was constructed of steel, while the steamer *Heidelberg* possessed a metalled hull, meaning she was built of wood but sheathed in copper to ward off wood-eating teredo worms. However, the most damning evidence would be found on a subsequent trip.

I was not able to return to the wreck site until two weeks later, again delayed by foul weather. I intended to gather more information on the first dive, and set out to measure the length of the unidentified vessel. Running a tape from the bow, I obtained a rough measurement of approximately 140 feet to the stern; due to the wreck's disposition, it was impossible to get an exact measurement of the ship's former length. In any case, the length definitely appeared to be a bit short for the *Heidelberg*. I then set out to search amongst the debris with my fellow divers, looking for an artifact that could yield any insight into the shipwreck's identity. Just off the starboard side, aft of the engine, we found a nice cache of objects. As Dean Marshall recovered a couple of nice glass candleholders, I noticed the graceful lip of a brass object buried nearby. As I started to pull it out of its sandy internment, my heart raced as I uncovered a beautiful brass bell! We all reveled in the discovery, hoping that it would be adorned with the name of the ship. Unfortunately, after wiping away some of the encrustation, it appeared the bell was barren of any identifying names or dates. Near the engine, I found a brass junction box embossed with the manufacturer, "RUSSELL & STOLL CO., NEW YORK." While the *Heidelberg* was indeed built in New York, as the junction box and some other observed artifacts indicated the ship was wired with electric lights, it was now clear that the "Middle Grounds Wreck" could not be the steamer *Heidelberg*; electric lights did not appear on sea-going vessels until the late 1870s. The wreck was still far from being identified.

On the second dive, we again worked as a team. After rounding up numerous artifacts from the bow and the debris field, Dean Marshall and I again poked around the engine and stern area. Towards the end of the dive, Dean raced over to me, clutching something that he clearly found to be intriguing. As I palmed the brass artifact, I quickly realized that Dean had found a portion of a letter from the name that graced the fantail of the shipwreck! Knowing that the letters "*L*" and "*I*" had already been found years earlier, we now had the letter "*G*" as yet

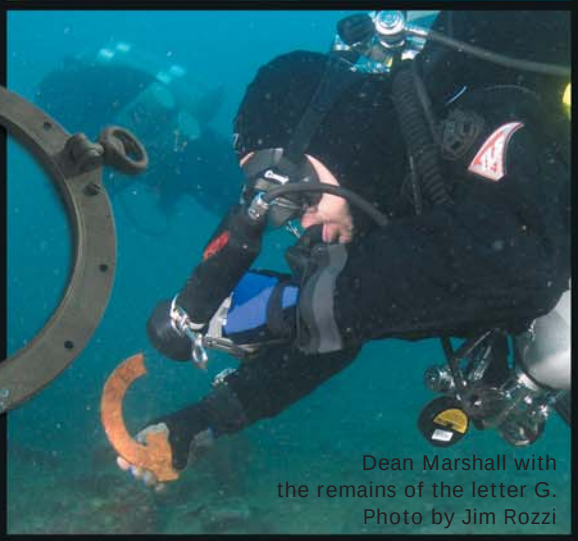


Author inspecting debris around the wreck site. Photo by Jim Rozzi



The remains of the steering quadrant on the stern. Photo by author

Image of the bow. Photo by Jim Rozzi



Dean Marshall with the remains of the letter G. Photo by Jim Rozzi

A brass pulley and porthole backing plate recovered in 1981. Photo by author

another clue to potentially identify the wreck. Dean and I celebrated the discovery underwater, hoping that this would facilitate our work to identify the "Middle Grounds Wreck."

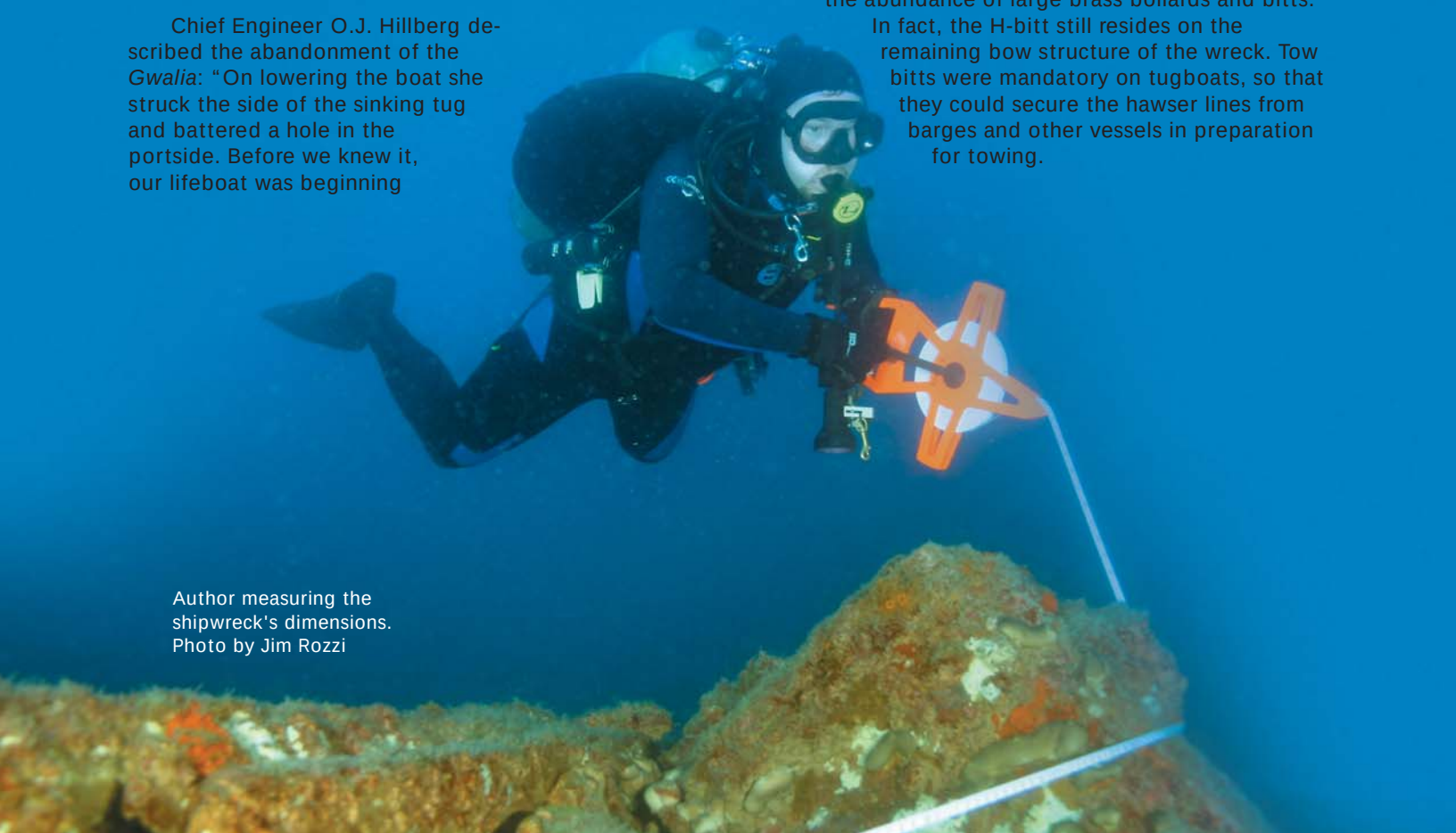
As the dive vessel *Cubera* cruised back towards the dock, I was hopeful that we had revealed enough evidence to potentially identify the wreck or at least narrow the range of suspect vessels. Back in my office the next day, I poured through my files. Thumbing through some printed copies of archived newspaper articles that detailed various maritime calamities, I came across the tale of the *Gwalia*.

The *Gwalia* was a robust 415-ton, ocean-going tug built in 1907 at a Philadelphia shipyard. A stout vessel, she registered a length of 130 feet and a breadth of 27.5 feet. With Captain M.D. Cogswell at the helm, the *Gwalia* and a crew of 14 departed Mobile, Alabama on December 2, 1925, bound for Tampa. In tow was the barge *Altamaha*, burdened with a load of gravel for the Tampa Coal Company. The iron-hulled barge, formerly a large freighter outfitted with three masts and auxiliary sails, was tended by Captain W.L. Borden and a crew of five men. On Friday, December 4, the two vessels encountered a strong winter storm churning in the Gulf of Mexico. Pounded by heavy seas, the *Gwalia* began taking on water from a leak underneath her boilers. The crew hastily departed the doomed tug in a single lifeboat after the *Gwalia* had almost filled with water. Immediately thereafter, the *Gwalia* rolled over and slipped beneath the tumultuous surface of the Gulf approximately 85 miles northwest of the mouth of Tampa Bay.

Chief Engineer O.J. Hillberg described the abandonment of the *Gwalia*: "On lowering the boat she struck the side of the sinking tug and battered a hole in the portside. Before we knew it, our lifeboat was beginning to fill with water. With a couple pails we began bailing the water out. The seas were high and we were drifting away from the barge. We worked frantically to keep our boat afloat. It was a tough job but Captain Cogswell spoke encouragement to us through it all. Saturday afternoon we sighted the barge and with all the strength we could muster, we rowed toward her."

Hillberg's matter-of-fact description on the chain of events is undoubtedly an understatement in relation to the actual peril the men faced. Onboard the barge *Altamaha*, Captain Borden detailed the arrival of the haggard *Gwalia* survivors: "The men couldn't have stood it any longer. Those men suffered. It is a miracle how they pulled through that gale in their lifeboat and reached us after we had drifted away during the night. When we lifted Captain Cogswell and his 14 men on board, they were so weak they couldn't stand up."

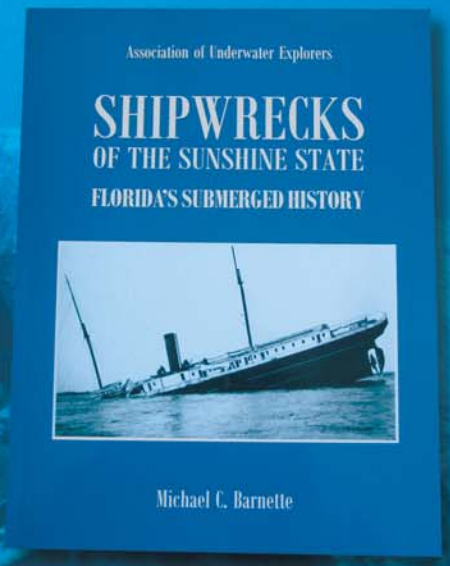
The connection was immediate. The relative sinking position coordinated almost exactly to that of the "Middle Ground Wreck's" resting place. Considering the deterioration of the collapsed hull, the dimensions of the wreck and tug were very similar. The junction box recovered near the engine had a patent date of April 1, 1902, which fit the era of the vessel. I noted that very large portholes were found throughout the bow area, but towards the stern, the portholes were significantly smaller. This would be consistent with the typical layout of a tug, which commonly had larger portholes gracing the rounded wheelhouse and forward superstructure. But the most telling of all the artifacts and diagnostic features on the wreck, the one that I totally neglected to consider until reading the 1925 newspaper article, was the abundance of large brass bollards and bitts. In fact, the H-bitt still resides on the remaining bow structure of the wreck. Tow bitts were mandatory on tugboats, so that they could secure the hawser lines from barges and other vessels in preparation for towing.



Author measuring the shipwreck's dimensions. Photo by Jim Rozzi

The *Gwalia* still rests peacefully on the bottom of the Gulf of Mexico, awaiting its next visitor. The wreck site is small, easy to navigate, and typically covered in marine life. Aside from the ubiquitous schools of amberjack, swarms of spadefish, and clouds of tomtates frequently flow around the slowly collapsing tugboat. As with many wrecks along the west coast of Florida, the *Gwalia* also plays host to several large Goliath grouper. While commonly a stop for anglers and spearfishermen looking for that last fish on the way back to the dock, perhaps some will now also stop to inspect the shipwreck for its own unique attributes. Hopefully, the "Middle Grounds Wreck" moniker will slowly disappear, and the wreck will be recognized by its real name—the tugboat *Gwalia*.

Michael C. Barnette is the Founder and Director of the Association of Underwater Explorers (http://uwex.us), a coalition of divers dedicated to the research, exploration, documentation, and preservation of submerged cultural resources. Employed as a marine ecologist with the National Oceanic and Atmospheric Administration (NOAA), he recently published Shipwrecks of the Sunshine State: Florida's Submerged History, which offers an extensive and comprehensive cross-section of Florida shipwreck narratives.



Shipwrecks of the Sunshine State
by Michael C. Barnette
Paperback; 8.5 x 11"
195 pages with 119 color images
178 b/w images and 4 site maps
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Dive the Deep Blue

UTILA

by ADM staff writer and photographer
Tom Isgar

I went to Utila for an opportunity to photograph Whale sharks. I have also gone to the Sea of Cortez, Belize, Roatan, Bali, Dominica, Galapagos, Costa Rica and the Persian Gulf to see Whale sharks. "Ya shouda ben here las week, mon!" No Whale sharks. But, "If you haven't been to Utila, you may have missed the best diving in the Caribbean."

Utila

Cheapest place in the world to learn to dive, beautiful reefs, stunning views, great bars and restaurants, 3000 foot walls, second longest barrier reef, more species recorded in a one week REEF (Reef Environmental Education Foundation) survey than any

Photo by Phil Colla

other place in the Caribbean, spinner dolphins everywhere, sinkholes leading to underwater caverns, three endemic lizards, mountain biking, caving, pirate treasure, and did I mention–Whale sharks.

Utila is one of the three Bay Islands (Utila, Roatan and Guanaja) which lie off the Northern coast of Honduras. England transferred the Bay Islands to Honduras in the mid-800's, so the language of Utila is basically English rather than Spanish. Utila is about 3 by 8 miles in size. The local population resides almost entirely in the small town of East Harbor. The population estimate range broadly from 2000 to 7000, but no one is counting.

East Harbor has one narrow street. Two small pickups must find a wide spot in order to pass, if the wide spot isn't filled with walkers, four wheelers, bikes, and mopeds. The street is always busy, but the pace is slow as you are guaranteed to meet an old or new friend who wants to visit.

Utila is one of the stops on the "Gringo Trail" a mostly European backpackers route through South America and Central America. This gives the town a sense of a mini-spring-break. There are several Internet cafes, shops, bars and restaurants. A stop at the Jade Seahorse (restaurant, bar, museum, art gallery, etc.) is a must. Of the three upscale lodges on Utila, Deep Blue is the newest and caters to the traveler wanting luxury rooms, great food, and personal attention.
Although Utila was a farming and fishing community, today it is about diving.

Diving

The are more than a dozen dive operations. Many of the shops are PADI and offer certification courses as well as day trips. Rates are inexpensive. One of the more comprehensive is Deep Blue Divers, a PADI five star, gold palm IDC center. For reviews see www.scubaspots.com. The current owners (Steve, Jasmine, and Shirley) have had the shop for three years. They certify more than 1,000 students per year in courses ranging from open water to instructor. The shop Instructors collectively speak six or more languages. Classes are at most four students with very personal instruction. They have several boats so they can accommodate larger groups if required.

