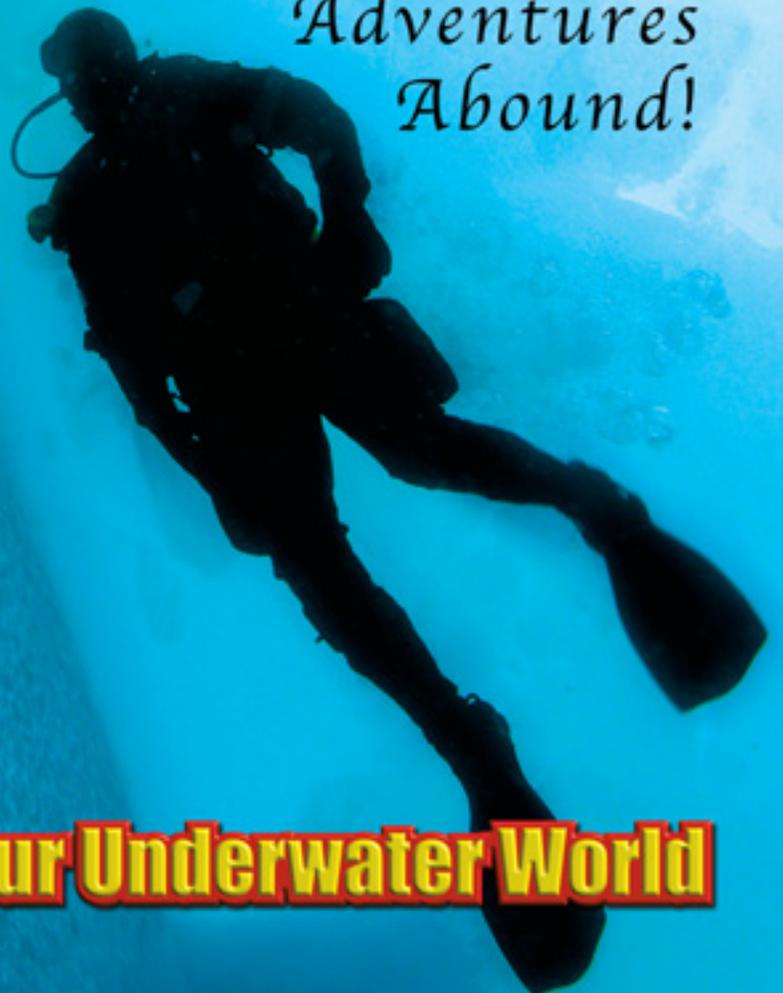


ADVANCED DIVER MAGAZINE

ISSUE 30

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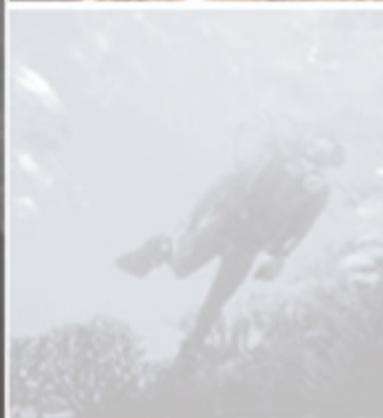
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Publisher's Notes

Advanced Diver Magazine continues to expand our horizons with the purchase of Rebreatherworld.com. Combining the forces of ADM, ADM On-Line, ADM E-Zine, and now Rebreatherworld.com (RBW) will allow us to achieve our goals for expansion in 2009.

Expansion will also include completing the steps for the ADM 501(c)3 Exploration Foundation, a not-for-profit foundation designed to assist with funding for continued underwater exploration, education, and scientific studies.

ADM and RBW already have a multitude of upcoming dive events planned, including a photo competition week in the Grand Cayman, shark diving in Freeport, Bahamas, and Wreck Fest 2009 in the Florida Keys, to name just a few.

ADM would like to welcome Richie Kohler and Sten Stockmann to the ADM staff of professional photojournalists. They both have a number of expeditions planned that will be featured inside our pages in 2009.

Of course, none of this would be possible without the dedicated ADM readers and our advertisers who support us financially.

Thanks for your continued support ... and safe diving in 2009.

Curt Bowen
CEO – ADM/RBW



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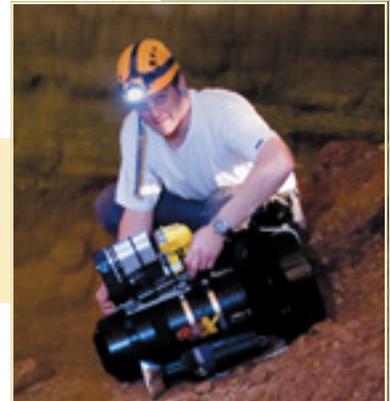
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rEvo

REBREATHERS

A CCR for Everybody

By ADM Photojournalist Mel Clark

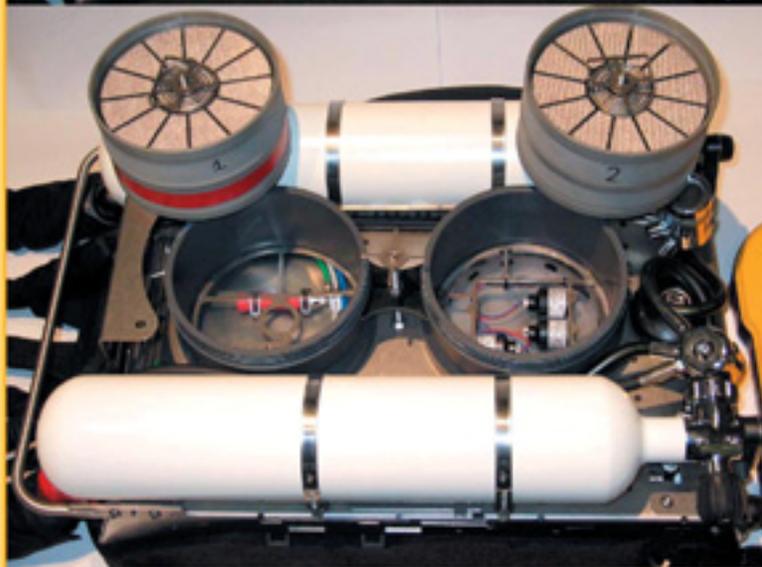
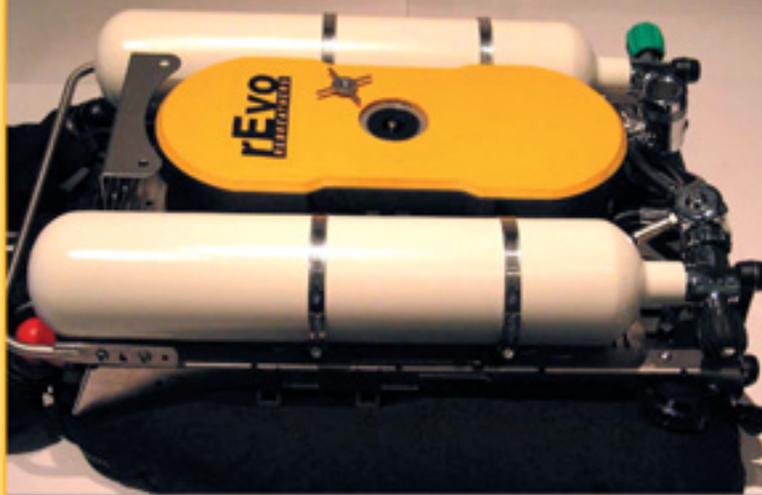
Paul Raymaekers of Belgium has launched a rebreather that will fit the needs of almost every rebreather diver. His new hybrid mCCR/eCCR (manual/electronic closed circuit rebreather) will suit the manual and electronic rebreather divers alike. The dual radial scrubber is perfect for the extreme expedition rebreather divers. The slim, compact design will be a delight for all rebreather divers, and is especially appropriate for cave divers.

Paul Raymaekers is a design/electro-mechanical engineer. In 1988, he started his company, Raytech, which is located in Belgium. Raytech builds precision parts for equipment manufacturing companies all over the world. With this winning combination and Paul's passion for rebreathers, a new design with high build quality has evolved.

The rEvo was originally released as a mCCR in 2006 and was called the "revolution." The revolution was warmly received by the CCR diving community, and quickly received the nickname "rEvo."

Paul was looking to solve a lot of the complaints that divers had about diving rebreathers. He wanted a CCR that was easy and fast to set up, break down, clean, and a CCR that the user could field repair without the use of any tools. And finally, Paul was looking for a reliable and safer CCR that was also simple and comfortable to dive. It was with these visions that Paul designed the rEvo.





The rEvo is extremely simple to set up. All of the rebreather parts are accessible by one hand-tightened nut. Once this nut is removed, the back scrubber cover can be removed allowing the diver instant access to the:

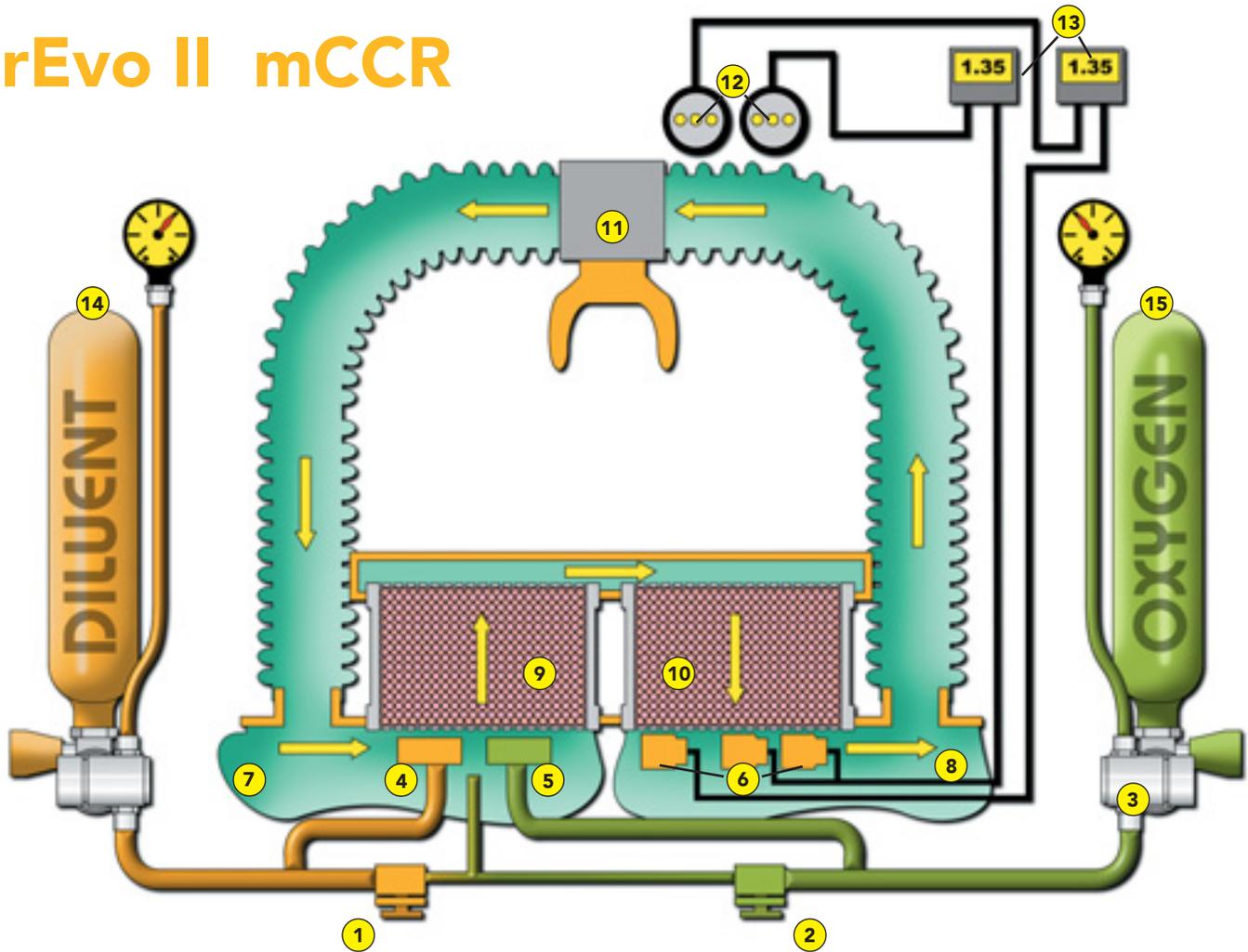
- Scrubbers
- ADV
- Constant flow orifice
- Solenoid (hybrid models)
- Cells
- Counter lungs

This allows the diver to maintain, fix, or replace most of the CCR parts without tools or time-consuming breakdown procedures. The rEvo also has only six user maintainable o-rings. The scrubber back cover has a double o-ring seal for added safety. The DSV is a simple barrel design that has no o-rings in it. For added safety, this DSV can be opened or closed with only one hand. To clean the rEvo, all the diver needs to do is remove the scrubber back cover, take the two scrubbers out, set the cell and gas addition grids aside, spray water in the counter lungs, drain, and let the unit air dry!

The rEvo is an extremely thin CCR that is very appealing to wreck, cave, or other confined space divers. This slim and clean design was possible because of the back-mounted counter lungs, the scrubber design, and placement. The back-mounted counter lungs (BMCL) also allow the chest area to be free of clutter unlike over-the-shoulder counter lungs (OTS CL). Unlike other BMCL CCR's, the rEvo places the counter lungs as close to the diver's body as possible. This is accomplished through the two-part adjustable back plate design that allows the counter lungs to be placed in an anatomically correct position. This placement lowers static work of breathing, giving the rEvo one of the best tested work of breathing rates in the market.

The rEvo is equipped with an automatic diluent addition valve (ADV), which allows the diver to add diluent to the loop without pushing any buttons. The rEvo also has manual gas addition valves for the oxygen and diluent that can be activated by pushing a recessed button on the bottom of the case. The buttons are hard mounted, allowing the diver to always know exactly where they are. Even in fairly restrictive spaces, the buttons can be reached easily. The rEvo also has the option of an off-board manual gas addition valve. This allows the diver to add other gases to the loop in case of an on-board system failure, or in the case of a diver wanting to have different mixes. This feature is extremely valuable for deep divers and cave/wreck divers.

rEvo II mCCR



<p>1. Manual diluent add valve hard mounted to the bottom of the rEvo housing frame, which is easy to find and easy to use.</p>	<p>9. Exhale scrubber: placed above the exhale lung and is first exposed to the un-scrubbed gas the diver breaths out: this scrubber will always be used first</p>
<p>2. Manual oxygen add valve hard mounted to the bottom of the rEvo housing frame, which is easy to find and easy to use.</p>	<p>10. Inhale scrubber: placed in the lower position of the unit and is most of the time unused, serving as a back-up scrubber. If the diver performs a cycle (one scrubber change after 2 hours of diving), this scrubber will be placed in the exhale position, while the former exhale scrubber will be refilled with fresh sorb and then placed in inhale position which is now the back-up scrubber.</p>
<p>3. Oxygen first stage regulator: in the case of the mCCR or hybrid rEvo, the first stage is modified into an absolute pressure regulator by putting an isolating disk above the membrane. Only for diving deeper than 80m, this disk is removed and the regulator becomes a standard regulator.</p>	<p>11. Dive Surface Valve (DSV) former standard Drager DSV, now equipped with a new O-ring sealed barrel that gives perfectly smooth opening and closing, and with a larger internal diameter to reduce further the Work Of Breathing.</p>
<p>4. ADV (automatic diluent valve). the backpressure at which the ADV fires can be adjusted by the diver by simply turning the center screw of the ADV.</p>	<p>12. Dual heads-up display: displays the PPO₂ of the inhaled gas with a straightforward code: solid green light, no flashing meaning ok, breathable gas, at the target setpoint. Flashing orange or red lights meaning deviation from the optimal setpoint, and the more flashing, the more annoying, more distracting: farther away from setpoint.</p>
<p>5. Constant Mass Flow (CMF) orifice: allows a constant mass flow of oxygen into the mCCR or hybrid CCR rEvo so that only minimal adjustments must be made by the diver.</p>	<p>13. PO₂ monitors (rEvodreams) the exact values of the PPO₂ can also be verified on the LCD</p>
<p>6. Oxygen cells: 3 or 4 cells are usually used in the different versions of the rEvo depending on the redundancy the diver wants to have in his system.</p>	<p>14. Diluent cylinder: different sizes can be attached with the fast-connect/disconnect supports</p>
<p>7. Exhale counterlung: located in the upper part of back mounted stainless steel housing and is completely protected from the environment.</p> <p>8. Inhale counterlung: also in the back mounted housing but covering nearly the entire surface of the back of the diver: in the horizontal diving position, the counterlung is as close as possible to the divers own lungs to ensure the best work of breathing.</p>	<p>15. Oxygen cylinder</p>

The rEvo boasts many safety features. The unique dual scrubber design allows for added safety while increasing sorb efficiency. The diver can either change one scrubber after two hours or both scrubbers after three hours of usage. The concept is that the exhale scrubber is exposed to carbon dioxide (CO₂) first and is used up first, while the inhale scrubber receives little exposure to CO₂ until the exhale scrubber is used up.

After two hours of use, the exhale scrubber is close to being used up. It is at this point that the diver can discard the exhale scrubber sorb and replace it with fresh sorb. Now, the relatively unused inhale scrubber is moved into the exhale scrubber position and the fresh scrubber is placed in the inhale scrubber position. This system allows for almost half as much sorb usage over most of the conventional single scrubber designed CCR's, but at the same time also allows for increased safety as there is always a new scrubber cassette in the inhale side.

Another unique safety feature of the rEvo is its ability to have two or three COMPLETELY independent PO₂ monitoring systems. Some CCR's boast they have independent PO₂ monitoring systems, but this is not entirely true. Most CCR's have two PO₂ displays and, in some cases, two independent computers but they still share oxygen cells.

The rEvo can have two to three completely independent PO₂ displays and computers, and the system is also designed so it does not have to share oxygen cells. With this design, if you have a complete failure of one system then the auxiliary system with its independent oxygen cell will still give accurate information, and will most likely be unaffected by the failure. This is true redundancy. Each rEvo PO₂ monitor (rEvodream or Shearwater) has its own power supply so a battery failure will not affect any other systems.

Yet another unique rEvo feature is the dual HUD system. Each rEvodream has its own HUD displaying the diver's PO₂ (one for each rEvodream). The HUD code differs from most of the CCR's on the market and it uses three LED's per display, green, orange, and red. When the display shows a steady green, the PO₂ is in a safe breathable range. When the PO₂ gets a bit higher or lower than the diver's desired set-point, the steady green light will still be on, but now a flash of either red (PO₂ is getting higher than desired) or orange (PO₂ is getting lower than desired) will also be seen. When the PO₂ is moving further away from the desired zone the red or orange LED's will flash more often and faster. At the point where the PO₂ is not safe to breathe, the steady green LED will not be on anymore. The diver will see only red or orange flashing followed by a solid red or orange. This is in contrast to most CCR

HUD's that flash constantly to indicate the diver's PO₂. The problem with the constant flashing is that the diver begins to ignore the flashes. In a situation where the PO₂ becomes unsafe, the diver may be so numb to flashes he will not see it. The rEvo addresses this problem by only flashing when things are not right. This prevents the diver from becoming immune to the flashes, and allows the diver's attention to be drawn instantly to any flashes for interpretation.

The rEvo is very modular and user modifiable. The diver may choose to have a fourth cell for added redundancy and safety. The diver can order the rEvo with one or two rEvodreams and corresponding HUD's. The rEvodreams can be set to monitor one or two cells each. A third PO₂ monitoring and decompression computer, "the Shearwater," can be added. The SW can be set to monitor one or three cells, and will allow for real-time, on-the-fly decompression information.

The SW computer/controller coupled with the rEvo solenoid allows the diver to run the rEvo in manual mode, manual mode with electronic backup, or completely electronic mode.





When in manual mode, the diver has a constant flow of oxygen entering the loop that is at a rate just slightly less than metabolically needed. This results in a very slow decay of the PO₂ in the loop, requiring the diver to add small bursts of oxygen every 15-20 minutes, assuming constant depth and workload.

When the diver has the hybrid electronics package, he can have the constant flow of oxygen into the loop and also tell the computer a lower or backup PO₂ to maintain. The diver can run this hybrid mode in high or low set point. The high set point makes the rEvo more like an eCCR than an mCCR, but an eCCR with a constant flow of oxygen. In this mode, the solenoid will fire more often than the low set point. When in the low set point the diver will manually add oxygen, and the solenoid/computer will merely act as a backup or parachute.

If the diver gets pre-occupied, then the computer will kick in and take care of the PO₂ when it hits the low-programmed PO₂ set point. This hybrid mode allows the diver to still be in control yet have the added safety of knowing that, if he gets busy, the computer will help maintain a breathable PO₂. This mode will also use much less solenoid battery power as the solenoid will not fire as often due to the constant flow of oxygen into the loop.

Finally, the rEvo can be set up to run as a purely electronic or eCCR with no constant flow of oxygen flowing into the loop. In this mode, the solenoid/computer will maintain the PO₂ through relatively frequent oxygen additions. This mode can be used for extremely deep dives where the constant flow mCCR will not continue to function.

To change the rEvo from mCCR or hybrid mCCR to fully eCCR mode, all the diver has to do is plug the constant flow orifice and remove the ambient pressure blocker in the oxygen regulators first stage. This conversion takes only a few minutes to accomplish.

