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Alert Diver

Digital Magazine

EUROPEAN EDITION

48

DECOMPRESSION ILLNESS IN A VEGETARIAN DIVER

GETTING READY FOR THE DIVE SEASON

DEEP ADVENTURE

A Thousand Feet Under the Sea

TECHNICAL DIVING & INSURANCE

NEW SECTION!

PFO FOR DUMMIES

THE MYSTERIES OF BUOYANCY

Photo from the "Semana Fotosub Formentera" photo contest, 2011

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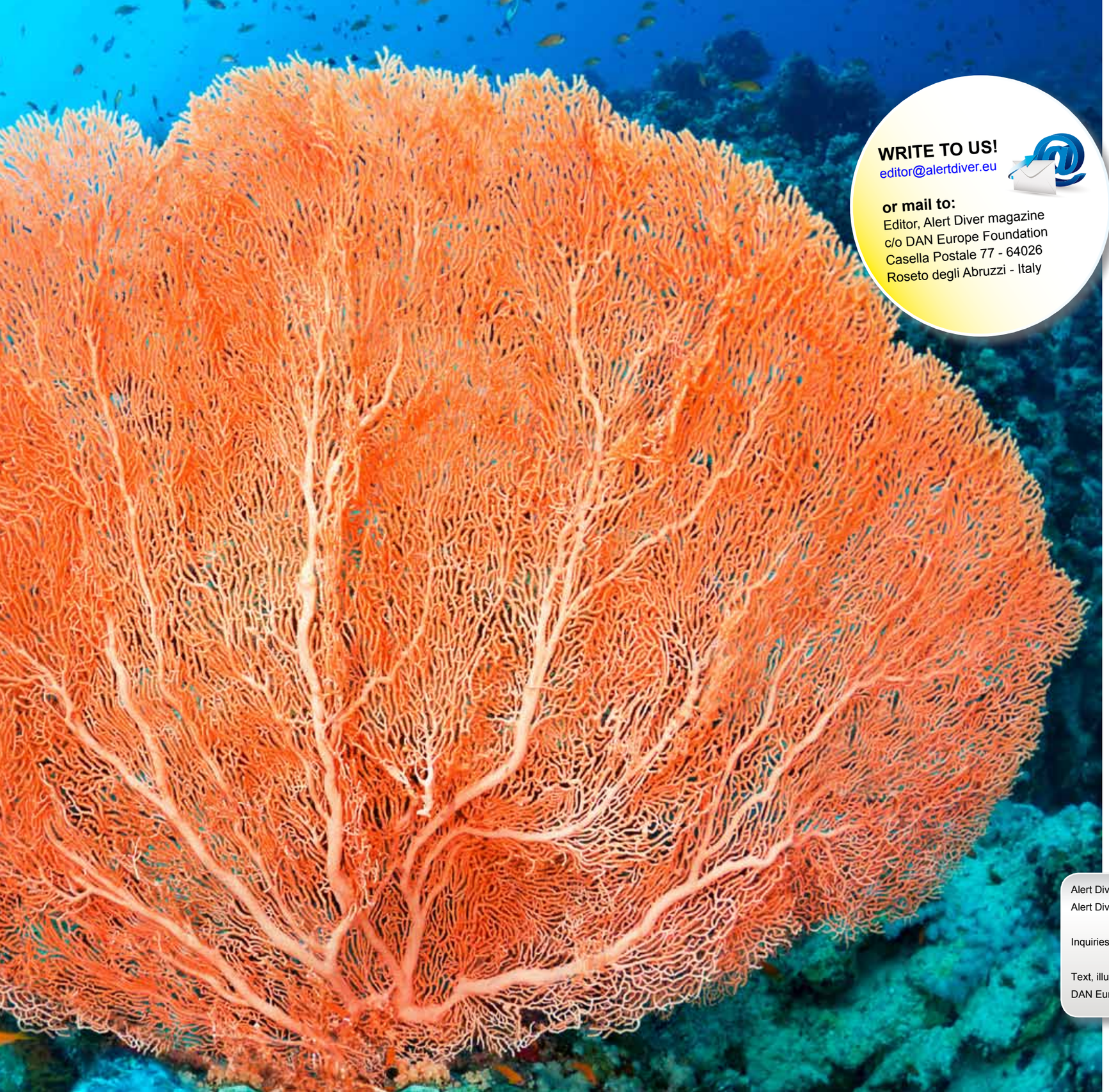
DAN DIVERS ALERT NETWORK EUROPE



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DIVERS ALERT NETWORK EUROPE

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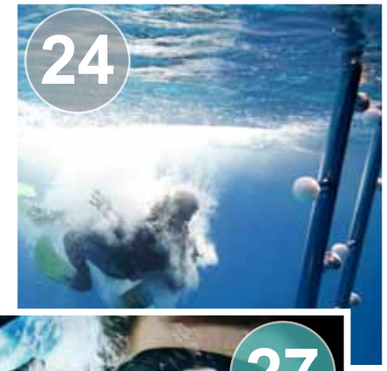
 # 48 (2nd Quarter 2012)

Contents



Editorial

Cristian Pellegrini
Editor

Brightening up This Summer with Plans for Our Next Dive

Summer has arrived, and along with it, the time to take holidays and to dive into the blue.

Preparing for our travels, whether near or far, we have probably worried about a series of tasks, ranging from checking the motor oil, to the maintenance of our bicycle or, as you prefer, skateboard. In await of leaving, we have finally taken on the series of tedious chores and things to organise. We've tidied up the garden and the toolshed, while the more fortunate among us have started the maintenance of their swimming pool... Staring dreamily at those crystal waters, our thoughts drift to our next dive, be it this weekend, next week or the upcoming one.

But then why, after the long winter "hibernation", don't we devote as much attention to the maintenance of our diving equipment and to the review of dive procedures? It will only be time well spent, believe me.

That's why, to better enjoy this summer, Alert Diver has included two full articles, devoted to the return to the diving season: *When The Buddy System Fails,* in the *Prepared Diver* section, and *Getting Ready for the Dive Season*, in the *Incident Insights* section.

Instead, if you've planned to stay home, I recommend reading *Deep Adventure* (*Features* section). While comfortably sinking in the folds of your favorite chair, you can follow an incredible adventure into the deep, aboard a small "pocket submarine".

Since diving is not just about procedures, diving tables and tedious calculations, we can have fun reading the new section *PFO for Dummies*. Now you can take us divers less seriously and, with your dive knowledge, get a different perspective on even the most difficult topics of dive medicine and physiology, with satire and humor.

I wish you a great Summer, and the best dives, with DAN at your side!

Comments?
Reactions?

Email:
editor@alertdiver.eu

Lost at Sea...

My name is Massimo Saviano. I have advanced "stress & rescue" certification and I am a DAN member.

I would like to tell you about an unpleasant episode, which I found reprehensible in terms of both morality and safety. It took place during a diving cruise at the Maldives last March, with three dives planned per day.

Fortunately, among my travel companions there were several diving experts. On the motorboat, we found two underwater guides, who, as we later realized, kept to themselves for the whole trip. To focus on this most disconcerting episode, I will leave out the details about the conditions of the motorboat, the state of the equipment, etc.

Sixteen of us dove with the two guides at Maav Beyru of Addu Atoll. After about 50 minutes underwater, we surfaced releasing regular floating balloons; to our surprise, our dhoni was nowhere to be seen. We were left at the mercy of the sea, which was also quite rough, for about 1 hour and 50 minutes without a vessel in sight, and only glimpsing the outline of a reef in the distance. We later found out from friends on the motorboat that the dhoni (which had no radio nor telephone) had gone back to the ship anchored in the atoll to tell them that we were lost, raising panic among the Maldivian crew, as well as for one of our travel buddies who'd stayed behind on the motorboat. Only after that, advised by the crew of another motorboat that had told them which way to go on based on the currents, was the dhoni able to spot us and rescue us.

I, personally, was very distressed and tired after being in the water so long, and because of the rough sea I needed help getting back onto the boat. Assistance was offered to me by my diving buddies – though certainly not by the two guides who only seemed concerned about who would be first to get back onto the dhoni!

After we returned to the motorboat, the guides offered no debriefing, nor any comments; they acted as if nothing at all had happened. Our dive was reported in the daily bulletin on the bridge, followed by the comment "lost at sea".

The day after a man came onboard, introducing himself as the manager of the company (probably worried that we'd demand some form of compensation). What he proceded to say made us only more perplexed, and left us astounded: he didn't offer any explanation or apology for what had happened, and instead asked us for suggestions on how a situation such as ours could be dealt with in the future. He confessed that, in truth, they had no protocol or guidelines to deal with people lost at sea!!!

At this point, I'd like to ask you:

- Do norms of behaviour and procedures for situations like this exist (procedures which certainly didn't exist in our case), and if so, what are they? How is this information dispersed to the various diving centres?;
- Are there minimal safety requirements to certify and accredit an organisation for carrying out diving cruises? (as in our case the boat displayed a haughty SCUBA accreditation on the bridge);
- What are the legal responsibilities and consequences in cases like this and to whom must they be attributed?

In the aim to ensure a minimum safety level for all those who practice this fascinating sport, I thank you for your consideration.

Prof. Massimo Saviano
Director of the General and Specialized Surgery Department
University of Modena and Reggio Emilia

Dear Prof. Saviano,

First of all, I'd like to thank you for your email and the detailed description of the event. Unfortunately, this is not an isolated event, but a problem of general interest.

In response to your questions, there are well-codified risk assessment and prevention procedures for similar situations. The problem is in the monitoring, which should be done before granting a licence to operate. The third question only has one answer: the responsibility is of the captain, the ship owner, the tour operator and the diving guides. You seem to have grounds to claim for damages.

On our part, in light of our "prevention first" approach to diving safety, we have developed an international programme for the identification of hazards and risk assessment for the providers of services to divers - the **DSP HIRA (DAN Diving Safety Partner - Hazard Identification and Risk Assessment)**. While impossible to totally rule out human error and accident, the DSP HIRA programme certifies and rewards the most reliable dive operations.

Cordially,

Dr. Alessandro Marroni, M.D.
President & C.E.O, DAN Europe Foundation
Chief Medical Officer, DAN Europe Foundation
President, IDAN (International Divers Alert Network)

Nautilus Lifeline

Don't get lost with this new safety product: A GPS radio for divers. This radio allows you to communicate with any VHF radio and allows to transmit on the international distress frequency of channel 16. It can also send your GPS coordinates to any modern marine VHF radio up to 12 mile range.

Soon availble at the online DAN Shop.

A New Safety Program for Dive Operations

The DAN Diving Safety Partner (DSP) Programme aims at creating, promoting and building a culture of safety at all SCUBA diving schools, charters and operations around the world.

The programme identifies the ideal procedures and activities, and encourages all dive operations to be properly prepared to prevent and manage dive emergencies. This is done by making sure the operations meet already-established safety guidelines (such as the Emergency Assistance Plan (EAP).

The programme is made up of 3 levels, with an associated Hazard Identification and Risk Assessment (HIRA) component.

Participating dive operations gain visibility and recognition within the recreational diving community, whilst offering quality services to their clients.

If you want to contribute to make this sport even safer, we warmly invite you to join the programme!

The Hyperbaric Centres of the DAN Europe Network – BARCELONA

by Cristian Pellegrini

Spain is one of the countries that attracts the largest amount of dive tourists in Europe. The famous "Costa Brava" as well as Islands such as Baleari, Canarie and the entire coast, with their marine parks, bring in many tourists, both Spanish and from around the world. Together, the mild climate, and the ease of transport make a pleasant stay for divers.

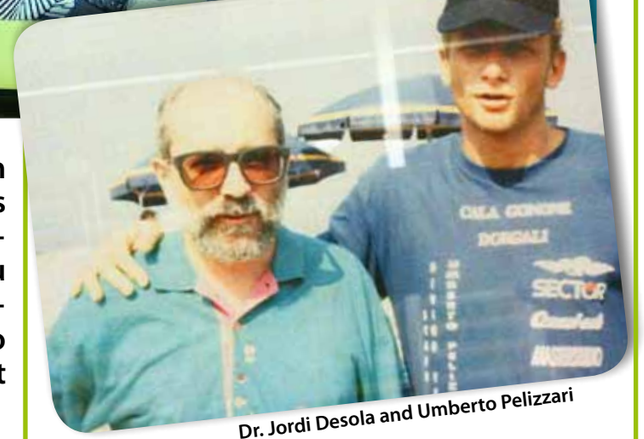
In the 70s and 80s, with the widespread development of recreational diving, the use of recompression therapy systems, of which the Hyperbaric Therapy Unit of CRIS-UTH was already a leader, became necessary. Thanks to Dr. Jordi Desola's initiative, CRIS-UTH joined what at the time was just the start of today's DAN Europe. The DAN Network in this region (Spain, Portugal and Andorra) is now locally represented by DAN Ibérica, of which Dr. Desola is Director.

Dr. Jordi Desola

Today we are meeting with Dr. Desola, asking him some questions about the Hyperbaric Centre he coordinates in Barcelona.

CP: Diving medicine has an old tradition in Spain, and CRIS-UTH, recently renovated, is a point of reference throughout the country, both for divers and non-divers. Can you tell us more about how this brand new centre is working now, and why you decided to move to the Moises Broggi Hospital in Sant Joan Despí - Barcelona?

JD: *SCUBA diving started being practiced in Barcelona in 1947. Those pioneers founded CRIS (Centre for Underwater Research and Recovering), a very old institution in the field of diving, in 1954. The first monoplace recompression device was constructed in 1959, and the multiplace hyperbaric chamber was initially located in the Red Cross Hospital of Barcelona in 1965, and it was constructed just to treat cases of decompression injury; up until the 80s, the number of cases treated in this chamber was between 5-10 a year. Then, in 1980, the main hospital in Barcelona asked us to treat a non-diving case: it was a young boy, 14 years old, suffering from cronical refractory osteomielitis, with an affected jaw, which risked disarticulation. He had been receiving hyperbaric oxygenation in a monoplace chamber, which due to technical problems was out of service. We replied that we were not yet prepared, since our chamber was not monoplace and could only host several divers at a time. Furthermore, it was designed only for divers (i.e., people in good physical condition before their accidents). By accepting that patient, we would be using the chamber every day to treat a single person with physical limitations. Also, we couldn't use hyperbaric oxygen, as was necessary for this patient, because the chamber was not designed for it and at that time only the use of compressed air was allowed.*



Dr. Jordi Desola and Umberto Pelizzari

New safety rules had to be introduced, with many complications and some risk! In April 28th 1980 we treated this patient for the first time. A couple of weeks later, we received a second case of osteomielitis, and some days later, a third case. Since then, we haven't stopped using the chamber for even one day.Now we treat more than 30 patients daily... compared to only 10 a year at the beginning! For this reason, we started talking about converting the old recompression chamber for divers into a clinical centre of hyperbaric medicine, where patients who can benefit from hyperbaric oxygen can be treated.

