

KUUR

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LÀ VENTA
ESPLORAZIONI GEOGRAFICHE

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Tullio Bernabei

Despite friends departing, the years passing, economic and bureaucratic ups and downs, ever more complicated lives (only superficially simplified by innovations), the La Venta Association presses ahead, accompanied by KUR, our record of what we've been doing.

New faces and forces engage with the group, driving it forward, mixing with the "old hands" and making progress, a little at a time, along that strategic path marked out many years ago now, and which still makes sense to present days. Indeed, it makes even more sense as time goes on: it is the path of all-encompassing exploration, of an organisation dedicated to pursuing curiosity, to telling all sorts of stories, to dreaming new dreams that can be got real, on condition that you give it your all. And at the same time it is the path that leads towards respect for extreme environments, now a *sine qua non* of all of our trips, and for the people that we meet along the way – something that is even more important than ever, given the times in which we are living.

Whether we're talking about Iran, Mexico, Chile, Iceland or the Philippines, as we do in this issue, our approach always aims to remain consistent, over the short and longer terms: minimal impact, sharing everything with the local people, contributing to the speleological knowledge of the area, documenting everything at the highest level. In terms of our impact in delicate places, in Chiapas we adopted the same conduct we had applied to the fragile Venezuelan tepuis: after more than four days spent underground, our solid human waste exited with us. This is a strong message – one that we, above all, have a responsibility to communicate.

In this issue of KUR, we recount our customary tour of the planet, focusing on a number of projects that have been ongoing for years or are currently in the initial stages. A great deal of space is given over to salt, or more precisely to the mountains of salt inside of which there are strange caves that are both marvellous and in



Salt speleothems in a cave in the Atacama desert, Chile

Good times at the camp on the Parau massif, Iran





The Cherilus agnellivanniorum scorpion, a newly discovered species, collected for the first time in the Puerto Princesa Underground River, Philippines

many ways fleeting. Not as ephemeral as the ones you find in the ice, of course, but nevertheless of “reduced” lifespan with respect to those made of limestone or, even more so, quartzite. Jo de Waele gives us a general introduction to salt karst, and then goes on to illustrate, together with Marco Vattano and Claudio Pastore, the discoveries made in the Atacama desert, in Chile. The salt caves of Iran are also subject to an ongoing structured project, which is surely destined to be developed yet further. These caves are covered here through a range of contributions from Luca Imperio, Marco Mecchia, Leonardo Piccini and Gaetano Boldrini. Again in Iran, but this time on the limestone mountains of Parau, on the border with Iraq, there is a speleological “paradise” where we have already carried out three expeditions. A summary is given here by Gianluca Selleri and Alfredo Brunetti. And just to ensure that our beloved ice also makes an appearance, Tommaso Santagata and Paolo Testa describe a survey they conducted in Iceland.

In terms of what is happening on the other side of the world, in the Puerto Princesa Underground River in Palawan, in the Philippines, we have often provided updates in KUR, and we have even recently published an entire book on the subject. What was missing, though, was a biospeleological summary, which is now offered here by Paolo Agnelli and Stefano Vanni. This is important for us, but crucial also for those who manage the tourist aspects of the cave, who have worked hard to follow our recommendations to limit the human impact on what is an extremely delicate ecosystem. The Mexican state of Chiapas is featured through my own story of our return to where it all began for us. Our latest expedition, including a new descent into the Rio la Venta canyon, yielded unexpected opportunities for exploration. In the same period we also completed the crossing of the great Cueva del Rio la Venta with a group of new members, but it was just the same as the first time, like being part of a family... as the indomitable Cesare Raumer explains. This long descent caused some serious disease, fortunately not permanent, and so we asked Giuseppe Giovine to help us reach a better understanding of histoplasmosis, with a view to taking more effective preventative measures in the future.

Returning to base camp after five days on the glacier, Iceland



Descending towards Rio La Venta, Mexico



SUMMARY

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LA VENTA

ESPLORAZIONI GEOGRAFICHE

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“HELL’S BELLS SPELEO AWARD 2019”

The ceremony for the “Hell’s Bells Speleo Award 2019” was held on February 26th 2019, at the Miela Bonaventura Theatre, as part of the Alpi Giulie Film Festival, staged by Monte Analogo. The competition was established in 2012 and thanks to the partnership between the Commissione Grotte Eugenio Boegan and the Società Alpina delle Giulie. The aim of the contest is to reward the year’s finest examples of documentary and reportage on speleology.

La Venta received the Golden Bell award for its video entitled “Palawan – River of Mystery”, a co-production with Arte France and Alexis Barbier-Bouvet’s One Planet. The prize was collected by Antonio De Vivo (who led the Palawan expedition) and by Francesco Sauro, who stated how that Palawan trip had been an all-encompassing scientific exploration, involving geologists, biologists, anthropologists and many other professionals.



Other prizes awarded during the evening included:

- Special mention for the video “Lights in the Dark: History and Explorations of the Remeron Cave”, produced by the Gruppo Speleologico Prealpino, directed by Claudia Crema, who collected the award.

- Silver Bell for the video “La Magára, the Secret Collector of Sapwood”, directed by Pino Antonini, who collected the prize, and Vito Buongiorno, Gruppo Speleologico Marchigiano.

With the Golden Bell, the Puerto Princesa Underground River in Palawan and La Venta together reached another significant milestone for a project on which the association has been working for more than 20 years.

GIOVANNI BADINO PUBLISHES STILL

It has been a little over two years since Giovanni Badino passed away. While we miss him terribly, his research continues to bear fruit in the form of fascinating articles, albeit necessarily written by his collaborators. This is the case of a recent article – put together by co-author Roberto Chignola – that appeared in the prestigious journal *Frontiers in Earth Science*. The article describes the results of studies conducted by the two authors on the anemometry of the karst complex of Mount Corchia and is entitled: “Fluctuations of Atmospheric Pressure and the Sound of Underground Karst Systems: The Antro del Corchia Case (Apuane Alps, Italy)”.

frontiers
in Earth Science

BRIEF RESEARCH REPORT
published: 11 June 2019
doi: 10.3389/feart.2019.00147

Fluctuations of Atmospheric Pressure and the Sound of Underground Karst Systems: The Antro del Corchia Case (Apuane Alps, Italy)

Giovanni Badino^{1*} and Roberto Chignola^{2*}

¹ Department of Physics, University of Turin, Turin, Italy, ² Department of Biotechnology, University of Verona, Verona, Italy

This was a highly technical piece of research that, taking a rigorous approach to the physics and mathematics of the case, analysed the recordings of the air currents of some of the entrances to this large underground complex. The monitoring, carried out using instrumentation developed by Giovanni over many years, shows barometric fluctuations that are manifested as a sort of very low-frequency “sound” that can be rendered audible if listened to in compressed form. It amounts to a sort of “voice” of the cave that can potentially provide indications on its internal structure and its real dimensions, of which the known part – which today covers more than 65 km – certainly constitutes just a small portion.

This is a highly original, cutting-edge piece of cave research. It represents very much the type of scientific challenge that Giovanni liked to take on, and which today astonishes us through its revelation of the myriad facets that the subterranean world offers up. The article can be downloaded from the following web address: <https://www.frontiersin.org/articles/10.3389/feart.2019.00147/full>

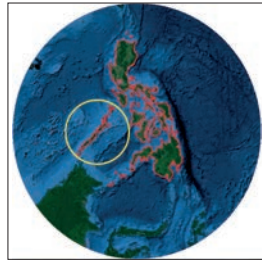
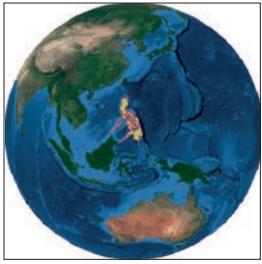


Ascent to the Last Cave, Khoorab diapir, Iran

PALAWAN

Philippines





LIFE IN THE DARK

Paolo Agnelli, Stefano Vanni

Zoologists are an unusual bunch, forever prepared to put themselves on the line by setting off to explore the most unusual of environments, in search of the natural mechanisms that govern those places and the creatures that populate them. When coming across bona fide explorers, who push themselves even harder, to the very limits of research, and who invite them to participate in a biospeleology expedition to one of the most beautiful caves in the world, the zoologists are not likely to demur. This is what happened to us when we accepted the invitation to share a new Philippine adventure with the speleologists of the La Venta Association, to study the extraordinary biological environment of the Puerto Princesa Underground River (PPUR) Cave on the island of Palawan.

The limited knowledge of the fauna in this cave came from a pair of expeditions organised between 1990 and 2000. The urgent need to learn more about the fauna that populates the cave – recently recognised by UNESCO as a World Heritage Site – was due to the fact that the number of tourists visiting it has now reached the

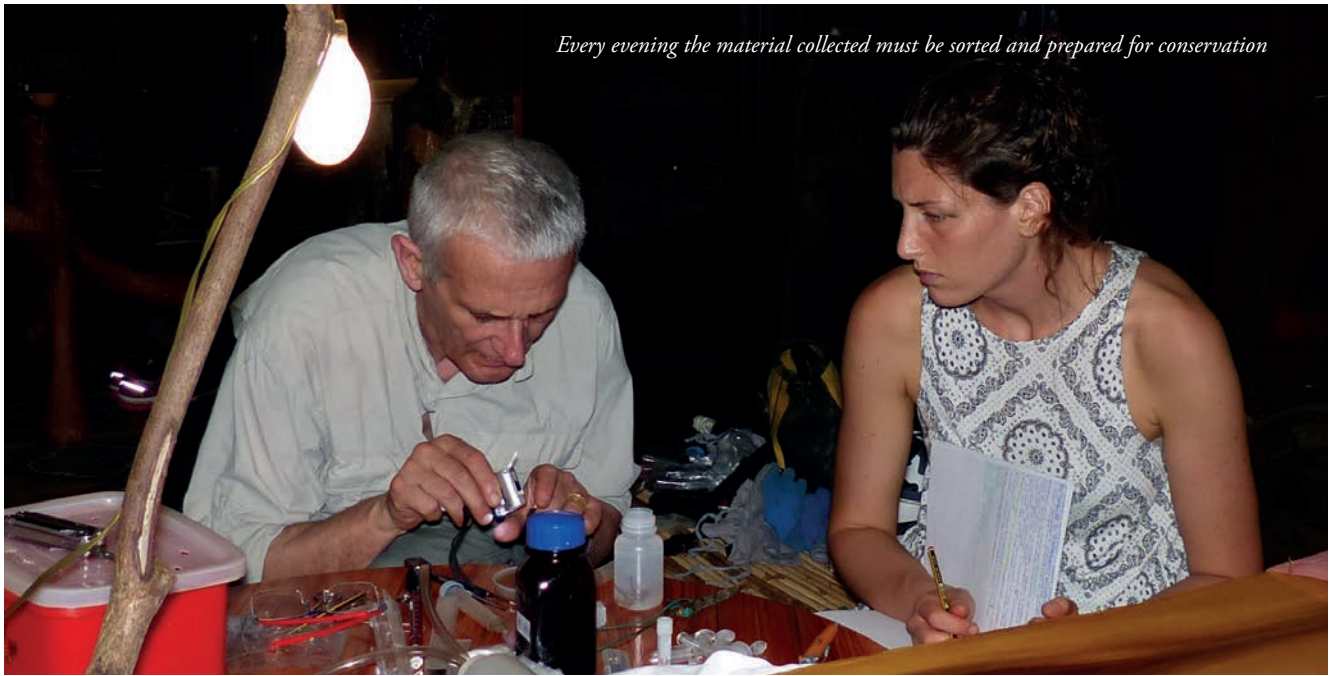
very substantial level of 1000 people a day! It was therefore important to evaluate the impact on the fauna of such an imposing anthropic presence before it was too late.

Based on the results of the previous biological missions and on an examination of the photographs taken during the geological and speleological surveys, we knew that the place held many surprises in store. We had to wrestle with an enormous cave, playing host to an array of ecosystems that are very diverse because not only is there a large underground river, but also extensive, isolated fossil branches, as well as a second upstream entrance that puts the cave in contact with a beautiful rainforest. We could, then, envisage the presence of a plethora of different types of fauna.

The task we set ourselves was to discover which species live in the cave, what ecological relationships bind them together, and which species are most under threat from the use of the environment by tourists. With a view to providing advice on appropriate tourist management, it was last but not least important for us to identify, out of



Gallery of the Gaia Branch



the most sensitive species, those that are easy to monitor, in order to use them as reliable bioindicators of tourist pressure.

The greatest difficulty faced by zoologists in sites such as this is being able to access to the right sampling instrumentation at the right time. They have to be ready to whip out a light net to capture a bat and examine the species; a grabber to get hold of a poisonous snake; a long, sturdy pair of pincers to capture a surly tarantula; and small, soft pincers to collect delicate insects, scorpions, millipedes, scolopendrae, little spiders and crustaceans. Without forgetting a more robust net to immerse into the water to catch crabs, prawns and fish. You then need myriad different containers to allow you to conserve some of the samples you have caught so that you can examine them and then study them properly once you're back at base camp.

Our adventure began in November 2016 with a short mission, the purpose of which was principally to make contact with the personnel of the PPUR National Park, obtain the study permits and get a handle on the difficulties and problems that we may encounter when studying such an extensive, complex environment. On the basis of this initial survey we had identified thirty or so different zoological groups, many of which we had defined down to the species level, and the appetising presen-

ce of at least nine species previously unknown to science! It was against this backdrop that we returned to Palawan in April 2017, better organised than before and with increased enthusiasm for what was to be a longer, more targeted mission. This time we had a richer team, and compared to the first expedition we had more time to study the fauna of the PPUR Cave and also that of the other caves that are located within the park, with the purpose of gleaning a better understanding of the biology of its karst complex.

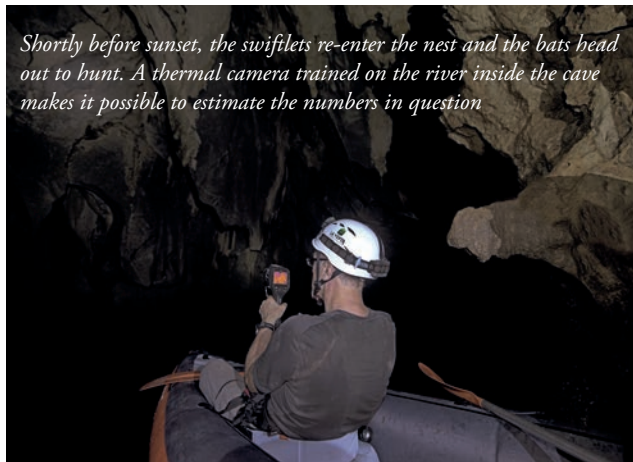
We spent entire days in the cave, assisted by the speleologists of La Venta and of the local caving groups Gaia Exploring Club and La Karst, followed by many evenings classifying and sorting out the material collected. It was laborious to say the least, but the results were not slow in coming and we realised immediately that the biodiversity of the PPUR Cave is quite extraordinary. Today, having examined the collected samples in our laboratories we can confirm that richness. The cave plays host to a full 17 species belonging to each of the classes of vertebrates: 4 fish, 1 amphibian, 3 reptiles, 2 birds, 7 mammals. For invertebrates, 11 different classes have been identified, amounting at the moment to a highly impressive 84 different taxonomic entities! This means that as the work of classification goes on, the number of different species will be at least 84. But that's not all. Thus far, we have discovered at least 18 new species previously unknown to science! In other words, our hard work has really paid off!

The study of animal groups that are the most difficult to determine requires the intervention of specialist zoologists, and often, for certain groups, these experts are very thin on the ground. To this end, another 31 specialists collaborate with us, from 15 different institutions in 10 different countries. Half of these specialists are associated with our Museum of Natural History at the University of Florence. Thanks to the work of this scientific community, it will be possible to classify every creature that lives in the cave and to describe the new species. It is a complex task that will necessarily take time to complete.



Tarantula of the genus Orphnaecus, still under investigation. It is probably a newly discovered species

In order to work out the most appropriate conservation plans, it is necessary to get to know the animals that populate the cave and the strict ecological relationships that bind them together. We know that here, as in many



Shortly before sunset, the swiftlets re-enter the nest and the bats head out to hunt. A thermal camera trained on the river inside the cave makes it possible to estimate the numbers in question

other underground environments, the base of the food chain is constituted by the guano that swiftlets and bats release during their time in the cave. We calculated that the bats alone produce at least 30 kg of guano every day! This relevant quantity of organic substances provides nourishment for a large number of small detritivores, which in turn serve as food for other, larger animals. The bats and swiftlets themselves are preyed upon by large tarantulas, centipedes and snakes. In short, the presence of swallows and bats is the basis of life for a cave like this, and so we decided to count them and utilise these data in the future for impact analyses. For the count, we used a thermal camera, which allowed us to film the evening flow of the bats leaving the cave and the swiftlets coming in. The numbers are really high, and even taking

account of the inevitable margin of error we can estimate that there are around 135,000 bats and 275,000 swiftlets!

