

## Switching to Rebreathers

# Why Switch?

Text by Mark Powell  
Photos by Chris Sterritt

**Technical diving instructor Mark Powell looks at switching from traditional open circuit SCUBA to closed circuit rebreathers.**

In the United Kingdom, the use of rebreathers has become very common amongst technical divers, much more so than in many other countries. In this article, we will look at the advantages of a rebreather and some of the reasons why people may want to switch to diving one. We will also look at the type of person who is suited, and in comparison, those who are not suited, to rebreather diving.

### Gas costs

One of the biggest factors that comes into the decision to switch to a rebreather is costs. This has two aspects—the costs of the rebreather, including buying and maintaining it, set against the cost of open circuit diving. One of the biggest disadvantages of open circuit trimix diving is the cost of the gas. A twinset of trimix can cost anything from GB£30 (US\$49) for a relatively week mix for use in 40m to over

£100 (\$162) for a mix suitable for diving deeper than 100m. This makes each trimix dive an expensive proposition.

On the other hand, a rebreather uses much smaller cylinders, because the gas is reused rather than wasted. As a result, we use much less, and the gas costs are much lower. We might

only be spending £10-£20 (\$16-32) for the same mixtures discussed above.

As a result, there is a significant gas saving when compared to open circuit diving. This can look very attractive when you are spending considerable amounts on each open circuit fill. However, this must be set against the costs of the rebreather.

Depending on the model,

a rebreather is likely to cost between £4,000 and £8,000 (\$6,500-13,000). If you go for an older second hand model, then you might get one for less than this. In addition to the initial cost of the rebreather, you will need to factor in training on the rebreather, which is likely to add on another £1,000 (\$1,623). In addition there will undoubtedly be additional costs to add on extra equipment to the basic rebreather. As a result, it is not uncom-

mon for the initial start up costs on a rebreather to be between £6,000 and £10,000 (\$9,700-16,200). Obviously, you will need to do a lot of trimix diving in order to save enough to justify this initial outlay.

The vast amount of technical divers do not do enough diving to clearly justify buying a rebreather based on savings in gas costs. Unless you are doing 20 or more trimix dives a year, then it is not cost effective. If you also do a significant amount of recreational diving, then each dive may actually cost you more on a rebreather.

On open circuit you may only need to pay for an air fill, but on even the shallowest dive, you will still need to use pure O<sub>2</sub> in one of the cylinders and use carbon dioxide absorbent in the rebreather. The annual replacement

of the three O<sub>2</sub> sensors and handset batteries also needs to be taken into account. This means that a shallow recreational dive may only cost £5 (\$8) for an open circuit diver but £10-£15 (\$16-24) for a rebreather diver.

It is clear that unless you are doing significant numbers of deep trimix dives a year with little or no recreational

diving, then the gas savings from using a rebreather will not outweigh the initial start up costs. However, there are still

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## Rebreathers

the critical factors become the amount of decompression we are incurring, the duration of our carbon dioxide absorbent and our risk of oxygen toxicity.

Of course, this assumes that the rebreather will always work as intended. Just in case there are any problems with the rebreather, we also need to carry open circuit gas to get us safely to the surface. In this case, we would need a bailout cylinder that we could start using at the maximum depth and would then need sufficient bailout to get to the surface completing all our decompression. Unlike the open circuit diver, the rebreather diver will not use their stages unless there is an emergency but will still need to carry them.

The fact that we are only using smaller cylinders makes the logistics of filling much easier. The volumes of gas needed are much

a number of other reasons why a rebreather is an attractive option.

### Gas logistics

Every time we breathe in, we only use a small proportion of the gas we inhaled—the rest is breathed out. On open circuit, this is exhaled into the water and lost. However, on a rebreather, the exhaled gas is fed back through the rebreather, carbon dioxide is removed and the oxygen we used up is replaced. As such, it makes much more effective use of the gas we have, and we don't need to carry anywhere near as much gas. As we have already seen, this makes each fill much cheaper. It also has a number of other advantages.

The amount of oxygen the body uses in each breath is roughly the same independent of depth. This means that we use the same amount of oxygen at 100m

as we would at 10m, and so our oxygen cylinder will last the same amount of time at 100m as at 10m.

On open circuit, we breathe much more at depth due to the effect of pressure, and so as we go deeper and deeper, we have to take larger and larger cylinders. Despite taking these large cylinders, they will still be used up very quickly, and so the amount of available gas becomes the most critical part of our dive planning.

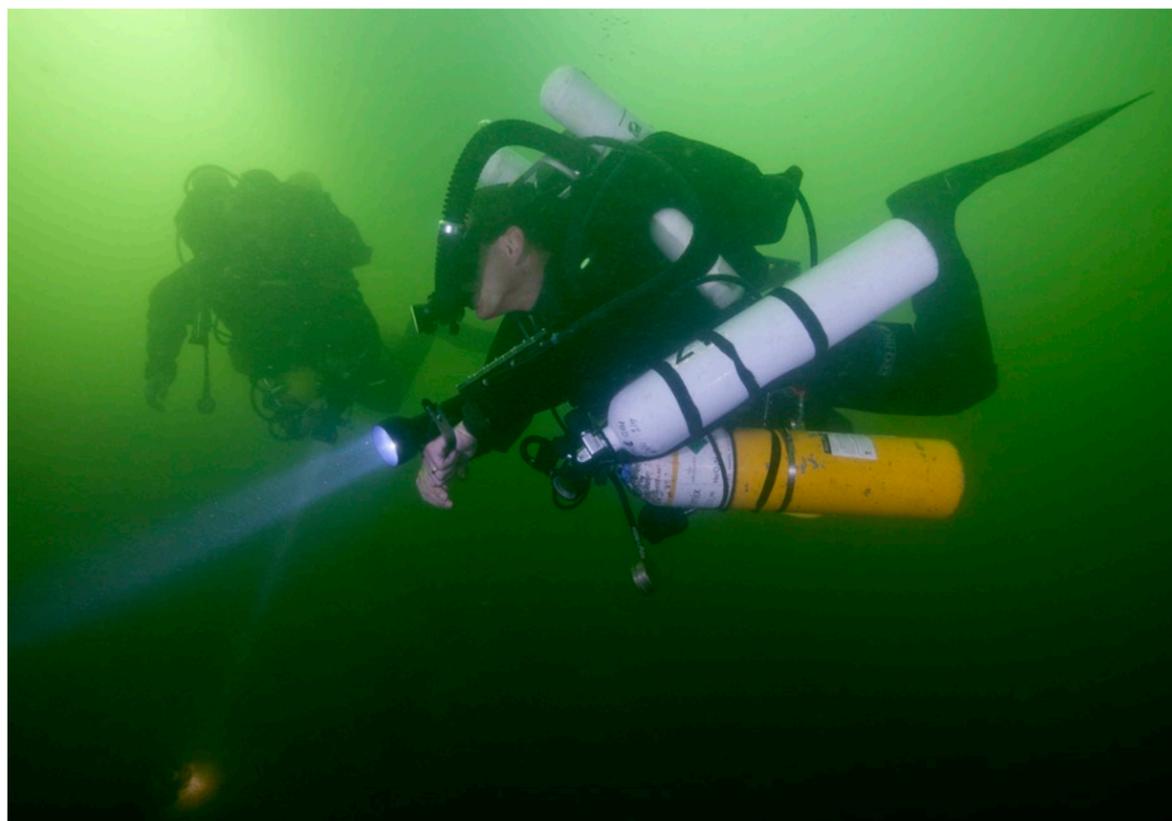
On a rebreather, our gas supply is used up at the same rate irrespective of depth, and so the amount of gas we are carrying is no longer the limiting factor. Instead,

