



HIDDEN VALLEY 2015

An Anglo-Malaysian Expedition to the
Gunung Mulu National Park, Sarawak



REPORT

on the findings of the

HIDDEN VALLEY 2015 EXPEDITION

to the

GUNUNG MULU NATIONAL PARK SARAWAK

During October 2015

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Edited by David Nixon & Rob Eavis

Maps, photographs & diagrams by expedition members.



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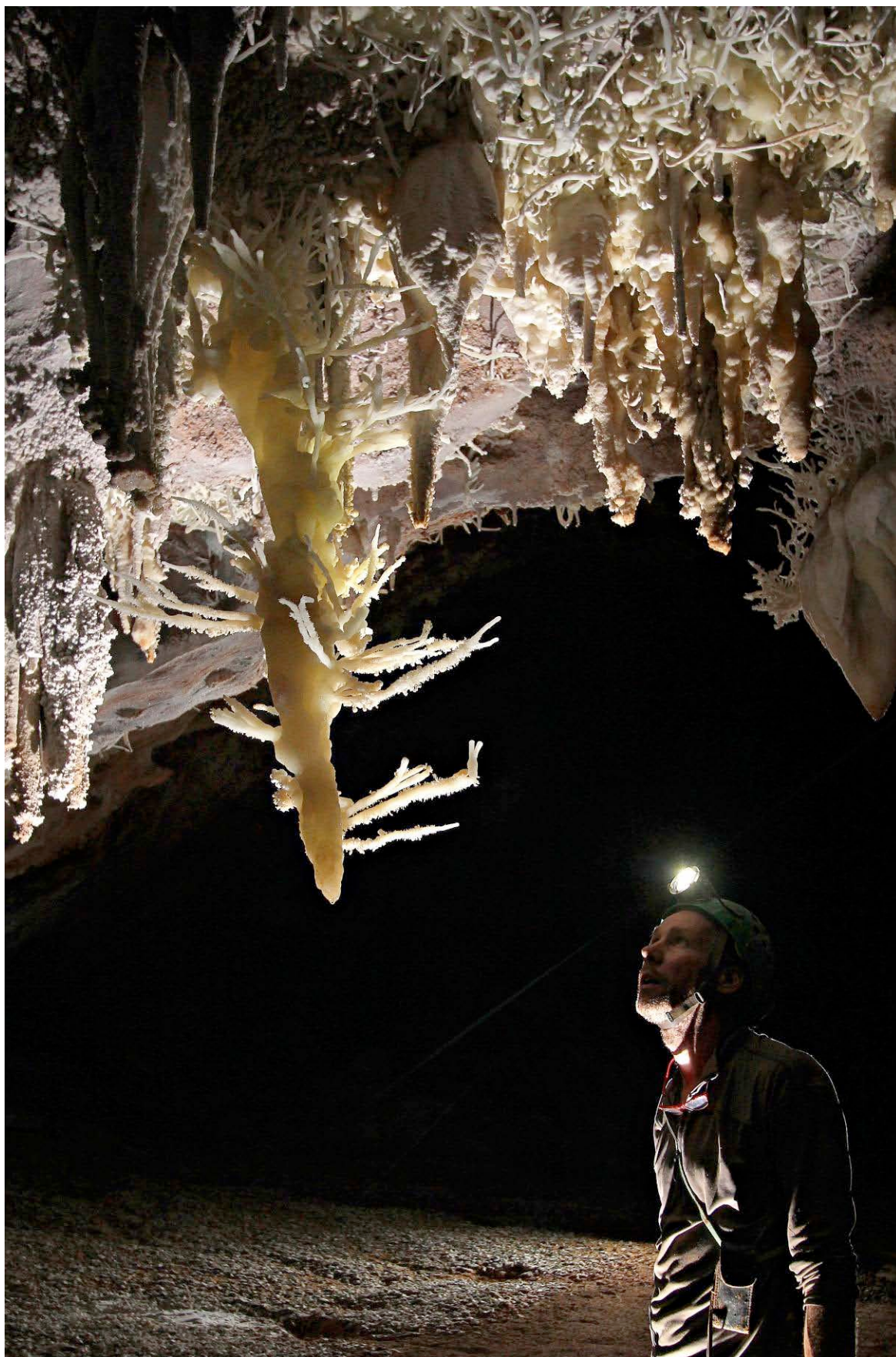


Figure 1 - The 'Star of Api', Governor's pleasure – Photo by Rob Eavis

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Cover design by Hugh St. Lawrence

Front cover : Dave Nixon at the start of the Rhino Canyon, Wonder Cave – Photo by Rob Eavis
Rear cover : Naughty but Nice, Conviction Cave – Photo by Rob Eavis

ABSTRACT

Mulu Caves 2015 was the 23rd Anglo-Sarawak Expedition to Gunung Mulu National Park and operated in the field between the dates 5th October - 4th November 2015. The expedition had three main parts:

- 1: Lightweight reconnaissance team to the Hidden Valley on Gunung Api, led by Andy Eavis, between 5th-22nd October.*
- 2: Larger team based at Camp 5 in the Melinau Gorge to continue leads in Whiterock Cave and other sites.*
- 3: High resolution 3D laser scanning of Sarawak and Api Chambers, combined with Scientific work and photography.*

The Hidden Valley team included a total of five members from the UK and Australia, together with a number of porters from the vicinity of Mulu National Park. The expedition was further assisted by the National Park Management and staff employed there.

Exploration

The expedition discovered a major new cave entrance, named Conviction Cave, high on the north cliff face of the Hidden Valley. This subsequently connected to Wonder Cave, which was first discovered and surveyed by the RGS expedition to Mulu in 1978. The team explored and remapped Wonder Cave using modern cave surveying techniques and as a result discovered a new continuation to the system heading north towards the Melinau Gorge. In total +2km of cave was surveyed making the Conviction / Wonder Cave system 7km in length.

Science

Only scientific based observations were made in the field, further studies of any findings will hopefully be done thoroughly on the return trip to this area of the national park.

Editor's note on the structure of this report

As outlined above, the expedition had a variety of objectives. This document is structured firstly to present reports on the reconnaissance exploration project to the Hidden Valley. At the same time as this small remote team were exploring the more remote parts of the national park a second larger team were based at Camp Five in the Melinau Gorge continuing the exploration of Whiterock Cave, among other objectives. The information for this appears in a separate publication.



Figure 2 - View of the eastern side of Gunung Api with the Melinau Gorge in the distance – Photo by M. Kirby

INTRODUCTION

LOCATION

The Gunung Mulu National Park is situated in north-eastern Sarawak, with its northern boundary forming part of the border with Brunei, (Figs. 1 & 2). It was officially constituted in 1974 and opened to visitors in 1985. Lying 4° N. of the equator it now covers an area of 813.9km².

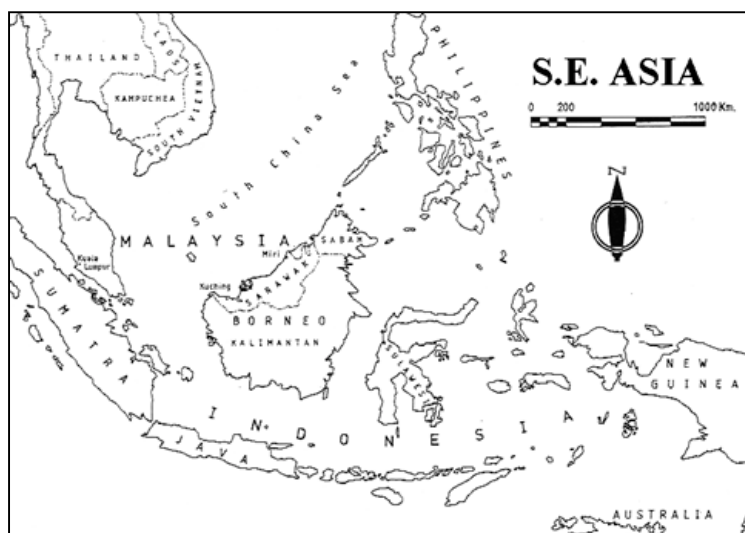


Figure 3 - S.E.Asia

The Park is dominated by the sandstone mass of Gunung Mulu, which rises to 2376m. To the west of Mulu, and on its flank, lies a band of Melinau limestone, which forms the lesser peaks of Gunung Api and Gunung Benarat. The lower slopes are covered in dense tropical rainforest, which rises to meet the montane forest of Mulu's upper slopes.

Both the G. Mulu National Park and the adjacent G. Buda National Park have recently been extended.

Mulu has a rich mixture of plant and wildlife and in the limestones beneath the forest canopy lie some of the world's most impressive caves. The biodiversity of the Park and the significance of its karst landscape were given international recognition in 2000, when it was declared a World Heritage Site.

HISTORY OF EXPLORATION IN MULU

A comprehensive account of the exploration of the Mulu caves is set out in reports dating back to the first RGS expedition and for the sake of brevity will not be repeated in full here. In summary, exploration commenced during the 1978 Royal Geographical Society expedition to Mulu and has continued since then with groups of UK cavers visiting the Park and working in partnership with the Forest Department and National Park employees to explore and study Mulu's underground landscape.

Exploration and survey work have established Mulu as one of the pre-eminent speleological sites in the world. Although precise definitions of 'the largest' or 'the biggest' cave passages and chambers remain open to debate, the Park contains one of the world's largest natural underground voids, Sarawak Chamber. It also holds what is arguably the world's largest cave passage (Deer Cave), the largest cave by volume (Clearwater) and what is currently believed to be the 8th largest chamber (Api Chamber, in Whiterock Cave).