It's amazing to think that this many creatures are prepared to take on the challenge, twice a day, of such a trip into the darkness! Bats have developed an ultrasound sonar that allows them to "see" in the dark with incredible precision. The true challenge, though, is that faced by the swiftlets. Given that they are diurnal birds, used to flying around in the sky in large open spaces, and that their sonar takes the form of simple twittering, what they do here is utterly breathtaking. They make their way deep into the cave following the river, for up to 5 kilometres, to reach the specific point where they make their nests, perhaps concealed in some narrow cranny. It takes immense effort, which must have had an important selective premium over the course of their evolution. Indeed, the ability to live in a dark environment that is inaccessible to other animals reduces the predatory pressure on adults, eggs and nestlings, and it also eliminates the competition with other birds for the vital spaces needed for nesting and resting.

From our repeated nocturnal observations with the thermal camera, a behaviour emerged that implied additional advantages and that would merit further investigation. After their evening return to the cave, many birds continue to fly around the large galleries and chambers, for many hours, even if the nest has been reached. There can only be one reasonable and plausible explanation: the swiftlets continue to hunt insects in flight, taking advantage both of the abundant presence of their prey in the cave and above all of the possibility to use their sonar. In fact, sonar functions only when there is the opportunity for it to bounce off a nearby obstacle, otherwi-



*An example of a troglomorphic species, this tarantula wolf spider (*Heteropoda simonealmannae*) is a new species discovered during our research*

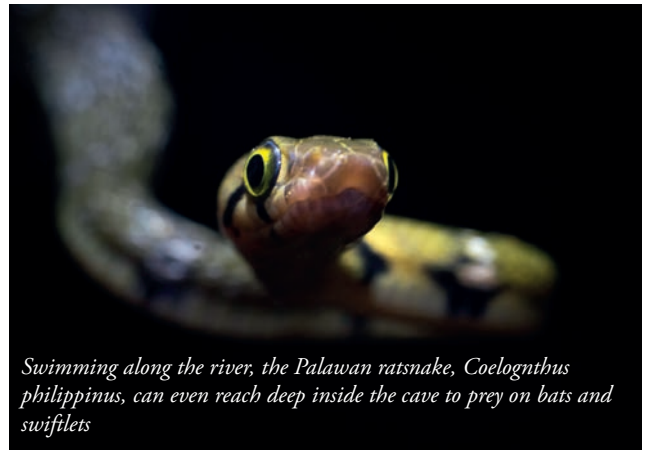
se the sound emitted fades away before it can rebound. Externally, once darkness falls the swiftlets have to interrupt their “unconcealed” hunting, but in the relatively reduced spaces of a cave they can continue to search for food by orienting themselves with their sonar. This supplementary source of food constitutes a real advantage, especially in the challenging reproductive period! Our work will continue for many months yet in order to



*The diadem leaf-nosed bat, *Hipposideros diadema*, is the largest of the seven species of chiropters that populate the cave. They group into large colonies with thousands of members*

reach the best classification of the rarest animals, about which science knows very little, but an important result has already been achieved. To this end, we left the management of the Park of the Puerto Princesa Underground River a set of precise instructions on the management of the tourist flows within the caves that we studied. For the PPUR Cave, which is the most important, any effort to conserve the extraordinary animal biodiversity there must take account of the following points:

- The cave must be closed to visitors from two hours before sunset until two hours after sunrise.
- Visitors must always remain on the bancas (boats used for the visits) without ever setting foot on the ground.
- Excursions along the river should extend no further than the God’s Highway, in line with the fossil remains of Dugongo. Any further spatial extension of the anthropic pressure would force the chiropters to waste too much energy to reach the calmer shelters.
- Light and noise generated by the visiting tourists are the main sources of disturbance for the animals. It is important to reduce these levels substantially.
- The floodlight should be manoeuvred, discreetly, only by the guide piloting the boat; visitors should not use any other light sources.
- The guide should ensure that the visitors behave responsibly and respectfully, not raising their voices. Information should be provided to visitors exclusively



*Swimming along the river, the Palawan ratsnake, *Coelognathus philippinus*, can even reach deep inside the cave to prey on bats and swiftlets*

through an audioguide and headsets.

- During the months of spring, particular care should be taken not to disturb the reproductive colonies of chiropters (mothers with their young) that are concentrated in the first section after the entrance.
- Every month, it is important to monitor the number of bats in the first section of the cave, in the morning, simply by counting them by eye, so that seasonal variations can be highlighted along with any changes in the populations in the “tourist” section. This monitoring will constitute a useful bioindicator of anthropic pressure.

In this way it will be possible to manage the biodiversity of this beautiful cave and to allow visitors to get the most out of the experience of being there, without impacting excessively on the extraordinary, fragile ecosystems to which it plays host.



*The large *Thereuopoda longicornis*, a ferocious, aggressive centipede that actively hunts its prey, using its potent venom to kill*

CAVES OF SALT

Jo De Waele

When we talk about caves, we tend to think straight away about the limestone version, and what comes to mind are stalactites and stalagmites, underground rivers and beautiful phreatic tunnels. We know, however, that there are also caves made of other types of carbonate rocks, such as dolostones (although these caves are not that different from their limestone counterparts). There are even caves made of evaporite rocks, such as gypsum, of which there are numerous examples in Italy. Caves that develop in gypsum are very different, with a rock that is often macrocrystalline, featuring minimal concretions, large amounts of clay and unusual shapes, such as ceiling channels. In addition, we often hear about volcanic caves, but they have nothing to do with the typical process of cave formation, which is called karstification. So-called lava tubes are formed during eruptions, and often they are just underground flow channels for fluid lava. In recent years, the spotlight has been cast on particular “exotic” caves formed in the quartzites, such as those – often very large – that are found in the tepuis of Venezuela, generated due to the effectiveness of the dissolution process, even though quartz is a mineral that is only very slightly soluble. In this case, the dissolution takes away the cement, freeing up the quartz granules, which are then dragged away by the rivers through erosion.

But which rock is the most soluble of all? It is, in fact, the one we use in our dishes to bring out their flavour: salt. Rock salt is so soluble that it is actually difficult to find it on the surface. As such, you have to go to areas where rain is practically absent, or at least below 200 mm per year; in other words, into areas defined as deserts. Rock salt is a rock that is deposited through chemical precipitation by a solution (a sea, a lagoon), in conditions in which most of the water evaporates. Rock salt is, then, part of that class of rocks called “evaporites”, together with gypsum and others.

The most well-known areas for outcrops of rock salt are the Zagros mountains, in Iran. The salt here, dating from the Precambrian-Cambrian period (deposited

more than 550 million years ago), rose up to the surface through diapiric phenomena, sometimes perforating the sedimentary rocks above. These salt domes, measuring up to dozens of square kilometres, are scattered throughout the Persian Gulf and in the anticlinal ridges of the Zagros mountains. This is the geographical area that is richest in salt caves, and many of these diapirs have been subject to speleological research for more than 20 years (conducted above all by Czech cavers).

The largest salt cave, however, is located in an isolated diapir on the slopes of the Dead Sea, in Israel: Mount Sedom, formed by salt during the Pliocene epoch (deposited around 4 million years ago). Malham Cave, which extends for more than 11 km, has recently been the subject of new explorations by Israeli and Bulgarian speleologists. It really is surprising that a mountain of such modest dimensions (12 x 2 km) contains a cave that is quite so long and complex.

Extensive outcrops of rock salt, this time dating from the Oligo-Miocene epoch (deposited around 20 million years ago), have also been found in Chile, near the village of San Pedro de Atacama. La Cordillera de la Sal is a ridge that is more than 80 km long and up to 8 km wide, which contains, alongside clay and marl, large deposits of halite (rock salt). For a little over 20 years, speleological explorations carried out first by French, and later American teams (and over the past 15 years by Italian teams representing the Trieste-based “Eugenio Boegan” Caving Commission), have led to the discovery of more than 15 km of underground tunnels. The systematic study of this karst area is far from completion, and other discoveries are sure to be made. On the 2018 expedition, La Venta discovered, surveyed and documented another 3 km of caves in remote areas of the Cordillera, and more than 50 entrances to probable caves, identified through the analysis of Pleiades satellite photographs (thanks to an ESA Earth Observation Data Project), which will be pored over in the future... to say nothing of the scientific research, which is producing a whole host of significant surprises!



Traversing a salt lake in Lar Province (southern Iran)

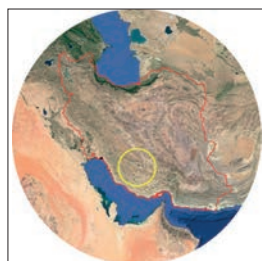
SHIRAZ

Iran



LA VENTA
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Exit from a gorge of the Minak river case



IRAN, FROM THE SURVEYS IN NORTHERN PARAU TO THE FIRST EXPLORATION IN THE SALT CAVES

Luca Imperio

The first La Venta expedition to Iran was carried out in August 2016, thanks to Giuseppe Spitaleri (known to everyone as “Peppe Spit”) who established contacts with the Iranian speleologists Joussef Sornina and Yones Shariatmadari. Having left Italy as a very small group, we met up with them and with other local cavers, and made our way to the Parau massif to carry out an initial survey. The main objective on that occasion was to leverage the contacts with the locals and to get a handle on the potential of the area; then, if possible, to descend into the shaft that the Iranian speleologists were tackling.

On reaching in Tehran in the middle of the night, without understanding even a word of Farsi we communicated through gestures until the arrival of Yones, who speaks perfect English – from that moment on, everything became a lot easier. Having overcome the inevitable wariness resulting from the differences in language and customs, we began to bond with the group of Iranians and with the various sector chiefs. There, everyone is given a set of tasks to do, and everything runs like clockwork. Every evening, we held meetings to discuss the day’s events and to organise the coming day. Escorted by two soldiers and assisted on the transport front by four mules, we reached an altitude of 3200 m, on the Parau massif, burnt by the sun and dying of

thirst. We understood immediately why they are always fully dressed – to protect themselves from the sun, which is utterly relentless there.

The early days were all about reciprocal study, to test out everyone’s skills, then after the descent into the cave everything became easier: speleology draws you together, in the cave we all speak the same language. After the first drop, we wandered around the Parau massif in search of caves. The potential figure was incredible, with numerous entrances found and marked with GPS. The mountain is the source for a single spring, which creates the river that then brings water to Kermansha; up there, though, the only water was that which we had brought ourselves, or the snow that we could melt. From Tehran, they had brought a generator that, while not compact or easy to handle, was extraordinarily efficient, and every evening we all dined together, sitting in a circle to share food and stories, but also the pain in our hips – us four Italians were in agony, we were not used to sitting on the ground for long periods, so we were constantly moving around trying to get comfortable, and we did eventually manage to do so. It was during one of these dinners that we started talking about salt caves. Yones had taken part in the expedition that Czech speleologists had carried out in 2014, to the south of Shiraz, on the coast, whe-



Entrance to a shaft on the Deh-Kuyeh diapir

re some caves and resurgences had been explored in the past, but not systematically.

From that moment on, things became increasingly interesting, leading us to organise, two years later, the first survey aiming to understand something about the 61 diapirs discovered by the Faculty of Geology at the University of Shiraz. This was an entirely different area with respect to the mountains on the border with Iraqi Kurdistan. Here we came across immense, semi-desert valleys, interspersed with mountain chains that furrow the landscape longitudinally as if it were the sandy bed of a beach after the retreat of the ocean waves, and with large urban centres rich in history and tradition, inhabited by humble, amiable and extremely hospitable people.

With priceless assistance from Yones, we hired a bus and headed southwards to see three of these diapirs, in a necessarily superficial way, given the limited number of days set aside in the schedule. Heat, thirst and salt are what call the shots there: the first bakes you, the second forces you to press ahead with 3 kg of water in your backpack, and the third dries you right out. On certain days, we had to desist from moving during the hottest hours of the day because that would have been truly exhausting and, in addition to being dangerous, entirely unproductive.

Over a few, intense days we started to glean an initial understanding of these environments and we saw some sensational things, including massifs of salt emerging from the terrain and standing out against the sky, as a result of shaking off rocks and earth during their geological uplift; unfortunately, much of this detritus is now at the base of the shafts, blocking them and, in the process, frustrating our ambitions.

As we set about exploring, once we got past the first ten or so metres of unstable material we were at last in a position to rig up the salt, which was compact and clean. It was astounding, it looked like a glacier mill. The Multimonti screw-in anchors were perfect for the salt, you just have to watch out for the powder that comes out of the hole when you extract the drill – it's no fun at all if it gets into your eyes.

The whole summit of the dome is a continuous series of shafts, sinkholes and dips, but we found them all filled, and as such it was not possible for us to descend more than 10-20 metres. We did, though, find a couple of viable shafts: one around 60 metres deep, the other



Water source on the De-Kuyeh diapir

around 100 metres deep, a nice bell-shaped shaft, it too filled up with detritus at the bottom. After this initial experience, we started to come to the conclusion that the only way to enter the diapir was from below, from a source that, if we could make our way along it, would lead to the cave.

Over recent days, we had given precedence to a second idea, which was to find low-level entrances. We thus identified a resurgence composed of two branches: a gallery followed by a chamber with bats, and a low branch, practically a crawlway in the salt. We made our way along it for 70 metres, but having gone in without a suit on, we decided to go no further. Potentially, in the whole area there are around 60 or so explorable diapirs, so the possibility of finding something interesting was relatively high, we just needed to continue looking.



Teaching caving techniques to our Iranian friends

Even if on this first occasion we didn't find anything particularly fascinating, the experience was very positive. We deepened our relationships with the locals. The support given by the speleologists of Lar – a small city along the road that leads from Firuzabad to one of the areas – was essential. In return for their hospitality, during the trip from the first exploration zone of Deh-Kuyeh to the Konarsiah massif, when we stopped in the city to get supplies, we held a little caving course for the members of the Lar Speleological Group, who were certainly willing and able, but entirely lacking in technique.

Moreover, crucial for forging ahead with any other explorations in the future was our meeting with the chairman of the Iranian Speleological Federation, and with the "elite" of the Faculty of Geology and Hydrogeology at the University of Shiraz, during which we discussed a possible collaboration to study and learn more about the Iranian salt diapirs.

IRAN SALT CAVES 2018

Leonardo Piccini

A patch of blue sky up above illuminates the rocky edges of the shaft. Regardless of whether it's made of limestone, gypsum or quartzite: what counts is the blackness that opens up under the narrow terrace onto which I'm hanging, while my attention is entirely focused on finding a suitable place to anchor my rope. In general, you look for areas that jut out, which will keep the rope away from the rock and reduce the risk of it breaking. What I have in front of me, though, is not a wall of solid Apuan marble but an agglomeration of heterogenous, variegated blocks, held together by a friable sandy matrix. Here, the rock jutting out is a chunk that is about to detach itself and, as such, should be avoided at all costs.

I use my hammer to produce a number of silent knocks, beating on the wall in front of me; finally I hear higher pitch knock, meaning that the rock is sufficiently solid. In the end, I decide to drill into a block of reddish rock, perhaps marl, that is well-recessed: for someone like me, who prefers "aerial" anchors, this is a real heresy, but there's nothing better on offer here. Still not happy, I bang in another bolt slightly higher and I connect it to the first with a long tape, to which I then attach, using a carabiner, the rope coming out of the bag between my legs— there are way too many metres of darkness under my feet to attempt to descend with just one bolt, and a doubtful one at that.

I push myself off and descend slowly, checking that the geometry of the anchoring is as expected and that the rope is not going to rub on some rocky ledge. Another few metres and I find myself hanging into the dark: the shaft opens into an enormous space, with threatening blocks of stone looming over me. Trusting that the saline cement will hold, I descend thirty or so metres until I glimpse a zebra-striped wall of salt. Hmmm... nothing

like the compact limestone of Palawan or the hard quartzite of the Tepuis here – we are in the south of Iran, where the caves are formed mostly of salt. The problem is that here, on the Konarsiah diapir, the rock salt does not surface; on the contrary, it is covered by a thick blanket of detritus and can only be found after descending a few dozen metres of unstable walls. Under that covering of detritus, though, the karstification must be intense and widespread, as evinced by the many absorption and collapse dolines that stud the upper areas of this diapir and others that we have seen quickly over recent days.

The first time I saw Iran was in March 1989, from the window of a Pakistan Airlines Boeing 747 bound for Karachi, where another flight would then take me to Manila, in the Philippines. I was travelling alone, and I was due to meet up with a group of friends (some of whom would go on to found the association La Venta) on the island of Samar for a caving expedition. I recall that I had been fascinated by that desert land that scrolled by slowly before my eyes, where long ridges burned by the sun alternated with plains of sand, with just the odd dark patch of cultivation, where evidently there was some water to be found.

I knew something about the country, having studied its geology in books – the Mount Zagros chain is one of the areas that comes up most often in geomorphology handbooks. Some of these ridges seemed to be of limestone, and the idea that they could play host to karstification and large underground systems inevitably emerged in my mind, but back then I was focused on the moist tropical caves that were awaiting me.

