



Text by Mark Powell

Technical diving instructor Mark Powell discusses nitrogen narcosis, one of the most underestimated risks to the technical diver but, with the use of the right breathing gas, one of the most easily avoided.

Of all the physiological factors that affect us as technical divers nitrogen narcosis is the most common but also the most widely misunderstood. Narcosis occurs as we dive deeper and becomes more severe the deeper we go. It has several side effects all of which serve to impair our ability to carry out basic tasks. Narcosis was most famously described in Jacques Cousteau's book, *The Silent World*, where Cousteau describes the symptoms and named it the "Rapture of the Deep".

The cause of narcosis has not been definitively proven, although it is widely believed to be caused by the anaesthetic properties of certain gases at raised partial pressures. Many divers incorrectly

consider narcosis to be a black and white issue, either they are suffering from narcosis, or they are not. Furthermore, many divers claim that they have never suffered from narcosis. This shows a misunderstanding of the properties of narcosis and a lack of understanding of the symptoms.

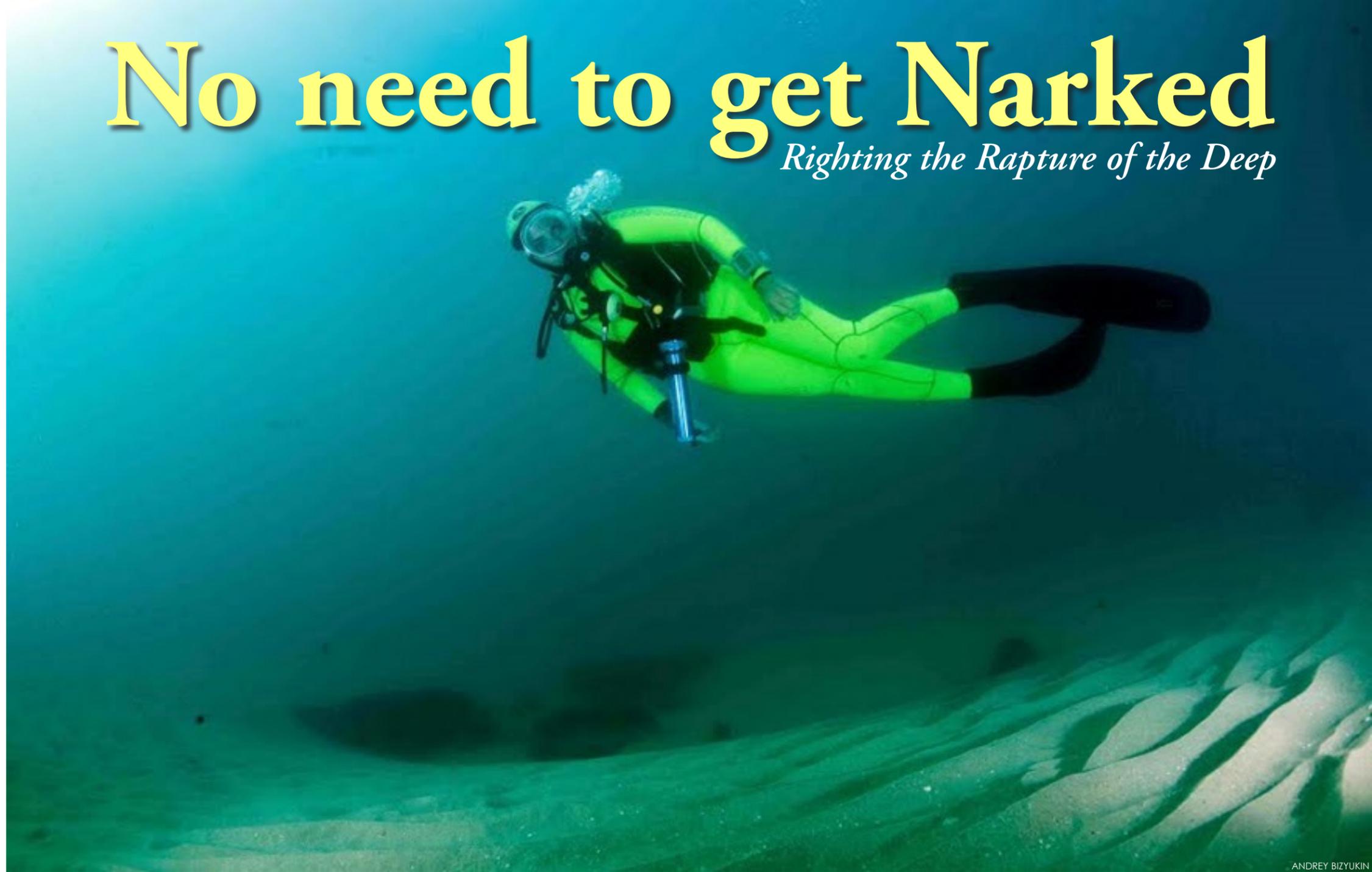
If, as we believe, narcosis is caused by the anaesthetic properties of gases at increased partial pressure, then the level of narcosis experienced should be proportional to the depth. As the diver descends, the narcosis should build up gradually. Those divers who claim never to have experienced narcosis have just never noticed the effects.

Effects

There are many effects of narcosis. The two most widely known are the extreme feelings of either euphoria or panic. In many ways the diver who experiences these feelings of panic and doom is

No need to get Narked

Righting the Rapture of the Deep



ANDREY BIZYUKIN

lucky in that this type of narcosis is acting as a failsafe and preventing them from going deeper and experiencing more narcosis. The diver who experiences euphoria is potentially at more risk, as they are more likely to take risks or act dangerously. However, these two symptoms are not the only effects of narcosis.

There is a wide range of other effects. These may not always be as obvious as a feeling of over-

whelming panic. Symptoms can be much more subtle and so are not always immediately obvious.

Lack of judgement. Divers suffering from narcosis often show a lack of judgement. They don't always make the best decisions, or in some cases, take an inordinate amount of time to make what should be a simple decision. I once watched a diver on a wreck penetration course take

several minutes deciding which of two points to use to make a tie off. Until pointed out later, they didn't realise that they had taken this long to make the decision.

Memory loss. Narcosis appears to affect our memory. Divers who report no other symptoms of narcosis frequently show a lack of memory of certain parts of the dive. I spoke to a diver a few years ago who had just done

the same dive as I had. I was on Trimix, and he was on air. The diver confessed that, despite a 20 minute bottom time, he couldn't remember any specific detail of the dive.

Loss of dexterity. Tasks which are easy in shallow water for some reason tend to become more difficult at depth. Loss of dexterity or motor control is a frequent symptom of narcosis. On many occa-



sions I have seen someone send up a DSMB from 10m in just a few seconds only to have exactly the same task take several minutes at depth.

Task fixation. Narcosis often causes perceptual narrowing or task fixation. Divers become obsessed with completing the task they have begun, even when other tasks have obviously become a much higher priority.

