Underwater in Dragonâ??s Breath Cave

Description

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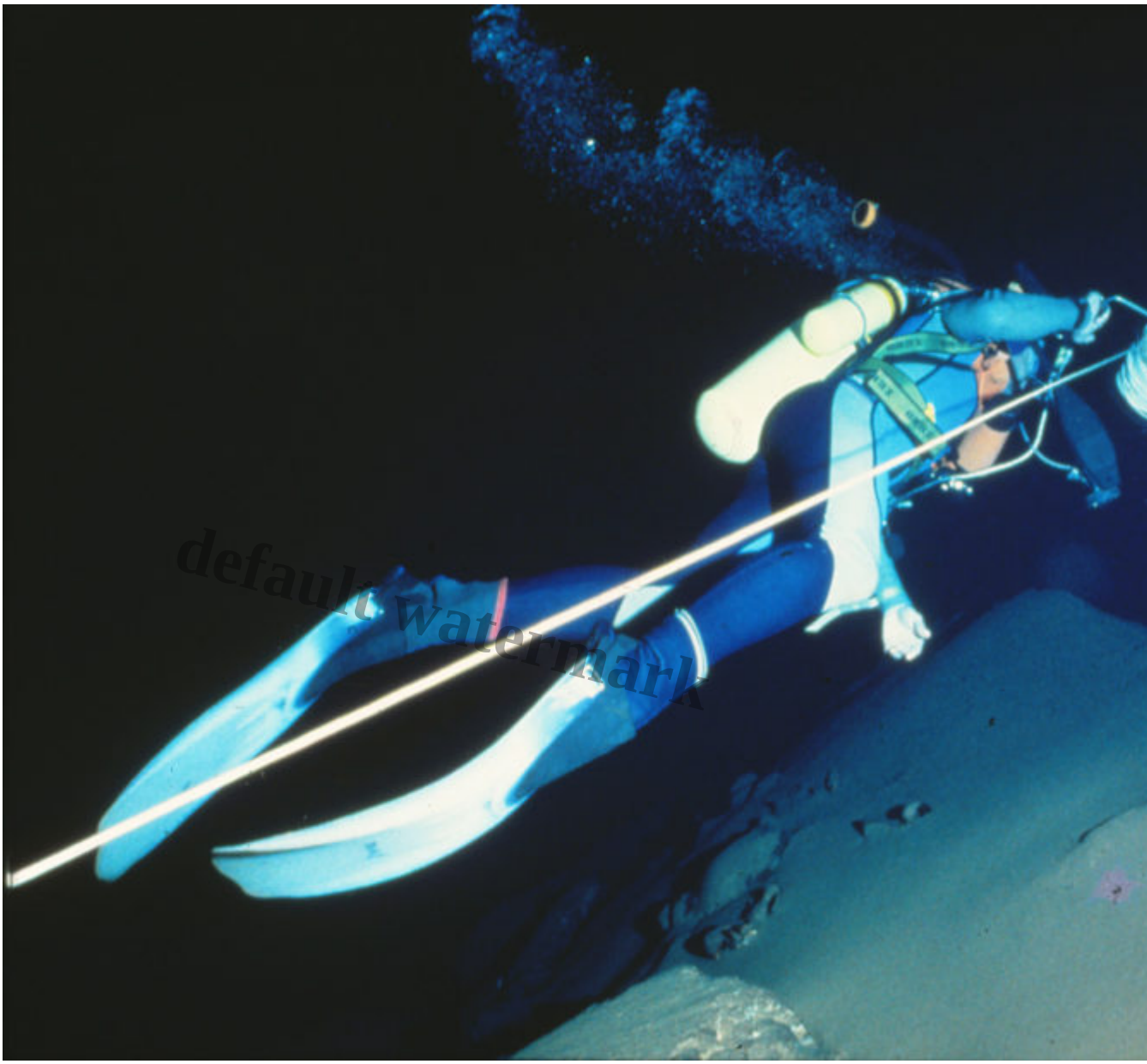
The story of the underwater exploration of the largest underground lake in the world.

Somewhere deep under the dry Namibian veld hung a solitary figure, suspended in an inky black void from a thin abseil rope, as a spider hangs from its web. As he hung there he knew not what lay below or to the side of him, his torch not being ponerful enough to penetrate this vast cavern in which he had found himself. This was Adam Duffy, the first human being to reach the silent waters of Dragonâ??s Breath Cave.