smaller when filling a 3L cylinder rather than twins 12s, and so it becomes feasible to take enough gas with you for even a week's diving.

This contrasts with the situation when using open circuit where significant volumes of helium and oxygen will be required, as the majority will be breathed out and wasted. This can make a big difference if you don't have a local dive shop that can fill trimix. If you have to drive 50 miles there and back to drop off a twinset for a trimix fill and then do the same thing the next day to pick it up, then the logistics of this can be significant. Similarly, if you are diving somewhere without easy access to a dive centre that can fill trimix, the ability to take your own gas simplifies the planning and logistics.

### But I want one

Even if you won't save money and don't need a rebreather for logistic reasons, there are still other reasons to switch. Diving is



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## Rebreathers

less require more care and maintenance than open circuit. For divers that throw their kit into the back of the car, or into the garage, and then don't look at it until the next dive, this can cause a problem. This type of person is not really suited to rebreather diving, unless they can discipline themselves to ensure they maintain the rebreather.

On the other hand, there are many divers who enjoy cleaning and maintaining their equipment almost as much as the dive itself. They get pleasure from adjusting the kit until it is just right, and it is viewed as part of the hobby rather than an added chore they must do. This type of person is ideally suited to rebreather diving.

In addition to cleaning and maintenance, rebreathers require discipline while diving them. There is a certain mindset that is required to ensure that the unit is assembled correctly each time, and that all of the pre-dive checks are rigorously followed.

Most rebreather accidents are caused by the divers not following the correct procedure. This includes not diving the unit if there is any problem with it. Many divers become complacent and will dive with known problems with their rebreather.

They are confident that they can overcome the problem, and in the majority of cases, they manage to deal with the known problem. However, if there is any problem during the dive, the impact of the initial problem can be significantly

a hobby and so doesn't always have to be justified on cost reasons. The cheapest option is not to dive, but most of us don't consider this a possibility. In the same way that some people spend their money on motor-bikes, horses, home cinemas, model helicopters or any other hobby, there is no reason why someone shouldn't spend their money on a rebreather just because they want one. Other people may switch to a rebreather to challenge themselves to learn something new.

### Should you switch?

As we have seen, there are a number of reasons why many divers want to switch to a rebreather. However, the risks of rebreather diving mean that there are some people who are better suited to rebreather diving than others.

Rebreathers are significantly more complicated pieces of equipment than an open circuit scuba set. Whilst rebreathers do not require a huge amount of effort, they do nonethe-

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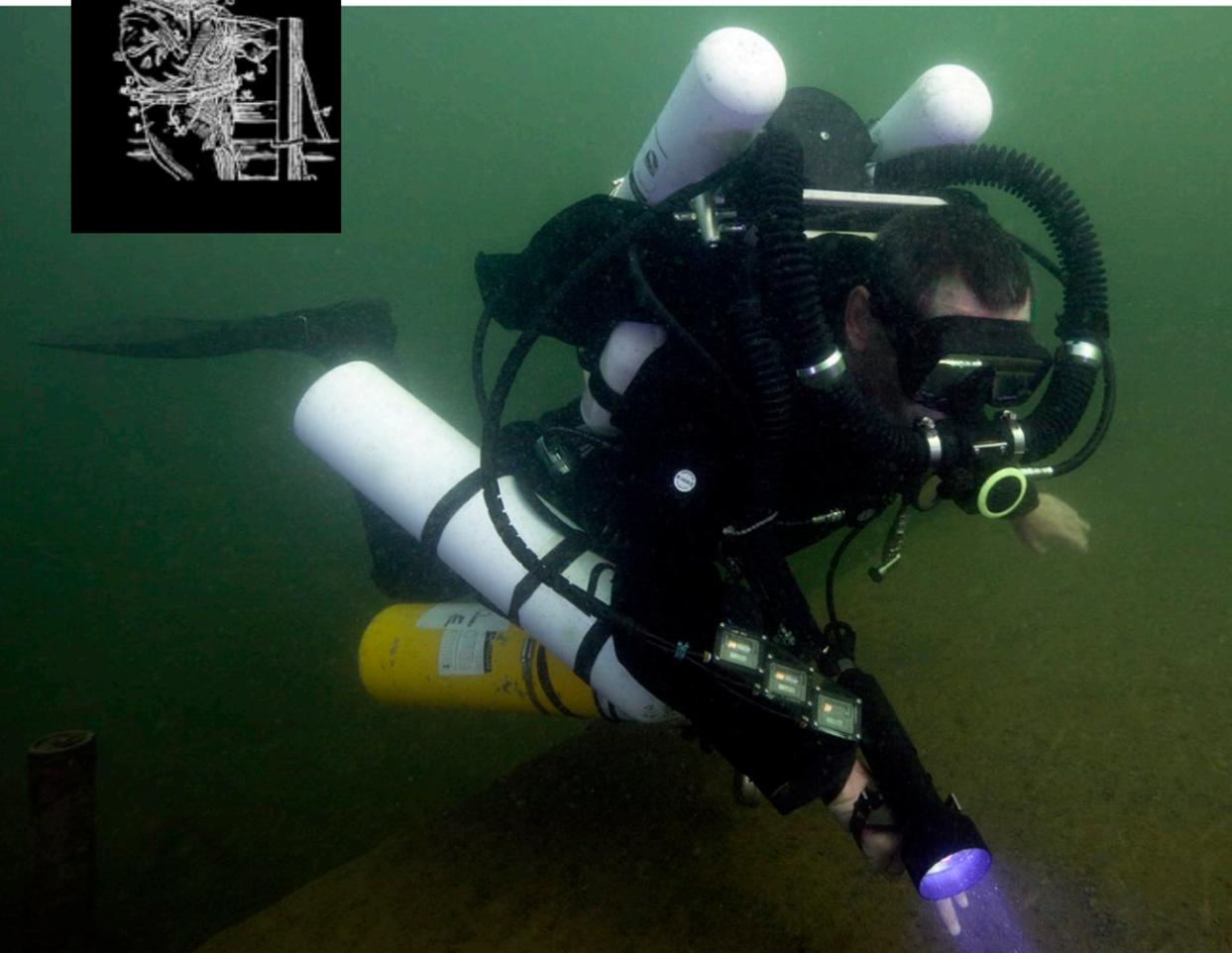


