

Antonio 'Tonín' Ramos, from the Cabildo's technical department, is the only remaining member of the small team of experts who worked on the building of the tourist centres under the guidance of their creator, César Manrique. Behind him is the new lift for stage props



Lanzarote in 1963

Luis Morales, head of the Lanzarote Cabildo Public Works technical team during the building of all the Tourist Centres, gave *Lancelot* a first hand report of conditions on the island at the time work began on Jameos del Agua Grotto and Theatre. 'In 1963 there wasn't a single paved road on Lanzarote and water often had to be ferried here by ship. At the same time as building the Centres at Jameos del Agua and the Fire Mountains we were asphaltting the island's first stretches of road and laying pipes to distribute water. The first desalination plant was not operative until 1964. In addition, we were building a 1,850 metre concrete runway at Lanzarote Airport to replace the bumpy dirt strip previously used. With just one small tractor the public works department built 100 metres of paved road daily working 10 hours a day from Monday to Saturday.'

A Swim in "Jameos" Lake

'In the old days the whole area around Jameos was basically wasteland. Islanders would come for a swim in the lake to cool off during the heat of the summer climbing in and out of the cave by rope or clambered down a precipitous path used by goatherds. Some people threw rocks and other rubbish through the aperture in the roof in order to hear the sound of it splashing when it hit the waters of the lagoon.'

'When César Manrique decided to convert the grotto and lake into a tourist attraction and build a concert hall in the cavern at the far end, our first task was to clear out all this debris although we had no suitable machinery, No cranes or winches and the lake was four metres deep and freezing cold. We built an improvised net of metallic mesh with long hooks attached and lowered it to the bottom. Retrieved boulders and stones were placed on a stationary



In 1983, Marcial Martín Bermúdez, Manager of Jameos del Agua at the time, being shown the very first Speleonectes caught in the Atlántida Tunnel by the Iliffe-team. Photo Horst Wilkens

Aguas. At that time, only César Manrique and the Cabildo President José Ramirez and very few others believed in Lanzarote's potential as a tourist destination."

"Eighth Wonder of the World"

"When Jameos del Agua was finished, the inauguration was attended by Hollywood star Rita Hayworth who had just finished making a film, *The Salt Route*, on Lanzarote. The screen idol flew to Paris the following morning and told a journalist she had just seen the "Eighth Wonder of the World". In response to the question where is it, she replied "on Lanzarote". Prompting the next question, "Where's Lanzarote?" This is just one small example of the fame this island received as a quality tourist resort due to the works of César Manrique."

raft we also had assembled ourselves and when full, we carried them by hand all the way up the spiral staircase to the cave exit.'

'The same applied to the auditorium, the entire cavern was filled with volcanic rocks and other debris and before we began work on converting it into a theatre had to carry it all out stone by stone.'

First Tourist Guide

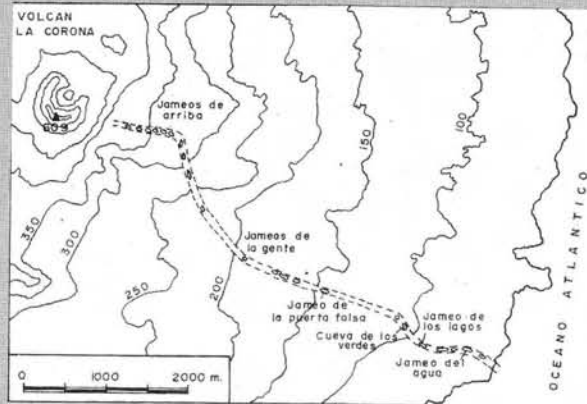
Marcial Martín Bermúdez, the Mayor of San Bartolomé and a former Insular Director, starting working at the Cabildo Tourist Centres at a very young age and was the island's very first tourist guide. "In the very early days, sometimes there would only be fifteen visitors at Jameos del

Atlantida Tunnel

The Atlantida Volcanic tunnel located in the north of Lanzarote beneath Malpais de la Corona is the longest volcanic tube in the world. It measures some seven and a half kilometres commencing in the heart of Monte Corona and continues underground all the way to the sea where it extends for a further 1,500 metres.

These tunnels, or tubes, are created during volcanic explosions. Whilst the mountain shoots out its rocks, lapilli and other debris and lava begins to emerge from the top of the volcano some of this lava flows straight from the core through the outer layer of the volcano excavating its own underground channel. The dragging effect produced causes the tunnel to become progressively deeper.