Slower response. Divers suffering from narcosis often respond slow-

er than they would in shallower water. These extra seconds can make a vital difference at depth.

Emergency situations

It is interesting that many of these additional symptoms of narcosis are not noticeable unless a problem or emergency occurs. If everything is going well, then the fact that tasks take a little longer is no problem, especially as both parties are likely to forget many of the details of the dive anyway.

However, narcosis becomes much more of an issue if a problem occurs. In this case, the diver now has to assess the situation, make a judgement and act on it. All three of these abilities may be affected by the diver's level of narcosis. This means that the diver is much less able to deal with a problem due to his or her level of narcosis.

We are lucky that the vast majority of dives do not involve an incident of any kind. During the dives that go well, we can tolerate the level of narcosis that we experience. It is only when dives don't go well that the level of narcosis becomes dangerous. Unfortunately, I still haven't been able to reliably identify in advance the dives when things will go well and those when an incident will occur. Until then, I will remain wary of narcosis.

Divers that claim never to have experienced narcosis are focusing on the obvious symptoms and are ignoring, or forgetting, the more subtle symptoms. If you can feel that you are affected by narcosis



Narcosis

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then the symptoms probably started 10-15m shallower than when you noticed them.

Environmental factors

For any given breathing mixture the level of narcosis is related to the depth of the dive, with technical diving we are almost by definition involved in deep diving. However, there is more to it than that. Depth is only one of the factors involved. The environmental and personal factors also play a significant part in narcosis. Environmental factors can increase your susceptibility to narcosis and can increase the symp-

toms at any given depth.

Visibility is one of the biggest factors in susceptibility to narcosis. Consider a dive where you have 20m visibility and plenty of ambient light, but then a week later you do the same dive, and this time, the visibility is less than a meter, and there is no ambient light. The second dive is much more likely to produce symptoms of narcosis than the first.

Current can also be a major factor in bringing on narcosis. If you are fighting against a current and breathing faster than usual due to working hard to swim down a shotline, then you are at

a higher risk of experiencing narcosis.

Minor equipment problems can also induce narcosis. A slight equipment problem which, in itself will not cause any issues, may be enough to induce narcosis. This is related to other psychological causes of narcosis. Concern over the dive, diving with unfamiliar equipment or unfamiliar buddies, cold, drugs, fatigue, stress, motion sickness and motion sickness medications have all been linked to an increase in the likelihood of narcosis.

All of this means that the depth in itself is not the only factor that

determines your level of narcosis. As such, it's impossible to draw an arbitrary line where you can say air/nitrox is safe at this depth but no deeper.

Psychological factors

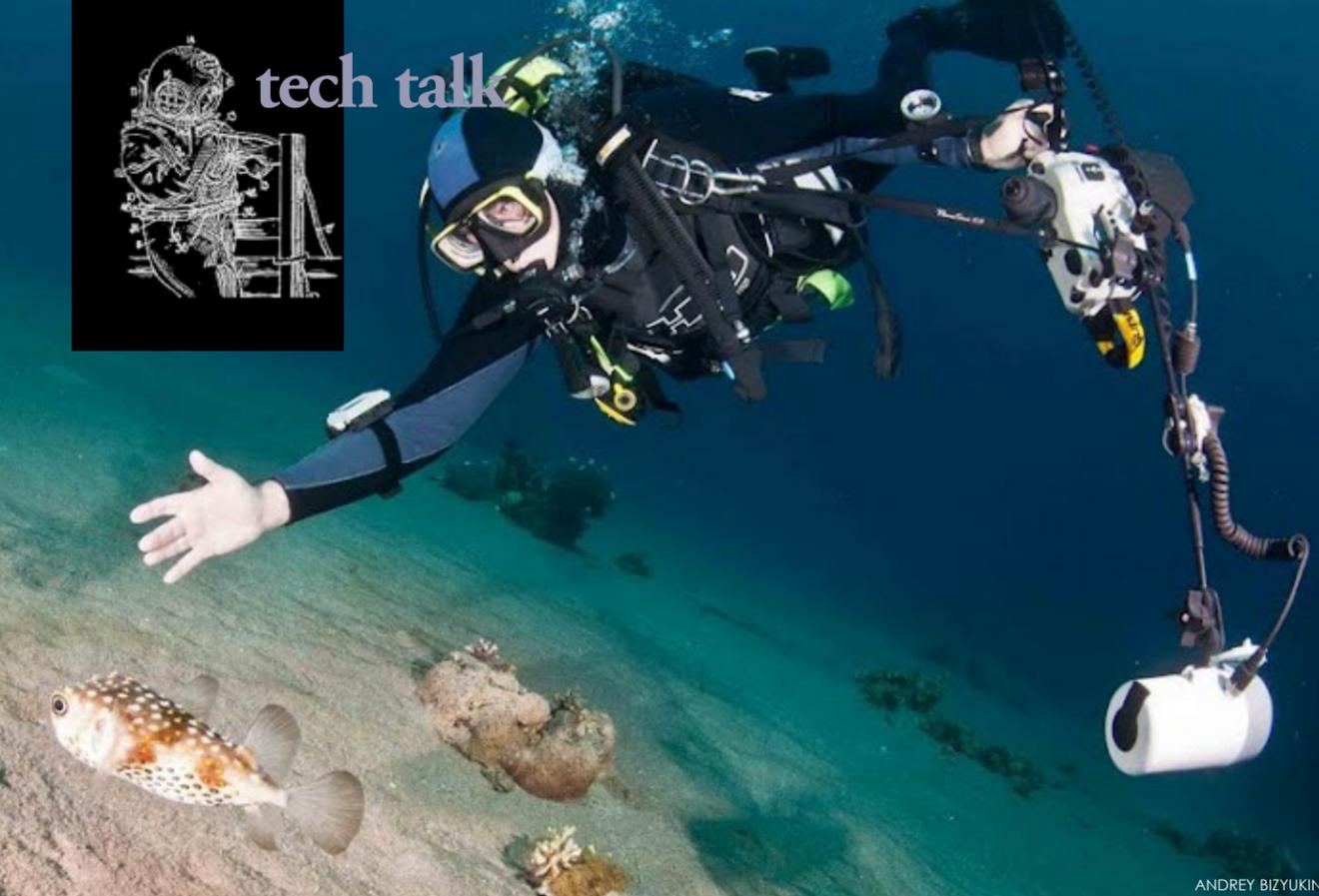
It is clear that psychological factors affect narcosis. There have been a number of studies which have attempted to show the psychological aspect of narcosis. Tom Mount and Dr Gilbert Milner carried out a study in 1965 that demonstrated that divers tend to experience a level of narcosis that is consistent with the level they expect to experience.