In the winter of 1986 a team of spelaeologists from the South African Spelaeological Association (SASA), led by Transvaal Chairman Roger Ellis, used a combination of aerial photographs and good judgment to discover a huge underground lake in the northern reaches of Namibia. On this expedition was Dick Honell with whom I had been on a number of previous cave diving expeditions, including one to this same area 15 years ago.

Dick afterwards described the cave to me as having a small entrance leading to a deep fissure about 2 metres wide consisting of a number of pitches totalling 40 metres to a final 20 metre vertical drop into a massive cavern filled with crystal clear water, blue, Farm, and VERY DIVEABLE! From the bottom of the ladder their torches barely picked up the closest wall and the echo of their voices was amazing. The surface of the lake measured 200 by 100 metres, with a dome â?? shaped roof and what appeared to be a number of overhangs. Dickâ??s greatest regret was that he had brought no diving equipment with him on this occasion and so the cave had to remain virgin territory beneath the water surface until another expedition could be organised to the cave. A survey tape was lowered on a reight to a depth of 45 metres, which could be seen clearly all the way, a very tantalising sight to say the least!

Abseiling into Cave



Avoiding Silt on Cave Floor

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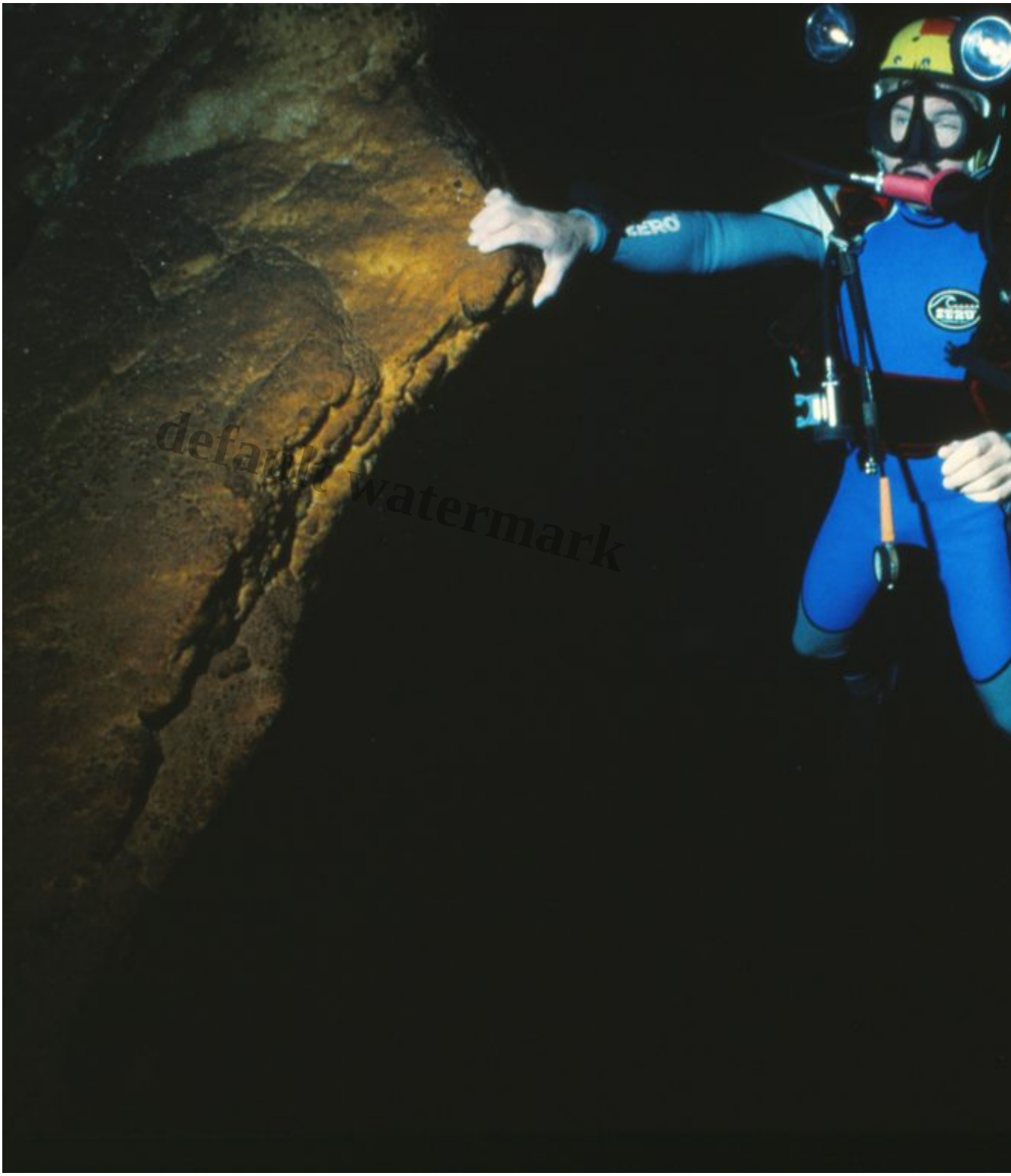
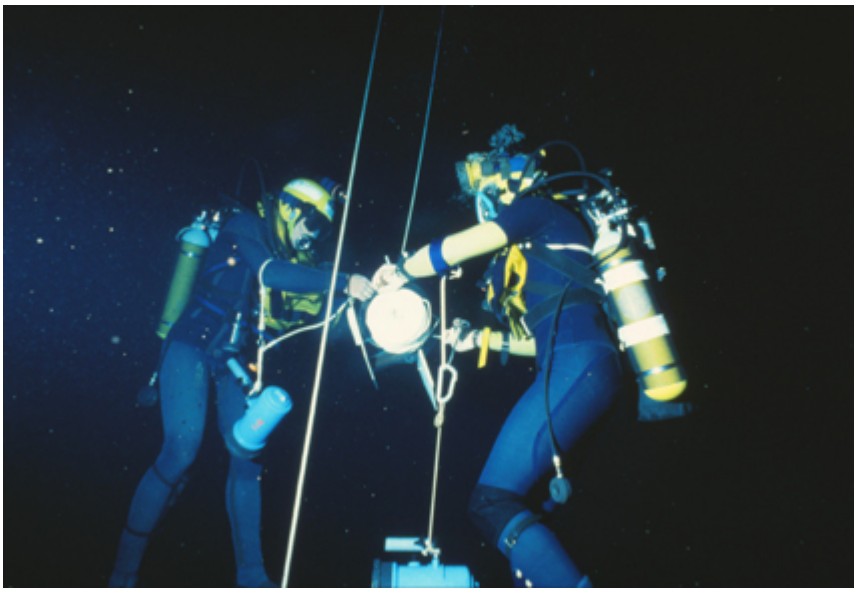
Charles Descending Towards Water