We needed a bigger chamber, more modern, with capacity of critical care and every kind of treatment available. In 1998 we had the opportunity to obtain a chamber that had been used in another Spanish hospital, which had closed. Then in 2008 we opened a hyperbaric facility in a new hospital, which would have a refurbished chamber. This enabled us to treat 18 patients at at once, meaning 36 patients a day, apart from emergencies. Now, each year, we are treating 200 cases of carbon monoxyde poisoning, about 20-25 diving accidents, and about one hundred of cancer patients suffering from complications produced by radiation therapy.

While the majority of patients are non-divers, divers can benefit from the efficiency of this new chamber, which operates daily and is in optimum condition. We have a team of chamber operators and nurses specialised in hyperbaric therapy, doctors who are on call and available 24 hours a day, allowing us to maintain the DAN hotline services.

CP: Still, this unit is well known in the diving community as an excellent hyperbaric centre.

JD: *We try to do our best! Over the years, we have been open to suggestions from divers. We are not only treating more patients, from all over the country, but providing the best and most specialised treatment available for every patient. Not all centers and chambers are capable of treating dive patients in extremely serious conditions. Thanks to prevention initiatives, the number of diving accidents is fortunately very low, but when they happen, they can be extremely serious and require intensive care.*

CP: Let's talk more about this relationship between the diving world and general medicine. DAN is conducting research through its DSL (Diving Safety Laboratory), addressing issues not only related to diving, but also general medicine. What's your opinion about this development?

JD: *The history of research in diving medicine has undergone different phases: military, oil/offshore/commercial industry... Now it's the recreational industry which has the greatest number of divers. An institution like DAN has a fundamental role in that. I had the priviledge of being one of the co-founders of DAN, together with Prof. Marroni. Our collaboration began in 1980, uniting the work we had been doing individually until then.*

CP: Let's talk about your experience treating divers and non-divers. Is there a particular story about a case or a patient, that you'd like to share?

JD: *In 1978 I was still working in the old chamber. One day we were treating two Dutch divers who were almost ending their treatment when an 18-year old diver arrived. As I mentioned before, we were not allowed to use oxygen in those days, so we had to bring the Dutch divers back to 50 meters in order to let the young diver inside, making us five people in the chamber. The young diver, whose condition was drastically worsening, was compressed to 50 meters and we had to complete a full US Navy Table 4 that lasted two days... Fortunately this does not happen today!*

Divers must not forget that, even though diving is fun, accidents can happen. Once we dealt with a case of near drowning and arterial gas embolysm, combined with fever and pneumonia. After hyperbaric treatment the patient felt better, but the fever would not go down. We also consulted a specialist in internal medicine, and the patient was diagnosed with Hodgkin's disease, a type of lymphoma.

My medical advice to divers is that you should always keep in mind that diving injuries need medical attention. You should never accept hyperbaric treatment without medical guidance, but always under the supervision of a physician!

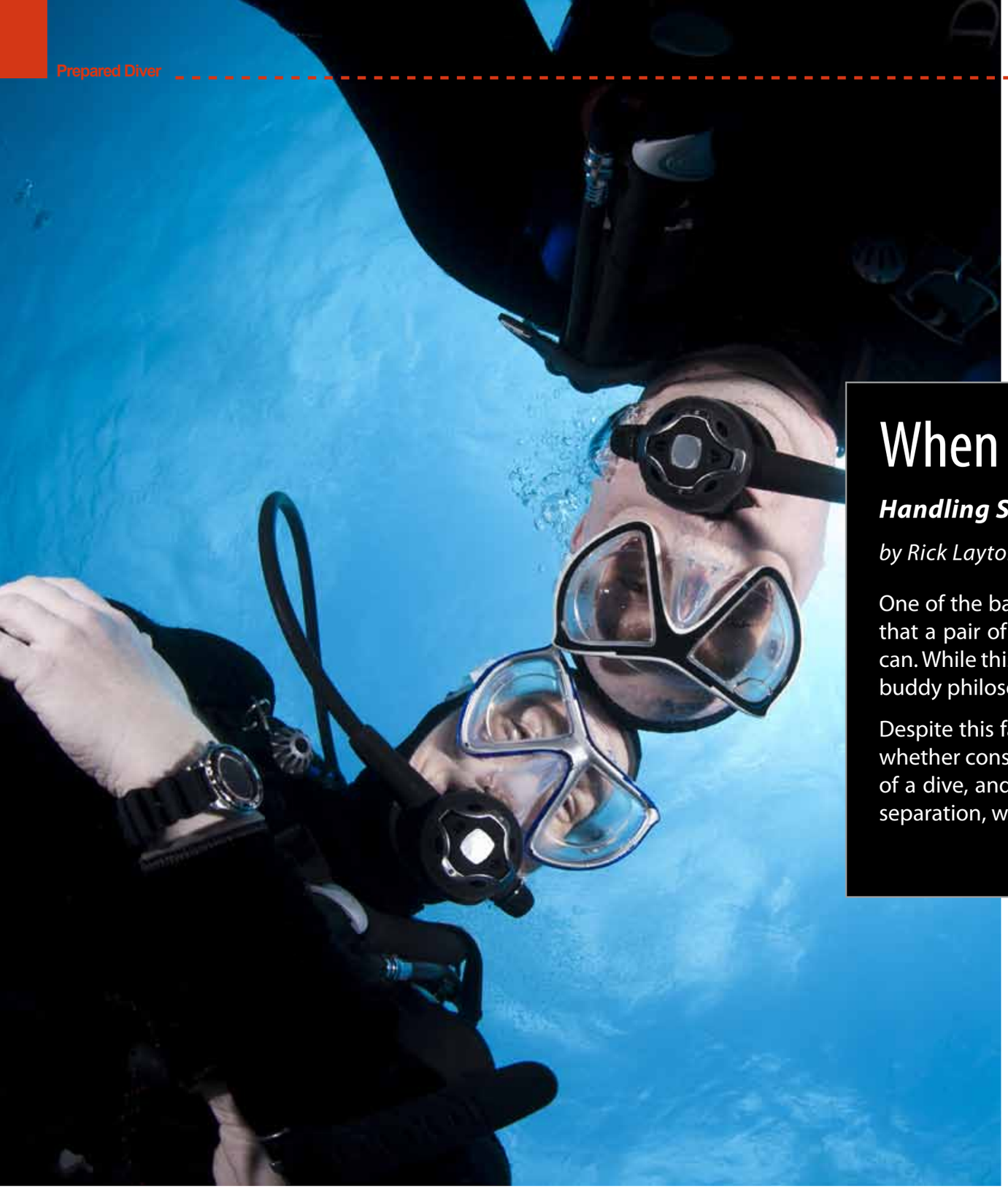
CP: So, the message is: Trust DAN and its recommended hyperbaric centres!

JD: *That is one of DAN's most important missions; choosing a suitable hyperbaric centre for an injured diver, and offering the best treatment he may need. When choosing a centre, the most important factor is not only its distance from the accident site, but its conditions and follow-up care.*

CP: What's your final message to divers?

JD: *Safety starts with prevention, so I hope that anyone reading this will keep in mind the important messages related to dive safety published in this magazine, so that, beyond this article, they will never need to confront dive medicine firsthand!* ■

Watch the videos!



When The Buddy System Fails

Handling Separated Divers and Compromised Safety

by Rick Layton

One of the basic tenets of safe recreational diving is to always dive with a buddy. The theory is that a pair of divers can better manage difficult situations or emergencies than a single diver can. While this point can be argued, most divers as well as certification agencies subscribe to the buddy philosophy.

Despite this fact, incidents of divers becoming separated are not unusual. The sad truth is that whether consciously or by accident, divers can end up alone underwater during various phases of a dive, and sometimes the results can be disastrous. By understanding the issues of buddy separation, we can help prevent potentially dangerous situations from developing.

Divers become separated for many reasons. Referring to diving fatalities occurring in 2003, the 2005 edition of DAN's Report on Decompression Illness, Diving Fatalities and Project Dive Exploration reveals: "A separation of divers was sometimes a matter of choice and sometimes accidental. In at least three cases, the divers may have panicked after losing contact with their buddies. In many cases, the buddies were separated due to poor visibility. In four of these situations, both divers died."

Dive buddies are often engaged in activities that absorb their attention, and consequently they fail to properly monitor one another. When divers become focused solely on their underwater task, a breakdown in the buddy system is likely. As we'll see, environmental conditions, equipment problems and diver attitudes can all conspire to separate buddies. Whatever the reason, the separation of buddies can be the weak link in the diving safety chain.

Poor Visibility

One situation occurred when two divers attempted to recover a sunken outboard motor. According to the report, the diver in question was a 45-year-old male who had earned his open-water certification five years before. He had not been diving for more than a year; still he and his buddy were attempting to recover a sunken outboard motor from the bottom of a lake.

Apparently, the two became separated in the poor visibility that either prevailed or developed during the dive. The diver's buddy surfaced, but he did not. When his body was recovered from a depth of 90 feet (27 meters) two days later, it was found that his cylinder was empty.

While it is unclear exactly what happened to the diver, what is clear is that he was unable to resolve on his own a problem that developed and ultimately ran out of air.

Failures and Malfunctions

Another situation that can lead to separation is an equipment problem, failure or malfunction. If the lead diver in the buddy pair is not conscientiously monitoring his buddy, a problem that causes the following buddy to stop or pause can quickly lead to a separation, especially in poor visibility. In the following report, the divers were in a kelp forest, which, like a terrestrial jungle, is an easy place to become separated.

According to the DAN report, the 41-year-old male diver with an advanced-diver certification had made multiple dives in a kelp bed with his buddies and had been having problems with buoyancy control all day. On the fourth dive of the day, the diver separated from his buddies and ascended. Once at the surface, he called for assistance and soon after lost consciousness. According to the DAN report, "The death was determined to be a drowning secondary to an air embolism. The autopsy also disclosed mild coronary artery disease."

Again, it is unclear exactly what trouble the diver experienced and why he separated from his buddies, but clearly he developed a problem that he could not resolve on his own. Had a buddy remained with him and provided assistance, the outcome might have been different.

The SOB Syndrome

In some cases, divers intentionally depart from their buddies. This can occur for a number of reasons, including the need to check on navigation or to complete a task while a buddy heads for the safety stop. In some cases, a diver with more air will remain below after others end their dives. Depending on their personal attitudes toward safety, some divers may not see close buddy monitoring as a necessity. Any time divers adopt an "SOB" (same ocean, buddy) approach to safety, the cards may be stacked against them.

Such may have been the case for a 52-year-old diver who had received his open-water certification some six years prior to the accident. He and his buddy became separated after about 15 minutes. The buddy eventually returned to the boat and later found the subject diver afloat, unconscious and with an empty cylinder.

The DAN report reveals that the diver had a medical history that included heart disease and that the diver had complained of chest tightness prior to the dive. Although the cause of death was deemed a drowning, it is suspected that a cardiac event may have contributed to the accident. It is uncertain whether a more attentive buddy could have saved this diver when a suspected cardiac event occurred, but it's a thought worth pondering.

The SOB syndrome may have been the undoing of a diver in the following report as well. An experienced 58-year-old male technical diver using a rebreather to explore a wreck at a depth of 104 feet (32 meters) was part of a four-person buddy team. As the DAN report says, "Before the dive, the diver had complained of fatigue; he did not dive the day before with the others in the group. During this dive, the decedent decided to dive alone. Since he had a habit of doing this, the buddy separation did not alarm anyone."

Unfortunately, something went awry, and the diver was unable to resolve the problem on his own. Although an autopsy was not performed, it appears that a cardiac dysrhythmia contributed to the diver's death. After his body was recovered, an examination of his equipment revealed that although the rebreather was out of gas, his bailout bottle was full. Again, we can wonder whether a nearby buddy might have made a difference in the ultimate outcome of this, the diver's final dive.

A similar accident occurred when an experienced 41-year-old male diver using a rebreather remained submerged after the other divers had surfaced. Armed with advanced certifications including cave-diver certification, the diver was with a group diving from a liveaboard, but it appeared he did not have a designated buddy for the dive in question. It would seem the diver made a conscious decision to continue diving alone after the others had terminated their diving. The DAN report reveals that the diver "had a habit of diving long after the other divers had exited the water. He had performed previous dives during the trip that lasted up to two hours." The diver never surfaced from this final dive, and the body was never recovered.

Shallow 'Safety' Stops

Experienced divers and especially technical divers with a significant decompression obligation often consider it "standard procedure" to make safety stops or decompress alone in shallow water. It may be that the divers simply perceive little or no danger in the waters so close to the surface. As this next accident highlights, serious problems can develop even while waiting to surface from a safety stop in shallow water.

In this case, the 40-year-old was a highly experienced technical diver who had just completed a night quarry dive using a rebreather and nitrox breathing gas. Twelve divers had participated in the dive, which involved poor visibility, and all 12 had ascended to the safety stop at the end of the dive. At the end of the safety stop, all the divers except the subject surfaced. He was later found unresponsive at a depth of 15 feet (5 meters).

A medical examiner ruled the death as a drowning, but an examination of the rebreather revealed that it suffered from poor maintenance and was not functioning properly. According to the DAN report, "There was carbon dioxide

absorbent throughout the rig, an oxygen sensor had been inserted incorrectly and was not functioning, and the oxygen addition valve was partially blocked, resulting in a 75 percent decrease in flow. Several loose connections were also present."

Although poor maintenance of the rebreather and its subsequent malfunction may have been the causal factor in this accident, an observant buddy might have detected a problem and provided crucial assistance before the diver perished.

Diving into Danger

Demanding conditions often separate divers from their buddies during entry or exit. While the divers involved in the following report were not injured, the scenario highlights what can be a potentially dangerous situation.