The diving is tremendous, with something for all levels of diver. There are 72 buoys around the island. No anchoring is allowed. A boat is either on a buoy or drifting. Divers pay a $3 per day fee. One dollar goes to the hyperbaric chamber, one dollar to support the buoy

system, and one dollar to the municipal Government. Utila's location, 18 miles north of the Honduran coast, creates two sets of unique dive sites.

The south side of the island offers dives along its entire coast. A typical dive is down a sloping wall to sand at 70 to 100 feet. The walls are covered in healthy coral, sponges, and numerous invertebrates. The tops of the walls are at 15 feet and loaded with fish. One hour dives are typical. Utila has more than 380 recorded fish species in the REEF database. I typically counted more than 70 species on each of my dives. On the first two dives, I was able to photograph a frogfish, two species of pipefish, and two seahorses. This is only possible in one or two other places in the Caribbean.

The north side of the island faces the open Atlantic, and while the water may be rougher at times, it also offers 100 foot plus visibility. Some sites drop off to 3000 feet so the diehard wall diver will be delighted. There are also several sea mounds which are diveable. The seamounds in Utila attract schools of larger fish as well as pelagics. I photographed Atlantic spadefish, being corralled by yellow jacks, the yellow jack school, turtles and rays. I saw several species of grouper on every dive. And, for those of you who are looking for small stuff, how about wrasse blennies, rough triplefins, and pikefish!

There were occasional light currents giving rise to the term "Utilian drift dive" which equals kicking from one spot to the next.

For cave divers Gunter Kordovsky, a local extreme diver, artist, and tour guide, showed me sinkholes in the ironrock leading to underwater tunnels and talked about offshore underwater tunnels and caverns with artifacts on the floors.

Spending the Deco Day

Although Utila is small and not developed, there are plenty of things to do on the deco day. The Island has good dirt roads and trails for biking which lead you to the top of the island for scenic views or to secluded beaches for near total privacy. There is a cross-island canal which can be kayaked in a couple of hours that provides opportunity to see wildlife up close and takes you to the other side of the island to a deserted beach.

The Iguana Station provides a good opportunity to take a bike ride, followed by a short hike to one of the highest spots on Utila, Stuart Hill. The Iguana Station, nearly ten years old, is working to protect the endangered Swamper Iguana (*Ctenosaura bakeri*) which lives only on Utila. Utila also has two endemic species of gecko and is home to the unique monkeylala or Basilisk Lizard (*Basiliscus basiliscus*) which runs upright on its hind legs and can, for short distances, run on water. The Station provides a guided tour and offers extended tours on the Island.

If you want to get off the Island, there are three ferries a day to the mainland as well as a ferry to Roatan. Or, better yet, you can take a local boat to Water Cay, a real deserted island with beaches and palm trees. You can stay for a few hours and get picked up or plan an overnight.

For more information on any of these activities, contact Deep Blue Resort.

Deep Blue Resort

Deep Blue Resort is owned by the owners of Deep Blue Divers. If you want to combine fantastic diving with great accommodations, friendly hosts, and a welcome cocktail, this is the place for you. Steve and Jasmine describe themselves as long time resort divers who have modeled the resort after the best of their own experiences as divers. The resort, located directly on the water, is only accessible by boat, but if you want to go to town, the resort will provide a boat and Captain to get you there and back.

There are ten air conditioned rooms in two buildings. A third building holds the large public area which includes a restaurant, bar, reading area, CD and video viewing equipment, and a free workstation for Internet access. The owners' home is on the top floor. The building interiors will remind you of the interior of a well appointed yacht with polished wood and local art. All of the rooms have ocean views and large (8 feet x 30 foot) balconies.

A day starts with both Continental breakfast choices and hot food. Local pineapples are a big hit. A short walk takes you to the dock and dive boat, where your gear is set up. You have two dives and return for lunch which features both hot entrees and cold cuts. In the afternoon another boat dive is offered, unless its night dive day. I used the free afternoons to shore dive in front of the lodge. Dinner, after drinks mixed by the host, consisted of salad or soup, a preselected entree, dessert, and coffee or tea. Other than alcohol, the price is all inclusive.

Basics

There is one day service to Utila from Miami, Houston, and New Orleans. Expect at least one and likely two plane changes. There are several Central American airlines (Atlantic, Islena, Sosa, Sol), but their schedules aren't linked to the major airlines. If you or your travel agent get stuck, contact Deep Blue Resort for help with travel in Honduras. For groups of 12 or more, Deep Blue can arrange for a charter flight from San Pedro Sula directly to Utila. There is also a three passenger private plane which will fly passengers between La Ceiba and Utila.

Electricity is 110-220, so everyone's gear should work.

Visas are not required for 30 day stays for citizens of most countries.

Currency is the Honduran Lempira, which was about 17 per $US in spring 2004.

Weather: It's wet September through February and dry the rest of the year. Temperatures are usually in the 80's. The water temperature was around 80 in early May.

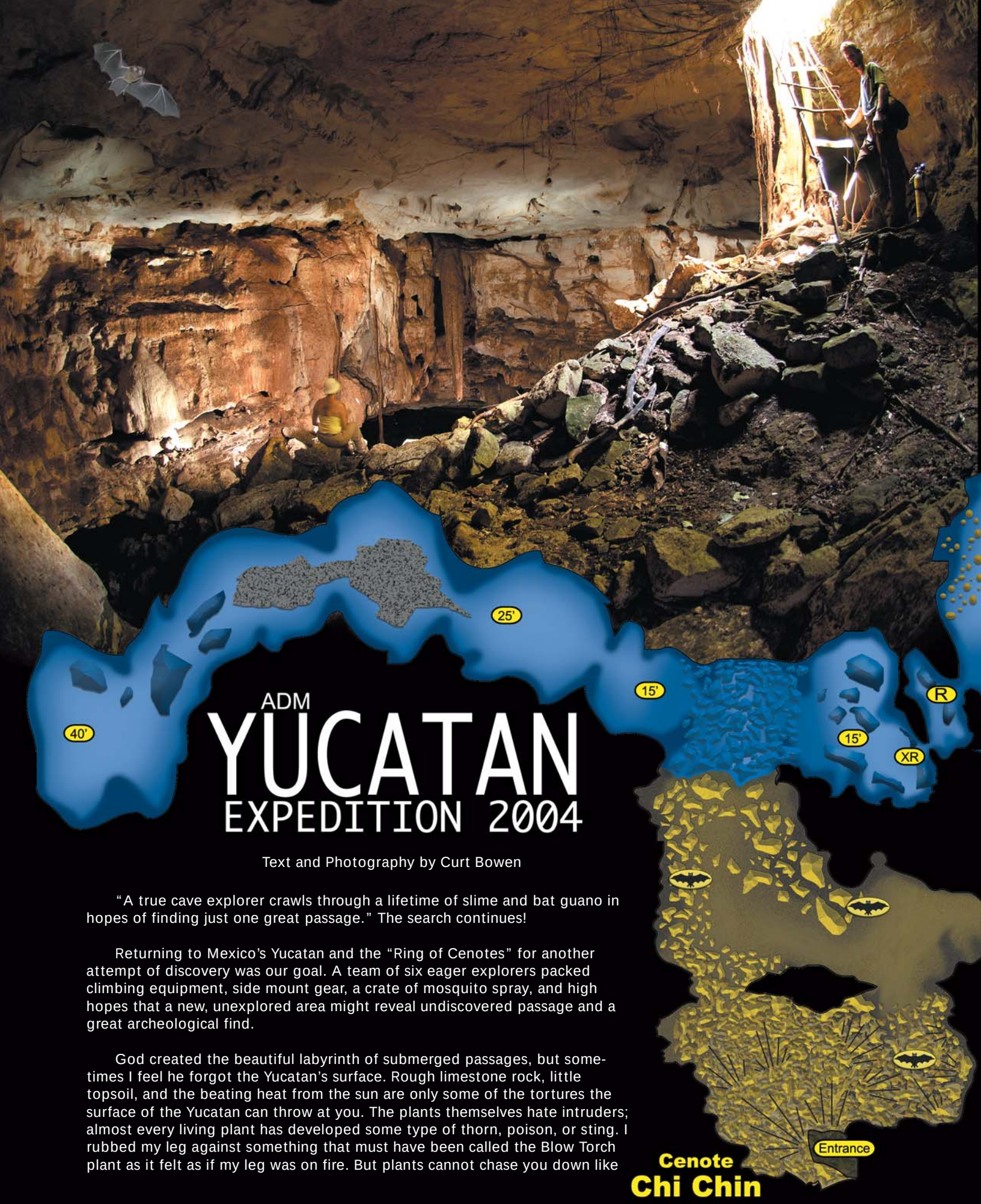
Biting things: They are there but a regular dose of repellent seemed to work, most of the time. The dive guides swear that a coat of baby oil with a mist of DEET on top will protect you even from no-see-ums. At the worst you will tan nicely.

Did I mention Whale sharks?

Although I was a week late to see Whale sharks, Utila continues to provide the best chance of seeing them in the Caribbean. Deep Blue Resort and Absolute Adventures-Shark Diver are jointly sponsoring a month long (March 19 to April 15) Whale shark tagging project in 2005. This is your chance to be one of the first shark divers to encounter these 30 to 50 foot leviathans in 100-foot visibility. Absolute Adventures-Shark Diver is committed to shark science. Guest involvement can include helping locate identifying marks on each animal and helping to determine the animals sex. I have already signed up for a week. For more information, visit Absolute Adventures-Shark Diver website and look for updates there and on the Deep Blue website.

Contacts:

Deep Blue Divers and Resort - www.deepblueutila.com
Absolute Adventures-Shark Diver - www.sharkdiver.com
Atlantic Airline - atlantic@caribe.hn
Gunter Kordovshy, Extreme diving and land guide - bicomput@hondutel.hn
Taca Airlines - www.grupotaca.com
Sol Airline - www.solair.net



ADM YUCATAN EXPEDITION 2004

Text and Photography by Curt Bowen

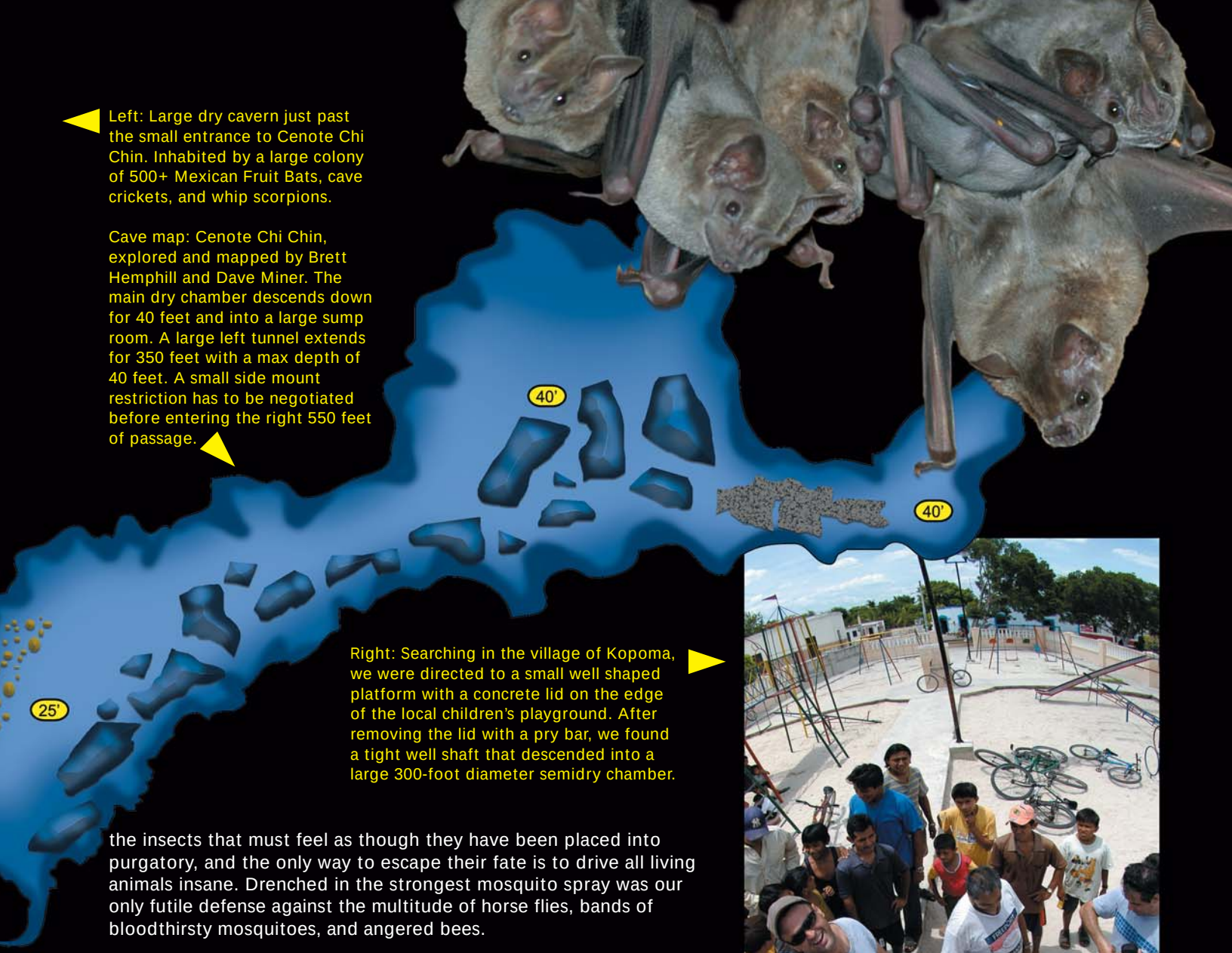
"A true cave explorer crawls through a lifetime of slime and bat guano in hopes of finding just one great passage." The search continues!

Returning to Mexico's Yucatan and the "Ring of Cenotes" for another attempt of discovery was our goal. A team of six eager explorers packed climbing equipment, side mount gear, a crate of mosquito spray, and high hopes that a new, unexplored area might reveal undiscovered passage and a great archeological find.

God created the beautiful labyrinth of submerged passages, but sometimes I feel he forgot the Yucatan's surface. Rough limestone rock, little topsoil, and the beating heat from the sun are only some of the tortures the surface of the Yucatan can throw at you. The plants themselves hate intruders; almost every living plant has developed some type of thorn, poison, or sting. I rubbed my leg against something that must have been called the Blow Torch plant as it felt as if my leg was on fire. But plants cannot chase you down like

Left: Large dry cavern just past the small entrance to Cenote Chi Chin. Inhabited by a large colony of 500+ Mexican Fruit Bats, cave crickets, and whip scorpions.

Cave map: Cenote Chi Chin, explored and mapped by Brett Hemphill and Dave Miner. The main dry chamber descends down for 40 feet and into a large sump room. A large left tunnel extends for 350 feet with a max depth of 40 feet. A small side mount restriction has to be negotiated before entering the right 550 feet of passage.



Right: Searching in the village of Kopoma, we were directed to a small well shaped platform with a concrete lid on the edge of the local children's playground. After removing the lid with a pry bar, we found a tight well shaft that descended into a large 300-foot diameter semidry chamber.

the insects that must feel as though they have been placed into purgatory, and the only way to escape their fate is to drive all living animals insane. Drenched in the strongest mosquito spray was our only futile defense against the multitude of horse flies, bands of bloodthirsty mosquitoes, and angered bees.