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increased by subsequent problems.

It requires a significant level of discipline to call a dive for what might appear to be a minor problem, but becoming complacent about these failures is one of the most common causes of rebreather accidents.

During the dive the diver must constantly monitor the unit to ensure it is operating correctly. This is summed up by the golden rule of rebreather diving: "Always know your partial pressure". It doesn't matter if the diver is at 10m or 100m, the level of monitoring is the same, and so a 10m-dive must be approached with the same mindset as a 100m-dive.

As such, there is no such thing as a casual rebreather dive. Not all divers have the mindset to adjust to rebreather

diving, but without this mindset, they should not consider rebreather diving.

In order to be a safe rebreather diver, there are a number of skills that need to be mastered over and above the basic open circuit skills. Some of these are

related to the normal operation of the rebreather, and some are related to emergency situations.

Like any skill, it takes practice to master these skills and practice to maintain them. When moving from open circuit to a rebreather there are skills, like buoyancy control, which must be re-learned. This takes time and effort.

For an experienced diver, this means the frustrating process of going back to basics and building up their experience. Unless you are prepared to put in the time to master the basic skills, you will always be diving on a base of weak

*First, you must decide whether there is a good reason to dive a rebreather and then whether you have the right mindset to be able to dive it safely.*

## Ambient Pressure meets PADI RecTec rebreather requirements

According to Ambient Pressure Diving's March newsletter, the new range of APD rebreathers, which will be available soon, will feature a number of developments.

The Rec2Tec range is an adaption of APD's existing range to meet PADI's CCR TecRec requirements.



These requirements set a standard for each level. At the Rec level, the software has to be depth limited to 18m, and the unit has to be supplied with ADV (Automatic Diluent Valve) and OCB (Open Circuit Bailout mouthpiece) as standard. Also, there has to be no manual inflators, so the customer will get blanked ports, which can have inflators added later, and once the user

progresses to higher levels.

The second level is depth limited to 40m by the software. The Tec 3 level is the existing trimix unit with ADV and OCB as standard further to PADI requirements. It is a relatively easy factory-fit model to add extra inflator ports for off-board plug-ins.

"Essentially all three existing APD units can be easily adapted to whatever requirements PADI, or any other training agent, requires by software download or hardware plug-and-play fitting," APD wrote. "From the point of view of the PADI instructor/resort offering these courses, the same APD unit is good for all levels and can be simply switched over from Rec 'try-dives' to deep Tec, same unit, same day." ■

rebreather skills, even if you were previously a very experienced open circuit diver.

These skills also need to be practiced regularly in order to ensure that they are maintained. This means that it is essential to dive a rebreather regularly in order to maintain the appropriate skill levels.

It is clear that for some people a rebreather is a desirable, and in some cases, an essential way to progress their technical diving. For others the advantages do not necessarily outweigh the disadvantages. For this reason it is a very personal decision and not one to be taken lightly.

First, you must decide whether

there is a good reason to dive a rebreather and then whether you have the right mindset to be able to dive it safely. Like many things, the correct decision will vary from one person to another. ■

Next time, Mark Powell looks at some of the mental aspects of technical diving. For more information on any aspect of technical diving, contact Mark at: [www.dive-tech.co.uk](http://www.dive-tech.co.uk) [mark@dive-tech.co.uk](mailto:mark@dive-tech.co.uk)

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FOURTH ELEMENT TEAM DIVER, Pete Mesley  
in Truk Lagoon, June 2010  
Pete wears PROTEUS wetsuit.

PROTEUS



photo &  
video

Manta Ray (*Manta birostris*), Little Cayman Island, Cayman Islands. 15mm lens, Fuji Provia (scanned) ISO 100, YS300 Sea & Sea flash, 1/100th second at F.11

Text and photos by Lawson Wood

**Night diving also takes on another dimension of concentration in your photography, as your field of view is limited, as well as your choice of subject matter. Fish that were once plentiful on the reefs have virtually disappeared and, in fact, there may be very little to see at first (even although you are using a flashlight or its equivalent for ambient illumination). Shortly after dusk, there is a brief hiatus in critter viewing, as this time period revolves around all the day fish and critters going into hiding for the night, and the night time fish and critters not having fully ventured into the open. Your eyesight is concentrated around the small pool of light created by your torch and inevitably you start to focus on the stronger colours—the reds, oranges, yellows, etc.**

As you get into the dive, several things happen. Firstly, you start to see more colour, or are more aware of more colour, than you did during the day. As

you are focusing closer and closer to the reef, you gradually start to see more small creatures. By this time, you are starting to relax more, so your breath-

ing has slowed down, your buoyancy has improved, and after 20 minutes or so, it looks like all of your dreams have come true, as a myriad of exciting new

and wonderful fish and critters seem to apparently manifest themselves before your eyes.