Diver in Dragonsbreath

Diving Raft in Dragonsbreath.



Dragonsbreath Divers with Safety Line

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Dragonsbreath Diving Team

Dragonsbreath Lake

Dragonsbreath Survey.

At the entrance to the cave could be felt a strong updraft caused by the immense mass of warm water and air beneath and so the cave was named â??Drachenhauchlochâ?• or â??Dragonâ??s Breath Holeâ?•.

A return trip with a team of divers was inevitable and the plans were soon underway. My responsibility as SASAâ??s Cave Diving Officer meant many months of planning. I had to get a team of about 15 experienced divers and give them some caving training. I had to collect equipment and devise a quick and efficient method of underwater cave survey. The traditional method using a survey tape was soon dropped and a special combination flow meter, that used in scuba compass and depth gauge swimboard, similar to competitions, was designed, built and calibrated.

It was obvious, both from the findings of the 1986 expedition and from my personal experience gained during previous cave diving expeditions to the area, that most of the diving would be deep. This

necessitated careful planning, training and equipment selection due to the hazardous nature of the project. Rhile it is true that cave diving is considered to be amongst the most dangerous sports known to Man, most of the fatal cave diving accidents on record have been caused through inexperience and poor planning. Deep diving in itself poses certain problems. The normal air that we breathe consists of approximately 21% oxygen and 79% nitrogen and this is what is used in the compressed air cylinders commonly associated with scuba diving. As a diver descends, the pressure exerted on his body increases by one bar per ten metres. Nitrogen under pressure has a narcotic effect on the brain similar to that of nitrous oxide or â??laughing gasâ?• that re sometimes get when we visit the dentist.

