Exposure

—How Long, How Deep, How Cozy?

FILE PHOTO: CHRISTIAN SKAUGE

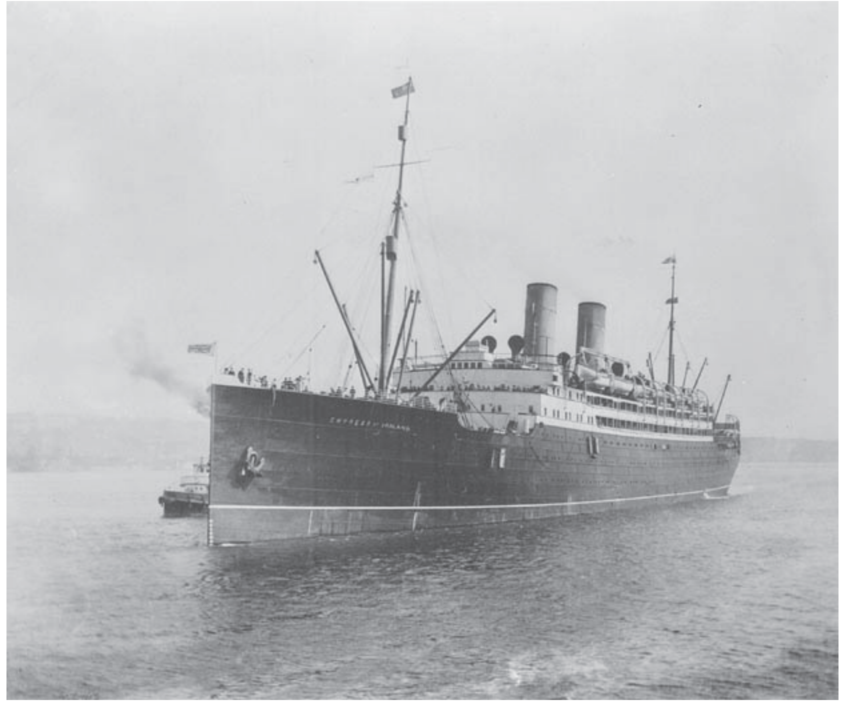
Text by Steve Lewis
Photos by Christian Skauge
and Peter Symes

— The following is an exerpt from Steve Lewis' latest book entitled, Staying Alive: Application of Risk Management in Scuba Diving.

The Royal Mail Ship, *Empress of Ireland*, was an ocean-going luxury liner on her way to Liverpool from Quebec City when she sank in the Saint Lawrence River, 14 minutes after colliding with a Norwegian collier in the early morning fog of 29 May 1914. She had 1,477 people on board—passengers and crew—and the accident claimed the lives of 1,012, more than 800 of them passengers.

I've had the privilege to dive on the wreck several times; the first was in the aftermath of Hurricane Hortense, which blew its way up the eastern seaboard of North America, and although it did not hit Rimouski directly, turned that late Quebec summer into a mini-maelstrom. The weather was awful—windy, wet and bleak. It had kept us out of the water and holed up in a small hotel for days, playing euchre and praying for a break in the weather. When a narrow window of opportunity finally opened up early in the morning on our last scheduled day in French Canada, we suited up on at the dock, threw our gear onto our charter boat, and hoped for the best.

The dive was fantastic—truly historic, but my most vivid memory is staring at my dive computer towards to end of it and seeing that I had earned 45-minutes of decompression. The water was between 3°C and 5°C. I had on inadequate thermal underwear, the current changed direction every few minutes and carried a force that varied from the relative comfort of flag-waving three-quarters of a knot to an extremely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RMS *Empress of Ireland* lies in 40 metres (130ft) of water in the Saint Lawrence River

unfriendly "hold your hat on Maude, we're going for a ride." The only up-side was a seal that seemed to delight in smart-bombing us relentlessly and at regular intervals throughout the various stops from about nine metres to the surface. It took a liking to my fins.

Lessons learned

I learned two lessons about "exposure" that day: never rely solely on a personal dive computer to track your decompression obligation (especially a second-generation dinosaur) because there might be a better way; and the speed at which time passes follows a curve proportional to falling water temperature.

Exposure in the context of diving and more especially risk management in diving, relates to surfacing safely without suffering decompression stress, hypothermia, heat-stroke, or wounding from passing critters, and without drifting off into the cosmos far from your lift back to harbor.

The focus in most texts is primarily on the part of a dive that begins around the time we leave the bottom and ends when we are back on the surface (or more correctly, when our surface interval is over and we know we are safe from DCS). This is the usual focus since DCS is a real risk on all dives even those on which the broader issues such as staying warm and comfortable, surviving other environmental conditions such as current, boat traffic, wildlife, and even being able to pee when the need arises are less compelling!

So, to conform to convention, let's start with that pesky decompression thing.

Following that first dive on the *Empress*, I understood viscerally that to follow a dive computer blindly and without question was not the best possible option. It can get one in over one's head, figuratively and literally. The PDC I was using—a demo from a European manufacturer—suggested I stay in freezing water and horrible conditions for far longer than necessary. Thankfully, my buddy and I carried lots and lots of "spare" decompression gas: most of which was consumed by the time our computers cleared us to surface, since both our respiration rates were easily double our norm.

Back in those days

Bear in mind, this episode was back in the dawn of personal dive computers (PDCs). They were reasonably new and those that did not lock-up when their user exceeded the no decompression limit (NDL), had strangely and well-padded degrees of conservatism built-in.

Adding 80 percent

What made the issue worse was that the user had zero jurisdiction over which level of conservatism was used. It seemed that each manufacturer had its programmers conditioned to think like litigation lawyers. If the Buhlmann algorithm (and they all seemed to use Buhlmann back then… it was free after all) called for four minutes at six metres followed by 12 minutes at three, it would add automatically something along the lines of a three-minute stop at nine metres and increase the duration of "real stops" by 80 percent or more. So effectively, on a dive that would merit a stodgy 16 minutes of deco time on tables, would have an ascent time twice as long using a PDC.

HOMEMADE

"...It seemed that each manufacturer had its programmers conditioned to think like litigation lawyers."

Adjustable conservatism

Modern PDCs are much more user-friendly even allowing divers to adjust levels of conservatism to suit their particular needs and proclivities. I wear one—occasionally two—especially for cave diving and when using a closed-circuit rebreather (CCR); however, I never dive without consulting custom dive tables created by using proprietary decompression software. This ensures me and my dive buddies are perfectly clear what the penalty we'll have to pay for hanging about as long and as deep as called for in the dive plan. It's simply part of our understanding of exposure and its control.

Ascent behaviour

I want to explain something called ascent behavior. It's a technique that came about because of the way I felt after that *Empress* dive, but before we go down that pathway, it's worth spending a few minutes explaining what works for me when it comes time to plan my personal decompression dives.

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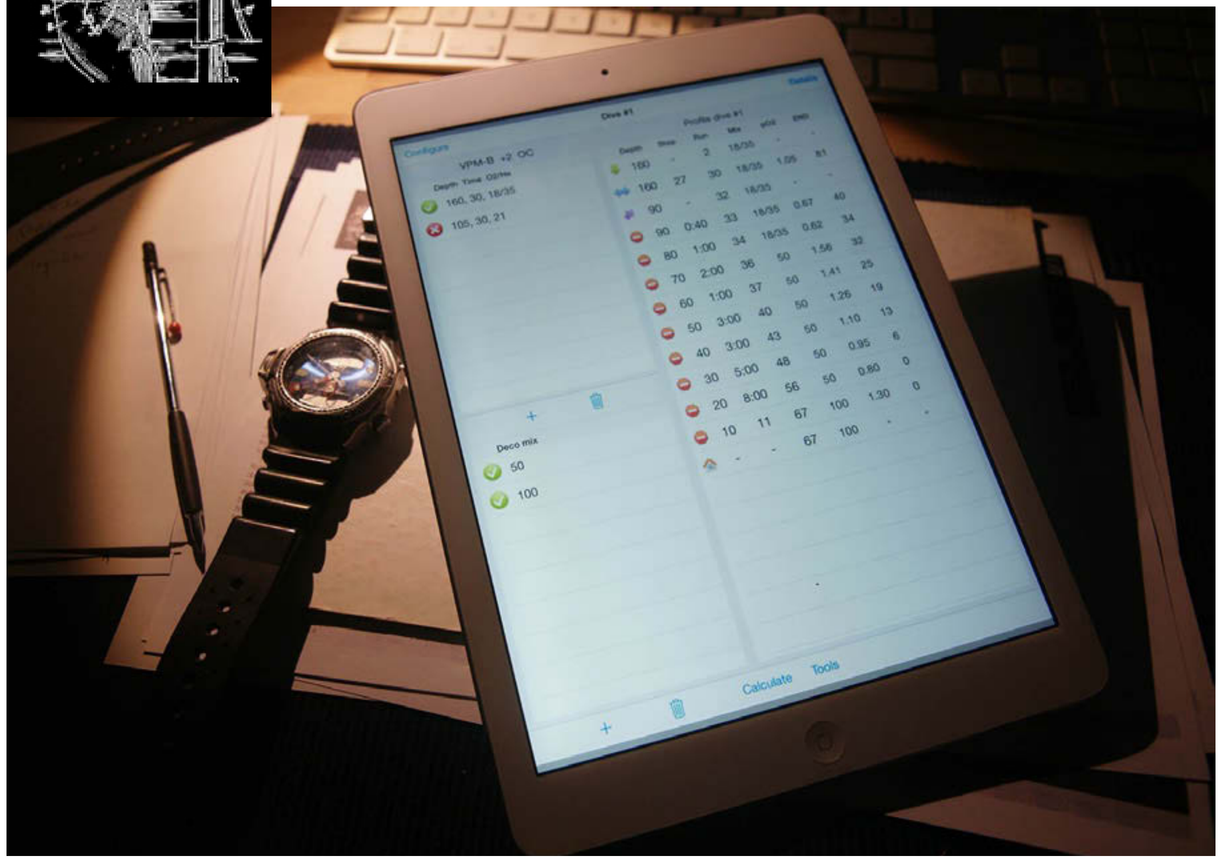