For almost thirty years this remained my only experience of that magnetic country, overflowing with history. In the meantime, caving managed to get a foothold there,



Rigging the initial shaft of a large sinkhole in the Konarsiah diapir



Corrosion shapes sculpted by the rare rains that affect these parts of Iran

too, thanks to the fact that it is one of the most limestone-rich areas in the world. But those mountains are not made of calcium carbonate alone. Amongst geologists, Iran is famous above all for its almost 200 salt domes. These great “bubbles” of rock salt were driven upwards from a depth of more than 3 km, through faults and cracks, by the overburden pressure of the rocks above. As we know, salt is the most karstifiable rock of them all. It is so soluble that it can only survive the act of surfacing if it does so in the driest areas on the planet. Iran is one of these few areas, and it is no accident that it is home to some of the longest salt caves in the world (along with the Dead Sea area and the Atacama zone, in Chile). Czech cavers, together with Iranian researchers, had already explored some of these diapirs, particularly in the coastal zone that faces the Strait of Hormuz, but many areas remained wholly or partially unexplored. Today, with the geographical systems offered by the web, it is not difficult to start “investigating” a part of the world while sitting comfortably at your desk. And that’s exactly what we did, too, identifying zones awash with large depressions, blind valleys and shafts, like the one we are exploring.

My second direct experience with Iran was rather different. First off, a bad-tempered servant of the immigration office, clearly irritated and determined to move with all the bureaucratic sloth he could muster, eventually stamped our tourist visas. Then, we sat in an empty waiting room – on chairs sadistically designed to prevent you from ever feeling at ease – for several hours, waiting for our friend Yones, who would guide and accompany us over the coming days as we carried out a preliminary survey mission in the diapirs that we had selected using the satellite images. The only distraction was the girl from the bureau de change, with her pretty, heavily made-up face, who smiled as she passed us a bundle of banknotes at least 10 cm high, in exchange for a few hundred euros.

A few hours later, Yones finally comes to get us. Same old situation, which we have been through many times before, though this time it’s on a smaller scale, given that there are just six of us. A line of chests and heavy bags,

piled on unstable trolleys, pushed along cracked roads outside the airport and then at last loaded onto a mini-bus that has surely seen better days. And then yet more miles, through the night, in an unknown land, dozing on painful seats, with the sequence of rapid visual flashes, images of life, stolen in the blink of an eye along roads and through villages that pass by out of the windows, between yawns.

We arrive mid-morning in Firuzabad, still half-asleep. The city is already abuzz, but a sense of orderliness just about prevails. The streets are clean, but the tangled electrical wires that hang from the lampposts make it all too clear that we are far away from our old, well-organised but rather tedious continent of Europe. We only have a few days here, so there’s no time to lose. Having unloaded our luggage into the welcoming rooms of the hotel, Yones proposes right away our first taste of the world of salt. Just a few miles from the south of the city there lies the diapir of Konarsiah – one of the largest in the whole country. After crossing a cultivated plain, our bus begins to limp its way along a dusty dirt road, towards high ground with sparse vegetation that is, however, sufficient to allow for nomadic pastoralism. As we reach the plateau at the top, already at the edge of the road, we note various dips and several dolines, but there is no trace of salt. This is not what we have been expecting. Wandering around on foot up to the mouth of a deep shaft, which Yones tells us he has been down, we realise that the salt here is covered by a thick blanket of detritus, several metres thick, constituted



A deep collapse shaft in the plateau of the Konarsiah diapir

by heterogeneous blocks of different rocks, immersed in an ochre-coloured sand. This is the overburden that the dome drags along during its tectonic resurgence, detached from the rocks above. This explains the vegetation, which otherwise could not survive on the sand. The next day, after a rapid procurement of provisions, we move to the area close to the town of Lar, around 200 km to the south-east of Firuzabad, where we have identified an interesting diapir with a name that is difficult to remember: Deh-Kuyeh. Here we are welcomed by a number of cavers from the Lar group. They are nice, friendly people, and thanks to their help we manage to reach the planned site of the camp, not far from an old rock salt quarry. The site is comfortable. We pitch our tents on



The arid landscape of the Deb-Kuyeh diapir at sunset

the flat section of an alluvial fan, at the outlet of a large canal. We take advantage of the remaining daylight for a quick survey of a place close to the camp, where we have already identified what seem to be deep collapse dolines based on the satellite images.

Along the old road, before the abandoned quarry, we also find a water source. The water emerges from a small, impassable cavity at the foot of a steep slope, forming a cascade adorned with a white outflow of crystallised salt. We cautiously have a taste. The water is ridiculously salty, much more so than seawater. In fact, the water is practically saturated, with around 350 g of salt per litre. Estimating a flow of around 1 litre per second, this means that around 30 tonnes of salt come out per day, which is equivalent to a large truckload. Beyond the source, we continue climbing up the valley, making our way into a landscape that becomes increasingly ghostly and alien. It seems like a classic backdrop for a science fiction film, like some lifeless planet in another galaxy, modelled by titanic forces of nature. The salt seems to be streaked with grey, red and greenish veins, and sculpted by the rare rains into serrated, sharp crests; similar shapes, in fact, to limestone, but which are probably formed in just a few days of rain, rather than in thousands of years. On reaching a plateau, around 200 m higher up with respect to the valley bed, we finally come across the first dips and a number of shafts, but even here they have that same covering of detritus, forcing us to realise straight away that it will not be easy to anchor our thin ropes. However, that's enough for our first foray, and so we return to camp for dinner.

Over the next few days we make our way into a number of shafts, deploying all manner of creative solutions in order to rig them, but unfortunately the results are not very impressive. Even an interesting salt cylinder, more than 50 metres deep, ends up at the bottom just being covered by detritus that has tumbled down there from the entrance. It seems clear that the depressions outside are simply the equivalent of the detritus that has fallen inside the shafts, which the seeping water excavates in the salt below; the chance of finding cavities of any real size now seems rather slim, to say the least. We also conduct a survey in the upper zone of the diapir, walking

for hours under a relentless sun, forced to keep our faces covered for fear of getting badly burned. The heat and dryness are merciless, and we discover that two litres of water each are not enough to avoid dehydration. Even up here, there's not much to report. Lots of dolines, some blind valleys, but also plenty of detritus, everywhere. Even the deepest shafts seem without exception to be full of rocks and sand that have fallen in from above. Perhaps, by digging, the odd cleft to the side may enable us to descend a little, but our expectations are not such as to convince us to move the camp up here.

After three days, with three shafts investigated and surveyed, lots of photos taken, reconnaissance missions carried out with the drone, a load of video shot and quite a few disappointments, we decide to head back to the Firuzabad area, where there are three relatively attractive domes, one of which has already been investigated by the Czech speleologists, who found a number of caves stretching horizontally for more than 100 metres. Following a survey in the southern sector of Konarsiah, the



Descent into a salt pit of the Deb-Kuyeh diapir

dome that we visited briefly on the first day, we agree to concentrate our efforts on what seems to be the largest sinkhole out of those we have identified. The large entrance opens up at the bottom of a deep gorge excavated out of the ubiquitous detritus – here more than 30-40 metres thick – that provides drainage for a blind valley. The hope is that the water has been able to carve out caves that are sufficiently large as to not be completely full of detritus. The answer awaits us now at the bottom



Salt incrustations at the outlet of the hypersaline spring in the Konarsiah diapir

of this great shaft that we are in the process of rigging. At the end of the 70-metre rope I need to split it into sections. Here, luckily, there is a compact, shiny wall of salt, where the large screw bolts attach securely in the drill holes. One such bolt is sufficient, and after another 20 metres of descent I finally land on a floor of detritus strewn with large blocks that have fallen from above. I move to one side, sheltering from any other rocks that may be falling, and I can finally give the go-ahead to my friends, who are soon with me. Before us we can glimpse a gallery that seems to continue, but before beginning our exploration I wait until everyone has come down: Luca, Beppe and, crucially, Yones who, lest we forget, is

the “host” here.

The group’s celebrations soon fade, though, when we come to large blades of salt that have collapsed down from the ceiling of the gallery, just 20 metres in from our starting point. We try to squeeze through even the slightest opening, on the hunt for wisps of air, but in the end we have to surrender. It is a large shaft, 100 metres deep in total, which is impressive for a salt cave, but it is certainly not the system that we were expecting or even just hoping to find. We head back up, after surveying and taking a few photos.

We have, though, now understood something about this strange “hypersaline” speleology. Diapirs with too much detritus over them are well-karstified, perhaps thanks also to the fact the detritus absorbs the rainwater and releases it slowly into the subsoil, but precisely because of this, the caves have entrances full of chokes and deposits. Better opportunities are probably afforded by the springs that border the largest massifs, but these are rare and only in certain cases can they be explored. Here, too, the dynamic is very fast, and so you need to be lucky to run into the cave during the right phase of its evolution – not too young, nor too advanced in age (meaning that it will have collapsed).

Well, it turns out that hoping to find a large system on our first reconnaissance mission, with no experience in this type of cave, was too much to ask, even despite Iran’s renowned hospitality. There’s nothing else for it but to try again next year, with more time and a few more ideas in mind.

Participants

Luca Imperio, Gaetano Boldrini, Martino Frova, Giuseppe Giovine, Luca Massa, Leonardo Piccini, Yones Shariatmadari



A large collapse gallery in a sinkhole in the south of the Konarsiah diapir

IRAN SALT CAVES 2019

Marco Mecchia

Hot dry desert – on the map the area is coloured light purple.

The La Venta expedition, numbering 17 speleologists, leaves Italy on 2 February, 2019, reaching Shiraz, capital of Fars Province, in the dead of night. At the airport we are met by Yones, an Iranian speleologist and friend, with the drivers of the minibuses that will take us around Iran. We load everything up and head immediately for Firuzabad, where it is still dark when we arrive. We are perhaps the only Western tourists in the city, and the locals are hospitable and curious. The first day is given over to organisation and shopping, and the next morning we split up into two teams and get going. One team will focus on the small dome of Khoorab, where the exploration of a resurgence last year came to a halt when faced with a bottleneck, and the other on Jahani, one of the largest Iranian diapirs, in part already explored by Czech speleologists.

On this second diapir, after a number of attempts, we identify an unpaved road that comes close to the south-western flank of the mountain, which is yet to be investigated. The minibus clammers up to a square that was once used by bulldozers for the extraction of salt; from here, we overlook a valley that rises up to the plateau with steep, multicoloured slopes. We pitch our tents, and the first night we are surprised by the temperatures approaching zero. The stern expedition chief communicates the wake up time: 6 a.m. local every day, to make the most of the cooler morning hours. And every morning Antonio and I emerge at 6 from our tent, which is a little isolated from the others, only to find, time and again, all of the other members of the team

finishing their breakfast, the coffee having already cooled down. “How efficient!” I think to myself. Only at the end of the week do I discover that the time difference with respect to Italy is not two hours, as my watch had it, but two-and-a-half hours. However, every day we leave the camp before sunlight floods the valley. Salt clusters are covered almost everywhere by a several metre thick layer of insoluble deposits and detritus. On the side of the diapir and on the upland we find a number of sinkholes and hundreds of dolines, a few of which have promising black holes at the bottom, which make us look forward to unforgettable explorations. Over the course of three days, we descend into fifteen or so shafts, down to a depth of sixty metres. Invariably, though, the bottom is obstructed, with no indication of a way through; a situation very similar to that described by the Czech-Iranian team vis-à-vis the north-western sector of the plateau. We take the opportunity to visit Waterfall Cave – a through gallery at the end of a long valley that cuts through the highland, flowing into the south-eastern slope of the dome – before we meet up again with the other team at Firuzabad. On the Khoorab, Marco has placed his animal traps both inside and outside the cave; the exploration of the resurgence comes to an end shortly beyond the bottleneck, and a few small caves are added to the records we are compiling; nothing spectacular, though.

On our day off, we decide what to do on the second half of the expedition. The other team heads for Lar, 200 km to the south-east, where they will meet the local authorities, and together with the local caving group they will climb the nearby Nameki diapir, exploring

The ascent of the Nameki diapir, near the city of Lar



Salt stalactites in the Waterfall Cave, in the Jahani diapir

a pair of shafts. Our team will reach the coast of the Persian Gulf before making our way back up to the Kuh-e-Namak in Dashti. “Hot dry desert”: on the map the area is coloured light purple...will we ever find the great salt cave?

During the night, on 13 February, 2019, the bridge over the road that links the town we are staying in to the coast is submerged by the river flood, but our minibus has now resurfaced. It's been pouring down for two days. The first expedition, last year, had had to deal with the oppressive April heat, so this year we pulled the departure forward. Today we will get supplies in the town on the other side of the mountain, as we wait for the weather to get better. Before the mountain became off-limits, Luca 1 and Luca 2 in our party had finally discovered the cave.

Kuh-e-Namak, the Mountain-of-Salt in the district of Dashti, not far from Hormuz, is utterly spectacular. In contrast to many other salt domes, here the salt surfaces almost everywhere on the mountain. The effect is remarkable: the salt, combined with grains of the insoluble detritus that it transports along with it, forms densely alternating bands in various shades (honey, ivory, black, sand). These are set against a landscape with sharp, jutting crests that delineate small valleys, while the twisting valley floor is marked by white strips of pure salt.

On the horizon, we can make out the large central panettone, which indicates the location of the mouth, the “fountain”, from which the salt has arisen, boring through the embedding rocks to emerge on the surface after an upward-thrusting journey of 5-6000 metres. This extraordinary diapir is amongst the most active in Iran. It is estimated that the salt comes out of the mouth of the fountain at the exceptional speed of 17 centimetres per year, and that of these a full 11 are then dissolved by the water of the albeit rare winter rains. Every year, half a million tonnes of salt, dissolved by the rain, is carried away by the torrents running both above and below the surface.

Impressive quantities of salt, with a thickness of hundreds of metres, were deposited by evaporation on the sea bed of this region between 500 and 600 millions of years ago. Thousands of metres of other deposits have subsequently buried the salt. Squashed under rigid, dense rocks, it was during the Cretaceous period (70 million years ago) that the lightweight, mouldable salt finally found the right fault to emerge to the surface, like volcanic lava, and to form the first Kuh-e-Namak, many millions of years before the formation of the

undulating Zagros mountains. It is not known whether the extrusion of the salt has continued since then, but in any case, the salt dome today rises 1400 metres above the surrounding flatlands.

A few days ago, we split into two groups, to attack the diapir from the plains to the north and the south. The cargo bed of a 4x4 takes us in the northern group close to the first salt outcrop. To the left and right of the central panettone, deep valleys separate it from the adjacent calcareous-arenaceous mountains. Near where we are, the salt has dripped from the fountain onto the surrounding rocks, covering them like a “glacier”; due to its similarity to this phenomenon, the salt was at one time also referred to as a glacier. More recently, a specific term has been coined for these salt formations: *namakiers*, a word deriving from *namak*, which means ‘salt’ in Farsi. The *namakier*, too, flows slowly, filling up valleys and passing over crests, transporting blocks and detritus before coming to an end on a front surrounded by deposits that seem to be moraines.

From the plain we head back into the white bed of a valley and divide up into two squads. Francesco, Giovanni and I climb the *namakier* to the left. The route is uneven and we make our way across areas of sharpened blades carved out of the salt; it is a beautiful day and the landscape is spectacular. We ascent to the base of the walls of the central dome, but there are no

*Salt waterfall in the northern namakier Kuh-e-Namak*

caves to be found. The route back takes us through valleys, walls of salt and narrow gorges, until we come to a final cascade of white salt that reaches the valley floor separating the diapir from the adjacent mountain. On the waterfall it really feels like being on a Patagonian glacier, and I can almost feel the absence of crampons on my feet. At the same time, a little further north, at the base of a limestone plate that emerges from the *namakier*, Luca and Luca bathe their feet in a river that disappears into a salt cave... The first look around allows us to establish that this is a large cave. The next day, Luca, Luca, Francesco, Gaetano, Mattia and Tommaso follow the underground river, amid little lakes and small drops, for around one kilometre. In the meantime, with Antonio, Giovanni and Leonardo we move even further north and discover an entrance, at the base of a little hill of salt, resting on the embedding limestone and isolated from the rest of the *namakier* during the course of the final retreat of the saline front. Yes, because like glaciers, *namakiers*, too, can advance or retreat. It depends on

how much salt emerges from the fountain and on how much is dissolved by the rainwater. The hill of salt is only one hundred metres long, and we cross it from one side to the other in an excavated gallery in contact with the limestone substrate.

The day after, the torrential rain begins again, forcing us to twiddle our thumbs. The precipitation over these two days corresponds more or less to the normal annual total, which according to the data recorded over recent decades should be 280 millimetres. “Iran is experiencing unprecedented climate-related problems”, with extreme events of exceptional aridity but also unusual rainfall and floods, the like of which had been unknown in this region – that is what was reported by Iranian researchers in a recently published article. It is possible that the effects of global warming are responsible for the strange climatic conditions we have run into. During most of the year, the salt is dry and deforms easily. Water, on the other hand, makes it less viscous, causing it to slide; during the strong rains, and so probably only for a few days a year, the salt travels at an estimated average speed of half a metre per day.

