

Ario Caves Project Expedition – 2015

Final Report

Picos de Europa, Spain

28th August – 17th September 2015

Report compiled by Mike Bottomley



The view from the entrance to Torca del Regallon (C4). Photo by Callum Braithwaite

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.

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EXPEDITION MEMBERS

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Tony Seddon

Phil Baker

Dave Ottewell

Helen Blyth

Callum Braithwaite

Dave Rose

Ben Hudson

Tom Baker

Si Jepps

Paul Mackrill

Andrew Mawer

Éabha Lankford

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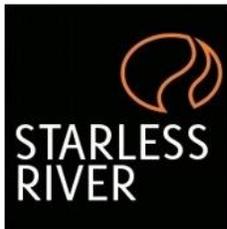
Acknowledgements

We would firstly like to thank the Ghar Parau Foundation (<http://www.gharparau.org.uk>) for their very much needed and appreciated financial support. Without them this expedition would have proved a much greater financial strain on expedition members.

We are greatly indebted to the Federacion de Espeleologia del Principado de Asturias (FESPA) for their support with the permit application, and to the Picos de Europa National Park for granting permission for this expedition to proceed.

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 Oxford University Caving Club (OUCC) for continued support, and loan of expedition equipment.
- the wardens of the Refugio Vega de Ario, Laura and Ignacio, for whose friendship and hospitality we are very grateful.



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Summary

Despite a smaller than usual team size and shorter time frame of just over 2.5 weeks, the expedition was successful in the following:

- Re-rigging Torca del Regallon (C4) to a depth of 300 m, and re-bolting the rest of the cave to the base of the final pitch (Marie Celeste) at a depth of approximately 587 m.
- Bolt climbing the 15 m upstream waterfall, which turned out to be 25 m to a steeply sloping ledge before continuing vertically upwards out of sight.
- Successfully reaching and diving the downstream sump (Special Agent Sea) for approximately 50 m, with the way on still wide open.

The expedition was not without its challenges though, and work had to be done to enlarge a very tight rift at the bottom of the final pitch (Marie Celeste) which barred access to the main streamway (Underground Overdrive). In addition, the arrival of bad weather in the form of heavy rain and 80 mph winds meant only one pushing trip was achieved at the waterfall climb and sump. However, both were deemed significant and ongoing leads, and as such the cave was left rigged for further exploration in 2016.

Background

Oxford University Caving Club (OUCC) has been exploring the caves of the Picos de Europa in Northern Spain for 53 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 -1135 m, 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) was a significant step forward in their knowledge of the area.



Plate 1 – *Location of the Picos de Europa*

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 – 900 m. However, little exploration was done with the main objective being finding a dry way into the further reaches of Cueva Culiembro, and

the diving aims had to be abandoned. It was agreed before the de-rig began to return in 2012 to finish the job.

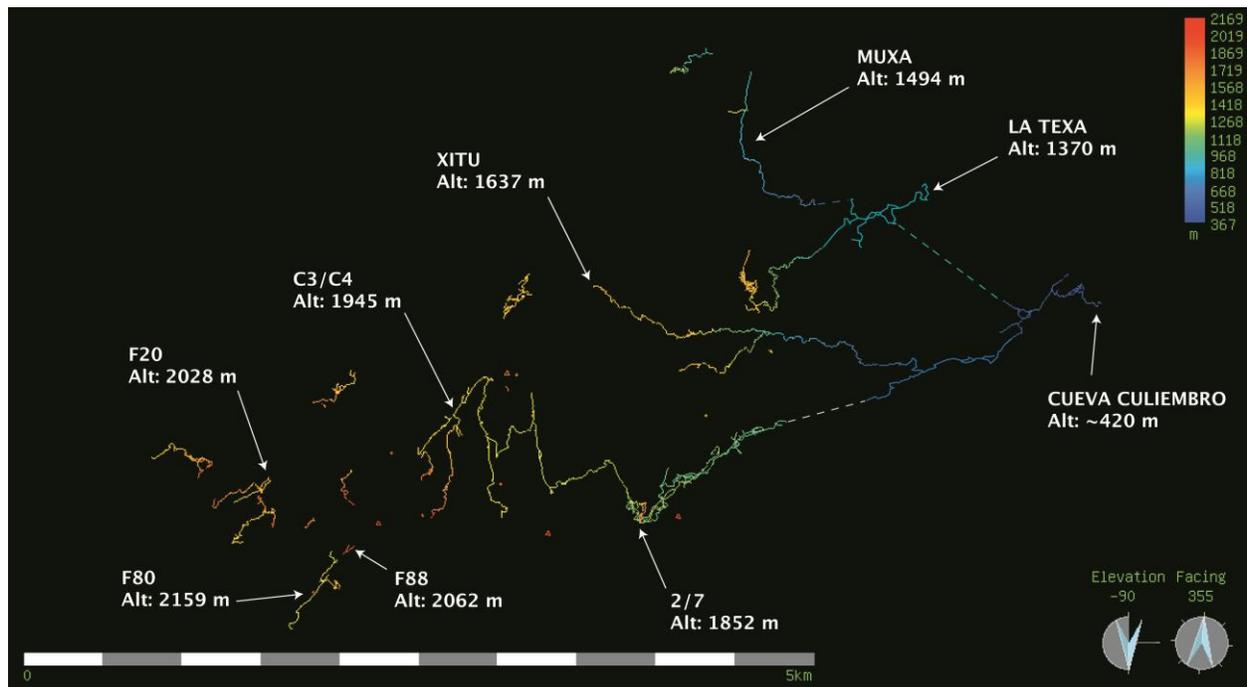


Plate 2 – *The caves of the Ario bowl ('plan' survey by OUCC)*

Culiembro is the resurgence cave for Xitu, Jultayu (2/7), Cabeza Muxa and likely Asopladeru la Texa. 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 exited 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.

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 1,800 m. 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 > 1,000 m (namely C3-C4, 2/7, Xitu and Culiembro). Connecting these up is now a very real possibility, with the Verdelluenga system heading upstream into 'blank space' and the downstream end separated from upstream 2/7 by what should be a short sump. Downstream 2/7 currently ends at an enormous boulder choke – Choke Egbert – beyond which the main streamway appears from survey data to drop rapidly in depth over a short distance to the furthest explored point in Cueva Culiembro.

The 2014 expedition focused primarily on continued exploration in Xitu, in an attempt to find a dry way into Culiembro as well as explore the possibility of high-level passages towards 2/7. However, a number of trips were achieved to C4, which was to quickly become the next target of the Ario Caves project!