A group of three divers was making a daytime dive on an oil rig some 20 miles off the Louisiana coast. It was March, and the surface waters in the area were heavily silted by runoff from the Mississippi River, reducing the surface water visibility to less than 2 feet (0.7 meters). The surface water was so murky that no light penetrated beneath the freshwater layer, and dive lights were required to see in the clear underlying water. The divers had planned to descend along the leg of the rig, passing through the low-visibility layer, and, if separated, they would join up in the clear waters below. The surface waters were rough, and a current was running at the surface at the time the divers entered.

During the descent, two of the divers experienced problems and ultimately returned to the dive boat. The third diver successfully negotiated the murky layer, and, after arriving in the clear water at a depth of 50 feet (15 meters), waited for the two buddies to join him. The diver waited approximately 10 minutes before searching the area around the leg of the oil rig for the two missing divers.

Unable to find them, he concluded that something had happened, and he surfaced, rejoining the others on the dive boat. Fortunately nothing went wrong, but if the "solo" diver had experienced a problem, he would have been on his own to sort it out.

A similar situation from the DAN files resulted in a fatality. In this case, a nitrox-certified 56-year-old male diver set out from a liveaboard as a buddy in one of two pairs of buddies. According to the DAN report, "The divers were performing drift dives in a strong current. During the second dive of the day, each buddy team became separated. The decedent and his buddy became separated prior to descent. They were the last divers off the boat, and the decedent's buddy went below the surface without him. The diver did not return to the boat, and his body was never recovered. His tank and safety sausage were recovered miles from the decedent's last known location."

As these reports suggest, divers should give careful consideration to a situation in which buddies will rendezvous underwater. Demanding conditions at or near the surface can leave a stranded buddy "over his head" and in deep trouble. Divers can also find themselves in more demanding conditions after surfacing than they faced underwater, and staying together can be vitally important, if not impossible.

In the final incident, a 29-year-old female with advanced open-water certification, but fewer than 20 dives since initial certification three years before, was completing a dive with a buddy when something went awry.

According to the DAN report, "[The diver] and her buddy surfaced far from the boat and descended again to swim back. The buddy ran low on air, and both divers were fatigued. They became separated, and the buddy was rescued on the surface a few hours later. The decedent's body was never recovered, though some of her equipment was found 13 days later."

These accidents emphasize that things can go wrong at the beginning of a dive or on the surface following an ascent. To ensure that nobody is left behind, divers should strive for strict adherence to the buddy system.

The buddy system can be a critical factor in the safety equation for recreational divers. By focusing on this important element throughout all phases of our dives, we can reduce the risk of disaster. ■

Tips to Help Prevent Buddy Separation

The buddy system is a critical element in recreational diver safety, and, when it breaks down, lives can be at risk. Consider the following to avoid buddy separation:

- Review buddy separation risks when planning dives, and make certain that the goals of the divers, their equipment and the environment in which they dive will not put the buddy system at risk. Independent goals, mismatched air supply and overly demanding conditions can lead to buddy separation.
- Don't assume the dive begins at some point on or below the surface: It starts as you step into the water.
- When diving in a group, don't assume that everyone is looking out for each another: Each diver should have a buddy and conscientiously monitor that person.
- Avoid dive plans that require buddies to work independently of one another. Distraction leads to separation.
- When one diver leads and the other follows, the "lead" diver should never assume that the "follower" is following. Maintain visual or body contact throughout the dive.
- Don't assume the dive has ended once you reach the safety stop. It doesn't end until all divers are out of the water.

Getting Ready for the Dive Season *by Joel Dovenbarger*

Each diver has his own style. Our individuality is what makes us who we are: We all do different things for a living, enjoy a range of activities, music, art and recreation. But if we're going to scuba dive, then we all must take the same path if we want to dive safely.

This guide is meant for everyone's benefit. Let's admit it, though. At one time or another, all of us have let some issues get in the way of safe diving:

"I always do it this way."
"I don't have time for that."
"Nothing ever happens to me."
"Just do what I do, and you'll be OK."
"Don't worry about it - somebody always has an extra (fill in the blank: strap, washer, O-ring)."

Excuses abound for us to bypass the sound safety guidelines listed. But there is only one safe way to get ready for the dive season: Know your skills, know your equipment, follow guidelines, stay within the level and skill of your training, and take your time - don't rush it.

Thanks in part to precautions aimed at reducing risks, dive injuries like decompression illness (DCI) are rare. Other injuries like ear and sinus barotrauma occur far more often with beginning divers and to those who dive infrequently. The flip side of this is that the low occurrence of injuries may lead to a less vigilant attitude toward safety.

The truth about any type of dive injury is this: When the right set of circumstances are set in place - inexperience, neglect, hurrying or just going along with the crowd - a diver can be hurt easily enough. You are less likely to be injured when you are following proven safety measures.

Consider the following cases from assistance calls to DAN.

The June Bug and the Woolly Caterpillar

File these under "I should have had my regulator serviced first."

For that first dive of the year, we sometimes get in a hurry: Rent the tank, get to the boat, gear up, turn on the air and jump in the water. Inhale a June bug that blocks the airway to one lung.

Of course, it was a dead June bug, but there it was. Later, with the diver under anesthesia, the bug was repatriated to the medical wastebin.

Imagine another diver's surprise when he hooked up his equipment for the first dive of the year. He took a breath of air from the regulator and got an unusual burning, stinging sensation in the back of his throat. His tongue tickled and burned as well. Over the winter, a woolly caterpillar had crept into the regulator before passing on. Without checking beforehand, the diver had simply inhaled it. Whatever happened to the so-called quick purge? With a "dormant" regulator, remember to purge it into your hand or a cloth before breathing through it.

The "New Diver Surprise"

Mask squeeze can happen to any of us, but it occurs most often in new divers or with those of us who don't dive often. It's the one injury that can sneak up on you, even if you are breathing correctly and clearing your nose and sinuses as you should.

It is surprising how many divers are either too new or too excited to remember to put a puff or two of air into their mask while descending. Even the more experienced divers can experience mask squeeze when they switch masks or borrow an unfamiliar mask of lower volume.

The call usually goes like this:

"I've got little red spots around my eyes, and my eyes are swollen. And the white part of the eye - that part is blood-red now. What should I do? Can I still dive tomorrow?"

The short answer is yes, but it's better to wait. Just a little more time during the descent and consulting a mental checklist would have prevented what will surely look worse tomorrow than it does today.

Do a buddy check

Recently we received a call about an all-too-preventable accident during miniseason. This was an extremely competent diver who had kept his gear current, was healthy and eager to dive on the first day of the season. He had not been diving in months.

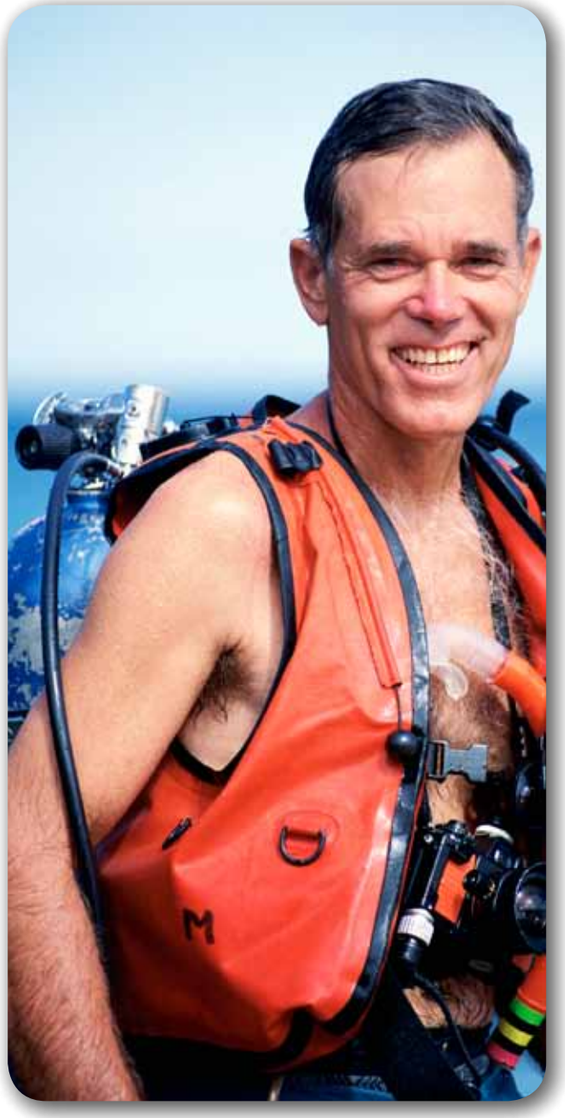
At the outset of the dive, he had wanted to be the first diver off the boat - and the first to get a lobster. He was in his gear in no time when they got to the first dive site, at a depth of only 12 feet (4 meters), and leaped into the water before the other divers.

Eager to get in the water, the diver decided he would put on his fins and put his regulator in after he jumped in. Too heavily weighted, he sank right to the bottom. He needed a breath when he put the regulator in his mouth, but he had forgotten to turn on his air. His friends found him within minutes resting on the bottom, but they couldn't revive him. Like most dive incidents, this was completely preventable. We're never too competent to do the buddy check.

"When can I dive?"

The off-season, usually winter, is the occasion for those surgical procedures you don't want interfering with your diving schedule. Divers may decide to have procedures such as LASIK (laser-assisted in situ keratomileusis), a form of refractive laser eye surgery; rhinoplasty, or having the nose "fixed"; abdominoplasty, the so-called "tummy tuck"; or even endoscopic frontal sinus drillout. Because of these procedures, we get another kind of preseason call at DAN: "When can I resume diving?"

The generic answer is this: You can dive when you have been released by your treating physician for all activities and when you can participate in those activities without a problem.



Do a self-check

As divers age, many of us develop medical conditions, a significant one being cardiovascular disease. This requires a little honesty: Are you a male older than 40, a female older than 50? Do you have risk factors such as hypertension (high blood pressure), diabetes, high cholesterol, smoking or have family members with heart disease? If so, you need to be assessed by your doctor.

Can we perform at the same level as we did when we were first certified - 20 or 25 years ago? For some, the answer is yes; for some, it's no. Answering in the negative doesn't have to mean an end to diving: It can simply mean changing the way you dive. That might translate into not putting yourself in a position that will test your stamina every time you get in the water. Or it might mean simply taking on less responsibility during a dive: Look out for yourself first.

Use common sense. Scuba does have a way of testing you when you're not ready to be tested.

One final suggestion for safe diving and risk reduction has to do with attitude. In diving, one size, color or style does not fit all. One attitude does, however: "If I'm going to do this, I am going to do it the right way."

Remember to ask: "What is right for my skill and equipment? What is my responsibility to my buddy and dive group? What will keep me enjoying my dives every time I get in the water?"

Try asking yourself these questions each time you suit up - or every time someone asks you about scuba and safety. DAN wants you to stay in scuba and keep enjoying a recreation that can last a lifetime. ■

Decompression Illness
IN A VEGETARIAN DIVER

A case report *by Robert A. Van Hulst, MD, PhD and Win van der Kamp, MD, PhD*

(Editor's note: the following is a shortened version of the article: Decompression illness in a vegetarian diver. Are vegetarian divers at risk? A case report published on "Caisson", 26. Jg./2011/Nr. 2, pp. 24-27)

A 36-year-old male dive instructor made one dive for 60 min at 18 mt and a second dive for 52 min at a maximum depth of 21 mt, with a surface interval of 2 hours. His dive computer gave a decompression stop for 8 min at a depth of 3 mt, which he accordingly made.

About 45 min after the dive, he felt tingling in his feet and left hand, weakness in his legs, pain in the elbow of the left arm and tiredness. During transfer to the hyperbaric chamber he breathed 100% oxygen and rehydrated himself by drinking 500 ml of water.

On his arrival at the hyperbaric chamber 6 hours later, he was well orientated with normal speech, pupil reaction and cardiopulmonary examination. The neurological examination was normal for cranial nerves, low reflexes in both arms, no reflexes in his legs, normal strength in arms and legs, abnormal sensory aspects for vibration and propriocepsis in his legs. Coordination was normal.

The patient was treated with a USN Table 6 and 4 daily HBO_2 sessions (2.4 bar, 90 min). His symptoms gradually improved during the treatment tables, but in between there was a relapse of his sensory symptoms and weakness of his lower legs. On Day 4 of his treatment we heard about his vegetarian nutrition, so we performed additional hematological tests and found abnormal values, suggesting macrocytic anemia with a vitamin B_{12} concentration of 100 pmol/l (normal range 165-835), folic acid 10.9 nmol (9.2-38), iron saturation percentage 7% (25-50), serum-iron 4 µmol/l (12-30), ferritine 108 µg/l (50-300). The Schilling test performed to exclude malabsorption was negative.

1000 µg cyanocobalamin was administered intramuscular for 5 days, then weekly in the first month and monthly for 3 months. The patient was completely recovered within 4 weeks and prescribed daily multivitamin tablets, including B_{12}. Because of his career as a sport/diving instructor, we also screened him for PFO by TEE, which showed no shunt. His blood values restored after 4 months, and he resumed diving after 6 months.

DISCUSSION

After reviewing the medical literature, we believe this is the first published case of a vegetarian diver presenting a vitamin B_{12} deficiency in combination with DCS.

Vitamin B_{12} (cyanocobalamin) is abundant in meat, fish and most animal byproducts. However, strict vegetarians seldom develop a clinical deficiency, as only 2.0-5.0 mcg (microgram) of vitamin B_{12} is needed a day and an adequate amount is available in legumes. The most common cause of B_{12} deficiency is malabsorption due to defective intrinsic factor production.

Vitamin B_{12} deficiency affects the spinal cord, brain, optic nerves and peripheral nerves. The onset of symptoms is gradual, with general weakness and paresthesias (tingling, "pins and needles" feelings etc). As the illness progresses, the gait becomes unsteady and stiffness and weakness of the limbs (mainly the legs), develop. Initially, there may be no objective signs; later on, examination shows a disorder of the posterior and lateral columns of the spinal cord. Loss of the vibration sense is the most consistent sign, noticeable in the legs and often over the trunk; position sense is usually impaired. Loss of strength, changes in tendon reflexes and clonus affect the legs.