Logistics for such expeditions into the remote villages of the Yucatan can be very difficult and without the proper local connections, impossible. For several years, I have returned to the Yucatan along with a small band of explorers. Over these years, I have become friends and colleagues with many of the local divers and government agencies. The Ecology Department provides our team with the required government paperwork, clearing us for exploration in the Yucatan along with requests for local village authorities to assist in our efforts with guides, sherpas, and lodging assistance. Aquatech - Villa DeRosa provides our team with a large van, a one-ton flat bed truck, and 30 aluminum, 80 cubic foot cylinders. An eight CFM compressor is provided by Protec Dive Center in Playa del Carmen.

Yucatan 2004 expedition took place in the small village of Chochola, which is located 90 kilometers to the south west of Merida, the Yucatan's state capital. We had selected this location because of its most western proximity and the lack of exploration in the past. Our goal was to explore, take notes, and document how the caves in this area compared to prior expeditions further to the east. Chochola's female President welcomed our team with open arms and graciously provided a small two-room blockhouse that actually had a toilet and shower that worked…sometimes. She also provided a guide, sherpa, and guard from the police department to assist with locating and gaining access to the cenotes.

After setting up base camp in the small house and hiring a cook for the week to follow, we set out to explore. I quickly noticed the terrain in the area was considerably rougher and overgrown compared to expeditions to the east. Travel down rough, narrow, rocky roads was very slow and the distances between cenotes was considerably long. This, along with the heat, bugs, and hacking our way through the underbrush quickly took its toll on the teams progress. But endeavor we did, and the list of newly discovered cenotes started piling up.

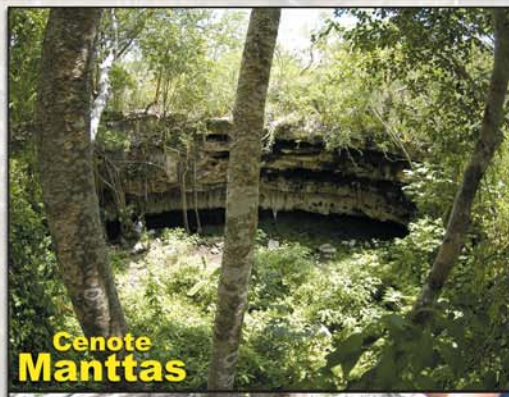
Further to the east, normal cenotes consisted of large diameter open pits with little to no going cave passage. Here in Chochola, the cenotes trend shifted to small cave entrances with larger underground chambers and small side mount passages. The karst itself appeared to be harder and possibly less soluble compared to the eastern limestone resulting in smaller passages and less cave formations.

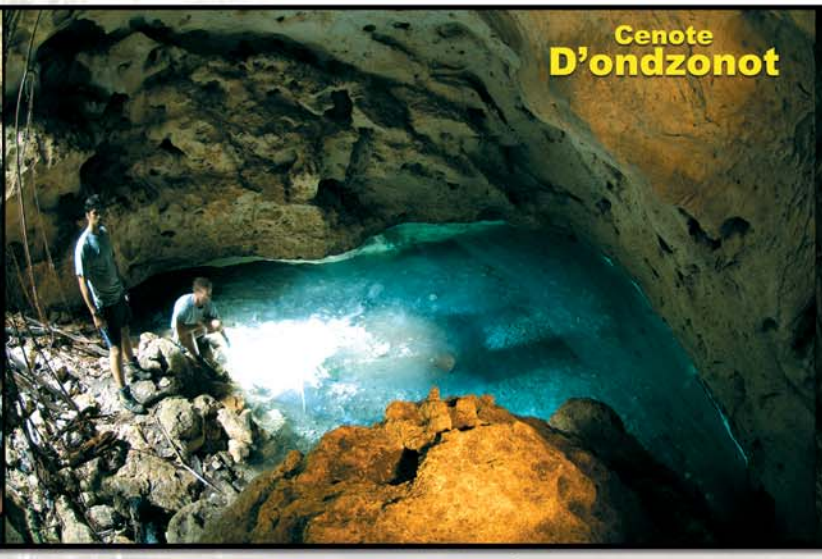
After a couple of days of pounding the brush and making few satisfactory discoveries, the team chose to head further south towards the villages of Del Parque and Kopoma in hopes of discovering larger systems.

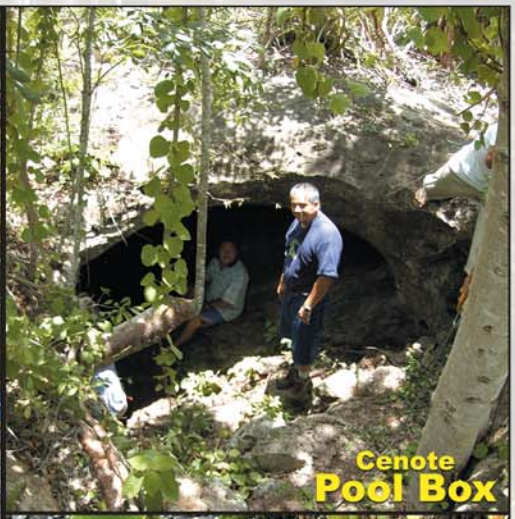
The Maya Indians have inhabited this area of the Yucatan for thousands of years. The Spanish discovered and converted the Maya to Catholicism in the 1600s, many times tearing down ancient Mayan temples to build their large churches. Like any culture, the Maya depended heavily on fresh water and built their communities around ample water sources. Almost every village I have visited in the past had the main church constructed within a stones throw of a main water source or cenote. Knowing this, I always search first for the village well or cenote.

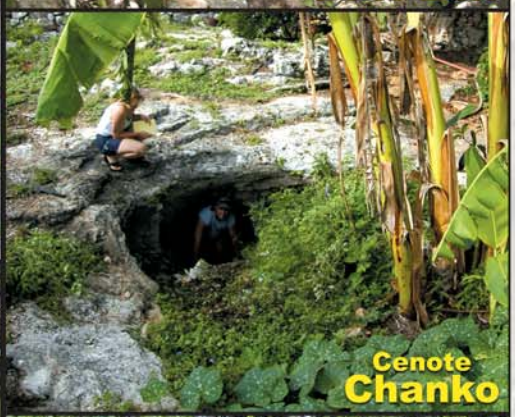
Upon entering the village of Kopoma, I scanned the area around the town square and church for any type of natural opening, kept an eye pealed for quick darting cave swallows, and listened carefully for the distinct sound of the Mot Mot bird who always live in the cool and protected cracks of cenotes. But I heard and saw nothing. How could this be I thought to myself, no culture can build without water.

Stopping beside a small hot dog stand in the Town Square, our team set down for a bite to eat. A few local boys gazed upon us with faces of wonder and intrigue. As we ate our lunch, I pondered about the unusual absence of the water source when a thought came to mind. The boys who giggled and peered beside me have lived here their whole lives and probably played on every street and field within a few miles of town, and they would know the answer I seek. I asked my translator, Enrique, to question the boys about possible water sources in the village, such as open cenotes, caves, or town wells close to the local church. Of course a couple pesos were offered in an attempt to quicken their memories. Quickly, the boys jumped up and pointed towards the playground located beside the church. Eagerly following the children, they lead me into the playground and to a round concrete









covered platform. The top of the platform had a square lid that had been sealed by concrete many years ago. This was it, a well, not more than 100 feet from the church that for some reason had been capped. But was it a dug well or an opening to a natural underground cave system?

Our guide from Chochola quickly found a local official and to our luck a close friend of his and asked about the covered well. Excited, the local man quickly produced a pry bar and some digging tools and granted us permission to remove the cover. After a few minutes and some struggling, we managed to lift the heavy cover from the well and slide it to one side. A small man-made hole, no wider than your shoulder's width, dropped deep into the ground. Peering wide-eyed into the well, we lowered a bright light on a string. Scurrying from the light, a large whip scorpion darted into a crack for cover as it passed. Thirty feet from the surface, the light dropped into a large cavern and landed in shallow blue water on the bottom.

Not particularly liking whip scorpions and being the broadest shoulder guy on the expedition, I quickly found Tamara Thomsen, the smallest and only female on the expedition and with a smiling face delegated this cenote exploration to her. As I anchored the lowering ropes, Tamara rigged herself with mask, fins, and a climbing harness.

Squeezing through the opening, I slowly lowered Tamara into the well shaft and past the nasty, hand-sized whip scorpion and into the knee-deep water. Tamara quickly reported a very large 300-foot diameter room with 15-foot ceilings. Dave Miner then suited up with his side mount equipment, and we lowered him and his gear into the well. After an hour of searching, we were disappointed to hear that no leads to off going tunnel were discovered. Pulling the two explorers from the well, we replaced the concrete lid and paid a local worker to seal the lid shut again. Several smaller discoveries were made in the Kopoma area but with very little going passage.

The team moved 20 kilometers to the east, just south of the village of Mukuyche, an area where a previous discovery of the giant bottomless Cenote Sabak–Ha (ADM issue 3) by Andreas Matthes was made in 1999. We had stopped and picked up an old friend and local guide of Andreas's to assist us in search of additional unexplored caves that can be easily accessed from a road.

With only one day left for exploration, we wanted to visit as many systems as possible. But as in most plans, the translation of "easily accessed

No Cave Hidden Here
GPS Coordinates

Cenote	North	West
Pool Box	20°41.40	089°48.90
Manttas	20°40.57	089°47.51
Xkulam	20°45.29	089°48.13
H'ondzonot	20°44.70	089°46.31
Chanko	20°43.83	089°49.69
Dzem-polom	20°40.91	089°49.09
Kopoma	20°41.23	089°52.26
San Titeo	20°41.20	089°52.29
Sanbula	20°38.62	089°54.21
Chen Ha	20°41.37	089°52.55
Chul Me	20°36.63	089°53.47
Chululila	20°38.47	089°36.34
Kopochen	20°34.63	089°34.87
Chi Chin	20°34.20	089°37.69

by road" was misinterpreted, and we found ourselves hacking tree branches and moving fallen timbers from a rock road just wide enough for the plants to scrap the paint from the sides of the vehicles. After several hours and multiple kilometers passed, we found ourselves half a kilometer from the desired destination, Cenote Chi Chin.

All the translation was not lost, the half-kilometer trek through the thickets was easy, and the cave had a nice stick ladder descending the first 10 feet down.

The large dry cavern zone was split into two levels, a large upper room and a lower bedding plane below. Hundreds of brown and gray Mexican Fruit Bats franticly swirled around both levels, their daytime sleep interrupted by the new intruders into their cave.

At the far reaches of the dry cave, we discovered an inviting pool of clear water. Explorers Brett Hemphill and Dave Miner geared up with their Armadillo side mount rigs as the rest of the team shuffled cylinders down through the dry cave, over rocks covered in bat guano, and to the blue water sump.

Tying off the cave reel to a rock at the pools edge, the two slid beneath the surface and into the large tunnel towards the left wall. Twenty minutes later they returned with the news and survey data from their discovery. Recalculating thirds, the team searched the small room on the right and found a tight side mount restriction that lead into over 550 feet of large cave tunnel. This passage contained highly decorated cave formations; one large room, and several species of cave specimens were noted.

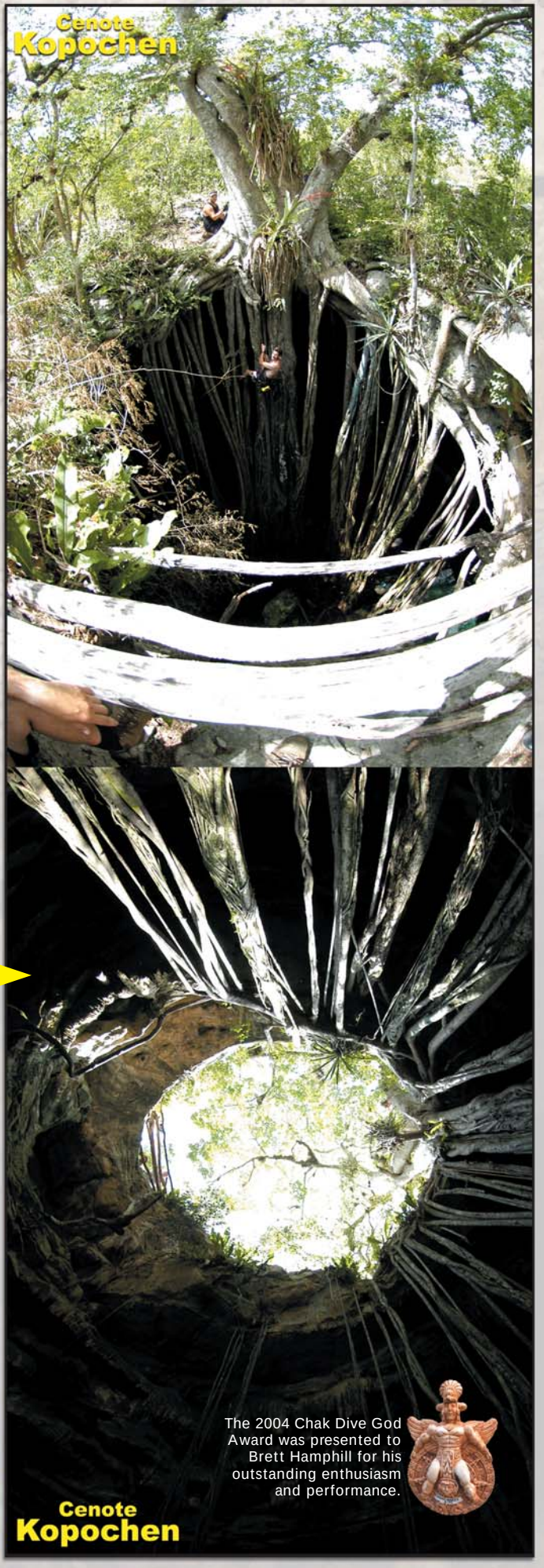
Overall the expedition went well even though we did not discover any extra ordinary systems or unique archeological discoveries.

But you can bet, the search continues!

Right: Cenote Kopochen, located just one kilometer from the bottomless Cenote Sabak-Ha provided a thrilling chance for great discoveries. Explorer Tamara Thomsen and James Kelderman regretfully returned with the disappointing word of no going passage found.

A. Pedro
B. Enrigue Soberanes
C. Curt Bowen
D. David Miner
E. Brett Hemphill
F. Dionisio
G. Steven Serras
H. James Kelderman
I. Tamara Thomsen
J. Roger
Not Shown: Patrick

Special Thanks
www.AquaticAdventures.com



Inner Space 2004

Divetech - Cobalt Coast Resort
Grand Cayman, Cayman Islands

The week is a diving event called Inner Space, dedicated to closed circuit Inspiration and Evolu tion divers and students. Inner Space is dedicated the exploration of our oceans, and who better to explore the underwater world than Closed Circuit Rebreather (CCR) divers? As Dr. Sylvia Earl once said "We know more about the moon than we do the deepest oceans of our planet". CCR divers have the enjoyment of spending many hours underwater at a constant PO2, in a warm, moist environment with no bubbles... no doubt the way of the future to explore our oceans.

The event was organized by Divetech at Cobalt Coast Resort of Grand Cayman, in partnership and sponsorship from Silent Diving Systems (SDS), the US and Caribbean distributor of the Inspiration and Evolution CCR's that are manufactured in the UK by Ambient Pressure Diving Ltd. Intended to create a friendly environment for CCR divers or students wishing to learn to dive the CCR's, Inner Space also introduced new technology to the attendees and allowed a great information exchange between all participants. A total of 26 CCR divers joined in. Several manufacturers's helped make this happen and release new options, products & toys for participants to try out.