V-Planner decompression planning software now runs on most platforms, including tablets such as the iPad and smartphones

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According to Haldanean models no bubbles are formed during asymptomatic decompression. The dissolved gas is eliminated ***while*** in the dissolved phase.

Haldanean models assume exponential ingassing and exponential outgassing and simulate the human body using several compartments with different saturation half-times.

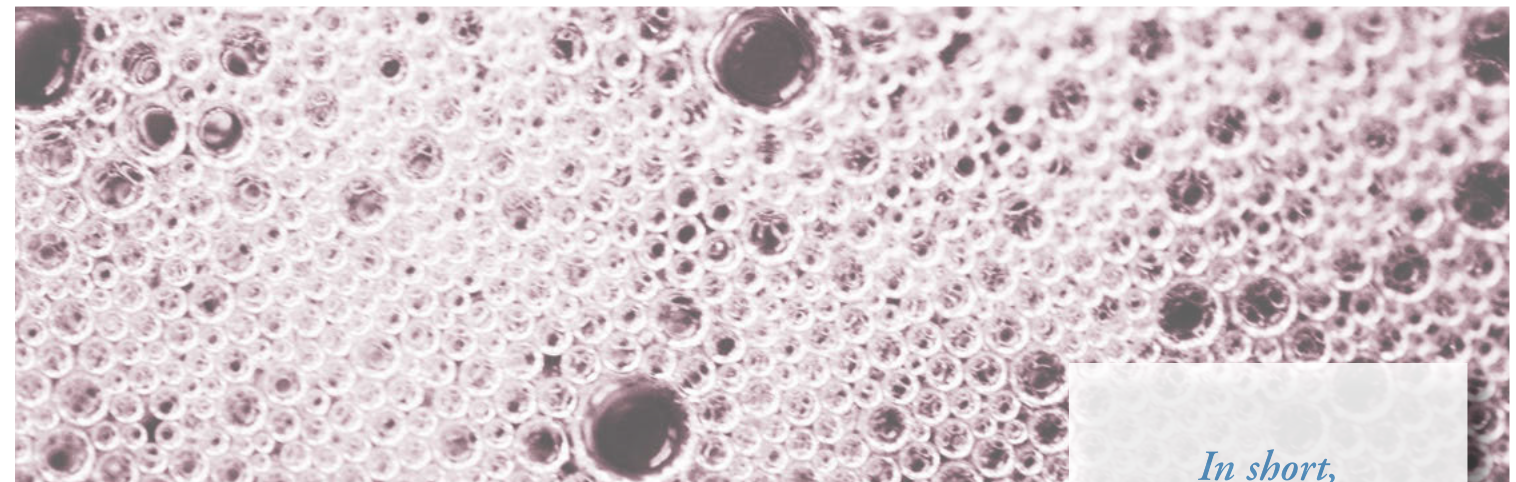
For example, tissues such as joints, which are slow to take up dissolved gases and slow to release them, have a long saturation half-time (on the order of many tens of minutes) while the opposite is true for highly adoptive fluids like the blood.

By contrast more recent models, which are supported by experimental observation, assumes that bubbles are formed during most asymptomatic decompressions, and that gas elimination must consider both dissolved and bubble phases.

The VPM model presumes that microscopic bubble nuclei always exist in water and tissues that contain water. Any nuclei larger than a specific "critical" size, which is related to the pressure (or dive depth), will grow upon decompression (when the diver ascends again).

Secondly, the bubble is permeable, meaning dissolved gases from the tissue compartment can move across the bubble's surface and into the bubble (where it becomes a free gas).

Thirdly, the surface layer of the bubble has specific properties that affects the permeability—the bubble is stabilized by a surfactant. ■



In short, bubbles do form in a diver's body during decompression, so best to adopt ascent behavior that accounted for them.

Deco software

I use V-planner. It is a software program originally created for PC's running Windows but which now runs on smart phones and tablets such as iPad.

When V-planner was first launched by a guy called Ross Hemingway in the summer of 2001, there were other versions of custom decompression software on the market, and they worked okay, but the switch from those to V-planner was almost epidem—at least in some circles. The reason was that V-planner is based on the original research of Yount and Hoffman at the University of Hawaii. It uses *bubble mechanics* and *dual-phase gas behavior* to model what happens in a diver's body. For many technical divers, this seemed to be a better way than the old Haldanian tenets to model what actually happens to their body during a dive (—see box, ed). I certainly felt more comfortable using decompression software based on this research than something known to be based on a faulty premise, which all Neo-Haldanian programs were. In short, bubbles do form in a diver's body during decompression, so best to adopt ascent behavior that accounted for them.

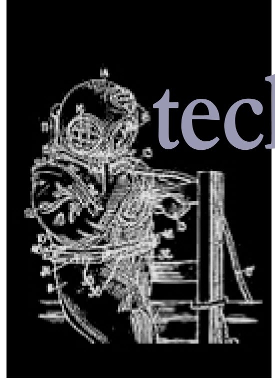
VPM was further developed by Yount, Eric Maiken, and Erik Baker, and following diver feedback on earlier versions of V-planner, Baker did more modifications and produced the VPM-B algorithm in 2002. Since then, V-planner software has used the VPM-B algorithm.

VPM stands for *Varying Permeability Model*. The B suffix simply indicates a more conservative interpolation. The Coles Notes (Canadian student guides —ed.) version is that VPM describes the change in state of the surface tension of the tiny bubbles of gas that form inside a diver as he or she ascends. If you read on, you will be introduced to my dump-truck analogy, and I am loath to spoil things by getting all scientific and geek-like here, so let's just say that VPM-B has become the most widely used bubble model decompression software among technical divers. It seems to work for a lot of people and has produced tables for some stellar exploratory dives. Your experience may vary but I've used tables from V-planner to guide me through more than 1,200 trimix dives without incident.

The focus in most texts is primarily on the part of a dive that begins around the time we leave the bottom and ends when we are back on the surface.

In use

Using the software is very simple and the interface is extremely easy to learn and user-friendly. The most important first step is to configure it in a way that suits



How would those extra minutes feel to a diver with a leaking drysuit for example?

PETER SYMES

your needs, including the *conservatism factor*. I do not intend to offer a blow-by-blow user-guide here, but for illustration only, here's a quick overview of what I usually do when using it to cut tables for open-circuit dives.

I set the conservatism in the mid-range. I believe the Nominal setting (zero conservatism) is the pure algorithm with each ascending "margin of safety" (from 1-5) making adjustments to the calculated critical bubble radius. In other words, the more conservative it's set, the smaller sized bubble the program will allow to form in the diver's body (all hypothetical of course) during the ascent up the water column to the next stage of his or her decompression

Settings

There are close to 40 user-adjustable settings. For example: oxygen narcotic or not; the oxygen depth of gas switches; extended stops after switches; depth of last stop; and overall descent and ascent rates.

A good exercise (and V-planner is one of the best teaching tools for students of decompression because of this flexibility) is to set up a sample dive and play with settings to see what differences some of these user-controlled variables make.

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Nineteen minutes more

As an example, the total run-time (head disappearing underwater until it pops back to the surface) for a simple 50-minute dive to 30 metres (100 feet) breathing an EAN32 (a typical tourist cave dive in North Florida), and with the conservatism set Nominal, is 65 minutes.

The program calls for a three-minute and 20-second stop at six metres (20ft), followed by nine minutes at three metres (10ft).