Whilst the obvious temptation is

always there to swim close to the edge of the reef or seabed, we should not ignore the water column above us, as many creatures live in a planktonic

# Night Photography





# photo & video

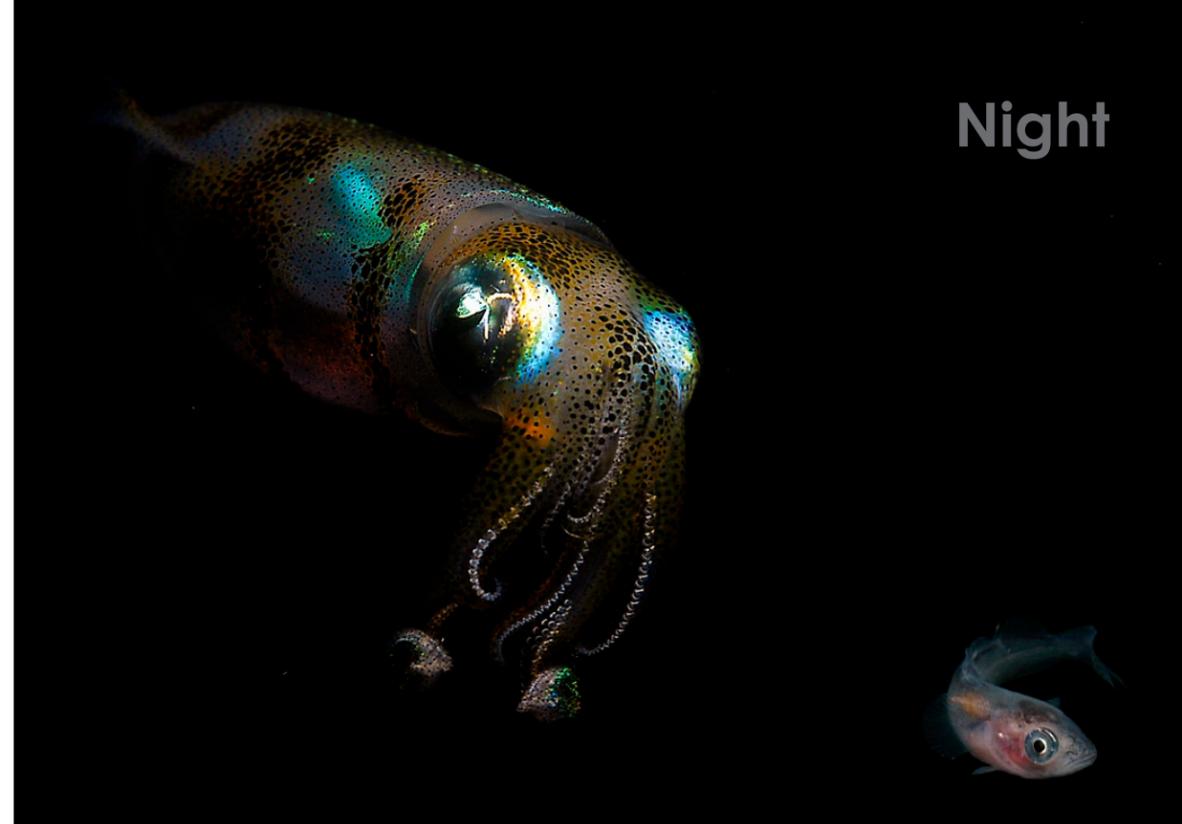
Red Banded Lobster (*Justitia longimannus*), Dominica. Canon S95 set on macro/automatic with full zoom and internal camera's flash



state, drifting by in the currents and feeding on other similar creatures. Other animals such as squid actually live in this water column, hunting small fish and crustaceans. On one particular night dive at Candi Dasa in Bali, diving with Gangga Divers, I had a superb guide who was searching the lower reefs for interesting critters, but my wife Lesley is also a great spotter for me, and she found this tiny juvenile squid acting out that age old game just above my head, and I hadn't even noticed, such was my concentration elsewhere.

Undoubtedly, we are attracted by colour, and it is this colour saturation that will always set your photographs apart from all others. Yes, this is just another form of macro photography, but now

we are even more concentrated in our aspect and viewing power. I do take wide angle photographs at night, particularly on wrecks where the vista is the same at any time of the day or night, but quite often you may be in a location where manta rays feed at night or even whalesharks. Macro and close-up photography are obviously used most of all, but do not ignore the chance of wide

