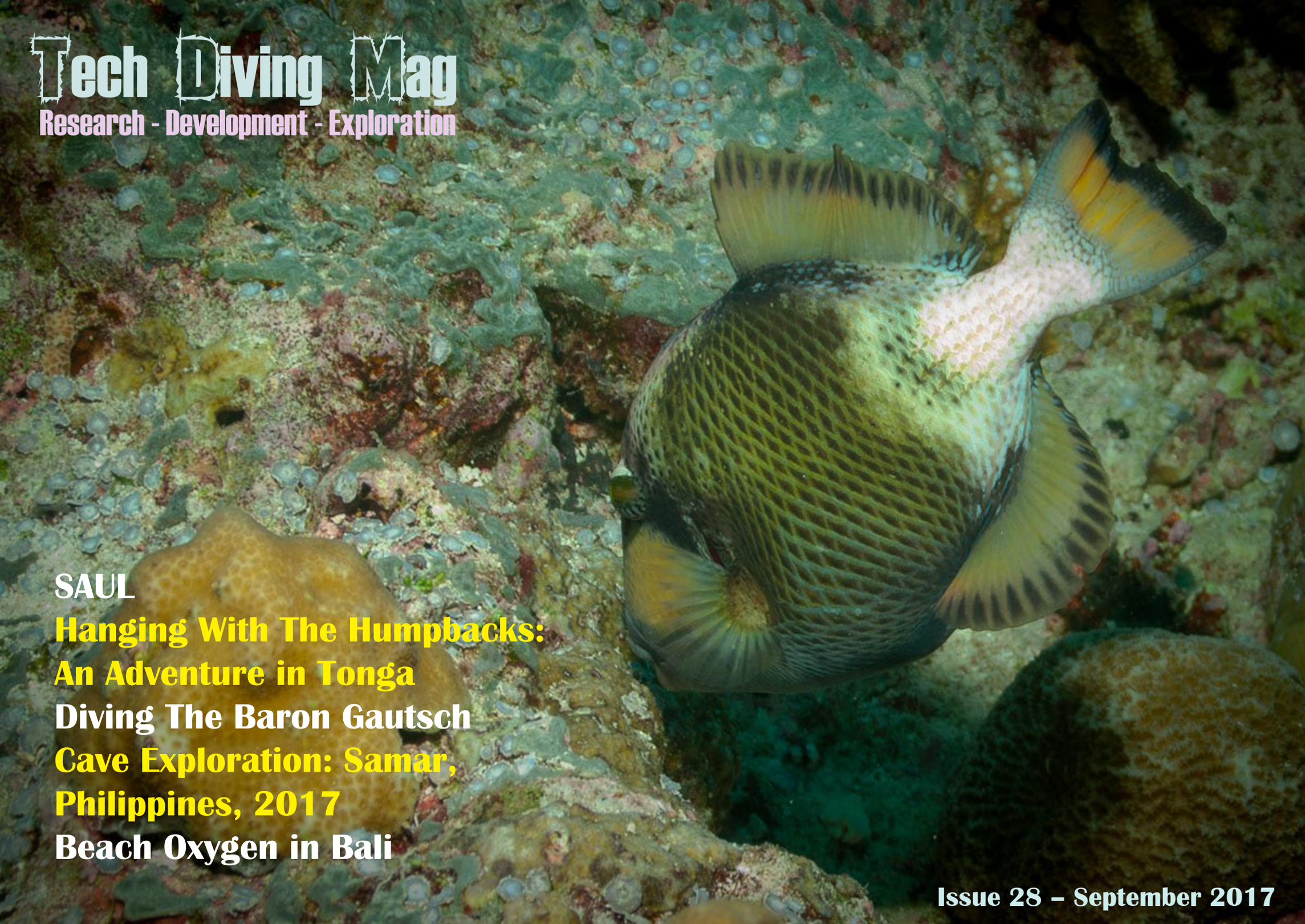
Tech Diving Mag

Research - Development - Exploration



SAUL

Hanging With The Humpbacks: An Adventure in Tonga

Diving The Baron Gautsch

Cave Exploration: Samar, Philippines, 2017

Beach Oxygen in Bali

Issue 28 – September 2017

Contents

Front cover image © T. Timothy Smith.

Editorial

Welcome to the 28th issue of Tech Diving Mag.

A quick reminder: as an endeavor to share knowledge and experience, Tech Diving Mag finds it inevitable to bring up controversial issues. Information published by Tech Diving Mag are always obtained from sources believed to be reliable. However, Tech Diving Mag can not guarantee neither the accuracy nor the completeness of any information published in its issues.

There's some good news! Due to the global demand and to avoid the sky-rocketing shipping costs, Best Publishing has made *Deep Into Deco* available through Ingram. Dive shops and bookstores throughout the globe can now order the book at Ingram.

If you've ever wanted to get an article you've authored published to an audience of thousands of technical -and wanna-be technical- divers, it's about time to make this happen. You're always welcome to contribute a piece and/or some photos. The guidelines could be found at www.techdivingmag.com/guidelines.html.