In divers, spinal DCS usually starts acutely within a couple of hours after surfacing with numbness, weakness in the legs, progressing with sensory and motor deficits: symptoms suggesting involvement of the spinal cord with a predominance of the dorsal and lateral columns. In histopathological studies, both DCS and vitamin B_{12} deficiency present spongi changes and foci of myelin and axon destruction in the white matter of the spinal cord. The most affected regions are the posterior columns in thoracic and cervical levels, but there are also changes in the lateral columns. The pathological findings of the peripheral nervous system are those of axonal degeneration and significant demyelination. In acute DCS, bubbles cause vascular obstruction in the arterial and venous system and liberation of gas bubbles in white matter of the spinal cord with spongiosis, axonal swelling and myelin degeneration.

Monkeys kept on a vitamin B_{12} deficient diet for a long period develop neuropathological changes indistinguishable from those in humans, in a time comparable to the time required to deplete the vitamine B_{12} stores of patients with pernicious anemia. In this diver, the Shilling test excluded the pernicious anemia.

The most immediate goal in the treatment of B_{12} deficiency is to saturate body stores and prevent relapse for as long as possible. The advice is to administer 12 doses of 1 mg of vitamin B_{12} weekly as initial therapy, then follow a schedule of 1 mg of vit B_{12} every 3 months. All neurological symptoms and signs improve mostly in the first 3-6 months of therapy and then, slowly, during the ensuing year or even longer.

We concluded that the diver in this case had DCS based on the acute onset of symptoms after a provocative decompression dive; he was at risk because of a vulnerable spinal cord due to a long-lasting vitamin B_{12} deficiency. We also suspect that some of his symptoms during post-treatment were manifestations of a B_{12} deficiency enhanced by DCS. However, we do not believe that vegetarians in general are at risk for DCS, but they should be aware of their nutritional status, particularly regarding vitamin B_{12}. ■

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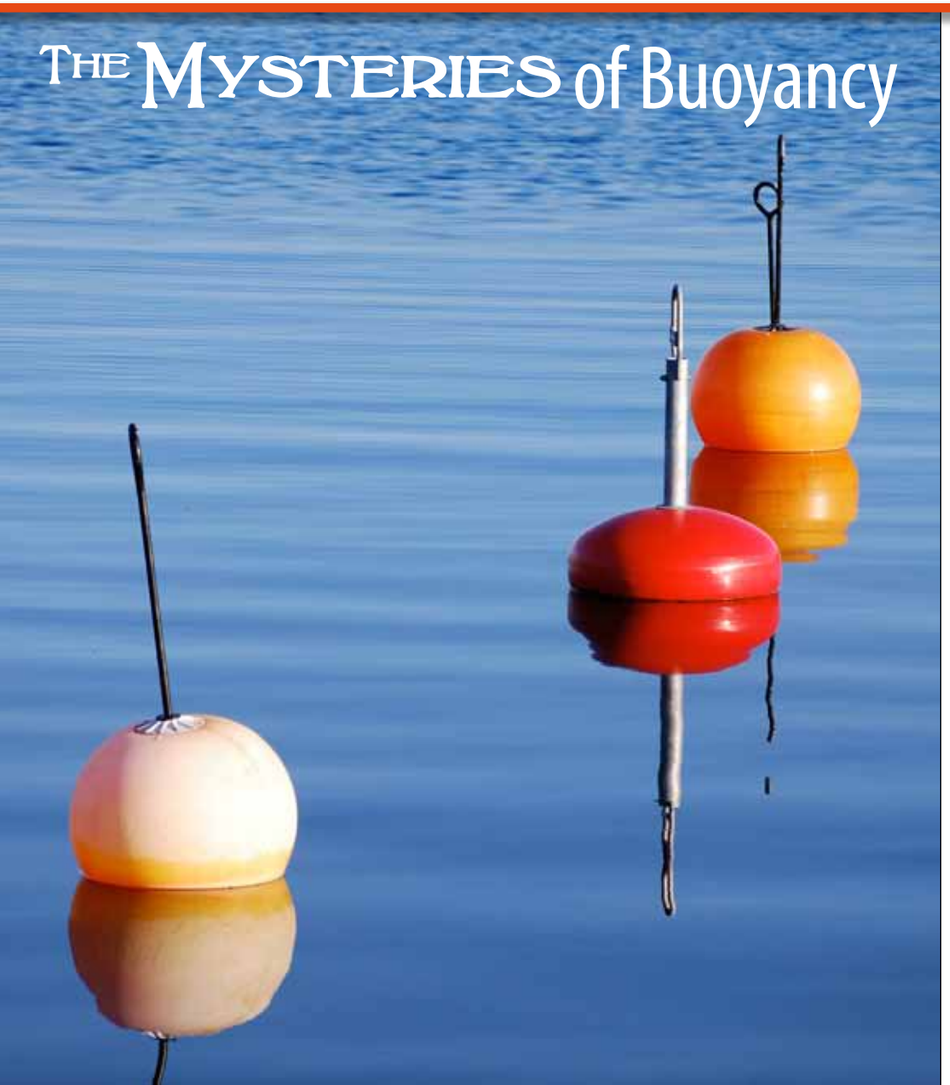
"PFO FOR DUMMIES"

HOW TO EXORCISE SEEMINGLY COMPLICATED DIVING PROBLEMS

Welcome to the first edition of a new light-hearted column in our magazine, ***by Claudio Di Manao,*** a writer, expert diving instructor and long-time DAN Member. Claudio, an attentive observer of the peculiarities of divers around the world, reflects upon a few safety aspects, without taking himself too seriously.

To find out more about Claudio, visit his website and check out his blog!



Imagine you find yourselves, through a mistake in universal spatiotemporal mechanics, having to explain to a Pharaoh of 4500 years ago what happens if buoyancy control is lost during a dive. Sporting your water-skin made from a goat's stomach and a belt with metal plates on it, you would be hard-pressed to describe to Cheops the workings of the wind machine you carry on your back; taking a risk that could either grant you the role of High Priest or... a sound whipping.

4500 years later: the descendents of Cheops (and of Genghis Khan) have now taken to diving. Though the difficult task of explaining the issue of buoyancy, even to a licensed and trained diver, remains the same to this day. Well, you might say, no human is born swirling on their flippers with a supply valve in their mouth. It's true, if this were to happen, midwives wouldn't call DAN, they would call the nearest UFO centre! Buoyancy control is learnt, it's not innate, but not all divers give the right attention to weights, nor the to the BC. You know those seabeds littered with nylon belts and weights… or with those black nylon bags, part of the weight belts, which can be often mistaken for mutant nudibranchia? Well, most of those objects are dropped by divers at the surface, either whilst getting ready to get into the water or whilst getting back into the boat. But that's not all...

I have seen things you people wouldn't believe... A lawyer make an uncontrolled ascent from thirty metres, whilst his weights, falling into the blue, just missed a magnificent acropora in the Red Sea. I have seen a barber deflate his BC and roll around on the bed, encroaching on the territory of a stonefish. Seeing these things makes you shudder, and even when you've been brought up in the light of 'positive reinforcement' you might resort to more subtle methods: make them repent. Thus, you give the lawyer a nice speech about the two-meter acropora disk that takes at least a century to grow that big. You tell him that just a little damage would kill the whole colony... and you convince him that the life of that immense complex of small molluscs who watch sharks go by and witness the mating of all endemic species is far more interesting than his own... The barber instead couldn't be bothered: he didn't care at all about the well-being of the poisonous fish.

I saw a diver plunge straight down to the sandy seabed. Whilst I asked myself if he had had time to compensate, a cloud rose like the ones Wile E. Coyote makes when he lands on the bottom of a canyon. In fact, I had noticed the diver don too much weight for my tastes, but I hadn't said anything. He was our guide.

Now - amongst the various problems presented, we have established that losing bits and pieces along the way is, above all, environmentally unfriendly, and what more, as recounted by the last issue of Alert Diver (Read it; if you haven't already.), they can cause traffic problems in hyperbaric chambers, or worse, in morgues. How can we avoid it?

Just doing what we always do; check ourselves. We regularly check to make sure that we have our keys or wallet with us before leaving the house, and we check our flies before leaving the bathroom of a restaurant. These slightly neurotic habits would do us well underwater, along with some other measures. At twenty meters, if you dive with a thick suit, the weight belt starts dancing the hula hoop. To writhe among rocks and wrecks is like being on public transport full of pickpockets: if we manage to check that we have our wallets on us on the subway of a large city, why not check that the buckles of our weight belts are still closed?

Making an uncontrolled ascent, I swear, can bring many more problems than being deprived of one's cash, credit cards and ID. My personal nightmare is not being robbed, but a half-open buckle – or a pocket-full of loose ballast weights.

Buoyancy problems and their attempted solutions don't stop here. An unaccountable number of divers weigh themselves down like a kamikaze. Ideology? Depression? No. They find it hard to descend. To break the water's surface and go down below is never a question of weight, but of breathing. You have to be patient: empty your lungs properly and wait for the water to fill the semi-dry suit, relying on the fact that nature abhors empty spaces. This principle works for many other things in diving, too. I'll spare you with the Latin and get straight to the topic: lung volume. Litres of air can be compared to the weights you have on your belt when wearing a thick suit. Breathing in gasps or trying to descend with your lungs full of air (and water is very adept at dejecting those who breathe too forcefully, just as it is with those empty spaces) is equivalent to cancelling out the weights on your belt.

Let's now look at the devil's real tool: the BC. In the beginning it aroused suspicion. Divers used to regulating their buoyancy with their lungs and a plastic bag didn't trust it. If you read the label on a BC you wouldn't blame them: WARNING! – a triangular sign with an exclamation point – followed by the list of misfortunes which could strike you following its improper use, including death. It's certainly more eco-friendly than lead weights (you don't find that many BCs on the seabed), and using it sounds more dangerous than hanging around a reef habitually bombed by poachers. What dangers does this strange instrument have in store for us? First, one of the biggest misunderstandings in the history of buoyancy control from the plastic bag onwards: the inflation and deflation buttons are to be used NOT like the buttons on an elevator. It's no laughing matter. People do this. Buying a 10.000 Euro BC does not protect you from the consequences of this mistake, or other misunderstandings. There are those who have survived the improper use of this infernal instrument...

"Let's now look at the devil's real tool: the BC."

A couple from the Cayman Islands discovered their computers blocked. They hadn't been diving for months, yet their computer screens flashed an SOS message. They sent their computers off for servicing, and found that the data in their memory revealed numerous rapid dives with rocket speed ascents.

It had been the couple's kids: twelve and fourteen years old. In their parents' absence, they had been borrowing the equipment and crashing down to the seabed. With the belt weights of adults. The only thing they had to fear was the depth: there beneath them existed one of the deepest trenches in the world. They were then surfacing by inflating the BCs. Fortunately those BCs had overpressure relief valves, otherwise they would have busted, sending the kiddos back to the bottom of the Cayman Trench, in the eternal company of very rare white spirographs and bacteria.

There is another thing I didn't tell you about BCs: They can inflate and deflate by themselves; underwater! It's no worse, if not better, than losing your belt. There is a solution (at least until you reach the surface)... as long as you take notice, that is. However, there's nothing to be done about the loss of your weight belt. Even with a thin suit three divers can't keep you down. Thus, we come to one of the most underestimated items of equipment that changes volume: the wet suit – a shortie of 3 or 7 mm wet suit, semi-dry or dry suit, or what have you. Many buoyancy problems come from changing from a thin to a thick suit. It's like going from driving a scooter to a lorry. Switching from a wetsuit to a dry suit without any training or practice is a folly with no positive outcomes.

Equipment or no equipment, the secrets of buoyancy would be much easier to explain to an ancient Pharaoh than to modern man. Good control of breathing, of its rhythms, and mainting calm and quiet observance in all that happens to us underwater, is what make divers (and coral) safe from potential problems. Making the right choice in weights, BC balancing, and carrying out continuous checks will allow you to enjoy one of the most beautiful things a human can experience: diving. Even today, the death of a diver is often portrayed by the media as the consequence of challenging a foreign environment where humans cannot and should not venture. In ancient Egypt, where the tens of thousands of deaths of labourers would have never made the Papyrus chronicles, the builders of pyramids would have thought the same. We, on the other hand, don't. ■

"It had been the couple's kids: twelve and fourteen years old. In their parents' absence, they had been borrowing the equipment and crashing down to the seabed."

Deep Adventure

A Thousand Feet Under the Sea

by Kai Garseg, photos by Stein Johnsen and Barry Brown

Many of us dream about exploring the great depths of the oceans in a safe and comfortable way. Finally it's possible! For a handful of dollars you can now play aquanaut for a day, in a submarine so far accessible only to scientists. We went to Curaçao to have our dreams fulfilled.

"Curasub to topside. Requesting permission to dive,"
pilot Barbara van Bebber says.
"Topside to Curasub. Go ahead - have a nice dive,"
the immediate reply sounds over the loudspeakers inside the small submarine.

