Ario Caves Project Expedition - 2014

Final Report

Picos de Europa, Spain

28 June - 3 August 2014

Report compiled by Ian Holmes

The Ario Caves Project's Mission Statement

To facilitate and further the exploration of caves associated in the region of Vega de Ario and the hydrology of Cueva Culiembro.

To investigate the potential for a hydrologically integrated, 'super deep' (over 1500m) system in the Massif Occidental of the Picos de Europa.

To provide a central point for organising access and collating information to these ends.

Expedition members
Acknowledgments
Sponsorship
Summary
Introduction
    Background
    The Ario Caves Project is born
Aims
Logistics
    Travel
    Accommodation
        Above ground
        Below ground
    Food and water
Financial report
    Expenditure
    Income
Exploration
    Xitu
    C4
    Digging
Plan for next year
Further information
References

Expedition members

Ian Holmes
Rowan Scott
Ian Peachey
Katey Bender
Rosa Clements
Mike Butcher
Nathanael Dalton
Rob Watson
Joaquin Valls
David Rose
Brendan Hall
Nathan Walker
Ka Leung
Richard Gregson
Richard Cole
Alex Ritchie
Jack Williams
Eabha Lankford
Avelina Wright
Roxanne Ramsay
Steph Dwyer
Rachael Rix
Thomas Gamble
Phil Baker
Lee Langdon
Howard Whittaker
Keith Mason
Andy Chapman
Alys Mendus
Paul Mackrill
Conor McAdams
Stephen Frawley
Jack Healey

Acknowledgements

We would firstly like to thank our two financial sponsors - the Ghar Parau foundation and the Speleological Union of Ireland for their very much needed and appreciated financial support. Without them this expedition might not have been possible.
http://www.gharparau.org.uk
http://www.caving.ie

We are greatly indebted to the Federacion de Espeleologıa del Principado de Asturias (FESPA) for their support and to the National Park in the Picos de Europa for granting permission for this expedition to proceed. In particular, our field agent, Xesús Manteca who was a great help with our application.

Aside from these, we would also like to thank the following people:

- our gear and food sponsors, whose contribution made this expedition a better one and fuelled our cavers during their long hours underground;

- the wardens of the Refugio Vega de Ario, Laura and Ignacio, for whose friendship and hospitality we are very grateful; and

- Rowan Scott who sourced most of equipment and lent the expedition his transit van saving the expedition hundreds of pounds and hours of searching for a feasible transport option.

Summary

Despite a mysterious illness (resembling flu) plaguing the team during the third and fourth weeks, whereby active caving personnel numbers reduced to approximately 60 – 70%, the major expedition objectives were typically achieved to varying degrees of success as per the sections below.

Typically, whilst less progress was made in C4 than hoped, given the distance of this cave from the surface camp and levels of team illness whilst it was being re-rigged, work undertaken in both Xitu and various surface digs yielder better results.

Pozu del Xitu (primary objective):

- Given many ropes were left in-situ or at pitch heads, Xitu was quickly re-rigged to allow the remaining leads to be pushed;
- The camp near to the Hall of the Mountain Dwarf was re-established at -550m to allow trips to the deepest part of the cave to be undertaken;
- Leads at Up All Night to Get Lucky (-1135m), Chunderpot (Dave Rose's missing 30 year lead at -930m) and Avelina's Bit – all pushed to conclusion, unfortunately with little additional passage being found;
- Snowcastle was relocated (with Dave Rose's help as we were looking in the wrong place last year), and despite the original descriptions, was found to contain a considerable draft, but no obvious way on – exploration was somewhat hindered however by abundance of exquisite formations;
- The trench pitches were re-dropped for the first time since original exploration took place during the early 1980s to allow Paul Mackrill to push the undived sump (-360m) and additional cavers to look for a possible dry bypass – unfortunately the dive terminated at a boulder choke at -6m depth and no dry bypass was found; and
- Toward the end of the expedition the camp was subsequently stripped and ropes de-rigged to the top of The Gap (-250m).

Torca del Regallon / C4 (secondary objective):

- The cave was successfully relocated ad re-rigged to the bottom of The Monster (-350m) – the re-exploration of C4 was somewhat harder the expected given that new bolts needed to be placed, lots of loose rock was encountered and melt water was hard to avoid deeper within the cave; and
- Most ropes were left in-situ (but hung up) to allow further exploration during next year's expedition (2015).

Culiembro and Cares gorge

A familiarisation trip into Culiembro was undertaken in preparation for a bolt climbing expedition in the near future (to look for potential dry sump bypasses) and a large fossil resurgence was explored high up within the cliffs on the Cares gorge – despite brief digging work within the remnant resurgent entrance, a sustained effort would be required to make any significant progress.