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tech talk



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Narcosis

be able to distinguish between the effects of air and nitrox. The result is that the question of whether oxygen is more or less narcotic than nitrogen can generate some interesting discussions but is effectively irrelevant for recreational technical divers.

As we dive deeper the effects of narcosis become more and more significant. We have seen that using nitrox does not help in reducing narcosis. Furthermore, the increased levels of oxygen limit the depth that we can dive using nitrox without risking CNS oxygen toxicity. So, for deep diving, we must look at another solution.

Deep diving

We know that different gasses have different narcotic properties, and so the best solution is to find a gas that is considerably less narcotic than either nitrogen or oxygen and use this to replace some of the nitrogen in the breathing mix. Helium and neon both have properties that predict that they would be considerably less narcotic than nitrogen, and experiments have shown this to be the case. Neon is prohibitively expensive, and so helium, though still expensive, has been used as the gas of choice for deeper diving.

Helium is considerably less narcotic than nitrogen, and so, as we replace some of the nitrogen with helium, we are reducing the overall narcotic effect of the combined gas. As we increase the amount of helium in the mixture, and so further reduce the amount of nitrogen present, we further reduce the narcotic level of the overall gas.

A more recent study carried out for the HSE by the Diving Diseases Research Centre and Plymouth University supported the importance of psychological aspects in addition to the bio-physical impact of narcosis. One of the conclusions from this study was that narcosis is not simply an objective measurable phenomenon; it also has a subjective facet.

Nitrox

Until very recently it was commonly accepted that the use of nitrox would reduce narcosis. On the face of it, this seems to make sense. If an increased partial pressure of nitrogen causes narcosis, then if we replace some of the nitrogen in the breathing mix with oxygen, we will reduce the partial pressure of nitrogen at a given depth.

The majority of nitrox courses taught exactly this reasoning until quite recently. However, it is now believed that it's not just nitrogen that causes narcosis, but that different gases result in varying levels of narcosis. Nitrogen has a high level of narcosis but is not the only narcotic gas.

As there is no definitive explanation for the causes of narcosis, it is difficult to prove which gases have more or less potential to cause narcosis.

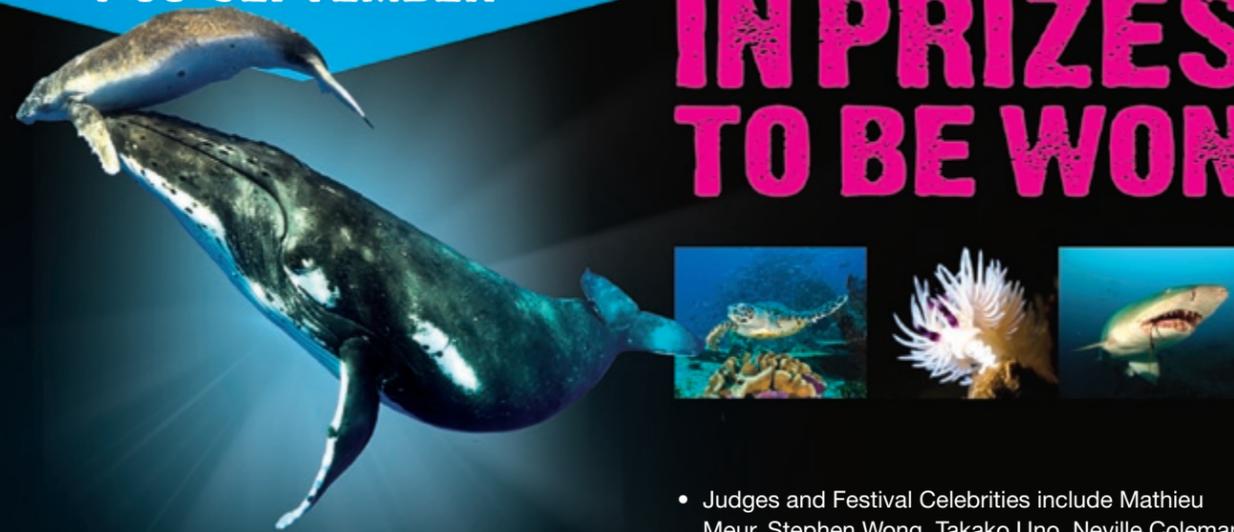
The best estimate for the levels of narcosis is derived from a theory that says the level of narcosis caused by an individual gas is related to the solubility of that gas in a fatty substance. This is known as the Meyer-Overton hypothesis. Using this measure oxygen should be more narcotic than nitrogen. If this is the case, then nitrox will not reduce our levels of narcosis, as we are just replacing one narcotic gas with another.

It would be nice if we could prove this argument one way or the other by comparing the narcotic effects of air and nitrox. Unfortunately, it's not that easy. In order to ensure that we had a measurable level of narcosis, we would need to be at a significant depth.

At these depths, the risks of CNS oxygen toxicity means that we would have to reduce the amount the oxygen in the breathing mixture to the point where it would be too small to

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Commercial and military divers often replace all of the nitrogen in their breathing mixture and just use a mixture of helium and oxygen. This is known as *heliox*. This produces virtually no narcosis, but due to the cost of helium, it is a very expensive option. Recreational technical divers tend to use a mixture of helium, oxygen and nitrogen, known as *trimix*. By adjusting the level of the three gases, the diver can select a mixture that has the desired level of narcosis.

Trimix

A trimix diver can perform a dive to 80m but can choose his breathing mixture so that they experience a level of narcosis that is the same as if they were breathing air at 35m. On a subsequent, deeper dive to 90m, they may be 10m deeper but can choose a breathing mix that still gives the same level of narcosis. This is known as the Equivalent Narcotic Depth (END). In this case, a trimix diver at 90m may be experiencing less narcosis than



a recreational diver at 40m on air.

As we have seen, trimix allows the diver to reduce the level of narcosis they experience so that the END is shallower than the actual depth, and the trimix diver can choose their own END. This

leads to the inevitable question of just what END should we choose? Some agencies mandate a maximum END. This limit could be 24m, 30m, 40m, 50m, 55m or in some cases even deeper.

One answer is to simply stick to the maximum END recommended or mandated by your agency. This has the advantage of standardisation whereby all members of a team or diving group are working to the same END and so will end up with standard gas mixes. This can greatly simplify dive planning and gas mixing. The downside of this approach is that with a variation of 24m to 55m, there is a huge difference between the various recommendations.

Which is right? With different groups and agencies advocating different limits, it can lead to pointless discussions about whose limit is right. Each group is convinced they are right and provides anecdotal evidence of the fact that they were or were not marked at various depths. These differences in experience should not be too much of a surprise.

As was found in the Mount and Gilner study, divers who expect to get narcosis at a particular depth are more likely to actually experi-

ence symptoms of narcosis at that depth. This means that if you believe that you will get narcosis below 30m, then you are more likely to experience symptoms if you are below 30m. On the other hand, if you have been told that you won't experience it until much deeper, then you are much less likely to experience symptoms in the 30-40m range.

