

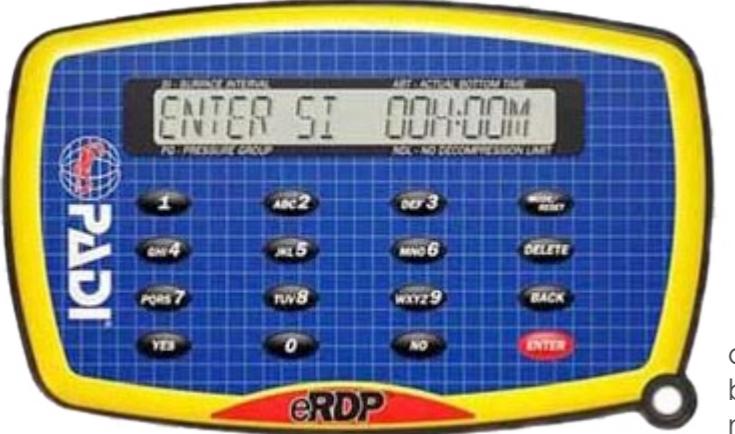
POINT & CLICK
ON BOLD LINKS



Edited by
Andrey Bizuykin
& Peter Symes

Extreme Pen

InkaTM is a precision-crafted all-weather, compact pen engineered to perform in extreme environments. It writes underwater, at any angle, temperature and altitude. It has a sleek, lightweight, stainless steel cylindrical design and pressurized ink cartridge. The pen can be used by the outdoor enthusiast – from pilot to scuba diver, mountain climber to fisherman. Inka's innovative design enables it to change from a quick-use pen to full-size writing tool. Inka's key-ring can easily and securely attach to gear or clothing. Inka has a lifetime warranty and is made in the US. Refills are available. www.inkastore.com



E-Dive Table

The PADI eRDP is an electronic version of the good ol' RDP dive table that will calculate your dive profiles just as the old plastic did, but with lots of new features and benefits including auto shut off, three modes, dive planning, minimum surface interval planning, maximum depth

planning, five consecutive dive plans, warnings and reminders, metric and Imperial options, plastic ring for slate, splash proof, convenient pocket size for carrying in a dive bag or pocket. It is user friendly, easy to navigate with no need for paper/pencil. £14.89 plus VAT. www.padi.com

New & Interesting

Equipment



Compact Oxygen Boosters

Hydraulics International's Rebreather Booster for Dive Shops and Dive Boat Owners ensures full 2400-3450 psi (166-238 Bar) rebreather bottle fills even if the oxygen supply drops below 500-psi (34 Bar). It weighs only 9.5-lbs. The unit is compact, manually operated by means of its integral hand pump assembly,

air driven by means of a low-pressure conventional air compressor and uses less than 4-cfm @ 90-psi of air. It is HP gas driven by means of a Regulated high-Pressure air storage supply (SCBA bottles).

USD 1599
www.hiinet.com



Any colour you like

Zeagle cut and sew BCDs in their own Florida factory, so now can custom make your BCD to your order. This picture shows how colourful and customized the Ranger, their most popular BC, can be made to look. Each of the fabric panels can be ordered in a custom colour, enabling an almost endless number of pattern combinations. Have it in your company colours, or make the instructors stand out. www.zeagle.com



Regulator with side exhaust

This side exhaust regulator model puts the entry and exhaust points on the same side, leaving one side free of bubbles and obstruction. The first stage automatically compensates for depth changes (without lube or grease) without letting water or debris enter, thus reducing the chance of freezing or fouling. It is available as yoke or DIN by 5-port or hammerhead swivel.

With an optional conversion kit, this regulator can be converted from side to bottom exhaust, or vice-versa.

The hose can be connected on either side with the bottom exhaust configuration. Available in brass, monel, and titanium. www.dynamodiving.com



Environmental and Microbubble Cognizant (EMC) Computer

The new Cochran EMC model has improved Touch Contact Programming method. A Lithium battery is used for improved reliability and longer battery life (but one can still use Alkaline). The new EMC-20H is capable of three automatic gas switches. Its depth has been extended to 130 meters.

www.divecochran.com



Seatrend shorty from SeacSub

This 3mm shorty is especially suitable for diving in warm waters and in swimming pools. Arm and leg toroidal ring seals, diagonal back zipper and anatomic cut ensure perfect wearability. The outer lining is made of nylon and fine mesh and the inner lining is made of nylon. Available in sizes from XS to XL, it is a practical and easy to wear suit.

www.seacsub.com



Flexi Fun Star

The latest Green Force divetorch and is composed of the 'Flexi Fun' batterypack and the 'Star' lighthead. Due to the universal Green Force connection and the 'easy-to-replace' AA batteries, the Flexi Fun Star is not only great for starters, but is also a handy travelling companion. The 'Star' lighthead contains a 3 Watt LED which has an output equivalent to 25 Watt. In combination with the 'Flexi Fun', this lighthead garantis a burntime of 16 hours.

www.green-force.com



Fast Attachments

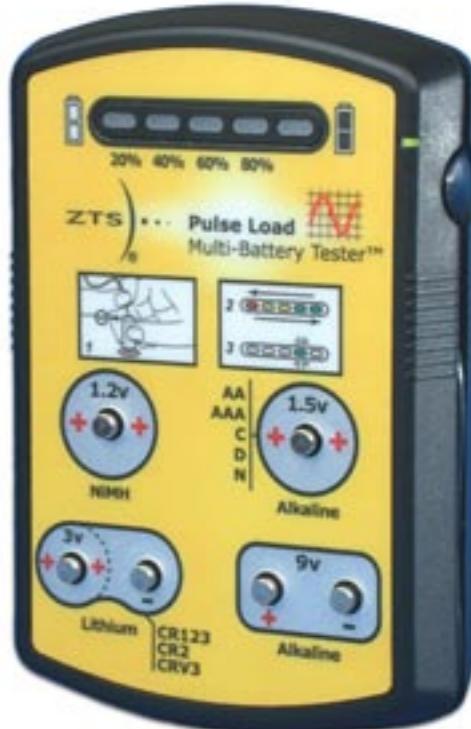
This Gear Keeper Low Force Retractor provides a convenient and secure attachment system for divers. It is ideal for small items that need to be tethered underwater. This retractor can't pull tools out of your hands. Divers can be streamlined with gear right where they need it. The recommended use of the unit is for securing knives where a high retraction force could be dangerous. The unit's Snap Clip attaches to a D-ring. It is built to last and designed to survive extended salt water and chlorine exposure. Sand and debris are flushed from the unit when operated in water. Made in the USA, it is backed by a full manufacturer's warranty.

Snap Clip Model RT2-0040, USD 19.99.
www.gearkeeper.com



Multi-Battery tester

This small 3 oz battery tester tests AA, AAA, C, D, NIMH, NiCd, alkaline, 3v photo lithium, or 9v batteries under load. Using a 2-second pulse load test, it computes the remaining power capacity. Now, you'll know whether charging in a foreign country has charged your batteries to full capacity or how much power is left in your alkaline batteries. Runs on 4 AAA batteries. USD 29.50 plus shipping. www.ulcs.com



Knife news

Riffe Silencer Knife has a self locking sheath, 1/2" serrated Teflon coated blade design, remarkable cable cutting capabilities and easy one-hand removal. A tool is built in at the end of the black and grey soft-grip handle for removing shafts wedged in rocks. It can also be used as a banger to attract the attention of other divers or fish. Rubber leg straps are included.