If we simply crank the conservatism to level 5 (the most conservative) the same dive with exactly the same gas warrants an 84-minute runtime with a five-minute stop at nine metres (30 ft); nine minutes at six metres (20ft); and 18 minutes at three metres (10ft). Since the bottom time for both dives is the same 50 minutes, the 19-minute difference in their runtime is ALL additional ascent time: 15 minutes of ascent time for Nominal conservatism compared to 34 minutes at level 5.

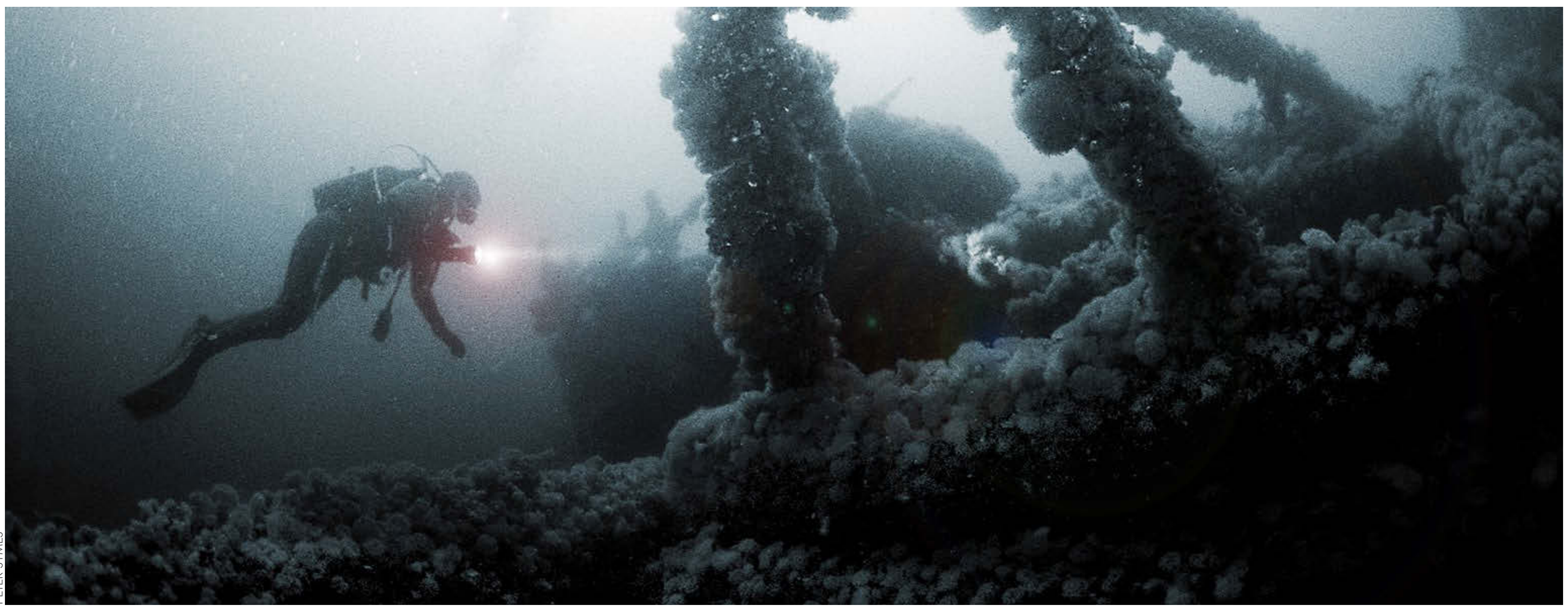
Which one is correct? I have no idea, what will work for you. In fact, there is no hard answer to that question. Certainly, the 84-minute runtime is the safer option—at least at first blush. However, when we consider safety, we have to take into account oxygen loading, specifically CNS percentage. (Actually, in this instance there is virtually no difference since the additional stop time is at a depth that delivers an oxygen partial pressure far below 1.0 bar. However, there may be a need for additional gas volume or better thermal protection. How would those extra minutes feel to a diver with a leaking drysuit for example?

Oddly, the level of conservatism has a greater effect on runtimes than variations in the constituent gases being breathed. Here's a classic example of "ideal-world-think" vs. what actually happens on dive trips.

The plan is a wreck dive for 25 minutes to 60 metres (about 200ft). A standard gas for this dive uses an 18/45 trimix (18 percent oxygen and 45 percent helium), with an EAN50 and pure oxygen as decompression gases. The total runtime for this dive at level 3 conservatism would be 77 minutes.

Oddly, the level of conservatism has a greater effect on runtimes than variations in the constituent gases being breathed.

In the field (on location), partial-pressure mixing can present challenges especially when gas supplies are limited. So let's assume that the gas chosen to do the dive is an 18/35—ten percent less helium. There may or may not be a noticeable difference to narcotic loading at depth (worth a test sometime, perhaps) but surely we will see a difference in the ascent profile. Not at all. The profile kicked out by V-planner for the same dive using 18/35 instead of 18/45 delivers a 77-minute runtime. This is not an error, it's simply the way the mathematics work. There is a slight variation in the shape of the ascent curve at the shallower



PETER SYMES

...set up a sample dive and play with settings to see what differences some of these user-controlled variables make.

Exposure

stops, but really not enough to worry much.

Therefore, the net effect of taking ten percent of the helium out of the mix is negligible.

However, if I flip the level of conservatism from +3 to Nominal and then back to +5 the runtimes vary considerably. Nominal conservatism, 18/45, nets a 68-minute runtime for the same 25-minute bottom time! At +5, same profile, same gases, the runtime becomes 86 minutes. (By the way, it's the same kind of story using 18/35—67 minutes and 84 minutes, respectively).

Playing this type of "what if" game with decompression software has taught me a couple of lessons that I feel are valuable.

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Implications

Perhaps the most important is that getting all twisted and upset when my local fill station hands my sidemount cylinders back to me with an 18.4/42.9 trimix when I asked for an 18/45 is simply no big deal. I can not only use it and probably not know the difference at depth, more critically, I do not have to cut and learn new tables: The ones I already have in my head and backed up in my wetNotes will do just fine… and I know they work because I've "wet-tested" them several dozen times.

By the way, the same is essentially true with decompression gas. While on location a while back, our team ran out of oxygen and had to top off EAN 50 cylinders with compressed air. When analysed we each had something close to an EAN40. Apart from being able to switch from backgas to decompression gas about six metres (20ft) earlier/shallower, our ascent times were identical to those we had been running all week using EAN50.

This is NOT presented here to condone sloppy practices or lax controls but simply to point out that in the grand scheme of things, it's important to focus on what matters, and a couple of points here and there with one's breathing gases can be immaterial when it comes to decompression times.

Perhaps this illustrates that decompression schedules are inherently sloppy and not something a scientist or engineer would put their signature to. From a control point of view, deco schedules are horribly ill-defined. You could be forgiven for thinking that a huge difference in gas contents would make as much difference as cranking up or down a virtual control knob that influence the size of a hypothetical bubble. But it does not. What I find a sobering thought is that decompression calculations can deliver so many different outcomes and each of them is as "correct" as the other.

In the field (on location), partial-pressure mixing can present challenges especially when gas supplies are limited.

Perhaps the key "take-home" messages from that little self-congratulatory pat on my back above is that my primary dive tables are in my head. That may be a function of the fact that a 60-metre dive using the gases mentioned is not something I've done several dozen times, but possible closer to three or four hundred times. It may also be that I have taught myself deco-on-the-fly and ascent behavior. Knowing these two techniques makes the task of remembering deco schedules very, very simple.

After the *Empress* dive, when the feeling of cold left my body and I got sensation back in my extremities—probably a couple of months later—I started to think about what an ascent schedule (a decompression plan) actually was, and what it represented. Until then, I'd never truly given profound thought to why or how a decompression algorithm worked. A strange admission since I was a trimix diver and teaching decompression diving. I'd read the books and listened to the lectures, and even had a couple of conversations with decompression theory 'experts' such as Bill Hamilton and John Cray, but I still thought that decompression was more science than the alchemy and black arts it actually is. I had much to learn. ■

In the grand scheme of things, it's important to focus on what matters

Steve Lewis is an active technical diver and instructor based in North America. He is an author, blogger and workshop host with a special interest in diver education and the development of safe diving protocols. He first tried sidemount scuba as a young dry-caver in the United Kingdom, and now many decades later, carries a TDI sidemount cave instructor rating and is an open-water/overhead environment Sidemount Instructor for PSAI. See ***Techdivertraining.org***

Flourescent

On the Rise / *Night Diving*

Text and photos by Steffen Beyer

Fluorescence night dives, or fluoro, UV and glow dives, as they are also known, are becoming increasingly popular as more and more dive centres offer scuba divers and underwater photographers the chance to experience this unique underwater phenomenon.