So, how should we choose the operating END, and as a result, the appropriate trimix mix to use for a given depth. As we have seen above, the actual depth of the dive is only one aspect of narcosis, and by simply focusing on the depth, we overlook all of the other psychological factors.

There are times when an END of 24m might be too deep and other times when an END of 45m might be perfectly fine. The choice of END should depend on the full range of factors—conditions, familiarity with the site, whether it is an overhead environment, whether there is a current or not, visibility, familiarity with your kit, buddies, the site, etc.

One approach is to take a baseline END, say 35m, and then reduce that END for every factor that is less than average, or increase it for every factor that

Narcosis

is better than average. So, for a dive in cold, dark conditions, wearing a rebreather in an unfamiliar overhead environment then, taking these five factors into account, you might want to plan on an END on 25m. On the other hand, in warm, clear water with a buddy you are very familiar with and diving a site you know very well, then with these four factors being above average, you might be happy with an END of 43m.

A clearer head

It is clear that the reduction in narcosis introduces a number of advantages. A clearer head allows divers to enjoy the dive and actually remember what they see down there. There is little point in exploring a wreck if you don't remember the experience after.

In addition, the reduction in narcosis removes the lack of judgement, loss of coordination and inability to resolve problems. This can give the technical diver a huge safety advantage, especially in the case of an emergency situation that requires judgement, coordination and the ability to resolve problems.

As divers go deeper and the risks increase, divers can help to reduce those risks by reducing their level of narcosis. With trimix relatively easily available in so many places around the world these days, there is really no reason for divers to risk diving deep on air and inducing symptoms of nitrogen narcosis. ■





photo & video

Text and photos
by Larry Cohen

When it comes to cameras, traditionally, gear is divided into compact point-and-shoot or single lens reflexes (SLR). By definition a SLR camera had a mirror and prism positioned inside the camera, so the photographer could look directly through the lens. This way, they could see the exact framing of the image. When the shutter opens, the mirror quickly moves out of the way, so the film or sensor could be exposed to light. SLRs are advanced cameras with manual exposure control and interchangeable lens systems. In the past and today, these cameras are used by professional photographers and advanced amateurs.

Digital single lens reflexes are referred to as DSLR cameras. They have very little shutter delay and can shoot uncompressed RAW files. The sensor that captures the

image, is larger than the sensor in a point-and-shoot camera. So, the pixels are larger, and the image quality is better. Many shoot video files that could be used for broadcast productions. The disadvantage is these cameras and accessories are expensive, large and heavy.

Compact point-and-shoot cameras, on the other hand, are simple devices that many people use just for snapshots. In the days of film, the camera would have a separate window viewfinder. The disadvantage was that the photographer would see the scene from a different angle and placement than the lens. So, one would not see the image exactly the same way the lens would capture it. Some digital point-and-shoot cameras still have these viewfinders, but most don't. The camera uses a LCD screen that obtains the image through the lens.

Typically, point-and-shoot cameras have built-in lenses. In order to keep the price low, the lenses are not as sharp as the ones designed for SLRs. Some compact cameras are compatible with add-on conversion lenses to expand their range.

Many point-and-shoot cameras only have automatic exposure control. The ones that do have manual controls are limited. Many of these cameras only shoot compressed jpg files, but all of them have a video mode. These cam-

Diver with Nikon Coolpix P7100 in the Fantasea P7100 housing, Sea & Sea YS-01 strobes, Light & Motion Sola 1200 with Beneath the Surface tray and arms at the pump house in Dutch Springs quarry

eras and accessories are more economical than a SLR camera. They are easy to travel with because of their small size.

There is now a new category, the mirror-less camera. These cameras are in the middle. No mirror, so they are smaller, but they have interchangeable lenses and advanced controls. Some of them are very fast. These cameras and underwater gear will be discussed in a future article.

The past

Digital photography has changed the way we document the world. In a very short period of time, film and silver halide prints—once the standard—have become an alternative process. This major change has affected the way the high-end professional photographer to the snap-shooter create images.

This revolution in imaging has had a major influence in the world of underwater photography. We are no longer limited to 36 frames of film per dive. Since the more we shoot, the better our images, this is important.

We now get to see our image instantly on the camera's LCD screen. This allows us to review the image, make corrections and reshoot. Back in the days of film, sometimes one would not have a chance to process the film until one was back home.

In the early days of digital



Point & Shoot





photo & video



Diver with Fantasea P7100 housing, BigEye dome, Sea & Sea YS-01 strobes, Light & Motion Sola 1200 with Beneath the Surface tray and arms photographing turtle in Bonaire

posable cameras. They started making housings for the Nikon Coolpix 990 in 2000. These days, Ikelite manufactures housings for more camera models than any other company.

Camera manufactures including Olympus, Canon, Sony, Fujifilm, Casio and others started manufacturing their own low-cost underwater housings for simple digital cameras. This allowed any scuba diver, snorkeler or beach bum to protect their camera and produce images around and under the sea. This brought underwater imaging to the masses.

Notice that Nikon is missing from the above list. In 2002, Howard Rosenstein started Fantasea Line. Their first housing was the CP4 for the Nikon Coolpix 885 and 4300. This low-cost

imaging, SLR cameras were large and expensive. So many photographers starting using compact, point-and-shoot cameras to do serious underwater photography. Many of these early digital cameras had professional features including manual control, hot-shoes, and could shoot RAW files. Most were also very slow.

Light & Motion made a housing for the Olympus C3030 back in 2000. This was an aluminum housing with bulkheads for the strobes and complete camera control access. In 2002, they came out with the Titan for the Olympus E-10. This was an over-sized point-and-shoot camera that did have a through-the-lens viewfinder. So technically, this was the first

housing for a DSLR. Since the camera did not have interchangeable lenses, it still shared many characteristics with point-and-shoot cameras. Before this Light & Motion manufactured video housings and were primarily a producer of bicycle lighting.

Aquatica, a major producer of SLR film camera housings, started in 2000 with the Coolpix 995. This aluminum housing had dual bulkheads and shared many of the features of their film SLR housing. They produced their first DSLR housing for the Nikon D100.

Ikelite always produced reasonably priced polycarbonate housings for film SLRs. They also had low cost options for film, point-and-shoot, and even dis-

housing still had many features needed to do serious underwater photography. This allowed many people to be able to afford shooting with their Coolpix camera underwater. Today, Fantasea Line still produces housings for the Nikon Coolpix Line, and other reasonably priced underwater photo accessories.

The present

Today, the number of compact point-and-shoot cameras is staggering. Cheap auto-only cameras seem to dominate

Diver with Fantasea P7100 housing, BigEye dome, Sea & Sea YS-01 strobes, Light & Motion Sola 1200 with Beneath the Surface tray and arms photographing turtle in Bonaire

Point & Shoot

phers of different levels.