Surface digs

Several surface digs were worked in the area including and surrounding Jenga Pot (in the Valley of Dry Bones above the terminal ‘Choke Eggburt’ choke in 2/7) – although progress was slow going in the well drafting Jenga (as it’s very loose), a significant breakthrough was made in a nearby dig during the last day of the expedition, whereby the start of pitch series has possibly been found (exploration will likely continue as part of next year’s expedition).

Other

Much to the Picos de Europa National Park warden and the Refugio Vega de Ario’s delight, several cave entrances were cleared of significant amounts historical rubbish relating to previous OUCC expeditions.

Introduction

Background

Oxford University Caving Club (OUCC) has been exploring the caves of the Picos de Europa (pictured in map below) in Northern Spain for 54 years. Since 1979, exploration has been centred around the Ario bowl of the western massif. Xitu was the first cave to be discovered in this region (area 5 in OUCC notation; hence, Xitu is 1/5). Over the next three years, it was pushed to a terminal sump at a final depth of -1135m, the deepest cave in the world explored by a British team at that time and the first over one kilometre deep. OUCC has been one of the main driving forces behind the exploration of the caves in the Western Massif of the Picos de Europa, and the successful link between Xitu and Culiembro (first made in 2010 by members of the Cave Diving Group[1]) was a significant step forward in their knowledge of the area.

In 2011 the OUCC expedition once again returned to Pozu'l Xitu to mark the 30th anniversary of the 1981 expedition and the 50th year of Oxford led expeditions to Spain. Despite continuous difficulties (persistent and significant storms), the cave was rigged to circa -900m. However, little exploration was done, and the diving aims had to be abandoned. It was agreed before the de-rig began to return in 2012 to finish the job.

The progress made in the last four years in the Xitu-Culiembro system has made it possible that in the years to come we will be able to connect a system in excess of 1800m.

Culiembro is the resurgence cave for Xitu, Jultayu (2/7), Cabeza Muxa and likely Asopladeru la Texa; the lower reaches of Xitu are now a possible base for discovering a way into Pozu Jultayu - 2/7 (the entrance to which is around 1200m above Culiembro – exploration has stalled at a boulder choke (-800), that bypasses some or all of the sumps between Jultayu and Culiembro. During the 2012 expedition a world record was achieved, the world's deepest cave diving traverse, where two members of the expedition successfully dived through Culiembro into Xitu and excited out onto the Ario bowl. This was then repeated in reverse in order to retrieve the diving bottles. The following year the expedition was led for the first time by a non-member of OUCC who had been attending previous expeditions. In light of the fact that it would no longer be an official University sponsored expedition, it was renamed the Ario Caves Project. The ethos, however, and the central point for information collation remained the same.

Figure 1 – Location of the Picos de Europa

The Ario Caves Project is born

The Ario Caves Project is therefore a continuation of 50 years of Oxford University Cave Club's exploration in the Massif Occidental of the Picos de Europa. The "ACP" is an extension and expansion of this work, whose primary aim is to facilitate and further the exploration of caves associated with the Vega de Ario and the hydrology of Cueva Culiembro. The goal is ultimately of yielding a super deep system in excess of 1,800m. This would be the deepest in Europe and one of the deeper caves of the world.

The scientific justification for this super deep system comes from the culmination of many years of exploration, surveying, geological studies, shaft bashing, careful GPS documentation and dye tracing. This work has uncovered many systems which, in their own right, range in depth from several hundred metres to >1,000m (namely C3-C4, 2/7, Xitu and Culiembro). Some of these are already connected, either by

overlapping survey data, physical connection or positive dye tracing. C3's survey overlaps with upstream 2/7 and upstream Culiembro is 2/7 (dye confirmed), together they form a system with a vertical range of 1,564m. Pozo del Xitu is a significantly deep cave in its own right, but is merely a tributary to the 2/7 – Culiembro system. C3/C4 is a cave whose survey data overlaps with a branch of 2/7 and currently ends at an unascended waterfall whose volume of water is described as significant. The ACP's aim is to determine which of the many promising leads/shafts uphill of these caves are the most likely to connect in the aforementioned system and these will be explored, bolted and dye tested to Culiembro.

Permissions

Our on-going relationship with the Parque Nacional continues to be a very good one, for which we have the work of FESPA and Xesús Manteca in particular to thank. We hope that this good state of affairs will continue, for without them and their crucial work there would be no expedition.

Aims

1. Continued pushing of leads in Xitu in the hope of finding dry connections through to 2/7 and Culiembro;

2. Re-rig of C4 to continue exploration upstream of the current limit and dye trace downstream to probable 2/7 and Culiembro connection;

3. Digging and prospecting caves within the area above 2/7 choke Egbert;

4. Preparations within Culiembro to facilitate future joint aid-climbing and diving trip; and

5. Establishment of a permanent equipment store out close to the Vega de Ario.

All aims were progressed to a varying degree of completion.