Silent Diving Systems was able to bring the first brand new Evolution to Inner Space, which allowed all participants a sneak peak at the new Vision Electronics and compact CCR. In depth seminars with lots of Q&A time were conducted.

MicroPore has developed a new adapter to allow a disposable CO2 canister called ExtendAir, an easy way to get the unit up and running without messing with the loose scrubber material. Participants were able to test dive the adapters and canisters throughout the week.

IANTD, the leading training agency in Rebreather training was represented by Tom Mount, perhaps the father of CCR diving in the recreational/technical diving community. Tom provided a great lecture on the hidden Dangers of CO2.

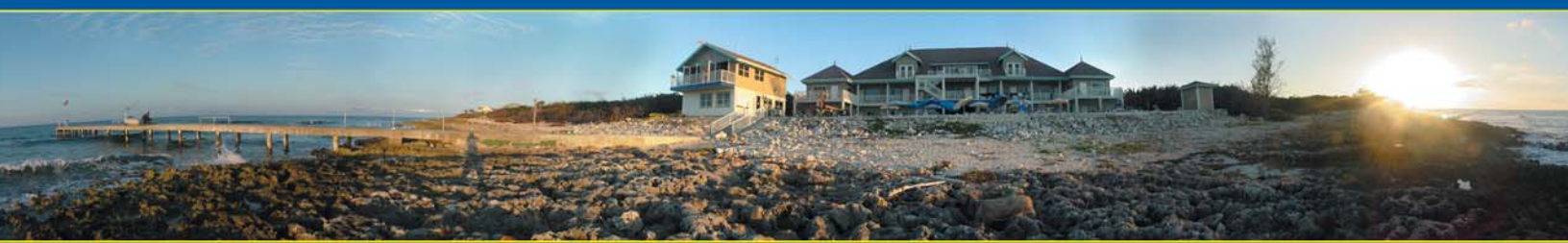
The early evening hosted a welcome reception at Cobalt Coast, and Mike Fowler of SDS unveiled the brand new – first in the US – Evolution CCR. Designed for dives in about the 2 hours range, compact, easy to travel with, new Vision Electronics and CO2 monitors on board

The week was filled with various groups interacting on land and under the water. Diving from both shore and boats, everyone experienced a variety of marine life activity – one of the coolest things about diving on a CCR – getting up close and personal with the Eagle rays that were swimming right up to the CCR divers, turtles, groupers, amber jacks, hammerhead shark, and the other 200+ species of marine life that bless the Cayman Islands.

The resort at Cobalt Coast made the evenings magical with wonderful buffets of assorted dishes while watching the sunset and then dining under 10,000 Caribbean stars. The Inner Space package was all inclusive, so everyone was fed well!

Divetech, with its 2 custom built dive boats and 2 pristine shore diving locations with only a couples of minutes swim to fantastic reefs and walls, kept divers moving, diving and getting gas fills. No one lacked for staying wet!

For more information on CCR Rebreather diving, or Inner Space 2005, contact:
divetech@candw.ky
cliff@silentdiving.com
iantd@iantd.com
eric@oceanicventures.com



Wreck of the Mairi Bhan BONAIRE

Article and photography by John Rawlings

Captain Luigi Razeto was irritated — in fact he was quite angry. Nothing seemed to have gone right on this voyage. His ship, the *Mairi Bahn*, had sailed from Genoa to Trinidad with a mixed cargo of olive oil, marble, cheap wine, and clothing and then had desperately sought an additional cargo for the return voyage. Ultimately, after much searching and sniffing around, he had arranged for a cargo consisting of barrels of asphalt that the ship would in turn transport to Venezuela before heading across the Atlantic to Marseilles. The whole thing had been a pain, and the ship's crew had not contributed much to his peace of mind. In fact, their reputation as "hell-raisers" had caused the Harbormaster of Kralendijk, on the island of Bonaire, to order the ship's immediate departure from port. Now, as the *Mairi Bahn* left the harbor, the captain again grimaced with irritation. He little suspected that his troubles were just beginning.

The *Mairi Bahn* was one of the ships fondly referred to as "Windjammers," a class of sailing vessel completely designed for speed and famous for fast runs between Europe and the Far East. Newspapers of the period are filled with accounts of voyages made in record time and of ships racing each other from one side of the world to the other, often neck and neck until the end. Built in Glasgow, Scotland in 1874 by Barclay, Curle and Company for the McIntyre Company, the *Mairi Bahn* was 239 feet in length with a 37-foot beam, weighing 1,386 tons. She added luster to the reputation of the Windjammer class by setting a new speed record from Glasgow to New Zealand on her maiden voyage — arriving in port after only 75 days. The *Mairi Bahn*, Gaelic for the "Bonnie Mary," had thus proved her worth from the moment of her birth, and she continued to serve the company well for many years.

Ultimately, however, the age of sail came to an end with the world's shipping turning almost completely to vessels powered by steam. Most of the Windjammers were sold off, stripped for scrap, or abandoned in far-off locations throughout the globe. In the case of the *Mairi Bahn*, she was sold to a small company based in Genoa, Italy. From that point on, the ship "tramped" from port to port, transporting any and all cargos of opportunity with no estab-

lished route. Ordered from harbor in Bonaire On December 7, 1912, Captain Razeto turned the ship toward the Venezuelan coast. This appears to have been the last action on which the witness accounts agree.

Despite many claims, apparently no one knows for certain why the ship ran aground on a reef off the northern end of Bonaire. It is almost astonishing in how much the stories differ from each other — some claim the grounding was the result of high winds, others that there was a freak storm that caused a shifting of the cargo — some mention a fire on board, often embellished by adding that it spread to the cargo of asphalt, causing a firestorm that the crew was unable to stop. Still other stories state simply that the *Mairi Bahn* had simply reached the end, becoming so much of a hazard that her captain and crew deliberately struck the reef rather than foundering in deep water. Whatever the cause or motive of the grounding, the crew apparently scrounged whatever they could from the ship and abandoned her on the reef at the mercy of both the elements and the local population. For weeks, many Bonairians salvaged what they could from the wreck, taking off much of the wood, rigging, and metal. The good times were not to last, however, and during a hurricane in 1913, the ship disappeared from the reef and sank into deep water to become the stuff of legend.

The *Mairi Bahn* remained undisturbed in her grave until 1968, when a team of divers located her in approximately 200 FSW, emerging from the surf astonished at their find and overcome with the sheer beauty of the wreck. On Bonaire, those that have dived her affectionately call her the "Windjammer." To this day, her location is seldom mentioned and does not appear in the many dive site guides available, as it is feared that recreational divers untrained and unequipped for such depths may be tempted to dive the wreck, a situation that could ultimately result in tragedy for everyone involved.

In June 2004, I traveled to Bonaire for ADM to attend the Annual Dive Festival, (see the upcoming issue of ADM for my story on Bonaire). While there, I was invited to dive the *Mairi Bahn* by my newfound friend, Martijn Eichhorn, one of two technical diving professionals operating out of Toucan Diving. Readily agreeing, I excitedly sat down with him to plan out the dive and the required bottom and decompression mixes, scheduling the dive for the morning of the day prior to my departure from the island. The day finally arrived, and we found ourselves happily bouncing north along the coastal road in a small shop pick-up with our doubles and stage bottles secured in back. Access to the wreck is from shore. Being a gnarly old (emphasis on "old") shore-diver from the Pacific Northwest, the thought of a shore entry through surf followed by an extended surface swim made me feel right at home, so after slipping into our rigs we staggered into the waves and did our best to avoid the ankle-busting holes and shallow clumps of coral.

Swimming out on the surface to the edge of the wall through the waves, I was struck by the beauty that surrounded me, the deep blue of the sky melting into the turquoise of the sea as the bright flash of the waves crashing onto the rocks lit up the shoreline like fireworks. Beneath us, the coral heads passed by as we kicked outward, fish darting here and there as our shadows loomed overhead. Arriving at the edge of the drop-off, we began our descent into the blue void. Within mere moments, I could see the edge of the drop-off and along with it the end of one of the huge metal masts of the *Mairi Bahn* pointing down the wall like a giant finger.

Left: Diver Martijn Eichhorn drifts slowly past the framed remains of one of the Mairi Bahn's crow's nests
Center: Encrusted with marine growth, part of the Mairi Bahn's anchor chain lies draped over her bowsprit
Above right: Black coral abounds on the wreck, particularly whip coral, which seems almost to spring out in all directions

Martijn had told me that the mast acts as a marker for the wreck and is generally used to locate the wreck from shore. We followed the mast down, passing a gorgeous array of corals and sponges bursting with bright colors on all sides. The visibility was astonishing as the light scarcely diminished as we dropped further down. Slightly before reaching 100 FSW, I could see a large, dark shape just beginning to materialize below and grinned into my mouthpiece as I realized that it was the *Mairi Bahn*.

Lying on her starboard side, the ship's two remaining masts stick out into the sand. Swimming down along one of them to its end, Martijn and I paused by the frame of the crow's nest, still intact but completely encrusted with marine life. Turning away briefly from the crow's nest, I spotted a small school of Jacks hurtling by. Spreading out on the bottom from the hull like a huge fan is the remains of her last cargo, a thick layer of the tar-like asphalt that should have ended up in Venezuela or Marseilles rather than at the bottom of the sea off Bonaire. Now dusted with a thin layer of sand and silt, the asphalt is no longer black, but you can easily see the patterns and shapes formed in it as it oozed out of the stricken ship like a lava flow.

With a few slight kicks, we again approached the main hull, which we also found to be covered with marine growth, various types of soft corals, black corals, and sponges. The wooden planking on the deck has long since disappeared. The metal framework that supported the deck is still there with long whips of wire coral dangling from each part like strands of rope. Each portion of the metal frame is coated with a myriad of cup corals, encrusting sponges, and gorgonians. The many openings of the cage beckoned to us, and we eased our way through one of them into the bowels of the ship, leaving us with only the ambient light flooding in from the side. Swimming along the inside of the base of the hull, I watched as our bubbles plunged upward to strike the ship's port side, tiny particles of rust and silt slowly drifting down towards us.

Emerging near the stern, we passed a large bollard, now almost dripping with wire corals and sponges. We then moved upward across the port side, softly making our way toward the bow — our planned bottom time was nearly at its end and it was time to begin the slow ascent. Once again using the lone mast plunging down the reef as our guide, we eased our way up toward the surface at our planned ascent rate, as well as making a series of deep stops as we went. Each time we stopped I found my eyes being drawn back down toward the *Mairi Bahn*. With the pure beauty of the sailing ships of a bygone era, coupled with the wonderful colors and shapes spawned by the soul of the Caribbean, she is truly the most gorgeous wreck I have ever dived on. I will return here.

Special thanks goes to Martijn Eichhorn and the rest of the staff of Toucan Diving for their hospitality, kindness, and assistance. For more information, please contact them at info@toucandiving.com or for technical dive info use ***tec@toucandiving.com***

Photo: Martijn glides past the ship's bowsprit, proudly pointing outward into the Caribbean as if she was still sailing.

Wreck of the Mairi Bhan

ISOBARIC COUNTERDIFFUSION

FACT AND FICTION

By B.R. Wienke & T.R. O'Leary
NAUI Technical Diving Operations

FACT — Isobaric counterdiffusion is a real gas transport mechanism. Please pay attention to it in mixed gas deco diving.

FICTION — Isobaric counterdiffusion is a theoretical concoction and doesn't affect divers at all.

WHY — Observed in the laboratory by Strauss and Kunkle in bubble experiments and is a simple physical law porting to diving. Studied first by Lambertsen and Idicula in divers in 1975, published and reported in many diving medical and physiology journals, and now accepted by the deco science community worldwide.

WHAT is isobaric counterdiffusion (ICD)?

Isobaric means equal ambient pressure.

Counterdiffusion means two (or more) gases diffusing in opposite directions.

For divers, the two gases are nitrogen and helium. And that is where concern is focused —iner t gases, and metabolic gases like oxygen, carbon dioxide, and water vapor, nor trace gases in the atmosphere. Thus, ICD in diving underscores two inert gases moving in opposite directions under equal ambient pressure in tissues and blood.But what' s important are relative speeds for counterdiffusion. Lighter gases dif fuse faster than heavier gases. In the case of helium and nitr ogen, surrounding nitrogen loaded tissue and blood with helium will result in greater total gas loading because helium will diffuse into tissue and blood faster than nitrogen diffuses out, resulting in higher total inert gas tensions. Surrounding helium loaded tissues and blood with nitrogen will produce the opposite effect, helium will outgas faster than nitrogen ingases and total inert gas tensions will be lower.

Perhaps a better descriptor is isobaric countertransport, because diffusion is only one of a number of different movement mechanisms. Historically, both terms have been used, with the former mostly employed in the decompression arena. Countertransport processes are a concern in mixed gas diving when differing gas solubilities and diffusion coefficients provide a means for multiple inert gases to move in opposite directions under driving gradients. While ambient pressure remains constant, such counterdiffusion currents can temporarily induce high tissue gas supersaturation levels and greater susceptibility to bubble formation and DCS.

In general, problems can be avoided when diving by employing light-to-heavy (breathing) gas mixture switches and by using more slowly diffusing gases than the breathing mixture inside exposure suits (drysuits). Such procedure promotes "isobaric desaturation," as termed in the lore. The opposite, switching fr om heavy-to-light gas mixtures and using more rapidly diffusing gases than the breathing mixture inside exposure suits, promotes "isobaric saturation" and enhanced susceptibility to bubble formation. Mor e simply, the former procedure reduces gas loading, while the latter increases gas

loading. The effects of gas switching can be dramatic, as is well known. For instance, a dive to 130 fsw for 120 min on 80/20 heliox with a switch to 80/20 nitrox at 60 fsw requires 45 min of decompression time, while 210 min is required without the switch (Keller and Buhlmann in famous mixed gas tests in 1965). Yet, skin leisions and vestibular dysfunctionality have developed in divers breathing nitrogen while immersed in helium (test chambers and exposure suits). And nitrogen-to-helium breathing mixture switches are seldom recommended for diving, particularly extended periods of time.

In the case of exposure suits filled with light gases while breathing heavier gases, the skin leisions resulting are a surface effect, and the symptomology is termed "subcutaneous ICD" Bubbles resulting from heavy-to-light breathing gas switches are called "deep tissue ICD", obviously not a surface skin phenomenon. Bottom line, if you don't want to read further is simple. Don't fill your exposure suits with a lighter gas than you are breathing, and avoid heavy-to-light gas switches on a deco line or lift bag. In both cases, bubble risk tracks with exposure time.