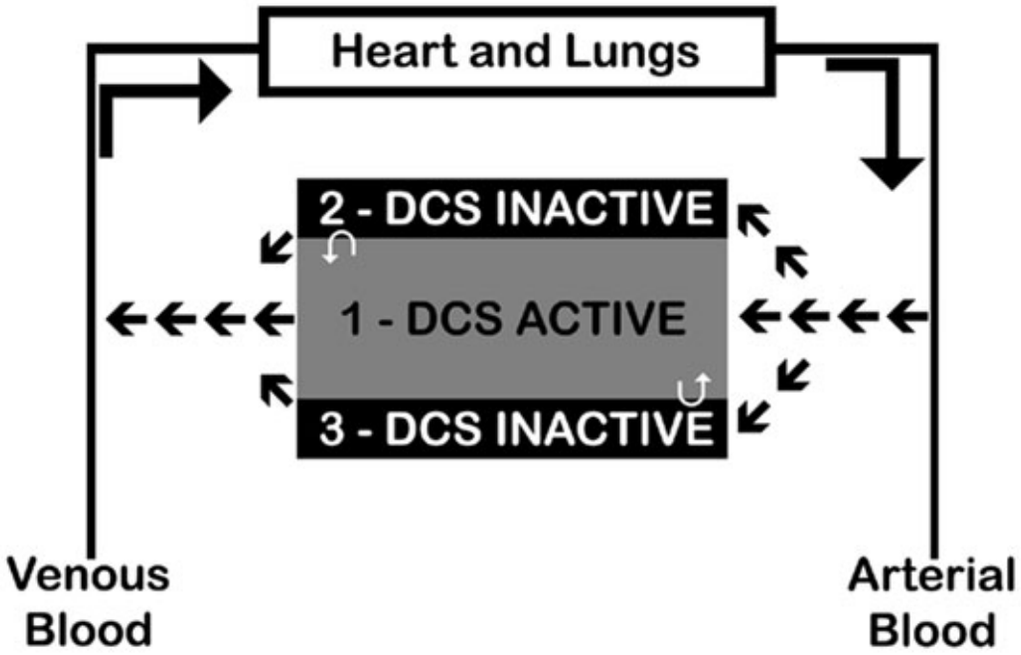
This is very much your magazine. If you want to share some views, drop a line to asser@techdivingmag.com. And please subscribe to the newsletter at www.techdivingmag.com/communicate.html to receive a brief email reminder when new issues are available for download.

Asser Salama
Editor, Tech Diving Mag

In 2007 Dr. Saul Goldman proposed a new model based on the interconnectivity of body tissues.[1] The concept behind his model is that dissolved materials (drugs, for example) could diffuse from one tissue to another. This is an established concept, and our current understanding is that it holds true for inert gases like nitrogen and helium.

What is new with this model? The Kidd-Stubbs model is already diffusion-limited and involves four compartments connected in series. The SAUL "general" model presumes three compartments interconnected in parallel. The difference is that unlike Kidd-Stubbs, all compartments in the SAUL model are connected to the blood flow — in parallel. However, only the central compartment is well perfused. Unlike perfusion-limited models, the peripheral compartments are connected to the central, well-perfused one — in series. The risk of DCS is carried entirely by this central, well-perfused compartment, while the peripheral compartments are not, in themselves, risk bearing. They only influence the risk of DCS indirectly by acting as reservoirs of dissolved inert gas.

When the body is on-gassing, the peripheral compartments act as overflow tanks. When the off-gassing phase starts, the sink becomes a source and the "overflow" gas diffuses back into the risk-bearing compartment. For example, a fatty tissue is not bearing the risk of DCS in itself. However, it can supply one of the nerve or the connective tissues next to it with dissolved inert gas via diffusion during the ascent, this increasing the receiving tissue's risk of DCS. On the other hand, in the Kidd-Stubbs original model all four compartments bear risk of DCS. The new derivative has risk associated with only the two outermost compartments of the series. Goldman claims that when an explicit risk is put into more than one compartment, the prediction capability of the model deteriorates.



SAUL interconnected model

The SAUL model is mainly about gas-exchange dynamics. Currently, two versions of SAUL exist: SAUL ICM (interconnected model) and SAUL ICBM (interconnected bubble model). Adding microbubbles to the model produces minor improvements. The most intriguing question about this model is does SAUL really stand for Safe Advanced Underwater aLgorithm, or is it simply the modeler's first name?

References

1. Goldman S. A new class of biophysical models for predicting the probability of decompression sickness in scuba diving. J Appl Physiol. 2007; 103(2):484-493.

Excerpted from *Deep Into Deco: The Diver's Decompression Textbook*. The title is available at:

https://www.bestpub.com/books/scientific-diving/product/428-deep-into-deco-the-diver-s-decompression-textbook/category_pathway-42.html

http://www.amazon.com/Deep-Into-Deco-Decompression-Textbook/dp/1930536798

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"*Deep Into Deco* is a stimulating read which covers almost every facet of diving from breathing to technical decompression. It is well referenced and dives into (forgive the pun) great detail concerning the past and present of diving theories. I recommend this book for all divers from novice to technical expert because Asser Salama makes even the most difficult topics seem easy and understandable. No diving collection is complete without this super overview book. I will keep mine on the coffee table as a discussion piece."

—Commander Joseph Dituri,
US Navy Saturation Diving Officer (ret) and Vice President of IANTD

"This book is long overdue. And it's worth the wait. What Asser Salama has accomplished with this book is remarkable. He has taken that early history of experimental trial and error and produced a stunning reference text that brings the science into sharp focus."

—Bret Gilliam, founder of TDI

"Asser's book is the best general overview of decompression modeling I have seen. The information it contains is relevant to divers of all levels, from the occasional sport diver who wants to know more about how their dive computer works to the technical diver planning extended decompression dives. It certainly is a welcome addition to my dive library!"

—Jeffrey Bozanic, PhD, author of *Mastering Rebreathers*

ASSER SALAMA, a technical diver and instructor, is founder of *Tech Diving Mag* and developer of Ultimate Planner decompression-planning software. He has a bachelor's degree in engineering and a master's degree in business administration. A software developer with an interest in decompression modeling, Salama plans to implement computational algorithms based on credible research papers to prevent some pioneering work from fading into academic obscurity.

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Hanging With The Humpbacks:

An Adventure in Tonga

By Bret Gilliam

Whales have fascinated me since I was a young boy watching them from fishing boats in Maine and commercial vessels in the Caribbean. Although my initial interest was stimulated by reading Melville's *Moby Dick* when I was just eight years old, the anti-hero in that tome was a revengeful white sperm whale. And sperm whales were not commonly seen back in the late 1950s… primarily because their habitat regions were not widely known and they had no particular interest in interacting with humans since they were still hunted worldwide.

But the gregarious humpback whale was extremely social and seemed to take delight in making contact during the summer season when they were gorging themselves on sand eels and krill as they beefed up before migrating from the Gulf of Maine back to the calving and breeding grounds on the Silver Bank located between the Turks & Caicos islands and the Dominican Republic. These protected reef areas were ideal for the females to give birth and for mating. Most of the humpbacks favored the Silver Bank but many also traveled into the Virgin Islands and other areas of the eastern Caribbean.