Logistics

Travel

All the expedition equipment was transported to Spain by transit van, ford focus and Nissan micra! The ferry was taken from Dover to Dunkirk and the journey continued through France and Spain to Los Lagos, the nearest road head to the Ario bowl.

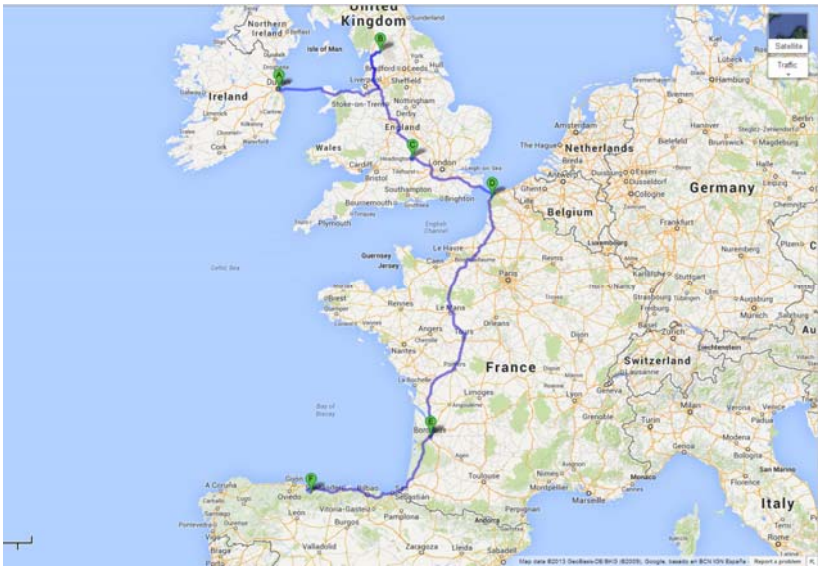

Figure 2 – A map showing the route taken by the vehicles from the UK to Spain.

Figure 3 – The prefect vehicle for expeditions.

Accommodation

Above ground

Historically on the OUCC expeditions, the majority of the expedition members were students and opted for free camping. The expedition's above ground base was situated within some of the abandoned shepherds' huts of the Ario bowl, see picture below.

Figure 4 – Inside and outside the shepherds' huts at Ario.

These offered an adequate base for the expedition, but it was felt that use of the Refugio a few hundred metres away might be preferable for sleeping, especially as protection from the elements should the weather become inclement. This also offered an opportunity to help promote local business and relationships. The wardens at the refugio, Laura and Ignacio, were incredibly helpful and allowed us to rent an entire room in the building exclusive to the expedition for a very competitive price.

Figure 5 – Destructive expedition neighbours!

The expedition also purchased two large tents that were used for additional equipment storage and overflow camping during the busiest weeks. Unfortunately the tents didn't hold up well during periods of high wind and the cows continued to be a source of unpredictable destruction. As such, a larger number of cheap smaller tents would be preferential in the future.

Below ground

An important objective of the expedition was to achieve a system whereby several groups of people could work at different leads within the cave simultaneously and for extended periods of time thus maximising time and energy efficiency. In order to achieve this there needed to be a comfortable & large enough camp that balanced cost, size and weight with an efficient means to keep warm and most importantly get dry again.

The camp consisted of a floor made from the extra tough plastic – visqueen - that is used to line concrete foundations, on top of this was a layer of sound proofing material to serve as an equivalent to thin roll matting (this was more cost and weight effective). Areas where people were standing and laying had cut up Inglesport bags to protect the matting from wear and tear. The shell of a living area big enough to sleep several people was made from a cut up cargo parachute given to us by Wilderness Leisure, a model based on the principles of keeping warm within a storm shelter. Inside this we had a washing line for our wet clothes, ample space to cook, eat & store food and two tent inners for sleeping up to 12 people. We dried our clothes by stripping down to our thermals and drying off over a petrol MSR stove that burned most of the time we were in the tent. Fumes did not prove an issue as a hole was cut in the middle of the tent to function as a chimney.

Figure 6 – Campsite at the Hall of the Mountain Dwarf, photos: Jeff Wade

Food and water

A large amount of the dried food and the occasional luxury items such as honey, Nutella, jam and condensed milk were purchased from supermarkets in the UK. As usual, all additional food purchased in Spain was bought in Cangas de Onis, the nearest town.

Breakfasts generally consisted porridge with honey / syrup. Evening meals typically comprised either pasta or rice with some sauce based dish. Although at times unpopular, TVP chunks purchase in the UK proved very useful for bulking out meals.