www.speargun.com



shark tales



Text and photos
by **Edwin Marcow**

ILLUSTRATION COURTESY OF FIONA'S SHARK MANIA
WWW.OCEANSTAR.COM

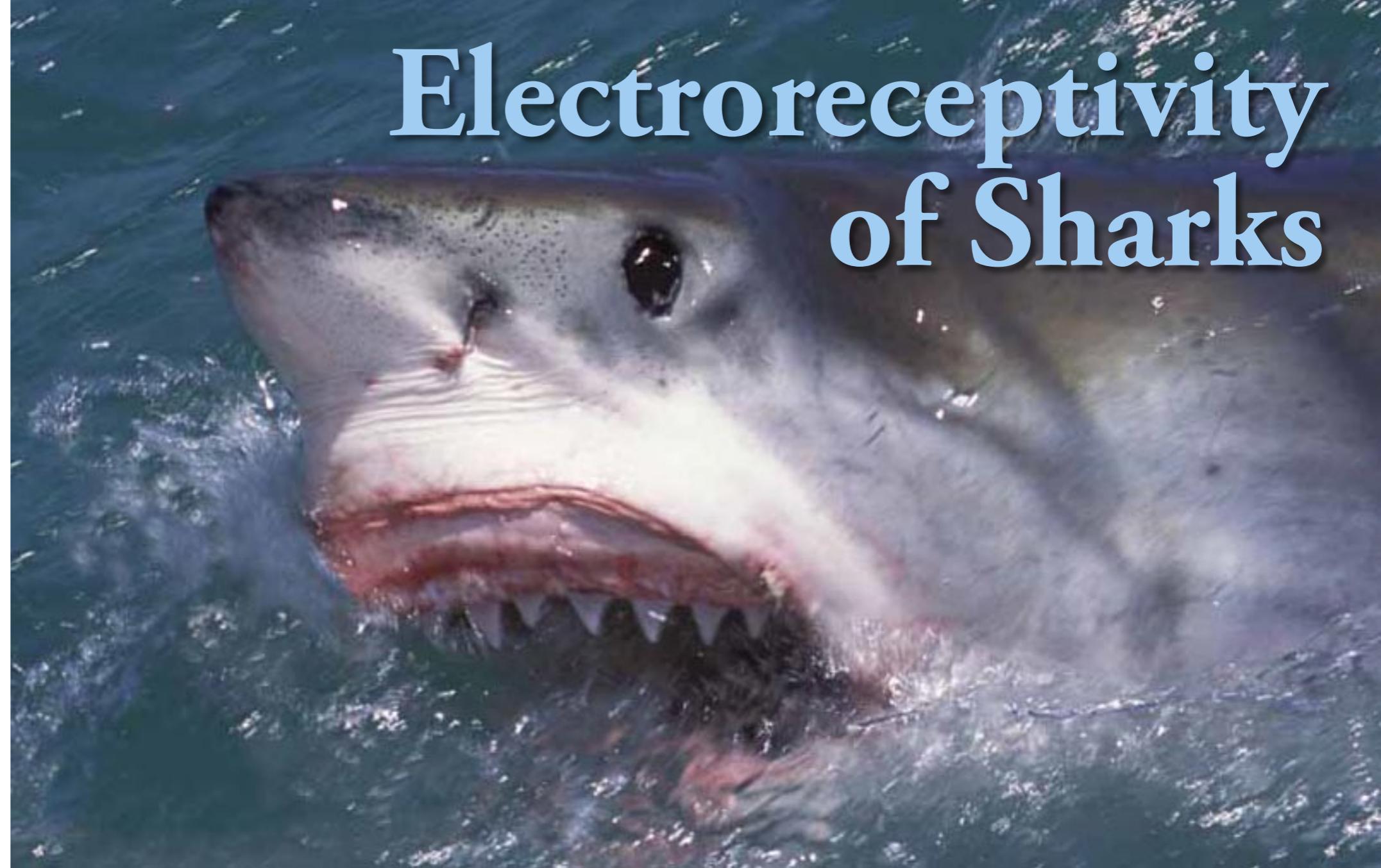
Gansbaai, South Africa, Great
White shark capital of the world

Bang.... we did not see it coming...Blinded by the sun, a large four-and-a-half meter Great White shark crashed into the side of the submerged cage moored alongside our boat. Topside, it was cool but sunny with blue skies, although our noses dripped continually from the sea air. We dare not talk, scratch, wipe our noses, or do anything other than concentrate on the seal decoy, which, along with the un-hooked bait, took an almighty pounding every few minutes.



Concentrating on the un-hooked bait, why did the shark investigate an empty cage? It has long been an accepted opinion that, when a Great White shark, or any shark for that matter, attacks, bites, or merely interacts with metal objects in the water, it is simply a question of sensory overload. The shark detects the bait by smell and by sight, and also by detecting electric fields. In a hunting mode it would most probably utilise these senses in the order given. Just prior to mouthing the object of interest, for example bait in the water, the shark will roll its eyes backwards and the nictitating membrane will cover the eyes.

It is at this stage that the shark hunts totally by its electroreceptivity. Some people believe that the shark can, in fact, only hunt with just a single sense activated. With this highly sensitive sensory organ employed the cage, or any other metal object, will produce far higher levels of sensory input than a seal carcass or shark liver, which is a particular delicacy to these sharks. Tricked and confused, the shark bites and mouths any metal object. To the uninitiated, predominately the non-diving community, comments range from "this man eater is even trying to sink the boat to get to us" to "stupid dumb animal."



Nibbling to know

In the case of the Great White shark some disagree with this hypothesis. For example, Andre Hartman, an acclaimed shark behaviourist, believes that this shark bites and mouths metal objects because the shark is investigating the object, be it the boat, cage, props, etc., floating on the water. A good example of this is when the bait is floating on the surface of the water, with its all prevading odour. Any person sitting on the boat will cast a

shadow or reflection down onto the water. This shadow or reflection will lie parallel to the surface of the water, even though the person is sitting vertically. The shark will see this shape and colour, and will attempt to mouth this 'floating' reflection. In a recent documentary production, a large Great White shark approached the boat, between the props, ignoring the cage, boat and any metal object raised out of the water, and mouthed the cameraman's video-lens. The shark was

investigating its own reflection, and ignoring objects producing significant electric fields. This biting and mouthing of props, cage and even the bow, has been seen many times. This behaviour appears to be quite complex but there may be a surprisingly simple answer.

The shark views the boat in the water as it would a large dead whale carcass. The mouthing and biting of the props and cage is not due to external electric fields but is like when a shark starts bit-

ing the fins or any extremities of a large whale carcass, floating motionless in the surface of the water. The boat is viewed in the same manner. The shark is asking itself where it can start eating this object. This is borne out by the fact that Great White sharks will often bite and mouth the bow of a boat even though there are no electric fields present there.

However, I believe the truth lies somewhere between these two hypotheses. For it is absolutely certain that sharks do have this

shark tales

extraordinary sensitivity to electromagnetic fields. This sensitivity is made possible by the ampullae of Lorenzini, named after the 17th Century Italian anatomist, Stefano Lorenzini who made his discovery in 1678. These ampullae are located around the head of the shark and its snout, and there can be as many as 2052 in the Bull Shark. Shaped like small round flasks connected to the sharks lateral line, they are joined to the surface of the skin by a tube filled with a conductive jelly of mucopolysaccharides which surrounds a bundle of modified hair cells. These hair cells are receptive to local changes in electrical polarity which then trigger the release of neurotransmitters. These then inform the brain of the electric fields present in the water outside the shark.

Recent research at the Scripps Institute of Oceanography has shown that the elasmobranchs, to which the sharks belong, can detect extremely small voltages. It has been shown, in fact, that sharks respond to electric fields as low as a 10^{-8} volt cm^{-1} . This is equivalent to the electric field produced by a torch battery connected to electrodes spaced 16000 kilometers apart in the ocean. Thus some shark species are able to detect electrical activity down to 5×10^{-9} volt at a distance of up to about 30 cm. To put this into perspective, the movement of a the gill-cover of a plaice will generate an electrical signal 5 million times greater than the minimum threshold of detection for an elasmobranch. The electrical charge, however, tends to dissipate readily in sea water which means that the ampullae of Lorenzini are only accurate to a distance of 20-30 cm from an object.

Electrical fields

It is a fact that all marine organisms, however small, generate an electric field. This includes fish hiding in the sea floor, and sharks of all species use this to their advantage. A good example is given in a recent study of hammerhead pups at the Hawaii Institute of Marine Biology. An electric field source placed in the seabed would be attacked immediately after being switched on, and then, when it was switched off the hammerhead pups would swim idly by.

Perhaps this great ability to detect electric fields can provide the answer to some of our own problems. A fascinating



example is a little known problem faced by oil companies. In the exploration of new oil fields many kilometers of cables are placed with an array of sensors and sonar devices that map the geology of the ocean floor. The problem is that sharks attack these cables and sensors, causing damage running into millions of dollars. Can, therefore, an electrical field be found that is repellent to sharks?

The navigation abilities of sharks. Can sharks detect the earth's own magnetic field and thereby use it to navigate the oceans? Can they use this underwater super highway, which is full of information that we are unable to decipher? One idea is that the ampullae

of Lorenzini may act as a very accurate electromagnetic compass. The dusky smoothhound shark, for example, regularly migrates southward for the winter months, from the waters of Cape Cod, Massachusetts. They must be endowed with an excellent sense of direction, for how else could they arrive every year at the same location? It is thought that sharks can detect the local geomagnetic signature of the sea-bed, thus enabling it to navigate tremendous distances. The smooth dog-fish, for one, can detect a change in direction of electric field intensity of 5×10^{-9} volt cm^{-1} .

The Shark Pod

By sampling the information coming from a wide source of objects from within the water, the shark creates a picture of the electric world within its immediate vicinity. This extraordinary ability can be used to protect both shark populations and people. In the early 1990s the Shark Pod was invented by the Natal Sharks Board to protect divers in the ocean. A battery and two sensors worn on the body emit powerful electromagnetic radiation that deter sharks but not other marine life.

In 1999 SeaChange Technology was formed and, under exclusive licence from the Natal Shark Board, built and marketed the Shark Shield. Many versions have been produced, extending from military and recreational diving applications to versions for snorkellers and surfers. It is hoped that, one day, versions of the Shark Shield will replace shark-nets in the protection of beaches.

There has been a lot of in-water practical experience gained using the Shark Pod. Although the sharks receive a shock from the overwhelming level of electromagnetic energy Grey Reef sharks, for example, can appear to become accustomed to these encounters, and after each initial shock appear to circle back to re-investigate. What has

been noted though, is that if individual sharks, not specific species, are exposed to an electrical field from the Shark Pod in the middle of a feeding frenzy, they will ignore this in their heightened state of excitement. Once their feeding has ceased they will then become aware of the large electromagnetic field and exit swiftly. This behaviour was witnessed in a handful of cases where the shark was at a heightened level of excitement.

Protection

One day I hope the Moses sole, as discovered and pioneered by Dr Eugenie Clarke, may, in conjunction with the Shark Shield and its predecessor the Shark Pod, prove a more all-round



ILLUSTRATION: THE FRESHWATER AND MARINE IMAGE BANK

answer to the prevention of accidental attacks on bathers and swimmers. This will in turn help to give the shark a more friendly image, and thus help protect shark numbers for generations to come.