But what, you say, about detox switches from deco nitrox to trimix or heliox back gas? We all know it's been done since time immemorial, and is still done. For most of tech diving in the 200 fsw to 300 fsw range, for periods of time not exceeding 60 min or so, short detox switches off nitrox to heliox or trimix are not high risk, so long as cumulative detox times stay below 40 min roughly. But the statements above are still true – switching from nitrox back to trimix incurs risk versus other alternatives that can be used. And for very deep dives in 500 fsw range and beyond (like the dives Mark Ellyat clocked), isobaric switches off nitrox back to trimix are not a good idea. In fact, because of the depths and pressures, increased ingassing gradients for one or other gases lead to "isobaric slam" as we have coined the word. Slam is mitigated by making isobaric gradients as small as possible within the deco plan. Slam also shows up on deep dives as inner ear vertigo with fluid shifts (bad). Or simply, ICD problems increase with depth as ingassing gradients for one or the other gases increase. Avoid this by careful selection of switch mixes, minimization of nitrogen, and washout with oxygen in the shallow zone.

Another important consideration is nitrogen level. Nitrogen is not your friend for diving, with risk of DCS increasing with nitrogen fraction across multifaceted diving. We come back to all of this in discussing Ellyat's record OC dive. Turns out most of this is an efficient deco strategy, too, within dual phase bubble models.

Details of ICD cannot obviously be recounted here in gory detail, but rudiments, time scales, and mechanistics are found Technical Diving In Depth, Reduced Gradient Bubble Model In Depth, and Basic Decompression Theory and Application. Also, released NAUI RGBM Tec Tables embody all discussed herein, but with a more simplistic approach to training. Minimization of intermediate and deco stage bottles for OC training is a NAUI RGBM Tec Table mainline, with just a single switch to pure oxygen at 20 fsw.

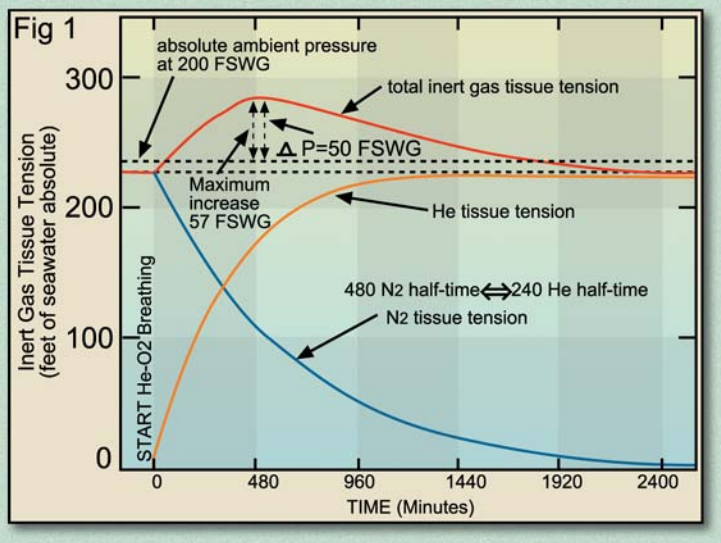
A closer look at the isobaric countertransport phenomenon is interesting. Particularly interesting is the "isobaric saturation" scenario depicted. Figure 1 tracks gas supersaturation following nitrogen-to-helium switching due to the isobaric counterdiffusion of both gases. For helium-to-nitrogen switching (hopeful case for technical and commercial divers), a state of "isobaric desaturation" would ensue due to isobaric counterdiffusion.

Fig 2
Decompression Schedule
Max Depth 1049 fsw

depth (fsw)	wait (min)	ppO2 (atm)
1049	1.0	1.6
740	0.5	1.2
730	0.5	1.2
720	0.5	1.1
710	0.5	1.1
700	0.5	1.1
690	0.5	1.1
680	0.5	1.1
670	0.5	1.1
660	0.5	1.1
650	0.5	1.0
640	0.5	1.0
630	0.5	1.0
620	0.5	1.0
610	0.5	1.0
600	0.5	1.0
590	0.5	0.9
580	0.5	0.9
570	1.0	0.9
560	1.0	0.9
550	1.0	0.9
540	1.0	0.9
530	1.0	0.9
520	1.5	0.8
510	1.5	0.8
500	1.5	0.8
490	1.5	0.8
480	1.5	0.8
470	1.5	0.8
460	1.5	0.7
450	1.5	0.7
440	2.0	0.7
430	1.5	0.7
420	1.5	0.7
410	2.5	0.7
400	2.5	0.7
390	3.0	0.6
380	3.0	0.6
370	3.0	0.6
360	3.0	0.6
350	3.0	0.6
340	3.5	0.6
330	3.5	0.6
320	3.5	0.5
310	3.5	0.5
300	3.5	0.5
290	2.5	1.4
280	3.0	1.3
270	3.5	1.3
260	3.5	1.2
250	3.5	1.2
240	3.5	1.2
230	4.0	1.1
220	4.0	1.1
210	5.0	1.0
200	6.0	1.0
190	6.5	0.9
180	6.5	0.9
170	6.5	0.9
160	7.5	0.8
150	9	0.8
140	9.5	0.7
130	8.5	1.3
120	8	1.3
110	9	1.2
100	13	1.1
90	13.5	1.0
80	14	0.9
70	15.5	0.8
60	16	1.4
50	17.5	1.3
40	21	1.1
30	22	1.5
20	24.5	1.6
10	31	1.3

TDT 412.1 min
Deco 400.5 min
CNS% = 1.86
OTU = 409.7 min
Gas consumption
2071. ft^3

Depicted in Fig 1 is a comparative representation of the time courses of changes in helium, nitrogen, and sum of the two, tissue tensions for 480 min nitrogen tissue compartments and 240 min helium tissue compartments. The depth is 200 fsw with abrupt change from normoxic nitrox to normoxic heliox. Note the buildup in time of total inert gas tension, with a maxima after some 400 min. W ith faster tissue compartments, this maxima builds more quickly, on time scales of the slowest tissues involved. Actually the cur ves remain the same as shown, but axis time scales are shortened by the ratio of the fast tissue halftime, t, divided by 240 for the helium compartment, t/240, and similarly for the nitrox compartment, tissue halftime, t, divided by 480, that is, t/480. This is quite obviously not a good scenario for the mixed gas diver. If the gases were flip flopped, a minima would develop, identical in shape to inverted Fig 1. For faster tissue compartments, usually the case in mild deco (non sat) diving, effects seen in Fig 1 occur much more rapidly, like in the 10 min to 50 min time frame.



Mark Ellyat (UK) has made a number of dives beyond the 500 fsw mark. A r ecent dive to 1040 fsw on OC trimix is a record and a spectacular accomplishment.

Mark Ellyat's Gas Switch Plan 1040 fsw

1040 fsw	bottom mix trimix	5O_2 / 76He / 19N_2
295 fsw	switch to trimix	14O_2 / 56He / 30N_2
138 fsw	switch to trimix	27O_2 / 43He / 30N_2
69 fsw	switch to trimix	50O_2 / 23He / 27N_2
30 fsw	switch to trimix	80O_2 / 20He / 0N_2
20 fsw	switch to	100% Oxygen

With a total run time in the 420 min range. Stops ar e made every 10 fsw or so beginning near 750 fsw. W ith rapid descent, a strawman RGBM schedule follows in Fig 2. As far as ICD (and HPNS because of the extreme depth), Ellyat's strawman schedule exhibits a number of interesting features.

Dives exceeding 400+ fsw require high helium and low nitrogen. On the way up, oxygen is increased in roughly the same proportion as helium is decreased, while keeping nitrogen fairly constant and in the 15% to 25% range (the lower the better for deco, but higher than 10% to address HPNS concerns). Oxtox management falls in a ppO2 = 1.2 atm r egion. Pur e oxygen is employed at 20 fsw. Note, ther e are NO isobaric switches to nitrox anywhere. Not EAN50 at 70 fsw. At 30 fsw , 80/20 heliox (no nitrogen) is the switch mix. Rather than EAN50 at 70 fsw, heliox 50/50 would be a better choice.

Also HPNS and rapid descents can be a problem on trimix below 600 fsw, just like heliox below 400 fsw. Though 10% nitr ogen is popular for mitigating HPNS, it's not foolproof, and nitrogen thus is above 10%. Bottom line here is ingassing gradients for nitrogen have been minimized by avoiding isobaric switches, and the transitions from richer-to-leaner helium mixes are also smoother. No slams.

Remind you of a rebreather in some ways? Y ea, guess it does.

Happy and safe tech diving.

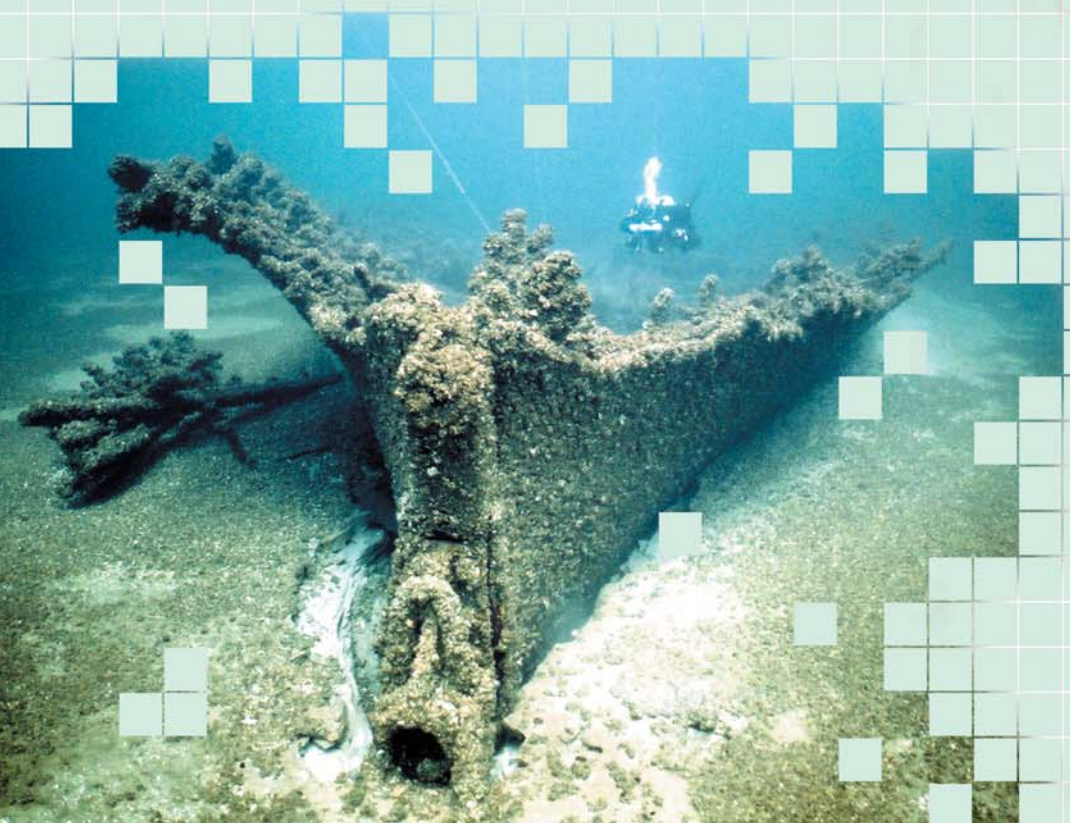
by Tom Wilson

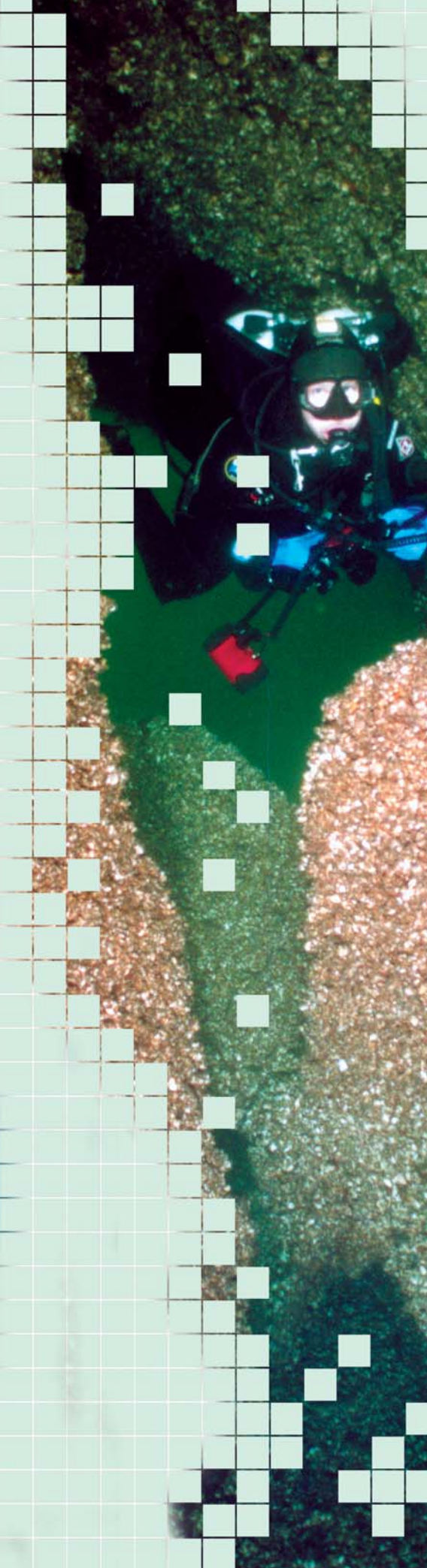
Graveyards are generally viewed as eerie places haunted by the specters of those who have passed on—macabre tracts of land most people avoid with the same determination Pamela Anderson avoids carrying sharp objects at chest level. That impression may have to change to account for the three shipwreck graveyards that lie near Kingston, Ontario, Canada.

Back in the late 1800s and early 1900s when the Great Lakes were experiencing their heyday as highways for moving goods from one town to the next, as well as around the world, thousands of ships passed through the region. These were hard working vessels, rarely pretty, but strong and stable enough to handle the sudden storms these inland seas are still famous for. However, just as the strongest of men age and fade, so did these mighty wooden ships, which helped build the United States and Canada into what they are today. Advancing years, fire, explosions, fatigue, and collision damage are just some of what caused these craft to fall below what actuaries of the day considered a reasonable insurance risk. Once they could not get their cargoes insured, they were essentially useless and worthless.

Many such ships sat at port, waiting to make one more run, which would never come. Despite their sometimes-rich heritage, they met with a most ignoble fate. Most lay rotting away at their moorings for extended periods with all their valuable equipment and machinery having been removed and much of the easily accessible wood being used to heat homes over the long winter months.

So the question arose: What do you do with a fleet of worthless, derelict ships only the ever-increasing number of rats could love? Considering several had sunk dockside, it likely was not a huge leap to come up with the idea of towing them out to deeper water to let the lake have them once and for all.





GREAT LAKES GRAVEYARD

In Toronto, the practice was to anchor them by the waterfront, blow them up, and watch them burn, which was cheap (and much needed) depression-era entertainment nicknamed "weenie-roasts." Kingston had other ideas though. Today they would be called "artificial reefs," requiring site surveys and impact assessments along with complicated and costly cleaning efforts, but back then, the times were simpler and the "environmentalist" had yet to evolve.

It was a Herculean feat to raise the ships that had been prematurely introduced to the bottom of the harbor. Then, one by one, make them seaworthy enough to be towed out where they could be easily forgotten. Some did not make it that far and now lie scattered across the bottom of the eastern end of Lake Ontario, whereabouts unknown.