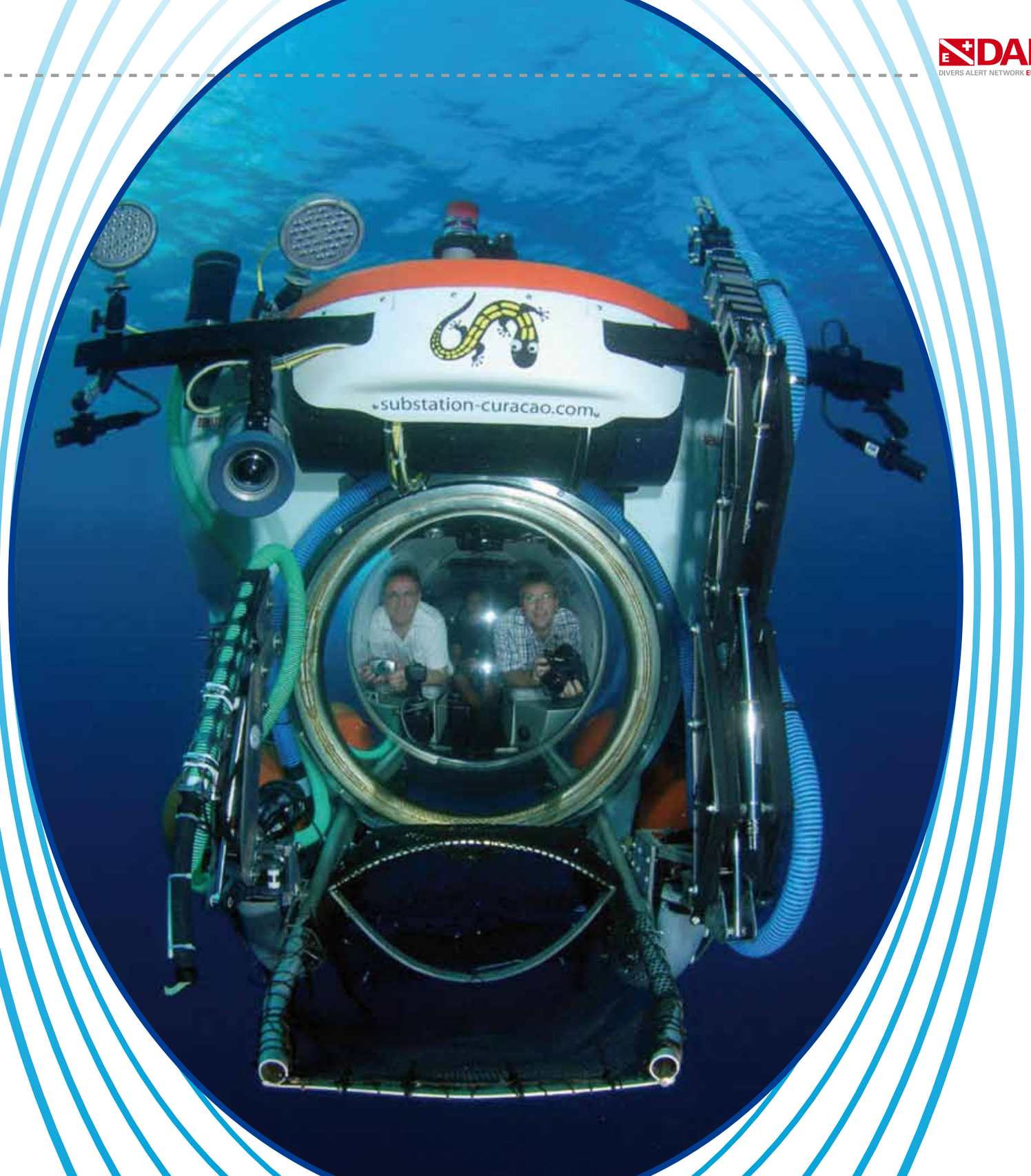
Barbara lets a little air out of the ballast tanks as she steers the submarine out of the docking station in Curasubs private, sheltered harbour. Just a few yards away the beautiful coral reef plummets into the abyss, and the hum of the electrically driven propellers signals the start of our journey. Our bodies are tense with excitement and expectations. We're at the Caribbean island of Curaçao, and we're headed for the eternal darkness a thousand feet deep.

Roundtrip

"We're going to give you quite a roundtrip today," Barbara says while manoeuvring the sub towards the drop-off with a joystick.

There are four people in the sub today. Barbara van Bebber sits in the middle piloting the sub while Bruce Brandt, who is also a pilot, is sitting in the back. He's just coming along for a joyride. Photographer Stein Johnsen and yours truly are placed up front by the large acrylic dome where the view is the best. Barbara can easily see between us, but she's also got several video screens and a 360° sonar to aid her in piloting the submarine.

"Usually there's one pilot and two passengers, but sometimes we have five people on board," Barbara explains before briefing us on the dive we're about to start.



"We'll be heading east along the coral reef to look at two shipwrecks located at 150 feet, before heading down to 290 feet to look at a giant gorgonian coral fan. After that we're going to plummet down a 250 feet wall which starts at 560 feet. At the foot of the wall we will be at 810 feet, and from here we're going to navigate in a westerly direction until we reach 1.000 feet. We'll have a nice two-and-a-half hour trip, so I hope you remembered to use the restroom," she says jokingly.

Wave home from the reef

Our first stop is at just 45 feet, right outside Substations harbour. Underwater photographer Barry Brown is waiting for us - everyone who dives with Curasub is photographed, and no-one leaves without a memory stick filled with very special images and a cool certificate to hang on their wall.

A professional to his fingertips, Barry shoots the submarine from all possible angles and waves at us to come even closer to the large dome at the front. The photo shoot is done in front of a permanent, underwater webcam so friends and family back home can watch the whole thing online as it happens. With great precision Barbara manoeuvres the sub close to the webcam giving us the opportunity to wave to anyone watching. The clip will also be posted on YouTube for the passengers to watch later.

After a few minutes Barry is satisfied with his images and waves a quick goodbye. Barbara backs the sub away from the reef and lets more air out of the ballast tanks. We're on our way.

"We always do the descent facing the reef. This way we always know the distance and we don't bump into anything," she explains.

She might know the distance, but we're pretty far off the mark sitting behind the thick acrylic dome for the first time. We estimate that the reef is less than 10 feet away, but Barbara tells us that she's keeping a 45 feet distance.

The tugboats

Curasub has now turned east, and we're flying along the coral reef while slowly getting more and more water between us and the surface. It's a strange feeling to supersede my maximum sports diving limit while lying comfortably on a couch. The pressure in the cabin is at one atmosphere at all times, so there is little feeling of depth apart from what we see through the dome. The propellers hum in the background and we're enjoying the ride while Barbara keeps feeding us interesting and useful information about the sub and what we see outside. At certain intervals and locations she reports back to the crew on the support boat at the surface. Information about where we are, depth and different readings are routinely passed to the people topside. Every message is acknowledged, and the details are logged somewhere up there in the sunshine.

After a short stop to have a look at a large anchor, we continue due east. Our depth is 150 feet, and soon we can make out a shipwreck in the distance. As we get closer we realize that it's not just one wreck – there are two! They're almost on top of each other, and Barbara manoeuvres the sub for us to get a really good look at both vessels. Resting on a ledge, they are a magnificent sight.

"The wrecks have a really unique story. The first tugboat sank in 1987, where she lies now. The other one went down four years later, and was at first perched in shallower water. When hurricane "Brett" hit the island in 1993 it slipped off the reef and tumbled deeper, almost landing on top of the first tug. Seeing two wrecks this close is quite special," Barbara says with a smile.

Into the abyss

After photographing the twin wrecks we venture deeper to have a look at a 10 feet wide coral fan growing at an incredible 290 feet below the surface. Barbara carefully gets us as close as she can and turns on the floodlights to bring out the beautiful colour of the coral.

When we get even deeper, there are no more coral to be seen. The bottom is made up of volcanic rock, and the number of fish decrease as the sunlight dwindles. At 560 feet we slowly glide over a sharp edge. Below there is nothing but abyssal darkness – and we keep heading straight down.

The huge rock wall appearing in front of the acrylic dome is completely out of this world. We're in the twilight zone and as we pass below 600 feet there is just a slight, blue shimmering above us. It's still enough to see most of the awe-inspiring, 250 foot wall rising towards the surface, covered with cracks and ridges like an old man's face. Would you believe it – we don't even have the floodlights turned on!

Reaching 1.007 feet

"Curasub to topside. We are at the ridge. Depth 1.007 feet," Barbara speaks into the microphone.

The loudspeakers crack slightly when topside answers. The connection is not quite as good as earlier in shallower water, but good enough for Barbara to deliver her status report.

We have come to a halt at the foot of the huge wall, where it disappears into the sloping bottom sediments. The last 180 feet of the descent was made with full floodlights, and the depth gauge shows a staggering 1.007 feet. The temperature outside is just 54°F, but even 1 hour 40 minutes into the dive we're comfortable and warm inside the submarine.

The thought of what it would feel like to be inside a giant "underwater housing" at this depth had of course crossed my mind a few times before arriving at Curaçao. Would it be comfortable, and more importantly – would I feel safe? I had worried that claustrophobia might sneak up on me, but sitting at the bottom of the ocean did not feel the least bit uncomfortable or risky. The submarine is approved for much greater depths by the renowned Germanischer Lloyd, and the competent pilots know the area like the back of their hands after close to 500 dives in the area. I was enjoying the ride, and had nothing else on my mind besides getting the most out of the experience while we were submerged.

At this depth the ocean is barren and lifeless compared to the teeming life we saw in the shallows, but every once in a while creatures we have never seen before turn up in front of the dome. Barbara is steering us close to the mountain so we get to see fish and crustaceans only found here in the abyss. Suddenly a

fish that seems somewhat familiar comes into view – a moray eel! It behaves strangely and looks rather confused as it bumps into stuff while trying to swim away. Maybe it's got nitrogen narcosis?

50/50 Science and tourism

After staying a while at a little more than 1.000 feet it is time to start the journey back to the surface. Barbara turns west and tells us more about the many uses of the submarine and exciting things they have planned in the future as we hum along.

"We're quickly coming up on 500 dives, which is a lot in just 18 months. No other deep ocean submarine is being used this much. About half the dives are with tourists, while the other half brings scientists from many nations into the deep. We're having a 120 foot research vessel named "Chapman" rebuilt to serve as a mother ship, enabling us to take both scientists and tourists on expeditions to other locations. It will be ready quite soon and then we can do both daytrips and longer expeditions," Barbara tells us.

While she's talking about this it's getting lighter outside, and she turns off the powerful floodlights. Slowly, we're getting back to shallow water and the temperature rises noticeably.

"It sometimes gets a little hot inside if we're staying too long at sports diving depths since the water temperature is 82°F. Most of our guests choose a standard dive with a maximum depth of 450 feet. Down there it's about 71°F which is a little more comfortable for us on the inside," Barbara says.

Condensation has made the walls of the cabin moist, but apart from a few droplets on my forehead the dive has been a very comfortable experience. After 2 hours 22 minutes we're back at the surface and safe inside the Substation Curaçao base. It has been a marvellous day and the memories will no doubt last a lifetime.

The wreck of Stella Mares

At 450 feet just outside the Substation base lies the wreck of Stella Mares. She is the main target of our second dive with Curasub, and today Michiel van der Huls has the controls. Michiel isn't just a submarine pilot – besides being a dive physician and an eager sports diver, he is also a very nice and impressive guy.

Like the other Curasub pilots he has vast knowledge about the marine life in the area and he naturally knows every nut and bolt on the submarine after a long training course hosted by the manufacturer. With a steady, calm hand he manoeuvres the sub slowly along the reef while he's telling us all about what we're seeing outside. We're getting close to the highlight of the dive – Stella Mares.

"Our one-and-a-half hour dive will take us to the Stella Mares, where we will spend most of our time. This is a standard dive we often do with guests," Michiel tells us while motioning to make us look forward through the dome.

We're cruising along the sloping bottom at 420 feet when something dark and ominous starts to take shape ahead of us. Here she is, the Stella Mares, a former cargo ship which in 1989 was taken in arrest by customs after they found a large quantity of illegal drugs on board.

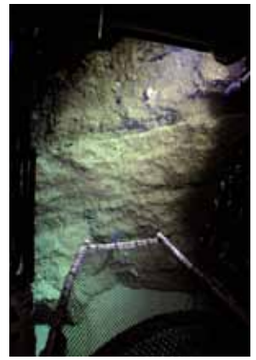
"Five years later the ship was cleaned and ready to be sunk as an artificial reef. Unfortunately something went wrong and she was sunk in water too deep for divers," Michiel explains.

He has manoeuvred the sub close to the bow of Stella Mares, which lies on her starboard side with a 90° list. The wreck looks small, but again it's just the optics of the acrylic dome fooling us.

"Come have a look through the flat window above me," Michiel says.

I crawl to the back end of the sub and look out the flat observation window located in the subs entry and exit tower. To my surprise the wreck is huge! Seen through a flat window without any distortion I get a true sense of size and distance, and Stella Mares is suddenly a "large ship" instead of a "small boat".

We follow the side of the wreck towards the deep end. I'm back by the large dome at the front when Michiel halts at the stern of the wreck and turns the sub around so we can have a look. The floodlights are off but we can still see the full length of the wreck – and this is a 240 foot ship! Visibility must be at least 300 feet and it is a magnificent view for sure.



Combine with scuba diving

If you're fascinated by the deep ocean and the magnificent creatures and shipwrecks hidden there, a dive with Substation Curaçao offers a unique possibility to explore and experience something completely out of the ordinary. Many people, and divers in particular, have this dream – and finally it is possible to have the dream come true.

"It is really a fun and fulfilling job to pilot the Curasub. Most of our guests are ecstatic after the experience, whether they are divers or not. Most of the divers combine the submarine dive with scuba diving on the beautiful coral reefs of Curaçao," Michiel tells us.

We're of course doing the same thing, and after finishing our second and last dive with Curasub we pack the rental car with dive gear. A few wonderful days of coral reef diving is waiting, and although the tug of the deep most certainly will be there we look forward to some memorable, shallow dives. The combination is almost unbeatable! ■

Facts about Curasub/Curaçao

Substation Curaçao has been in operation for a year and a half, and they celebrated dive number 500 with the Curasub on December 22, 2011.

Substation Curaçao is a subsidiary owned by Curaçao Sea Aquarium, where they are located. In addition to diving with tourists and scientists, the submarine is used to collect deep water fish species for the aquarium.

Curasub is certified for an operating depth of 1.500 feet, but has been designed to withstand pressure many times this depth.

On the inside, Curasub's pressure hull measures 3 feet 10 inches, and is 8 feet 8 inches long. The large acrylic dome at the front measures almost 3 feet 4 inches. In addition, Curasub has six smaller windows, two on either side and four in the tower.

The pressure inside the submarine is always one atmosphere, just like on the surface. The CO_2 is cleaned with a scrubber system of the same kind found in rebreathers, and the total breathing gas supply is 480 man-hours.

The submarine is electrically powered by a total of 20 batteries in two outside cylinders. The operating power is 240V and drives six thrusters (propellers). The ballast tanks create 1.455 pounds of buoyancy and droppable lead weights another 1.984 pounds.

The pilot stays in connection with the topside crew via a two-way radio system, and Curasub has several outside video cameras delivering live feeds to the screens in front of the pilot. Curasub is also equipped with powerful floodlights and a 360° sonar, as well as manipulator arms with suction hoses used by scientists and the aquarium for collection of fish.

Anyone with normal health can do a dive with Curasub. A medical waiver is available on the Substation homepage.