The benefits of the technology of the Shark Shield and its predecessor have given us the best chance that we may have to co-exist peacefully, side by side, in the realm of the shark. Elasmobranchs possess this extraordinary ability which is shared by only a few other species. These electroreceptive abilities assist sharks in the detection of prey, in their spatial awareness of their surroundings, and in the navigation of their ocean realm. ■



manufacturer

Text and Photos
by Peter Symes

Future Fabrics

Putting the glamour back into diving



Jim Standing
Fourth Element Co-Director

"Where did James Bond go?" Looking for passion and style.

As I boarded the aircraft heading out to Cornwall to see Fourth Element it really hit me that I didn't quite know what to expect. And rightly so. What I found was not a plant full of sputtering machinery with pulsating pistons, but a bunch of ideas and visions on how to rebrand diving for the 21st century.

Fourth Element is headquartered not far from England's southernmost tip. Jim Standing, who is one of the two founding directors of Fourth Element, came to pick me up at the not so nearby Newquay

airport as I arrived with the early bird flight from London. Having to fly as the only practical option to get here only served as a testament to the fact that Cornwall is a considerable distance from London. So far south, that there are, in fact, some palms here. "Why on earth place an emerging enterprise all the way out here?" I queried Jim, as he drove us through the spring-green landscape where the ancient stone-fences brought images of King Arthur and Sir Lancelot to mind rather than those of modern enterprises. In fact, the remains of one of the fabled castles from these myths, Tintagel, is one of the local sights to be seen in these parts.

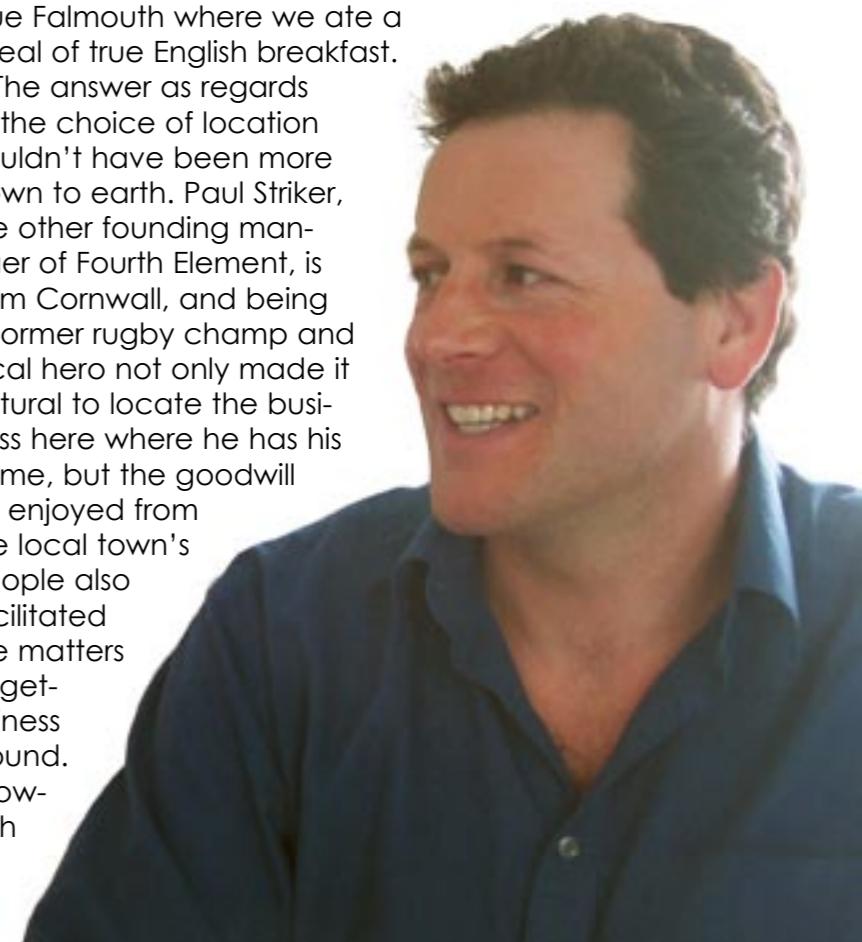
"Did the county or maybe the EU offer any special incentives to lure businesses out into this fringe area of the kingdom?" I wanted to know. I was still craving my morning coffee, so I welcomed Jim's offer to answer me at

length over a cup of java at a quaint little café in picturesque Falmouth where we ate a healthy meal of true English breakfast.

The answer as regards to the choice of location couldn't have been more down to earth. Paul Striker, the other founding manager of Fourth Element, is from Cornwall, and being a former rugby champ and local hero not only made it natural to locate the business here where he has his home, but the goodwill he enjoyed from the local town's people also facilitated the matters of getting a business off the ground. Besides, nowadays, with

When the layman thinks about diving, the thing that comes to mind is James Bond and Ursula Andress - and the Adventure. Diving is meant to be something elegant, a lifestyle

Paul Striker
Fourth Element Co-Director





the world-wide use of electronic communication and the availability of efficient global shipping to a world market, it really doesn't matter in which end of a country you are located.

That being said, I soon enough found myself going down a narrow pot-holed county road to find that Fourth Element's headquarters is located in idyllic surroundings, with its offices directly overlooking the rolling landscape disturbed only by the ongoing construction of their new warehouse.

Stepping inside was like being beamed out of one world and into another. Here, the distance from rural countryside to a modern and buzzing office landscape with ringing phones and printers was only one short step. Right, where is my pen and notepad? Let's uncover the truth behind Fourth Element.

X-RAY: Where did the idea come from? Who had the original idea?

Paul: The entire process has always

been a joint discussion, but it started back in the Sanafir hotel (a hotel in Sharm el Sheikh, Egypt ed). We didn't know one

another that well at that time, but when we looked around, we both saw all these divers wearing expensive equipment, and some of them were going on these really exclusive liveaboards, but at the same time they are just wearing really cheap t-shirts and such. It was such a mismatch. We then came to ask ourselves, what would you buy clothing wise?

Jim: ...why has the technology for thermal protection not changed for so many years? And why are we still wearing these woolly-bears as thermal protection inside our drysuits? When the layman thinks about diving, the thing that comes to mind is James

Bond and Ursula Andress - and the Adventure. Diving is meant to be something elegant, a lifestyle

Paul: What PADI did was making diving an everyday thing to do. They made it low risk. Consequently, it took the edge out of it, and I don't think that it did the perception of diving so much good.

Jim: The growth of diving, and now I am thinking primarily through BSAC and the way it was taught through the clubs in this country, also led to a low-budget approach to diving. Everyone wanted it cheap. The end result was the glamour was removed. Look at

windsurfing and a lot of other sports. They have a completely different image. We wanted to put the excitement back into it. Surfing and other sports are displaying the passion.

Paul: ... and we are trying to inject that passion into our clothing. Make the clothing and diving something to get excited about again.

X-RAY: Are you "crusaders" or manufacturers then? (laughter)

Paul: What could we do to bring the excitement back into diving? We didn't have delusions about what impact we could have, but we cer-

tainly wanted to try it.

X-RAY: Are you using the fact that you are manufacturers to convey a vision and idea, or is it the other way around? And why clothing rather than something else?

Jim: There is a number of factors...

Paul (kicks in): ... there was a need!

Jim: As regards to how divers were dressed, we had this feeling of, "I wouldn't be seen dead in that". There was a lot of other odd and outdated stuff around,



FAR LEFT: Jim Standing

CENTER: The picturesque location of Fourth Element's Head Quarters in Cornwall, England

BELOW: Fourth Element's Xerotherm Artic suit is part of a high performance system for divers in the most extreme environmental conditions. It combines two layers of advanced fabric to manage the microclimate around the wearer's body. The low bulk construction makes it ideal for using under neoprene drysuits. Even when wet, the suit retains its performance.



manufacturer



Paul Striker discusses the future of fabrics in the dive industry while on coffee break at nearby Lizards Point, the southernmost point in England.

and we got into this conversation that existing dive clothing was really unsubtle, "Divers do it Deeper" t-shirts and such.

Paul: We felt that there was a need for another brand, more stylish something you could wear in the evening too... and better thermal clothing.

X-RAY: So, it was a reaction against ugly t-shirts?

Paul: It was a reaction against having as contrast to an expensive Suunto watch, you have this cheap t-shirt, cheap in more than one sense.

Jim: ... exactly. Someone came up to us at a show and said: "You guys are to scuba diving what Gucci is to clothing" and that felt really good.

X-RAY: Do you see branding and changing the image of diving as the new main challenge for the scuba diving industry?

Jim: PADI and National Geographic did a good example of re-inventing diving as something adventurous and giving the edge back into it again. It is, in a way, brilliant. It is edgy so far that the litigious circumstances American society suffers from permits.

Paul: Diving also set itself apart in the sense that it doesn't have – as surfing – a fitness requirement.

X-RAY: Does that pose a marketing challenge?

Jim: Absolutely... (pointing to a group picture of 12 top technical diving instructors – all being bald pot-bellied blokes). Does this lure more people into diving? I think not. These guys, as sweet and nice and professional as they may be, do not sell any tickets and get more people into diving. These are the harsh realities we must address. We must have something sexier, even if it means risk-

NAUTIC TEAM GOZO

Special
November 2005

A photograph of a scuba diver in a dark wetsuit and mask, swimming in a dark, blue-lit underwater environment. The diver is illuminated by a blue light, creating a dramatic effect. The text "Wreck- & Cavern Diving" is overlaid in yellow at the top left, and "NITROX available" is overlaid in green at the bottom right.