The SW computer also offers some of the most tested nitrox and trimix decompression modeling available, with gradient factors to adjust the decompression to more or less conservative.

The rEvodreams are very power efficient and will usually last well over 200 hours between battery changes. Another feature of the rEvodreams is there are no buttons or through holes to leak. The "dreams" are controlled by tapping sequences.

The rEvo can be ordered with a lightweight titanium case, and extended duration radial scrubbers can also be added.

The manufacturer is dedicated to public safety and has proven this through accepting new ideas and adding them to the current design. Paul's company is ISO 9000 certified, and he extensively tests the rEvo with ANSTI. As a consumer, you can rest assured that, if you experience any problems, there will be a manufacturer still there to support you.

The rEvo was designed by a man with a vision to make CCR diving easier, safer, and to allow more people to enjoy the rebreather. Paul has delivered on this vision with the rEvo II mCCR/eCCR.

For more information about this great rebreather, visit: www.revo-rebreathers.com



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GOCKING

Now and Then

Text by Richard Harris

Images by Geoff Paynter, Doug Friday,
and Simon Doughty

Swimming through cobalt blue and white passageways with vision limited only by the power of our dive lights, the expanse of tunnel disappears ahead into a liquid infinity. The railway tunnels of Australia's longest water-filled cave have become legend amongst cave divers both at home and overseas. We have come to see them for ourselves. Not just to look along the kilometers of submerged limestone, but to attempt a journey to the known end of the cave and just possibly...beyond.

Photo: At the base of the doline 40m below the surface, Ken Smith receives a scooter to add to the slowly increasing pile of equipment.



Cocklebidy Cave • Australia

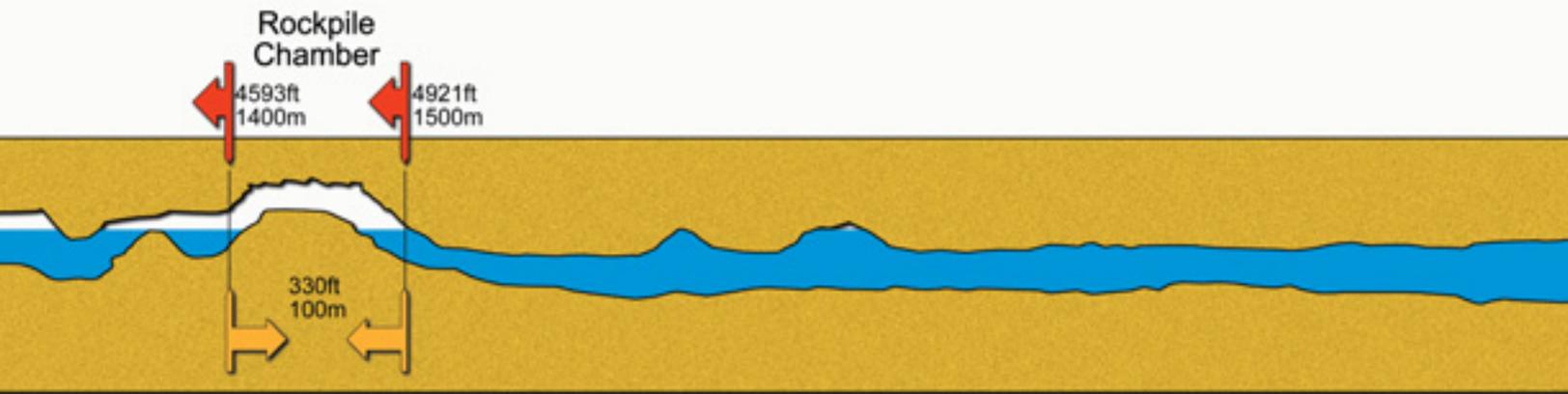
Over a year ago, I was lurking on one of Australia's on-line diving forums. The subject was "Cocklebidy," the best known of the thousands of Western Australia's famous Nullarbor Plain caves. A cynical diver made a throwaway comment in effect saying, "Any cashed-up diver with a rebreather and some scooters could get to the end of Cocklebidy these days!" The words struck a chord with me because I had been thinking of trying something exactly along those lines! But was it really as easy as the armchair expert on the Internet had suggested? Divers with Cocklebidy experience I had spoken to recently made me believe it was anything but simple...no matter what techno-toys you took along for the ride. Mountainous rock-piles, achingly long swims, and extraordinary isolation were all factors not to be taken lightly.

So what started as a vague idea had to be firmed up into a concrete plan. I needed to talk with someone who had real life experience in the cave. For that I turned to Craig Challen, a Perth cave diver, and one of only a handful of divers who had been to the end of the main passage in the site's third sump. In 2003, Craig supported Karl Hall in a quest to extend the end of the known cave. After scooting the 1.6km first section of the cave to the "Rock Pile," they carried gear over the chamber to the second sump. Next they commenced the 2.5km underwater

traverse to the second massive dry chamber known as "Toad Hall." Finally, with the assistance of two other divers, they entered the third and final 1.6km sump and began to swim. Near the end of the main line in the third sump, they stopped at a restriction where the French divers had started their final push in 1983. At this point, Karl removed his rebreather then pushed on with open circuit equipment, while Craig waited patiently for his return. During the fifty-two minutes that Karl was gone, Craig's rebreather began to malfunction and he endured a nerve-racking wait. Karl didn't have it much easier with some buoyancy and gas problems, meaning that whilst he made it to the end of the permanent line (laid by Australian Chris Brown in 1995), he couldn't go any further. Twenty-nine hours after entering the cave, the team exited in a state of complete exhaustion and without achieving their primary goal of extending the cave. In other words...Craig had unfinished business in the cave. I offered to support his push to the end of the cave, and so our plan was born.

Photo: On the surface, the boys warm up after a near freezing desert night. Lowering the gear into the cave, then walking it 200m down the rock slope to the water's edge takes most of the first day.



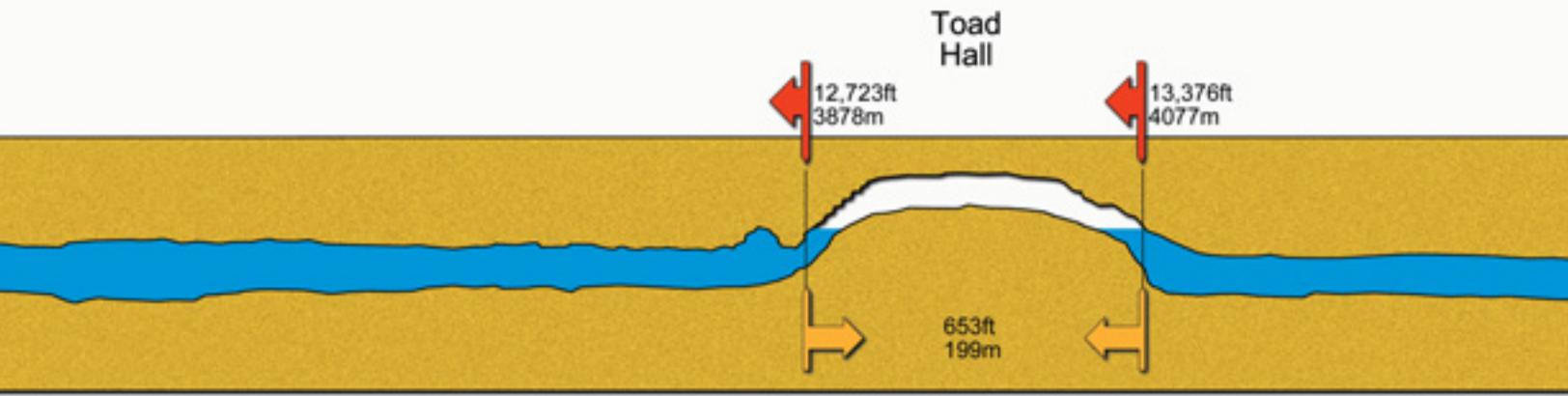


To fully understand the hardships Cocklebidy has to offer, one has to look to the story of the early exploration. After the initial exploration dives in the first sump in 1972, it rapidly became apparent that extending the cave required large-scale expeditions with multiple cylinders and support divers. The side bar at the end of the article outlines where important progress has been made in the cave, but the effort and courage needed by the early explorers swimming massive sledges loaded with tanks through the long sumps defies belief! Martyn Farr's book, *The Darkness Beckons*, contains a beautiful summary, rich with images, and makes for essential reading.

Back to the present day expedition: Our aim was to take a more lightweight "Alpinist" approach to the cave. Get in and out in the shortest possible time using long-range rebreathers and scooters that we could transport across the much-feared rock piles without an army of support divers. Sounds easy, eh? Two factors loomed as critical to our success: rebreather duration (in particular the duration of the CO2 scrubber) and scooter battery duration. The traditional use of open circuit SCUBA requires vast numbers of cylinders to be both staged and breathed in the cave. A single long-range closed circuit rebreather could take the place of literally dozens of tanks. Craig and I both owned (modified) units that we felt could perform for eight to ten hours underwater without "recharging." The second problem lay in the scooters. To get the scooter duration required for the cave was usually resolved by using multiple large (heavy) scooters that needed to be disassembled to be transported across the dry chambers. We each wanted to use a single lightweight scooter with extra long duration

Photo: The author about to submerge in the entrance lake. He is using a Mk15.5 closed circuit rebreather with a full face mask. The muddy waters in the first sump will soon change into the crystal clear water the cave is famous for.





Important dates in the
Exploration of Cocklebiddy Cave

- 1961** First documented dive in cave
- 1972** First expedition, pushed 300m into first sump
- 1976** End of first sump reached, second sump noted (Allum, Beilby, Morrison, et al)
- 1982** Toad Hall discovered, third sump noted (Allum, Morrison, and Roger, et al)
- 1983** French cave divers explore third sump (to 1550m) with scooters and composite cylinders to total distance of 6090m (Le Guen, et al)
- 1983** Australians return to push third sump with more streamlined equipment, adding 250m more line to 1790m (Allum, Morrison, and Rogers, et al)
- 1995** Chris Brown, et al, adds 20m in third sump using a unique dual-tank off-mount system
- 1997** Eberhard and Payne "Alpinist-style" dive to Toad Hall
- 2003** Hall and Challen, et al, visit the end of Brown's line in the third sump using closed circuit rebreathers
- 2008** Challen and Harris, et al, add 120m to third sump using CCR's and lightweight scooters

batteries. The standard battery in our scooter of choice ran for only sixty minutes whilst we needed three hours. How to do it without increasing the weight? We turned to fellow cave diver John Dalla-Zuanna for the answer. "JDZ" is one of Australia's most experienced cave divers, and he disappeared into his shed with a couple of other boffins for several months! Just days before the trip, and with much angst from all parties, JDZ reappeared with the solution in the form of superbly made lithium ion battery packs for the scooters. The final R&D would have to occur in the cave!

The final team of nine divers assembled at the cave from both sides of the country. Ken Smith from Adelaide attended as a diver; but, more important, he brought his unique radiolocation technology (the "Pingers"). These could be used to locate precise points within the cave with GPS, and hence add detail to the map of the third sump. Doug Friday and Geoff Paynter from Perth came to document the trip with video and still photography. Mark Brown, John Currie, Simon Doughty, JDZ, and I completed the complement of divers to assist Craig's quest for the end of the line.

Is Cocklebiddy hard work? The short answer I was soon to discover was an unqualified YES! Harder than I could have imagined! With every passing day loading gear into the cave, transporting it to the cave lake and then through the first sump and across the Rock Pile to the second sump...it became clear that a strong back and a high pain threshold was required! To my Internet friend who believed Cocklebiddy to be a "doddle," I was given to frequent cursing! So much for a lightning raid to the end of the cave with minimal assistance. Even with our gas-saving rebreathers and lightweight scooters, we still needed the assistance of all the divers and several days to get prepared to tackle the second sump.

Photo: Craig Challen scooters through the first sump, his lights illuminating the blue-white limestone walls of the cave. This is Nullarbor diving at its best!

Only then could Craig and I set off for our first foray into the second sump. Twenty minutes into the dive to stage tanks in the 2.5km long sump, Craig's scooter died. So I pushed on for my first visit to Toad Hall solo, staging some cylinders on route. Toad Hall...300m of enormous boulders and stiflingly humid air to traverse. Not a place I wanted to linger on my own, and certainly not somewhere to sprain an ankle or worse. This dive had revealed a problem with our "top secret" scooter batteries: one scooter had gone for twenty minutes whilst the other had performed perfectly for three hours. The boffins all disappeared back into the "shed" and emerged with theories about chargers, resistors, and other electronic mumbo jumbo, and over the next few days the scooter batteries started to perform as expected. We were back in business!

With gas staged in the second sump, Ken and Simon took the opportunity to visit Toad Hall and add their names to the slate that resides there (forty names in total now). With the scooters operational, Craig and I did our second dive to Toad, and spent several hours transporting gear to the start of the third sump. With a twelve-hour turnaround, I was beginning to really sense how exhausting trips into the cave could be.

A rest day and a hamburger with the lot at the Cocklebiddy Roadhouse, then another day with equipment problems finally saw us in good shape for the push dive. Having good support divers make or break this kind of venture. John and Mark came out to the Rock Pile with us and carried our scooters into the second sump. That just left us to stagger across with our 'breathers on our backs. A speedy sixty-five minute scooter to Toad Hall had us in the start of the third sump well ahead of schedule. To avoid carrying more scooters across Toad Hall, we had decided to swim the third sump. We activated the Pingers before departure so Ken could follow our progress from the surface. Three of these we deposited at important points in the cave, which Ken located from the surface and then recorded the GPS points. Sixty minutes into the third sump and the cave had changed substantially. No longer were we in the enormous tunnels of the first and second sumps. Now the cave closed in and became more complex, jagged, and interesting. Haloclines split the water like shivering mirrors. Truly one of the most beautiful places I have ever been. At ninety minutes, the cave appeared to almost come to a halt, and the large yellow cord laid by Hugh Morrison was replaced by fine white line. Here, Craig removed his rebreather and set off through a

Photo: Doug Friday loads his video housing onto the author's scooter. The camera will be used to video the entire cave, including most of the third sump.



restriction. breathing from his side-mounted tanks. Hurrying along the line and conscious of his finite gas reserves, Craig Challen swam into the darkness over six kilometers from the cave entrance. I was left alone with my thoughts while he pushed the cave.

At the end of one third of his first cylinder, Craig reached a restriction that he could not pass with both cylinders. Removing the partially depleted cylinder, he pushed the second tank ahead of him through the slot, his body following behind. No ordinary cylinder, this second one carried dual regulators and its own buoyancy device to safely assist his passage. Once through the "no-mount" restriction, Craig reached the end of Chris Brown's line about 200m from where I waited. And ahead of that...more cave passage awaiting exploration. Without pausing, Craig tied off a new reel and swam on another 120m before turning the dive as he reached his gas reserves. He glanced ahead at the cave still beckoning him on. Next time perhaps....

The underwater reunion seventy minutes after Craig's departure was glorious! Great to see him back safely and equally exciting to see his almost empty exploration reel! Turning for home, we started the slow exit from the cave. To say Toad Hall was painful

Right Photo: Disaster strikes! The author poses by the burnt out wreck of his 4WD and trailer. Cameras and housings, dive gear, rebreather and personal possessions all destroyed by the inferno.

on the way home would be an understatement. Twenty hours after entering the cave, we surfaced in the entrance lake to a warm reception, a hot meal, and a beckoning sleeping bag.

The following day, Simon and Ken returned to Toad Hall to extract the remaining cylinders, and Ken swam far into the third sump to retrieve all but one of the Pingers. Two more days to clear out the cave, and Ken and I hit the road for the sixteen hour drive back to Adelaide. One last bit of excitement awaited us. On the way home, my 4WD caught fire — the vehicle and all our dive gear were completely destroyed by the flames. Yep, Cocklebidy is easy. Anyone with a scooter and a rebreather could do it....



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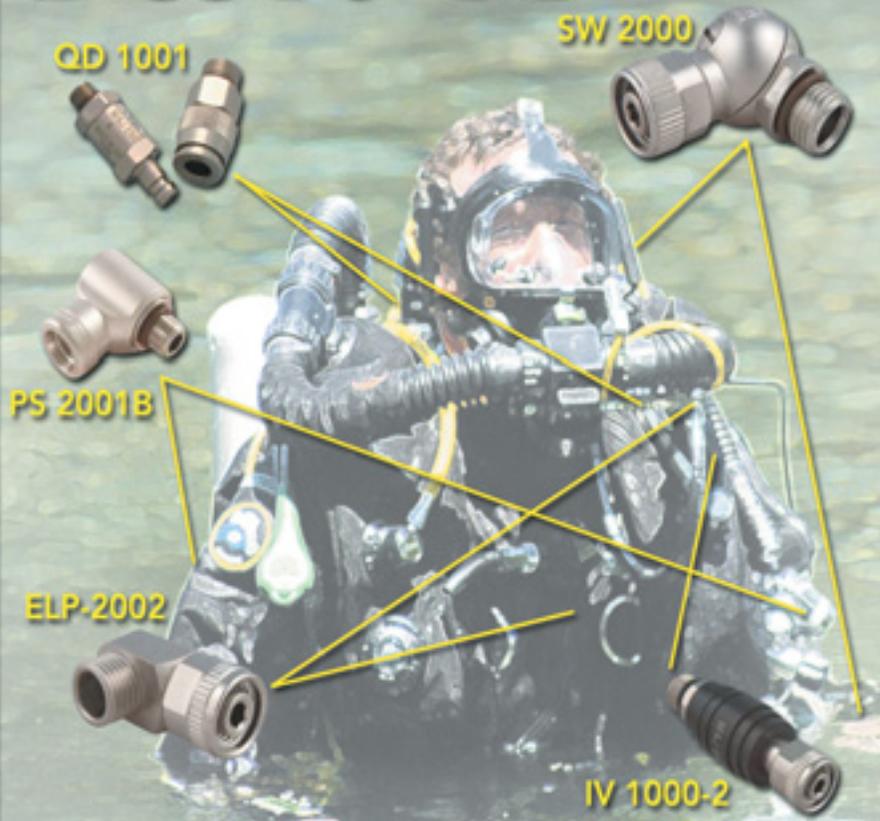
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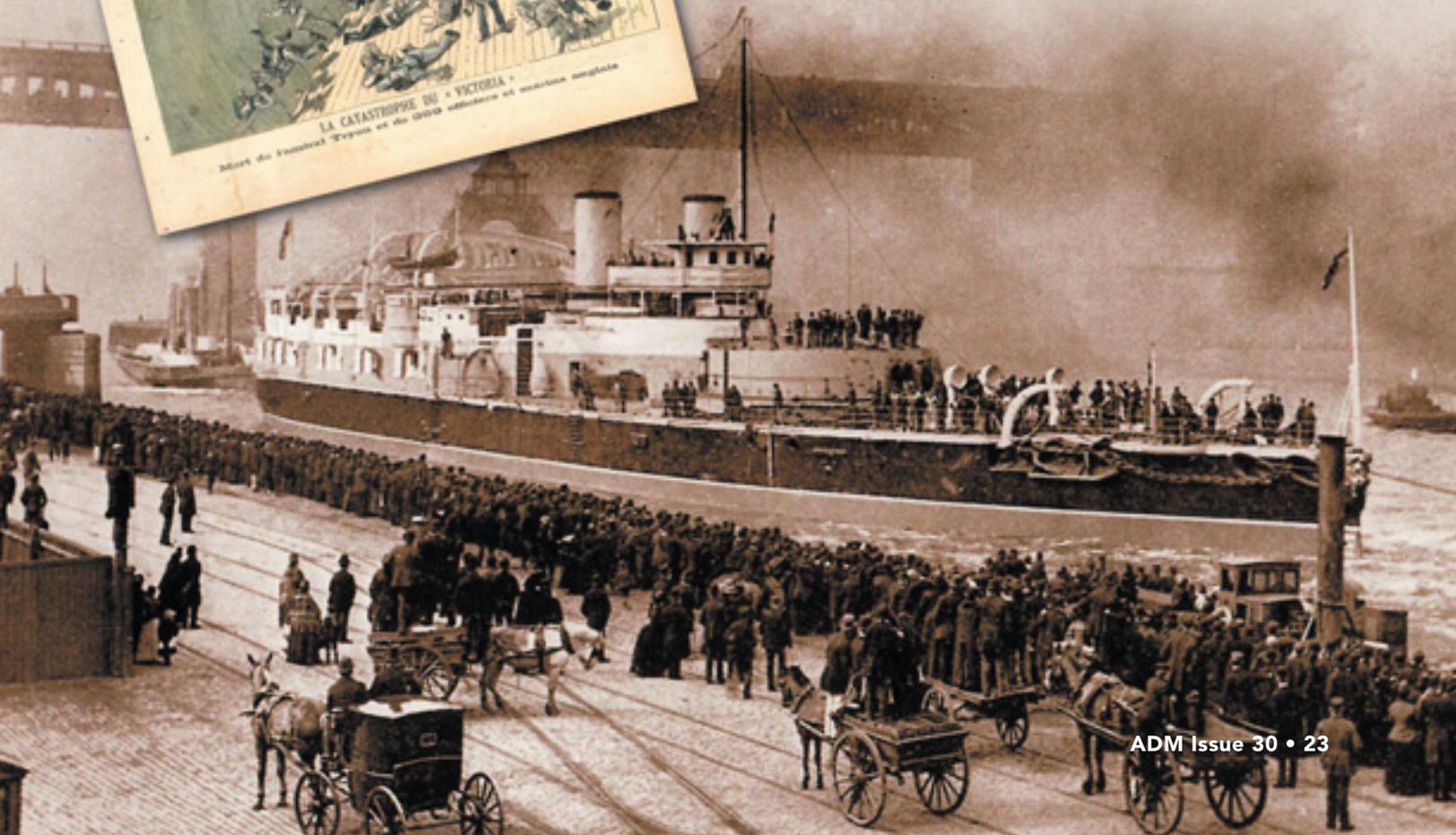