Scuba diving at Curaçao

The Caribbean island of Curaçao is located north of Venezuela, and has always been one of the region's favourite dive destinations. The best diving is found on West Punt, about an hour's drive from the capital city of Willemstadt. In other places, the diving was more average, but West Punt and especially the dive site Watamula really impressed us.

First Aid Oxygen **Update**

by John Paul Longphre, M.D.

The basics of diving gas physics

In a previous article, we discussed basic diving gas physics. In short, we concluded that the more oxygen you breathe, the more the nitrogen (presumed the key player in the development of decompression sickness, or DCS) is washed out of the tissues.

Remember that the lung is primarily a large surface area: When spread out, it's about the size of a tennis court. Only a single thin layer of cells separates blood from the air we breathe, allowing for the all-important gas exchange.

When you're safely decompressing, nitrogen travels from the body's tissues through the bloodstream back to the heart and into the lungs; it crosses the thin lung cells into the lung's air sacs and is exhaled without your even realizing it. Some nitrogen molecules coalesce to become bubbles in the body if there are enough molecules around. These bubbles are frequently detected (using ultrasound technology) in the bloodstream. We routinely see bubbles at Duke during research studies; they are present even after some rather shallow dives.

Dr. R.D. Eckenhoff and colleagues at the University of Pennsylvania reported in 1990 that you could expect to detect venous bubbles in 56 percent of divers who had spent 48 hours at the shallow depth of 16 fsw (5 msw) (1). However, this saturation profile (48 hours at 16 feet/5 meters) is far longer than what the average recreational diver would experience. In addition, short, shallow dives would be far less likely to lead to measurable bubbles than a 48-hour exposure.

This was a significant discovery, however, because prior to that, few dive medicine specialists believed that bubbles were so prevalent. With rare exception, all of these bubbles are simply filtered by the lungs before they have the chance to cross into the arterial circulation, where they could do damage by obstructing blood flow.

Nitrogen bubbles can be minimized by decompressing with 100 percent oxygen; this lessens the chance of rogue nitrogen bubbles forming in appreciable numbers. If pure oxygen bubbles should make their way into the arterial circulation, these are considered less troublesome than nitrogen bubbles. That is because oxygen is a metabolic gas, i.e., a fuel, and will be consumed, unlike the inert nitrogen bubble. Any reasonably small oxygen bubble, even those that go to the brain, will be consumed eventually.

This is one of few times we can praise the brain's insatiable appetite for oxygen. (It consumes more oxygen per unit weight than any organ, and the lung consumes very little). One safety note: While underwater, to minimize the risk of central nervous system oxygen toxicity (usually seen as a seizure), never breathe 100 percent oxygen deeper than about 20 fsw (6 msw). As the risk of oxygen toxicity is smaller when the diver is at rest in a dry chamber, 100 percent oxygen is used as deep as 60 fsw (18 msw).

The Findings

Switching gears, I would like to summarize our initial findings while interspersing a bit of commentary and explanation.

We looked at 2,231 cases of DCS in the DAN diving injury database (from 1998-2003) and found that the median time from surfacing to DCS symptom onset was 2.2 hours for all DCS types combined. "Median" refers to the middle number between highest and lowest numbers. It is generally believed that almost all (95 percent) of DCS symptoms occur within the first six hours of surfacing, so 2.2 hours is not unreasonable.

When symptoms of DCS were suspected, 47 percent of the injured divers were found to have used FAO_2. I think the diving community still has a lot of room for improvement here, and I suspect that the number is higher now, given better diver education.

The type of DCS that tended to be treated with FAO_2 was interesting as well. Those divers with rather dramatic symptoms, such as those who presented with cardiopulmonary complaints (i.e., the chokes) or serious neurological complaints (i.e., paralysis) were most likely to be given FAO_2.

One interesting finding came from those divers who had skin bends, in and of itself not a life-threatening form of DCS: Those divers were administered FAO_2 more rapidly than all other types. Their median time to FAO_2 was 18 minutes. This rapid initiation of FAO_2 may be because skin bends are easily seen by all those around and are frequently dramatic-appearing rashes. We were surprised to learn that the median wait for divers with serious neurological symptoms like leg weakness, paralysis or depressed level of consciousness was 54 minutes from symptom onset to FAO_2.

This point is worth repeating: injured divers with serious neurological symptoms tended to wait some 54 minutes for FAO_2. Most dive medicine specialists would agree that a paralyzed diver should begin receiving oxygen much sooner than 54 minutes after symptom onset. If you had simple pain in a joint, the wait was a little more than three hours after onset of symptoms. Numbness and tingling? Almost six hours. If you get bent, we would hope you would be started on breathing 100 percent oxygen more quickly.

Out of the 2,231 cases, we had very little information about outcomes on those who received FAO_2 before they were put in a hyperbaric chamber. In fact, we had only 330 cases in which we knew how the diver felt after being given FAO_2 but before hyperbaric treatment. Of those 330 divers, 65 percent (205 divers) reported either complete relief of symptoms or improvement with FAO_2 alone.

This is an inspiring finding but not strong enough to preclude the need for further hyperbaric treatment, which is still the definitive therapy. If you add a hyperbaric treatment after the FAO_2, the group with complete relief jumps to 67 percent compared with those who didn't have FAO_2 (58 percent with complete relief).

In other words, when you receive FAO_2 before the hyperbaric treatment, the chance that you will have complete relief after your first hyperbaric treatment is greater. This finding was statistically significant.

What about the chance of FAO_2 decreasing the total number of hyperbaric treatments required to fully treat an injured diver? Well, we found that those who had FAO_2 less than four hours from DCS symptom onset were less likely to require more than one hyperbaric treatment.

In other words, if you receive FAO_2 quickly, the chances are greater you'll need only one hyperbaric treatment. At the very least, oxygen should be available on all diving vessels. There should be enough oxygen onboard to treat one or two divers for the entire time it takes to get to the hospital.

Getting the most out of your oxygen

A high-efficiency, low-flow rebreather such as the Remote Emergency Medical Oxygen unit ($REMO_2$™) – (see Figure 1) or similar devices are well worth considering, especially if you're diving in more remote locales, i.e., far from medical facilities. These devices can very efficiently deliver more than 90 percent inspired oxygen with a miniscule 1 L/min oxygen flow rate average.

It can do this by recycling the unused oxygen in your exhaled breath. The $REMO_2$™ uses an oronasal resuscitation mask that makes an effective seal against the face. Few units are this efficient. In the case of a stable injured diver who does not need helicopter evacuation, this will allow much more time for the boat to make the trip back to shore, before the oxygen supply is depleted.

As a comparison, the plastic oxygen masks (without reservoir bag) seen in hospitals require 13-15 liters per minute (L/min) to attain 50 percent inspired (breathed)

oxygen. Nasal prongs are much less effective, raising inspired oxygen only a few percent higher than air. We found that an alarming 7 percent of injured divers given FAO_2 still used nasal prongs. Most providers used the commonly available and reasonably efficient nonrebreather mask (37 percent). Found in emergency rooms, these are the fairly efficient, flexible plastic masks with the plastic reservoir bag attached beneath.

So, how much oxygen should you bring with you on your dive trip? Here's a small chart (Table 1) comparing inefficient modes of FAO_2 delivery (15 L/min) to the efficient $REMO_2$™ unit (1.3 L/min average)*. The difference is remarkable. I have included, via simple math, an explanation that you can adapt when using different size cylinders. Always remember to allow for delays, and bring a little more than you think you may need for the boat trip back.

In conclusion

We still need to learn more about those divers who use FAO_2 alone and without hyperbaric treatment as well as those who use FAO_2 alone without seeking formal medical attention. ■

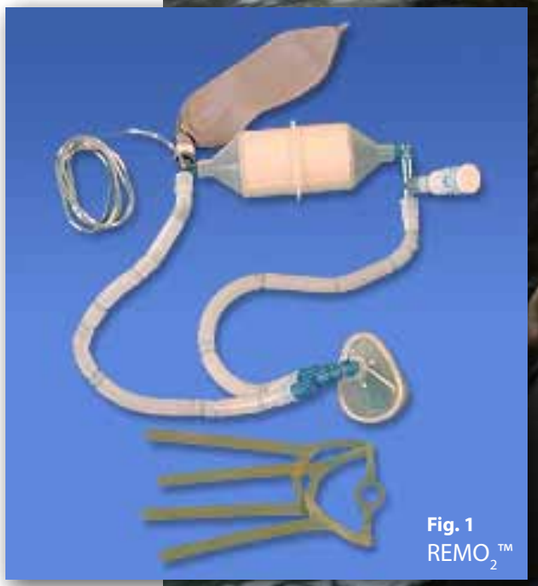


Fig. 1
$REMO_2$™

**This information is based on the $REMO_2$™ system, however, this system is no longer in use. Medical oxygen rebreathers similar to the outdated $REMO_2$™, such as the Wenoll system, are currently utilized in Europe and produce similar results.*

Table 1: **Different Methods of Oxygen Delivery**

Desired O_2 Duration (hrs)	High Flow Oxygen (15L/min) i.e., inefficient O_2 use. Total Liters of O_2 Used	Number of Jumbo-D cylinders needed	Low Flow (1.3 L/min) i.e., efficient O_2 use. Total Liters of O_2 Used*	Number of Jumbo-D cylinders needed
1	0,9	1 ½	78	< ¼
2	1,8	2 ¾	156	¼
3	2,7	4 ¼	234	< ½
4	3,6	5 ¾	312	½
5	4,5	7	390	< ¾
6	5,4	8 ½	468	¾
7	6,3	9 ¾	546	< 1
8	7,2	11 ¼	624	1
9	8,1	12 ¾	702	< 1 ¼
10	9	14	780	1 ¼

References

1) Eckenhoff, R.D.; Olstad, C.S.; Carrod, G.; "Human dose-response for decompression and endogenous bubble formation," Journal of Applied Physiology, 69(3): 914-8 (1990).

About the Author

John Paul Longphre, M.D., is a former clinical and research fellow at Duke University's Center for Hyperbaric Medicine and Environmental Physiology and is currently in the division of Occupational and Environmental Medicine, Duke University Medical Center, Durham, N.C.

A Traumatic Slip
An Instructor's Injury in Thailand

by DAN Europe Staff

The protagonist of our "success story" is a 30-year-old diving instructor who traveled to Thailand, a renowned paradise for lovers of marine and underwater environments.

It was the 4th of May. As he was getting back onto the boat after a dive, he slipped from the ladder and injured his foot, with an open fracture aggravated by a dislocation, a tear in the tendon of his fourth toe, as well abrasions on his face and nose.

He was taken to the nearest clinic, on the island of Koh Tao, where he was given first aid, however, the facility was too small to offer him adequate treatment or to be able to operate on his foot, which was in a nasty condition. Luckily though, the diver was a DAN member and called our international emergency hotline, which recommended a larger and better-equipped hospital: Bangkok Samui Hospital of Koh Samui. DAN operators immediately began the process of arranging and organising a transfer between the two hospitals.

When the injured man reached his destination, eleven hours had passed since the time of the accident; the injury had a high risk of infection and there was need of an urgent operation. The patient, scared and worried, was comforted regularly by the medics at DAN who were daily evaluating the terms and regulations of the Bankok hospital. In the meantime, he was guaranteed immediate medical assistance, and direct payment of all the medical costs to the facility. Now, he could finally just relax and focus on his recovery.

The foot operation initially seemed to have worked: the patient spent six days in hospital on antibiotics, doing physiotherapy, and was then released. The following control visit, however, detected further problems and a risk of gangrene – making it necessary to procede with a second hospitalisation period of 5 days. The DAN medics, who had been continually following the case and in communication with the Thai hospital staff, were able to arrange discharge from the hospital, allowing the patient to continue his treatment at home. DAN then handled all of the necessary procedures for the return trip; including, ensuring a business class reservation that would allow the patient to keep his limb elevated throughout the journey. DAN medics maintained communication with the patient-diver even after his return home, up until the 26th of May when the situation was finally stable.

A tale with a happy ending, notwithstanding the underwater accident, medical complications and overall cost of €13,000, which was entirely covered by the DAN insurance plan.

Ladder accidents: A problem of misinformation

For the past few years, DAN has been addressing a problem which has been given too little attention, but one of which all divers, boat owners and handlers should be aware: **the potential danger of boarding ladders.**

What kind of damage can they do?

Potential injuries range from slight bruising - generally to the hands (but not only, as the prior case has shown), to the traumatic amputation of one or multiple fingers.

Furthermore, badly designed ladders that don't offer a safe and stable support for feet (when wearing flippers, too) make it easy for a diver to fall as he is getting back into a boat. Accidents like this can also cause severe trauma to the divers below.

What does an ideal boarding ladder look like?

The most dangerous part of a ladder are the hinges, used to fold it back onto the boat during navigation.

The positioning of the ladder to the side of the boat is also important. If it is not well fastened or too mobile, particularly if it's on the side of the boat, it can oscillate and trap the hands or fingers when the rocking of the boat brings it back against the side.

This occurance is less frequent, but still possible, for ladders on the stern, as the boat can pitch forward forcefully. It is even more likely to happen if the ladder is hinged, or if the spacer between the ladder and the side/stern of a vessel is not of an adequate length.

In the case of a diver falling off a ladder, the design of a ladder and it's construction are both factors to be considered. A ladder that is too narrow or short, is not designed to be climbed with flippers, or is made with slippery materials, can constitute additional risks that could be avoided with a correct design.