At a certain distance from the centre of this emission the surface of the underground lava stream cools down and solidifies, whilst the magma continues to



charts the various heights of the tunnel above and below ground. Sketched by Cabildo surveyor Telesforo Bravo in 1964

flow underneath the newly-formed crust. The level of the underlying lava-flow drops gradually as the emission ceases or as the channel deepens. Between the solidified and the surface of the subterranean lava flows, a cavity is created - a volcanic tube - whose form and dimensions are dependent on the characteristics of the original channel as well as the force of the subterranean sub-aquatic flow.

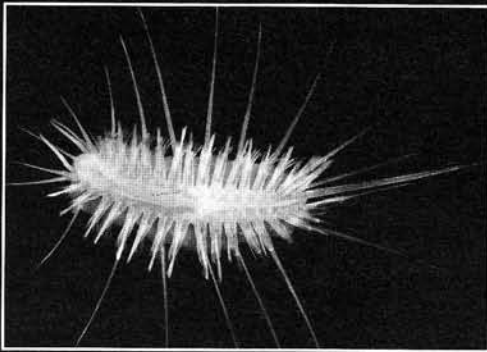
On only very rare occasions have several superimposed tubes have been formed as is the case in the Atlantida tube. This is clearly

An overall view of the course of the volcanic tube follows its underground route from the core of Malpais de la Corona Volcano until it reaches the Atlantic close to the exterior of Jameos del Agua. The illustration

seen when visiting the multi-level galleries of the Green Caves linked by spiral staircases of volcanic stone. The manner in which these uncommonly few tunnels are identified and the direction they take is indicated by a series of large cavities on the surface. These are created when the roof or part of it collapses. On Lanzarote the term used to describe such roof collapses is "jameo." Atlantida Tunnel has 16 such roof collapses the most famous of which is Jameos del Agua, so called because of the lake in its interior.



Atlantida 2008 Underground Diving Expedition on Lanzarote



*The blind cave crab *Gesiella jameensis* which visitors generally see lying on the bed of the lake. It is, however, only one of the fifty species which inhabit the waters of the Atlantida Tunnel*



Tom Iliffe with plankton net in the Atlantida Tunnel (Photo: Jill Heinerth)

Atlantida Tunnel

Millions of tourists have admired the beauty of the fascinating grotto at Jameos del Agua Tourist Centre since it first opened over three decades ago but only very few are aware that hidden below ground lies another awesome creation of nature known as the Atlantida Tunnel, which submerges into the Atlantic just behind the restaurant bar. This is the final section of one of the world's longest volcanic tubes created some 20,000 years ago when the nearby Monte Corona, became active spewing out vast amounts of lava which settled to form the surrounding landscape.

The lava tube begins at the volcano, crosses the whole 7 kilometre-long lava field until submerging to continue underground for another 1.4 km at a depth of about 50m. The interior

is completely filled with seawater, but although it apparently does not seem to have a wide opening to the ocean, it is flooded through a system of small fissures, which accounts for the one hour delay between tide levels at Jameos del Agua and the tunnel.

Expedition Atlantida 2008

Due to logistic and technical difficulties in conducting a thorough scientific study of the Atlantida Tunnel, no more than about 10 biological explorations have ever taken place. The most recent, Expedition Atlantida (March) 2008 was planned and organised by Prof. Thomas Iliffe (University of Galveston, Texas, USA), Prof. Pedro Oromí (Universidad La Laguna, Tenerife) and the authors of this piece, (both, University of Hamburg) who were joined by other biology

specialists from the Universities of Hannover, (Germany), La Laguna (Tenerife), and Galveston (Texas). Besides the 8 named scientists other highly experienced divers were also among the team. The organisers expressed their gratitude to the Lanzarote authorities for issuing the necessary permits promptly and without any complications.

“Closed Circuit” Diving

This was the first time the “closed circuit” diving technique was used in a marine dive in the Atlantida Tunnel. This system is advantageous because divers do not exhale bubbles, thereby preventing ecological damage to the tunnel's environment. During “closed circuit” diving, carbon dioxide is chemically extracted from the breath and a computer-controlled reserve tank releases