HMS VICTORIA

ADMIRAL TRYON'S BLUNDER

By Vic Verlinden

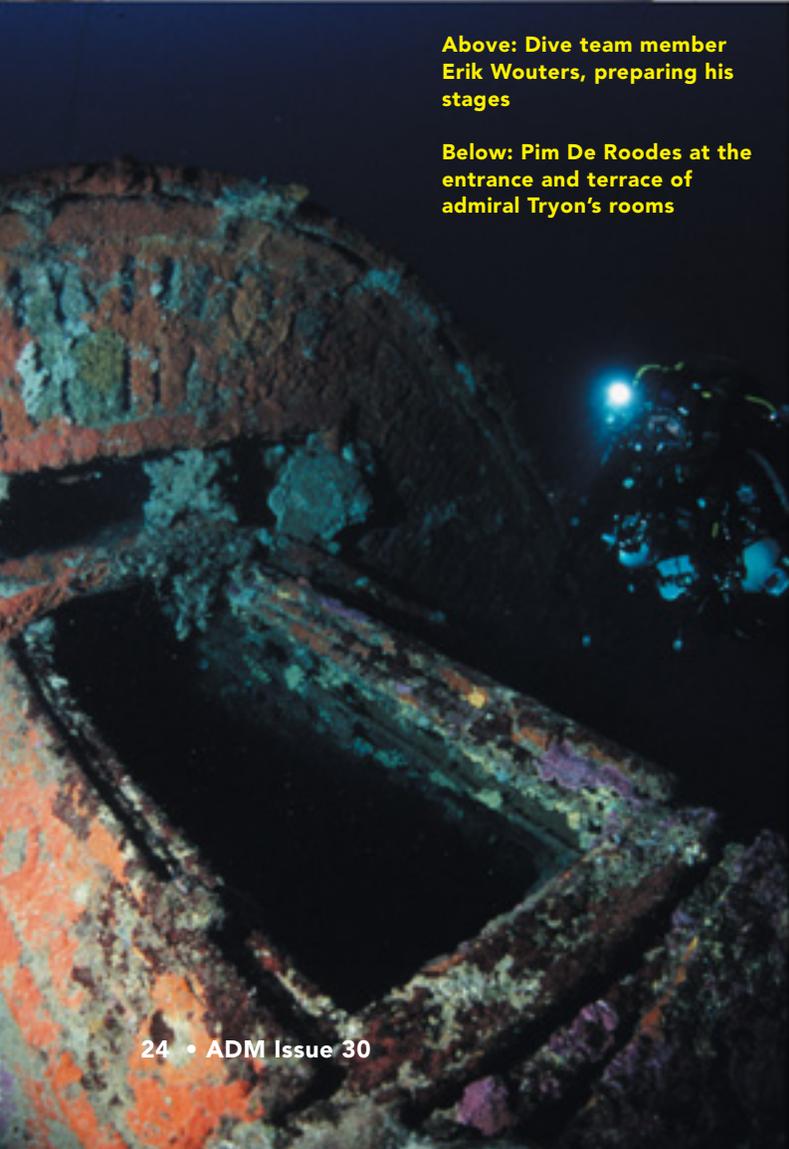
When Admiral Tryon gave the order that positioned both mighty war vessels *Victoria* and *Camperdown* on a collision course, he made a huge mistake. So huge that it cost the lives of more than 350 crew members. The *Victoria* now is the only shipwreck worldwide that is positioned vertically on the seabed.





Above: Dive team member Erik Wouters, preparing his stages

Below: Pim De Roodes at the entrance and terrace of admiral Tryon's rooms



On 22nd June 1893, standing on the bridge of his flagship, *HMS Victoria*, Admiral Tryon was the commander of the biggest battleships of the biggest Marine/Navy worldwide. Having the coastline of Tripoli, Lebanon, already in view, the Admiral commanded his fleet to turn around. At a distance of approximately 1100 meters, the battleship *HMS Camperdown* was positioned next to *HMS Victoria*. According to the Admiral's order, the two vessels would have to make an inward turn before being able to turn around. The commanding officer informed the admiral of the fact that the distance between the two ships was not sufficient to perform this manoeuvre safely. The turning circle of both ships had to be at least two kilometers in order to avoid a collision.

In the Royal Navy, one should never doubt an order given by an officer higher in rank. Admiral Markham, in charge of the *Camperdown*, doubted the given order that was signalled over by flags — so much so that he didn't obey it. It was not until Admiral Tryon signalled 'What are we waiting for?!' that Markham had no other choice but to obey his superior's command. The order was given to turn the rudder/wheel 180 degrees.

The collision

At a speed of nine knots, the two vessels, each weighing 10,000 tons, were now turning towards each other. For several of the officers-in-command, it became crystal clear that a collision was inevitable. Captain Bourke again hinted to Admiral Tryon that they had moved too close to the *Camperdown* for the manoeuvre to be executed. However, the Admiral didn't give in, and proceeded with the manoeuvre as planned. The combined speed of both flagships was now eighteen knots, and their distance decreased quickly. In the minutes to follow, Bourke warned Admiral Tryon twice that they would get too close to the *Camperdown*. When Tryon finally realised a collision was unavoidable, it was already too late. The admiral frantically gave the order for both propellers to be switched to "reverse." However, both vessels had too much speed for a collision to be avoided. The first chief (steersman) pushed the telegraph in full reverse while at the same time the process for having the propellers reversed got the green light in the engine room. Those propellers were driven by 14,000 horsepower. The distance between both ships was now only a few hundred meters, and nothing could be done to avoid a collision. Only the counterthrust of the reversing propellers could slightly slow down their speed.

In the meantime, the *Camperdown* had gotten so close that the officers standing on her bridge became visible. A few moments later, the *Camperdown's* bow rammed into the starboard side of the *Victoria*. The *Camperdown's* ram, made of hardened steel, plunged into the hull of the *Victoria*, at about where the coal bunker was. The officers' wards were crushed instantly. The impact was devastating and felt like an earthquake had happened throughout the ship.

On the *Camperdown*, the order was given to reverse the propellers. Slowly but surely the flagship freed herself from the iron grip of the *Victoria*. An enormous gap was left in the hull of the *Victoria* through which the vessel took on water very quickly. Immediately, the *Victoria* started listing with her bow in the deep water. Water was flooding the ship through the portholes that had been open due to warm weather conditions. A moment later, the ship's bow disappeared beneath sea level as the still working propellers were tilted out of the water. Everyone capable of doing so jumped overboard to save himself. Hundreds of crew members were stuck in the hull while the ship perpendicularly sank into the deep, big blue — propellers still functioning. Anyone who jumped overboard had to be careful not to be sucked down into the deep or crushed by the moving propellers.

On the other battleships, the crews witnessed the events in total bewilderment. They tried to pick up survivors from the water. "It's all my fault," were the last words spoken by Admiral Tryon to his officers. That was the last ever seen of him since he went down with his ship, as dictated by tradition in those days.

Test Dives

The wreckage of the *Victoria* was discovered in 2004 by Christian Francis and Mark Elyat at a depth of more than 150 meters. Much to their bewilderment, it stood completely vertically on the sea bed. The enormous weight of the cannon combined with the still functioning propellers drilled the ship's bow into the seabed where it remains today.

Our dive team consisted of eight rebreather divers. It was our intention to photograph and film the wreck at a maximum depth of 120 meters. Our starting position was the well-equipped dive centre of Walid Noshie in Beirut, which would support the complete expedition technically. Upon arrival, our first task was to reassemble our rebreathers that had been transported dismantled. That same day, a first test dive was made to check on the good working order of our materials.



Above: Illustration on how the wreck is standing vertical on the sea floor

Below: Preparation test dive on the wreck of the SS Lesbian





Above: Eduardo Pavia helping Pim to adjust his minicam on his Kirby Morgan

Below: Big gun on the stern of the wreck



The following day, our agenda indicated that we had a wreckage dive at a depth of 65 metres. The Lesbian, named after the Greek Isle of Lesbos, is a magnificent wreck that was sunk during the Second World War. Ever since then, it's been lying untouched on the seabed. Bad weather conditions forced us to make a second dive on the wreck the next day. After our first deep wreckage dive, we agreed to set up a decompression station in order to heighten the security measurements. During our second dive, this station was also tested thoroughly to check its performance. Everything went as planned, and that became the moment we thought to be ready for our dives to the Victoria.

Dives on HMS Victoria

Prior to diving the HMS Victoria, it was necessary to first cross the 80-kilometer distance from Beirut to Tripoli. We did so by a rental bus, which also allowed us to take along all of our gear. Once in Tripoli, we were taken to the wreckage by boat, located approximately five kilometers off shore. It was still very early morning when we found ourselves anchored to the buoy pinpointing the wreck's exact location. Everything was checked for the last time when I, together with Pim de Roodes and Danny Moens, made our descent to the wreckage as the second team. After awaiting dive buddies at the buoy, we finally started our descent.

Looming up from the deep blue at 65 meters, we landed on the wreck's stern at 76 meters. The two enormous propellers and rudder were the first items that caught our attention. Prior to our further descent, I prepared my camera, as I wanted to make sure of getting pictures of the name mentioned at the back of the wreckage. After three or four frames, we swam further towards the deep, passing by the balcony and the entrance door of the admiral's quarters. Positioned on the quarterdeck, we now got to see the nine-ton heavy cannon that had its barrel pointed straight to heaven. It was a tremendous sensation and privilege being able to swim freely right next to this great wreck which was positioned straight up...just like a big apartment block.

The display of my dive computer showed a depth of 91 meters. Because my camera casing allowed a maximum depth of 75 meters, I was not willing to take any further risks. I limited myself to taking pictures of the big gun whilst my buddies continued their downward dive until 110 meters. On the side, I also noticed one of the smaller guns sticking-out of the porthole so I gladly snapped a few pictures. Unfortunately, time flew by, and after twenty minutes of bottom time we had to start our decompression ascent of nearly three hours.

Once back aboard, the crew informed us that a car bomb had exploded 500 meters from where we had started off that day. Five soldiers were killed and thirty people injured. In the distance, we could still witness the smoke caused by this outrage. Having to travel back to Beirut by bus was in no way reassuring!

Further exploration of the wreckage

The following day we had planned a full day's rest. But the day after we were again lying above the wreck. I had agreed with Pim de Roodes to first take a few pictures at the entrance door of the

admiral's quarters. In the meantime, he would make video footage with the mini-cam, mounted on his Kirby Morgan mask. When we landed on top of the wreckage, it appeared that the visibility was even better than two days earlier! I was able to start my recordings immediately after which we swam to the propellers for a few more snapshots. We then moved back to the bow where, at a depth of 85 meters, I left my camera on the wreck in order to descend some more. At 111 meters, we found ourselves right underneath the big cannon. The deck's board flooring had remained in place in some parts as had the big capstan on the deck. Looking up, it was an incredible, hallucinatory sight to witness this huge wreckage from this angle. Underneath the cannon there appeared to be a big hole through which one would be able to swim through. Yet again, time had run out and we urgently had to start our ascent and decompression halts. On my way up, I didn't forget to pick up my camera, and was still able to take a few more pictures of Admiral Tryon's terrace. After more than four hours of diving, my head reappeared above the water. This dive left an even bigger impression than had the first one.

Last dive on this incredible wreckage

For the last dive, I decided to leave my camera aside so I could fully enjoy this unique experience. At a depth of 120 meters, there were even more holes in the deck. Looking inside, I found plates and other tools; however, we left everything untouched, as this wreckage is a war grave site. On the side, I also saw a few quick-firing guns still mounted on their original undercarriage. Back at the big capstan, I noticed the driving gear. Again, I could see the big cannon above me and realised that the wreck's bow will one day crush under the enormous weight. I noticed some additional smaller guns on the side sticking out of the portholes. Following my trail along the bow, the two big propellers reappeared above me. They must each weigh a few tons. I arrived back at the rudder and our ascent rope. Behind me, I encountered Admiral Tryon's terrace again where he once must have stood to get some fresh air. However, he went down together with his enormous war machine and is buried somewhere in this big tomb.

When I started my decompression, the thought occurred to me that this must have been the most impressive wreckage I'd ever seen so far. No one knows how much longer this wreckage will remain in this unique position: vertical on the sea bed.



Above: Film team landing on the stern at 250 feet/76 meters

Below: Victoria sinking with the propellers still working



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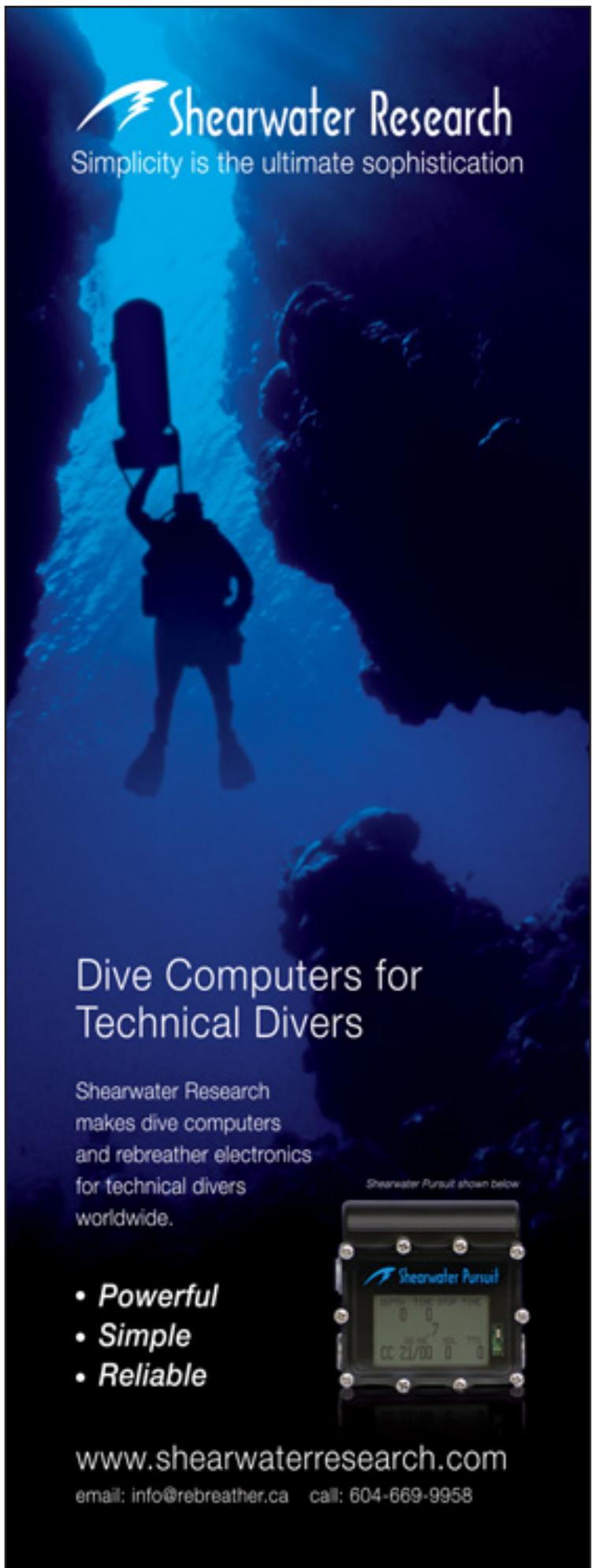
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—John Steinbeck and Ed Ricketts

The Log from the Sea of Cortez, 1951

In Search Of Giants

ADM Sea of Cortez 2008 Expedition

Text by Jeff Toorish

Photos by Curt Bowen, Jeff Toorish, Alan Studley, and Jon Bojar

The Sea of Cortez goes by many names; locals prefer Sea of Cortés, in Spanish it is called Mar Bermejo, and to others it is known as the Sea of California. It is the narrow body of water between the Baja California peninsula and the main isthmus of Mexico. It is also one of the most beautiful places on Earth, with unique diving and spectacular wildlife.

A team of *Advanced Diver Magazine* photographers and explorers assembled for an unprecedented expedition to the Sea of Cortez in September 2008. In addition to ADM team members Curt Bowen, Jeff Toorish, Alan Studley, Jon Bojar, and Kim Smith, there were an additional fourteen divers aboard the *Don Jose* dive boat out of La Paz, Mexico. Normally, the *Don Jose* hosts sixteen open circuit divers, but this would be a rebreather-only trip, and there would be a whopping nineteen rebreather divers aboard. Space was tight, but the caliber of the divers allowed for smooth sailing for the six days of the expedition.

The dive team assembled from around the world, including Great Britain, Canada, the U.S., and Hong Kong, as well as locally near La Paz. KISS rebreathers were the most common aboard, but there were also rEvo, Megladon, Inspiration, and Nautilus CCR units. Remarkably, equipment problems were very minimal and not a single diver was forced to resort to open circuit during the entire trip.

Scientists believe the Sea of Cortez was opened up about five million years ago, give or take a few hundred thousand years. Its surface area is roughly 62,000 square miles. Several rivers end their journeys in the Sea of Cortez, including the Colorado, Fuerte, Sonora, and Yaqui.

The mountains that border the two sides of the Sea of Cortez are clearly tectonic, and provide a breathtaking sense of the power that created this gulf. It is probable that its waters would have flooded the Mexicali and Imperial valleys had the massive Colorado River delta not blocked the sea from progressing further.

Most of our team flew into the airport that serves Cabo San Lucas and nearby Los Cabos; from there we used two large vans to carry our many boxes of gear to La Paz, where we would pick up the *Don Jose*, the dive boat we would call home for the next six days.

The Tropics

La Paz is the capital of Baja Sur (the southern Baja state), and a beautiful, rustic seaside town. It has grown due to the tourist industry but retains many of its natural elements, giving visitors a more accurate view of life in this part of Mexico. Cabo San Lucas was always known as the more gritty place in Baja, with a reputation as a top surfing spot. Some team members spent a night or

two in Cabo San Lucas and discovered firsthand the intensity of the waves, with an undertow so great that people walking on the beach had to stay far away from the water lest an errant wave literally pull them in. Even after a night at Sammy Hagar's Cabo Wabo bar and several shots of tequila, no one thought it prudent to try a swim in the roiling waters.

The drive from Cabo to La Paz showed the Baja countryside vibrant green, thanks to recent rains. While normally it was a classic scrub desert, brown and gray and uninviting, it was far more lush during our visit, with some cacti flowering. The two-hour drive crossed the Tropic of Cancer, and required more pit stops than normal due to the consumption of *cerveza* by team members.

Once in La Paz, the truly enormous amount of gear was somehow stowed aboard the *Don Jose* in short, efficient order, a quick dinner in town and a return to the boat for an early night. The next few days were going to be busy and adventure filled, and everyone understood the need for a good night's sleep.

The *Don Jose* is an 80-foot vessel operated by Baja Expeditions. It was built in 1978, and offers relatively comfortable quarters and a steady ride. No roughing it here, the cabins are comfortably air-conditioned at night, and the food was nothing short of superb. The cooking staff even prepared special meals for the non-meat eaters aboard. Captain Jose Lozano has been with the ship since the beginning, rising to take command with a firm, quiet authority.





The Dive Master for the week would be Peter C. Schalkwijk, and the team could not have asked for a more professional leader. Peter handled every problem and issue with humor, grace, and style, ensuring an expedition with no on-board drama.

On September 22nd, as the sun came up over the nearby mountains casting a golden hue over the town of La Paz, the *Don Jose* cast off and the adventure truly began. One of the benefits of diving in the Sea of Cortez is the relatively short distances between dive sites. It would not take long, steaming at a moderate speed, to reach our first dive site – a reef called Suani (pronounced swanee) for a shakeout dive.

The hopes of the team were to photograph large sea animals, such as hammerheads, whale sharks, and perhaps some giant rays. As with any dive trip, nothing is guaranteed; but, if nothing else, divers are an optimistic group. There was no thought of seeing anything particularly large at Suani, but the reef was teeming with schooling silver fish, curious puffers, and colorful nudibranch.

Each dive saw an array of rebreathers, camera, and video gear enter the water via the dive platform on the stern of the *Don Jose*. The crew had an astonishing ability to match up each diver with his or her various pieces of equipment after only a couple of dives, something that never failed to amaze.

The Right People And Places

Speaking from experience, there is no doubt that even one difficult person on an expedition can have a hugely negative impact on the overall dynamic of the team. Negativity has no place on a dive trip, especially one involving a lot of technical divers with all that gear in the confines of a boat at sea. Fortunately, no such stress occurred on this voyage; every diver was experienced, adept, and positive. There was a great deal of sharing of equipment when necessary, and plenty of pitching in to help when help was needed.

Peter Piemonte summed it up perfectly: “Combine agreeable companionship, a fine vessel and crew with warm clear waters, and you have the 2008 *Advanced Diver Magazine* trip to the Sea of Cortez. A great trip that I was glad to be a part of.”