Always be careful when climbing up ladders, even on your own boat! ■

8th International DAN Divers Day

Photo: Alberto Gallucci

"New Perspectives in Diving Medicine"

September 16th, 2012 - Belgrade, Serbia

DAN International DIVERS ALERT NETWORK

Program of the Conference

Morning Session

10:00 – 10:15: **Welcome and Introduction**
Alessandro Marroni (IDAN)

10:15 – 10:30: **The Divers Alert Network and its Mission**
Cristian Pellegrini (Italy)

10:30 – 11:00: **Oxygen in Decompression**
Jacek Kot (Poland)

11:00 – 11:30: **Respiratory Problems in Diving**
Dragana Ivkovic (Serbia)

11:30 – 12:00: **Recent Advances of DAN Europe Research on the Pathophysiology of Breath-Hold and Scuba Diving**
Costantino Balestra (Belgium)

12:00 – 13:15: **LUNCH BREAK**

Afternoon Session

13:15 – 13:45: **Technical and Rebreather Diving in Popular Diving Destinations: Lights and Shadows**
Adel Taher (Egypt)

13:45 – 14:30: **DAN's Diving Medicine and Safety Programs: Better Awareness Makes Safer Diving**
François Burman (South Africa); Guy Thomas (Italy)

14:30 – 15:00: **"Effect of delay to recompression on outcome of DCS"**
Petar Denoble (USA)

15:00 – 15:30: **Participated Field Research in Diving Medicine and Physiology. A Powerful Data Collection System to Complement Classical Lab Research. Methodology and Recent Acquisitions**
Alessandro Marroni (Italy)

Conference venue
SAVA Centre - Milentija Popovića 9, Novi Beograd, Belgrade

Participation is free of charge. Reservation is recommended
The official language of the conference is English. Simultaneous translations (English-Serbian) available on request

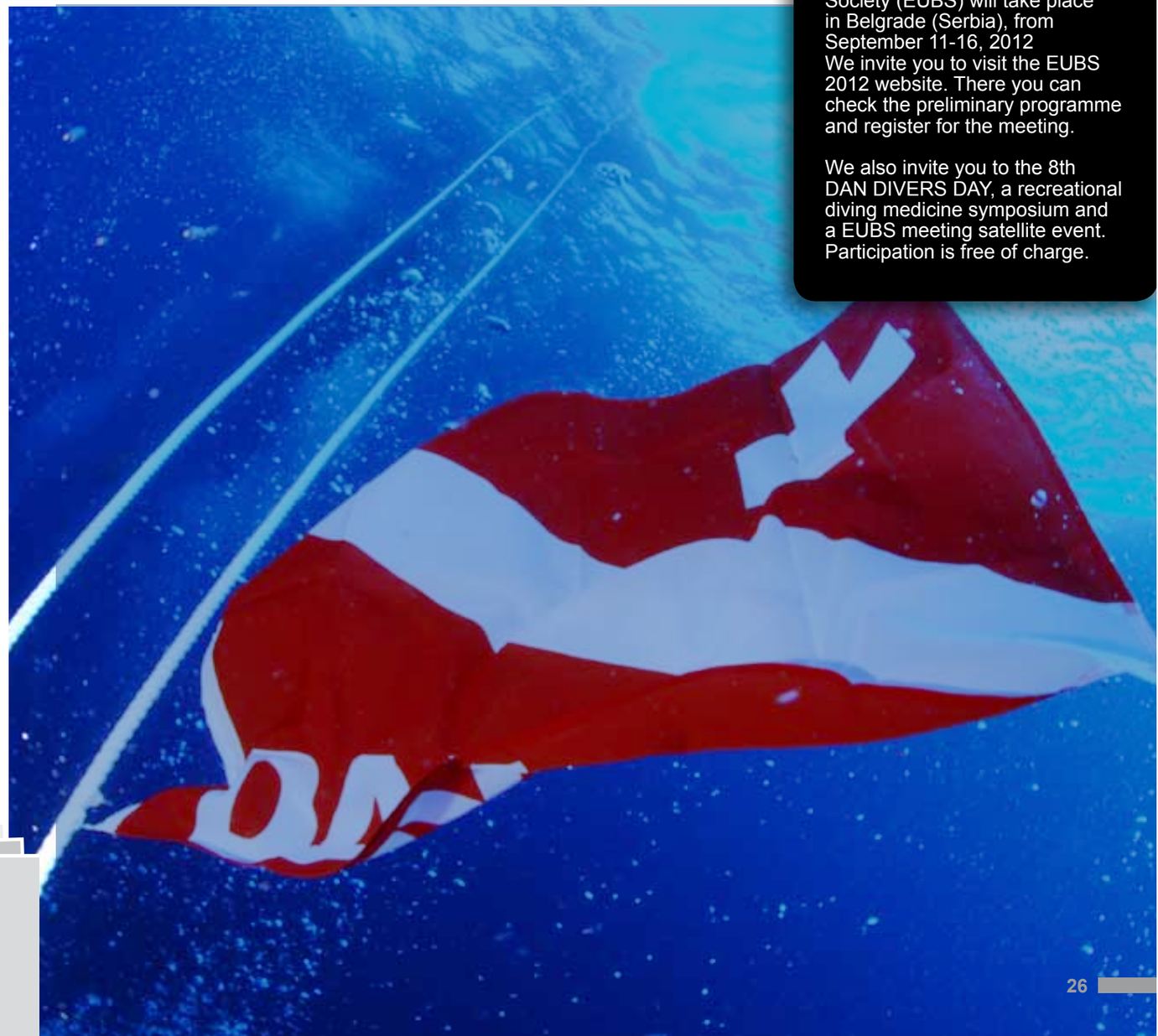
For more info: ddd2012@daneurope.org

www.eubs2012.org

EUBS Meeting & DAN Divers Day to be held next September in Belgrade

The 38th Annual Scientific Meeting of the European Underwater and Baromedical Society (EUBS) will take place in Belgrade (Serbia), from September 11-16, 2012
We invite you to visit the EUBS 2012 website. There you can check the preliminary programme and register for the meeting.

We also invite you to the 8th DAN DIVERS DAY, a recreational diving medicine symposium and a EUBS meeting satellite event. Participation is free of charge.



DAN Europe at the Conflans Aquatic Centre:
STEPS FORWARD IN PARTICIPATED RESEARCH

Report by Massimo Pieri

Conflans, 2 March 2012: Our journey in the exploration of bubbles continues...

Every time we set off on a new adventure, we wonder what discoveries we will make and how many new friends we'll meet. This time our friends are Christian Furet and Christophe Riou, who await us smiling in front of the Centre Aquatique de Conflans to sign the official agreement of collaboration with DAN Europe, thus starting a new phase of research. Christian, an expert diver and motorcycle enthusiast runs the pool, whilst Christophe runs the aquatic centre. Active since 2001, the centre welcomes nearly 20 thousand divers a year, attracted by a pool 20 metres deep, the only one near Paris.

A 10-metre long banner hangs from the balcony facing over the pool, welcoming divers before their immersions. It says **"Building Diving Safety Together".** A slogan suitable for DAN Research, because without the help of precious facilities like this and the enthusiastic participation of divers all this wouldn't be possible. Even **Pierre Yves Cousteau,** who collaborates with DAN Europe DSL (Diving Safety Laboratory), has accepted our invitation and is ready to follow us into the water. Pierre-Yves is an expert diver despite his young age, and has thousands of dives in his logbook.

So we get to the 2nd day of tests. A new machine, a high quality ultrasound scanner, will support us on our journey to learn more about post-dive bubbles. The bubbles will be classified according to a version of the Spencer scale (echocardio), suitably adapted by DAN Europe to make it comprehensible to divers.

BUBBLE GRADE

0	No bubble	Green
LBG (Low Bubble Grade)	Low bubble grade	Yellow
HBG (High Bubble Grade)	Many bubbles	Red
HBG+ (High Bubble Grade Plus)	Too many bubbles to count	Violet

The initial briefing includes the explanation of the dive protocols and tests to be carried out. There are four dives in two days, with the same duration and depth, but differentiated *(see tables 1 and 2)* according to the physical effort made during the dive. The divers make "square dives" that are recorded with modern underwater computers.

TABLE 1 - GROUP A DIVES

DIVE	DEPTH	DURATION	PHYSICAL EXERICISE YES	NO
1st day	20 metres	30 minutes	X	
1st day	20 metres	30 minutes	X	
2nd day	20 metres	30 minutes	X	
2nd day	20 metres	30 minutes	X	

TABLE 2 - GROUP B DIVES

DIVE	DEPTH	DURATION	PHYSICAL EXERICISE YES	NO
1st day	20 metres	30 minutes		X
1st day	20 metres	30 minutes		X
2nd day	20 metres	30 minutes		X
2nd day	20 metres	30 minutes		X

PHYPODE Project
Physiopathology of decompression

This event was held in collaboration with the PHYPODE Project.

Advancing knowledge on the physiopathology of decompression, highlighting the risk factors for the formation of intravascular bubbles: it's the objective of PHYPODE, a European Union-funded project under the Marie Curie Initial Training Networks initiative.

PHYPODE unites academic and industrial partners, international nonprofit associations and hyperbaric medical centres on an international scale.

The physical effort planned during the dives of Group A *(see table 3)* consists in taking the flippers off on the bottom and running from one side of the pool to the other. The effort made during this movement corresponds to level 3 on the DAN Europe DSL scale.

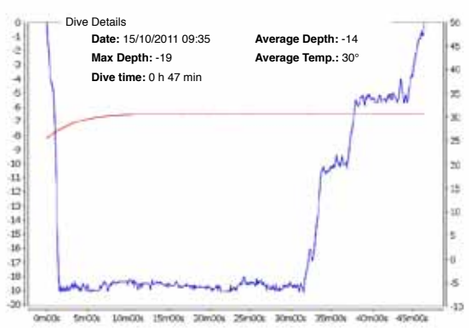
TABLE 3 – EFFORT GRADE
(DAN Europe DSL Scale)

0	No effort	
1	Light effort	Diving in currents or photography
2	Moderate effort	Diving with some trim difficulties and flipping to maintain trim
3	Severe effort	Diving against a moderate current
4	Extenuating effort	Diving against a strong current or buddy emergency

During the tests carried out in March 2011 *(cf. Alert Diver 3_2011)* we had found a low production of bubbles, probably due to some typical variables associated with diving in pools (and therefore, also in a Trench): warm water and little exercise.

Another factor to be considered is that **divers think of deep pool merely as "pools", forgetting the adjective "deep"** and even behaving like yo-yos, usually avoided whilst at sea.

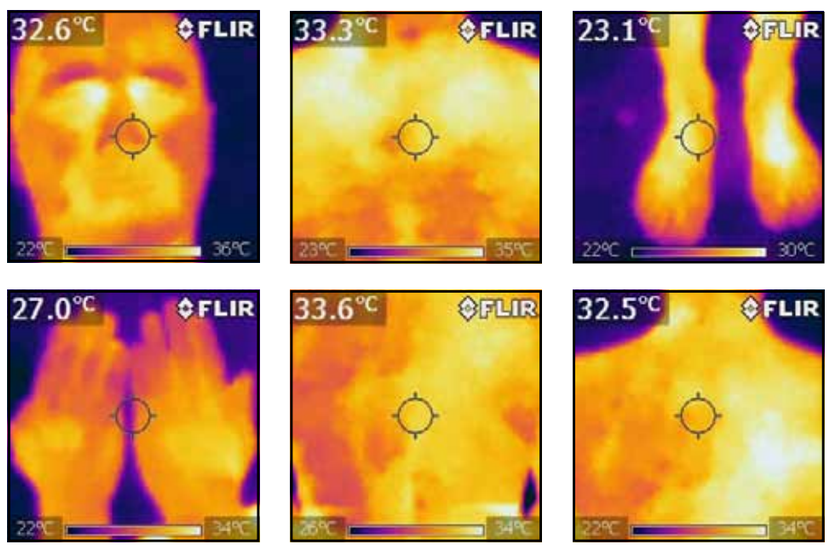
DIVE PROFILE



Depth	Dive time	Extra deep stop	Safety stop
20m	30 min	3 min at 10m	5 min at 5m

In the image of the **profile recorded during the tests,** the diving profile is highlighted.

To carry out post-dive tests a laboratory was set up right by the pool: this means that some measurements, such as **thermal photography** to highlight variations in post-dive body temperature were taken in the "zero moment", i.e. immediate after the dive and ultrasound scans. The thermal photos were taken in specific body areas: the face, chest, feet, hands, shoulders and back, following to a precise protocol.



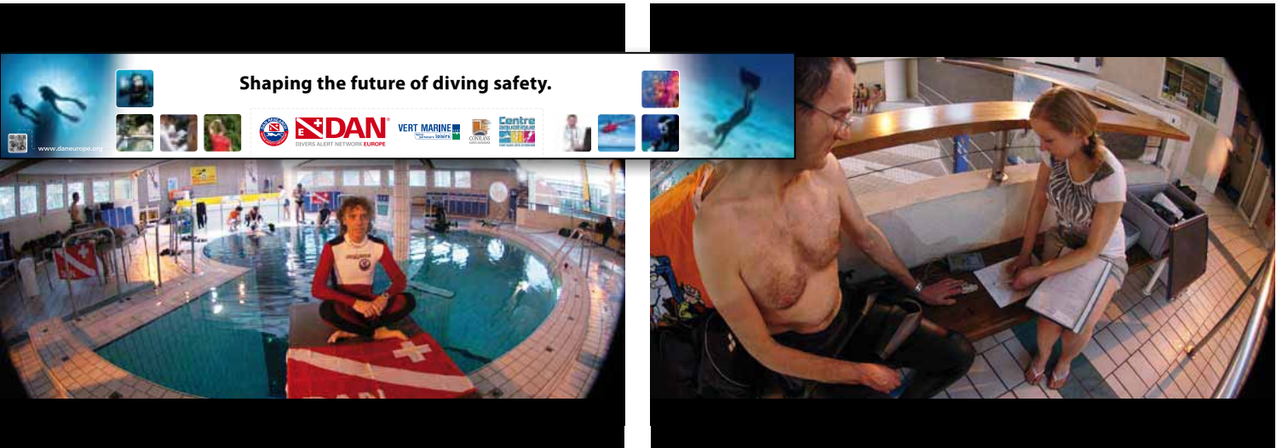
THERMAL PHOTOGRAPHY

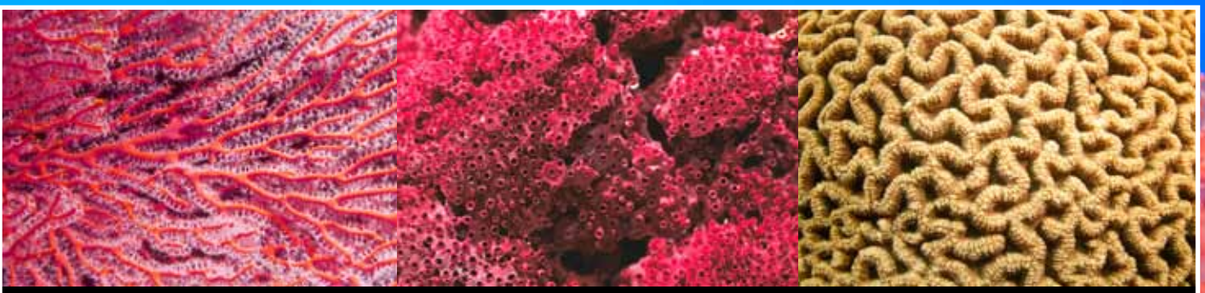
Post-dive ultrasound scans confirm a first result: Group B (divers not doing the exercise) produced few bubbles, with values of between 0 and Low Bubble Grade; on the contrary, the divers in Group A who did the substantial effort exercise (cf. Table 3), registered a high presence of bubbles (High Bubble Grade). This result, even though it needs confirmation from a new round of tests with a dedicated protocol, makes us reflect once more on the adequacy and wisdom of a an old adage: don't make any efforts during a dive.