Scientific Discoveries in the 7.5 Km Volcanic Tunnel

Text and photography HORST WILKENS and ULRIKE STRECKER

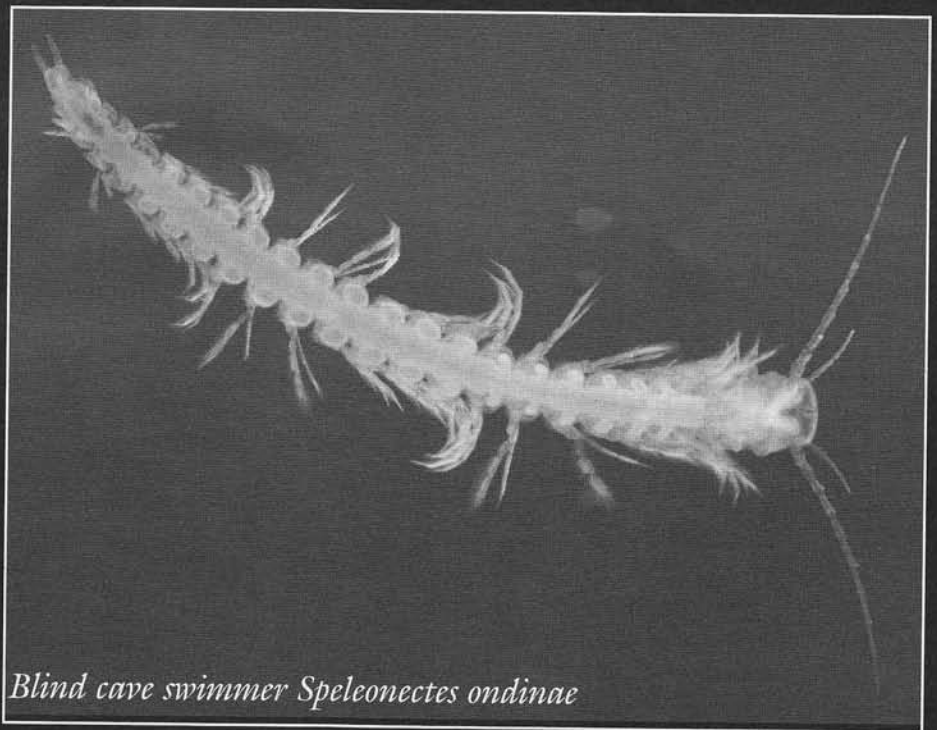
oxygen. This increases breathing efficiency and enables divers to stay below for longer periods and at greater depths. However, the equipment is more complicated and a large amount of gear had to be transported to Lanzarote. Divers resembling astronauts in full kit, could be heard groaning as they trundled between the entrance at Jameos and the lake weighed down by bulky equipment as they negotiated the spiral staircase.

Major Scientific Discovery

Professor Tom Iliffe is acknowledged as the most experienced specialist in the world in Marine Cave Biology having led research expeditions in hundreds of caves in Bermuda, the Bahamas, the Caribbean, Mexico and the Pacific. Already back in 1983, during our first scientific investigation of the Atlantida Tunnel at Jameos del Agua, Tom Iliffe and the authors of the article, made a spectacular discovery. We identified a member of a new class of the Remepedia crustacean which had only ever been spotted on one previous occasion in the Lucayan Caves on Grand Bahama and were only the second team to have ever even caught sight of it.

Speleonectes ondinae

Named *Speleonectes ondinae*, it is closely related to a species that had been found in Bahamian caves only two years earlier in 1981. These animals, which resemble pale millipedes and are up to 3m long, swim continuously using their numerous legs and as they spend their entire life in total darkness, completely lack eyes and body pigmentation. The species found in the Atlantida is endemic to Lanzarote and is a very archaic member of the crustacean family. We know from fossil records that their ancestral relatives lived during



Blind cave swimmer Speleonectes ondinae



The 2008 Atlantida team, L-R, Jill Heinerth (Diving photographer and film maker), Thomas Iliffe (University of Galveston, Texas, USA), Horst Wilkens, Ulrike Strecker (both University of Hamburg, Germany) and authors of this article and Stefan Koenemann (University of Hannover, Germany).

the Carboniferous System some 300 million years ago.

Montaña de Arena

One of the main focuses of our research this time was the faunistic study of the so-called Montana de Arena (Sand Mountain). This is a huge mound of sand lying 25 metres below the

surface about 720m away from the entrance which consists of numerous shells and invertebrate skeletons, which were smashed into fine grains by waves breaking on the rocks and the shore. Several stretches of these beaches of white sand are located along the Malpais de la Corona coastline bordering





Atlantida 2008 divers at the Montana de Arena (sand mound), photo: Jill Heinerth

the tunnel, particularly Caletón Blanco. Inflowing tidal waters wash this material into the lava tube through the fissures in the roof. The size of the mound indicates that the content accumulated over a long period of time.