Fast-forward six decades and shipwrecks scuttled as garbage back in a day when recreational scuba diving was essentially non-existent have long since fallen from the memory of all but a rare few. The individuals who know where the precious wrecks are aren't telling—they're protecting their stash of "private" wrecks, ostensibly in the name of preservation to ensure nothing is removed or damaged. While it is true some artifacts have grown fins and swam off, Kingston can boast one of the most effective diver education programs on wreck conservation in the world, spearheaded by a group called Preserve Our Wrecks (POW). The deck of the dredge *Munson*,

which sits at 110 feet near the port of Collins Bay, sees a multitude of divers every year, yet still has a collection of plates, bowls, pots, and tools few wrecks anywhere can rival. It is the jewel of POW's efforts and a triumph in a sport where all too often the prevailing attitude is, "If I don't take it, the next guy will."

Until roughly 15 years ago, diving in the area was usually of the Braille variety—you had to be in contact with the wreck to experience it. Then, a European freighter accidentally introduced zebra mussels to the Great Lakes and visibility changed dramatically. The little clam-like filter feeders (often called considerably less polite names) have reduced the amount of suspended particulate in the water to where 100 feet of visibility, particularly in the spring and fall, is not uncommon in some areas near Kingston, although the average is usually around 50 feet. Despite being only three-quarters of an inch long, zebra mussels can obscure wreck details by building up a layer several inches thick as they multiply at a rate rabbits can only dream of. One American study recorded populations in excess of 5,000 mussels per square yard in some of the worst hit areas. If given the option of seeing almost nothing or seeing a wreck coated in a relatively thin layer of zebra mussels, most divers would opt for the latter.

As the visibility improved over the years, so did the diving. Suddenly those shipwreck graveyards, which had been thought worthless, were a goldmine to the dive industry and a solid link to the rich nautical past of the area, which had once served as Canada's capital. All that was needed now was to find the wrecks.

The Amherst Island graveyard has been dived for years, containing at least nine ships of which few details are known. Large ships with names long lost were quickly given monikers like *Titanic, Queen Mary, Empress of Ireland,* and *Lusitania*. Another was a joke played by the finders who triumphantly announced they had located the *Glendora*, a ship legends claimed carried a fortune in gold when it went down—the gold was nowhere to be found but the name and laughter remains.

Although others remain to be found, the premiere wreck in this graveyard so far is undoubtedly the paddlewheel steamer *Cornwall*. Built in 1854 as the *Kingston,* she was such a luxurious ship, she hosted the Prince of Wales (who later became Edward VII) during a Canadian tour but would later suffer a number of fires causing numerous fatalities and several rebuilds, which eventually turned the once fine ship into a humble wrecking tug. In a bizarre twist of fate, it was actually the *Cornwall*, which towed many of the graveyard occupants to their final resting place before joining them in the late 1930s, courtesy of some intentional dynamiting. Two boilers, a prop, and a pair of sizeable paddlewheels make this one of the most interesting wrecks in the area, all in just over 70 feet of water.

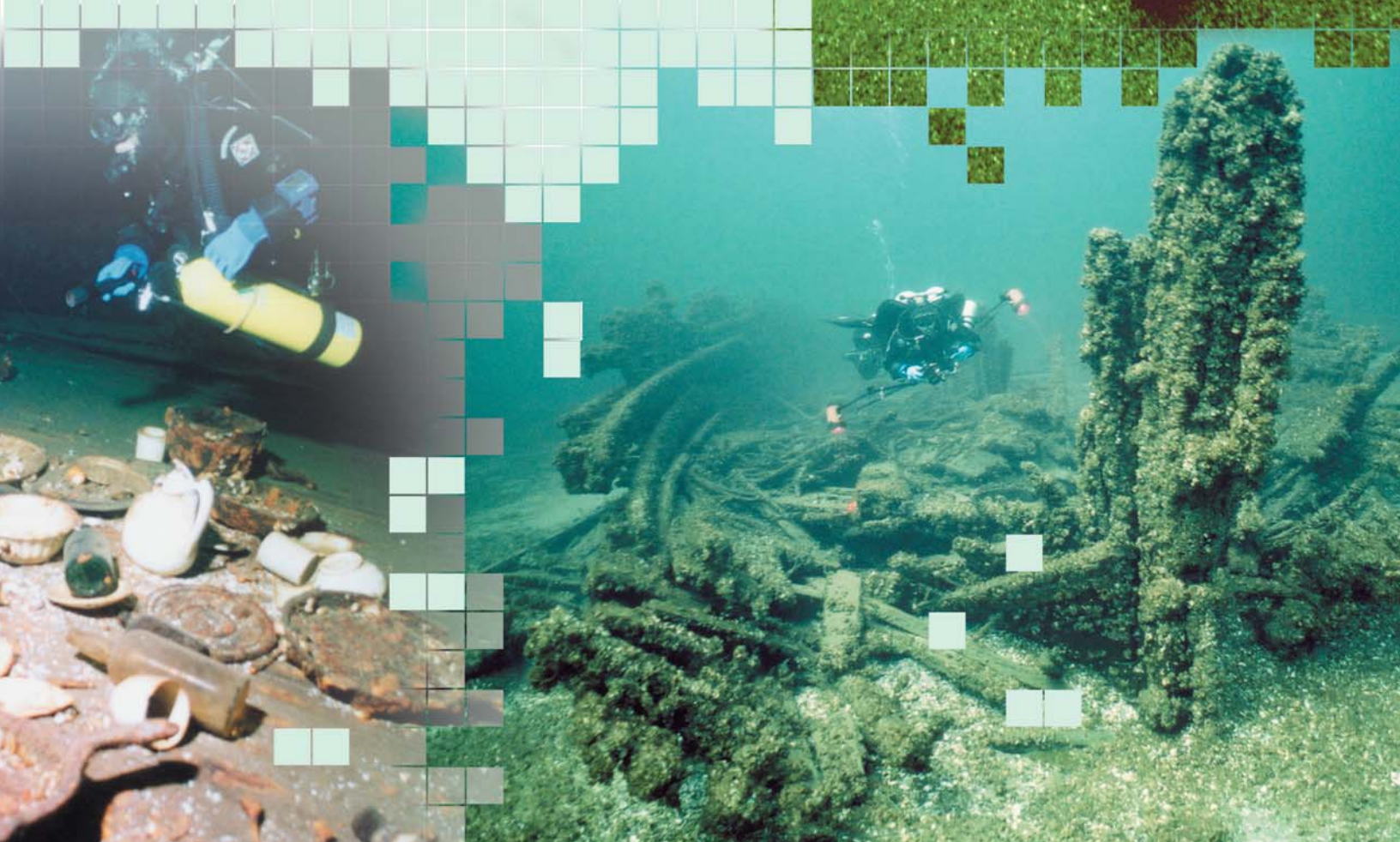
The locations and details of the other two graveyards were not as well known. Enter Tom Rutledge and Dan MacKay, owners of a fledgling dive store operation, Northern Tech Diver, in Kingston. While other boats were using finders meant for fish, they decided it was time to get serious and invested in one of the area's first

computerized side scan sonar units. As for why they went to all the expense and trouble, Rutledge said with a swagger reminiscent of the early days of diving, “Because people told me we weren’t allowed.” In their first season of using the side scan sonar, they located 27 wrecks, some whose coordinates were being kept quiet and immediately started a comprehensive project of recording the sites with both video and still photography.

“The water helps preserve these sites but they are still deteriorating,” said McKay, a technical instructor for Global Underwater Explorers and an accomplished underwater videographer. “We’ve seen them change dramatically over the years we’ve been diving the wrecks around here, and there’s almost no visual record of them.”

The Wolfe Island graveyard is the latest focus of their efforts. Few names are known for sure—history is still waiting to be rediscovered. The two most recent wrecks found and tentatively identified were the 227-foot steamer, *Sarnor* and the three-masted schooner, *Hattie Hutt*, which is 100 feet shorter. These wrecks lie roughly 90 feet apart with a line running between them, making it possible to see both wrecks on a single dive to 90 feet.

With many of the shallower wrecks having now been found, Rutledge and MacKay are planning to turn their attentions towards the deeper ones, including the *St. Louis*, which reportedly lies in 300 feet of water, but that expedition will have to wait until after they locate a few long-lost military planes, but that’s another story.



Exploration Guiding Science Guiding Exploration...

by Jill Heinerth

Above: Scientist entering Norman's Pond Cave, Exumas to conduct sediment studies. Photo: Jill Heinerth

Below: Divers Jill Heinerth and Tom Morris using a measuring tape to set up a dye trace experiment in a Florida cave. Photo: Wes Skiles

Attendees at the 2003 NSS-CDS Annual Workshop heard some sobering news about their responsibility in assisting the scientific community. Wes Skiles, President of Karst Productions and Karst Environmental Services Inc. spoke about the critical need for cave divers to cooperate with state and local governments and members of the scientific community in better understanding biology, geology, and archaeology of caves. His talk carried a somber message–help out or risk losing access to sites.

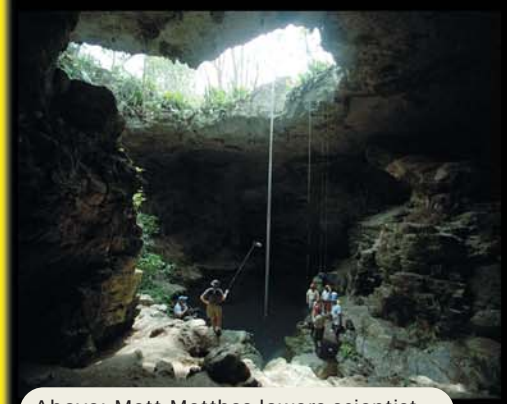
In our ever-more litigious society, there is one certainty for landowners. It is easier to deny access to cave divers than to deal with the liability and perceived hassle of inviting divers to a property or site. The cave diving community must step up and improve the perception of our value to the scientific community and governmental agencies.

Although cave divers have already significantly contributed to the exploration and mapping of caves, there is much more that we can do as a community. The NSS-CDS has posted a special section on their website www.nsscds.org. Under the tab "Dive Sites," visitors can download forms called "Spring Reports." Jim Stevenson, former chairman of the Florida Springs Task Force created this form in order to track changes and trends in Florida caves. This form will enable the collection of long-term data that will support biological and geological studies. By using this form and submitting it online or by fax, cave divers contribute significantly to the understanding of cave ecosystems and the impact that society has on those dynamic environments.

Cave divers in Mexico have an additional responsibility of reporting archaeological finds to the proper authorities. All archaeological finds should be reported to INAH in Mexico City with as much information and detail as possible. Photographs and maps are extremely helpful to Mexican scientists that are compiling an Atlas of cenotes. In all cases, the most important thing is that national treasures remain undisturbed, so that when scientists are ready to examine artifacts, their integrity has not been compromised in any way. Even the amount of silt on an artifact can be a key indicator of how long an item has been in its current resting place.

The debate rages in the caving community about cooperation with scientists, but the writing on the wall is very clear. Although some cavers fear closure of sites after reporting the presence of artifacts or a significant change in ecology, it is critical that we improve cross-communication and convey our eagerness to guide and support science where scientists cannot reach. Synergy between scientists and cave explorers will open access to purposeful cave diving rather than limit it. Without that cooperation, our community will be branded as being unwilling to support the better understanding of the environment and its wonders.

Above: Brian Kakuk replacing broken line in Subway Cave on Great Exuma.
Photo: Jill Heinerth



Above: Matt Matthes lowers scientist Tom Iliffe into Chui-hol in Mexico's Yucatan. Photo: Emory Kristof

Right: Cave diving film team enters Cenote Ucil in order to conduct tests in the deployment of ROVs for cave exploration. Photo: Emory Kristof

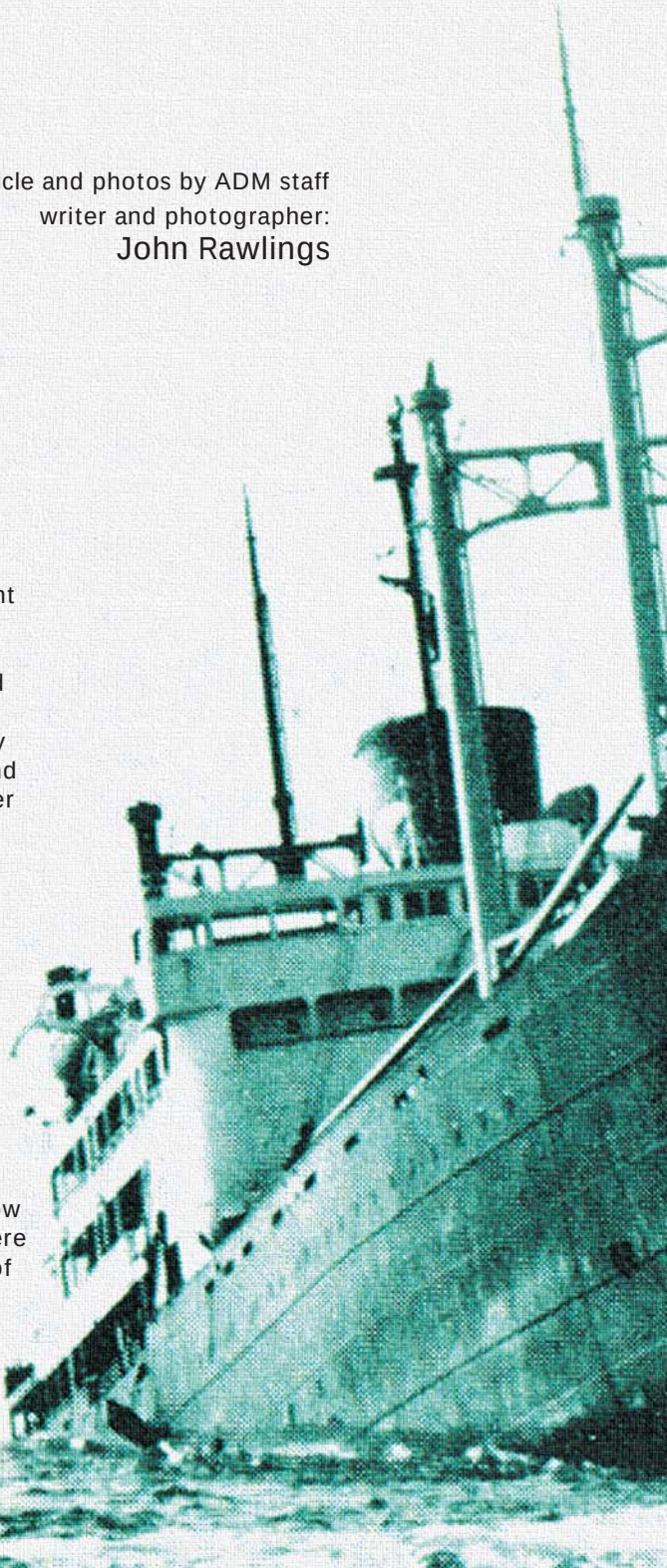
Tom Iliffe conducts a plankton tow in the sensitive Oven Rock Cave in the Bahamas.
Photo: Jill Heinerth

WRECK OF THE VANLENE

Article and photos by ADM staff
writer and photographer:
John Rawlings

Captain Lo Chung Hung was tense and nervous. He had every right to be. He was passing through some nasty weather and was now dealing with a thick fog that prevented even the sharpest lookout from seeing what was ahead. It was the night of March 14, 1972, and his ship, the 473 foot Panamanian registered *Vanlene*, was enroute to Vancouver, BC from Japan loaded with a cargo of 300 Dodge Colts. She had sailed with only one working compass and completely non-operational navigational gear, (the ship's owners would later dispute this in the resulting inquiry), and the result had been many long, sleepless nights spent trying to determine their actual location and course. This was Lo Chung Hung's first command, and the lack of proper navigational gear had made the voyage one of constant worry and concern, forcing him to use every trick he knew to keep the vessel on course. Additionally, both the echo-sounder and radar were non-functional, of particular concern now that the vessel was approaching land. He was seeking the entrance to the Strait of Juan de Fuca between Washington State and Vancouver Island and was confident that the *Vanlene* was approaching the entrance to the strait despite the poor conditions and thick fog. Captain Hung was wrong. In fact, the *Vanlene* had entered Barkley Sound on the west coast of Vancouver Island, over 57 miles north of where he believed his ship to be.