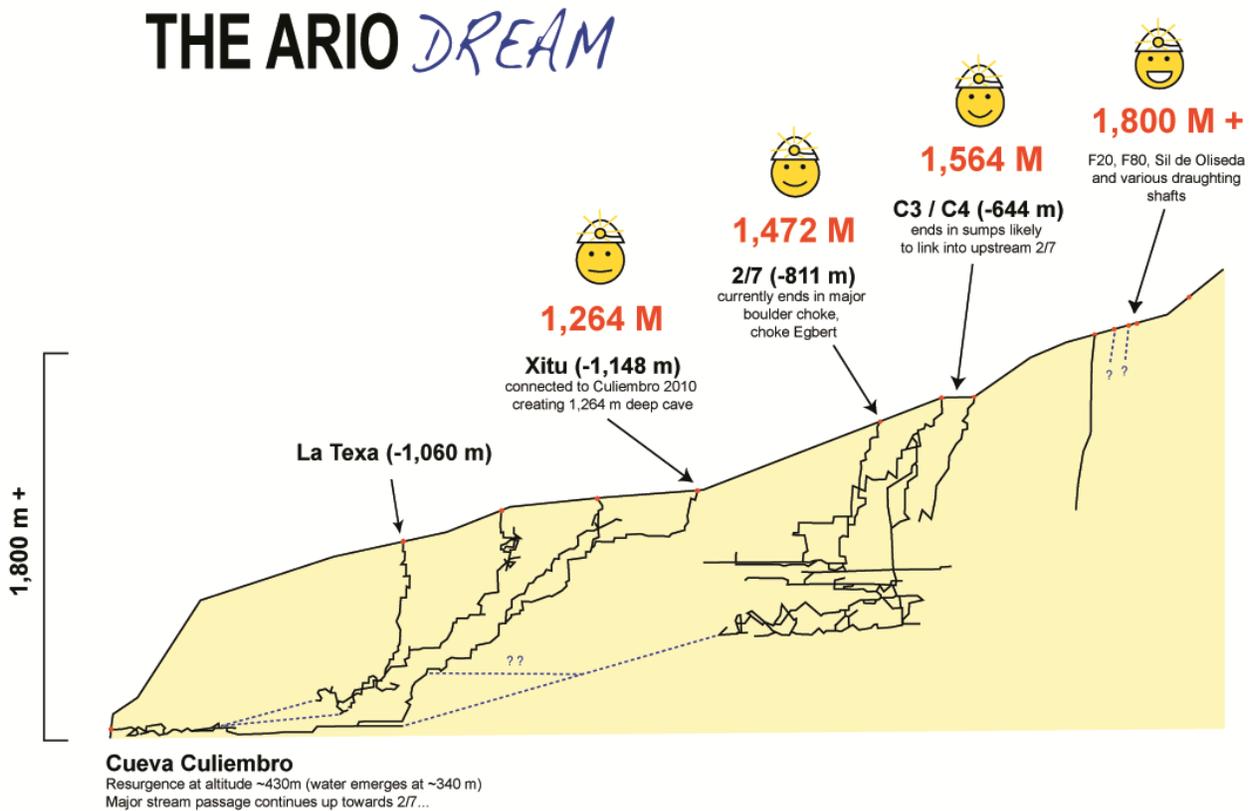


Plate 3 - The Ario Dream (pictorial representation based on OUCC surveys and compiled by Mike Bottomley)

The 2015 Expedition

The aim of the 2015 expedition was to investigate a number of leads at the bottom of Torca del Regallon, or C4 as it is commonly known. This is one of two entrances (the other being C3) to the Verdelluenga system.

The system was first explored by the OUCC via the tight and arduous C3 entrance in 1994 and 1995, and found to drop into a significant streamway – Underground Overdrive at approximately 600 m depth (plates 4 and 5). The streamway terminated in a large lake ‘Special Agent Sea’ at its downstream end, which was later ‘sailed’ on an inflatable dingy and found to close in, therefore forming a terminal sump. Upstream was followed to a boulder pile.

An expedition the following year succeeded in discovering an easier entrance to the master streamway, in the form of C4. During this expedition, and the 1997 expedition, various leads were examined and Underground Overdrive followed upstream to a ~15 m high waterfall. This was left unclimbed!

Further work in 2/7 during the 2000 expedition resulted in significant upstream extensions, which started to close the gap between 2/7 and the Verdelluenga system, and showing Underground Overdrive to be the upstream continuation of the 2/7 master streamway, and therefore of considerable importance. By the end of the expedition, the two ends of the survey – upstream 2/7 and Special Agent Sea – were found to be roughly 30 m apart.

In 2002, a Polish team led by the late Wlodek Szymanowski tackled C4 ready for an attempt on the sump. This ambitious expedition ran over a 2 week period with only 6 cavers. Despite an impressive effort, the team was stopped at Rio Grande Rift – a hideously tight rift barring access to Underground Overdrive.

No further work was done in connecting these two systems until 2014, when C4 was entered again and re-bolted down to the top of the Monster.

And so, 2015 arrived and an exciting plan to dive Special Agent Sea in an attempt to connect with 2/7, as well as scale the upstream waterfall, which looked from surveys to head into blank space and further up the mountain (plate 6).

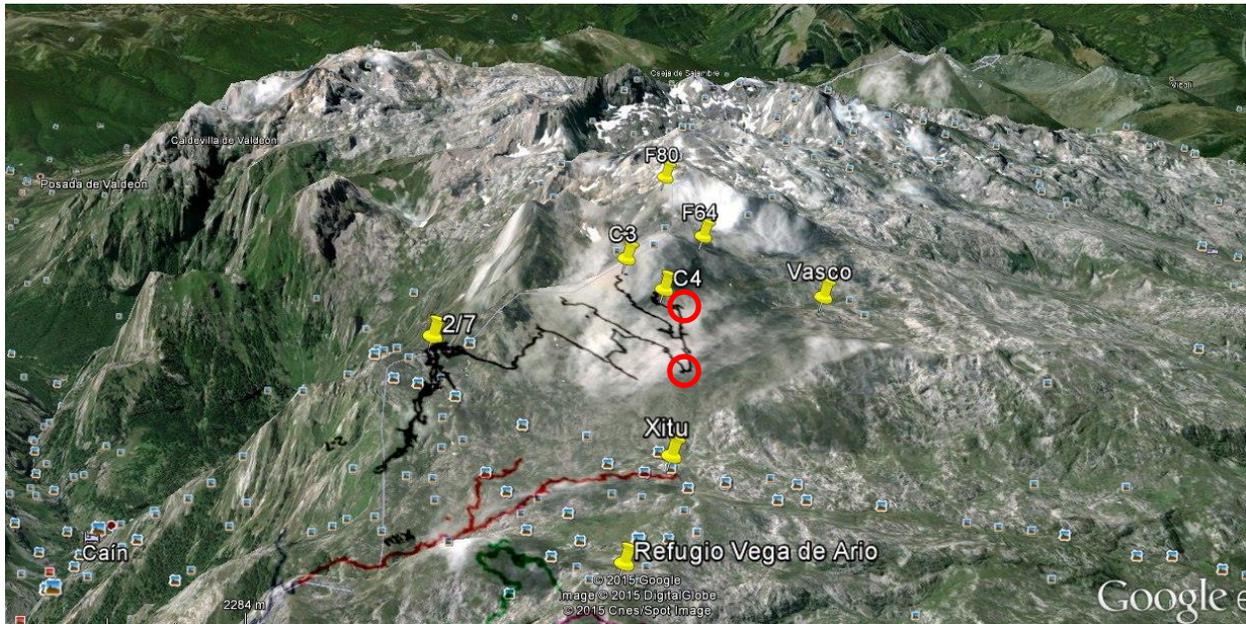


Plate 6 – Google Earth compilation for the caves of the Ario bowl (*'plan'* survey data from OUCC and compiled by Mike Bottomley). Both of the *'major'* leads are shown in red circles, with the upstream waterfall climb leading into blank space!