In the meantime, for its part, the South group has been busy too. The two Giuseppees, with Vito, Gaetano, Alessandro, Diego and Yones, have discovered and explored a system of underground galleries, set along a valley, alternating with segments of epygean gorge, on a path extending for a kilometre.

Other caves are being explored. The weather has calmed down. On the last full day of the expedition, we all ascend to the highest entrance of the Namak River Cave, the “Cave of the River of Sand”. The descent is thrilling, in a gallery full of meanders, between walls with coloured banding and stalactites of white salt. The torrent flows on down, apparently indifferent to the presence of the cave, and in some sections there is no roof to the

gallery, the light penetrating the gorge. The features of the gallery recall those of the Perito Meccanico, the cave that we explored in 1995 in the Perito Moreno glacier in Patagonia.

The Namak River Cave extends for just a few metres under the surface of the topography: every now and again, the roof has collapsed, opening the gallery up to the outside world. We walk through the river with the water at times up to our waists (it’s not cold here, though!), with a few drops that break the slope of the profile. As we head down, we carry out the survey, taking photographs and shooting some video. At the end, we come out of the gorge on the front of the namakier.

Participants

Gaetano Boldrini, Leonardo Colavita, Giuseppe Giovine, Luca Imperio, Marco Mecchia, Giovanni Rossi, Tommaso Santagata, Giuseppe Savino, Mattia Bernabei, Vito Buongiorno, Luca Bussolati, Marco Isaia, Gaetano Proietto, Francesco Spinelli, Antonio Trocino, Alessandro Uggeri, Diego Zanzi, e l’amico iraniano Yones Shariatmadari.

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Galleries of the Namak river cave

A SALTY STORY

Gaetano Boldrini

That salt has been part and parcel of the lives of human beings since the Neolithic period is well-known. Called “divine substance” by the Greeks and “white gold” by the Latins, it began its journey at the birth of civilisation, crossing oceans and uniting continents. Taking advantage of mankind’s natural propensity for good food, it has made its way silently onto our tables, in myriad forms: sea, iodised, low-sodium, blossom from the Camargue, smoked or copper from Denmark, red from Hawaii, black from Cyprus, violet from India (Kala Namak), grey from Brittany, blue from Persia, pink from Peru, green from Hawaii, Maldon from England, Murray River from Australia, Halen Môn from Wales. But even before it became a condiment, it was used as a medicine by the Mayans and as a salary to pay the legionnaires, as well as to preserve meat and even mummies, and in the sacrificial rituals of the Greeks and Romans. It has taken on numerous symbolic meanings in different cultures, and at different times it has served as a multi-faceted synonym: for the eternal pact between God and Israel, for the loyalty of Indian troops to their English masters, for longevity and endurance, but also for truth and wisdom.

What we do not know, or what we have ignored, is that people have tried to warn us about it. They reminded us, for example, that spilling it was an evil omen; and according to mediaeval etiquette, you could not even touch it with your hands, only the tip of a knife would be even remotely acceptable. There must have been some reason? Yet we carry on regardless...

In chemistry class, we are taught that salt is an electronically neutral compound. This, though, is a false asser-

tion, for it is not in the least neutral: when it decides to give you a hard time, it pulls no punches, and it can’t be stopped. And then it is also treacherous: it insinuates itself into your life deceitfully, and once you realise it’s there, it’s too late... it has already caused unspeakable damage.

It creaks and squeaks under your boots. Crunch, crunch – you like to walk for hours and hours on those white rivers, under a pounding sun that never lets up. You almost get attached to them... those funny little crystals; you even feel guilty when you destroy them, without



Climbing the Namak diapir

understanding that it is of no interest to them, because they have already decided. You walk on unawares, thinking that you have cheated them, just because you’ve been a bit prudent and put sunglasses on. Without your shades, all that whiteness and the 24/7 sunshine would soon take your sight away. But we were ready for this, we knew about it. What we didn’t know is that it – the salt – has set the trap for you: it is no longer neutral, and it has named you as its sacrificial victim. Slowly,

Khoorab diapir, ascent to the Last Cave





Khoorab Spring Cave

but inexorably, the peaceful white river increases its incline, it scrambles its way up and, as you plod along beside it, above it on the diapir, the traitor is silently transformed, and you realise that the atoms of which it is made have joined forces against you. The innocuous crystals on which you were effortlessly walking have become cutting blades, pointed steeples, ragged corners and, under the best possible circumstances, scintillating little mountains – like oversized cauliflowers, but hard and abrasive. You move forwards, you don't stop, also because you have adopted the appropriate countermeasures: you've got the gloves, nice and thick they are, too, allowing you to face up to the challenge, and you also know what to do if you fall. Naturally, the imperative is not to fall, the result could be devastating for your body but, were it to happen, you would need to try to spin round onto your back, so that your rucksack gets skewered rather than you.

The crystals are pretty, that's for sure, but lethal. Unbeknownst to you, you keep on entering the trap until finally, after days of searching, you find the cave, and you go in. Of course you do... you're a caver! And it knows it, it's been waiting for you. Like a spider awaits its prey, it waits for us. And it does so in its most malign form, its most deceitful. Alongside your gloves, you've also put on your knee pads and your overalls... but it's not enough! When you crawl into those wonderful white tunnels, it attacks you from all sides, taking ad-

vantage of your lack of attention to get you right there, in the most painful, undefended parts – little stabs made with surgical precision. When you leave, giddy at having been able to explore incredible places, you begin to get a vague suspicion of what has happened to you: your overall is rigid and white, look at your boots... they're white too, as are your gloves and your rucksack, as well as everything else. Everything is covered in salt, very fine crystals, impalpable. But it is only when you arrive at the camp, and you focus on cleaning your photographic equipment, that you realise what dishonesty really means. It's taken for granted that the camera will be covered in salt on the outside, but you struggle to explain how – given that you have gone to great lengths to protect the unit as a whole, not even changing the lens – salt has still found its way inside, depositing itself on the sensor, between the ring nuts and the mechanisms. Well, you clean what you can – it's easy... with a cloth, some water and a whole lot of care. We avoid taking water from the river, because obviously it's salty, using instead the bottled water we bought at the market. But a doubt starts to fester in our mind: if the cloth you are using, the clean one you chose out of the several available options, the one you've been carrying around in the plastic bag at the bottom of your rucksack...are you really sure that those pesky crystals have not ended up in there, too?



Climbing the Namak diapir

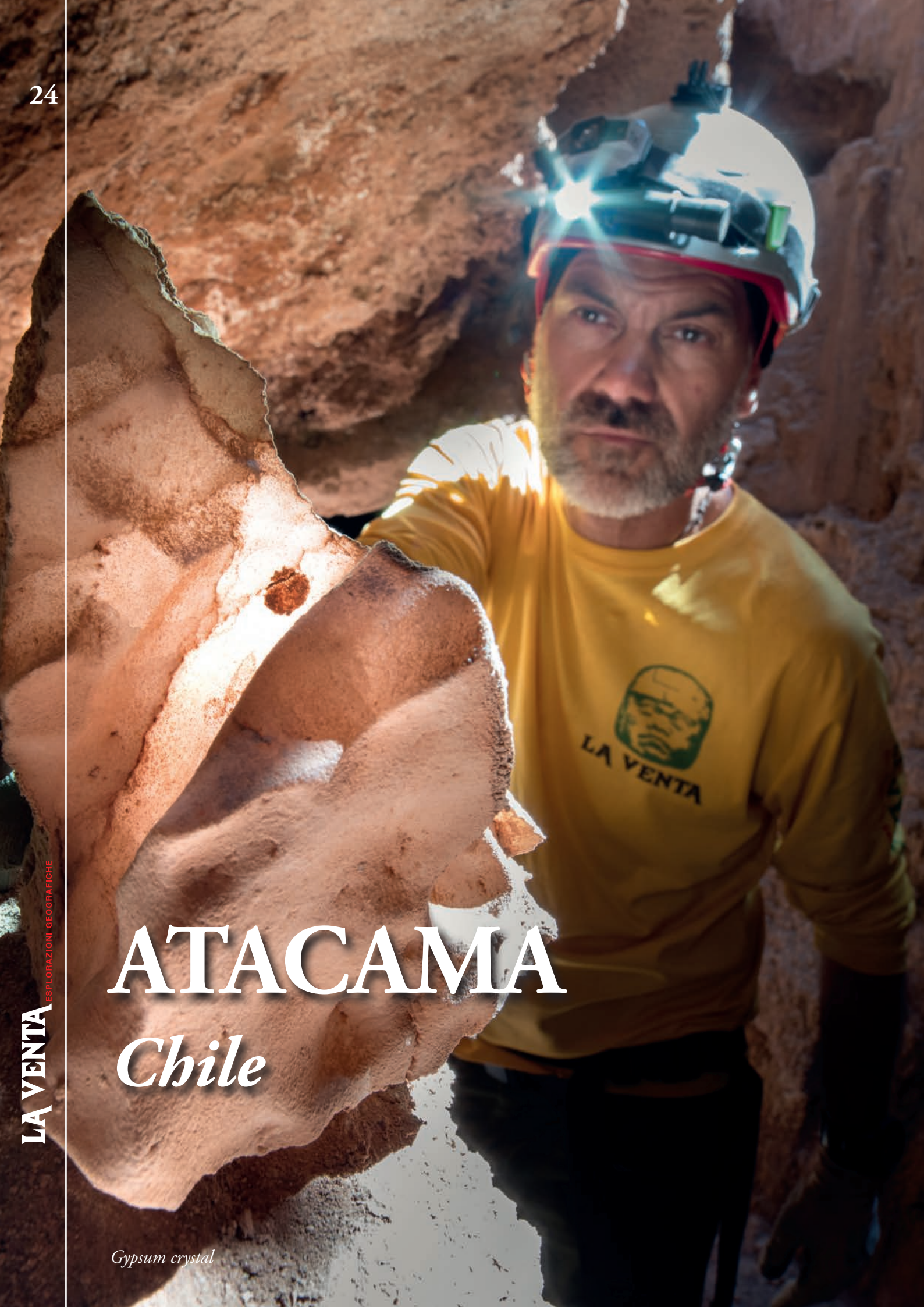


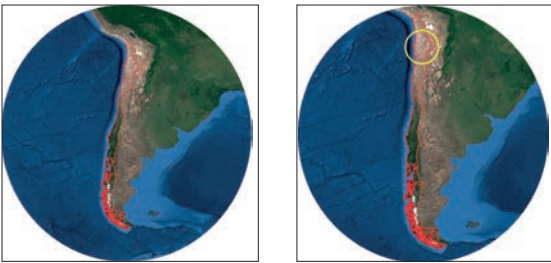
An example of what the camera looked like after crossing the gorge of the Namak river cave

ATACAMA

Chile

Gypsum crystal





THE SILENCE OF THE SALT

Scientific expedition in the Atacama Desert (Chile)

Marco Vattano, Claudio Pastore, Jo De Waele

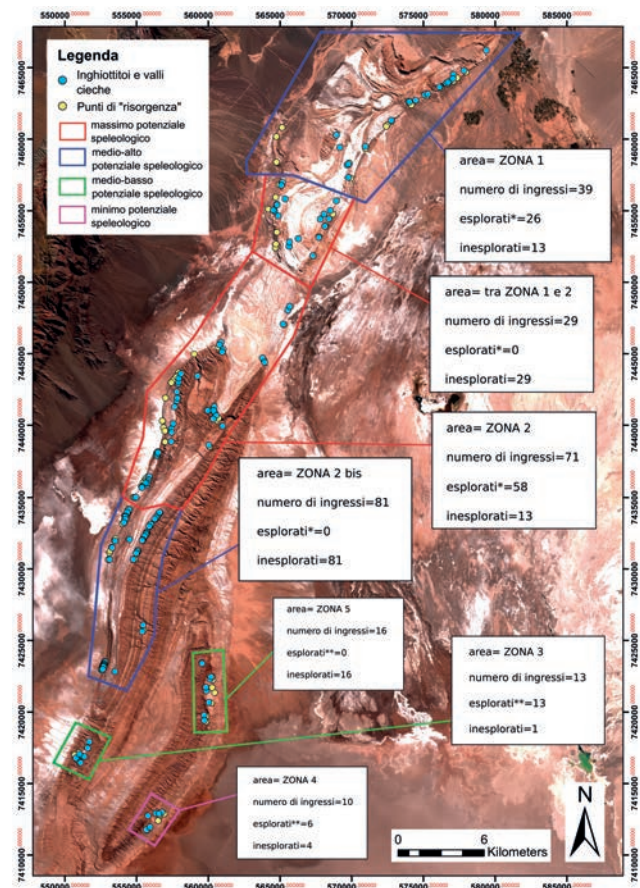
The night begins only when the cracking of the cooling rocks ends and an intense, empty silence falls over us. The time has come to take stock of the past twenty-four hours, to replay the events of the day in our minds and try to close our eyes under a star-laden and – to us – unfamiliar sky. I say, “try”, because we all end up staring at the stars from our sleeping bags for hours; closing our eyes is the last thing on our minds. Being in a group means you don’t fully appreciate the emptiness, but the absence of light and sound is incontestable. And for this, we count our blessings, until sleep overtakes us.

“What would it be like to go on a La Venta expedition? It’s a question I’ve been asking myself since I was 16. Finally, 12 years later, I get to find out! And it’s a really juicy trip at that, with some impressive scientific credentials. The grant from the National Geographic Society, which is sponsoring the expedition, requires us to take biological and mineral samples, and radon measurements ... and to do a lot of exploring, too, naturally, and all this in one of the most arid and remote places on Earth. In other words, the sort of opportunity that doesn’t come along every day! When the offer to take part arrives in December, I don’t have to think twice. I’ll be there, I say, even before I can check I can get the time off work. Suddenly it’s March, and the excitement is more intense than ever. Inevitably, we meet the first unexpected hurdle on the day we leave: an air transport strike, meaning our flight from Bologna to Rome is grounded. We scramble to find a way to get to Fiumicino airport ... luckily, our flight from Rome is one of the guaranteed flights, and we manage to board for the more than 12-hour journey to Santiago in Chile, a transatlantic flight being another first for me. Another plane awaits us in Santiago, which takes us to Calama Airport, 90 km from San Pedro de Atacama. [C.P.]”

We are back in Chile, in the driest spot on the planet, the Atacama Desert, to seek out and study new caves in the salt. There are 19 of us in the group, half of us being geologists. We have our work cut out for us, too, from collecting mineralogical and microbiological samples, measuring radon levels and monitoring cave meteorology to taking photographs and video footage, as well completing below- and above-ground geostuctural sur-

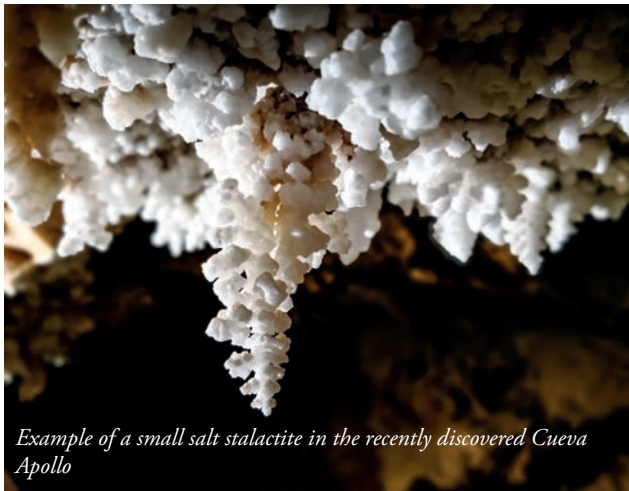
veys and 3D laser-scanning and photogrammetry surveys in various sectors of the Cordillera de la Sal.

Extensive remote-sensing analysis has been carried out in Italy in advance of the expedition, using both the free programme Google Earth Pro, and high-resolution images from the Sentinel-2 mission, part of the European Space Agency’s (ESA) Copernicus Programme. Thanks, specifically, to the project “Atacama: a perfect evaporite karst Martian analogue”, we managed to put together a set of images covering the entire Cordillera. Also through ESA, we were able to access data from the Pleiades satellites (with a ground-level resolution of just half a metre) with which it was possible to create incredibly high-resolution digital elevation models (DEM) of the terrain.



Satellite photos of the Cordillera de la Sal, with sub-division into zones and the entrances of the various caves (from the degree thesis of L. Pisani, 2018)

The remote-sensing work was complex and time-consuming, but it was necessary to identify potential cave entrances, create vector maps of the fluvial network and drainage basins, and, essentially, organise the expedition more effectively by carefully selecting the most suitable areas for exploration. The new areas, in the southern sector of the Cordillera, were christened Zone 3, Zone 4 and Zone 5. As soon as the exploration work began, the quality of the preliminary investigations using the satellite images was clear: in pretty much every point we identified in our hours on the computers, we found a cave! The remote-sensing work had mapped the entrances to over 120 caves, of which – based on data from the expeditions completed by the “Eugenio Boegan” Cave Commission of Trieste – little more than forty were known before the expedition. Of the remaining caves, nine were explored in the course of our expedition. The Trieste speleologists had conducted expeditions in the northernmost zones, 1 and 2, over a number of years. For this reason, it was decided that we would not carry out any exploration in these zones, even though we did identify various potential unexplored entrances. Furthermore, as far as our scientific work was concerned, we limited ourselves to known caves, which are currently some of the most extensive and most significant systems in the whole Cordillera.