Meals at underground camp were based around sachets of dried food – pasta, cous cous, beanfeast, custard and similar.

Figure 7 – Meal time at the underground camp

It was encouraged that snacks for underground use were bought personally to account for individual preference. Furthermore, personally sourced snacks generally do get saved to be eaten underground, rather than being devoured on the surface during rest days.

The tap outside the Refugio supplied us with water for the whole five weeks and an abundance of snow in the Ario bowl meant water was plentiful.

The expedition purchased a new Coleman dual fuel stove for use at the surface camp and proved to be very reliable. Ignacio has kindly offered to keep this at the Refugio for us until next year, for this we are very grateful.

Financial report

Accounts summary

The expedition expenditure was typically finely matched to income received.

	INCOME	EXPENDITURE
Expedition fee	£ 3,300.00	
Ghar Parau grant	£ 500.00	
SUI grant contribution	£ 200.00	
Sidetracked article	£ 400.00	
Oxford university placement scheme	£ 300.00	
Equipment expenditure		£ 2,250.00
Accommodation		
Contribution to refugio accommodation	£ 2,746.00	
Payment to refugio for accommodation		£ 2,692.00
Field		
Food costs		£ 1,500.00
Transport costs (van/car)		£ 1,000.00
TOTAL	**£ 7,446.00**	**£ 7,442.00**