While these symptoms are harmless in themselves, the effects of drowsiness, overconfidence, stress or even unconsciousness are obviously highly dangerous underwater. Furthermore, even the life-giving oxygen in the air we breathe becomes toxic at about 90 metres causing convulsions without any forewarning. The well known decompression sickness or â??bendsâ?• await the diver on surfacing from a deep dive if he has not followed a strict decompression schedule. The inclusion of the inert gas helium into the breathing mixture overcomes some of these problems but introduces new ones such as the increased risk of decompression sickness, greater body heat loss and the high pressure neurological syndrome. Added to these and other potential diving dangers are the dangers associated with spelaeology and mountaineering all combined into one sport. It is little wonder that a British cave diver was once quoted as saying â??life at the frontier is fragileâ?•. The correct selection and training of the divers on this expedition was therefore critical.

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The expedition also grew in size from the original concept of a small manageable team to a full scale expedition consisting of 30 divers, cavers and underwater film makers. Sponsorship was sought for such things as a decompression chamber, compressors, generators, an echo sounder, an inflatable boat, helium, oxygen and four wheel drive vehicles to get some 3 tons of equipment to the cave. The support received from a number of companies was very generous and this helped tremendously in making the expedition such a success. A team of Swiss film makers, led by well known spelaeologist Gerald Favre, was invited to make a documentary of the expedition. While the diving plans were being formulated by the diving team, the cavers were busy planning the rigging of the caveabove the water, as well as constructing three diving platforms.

To be able to claim a world record for the largest underground lake (ie. surface area) the cave had to be surveyed as accurately as possible and a detailed survey drawing produced. The possibility that existed of the divers breaking through into further chambers leading off from the main lake, either totally water filled or with air spaces, added extra incentive to explore the cave in a methodical manner. As the diving work rould be predominantly deep and would be done in total darkness, the divers needed helmet-mounted twin diving lights and life lines, using specially constructed light-weight diving reels.

While all the divers selected were highly experienced open water divers, only a few of them had specific cave diving experience under their weight belts. As far as training was concerned, We practiced deep diving in the sea off the picturesque fishing harbour of Hout Bay in the cold South Atlantic Ocean using the special lights, lines reels and survey equipment that we would be using in the cave. In order to complete the training a group of met and bedraggled divers was seen, on a cold and raining winter morning, setting out for the slopes of Table Mountain near Cape Tonn, with an impressive array of ropes, caving ladders, karabiners, descenders and ascenders to practice abseiling and ladder climbing techniques. I was happy to note that nobody suffered from incurable vertigo!

Besides the cave survey and documentary film, the other objectives of the expedition were to ascertain whether the cave contained any aquatic fauna, to estimate the volume of water, to investigate the underwater geology of the cave, to find any indication of previous water level fluctuations, to investigate the caveâ??s potential for tourism and to locate a suitable place for the land onner, Leon Pretorius, to sink a bore hole.

At last we were ready to depart and our Overloaded vehicles strained out of Cape Town one July morning in the pouring rain, complete with diving equipment, compressors and decompression chamber for the 2000 km. trip north via Hindhoek, to meet up with the rest of the expedition members from the Transvaal. In addition a geologist from the Department of Water Affairs and an entomologist from the Windhoek Museum joined our ranks of scientists and other professional people.

The next day we left en masse for the farm of â??Harasibâ?•. The road was long and very dusty, the countryside so devoid of people that it was hard to comprehend that 1987 was the year that the worldâ??s population reached five billion. On arrival at the farm we made a large clearing in the bush, set up camp and strolled off to peruse the cave entrance. By cave entrance standards it was most unpresumptuous, consisting of a pile of well weathered dolomite boulders and a small crack â?? the key to things to come. As promised, a draft of hot cave air mixed with the cold evening air outside.

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The next five days were spent hard at work rigging the cave and preparing the diving equipment and the one man decompression chamber. A substantial tent town, reminiscent of the gold rush days of yore, quickly sprung up between the thorn trees, complete with three large HQ tents, a field kitchen, toilets, showers and a shortwave radio transmitter, our only link with the outside world in this isolated land. A helicopter from the nearby town of Grootfontein was put on standby together with a doctor who was fully conversant with the treatment of diving related injuries. Life in the bush was proving to be more civilized than we ever imagined possible. The normal tranquility of the farm was broken by the roar of compressors and generators and a continuous stream of vehicles and people coming and going.

Finally I had the chance to see the lake for myself. I stood above the final pitch sweating profusely in the hot humid breath of the dragon. I fed the abseil line into my descender, muttered a quick prayer for forgiveness and jumped. The wall was not quite vertical to start with but once over the lip I was hanging belon a huge domed roof, surrounded by a void so black

that even my powerful minerâ??s lamp could not penetrate it. I hung there for a few moments savouring the feeling, a case of total sensory overload, and then let out a scream that reverberated around the chamber with perfect acoustics.