Expedition Timeline & log

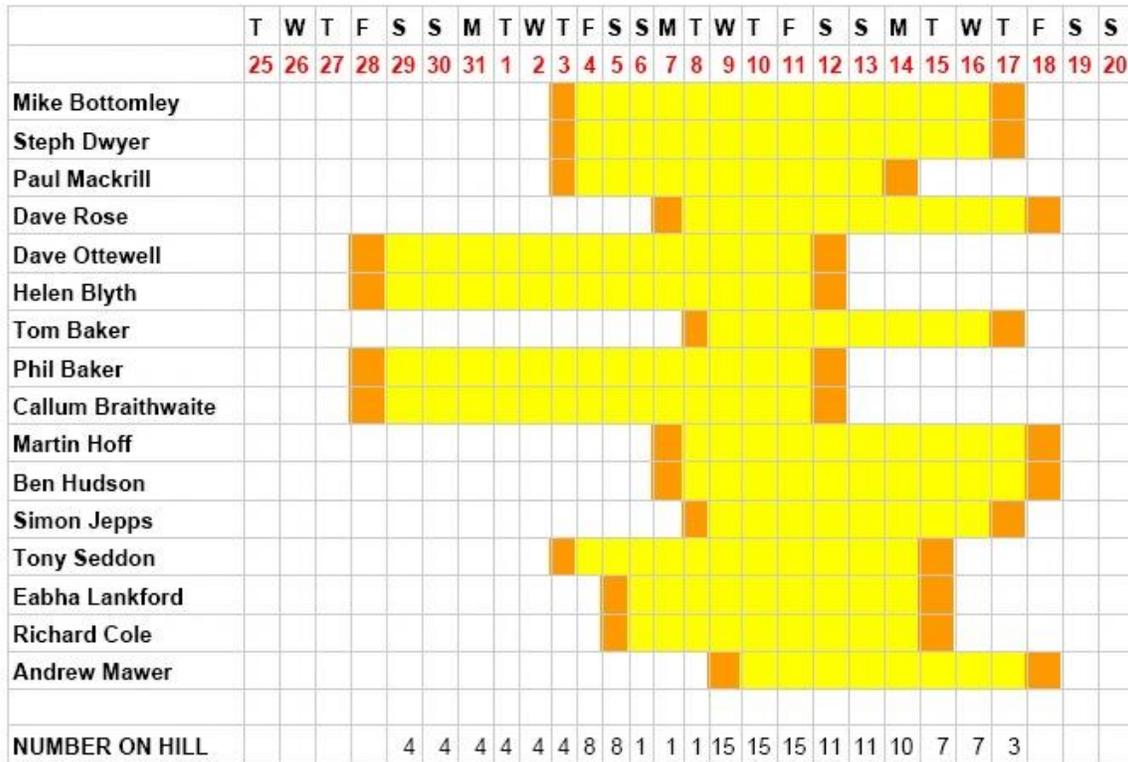


Plate 7 – Timeline for the expedition

| Date | Progress |
|---|---|
| Friday 28 th August – Saturday 29 th August | Advance team (PB, DO and HB) leave UK by car. Arrive Cangas des Onis Saturday eve and camp. |
| Sunday 30 th August | Advance team arrive at Los Lagos and carry 1 load of expedition equipment and personal kit up to the Refugio Vega de Ario in poor weather. Booked 'horse' didn't turn up (later found to have been lost by its owner for a few days). Upon arrival at Refugio, and with a poor forecast for the coming few days, the entrance to C4 is located and some way marking done to make travel between the refugio and cave easier and safer. CB arrives in evening. |
| Monday 31 st August | Advance team do further carry of equipment from Los Lagos to Refugio. Significant storms in the evening bring first 'major' rain to area since June. |
| Tuesday 1 st September | Advance team carry equipment up to C4 entrance and PB |

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| | re-rigs ropes down to the top of the Monster (-150 m). Improvements on rigging noted for the next trip. Poor visibility and light rain on the surface. |
| Wednesday 2 nd September | Advance team back down C4. PB rigs first section of the Monster, before handing over to DO and HB to rig the second 76 m section. PB and CB then add bolts to pitches in entrance series to improve rigging. |
| Thursday 3 rd September | Very poor weather so advance team carry remaining equipment from Los Lagos up to Refugio. MB, SD and TS arrive at the Refugio in the evening. |
| Friday 4 th September | MB, SD and HB do a carry of kit to C4 entrance, and establish a tent near entrance. DO and TS improve rigging on the Monster. PB and CB enter the cave late in the afternoon to continue the rigging beyond the Monster. They exit the cave after a 9 hr trip rigging down to Hash Brown and are back at the refugio by 7am. |
| Saturday 5 th September | MB & SD enter the cave early to continue rigging beyond PB and CB's limit. Extra rope and other kit is carried down the cave. SD rigs Hash Brown and Bugger Bognor. MB then rigs Cat O'Nine tails (P65) while SD heads back to Growing Up for more rope. MB rigs Free N' Easy (P45) and continues down to head of Gooseberry Pot (P15) before both exit the cave, reaching the surface after a 12 hr trip. PM arrives. A horse helps to bring expedition and diving equipment up to the Refugio. |
| Sunday 6 th September | TS enters cave on a solo trip to continue the rigging down to the top of the Cheated Necromancer, finding a higher level, easier route bypassing Clinkers Crawl. MB and SD do a carry of underground camping equipment from the car park up to the refugio. RC and EL arrive at the Refugio. |
| Monday 7 th September | PB, DO and HB enter the cave to rig to the bottom and (hopefully) reach Underground Overdrive. RC and EL carry underground camping equipment down to the bottom of Bugger Bognor (-350 m) and set up a small camp. DR, MH and BH arrive at the Refugio. |
| Tuesday 8 th September | PB, DO and HB arrive back at the Refugio with bad news! The Rio Grande Rift was desperately tight and not passed. A plan is hatched and TS and PM pack equipment ready for a trip to enlarge the rift the next day, staying underground for a few nights. |
| Wednesday 9 th September | TS and PM enter cave early to work on Rio Grande Rift. Other teams pack climbing equipment and diving equipment ready for big pushing trip on the thursday. Some equipment is carried up to tent at C4 ready. TB and SJ arrive at the refugio. MB, DO and PB do a carry of food/equipment from Los Lagos. |
| Thursday 10 th September | MB, SD and CB enter the cave early with climbing |