For the next five days, the *Don Jose* steamed across the Sea of Cortez, taking the dive team to exotic sounding places with names like Los Islotes (Small Island) where we learned that seals, while playful, are also extremely territorial. At Los Islotes, the seals have a very strong hierarchy, and the dominant males are incredibly protective of their females and pups (as ADM photographer/explorer Jon Bojar discovered when he got a little too close to a seal home).

Los Islotes is one of the most famous dives in the Sea of Cortez, and with good reason. Divers have the opportunity to observe seal behavior in close proximity, both on the surface and below.





The next day, we traveled to El Baho (The Sea Mount). This dive featured three pinnacles where hammerhead sharks sometimes gather. As rebreather divers, we have a greater chance to see the elusively shy hammerheads because we don't produce the bubbles that are known to scare them away. Unfortunately, on this day no hammerheads were visiting El Baho, although several dive boats with open circuit divers were — along with their bubbles! (To paraphrase Shakespeare's Lady Macbeth, "Out, damn'd bubbles, out I say!")

Even without the hammerheads, El Baho was a fascinating dive with a great deal of fish life, and moray eels seemingly in every crack and crevice. Many of the morays appeared to be huge; and, in some cases, there were two in the same hole, making them appear as one eel with two heads.

Other dive locations we visited: Los Puntos (Sea Lions); Bajo Reina, where we encountered a kicking current and found four anchors, one with about 40 feet of line still attached; and an interesting wreck that offered excellent exploration opportunities. What we did not manage to see were the large animals that are sometimes prevalent in the Sea of Cortez.

While that was our objective, as it turned out, because of the spectacular dives and excellent company, the diving itself was a success, as diver Garry Gressett put it so eloquently:

"A wonderful trip that can be remembered for years to come. I went expecting to see big mantas, but found a big digital camera with all the attachments instead —sparking my sudden interest in photography. It's amazing to start a new hobby with advice from the best underwater photographers in the world. Thanks, guys, and safe diving!"

Other members of the dive team: Bob and Amy Ferguson, Brian Hackett, Patrick Vigeant, Andy Higgle, Robb Witt, Andy Niven, Casey Omholt, German Yanez, and Padro Cervantes.

Special thanks to the crew of the Don Jose: Engineer Hernan Parra, Chef Benito Leon, Assistant Chef Orion Flores, skiff driver Felix Higuera, skiff driver Antonio Orozco, deck hand Juan Alejandro Lucero.



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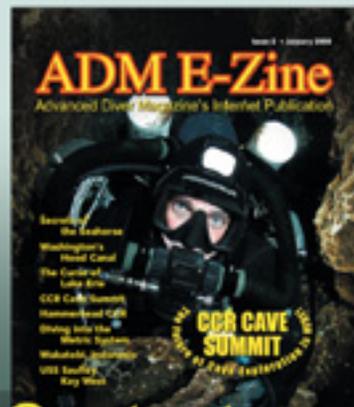
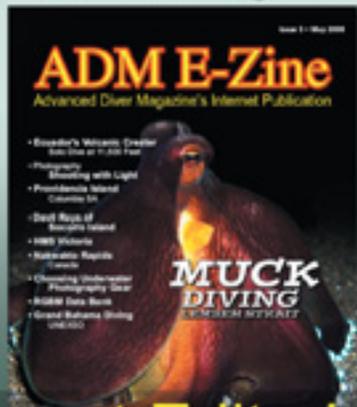
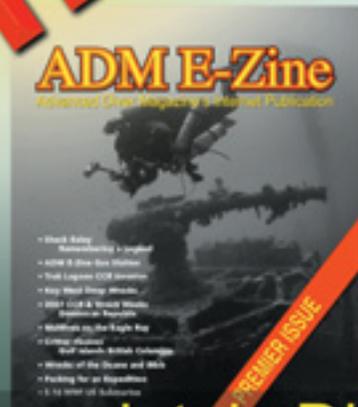
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Road Trip Springs of Missouri

By ADM Staff Writer Tamara Thomsen
Photography by Tamara Thomsen and Christa Loustalot

As winter approaches and the cold sets in up north, we pack up the trailer with dive gear and provisions for a long weekend and head south down the lonely highways amongst denuded cornfields. Our sights are set not on the karst plains of northern Florida, but rather the geographical center of the U.S., the Ozark Plateau. Historic Route 66 traverses the state of Missouri, and we find ourselves on and off the historic roadway winding our way through the karstic landscape. You'll certainly "Get Your Kicks on Route 66" (as the long forgotten song reminds us) and, if you venture off the easement to the back roads in search of diveable springs, you'll get your butt kicked in the screamin' currents of many of Missouri's more popular spring dives.

The countryside is potted with sinkholes and cut by losing streams – sure indicators of what lies beneath the surface. The Missouri Speleological Survey reports in excess of 6,000 caves in the state. The National Park Service has made the larger springs of the Current River and adjacent waterways off-limits to diving except by permit, as part of their management strategy for the National Scenic Waterway. This is not limiting in any way – there are still many diveable springs and caves with diveable sumps in the state. There is plenty to choose from – at many of the sites, you may be the only dive team the amicable locals have seen in a while, which sometimes draws an interested crowd.

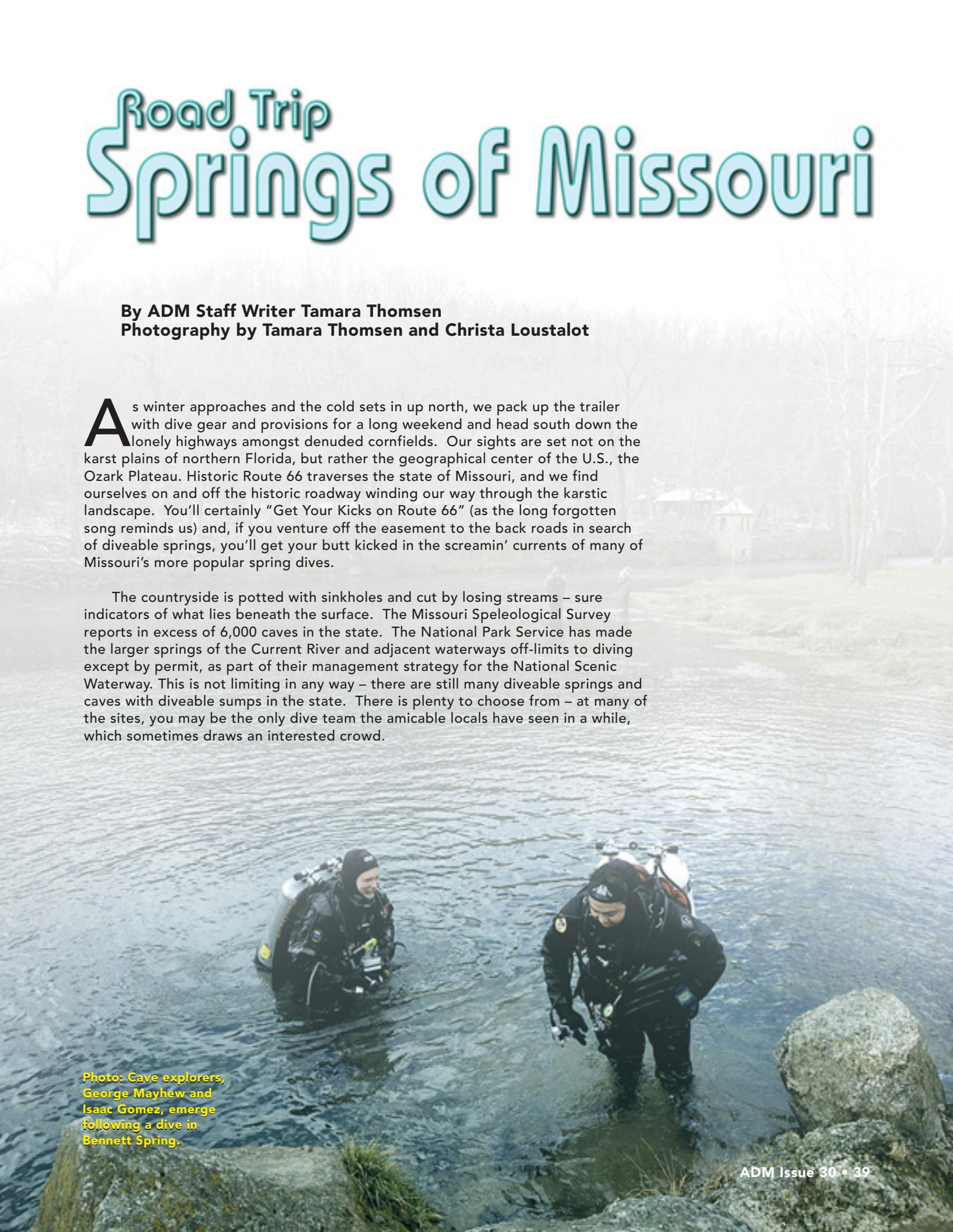
A photograph showing two divers in full black gear, including wetsuits, hoods, and BCDs, emerging from a spring. They are standing in a shallow, rocky pool of water. The background is a misty, wooded area with bare trees and a small building in the distance.

Photo: Cave explorers, George Mayhew and Isaac Gomez, emerge following a dive in Bennett Spring.



The caves of Missouri are dolomitic, most noticeably a bit darker than those of the bright and airy limestone of North Florida. Goethite projections hang from the walls, adding to the dark earthy tones of the caves. Higher flow rates are common to the more popular springs; and the recharges are local, so caves respond quickly to changes in local weather. It is good to keep an eye on the weather as many of the springs will be impacted by rain events, and you may find yourself amidst a wall of muddy water when you least expect it! The topography of the Ozark springs is repeated over and over – in many caves, there will be 400 to 600 feet of linear penetration where upon you will find “The Pit.” Upon bottoming the pit (with depths that can range from tens of feet to hundreds), the cave will either continue onward with a horizontal tunnel allowing deeper linear penetration, or terminate in an impassible stone choke. The water temperature is a brisk 55° Fahrenheit, making thermal planning a must. This is where a suit heater is a godsend, if you are facing prolonged decompression! Given the temperature constraints, many divers choose to wear full gloves or slightly modified gloves, with the forefinger and thumb removed to make line handling a bit easier.

Cannonball

One of the more popular springs of the Missouri Bootheel is Davidson’s Blue Spring, more commonly known as Cannonball. Located just south of the village of Greenville, Missouri, in the Mark Twain National Forest, Cannonball is located on the bottom of Lake Wappapello. With the construction of a dam in 1941, the spring run was

flooded, forming an arm of the reservoir. On your first visit, it is probably best to go with divers who have been there before, not just to find the parking lot, but also to find the cave entrance. The site is well off the paved road, and not entirely obvious – that’s right, there aren’t any “Dive Here” or “Dangerous Cave” signs. The lake water can be very murky until you are just above the entrance, where it opens up as you drop down the wall into the clear spring water. When flow is up, the somewhat typical boil on the surface of the water is a dead giveaway that the entrance is somewhere in the vicinity. A low planar entrance opens up to beautiful rolling phreatic tunnel. Several side passages can be connected in the first 600 feet of cave,

leading back to little-visited low and silty rooms. For a cave diver with good technique, this can be an exceptional route to follow.

About 600 feet into the cave, the mainline takes you past a series of natural bridges, and less than a hundred feet later you will find “The Pit.” The pit at Cannonball can be a religious experience on days of exceptional water clarity - the blue water actually appears to shimmer! This mirage effect is what my friend Brett Hemphill refers to as “cobalticity,” which I think describes it perfectly. The pit is huge – over a hundred feet across – and drops to just over 200 feet in depth before angling back and dropping further to 280 feet. At this point the diver will find a restriction that at times of high flow is a severe challenge to additional

Above: All kitted up and ready to dive, Jason Dostal shows his approval for Ozark cave diving.

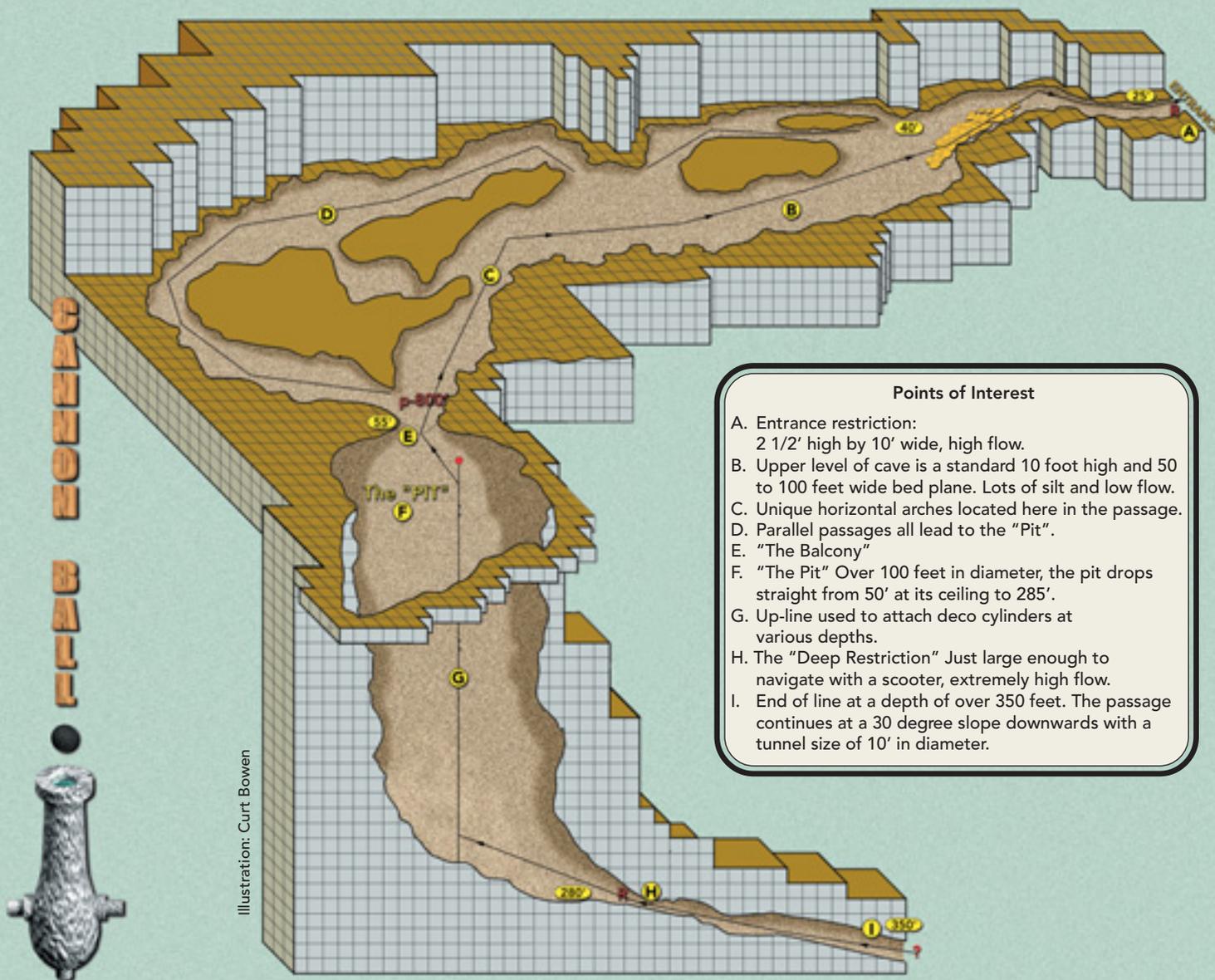


Illustration: Curt Bowen

Points of Interest

- A. Entrance restriction: 2 1/2' high by 10' wide, high flow.
- B. Upper level of cave is a standard 10 foot high and 50 to 100 feet wide bed plane. Lots of silt and low flow.
- C. Unique horizontal arches located here in the passage.
- D. Parallel passages all lead to the "Pit".
- E. "The Balcony"
- F. "The Pit" Over 100 feet in diameter, the pit drops straight from 50' at its ceiling to 285'.
- G. Up-line used to attach deco cylinders at various depths.
- H. The "Deep Restriction" Just large enough to navigate with a scooter, extremely high flow.
- I. End of line at a depth of over 350 feet. The passage continues at a 30 degree slope downwards with a tunnel size of 10' in diameter.

penetration. At times of drought, however, a diver can easily continue onward for further exploration. In recent years, a line has been strung around the top of the pit, and circumnavigating it can be a substantial and exciting dive in itself – depths do not exceed 55 feet!

Roubidoux Spring

Roubidoux Spring is located right in the heart of downtown Waynesville, Missouri. One of the most popular diving sites in the state - divers can be found congregating in the parking lot above the spring nearly every weekend of the year. The spring issues from under a roadway retaining wall at the base of an immense bluff. Divers need to check in and out of the spring by presenting a cave diving card and identification at Waynesville's 911 Center a few blocks away. Roubidoux's vast cavern is worth a dive in itself, and offers many photographic opportunities of the geological features typical of this cave as well as a population of resident trout and shell crackers. The yawning cavern funnels divers down to 55 feet in depth to the cave passage at its left side. Continu-

ing down this tunnel, the force of water flow in the system is apparent. Well-washed perfect circular and oval stones of medium and large size litter the floor and are a testament to the forces of nature. Fragile goethite projections adorn the walls and ceiling of the cavern and cave passages. Roubidoux's pit is approached at around 400 feet of penetration, and drops from the 50-foot mark to 140 feet. Cave coral can be found in the lower tunnel, reminding us that the Ozarks at one point in geological time was at the bottom of a prehistoric sea. These prickly rocks reach out to grab neoprene, puncture drysuits, and steal dive gear, so it is important to make sure that your kit is tidy and everything is properly stowed for a swim here. Local divers maintain loops in the guideline for clipping off deco bottles at appropriate depths – please use them to avoid damage to delicate cave formations. Roubidoux is a perfect cave for staging and scootering. The cave passage goes on and on – but if you are new to scootering in lower visibility caves, make sure to address the line at all times (especially when returning up the pit) – visibility is usually under 40 feet in this cave.



Left: Diver Matt Schultz swims amongst German Brown Trout in the entrance to Bennett Spring.

Below: Jason Dostal adjusts his sidemount rig at the edge of the Big Piney River while his buddy, George Heeres, waits across the river in the entrance pool to Boiling Spring.

Boiling Spring on the Gasconade

Another great side-mount dive is Boiling Spring on the Gasconade, located directly across the Gasconade River from Boiling Spring Campground in Dixon, Missouri. A small entrance fee needs to be paid at the self-pay box to use the boat ramp access to the river. You are asked to leave your potty-mouth and alcohol back at the hotel - the campground is a Christian-run family place and these practices are looked down upon. The spring emerges in shallow water in the river bottom at the base of a towering dolomite cliff. Geologically, the surrounding bluffs support twelve dry caves and two water-collecting sinks above the spring – leading to a great deal of pressure in the system. The spring can be easily identified by the four-inch boil blowing up above the river’s surface. Once through negotiating the tight entrance, the flow subsides and large cave passage follows a fault line in the ceiling back to the pit at 400 feet of penetration. The bottom of the pit is 90 feet deep, and a second low and tight restriction must be tackled. Both restrictions have “helper” ropes or pieces of webbing that have been left to assist in pulling hand-over-hand through the current. These helper ropes are hidden inside, so the first diver enters without them – please hide them again when you are finished to avoid attracting untrained divers. Once beyond the second

restriction, the cave opens up again and rolls along until coming to the top of a hill at 1000 feet. From here, the cave gradually drops to depths exceeding 170 feet as it continues to follow cracks in the ceiling. You’ll deco in a beautiful cavern filled with wildlife. Many of the fish from the river hang out in the cavern enjoying the cool spring water in the summer months and its relative warmth in the winter. They can be easily spooked as divers enter the cave - so if diving at Boiling Spring on the Gasconade, don’t be surprised to see reduced visibility in the cavern caused by these critters.

Bennett Spring

The final stop on our Missouri road trip is Bennett Spring State Park located just north of Lebanon, Missouri. The spring is open seasonally for diving from November 1 through the end of February - for the rest of the year, it is operated as a fish hatchery and diving may interfere with spawning and popular fishing seasons. Reservations for diving must be made in advance, but it is well worth the effort. The park’s management plan allows access to only four divers at a time, with a maximum of six divers per day. Diver access is limited to the front part of the cave unless by scientific permit. Most of the time, water flow is so strong that access is physically limited to forward of the second restriction.





Above: A careful step! Tamara Thomsen cautiously makes her way down the cliff to enter the water at Cannonball.

There, multi-colored rocks the size of lottery balls whip around in the current, popping up and churning right before your eyes! Although the second restriction is located only approximately 200 feet from the cave entrance, there is plenty of fun to be had in the cavern zone! A crazy amount of German Brown Trout fill the spring basin and, like dogs, these curious fish follow divers around during their skills. While setting a line, there can be twenty fish eyes examining your choice in line placement and tie-offs. The always-scrutinizing fish will follow the teams down past the first restriction, and then jump into the main part of the current and sail out of the cave with you!

As a Midwestern cave diver myself, the springs of Missouri offer places for recreation and exploration close to home. The springs described here are just a sampling of all that the state has to offer, and I have limited this article only to those that are easily accessible by car. If you have access to a boat (even a canoe), many more opportunities abound. Although the 55° water may keep many of the southern divers away, there are long passages, a diversity in dive sites, and a plethora of exploration still to be done amongst the cordial backwoods of the Ozarks.