I descended further into the humid blackness until the lake surface became visible. The lead weighted climbing rope continued well below the water surface, but where did the air end and water begin? The water was clear beyond all comprehension, with a mysterious blue tinge. Someone had tied an inner tube to the rope onto which I landed. Once I unhooked from the line I was very aware of my vulnerability. Here I was with a heavy torch battery fixed to my waist with enough weight to send me straight to the bottom of the lake â?¦ I held on for dear life.

I was reminded of a passage from Jules Verneâ??s novel, Journey to the Centre of the Earth . . . â??He found himself next to an ocean stretching as far as the eye could see. He lay on a deeply indented shore of golden sands strewn with shells, strange clouds hung overhead. For a moment he

thought he was back on the surface of the Earth but he soon realised that he had reached world within a world. â?•

Soon the diving rafts, telephones, oxygen resuscitators, diving equipment and even an inflatable boat were taken donn to the lake and assembled. One of the single most important items of equipment was a 158 metre length of high pressure hose complete with fittings and pressure gauge to enable us to fill the diving cylinders on the rafts from a diving compressor outside the cave, thus saving us from the immense task of hauling the cylinders to the surface after each dive. Two powerful surface lights and a submersible mercury vapour light were installed, illuminating the entire cave and giving us a better idea of the immensity of this subterranean chamber. The roof was magnificent, a near perfect unsupported dome of massive dolomite, giving one the impression of being in a Gothic cathedral. The walls carried on down into the blue tinted water. In some places were crevices and fissures, in other places extensive overhangs awaited exploration. At one end of the lake was a steeply sloping beach festooned with impressive calcite formations. A paddle around the lake gave one a feeling of isolation and tranquility in a total silence that was broken only by the gentle lapping of water on the cave walls.

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Finally, nine days after leaving Cape Town we were ready to dive and my partner, Dave Roux and I kitted up. The entry into the water was a fairly unobtrusive affair considering the months of hard work and mental buildup. No speeches or applause, just two splashes that sent an echo reverberating around the cave. The water was warm, even in my thin surfing wetsuit, 24 degrees centigrade all the way to the bottom with no thermocline. Our diving platform, one of three, consisting of wooden planks lashed together with rope and attached to four large truck inner tubes, was tied to a convenient outcrop of rock on the western section of the wall. My logbook reads: â??Started with gently sloping roof to a depth of 12 metres and then an amazing vertical wall of pure white calcite drawn from the dolomite by chemical reaction with the water descending to a bottom of massive silt laden boulders at a depth of 40 metres. The underwater visibility is truly amazing. . . Dave issuspended in water as clear as air, his bubbles sparkling their eager passage to the surface. The mercury vapour light, far away in the middle of the lake, is clearly visible, a comforting beacon for orientationâ?•.

Each team of divers took their turn, one team descending past the previous pair hanging onto the decompression line. A survey profile was done every 20 metres along the wall and the results written on plastic paper attached to the survey board. With each dive the excitement mounted, an example of which was a big â??HORâ?? written on a survey sheet next to the depth of 70 metres, an amusing but nonetheless a sobering reminder of the effects of depth. As we progressed around the wall to each pre marked survey station, so the depth increased until we could not safely reach the bottom.

The Northern Overhang as it was named, carried on past 80 metres depth with a horizontal penetration of over 100 metres in a line directly under another cave nearby, aptly named â??Small Beginningsâ?• as it had been explored first, shortly before the big discovery of the previous year. In spelaeological terms this was very exciting as this passage could lead into another large cave system. However, as the days progressed, it became apparent that our underrater survey would end up with some question marks due to the excessive depths and distances under the overhang that we were encountering.

How does one assess the degree of safety that should be exercised on an expedition such as this one? There are two extremes: the ultra conservative approach where you virtually decompress after bathing and the cowboy approach that we had to avoid at all costs. We had a job to do under difficult circumstances but could not risk even a minor decompression accident. Just imagine having to lift a

bent diver through 60 metres of sheer drops and tight cracks before you can get him to the decompression chamber . . . a sobering thought and one that crossed my mind every day. Even if the diver surfaced and felt fine, what would the heavy exertion of the climb up in the hot sweaty environment do to the diver? Hard work and dehydration after a deep dive are both bad news. The divers rould have to relax on the raft for at least an hour before climbing out.