I've been diving with them since January of 1971 for in-water encounters and filming. We learned early on that scuba was not really an option since the bubble exhaust caused the whales to immediately abandon us. So free diving was our method of getting close encounters. I grew up snorkeling, first as a kid in 1959 when my naval officer father was assigned to Key West. I also started scuba diving the same year when participants were considered to be more than a bit odd by casual observers. Back in those days, anyone who would deliberately descend to ocean depths with nothing but a steel tank on their back and a strange double hose device to breathe through was lumped into the same group of deviants as skydivers and those attempting to summit Mt. Everest. Nut cases who needed therapy was the general conclusion.

Mother and calf ascend with me from a depth of 80 feet. I had been free diving down to make eye contact and get their curiosity stimulated. They have little contact with humans who dive deep and join them in the deeper depths. My dives were running between two to four minutes. On the third dive, the calf broke away from his mom and came over close to "eyeball" me from less than three feet away.

But I was initially content to simply view the ocean from the placid safety of the surface and later began free diving to spear fish and catch lobsters. By the time I was 12 I could easily hit 60 foot depths and hold my breath for a couple of minutes… more than enough to distress my mother when I disappeared for what seemed to her to be an eternity. And, of course, she was certain that I'd eventually be eaten by a shark since all such predators then were labeled as certain death if you happened to get within a mile of one. Nonetheless, I managed to survive.

In 1971 I began my professional diving career when I was assigned to an experimental deep diving U.S. Navy team in the Caribbean filming fast attack submarines as part of the Cold War era tactics of trying to make them undetectable by Soviet ballistic missile subs. One day we were doing a long deco hang in the Virgin Islands trench (that had depths over 10,000 feet) following a dive to nearly 300 feet when a pod of humpbacks cruised by us and detoured to give us a look. I thought I'd died and gone to a special heaven!

The leviathans simply enthralled me and further encounters resulted that only increased my interest. A discussion ensued with a NOAA scientist who explained the migratory habits of humpbacks and that a huge population would be found on the Silver Bank between January and April… only about 400 miles to the northwest. So I made up my mind to visit somehow. Sure enough, I had some time off and a yacht owner was looking for some experienced crew to take his vessel to Ft. Lauderdale. I corralled three other mariners and we signed on to do the delivery with permission to detour en route and visit the whale grounds of the Silver Bank.

Upon arriving we anchored and were surrounded by scores of humpbacks spouting, breaching, and generally cavorting within a few feet of the yacht. We got five days of free diving and a college education in how to best interact. The whales cruise on the surface, generally headed upwind that can make for a tough swim to keep up. We quickly figured out that getting ahead of them in our inflatable and shutting off the engine to let them intersect our position as we lay quietly on the surface in snorkeling gear was most efficient. Sometimes they'd immediately engage but the mothers tend to be quite cautious and protective and they'd do slow descents to about 80-90 feet and just hang motionless.


A male whale begins his dive for a deep descent.

We would then free dive down and maintain a respectful distance while making eye contact directly while remaining motionless and trying to blend in. We'd manage a few two to three minute dives and this stimulated the whale's interest, curiosity, and established a bond. They then would follow me back up to the surface and maintain contact sometimes for up to an hour or so.

These magnificent animals get up to 55 feet in length and over 50 tons. The calves are born at about 8 feet and less than 200 pounds and then begin a nursing regimen that has them rapidly growing. I've since made over 30 trips to the Silver Bank. Along the way, my work had been published internationally as well as documentary films for such productions as *National Geographic Explorer*, *Discovery*,*Travel Channel*, *BBC*, etc.

And as much as I've enjoyed my relationships with the North Atlantic humpbacks, I've always wanted to visit their relatives in the South Pacific and that led this year to an August two-week trip to the Kingdom of Tonga. Located east of the Fiji islands, it's one of the best places in the world to catch up with humpbacks.

My host was the 120-ft. motor sailing vessel *Nai'a* from Fiji that devotes a portion of their annual schedule to operations with the whales in Tonga. The crew is excellent and chef extraordinary. Some of the best cuisine and food service I've ever experienced on a liveaboard vessel anywhere! (Check them out at: www.naia.com.fj)

The *Nai'a* guides used some different protocols to try for encounters but I found my proven methodology to work better and let me get close up encounters from only a few feet away… all with the mother's approval and welcome. Again, the cycle of initial deep free dives to 60-90 feet for up to three or four minutes established the curiosity and "fellowship" that had worked for me for 46 years on the Silver Bank and Caribbean islands.

The Tonga islands are beautiful and the people pleasant and friendly. But it's not an easy place to get to with flights only coming in from Auckland, New Zealand or Nadi, Fiji. And a schedule that is more than a bit erratic at times. It's worth the effort for the whale experience.

Enjoy the gallery of images and I hope you may be motivated to seek out the company of these special animals yourself sometime in the future!