There are also an increasing number of vendors offering diving equipment for use on these special dives, and the purpose of this article is to explain the basics, background, techniques and equipment associated with this interesting aspect of the underwater world.

The basics—what is it?

Fluorescence is the capability of certain materials to absorb light transmitted on one wavelength and then emit it again nanoseconds later on a different wavelength. The phenomenon occurs in certain living organisms, various minerals and in petrified fossils.

Fluorescence should not be confused with either phosphorescence, which is the capability to store light and then emit again over time such as on the dials of our diving gear or watches, or bioluminescence where light is produced by living organisms when they consume energy.

Underwater fluorescence is usually identified with green, and indeed it is the most common colour for reasons that will be explained, but it is also possible to see red, orange and yellow fluorescence.

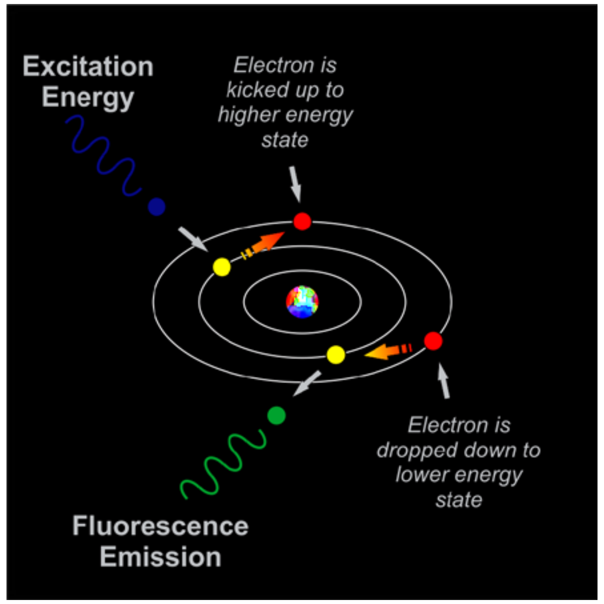
The background

—Once upon a time in Torbay...

The fluorescence phenomena is believed to have been first discovered in marine creatures back in 1927 when a certain Charles E.S. Phillips noticed some glowing anemones in a tidal pool on the beach at Torbay, in the southwest of England.

The bright green colour they were emitting caught his eye, and he took some samples back to his laboratory where he used a light source together with a filter called "Wood's Glass", which absorbs visible light but allows ultraviolet light to pass through, to establish that the anemones

Fluorescence schematic (right); Red fluorescing anemone in daylight (far right)



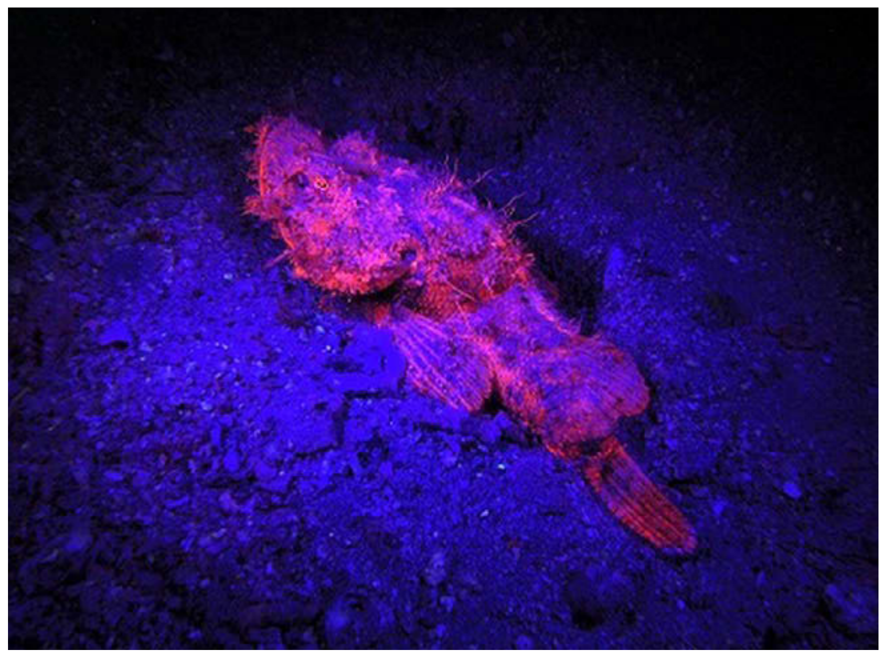
were in fact fluorescent.

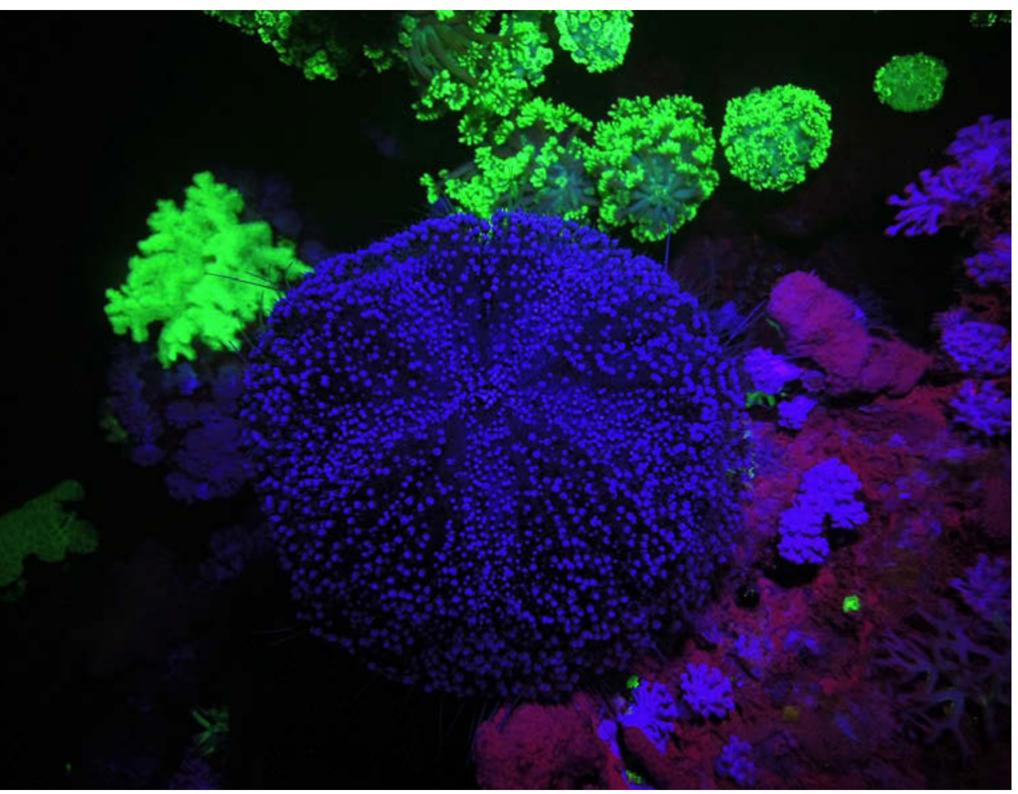
Then in the 1930s, the Japanese marine biologist Siro Kawaguti established that the most common coral pigments also in marine creatures fluoresced in green, followed in 1955 when those pigments were first described and formally recognised as a protein—coining the name "Green Fluorescent Protein" or GFP.

During the late 1950s, as more people started to scuba dive, the phenomena became more widely known, and articles started to appear in publications such as *Skindiver* and *National Geographic* showing the use of "blacklight" ultraviolet underwater torches to observe it.

In 1963, Sir Arthur C. Clarke, the renowned author and diver, further popularised the phenomenon when he described his experiences with fluorescence in his science fiction novel *Dolphin Island*.

Probably the most well-known example of fluorescence from those early days, and one which still puzzles many to this day, are bright red anemones at depths well beyond where the colour has completely disappeared from the visible spectrum. Just ask any underwater photographer about the puzzling results from their efforts to capture an image of such anemones.