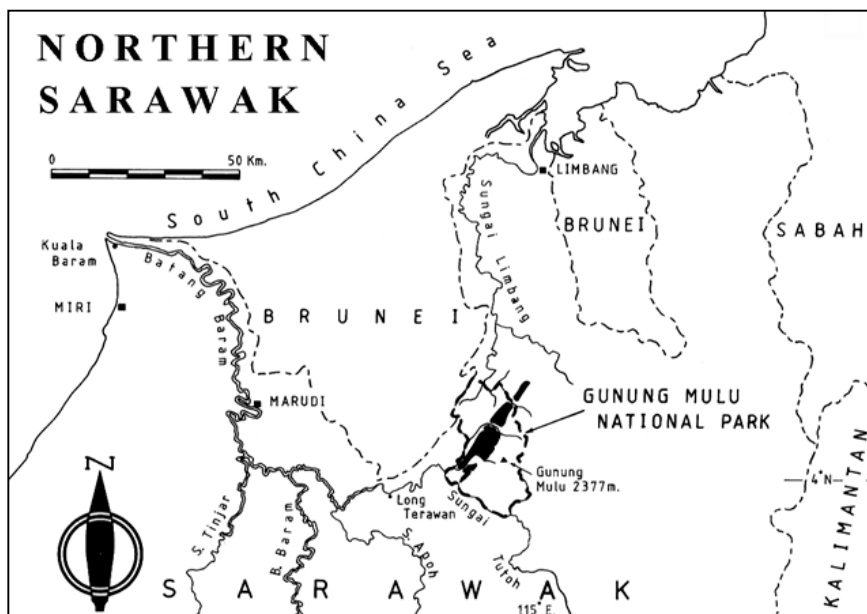


Figure 4 - N. Sarawak

The early expeditions to the Park (1978, 1980, 1984) made rapid and significant discoveries with over 140km of passage explored and surveyed. Although the pace of exploration has slowed somewhat, new caves and additional passages continue to be discovered in the Park.

Figures 3 and 4 contrast the extent of exploration after the 1984 expedition with 2014.

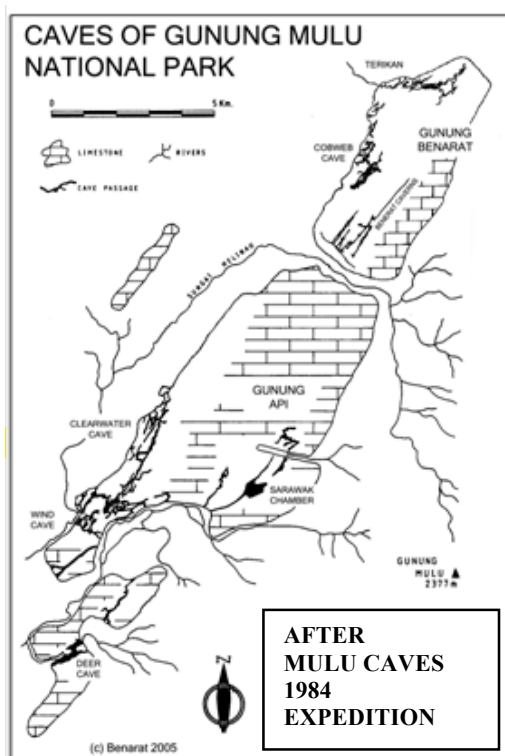


Figure 5 - Exploration up to 1984

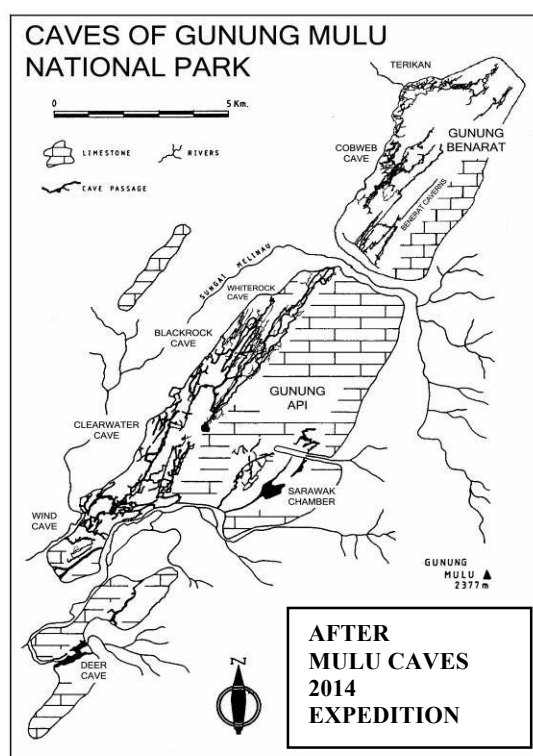


Figure 6 - Exploration up to 2014

By the end of 2015, Mulu National Park had seen 23 major expeditions, bringing the total of surveyed cave in the G. Mulu National Park to 403km. In addition, the adjacent Gunung Buda National Park contains a further 74km of cave.

HISTORY OF EXPLORATION IN THE HIDDEN VALLEY

Comprehensive accounts of all the exploration in the Hidden Valley can be accessed by means of the Mulu Caves reports from the years quoted below and are referred to on numerous occasions in this report.

The first expedition to the Hidden Valley also happened to be the first expedition to Mulu, 37 years ago. It was an honour, therefore, to have one of the original members from the 1978 trip on this the 5th British visit to this remote part of the Gunung Mulu National Park.

Given the lack of infrastructure in place at Mulu all those years ago it makes the achievements of the first party here even more remarkable.

Without venturing into the western end of the Hidden Valley, the 1978 team mapped nearly 5km of Wonder Cave. It was 15 years before a team returned to prospect for further possibilities in the area.

The 1993 trip was again a lightweight reconnaissance expedition to establish the merits of a return trip. Exciting developments in Clearwater delayed an immediate return, but when eventually it occurred hard won gains were the reward for the 1996 team in the discovery of major cave development deeper into the western end of the valley. The Cloud/Bridge/Cobra Cave system then proved that other large areas of Mulu contained extensive and mature development as well as the caves on the western margins i.e. Clearwater Cave.

The 1996 return to Wonder Cave resulted in a minor extension at the northerly end of the cave but was overshadowed by a fall and subsequent rescue from within the cave, which fortunately didn't end up as a serious incident. This was to be the end of exploration in Wonder Cave for another 19 years.

Prior to this year's visit, the last visit to the Hidden Valley was in 1998 where a determined effort was made to continue the exploration in the Cobra/Cloud/Bridge Cave system and surrounding area and also to push deeper towards the true western end. The nature of the ground and conditions were almost unbearable, coupled with a feeling of great remoteness and exposure to risk this is where the Hidden Valley exploration ran out of steam, until 2015.

THE EXPEDITION

PREFACE

By Dave Nixon

Given that the previous year the British expedition had exposed two new higher levels in *Clearwater Cave* and walked away leaving over 100 open leads in *Creedence*, many were questioning the logic behind this year's plans in Mulu. An audacious stab in the dark or a well calculated strategy?



Figure 7 - General view of the Hidden Valley facing west - Photo by M. Kirby

The seeds for this year's expedition were sown during July 2014 while in Mulu but this time on a filming trip supported by the Discovery Channel. Their new series 'Lost Lands' was an attempt to capture the sense of adventure by means of climbing, caving and a sprinkling of biology and science thrown in for good measure. Little did they realise that their idea would initiate the genuine article for the members of this year's trip and certainly others to follow in years to come.

The main thrust of the caving contained in the TV series would be a traverse through *Clearwater Cave* culminating in a rock climb. This took the form of an attempt by Leo Holding to perform a first ascent out of the *Secret Garden* to the surface. To enhance the dramatic appearance of all this, a helicopter was hired and aerial footage was shot of the *Secret Garden* opening from several hundreds of metres above.

At this stage the assistant producer, Patrick Greaves, should be mentioned, as without his forethought it is likely that none of what is in this report would have occurred. He had the vision to mount a couple of GoPro cameras on the underside of the helicopter, which were then running for the whole

duration of the flight. Furthermore the flight was to be routed from Mulu airport, through the Melinau Gorge, Hidden Valley, Paku valley and finishing off in the *Secret Garden* area. Maybe they just wanted an aerial tour of the park. This was fine by me, because, after a bit of careful negotiation, copies of the GoPro footage, all 25GB of it, were given to us as a virtual aerial tour of the park.

The flight down the Hidden Valley was by far the most spectacular section of footage with towering limestone cliffs on either side and the deep valley below with river sinks and plentiful dolines. Heading west I was hoping to get a glimpse of the large doline we emerged out of on last years *Creedence* trip. This wasn't to be, as before getting that far west the route headed south over *Bridge Cave* and to Batu Nigel. None of that really mattered anyway, as I realised we'd inadvertently acquired a very valuable asset. We had a frame by frame high definition movie image of the entire route, from a perspective that had only previously been covered via the occasional snapshots from similar flight paths in previous years. It was time to start the cave spotting exercise.

The luxury of being able to fast forward or rewind the footage is that there's no chance of missing anything that was seen from the helicopter. Before too long, several interesting locations were identified all along the karst areas below. Scrutinizing carefully the old reports helped familiarise myself with the area even though I'd never been there. No matter which way I looked at it there were features not mentioned anywhere within the reports. Numerous anomalies could be seen, and in particular three sites towards the eastern end of the valley looked promising.