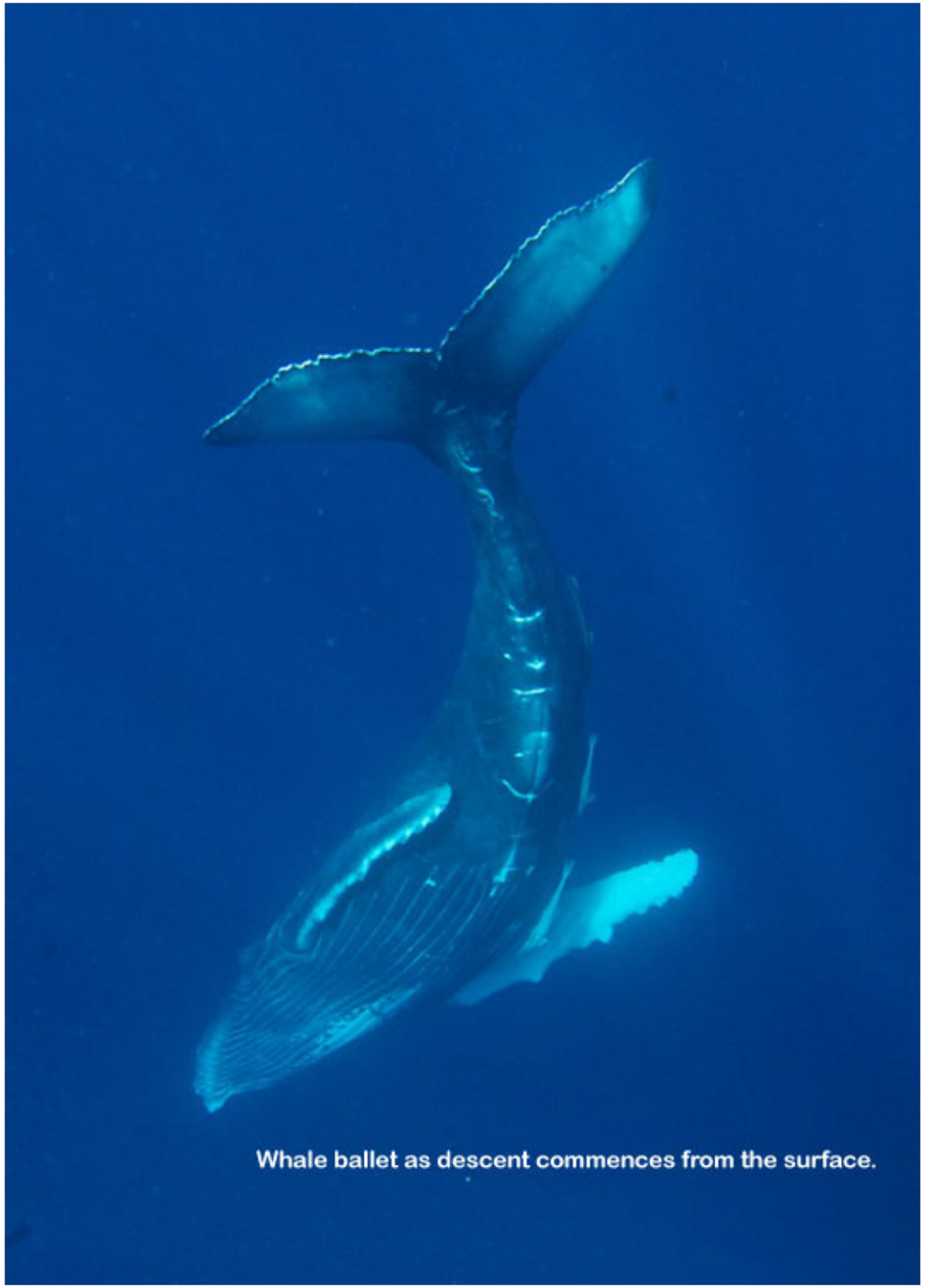
A beautiful early morning Tonga sunrise cascades in multi-colored layers.

This calf descends with me to rejoin his mother in depths of about 90 feet. He always remained close to me and maintained eye contact all the way. Then hung motionless at depth with me for nearly three and half minutes.

Mother and calf humpback whale in the isolated Tonga islands. I shot this while snorkeling within about two feet of them. We'd been interacting for a while and they seemed fascinated that I could keep up with them. They were even nice enough to occasionally slow down and let me catch my breath.

This calf approached me when I was hanging at about 70 feet holding my breath and became fascinated. He swam over close and circled me as his mother watched approvingly. When I began my ascent after about three minutes, he followed me all the way to the surface and came within inches of my camera lens. You can just see his mother below him in the depths.

Frolicking male at the surface trying to impress the females. Doing a series of "roll overs" here.



Whale ballet as descent commences from the surface.

Male humpback gives a tail wave during surface activity.

A pod of four males engage in aggressive surface activity to impress the females. Their behavior includes breaching, tail waving, forceful pectoral and tail slaps that can send splashes 20 feet in the air.

This calf approaches me within about four feet and then circled me for ten minutes.

The 120-ft. Nai'a was my host vessel for nearly two weeks while in Tonga. This is the only liveaboard vessel in Tonga.

Female humpback on the surface. I shot this from inches away from the pectoral fin as we swam together.

Diving The Baron Gautsch

Text by Mario Hauser

Photos by Güunther Wedermann

Where: Croatia / Istria / Brioni

How: CCR (Revo) / dry suit

Who: Alpen Trekkies Tirol / Mario Hauser (chairman) & Günther Wedermann (vice chairman)

Dive base: Triton Diving (Vrsar / HR)

Duration: 70min (runtime), 40min of which at the wreck

Conditions: Light current at the wreck running bow to stern, good visibility at the wreck and perfect visibility in the wreck

The Wreck

The *Baron Gautsch* was built at Gourlay Brothers & Company shipyard in Dundee (Scotland) and was launched on May 3, 1908. On June 16, 1908 the *Baron Gautsch* started her maiden journey; Triest was her home port. The *Baron Gautsch* operated under the Austria-Hungary flag and was named after the minister of the interior Paul Gautsch (Baron of Frankenthurn). The passenger ship *Baron Gautsch* and her sister ship were built to ship the route south of the Austrian Riviera along the coast of Istria and Dalmatia (today's Slovenia and Croatia).

Length: 84.5m
Breadth: 11.64m
Draught: max 7.5m
Measurement: 2069BRT / 862NRT
Engine: 3 cylinder steam engine with 3 oil-heated steam boilers
Power: 4600 PS (3383kW)
Top speed: 17kn (31km/h)
Propeller: 3

After the beginning of WWI, the *Baron Gautsch* was under the order of the K and K navy. On August 11, 1914 she ended her service and was handed over to Austrian Lloyd.

The Sinking

On Thursday, August 13, 1914, the *Baron Gautsch* started her first regular passage as a passenger ship since the beginning of the war. Around 11 o'clock, the ship left Veli Lošinj (Dalmatia) to Triest. On board there were 66 members of the crew and 240 passengers. Captain Paul Winter was in command; second officer Tenze was supposed to stand guard after the officer in command went for lunch.

The *Baron Gautsch* went with direct North course which brought her closer to the Istrian coast than was ordered by the navy. Mines where placed along the coast in which the *Baron Gautsch* was now stearing.

The minelayer *Basilisk* saw the passenger ship at the Brionic Islands stearing directly into the zone of danger and sent warning signals which were either not recognized or not understood. In the last moment, the danger was recognized on board the *Baron Gautsch* and the rudder of the ship was reversed, but then the ship was already in the middle of the mine field.