Example of a small salt stalactite in the recently discovered Cueva Apollo

“The first two days are largely spent in our 4x4s travelling along back-breaking tracks whose bumps and potholes make your skull vibrate (by the end of the expedition, we will have travelled almost 3,000 km over these “humps”!) Once we have identified how to get close to the target locations, we begin a series of excursions to verify what we had seen on the satellite images. On one of the first days, we travel by car to the end of a canyon, where we will be left and picked up again the following day. We start to make our way up the canyon and, just as expected, we find the first sizeable opening. The heat of the day is oppressive, and the water we’re carrying is worth its weight in gold in these totally arid conditions.

I’m used to more ‘traditional’ caves, in calcareous and calcite rock, so these halite caves leave me open-jawed, even before I step inside. Even at the entrance there is a wealth of

white concretions with perfect formations of cubic salt crystals adorning the roof. We begin our exploration, the cave alternating between meanders and crawlways, and sunlight filtering in through skylights. We have to keep our “explorer’s mania” in check and move with the greatest delicacy, trying to touch as little as possible and leaving all the lateral branches and openings unscathed. This is vital because the scientific team, which will follow in a week’s time, has to take microbiological samples and there is a serious risk of contamination. We document the exploration with images and video, record the location of the entrance, conduct our surveys and head back to our base camp when the sun begins to set.

It is now that the show really begins, between dusk and dawn. The Atacama is best experienced by night. The desert’s air of mysticism derives more than anything from the view of the southern heavens, which is the clearest you can find anywhere on the planet, thanks not least to the altitude of over 2,000 m, and the total (TOTAL!) absence of light pollution. Without a single leaf to stir in the breeze (since nothing grows here at all), there is also a deafening silence. The only noise, other than our own voices, is the creaking of the walls of rock as they contract in the cooling conditions. These two sounds do not last long, however. As soon as we have climbed into our sleeping bags and the rocks have settled, an inexorable silence descends. Over an hour passes before I can convince myself to tear my eyes from the heavens. My gaze returns over and over to the Southern Cross as I try to imprint it in my retina and my synapses so as never to forget it.

The first week continues in this vein, measured out in 100-km plus drives on dirt tracks and punishing treks in the



Floor covered in salt concretions, in one of the caves in Zone 4



scorching sun, interspersed with explorations of the caves we encounter on our way. Here, the discovery of a cave means salvation, a vital escape from the baking heat.

The rest of our group arrives the second week. In the meantime, we have already had two punctures. It is easily done and our 4x4s always travel in pairs, because out here, without a phone signal and a support car, if we were to puncture the spare tyre too, we could be in serious trouble. And we have come close a couple of times. On one occasion, four of us had been left to camp overnight at the Cueva del Arco to allow us to take geostructural measurements. In the morning, when we called the base camp at San Pedro to arrange the pick-up, Jo responded in an unusually serious manner, telling me in that distinctive accent of his, 'Get ready. You might have to spend another night out there': disconcerting news, so much so in fact that I didn't even ask him what was wrong. To tell the truth, though, the idea of spending another night in these awe-inspiring surroundings was not so unpleasant. To take our minds off the wait, we took a walk among the gullies on the flank of the Cordillera. Shortly before nightfall, a cloud of dust appeared in the distance like a mirage: they'd come to collect us. What had happened? It turns out the other 4x4 had been stuck in mud (in the driest place on Earth!!!) in the middle of the Salar for a whole night. Another small group had stayed to try to pull it out. Fortunately, after a hard day's work in the 40-degree heat, they'd succeeded.

The vehicles are hugely helpful, but the difficult approach to the Cueva Cressi, the most important cave discovered thus far anywhere in the Cordillera, involves at least three hours' travel through the desert, and even then, the 4x4s can take us only as far as the base of the first of the three rocky ramps that lead up to the high plateau and on to the canyon. We are nearly at the midway point of the expedition, and a group is already out at the Cressi. The evening before they return, the rest of us are discussing what to do the following day: we think we might manage a visit to Zone 5, as it has been called, which of the study areas identified is the fur-

thest and hardest to access. The following morning, however, a message arrives by satellite phone from the group at the Cressi: 'Bring a 50-m rope and gear for taking photos and videos. Meet us at 17.00 at the foot of the Cordillera.' We are there at 5 pm on the dot, and debrief our colleagues to find out what needs to be done. The secondary entrance to the Cressi has collapsed, barring access to the lower reaches of the system. To reach the lower section, we now need to descend a 40-metre shaft that has never been used before now! With our backpacks bursting with equipment, food and – most importantly – (a lot of) water, we set off to the canyon of the Cueva Cressi. We are relying on GPS and the eyes of Marco and Riccardo, who have already been there, but once the night begins to fall we have to make do with just the GPS. Climbing down that canyon in the dark is no laughing matter: extremely steep, and distorted by penitentes (sharp spikes of salt) at times as much as a metre high, we don't even know what the best route down is. We know the waypoint is there, below us, but we have to find our own way down to it in the dark. Again, we put our trust in Marco, who is leading the way. Luckily, his intuition is sound, and we find ourselves at the advance camp where we are to make our base. We are exhausted, drained by the heat and the weight of our packs and water stores, but than-



Salt crust deformed into bubbles, in one of the dried lakes of the Cueva Cressi

Hiking towards the Cressi System, laden with the necessary equipment for a stay lasting several days



ks to the surroundings, the company and the fact we have shared these hardships, we don't feel sorry for ourselves for long. Over the following two days, we carry out our work (photos/video, geostructural surveying, retrieving the radon sensors, rigging, de-rigging) in one of the most beautiful caves I have ever seen. The Cressi really is something special: huge spaces with just a few low passages and the odd skylight. The concretions are jaw-dropping, and the meanders are uncommonly beautiful, for instance the shaft we had to climb down, a colossal pit of 40x20 m and no picnic when it came to rigging it for the descent. Here, in contrast to what you experience in "traditional" caves in calcareous rock, you can actually appreciate the plasticity of the caves. It rains very little in this desert, but when it does, the rain is intense and with every spate the caves are remodelled, changed in every aspect. [C.P.]

Seven new caves were discovered in Zone 3, including the system christened "Apollo", which comprises three underground segments that extend for 218, 534 and 172 metres respectively, separated by short sections above ground. Among the other discoveries in Zone 3 were

the "Primerosal" system comprising two underground sections of 335 and 102 metres, and the "Agujas" (173 m development) and "Dama del Quiosco" (302 m development). The caves in this sector are rich in speleothems, of various forms, and include underground passages of up to 10 metres in height and 5 metres in width. Reaching Zone 4 requires another bone-shaking ride. While the journey to Zone 3 involves two hours of off-road driving, a further two hours on non-existent roads are needed to reach Zone 4. The presence of marlstone rather than saline outcrops marks this area out from the others. In the three days of camping in the zone, initial reconnaissance was carried out by drone: many of the potential entrances identified were discovered to be unmanageable, but two caves of some extension were found. These were the "Alliento de Oxigeno" (which extends for 718 m), and "Cueva Corta" (414 m), both of which were characterised by powdery deposits, with little in the way of concretions. Due to time restrictions, Zone 5 was only investigated using the drone.

While part of the group was engaged in the scouting phase, other members were able to conduct surveys of

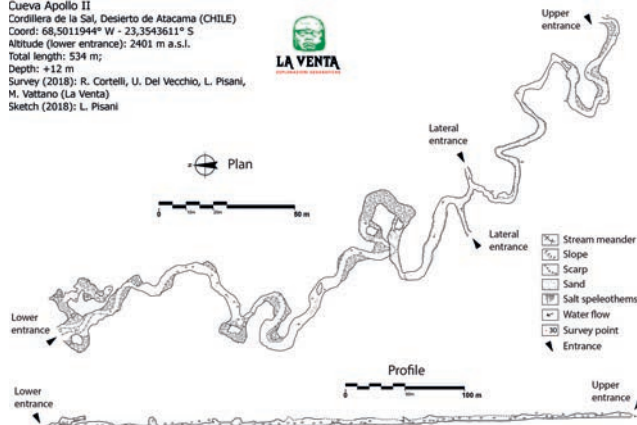
Driving towards Zone 4, in the section of track still in good condition



Shaft within the Cueva Cressi



Cueva Apollo II
Cordillera de la Sal, Desierto de Atacama (CHILE)
Coord: 68,5011944° W - 23,3543611° S
Altitude (lower entrance): 2401 m a.s.l.
Total length: 534 m;
Depth: +12 m
Survey (2018): R. Cortelli, U. Del Vecchio, L. Pisani,
M. Vattano (La Venta)
Sketch (2018): L. Pisani



Initial analyses carried out in laboratories in Seville revealed the presence of more than twenty distinct bacteria and the certain presence of *Salinisphaera halophila*, a gammaproteobacterium typically found in highly saline environments. To find these organisms in a hypersaline and totally dark environment like this is close to sensational. Future research will attempt to identify what they are exactly, what they survive on, and what sort of metabolism they are based on.

entire caves using a laser scanning device, namely the Leica P40. These surveys were completed with the assistance of the Virtual Geographic Agency (ViGeA) of Reggio Emilia, and were conducted in the systems of the “Cueva Lechuza del Campanario” (84 scanning positions over 1 km), the “Cueva de Chulacao” (main branch only, with 18 scanning positions over 550 m) and the “Cueva del Arco de la Paciencia” (over 800 m from the lower entrance, with 92 scanning positions). Mineralogical samples were collected to some extent in all of the caves visited. The unique environmental conditions and presence of volcanoes give rise to a wide range of minerals. Consider that while only halite, anhydrite, calcite and sylvite have been found in the caves of the saline regions of Israel and Iran, here in the Atacama our investigations over recent years have uncovered some sixteen different minerals, to which we must now add humberstonite and nitratine, two rare minerals that were identified on this expedition.

Microbiological studies were another major part of the scientific work. Taking all appropriate precautions, almost 40 samples were collected, 12 from the caves of the Cressi system, 8 from the Cueva del Arco and another 6 from caves discovered on this expedition. A key factor in the choice of sample sites was the absence or severe limitation of human activity. Indeed, the sections of the Cressi system and the Cueva del Arco were only visited by speleologists belonging to the 2014 and 2015 expeditions, while in the newly discovered caves the collection of samples took place as the caves were being explored for the first time.



Microbiological sampling in a branch of the Cueva Cressi rich in concretions

Salt columns inside the Cueva Cressi

Participants

Salvatore Cabras, Carla Corongiu, Roberto Cortelli, Vittorio Crobù, Norma Damiano, Umberto Del Vecchio, Jo De Waele, Riccardo De Luca, Stefano Fabbri, Roberto Ferrara, Stefano Marighetti, Andrea Meloni, Claudio Pastore, Luca Pisani, Alessio Romeo, Patrizio Rubcich, Laura Sanna, Tommaso Santagata, Marco Vattano.

The following specialists were involved in the scientific activities: in the mineralogical analyses, Cristina Carbone of the Department of Earth and Life Sciences at the University of Genoa; in the microbiological research, Dr. Ana Zelia Miller of the CSIC-IRNAS in Seville; in the remote sensing, Prof. Matteo Massironi and Dr. Riccardo Pozzobon of the Department of Geosciences at the University of Padua.

Joining the expedition team were: Dr. Laura Sanna of

the Italian National Research Council's Institute of Biometeorology in Sassari, who was involved in work on CO₂ and micrometeorological conditions; Dr. Claudio Pastore from U-Series in Bologna who conducted the radon analysis; Dr. Luca Pisani, who coordinated the geostructural surveying of the landscape; and Dr. Umberto Del Vecchio and Tommaso Santagata from the company ViGeA - Virtual Graphic Agency of Reggio Emilia, who compiled the laser scanner surveys and who were assisted by Dr. Stefano Fabbri of the University of Bologna's Flaminia Foundation and Roberto Ferrara of the Institute of Biometeorology in Sassari.

This expedition was made possible by the generous contribution of the National Geographic Society and the following sponsors: Amphibious, De Walt, Ferrino, Insula, Intermatica, Mytho, Scurion, and Tiberino.

Large salt crystal in a secondary gallery of the Cueva Cressi



Atacama desert, Cueva Apollo, salt speleothems of various ages

THE MERCENARY

Gaetano Boldrini

“Call me Ishmael”. To paraphrase the opening lines of Melville’s famous novel, *Moby Dick*, we could say “Call me Mercenary”. In truth, of this character, created by Vicente Segrelles (Barcelona, 1940), we know absolutely nothing, not even his real name. He just is, and that’s it. All we know is that as a child he managed to escape the human sacrifice that was intended to be his fate.

Since childhood, Segrelles has shown a natural propensity for painting, driven by the influence of his father and his Uncle Pepe, an illustrator. In his early career he illustrated the covers of the Spanish magazine *Cimoc*. In 1980, in that same publication, the saga of the Mercenary got under way. This series of fantasy stories has also been available since 1982 in Italy, initially in the comic *L’Eternauta* and then in *LancioStory*. The stories of the Mercenary have thus far been composed of 13 episodes. Segrelles made his name as the illustrator of the covers of the science-fiction novels in the *Urania* series, and is also renowned for having published a new comic in 1992: *Sheriff Pat*.

In his adventures, Segrelles draws inspiration from the multitude of legends that have always been handed down across the generations by the peoples who inhabit the mountainous areas at the foot of the Himalayas. One of these stories, set presumably around the year 1000, describes a mythical land, situated on the top of towering mountains covered by clouds, from which emerge rocky outcrops, wide valleys, rivers, lakes and deep gor-



ges. The inhabitants of this land developed a civilisation parallel to the other peoples of the Earth, with whom they had no contact.

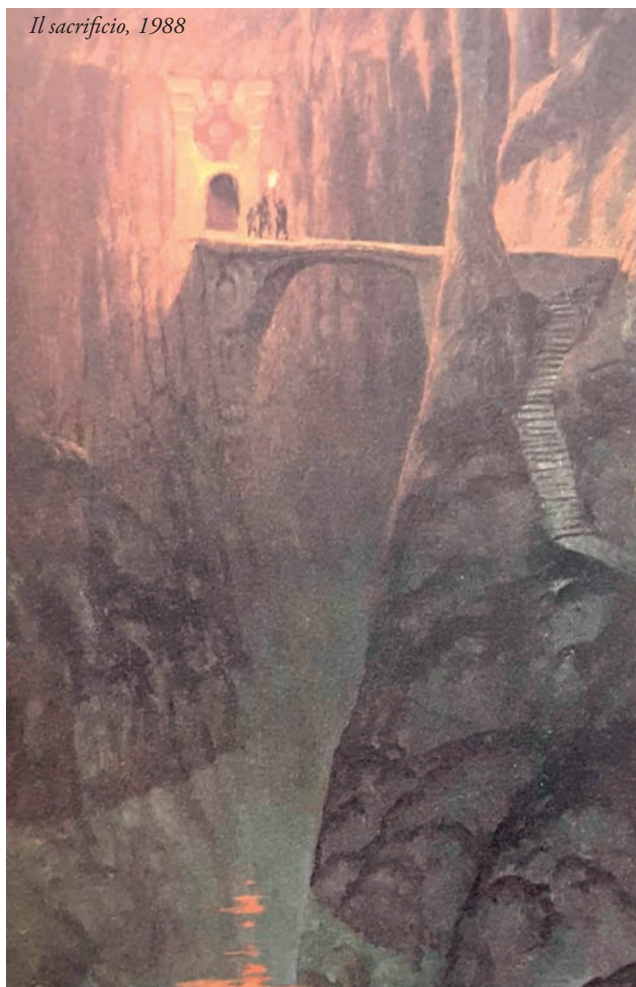
Our hero lives and moves in this world, which combines fantasy with a perfect historical reconstruction, inhabited by enormous carnivorous reptiles, flying dragons that are used for transport, and a population that builds large wooden, Leonardesque machines and barbaric flying discs. Wearing armour and equipped with medieval-style weapons, like every self-respecting soldier of fortune he offers his services as an armed escort to rich lords, as a saviour of defenceless young ladies and as just the man to recover valuable manuscripts.

The Mercenary caused a real revolution in comic-book animation across the globe thanks to its stylistic innovations. To illustrate his stories, Segrelles uses oil paints, turning every vignette into a painting. His early panels were in fact the size of a broadsheet newspaper. He sets aside a great deal of space for the images, using text only when strictly necessary: the importance of the plot is relative, the story serving as a pretext for the artist’s showcasing of an imaginary world of incredible beauty. The illustrating of caves is no different, and the techniques used are very similar to those described above. In *La Formula*, published for the first time in issues 7 to 12 of

L'Eternauta magazine, from September '82 to February '83, the caves are located within huge chasms similar to giant Sótanos and are used as residences, workshops and places of worship by a sect of scientist-chemists.