Sea urchin (above) and scorpionfish (center) show fluorescent properties

Ultraviolet and blue light 101

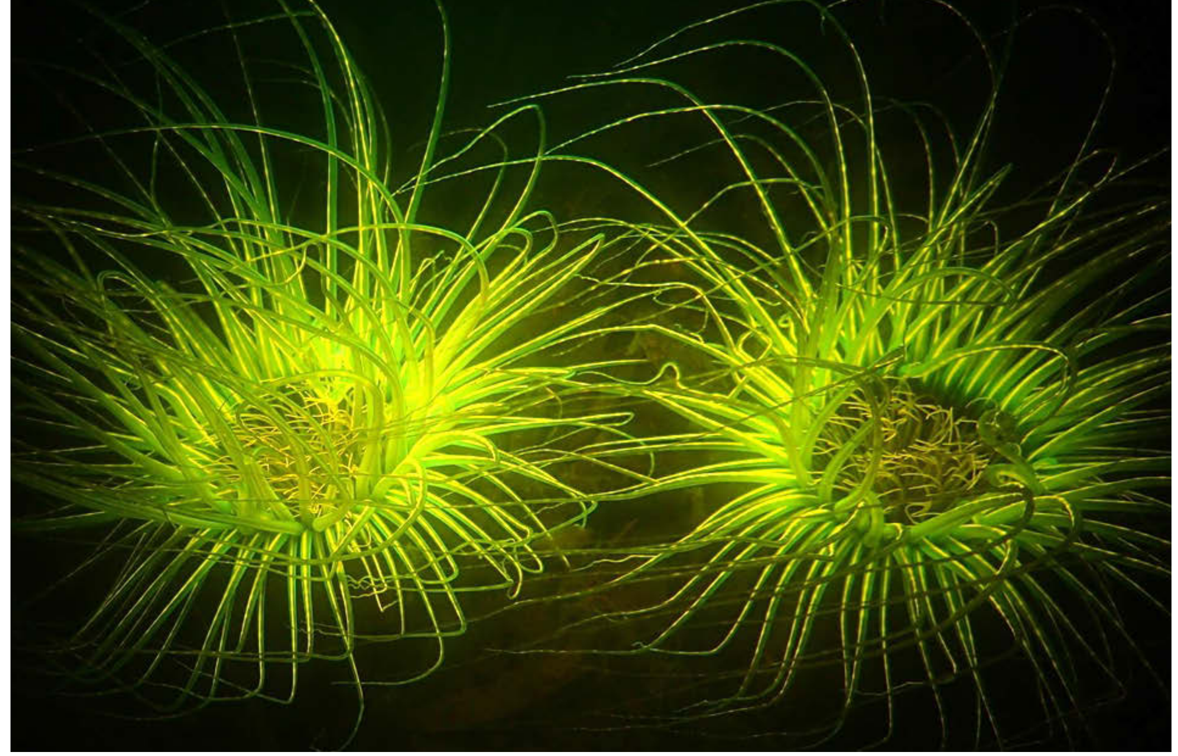
While it is possible to see fluorescence underwater during the day, it really is at its eerie best after dark, but you will need a light source to stimulate those proteins! For many years ultraviolet (UV), or "blacklight"—light which in not visible to the human eye because of its relatively high frequency—has been synonymous with viewing fluorescence, largely as a result of the work done by Dr Rene Catala in the late 1950s at New Caledonia's Noumea Aquarium.

But in the early 1990s, research by Dr Charles Mazel in the cold waters of Massachusetts and the warmer climes of the Bahamas, established that blue light was much better than UV. What Mazel found was that blue light (high energy visible light with a frequency between 400 and 500nm) was much more effective at exciting those proteins to fluoresce, and he went on to start a company called NightSea in 1999, which manufactures equipment for viewing and photographing fluorescence—be it underwater or in the laboratory.

Although much more efficient than ultraviolet, there is a downside to using blue light, as the fluorescence has to be viewed through a yellow barrier filter to block out the blue light reflected back to you, which tends to overwhelm the actual fluorescence. Plus high energy visible light has been linked to age-related macular degeneration.

The yellow filter is mounted on the face mask and basically makes it safe to view the blue light induced fluorescence, while greatly enhancing the overall experience—you can see much more fluorescence with the filter than without it.

Anemones fluorescing (right); Brain coral fluorescing (lower left)

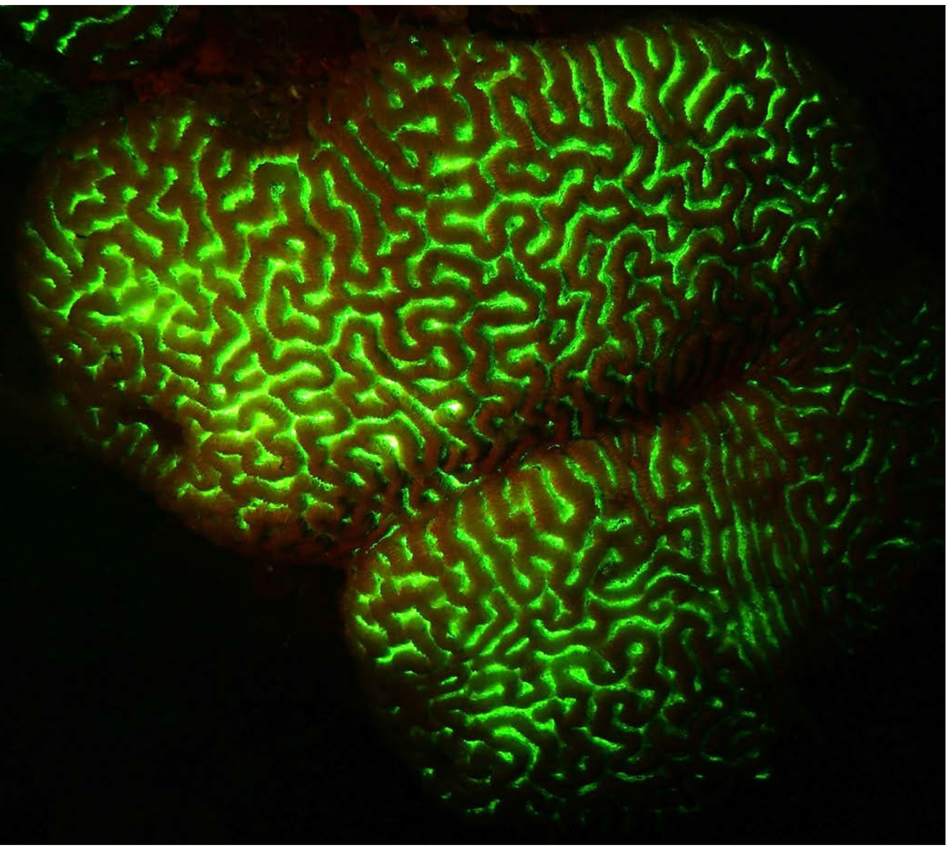


Why is the fluorescence there?

Fluorescence occurs in many marine organisms such as coral, tunicates, barnacles, sponges, anemones, jellyfish, clams, nudibranchs, cephalopods, shrimp, crabs, worms and fish—to name but a few. It also is found in some fresh water organisms, and it seems obvious that the phenomenon must provide some form of benefit to all those creatures, but unfortunately research into what benefit this might be is still in its infancy.

However, there are some preliminary hypotheses and findings, one of which is that some studies suggest that fluorescence in corals may act as a form of sunscreen by protecting the corals and their symbiotic algae against harmful UV radiation.

Another hypothesis states that fluorescence allows corals to transform the only light available to them, namely blue light, into such wavelengths as can be used by their symbiotic algae for photosynthesis, allowing the corals to dwell successfully at greater depths than their competitors without such a capability can, giving them an evolutionary advantage to survival.



Yet another is that fluorescence in reef fish may help them to visually merge with their coral backgrounds so as to make less conspicuous to predators.

And a recently published study shows that the health of corals correlates with their fluorescence, which means that the latter can be used as a measure of the former.