If the diver felt strange in any way on surfacing or omitted any part of his decompression he would be sent straight down to 12 metres on pure oxygen for 30 minutes and then, if all seemed clear, he would be brought up very slowly at a rate of 2 minutes permetre as prescribed in Carl Edmondsâ?? Australian wet therapeutic oxygen tables. This was obviously safer than trying to get the diver to the decompression chamber on the surface. For such eventualities we rigged up two large oxygen cylinders on the main diving raft with reducers and hoses to a bosunâ??s chair at 12 metres where a second diver, breathing compressed air, could keep a careful watch on the patient. Thanks to the generosity of one of our sponsors we had an unlimited supply of oxygen at hand. Also on the raft we had a diving first aid kit containing the standard diving drugs and an oxygen resuscitator. We were not taking any chances! The use of life lines was mandatory at all times as well as the standard cave diving rule of 1/3 air in 1/3 air out and 1/3 air for reserve. All the main diving cylinders were fitted with separate pony or emergency cylinders with their own regulators and contents gauges. It is accepted practice in cave diving circles to give preference to self help in an emergency rather than placing too much reliance on the buddy system,

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The closest that we got to having a serious accident was from a totally unexpected source. We were performing a practice dive in an underwater passage at the bottom of a huge sink hole named â??Gross Harasibâ?• a few kilometres from the camp. While one of the divers was filling a pony bottle for his buoyancy compensator from his main diving cylinder, he heard the noise of escaping air. On closer inspection he noticed that a crack had appeared on the neck of the pony bottle from where air was escaping. To make matters worse, on trying to remove the pony bottle from the main diving cylinder so that he could empty it, he found that the pressure release valve had seized up and that the pressure could not be released. The divers were non in the unenviable position of being in the confines of a small chamber, some 2 metres across, with a potential high pressure bomb that could go off at any moment, bringing the rubble slope above them crashing down. The still coupled cylinders were placed gingerly in a corner of the chamber and the divers beat a hasty retreat, waiting until all the air had escaped from the pony bottle before venturing back.

While the divers worked belon, a surface gravimetric survey was underway to estimate the extent of the cave where the divers could not venture. The results of this survey did not indicate the existence of a large cave system extending past where the divers had penetrated, but as the instrument was working through solid rock of up to 150 metres thick, the possibility of the system carrying on could not be overlooked. However, we found no grounds to substantiate the theory that the numerous known water filled caves in the area were interconnected as it has been established that the water in each cave system is at a different level. However, there may be a very slon percolation of water between some of them. The positive identification of identical cave dwelling aquatic fauna in two adjacent systems would also be a good indication as to the possibility of there having been a good connection in geological history, but such a discovery has not as yet been made.

Ironically, the day that John Irish, an entomologist from the Nindhoek Museum left the farm, one of the divers chanced to dive directly below the entrance to the chamber where the bottom was only about 35

metres deep. On the silt laden bottom, gently sloping towards the abyss, he spied some strange pure white shrimp like creatures moving around in the mud.. These specimens were sent to the University of Cape Town where it was ascertained that three new species of cave dwelling amphipods had been discovered, being totally sightless and adapted to the cave environment. The collection of these amphipods proved to be less simple than one might have expected. I tried to put my crayfish catching skills to good use but to no avail. Although blind and presumably unaccustomed to the presence of predators in their isolated environment, these creatures were amazingly agile. As a diver, clutching a collection bottle, approached a specimen lying on the fine silty bottom, the animal would become agitated and start to move away, displaying an amazingly advanced sensory adaptation to its environment of perpetual night. If the specimen was not captured immediately the diver would stir up a cloud of silt that would render further efforts in that area futile. He soon discovered, however, that the amphipods crawled better than they swam and therefore developed a technique of creating a small water turbulence with a hand movement that swept the unsuspecting creature into suspension above the silt where it could easily be introduced to its new home in the sampling bottle. As our main objective

has to explore and survey the lake, we did not have enough time to engage in a systematic zoological sampling exercise, leaving scope for a further scientific expedition in the future. We were disappointed that we found no evidence of the unique cave catfish Clarias cavernicola that frequent a nearby cave.

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To complement the underwater survey a bathymetric survey, using the inflatable boat and an echo sounder was performed and the bottom profile contoured. Unfortunately this could only be done from the lake surface so that the most interesting area beneath the Northern Overhang could not be covered in this way. One of the most interesting areas that we found underwater was near the beach where we found impressive submerged stalactites. As these calcite formations can only form in air, their presence was a good indication of previous water levels in the cave. These particular formations were found as deep as 15 metres belon the surface of the water. The bottom of the lake was strewn with broken formations, the pure white of the calcite contrasting radically with the dark silt laden background. The resulting effect was to give the impression of a strange and alien landscape in this crystal clear water.