Amazingly, in the fog, the ship managed to steam past numerous rocky reefs and islands without incident. Missing some of the rocks by mere feet, the *Vanlene's* captain and crew were blissfully unaware of how close to disaster they were. This ignorance was not to last. Breakers were sighted dead ahead and with a colossal lurch and the sickening shriek of tearing metal, the ship struck a cluster of rocks just off Austin Island in Barkley Sound. The violence of the collision forced the ship's bow completely out of the water and left the stern nearly awash. In the resulting mayhem, a distress call was sent out stating that the ship was aground on a rocky reef "somewhere off the coast of Washington."



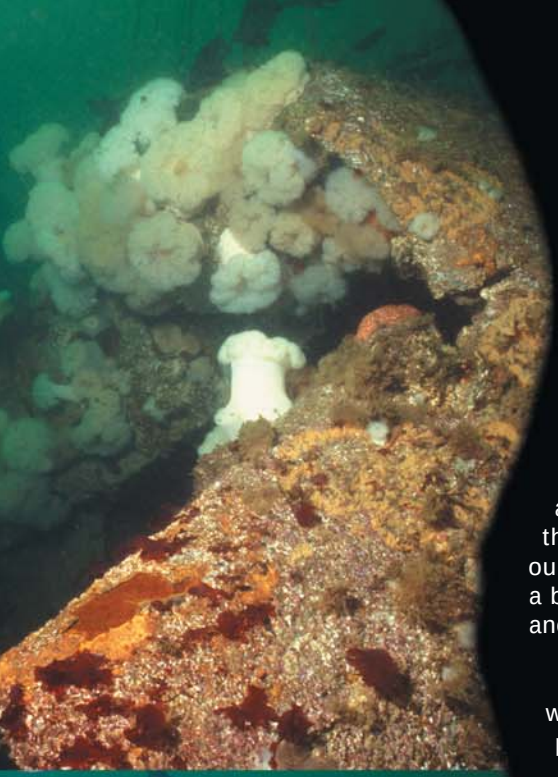
The U.S. Coast Guard immediately responded with a massive search and to their horror, thinking she had foundered, could find no trace of the vessel. Canadian rescue efforts had also immediately been launched and rescue vessels were hurriedly steaming southward to assist their American comrades in the search. To everyone's surprise, the Canadian Forces' ship *Lamar* and the tug *Neva Straits* sighted the *Vanlene* stranded on the rocks inside Barkley Sound. Upon the arrival of the *Neva Straits,* the officers and entire crew of the stricken vessel leapt to the deck of the log barge being towed by the tug, an act that caused several unnecessary injuries among them. The crew was taken to Port Alberni and both clean-up and salvage efforts began. Efforts were made to recover some of the floating oil before the nearby herring spawning grounds were polluted, and the oil remaining in the *Vanlene's* fuel tanks was pumped out and removed. While many of the Dodge Colts were underwater and ruined, those remaining above water were taken off one at a time by helicopter, a sight spawning tales that entertain locals to this day!

Following the salvage of the cars, it was decided that the *Vanlene* herself was not in fact worth the time, money, and effort required to refloat her and she was left to the sea, her bow still forlornly perched on the rocks. She was visited often by local boaters and fisherman and anything valuable was removed. According to the Underwater Archaeological Society of British Columbia, "Hardly a resident in Bamfield or Ucluelet does not display or utilize something from the *Vanlene.*"

The wreck remained on the rocks for several years, buffeted by the fierce winter storms that regularly strike the west coast of Vancouver Island. Ultimately, during one such hard blow, she slipped off the rocks and sank into the deeper water adjacent to them. Due to the remote location and the storm, no one was there to see it except perhaps wind-swept sea birds and possibly a few Sea Lions, but the sight must have been tremendous.

Today, despite its remote location, the *Vanlene* has become one of the most popular wrecks in British Columbia. Divers throng to her as if by the sirens' call whenever their path takes them to Barkley Sound. Because of weather conditions and large swells coming in from the Pacific, the *Vanlene* must necessarily be a dive planned based on existing conditions and alternate dive sites considered in advance–after all, as her captain and crew learned to their regret, the rocks and breakers are nothing to mess with in bad conditions and there is really NO point in adding another, smaller wreck alongside the ship on the bottom!

Over 30 years after the *Vanlene* struck the rocks and came to her end, my buddy, Sparky, and I found ourselves once again in Barkley Sound heading west toward her grave. As always, our host was Dave Christie of Rendezvous Dive Ventures, and we were joined by a group of Canadian divers just itching to dive the wreck. The wind and waves were



calm as we departed the lodge at Rainy Bay, but as we neared the outer edge of the Sound a thick, dense fog began to envelope us. The air was perfectly calm and the water as still as glass. The only sound the rumbling of the boat's dual engines and the conversations of the divers. Knowing the Sound like the back of his hand, Dave still kept his eyes on the GPS and depth-sounder, knowing that a moment's inattention could easily put us aground much like the *Vanlene* herself years ago. Watching the screen, we could see that we were passing small islands and rocks, even though they were completely hidden from us in the dense fog. As Dave slowly turned the boat at an angle I started to see a few treetops jutting out over the fog, then suddenly disappear as though they had never been. Then, just like in one of those old Doug McClure "Lost World" movies, the island appeared ghostlike through the fog and we seemed to plunge out into the daylight, the rich green of the trees and the Pacific itself seeming to gleam in the morning sun. Waves crashed over the outer edge of the rocks while a carpet of kelp coated the surface on the inside like a brown mat. We had arrived and almost within seconds, Dave had dropped anchor. Grinning, he loudly announced that the pool was open!

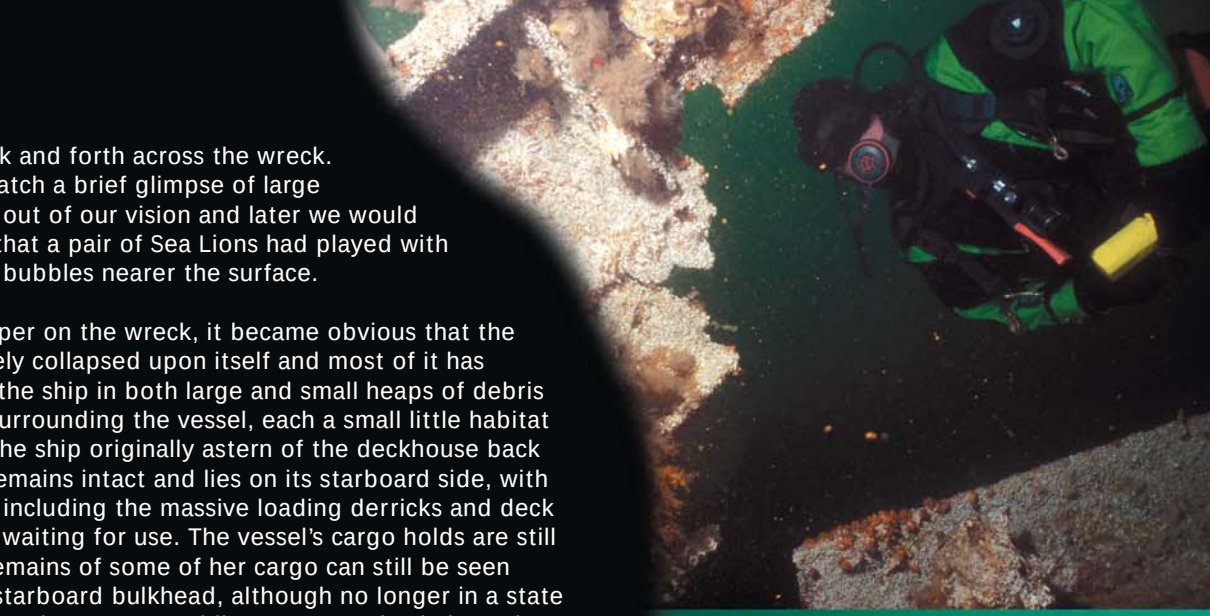
As always, the Spark and I were excited and it wasn't long before we were both poised at the stern and grinning at each other through our mouthpieces. With a quick stride, we vaulted into the water and sank quickly downward to the rocks below. Since the ship slid off the rocks stern first, her bow lies in shallow water beginning around 30 FSW. More of the yearly winter storms have done their work and the bow section more closely resembles a colossal heap of debris rather than a part of an ocean-going vessel. Piles of twisted, jagged metal lay everywhere as we headed into deeper water, all of it covered with beautiful anemones and invertebrates of all sizes and shapes. Finding one of the colossal loading derricks laying at an angle on the bottom like a giant tube, we began following it downward into the greenish gloom, knowing that it would lead us to the wreck as sure as if we were following a road sign. Within moments we left what can best be described as a debris field and came upon the remains of a recognizable ship.

Near the surface, the *Vanlene* is coated with a layer of acorn barnacles, looking like a white shroud, but as the depth increases these denizens of the intertidal grow fewer and other invertebrates dominate. Giant Rock Scallops gape from nooks and crannies, colonial tube worms appear almost as a carpet in some places, sea stars of every size and color glide across the wreckage in search of prey, and everywhere huge clumps of ghostly white Plumose Anemones cluster in profusion like massive wads of cotton. Sponges and tunicates add their bizarre shapes to the seascape as well as splashes of color here and there. Through it all scamper thousands of small spider crabs, each decked out in its personal finery of bits of sponge and algae.

Rockfish of various species abound on the wreck,Yellowtail Rockfish (*Sebastes flavidus*) in particular following us around during the dive like curious puppies and scattering when we turned to look at them as if we had caught them doing something "naughty." Tiny Scalyhead Sculpins, their eyes looking like sunbursts, darted here and there wherever we looked, their bright colors flashing in our

lights as they swept back and forth across the wreck. Periodically, we would catch a brief glimpse of large shadows darting by just out of our vision and later we would be told by other divers that a pair of Sea Lions had played with them and danced in our bubbles nearer the surface.

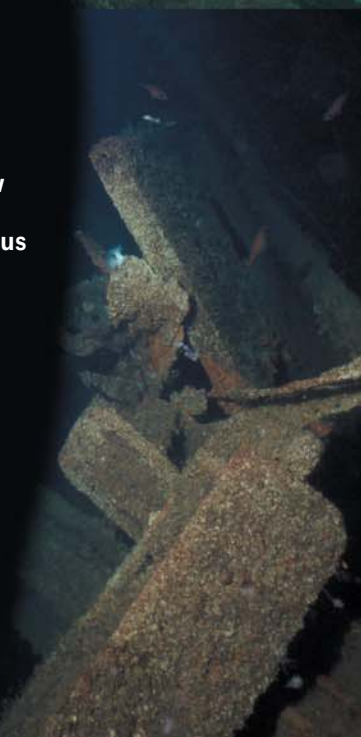
As we dropped deeper on the wreck, it became obvious that the deckhouse has completely collapsed upon itself and most of it has become detached from the ship in both large and small heaps of debris on the sloping bottom surrounding the vessel, each a small little habitat all its own. The area of the ship originally astern of the deckhouse back toward the stern itself remains intact and lies on its starboard side, with all of the deck structure including the massive loading derricks and deck fixtures still poised as if waiting for use. The vessel's cargo holds are still open and the jumbled remains of some of her cargo can still be seen jammed up against the starboard bulkhead, although no longer in a state that one would ever recognize as automobiles. As we cruised along the stern we saw several open hatchways leading into the *Vanlene* but chose not to penetrate as our knowledge of the ship's interior was completely lacking. Many penetration dives have been made on the wreck, however, and a lot of souvenirs have been brought up from below decks. Turning the dive at her stern in approximately 130 FSW we slowly swam upward on the opposite side, a massive Ling Cod disturbed by our lights abruptly speeding off into the gloom like a torpedo.



As we continued our ascent, the bright sunshine darted down into the water like long green fluorescent fingers, bathing the wreck in its intensity. A school of shiny Striped Sea Perch glistened in the light and dozens of them surrounded us as we slowly moved through them toward the surface. The occasional China Rockfish would stare at us from small ledges in the ship's railing, their beautiful shiny black color emblazoned with a bright yellow "swoosh" on their sides as if they were part of a Nike commercial. Our final stop was on a massive piece of unrecognizable twisted metal on which stalks of Bull Kelp had attached and plunged up to the surface like long, thin spears. The sun shining through the mat of kelp gleaming on the surface gave the spot an incredible golden-brown hue that made our last minutes underwater a vivid memory.

Climbing back aboard the "Rendezvous," I could see grins all around and knew that our fellow divers had also had experiences that would last them for weeks of tall tales with their buddies back home in Alberta and Saskatchewan. As Dave swung the bow of the boat eastward back toward Rainy Bay and home, each diver described in detail the memory of his or her dive. Like us, perhaps they too were making silent vows to return again to Barkley Sound and the grave of the *Vanlene*.

My special friends Dave and Renate Christie have now retired! Readers desiring more information on diving in Barkley Sound may contact the new owners of Rendezvous Lodge, Peter Mieras and Kathy Johnson at www.rendezvousdiving.com or toll free at 1-877-777-9994.