Exploration

1/5 - Pozu del Xitu

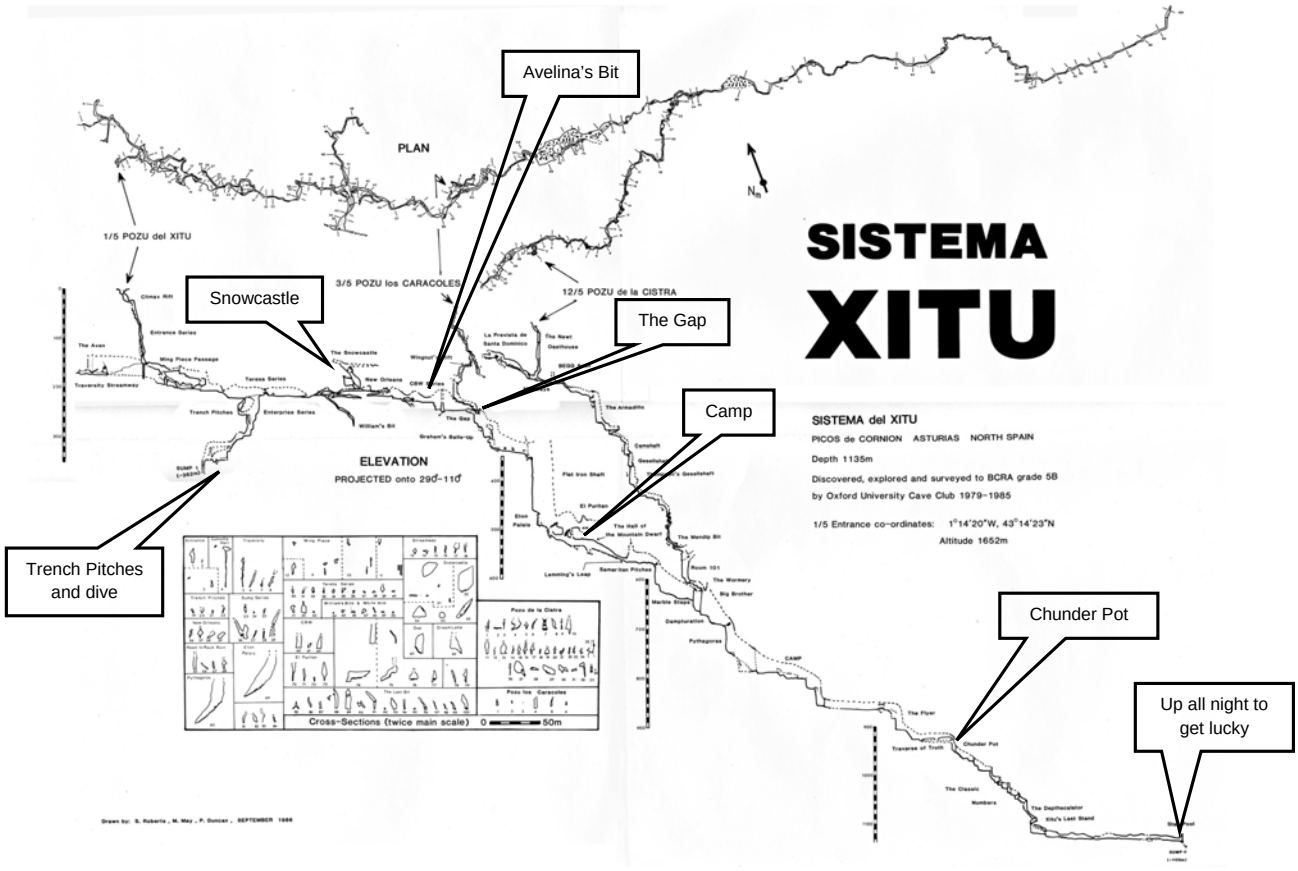

Figure 8 – Xitu survey

Diving the Trench Series, -362m, 18th July 2014, Paul Mackrill

I used to just take a small Premiere Carbide, woolly underwear, helmet and a chest band tied from a bit of climbing tape for a life line point. It fitted into a small basic canvas rucksack. 5 of us would trail off in a small car to the Yorkshire Dales from Lancashire. Now I have filled the car with a 300 bar diving compressor, 5 cylinders, 1500 lumen lighting systems, full SRT kit, 7mm wetsuit, dry caving suit, kit bags, etc. The car is full and I am travelling on my own!

My objectives are twofold. There is a sump at the bottom of the trenches series which has been a conundrum for all the years since its discovery during the original exploration at the end of the 70's. The original end of Xitu had dropped down a series of pitches to a sump and the water headed off to an unknown destination. The second objective was the sump lying at the bottom of C4 and the survey showed it "inches" from 2/7.

Unfortunately only the rigging of Xitu was completed in time for an exploration of the underwater world. C4 was rigged to the bottom of the Monster and is left for next year's objectives.

So on the 15th July, with a small team [Rowan, Nathan, Rosa and myself], we set off with the objective of either rigging to the sump or finding a sump bypass.When I arrived the trenches had been rigged to the bottom of the main pitches and through a traverse to the final cross rifts [just after, I assume, Chopper pitch]. I had the choice to follow the original route, down Grey pitch, which led into what was described as crawling through loose rocks and mud OR attempt to bypass the sump via the upper rift only visit by John Singleton on the original explorations in 1980 [?].

This was a good choice as the rift, after a brief narrow section gave way to a high traverse. As the traverse opened out I chose to rig a wide rift down some 20/25m to an area of loose boulders with a stream running in a narrow slot under the boulders below, which would have been the original route to the sump. I traversed back upstream and came out opposite the original route on the ledge 5m up from the bottom of Grey pitch but I couldn't climb down to the rift to the original route to the sump. I had arrived here via the "parallel boulder-filled rift which was not followed as it seemed to choke very quickly" described in Proc 9. Back at our arrival point Nathan had found a way on via a climb up into the boulders and past a couple of windows down into the rift to the stream. A further short sandy crawl led to a drop down an ancient mud-filled muddy vadose streamway which led around a corner to 6m drop to the long sump pool.

The sump pool looked cloudy with clean rock walls rising above the water for about 2m, suggesting underwater might be cleaner. The new approach gave a good kitting up area and I felt that an exploration dive was on.

Figure 9 – Kitting up above the sump pitch

I got a small group to drag all the dive kit up with me to Ario, then on the 18th July we set off as a small and motivated team to attempt the sump (Eabha, Jack, Nathanial and I). I took in a pair of 4 litre cylinders and stripped back the weights to just 1kg as I'd be diving in SRT gear (additional weight). I also feared the sump would be deep and didn't want to enter the negative buoyancy territory; and I'd compensate with a bit of finning to get me down. As it was I was almost in perfect neutral buoyancy in the sump.

The cylinders were protected with Karrimat and the valve heads with used Mornflake tins, which survived the carry through climax rift and all the obstacles beyond to arrive at the kitting area in one piece. I laid the kit out on the empty bags to avoid getting mud in the valves and joints, and I changed on Eabha's survival tent.

Figure 10 – Abseiling into the sump

The entry to the sump had me on totally new territory. I had to negotiate a 6m vertical and muddy walled pitch into a sump of unknown depth. We had forgotten a spare line to lower the ancillary kit such as fins and dive real; so I elected to abseil with the full kit in place, so when I hit the water I would have everything in place. I prefilled my scoff buoyancy bag to be sure I didn't sink out of sight on entry as I had no platform to pre-test all the kit and be sure of my trim. The cup of hot tea I had before I set off was most welcome.

I hit the water and was almost relieved at its cold 6°C grip as I was pretty warm after all the kitting and entry antics. However I was now standing on a shelf of sandy mud which was some 1 metre below the water level.

I had wound the dive reel with 100m of line, but the conditions meant that it wasn't easy to lay the line with ease from a bobbin; so I shed 20m by getting the team to pull in some line until I had a tidy line reel.