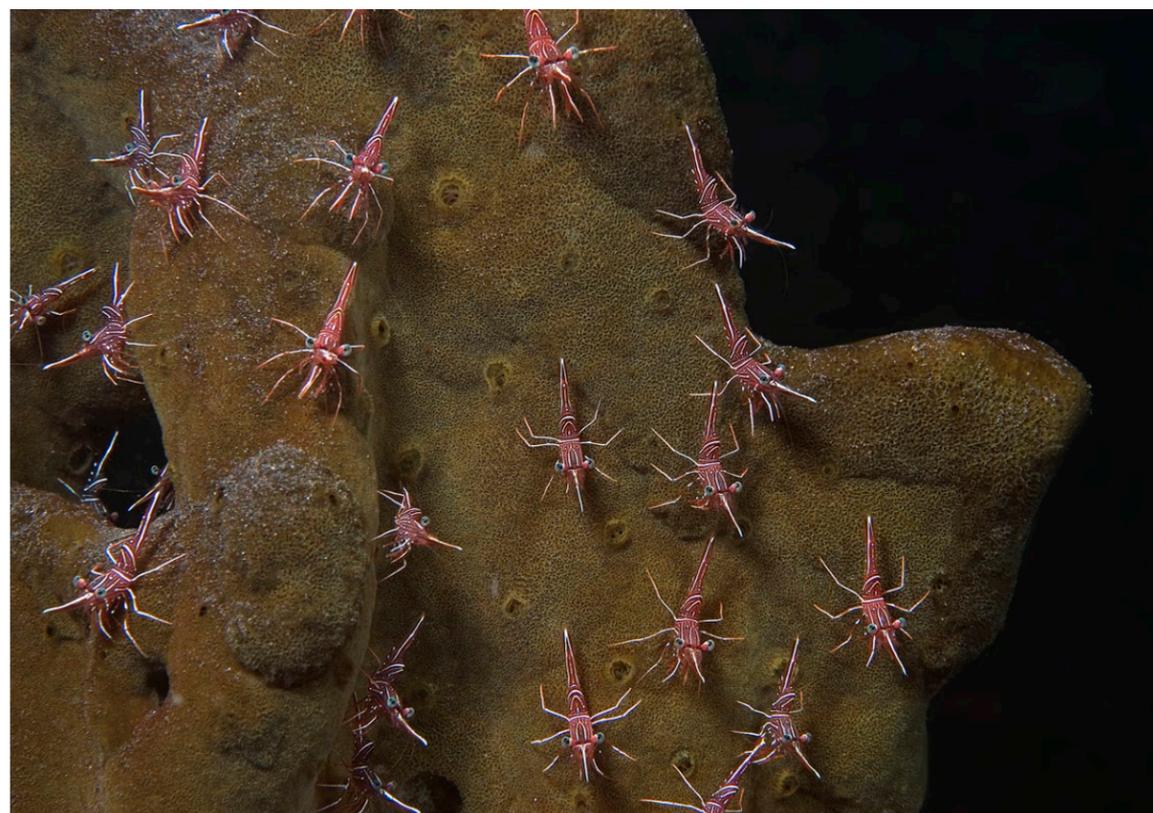
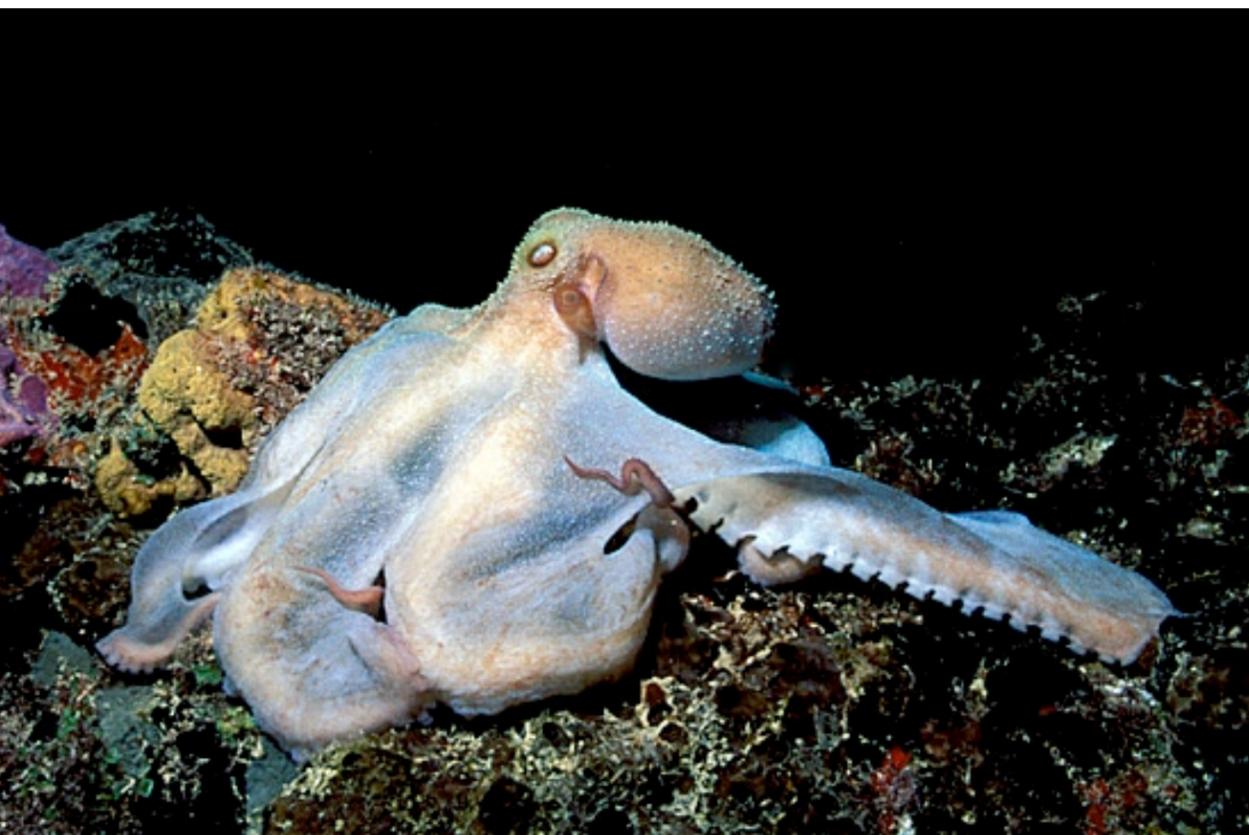


## Night

Reef Squid (*Sepioteuthis lessoniana*), Bali, Indonesia. 105mm lens, ISO 100, twin YS110 Sea & Sea flash, 1/80th second at F.1

Hinge-back Shrimp (*Rhynchocinetes durbanensis*), Bali. 105mm lens, ISO 100, twin YS110 Sea & Sea flash, 1/80th second at F.16

Caribbean Reef Octopus (*Octopus briareus*), Salt Pier, Bonaire. 15mm lens, ISO 50, Sea & Sea YS 350 flash, 1/80th second at F.16



are disturbed.

Shy creatures such as octopus actively hunt at night, and they are always a delight to find. Rare animals such as the orange-ball corallimorph only appear at night, as they are very light sensitive. You may actually only get one chance to take a photograph, before they retreat underneath the sand once more. Spotted lobsters are more approachable, as are a variety of fish, which are very shy during the day, yet appear to pose for us at night.

Some brilliantly coloured coral polyps also only come out at night, and for those who frequent tropical waters, look out for the Spanish Dancer nudibranch, which can move freely through the water by undulating the mantle of its

angle photography wherever it is appropriate.

As we get into the night dive, free swimming fish, such as parrotfish, wrasse and anthias godfish tuck themselves into the reef amidst stony corals and sponges. Parrotfish actually secrete a

membrane cocoon around themselves for protection. It is very important not to disturb any sleeping fish, as they can wake up with a start and blunder off at full speed, crashing into the corals and damaging both the corals and themselves. Others may actually attack if they