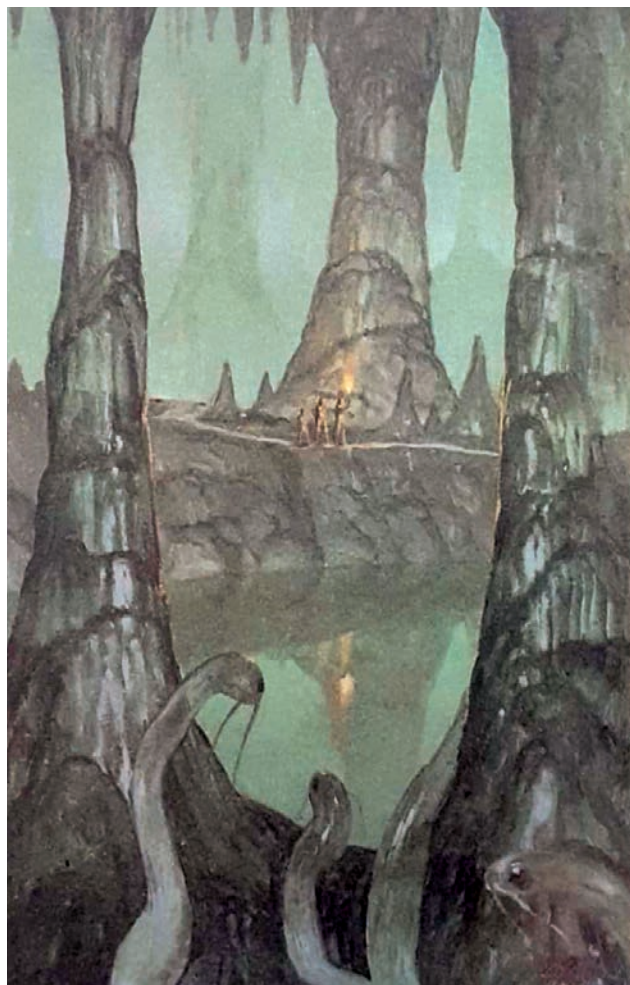
The figurative beauty that emerges from the blending of fantasy and what could be absolutely real is incredible. In *Il Sacrificio* (1988) (L'Eternauta issues 62/64 of May/July 1988), the illustrations of the underground world, albeit in their grandiose and imposing immensity, are textbook, pared down and more closely related to reality. As per the classic iconography of cartoons, the cave is

Il sacrificio, 1988



used as a route from one place to another. Immersing themselves completely in the atmospheres and visual evocations, readers can almost sense the humidity that pervades the chambers, feel the rumble of the river that runs within the deep gorge, and listen to the echoes of the steps fading in the great chambers. Even in the last panel Segrelles gives us an outstanding example of his visionary, powerful painting, in which the cave – while maintaining its real features – is transformed and becomes a place of worship, where the natural elements like enormous stalactites and stalagmites merge with the man-made works, giving rise to a mystical cathedral consecrated to an ancient, mysterious cult that has been on the go since time immemorial.

Il sacrificio, 1988



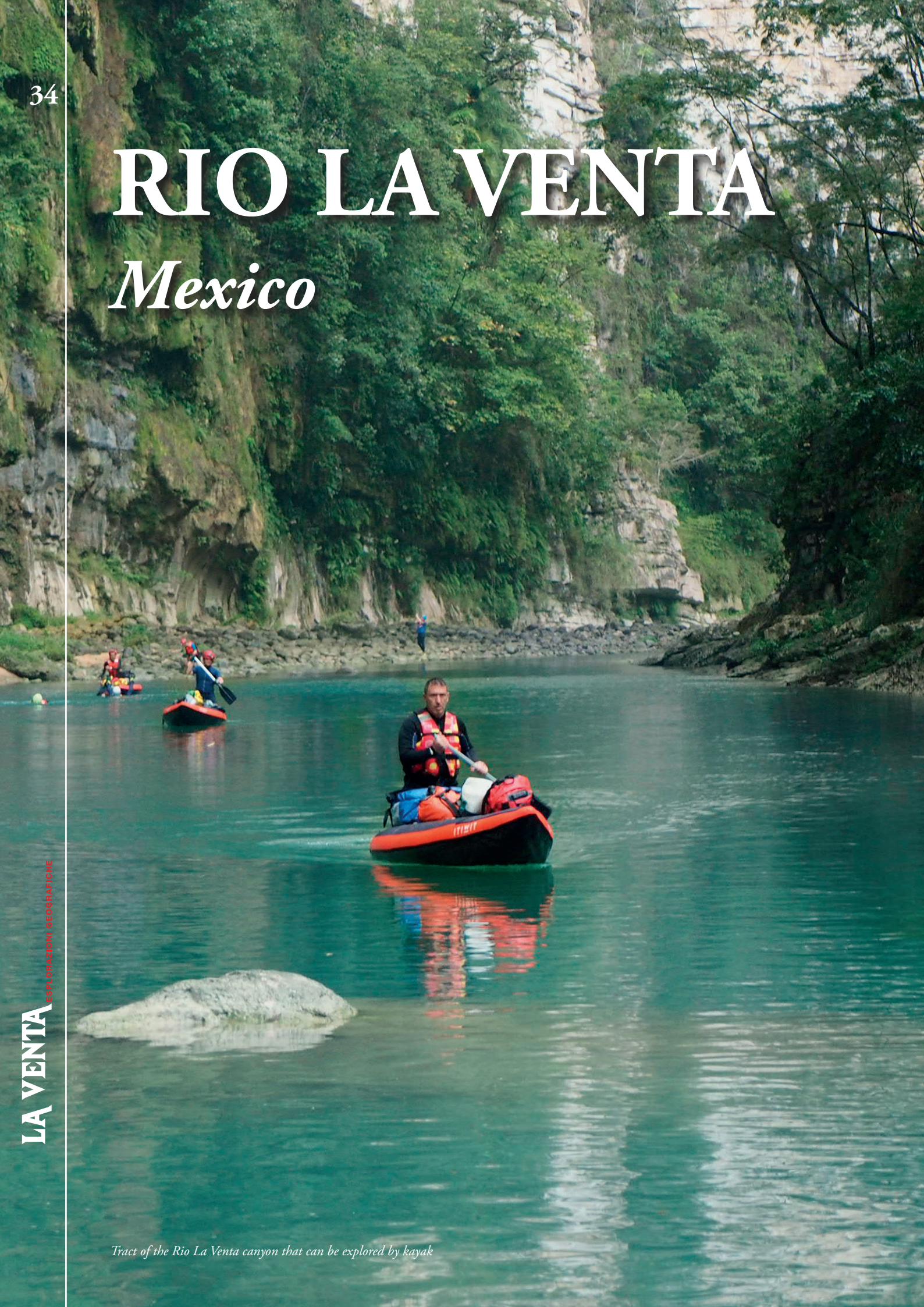
Il sacrificio, 1988



RIO LA VENTA

Mexico

LA VENTA
EXPLORAZIONE GEOGRAFICA



Tract of the Rio La Venta canyon that can be explored by kayak



THE CALL OF RIO LA VENTA

Tullio Bernabei

Our exploratory expeditions to Chiapas, Mexico, came about in partnership with the Association in the early 1990s. They weren't the first; rather, they were the fruit of various missions carried out in the '80s by the Circolo Speleologico Romano. In January 1981, we came to find out about the downstream parts of the canyon incised by Rio la Venta, navigating the river upstream: on those long days spent in a cave overlooking the river, waiting for a boat to come and take us back to civilisation, with attendant "Mexican" delays, we had the idea of exploring the geographical marvel of which we were only getting to know the final part. Waiting for us upstream were around 80 km of canyon, about which nobody knew anything, aside from what the faded aerial photos showed: a sort of long serpent, at some points very narrow, which meandered through equally unknown karst forests. In the event, we would have to wait nine long years to realise that dream, which then triggered numerous others and which, to this day, continues to make everyone dream – not just us but also the new explorers following the same route.

Although cavers' attention has been focused on it for several years now, Mexico remains a far-off country, and

our association has a multitude of speleological objectives, right across the world. Not surprisingly, then, the exploratory potential of the canyon gradually faded from view over the course of the past decade, and the number of full descents completed was very low. For this reason, in March 2018 we decided to travel once again along Rio la Venta with eyes both old and new, in search of unexplored caves.

In reality, finding new caves was not a difficult challenge, because there have always been a plethora of holes peeping out along the two sides of the canyon, which account for a total of 160 km of limestone rock face. Nevertheless, a while back we stopped looking for them, locating and evaluating them with a view to future explorations. This, therefore, together with the identification and description of all of the springs that bring water to the canyon from the two sides, was the aim of the descent carried out from 13 to 18 March, 2018, by a large group of Italian and Mexican speleologists.

Many of us did not know Rio la Venta, and as such it was a highly significant experience. The descent, as always, was carried out using different techniques based on the feasibility and the water level: on foot, transpor-



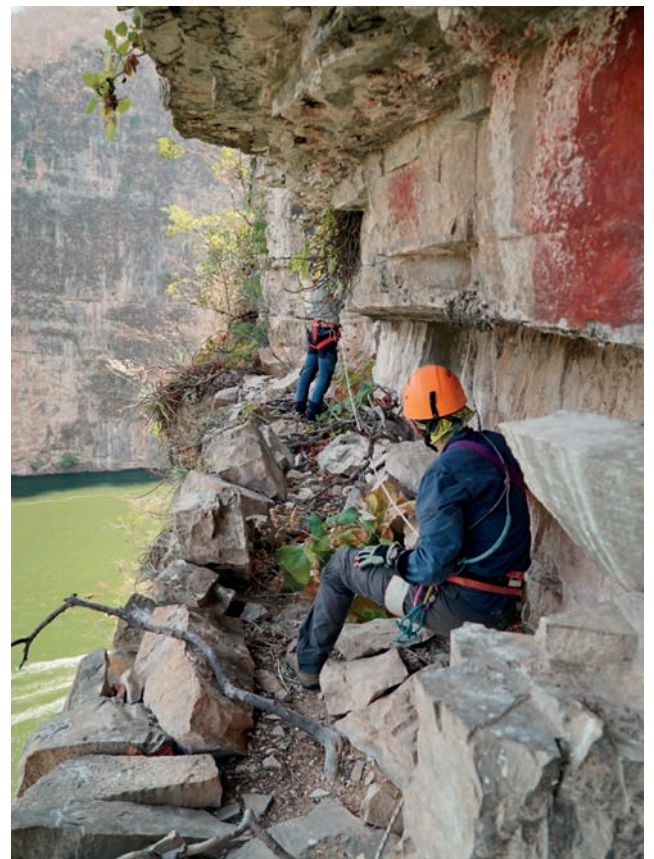
Transporting materials along the Little Landslide (Piccola Frana), Rio La Venta Canyon



ting the material on our shoulders, swimming or, where possible, sailing on board inflatable kayaks. At least five very interesting entrances were identified, some of which of large size, and reaching them will be the objective of an expedition planned for March 2020. It is worth stressing that only one system is known to exist in the whole canyon, the Cueva of Rio la Venta, a crossing that is more than 13 km long; it's fairly clear that there must be other, parallel systems, just waiting to be discovered. Over and above the wonderful experience we had in an extraordinary environment, the 2018 expedition allowed us to work out new objectives in a place that had been "abandoned" by us for a few years, and above all to transmit all of our know how to those who would be relying on it to go back there and explore further.

After the descent, one group used their day off to explore the Cueva Dos Rios (extending for almost 800 m), at Laguna Belgica, before we all moved to the Sumidero canyon, not far from the capital Tuxtla Gutierrez. Here, the "Arbol de Navidad" project is under way – the hydrogeological and speleological study of the basin feeding the large waterfall spring (almost 200 m high) giving name to the project, which envisages research both on the walls of the canyon and on the highland, near the village of Triunfo Agrarista. In the upper zone, fifteen or so caves were explored, with results that, while not sensational, are nevertheless useful for gleaning an understanding of the karst network. In the large canyon, which is also a national park and is visited daily by thousands of tourists in boats, various climbs up the rock face were carried out – some very difficult and lasting several days – for the purpose of reaching entrances seen from below, including the Arbolito (opposite base camp) and, way up high, the Cueva of the Mono y Tapir. Our efforts were not repaid as we had hoped, but the caves discovered did enhance our knowledge of the karst phenomenon that characterises the walls of the canyon. Also of significance

was the return to the Cueva Na Un Ku (House of the Eagle in one of the Mayan dialects), which I had explored back in 1987 together with Marco Topani, Marco Leonardi and Mario Pappacoda. More than 800 metres long, it is the largest known cave in the canyon and the only one with a stream running through it, which functions as an overflow in the rainy season. A number of internal ascents made it possible to identify exploration possibilities, but the most important result was without doubt having once again reached and rigged it, given that it is located at a height of almost 90 metres.



Traversing a ledge to reach the Arbolito, Sumidero Canyon

The ascent of the wall giving access to the cave called Na Un Ku (Home of the Eagle), Sumidero Canyon



In March 2019, we were delighted to return and explore once again the Cueva of Rio la Venta – another cave that we had not visited for many years. With great pleasure, we received the request by Cesare Raumer, the renowned manufacturer of anchorages (and much more besides), to return to that cave (he had been there in 2012, but only for a “tourist” trip) alongside a group of caver friends of his; the idea was to enhance the fixed rigging and to attempt some new exploration. No sooner said than done: on the ides of March, 21 of us entered the cave, including 3 Mexicans, and we remained there for four days, re-equipping a large number of passages with

stainless-steel anchorages and new ropes. Two attempts were made at exploration: the first was an ascent of the Escalera del Diablo, a large tributary waterfall that we came across on the first day of descent; the arrival of water revealed itself to be merely a “re-entry” of part of the main river, deviated upstream by a lateral leak. Better results were achieved with the second attempt: the exploration in the upper parts of the chamber referred to as being “At the Gates of Chaos”, around half-way along. It was here, in 2013, that Vittorio Crobu had carried out an admirable ascent on a calcitic flowstone, discovering an upper fossil branch and coming to a stop under a vertical wall. Spending two nights at Camp 2 – so doing things with no hurry – we continued upwards also using the artificial system put in place by our Cesare: the so-called Stick-up. The result was the discovery of a beautiful fossil branch, with various large galleries that extend high up for more than 1 km, demonstrating that the system is, as often happens, much larger than we currently know.

In addition to the exploration, there was a new aspect that marked a real turning point, at least in terms of our explorations in Mexico. Given the quantity of people, the four-day stay and the fragility of the cave in the fossil zones chosen for the base camps, we decided to bring with us some “care bags”, which are specific containers that allow us to take away all of our waste, meaning we don’t need to bury it in the cave. It is a solution we have been using for many years now in the exceptionally fragile, isolated underground systems of the Venezuelan Tepuis, and it seemed like the right thing to do to introduced them on our normal expeditions, too, starting with this one. As far as we know, this is the first time this solution has been applied in Mexican caves, and we hope that our example will be followed by many others, locals and non-locals alike; or at least that it will focus the attention of the international speleological community on the matter of waste. The operation was out of the ordinary, for obvious reasons, but everyone grasped its meaning and the symbolic value.

The majestic Sumidero Canyon seen from the entrance to the cave called Na Un Ku (Home of the Eagle)



One of the first chambers you come to in the "Home of the Eagle"



Unfortunately, we had to record an accident that occurred on leaving the cave, right at the end of four very intense days: a participant slipped near the start of an 8-metre drop, practically at the entrance of the cave. The fall was luckily softened by the vegetation and the result was "only" a broken arm, which was treated in a local clinic the day after the accident. The main problem we had to deal with was that the accident occurred in a very remote location at the base of the canyon. This forced us to organize a small mountain rescue action, in order to enable the injured party to climb back up, supported but on her own feet, the long steep slope to the highland surface.

Another issue that came up, again health-related, was

that several participants unfortunately contracted the notorious disease called histoplasmosis, caused by a fungus that nestles in the guano of bats in tropical caves and produces a series of symptoms of various degrees of gravity. Normally, our defences eradicate it naturally, but in certain cases it is necessary to be taken to specialist clinics and to take antifungal drugs; those affected in our group did so at the hospital in Negrar, near Verona. The fact that in the Cueva of Rio la Venta no previous cases of histoplasmosis had ever been recorded had led us to underestimate the risk, and so we neglected to use masks in the first section where the guano is found. This was a mistake we won't make again, but which of course will not make us ignore the irresistible call of Rio la Venta.