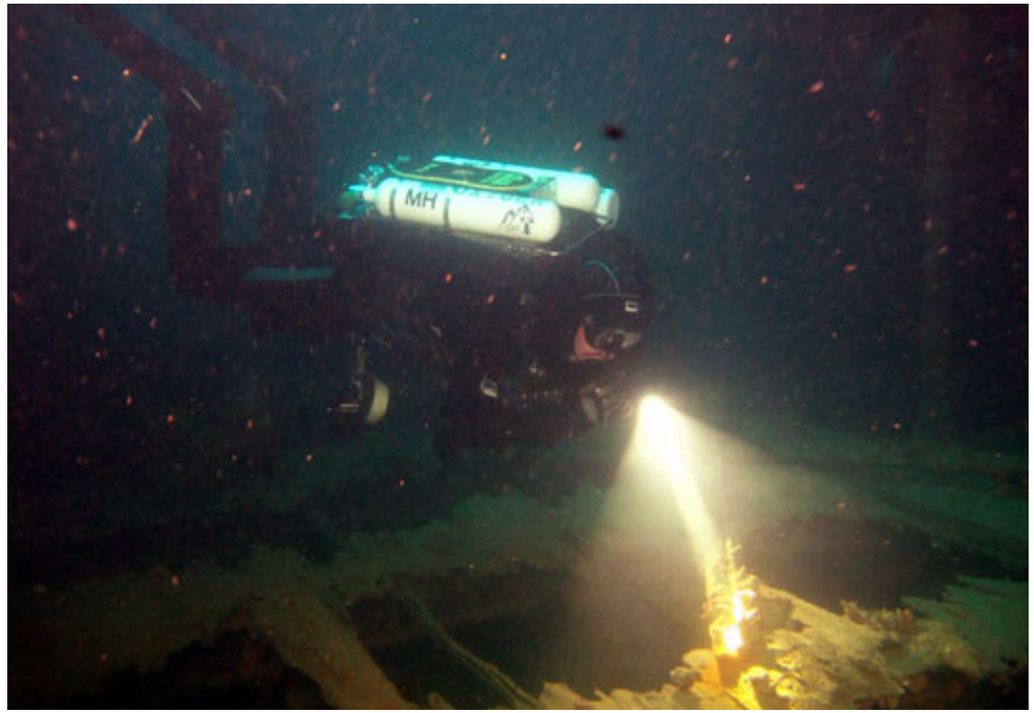
An enormous explosion on portside tore open the side of the ship and made the steamer shake. The *Baron Gautsch* turned portside and quickly filled with water. She was soon too heavy to balance herself. It took her only 7min to capsize and sink.

The Austrian-hungarian destroyers *Csepel*, *Triglav* and *Balaton* were in proximity to the *Baron Gautsch* and came to rescue the people on

board. Together they were able to save 159 people from the water. 147 passengers and members of the crew, mainly women and children, died.

The Dive

On July 6, 2017 we (Mario H. and Günther W.) met at Triton Diving dive base in Vrsar at the camp ground Osera. The managers of the dive base (Matthias Hanuschka, Barbara Leth and Ivan) are long-standing friends and also board members of Alpen Tekkies Tirol. In the very well equipped dive center, which also provides for technical divers, we checked our rebreathers (Revo), stages (bailout) and various other equipment. We talked through our dive plan and put the equipment and our camera (Canon G11) into the zodiac. When we arrived at the wreck, our wish was granted and we moored at the bow; we again checked our equipment and began the dive. We dove down to the bow of the wreck along the rope and entered the wreck on the starboard side through an opening (1.5m x 1.5m) at about 34m depth. From there we went into the salon were we could still surmise a few relicts (stool of a piano), but the salon is already very aged. Through the salon we went along the bow side of the ship towards the rear, we passed the cabins were we could still see bathtubs etc. Also a forkbeard visited us there. At the end of the cabins we dove to the left and entered the impressive engine room; the steam engine, boilers and further engines are in a surprisingly good condition and beautiful to see. Now we crossed the engine room towards starboard and there we dove to the bow, passing the cabins. The cabins on this side of the ship are much better preserved than on portside. We returned to the salon and passed the fireplace, and from there entered the promenade deck and dove to the rear of the ship. The promenade deck is beautifully overgrown, but one can see that a lof of people dive here. Arriving at the rear we turned around and made our way through the sun deck towards the rope at the bow. After 40min in the wreck we started our ascent. We spent the 28min decompression time in free water in a very low current and returned to the zodiac.