Wreck- & Cavern Diving

NITROX
available

**1 week accommodation
in a self-catering appartement,
Airport Transfers, 10 accompanied
wreck and/or cavern dives, incl.: air / NITROX (for certified divers) tanks,
weight, transport to dive sites either by bus and/or boat. At cost:**

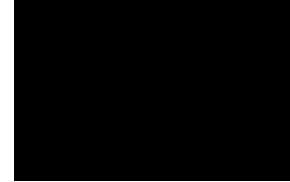
 www.nauticteam.com

 nauticteam@fastnet.net.mt









ing to revert to some old stereotypes.

X-RAY: But don't we risk that the whole brand / branding issue take over the focus from the product it sells?

Paul: The product needs to be good. Branding is no good if your product is bad.

Jim: We are building up the brand, but we are backing it



FOURTHELEMENT



FOURTHELEMENT

with technical innovations. We hope that the brand will then tell something about the diver.

Paul: ... but the brand needs to be good. The brand is just a part of the overall parcel.

X-RAY: So, in your opinion, is scuba diving a means to an end or an end in itself?

Jim: A means. We want to get more into marine conservation – like the Rolex OneWorld Scholarship, and next year, we are planning to get into shark conservation.

Paul: The greater picture is important. The ecological awareness is something that we would like more people to get involved with, and we believe that most divers are very ecologically aware. So, the more divers we have, the more knowledge and awareness we can create to promote a greater understanding and appreciation of the oceans.

X-RAY: Do you have any concrete plans as regards

to new projects or setting up funds or sponsorships?

Paul: First of all, we want to get into shark conservation, but also get involved in projects like the Rolex OneWorld sponsorships. In the future, we want to do more expedition types of work. We are also involved in a boat project that would do conservation work.

Jim: We are happy to be associated with the Rolex / One World Scholarship because it has exposed young people who would otherwise just be white collars workers to the marine environment. Take Joe Stephens (the first European Scholar, ed) he is now with the BBC Natural History unit. Richard Somerset is running a dive school over in Bristol. Jade Berman is a sponge expert. Phoebe Rudomino-Dusiacke was the production coordinator of the underwater unit

at Pinewood film studios but now she works for the British Antarctic Survey.

X-RAY: How did these new fabrics come about?

Paul: There were not dedicated empirical tests, but a lot of literature research, looking into specifications and then trying fabrics out in practice to see what worked. After experimenting, we also started looking into a commercial niche. The thermal protection seen in scuba diving was old. Thinsulate, for example, has been around for ages, but the new fabric technology has already gone far beyond that. So, we looked into many interesting fabrics with much better properties as regards to thermal performance weight for weight. Our fabrics are also machine-washable. ■

For more information, visit:
www.fourthelement.com



At Fourth Element's headquarters one can enjoy a wonderful view over the Cornish landscape



Sarawak's ecological heritage is among the most distinctive in the world. Being part of the Indo-Australian Archipelago, the epicentre of marine biodiversity, the region comprises nearly 1000,000 square kilometer of coral reefs or 34 percent of the world's total, housing 600-800 reef-building coral species in the world. It is home to more than 3,000 species of fishes and the richest concentration of invertebrate species.

Underwater Jungle

www.sarawaktourism.com

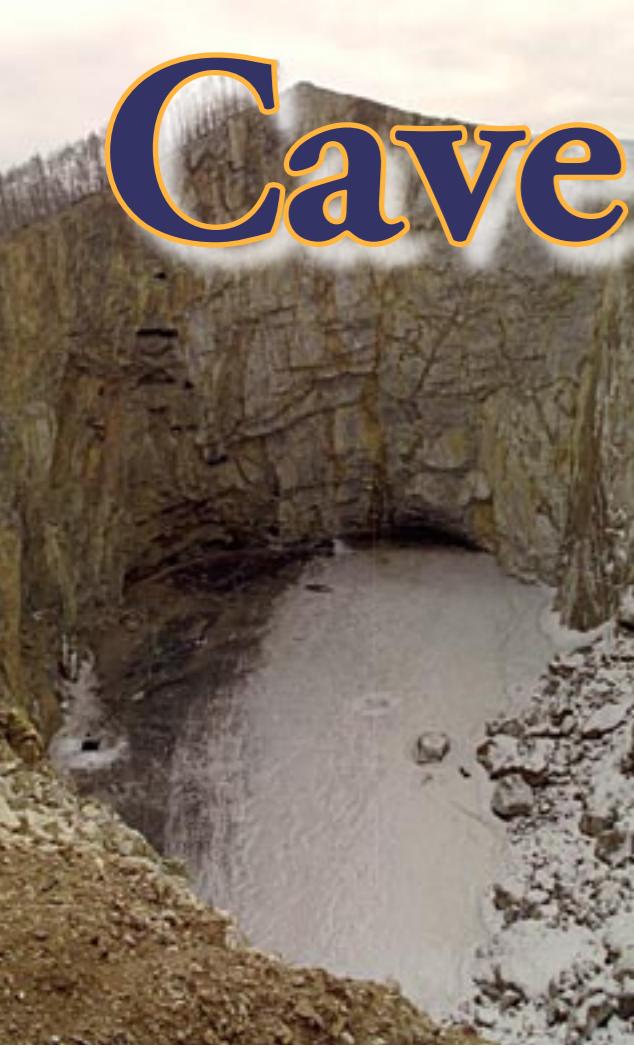
SARAWAK
TOURISM BOARD
Level 6 & 7, Bongawanaya Tower, Sarawak State
93400 Kuching, Sarawak, Malaysia
Tel: +60 82 423800 Fax: +60 82 416700



Cave

Diving in Siberia

Text and photos by Andrey Bizyukin



ABOVE: View of the huge Tuim's collapse from above. The wall is 120 m high, and the lake is covered with thick ice. From this height, people on the bottom look like ants

It is only four hours by plane from Moscow to Abakan, capital of Khakassia. The above-freezing temperatures, sunshine and the absence of snowdrifts contradict the traditional idea regarding the severe climate of Central Siberia. Together with the Novokuznetsk cave diver's team, we drove up through the foothills of Kuznetsk Alatau and the picturesque valley of the Small Sya river to the mining town of Tuim.



The surrounding forest-covered, beautiful mountain ranges are inspiring, and there are caves with painted rock pictures and many untouched historical monuments everywhere. The first settlements of Homo sapiens appeared here about

34 000 years ago. Ours divers' base is in the old village called Small Sya. This is a favorite place for modern shamans and is a well-known Stone Age settlement. Stone axes, bones of mammoths killed by our ancestors, and the most ancient

A diver lowers a homemade soft underwater habitat for comfort during decompression in the cold water under the ice



*Mountain-top subsidence close to Tuim
Huge crater formed*

musical instrument in the world, a flute, has been found here. Here are salt lakes, possessing wonderful medicinal properties from the very oldest times, around which people collected, seeking for a vision of God. The water of the lakes is so

strongly saturated with salts that it is easily possible to read a newspaper while floating on the surface. There was already a prospering nation here five thousand years ago from which has survived one of the most ancient observatories in the

adventure



ABOVE: Local mountains with cave entrance. Caves here are where ancient peoples lived during the Stone Age

world, Shira with its dolmens resembling Stonehenge. Everywhere there are barrows and fresh excavations of them.

Our objective, though, was a huge subsidence in the top of a mountain close to Tuim town. This is a place described as Tuim camp by A. Solzhenitsyn in his book *The GULAG Archipelago*. It was a correctional

TOP CENTER: View of the local river, Malaya Sia. There are many old places to be found with evidence of Stone Age people

camp for enemies of the Soviet government which worked the copper-ore mines here. It was very hard labouring here, and after only two years many had died. In the Stalin years all the slopes of the copper mountain were literally covered by prisoners from the Soviet concentration camps. At any one time there were up to 2300 exiles working here.

Prisoners dug many shafts into the limestone in order to get to the deposits of copper- and molybdenite-ores inside the mountain. The surviving local residents recently told that they sometimes penetrated into natural caves or, when removing the ore, created huge man-made under-



captions



INSET: One of the Shamans' stones. On the rope around the stone, you can see pieces of textile material. These are wishes and prayers to local Gods



Divers place a soft underwater chamber under the ice

ground caverns. Later, being afraid of a possible collapse, part of the top of the mountain was brought down by a large force-directed explosion. This created a majestic subsidence, a hole with vertical rocky walls up to 140 meters high. Some years after that a beautiful turquoise lake formed at the bottom of this hole which has since became a popular place for cave divers to explore.