Two members of the Swiss team performed the deepest dive of the expedition to a depth of 90 metres, using a carefully calculated mixture of helium oxygen and nitrogen. Each diver had three huge 18 litre cylinders weighing 120 kilograms and filled with a mixture of air and helium strapped to his back. This amazing plethora of diving equipment required to get the divers to the very core of the earth was checked and rechecked in nervous anticipation. Eventually they left the surface in an explosion of silver bubbles and quickly sunk to the bottom. Even at 90 metres below the surface we could see them clearly, looking like diminutive ants crawling along on the bottom, their powerful underwater lights illuminating the cave floor in deep blue. There was one thing that nobody complained about. . the visibility.

One of the highlights of the trip for me was a 81 metre dive to try to ascertain the extent of the elusive Northern Overhang. As he had built up slowly to this depth the effects of nitrogen narcosis were becoming minimal and we therefore opted to use normal compressed air as the gas mixture used by the Swiss divers for their 90 metre dive would have extended the time spent on decompression considerably. At 81 metres I experienced a feeling of isolation mixed with the euphoric sensation of nitrogen under pressure. I was now 140 metres below ground level, equivalent to the height of tro tall office buildings stacked one on top of the other, in a place never seen before by human eyes.

Our pure white life line snaked reassuringly anay towards the surface . . . our one link with safety. Incredibly, the submerged mercury vapour light, some 200 metres away, mas still visible, be it appearing only as a pin prick of dark blue light, having travelled through such a vast expanse of water. Could I be exaggerating if I were to estimate the visibility to be at least 250 metres? If it were possible to have the sun shine on to the surface of this lake the sight would be absolutely amazing, but it is in fact this very lack of sunlight that inhibits the growth of algae and keeps the water so clear.

I looked up from the base of a huge silt festooned boulder where I was looking for any form of life to see Dave perched cheekily upon the boulder diligently scribbling on his note slate. To the north the cave carried on as if in defiance of our puny efforts, continuing under the overhang, a tempting sight in spite of the fact that the distance from roof to floor was diminishing quickly. My decompression computer was telling me that it was time to leave the bottom, but the scene was so totally amazing that I was sorely tempted to stay a few minutes longer to savour the sensation. Common sense prevailed however and I signaled to Dave to start the long ascent to the first decompression stop. As the standard decompression tables are based on dives at sea level, this dive was equivalent to a sea level dive to 101 metres and even a few more minutes spent at the bottom would carry the penalty of an extended time spent on the decompression line. In spite of the depth of this particular dive, we had only achieved a horizontal penetration of 96 metres due to the steep slope of the roof in this area.

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It was only on reading a book on cave diving by British cave diver, Rob Palmer, after my return home that I discovered that the British depth record for cave diving on compressed air, set at 75 metres in the Big Creek Blue Hole in the Bahamas in 1984, had been unknowingly exceeded by us on this dive.

The two questions asked of me most frequently about the expedition are, â?• Has it fun?â?• and â??Was it a success?â?• To the first question I must confess that â??funâ?• is probably a misleading description of my stay on Harasib farm. It was very hard work with some working days stretching to 16 hours non stop. In addition, with such a responsibility on my shoulders, it was not easy to relax. On the other hand the expedition was totally successful with all the objectives having been accomplished and most important no accidents having occurred. The merging of tro specialised disciplines, that of vertical spelaeology and deep diving was done to obvious advantage and I, for one, benefitted tremendously from the experience of leading such a diving team. Furthermore, if the Guinness Book of Records is anything to go by, we have established a nen world record for an underground lake. The Lost Lake of Tennessee is given as 1,8 hectares and our Dragonâ??s Breath survey indicated a lake of 1,9 hectares . . . close, but nonetheless a record.

As far as the future of Dragonâ??s Breath is concerned, we have established a good friend in farmer Leon Pretorius who is fully aware of the dangers of allowing inexperienced people into his cave. Maybe one day he will open the cave to tourists and again the echo of excited voices will reverberate from the very heart of this subterranean world. In the meantime the valuable water will be pumped up to irrigate his dry and dusty land but always with the conservation of the cave in mind.