The first was an obvious large entrance in the south side of the valley, which is likely to be part of the triple entrances mentioned in the 1993 report. The second was only visible for a few seconds but looked far more enticing and appeared to be a smaller entrance at the base of a cliff face on a prominent step on the north side. Finally on the same northerly step a larger dark gulley could easily be interpreted as an entrance.



Figure 8 – View down on the Hidden Valley from the air with all objectives highlighted – GoPro Footage

Further entrances and features of interest could be seen over the western dolines but my curiosity had already been aroused. All I wanted to do was get a team together and cut a trail onto what we now call the '*Naughty Step*' to investigate these two objectives in particular.

Objective 'A' was the most attractive in terms of location, if it went into Gunung Api at that elevation even for 100m horizontally we'd be four times that figure vertically below the surface before breaking into a sweat. All we had to do was to avoid *Wonder Cave* and the largest block of limestone in the whole of Mulu would be ours to explore, at least until we got to the Melinau Gorge, 5km to the north. There was nothing on the map neither east, west, above or below.

It could, on the other hand be just an alcove.

Reading in depth into all the previous Hidden Valley reports makes one realise that this is not a place to be taken lightly. Restricting the expedition to a reconnaissance visit and also limiting it to the easier, accessible eastern end of the valley were in our favour, the unknown factors weren't. Camping sites, water supplies, communications and solar power recharging options were all questionable elements.

The plan was for a five man reconnaissance team to spend 17 nights camping in the valley investigating the objectives and hopefully exploring/surveying some of the highest caves in Mulu.

In consideration, yes, it was an audacious stab in the dark. But come what may, it would undoubtedly be a bona fide adventure.



Figure 9 – South face of the Hidden Valley from the air– GoPro Footage

ACCESS TO THE HIDDEN VALLEY

Unlike 1978, when Mulu and the Hidden Valley had first been entered, access to the Gunung Mulu National Park is now very straightforward with twice daily flights taking tourists and local people to and from Miri. As usual, the team purchased supplies in Miri on the way in and good mobile telephone communications meant that additional supplies could be ordered on an as-needs basis and brought up by plane when required. This was all very different from the 3 day ferry / canoe journey up river and helicopter re supply flights, courtesy of the Royal Malaysian Airforce, that had been the norm on the early trips. In addition, the excellent canteen at Park HQ and the facilities of the bars adjacent to Park HQ meant that cooking was unnecessary other than on underground or exploratory trips.

From Park HQ a network of plank walks now radiate out to the main tourist features – Clearwater, Wind Cave, Racer, Lagang's, Deer Cave and the minor caves in the Southern Hills. These paths are well maintained and provide easy and fast access to the main caves in the area. It should be noted however that the path to Sarawak Chamber is still a forest track, branching off the main Deer Cave plank walk and subject to flooding where it intersects the S.Melinau Paku. In high water conditions people have been trapped on the far side and a rope across the river at this point can be necessary to ensure a safe crossing.

There were two trains of thought when it came to accessing the Hidden Valley this year and both involved a great deal of leg work.

Firstly was the option of a relatively leisurely start from Park HQ and follow the well-trodden route as if you were going to the summit of Gunung Mulu. This leads to Camp One where an overnight would then put you in a relatively close proximity to the Hidden Valley, relative to Park HQ that is. It's still a good day's ramble from Camp One to Prediction Cave via the much less well trodden route branching off to the climb up to the 900m ridge marking the entry point into the steep valley beyond.



Figure 10 - Camp One – Photo by Tony White

The second option was to have an extremely early start at Park HQ and make a swift and direct route straight to Prediction Cave. Without doubt the harder option but one which would enable a team to establish the camping possibilities and clear the route. Either way the distance is almost identical.

Travelling light it's 10 hours, in round numbers to get from Park HQ to Prediction Cave with minimal stops. The route goes from the boardwalk, passing the falls then all the way up the Paku Valley. Skirting to the southeast of Batu Nigel and systematically crossing rivers and working towards the ascent of the ridge. The steep descent into the Hidden Valley is treacherous and ironically the first bit of limestone you stand on is when you cross the drip line into the entrance of Prediction Cave at the finish line.

As it turned out we did both options, a three man team with porters did indeed do the traverse in one long day, making Prediction Cave by nightfall, but only just. The bulk of the equipment and the two other team members went via Camp One and arrived mid afternoon the day after, following the route taken the day before minus some of the errors in route finding.

All this was well and good but the unknown aspect of the whole trip was the nature of the base camp. Prediction Cave was chosen as it was initially anticipated that we were to spend one night there before establishing a camp in our 'new cave'. Yet another gamble?

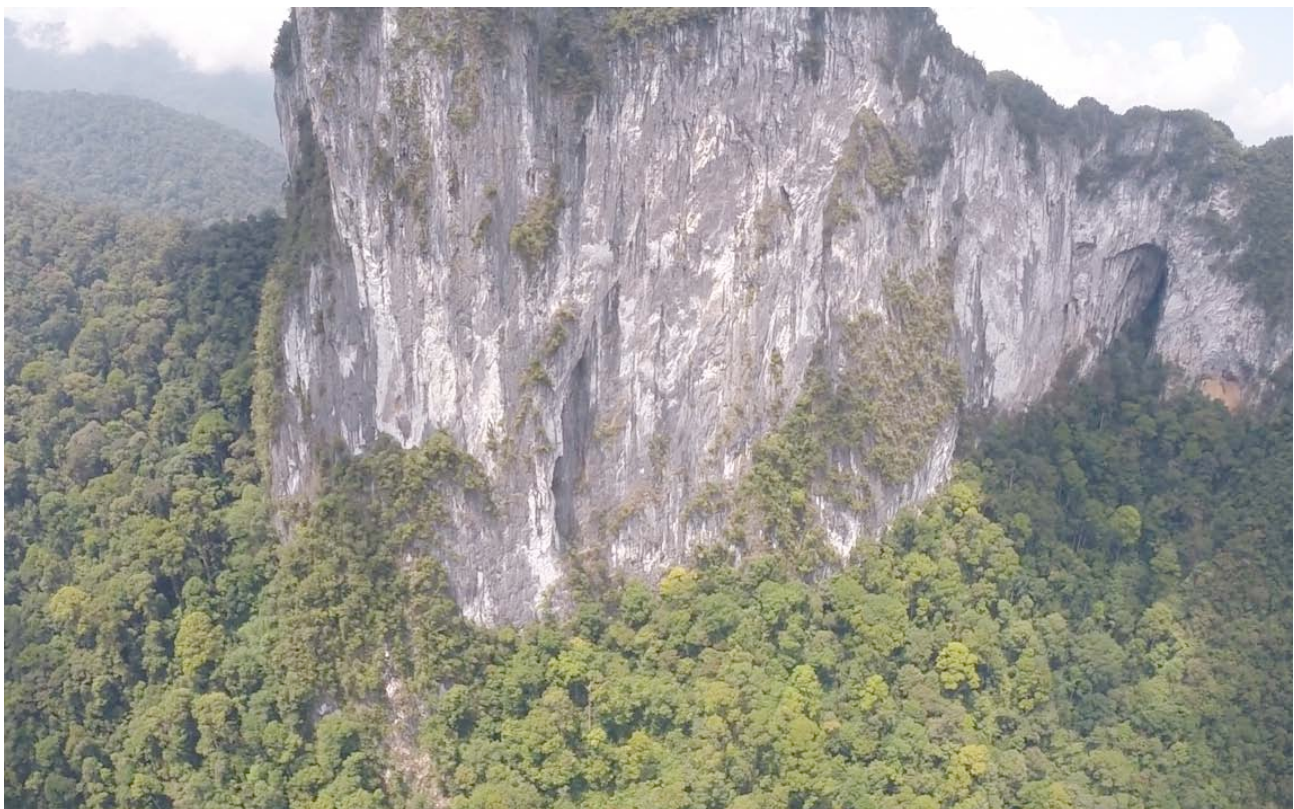


Figure 11 - The imposing 400m high south eastern cliff face of the Hidden Valley with the ridge on the left – GoPro Footage

CAMPING AND LOGISTICS

The three previous expeditions to the Hidden Valley had all camped in the base of the valley at various locations adjacent to the river, which eventually sinks west of Prediction Cave. By all accounts this wasn't a pleasurable experience and one that caused concern at the planning stage of this year's trip. Reports of uncomfortable conditions, an almost continuously damp environment, sand flies galore, leaches and the constant threat of torrential downpours didn't exactly fill us with enthusiasm to camp there. This also didn't include the thought and effort for materials needed to build the camp, which would have to be hand carried in. In addition, time would be required for constructing such a feature.

We were certainly on the look out for an alternative option, hence the idea of possibly camping in the entrance to Prediction Cave.

Despite an attempt to gather any intelligence on the suitability of this site for its camping merits all enquiries drew an inconclusive response. We were just going to have to chance it.

Arriving at Prediction camp at the wrong end of dusk after the long walk in was a great relief. Soon after, we realised that we'd landed well and truly on our feet, which was a feeling of pure solace.

The morning after, three weary cavers awoke to discover that the Prediction Cave campsite wasn't just good it was absolutely perfect for our requirements. At over 100m wide and just under the drip line of the south cliff above us there was enough room for everyone to spread out and personalise their own dry area. Not just was it out of the rain but to the extreme west was a solitary small trickle of water, more than enough to capture and use as a domestic supply without having to go to the river. There were no reports of insect bites during the night and we thought perhaps the hostilities would soon start but this never materialised, things were definitely looking up.