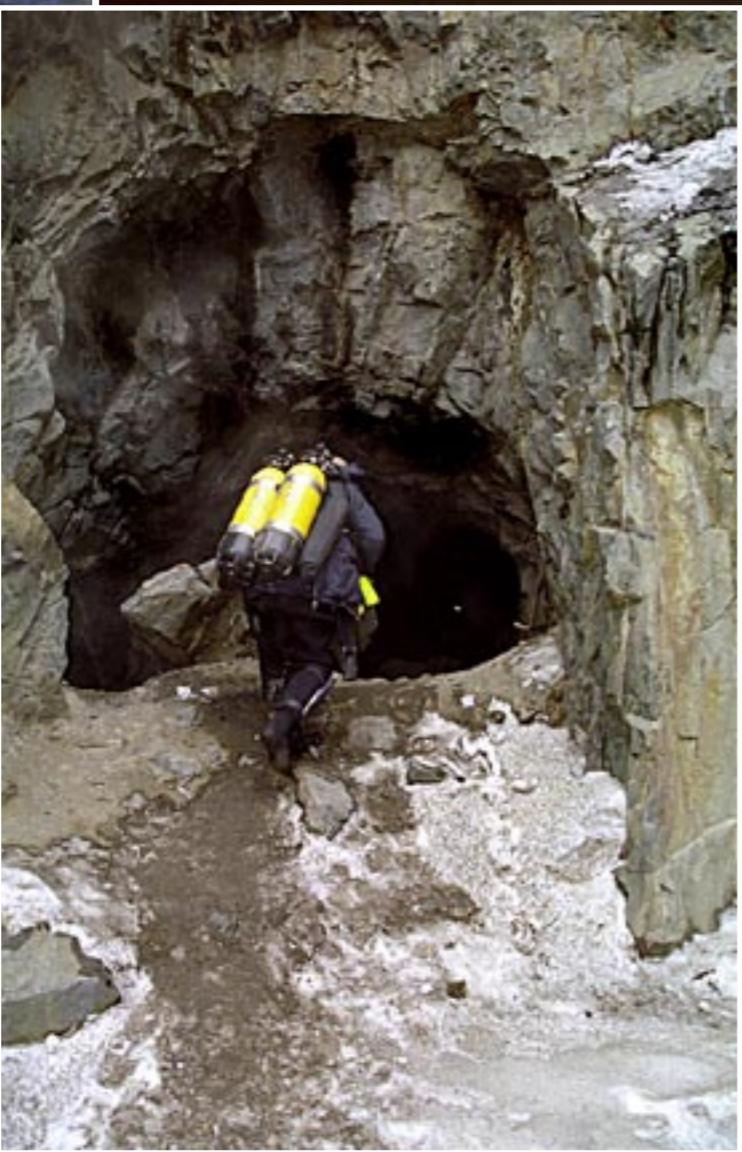
siberian caves

BOTTOM RIGHT: Excavation of a settlement of ancient people from an unknown age

adventure



Siberian Caves



Diver under ice with guide line. Don't lose a way to get back home

to dive into sumps was so strong that I began my scuba diving studies. In 1983, at the age of 17, I plunged into my first sump in a cave, Pandora's Box. Many years later, after becoming a dive instructor, I had to travel and dive in many various places, in warm and cold seas, rivers and lakes, to communicate with the large number of divers around in the world."

It is not the first visit of Oleg and his team to the Tuim subsidence, they have already dived here many times. In the beginning they used ropes and speleological techniques to get down from the top of the rocks to the lake, and to carry down underwater equipment. It was a very dangerous and unsafe way because of frequent falls of rock. Later they found a more simple way, an old 250 meter horizontal mine which connected the subsidence to the open mountainside.

Entering the cave

Having armed ourselves with miners' lanterns, we now dragged our cylinders through a seemingly endless underground tunnel. It is very

Twin sets are going into a mine entrance.
This is the way each day to the air compressor

XEROTHERM ARCTIC

EXTREME PERFORMANCE UNDERSUIT

comfort
freedom of movement
low bulk
superior insulation

"I did not get cold during the 14 day expedition diving in water temperatures of down to 2 degrees"

Phill Short, pioneering cave diver after a 14 day exploration of a cave system in Siberia.

A photograph of a man in a black long-sleeved undersuit standing next to a diver in a blue wetsuit. The diver is in the water, performing a backstroke. The background shows a dark, rocky underwater environment.

fourth element
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photo: www.louisemurray.com

Divers share a short meal and a coffee brake on the ice tables. This is a view from one of many mine entrances that can be found in the area

Oleg

The leader of the diving project for the exploration of the Tuim subsidence was Oleg Grigorjev who is a very experienced dive instructor and cave diver from the city of Novokuznetsk. "I entered my first cave when still a schoolboy ", said Oleg. "I was attracted by the darkness and the vertical pits. I have always been keen on exploring caverns and apparently endless labyrinths, and I was fascinated by the mysterious magic of the subterranean world. I started as an ordinary caver and a member of a cave divers' support team. We just carried cylinders through caves to sumps. But my dream and wish



adventure



cold here, with temperatures below freezing point, and the floor of the mine is covered with ice. It is necessary to be very careful that one does not strike one's head on a low stone arch or on the many spikes of rock sticking out everywhere, and also not to fall on the slippery ice. Happily, having avoided all dangers in the mine, we finally come to a strong sheet of transparent ice covering the lake at the bottom of the subsidence. Rocky walls reaching to the heavens hang above our heads, and the broken blocks on the ice are the traces of recent rockfalls. Recalling a Latin saying, memento more, there isn't much relaxation.

Our expedition is a part of the long-term research project. Step by step, trip after trip, cave-divers will eventually explore all the underwater areas. There are many underwater mine shafts, some of which have very narrow entrances. In others there are old rails, trolleys, cables and wooden logs. The bot-



tom of the lake, some 40 meters in depth, has been filled up with huge blocks of rock. It is thought that there is an entrance into a big



underwater cave somewhere within the depth of the lake.

The sun is rarely a visitor to the bottom of the subsidence, so that the water temperature here seldom rises above 2 - 3°C, and visibility varies from season to season. The best visibility is up to 10-15 meters, under the ice, and therefore just as we arrived here at the end of March.

Goals

Within the framework of present expedition our team had three main objectives:

- A support team will make two big ice-holes in the ninety centimeter-thick ice. One of them will be very close to the egress from the dry mine, where the

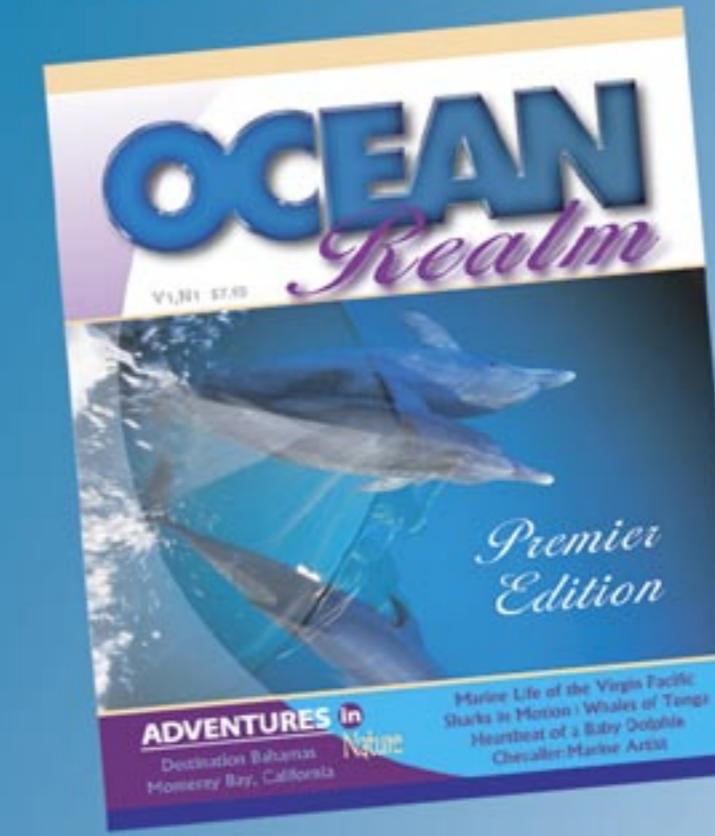
Siberian Caves

LEFT: Free flow for filling a chamber with air

INSET: Checking a valve at the top of the chamber. It should be ready to release air for any rescue incident

BELOW: Time to go for decompression inside the chamber

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ABOVE: In the main tunnel, people carrying tanks across the slippery ice floor should be very careful

depth of the lake is only 18 meters, and the other above a deep part, which we think is just above a probable entrance to the underwater cave. It will be necessary to lay 150 meters of guide line on the bottom between both ice-holes at depths from 18 up to 40 meters.

- Divers are to fix a diving bell. Last year an attempt to do so failed, as the six ton steel cable could not hold it and broke. The cave explorers have now made all the necessary constructional changes, and were perfectly prepared.
- After a successful completion of these objectives, Oleg Grigorjev will make a deep-water dive to reach the greatest possible depth and to explore a possible new underwater cave.