Tamara Thomsen owns Diversions Scuba (www.diversions-scuba.com) in Middleton, Wisconsin, where she teaches courses in cave diving and advanced cave specialties, and guides regular trips to the caves of the Ozarks.

Christa Loustalot, a Houston-based scuba instructor and photographer (www.photograsea.net), actually prefers warmer dive locations over cave diving and exploration in the Ozarks in the middle of winter, but can usually be talked into anything once.

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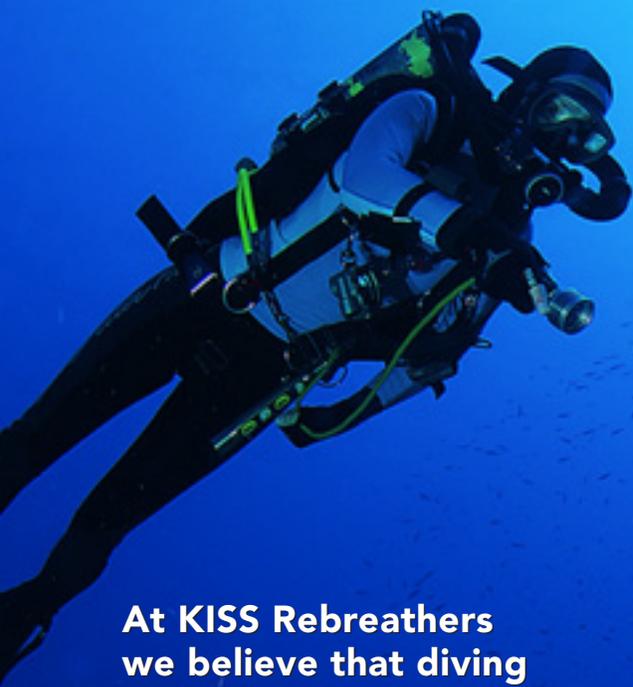
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Greenland

Where Adventures Abound!

Text and Photography by Erling Svensen

I can only warn those who consider going to Greenland:

- If you don't like adventures ...
- If you don't like beautiful and untouched nature ...
- If you don't like memory cards full of incredible pictures ...
- If you don't like nice, open-hearted people ...
- If you don't like exceptionally different diving – stay home!

Above: A diver is captivated by the never-ending display of blues and greens that are reflected off a submerged iceberg.

Right page: Just one of the many bizarre creatures you will discover diving below the arctic ice is this 13 armed starfish, *Crossaster papposus*.

Sunny, still, and *minus*18 degrees ... weather that you could only wish for! Morten Beier, of Arctic Dive Travel, which brings divers hungry for new experiences to Greenland, had brought me to Ilulissat, about half way up Greenland's west coast. It is a beautiful location at the mouth of the ice fjord that is on the UNESCO World Heritage List, and really special.

Icebergs about 500 meters thick are birthed into the fjord from the world's fastest moving glacier. At up to three meters per hour, a volume of between 20 and 300 million tonnes slides into the fjord each day. The ice is 100,000 to 300,000 years old, with a characteristic blue colour due to the high pressure and low oxygen content. The enormous icebergs break off and spend up to eight months drifting their way out through the fjord. They then move north, make a turn and drift south along the east coast of Canada. These enormous icebergs often create huge waves in the fjord when they turn upside down after melting in a way that shifts the centre of gravity.

As a tourist, the best way to see the ice fjord is probably from one of the boats providing guided tours. We took this trip and got useful information from the captain/guide, in addition to a great nature experience – and you can get really close to the icebergs.

After two days in Ilulissat, we were off to the spectacular town of Sisimiut. With 5,000 inhabitants, it is considered a big town in Greenland. We met up with Bo Lings who owns and runs Sirius Greenland, which sells and lends diving equipment, makes diving and charter trips, and much more. At Bo's dive shop, we collected and packed the dive equipment, which had been sent by air cargo some days before. At the harbour, we loaded everything on board the dive boat, a rugged Tagra 35-foot hardtop with 600HP, perfect for diving in Greenland.

There was crust-ice on the fjord as we sailed from the harbour. The weather was brilliant and the light conditions could not have been better. At one of the two icebergs that were stranded just a few kilometres away, and which Bo declared 100% safe and untiltable, we anchored and made ready for our first dive. I slipped into the -1.7 degree cold water. Right from the surface, I could see the bottom 23 meters below me. My regulator didn't really like these temperatures; spit freezes at minus degrees, which creates problems for the second stage. It is important to have two regulators and change during the dive as it begins to free flow slightly. It took ten minutes for this to begin happening, which meant a few changes during a dive.

We swam to the iceberg, not one of the biggest but it stood solid on the ground and rose ten meters above the water. We glided down the ice wall and reached the bottom, a fantastic sight with incredible blue and green colours. At the ice wall, I noticed the small crustaceans (or ice fauna, to use the generic term). The amphipods are dependent on the perennial ice, and have created their own little world on the icebergs. We continued all the way around the iceberg, and reached the melt water channel with its incredible blue colour. The computer showed we had been diving for twenty-five minutes, and the temperature was beginning to tell.

The conversation after the dive was lively. We decided to stay and make another dive. There was rich sea life around the iceberg, on the sandy bottom and around the rocks. In the sand were beautiful digging



anemones, and on the rocks I saw unknown starfish, annelid worms, and various other animal life. I had put hot water in my gloves before this dive, which made it possible for me to be under for almost forty minutes, but by that time my index finger was non-existent – at least it felt like that.

For the next dive, we moved to a small bay with a cliff wall, which went to a sandy bottom twenty-five meters down. The marine life here was totally different from what we saw around the iceberg: big forests of seaweed, sea anemones, sea squirts, Icelandic scallops, lumpsucker, sea cucumbers, and lots of other interesting stuff. It was also weird to see the land ice continue underwater to well below one meter. This can happen when the water temperature is as low as -1.7 degrees and very close to the temperature that the water turns to ice.

After the dives, we compared the diving we experienced in April to that in summertime. Bo and Morten said that during the summer you see a great deal of fish, which were almost absent during our first three dives. The summer water temperatures at three to five degrees are more comfortable; the visibility is not quite as good, but still excellent.

Back on land, we took care of the equipment and settled at Bo's hostel for the night – a great place to rest and recuperate for the next day's diving.

We woke up to good weather, so we sailed north to the entrance of a bigger fjord, where we dived at Mussel Island. Here the cliff wall dropped to terraces more than thirty meters down. Morten gave the signal, and we glided down through a forest of seaweed. Amongst the seaweed were half-meter long sea squirts on long thin stalks looking like creatures from another planet. *Boltenia ovifera* is the scientific name, and were unlike anything I had ever seen. At the vertical wall, the sea life was spectacular. Along with the sea squirts, there were

thousands of beautiful red sea cucumber, in the crevices were Icelandic scallops, brown sea cucumber, small shrimps, and huge numbers of six-armed starfish, many of them curled up like plates on the rocks.

After the dive, we evaluated the conditions. The water temperature wasn't proving to be a big problem, although I envied Morten his dry gloves. I wanted another dive on soft ground so we sailed to Sertafloq Island, a few nautical miles from Sisimiut. Here the ice covered the entire bay, but the boat's 40mm hull cut through easily. Again, the visibility impressed me. It was sixteen meters deep here, and the sea floor was clearly visible. We sank through the hole in the ice behind the boat. On the sea floor there were again big crowds of digging anemones. We drifted silently around looking at the marine life that must have defroster in their blood, otherwise they would have frozen stiff. It is an incredible world full of life no matter where you are.

The next day we headed south on an overnight trip. Bo took us out to the open sea into the meter-high waves. There was heavy snow, and the first half-hour's ride was very strenuous. It improved as we sailed into the lee of some cliffs. Our first destination was supposed to be the wreck of the *Borgin*; but as we came into the Itivdleq fjord, it was full of ice. Even with 600 HP and 40mm of hull, it was impossible to move through it.

We decided to dive a sloping cliff that dropped down 150 meters. Here the life was different from a bit further north. There were more fish – father-lasher, butterfish, and lump sucker, starfish, and stalked jellyfish. For the first time on the trip, all my equipment worked perfectly, so I just enjoyed the dive.



Left: Leaving the comfort of the vessel behind them, the Arctic dive team pulls their equipment with sleds, cut a hole through the ice and dive the shipwreck of the *Borgin*.



Right: Diver explores the wreck of the *Borgin*, a beautiful three-masted 110ft wooden schooner. Built in 1914 in Svendborg, Denmark, she sank in 1954 with a full cargo of salt fish, after a fire in the engine room. She lies on her keel 26m down. Two of the masts nearly touch the surface, with remarkably well-preserved rigging. Two cylinders and the flywheel are visible in the burnt out engine room. On the portside hangs an anchor. The propeller sits by the rudder like a huge flower. Access to the crew quarters is through a large hatch, for views of preserved hammocks, clothes, and bathrooms. The *Borgin* is usually surrounded by cod and other large schools of fish.



Left: Light illuminates the man-made triangular hole that is shaped in the ice as a diver descends into the crystal clear Arctic waters.

Right: Peering into the depths, Arctic dive explorer Erling Svensen scans the sea floor for the wreck of the *Borgin*.

Next we sailed into the small village of Itilleq that with its 120 inhabitants is more like an outpost. But even this small place had a school, a church, and its own Danish teacher who had moved here three years previously with his wife and two children. Bo made an arrangement with him to borrow a dogsled and an ice pick. He had a *plan*.

We went back to the Itivleq fjord where we found a vertical cliff that went really deep, with rich biological life – a fantastic place to dive. We decided to stay and make a night dive as well. We went into the water at half past ten, and I was amazed how the sea life changed between day and night. Suddenly, there were shrimps and fish! Several new kinds, which I hadn't seen before, were lying around and consented to have their photo taken. Night diving is just great, though impossible during the summer since there is midnight sun in this part of Greenland.

The next morning we woke again to perfect weather. Bo got the dogsled, the ice pick, and a lot of optimism on board, and we sailed back to the edge of the ice to carry out Bo's idea. Morten was equipped with a snow shovel wrapped with aluminium foil. He walked across the ice, and we followed him on the radar. By comparing the radar signal with the GPS position on the map, we could direct Morten via the portable VHF – left, right, and back. After a quarter of an hour, Bo shouted at Morten to stop! Mark the spot! He was sure Morten was over the wreck. We packed the equipment on the dogsled; pulling the heavy sled was a hard job, so everybody had to work.

At the right spot, a triangle was marked out and we began hacking at the ice. Soon, we had a hole big enough to get through. Then Bo marked out four 50cm wide paths, approximately eight meters from the hole, so that a circle with a diameter of sixteen meters was made. On one line, he marked an arrow pointing to the hole. I was a little dubious. After decades of diving wrecks, I thought we would be more likely to find a needle in a haystack than to actually find the wreck. But the idea was just crazy enough, and an ice dive would be great for the article, so I agreed! The water in the hole turned to ice in minutes, and there was a thick brash as I jumped in. With camera in hand, everything was properly photographed for this had to be documented. I followed a rope we'd dropped from the hole to the sea floor; at a few meters depth, I passed the back-up tank, which was there in case someone needed air or ran into freezing problems. At ten meters, I saw two masts towering right in front of me.

At eighteen meters, I saw the bow of the *Borgin* – the rope was only one meter in front of the bow. Here was a complete wooden ship of a 110 feet, loaded with 350 tonnes of salted cod, sunk in 1954, but almost as intact as the day she sailed. I swam round the back to where the fire had been and turned around to see whether I was still in control of where I went down. Then I understood why Bo had marked the circle round the hole. Even at forty meters distance, the hole sent rays of light towards me. I thought briefly about freezing regulators and other inconveniences....



After a bit of cruising round the bow and along the starboard side, I was satisfied. It was an incredible experience. I gave the signal that I was going up, Bo and Morten followed. After a safety stop, and more photographing just under the ice, I crawled up through the hole. I couldn't stop laughing! Amazing!

The equipment was packed, and we pulled ourselves back to the boat for lunch. I politely declined an additional dive at the wreck or at a wall on the way home. It wouldn't do to spoil this fantastic experience, which had just been imprinted on my brain. A story that will get better and better as time goes by. Great that it was photographed, so the documentation is there for the future.

We arrived at Sisimiut during the afternoon. A fantastically successful overnight trip had come to an end.

Next day a new adventure was lined up: dog sledding through the stunning landscape. Marius Olsen, 64 years old, brown, and fresh after a long life spent outdoors, welcomed us. We had been told he was one of the best. Sixteen dogs fought their way through the most incredible places with three men and equipment on the sled, and gave us a good idea of what Greenlandic nature has to offer. It was a worthy end to a fantastic trip.

I would like to thank everyone who made this trip possible, and who gave everything they had to make the adventures complete as they were.

Useful information

DIVING:

The only operator bringing divers to Greenland is Arctic Dive Travel. For more information, contact Morten Beier at (+45 26800131) or visit his web page www.arcticdive.dk. Here you'll also find links to Bo Lings' company Sirius Greenland, plus general links to Greenland Tourism.

WHAT YOU SHOULD BRING:

Warm clothes, a cap, and gloves are important. Concerning diving equipment, woollen underwear and a good inner suit is a must, also good, warm gloves (dry or wet). You don't need a full-face mask. That is not where the temperature becomes a problem. It is also important to have a regulator with an octopus, preferably newly serviced.

GREENLAND:

The island is the world's biggest, at about 2.2 million km² with 56,000 inhabitants, most living on the west coast. 81% of the island is covered with ice.





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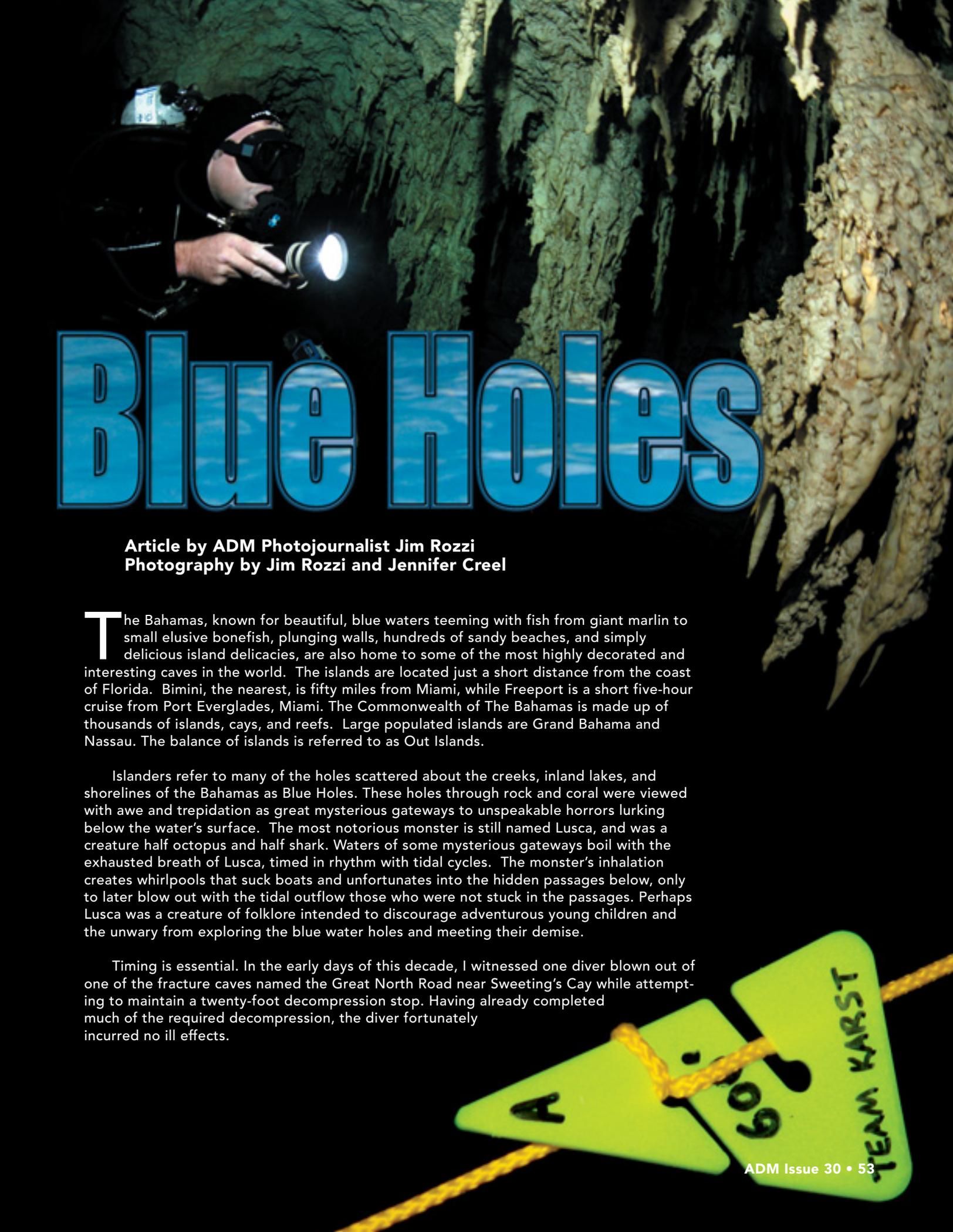
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A diver in a cave, wearing a black wetsuit and a diving mask, is holding a camera and a flashlight. The diver is positioned on the left side of the frame, looking towards the right. The cave walls are dark and textured, with some light-colored rock formations on the right. The overall lighting is dim, with the flashlight providing a bright spot of light.

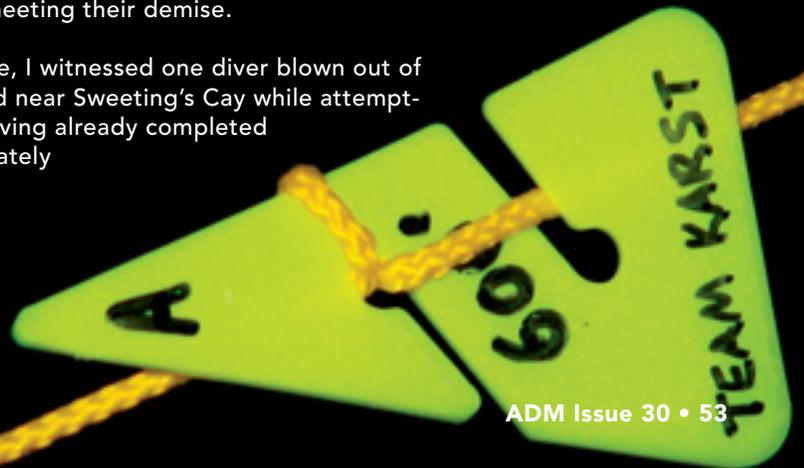
Blue Holes

**Article by ADM Photojournalist Jim Rozzi
Photography by Jim Rozzi and Jennifer Creel**

The Bahamas, known for beautiful, blue waters teeming with fish from giant marlin to small elusive bonefish, plunging walls, hundreds of sandy beaches, and simply delicious island delicacies, are also home to some of the most highly decorated and interesting caves in the world. The islands are located just a short distance from the coast of Florida. Bimini, the nearest, is fifty miles from Miami, while Freeport is a short five-hour cruise from Port Everglades, Miami. The Commonwealth of The Bahamas is made up of thousands of islands, cays, and reefs. Large populated islands are Grand Bahama and Nassau. The balance of islands is referred to as Out Islands.

Islanders refer to many of the holes scattered about the creeks, inland lakes, and shorelines of the Bahamas as Blue Holes. These holes through rock and coral were viewed with awe and trepidation as great mysterious gateways to unspeakable horrors lurking below the water's surface. The most notorious monster is still named Lusca, and was a creature half octopus and half shark. Waters of some mysterious gateways boil with the exhausted breath of Lusca, timed in rhythm with tidal cycles. The monster's inhalation creates whirlpools that suck boats and unfortunates into the hidden passages below, only to later blow out with the tidal outflow those who were not stuck in the passages. Perhaps Lusca was a creature of folklore intended to discourage adventurous young children and the unwary from exploring the blue water holes and meeting their demise.

Timing is essential. In the early days of this decade, I witnessed one diver blown out of one of the fracture caves named the Great North Road near Sweeting's Cay while attempting to maintain a twenty-foot decompression stop. Having already completed much of the required decompression, the diver fortunately incurred no ill effects.



In the 1960's, a Canadian diver, Dr. George Benjamin and his son, George Junior, began an organized examination of many of the Blue Holes near and on Andros. This island, although not extensively populated, is the largest of the many Bahama Islands. Andros lies south of Grand Bahama Island with extensive shallow water on its western shores. On its east is the famous Tongue of the Ocean with great walls plunging to depths in the thousands of feet, and which provides training for submarines because of the exceptional depth of the trench.