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| | <p>equipment to make a start on the upstream waterfall, assuming the rift now passable. Upon arriving at the camp, a brief chat with TS and PM found this to be the case and the trio continued on down the cave. Underground Overdrive was soon gained and progress made upstream to the base of an impressive waterfall. Food was eaten and kit quickly arranged before Mike started climbing with Callum belaying. 2.5 hrs of awkward bolt climbing with some poor rock and an awkward overhang gained a steeply sloping ledge 25 m up, before continuing vertically out of sight with the water entering from a small hole to one side. A fixed rope was rigged and the climb stripped of climbing gear. More food and drink was consumed before starting the steady journey out to underground camp, arriving tired at around 2am. More food and drink was consumed before a few hours kip. The diving Sherpa team (DR, EL, RC, BH, TB and SJ) had brought equipment down to camp, and all exited bar DR. On the way out, SJ is hit by falling rock and suffers injury to shoulder. PB and MH have a photography trip to the top of the Monster. AM arrives at the refugio.</p> |
| Friday 11 th September | <p>MB, SD and CB exit the cave. EL, RC and BH into the cave early, and upon reaching camp continue down to the sump with TS, PM and DR. The sump is dived for 50 m with further progress hindered by small (4L) tanks and lack of belays for the thin line. 2 further dives are achieved to check the 70 m long lake for other outlets. None are found. Once back at camp, PM and TS exit the cave while the others remain in camp for the night. PB, DO and HB leave for home.</p> |
| Saturday 12 th September | <p>Rest day for most. MH, TB and AM have photography trip to Free N' Easy.</p> |
| Sunday 13 th September | <p>Very poor forecast means no one enters the cave. Forecast for 15th onwards very poor with heavy rain and 80mph winds. Plan is formed to de-rig cave on the monday. Some equipment is carried off the hill ready for TS to bring home.</p> |
| Monday 14 th September | <p>TB and SJ enter cave very early to de-rig from Underground Overdrive back to bottom of Cat O' Nine Tails. Dry pitches left rigged, ladders removed from Marie Celeste and ropes left coiled at top of wet pitches. MH, TS and DR photograph the Monster. MB and SD take over from TB and SJ and de-rig from Cat O'Nine back to the Monster, stripping the camp en route. BH and AM enter the cave late to de-rig the Monster back to the entrance. All back to refugio except BH and AM who exit late and stay in tent at entrance. EL & RC leave for home.</p> |
| Tuesday 15 th September | <p>TS and CB leave for home. BH and AM have an entertaining time packing up tent and bringing remaining kit down to the refugio in very high winds! MB, SD, TB and SJ leave the</p> |

| | |
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| | refugio later in the day and have a hideous walk down to Los Lagos, being blown over repeatedly by the high winds! The weather has definitely turned autumnal!! Several trees down on the road down to Covadonga. |
| Weds 16 th September | Only DR, MH, BH and AM remain at refugio. Equipment store at base of Xitu's entrance pitch is tidied and an inventory done of equipment left there for next years expedition. Everyone off the hill the next day (17 th Sept). |

Logistics

Most expedition members flew to Oviedo (Asturias), Santander or Bilbao airports and then teamed up to hire cars to Los Lagos. Some expedition equipment was brought out in additional hold luggage.

In addition, three vehicles brought team members and expedition equipment including diving gear.

Rigging C4

As Plates 4 and 5 show, C4 is a relatively short and very vertical system. The cave was located and rigged to the Monster during the 2014 expedition led by Ian Holmes. Problems with drill batteries slowed the rigging process, but the cave was found to be large, impressive and generally easy going with the main hazards comprising loose rock on some of the pitches, particularly the first section of the Monster. Some of the old 8mm spits were found to be in good condition but the rigging was bulked out with additional throughbolts to improve safety and also get away from the water.

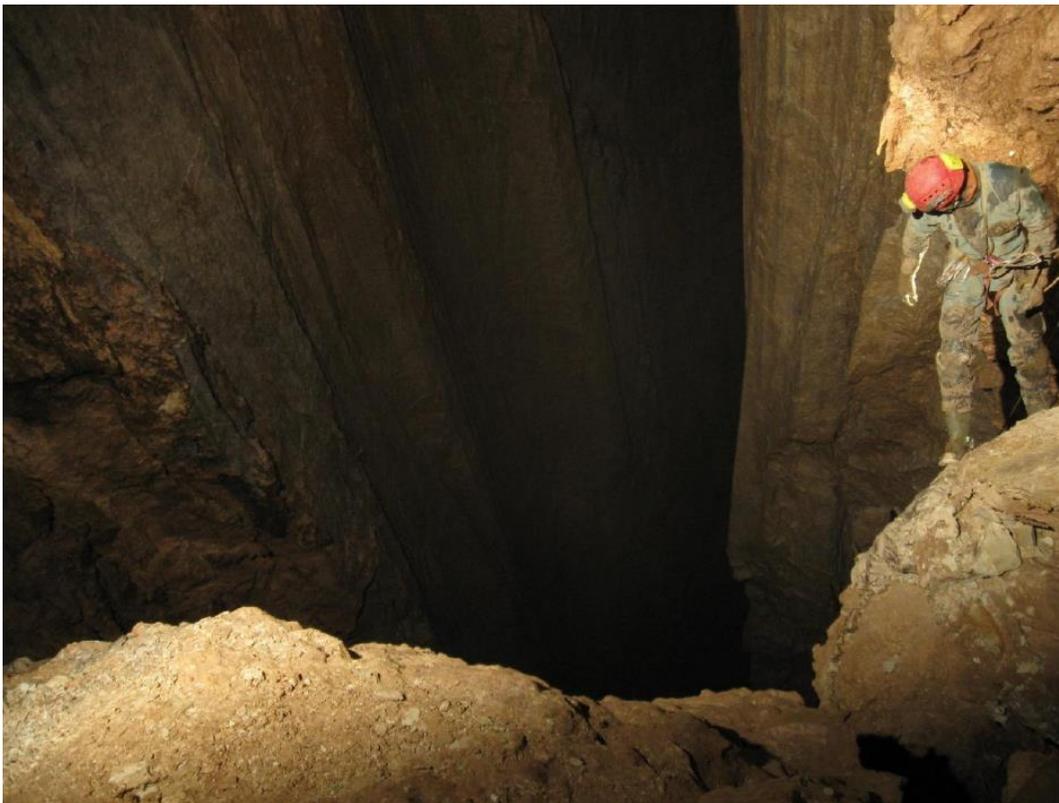


Plate 8 - *Phil Baker looking down Part 1 of the Monster (Photo: Martin Hoff)*

C4 is located just under 1.5 hrs walk from the refugio. In the past, OUCC have accessed the cave from a 'top camp' but as with 2014, it was decided to base the expedition in the refugio. The walk is relatively straightforward until around 20 mins from the entrance where some loose scree and very deep holes are encountered which meant a well-marked route (hazard tape and reflective stickers) was required. Fortunately, the advance team were able to locate the entrance on the day they arrived at the refugio before the weather deteriorated for the next few days, a task made much easier by the presence of Phil Baker who played a key part in rigging C4 during the 2014 expedition.