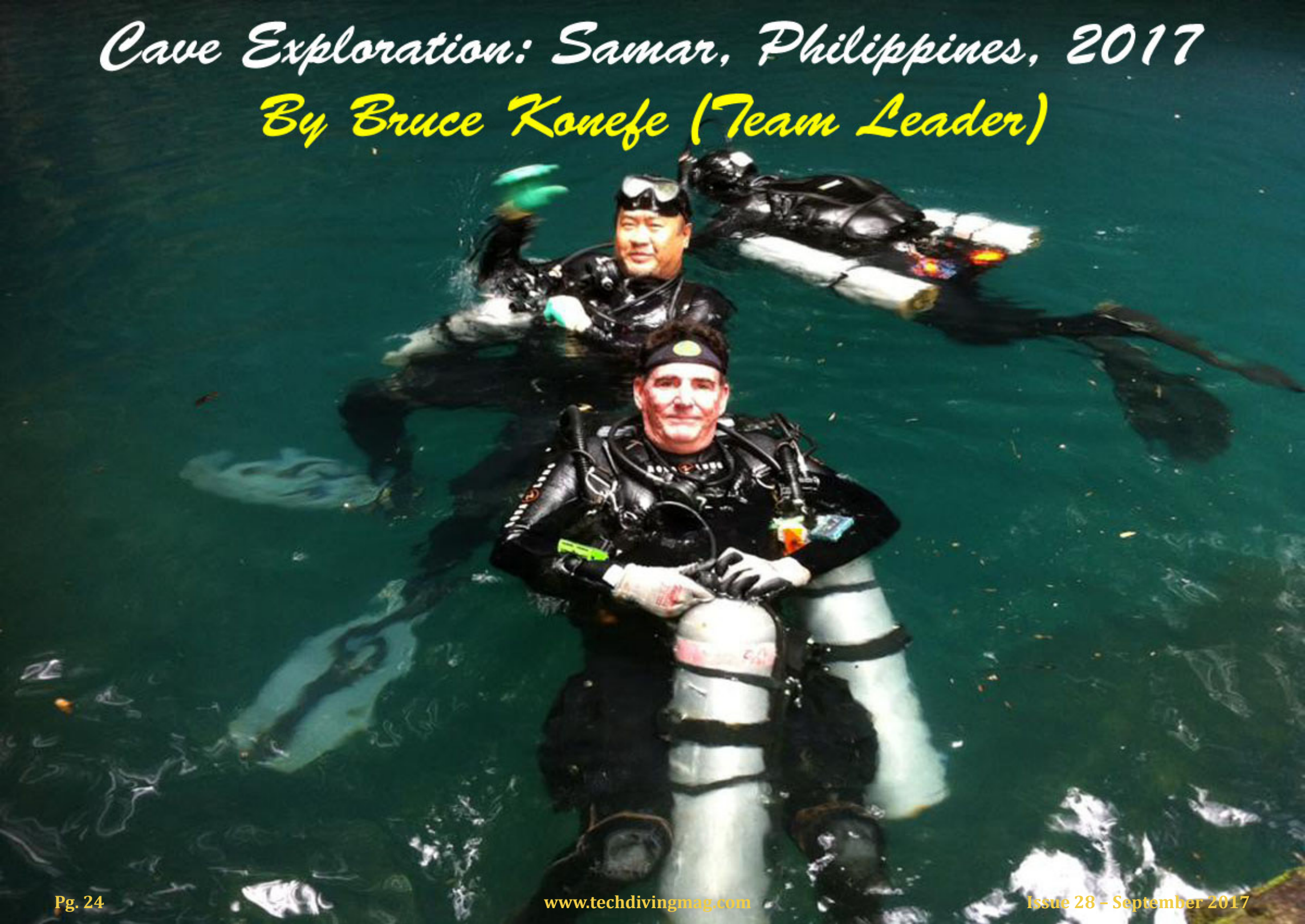
Conclusion

The *Baron Gautsch* is a wonderful wreck, which unfortunately seems very much used and highly frequented. But the wreck will never lose her glamour. For me, Mario Hauser, she is one of the most beautiful and historically interesting wrecks in Europe.Unfortunately, neither the screws not the fire places are still there, but time takes its toll.

It was a wonderful trip through the *Baron Guatsch* and an absolutly great dive with my buddy and photographer Günther Wedermann. I'd like to thank Matthias Hanuschka, Barbara Leth and Uvan from Triton Diving (www.tritondiving.eu), Mario Hauser and Günther Wedermann from Alpen Trekkies Tirol (www.alpentrekkies.at) and Günther Wedermann for the pictures.

Cave Exploration: Samar, Philippines, 2017

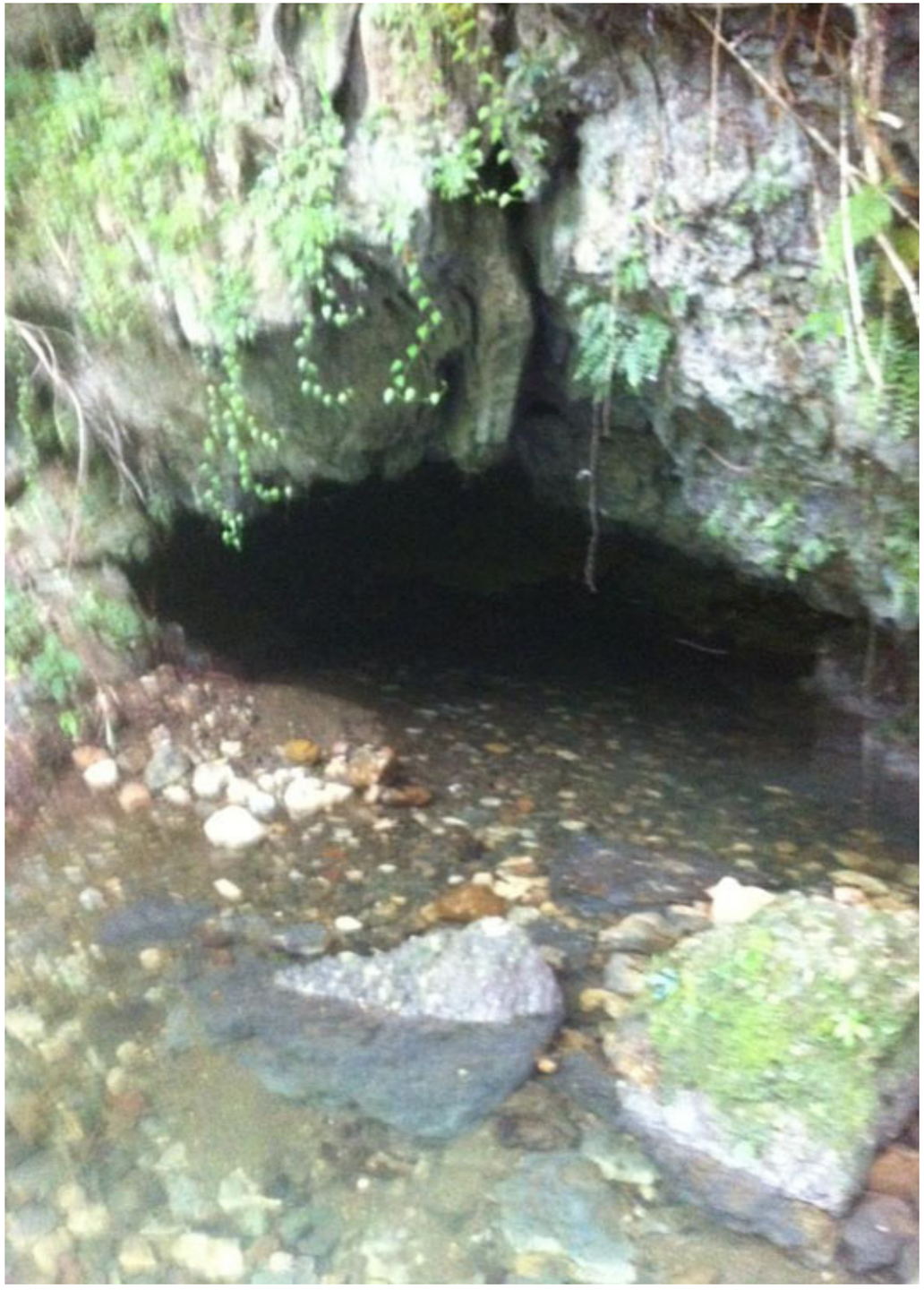
By Bruce Konefe (Team Leader)