Special Habitat

Within the stony and barren lava tube this sand mound is a very special habitat as its tiny fissures provide an environment for microscopically small worms and crustaceans. Furthermore, dead organic material is also transported into the tunnel interior at this point by the tides and some species of shrimp exploit its presence and feed on it. They are red coloured as they also live outside the lava

tube in water at a depth at which the red segment of the light spectrum is absent. This affords them excellent camouflage as they appear black in their natural environment and remain undiscovered by both predators and prey. One of the species is the Scherengarnele which is about 7cm long. Another is still to be identified, it seems new to science.

Several specimens of stony coral were detected in the roof of the mound of sand as well as a type of polyp. These animals, which are sedentary and about 3 cm long, live within a calcareous exoskeleton and obviously filter microscopic planktonic plants and animals out of the inflowing water. Yet a further new discovery.

50 Species of Animal Life

Generally visitors at Jameos del Agua only get to see the "Jameito", the blind white shrimp (crab) usually present on the bed of the lake, as the only inhabitant of this lava tube system, although it is the habitat of many others. Scientists at La Laguna University, Tenerife have listed about 50 species of animal life living in the Atlantida Tunnel and the number rises constantly. The majority are crustaceans, comprising 26 mostly endemic species.

Future Research

The second group are members of the marine worm family. Six of the thirteen types are found only on Lanzarote. White and eyeless species have evolved, having lived underground for a very long time, but only colonized the geologically (relatively) young lava tube following its creation some 20,000 years ago. To date, the scientific study of the ecosystem of Lanzarote has brought to light some remarkable information about evolution in general and that of the fauna of the Canary Islands in particular. We are convinced that many more biological discoveries await us during future research expeditions into the marine life of the Atlantida Tunnel at Jameos del Agua.



Cover of the new book of photography by Ulrike Strecker and Horst Wilkens published in March. Large A4 format filled with spectacular colour photography and minimal text of the most important natural habitats of Lanzarote and their typical flora and fauna. Over 80 fascinating photographs in the 120 page hardback multi-lingual work. One chapter corresponds with the article above showing large photos of the interior of the Atlantida Tunnel and its animal life which have never ever been seen by anyone with the exception of a few marine biologists. Exceptional gift for all lovers of Lanzarote's Environment.

On sale at the souvenir shops of the Cabildo Tourist Centres: Fire Mountains, Jameos, Cactus Garden, Mirador del Río, El Monumento; Pardelas Park, Orzola; the Bookswop, Puerto del Carmen and Boutique Aha, Tegüise.