We soon got to work on a latrine and found a far more direct route back to the river, which was only a 7-minute easy walk. This location was ideal for washing and bathing with deep pools of clean warm water replenished from the constant run off of Gunung Mulu. It also provided the crossing for the start of the trail up to Conviction Cave.

With a make shift kitchen, temporary tables, chairs and food storage areas soon erected it was beginning to look like an excellent base camp, as it turned out it was that good we did no underground camping at all.

Quite why the previous trips to the Hidden Valley didn't utilise the same site is something of a mystery.

The sun blessed us for only a few hours in the day and the solar panels we'd brought in were strung up high to maximise the ability to harness the sun's power. Alas this wasn't sufficient for our requirements.



Figure 12 - The accident and emergency department of the base camp – Photo by Rob Eavis



Figure 13 – Myson, head chef at Prediction Camp kitchen – Photo by Dave Nixon

EXPLORATION

CONVICTION / WONDER CAVE

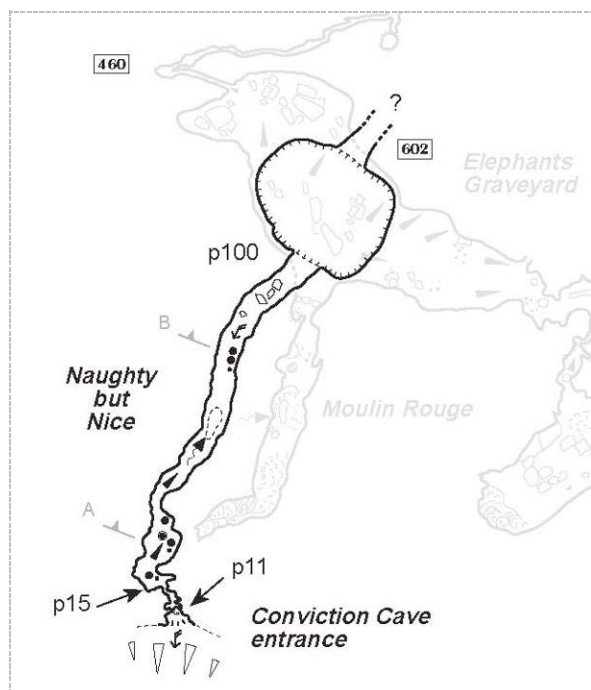
(See Appendix 1 for full survey)

The entrance to Conviction Cave is situated in the north face of the Hidden Valley 270m above the river level on a prominent steeply sloping bench, *'The Naughty Step'*. Access is gained by a moderately easy trail cut from Prediction Cave base camp, which comprises of steep scrambles, free climbs and a single pitch. Being at an altitude of 685m this now represents the highest cave entrance in Mulu.

In detail: Once across the river(s) and right at the fork for the helipad (left) the narrow plain turns to an incline and shares the same route that one would take if heading for Wonder Cave. On reaching the lower cliff turning west (east for Wonder Cave) and maintaining as best you can a route on the contact between the cliff face and the slope. A large prominent orange mark on the cliff above is a great point of reference. Beyond the mark, easy route finding options soon reduce to zero and two lead climbs are necessary. Doubling back it is then possible to rig a free hanging 16m pitch from an obvious tree thus permitting access proper to the *Naughty Step*.

Further steep ascents through thick vegetation lead to the upper section of the cliff base, following this west a 12m wide entrance is easily found, this is what was seen from the GoPro footage. Travel time from base camp to Conviction Cave is 1.5 hours.

The entrance contains a boulder slope down to a small open aperture amongst thick flowstone at the back of the alcove. The 11m pitch leads to a further climb down and a flowstone/stal restriction, *'The Gates of Api'*, where an extremely powerful outward draught can be observed. Immediately through this small aperture is the pitch head and a 15m descent drops into a very well decorated 18m wide passage heading north, *'Naughty but Nice'*.



Section and plan of entrance series of Conviction Cave and greyed out Wonder Cave beneath.

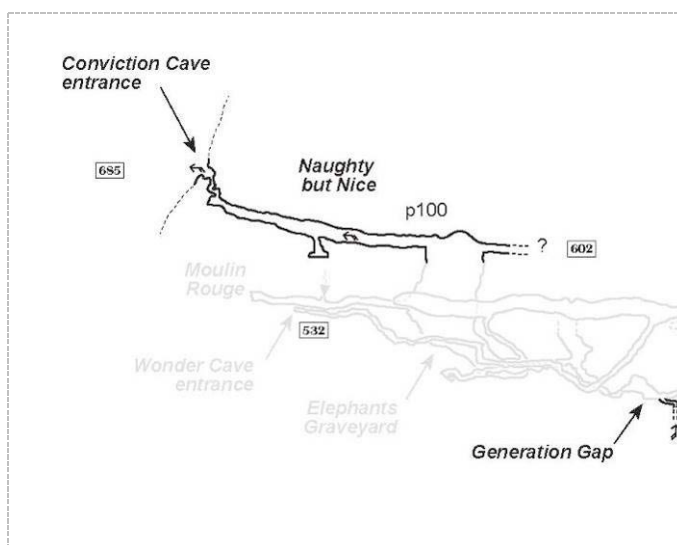




Figure 14 - The highest cave entrance in Mulu, Conviction Cave - Photo by Rob Eavis

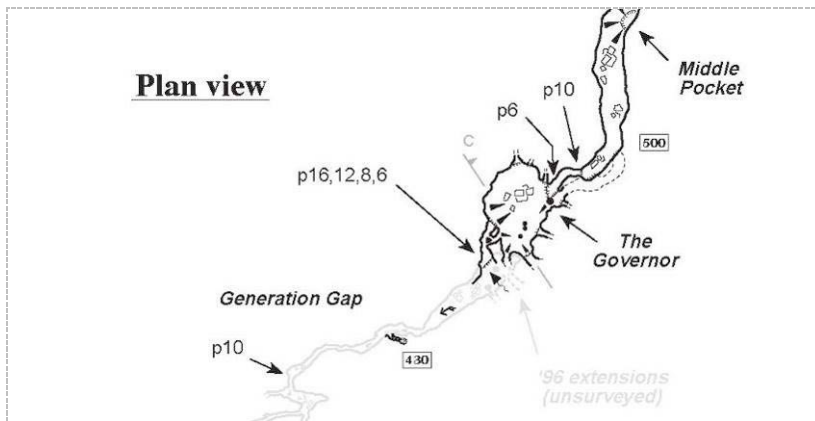
It's Naughty but Nice

Steeply descending at times a 15m hand line is useful for one section but progress is relatively easy the further away from the entrance you get, as the formations diminish and the passage levels out. Concealed under the first bouldery section is a 20m pitch descended to a flat muddy pit with no way on; this captures any localised percolation water from the entrance series and is directly above *'Moulin Rouge'* in Wonder Cave.

The passage continues in fine style before, 300m from the entrance, it is abruptly interrupted from its horizontal path by a large deep void. Visible on the other side of this chamber, 140m away, is the challenging continuation of the passage, heading off at the accepted Mulu default of 30° east of north.

This is the uppermost limit of the *'Elephants Graveyard'* in Wonder Cave and the connection is possible by means of a spectacular 100m descent to a section of cave first explored on the RGS expedition to Mulu in 1978.

Down the steep and large boulder slope is the route back to the entrance of Wonder Cave via *'Calgary, Peters and The Passover'*. This detail and other passage descriptions are to be found in both the 1978 and 1996 expedition reports. The remainder of the 2015 expedition was spent at the far reaches of Wonder Cave, which is accessible only via the passage heading off the northwest corner of the *'Elephants Graveyard'*.



The Generation Gap and limit of the 1996 expedition.

Bolt climbs out of terminal chamber and route into the far reaches.

There's a Generation Gap

In brief the *Generation Gap* is a well decorated, small but superbly sporting, draughty passage explored to a terminal chamber last visited 19 years ago. During the initial discovery this passage was not given a name. It was only this year when it was proved to be such a vital link to the further reaches of the cave that the 2015 team gave it this name. One well suited, due to one of the original explorer's sons being part of the successful re-discovery trip.

En route there are two notable features that warrant further description. At approximately half way to the terminal chamber a large cross rift is encountered containing the 10m pitch, which was the centre of the 1996 rescue incident. Several high-level opportunities were seen for aid climbing in the large cross rift, which would possibly bridge the gap up to the projected '*Naughty but Nice*' horizon 125m above.

Secondly, at its lowest point shortly after the 10m pitch, obscured by a fallen block is a crouching sized passage on the southeast side. This was only explored for 8m to a small pitch down, which was not descended. An outward draught was noted at this point.



**Figure 15 - The lowest point in the system, 'Generation Gap' discovered in 1978, named in 2015.
Photo by Rob Eavis**

Doing Time with The Governor

From the 1978 terminal chamber a series of new aid routes were ascended, comprising of four pitches (16, 12, 8 and 6m) on the northern side of the chamber. An 80m long passage heads off at the head of the first pitch but ends in a terminal boulder choke. The main way on was found at the top in the form of a well decorated roof tube, 50m above the start of the pitches, again heading north. This can be followed, with draught for 30m to the rim of a large chamber 50m in diameter with a grand view across to a mighty passage continuing on the opposite side. Acting as a guardian for this tempting new route is an enormous solitary column '*The Governor*'.

Access to the chamber can be gained by means of a low passage and a climb down on the southeast just prior to the rim. Numerous open leads can be seen in this chamber and all, with the exception of the obvious one were not investigated and remain unexplored.