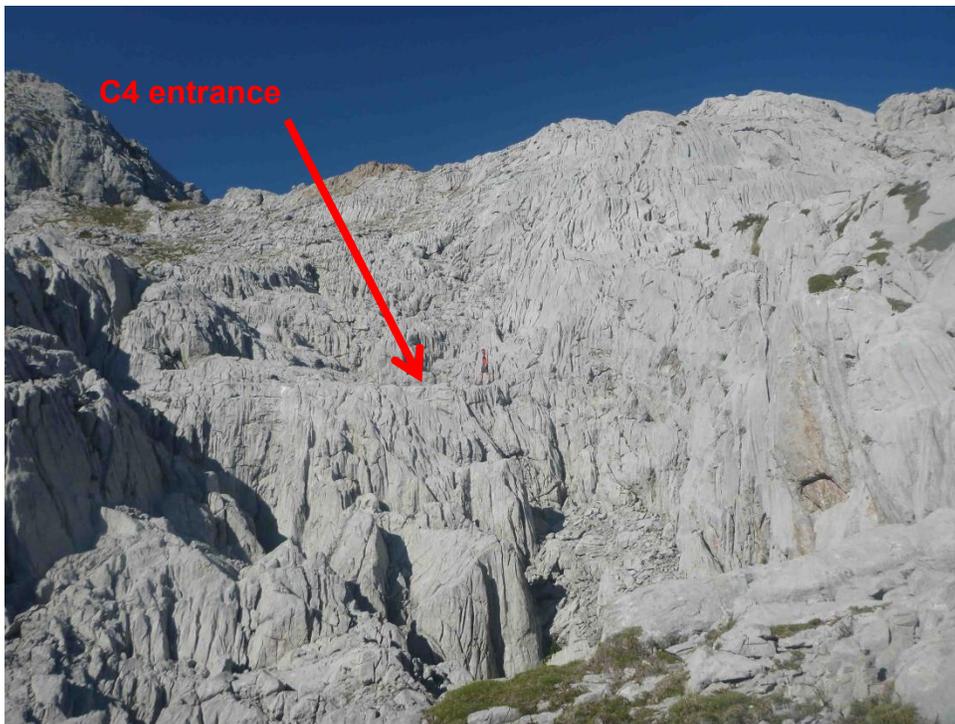


Plate 9 – *The area surrounding the entrance to C4 (Photo: Éabha Lankford)*

The re-rigging of the cave took place between 1st and 7th September as highlighted in the timeline above. 2 compact Bosch 18V SDS drills and 8 high-capacity Li-Ion batteries were sourced for the expedition, which performed impressively and meant battery power was never the hindrance during rigging trips. Stainless steel 8mm Raumer throughbolts with double expansion collars were used to ensure bolts remained in good, lasting condition. Ropes were sourced from expedition members, as well as loans and donations from Mark Wright and Heightec in particular. Other metalwork, including hangers/maillons and karabiners were either bought or sourced from expedition members as well as the Ario and OUCC equipment stores.

The rigging proved to be relatively straightforward with generally good rock, although the Monster required a few trips to ensure a good, safe route was rigged, well broken to allow a speedy exit for groups. A ladder was used on the Marie Celeste pitch as suggested by members of the 1996 expedition due to poor rock and awkward access which actually meant it was easier to ladder the pitch rather than approach with SRT gear on.



Plate 10 – *Richard Cole at Entrance to C4 (Photo: Éabha Lankford)*

A small camp was installed at the base of Bugger Bognor, which was initially meant to be temporary but remained here for the rest of the expedition as no other suitable locations were found. Although high up in the cave it did prove invaluable for cavers exiting the cave after the long climbing and diving trips towards the end of the expedition. The shelter was bespoke made by Aiguille Alpine equipment based near Kendal and modelled on the tents used in Krubera-Voronya (a cave visited by both Phil Baker and Mike Bottomley, who could see the benefit of a good quality shelter floored with cheap mats and equipped with 2 MSR stoves and enough fuel to run continuously and allow cavers to dry undersuits completely before getting into sleeping bags).

Progress in the cave was excellent until the advance team reached Rio Grande Rift on Monday 7th September. Despite several attempts by all three cavers, the rift was not passed and news of this was relayed to the rest of the expedition the next day upon arrival back at the refugio. The rift itself began with an extremely tight squeeze along the base of a hading rift angled at 45 degrees, to a slight enlargement. This was attained by the smallest member of the group, Helen Blyth, who could see that the next section involved another desperately tight squeeze to a corner beyond which it wasn't possible to see what happened next, therefore making it particularly committing. The news of the rift wasn't unexpected and a team was sent in on the 9th September to work on enlarging the rift so that both cavers and diving equipment could pass easily. This was achieved after 6 hours of hard work and Tony Seddon and Paul Mackrill gained Underground Overdrive and followed it down to the terminal sump.



Plate 11 – *Dave Rose on the second part of the Monster (Photo: Martin Hoff)*



Plate 12 – *The underground camp, at the base of Bigger Bognor (-350 m) (Photo: Martin Hoff)*



Plate 13 – *Tom Baker near the bottom of Free N' Easy (Photo: Martin Hoff)*

The pushing trips that followed are described in the following sections.