The principals of producing a well-crafted underwater image have not changed. The rules stay the same for film, expensive digital pro or inexpensive snapshot cameras. Let's explore these rules and how they relate to our gear choices.

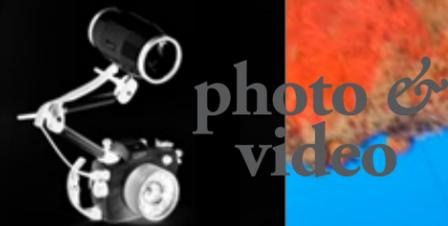
Get close

The less water between the camera lens and the subject, the better the images will be. In order to get close to the sub-

the market. There are still some cameras with advanced features that are suitable for underwater imaging. Nowadays, the price of DSLRs have dropped dramatically, but using a point-and-shoot camera does have some advantages.

Besides the price, point-and-shoot cameras are small and easy to travel with. Now that airlines charge us as much for our gear as our seat, size and weight does matter. Although they have limitations, the simplicity of a point-and-shoot camera does appeal to many photogra-





Diver with Fantasea P7100 housing, BigEye dome, Sea & Sea YS-01 strobes, Light & Motion Sola 1200 with Beneath the Surface tray and arms on the HILMA HOOKER wreck in Bonaire

ject, one needs to have a wide-angle lens for large subjects or a macro lens for small subjects. All point-and-shoot cameras have a macro mode. Cameras with small sensors excel at small subjects. All one has to do is put the camera in macro mode (usually a flower icon) and move in close.

Many housings allow the use of optical accessories on the lens port. Use of a close-up lens will allow us to have a little more distance from the subject, but still get the magnification. This has two

advantages: first, we will not scare a camera shy subject; second, it gives us room to be creative with lighting.

Large subjects are harder to deal with when shooting with a point-and-shoot camera. By design, these cameras do not have interchangeable lenses. So, we need to start with cameras that have a wide-angle lens. In the past, most cameras had a lens with an equivalent angle of view of a 35mm lens. Add in the 25 percent size distortion that happens underwater, and we have to move too

far back. Nowadays, we do have cameras with 28mm and even 24mm equivalent focal lengths. Although this is an improvement, it is not wide enough. So, the solution is to use wide-angle conversion lenses on the outside of the housing port.

These lenses will have a magnification factor of around 0.56X. By multiplying this factor with the focal length of the lens, we get our angle of view. A camera with a 28mm lens will have an angle of view of a 15.68mm lens when using this con-

version lens.

Our other problem is vignetting. Unless the conversion lens is designed for the optics on a particular camera, we might get cut off in the corners. Even if we have to zoom in a little to remove this, we are still better off using a conversion lens.

Some housings use a conversion dome instead of a conversion lens. This corrects for the 25 percent size distortion that happens underwater. The camera's built-in lens will have the same angle of view underwater as it does above. Ikelite uses a conversion dome on many housings for cameras where a conversion lens would not be effective. This includes their Canon G12.

Fantasea Line also has a conversion dome they call the BigEye. Besides having the dome for their P7100 housing, you could get them for certain Canon, Sony, and Fujifilm housings. They also make one that fits housings with a 46mm filter thread. The problem with these domes is they could cause flair. If you are filtering for color, this is not an issue. If you are using dual strobes, you might get flair that could be retouched or cropped out.

An advantage of this kind of optical system is that conversion lenses or domes can be attached or removed underwater. This allows us to shoot macro and wide shots on the same dive. With a DSLR, we have to pick a lens and stick with it for the entire dive. So, we always see that rare nudibranch when shooting wide-angle, and the whale shark when shooting macro!

When picking a housing, it is important to make sure some sort of optical accessories are supported. Many of the housings manufactured by the camera companies might not be compatible with any optical accessory.

Color correct

Water changes the color of our image. Warm salt water will turn your image blue, while fresh and cold salt water will



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Using the Fantasea P7000 in the ice fields of Alaska

have a green look. Sometimes this color shift will add spice to an image. Certain subjects including shipwrecks could benefit from this color shift. Usually, we will want to correct this shift so we can see the natural colors of the underwater world.

Many point-and-shoot cameras will have an underwater mode. This is like putting a digital orange color-correcting filter over the lens. It will correct your image when shooting in blue water. This gives you an average correction. Sea conditions and depth will change the color and might need a stronger

amount of filtering. All digital cameras have a custom white balance mode. By using a white colored target, the camera will create a digital filter pack to correct the color for the current conditions. This takes slightly more skill than using underwater mode, but it will get you better results.

Using filters is another way to correct the color. Both Fantasea Line and Ikelite produce blue and green water color correction filters.

Magic filters are a gel filter that can be cut to size. One would then attach the filter to the lens or place inside the

lens port. Magic filters are available for green or blue water. These filters are designed to do a custom white balance along with using the filter. They will get you the best results and will be effective even in deep water. The company also makes a filter to be used with an auto white balance setting.

Filters are effective in shallow water, and they flatten out the image. This is because they are color correcting the background and the subject.

By using a strobe, the daylight balanced light will bring back the natural color of the subject. By their nature,

Point & Shoot

strokes will only light up a small area. So, the background will continue to have a vibrant blue or green colorcast. This could create a very dramatic image. Never use a filter, underwater mode, or custom white balance when using a strobe. Auto white balance will work best when using strobes.

Since we want to work close, with a wide-angle lens, strobes with a wide beam angle are needed. If our flash has a continuous power dial, this will make exposure control much easier. Traditionally, the strobe connects to a waterproof bulkhead on the outside of the housing. There's a connection on the inside to the camera's hot-shoe. The problem is, not every point-and-shoot camera has a hot-shoe, but they all have a built-in flash.

The camera's flash is not powerful enough and is in the wrong position to use underwater, but it could be used to trigger an external strobe. The external strobe has to have a built-in slave sensor, or we need to be able to add one. When the camera's flash fires, it will set off the external strobe.

The camera's built-in flash fires off a pre-flash to gather exposure information. It is important that the slave sensor can recognize this pre-flash and only fire the external strobe when the shutter is open. Some systems now allow the external strobe to mirror the pre-flash information and give you automatic flash exposure. This is called DS-TTL. Using a strobe with an exposed slave sensor will also be triggered by other photographers strobes.

Some companies including Sea & Sea have their slave sensors setback. Here, we need to use a fiber optic cable to move the light from the camera's built-in flash to the slave sensor. This is a very efficient way to fire a strobe. Now many housings for advanced DSLR cameras use this system.