Despite the size and grandeur of the continuation it is awkward to access and involves a traverse around the *Governor* followed by a graceless 6m pitch into the lower continuation. This is almost immediately followed by a loose and tricky 10m pitch up to regain the horizon you set out from. A high level alternative some 20m above to the southeast is unexplored and thought to simply be an oxbow but may provide an easier route.

Once away from the breakdown area of the chamber the passage adopts a more congenial nature and does it in prodigious form, being 16m wide and 30m high. With the draught detectable even in such a vast cross sectional passage, '*Doing Time*' stampedes off into the heart of Gunung Api.

The next obstacle is the '*Middle Pocket*', it occupies the entire east side of the passage and contains a pitch of unknown depth at the neck of a massive boulder funnel. This remains unexplored. No route round this obstacle is possible.

Therefore a delicate abseil, traverse and climb out of the north side using 80m of rope achieves the desired effect and normal service is resumed. Open leads are visible on the shoulders of the passage beyond and also an obscure deep hole amongst boulders in the floor. Progress can be made by a bold but safe traverse on the east wall up onto an area where the passage splits into at least three ways on. Two of these lay in the roof where an inlet from above feeds flowstone which then sinks in amongst boulders below. A bold, greasy traverse across frictionless flowstone permits access into the way forward on the west side where a low passage bypasses the partial collapse area to soon rejoin the major route. Prior to this a canyon type passage can be seen coming in below on the west side, this was not descended into. Before heading off again northwards, it's possible to double back on yourself and ascend to a point where you can look back down into the passage above the slippery flowstone. Here the inlet appears to come in from above at an aven but this area wasn't fully explored.

Northwards continues in similar fashion to a cross-jointed zone requiring a low scrambling route under a roof edge to avoid a deep canyon on the west. It becomes obvious at this stage that there are two stages of development responsible for the character of the route being followed. A deep vadose canyon is present under the entire section of cave from the *Governor* northwards and the phreatic passage above has, and is collapsing into it. The unexplored routes in the floor represent the open connections between the two.



**Figure 16 - The upper phreatic component, breaking off the vadose development at the ‘Governor’s Pleasure’
Photo by Rob Eavis**

Avoiding the canyon by skirting to the west, easy walking passage continues passing more access points to the lower passage and more unexplored routes off to the west. Subsequently the canyon is again reunited with the upper passage at a point where an inlet comes in from above and easy access can finally be gained to the base of the younger abandoned vadose passage. We now had two major fronts.

At the Governor’s Pleasure

Staying high and to the east, some fine formations soon exhibit themselves as well as several ways on in the ‘*Governor’s Pleasure*’. The major one is a scramble up over boulders and a low crawl to reach a large wide passage, which can be accessed more easily by means of a not so obvious bypass route to the south. Another small passage high up on the east and heading south ends in an easy dig which draughts inwards.

Ahead the route forms a wide passage with a large flat dry mud floor encrusted with delicate deposits of calcite on cracked mud banks. The roof is galore with the most abundant and spectacular display of stalactites and helictites anyone could wish to admire. One in particular being the ‘*Star of Api*’ is without doubt one of the highlights of the cave so far.

Beyond is a tiny vadose trench on the east under a low roof, while a small phreatic tube is secreted at the top of a short climb on the west. Neither were fully explored, while ahead leads into a small breakdown chamber.

Again on the west side a low level route can be followed down, eventually to a 5m pitch, which was undescended while the route straight ahead in the main component is choked. A low muddy passage was pushed and dug to a point where an inbound draught could be felt at a letterbox, which was too small to pass. Immediately beyond this restriction a very large passage could be seen to continue northwards.

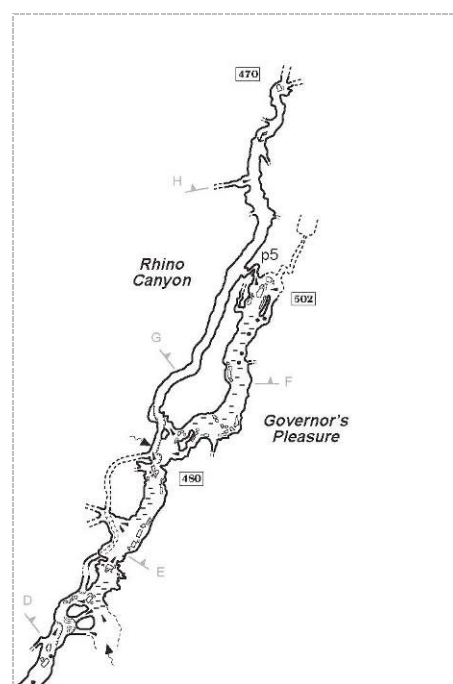
The White Rhinoceros and his canyon

It's not often you see a White Rhinoceros in Malaysia but the wonders don't seem to end, as here we have one. Not only that, but it is custodian of a fantastic campsite complete with soft dry flat floor, room to spread out and even a water supply. We were sold on the idea instantly.

Back at the junction with the vadose trench is a rock formation with more than a slight resemblance to the head of a *Ceratotherium simum*.



Figure 17 - Tony White, face to face with the White Rhinoceros at the proposed campsite – Photo by Rob Eavis



Plan view of the far reaches of Wonder Cave.

Accessing the 'Rhino Canyon' can be done back at the inlet previously mentioned and once in the base of the trench progress is both easy and glorious. The downstream section of the canyon was unentered.

Upstream the curvaceous 5m wide by 15m high trench winds it's way merrily north in classic keyhole style with abundant formations - at one location in micro fashion, with a display of what is thought to be selenite (calcium sulphate) crystals present as tiny sub millimetre wide threads of mineral irregularly growing upwards from the floor.

At about 180m a small route on the east is thought to connect with the 5m pitch in the breakdown chamber at the end of the *Governor's Pleasure* but was not confirmed.

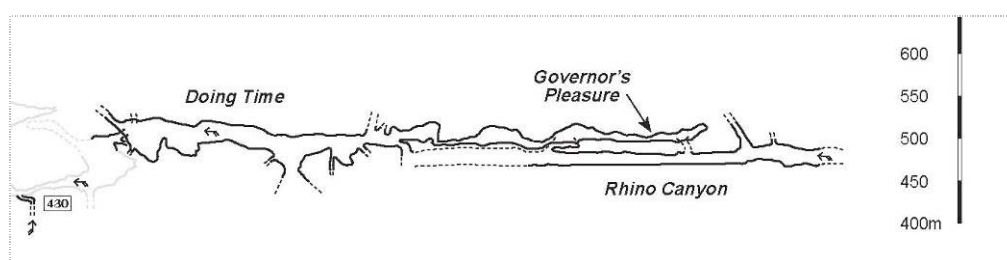


Figure 18 - The start of the magnificent ‘Rhino Canyon’ the deepest point from the surface in Mulu
Photo by Rob Eavis

The *Rhino Canyon* was explored for 400m in total, containing many unexplored routes heading off on both east and west side, both at floor level and in the form of future aid climbing projects. At the point where exploration was suspended a large collapsed block has fallen into the trench, but an easy free climb enables access to the continuation. There appears to be a division of the passage with the trench on the left and a high level route to the right - both leads are open.

The draught was still emanating from the north, where it is approximately 4km horizontally to the Melinau Gorge. The retraction point was 450m due south of the summit of Gunung Api (1692m) in plan view but -1.3km beneath it. From this point it is also -395m vertically to the assumed resurgence at Nasib Bagus, although no information is currently available on the hydrology of the new area. Neither do we know anything about the limestone contact arrangement with the Mulu shale formation beneath us.

Therefore, the limit of exploration in Conviction/Wonder Cave is the deepest point from the surface of any cave in Mulu.



Cross-section of the limit of exploration in Wonder Cave.

WONDER CAVE – LOWER ENTRANCE



Figure 19 - Tony White at the 1978 entrance to Wonder Cave - Photo by Rob Eavis

On the last caving day of the expedition a reconnaissance trip was mounted into the original Wonder Cave entrance, primarily to try to ascertain which is the best entrance to gain access to the further reaches of the system.

Wonder Cave entrance is situated 120m to the east of the route to Conviction Cave at an altitude of 532m. This small, easily missed entrance is most notable for the incredible draught moving all nearby vegetation. A small climb down and short grovel leads quickly to a fine 3m diameter passage along the strike. An exposed step around a +15m deep pit accesses a larger passage with some formations and multiple ways on. Following the obvious route the large passage formation is quickly lost and a short climb down leads to an awkward pitch head down into a small rift series. A couple of short rope descents lead down to a small, muddy squeeze emitting the whole draught. This sharp and awkward section is short lived and soon the passage regains a reasonable size in a tall rift cavern. The way on is an exposed climb up that requires rope protection, which was not anticipated, and so we were forced to turn around. Once

back through the squeeze a small rift feature heading steeply up to the west was explored for 25m, following significant graffiti, but only to a too small restriction with no draught.

On this trip not even half of the entrance series was completed and much less of it enjoyed. It is therefore very clear that Conviction Cave gives the quickest and easiest access to Elephants Graveyard and beyond, whilst also providing a much more enjoyable and respectable experience throughout.