Upstream waterfall climb

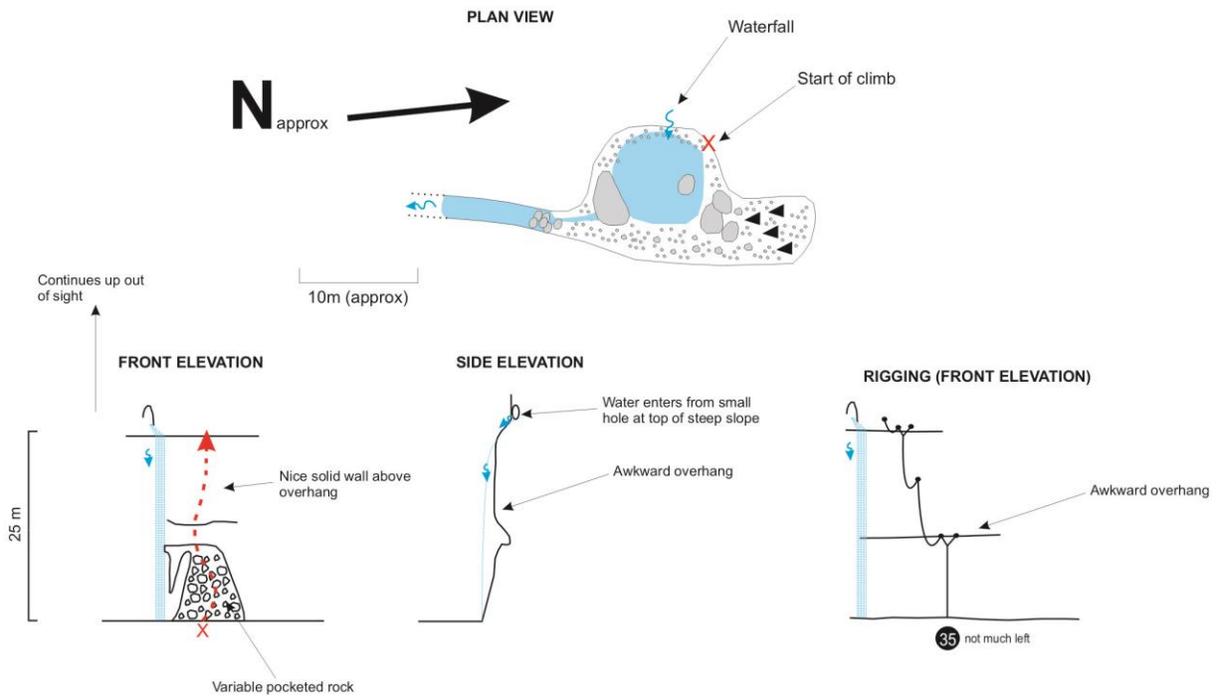


Plate 14 – Sketch survey of upstream waterfall (drawn by M Bottomley)

The first 'major' lead to receive attention was the waterfall found during the 1997 expedition and terminating the upstream end of Underground Overdrive. This was estimated at 15 m in height, and the only previous attempt was by an ill-informed team of 2 who arrived with traditional climbing gear expecting a 5 m climb only to find a much higher, and overhanging climb!

A team comprising Mike Bottomley, Steph Dwyer and Callum Braithwaite arrived at the base of the waterfall at around 6 pm on Thursday 10th September after a steady trip down the cave. It was found to be a large and very impressive, but hostile place with a chilling draught generated by the waterfall. Gear was quickly arranged and food eaten before Mike started up the climb with Callum belaying. A route was chosen close to the waterfall, but which looked to gain the best rock and give the shortest route to what appeared from below to be a passage leading off from the top of the waterfall. However, the climb did look greater than 15 m!

The climb began up steep, highly pocketed and variable rock with some zig-zagging required due to poor rock in places. This section was followed by an awkward overhanging section, beyond which good

progress was made up a vertical, but solid wall comprising good rock. The top of the waterfall was reached after around 2.5 hrs of climbing, beyond which a steep slope continued up for approximately 3 m before the wall continued up vertically out of sight. The water was found to enter from a small hole to the left.

The pitch was then rigged using stainless steel throughbolts and a 35 m rope, and the climb stripped of gear. Callum prussiked up the rope to examine the way-on and a quick survey done (see Plate 14) before gear was packed away, more food was eaten (Expedition Foods dehydrated meals) and the trio set off back to camp at Bugger Bognor. This was reached at around 2.30 am, where a few hours sleep was had before exiting the cave.



Plate 15 – *The base of the upstream waterfall back in 1997 (Photo from OUCC archives)*

It was disappointing not to gain the upstream continuation of the streamway despite looking very promising from below upon first arrival. However, a successful trip was had gaining a point roughly 25 m above the floor, and the lead is still ongoing. It will be possible to belay the next stage of the climb from

the sloping ledge, and the rock above looks to be of good quality although muddy in places. It is likely that the water has cut its way down a high, narrow rift to exit via the small hole encountered at the high point of MB's climb. As such, the best hope of gaining the upstream continuation will be to continue vertically upwards and hopefully drop in from above, as the hole looked too small and wet to enter safely. There is a lot of 'black space' above, and large, high-level phreatic development (seen in other parts of Underground Overdrive) could be encountered at the top of the climb, which would probably allow easier progress than a narrow rift cut down by the water.

Diving Special Agent Sea

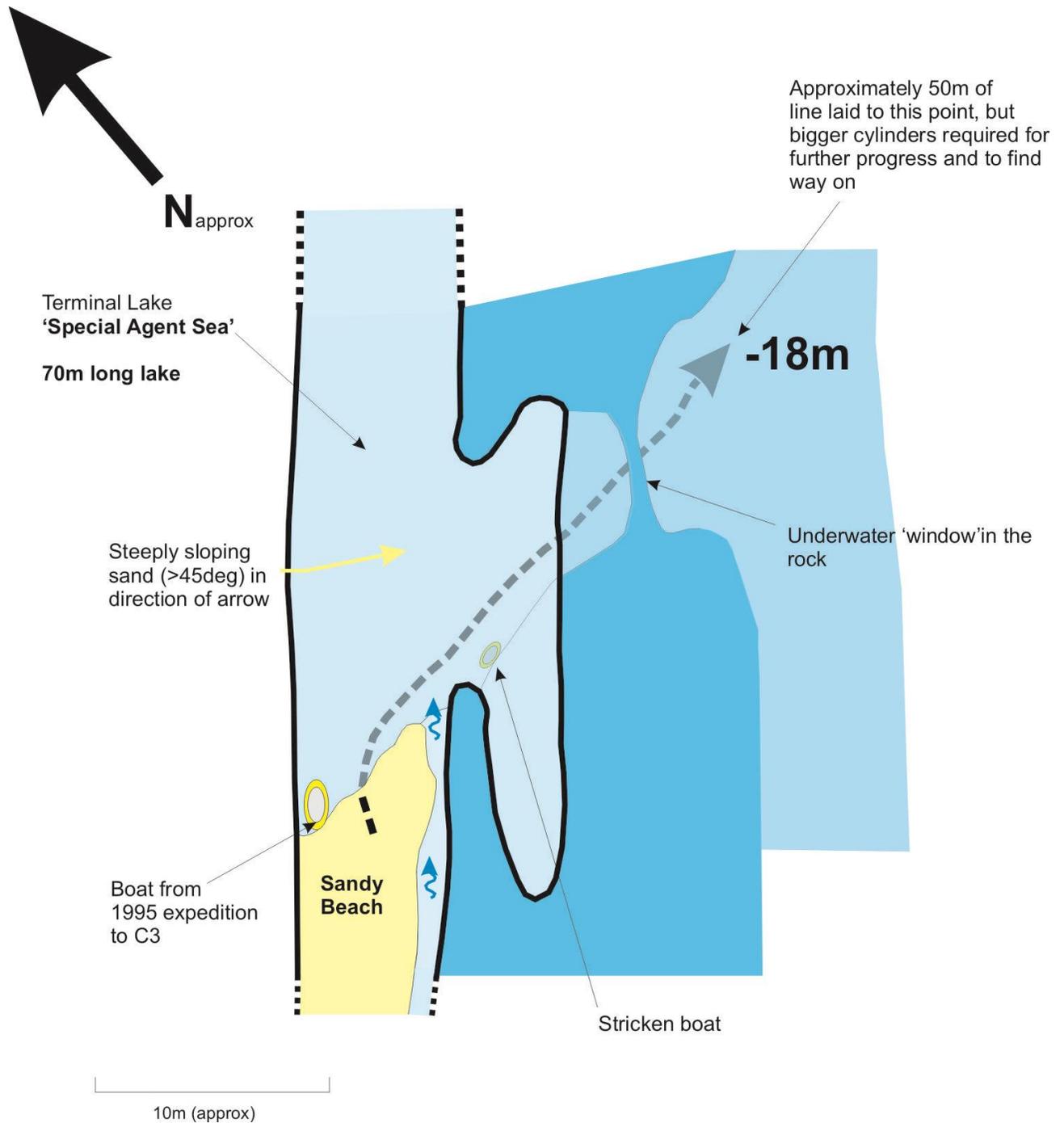


Plate 16 – Sketch of dive (based on Paul Mackrill's sketch and notes. Drawn by M Bottomley)