"Diving is, first of all, a pleasure and an

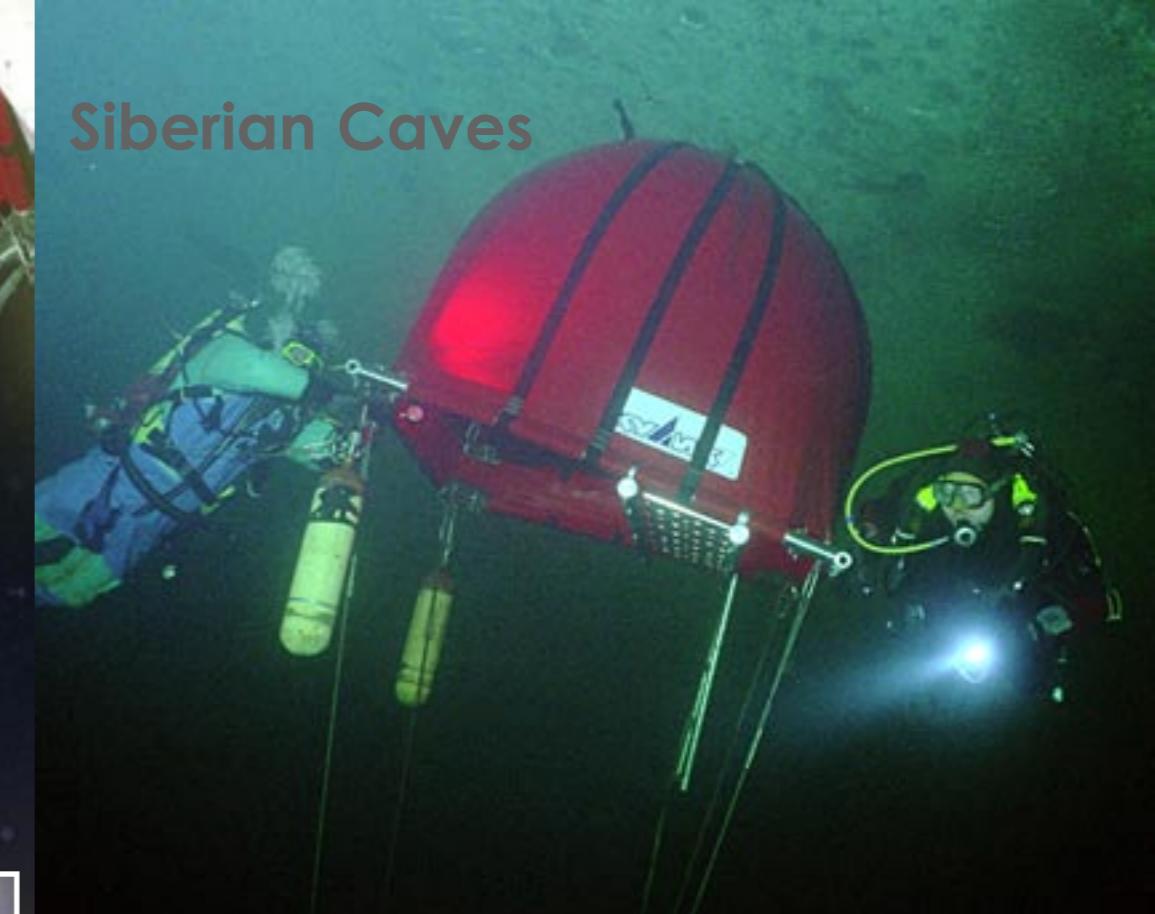
INSET: Diver under clear ice

aspiration to spiritual and physiological perfection. Here we have all the requirements for this in the subsidence; huge underwater volumes, depth, a gloom and the ice's clear water. Even the most powerful torch does not always reach to the opposite wall or the ceiling of the huge underground tunnel. The history of the subsidence and the events connected with

it can bring gloomy thoughts to mind of the diver. Most of all, I am afraid of the terrible cold of the water and of the non-stable functioning of the regulator, or its freezing, when it will then be necessary to close the valve of cylinders and to wait, while the first stage thaws. And so over and over again, before the next problem. I like diving in the subsidence very much, though it is sometimes neces-



sary to overcome my own reluctance. A very high degree of endurance, together with being very fit, is necessary for diving at the subsidence at Tuim," says Oleg. "Siberians nevertheless differ from Europeans. Maybe they worry less, but due to the Siberian temperament they do things faster and more rationally. They just have no other ways for survival. To become a good cave diver, at the very



TOP CENTER & RIGHT: Divers from the support team assist in the decompression procedure. Little tanks attached to the chamber are filled with pure oxygen

least it is necessary to be very clever, prudent, and be rich. These are the key conditions for a top-rank cave diver. And you can add to this the narrow and muddy sumps of Siberian caves, with their cold and stagnant water, which so easily grows turbid, so that it is generally necessary to search for a way home through the zero visibility using only touch. This means that Siberian underwater cave explorers must

also have qualities such as exceptional patience and purposefulness."

Hypothermia

It is dangerous to dive for long in ice-cold water, in this case more than one and a half hours. Hypothermia can cause cramping and muscle pains in the hands and legs, hallucination, and loss of consciousness and control underwater.

Therefore, the plan for this dive was to eliminate all such risks as far as possible.

Prior to such deep dives, speleologists usually carry out training dives, for a couple of days, down to depths of 55-60 meters with air, checking and adjusting equipment, refreshing skills and getting themselves in the right frame of mind. For the deep diving a bottom mix has been prepared with MOD for 90 meters, consisting of 16 % oxygen, 34% helium, and 50% nitrogen; travel mixes 28 and 50 EAN; and separate cylinders with pure oxygen for the final decompression from five meters. The danger of the regulator freezing is so high that a time turn around point is moved from the traditional 1/3 of the volume of gas to 1/5 of it. The bigger the reserve of gas left for the return back to the surface, the more safe will be such an extreme dive.

The dive

The dive begins in the ice-hole. Oleg is under the ice and begins falling very



adventure

Siberian Caves

A diver ascends to the underwater chamber under the ice

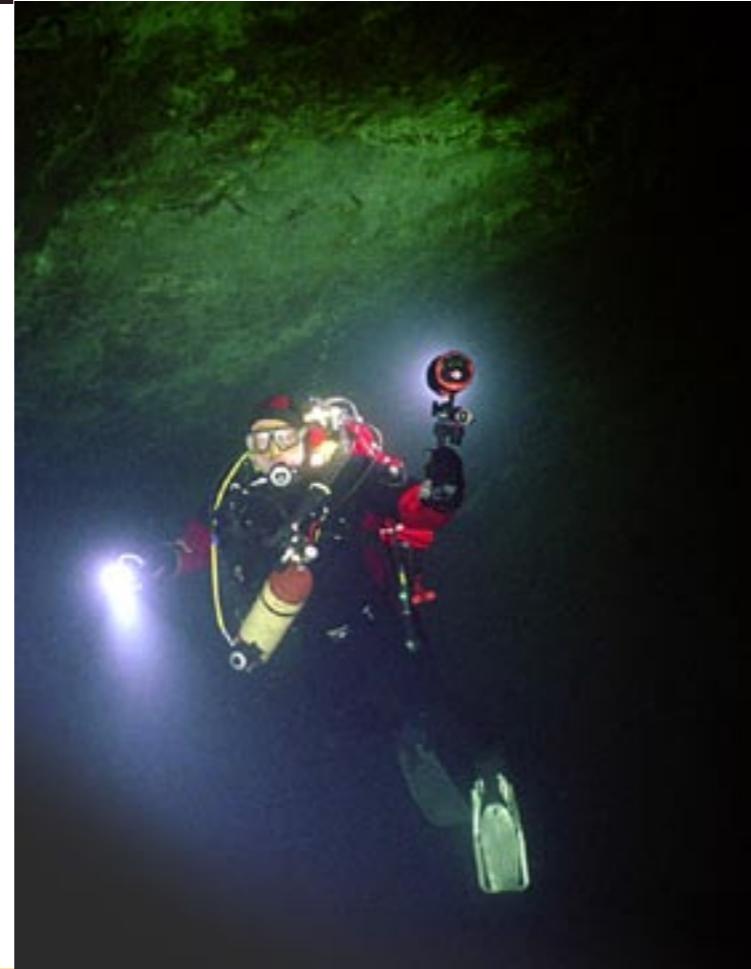
as the light of the torch can reach there is darkness all around, with only the right wall being visible from time to time. There is the feeling that the water here is black in colour. Oleg goes down between blocks bigger than a man. It sometimes seems that his guide line goes down straight into black emptiness. The blockage is behind his back, and ahead, where the torch reaches, is the all-consuming gloom and uncertainty. The descent continues for 13 minutes, at which point the floor starts to appear at 70 meters depth with a little slope, and finally at 80 meters he arrives at the horizontal bottom which is covered with large rubble. Neither ceiling nor walls are visible. It is possible to move any direction and Oleg has chosen a way and started to unwind the thin white guideline. Fears about possible problems with equipment began to return with their ominous whispers, and he thinks about the long decompression time in the ice cold water. But all the same, it is necessary to move forward, so he

fast, following a rope, and has already reached the visibility limits of the subsidence wall. A huge arch, about 20 in height and about 30 meters wide appears at a depth of 22 meters. This is the majestic entrance to an underwater cave and the deepest underwater part of the subsidence. Very big flat block lies on the steeply inclined slope of 45-50 degrees at the bottom of the arch. A guide line from previous dives is fixed to its lower end. At this moment, looking back, it is still possible to see the greenish gloomy daylight which can hardly make its way down through great thickness of water. There are friends, fresh air, the sun and warmth, so far back, above a thick layer of ice and water.

Having jumped out from the slope, the cave explorer starts a seemingly endless fall down into the black attracting abyss. The fall is so fast that from time to time Oleg loses the guide line, but grabs it again at a depth of fifty meters. He tries to maintain a correct direction and orients himself on rocks of the blockage during this descent.