Cueva of the Rio La Venta, gallery upstream of Los Perezosas lake, towards the Odyssey chamber



CUEVA DEL RIO LA VENTA 2: THE VENDETTA

Cesare Raumer

There are certain stories that it is always enjoyable to tell because they sum up a particularly important moment in your life. In 2012, I was invited by Tullio Bernabei, one of the founders of the La Venta Geographical Explorations, to participate in an expedition to the famous Cueva del Rio La Venta, in the Mexican state of Chiapas. That really was a great story. Everything went smoothly, from the preparations for the trip, to the logistical management in Chiapas, as well as the three days spent inside the cave, and those spent outside, before returning home. Over subsequent years, on recalling that experience, a number of friends kept asking me to accompany them to the Cueva. I would certainly have liked to take them up on their offers, but the cave was hardly “just beyond the vegetable patch”, as my father would often say. So I put it on the back burner. Then last year, when I went on an expedition that I had organised myself, to the Grotta Grande del Vento in Frasassi, together with a large group of caving friends, I finally acquiesced and agreed that I would orchestrate a return to the famous Cueva. To tell the truth, I found the prospect rather worrying, not least because of the physical commitment involved. I'll not go into all of the preparations I made – suffice it to say that the planning required a considerable amount of time and effort. To give some idea of my state of mind at the time of departure, I'll limit myself to describing an episode that distressed me tremendously. Having divided up all of the group's material required for the scheduled explorations, I tried to squeeze my portion into my rucksack as best I could. A few nights before departure, I closed up my bag, grabbed the scales and lifted it all up: 30 kg! There was no other option, the maximum you are allowed to take on board the plane is 23 kg. A further streamlining of both my own stuff and that of the group allowed me to get under the weight threshold, but when I tried to lift up this miniature mountain, put it on my shoulders and walk a little...well, after just a minute I could feel my back starting to ache. We at last set off on 1 March, 2019. I met up with my friends from Puglia and the speleologists from Valle D'Aosta, got on the flight and arrived in Mexi-

co, where we finally met up again with Tullio. After making a short visit to the Sumidero Canyon and preparing our personal bags and the group's material, we headed to the upper entrance of the Cueva. The group contained nineteen cavers from various Italian regions, along with three Mexicans. To get the most out of this experience, we had set ourselves three objectives: the first was to make our way back up the Escalera del Diablo, a waterfall with a substantial flow rate, the provenance of which was unknown; the second was to complete the ascent at the so-called Hall at the Gates of Chaos, started a few years before by Vittorio Crobu but cut short due to a lack of time; the third objective was the production of a full video documentary of the entire expedition, with recordings of a type that had never been made in the Cueva before. We managed to achieve all of these objectives, even if one of them did not give us the results we had been hoping for. I'm referring to the climb back up the Escalera, which led us into some very narrow, dead-end tunnels. However, the ascent and explo-

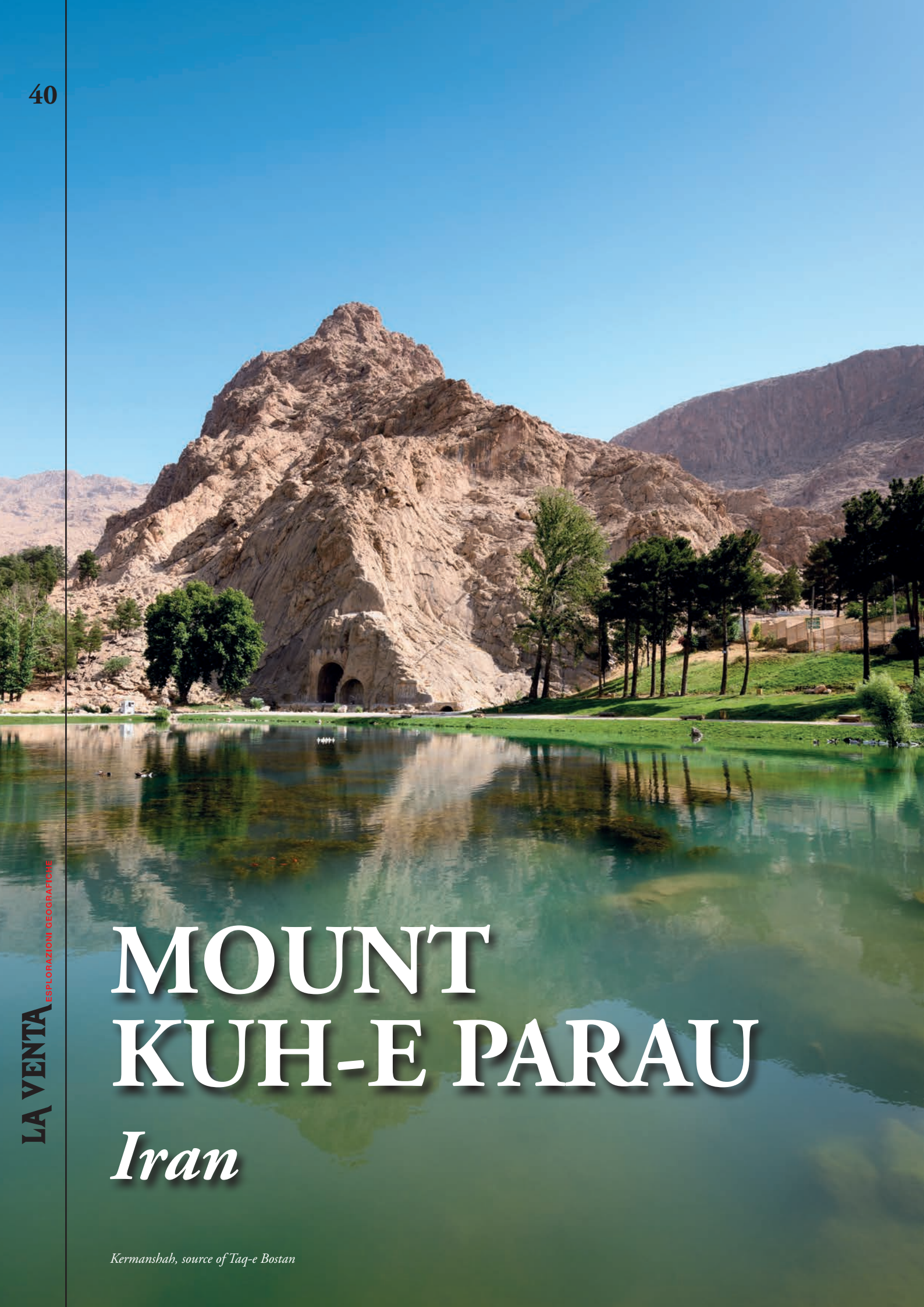


Ascending the tributary to the Escalera del Diablo

ration above the Gates of Chaos enabled us to investigate a giant upper branch extending for around 1.5 km. The third objective was also fully met. In short, it ended up being an expedition very much worth remembering. The cave, though, did not give us an easy time of it! That said, there were some pretty memorable moments. Sadly, after falling near the exit, one young lady broke both her arm and her shoulder, and ended up with serious bruising on her knee and ankle. Moreover, just about all of us picked up a fungal infection: the notorious histoplasmosis. Luckily, we all got over it. Despite these problems, I would happily do it all again: so many happy memories, the cave was impressive as always, the Chiapas landscapes were breathtaking, and the company was most enjoyable...



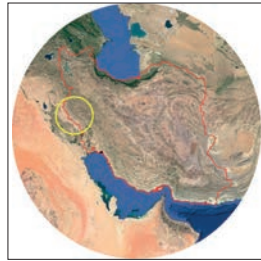
The group composed of 19 Italians and 2 Mexicans



MOUNT KUH-E PARAU

Iran

Kermanshah, source of Taq-e Bostan



KERMANSHAH – IRAN - NORTHERN PARAU EXPEDITION 2017 – 2018

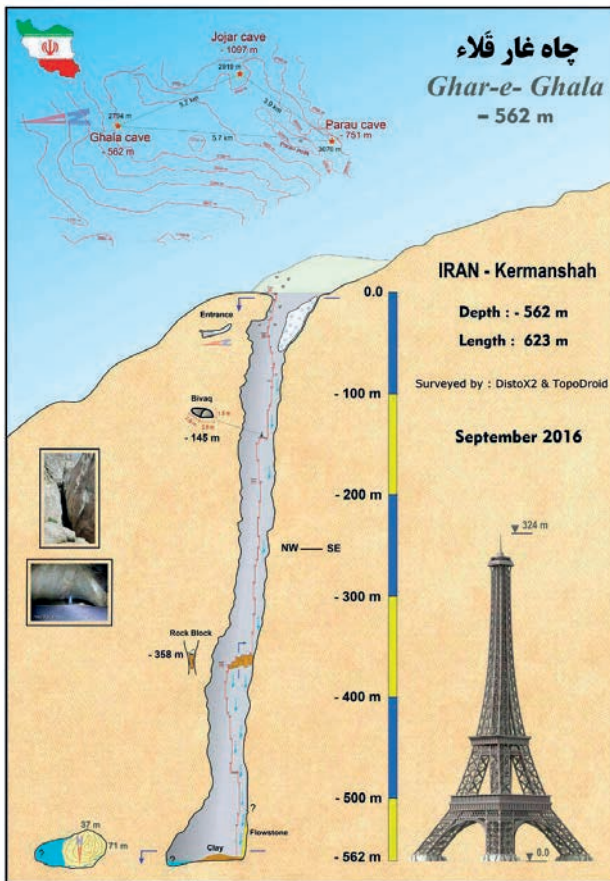
Gianluca Selleri, Alfredo Brunetti

Severe, jutting mountains, limestone pavements and seemingly bottomless holes in the rock, the Persian nights illuminated by the military forts that guard the mountain passes: we are back on the northern Parau massif in Kermanshah Province, at the edge of the Iranian Kurdistan and less than eighty kilometres from the border with Iraq. In purely human terms, the second La Venta expedition to Iran was a unique experience whose powerful, penetrating sensations have left an indelible mark on those who participated. It is difficult, actually, to think back to the mountains of the Parau and simply envision the brutal ruggedness of the high plateaus, the plunging shafts with snowfields, the caves. You cannot help but experience again the colour of the massif, the dusty dryness of the air that burns your lips and nostrils, the view from the camp overlooking the limestone mountains and valleys behind it – a landscape of countless well-defined and thus far unexplored dolines – the unexpected deliciousness of the food, and all the sensations that things such as these reawaken in the mind. Just as insistent is the memory of our Iranian companions, their combination of coarseness and civility, warmth and formality, stubbornness and deference. And the caves? The Parau – that extreme offshoot of the Zagros Mountains – surely induces the same effect in every speleologist, a spellbound captivation, like a child

on a trip to the funfair. The vastness and ruggedness of the limestone pavements with their countless unexplored swallow holes, the monstrous Qala Cave, which drops down to 563 m, the crystalline hues of the lake at the bottom of the Gholan Shaft and the beauty of the concretions in the recently discovered Ghizhalan Cave: it is a spell that is impossible to escape, that represents the real reason that we have returned to these half-unknown mountains and attempt to shed some light on an even greater part of the vast darkness they harbour in their depths. The Ghala Cave is an exceptional geological phenomenon, a huge natural chasm that opens at an altitude of around 2,800 m and reaches down some 563 m towards the heart of the Parau massif. Around 400 m from the mouth is a terrace of enormous blocks, where a trickle of daylight is still visible. It is formed from an unstable cone of fallen detritus that has got caught in the shaft, and overlooks the final section of the cave. Those who wish to reach the large chamber at the bottom face a dangerous descent. At the foot, they will find a stretch of mud leading down to an underground lake, which is fed by the incessant dripwater and an underground stream at the bottom of the shaft. As part of this expedition, the first professional photographs were taken to document the cave. The mouth of the Ghizhalan Cave (current known depth 450 m) opens at an altitude of approx. 3000 m

Landscape of Mount Kuh-e Parau



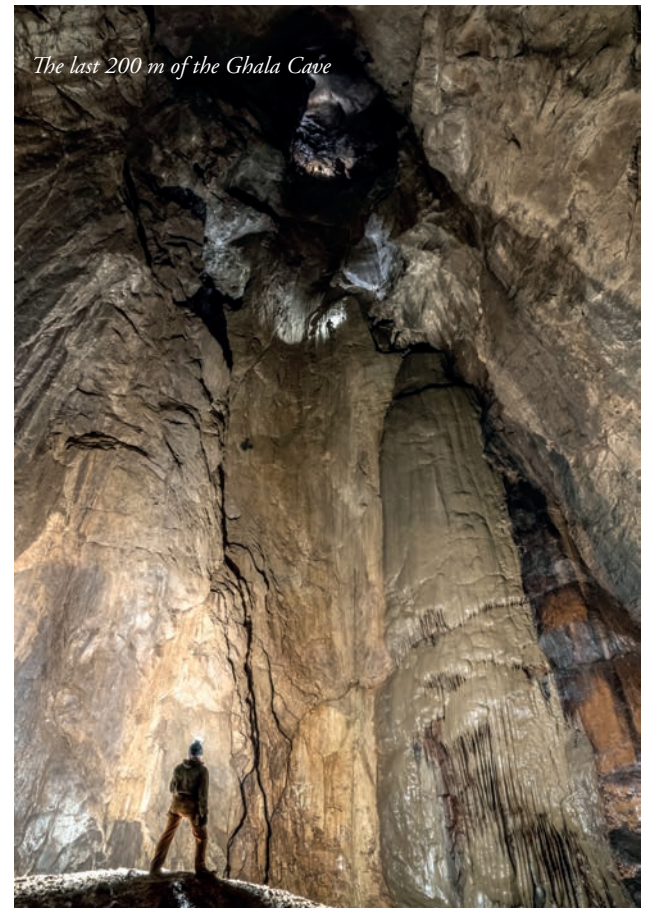


above sea level. At the foot of the huge entrance shaft, at a depth of around 120 m, there is a bank of snow and two branches: a large, twisting passage with an initial drop of about 20 m still unexplored and a passage formed in a phase of rejuvenation that, albeit more modest in size, had obvious air currents that immediately attracted our attention. At a depth of -350 m the shaft splits on one side is another tight passage formed by a rejuvenation phase that extends for a few dozen metres via narrow tunnels and small drops until it reaches yet another, half-flooded narrowing. On the other, there is a fossil branch that, after 20 m, descends into a large shaft around 80 m deep with wonderful concretions on the walls. At the bottom the meandering passage continues, wide and covered by calcite concretions, with drops as it makes its way downwards to another pit where previous explorations were halted due to a lack of equipment. The huge size of the massif, together with the lack of water and the harsh environmental conditions made surveying from above ground particularly challenging. All the same, we managed to form some idea of the wealth of opportunities hidden within these ancient mountains. During the survey several cave entrances, literally riddling the plateau, were identified at altitudes between 2,800 and 3,100 m. It was only possible to probe a few of these shafts, which were found to range from a few dozen to 70-80 metres in depth, although GPS positions were recorded for many of the others [G.S.]

Winter 2018: "Listen, fancy a trip to Iran? If you do, call Spit and he'll explain." At the other end of the line is Leonardo Colavita. "OK," I blurt, "give me his number." A trip to Persia? Why would I need to think



about it? The enthusiasm I had already harboured for that wondrous land of ancient history, enchanting landscapes and huge speleological potential had been fanned by tales of La Venta's work from two years earlier. Seven of us set off from Italy, arriving in Tehran in the early hours of the morning where we negotiate the far-from-straightforward matter of getting through customs. The economic difficulties faced by the country in the wake of the questionable sanctions imposed recently by the United States are immediately apparent as we are literally besieged by countless "merchants" who offer to change our money at a rate three times what it had been just a year ago. All this in a place where credit and debit cards are virtually impossible to use. Fortunately, our Iranian colleagues are there to welcome us and restore our spirits with smiles, delicious sweets and the inevitable cups of tea. We pass the next few hours waiting for our other colleagues, who are joining us from Poland, Spain and Armenia, another reminder of the international nature of the project.