The other 'major' lead of the expedition was the downstream sump 'Special Agent Sea.' This was reached by the diving team on Friday 11th September, which comprised Paul Mackrill (diver) and a sherpa team of Tony Seddon, Dave Rose, Ben Hudson, Éabha Lankford and Richard Cole. Progress to the sump with diving gear was relatively straightforward although the narrow rift prior to Marie Celeste was awkward, and Underground Overdrive provided 1.5 hrs of unexpectedly awkward going with plenty of boulder obstacles and very little in the way of 'romping passage' as was expected from a master streamway!

'Open circuit' diving equipment was utilised for the dive, which included 4L cylinders which were deemed appropriate for what was expected to be a short, shallow dive. Rio Grande rift was a further factor in cylinder selection given that it sounded unlikely from previous expedition reports that it would be possible get anything larger through the squeezes! A summary of each dive is given below, based on Paul Mackrill's notes (see also Plate 16 above):

- **DIVE ONE:** Quickly found a way on under right wall. V steep sand slope led down. Passed under rock arch at -18.6 m. Wall followed on left in huge cross rift, with far wall 5 m away and no sign of floor or roof. Line tied off at rock thread in what seemed like a 'predominantly' wall-less, floor-less and roof-less environment at -18 m. Could easily be > 30 m deep!
- **DIVE TWO:** Exploring where sunken boat found on way back from 1st dive. Passage seen, but sand rises and surface in cross rift adjacent to lake.
- **DIVE THREE:** Swim whole lake (70 m long approx). Follow left wall. Sand floor seen to drop steeply to right along length of lake. Sand floor rises to end of rift (definite closure). Return down right wall. Water always deep blue! No sign of floor.

The three dives achieved at this site have been successful in locating a potential way-on, but it wasn't possible to dive any further on this trip due to limited air reserves and a lack of line belays. The sump was found to be far bigger than expected, which meant far greater care was required in terms of line management as a loss of line or line-break would prove extremely serious, especially with limited air reserves available to locate the exit.

The inflatable dingy used in the earlier C3 expedition was still found to be moored, and a further 'sunken' dingy was found in the sump during dive two.

Once the dives had been undertaken, the equipment was packed up and the group made steady progress back to camp at Bugger Bognor. Paul and Tony then exited the cave, while the rest remained in camp for the night, exiting the cave the next day.

Although it was disappointing not to make the connection with 2/7 on this trip, some valuable knowledge was gained on the sump, and further dives should hopefully make the connection assuming

the passage is open. Thankfully the enlargement of Rio Grande rift will allow bigger cylinders to be brought to the sump, and it is possible that further dives will be undertaken using a rebreather in case the way on is not obvious and time needs to be spent underwater to search this massive sump!

A further, significant observation was made during this trip regarding the draught, which was found to disappear into some higher-level development approximately 100 m upstream of Special Agent sea.



Plate 17 – *Paul Mackrill about to dive Special Agent Sea (Photo: Éabha Lankford)*

Last few days

Unfortunately, the weather deteriorated rapidly following the climbing and diving trips described above and so a plan had to be formed regarding the de-rigging. The leads explored during the expedition were definitely worthy of further work and so it was decided to leave the cave rigged for a follow up expedition in 2016.

Much of the camping equipment was removed from the cave, leaving the underground shelter and camping mats at the bottom of Bugger Bognor. Ropes were removed from wet pitches (in particular the Monster), as well as other pitches that showed evidence of becoming wet during the winter months. These were left coiled at the top. All other pitches were left with the ropes in place.

All the above was achieved on a single trip on Monday 14th September, and an inventory done of equipment left both in C4 and below the entrance pitch of Xitu where there is currently a gear store.

All expedition members were off the hill by Thursday 17th September, with some 'fun' had leaving the Refugio on Tuesday 15th September in heavy rain and 80 mph + winds, which resulted in a number of trees down on the road down to Covadonga.



Plate 18 – *Driving away from Los Lagos during a storm on 15th September (Photo: Mike Bottomley)*