â??I am forever walking upon these shores
Betwixt the sand and the foam The high tide will erase my footprints
And the wind will blow away the foam But the sea and the shore remain. . .
Forever.â?•
From Sand and Foam by Kahlil Gibran).

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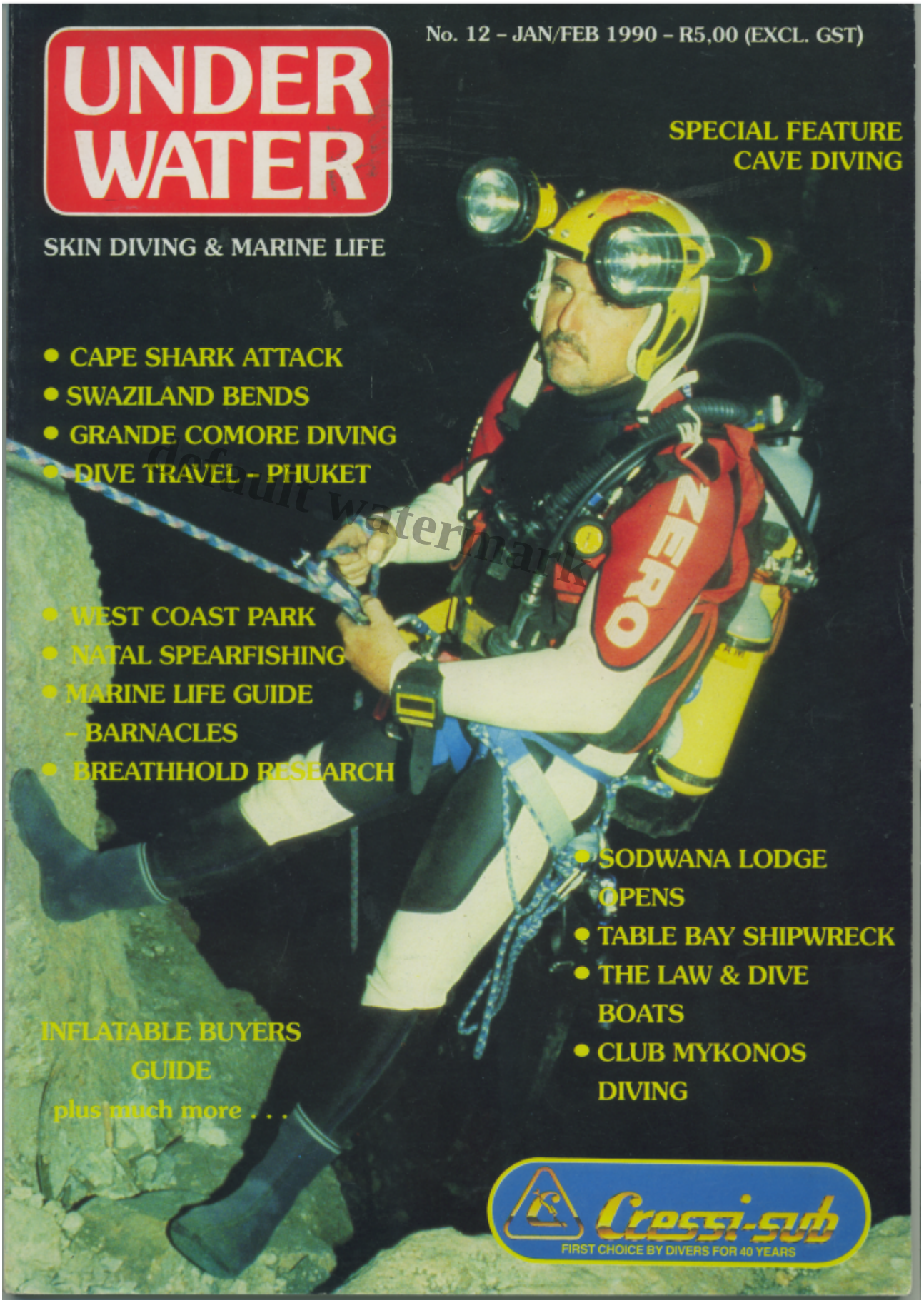
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Discovering the Drago

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Dragon's Breath – the sinkhole discovered and explored recently in SWA-Namibi probably the major undertaking in which divers have been involved in many n Divers, spelaeologists and scientists combined to make a comprehensive explora the underground lake. Above are some of the team. See page 42.

By Charles Maxwell
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