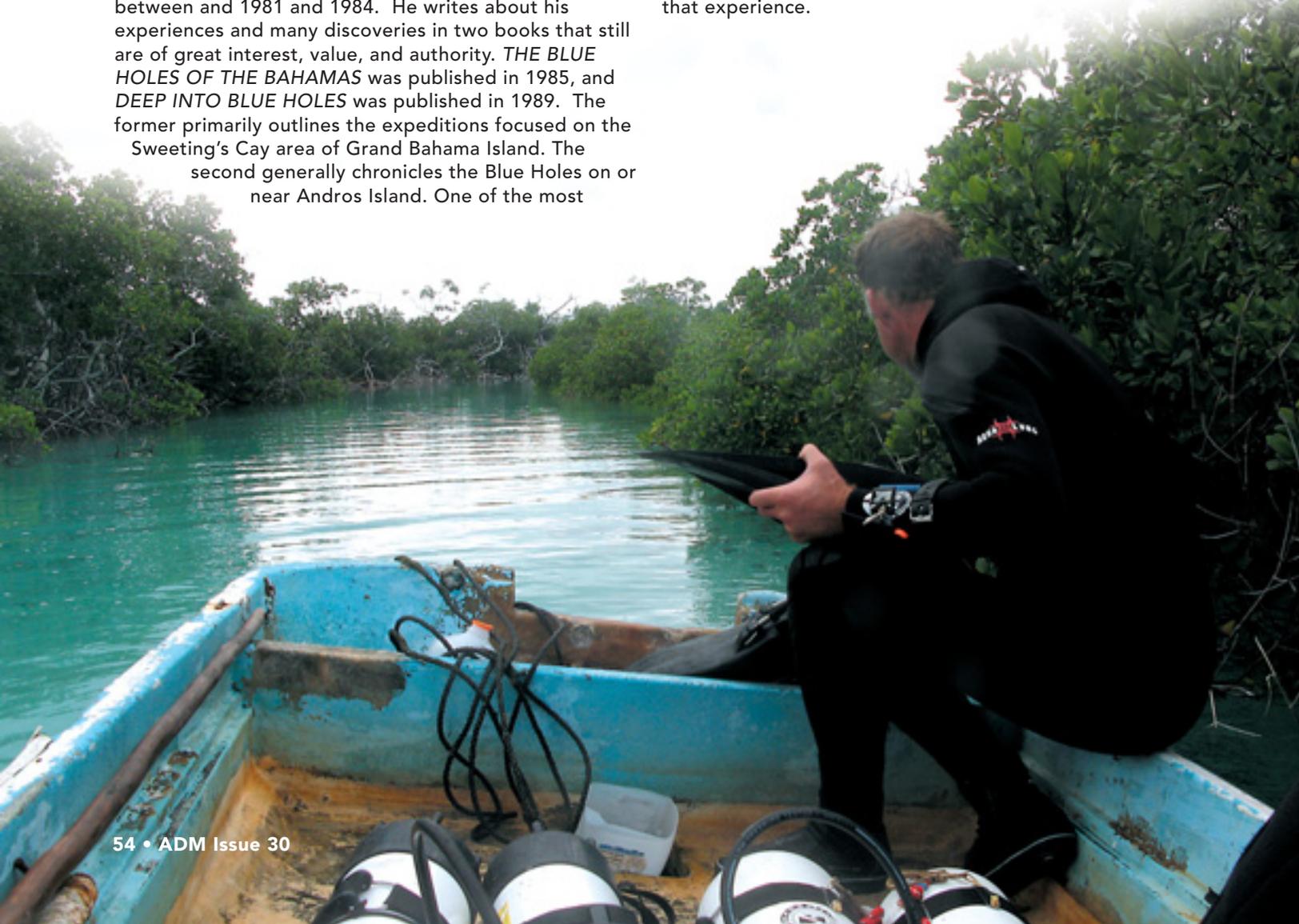
Dr. Benjamin and his explorers found, surveyed, and photographed many of these exciting caves; and, in the process, advanced the cause of underwater photography and the creation of better cave diving equipment and techniques. Benjamin and Ike Ikehara collaborated on the design of a crossover manifold that allowed the connection of two back-mounted regulators. If one failed, the diver was still able to access the air in the tank through the remaining regulator on the christened Benjamin Crossover Manifold. Appropriately, one of the Blue Holes near Andros is named Benjamin's Blue Hole.

Robert Palmer, an English cave diver, enthusiastically took up the banner of exploration in the Bahamas. Prior to his untimely death in 1997 in a Red Sea diving accident, Palmer led four expeditions to the Blue Holes between and 1981 and 1984. He writes about his experiences and many discoveries in two books that still are of great interest, value, and authority. *THE BLUE HOLES OF THE BAHAMAS* was published in 1985, and *DEEP INTO BLUE HOLES* was published in 1989. The former primarily outlines the expeditions focused on the Sweeting's Cay area of Grand Bahama Island. The second generally chronicles the Blue Holes on or near Andros Island. One of the most

famous of the Androsian caves, which was instrumental in igniting my desires to cave dive, is Stargate. Palmer and his team of explorers in 1985 with the use of rebreathers and mixed gas dove to a depth of eighty-seven meters. The photo of the north passage of Stargate taken by Bill Stone is still inspirational to this day.

In 1995, Dan Malone and Gene Flipse, owner and captain respectively, of the *Ocean Explorer* began operations intending to focus on upscale charters in the Bahamas. I was introduced to *Ocean Explorer* by Curt Bowen, owner and publisher of *Advanced Diver Magazine*. *Ocean Explorer* and Brian Kakuk collaborated to extend to many divers the opportunity for Blue Hole diving and exploration. Through this collaboration, I was able to make many Bahama Blue Hole cruises. Brian, a former navy diver, is an extensive explorer, guide, and cave diving expert who makes his home in the Abacos. I was fortunate to be included on the final voyage of the *Ocean Explorer* on a return to the Zodiac and Great North Road caves led by Brian in December of 2002.

The beauty of the Zodiac caves remained indelibly etched in my brain. I referred to my photos, logs, and Palmer's books, and was finally able to solve the logistics of how to accomplish my return. This article is about that experience.



Sweeting's Cay

Sweeting's Cay (pronounced Key) is located on the east end of Grand Bahama Island, and is accessible by a fifteen-minute boat ride from McClean's Town. The town consists of a couple of roads, with twenty or thirty abutting, multi-colored homes. A small school is located across the road from the wooden pier that juts into the creek. It takes about forty minutes to drive east from Freeport on the Grand Bahama Highway to the small boat dock at McClean's Town.

Sweeting's Cay, resting on sheets of limestone, lies above major north-south fractures that resulted in the formation of three lakes and the Zodiac caves over thousands of years and several ice ages. Palmer and his team explored this area and discovered numerous, very amazing sites. Collectively, the caves were named after the Zodiac inflatable utilized by the team to gain access to the first creek, also named Zodiac creek. In his book, Palmer in great detail outlines the formation of the lakes, caves, and speleothems of varying shapes, colors, sizes, and textures. He explains that horizontal caves formed along the halocline, which hollowed out the limestone along distinct layers beneath the island's surface.

There appear to be two general classes of caves present near Sweeting's Cay: the Great North Road Caves and Zodiac Caves, which includes Lucy's Cave. The Zodiac caves are inland, highly decorated, and relatively shallow to depths approaching ninety feet. The Great North Road Caves are offshore near Big Creek. They appear to be undecorated fracture caves that go deep beyond 300 feet. Charged with Lusca's breath and saltwater, the better known ones are Lothlorian and Helm's Deep.

Traverse from Mermaid's Lair to Owl Hole

While diving Ginnie Springs, Jennifer Creel met Ben Cook and the two quickly hatched a plan to dive the Zodiac Caves. Steve Muslin and I were soon added to the ADM dive team. After a couple of months of planning, including many e-mails, we were off to see the Bahamas. Ben, who grew up in the Bahamas, is a cave instructor who splits his time among Florida, Grand Bahama, and Mexico.

Ben suggested that we do a shake-down dive at Mermaid's Lair, which is a short drive from Freeport. Our scenic drive along the highway was reminiscent of old Florida landscape...a scene created by Morrissey palms lining the highway as far as the eye could see, growing beneath a forest of pine. Ben turned to the right taking the limestone Beach Road to the path leading to the cave entrance. The path coordinates are N 26° 35.109, W 078° 27.818.





We were warned to be on the lookout for the Poison Wood tree, a close but more treacherous relative of Poison Ivy. Access to the cave is relatively easy, we transported our gear to the small basin inhabited by a crab and found the entrance below the limestone out-cropping. We made the 2,730-foot traverse from Mermaid's Lair to Owl Hole in fifty-seven minutes at an average depth of sixty feet. After the major breakdown of large sheets of limestone in the cavern zone, the passage becomes smaller and is lined with many colorful and intricate decorations. The team stopped to read the plaque attached to the line at the midway point. The inscription read: "On June 1, 1984, Mermaid's Lair was connected with Owl Hole forming the Old Freetown cave system. Barry Taylor, Gina Chenoweth, Howard Cosgrove."

A word to the wise: the traverse consists of sixteen T's along with one four-way and one five-way T. Best bring lots of clothespins. Secondly, bring sufficient air to make the return dive, or be prepared to ascend a twenty-foot steel ladder to exit from Owl Hole — past a large beehive.

Sagittarius, Lake 1

Our shake-down was done. We were off to see and explore the Zodiac Caves. Captain Wilton Thomas picked us up at the McClean's Town dock for the fifteen-minute ride with our gear to Sweeting's Cay. We were met by several exuberant youngsters who helped us with our tanks. Our first dive was in Lake 1, which is a short distance down the road adjacent to the school-house and behind a health care clinic on the left. From this point, it is a one hundred fifty yard, hard walk through scrub brush growing between the cracks in the undulating limestone

to the rocky shore of the lake that hides the entrance to Sagittarius. The coordinates are N 26° 36.640', W 77°53.081.

The main line is tied at the top of the limestone and runs down a steep, easily silted slope to emerge to the right at a depth of around fifty-four feet. The character of the cave is akin to an amusement palace with the colors changing from red to orange, and orange to white with hundreds of multi-sized flowstones, stalactites, and stalagmites. We followed the main line to about seven hundred feet, passing through a great room that resembles a bakery shop in which the baker has spilled gallons of wedding cake icing along the shelves, tables, and floor allowing it to drip and run to form intricate designs impossible of replication.

As we exited the cave, our reverie, induced by the transcendental secret sights just observed, was broken by the sounds of youthful chatter and laughter as several youths awaited our escape from Lusca. They were invited to jump in and try breathing from our second stages. This was Discover Scuba Bahamas style.

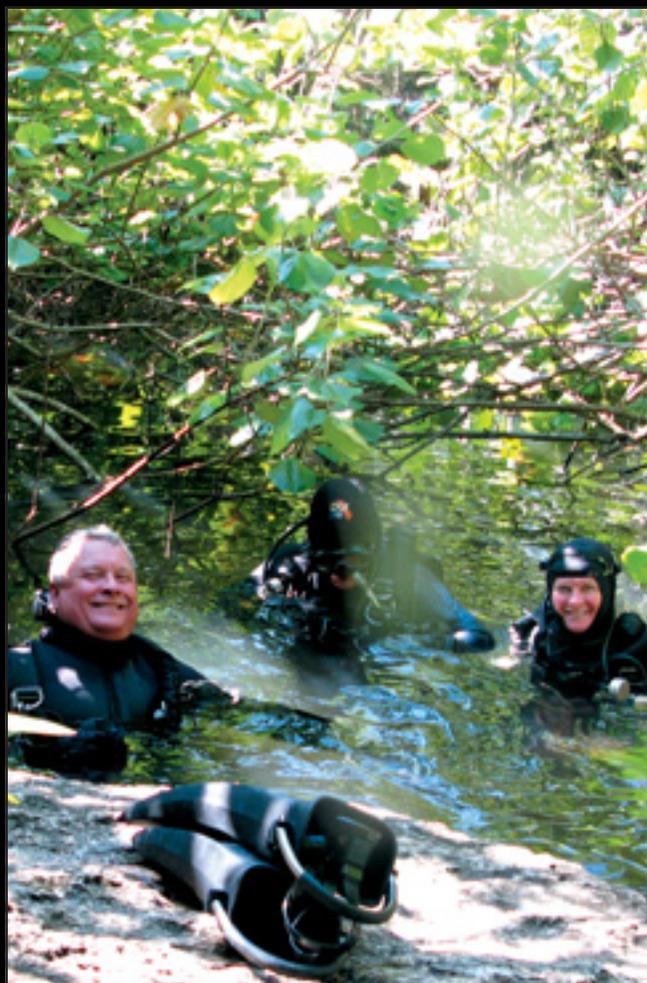
Lucy's Cave

Lucy's is named after a Robert Palmer team member, and may be one of the most beautifully decorated caves that I have been privileged to dive. At the top of my list has always been Gran Cenote in the Yucatan, particularly emphasizing the traverse from Calimba. But now there is Lucy's. This cave just goes on and on with mind-blowing cave decorations at every glance in the crystal clear water as far as the eye can see. Its beauty makes up for the difficulty in reaching the location.

A shallow draft boat or dinghy is required to navigate up Little Harbor Creek, located west and north of Sweeting's Cay. The coordinates of the landing are N 26° 37.092', W 077° 52.915'. Near the shore, our boat grounded and we off-loaded our gear and tanks and began the long trek through landscape chocked with palmettos and grasses growing from the uneven limestone. After about two hundred feet, the limestone disappears beneath a marsh, which we plodded through slipping and sliding in the mud, muck, and cratered limestone. The path continues on about 150 feet as it turns to the left. Small orchids and bromeliads hang among the branches of the small trees growing about. The path ends at a small pond bounded on one side by a limestone ledge. A line is tied off on the limestone; and directly below, near a depth of forty feet, is a restriction that must be breached. I passed my camera and strobes through and wiggled past. Through the restriction, the cave opens up to divulge gorgeous floor-to-ceiling columns and many more spectacular and diverse decorations. As we continued, we entered a magnificent room that completely swallowed my 21-watt HID light beam in the blackness created by the chamber's immensity. The team continued to a penetration of nearly 1500 feet with a bottom time of seventy-one minutes and a maximum depth of ninety-eight feet.

If You Want To Go

Several air carriers fly daily in and out of Freeport. However, air travel with dive gear, camera equipment, rebreathers, and cylinders is now becoming expensive and difficult. An alternative to air exists. Travel to Grand





Bahama Island is made easy by Discovery Cruise Line, which operates between Port Everglades, Fort Lauderdale, and Freeport, Grand Bahama. Access to the cruise ship is simple. Just take I-595 east until it ends. Signs direct you to the terminal and parking. The ship runs everyday with the exception of Wednesday. Embarkation starts as early as 5:00 a.m., and she sails at 8:00 a.m. Freeport arrival is scheduled for 1:00 p.m. She returns every afternoon except Wednesday with a planned arrival in Port Everglades at 10:00 p.m.

The cruise line was very accommodating to us and all of our dive gear, including filled scuba cylinders. Advance written approval was granted for our twelve scuba cylinders. Six were decompression cylinders with 50% and 100% O₂. A surcharge of \$15 to \$20 was levied per cylinder. It is recommended that advance written approval be obtained to transport the filled cylinders. We were asked several times by port security and TSA about the cylinders, and used the letter as our authority to board with them.

Round trip passage was approximately \$200.00 per person. A sleeping berth could be rented for \$30. On the crossing to Freeport, a sumptuous breakfast buffet and lunch were included. The return trip includes a plentiful dinner buffet with many delicious selections and a featured entree of roast beef and all the trimmings.

If time allows for an arrival before the ship's day of departure, there is an even better and more economical means of gear transport available. Steel pallets may be rented in various sizes to accommodate large quantities of gear. Current information about Discovery Cruise Line may be obtained at www.DiscoveryCruiseLine.com.

About the Author

World explorer and photographer, Jim Rozzi, shares his view of our world through the camera lens. He resides in Naples, Florida, with his wife, Suzy, and may be contacted by e-mail at JimRozzi@AOL.com.

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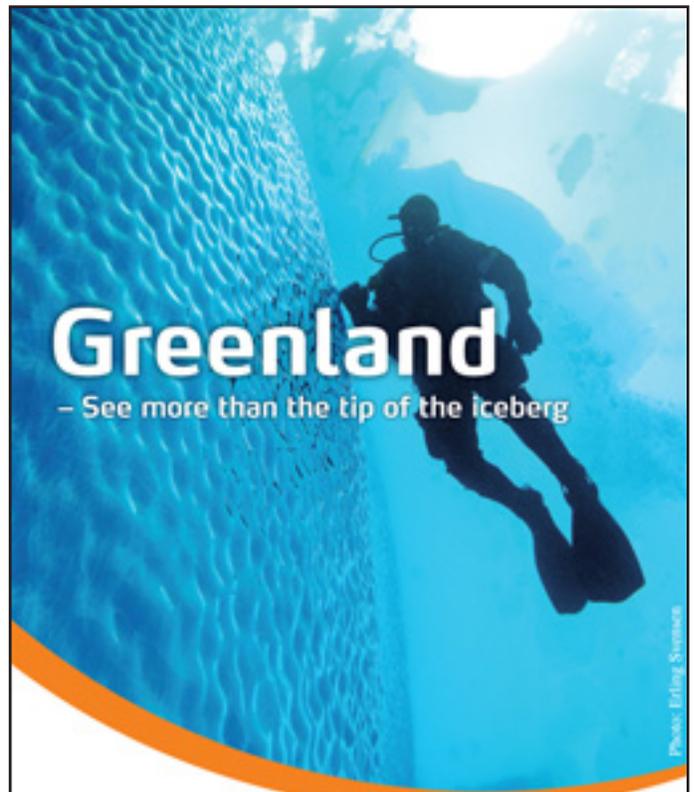
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Expedition Diving

The Tip of the Canyon Wreck

By: Richie Kohler

Webster's dictionary defines an expedition as "a journey of some length or difficulty for a definite purpose." So a charter to, let's say, the *Andrea Doria*, is an "expedition" in the literal sense, but Expedition Diving is much more complex than a 250-foot *Doria* penetration, or push to lay new line in a cave. Definitions vary by perspective, and mine is that Expedition Diving is a team-driven project, generally deep (300 feet+), with long run times (4-8 hours), and, as such, the bottom divers can't physically carry enough gas to be self-sufficient — whether it's deco gas for open circuit, or bailout gas for a closed circuit endeavor. These dives are focused on specific goals, being organized and planned months in advance, the *Lusitania* and *Britannic* expeditions being prime examples. A detailed dive plan or SOP (Standard Operating Procedure) is drafted, outlining EVERYTHING related to the project, from initial mobilization to post-dive breakdown. All possible logistical, equipment, and operational considerations are recognized and addressed. Gas calculations, material requirements, and emergency protocols are planned with layered support and backup. The SOP must clearly guide the team through the expected and emergency (oh, crap!) situations, and account for the physical and material requirements needed to get the bottom divers back to the surface regardless of the what, why, when, or where. No matter how well you plan and prepare, once heads are underwater there is always inherent risk. The million dollar questions are where to draw the line and how much risk is acceptable?

Prior to my first expedition type dive, I always carried all the gas I needed to make a dive, leaving nothing to chance. Gas waiting on the anchor line, under the boat, or even the dive boat itself for that matter, might not be there when I needed it. Eventually, my open circuit trimix dives hit a wall, limited by how much gas I could carry and the risk I was willing to assume. On deep dives, a buddy could be more of a liability than a benefit. Most of the time I chose to dive alone; if someone did have a gas problem, we simply didn't carry enough gas for two. Comfort-



able in my gas management, it's a risk I was willing to assume. But push that line, something really bad was going to happen. I've been jumped twice by out-of-air divers on *Andrea Doria* expeditions. The first time it happened I was blindsided and nearly drowned, having never seen it coming. The second instance, I saw the diver coming at me, hand slashing across his throat. But despite my offer of a backup regulator, I was bowled over and he yanked the one out of my mouth. In both cases, emergency gas was dropped over the side of the dive boat, and both only suffered bruised egos and made the captain's "boat's full list." Both incidents occurred at twenty feet under the boat, and it seemed it was only a matter of time before someone had a major gas issue at depth. That cold reality hit on a 280-foot dive after having just located the German U-boat, *U-215*, on the Georges Banks 150 miles off Shelburne, Nova Scotia. It was a fantastic dive; everything had gone well, that is until I noticed the other two members of my team buddy breathing on the ascent. The tide was roaring and it was everything we could do to hold on to the down/ascent line. A pea soup fog had come in, so our planned drift deco had been flagged. Our one support/safety diver had a problem (with his then new-fangled CCR) and never splashed, so topside was unaware of the drama unfolding below. When it rains, it pours. Splitting one cylinder of deep deco gas, the pair barely eked out a marginal profile, surfacing a little pale but none the worse for the wear. When I surfaced, every gauge I had was in the red, and had I been asked for gas, I had none to give. That's as close to the line as I ever want to be.

My switch to a closed circuit rebreather provided me a quantum leap in range, but required a total reworking of technique and philosophy. Like a new open water diver, the importance of a dive buddy returned, but with new significance: the bailout gas carried by a buddy is factored into my dive/emergency plan, as my bailout is into his. We are partners now, and on deeper dives three to four divers with a communal bailout gas plan is not uncommon, but requires a much greater obligation to stay together -- a far cry from "same dive, same ocean" mentality of days past. As a member of a CCR dive team, I have expanded my available bailout and make a commitment to accept the risk limits of my partners. With CCR we are now making amazing dives, but the limits of how much bailout gas a team can carry and the amount of risk we are willing to assume still exists.

A major component of Expedition Diving is the support divers, whose single most important task is to provide gas (or back up CCR) to bottom divers in a major unit failure. Layered support provides the ability to handle multiple situations so that no matter what issue or combination of problems arises, the decompression phase is uninterrupted and as stress free as possible. Besides their assigned jobs for the normal or planned dive, emergency scenarios such as diver adrift, gas loss, electronics failure, loop flood, and even an unconscious diver are discussed and prepared for with a planned reaction and assignment. Everyone clearly knows what is expected of him in case of a problem. Long runtimes clock out the OTU'S, and a CNS oxygen toxicity seizure during the long decompression phase is a very real possibility. Support divers are in the water with the dive team during the entire hang, diligently monitoring them, ready to lend assistance and surface a convulsing diver. The number of support divers, (deep, intermediate, and shallow), is determined by the gas needs of the bottom divers, environmental conditions, the size of the dive platform, and having more support divers in the water is not always better.