If we think of how far we have come and how far we still have to go, we can understand even more the **importance of participated research, of which DAN Europe was the pioneer.** Today we can say we have a vast and tested experience in the training of research technicians, and can define 95% of the data collected in the field as being of "excellent quality".

Another interesting moment at Conflans was the scientific study carried out on free divers, aimed at measuring endothelial reactivity after apnoea diving. The study is about to be published and we will be able to provide you with more details in the next issue of the magazine.

A special thanks goes to all those who participated, making this new and fascinating adventure possible! ■





The CATLIN SEAVIEW SURVEY Project

The Catlin Seaview Survey is first and foremost an important scientific expedition. It aims to carry out the first comprehensive study to document the composition and health of coral reefs on the Great Barrier Reef and Coral Sea across an unprecedented depth range (0-100m) – addressing a series of important questions regarding the changes associated with the rapidly warming and acidifying oceans.

However this is not just another scientific survey.

Usually scientific surveys don't have the ability to really capture the public's imagination and engage people in the science. Expeditions and their findings tend only to be fascinating to other scientists. This project is very different. The images from the expedition, when stitched together, will allow scientists and the public at large to explore the reef remotely through any device connected to the Internet. It will allow them to choose a location, dip underwater, look around and go off on a virtual dive. It has the potential of engaging people with the life and science of our oceans in a way that's not been possible until now. It is a very exciting time.

Underwater Wi-Fi

A wireless network to control underwater robots: this is the result of an experiment which has been successfully carried out by a European research group coordinated by Andrea Caiti, of the "Piaggio" centre specialised in robotics of the University of Pisa.

"Communication under the sea" – explained Andrea Caiti in a press release from the University of Pisa – "is problematic and conditioned by varying factors, such as local oceanography, temperature, the saline content of the water, and depth. Our robots can build efficacious underwater communication networks, which can be used to create surveillance systems for limited access underwater sites – like protected marine areas or ones of archaeological interest, as well as for industrial or port facilities along the coast – whilst at the same time measuring important parameters that examine the state of the marine environment, such as water temperature, salinity and pollution".

The final stage of the experiment took place in the Norwegian fjords using the robot, "Folaga", that measures 2 metres in length with a diameter of 12 centimetres and weight of 30 kilograms, and to which a temperature sensor was applied.

The researchers were able to verify that the robot, navigating in the busy port area of the fjord, was capable of working autonomously, responding to commands sent from the central station. Futhermore, when testing what would happen in the case of a lost connection, the researchers found that the robot was able to re-establish contact autonomously.

Image credit: www.ua-net.eu "Concept of an Underwater Acoustic Network"

Links

http://www.piaggio.ing.unipi.it/

http://www.piaggio.ing.unipi.it/index.php/research/123-robotics

http://unimap.unipi.it/cercapersone/dettaglio.php?ri=5685&template=dettaglio.tpl

http://www.dsea.unipi.it/Members/caitiw

http://www.ua-net.eu/

Technical Diving and Insurance

by Claudia Farrugia, DEIB - DAN Insurance Brokers

A technical diver requires extensive experience and advanced training. He/she often uses Rebreathers or breathes different breathing gases other than air or nitrox. One can usually make a distinction between a Technical Diver and a Recreational Diver from their equipment. A Technical Diver looks quite posh wearing his stylish, top-of-the-line equipment: a Rebreather or a pair of twin cylinders on his back, one or more bailout cylinders strapped to his sides, a computer and a bottom timer on his wrist, and plenty of other accessories stuffed in his pockets or attached to his harness. The "no fun, just business" facial expression whilst walking towards the entrance point make him look like a model on a catwalk, with all the other divers staring at him with respect in their eyes. Meanwhile, a Recreational diver wears his scuba equipment with a big smile on his face. Ready to go for a pleasure dive with his friends to admire the underwater world, he's hoping that on his way he'll spot an octopus, who'll give them a chance to play around.

"DAN Europe isn't your average insurance company! DAN Europe is an organization dedicated to the health and safety of its members, and together with its subsidiary company, International Diving Assurance Ltd., it offers insurance policies which are certainly designed to meet the needs of its techie members."

Technical divers are usually very experienced but even though they have many dives under their belt, the liquid world will always remain an alien environment where human beings don't belong. No matter how many safety procedures are adopted, technical diving will always carry a certain degree of risk where tech divers are susceptible to danger. That said, it is normal for tech divers to be concerned about their insurance coverage. Various insurance companies offer different types of insurance products, but DAN Europe isn't your average insurance company! DAN Europe is an organization dedicated to the health and safety of its members, and together with its subsidiary company, International Diving Assurance Ltd., it offers insurance policies which are certainly designed to meet the needs of its techie members. Many other insurance companies offering diving covers might exclude technical diving, so always be careful to read the details before you buy.

DAN Europe Insurance Brokers

International Diving Assurance

Probably the only specialist diving insurance company worldwide

DAN Europe Insurance Brokers

International Diving Assurance

Probably the only specialist diving insurance company worldwide

Some typical queries that technical divers might have, include:

"Is technical diving covered by DAN's Insurance Policies?"

Technical Diving is covered under all of DAN's Insurance Policies, with the exception of the Sport Bronze Plan, which has a depth limit of 40 meters using only Air or Nitrox as the breathing gas.

As technical divers, let's be as wise in choosing the right insurance plan as we are in choosing the right equipment.

"Does the insurance policy limit me from diving at great depth?"

As a diver, you are free to plan the depth of your dive as your insurance policy does not impose any depth limit. However, if you intend to explore places in the abyss where few have ventured before, DAN requests that if you intend to exceed 130 meters, you inform DAN experts before the dive. This is done in order to assess the relevant dive criteria, and to ensure that all is done within the proper safety parameters. Any depth-related injuries incurred during a dive beyond 130m which is not approved by DAN would not be covered.

"Will I be covered if I plan a dive using a partial pressure of oxygen of 1.6ATA?"

Yes, you will be covered since the gas partial pressure of 1.6ATA Oxygen and 5.6ATA Nitrogen are confirmed to be safe. Notwithstanding, it is medically recommended to use a gas partial pressure of 1.4ATA Oxygen and 3.95ATA Nitrogen in the breathing mixture.

"Will I be covered if I use 100% oxygen during my dive?"

A golden rule when planning a technical dive is to ensure that you keep breathing at great depths. This requires several litres of gas that can actually be compressed in a single cylinder. Plus, this type of diving entails a slow ascent with several decompression stops. Thus a tech diver has to carry one or more decompression gas containing different fractions of oxygen, and at times a cylinder containing 100% oxygen for usage at a maximum depth of 6 meters is required to complete the dive. Your insurance policy does not exclude the usage of any gas mixture in particular the use of 100% Oxygen, as this is used to maximize dive safety. Therefore, you are free to choose the gas mixtures that best suit your dive plan. So, if you are planning your next dive, you can put your mind at rest that you will not be in breach of any condition under your Insurance Terms.

"I am a commercial diver. Am I covered under my insurance policy?"

No, commercial diving is outside the scope of the definition of technical diving, and the insurance specifically excludes any losses arising out of or in connection to:

- Naval, Military or Air Force services or operations
- Professional Coral fishing or record breaking attempts of any type
- Commercial, industrial or any other business purposes
- Any kinds of diving outside the definition of technical diving

If you are engaged in this type of diving activity, you can, however, notify the insurance provider and an insurance cover with special terms and conditions may be provided.

If you are unsure of which insurance plan to choose, or you think you may be in breach of one or more Insurance Conditions, we encourage you to contact DAN offices before you perform your dive, to clarify any queries you may have. Rest assured that the DAN's team will do its utmost to help you in your diving and insurance matters.

On behalf of DAN Europe, I wish you and your buddies plenty of safe diving, and always remember to plan your dive and dive the plan! ■

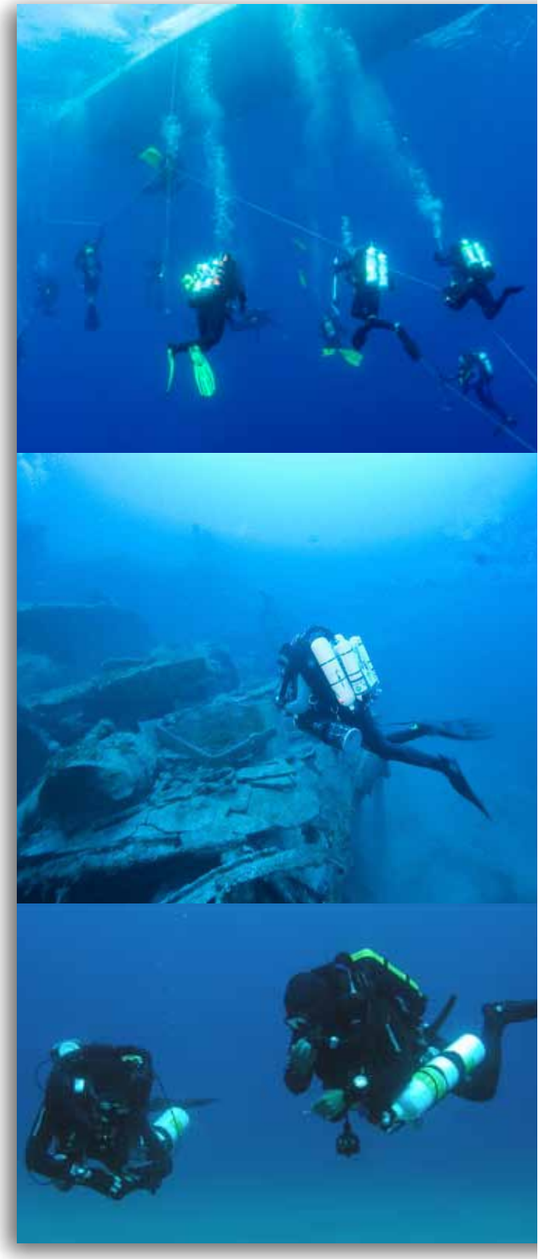


PHOTO PORTFOLIO

The DAN Europe Photocontest as we know it has come to an end. Our Editorial Board is currently working on a renewed version: in the meantime, all underwater pictures received will be published in this Portfolio section.

You can e-mail your photos to: portfolio@alertdiver.eu

Photo by Andrea Maffi

1. Andrea Maffi

2. Carlo Giacomo Avio

3. Andrey Nekrasov (winner of the 2011 Photocontest)

4. Lisa McDonald

DAN Partner Program

The DAN PARTNERS are individuals or organizations that cooperate with us to promote DAN's image among divers.

As a DAN PARTNER you can get points or commissions, with great benefits.

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DAN® Shop

Visit the online catalogue today and discover the complete range of DAN products!

€ 21,53 + VAT

“Ossidabili” Explorer

This “ Explorer “ necklace is made of Bronze (leadfree) while its coloration is obtained during a galvanic process with gold and Ruthenium.
The polishing of this necklace was carried out with Nickel free materials.

€ 23,28 + VAT

The EEZYCUT TRILOBITE Emergency Cutting Tool

The unique cutting mechanism of the EEZYCUT TRILOBITE provides the cleanest, sharpest, most effortless cutting action available. It is rated to cut line with ease, repeatedly, up to 8mm thick, and can easily cut through larger line. With replacement blades, this cutting tool provides you with the best cut, every time.

€ 18,00 + VAT

15L Dry bag

This handy, 15 litres, dry bag with shoulder strap and handle will soon become one of your favorite bags during dive excursions.

€ 98,98 + VAT

Set of 3 Dry DAN bags

If it is difficult to make your choice or you may want different bags for all your materials, the set of 3 different dry bags (15, 60, 90 lt) will bring a solution.

This set is sold at a special packet price.

DAN
DIVERS ALERT NETWORK EUROPE

DAN Europe Product Selection

Visit the online catalogue today and discover the complete range of DAN products!

€ 54,75 + VAT

Slam Men's Summer Sailing Vest

Sleeveless jacket in nylon taslon with special waterproof zippers. It has two outside pockets with zip in a contrasting colour, and two on the inside. Details such as the elastic waistband and the reflector band on the collar make this garment even more practical for life on board. Waterproof and windproof.

€ 183,13 + VAT

Prestan Adult CPR-AED Training Manikin with CPR Monitor

Realistic to the eye and the touch, the Prestan Professional Adult Manikin is unlike any other on the market. Prestan's revolutionary CPR Rate Monitor allows for instant feedback to both instructor and student regarding the rate of chest compression. This allows each student to gauge their rate of compressions on their own as well as allowing the instructor to monitor several students quickly and easily. In addition, the manikin incorporates a mechanism ("depth" clicker) to help them use the correct force to compress the chest to the correct depth.

€ 14,11 + VAT

Double Function Guardian Led Light with Fox 40 Micro Pealess Whistle

The Guardian Led light is the lightest, brightest, toughest light in its class. In situations where being seen is a must, the Guardian sets unsurpassed standards with its versatility. It comes with a clip and key chain attachments that can be fastened to either the user or equipment.

€ 3,30 + VAT

DAN keycord

Red and white DAN keycord with anti choking release, mobile phone connector and detachable carabiner hook.

€ 11,04 + VAT

Baseball cap with DAN logo embroidered

Baseball cap with DAN logo embroidered - weathered look.

€ 3,39 + VAT

DAN cloth patch: OCTOPUS

€ 670,79 + VAT

Standard "Pin Index" DAN Oxygen Unit (with empty cylinder)

This standard DAN Oxygen unit is specially developed to treat injured divers and includes a 2,5 liter Pin Index Oxygen cylinder.

Organo ufficiale del Divers Alert Network Europe
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