After a two years wait we were able to finally put together another cave exploration in Borongon Samar, Philippines. To me those two years seemed like ten years; cave exploration is one of my favorite activities. This time Raymond Chan, Michael Pettersson and Allan Chuizon were going to be joining on the trip. I had been in contact with Eleazor T. Labtic (Zar), our cave guide for the past three months trying to make this trip a reality. The original plan was to explore four virgin caves and check out the possibilities of a few more that we could explore on future dive trips.

The trip started in Moalboal Cebu from Michael's resort Kasai village, where we had departed on July 19. Before we even left we had to spend the day filling tanks, picking up a small compressor and packing the dive equipment. The area where we were going cave exploring is remote; there are no local dive shops around where we could rent tanks and equipment from, so we brought all the equipment with us. It would take us almost two full days of driving and time on a ferry just to get to Borongon Samar. We arrived late afternoon on the 20th and the first thing we did was to meet up with Zar to make plans and start preparing for the first day of exploration. Zar had already booked us rooms in Dona Vicenta hotel for the week.

Day One: The first day we were eager to get going, we had an early breakfast and met up at 0800 to start exploring. The first cave we were to visit is called Sohoton cave which is located in Sohoton Borongan. This was a very easy cave to get to compared to some of the other caves we explored in the past years. We had a short hike back to the entrance of the cave, from the entrance to the cave we had about a 100m walk/crawl to where the sump was located. Before we lugged all the equipment in we went to the very end to the sump to see if it was worth diving or not. When we reached the sump it looked like there were some good possibilities that the cave would continue on. Raymond volunteered to be the first one to check it out. The porters had brought all of Raymond's equipment to the cave entrance and then carried it back to the sump. There was a lot of low ceiling and waist deep water to walk through before entering the sump. Raymond had kitted up and had placed a primary tie off just at the entrance to the sump and another tie off a short way into the cave. While Raymond was exploring the cave we waited at the entrance for him to return. When Raymond surfaced he reported that the cave had only gone in about 50m before the passageways were too small to continue on. This was not what we were hoping for but that is why they call it exploration. In cave exploration you never know what you will come across, the cave can wall out in a couple meters or can go on for kilometers. You can be very surprised what you can encounter after squeezing through a very small hole that opens up to seemingly endless passageways.



Day Two: Another early start with just a short drive to check out a cave called Sulop Cave. The cave is located in Brgy Kalingatngatngan just outside of Borongon City. We got a couple of locals who were helping build a dam to carry the tanks across a shallow river to the cave entrance. Today Michael would be checking out the cave first. Normally the plan is to have one diver take a look at the cave to see if it is worth further exploring. This helps save a lot of time and energy bringing all the equipment to the cave. We set a time of 20 minutes for Michael to check out the cave, if Michael was not out by then we would be prepared to send in another diver to make sure everything is ok. At 20 minutes Michael had exited the cave with a smile on his face. Michael had laid over 100m of line with a max depth of 6m. The passageways were a bit smaller and there were a lot of tree branches in the cave. Michael thought that the cave could definitely be explored more so he had left the line in the cave. Raymond had assembled his equipment so he could check out some of the side passageways. On this dive Raymond had gone in and found a much bigger chamber where he could not see the other walls. This cave definitely has some very good possibilities and we will keep it on the list for further exploration.

Day Three: Even though Sulop cave had a lot of good possibilities we still had a couple other caves that we wanted to explore. This next cave to explore was just right off the main road and very easy to get to. Michael had started to kit up for the dive. While we were there it seemed like the entire town had come out to see what we were doing. There where kids and grownups lined up next to the cave entrance. Michael did the first initial check of this cave and was able to lay more than 100m of line and it kept on going with passageways that we still have to explore. There was only one day left and we still had a couple more caves to check out so we decided to come back another time to further explore this one.

The same afternoon we went to check out what we call the Blue Lagoon, before we could do this we had to check into the local police department and also speak with the mayor to get approvals. The Blue lagoon looked like one of the most promising caves that we would see on this trip. Upon arrival to the cave we were amazed by the big pond with the crystal clear blue water. Looking from the surface, it seemed like there could have been passageways going in either direction. Today would be my day to kit up along with the other guys to be able to check out the different areas. All three of us kitted up and entered the water. I was checking the one end of the pond while the other guys were at the other end. There were passageways at both ends but the passageways at the other end looked much more promising. All of us had swam around the pond looking for potential cave passageways, after about 30 minutes we ascended and planned what the next move would be. Michael has spotted a large passageway so we descended down laying line into the cave. After a short while we had tied off and turned around but that was not the end of the passage. After changing out tanks Michael and Raymond went down to see how far the passage is going. They laid about 100m of line and the passage came to an end. When they surfaced Michael saw another hole that looked like it may go somewhere. We kitted up and I let Michael lead the way to the hole. I stayed at the entrance and waited for Michael to return. So far the max depth was 12m and we had laid about 70m of line but there was still more to explore.

When we were on the surface the land owner told us that there was another cave and it was only about 100m away. We walked over and could not believe the crystal clear blue water that was just inside the cave entrance. I was all excited thinking for sure that these two caves are connected. I volunteered my services to explore this cave out. The porters carried my tanks and equipment over to the cave and I kitted up. I tied off just at the entrance of the cave and a 2nd tie off a few meters away. I could not believe how clear the water actually was as I swim along. The cave did not go in very far and I could see that there was an air pocket. I ascended to see if the cave is going further inside. When I surfaced breathing from my regulator I could see it was just a dome and did not go anywhere. I descended down to check out a couple passageways but they did not connect to the other cave as I expected.