ATLANTIDA TUNNEL

Jameos del Agua • Lanzarote, Canary Islands

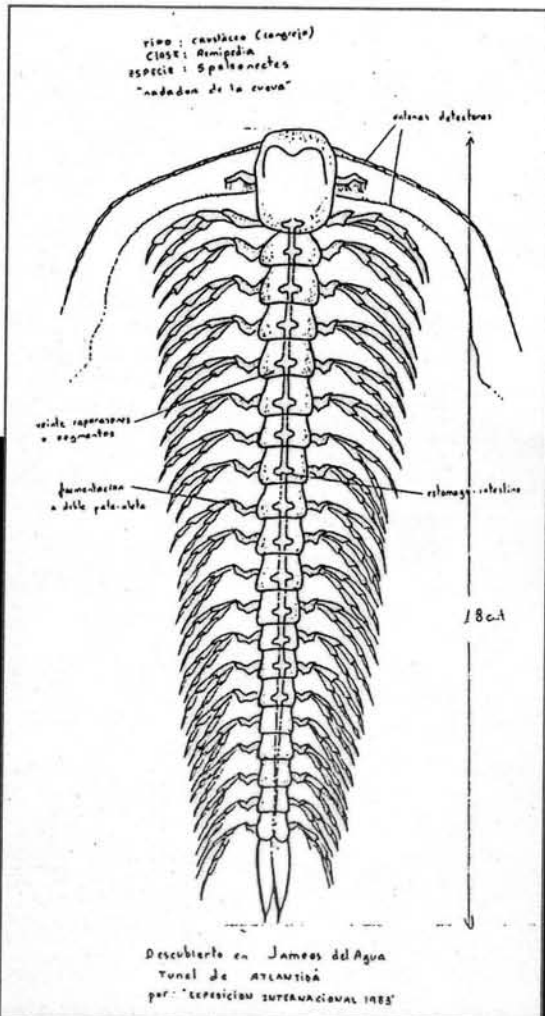
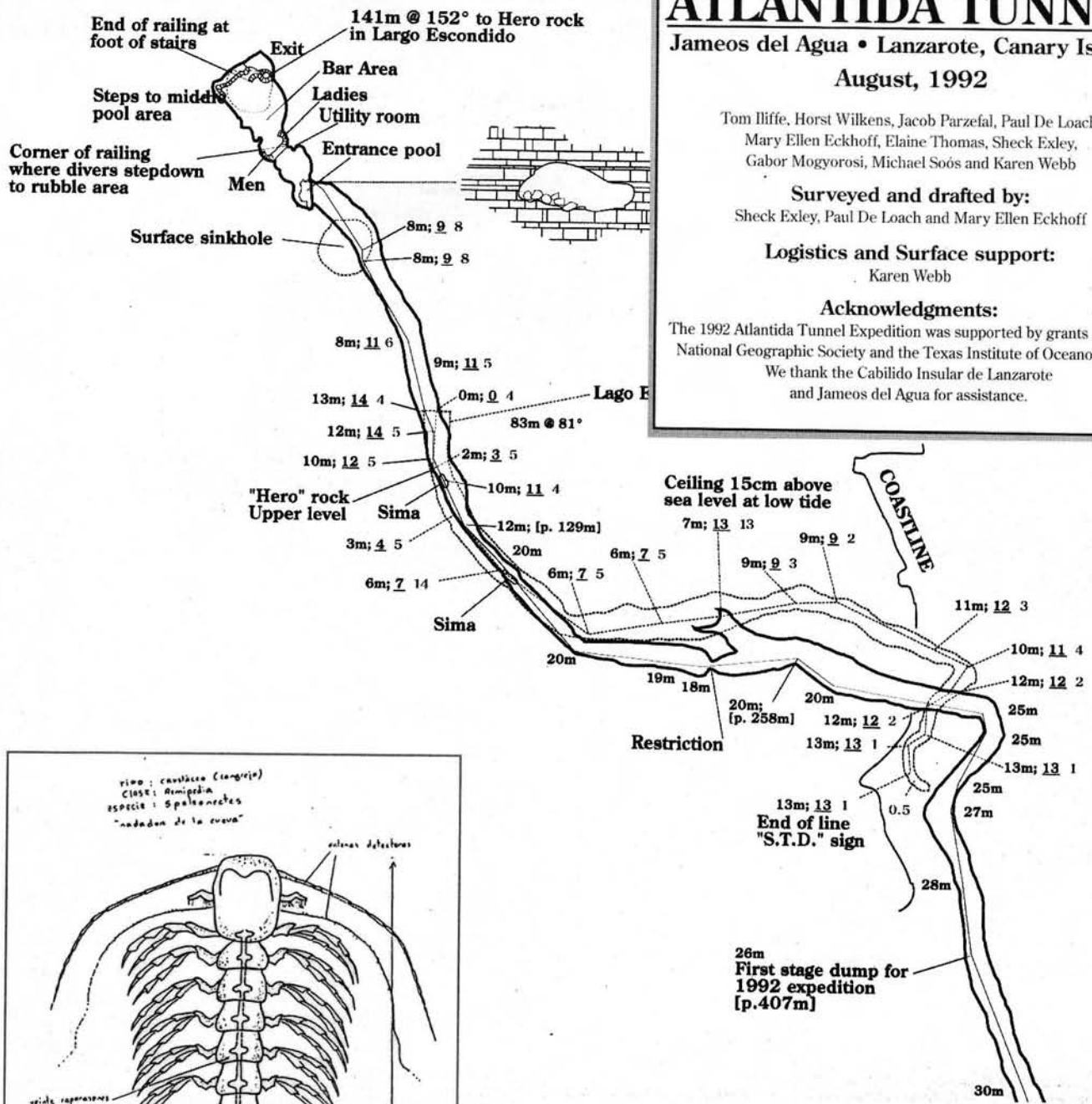
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Map courtesy Luis Ibañez

Biological Treasure Trove

Atlantida Tunnel is an outstanding treasure-trove for biologists, providing insight into the mysteries of the fauna living in the lightless system of tiny openings of the volcanic underground of Lanzarote full of seawater. However, these treasures remain safely preserved as the sole point of entry into the tunnel is very difficult to negotiate and too dangerous to be used by anyone except for cave divers with many years of experience. Divers must follow exactly the same trajectory in both directions, a 3 kilometre swim without any possibility of emerging. It is also of great importance to take the tidal flow into consideration to avoid swimming against the strong current.

Sketched by Luis Ibañez