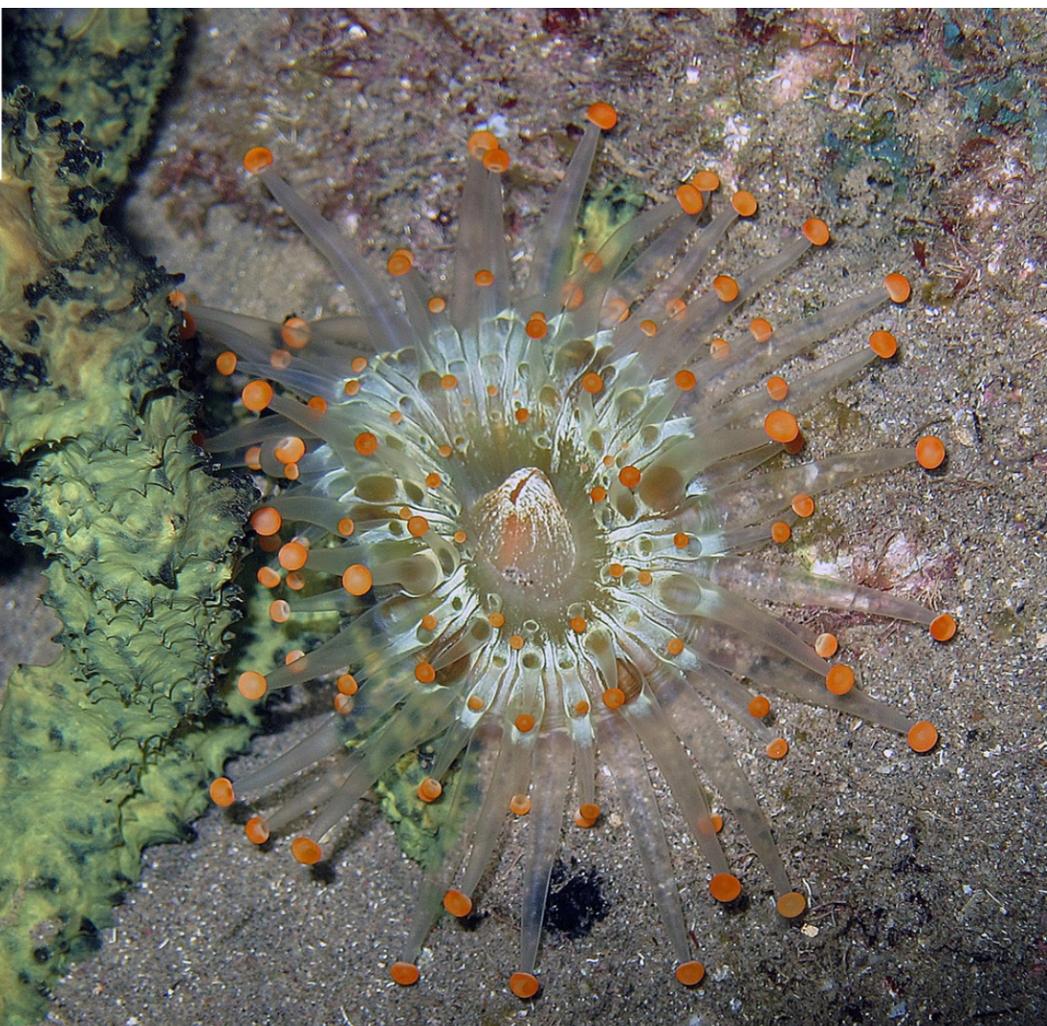


# photo & video

Orange-ball Corallimorph (*Pseudocorynactis caribbeorum*), Dominica. Canon S95 set on macro/automatic with full zoom and internal camera's flash

Sharpnose Pufferfish (*Canthigaster rostrata*) asleep on sponge, Honduras. 60mm lens, Fuji Provia ISO 100 (scanned), YS120 Sea & Sea flash, 1/60th second at F.16

Blue Parrotfish (*Scarus coeruleus*), Theo's Wreck, Grand Bahama Island. 15mm lens, Fuji Velvia ISO 50 (scanned), Sea & Sea YS300 flash, 1/60th second at F.16



body. Please do not encourage them to 'swim' to get the photographs you want. Whilst these colourful large nudibranchs are always a delight to find on the reef, look closely around the gills as there are usually a pair of commensal cleaning shrimps living on the back of this beautiful creature.

### Night diving etiquette

Night diving has been classed as an adventure within an adventure. With that in mind, on entering the water for the first time at night, it is sometimes better to dive with someone experienced with the dark and also someone who has knowledge of the particular marine environment that you are in. Once you have chosen your night dive location, if possible, you should familiarize yourself with the site by diving the same area during the day. Perhaps

Golden Cup Coral (*Tubastrea aurea*) Red Sea. 60mm lens, ISO 100, twin YS110 Sea & Sea flash, 1/80th second at F.16

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Spanish Dancer (*Hexabranchnus sanguineus*) L'Ilot, Seychelles.  
15mm lens, Fuji Velvia ISO 50 (scanned), Sea & Sea YS300 flash, 1/60th second at F.16

Juvenile Spiny Lobster (*Panulirus versicolor*) Sulawesi.  
105mm lens, ISO 100, twin YS110 Sea & Sea flash, 1/80th second at F.16



Night

Berried Anemone (*Alicia mirabilis*) Sulawesi.  
60mm lens, ISO 100, YS120 Sea & Sea flash, 1/100th second at F.11



some low level photography, be absolutely certain that you are not going to land on something, as you jockey for position. This includes the circle of area which extends to your tips of your fins. Also be careful when you rise up from the seabed, as your fin kicks can utterly ruin the scene for someone else coming along, as well as dislodging whatever it was that you were photographing.

- Many creatures are very skittish at night, so try and be particularly sensitive and do not 'over shoot' the subject as they are out at night because they do not like strong lights.

- Try and avoid photographing large sleeping fish, as the sudden flash may scare them awake and they flee from you, crashing into corals and injuring them and the corals. ■

the easiest way of introducing yourself to the night would be by diving at dusk and slowly acclimatizing yourself to the change between ambient light and the artificial light of your dive lights, photographing the transitional stages of natural light on the reef and the creatures associated with it.

- Get your buoyancy correct as soon as you enter the water, as you have to be even more careful about approaching the reefs at night. In general, there are more fragile organisms out in the open, plus of course the danger of blundering into an unnoticed sea urchin, scorpion fish or electric ray.
- Stay well clear of fellow photographers, particularly if you are