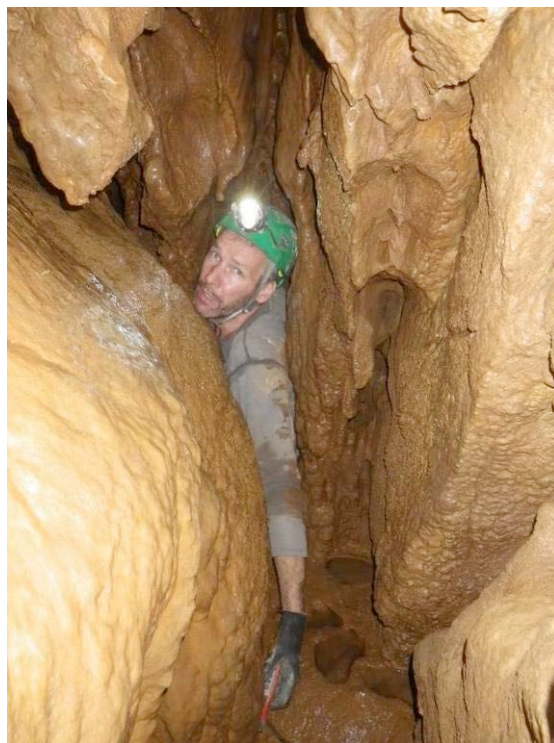
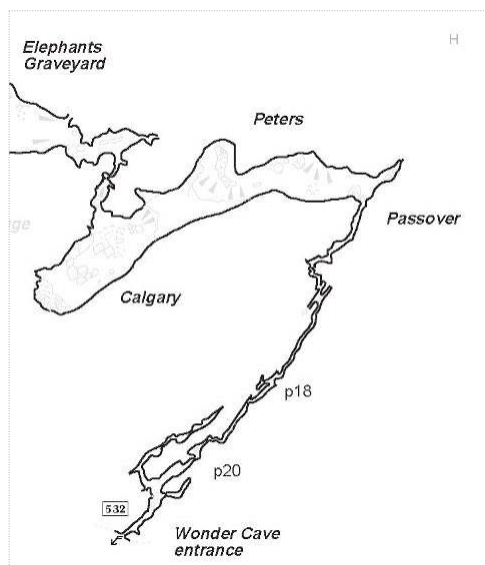


Figure 20 - Dave Nixon enjoying the squeeze in the entrance series of Wonder Cave – Photo by Tony White

PREDICTION CAVE EXPLORATION

By Andy Eavis

On Thursday 8th October, Colin Boothroyd, Dave Nixon and Robert Eavis decided to attempt to reach objective 'B' on the northern Hidden Valley cliffs they had been "convinced" was another open entrance.

It was thought that everybody going on this objective would be rather mob-handed, so Tony White and myself decided to go and have a look at the far end of Prediction Cave. I had last been there in 1978 and remembered it as a small draughting hole in calcite.

The two of us soon got to the far end, admiring the amazing passage which was once one of the largest open cave passages in the world but has been filled right up to the roof with sediment. In places the sediment and the roof are down to about a meter apart, and the floor is a three dimensional mirror image of the ceiling. This has led some people to think that it may have been a landslide type of event that filled the cave some time in geological history. An alternative theory of course is that the sediment gently filled the place to the roof and it has been undermined since and has settled leaving a gap between the floor and the roof.

There are a number of places where a lot of sediment has been removed and the passages is quite open but all of them quite short. After about 350 metres or so, it narrows down and we came across the ropes we had left in since 1978; we replaced these with modern ropes and then spent a considerable amount of time investigating every possible way on.

Since 1978, I have several times been the other side of this in Sarawak Chamber looking for ways through from there. On the Sarawak side it is predominantly breakdown, and there's a very complicated situation where you can crawl between slabs of boulders fallen from the roof and make progress, but it is very tortuous and route finding is a nightmare with little draught.

On the Hidden Valley side there is much less breakdown, it is predominantly sediment infill, probably backing up on the collapse that we now know on the other side. The small draughting hole I remembered from 1978 looked very uninviting so Tony and I pushed every possible lead between the sediment and the roof both from the left and right side of the passage. There was a distinct absence of draught and the only particularly draughting place was the small eyehole that had been seen in 1978. It was decided to leave this for another day and we made our way out to the surface. This is of course when we heard Dave Nixon's verbal morse code and Colin's rescue was put in to action.

The second trip into Prediction Cave was nine days later on Saturday 17th October. This day had started with the sharp end team of Robert, Moose and Tony not returning until 6.30 in the morning. I had walked in at 6pm the night before and was somewhat worried and then relieved when they arrived intact. The memories of Colin's problems nine days earlier were very fresh in my mind.

As I only had a couple of days in Hidden Valley, Robert and I decided to have another look at Prediction Cave. We particularly were aiming for the small draughting hole. When we got there we realised it was passable, and without much modification Robert got through it to a small chamber beyond. Interestingly, the chamber had an incredible echo and our expectations were very high. Unfortunately, just after I got through the squeeze it was realised that there was actually no obvious

way on, although we did look pretty hard and there *may* be a bolt climb to be done at the very end into a possible roof continuation.

Really, Prediction Cave is an example of so near and yet so far. Future work would be best to take place from the Sarawak Chamber end, although it wouldn't be a bad idea to have somebody at each side and see if a verbal connection could be made. There is probably much less than 100 metres between the two sides but both sides are now very complicated and I'm not sure each side has been pushed in every possible lead or in easy digging spots.

There is a future opportunity here.



Figure 21 – Looking into Prediction Cave from Camp – Photo by Tony White

SURFACE INVESTIGATIONS

Once objective ‘A’ (Conviction Cave) had been connected to Wonder Cave and objective ‘B’ proven to be just a deep gulley, moral was at a low. Throw in the rescue mission leaving us with 25% fewer people and 3 days lost, we needed to get something going and quickly.

The next and last objective on the list was objective ‘C’, again spotted from the 2014 helicopter flight. This is situated in the Southern slope, just slightly west of opposite from Conviction Cave. It was thought to be a potential continuation from before the down-cutting of Hidden Valley, possibly heading over the top of Sarawak Chamber. Researching the old reports and subsequent first hand discussions suggested that it may have been the upper of the “Triple Entrances” spotted on the ‘93 and ‘96 expeditions, which was never reached.

A few spots on the Naughty Step offer a clear view of objective ‘C’ on the other side of the valley. It looked superb, plus it was at a slightly lower altitude and didn’t look too difficult a climb up. So for a break from the Naughty Step we took a stroll down the valley armed with all our climbing gear. A gap in the trees by the river gave a glimpse of the entrance and a good view of the approach, and we finally understood why such a good looking entrance was never reached. The route up looked like it would be complex, due to limited vegetation and very steep faces of poor rock. It certainly didn’t feel like a target for a lightweight reconnaissance.

Attention was therefore turned back to the northern cliffs. From a bend in the river near the old helipad there are a number of good views of large features less than 100m up from the valley floor. In ‘96 only one entrance was reported as being reached, that on a bearing of 30° from the helipad. The next good looking entrance was slightly further down-valley, at a bearing of 0°. This is in an encouraging position, as it is further west than any part of Wonder Cave and at a similar height to the Generation Gap development.

After two days of technical climbing and bolting a number of small entrances and fissures were found in this area, although none that matched the black hole seen from below. Significant swift activity was spotted around, and it is quite possible that there remains a large entrance here that was narrowly missed. A return trip would be assisted greatly by a second team spotting from the southern slope.

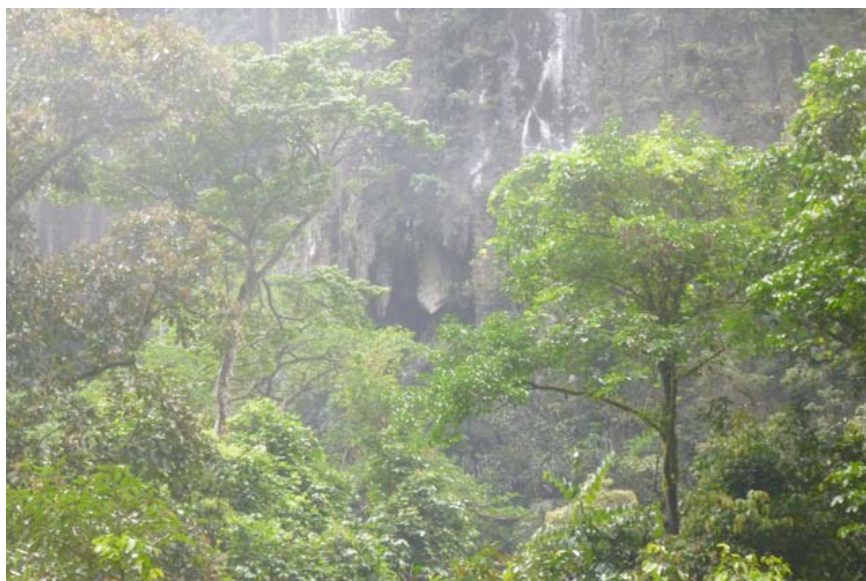


Figure 22 - Low level surface objective on north face of Hidden Valley west of the old helipad – Photo by Dave Nixon

MEDICAL REPORT

By Tony White

Introduction

Neither the Hidden Valley team, nor the Camp 5 team were able to enlist a doctor. Some members of both teams had first-aid training but the nearest doctor in the event of a major incident was at the clinic near Park HQ.

First Aid Kits

First-aid kits were the same as used by the 2013 and 2014 expeditions. Each contained laminated instruction sheets and list of contents so that they could be checked and restocked with items brought from the UK.

- Major trauma kit with stretcher - kept at Park HQ ready for deploying to either team.
- Forest Camp Kit consisting of two large Daren drums – kept at the main camp for Hidden Valley at Prediction Cave.
- Underground Camp kit (1 medium Daren drum) - taken to the Conviction Cave entrance and kept there during exploration, because no underground camps were set up.
- Two day kits - carried by surface and underground parties.