Photographing fluorescence

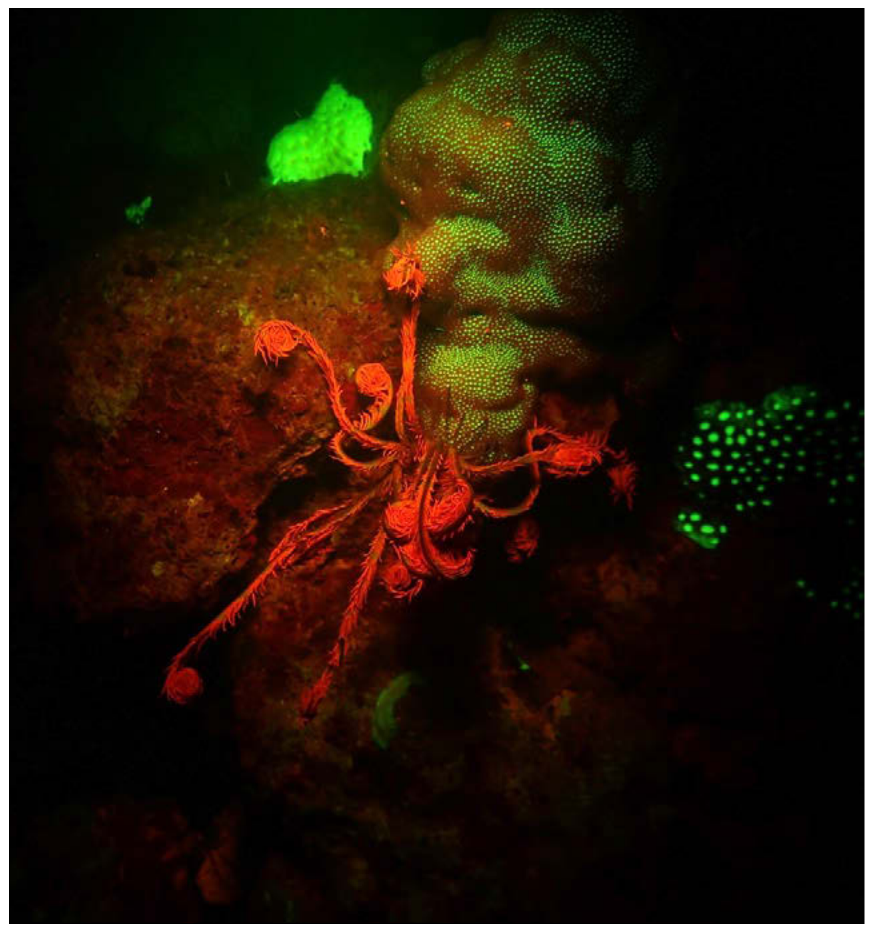
To photograph fluorescence underwater a normal camera and strobe is used, but two additional special filters are required—one on the strobe and the other on the camera. The strobe filter converts the normal white light output in to one of intense blue light, which stimulates the fluorescence and allows it to be photographed.

While the one on the camera is a yellow filter, which allows the sensor to record the image in the same way the barrier filter allows the human eye to view the blue light induced fluorescence.

Once suitably equipped, the physical logistics of night time fluoro-photography need to be given some thought. Specifically, you will need a traditional white light source to find your way around the actual site and a blue light one to initially stimulate the fluorescence so it is visible.

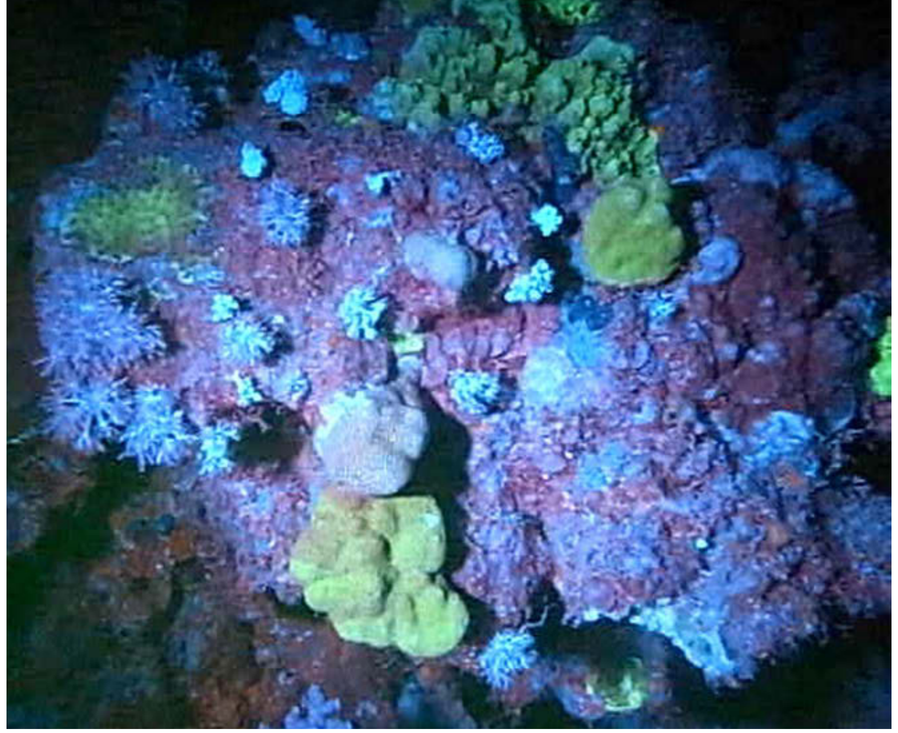
Prior to switching light sources the yellow barrier filter on your mask needs to be in place so that you can see the fluorescence properly, but once the filter is in place that is all you can see and everything else is pitch black.

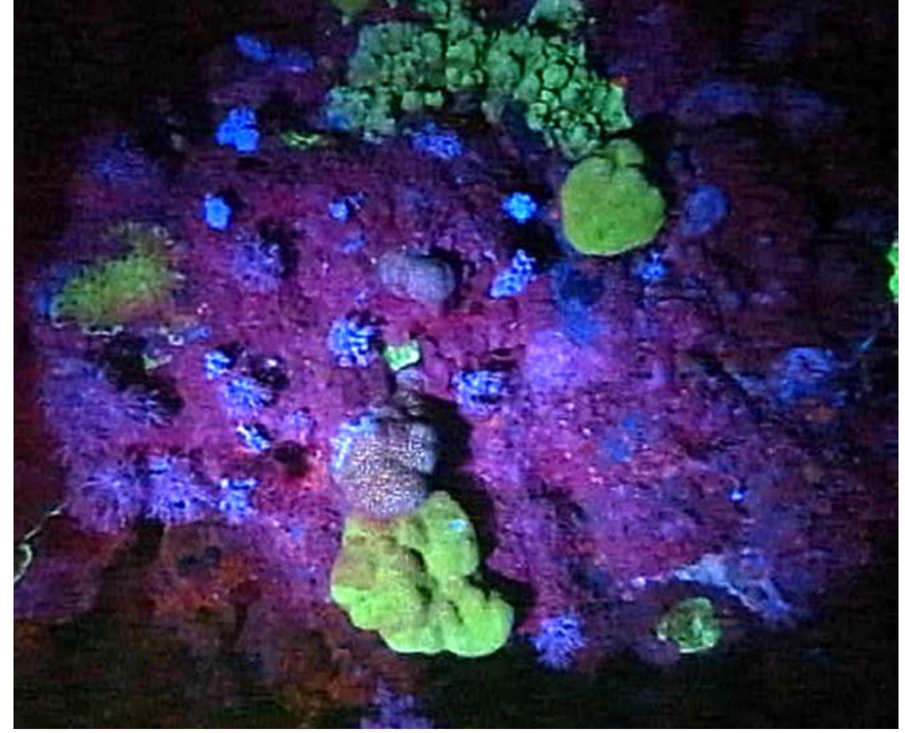
There are various solutions to this, with some divers opting for the more expensive option of two separate torches, while others have a blue dichroic filter on a traditional torch so that blue light can be switched to white as required. Alternatively a phosphor filter can be used on a blue light torch to



Feather star fluorescing

photo & video

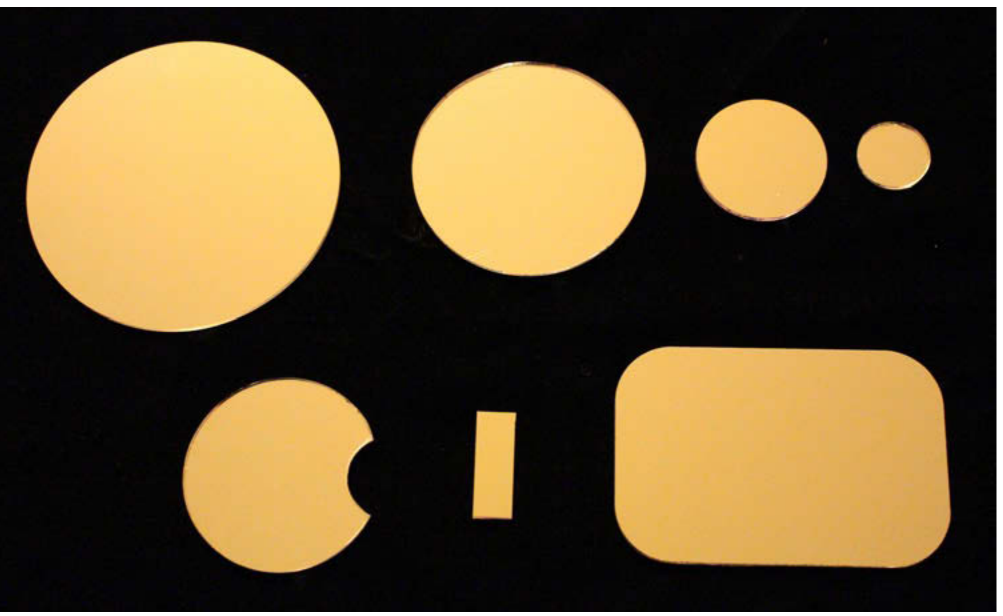

Fluorescent coral without blue filter


Fluorescent coral with blue filter

convert it to white light.