The size of the tunnels are very impressive. As far

A diver explores the depths of the abyss in a huge underwater cave



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A diver approaches a huge arch of stone, which is the entrance into the underwater cave

Siberian Caves

pulls himself together, for he has a specific geographical exploration to carry out. And the most difficult part is not to cross that invisible line beyond which it is not necessary to go, not make that superfluous precipitate step which could lead to one's death.

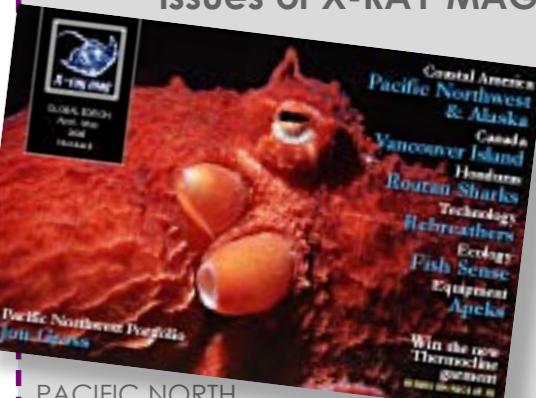
Only three minutes at that depth to spend on exploration and further searching. It is done! Oleg fixes the guideline, knotting it round a stone. It is time to return, back to warmth, light, hope and smiles – a long way back through the depths of the cave water and ice. At a depth of 40 meters, it will be necessary to re-clip on the guideline which shows the way to the decompression bell, and then to cross the 150 meters under the ice up to a shallower part of the lake. Here, under the second ice-hole, is the warm underwater chamber and the previously stored oxygen cylinders. There, in relative comfort, it will be possible to stay for the whole decompression time.

Story time

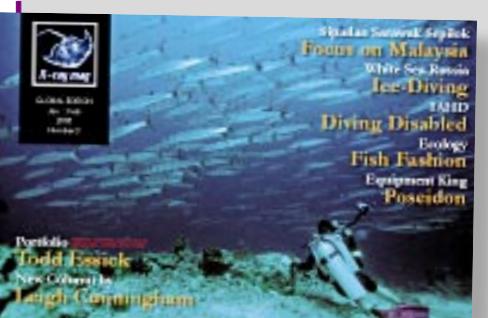
During the long way back to the surface Oleg tried to cheer himself up by recalling amusing stories about things that have happened to his friends under water. In the gloom of the cave, while at one of the stops, he remembers the frightened Maldivian diver who hid from a shark in an underwater grotto. Only there, in the full darkness, did this scuba diver feel himself in safety, so nobody could entice him back.

Resisting the underwater cold and the great weariness that comes after a long deep dive, Oleg recalls one Russian cave diver, Ivan, who

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adventure



Oleg on the deco-stop with oxygen during one of the check dives

Siberian Caves

fell asleep in the 45 meter-deep sump. Weariness and nitrogen narcosis had so affected him that his brain was almost disabled, but he continued along the guideline by subconsciously kicking his fins. Ivan only woke in a cold sweat when his helmet struck the wall with great force. He was really lucky that he was fastened by a clip to the guide line. "How are you? What happened? Tell us?", friends asked him later. "I remember nothing", Ivan replied. "I remember only the great impact of my head on the wall. Bang! Splash! And I returned to full consciousness. Where am I? In the sump? Forward! Go!"

Close to the underwater decompression chamber Oleg thought about his idols Olivier Isler and Jocben Hasenmayer, the world famous cavedivers, the heroes that have broken many records and survived, but only because they trusted themselves, planned dives correctly, and had the excellent support of the dive team. "Our power is in our team and its help is vital for me. I could not make these dives without the help and support of Alexey Bazarov, Gleb Sitnikov and

Vladimir Komarisov", said Oleg later.

"Many people think that we are abnormal. Why do we dive in such cold place? But for us this cold water diving to great depths is excellent training and fine recreation. It is just interesting for us to explore all of the subsidence at Tuim, and to dive even more deeply here. Besides, here is the ideal place to test equipment under very extreme conditions. My dream is to find the finest, most trouble-free, underwater equipment, although last time I had already begun to doubt that such equipment really exists", said Alexey Bazarov.

"The subsidence at Tuim gives one a feeling of Man's smallness in Nature's greater order of things. We are moved by a hope to touch uncertainty, and a passion to be the first to explore a previously unknown subterranean aquatic space. Here, under water, is the voice of the Abyss, giving us this unforgettable sensation of peacefulness. The history of an ancient underwater cave can be only a story, but all of us trust in the dream and we amuse ourselves by hoping to find it", explains Gleb Sitnikov.

Afterthoughts

After the end of our diving trip, Oleg Grigorjev expressed the opinion that even if there is a technological breakthrough in the near future and the working pressures for cylinders increases up to 1000 atmospheres, or even if rebreathers which actually work in cold water make their appearance, the subsidence at Tuim will still remain an unique range for testing all these innovations.

It is not surprising that much of what is suitable for Red sea techno-divers does not function here. Gradually, step by step, ignoring whatever the advertisers might claim, cave divers will test and choose the most reliable and trouble-free equipment for all types of diving. Oleg is confident that the exploration of the subsidence will inspire other divers to do similar underwater researching in other places of Russia.

"I am a patriot of my country and believe that the future diving expertise of Russia will grow in Siberia", with these words Oleg Grigorjev finished his story of the subsidence at Tuim. ■

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Text and photos
by Dan Beecham

Photography

In the past few years underwater photography has been transformed by new technologies and new ideas. It's not only the equipment and techniques that have changed. The way we store and view our photographs has also been revolutionized. This has made underwater photography more popular than ever.

Cameras are everywhere nowadays — on our computers on our phones. In fact, most people have a digital camera of some sort with them at all times. The same is now true for many divers. Entry-level cameras are now so cheap, compact and effective, that they can be carried on every dive — slipped into a BCD pocket for a quick snapshot if the opportunity presents itself. Most divers now enjoy early success with their photography. Whereas, in the past, entry level film cameras took a lot of time and attention to get pleasing results.

Things have also changed in professional level equipment. There are housings available for the top of the line Canon and Nikon digital SLR's, and nearly all professional underwater photographers have now made the switch to digital, this is allowing them to produce new and exciting images which have



never been achieved before.

In this issue, we're going to look at the advantages and disadvantages of digital, and in the future we're going to tackle many different aspects in detail, including specific types of cameras, techniques, lighting, digital enhancement/manipulation, storage of images, and maintenance of cameras. We'll also be looking at diving equipment, locations and resorts that are set up to cater for the needs of the underwater photographer.

Many of the advantages and disadvantages of digital underwater photography are the same as those on land, but it's worth looking at how they affect us as divers.

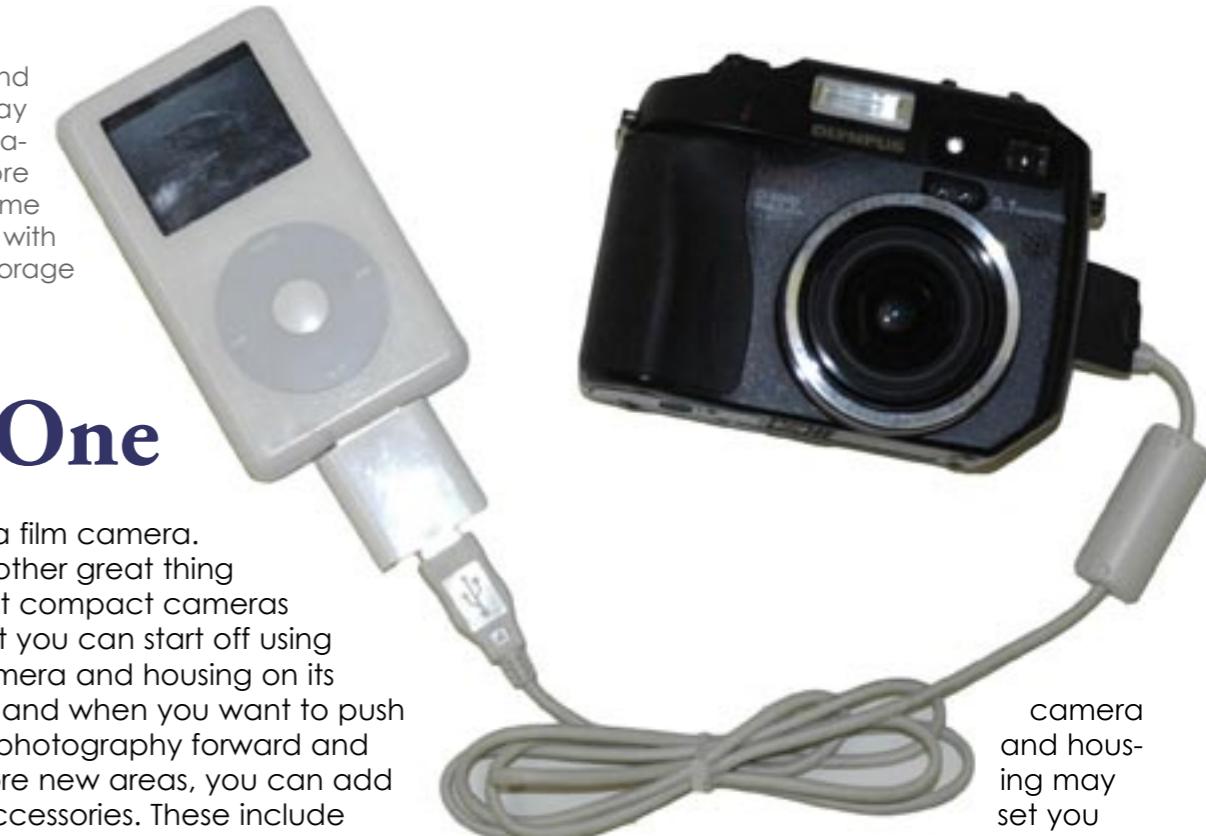
LCD

The LCD on a digital camera allows you to review images and navigate the camera menus. On a compact camera, this is also used for composing the picture. On a digital SLR (Single Lens



ABOVE: Film vs image card

Digital camera and i-Pod. i-Pods may be used as data-medium to store images. i-Pods come in various models with up to 40Gb of storage



camera and housing may set you back £500

(USD 916) or less. This on its own will offer you tremendous flexibility. At the other end of the scale, the costs can be astronomical. Some manufacturers now produce housings for top-of-the-line DSLR's such as the Canon EOS D1s Mk II, or Nikon D2X. These cameras are the tools of professionals, costing many thousands of pounds. Housing systems often cost as much or even more than the camera.