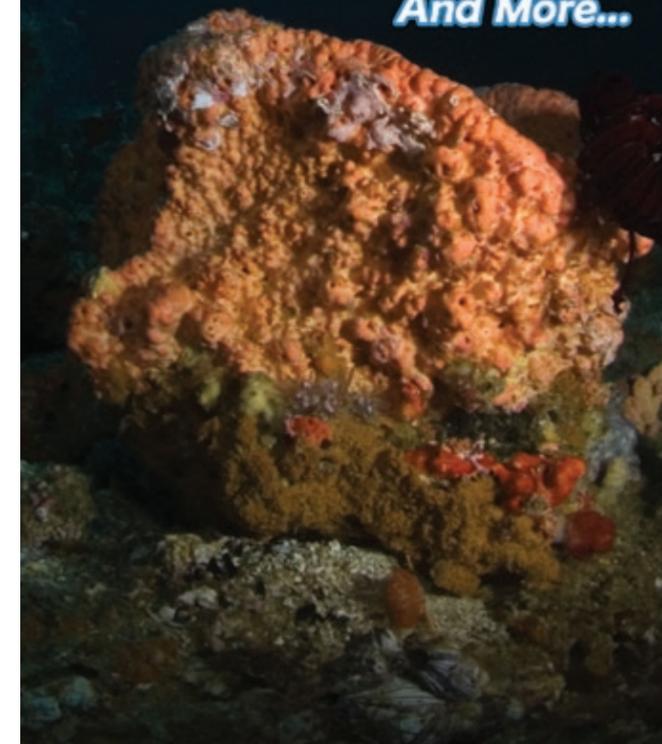
Manual exposure

Automatic and program modes are set-up to work with surface conditions.

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| <p>ADVANTAGES</p> <ul style="list-style-type: none"> • Economical • Compact and easy to travel with • Simple to use • Conversion lenses can be attached or removed in the water. Allows for both macro and wide-angle subjects to be photographed on the same dive. | <p>DISADVANTAGES</p> <ul style="list-style-type: none"> • Smaller sensors—image quality not as good as a DSLR • Built-in lenses not as sharp as lenses designed for DSLRs • Less control • More shutter delay • Many point-and-shoot cameras shoot jpg files only. The ones that shoot RAW files are very slow. |
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The underwater environment will confuse these systems, and one will get over or under exposed images. When using an external strobe, the background is affected by the available light exposure. This is controlled by the shutter speed and f-stop.



we could use exposure compensation to control available light. The problem is the camera might change the f-stop as well as the shutter speed. This of course will also

pressed file with minimally processed data. They require post processing in the computer. This takes more skill and time, but allows us to really tweak the image to perfection.

Since these are larger files, they could slow down a compact camera. DSLRs have large buffers and can handle these files better. Some point-and-shoot cameras have larger buffers, so they can capture RAW files without putting you into deco.

The foreground is affected by the strobe. We control this with the camera's f-stop and the strobe-power. Often, a correct exposure might not be what we want. Usually, we will want to under-expose the available light, so the background gets darker. This way our subject will stand out, and our image will have more contrast. This is why it is important to work in manual mode.

Many of today's compact digital cameras have auto and program modes only. In program or aperture priority mode,



change our foreground exposure. So, ideally, we want to use a camera with manual mode.

Speed

In the past, point-and-shoot cameras focused very slowly, and there was a delay between pushing the shutter button and the shutter opening. This is called shutter delay and is responsible for many photos of fish-butts. These days, compact digital cameras are much faster, but there is usually some shutter delay. In order to get fish heads instead of fish butts, we should use a camera with as little shutter delay as possible.

The file format could also affect the camera's speed. It is best to shoot RAW files. This is usually an uncom-



Housings

It seems obvious, but make sure there is a housing for the camera. No housing, no underwater images. It is amazing how many people get a camera

and then try to find a housing for it. They are disappointed when they discover none exist. It is also important to make sure the housing has the required features. If we are doing a 300-foot tech dive, we need a housing rated to that depth. It is important to make sure the housing can access all the major camera controls and accepts optical accessories on the lens port. We also need to be able to easily attach a strobe arm and be able to fire our strobes. When shopping for a camera to take under-



water, we need to look at the housings at the same time as the camera models.

Choices

Point-and-shoot cameras have an extremely short life span.

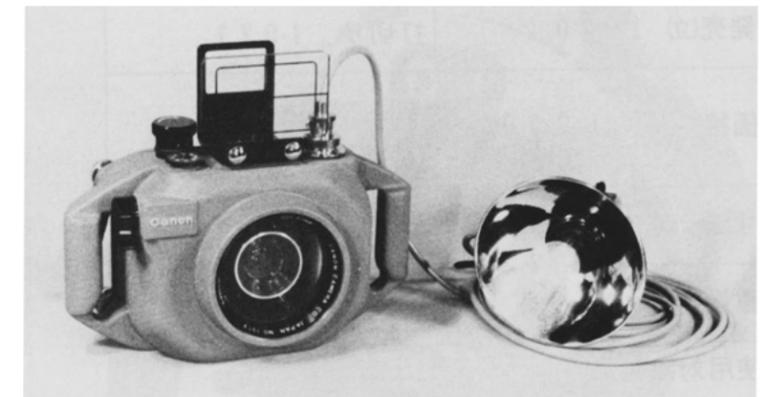
So, the models we talk about today might not exist an hour from now. We need to ask ourselves the question: why are we taking photos underwater? The

majority of divers will be happy with an advanced point-and-shoot camera. Many of us just want images to show our non-diving friends why we spend so much time underwater.

The advantage of a small travel-friendly system that is simple to use is huge compared to a DSLR system. The explorer that is already burdened with heavy dive and scientific gear will also find a compact camera a blessing. The important thing is to make sure the camera, housing and strobe work together the way you need it to.

In the next issue, we will discuss compact camera models that are best suited for underwater photography. We will also go over housings and other accessories. ■

CLOCKWISE FROM TOP RIGHT: Fantasea FP7100 housing for the Nikon COOLPIX 7100; Olympus PT-050 housing for the Olympus XZ-1; Ikelite wide-angle conversion dome for the Ikelite G12 and other housings; Ikelite housing for the Canon PowerShot S100; Ikelite housing for the Canon PowerShot G12



Canon made their first underwater housing in 1959 for the Canon VT 35mm rangefinder camera



Edited by
Don Silcock

Canon Rebel T4i/EOS 650D DSLR

Canon has announced the release of the Rebel T4i/EOS 650D DSLR camera, which features an 18 megapixel APS-C sensor and DIGIC 5 processor with a native ISO range of 100 to 12800. The sensor is stated to be a "hybrid" design, with pixels dedicated to phase detection autofocus (AF) to improve the performance of AF in Live View mode and provide continuous AF in video mode. The 650D can capture 1080p HD video at 30-, 25- and 24fps and has touchscreen control on the LCD which provides focus point selection and shutter Release in Live View, multi-touch type gestures for image review and menu selection. The Rebel T4i/EOS 650D will ship at the end of June for an estimated retail price of US\$850.