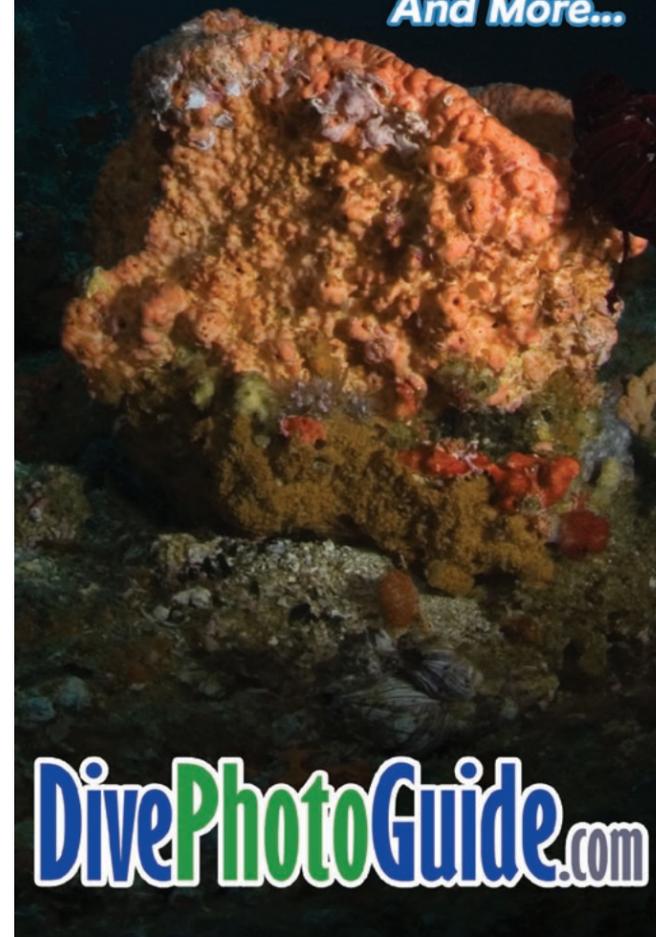
working along a vertical wall, as your exhaust air bubbles may pass in front of a diver above you and inadvertently dislodge or frighten whatever critter they were photographing, plus of

course ruining the shot and annoying a colleague.

- When approaching the seabed, perhaps to kneel down or lie down to do



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### Sea & Sea YS-D1

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### Canon's new DSLR's

Following right behind Nikon's recent announcement of its new high end DSLR's the D4 and the D800, Canon has announced the EOS 5D Mark III and the EOS-1D C. The EOS 5D Mark III is the latest in its enthusiast full-frame 5D series and successor to the popular EOS 5D Mark II. The new based around a 22MP full-can shoot six frames per second 61-point AF system much like the capture 1080p movies at 24, 25 or 30 fps and offers high quality intraframe (All-I) video compression amongst a host of movie-related improvements. The Canon EOS 5D Mark III became available from the end of March with an MSRP of US\$3499 / €3299 / GB£2999.99



camera is frame sensor, and features a EOS-1D X. It can also capture 1080p movies at 24, 25 or 30 fps and offers high quality intraframe (All-I) video compression amongst a host of movie-related improvements.

### Nauticam Housing

The NA-D800 housing incorporates many of the features from the highly regarded Nauticam housing for the Nikon D7000 such as the redesigned sub command dial control and right thumb-operated control, which uses a double paddle lever assembly to engage the record function. A double paddle arrangement has been utilized so that the left thumb can be used to activate playback and ISO control. The



multi-control features a pad arrangement rather than buttons, and the housing has a port that is capable of taking the company's HDMI bulkhead. The NA-D800 housing has two fiber optic ports as standard, although Nikonos, S6 and Ikelite bulkheads are available. The new housing will start shipping on 11 May, 2012 and will retail at US\$3600. [www.nauticam.com](http://www.nauticam.com)

### Canon EOS 1D C

The EOS-1D C is Canon's new high specification video enabled DSLR and is capable of capturing 4K (4096 x 2160 pixel) video at up to 24p, without downscaling, from an APS-H crop of its 18MP full-frame sensor. The camera, which shares the majority of its specifications with the still-awaited EOS 1D X, can also capture 1080p60 or 50p or output it uncompressed over its HDMI connector. Full HD can be captured from a 16:9 crop from the whole sensor, or a smaller, APS-C-like Super 35mm sub-frame, that allows the use of Canon's EF Cinema Zoom lenses. The camera will cost around €10,000 and will be available from October.



### Canon G1 X Housing

The new full-featured Ikelite housing for the Canon Powershot G1 X camera is an affordable option for the "most discerning of underwater photographers", the company writes. As standard, the housing comes with an optical port that allows full use of the camera's zoom without vignetting. Additionally, special circuitry built into the housing allows TTL with any of Ikelite's DS strobes. Changes include a right-angle bulkhead, which "relieves strain on the sync cord during handling and assembly". [ikelite.com](http://ikelite.com)



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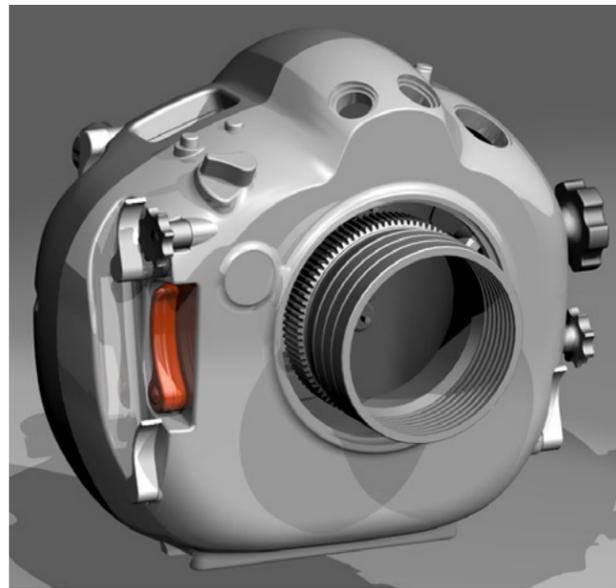
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photo & video

## Hugyfot

The Belgian manufacturer seems to be well down the path with its housings for both the Nikon duo and the Canon's and provided conceptual designs for its D800 and D4 housings.



## Subal

Subal is also developing and testing housings for the Nikon D4 and D800, plus the Canon 5D Mark III and the EOS-1D C and provided a conceptual design of its D800 housing.



## Gates Deep Epic Video Housing

Gates has announced that they are now delivering their first shipments of their Deep Epic video housing for the Red Epic and Red Scarlet Cinema cameras. The new housing features support for a wide range of lenses, external monitor, adjustable fingertip focus/iris/zoom controls and is manufactured from machined aluminum, depth rated to 450 feet and comes with a two-year warranty. The Deep Epic housing is an impressive 25 percent smaller than the previous DEEP RED housing.