Contrary to what one intuitively thinks is the correct white balance setting, "Fluorescent Light" should not be used and Auto should be selected instead. Because the overall levels of illumination are not high with fluoro-photography, it is best to increase the camera's ISO setting to make its sensor more sensitive to the available light and smaller apertures are preferred.

Interestingly, as any reflected blue light is absorbed by the yellow camera filter, fluoro-photography is not as susceptible to backscatter as white light photography. Therefore, blue light strobes do not need to be positioned as far away from the optical axis of the camera as they are in white light photography.


Dichroic or interference filters of different shapes and sizes

Let there be (blue) light!

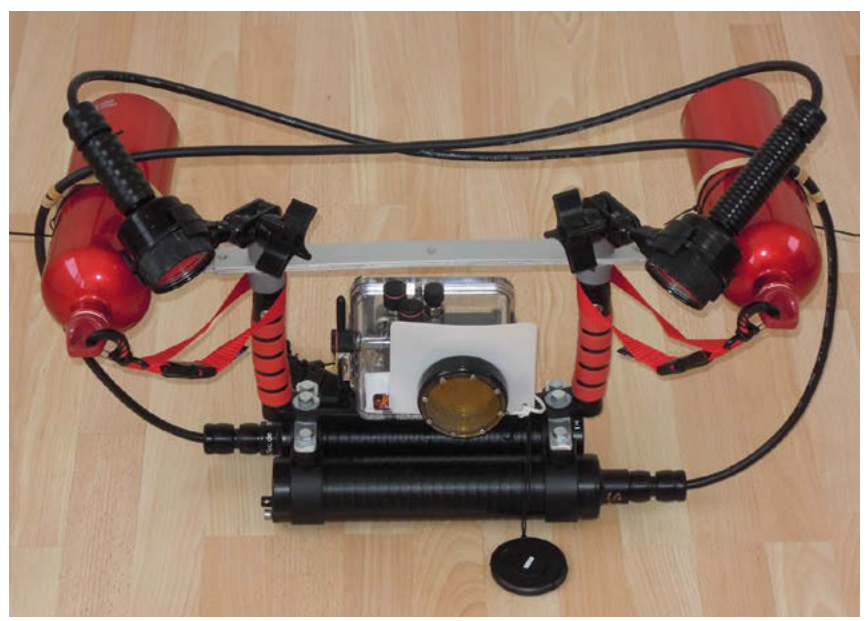
Night time fluorescence diving and fluoro-photography is indeed an interesting and exciting new aspect of the underwater world, which will continue to attract interest because of its uniqueness. Our eyes and senses are attuned to seeing things as they are illuminated and reflect light back to us, but with fluorescence the light is being emitted from the object itself and all else is blackness—a truly strange and enthralling experience! ■

Steffen Beyer has been a keen scuba diver since 1988. He graduated from Aachen University in Germany where he studied computer science and biology. In 2004, he worked as a patent examiner in the field of "computer-implemented inventions" at the European Patent Office in The Hague, Netherlands.

Inspired by Sir Arthur C. Clarke's book, Dolphin Island, in autumn of 2010 the Beyer began building his own fluorescence torches, because he could not find any commercially available UV dive lights.

In order to get as close to the experience described in the book as possible, Beyer initially exclusively used UV LEDs and built torches of increasing power, first with a single LED of about 395-410 nm and 1 Watt, then a torch with two LEDs with 365 nm and about 6 Watt, and finally one with 4 quadruple LEDs (equivalent to 16 single LEDs) at 365nm and 46 Watt.

*Together with the dive instructor and physicist, Lynn Miner, Beyer founded **www.FireDiveGear.com** in May 2012, in order to develop high quality yet affordable equipment for fluorescence diving and fluoro-photography.*


The author's current camera set-up


The author's torch with 18 blue Cree LEDs and a dichroic blue filter

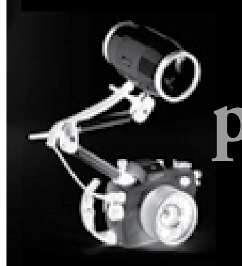


photo & video

Edited by Don Silcock

PRODUCT SHOTS COURTESY OF THE MANUFACTURERS

Sea & Sea EOS 70D Housing

Sea & Sea has released their new housing for the Canon EOS 70D. The MDX-70D housing is made from aluminium and features the company's new internal optical YS converter, which converts the camera's TTL electronic signal into a fiber output. The housing features a quick control multi-function button, leak sensor and an externally accessible port lock. ■

Nauticam S120 Housing

Nauticam has announced the release of their new housing for the very popular Canon PowerShot S120 compact camera. The NA-S120 housing features access to the camera's front command dial, a 67mm thread on its lens port to allow the attachment of accessory lenses and fiber optic bulkheads for strobe triggering. ■

Nauticam OM-D E-M1 Housing

The march of the mirrorless cameras continues, and following Sony's recent announcement of the first full-frame versions comes the new Olympus OM-D E-M1 camera. Olympus has built on the tremendous success of the first OM-D, the E-M5, a camera that impressed virtually everybody that used it with its excellent functionality and images. But the E-M5 was aimed at the "enthusiast" market—keen photographers who were looking for most of what a DSLR offers, but in a small package. This time Olympus is looking for the E-M1 to tempt the high-end enthusiasts and professionals looking for that smaller package, and so far the signs are very positive they will achieve that. Nauticam has responded to the new Olympus in the usual record time and has announced the release of the new NA-EM1 housing. The housing is designed to make the most of the E-M1's capabilities and looks more like a fully-fledged DSLR housing with its attached set of handles. ■

Nauticam Blackmagic Pocket Cinema Camera Housing

Nauticam has released their new housing for the Blackmagic Pocket Cinema camera. The very highly regarded Pocket Cinema camera cab record 1920x1080 30P video in the high quality lossless CinemaDNG RAW and editing friendly Apple ProRes(TM) formats. It is also capable of an incredible 13 stops of dynamic range. The Nauticam NA-BMPCC housing provides access to the main camera controls such as record, focus, and lens control—all of which are placed within finger reach from the grips. Nauticam has also angled the housing's handles forward by 15 degrees for comfortable use in a level, swimming position. ■

Sea & Sea RX100 Housing

Sea & Sea has released their new housing for the very highly regarded Sony RX100 compact camera. The MDX-RX100 is made from aluminium and can accommodate versions 1 or 2 of the Sony camera using a bumper pad kit that is supplied with the housing. The housing also features a flash deactivation lever, a multi pad controller and a control ring for the camera's front command dial. ■

Ikelite D610 Housing

Ikelite has announced that it has updated its housing for the Nikon D600 to accommodate the revised D610 model. Although externally identical to the D600 housing, the new D610 has updated circuitry to enable the use of Live View underwater. The D610 housing has 200-foot depth rating and is very competitively priced at US$1,600. ■

Gates Sony Z100 housing

Gates Underwater Products has announced their new housing for the Sony Z100 4K professional camera. The new housing features complete access to all the Z100's controls, including manual focus, iris and white balance. The buoyancy and trim of the housing can be adjusted via the use of trim weights, and the housing can be outfitted with an HD-SDI surface feed. ■

Fantasea G16 Housing

Fantasea has released their new FG16 housing for the Canon Powershot G16 compact camera. Unlike the Canon housing for the G16, Fantasea's approach is to provide full access to all camera controls underwater, plus the housing is also supplied with a double fiber optic port and a moisture detector as standard. The FG16 is priced at US$499.95 and in some regions of the world, Fantasea is offering housing and camera bundles. ■

Nauticam G16 Housing

Nauticam has released their housing for the Canon PowerShot G16 compact camera. The NA-G16 housing offers access to both front and rear control dials on the camera, a 67mm thread on its port for wet lens mounting plus fiber optic bulkheads for strobe triggering. The housing also features a single 16mm threaded port for attaching an accessory vacuum system or electronic strobe triggering bulkhead. ■

Aditech MVHS-FS700 Camcorder Housing

Aditech has announced their new housing for the Sony NEX-F700 and FS100 camcorders. The Mangrove MVHS-FS700 housing is made from marine grade aluminum, which has been machined and anodized, while the rear cover is machined from solid Delrin. The housing features a control system that uses the camera's LANC control and all the controls are accessed via 12 external push buttons, which provides good user feedback via the camera's touch screen. Review and framing are achieved via a 3.5 inch (9cm) TFT rear mounted monitor. The Mangrove MVHS-FS700 housing is available now at a retail price of EU€3,119. ■

Blu Rivard

P O R T F O L I O

Paradise Fever, by Blu Rivard. Oil on canvas, 24x20 inches

Blu Rivard

Passion for Paradise, by Blu Rivard. Oil on canvas, 30x40 inches
PREVIOUS PAGE: *Journey thru Paradise*, by Blu Rivard. Oil on canvas, 30x40 inches

Based in Southern California, American artist Blu Rivard is passionate about the underwater world—a realm of wonder which he captures in vivid oil paintings on canvas. An avid scuba diver, he found inspiration for his art in his diving adventures in places such as Australia, Asia and islands of the South Pacific. His passion for the beauty of life in the sea led to a desire to help protect the oceans and the fragile ecosystems of the reefs.