Sea & Sea Canon EOS 5D Mk III Underwater Housing

Sea & Sea has released CAD drawings of their new housing for the Canon EOS 5D Mark III SLR. Although full details and specifications of the housing are not currently available, Sea & Sea stated that it will be available in July 2012. It appears that the housing will continue with electrical strobe triggering and that the controls and latch system will be very similar to those of the previous MDX-5DMkII housing.

Aquatica A5DMkIII Canon EOS 5D Mk III Housing

Aquatica has announced the release of their A5D Mk III housing for the new Canon EOS 5D Mark III SLR. The new housing features a redesigned camera tray and both the zoom/focus gear and the lens release lever can now be retracted to provide additional room to allow larger lenses to be inserted. Aquatica has clearly prioritized the housing for video use, a major strength of the 5D cameras, and the video controls are very easy to reach. Plus, they have provided a total of three ports to allow for monitors, etc., to be added. Additionally, the AF-ON and star button now has a locking collar to prevent the control from being activated by water pressure, and the zoom gear has been redesigned to enable a smoother action—another key feature for video users. The Aquatica A5D Mark III will retail at US\$3,199.



Nauticam NA-5DMKIII Canon EOS 5D Mk III Housing

Nauticam has released its NA-5DMKIII housing for the Canon 5D MkIII DSLR. The housing features a double paddle lever for the right thumb that activates AF-On and Record plus "piano key" controls for the Set and Quick Control functions, and a multi controller pad for the camera's joystick. In addition, the ISO, Live View/Movie and Focus point selector controls are all available from the right hand handle. Nauticam has released the NA-5DMKIII housing initially with a Nikonos-type sync port, although other bulkheads are available, but it appears that a fiber-optic solution for the housing and camera will be offered in the future. The housing retails at US\$3,600.



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World ShootOut 2012

This is the second year in a row that the World ShootOut universal underwater photo competition takes place worldwide, including a special new category for children.

Introducing new categories and glorious prizes, the organization is proud to invite all divers, underwater photographers, diving centers, liveboards and media partners to take part in one of the most innovative, creative, international and festive events ever produced.

During the month of August 2012, the whole underwater world will be performing as a huge underwater festival, hosting young, amateur and professional photographers from all over the world, competing with each other for some very worthy prizes, including cash prizes, luxurious diving trips, diving equipment, photo gear and more.

Producer David Pilosof initiated the first World ShootOut competition in

2011, breaking all boundaries and introducing an international competition as never featured before. Hundreds of photographers from 27 countries around the world took part in the first World ShootOut competition and over 1,500 images were submitted, ranging from those that captured the calm lakes of the Nordic countries and Canada to others that showcased the exotic secrets hidden in Alaska and dramatic images of the great white shark in the Gulf of Mexico.

Up until now, the competitions have awarded underwater photographers with over half a million dollars of prizes!

Please see the competition website for full details on this year's ShootOut: Worldshootout.org

Acquapazza APSO-NEX5N housing for Sony NEX-5N

Acquapazza has announced the release of its housing for the Sony NEX-5N EVIL camera. The APSO-NEX5N is available with either a bayonet or threaded port attachment systems and Acquapazza offers a total of eight ports, which cater for virtually all the Sony lenses available for the camera including the A mount 16mm wide-angle, and the 50mm and 100mm macro manual focus lenses. Acquapazza offers both mechanical and magnetic zoom/focus control, with the possibility of both being available, and the user can vary the LCD viewing angle via an external control. Comes in 14 cool colors!



Sony DSC RX100 High End Compact Camera

After a seven-year absence at the very top end of the compact digital camera market, Sony has returned with a vengeance and announced its new DSC-RX100 enthusiast compact. The highlights of the RX100 are its impressive 20.2MP 1-inch digital sensor and Carl Zeiss sensor 28-100mm f1.8-4.9 zoom lens. The sensor is at least double the size of the ones in the other cameras competing at the premium end of the market—the Canon S100 and Olympus XZ-1. The lens is also one of the brightest available. The camera also features 1080p60 HD video and is equipped with extensive manual camera controls and RAW image capture making it a very appealing candidate for underwater photography. It is expected to generate a lot of interest among the housing manufacturers. The RX100 will be released in July and is priced at US\$649.



Watershot V1800 Action Sports Camera Lighting Kit

Watershot has released an underwater lighting kit that is designed to be used with both video and still cameras. The kit uses a 1,800-lumen video light that's configured with a mounting bracket and is powered by Watershot's eGrip rechargeable batteries that are stored inside the handle grip. The light delivers an evenly distributed 75-degree flood beam pattern and provides 1.5 hours of illumination when set on full power, and up to six hours when set to low. It has a battery level indicator located on the light head. Depth-rated to 492 feet, the light offers four modes: high, medium, low and strobe. The kit retails at US\$979.



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South

Text and photos by Bartosz Stróżyński

Georgia

Unique Dive Site



South Georgia is the most well-known of the Falkland Islands, also called *Islas Malvinas*. It lies nearly at the end of the world in the Southern Atlantic Ocean. To find this place on the map, draw an equilateral triangle with one vertex on Cape Horn and another on the Antarctic Peninsula. The third vertex in the east is our destination. Cold, windy, raw landscapes are characteristic of this mountainous, breathtaking, pristine place. It's a living paradise where large concentrations of animals amaze all who visit.

South Georgia has an interesting historical heritage. It is a whale sanctuary and a cemetery. On the island, one can find the grave of one of the most famous explorers in history, Sir Ernest Shackleton, an undisputed symbol of leadership and courage.

The territorial affiliation of the island is under diplomatic dispute. It's currently under the jurisdiction of the United Kingdom, but Argentina is questioning the claim. This conflict even led to war in 1982.

South Georgia is a very remote place. From Europe, one must travel to Buenos Aires in Argentina, then fly further south to get a ship and finally cruise to the island. It took a really long time and a lot of money to get here.

There is no tourism infrastructure on the island. All activity is done from a liveaboard boat with catering done on the deck. Due to rapidly changing weather conditions, there



South Georgia amazing underwater kelp forests, often patrolled by leopard seals





Fur seal (left) defending its rock, very curious and active, moving around all the time; King penguin pair (above) and seals on beach; Female elephant seal (right) swimming in one of the South Georgia bays



is no guarantee of success on any expedition. Getting to land requires a Zodiac boat, and operating it on the rough seas in the area may be very dangerous, often impossible. Despite the challenges, there are many operators offering this destination in their portfolio.

Ghosts of the past

South Georgia holds inglorious reminders of the extensive sealing and whaling activities in the region of the past. There are numerous remains of whaling stations and whaling boats laying around, with no access, due to safety. They make a very strong impression when seen from the liveaboard.