JEAN BRUNEAU

Staff photographer for Aquatica

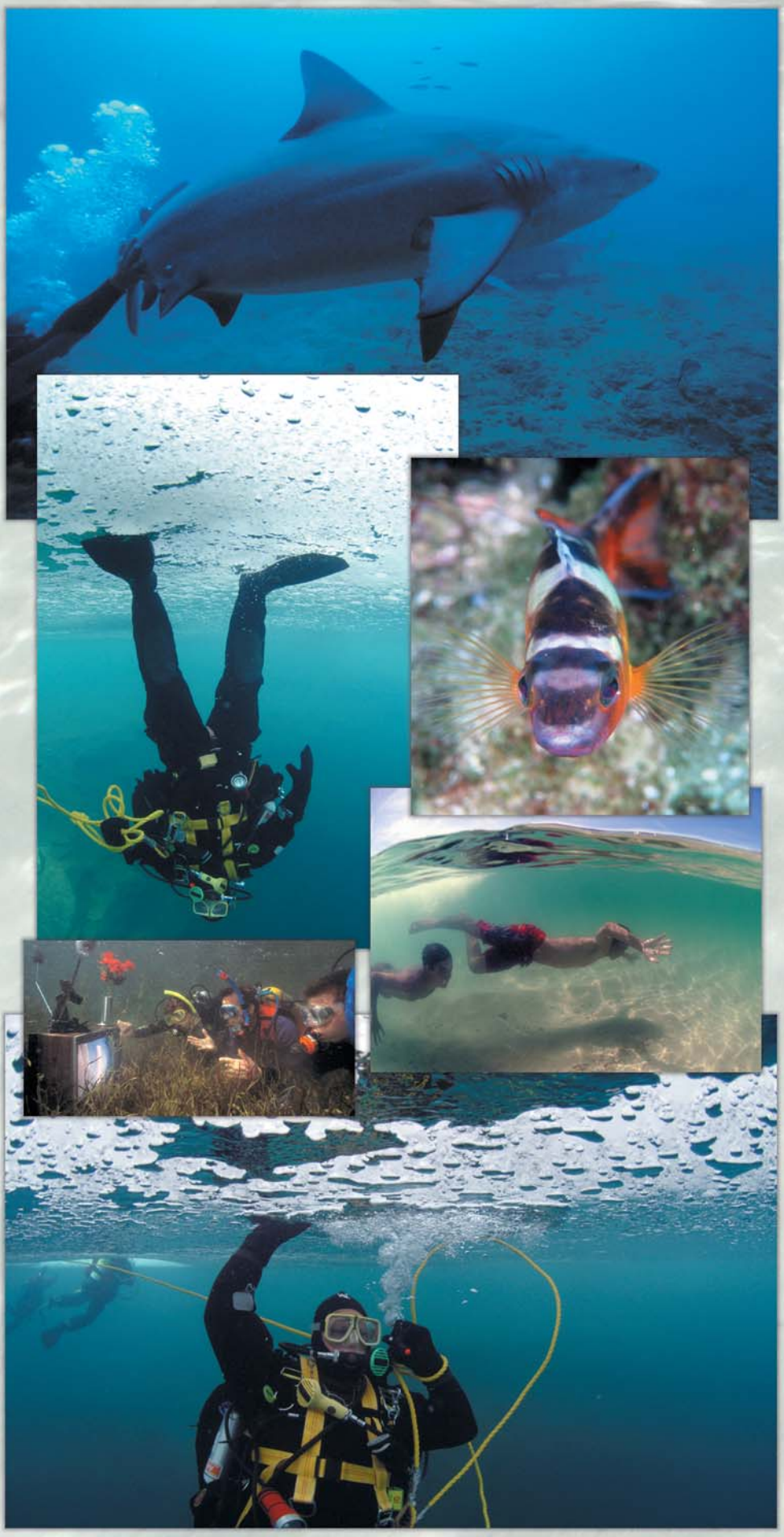
I am, if I was to describe myself, a self taught, stubborn, dedicated, and technically oriented photographer. After countless hours of sifting through magazines and books, I finally went out in 1990 and purchased a Nikonos V camera. I then proceeded to take my open water course. It was and still is my opinion that for me, diving without an underwater camera was pointless. Photography is the only thing that I have done since 1971 and diving was just an excuse for a subject change. Boy was I in for a surprise. Shooting underwater happens to be the toughest form of photography that I have done so far. The technical aspect at the time was staggering and anybody that has taken a Nikonos under will vouch for the difficulty at mastering this type of camera.

The auto focus reflex type cameras where just beginning to emerge and be submerged in housings and this is where my photographic life got interesting. I happened to live where the world-renowned manufacturer Aquatica was recruiting personnel for their testing and assembly facility. My background as a service manager in the camera repair business helped me get the job, and a few days later I was punching my card at a different address.

Now if you think testing underwater housings takes you to exotic locations with bottomless budgets, you would be wrong! Most of the testing is done in a pressure tank, where the equipment is subjected to the pressure equivalence of 330 feet. The ergonomic and optical tests are done in our 50-foot deep pool. I went through my training quickly and mastered the optical dynamics of a housed camera.

Open water in Canada is cold and murky. My access was limited mostly to the summer months until recently. Now with an Ice diving certification, the diving is all year round and provides an excellent opportunity to test equipment under the harshest of conditions. This has been very useful in analyzing the behaviour of the newest digital camera housing in a cold environment.

My current set up is comprised of two rigs, one Aquatica housing for the Nikon D100 and one for the Fuji S2pro. I prefer the Aquatica/Nikon D100 setup for wide angle and use it with the 10.5mm F:2.8 DX fisheye lens and the 14mm F:2.8. The 10.5mm fisheye is an awesome lens for wrecks and can



be corrected in the proper Nikon software with good results. The 14mm is sharp and gives the equivalent in coverage to a 21mm on a 35mm camera.

For macro work, it's hard to beat the Aquatica/Fuji S2pro combo, which allows the use of a TTL flash. Something that is missing are digital compatible TTL flashes, but TTL works 90% of the time in macro and for the few times that it doesn't deliver, there is the manual override and the LCD monitor to confirm results. The lenses I use are the 105mm F:2.8 Micro and the 60mm F:2.8 Micro Nikkor, which is my favorite. For strobes, I use the Nikonos SB-105. I have six of these strobes and find them very reliable for the price. For cross-referencing, I use the Sea & Sea and Ikelite units and recently began testing the Inon flashes.

One type of photography that I recently rediscovered is available light. With the advent of manual white balance on today's digital cameras, it is fairly easy to filter and calibrate your light source for good results without the use of strobes. I recommend soothing in the RAW mode to keep the flexibility and quality at maximum level.

As far as destinations go, I enjoy the warmth of Venezuela. My wife being from there, it's a second home for us and the muck photography is excellent. My other soft spot is Cuba, which for us is very cheap and easily accessible. Cold water diving is now wherever we can drill a hole in the ice and the St. Lawrence River, which is one of most navigated waterways in the world and home to hundreds of wrecks. This river offers advanced deep salt water diving on historical shipwrecks, to shallow freshwater fish I.D. diving, to ice diving, and some of the best-preserved century old wooden shipwrecks in North America. If it were not for all the gear and body protection required, it would be perfect.

Having been involved with Aquatica in the business of underwater photography for the last 15 years has given me a front row perspective on the evolution of underwater photography. I personally went from 36 exposures of guessing with my old camera, to 300 plus exposure confirmation on my new digital cameras. There are a handful of masters in this field who have the talent, time, and budget to succeed. This is not my case. When I am not shooting chart in the deep end of a pool, I most likely end up on a dive trip with a bunch of non-photographers, who most likely will hate me at the end of the dive because I slow everybody down. But with digital, I can make a CD of my pictures and offer everyone some of my shot's, and presto, I have instant new patient friends.

Jean Bruneau: jean@aquatica.ca

DIA: Dive Incident Analyses

by Jeffrey Bozanic, Ph.D.

Scuba diving involves a degree of inherent risk. As we dive deeper or enter caves or wrecks or utilize advanced equipment, the level of risk increases. This is why some experts consider technical diving to be too dangerous for recreational divers. However, risk can be reduced by many factors, including education, experience, proper equipment, and practice.

One of the most important factors in reducing risk is proper education. Many certification agencies have been established that offer training in technical diving activities. Yet, the endeavor of technical diving is still young and still evolving. One of the ways it changes is through the evaluation of incidents that occur to divers while diving. As a community, we are always learning lessons from new incidents and modifying training and practices as a result of those lessons.

In an effort to broaden dissemination of this information, *Advanced Diver* is establishing a column that will examine one incident every issue. Our goal is that you, the readers, will continue to learn from the mistakes of others, helping to make technical diving safer for all of us. While the cases are based on actual incidents, minor editorial changes have been made to protect the identity of the divers involved.

Case history: What's my mix?

Steve and Jim were diving off Catalina Island, California. They were looking for a wreck that was reported to lay off Ship Rock. Their first dive was to 170 fsw (52 msw) using trimix with 21% oxygen and 45% helium (TX 21/45). They mixed their bottom gas using partial pressure blending and confirmed the mix with their oxygen analyzer.

They utilized Deco Planner® to plan their dive using nitrox with 50% oxygen (EAN50) for their decompression stops, which began at 70 fsw (21 msw). Their bottom time was 25 minutes, resulting in a decompression time of 49 minutes. They completed their decompression without incident, but were unsuccessful in finding the wreck.

Steve finished his dive with 1,800 psi (125 bar) of bottom mix and Jim with 1,500 psi (102 bar). They decided to conduct another dive to attempt to locate the site. Motoring into Two Harbors, they left their doubles to be topped off with air to 3,000 psi (204 bar). While this was being done, Steve calculated that their resulting mix would be TX 21/30. As they did not have their computer with Deco Planner® on the boat, they used air decompression tables to calculate their decompression for the repetitive dive. Upon receiving their cylinders, they analyzed them for oxygen content and prepared to dive again.

Two hours after surfacing from the first dive, they began their second dive. They quickly swam back to the same depth (170 fsw/52 msw) for 20 minutes, followed by 39 minutes of decompression. They finished their dive and exited the water about 5:00 pm.

A short time after surfacing from the dive, Jim began complaining of a dull ache in his shoulders. Ten minutes later he began to notice a slight loss of strength in his left arm. He breathed oxygen on the surface for 10 to 15 minutes with no relief and decided that the symptoms were probably from overexertion and being cold during the dive. To warm up, he took a hot shower, which made him feel better, but did not improve the pain he was feeling. Since the pain seemed to come and go in waves ranging from intense to a dull ache, Jim tried to ignore it.

Finally, at 9:30 pm, he contacted a recompression chamber, and was told to come in. Upon evaluation, he was found to have other neurological symptoms, including minor loss of fine motor skills and leg weakness. Following a twelve-hour treatment, all of the pain had resolved, as well as most of the weakness he was experiencing. A second treatment two days later resolved the remaining problems.

Steve and Jim made several errors during their dives. The first was in mixing their bottom gas. When they blended their initial mix, they started with oxygen, placed helium on top of that, and then topped off with air. When they analyzed their cylinders, they only tested for a single gas (oxygen). This did not provide them with adequate information about their breathing gas. In fact, it left them almost in the dark about the two most important gases from a decompression status, the fractions of helium and nitrogen.

It is impossible to plan decompression unless you know the inert gas fractions of the mix. Early in the days of mix diving, helium analyzers were expensive (the one I used to use was about $25,000!) and temperamental. They were used infrequently, so there was always some uncertainty about the mix in use. To account for this, tables were generated that allowed for a wide variation in the inert gas fractions. While this allowed an imprecise mix to be used, it resulted in much longer decompression profiles than those that would be incurred if an exact mix could be programmed.

Steve and Jim used Deco Planner® to compute their initial decompression. This calculates decompression based on exact gas fractions. I have seen mixes in which the fractions of inert gas were off by 10% from those expected from partial pressure blending, with the oxygen fraction only varying by 1% from expected (within the accuracy range of most oxygen analyzers used by divers). The only way to identify this problem is to analyze a second gas constituent. Helium analyzers now only cost about $1,000 and are readily available. If you are going to use a decompression planning software package like Deco Planner®, which incorporates exact fractions to minimize decompression, then you *must* use such an analyzer.

They compounded this problem by topping off their bottom mix cylinders for the second dive. This second generation blend further increases uncertainty, by adding another level of potential errors (I have seen errors exceeding 20% when this has been done). In fact, they miscalculated their resulting mixes for the second dive. Had they worked the math properly and done so for both sets of cylinders, they would have found that Steve's final mix would have been TX 21/27 and Jim's TX 21/23, not the TX 21/30 they had figured. This error could have easily been detected had they properly analyzed their gases.

The next error they made was switching decompression tools during a series of repetitive dives. Besides using the wrong tool for the first dive, they then switched to another wrong tool for the repetitive dive (air tables for a trimix dive). Jim's comment was that, "since we were using air tables, and they

are always more conservative than trimix, the mix really didn't make a difference." In fact, the tables you use *do* make a difference.

All tables and decompression software programs are based on an underlying model or algorithm. Different tables, decompression software packages, and dive computers often use different models. Since these involve different assumptions and on- and off-gassing parameters, you cannot switch indiscriminately between them during a series of repetitive dives. This is especially true when breathing helium-based breathing gases.

Finally, Jim demonstrated one last error in judgment. Upon surfacing from the second deep dive, he began experiencing symptoms consistent with decompression sickness. He attempted to diagnose that by breathing oxygen on the surface, and when that did not resolve the problem, he attributed the pain and other symptoms he was experiencing to another cause.

It can be extremely difficult to diagnose any type of decompression illness on the surface. Even experienced hyperbaric physicians often must conduct a test of pressure by recompressing the affected individual in a chamber to arrive at a differential diagnosis. In fact, Jim's symptoms did not begin to subside until he had been in the chamber for almost an hour. His symptoms gradually resolved over the next eleven hours in the chamber. Had he not delayed seeking treatment, it is probable that resolution would have occurred much sooner and possibly without the residual symptoms that ultimately required a second treatment.

Steve and Jim were lucky. Steve experienced no problems at all. Jim's problems could have been much worse. As it is, he is diving again, and enjoying the underwater realm he loves so much. And hopefully, they have both learned from this experience....

Lessons learned:

1. Never breathe a gas without knowing what you are breathing. When using trimix, always analyze at least two of the mix constituents (oxygen and helium).
2. When planning decompression, always use the appropriate tools for the job.
3. Do not mix decompression planning tools when planning a repetitive diving sequence.
4. If you suspect decompression sickness, do not delay... get on oxygen and seek a qualified medical evaluation.

Jeffrey Bozanic
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Jeff was certified as a NAUI Instructor in 1978, is certified to teach diving for IANTD, TDI, NAUI, and the NSS-CDS. He is active in teaching rebreather, nitrox, technical nitrox, and trimix diving courses. Together with his wife, Rebekah, he has maintained the combined accident files for the cave diving community (a joint project of the NSS-CDS, NACD, and IUCRR). He has published extensively on diving education topics, with heavy emphasis on cave diving safety techniques. He has edited/reviewed many diving textbooks and is the author of *Mastering Rebreathers*. He has served on several Boards of Directors in the diving community, including as Chairman of the NSS-CDS and as Vice Chairman of NAUI, and as Treasurer on the AAUS Board. He has received the NAUI Outstanding and Continuing Service Awards; the Silver Wakulla, Abe Davis, and Henry Nicholson Awards for safe cave diving; the SSI Platinum Pro 5000 Award, and is a NAUI Hall of Honor inductee.

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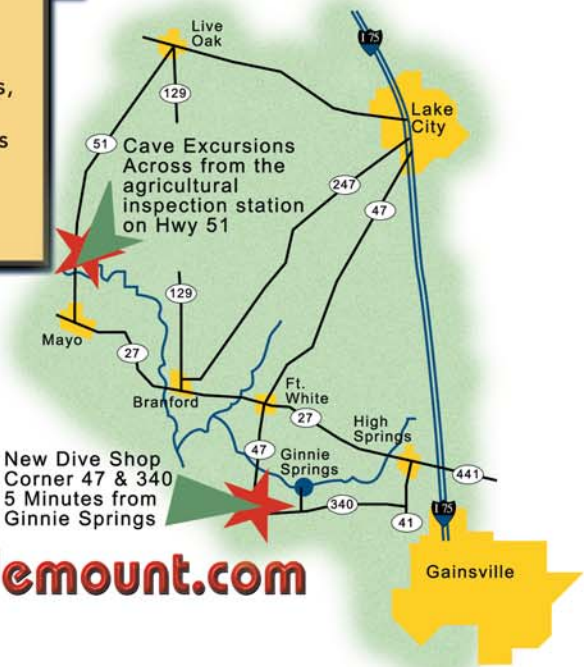

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