Text by Gunild Symes
Photos courtesy of Blu Rivard

A keen observer of nature and the play of light on natural forms, Rivard has developed a body of work that reflects his interest in the sea and its many inhabitants.

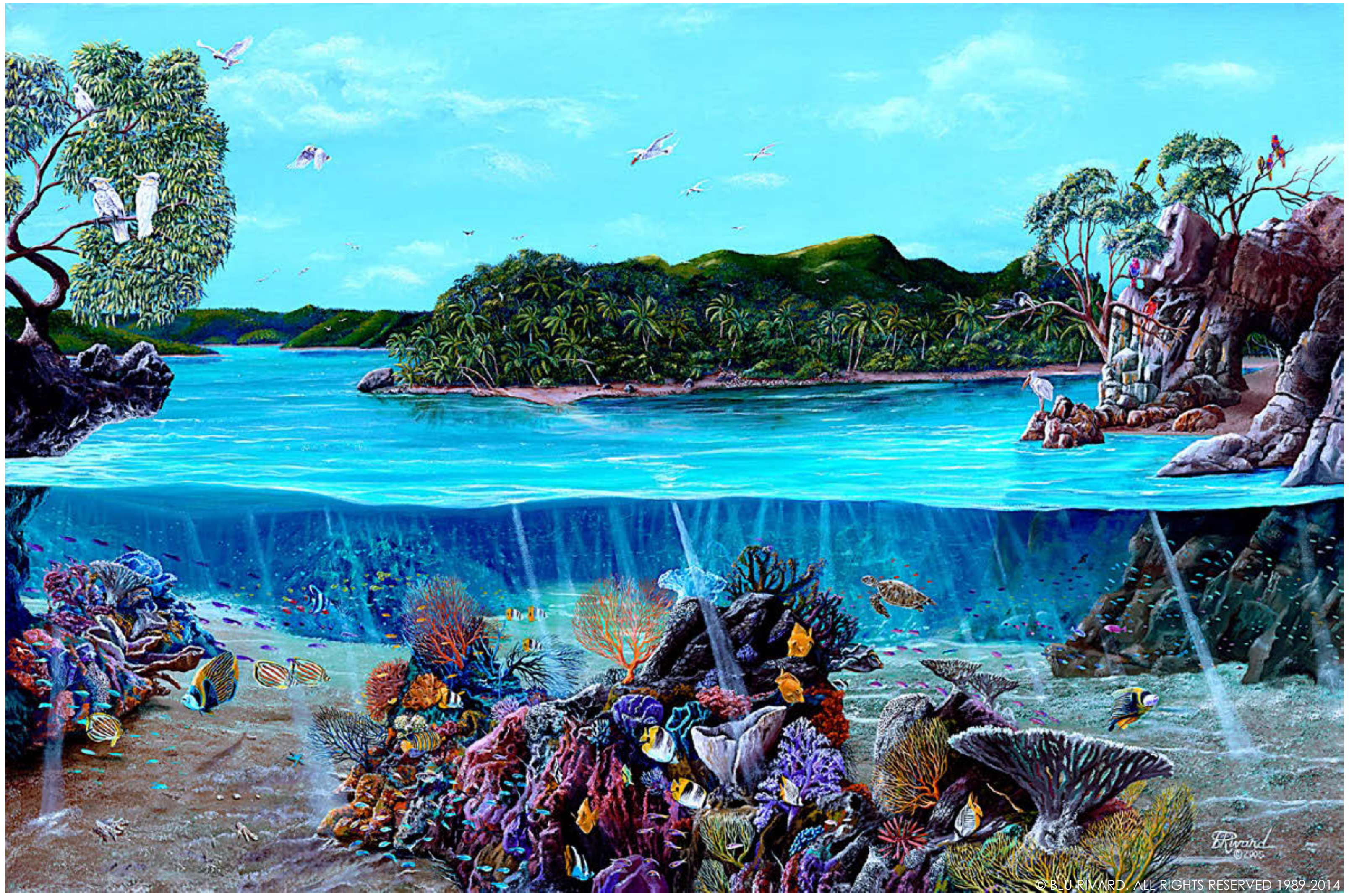
"The sea and its residents fascinate me in many ways," he said. "Each has a role to play in the scheme of things."

Leaving his native Detroit in the late 70's, Rivard came to live in Southern California and developed a love of the sea and its many creatures.

"The first time I saw reef fish, I was hooked," he said. "I needed to understand how and why they were so colorful. So, I started to study marine biology and oceanography. The more I learned, the more I wanted to learn. I soaked it up like a sponge.

"Of all the creatures, turtles are probably most dear to my heart. They are majestic but yet docile creatures that seem to convey a sense of

Blu Rivard



Serene Surrender, by Blu Rivard. Oil on canvas, 24x36 inches

ancient wisdom."

For a time, Rivard lived in Guam, where he explored the natural wonders of the Pacific Rim. While he had many diving adventures, Rivard is hard-pressed to claim a favorite location.

"I really have no absolute favorite dive location," he said. "They're all fascinating and unique in their own way. I've been fortunate to dive in so many wonderful locations around the world—the California coast, Hawaii, the Great Barrier Reef, Micronesia, Bali, the Philippines, Fiji and the Grand Caymans amongst them."

In the future, Rivard hopes to dive in Papua New Guinea, Thailand and the Red Sea, he said.

Art with a message

In his art works, Rivard seeks to communicate his passion for the diversity and beauty found in marine ecosystems.

"My paintings are oil canvas," he said. "This enables me to achieve the realism for which I am known. I love detail and diligently seek to reveal my passion to the viewer."

With his artwork, Rivard reveals a world not seen by many people.

"When my first image was published (*Send In The Clowns*, 1989), it allowed me to share with others the magic of a world unknown to most," he said. "A significant percentage of the population will never experience planet Earth as I have been fortunate enough to do. Long ago, a close friend sug-

Into the Light, by Blu Rivard. Oil on canvas, 20x16 inches

Splash, by Blu Rivard. Oil on canvas, 20x16 inches

The Ascent, by Blu Rivard. Oil on canvas, 20x16 inches

Pacific Treasures, by Blu Rivard. Oil on canvas 30x24 inches

gested I share my art. Little did I know something that gave me intense pleasure would resonate with so many others."

Creative process

In his creative process, Rivard uses underwater camera equipment to get source images that inform his paintings. He uses Nikonos IV and Nikonos V cameras. Lenses he uses include a 15mm fisheye lens, 28mm, 80mm and 35mm as well as extensions. For illumination, he uses four Ikelite Strobes A51s.

"Although I hold an underwater photography certification," he said. "I don't shoot photos to be compositions in their own right. I photograph marine life in different poses and various sections of coral that I think would be compelling in my paintings."

Being true to the forms of nature and the shapes of living things is important to Rivard who sees artistic value in the details.

"All along, I try to portray these life forms in a biologically and anatomically correct manner," he said. Although, he admitted, "Occasionally, I use a little *artistic license*."

Saving the oceans

Over the years, the oceans that have inspired Rivard's art works have also inspired him to take action. For the past 13 years, he has served on the Honorary Board of Governors of PADI's conservation organization, Project AWARE.

"Conservation. Now that's hugely important to me," he said. "We live on a planet where too many seem more intent on exploiting and destroying, not discovering and enshrining.

"Much of it is selfishness and greed," he continued. "Something owned is generally not something shared. Worse,

Land Down Under, by Blu Rivard. Oil on canvas, 20x16 inches

it becomes ever more challenging to clean up the mess exploiters leave in their wake."

Rivard sees art as an answer—a way to raise awareness about the plight of our oceans.

"Why art?" he asked. "Well, look around you! See what I see! We're highly visual creatures and have been since the dawn of time, as ancient cave drawings remind us. I try to inspire others to positive action with my art."

But what are the challenges artists face today in creating work that will get people thinking?

"I think the challenges most artists face today could be characterized as 'The Triple E'—exposure, the economy, and the economy!" said Rivard. "The benefits to being an artist today is that more people are becoming aware of the messages art conveys."

In the end, Rivard said his artistic mission is not unique but quite necessary. "We all have a responsibility to this liquid planet as its custodians," he said. "What most concerns me is the ocean. Every form of life depends on it." ■

For more information or to purchase art work from the artist, please visit: ***www.blurivard.com***

Tortuga Point, by Blu Rivard. Oil on canvas, 24x30 inches