The Dive Marshall (aka Diving Supervisor) is the "go-to guy" running the dive operation topside; liaising with the captain and support crew, tracking all divers' times and assigning tasks to support divers as required by schedule or emergency. In short, the DM is the final word on everything that pertains to the dive. Mirrored after military and commercial operations, the SOP and its command structure is designed to control all activity on the back deck,

ensuring that all aspects of the dive operation are monitored and provide a clear and concise emergency protocol if needed, all with a nod to the limits of a sport diving team's resources.

This article is not intended as a draft for an SOP, nor could I, in the limited space, list all the nuance and detail covered in a well thought out dive plan. There are many ways to run an Expedition Dive and no single SOP that will work in every situation. The key is to HAVE a written plan which covers all contingencies and failures, distribute and discuss the plan with the team, assigning tasks and responsibilities for both standard and emergency operations. When I am questioned about how I execute these dives, or what gases I would use, etc., I often (half jokingly) say, "Don't follow me, I ain't leading!" But the truth is we all follow in the tracks of previous explorers who push the envelope, and (hopefully) learn what worked and then expose, analyze, and correct what didn't. Each dive team needs to adapt their SOP to the unique set of conditions and parameters they face on their project. Where the footprints ended for the previous explorers, the next group goes a few steps further.

Further doesn't have to mean far away and exotic. More CCR divers are pushing the line deeper, and Expedition Diving isn't just being done with large teams on historic wrecks like *Lusitania*, or *Britannic*. Awesome technical dives are happening in our own backyards. When I broached the idea of running an Expedition Dive to a 400-foot deep virgin wreck site to Dan Bartone, captain of the New Jersey based dive charter boat Independence II, he didn't blink, only asked me, "When?"

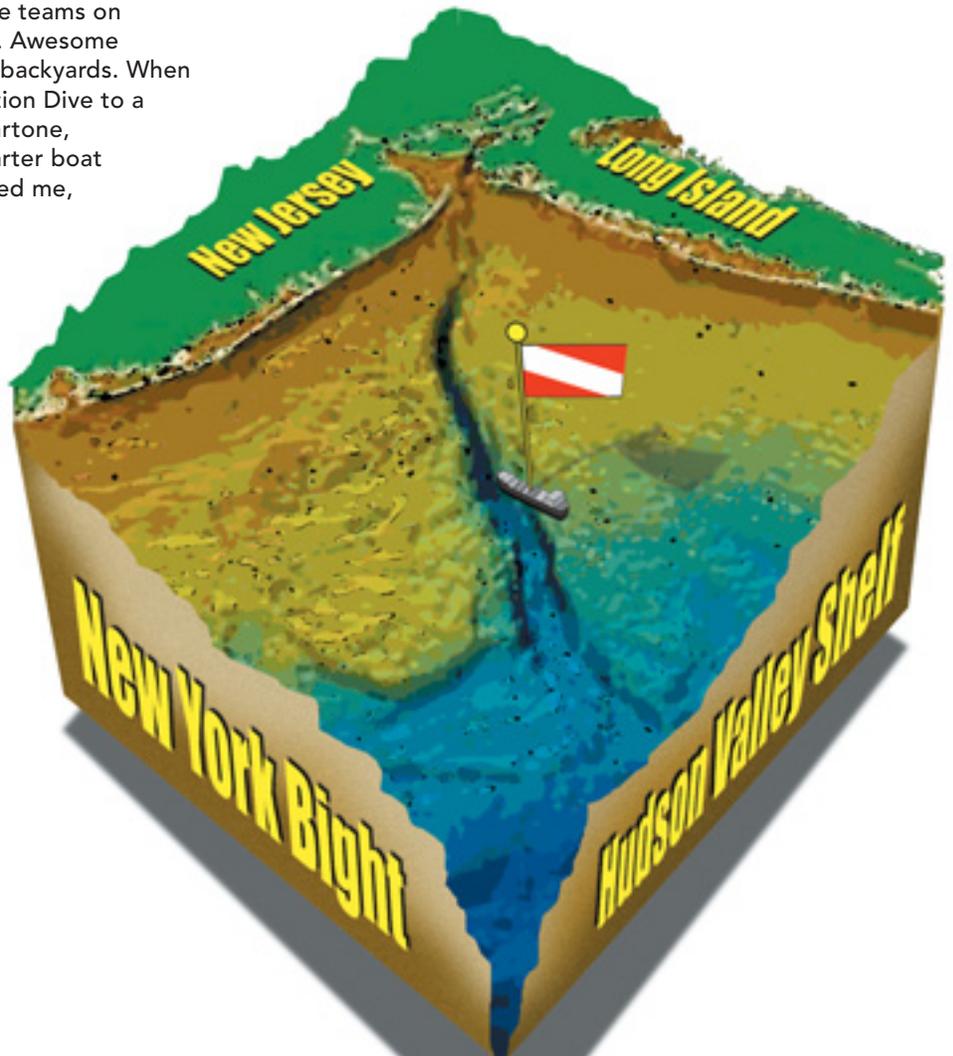
I've known Danny for years and, as expected, the questions came fast and furious. "Where'd you get the numbers? They good? Who'd you have in mind?" I told him the numbers are solid; they came from one of my Dad's fishing pals. It's big, with sixty feet of relief, but it's 100 miles offshore, near the Hudson Canyon.

"Canyon huh? 400 feet deep and 60 feet of relief? Yup, that's what he says. "Cool!"

I don't believe anyone has ever tried to dive out there before, Danny. "I am sure of it, so how we going to do this safely?" That's a good question....

For 10,000 years, New York's Hudson River has gouged a trough in the sea floor that extends a hundred miles out into the ocean, right to the edge of the continental shelf. It's here that the Hudson Canyon begins as a sharp-edged crack whose sheer walls plummet three-quarters of a mile down into the abyss. Comparable to the Grand Canyon in size, it is one of the largest submarine valleys in the world, for years drawing fishermen as the spot where currents collide, baitfish churn the surface, and giant tuna, billfish, and iridescent mahi-mahi cruise with torpedo-like speed. On NOAA chart #12300, there is a wreck icon in 400 feet of water that appears to teeter on the line demarcating the edge of the canyon wall and the sheer drop 1,200 feet down to the canyon below. Those who have fished it claim the wreck is huge, with ghost nets shrouding the upper sections, and a vicious current that runs at 3-4 knots. Probably with good reason, no one has ever tried to dive here before.

Borrowing heavily on the lessons learned and protocols established on the 2006 *Britannic* expedition I led with John Chatterton, I began to outline our "Tip of the Canyon" SOP with Captain Dan, but there were major





differences. On Britannic, I had a twenty-five-man team with twelve bottom divers, working for two weeks from an eighty-foot vessel three miles from shore in warm clear water. The Tip of the Canyon project had a shoestring budget in a "one and run" operation that was one hundred miles out at sea. The conditions were night and day as the warm clear Aegean was replaced by the dark and cold North Atlantic and, unlike Britannic, we were carving our own path with no idea what to expect from conditions or what we might find on the bottom. The currents reported at the site could be too strong to dive, and there was real concern of the waterfall effect -- a down welling over the edge of the continental shelf where tide and current meet -- that could hamper or prevent ascent. Recognizing all the possible problems, then factoring in the unique conditions and planned responses, the SOP took form. We could not and would not compromise on safety.

Based on the amount of emergency open circuit bailout required for the planned dive profile, we decided upon a three-man dive team. The divers had to be experienced CCR wreck divers with dives to over 300 feet and be familiar with the conditions experienced in the North Atlantic. The evil you know is better than the one you don't, so I pegged two personal friends with expedition diving experience to pull this off. Detective Frankie Pellegrino of the NYPD scuba team would be diving his Ouroboros, and Evan Kovacs underwater imaging specialist at Woods Hole Oceanographic Institute would use his custom side-mount Prism. I would dive my Evolution Plus. Our OC bailout tables, gases, and switch depths were chosen in order to maintain (as closely as possible) an average 1.30 set-point so in an OC bailout emergency the ascent and runtimes would still be close to the CCR dive plan. This necessitated six different bailout gases; and a worse case scenario failure at max depth/time with a 1.5 fudge factor required eight 80-cubic-foot cylinders to safely decompress one diver. Using 10/90 Heliox as our diluent, we would also carry a 10/90 Heliox (bottom) bailout plugged into our manual diluent add buttons. The second bailout carried varied in the team with two divers carrying a deep bailout and the third carrying an intermediate bailout, all calculated to get from 400 feet to 170 feet before requiring topside support gas. From then on we would be dependent on the support team to supply the diver with cylinders for the rest of his hang.

Based on our profile, operational considerations, and possible emergency needs, we decided on three safety/support divers, each with a depth and time limit predicated by our planned runtime and required gas switches. Leading the support team, Bill Trent was chosen as Dive Marshal, working with the captain to set the shot, check current and drift, and approve the dive. Nothing moved or happened without Bill's approval. If the conditions or any member of the team's kit didn't measure up, the dive was scrubbed -- end of subject. Once the dive commenced, Bill would monitor the clock and splash support divers at the required time. If there were an emergency, he would be the one voice to dictate action and assignments based on need.

Steve Lombardi would be the deep support diver, meet the team at 200 feet, exchanging deep bailout (bottom and deep) gas for shallower mixtures, and then move up on his own deco profile. At 120 feet, the intermediate support diver, Dan Martine, would swap out bailout once again with shallower mixes before being relieved by the shallow support diver, Dr. Brandon McWilliams, at 60 feet.

For the rest of the deco phase, the support divers would take turns ferrying bailout bottles, cameras to the surface, and bring drinking water. At no point would the bottom divers be unattended. The support diver would stay behind and below the dive team monitoring for any possible CNS problems in a position to catch an unconscious or seizing diver.



As the weeks went by there were numerous meetings, refining the details of the SOP, clarifying assignments, and reviewing every possible scenario and the expected response. The tables and gas switches were discussed in detail, down to who unclipped what and when. When it came to diver-to-surface communications, we opted for low tech -- relying on SMB's and the trusty slate rather than full face masks and comms.

On August 13th, the forecast was excellent. In the 3:00 a.m. darkness, the *Independence II* set sail from her berth at Point Pleasant, New Jersey, arriving five hours later at the edge of the Hudson Canyon as the early morning sun smeared red across the eastern sky. Crossing over the western wall, everyone in the wheelhouse silently stared as the sea floor dropped from 400 down to 1200 feet on the glowing bottom finder. Dan slowed the motors to a crawl as we got closer to the numbers. The eastern wall rocketed up to 460 feet and then roller coasted in a series of spikes nearly 80 feet high that seemed to dance across the screen! Crossing the sharp peaked ridges that rippled across the edge, the seafloor stabilized at 400 feet as a huge square edge marked hard on the sonar just as we hit the numbers! Dan motored about, plotting the wreck on the bottom 400 feet below. The seafloor had a sharp grade with one end of the wreck in 400 feet and the other in 360 feet. The object seemed to be about 200 feet long, with over 40 feet of relief at points, and soft white returns indicated large ghost nets hung up and floating above the object below. With no wind topside, Dan checked his set and drift and was relieved to find no appreciable current (at least on the surface), and with the dive marshal's approval the next step was to "shot" the wreck.

Dan crept on the wreck and made the call: "Drop it!" A one-hundred-pound weight shackled to a twenty-pound sand anchor on a twenty-foot leash of chain screamed into the depths followed by 500 feet of 1/2" poly line. The morning sun was still low on the horizon; but as the yellow line disappeared into the blue water, we could see we had great surface viz. The two large floats followed by a trail line and smaller ball all went over the side and sat languidly together on the surface...there was still no current. Dan motored around for a half hour confirming the shot was set as we slowly began to kit up.

I splashed first, followed by Frankie and then Evan who had brought a huge HD video camera, nicknamed "Big Blue" from WHOI to document whatever waited for us below. After a bubble check, we made our way down the line, hooting and hollering at each other at the stellar viz. At 160 feet, we hit a thermocline and the warm (70 degree) water dropped markedly to the low 50's but remained clear. Turning and looking back to the surface, we could see the props churning the water, amazed at the near 200-foot water clarity. At 250 feet the shot line began to arc away, and the ever so slight tug of current began to be felt. The ambient light was fantastic, and at around 300 feet dark shadows began to take form below. The yellow shot line angled across the deck and between two large cylinders that I immediately thought were boilers. To my left, dark forms appeared on the deck in a circular pattern that I hoped was a huge paddle wheel. We touched down on the deck at 360 feet and swam forward to check the hook, setting strobes on the line more out of habit than necessity, the viz on the bottom was at least sixty feet in the ambient light. The deck was thick wood with lots of cable and debris spread out, and everywhere there were chain dogfish, hundreds, if not thousands, of them just lying about. The yellow line disappeared straight down a hatch in-between the two "boilers," an actual hole in one!



Looking down the hatch, a stocky wooden ladder descended down into the wreck further than my light could shine. We checked each other, all was good, and began to look around. What looked like boilers were, in fact, large steel cylinders, about six feet in diameter by twenty feet long. One was filled with a large strange white soft coral or hydroid that looked way out of place. The structural members next to the ladder told me what I was already beginning to suspect, but I had to be sure. Frankie and Evan had spread out and their lights played across long wooden beams, cables, pipes, and the odd torn net as we moved over the deck. Reaching a square end of the wreck that was wrapped in a huge floating net, it was obvious that this was no wooden steamship or paddle-wheeler, but a massive barge. As we swam around, we noticed more of the steel cylinders chained to the deck, peered into hatches, and when we came to the semi-circular debris, it was clearly no paddle wheel but the remains of a collapsed deckhouse and wishful thinking. Swimming along the edge of the hull and peering down, it was amazing to see the wreck sitting forty feet off the bottom, with the deck on a 20 degree angle, ready to slide down into the canyon below with a little push. We reconnoitered around the wreck until at 24 minutes it was time to turn the dive. Frankie and I had a great time and enjoyed the dive, but Evan was having camera issues (what else is new?), and we could hear him cursing and grunting. We slowly rolled up the line on our stops, and at 200 feet we tripped a quick release, breaking free of the lower 300 feet of line, the tackle a sacrifice to the wreck. A 20-pound weight was clipped here on the ascent line to keep it taut in the water column. Once free, we shot a red SMB to let topside know we were at 200 feet and now adrift, and all was good. Soon after, our deep support diver, Steve, met us, swapping out tanks and taking our slate topside with our dive details. The next few hours of deco went smoothly, regularly swapping bailout with richer mixes -- first with our intermediate support diver, Dan, and then our shallow support diver, Brandon. At one point, we drifted through a strong upwelling of bitterly cold water with reduced visibility and filled with jellyfish. Thankfully, in a short while the warmer, clearer water returned. Unfortunately, no right whales, tuna, or swordfish came by during our deco, only a few curious mahi-mahi and a school of hungry bluefish. With no niggles or problems, we surfaced and shared with the team the details of the dive. Our mild disappointment at the wreck being a barge rather than a more significant wreck was easily dismissed by the success of the dive and the fantastic conditions we



had. With that site ticked off, we now know where a good wreck isn't, and are already looking at a few other sets of interesting numbers close by.

Searching for new wrecks in deep water is risky business, and you never really know whether you'll discover anything worth finding. But if you don't look, you'll never find anything. On this trip, we didn't find a primo wreck, just an old work barge. But we did document some funky-looking soft coral that caught the attention of the folks at OCEANA, and has their scientists pretty excited. Who knows, we may have found a new species? We also shared all our dive data with the researchers at DAN to create a database of what some CCR technical divers are doing in order to push the line, both with gases and with the decompression algorithms. (Dare I say some of us LIE to our computers???) We all hope that the research we're contributing to will minimize the risk for the next team.

Technically speaking, every aspect of our dive went according to plan. From the bailout carried to the support team splashing and swapping out on schedule and, with the exception of Evan's camera, all of our equipment worked flawlessly. But like a shadow behind us, the risk was always there. Each time we push the line, we must be certain that, if our primary systems fail, we have backup to get back home. Doing expedition dives without adequate planning and realistic bailout is like jumping from a plane with only one chute -- you may get away with it, but WHEN it fails, you're dead.



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RISK ASSESSMENT!

Text and photography by Jill Heinerth

When Richie Kohler asked me to submit a sidebar for his article about the “Tip of the Canyon” wreck, it led to a stimulating discussion about technology and risk assessment. With the tools needed to complete record-breaking dives only a credit card swipe away, technical divers all over the world are experiencing a paradigm shift. While Richie lamented about some of the unprepared but lucky divers he has encountered on deep wrecks, I shared some recent incidents in Florida caves. Whether on wrecks or in caves, there is an upward trend in accidents involving divers who choose to exceed their training and experience.

As instructors, we create a partnership with our students and help them to perfect their diving skills. As role models, we discuss our own mistakes and offer personal motivations for diving. Ultimately, we can assist a diver in their quest for knowledge, but only real-world diving experience, not our short time together in class, will permanently shape their behavior beyond our watchful eyes. We can’t dictate choice. We can only hope that our students carefully consider each risk prior to every dive.

Too Safe for Comfort

In the 1970’s, automakers concluded that anti-lock brakes would reduce the rate of skids and rollovers. With a well-earned reputation for innovative safety features, Volvo automobiles enjoyed increased sales. Soccer moms loaded their kids in the back with the illusion that the new technology would increase their safety envelope. Unfortunately, research has proven that although people perceived their risk as reduced, they actually drove more aggressively.

Like car drivers, when we divers perceive conditions as less risky, we tend to take on more risk. When conditions are unknown and the perils seem great, people tend to act more conservatively.

Running Scared

Modern diving equipment, such as closed-circuit rebreathers and Class-A scuba regulators, has reduced the frequency of gear failures. Many CCR divers log hundreds of incident-free dives. However, most experi-

enced rebreather divers can recount an incident when they realized that complacency had crept into their performance and left them vulnerable to an accident. The lucky ones learn from those experiences. The unlucky ones either quit or die. A certain amount of fear equals a healthy respect for life.

The Alpine Approach

As reliability of equipment increases our range and capability in diving, the lure of the "hero-dive" is hard to ignore. We can go deeper, stay longer, and explore places never seen by man. Rumors spread on Internet forums and dive blogs about new wrecks and virgin cave passages, seducing divers to leave their mark in technical diving history. When planned carefully, exploration opportunities can be rewarding. But ill-conceived or intensely goal-oriented dives often lead to disaster.

Technical divers are often compared to mountain climbers. But the mountain climber that runs up Everest without a tent, pack, or supplemental oxygen, puts more than himself at risk. If he is lucky, he will make a speed record and gain a notch for his summit-belt. If he retreats in a storm, desperation may lead to stealing staged food, tents, and vital oxygen tanks from another team. In the worst-case scenario, some well-meaning rescuer may lose his life in attempts to return his body to base camp.

Climbers on the world's greatest summits now walk past the remains of less fortunate climbers. They stop for a moment of reflection with "Green-Boots" or "the guy from the storm of 1998." If you think the technical diving community has not already reached that phase in its development, think again. Wreck warriors in the northeast U.S. have conveniently left body recoveries for the end of a big dive weekend - and at least seven caves have become permanent tombs for long-range cave divers.



Personal Preparation

As more fixed ropes and guide operations escort unprepared tourists up the face of Everest, we are reminded of the simple fact that when Mother Nature rears her ugly head each climber or diver is reduced to his own capabilities and equipment.

When I certify a student at any level of diving, I ask myself if that person is capable of self-rescue and capable of buddy-rescue in conditions similar to those of their certification level. I can sign them off on their behavior and performance at a given level, but must rely on them to continue to make good choices in the future.

Motivations

Whether it is the environment, camaraderie, or technology, most people start their diving career for good reason - for a love of the sport.

Age and experience should be accompanied by wisdom and a renewed understanding that we are not invincible. My very capable and experienced colleagues and I turn down more expeditions than we accept. The risk is simply not worth the undertaking.

As you develop your skills and increase the size of your gear locker, remember to stay content in your goals and your time frame. Be patient and careful as you choose to increase risk and be content with your participation at any level. If you achieve your goal of the mountain's summit, or the end of the line in the cave, then that is icing on the cake. But no matter the investment in time and money, be prepared to walk away a few feet short of the goal. Ultimately, the only successful expeditions are the ones from which you return.



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Åland

The Pearl of the Baltic

Text and photography by Sten Stockmann

Imagine a dive to a virgin wreck...completely untouched...with the ship's bell, engine telegraph, compass, and steering wheel still in place. Now imagine diving two to three such wrecks every day for an entire week — just half a day's travel from home. Impossible? Obviously, you have never visited the Åland Islands.

The Åland Islands form an autonomous province of Finland that is situated in the middle of the Baltic Sea. It consists of about three hundred islands and some six thousand smaller skerries. Due to its strategic location, shipping and trade have always been the major source of income. Simply combine several hundred years of shipping with a treacherous archipelago, add some clear, cold Baltic water, and presto! You have some of the best wreck diving in the world, and there is plenty to choose from. With more than five hundred known wrecks, the Åland has among the highest density of shipwrecks in the world.