Individuals provided for their personal medication and a reasonable supply of items for their own foot care.

Hygiene

Drinking water was obtained from drips from the roof collected off plastic sheeting but there was no plentiful running water for washing in the immediate camp. General washing was done at the river less than ten minutes from camp. Hand hygiene was maintained by using antibacterial hand sanitiser at the toilet as well as a bucket of disinfected water and soap near the kitchen, which was changed regularly. There were no illnesses or hygiene issues.

Incidents

The one major incident, which occurred, was Colin's accident where he fell an estimated 35 meters down an almost vertical vegetated cliff on the surface below Conviction Cave. His injuries amounted to a broken left collarbone and three ribs also on his left side. Considering he was not wearing his helmet at the time he was extremely fortunate not to suffer any head injuries. Amazingly he did not suffer any cuts, grazes or breaks in the skin or any significant internal damage or bleeding. He was wearing a caving pack, which remained, on his back. He believed that he was conscious throughout but was winded to the extent that he was unable to respond to his companions' anxious cries.

He was reached within a few minutes by Moose and after a brief examination, which proved to be accurate was made safe by getting him into his harness. He was in significant pain so ibuprofen tablets were given as they were on hand. With Rob returning as fast as possible back up to Conviction Cave to get the underground first aid kit he arrived about 15 minutes later to immediately administer Tramadol.

Although in severe pain Colin was able to use both legs and his right arm. Evacuation down the cliff was the easiest option but this was into unknown ground and with only one 60 meter rope available the risk of getting trapped on the way down was too great. Hauling him up was much harder but was the safe option. Park radios were available at Prediction Cave but had been forgotten that morning. So the method used to alert the team at the Prediction Cave camp was to signal SOS with 3 short, 3 long, 3 short shouts every couple of minutes. This was maintained for about three hours until a response was heard at 16:45.

Not knowing what the nature of the emergency Veno and Jimmy were sent up with radios, rope and the forest camp medical kit and at 18:00 Veno was able to report on the situation by radio. By 21:00, after about seven hours of hauling, Colin was at Conviction Cave and sleeping gear, stove, food and drink had been taken up.

The following day, after an extremely uncomfortable night Colin was brought slowly down the cliff, assisted by three people, and back to Prediction camp while Andy and Veno set off to the ridge to radio for help. During the descent Colin complained of nausea whenever he stopped moving.

On the third day Colin's condition had improved slightly. Andy and Veno went to Park HQ to organise logistics for either surface or helicopter evacuation. Colin's medication was changed from tramadol to codeine phosphate in case the tramadol was inducing nausea but the nausea continued. Colin was moved by the Hidden Valley team slowly up to the ridge and were met half way up the hill by Paris and his team. This dramatically speeded up the recovery and took him over and down to the first river crossing where a camp was being set up. On the fourth day Paris's team brought Colin to Park HQ. He received proper medical attention at the clinic and later flew to Miri to hospital for an x-ray.

The other incidents were a twisted knee sustained from slipping while descending the surface track from Conviction Cave and a case of Mulu foot caused by a pair of boots, which were too tight to allow Sealskin socks to be worn. Both these incidents resulted in lost man-days.

Other Injuries or Complaints

Minor cuts on ankle.

Minor cut on wrist.

Bites or stings: wasp or bee, leeches, fire ants, ticks.

Supplies Used

Zinc oxide tape 5cm wide.

Blister plasters.

Iodine.

Cotton tips.

Triangular bandage.
Assorted plasters (larger ones useful for covering adjacent lesions).
Inadine non-stick iodine dressing.
Flucloxacillin antibiotic.
Ibuprofen.
Tramadol.
Codeine Phosphate.
Hydrocortisone cream.
Daktarin antifungal powder.

Recommendations

1. Many items in first-aid kits will have passed their expiry dates by the next expedition and should be replaced.
2. Improved and clearer instructions with less medical speak. (Could prevent 'pr' medication being given 'po'.)
3. Additional quantities of plasters for dressing minor wounds, blisters and sores as well as more tubes of Hydrocortisone for Mulu foot.
4. Mosquito's and sand flies were not a problem around Prediction Cave camp. This was the opposite of previous camps down by the river, but preventative measures should be taken anyway.
5. A helicopter evacuation plan needs to be pre-arranged. The best way to arrange this is to prepare the existing helipad and ferry gear and people in at the start thus verifying the evacuation system.
6. A doctor on any future trip would be a distinct advantage.

EXPEDITION RESCUE LOGISTICS

By Andy Eavis

After Colin Boothroyd's accident (see Appendix 2), I reviewed my 50 year thoughts on expedition rescue logistics. During the previous year there had been a couple of major international rescues; one in Germany and one in Peru, both of these involved difficult logistics and lots of manpower. For our relatively lightweight expeditions to the Hidden Valley we had always considered self-rescue being a relatively easy and practical proposition. In view of Colin's problem, I for one have now reviewed my thinking.

The Hidden Valley re-visit in Mulu was always going to be a lightweight reconnaissance trip, looking at a virtually unexplored block of limestone that is as remote as it is possible to be in the Mulu national park. Unfortunately, there were no fast rescue backup plan at all. In addition, at that time in the expedition, there was not a huge amount of manpower capable of performing a difficult underground rescue available at all. Luckily Colin had his accident on the surface and a prolonged, difficult underground rescue was not necessary - thank goodness.

Colin took a fall while traversing high on the northern wall of Hidden Valley, at least 200 metres above the valley floor on virtually vertical limestone but with a covering of vegetation. In Mulu everything that's not seriously overhanging is covered in vegetation. The vegetation slowed Colin on his 35 metre drop and he did ultimately rest on a ledge against trees above a further vertical drop, which would probably have killed him. He did however suffer a badly broken collarbone and 3 broken ribs. In retrospect he was lucky not to have worse injuries; to have broken ribs but no internal damage was very fortunate.

The rescue then undertaken by the small group, initially only Rob Eavis and Dave Nixon, was extremely well performed and great praise should be given to them. But in retrospect they were out on a long limb. Had the accident been deep underground or an even more serious injury, it would have been a much more serious predicament.

That is where lessons of the big rescues in Peru and Germany come in; a lot of manpower would have been needed to have brought a stretcher from the end of Conviction Cave to the surface. This manpower would have been difficult to assemble and the time scale would have been large, even utilising the cavers, both local and expedition, available in Mulu at the time. In my opinion, to have brought a stretcher from the far end of the cave to the surface would have required at least 20 good cavers working in shifts to get a stretcher bound patient out in a reasonable timescale. To have covered a worse-case scenario in an acceptable manner in my opinion would have required better transport facilities and better communications. Although building a helipad in advance would not have been essential, a contingency plan to build a helipad should definitely have been in place with the appropriate helicopters operators warned and chain saws etc. available. The site for a helipad should have been chosen which would almost certainly have been the same locations as the one used in previous expeditions to the area.

In addition, the communications into Hidden Valley were very poor. We were relying on a satellite telephone, which, as we discovered in the narrow valley, didn't work very well at all. It highlighted the poor abilities of the Iridium satellite system in forest or mountainous terrain. Even sending a text message was difficult, as you had to send it in the short time window when the satellite was overhead; in the Hidden Valley this was very occasional. The phone would not store a message and send it when there was a signal, so it had to go manually at the moment coverage was available.

You also had no idea whether the message had gone or not so the basic situation was frustrating and terribly time consuming. To compound issues, the national park radio system didn't work into Hidden Valley at all. The only way to have reasonable radio reception was to take a 1+ hour climb out of the valley on to the ridge. Once there reception was good but it was on an open radio system where everybody in Sarawak could listen in to the radio traffic.

Lessons to be learnt for the future

The next expedition into Hidden Valley will also be a comparatively lightweight trip. Hopefully it will go in by helicopter to a newly cut helipad, which will prove the viability of using a helicopter in this situation and the pad will be available for any emergency evacuation.

Including local cave guides, there will be at least 20 good underground people available for a serious rescue. If necessary, extra manpower could be bought in by helicopter from the park headquarters.

There should be a better radio or satellite communication system out of Hidden Valley, either by putting a radio repeater on the ridge and extending coverage into this part of the national park. Alternatively, by a new type of satellite phone system, which will operate using two stationary satellites and not be dependent on the very problematic Iridium system in this type of terrain.

Above all else a very rudimentary risk assessment will be implemented to make sure the risks are acceptable. We should be in a position where we feel we have covered all the hazards properly and in the event of accident be as best prepared as we can be in the circumstances.

That was not the situation in Mulu in 2015, and as overall leader of the expedition I have to take responsibility for that. Consequently there are lessons to be learnt for all, and these need to be recorded and passed on for others in the future.

POWER GENERATION IN THE HIDDEN VALLEY

By Rob Eavis

Prior to the expedition, many hours were spent considering the best way to provide power to charge things in the field. This is a familiar exercise for expeditions, but with modern day airport restrictions limiting the possibilities significantly, both with Lithium ion batteries and also any generators that use fuel, it constantly needs re-evaluating. Also the lightweight nature of this reconnaissance trip is relatively uncommon in Mulu, so it was worth a look.

Initial forays into a 12v DC generator driven by a petrol trimmer were dismissed due to engineering and reliability concerns, plus the probable requirement to strip-down and clean every element prior to flying. Discussions also evaluated buying a small AC generator in Miri, but with the difficulties of getting it on to Mulu and the reliability concerns of taking an untested machine deep into the rainforest, a different solution was desired.