Day Four: On the last day of our exploration we had a team meeting at breakfast to decide what caves we would explore. There were a few caves that had what we were to believe very good possibilities but it was an unanimous decision to go back to Blue Lagoon one last time. All three of us had kitted up and entered the water. I went to the opposite end of the pond to check out a hole. Raymond and Michael went to extend the line in the passageway we had gone the day before.

Raymond led the dive laying the line and Michael was taking video from behind. We had promised the mayor that we would give him an in detail report and video of what we had discovered in the cave. On their dive they ended up laying a total of 200m of line almost using all of the line on Raymond's reel. Michael was able to get some very good footage of the cave and also left some cookies on the line where there was some other off shoot passageways that we could go back and explore the next trip.

After the last dive was completed at the Blue Lagoon we went to speak to the mayor and update him with the progress of our trip. Now for the long trip back to Moalboal Cebu. It is a long journey but it is well worth the time and effort. Samar is loaded with plenty of unexplored caves that keep bringing us back for more. From the months of September to March it is the rainy season in this area. We are planning 2-3 trips for this next year to explore these caves further and see what else is out there for us.

Beach Oxygen in Bali

By Simon Pridmore

The other day, I drove down to the parking lot near the drop off at the eastern end of Bali's Tulamben bay. I hadn't been there for a while. As I set my gear up I noticed a new installation at the edge of the car park, near the beach. There was a new roofed plinth that housed, to my surprise, a 50-litre bottle of oxygen and an oxygen delivery kit. A banner attached to the roof declared that the facility had been provided by Alba Diving.

Extremely impressed, after the dive I headed to Villa Alba, Alba Diving's beachside resort, and asked the owner, Alex Ford, what the story was. We sat down for a drink and he explained.

Lately he and his instructors had witnessed two incidents on Tulamben beach, which had brought home the need for oxygen to be available on the beach to treat injured divers and the fact that many diver operators in the area did not have oxygen available.

Alex and his dive buddy had just surfaced from a dive on the *Liberty* shipwreck and we were waiting on the beach for two other Alba Diving guests to come out of the water, when they noticed two dive guides from another company escorting a diver up the beach. They sat him down on a bench and left him there. It looked like the diver was in a bad way, but when Alex suggested that he might need help, the guides told him there was nothing wrong and that he would be OK. He didn't look OK: his face was deathly white; he was just sitting there immobile and seemed exhausted.

Alex suggested that the guides put the diver on oxygen straightaway but they said they didn't have any, neither on the beach nor in their van. Alex got his own oxygen kit out and had the diver breathe from this until the cylinder ran out. By that time, the diver said he was feeling better. He certainly looked better. Alex advised the dive guides to find more oxygen for the diver and recommended they monitor his progress, contact the Divers Alert Network (DAN) and call a doctor if the diver's condition deteriorated. The group departed and Alex never found out what happened subsequently.

A few days later, in the same location, one of Alex's divemasters was snorkelling over the shipwreck when he noticed a diver floating on the surface on his back, completely motionless. The diver was unresponsive and the divemaster towed him to the beach and commenced CPR. He called for help from the other divers and dive guides on the beach and asked them to get some oxygen. No oxygen appeared so all he could do was just continue the CPR.

A few minutes later, the injured diver's team surfaced and swam back to the beach. They said they had no idea what had happened. They had been swimming along in the shallows when suddenly the injured diver had headed for the surface. Alex's divemaster continued CPR for a further 10 to 15 minutes. Still no oxygen supply had been produced. Finally, the injured diver's team carried him to their car and drove away to get medical help.

These incidents brought home to Alex the fact that, while Alba Diving and some other local dive operators carry emergency oxygen when they run dive operations in Tulamben, the majority of dive operators do not. This was something that DAN had found when they carried out a survey in the area several years previously. The excuse cited by many was that they had never had an accident and, if they did, they would find one of the operators who did carry emergency oxygen and ask to use theirs. The situation was no better today.

So Alex approached the Tulamben Dive Association, a group of villagers that administer access to the beach and arrange porters and

trash collection, among other things. He explained the issue and told them that, if they were in agreement, Alba Diving, in conjunction with the training agency RAID, would supply and maintain two emergency oxygen depots on Tulamben beach, one near the Drop Off, the other near the *Liberty* shipwreck. The two sites would be for anyone to use and, in addition to the oxygen supply, there would be an oxygen delivery kit there, together with instructions in English and Indonesian. The Dive Association agreed wholeheartedly with the proposal and was extremely supportive.

Alex estimated the set up cost at US$300 and estimated that the annual cost of running the depots would be around US$50. As he said, this was not a huge amount when you considered that lives could be saved. He added that it also demonstrated to visitors that the Bali dive community was serious about diver safety and welfare.

I told Alex that I thought his initiative was highly commendable but that a more convincing indication of commitment would be if all licensed dive operations were required to have emergency oxygen available as a condition of their license.He nodded but threw his arms up in a silent expression of frustration, indicating that he didn't think that was likely to happen.

I mentioned that, in my books, I tell divers that a good sign of a professional dive centre is if they have emergency oxygen available. I also advise them to ask the question whenever they are considering operations to dive with when they go on holiday. I said I hoped that perhaps some good would come of this and that, even if they didn't have the common sense to do it anyway, maybe dive centres would start providing emergency oxygen simply because of customer demand. Had Alex had any approaches from other dive shops interested in joining him in this endeavour.

He shook his head, saying that, while the Tulamben Dive Association had immediately come on board with his plans, he had not received universal acclaim, particularly from his peers. Some in the local dive industry blamed him for not having taken action earlier. Others accused him of only doing it now for the publicity. But he refused to be downhearted and said he knew that what he was doing was of substantial benefit to both visiting divers and the community, even if not everyone appreciated it.

I reminded him of the adage that, "no man is a hero in his own land", and said that he might not be doing it for the publicity but I for one thought that news of his efforts deserved a wider audience and I would do my best to make sure they received one.