I dived the length of the pool looking at the floor for a clear way on. Under water it was narrower than I expected and my side mounted tanks scraped both walls. I choose not to drop down immediately until I had secured the line as, with the line coming in at an angle, I feared a line trap lower down as the sump could have narrowed. Near the far end I found a flake, put in a snoopy and dropped down into clearer water. Another flake and snoopy and I was moving forward under the far end of the sump and into the unknown. But the wall dropped down in front of me and formed a curved alcove. I let myself sink hoping the way was underneath but the vis below was zero and my hand hit mud. I felt from side to side and the mud lay evenly across the bottom.

So I surfaced and made two more direct descents at different points along the rift. I always reached a zone of zero visibility and my hand searching in the gloom only found sandy mud from wall to wall.

I finally surfaced and called it a day. Any way on would require digging and the fill seemed to be pretty even at about -6m from the sump surface. I now had to get myself out and I took off my fins and attached them to my hand jammer. I then had the joy of SRT climbing the 6m pitch to the ledge fully kitted, which surprisingly straightforward. It was a matter of dekitting, redressing and eating before the 362m climb back to the surface giving an 11 hour trip.

Figure 11 – 'It doesn't go'

So what have we got? In my opinion the sump is a mud filled rift with the water seeping through the sandy mud to a probable rift. It could escape the rift in either direction. The water backs up to at least 10m above the sump in flood and there is mud on all the approaches to the sump. Although the pitches are huge leading down to the bottom of the first canyon, the connection through the steep vadose passage of the way to the Chopper shows the more immature nature of this passage. Most of the water in Xitu went into the Teresa series, the trenches only being a relatively immature sink created much more recently.

Later attempts to bypass the sump at a higher level [along the passage followed by John Singleton] by Eabha and Rowan showed that the passage split into two parts, and both closed in and dropped back to the final sump. As yet no way on in this area has been found. Earlier dye tests have been made but I do not yet know of the dates and their results. For me this was a very useful exercise in conditioning and carrying dive equipment for deep caving. Thanks to all that helped make this possible.

Snowcastle (-150m)

Following unsuccessful excursions during the previous two expeditions (2012 and 2013), Snowcastle was subsequently relocated with Dave Rose's assistance. A number of trips were then undertaken to photograph and recheck the leads in this area.

Figure 12 – Snowcastle (Thomas Leung)

Although drafts were detected during the exploratory trips, indicating the presence of air movement and possible unexplored passage, no accessible leads were found.

Figure 13 – Exquisite formations at Snowcastle (Thomas Leung)

Exploration is particularly difficult in this area given the delicate nature of the formations.

Figure 14 – Exquisite formations at Snowcastle (Thomas Leung)

Avelina's Bit (-230m)

The remaining leads at Avelina's Bit, previously explored during 2013, were all pushed to conclusions. Typically the leads quickly looped back in to the main route.

Dave Rose's 30 year Chunder Pot lead (-930m)

After a 30 year wait, Dave Rose heroically directed a team to his long dreamt about lead near the top of Chunder Pot. However, although a thorough search of the whole area was undertaken, no significant new passage was found.

Up all night to get lucky (-1135m)

Following on from 2013 expedition successes above the terminal Xitu sump (The Stag Pool), a small group returned to Up all night to get lucky.

Figure 15 – Temporary base at Up all night to get lucky

Unfortunately, despite a valiant 20 hour pushing trip, no new leads warranting further exploratory had been located.

De-rigging

During the last week of the expedition the camp was removed and Xitu was de-rigged to The Gap (-250m). The ropes on the pitches above The Gap were left in-situ, but pulled up where required.