## BS Kinetics Namib

The Namib is BS Kinetics' lightest and smallest video housing, weighing only 1.8 kg and measuring 190 x 145 x 205mm. The controls fit a range of cameras from Panasonic, Sony, Canon or JVC. Since up to 12 controls can be fitted, all supported cameras can be fully controlled. The housing is built from a composite of carbon fibre and epoxy resin, which is very tough, durable and resistant against saltwater and UV rays. The integrated port comes with an M67 thread, which enables the attachment of wet lenses for both macro and wide-angle recordings. [bskinetics.com](http://bskinetics.com)



## Blackmagic Design

Blackmagic Design, a company best known for its external film recording boxes, has announced a compact-style cinema-quality video camera called the Cinema Camera. The Cinema Camera captures 2.5K, 12-bit RAW footage on a sensor very similar to the micro-four-thirds ones used in mirrorless cameras, so that just as those cameras brought SLR quality to smaller bodies, the Blackmagic Cinema Camera brings cinema-quality video to a compact size. Blackmagic Design claim an impressive 13 stops of dynamic range for the Cinema Camera, which features a Canon EF lens mount, a touch screen and thunderbolt connection for speedy transfers. The Cinema Camera comes with a price tag of US\$3000.

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## Ski & Dive Andorra

Text by Svetlana Murashkina, PhD.  
Photos courtesy of Igor Murashkin,  
Diving Andorra, Vallnord Andorra

**The first ascent. From the top of Les Portela (Les Portelles 2,552m) we could see the surrounding peaks Arcalis and Kota, trails and wild nature. I seemed to have it all for myself! Large snow flakes settled gently on the trail from their journey out of the sky, creating a perfect ski slope and melting on my lips. I put on my gloves, then my hood and mask. Then felt like I was missing something. Oh yes, I'd better put the regulator in my mouth, too.**

But wait a minute, I am on a *ski* vacation. Even an editor of a dive magazine needs to have a holiday once a year and go skiing in white sparkling snow with the wind whistling in the ears, among rocky peaks, with crowds of tanned skiers. This time, I went to Andorra, the tiny principality wedged high in the Pyrenees straddling the border between France and Spain.

We made several fast downhill runs on the slopes, before doing the foolhardy thing of venturing off the trails into deep snow. Later, as I headed home to the lodge, I found a red trail, La Kanaleta, which went down a long way but was not very steep so a variety of turns could be made. On the slope, I passed a sign saying, Diving Andorra, but at first, I did not realise the meaning of it. The next downhill run took me close by, and I decided to inves-

tigate. The path took me over a small lake, and at the far end, I could see something that looked like a wooden house and a boat ramp. Vacation or not, this was interesting!

### High-altitude diving

At the entrance, there were a couple of skis and boards. Inside the house, the inhabitants were donning drysuits right over their ski pants and putting on dive gear. And down they went into the depths of La Kanaleta Lake. The depth was six meters, and there were routes under the ice of the lake. It started at the maina (hole) and went along the lake perimeter. There was another maina in the middle of the route, just in case. Divers entered in pairs, and there were two instructors in the water. Both certified divers and beginners, for whom it was the first dive,

THIS PAGE: Scenes from under the ice of mountain lakes in Andorra





CLOCKWISE FROM LEFT: Diving in the mountains, divers prepare a dive hole in the ice; Preparing for a cold dive under the ice; Svetlana Murashkina points out the sign on the ski trail to Diving Andorra (below inset)

level. The beautiful lake is of glacial origin and some access points are only accessible by helicopter. In the fresh water there is trout, medium-sized vertebrates, amphibians and local micro-organisms, some of which have not yet been described by science.

The lake is also being studied by researchers from the University of Zaragoza who conduct diving under the ice during winter, bringing up equipment by donkey during summer and volunteer divers who are taking part in the study of flora and fauna of the lakes. Enkenty Hector, one of the founders of the project and director of the dive center told us an amazing story. Funds for the center have been provided by an Andorran government body as a grant for innovative projects which aim to attract more tourists to the country.



## Andorra



DIVING ANDORRA

could have their ice diving "baptism" here. Going under the ice in a drysuit for the first time was something out of the ordinary for me, too, so why not? For tourists, it would be a lifetime memory. But many, especially from neighbouring countries France and Spain, could return for regular diving courses later.

### The dive center

Diving Andorra, which happens to also be the name of the dive center, is only a few years old. The purpose of the center is to provide high-altitude diving. In Andorra all the conditions are met: mountain lakes with unique ecosystems, depths from six to 90 meters at an altitude ranging from 2,000m to 2,700m above sea



The dive shop office, which has a compressor, equipment and documentation, is located near the Andorran Olympic swimming pool, and at the ski station Vallnord (La Kanalete), they have a "field base".

Hector—who is a hydrogeologist, a graduate of the University of Barcelona and one of the founders of the underwater Andorra Red Cross—is the master mind of this project along with Raul Baro, an experienced dive instructor specialized in ice diving, drysuit diving, and high-diving. He has worked in many parts of the world including the Caribbean, Polynesia and Micronesia, Malaysia, Indonesia and

Divers outfitted with dive gear head to the dive site on skies

feature

Andorra





Preparing the maina, or dive hole; Preparing for the dive at the maina (right). PREVIOUS PAGE: Vallnord backcountry area

the Red Sea. Hector and Raul continue to work together, but have acquired a group of staff and volunteers.

What I find most remarkable is that this place is used as a base for the Canadian training agency ACUC. Andorra has also established its own teaching and research organization—the Center for Training and Development Maintenance and IDI (research, innovation). And Diving Andorra issue their own certificates. “A person who has been trained by us, will always remember that there is on Earth a tiny mountainous country, Andorra, which is not only good for skiing and walking in the mountains, but also for diving!” Hector proudly proclaimed.

**Mountain lakes**

The most beautiful lake that is relatively accessible is Tristayna, which is located in Ordino-Arcalis (Vallnord). In this formation there are three lakes of glacial origin. The altitude is 2,305m, and the maximum depth is 25m. You can walk there from La Coma Restaurant or descent on skies via a free-ride zone, like we did.

In the Ordino-Arcalis area, there are not only 25 kilometers of normal ski routes, three official free-ride zones and a large number of off-trail opportunities but also four mountain lakes! And Andorra had other surprises in store for us. Sakura is a city



park, which has been donated by the Japanese government. There are free buses that take you from the capital to the ski area Vallnord, and there is a dive site right in the ski area. I should probably come back on a business trip. ■

Associate editor Svetlana Murashkina, PhD., is an expert in geographical science and serves as editor of the premier Russian dive magazine, InVertum.



Diving in as onlookers take pictures; Vallnord ski resort (top)