One of these sites, called Grytviken, was cleaned and made available for visitors. Tourists can walk around and get a feeling of how the whaling process

worked, what type of equipment was used and actually how brutal the process was. Several whales skeletons may be seen laying about as well. All those frightening artifacts bring about real emotion and deep reflection among visitors.

Today, South Georgia is the location of two research stations working on conservation and protection of the unique ecology of this region.

An established museum also plays an important role in preserving the historical heritage of this place, especially its sinister whaling activities of the past. It is seen as symbol of what people should never repeat. A lot of unique exhibits may be seen at the museum such as everyday objects that belonged to whaling station workers, equipment used at the time, tools, etc. There is also a section exhibiting the flora and fauna of South Georgia.

In addition, there is a very specific room dedicated to Sir Ernest Shackleton and his spectacular achievements.

Sir Ernest Shackleton

Hailing from Ireland, Shackleton was an early 20th century polar explorer whose ambition was to make the first crossing of Antarctica from the Weddell Sea via the South Pole to the Ross Sea. He did not manage it, but he still became one of the most famous explorers of his time, thanks to everything that happened during his expedition in 1914-17.

Shackleton reached Antarctica with his crew, but his ship, *Endurance*, became trapped in pack ice in the Weddell Sea and eventually sank. Having lost the ship, the captain and crew decided to travel north over the ice to Elephant Island in the South Shetland Islands, where they

spent the following days relying only upon themselves. They had some equipment they saved from the ship. They slept in tents, ate seals and penguins and waited for rescue in an extremely difficult and demanding environment.

Unfortunately, nobody knew about

their situation, which concerned the captain a great deal. When the weather got better, Shackleton decided to sail in a small wooden lifeboat, saved from the *Endurance*, to South Georgia and alert the world to the crew's desperate situation.





Unique Dive



Colourful heads in harmony—King penguins strolling the beach. Images are usually taken *en-face*, because when we look at them, they look at us; for me, it was really difficult to capture them from the back. A nearly endless colony of King penguins (left). South Georgia is famous for the largest King penguin colony in the world, around 300,000 in one place. Fascinating forest of heads despite disgusting smell

concentration of King penguins, making this place uniquely interesting for scientists and tourists. On the island, there are around 600,000 King penguins in total. The largest colony contains about 300,000 individuals. It is an amazing feeling watching this endless, smelly and

noisy family.

King penguins are beautiful birds when they reach adulthood. This may be a kind of compensation for childhood, because they are awfully ugly as chicks. I am not a biologist researching King penguins, but I made some intriguing observations about their lives.

On first sight, such a large colony looked like a monolith, but when I watched a bit

The captain was a really brave man. The plan to cross the distance of 1,300km in open ocean on extremely rough seas in such a tiny boat after an exhaustive time spent on the ice seemed insane, but he was really determined to save his crew.

When looking at a map, South Georgia is a tiny spot in a huge area of ocean. It was amazing that without computers, just simple navigational tools, Shackleton was able to find his way over the ocean to land on the island of South Georgia. His extensive experience and understanding of the currents paid off.

We can only imagine what could have happened if he had passed South Georgia and missed it. But this was not the end of the story. Shackleton reached the island landing on the far side. To get to the whaling station, he had to cross the mountains.

Today, it is known all over the world that Shackleton's spectacular navigational efforts ended with his successful cross-

ing of the island and alerting the world of his stranded crew. His outstanding courage and leadership was rewarded. After 18 months of an unbelievable fight for life in the Antarctic, the crew was saved. Shackleton returned home a hero.

Unfortunately, during his next expedition, he died, and his remains were buried on South Georgia. His grave is one of the main memorial attractions to this day.

Diving

Scuba diving is limited on South Georgia. Most of the significant attractions here are on land. Despite this, it was worth getting wet to experience this beautiful place underwater as well. Diving was mostly about watching aquatic mammals playing around, everywhere, from small bottom dwelling creatures to amazing underwater kelp forests patrolled by leopard seals.

South Georgia is really full of life; sometimes it is difficult to cross over a beach due

to the number of seals resting there. Once, when watching seals playing, somebody said to me: "If I were a seal in my next life, I would like to live in South Georgia." The sentiment described very well the friendly atmosphere here, untouched by human beings, raw and really free.

Penguins

South Georgia hosts the world's largest





Unique Dive



Fur Seal on the rock (above). This image was taken in washing machine conditions—very rough, strong waves, dark weather, cloud covered mountains and hundreds of fur seals jumping, playing, fighting and swimming like missiles. The purpose of this shot was to capture one seal separate from the colony, a break in the never ending action, expressing at the same time the very specific feeling and raw atmosphere of the South Georgia landscape. Portrait of King penguin in early morning shower (far left)

Based in Poland, Bartosz Stróżyński is a nature and underwater photographer, composer, lyricist, author of music videos and multimedia projects, graphic artist and sculptor with several international photo competition awards including the International Photography Awards, European Wildlife Photographer of the Year, International Nature Photo Competition Asferico and the Great Photographic Competition of National Geographic. He has participated in many photographic expeditions including the Elysium Epic Shackleton's Antarctic Visual Epic Project. For more information, visit: www.fimufo.com

hand. It is a memorial of spectacular courage and, at the same time, it has been caught in political and armed conflict.

Yet, the royalty of South Georgia is unquestioned. With 600,000 King penguins on just 3,600 square kilometers of land, living together in harmony among themselves and other species, is it not possible for us to learn to exist this way in a 21st century world? Yes, we can hope that it may be a bit inspiring to us all. ■

leaders, followers, shy ones, brave ones, extraverted, introverted, etc. It amazed me, how they could live together in one place, in a limited space, and manage it well. It was incredible.

King penguins are very faithful and loyal. They normally have only one partner their whole life. As with all penguins, they feed on fish and krill. When in the water, they transform from funny, swaggering, proud animals into sleek, underwater missiles. We watched groups of penguins walking along the beaches and, time after time, jump into the water to hunt and feed. This crowded seaside looked like Copacabana—a beautiful, busy and playful place.

Seals

Seals can be found in many places on the planet, but probably nowhere with such huge concentrations as on South Georgia. Fur seals, elephant seals and Weddell seals were everywhere. If we

consider that humans decimated their populations over the centuries by extensive hunting, the restoration of the species seems to have come quite quickly.

Diversity

The richness of life on South Georgia is not a miracle. There's a reason for it. The currents flowing from Antarctica mix around the island and bring a rich river of krill to South Georgia, which feeds most of the animals living here. It explains the wildlife phenomenon of this place. But year after year, there is more and more concern about fluctuations in krill populations, the reasons for these fluctuations, and their impact on the environment in the future.

South Georgia has many faces and inspires extreme emotions. It is a beautiful, incredible dream of freedom and life on the one hand, and a frightening reminder of the brutality of the sealing and whaling of the past, on the other



longer, a continuous interaction among penguins could be observed, including very aggressive attacks on each other. It was similar to what people do. I saw