C4 – Sistema Verdelluenga

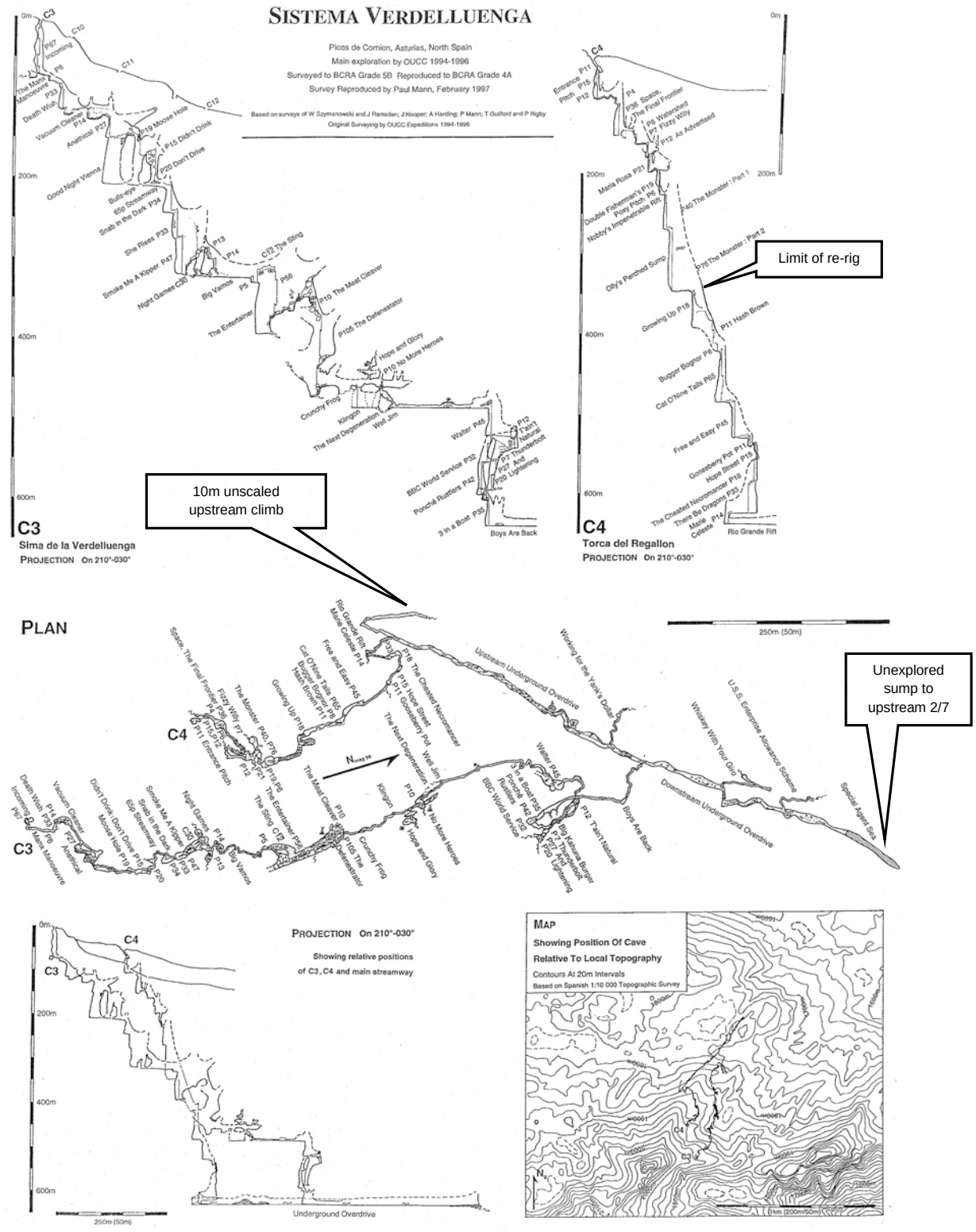

Figure 16 – C4 surveys

The expeditions' secondary objective was to relocate and re-rig C4 in preparation for renewed exploration within the active deeper streamway.

C4 (and the adjoining C3) was pushed during the early 90s to a sump at the downstream limit and a short unscaled waterfall climb upstream. Furthermore, upon interrogation of the survey data, the downstream sump was though to be short as the surveys for both C4 and 2/7 almost overlapped.

Whilst several re-rigging trips were made into C4 during the 2014 expedition, progress was typically slow due to loose rock, large quantities of melt water on some of the larger pitches and multiple drill failures. Given this, and the reduced numbers of personnel available during the latter stages (a third of the team being effected by some mysterious flu like illness), the cave was subsequently only rigged as far as the base of the Monster (-350m).

Figure 16 – C4 wet pitches

Despite the setbacks, all the ropes were left in-situ and hanked up at the top of pitches at the end of the expedition. As such, C4 can be rapidly descended in 2015, whereupon the re-rig can recommence.

Finally, it is worth noting that whereas C4 was originally pushed from a tented top camp immediately adjacent to the entrance, during 2014 we opted to walk in from our permanent base back at the refugio on each trip. The journey to the entrance therefore generally took 1-1.5 hours (repeated after caving).

Given the above, consideration should be taken to reinstate the tented top camp during future expeditions.

Additional C4 descriptions can be found in the OUCC 1996 expedition report.

Digging

Cliff entrance above Culiembro

A (long) days excursion was made to a relic resurgence high on the cliffs above Culiembro, with Paul McKrill and Richard Gregson leading the navigation (having both been there previously).