Brief rendezvous in Kermanshah with exchange of books

With the team reunited, we set off westwards travelling comfortably by coach for around 600 km. The tiring journey begins to take its toll, but I am so curious to see this land – this meeting point of civilisations and religions – that I manage to stay awake for long sections. Finally, we reach Kermanshah and the home of the gracious Mahdi – brother of the mission leader Youssef Sorninia – where we experience Iran’s proverbial hospitality for ourselves, sipping tea on comfortable rugs. For some, it is also a chance to greet friends with whom they shared memorable moments during the explorations of the previous year. We pass the first day sorting out our equipment and purchasing our final supplies at the local bazaar, where we are immersed in a kaleidoscope of colours, sounds, smells and flavours. Westerners are an unusual sight in this part of the city, and we are frequently stopped by local youths who take photos and ask us questions in broken English. The following day, long before dawn, we begin our journey to the summit of the Kuh-e Parau massif, which overlooks the city of Kermanshah to the west. As in previous years, to reach the rest of the group and our equipment, we foreigners are required to make the roughly three-hour trip along the valley, thus avoiding

the military outposts. The first section of the approach is pleasant, in any case, cutting through canyons and small villages that are either inhabited or empty depending on the time of year. Close to a number of small springs, we come across the dwellings of nomad herders, who watch us curiously as we pass. For a moment, it feels like time hasn’t passed here for centuries. Our route covers over twenty kilometres, with a vertical displacement of almost a kilometre and a half. We only reach the plateau, at 2,800 m, late in the evening. Here, we set up our base camp close to the Gholan Shaft (“the water cave”). Objectively, the logistics of the camp are not a straightforward matter, and I can’t deny having more than a few concerns when we arrive. Will there be enough food for the duration? Even more importantly, will we be able to find enough water for what will turn out to be a group of around 30? This is an extremely arid area, and my dry lips and burning throat do not bode well. Fortunately, my concerns are immediately swept away by the impeccable preparations of our Iranian friends: the camp kitchen is run expertly by the admirable Ali, and we take turns descending the 130-m well of the Gholan Shaft to collect ‘blue gold’ every day using a winch. The meticulous Youssef has also planted carefully hidden bottles and jerry cans of water around the surrounding area, which can be used in case of emergency. These will turn out to be invaluable, as we will discover in the days to come. The morning after our arrival, with our legs still stiff from the long journey, the first team hurries to the Ghizhalan Cave, where they will re-rig the initial section and, more significantly, push on further with the exploration. Back above ground, other members of the team deal with retrieving the remaining equipment from the plateau at 2,300 metres, and the tricky business of collecting water. Negotiating narrow, half-flooded tunnels, small drops that will need to be free-climbed on our ascent, and the never-ending, omnipresent mud, we move quickly to



Gholan Shaft (or Water Cave), the 130 m well at the base of which lay the camp’s only water supply



Ghizhalan Cave at the start of the well, 80 m wide and around 350 m deep

reach the shaft 450 m underground where the previous year's exploration was halted for lack of equipment. We reach what has been described to me as a 20-metre pit, but as soon as I lean over the edge, I have the feeling that it is not as advertised: I can't make out the bottom by the light of my head lamp. We climb down what is actually a shaft of 80 m, and it is clear that the cave continues even further! In the following days, during several descents, we reach a depth of 700 metres, an impressive result that makes this recently discovered pit in the Parau plateau the third deepest cave in Iran. Our only regret is that our Iranian companions are not able to join us in the exploration, as they are busy running the camp, the only exception being a couple of sorties by the inspiring expedition leader, Youssef. Despite the decidedly unfavourable conditions of this wonderful, Martian landscape, we manage to carry out a number of new and fruitful exploratory excursions, investigating some of the entrances identified the previous year and locating new entrances, as well as collecting samples for scientific projects conducted by Iranian friends at local universities [A.B.]

Ghala Cave (from one of just a few diary entries)
"It's my day off, and I am in my tent tired, with cracked lips and sores in my nose that won't give me peace. I have tried everything I have been recommended to protect the mucous membranes, but it has been a miserable failure. The explorations have gone really well, and our above-ground recon has confirmed what we suspected from a first look at the terrain. There is enough exploring here to keep us busy for years. We are just a few hundred metres from what is currently the

second-deepest single shaft in the world. I should probably take a look! I get ready quickly, and after our usual, hearty and delicious breakfast prepared by the untiring Ali, I ask Youssef for an update on the descent schedule he has set up. You can't just decide for yourself to make the descent, Youssef has made this perfectly clear, so I am happy to discover that everyone else has already done it and there are spaces for those who haven't managed to visit the 'pit' because they have been busy with other explorations. Joining me will be Mirko, who is as excited as I am about this opportunity, not least because it will give us a sort of 'advanced-speleologist' status. For Youssef, the descent to the bottom of the Ghala is a kind of test for members of his caving group, of which we are now unofficial members. Only those who dare to test themselves against the 562-m descent will make the grade: another reason, as if it were needed, not to pass up the opportunity. We make our descent slowly, enjoying the beauty of the enormous chasm with its hanging snow banks and the echo of birdsong. The decision to take it slowly will also be rewarded on our ascent, as we have the sun providing light as deep as -350 metres and giving us a new perspective on our majestic, magnificent surroundings that our head lamps were unable to provide." [A.B.]

Participants (2017-2018)

Yousef Sorninia, Naser Raznahan, Younes Shariatmadari, Ali Daychin, Afshin Ahmadinejad, Saeid Mohammadi, Hosein Frouzandeh, Hossein Shahiri, Majid Abdollahi, Mehdi Shomali, Jamal Ghorbani, Mohammad Khalizadeh (Surena Caving Team, Tehran); Alvaro Perez Martinez, Ferriol Canyelles, (Spain); Johan Boccarossa (France); Alfredo Brunetti, Umberto del Vecchio, Francesco Ferraro, Mirko Meneghini, Alessandro Rinaldi, Alberto Romairone, Alessio Romeo, Gianluca Selleri, and Giuseppe Spitaleri (La Venta).

Acknowledgements

We wish to thank our friends Younes Shariatmadari of the Iranian Cavers and Speleologists Association (ISCA), Yousef Sorninia, Javad Nezamdoost (President of the ICSA), and all our other friends from Iran who have provided assistance. Our thanks also to Shiraz University, the Speleology Society of Lar (Iran) and the regional authorities who granted us access to the mountains and cave sites.



Hiking towards Ghizhalan Cave

ICELAND 2018

Tommaso Santagata, Paolo Testa

45

LA VENTA

ESPLORAZIONI GEOGRAFICHE

The glaciers of Iceland have always attracted the attention of speleologists, drawn there by numerous phenomena associated with glacial karstification. Although La Venta has never organised a proper expedition to Iceland, on several occasions various members have taken part in projects and trips orchestrated by speleologists from Italy and further afield. In 2018, a new expedition planned out by speleologists from various regions of Italy enabled La Venta to take part in the “Iceland 2018” exploration project.

Our main destination was Breiðamerkurjökull, a glacier tongue that is an outlet of the Vatnajökull glacier, situated in the south-east portion of the island. The tongue is 12 km wide and around 23 km long. The main objectives of the expedition were as follows: to understand how glacial karstification develops, collecting as much information and data as possible (by placing GPS devices at the entrances and by surveying and photographically documenting the mills explored); and to evaluate the morphological and topographical variations of what is the most extensive glacier tongue in Europe.

With help from Niccolò, an Italian guide who has lived for many years in Greenland and Iceland and who is an

old friend of some of our members, we worked on the logistics and organised transport on the glacier, which involved the use of off-road vehicles made available by local guides. To our great surprise, we would later discover that these vehicles are even capable of going well beyond the glacier front (where we were left with the material to be transported on foot), which is something to bear in mind for any more substantial expeditions we may sign up for in the future.

As soon as we set foot – or rather, crampon – on the ice we realise that its consistency is very different from that of its Alpine counterpart. Here it is much harder and more compact; the slope is minimal and the ice is almost polished – something that is not common on our glaciers. All of this greatly facilitates progress, particularly with our heavy backpacks. We set up camp above a moraine, in a strategic location just a few kilometres from the glacier front, and relatively close to the target areas for our explorations. Unfortunately, though, over the coming days we soon learn that it is no easy task to deal with Iceland’s wind and rain, which after just four nights spent at the camp force us to withdraw, due to the breaking of a number of tents and the impossibility of achieving anything. In the limited time available, we do, however, manage to split into various teams and carry out survey missions that immediately give good results. The area is undoubtedly interesting, and worthy of in-depth study in the future.

After this first part of the expedition, the group splits up, with some members heading back to Italy and others moving on to other ice tongues. In the second phase of the expedition, research is also conducted on Sólheimajökull (a tongue of the Mýrdalsjökull, the island’s fourth largest glacier) and it becomes immediately clear to us that here, too, karstification is highly developed.

On the whole, we can say that the research carried out in various areas of the Vatnajökull glacier has produced remarkable results, despite the problems caused by the weather. In total, 28 glacier mills were explored and documented. The largest of these extends in the form of galleries and meanders, and we succeeded in descending down into it to a depth of -130 metres. Unfortunately, it was not possible to conclude the exploration due to the quantity of nebulised water being released by the impressive waterfall.

This expedition was sponsored by: Club Alpino Italiano, La Venta Esplorazioni Geografiche and Progetto Speleologia Glaciale. Special thanks to Tiberino for serving us hot food during the stormy days we spent in the tents; to Enervit and Grivel for the supply of high-energy food and a number of pieces of equipment; and last of all to Niccolò Segreto and the local Icelandic guides for their priceless logistical support.

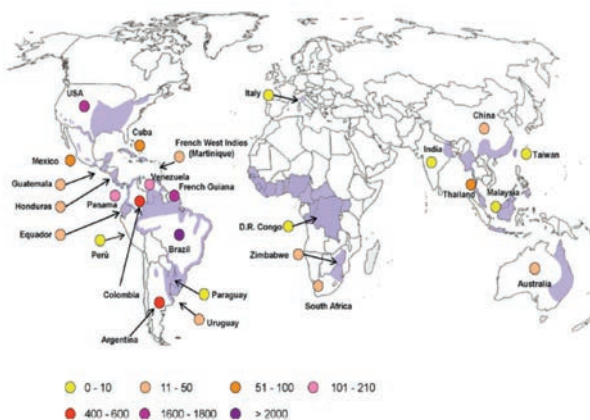


Horizontal tunnel

Histoplasmosis, aka Darling's Disease aka Cave Disease

Giuseppe Giovine

Out of all the illnesses that it is possible to contract by visiting caves, perhaps the one we can consider the most distinctive is histoplasmosis. Although not very widespread at our latitude, it is not entirely absent, either. It is, however, endemic in the southern USA (the valleys of the Ohio and Mississippi rivers, part of northern Maryland, southern Pennsylvania, central New York state and in Texas), as well as in Mexico, Panama, Ecuador,



Epidemiology of histoplasmosis (from Dr. Pedro Torres Gonzalez, 70th anniversary of the Instituto Nac. de Ciencias Medicas y Nutricion Salvador Zubiran)

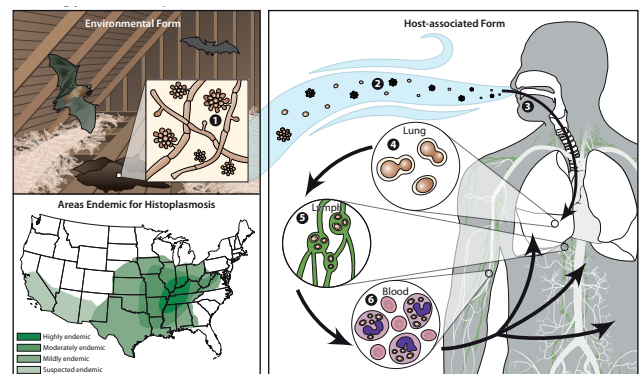
Cuba, Paraguay and a large part of South America. What causes the disease to take hold is not any form of bacteria, like those that most frequently cause urinary tract infections or skin conditions or lung disease, nor is it any sort of virus (viruses are normally responsible for influenza); rather, it is caused by a fungus! It is not uncommon for a fungus such as candida, or ringworm, to cause disease, but for one to invade, develop and cause illness through the lungs is an unusual phenomenon. This particular fungus, *Histoplasma capsulatum*, thrives in dark, warm, humid situations, but it can also survive under extreme environmental conditions (from -6°C to 50°C), producing spores – organs of reproduction and dissemination – in any surroundings, and is capable of



Large deposit of dried guano in the cave of Rancho Nuevo, Chiapas, Mexico

survival for prolonged periods and of re-growing once the temperature returns within the range of 18°C to 32°C , with relative humidity above 65%. As such, it comes as no surprise that the fungus is to be found in certain areas, including caves.

Histoplasms do not just attack human beings, but also rodents, birds, dogs, cats and bats. The elements are as follows: a warm, damp cave, in Mexico or another equatorial zone, and the presence of bats. But does this mean that we will all become ill? Certainly not. It is unusual to be afflicted by the disease visiting or even living in those geographical areas – you really have to try hard to catch it! People become infected mainly by breathing in the spores, which lie on the ground and are lifted up when you walk over them; in other words, they are transported by the wind and the circulation of the air. Having reached the lungs, they enter the bloodstream, in the same way as oxygen, and there they are collected by a cell called a macrophage, which serves to protect us from external agents and which works by engulfing the enemy agents, which it then dissolves and digests, rendering them innocuous.



Biology of histoplasmosis (from CDC, Centres for Disease Control and Prevention)

Now we've got all the ingredients you need. When you explore caves in geographical areas that are at risk of the fungus, it is advisable to avoid sloshing about in the guano. To this end, you have to protect your mouth with a mask that adheres effectively to your mouth and nose, or alternatively you can wear a large scarf, ideally dampened. Moments of physical weakness, tiredness, recovery from influenza or viruses, or courses of antibiotics can all cause the macrophages to be weakened and unable to eliminate the fungal spores; in such circumstances, they are transported to the whole organism, where they are then to be found alive and kicking, capable of infecting and giving rise to the disease.

To give you some idea of the gravity of the infection, it

should be stressed that, in those lacking a functioning immune system, the mortality rate for histoplasmosis can reach 100%. There are three forms of the infection that can be contracted.

1. Acute pulmonary: the most frequent, this manifests itself as an influenza-type syndrome, with fever, widespread muscular pain, headache, weight loss and cough, often accompanied by chest pain, lasting around one week. Often, due to these characteristics, it goes undetected, and our immune defences are sufficient to overcome the crisis.

2. Chronic pulmonary: persistent, it affects above all those who already have longstanding lung problems, where the fungus can more easily take root. It can easily be confused with a tubercular infection.

3. Disseminated form: it strikes not only the lungs but also other organs such as the liver, the pericardium (the membrane surrounding the heart) and the nervous system, and can give rise to fibrosis of the space that contains the heart (mediastinum) and the bone marrow. Extremely rare, and almost always fatal, it attacks those with a severely compromised immune system.

The drugs used to treat the condition are not antibiotics, which in this case are useless, but antifungals (itraconazole in the classic forms or amphotericin in the most serious cases). When significant breathing difficulties are involved, cortisone may be useful for a short period. Confident diagnosis is possible only with the cultivation of the infected tissue, where mycotic hyphae – collected for example with a bronchial wash (sigh!) – will then grow. There is the option to determine the presence of proteins of the fungus (antigens) wandering around the organism through the most common blood or urine tests. The fact is that it is not always detectable, or it may be detected only very late, sometimes indicating the presence of a histoplasm that is not actually there. If positive, these tests can help to monitor the ascertained diseases and to check the effectiveness of the treatment.

Can we prevent the disease?

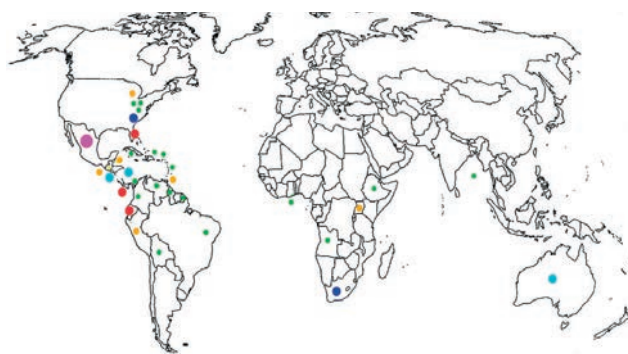
Taking drugs preventatively, before visiting an endemic area, only makes sense if you are affected by diseases that compromise your immune system in some way. The same applies if you have just stopped, or are still taking, a treatment with an immunosuppressive effect.



Example of full-face mask

Protecting the airways is a difficult issue: common protection systems such as single-use masks or elastomer masks that cover the nose and mouth are a hassle, they make progression almost impossible,

and their preventative power is extremely low. It would really be necessary to use a full-face mask with changeable filters and battery-powered forced ventilation (impossible to imagine!). As things stand, I continue to use a large damp scarf to cover my nose and mouth, but you also need a mask for your eyes and rubber gloves. Pay a great deal of attention to areas of the cave that are rich in deposits of guano, particularly if dry and, therefore, volatile; walk without generating clouds of dust; choose appropriate places in which to refresh yourself and take care to wash your hands well. On leaving the cave, it is important to place your overalls, materials and footwear in a properly sealed bag, without letting them fly around



>200 cases; 51-100 cases; 31-50 cases; 21-30 cases; 11-20 cases; 1-10 cases.
Distribution of cases of acute histoplasmosis occurring among healthy, immunocompetent travellers (from Staffolani et al., 2018)

everywhere – it is essential to immerse them in water to cleanse them effectively of all residues of dust and powder.

If you suspect that you have contracted histoplasmosis, you must contact specialist centres for infectious diseases (ideally, for infectious and tropical diseases), which are to be found in all major cities and usually have dedicated (travel medicine) clinics. Help them by describing the circumstances in detail.

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Paolo Forti



The home of Hypnos

This seventeenth-century allegorical print has recently become part of the collections of the “F. Anelli” Centre for Speleological Documentation. It illustrates the cave in the land of the Cimbri (the Alpine area between the Veneto and Trentino regions of Italy), which was home to Hypnos, the God of Sleep, as described by Ovid in his “Metamorphoses” (Book X, vv.592-649). In the deep cave, where silence reigns, neither sunlight nor gusts of wind ever penetrate, while sinister vapours rise up from

the soil, as the waters of the Lethe (the River of Forgetfulness) flow off to one side. At the centre of the cave, Hypnos sleeps soundly in a bed of feathers, while around him lie a plethora of dreams still waiting to be dreamt. The print captures the moment in which Iris, Goddess of Rainbows, wakes Hypnos at the request of Juno, so that he may send his son Morpheus to Alcyone, daughter of Atlas, with a deceptive dream.



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