No article on diving in Åland would be complete without mentioning the three-masted barque *Plus*, which lies just outside Mariehamn harbor. The 70-meter long *Plus* was built in 1885 by Blohm & Voss in Hamburg, and had a Net Register Tonnage of 1.117.

The ship met its fate on a bitter cold, snowy December night in 1933 when the crew, eager to get home for Christmas, tried to get the vessel into harbor without piloting. The ship was tragically lost only 330 feet (100 meters) from land, and became a grave for fourteen of the sixteen men onboard.

As the wreck is situated so close to the harbor, and protected by surrounding islands, it is possible to dive in almost any weather condition. The hull is intact with a lot of details to be seen. The depth varies from 55 feet (17 meters) to 104 feet (32 meters), and is thus accessible for any diver with moderate experience. Visibility depends on the season, from 6 feet (2 meters) to 50 feet (15 meters).



Nearby, just in front of the Marhällaren Lighthouse, lie the wrecks of *Nederland* and *Kaskelot*. The *Nederland* was a Dutch river barge that sank in 1917 on its way from Finland to the Netherlands while carrying stones for road pavement. This is an easy dive at a depth from 65 feet (20 meters) to 78 feet (24 meters), with usually good visibility.

Only a 200-foot (60 meter) swim away, and a few meters deeper following a pre-laid guideline, is the ketch *Kaskelot*. This was a two-masted private sailing boat, which sank in 1970 after hitting an underwater rock. Although both wrecks are fairly small, the possibility to explore two wrecks on a single dive makes it a worthwhile visit for divers with any level of experience.

For the more experienced diver, Åland has even more to offer. A two-hour boat ride south of Mariehamn brings you to the wrecks of the *S/S Helge* and the *Balder*.

S/S Helge

The *S/S Helge* was built in 1869 in Scotland, completely of wood. The steamer sailed between Finland and Sweden during World War I until she was boarded by the German submarine *U-26*, south of the Flöttjan lighthouse. Since the ship was from Finland, at that time part of the Russian grand duchy, and carrying gunpowder and other contraband, she was ordered to be sunk.

After the crew had been removed to the lifeboats, the U-boat crew detonated charges amidships and astern. The ship sank in a matter of minutes, finding its rest at the sea floor 177 feet (54 meters) below. Even though the destruction was devastating, *Helge* still has an intact hull, measuring 200 feet (61 meters) in length and 28 feet (8.5 meters) in width.

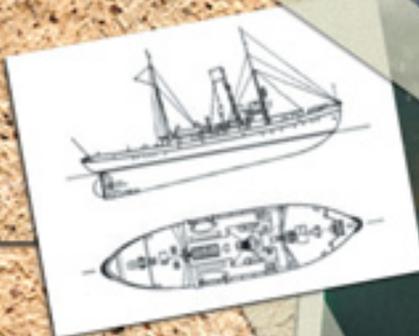
The wreck was discovered in 2001, and can again be admired by the advanced trimix/technical diver, a true time-travel with many fine details preserved.



Heading out from Mariehamn for another great day of diving. Clockwise Mikko Vormala, Thomas Stenius, Mikko Vuorela, Alastair Ansell and Toni Leskelä

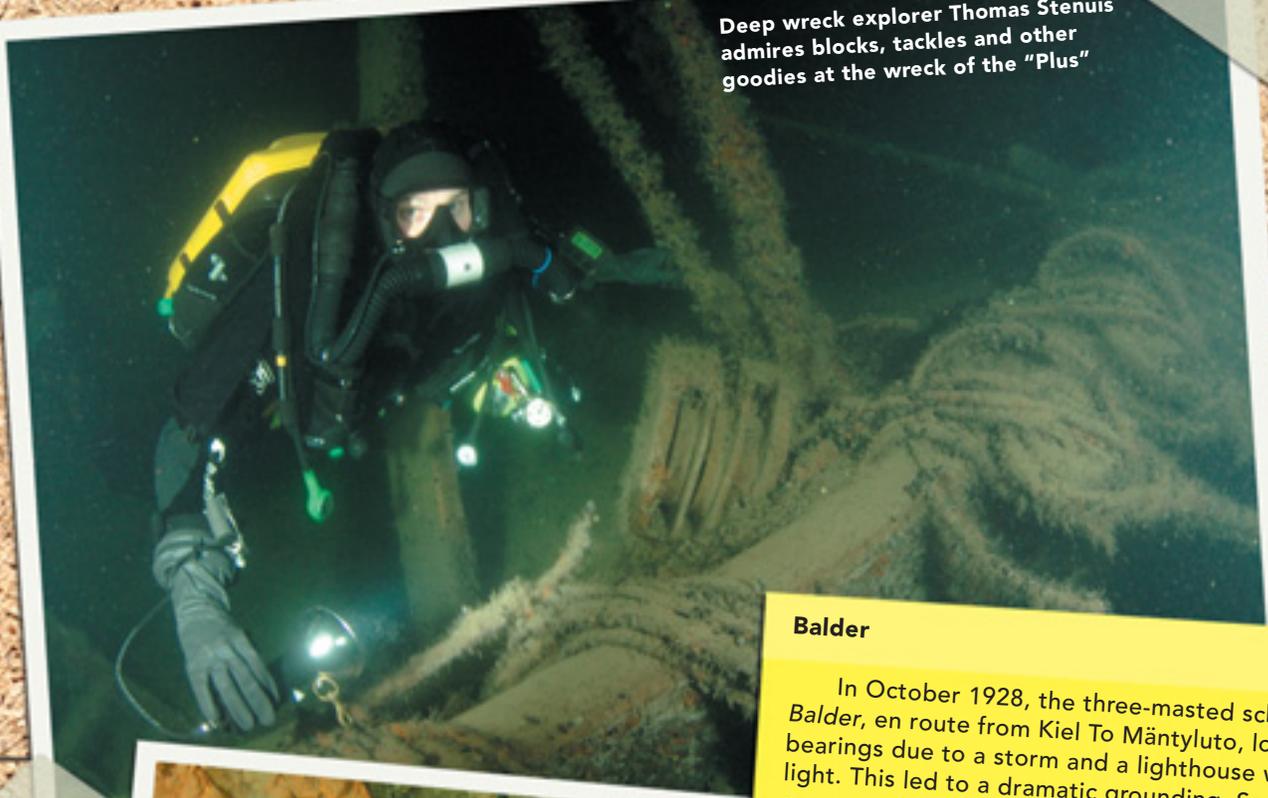


Technical diver, Thomas Stenius poses beside one of the masts on the wreck of the "Plus".



Diver Mikko Vormala takes the plunge into the crisp November Baltic Sea

Deep wreck explorer Thomas Stenuis admires blocks, tackles and other goodies at the wreck of the "Plus"



Balder

In October 1928, the three-masted schooner *Balder*, en route from Kiel To Mäntyluto, lost her bearings due to a storm and a lighthouse with a faulty light. This led to a dramatic grounding. Some of the crew members managed to get the lifeboats launched, but they drifted for eleven hours before being saved. This site remains the grave of one of the ship's crew, so please treat it with respect.

The ship was built in Lemland in 1922. She was 147 feet (45 meters) long, 36 feet (11 meters) wide, all in wood. The ship stands on the sea floor at 213 feet (65 meters), looking just like she did in 1928.

Since the ship was discovered as late as 2001, all equipment is preserved on board to be seen and enjoyed. The visibility is more than 33 feet (10 meters) in this area.

Hindenburg

The *Hindenburg* was an icebreaker in the Royal German navy. In 1918, she served both as an icebreaker as well as a protection from mines, as the Åland waters at that time were heavily mined. Only a short distance from Eckerö, the *Hindenburg* hit a mine, which blew a big hole in the bow. The ship took on water rapidly, and three men from the crew lost their lives.

This wreck is truly unique, 167 feet (51 meters) long and 42 feet (13 meters) in width, and an exclusive visit that is conducted only twelve times a year, due to restrictions. The depth is between 121 feet (37 meters) to 154 feet (47 meters), and has many fascinating details for the adventurous diver.



Diver Mikko Vuorela examines one of the telegraphs on the wreck of the "Hindenburg"

Logistics

We stayed with Dive Oxygene (www.divealand.com), who has a very nice dive operation set up in the middle of Mariehamn. The dive centre is an IANTD Fill Station Centre, and supplies nitrox, trimix, argon, and O₂ for your technical diving needs, and even has an 80,000-liter air bank to speed up the mixing. It is a mere 250-foot (75 meter) walk down to the boat.

The dive centre also offers dormitory-style accommodation for up to ten people. The facilities include a well-equipped kitchen where you are welcome to prepare meals, an equipment room for personal gear and equipment, and, naturally, as we are in Finland: a sauna section with showers.

As the airfield in Mariehamn is only serviced by small aircraft, the best way to reach Åland is by ferry from Sweden or Finland. April to November is the main diving season, as a large part of the Baltic Sea freezes solid in winter.

Sten Stockmann is a 36 year old Finn who has been diving since 1987, and became involved with technical diving in the mid 1990's. Besides cave diving and underwater photography his main interests are exploring and documenting the wreck-littered Baltic sea. Sten can be contacted at sten@elisanet.fi

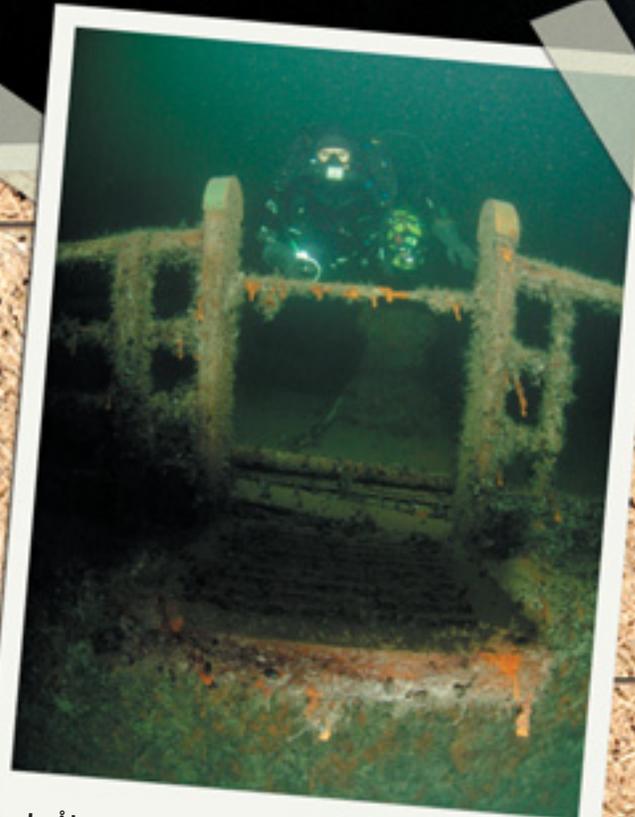
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Wreck diver, Mikko Vuorela on the shipwreck "Helge"



Mikko Vormala admires the wheel of the shipwreck "Balder" at 196ft/60m



In Åland the "door" is open for great wreck diving experiences for all levels of divers. Explorer Thomas Stenuis poses in the background.

The Reluctant Closed Circuit Diver

**Text by Paula Towry
Photography by Curt Bowen**

Let me tell you my story.... I started diving in January 2005 with a dive shop called Adventure Scuba in Chantilly, Virginia. I took to diving instantly. It was a dream come true for me. I spent all my growing up years fantasizing about the world beneath the sea. I was glued to the television every year for Discovery Channel's Shark Week. I never missed an underwater special, no matter the topic. I simply did not have the opportunity to do anything about it until three years ago. I did my check-out dives in Nassau, Bahamas. I seemed to be a natural. I was the fearless one. I was the first one off the boat at every site. My instructor, Larry, literally held me back by my tank yoke to make sure my gear was in order before letting me take that giant stride. I dived at every opportunity I had, in every place I could, and, pretty soon, I realized that I had been everywhere from Juneau, Alaska, to Santa Cruz, California, on the West Coast and Bethlehem, Pennsylvania, to Honduras on the East. I took every "next" course and soon had seven or eight ratings under my belt. I had settled in to being a very relaxed, very comfortable open circuit diver. But....

I had the same dive buddy through it all. He took his first course with me and we were lock step throughout all our training and traveling. Until... he began to notice rebreathers. Sigh. He was hooked. We had a running dialog all along about what our goals in diving were. We were in agreement that soon we would be turning a corner and become technical divers. We both wished to see sights that are beyond recreational limits. I naturally intended to go there on doubles with staged cylinders along the way. My buddy, Paul, did not. He read everything he could get his hands on about rebreathers. He started spending hours a day monitoring the web site Rebreather World. Through that very web site, he bought a semi closed circuit rebreather from a doctor in Lakeland, Florida, and started





making plans to do some transitional training. He asked me to join him. I said yes; not because I intended to EVER dive one of those voodoo units, but because I thought that I should know my buddy's system.

So, we headed down to Crystal River, Florida, to check out in the semi closed circuit unit. I studied the textbook with much skepticism and no small amount of trepidation. I consoled myself with the fact that I was already a comfortable diver. How different can it be? We had a full day of classroom, and headed out early the next morning to begin the dives. Let me tell you just how different it can be! There is nothing quite like the feeling you experience the very first time you breathe on a closed circuit (or semi closed) unit. It feels NOTHING like open circuit at all. I couldn't even tell whether I was still breathing. I couldn't hear myself. The oh so comforting sound of open circuit exhaust was gone! I felt like I couldn't exhale fully. I struggled to orient myself in the water. To top it all off, I felt like I had a Volkswagen on my back! I could not do it. I called the dive. I called the training. I went home in disgrace. I had failed; utterly and completely failed to see the goal through. I resigned myself to being a mixed team. At least I knew Paul's unit and the science of what he was doing. I could assist him if he ever needed me. We dived like that for some time. We even made a trip to West Palm Beach to dive with the very same doctor who had sold Paul his unit. Then, just when I was lulled into a false sense of security, Paul discovered fully closed circuit rebreathers.

He knew that he would not settle on semi closed circuit forever. He only intended to use it as a stepping-stone to the full transition. Sigh. So, once more into the fray. Paul, again, bought a rebreather from a diver on Rebreather World. Now he had a fully closed unit. He needed training. He asked me to join him. I agreed. What was I thinking??? I can't say. I think I've blocked it out. We headed to Miami this time for a fully closed circuit course. I read the textbooks in advance. I knew the unit pretty well by now. Paul had set the course up with the president of IANTD, Tom Mount. He has an incredible reputation as a diver. I began to forget my earlier bad experience in the hopes of liking this unit. I did well in the classroom. I aced the written test. I really understood the science of closed circuit diving. This was, after all, my second rebreather course. So, off to begin the dives. I had borrowed a unit to train on. I had no say about its configuration. This time, I only felt like I was diving with a refrigerator on my back instead of a VW Bug. Once more, I could not master it. I had one dive on it... in a pool! I managed to stay down for forty-five minutes; but let me tell you, I spent that forty-five minutes praying that I would not die. The automatic diluent valve had been disconnected so there was no automatic addition. I bottomed out the counterlungs on descent and managed to gulp, scratch, and claw my way through the dive. I resisted the urge to surface and call it off, but it took every ounce of self-control I possessed. I looked over at Paul who was happily diving and experimenting with his new and beloved unit. I could envision myself throttling him. Why was this so easy for him?



What was wrong with me? I did not call that dive off, but I did back out of the rest of that course. I went along on all of Paul's training dives as his open circuit buddy and stared at the floor as he received his CCR rating. Ok. I had had it. No more. We would be diving as a mixed team from now on. I would stage twelve cylinders and carry double 120's, if I had to. It was worth it. Wasn't it?

We are both in the travel industry. We went to DEMA 2007, and ran across the self-same doctor who had sold Paul his rebreather. His name is Doug Ebersole. Oh, and did I mention that he is a rebreather instructor, too? One might suspect a conspiracy, at this point. As we stood talking on the show floor, Paul suddenly said to Doug, "Hey, Doug, while we're down here, could you do a KISS unit experience with her at your pool?" I couldn't believe my ears. Paul had just asked this nice man to put me on yet another closed circuit unit. Could he be serious? Did I hear him right? I noticed the two of them looking at me, waiting for something. While I had retreated to a panicky place in my head, Doug had said yes and they had arranged all the details. They were simply waiting for me to ok them. I was stuck. I was on the spot. What could I say? As I'm trying to find a tactful way of saying no (and throttling Paul) I find, to my horror, that I am actually nodding and smiling to Doug. Could it be? Did I just commit myself to another rebreather dive? I thought about being sick. I thought about running away. I thought about committing murder. ANYTHING to get me out of this! No dice.

The next morning found me on my way to Lakeland to do Sport KISS experience. I tried to think of something else all the way there. I went to Off The Wall Adventures where I would have this horrendously bone-chilling experience. Doug met me with the unit assembled and ready to go. As soon as we shook hands he said, "Ready?" No! I wasn't ready! I was nowhere near ready! Didn't I even have time for a last request? How about a prayer? I walked to the restroom to change in a fog. I couldn't keep my thoughts straight. I met Doug out by the pool and he helped me into the unit. I slid into the water and just put my face in. I was using all my powers of concentration on breathing like a person instead of a moray eel. Doug descended and beckoned me all the way down to the staggering depth of four feet! I tried. I really did. I couldn't do it. I physically could not do it. I popped up and Doug came up to ask what was wrong. I told him I couldn't get down. What I did not say was that I was so scared that my lungs were blown up to approximately twice their normal volume. He frowned and went to get more weight. He is a doctor. I suspect he knew the real problem, but he acted like more weight would fix everything. He smiled and gave me four extra pounds. I sank. I couldn't help it. I had to. I swam to the deep end and descended all the way. I could not believe it. I liked it! I actually liked it! He gave me the "You ok?" sign. I said yes. I meant it. I was okay. I swam around to test the unit's buoyancy. I began to relax. I tried it in different orientations. It was all good. The dive only lasted for twenty minutes or so. When we came up he asked me what I thought. I told him that this was the



first time I had ever smiled about a rebreather! I began to see its appeal. I told him that IF I decided to get my KISS rating and IF I passed the class AND still liked it, I would buy a Classic through him. I wanted him to have every incentive to work with me. I left his shop on cloud nine. I had done it. I had a successful dive on a rebreather. I did not think it was possible.

I mulled the idea over for months before finally deciding to make the switch. I sent him an email asking for his schedule and selected training dates. I selected the very last day of May into the first couple days of June. By the time I got there, I was nervous again. It had been six months since my experience. The first day of diving came too quickly. As I stood at the water's edge with Doug already in the water, I froze. The unit was on my back. The breathing loop was in my mouth. I didn't like it. I could not make myself take that giant stride. He asked, "What's wrong?" I just shook my head. He said, "Doesn't feel good, huh?" I shook my head again. He said, "It won't until you're in the water. Jump in open circuit. We'll switch at depth." This sounded like the worst plan of all to me. Switch at depth? No way is a mega familiar open circuit mouthpiece leaving my mouth once I get down there! I mutely obeyed against all my reason. I had to start trusting sometime. I descended in a cloud of bubbles. I got to the platform where he was

waiting. He asked me what my PO₂ was. I tried desperately to remember the hand signals he had shown me on the surface and fumbled out something barely distinguishable. He understood. He grabbed my BCD and let all the air out. He pulled me down to a stomach down position on the platform and handed me the breathing loop. I took it from him before I changed my mind and made the switch. Nothing happened. I didn't die. I just lay there and kept breathing like normal. Wow. Who'da think? He let go of me and backed away. I was doing it. I was on a real dive, on a real closed circuit rebreather, not dying. I tentatively swam around, and still didn't die. I realized I could do this thing.

Now, I'm not saying that the next few days were worry free. We still had some issues to handle but we did it together. The end of this tale is a happy one. I passed the course. I became a certified, fully closed circuit rebreather diver. Better than that, by the end of our training, I was truly comfortable on the unit. True to my word, I bought a KISS Classic through Doug. I received it four days ago. I can't believe it. I am won over. I already have two dive trips scheduled within the next two months. My thinking has completely changed. I am actually excited about the trips. I can't wait to get some real time on it. Thank you, Doug. And thank you, Paul. I could not, would not, have done it without both of you.



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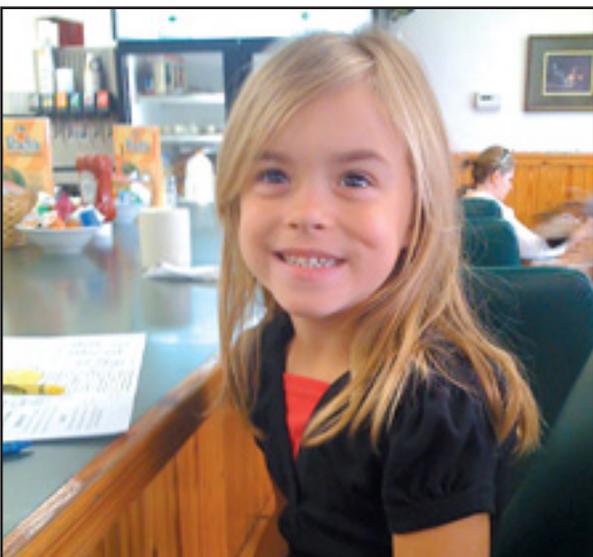
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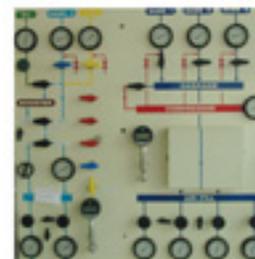
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