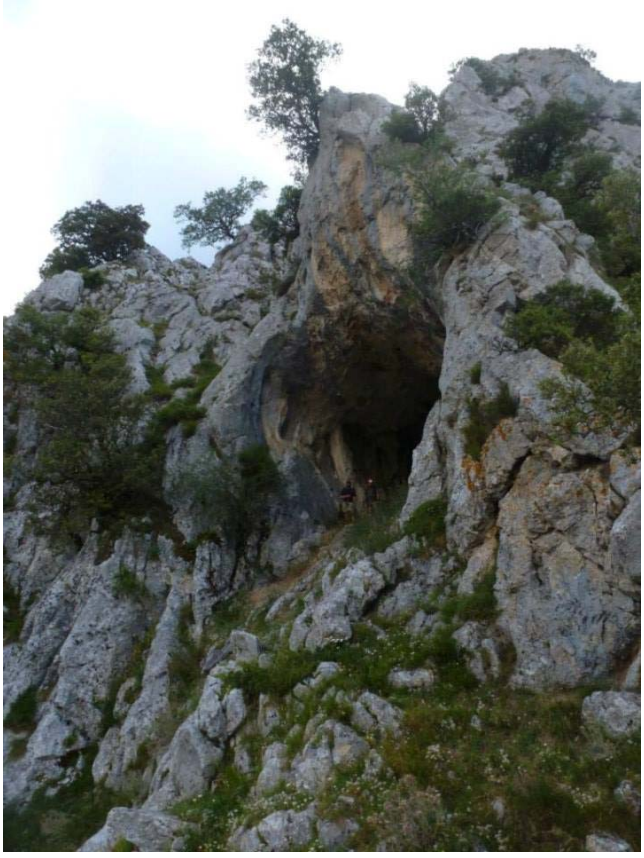

Figure 17 – Cliff resurgence

The trip involved an energetic scramble up the steeply inclined Cares Gorge whilst picking a route through the maze of ledges and cliff outcrops. Annoyingly the journey requires the team to climb much higher than the entrance and then drop back down along a ridge to the abseil take off point. The final 10m abseil comprises an exhilarating descent over the side of the Cares Gorge with pendulum over into the entrance.

Figure 18 – Cliff resurgence

Unfortunately, typical of the area, the impressive 10m round tunnel very quickly closes down into a number of digs and calcited blockages. Given the short amount of time available, the team split into pairs and looked at each of the leads in turn. It became apparent after a few hours of work that a sustained digging effort would be required to make any significant progress, and the team duly retired before it got dark.

Note to any tempted future explorers – there is nowhere to replenish water once you start scaling the side of the Cares Gorge. Teams should allow for 3-4 hours of walking and scrambling each way, to and from the entrance.

Valley of Dry Bones / Jenga

Considering the Valley of Dry Bones location above the terminal choke in 2/7, attention was again turned to Jenga cave and the additional entrance situated nearby, and particularly toward the end of the expedition as personnel numbers reduced.

Figure 18 – Spoil at the entrance to Jenga

Although a significant amount of time was spent in the promisingly drafting Jenga, the broken down nature of the choked entrance made it a difficult obstacle in which to make progress. Generally there are no obvious features to follow at the dig faces.

Figure 19 – Spoil at the entrance to Jenga

Given the slow progress at Jenga, activity switched to focus on the other drafting entrance chokes within the immediate vicinity. Typically, just before the expedition ended, a squeeze was enlarged to yield constricted but ongoing, drafting passage. This cave will undoubted be explored further in future expeditions.

Figure 20 – Enlarging a squeeze within a surface dig close to Jenga

Objectives 2015

The following objectives are planned for the 2015 expedition, albeit they may be subject to change following confirmation of attendee numbers and experience:

- Strip all rigging and camping equipment out of Xitu from above The Gap;
- Complete re-rig of C4, to gain access and allow exploration of the upstream C3 streamway, which includes a short (approx. 10m) aid climb at the previous limit;
- Dye tracing C3 / C4 sumps to downstream 2/7 streamway via Culiembro or Hoy la Madre;
- Possibly attempt to dive the connection between C3/C4 and 2/7;
- Further work in promising surface digs in the Valley of Dry Bones above Choke Egbert;
- Familiarisation trips into Culiembro to prepare for joint diving and aid climbing expeditions; and
- Additional activities on the cliff entrances above Culiembro to determine exploration potential.

Further information

www.ariocavesproject.com
http://www.youtube.com/watch?v=rQVs7uMObUo
https://www.facebook.com/ArioCavesProject
https://www.facebook.com/groups/ariocavesproject/
http://www.oucc.org.uk/expeditions/expeditions-spain.htm
http://www.cavedivinggroup.org.uk/cgibin/CDGNLDives?searchtype=contain&cave=culiembro
http://www.casj.co.uk/index.php/culiembro-expediton

References

http://www.casj.co.uk/index.php/culiembro-expediton

http://www.cavedivinggroup.org.uk/cgi-bin/CDGNLDives?searchtype=contain&cave=culiembro