Further observations & discussion

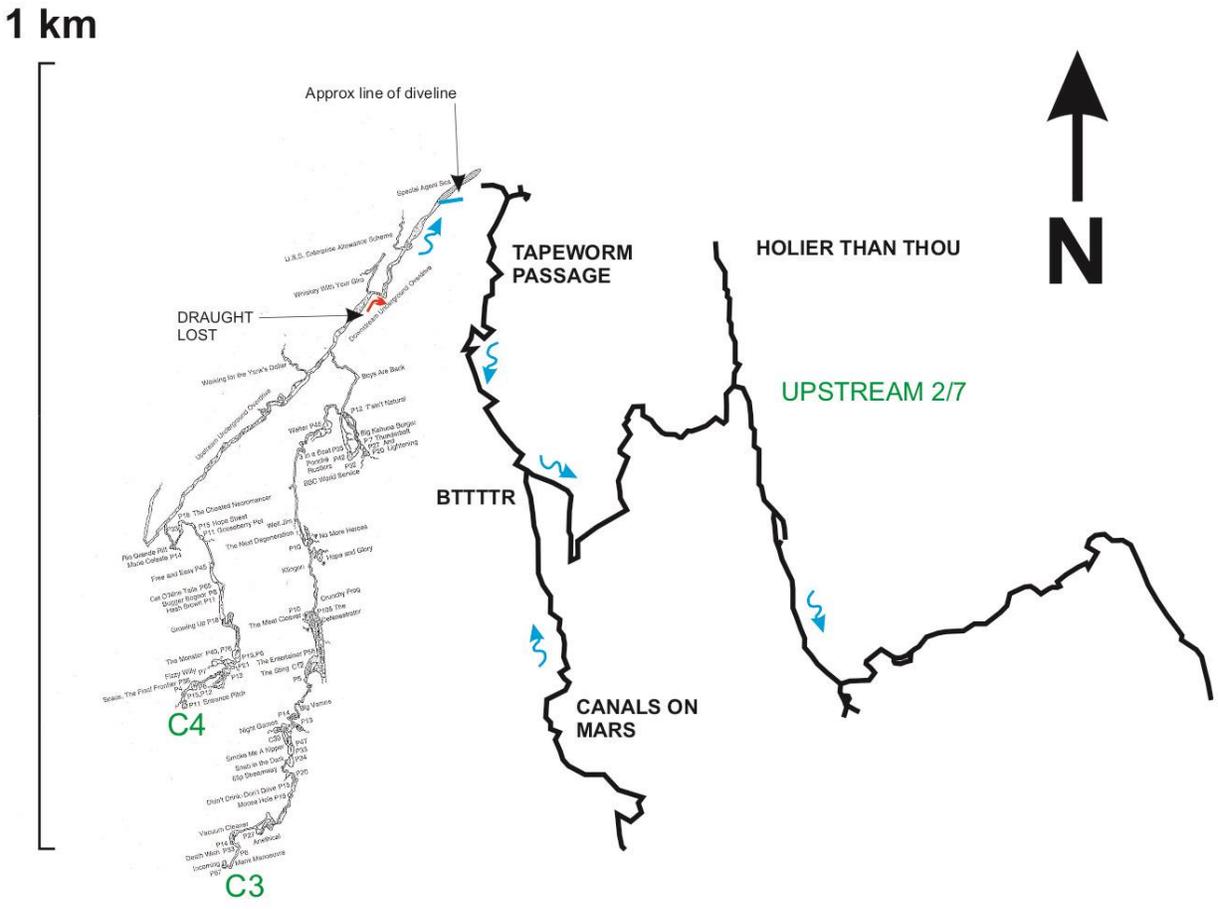


Plate 18 – Verdelluenga system and 2/7 (compilation based on surveys by OUCC and drawn by M Bottomley)

The above compilation (Plate 18) provides a better understanding of the relationship between upstream 2/7 and the Verdelluenga system. The surveyed ends of both systems are estimated to be 30 m apart, and if the passage found during the first dive by Paul Mackrill (represented by blue line) is indeed the way-on, then the above compilation would appear reasonable. The draught is lost into a high-level passage roughly 100 m upstream of ‘Special Agent Sea’ and possibly indicates a connection with Tapeworm Passage in 2/7. Such a connection would be extremely significant, and would allow relatively easy access to upstream 2/7, especially now that Rio Grande rift has been much enlarged. This would allow important leads such as ‘Canals on Mars’ and ‘Holier than Thou’ to be pushed more thoroughly

and safely, and also allow easier access to Choke Egbert although this would still involve a fairly long trip.

The upstream limit of Underground Overdrive – the 25 m waterfall – remains an excellent lead for 2016. An interesting observation made by Paul Mackrill during this years' expedition relates to the size of the passage in Underground Overdrive, particularly where the C4 inlet intersects the master streamway. Here, the passage is narrow and out of keeping with the rest of Underground Overdrive, suggesting that the main development is indeed at height in the top of the passage and therefore this section of narrow streamway between C4's point of entry and the upstream waterfall is a more recent development where the streamway has cut a more recent route down.

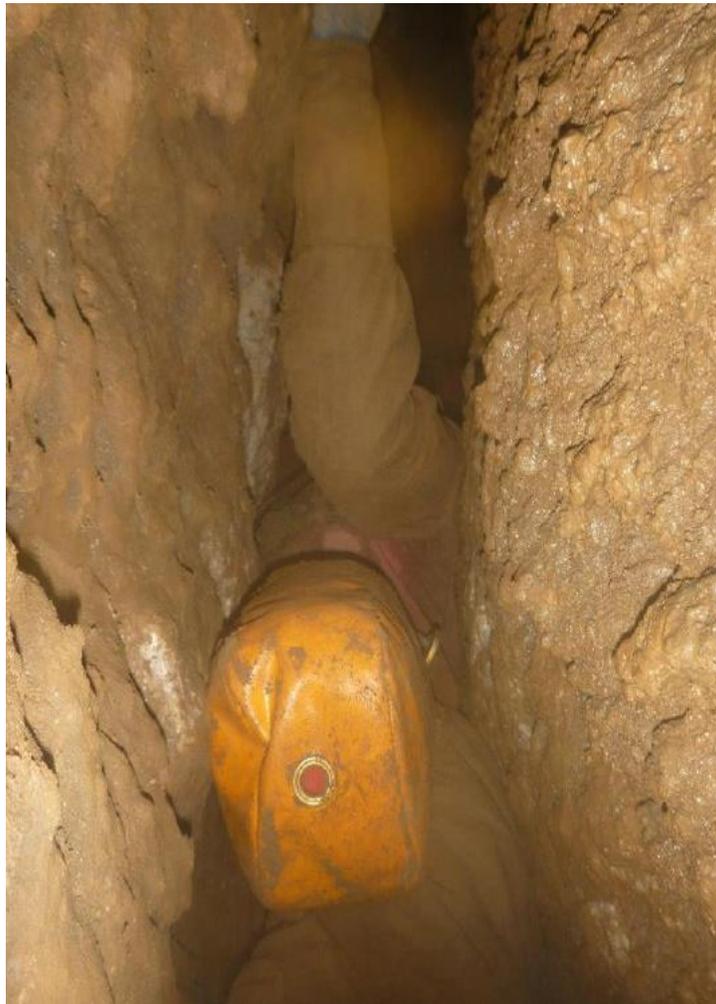


Plate 19 – *The first squeeze in Rio Grande Rift.....after 6hrs of enlargement!! (Photo: Éabha Lankford)*

Expedition accounts

The table below summarises the accounts as 'handled' by the expedition (*personal items such as flights, hire cars etc not included*):

| ITEM | INCOME | EXPENDITURE |
|--------------------------------------|------------------|--------------------|
| Expedition fee (£90 each in total) | £1,440.00 | |
| Ghar Parau Grant | £350.00 | |
| | | |
| Equipment expenditure | | £1,268.62 |
| | | |
| Payment to refugio (accommodation) | £1,021.57 | £1,021.57 |
| | | |
| Communal food | | £300.00 |
| Horse to bring equipment up the hill | | £86.53 |
| Excess baggage fees | | £28.84 |
| | | |
| Contribution to vehicle costs | | £100.00 |
| TOTAL | £2,811.57 | £2,805.56 |

Objectives 2016

With the cave re-bolted and currently rigged to the bottom, it is hoped that the leads explored this year will be pushed to a conclusion, at least in the downstream section of the cave where further dives are planned in Special Agent Sea and some higher level development, which appears to take the draught, may provide a dry connection with 2/7. Upstream, further climbing is required but it should be possible to get a climbing team to this within the first 2-3 days of the expedition arriving at the Refugio. Hopefully this will be pushed into the upstream continuation of the master streamway with excellent potential for further discoveries. If a dry connection is forced downstream to 2/7, then some work may be possible in the many inlets which can be found in upstream 2/7.

Further information

Further information can be found at the following links:

www.ariocavesproject.com

www.oucc.org.uk

www.facebook.com/ArioCavesProject

With thanks to Ignacio, Laura and family and Marie for their superb hospitality!