Compared to film however, the running costs are much lower.



Sizes: Digital camera and house compared to a UK passport

Reflex), the screen cannot be used for composition. The camera viewfinder must do instead.

When used as a viewfinder, the LCD screen provides a large, bright, clear viewfinder. This is a very important feature in an underwater camera. When using the LCD, you can hold the camera at arms length, and still clearly see the screen. This feature can be handy when trying to shoot shy critters, which may not like you and your bubbles getting too close.

Previously, on entry level cameras, the viewfinders were very poor. You also had to battle parallax (the difference between the image seen in the viewfinder and the image which is actually recorded by the camera). With an LCD you see exactly what the camera is going to record, and you can see the image after it's been taken. This means you learn on the dive, and this is what has allowed people to get underwater pictures they are happy with much sooner than they would with

with a film camera.

Another great thing about compact cameras is that you can start off using a camera and housing on its own, and when you want to push your photography forward and explore new areas, you can add on accessories. These include ancillary wide angle and close up lenses, external flash units and colour corrective filters. This allows you to spread your costs over time, and get to grips with using one piece of equipment before moving onto using something else.

Number of Exposures

In the days of film, if you wanted to take more than 36 pictures on a dive, you had to carry two cameras. Only having 36 exposures often stopped you taking risks or trying new techniques or ideas — every shot had to count. Nowadays, by using a large media card, you can take hundreds, or (if you really try) thousands of pictures on a dive. You can just shoot, shoot, shoot — and if you fill up your memory card, you can start deleting the shots you don't want and shoot some more.

Costs

The start up costs with most entry level systems is extremely low, a compact

Let's say you're planning a trip to the Red Sea, shooting film. You're going to be doing three dives a day for five days. This means you could get through fifteen rolls at a total cost of as much as £70 (USD 128) for a high quality film. Processing at a reliable lab can cost as much as £5 (USD 9) a roll, that's another £70 (USD 128) or more. If you're using slide film, you now need to pay out for scanning of images if you want to view them on your computer, and the cost of prints if you want pictures to keep in an album or on display in your home.

Now consider that with digital you





photography

could be taking many more pictures per dive, and you would be seeing straight away what you were getting. You could then save the pictures you're pleased with, and even print them out on a home printer. Your only cost for the whole process would be that of paper and ink for your printer.

Adjustable ISO

Traditional film is available in many different sensitivities, or ISO's. Higher ISO's produce a lower quality image, where the grain of the film is often visible at very high levels. A picture taken using a film with a lower ISO yields much higher quality, but you need more light to expose the picture properly. This means you could start the dive using a film such as 100 ISO, but when you get under water you may find out that it's too dark, and that you should have used 400 ISO instead.

On a digital camera, you can change the camera sensitivity on the dive to suit the light levels at the time.

Size and Weight

Entry level compact cameras are so small and light that they can be carried at all times. This is beneficial not only whilst diving, but also when travelling. Many underwater photographers have difficulties transporting their heavy and bulky equipment to a destination. This can still be an issue when using an SLR. The size and weight generally remains the same using a compact, however you can slip a whole system into your rucksac and carry it with you on the plane.

Disadvantages

They're few and far between, but digital



photography does have a few disadvantages.

Sometimes digital cameras do not handle strong areas of contrast very well. As an example in an image of a diver with the sun in the background, the sun will not be as crisp and defined as it would have been when using film.

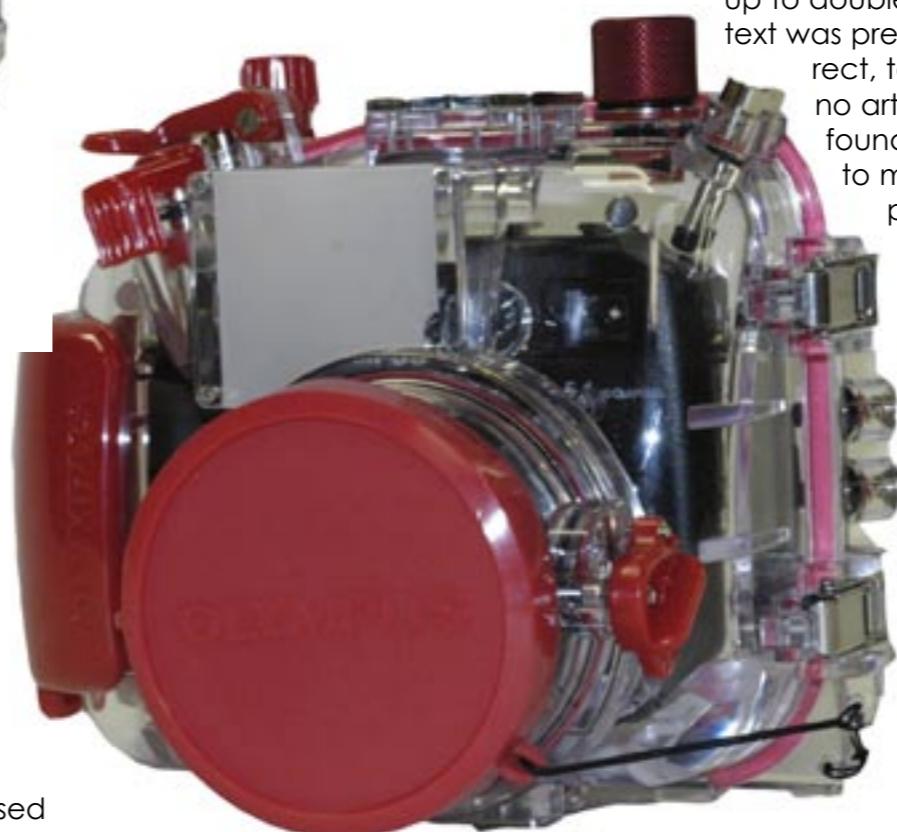
Another problem, which is present only in compact cameras, is *shutter lag*. This is a small delay between pressing the shutter release button, and the camera actually taking the picture. This happens because the camera's on board computer takes time to adjust its settings, achieve focus and record the new image.

When you first use a camera with shutter lag, it can be very distracting, especially if you're used to the instant shutter release on an SLR. If the camera is very slow, it can stop you getting the picture you wanted, especially if you are photographing fast moving subjects such as dolphins or sharks. However, for the majority of subjects, shutter lag is not an issue — take wrecks as an example.

There are ways to reduce shutter lag, but if you choose to use a compact camera, expect shutter lag.

When using a Digital SLR, the only delay you have is that of the camera's autofocus locking onto the subject, and so is generally unnoticeable.

The obvious down side to this is the greatly



increased expense involved with getting an SLR under the water.

When using many digital cameras, or when using RAW settings on your camera, the images that come off the card and are transferred onto your computer need to be adjusted to get the best possible result. This requires knowledge of software such as Adobe Photoshop, and can often be time consuming. If you do not put the time in on the computer to get the best of your images, you may find your pictures look flat, or the colours

may not be as vibrant as you would like.

Reliability

One final point which needs to be made about the disadvantages of digital cameras is something that we are all too familiar with: computers can be unreliable. When I was getting ready to send off the final draft of this article to the editor, I transferred the file on a portable hard drive to broadband over from my work computer. When I tried to open it

up to double check the text was present and correct, to my horror, no article could be found. I went back to my laptop, with panic creeping in — the original file was nowhere to be

however, that sometimes computers are simply out to ruin my day. I'm blessed with the dolcid tone of my Mac restarting a few times every day. Just remember this, if you've got a picture that's important to you, BACK IT UP!

When you consider all the features that digital offers you over film, the few disadvantages seem insignificant. The trick is to use digital cameras where they are most effective, rather than attempting to replicate pictures where film would outperform.

Digital is here to stay, and day-to-day we're discovering just how much these cameras are capable of. These are exciting times to be an underwater photographer. In the next issue, we'll look at specific types and models of cameras, from Entry Level compacts up to Professional level DSLR's. We'll also look at the housing systems available for these cameras, and find out which one is right for you. ■

*Dan Beecham of **Ocean Optics** in the UK won the Our World Underwater Young Photographer prize at the 31st Annual World Festival of Underwater Pictures in Antibes, France, 2004*



LEFT TO RIGHT: Olympus 5060 camera with underwater housing and lens, Olympus 5060 camera with underwater housing, Olympus 5060 camera body