The most important element to evaluate during this exercise is to work out what will actually be needed to be charged in during the expedition. Initial assumptions were made around the drill batteries, but after one of the new 5Ah Makita batteries put in 55x 8mm holes at 65mm depth, we decided that if we simply take in 3 fully charged batteries we would have enough power for most objectives for the duration. And what's more, there was always the backup option of getting empty batteries taken back to Park HQ by porters and returned as part of the planned re supply efforts. This seemed sensible, and significantly reduced the in the field charging requirements.

This left head lights, surveying gear, cameras, plus GPS and sat phone as the main requirements, which including spare batteries totalled ~500Wh of energy being carried in (assuming everything goes in fully charged).

Rob	
Scurion	OEM Li-Ion 7.4v
Zebra Light	AA
Camera	OEM Li-Ion 3.7
Flash Guns	AA
Z6 Phone	OEM Li-Ion 3.7
DistoX	AAA
Sat Phone	OEM Li-Ion 3.7
Andy	
Scurion	OEM Li-Ion 7.4v
Tony	
Fenix HP25	AA x 4
Fenix HL55	18650 x1
Canon G9	OEM Li-Ion 3.7
Pentax WG-1	OEM Li-Ion 3.7
Colin	
Fenix headtorch	AA x 4

Fenix headtorch	AA x 4
Cycle spotting torch	18650 x 4
Iphone 5	OEM Li-Ion 3.7
Dave	
Scurion	OEM Li-Ion 7.4v
Fenix HL55	18650 x1
Camera	OEM Li-Ion 3.7
Z6 Phone	OEM Li-Ion 3.7

The usage of these lights was going to be heavily dependent upon how much time was going to be spent caving, and especially whether the main base camp was underground. This main variable was impossible to judge, so it was clear whatever solution was sought had to be flexible enough to deal with many eventualities.

A two-fold plan was decided on, solar panels plus a battery bank. The battery bank would provide a means of starting with plenty of spare power, plus also give means for further power to be carried in if necessary. The solar would trickle charge the batteries, ideally on average keeping up with demand.

Extensive research led to 2x 60w SunPower foldable panels being purchased. At less than £200 each these gave significantly better watts per pound than any other lightweight option, and seemed to be made to a good quality so should last for many expeditions into the future. They were wired in



parallel and, via an extension cable, plugged into a solar charger unit. This separate unit provides 12v power to the headlight chargers, and manages the trickle charging of any excess power into the battery bank.

Battery choice was not obvious. Ideally Lithium Ion would be used for its weight advantages, but large units are prohibitively costly and cause significant difficulties with airfreight (most airlines limit Li-ion batteries to 150Wh, and normally only one per passenger). After reviewing other options it was decided that lead acid would be the most suitable option. It is locally available in Miri, cheap per Wh, very robust, typically comes as 12v, and will last for many expeditions.

We bought 6x 7.2Ah UPS batteries and brought them up the river, instead of trying to get them on the Miri - Mulu flight. These had the added advantage of being good at handling deep discharge cycles, and also easily divided between porter loads. Also by having more than one unit, we had the option of powering camp on a few cells whilst the others are back at Park HQ getting charged.

Figure 22 – The two solar panel kits at Prediction Camp – Photo by Rob Eavis

Results

We had sufficient power available such that nobody had to limit their normal usage, but only just.

It has to be said that solar power in a rainforest is not an obvious choice because typically the trees have already capitalised on what is available. Our initial plan was to be based just inside Conviction Cave (then known as objective 'A'), which being placed high up on the northern face would be clear of the big canopy and in October would have a very good vantage of the sun to the south (not true in the summer). All of this in retrospect is true, the entrance would take very little work to become a good spot for solar power during the winter.

However this year we were lured into staying at the luxurious Prediction Cave camp. Being low and on the other side of the valley this was almost always shaded by both the trees in the entrance and the high cliffs above. It was also noticeable how the sun moved further south throughout the 17 day expedition, meaning gradually less solar was collected within the dry-zone of the entrance. Additionally whilst the weather wasn't too bad, it was rarely blazing sunshine.

Solar power collection was not monitored in the field, but my estimate would be an average of 20 Wh per day (less than 1/2 a Scurion battery, not allowing for charging losses). If the expedition had been held during the summer months, and if time was put into clearing some of the low lying vegetation, this could have been significantly increased. Alternatively the panels could be located away from the camp, such as at a future helipad down in the valley. Then the batteries would need transporting to and from the base camp, and having a 3-in 3-out system could work well.

Future suggestions

If a return expedition is planned which involves more people for more time, taking a small petrol generator is likely to be the best option, especially if there is a requirement to charge drill batteries in the field. A neat setup would be for the generator to charge the 12v batteries daily, allowing people to charge their individual units at their leisure through the day or night. The batteries could then be topped up by the solar, slightly reducing petrol usage and acting as an emergency backup in case the generator fails.

NB. The draught in the entrance of Conviction could potentially be a power source! Calculations using a leaf, and a unit Moose length, plus a 60fps video camera, suggest the wind speed was ~7.5m/s. This was done in average conditions. Using a modern wind turbine with less than a 600mm diameter, this could output 4-7W. Whilst not much, over a 24h period the +100Wh could provide a very useful level of power for any small team working in the system.

COMMUNICATION IN AND OUT OF THE HIDDEN VALLEY

By Rob Eavis

Satellite Phone

An Iridium 9575 Extreme was taken as the primary method of communications from Prediction Cave to park headquarters and also back to the UK, but it was not as useful as had been hoped. The Iridium satellite network is composed of 66 polar orbit satellites which each take ~100 minutes to complete one full orbit (pretty fast). This means that signal is worst at the equator and especially in a deep East-West valley; really not good for Hidden Valley! Signal was extremely intermittent and only lasted for a minute or two at most. Half the text messages were never received (in either direction) and phone calls were simply not possible. It was used somewhat successfully at the ridge, but again the signal was generally poorer than acceptable.

Park Radios

These were used from the ridge to all key locations (inc park headquarters, Prediction Cave and Conviction Cave), they also proved reasonably reliable around Hidden Valley itself such as between Conviction Cave and Prediction Cave. These were extremely useful during Colin's rescue.

Other

The most reliable method of communication was notes given to porters. Local SIM mobiles did work occasionally from the ridge and on the walk between the ridge and park headquarters. Finally Dave Nixon's SOS barks from Conviction Cave to Prediction Cave worked well, once the basecamp team were back from their underground trip! Unfortunately due to the high power of this method it took many hours to recharge his voice box.

Suggestions for future trips

In the past a solar powered, radio repeater used to be installed on/near Mount Mulu. If reinstated this would allow for radio contact direct from HV to headquarters, which would prove invaluable for everyday communications, and especially in emergency situations.

An alternative solution for satellite phones is to move to the Inmarsat network. This uses multiple geostationary satellites, with likely the best for Hidden Valley being the "I-4 Asia-Pacific" one which sits at 143.5°E. This puts it at a bearing of 100° at 42° above the horizon, which should be in a good location for Hidden Valley (and also Camp 5). The main advantage is once a good location has been found, it should be constantly and reliably there (other than due to weather variations).

PHOTOGRAPHY

By Rob Eavis

Due to this expedition being a lightweight reconnaissance, the photography equipment taken had to be more minimal than would normally be desired. Also, the expectation was for relatively little time to be afforded to photography, so the gear had to be simple and quick. However the expedition did need the capabilities of good, clear, well-lit photos to be taken, as the places being visited had at best been photographed more than 20 years ago, and more generally never.

With this in mind a small kit was put together which would be used as the main underground kit. This comprised of a single SLR (Canon 60D) with a single lens (Canon 10-22mm). Two small flashguns (Yongnuo YN-460) were taken, each triggered using a radio slave system (Yongnuo RF-602). This was all housed inside a medium daren drum, along with lots of other equipment and kept dry using silica gel pouches.

Additional to this main kit, each member had their own small compact digital camera or phone with which many worthwhile photos and videos were captured both above and below ground.

In The Field

Due to the exceptional nature of the discoveries in Wonder Cave, the team were aware of both the need to survey as much as possible and explore as many open leads too. This was clearly important but so too was the recording of some of the incredible passages and formations. The challenge was on!

The main photography kit was fortunately taken in on the primary pushing trip and left in the cave. During that day, time was taken to photograph back from the end of Governor's Pleasure to the Rhino Canyon junction. Then on the next trip, the first de rigging trip, all the remaining photos of the new discoveries were captured on the way back to the Elephants Graveyard. Finally once virtually all de rigged an easy day was spent capturing the images of Naughty But Nice and the entrance series.

SURVEYING

By Dave Nixon

All the survey work in the field was done electronically using the distox and PDA method with all processing work and final drawing done either back at park headquarters or on return to the UK. Notes in the field were solely taken using computer generated graphics on site and stored for reference in the shared cloud storage facility folder for the Mulu Caves Project.

Surface fixing was never going to be easy in such a steep sided valley complete with dense canopy cover. However the GPS fixes we acquired were a major improvement on the previous non GPS days of fixing points for the cave entrances in the Hidden Valley from maps. The most accurate fix

was up at Conviction Cave entrance although this wasn't as good as we would have liked. With a surface traverse completed between here and the entrance to Wonder Cave this now represents the 'anchor point' for all the survey work in the Hidden Valley until such time as we get a more accurate point.

In addition to the surface traverse obviously there is now an underground traverse possible from Conviction to Wonder Cave but using data nearly four decades apart. Integrating this data was necessary as a resurvey of the entrance series of Wonder Cave through Calgary and on to Elephants Head chamber wasn't possible on this trip.

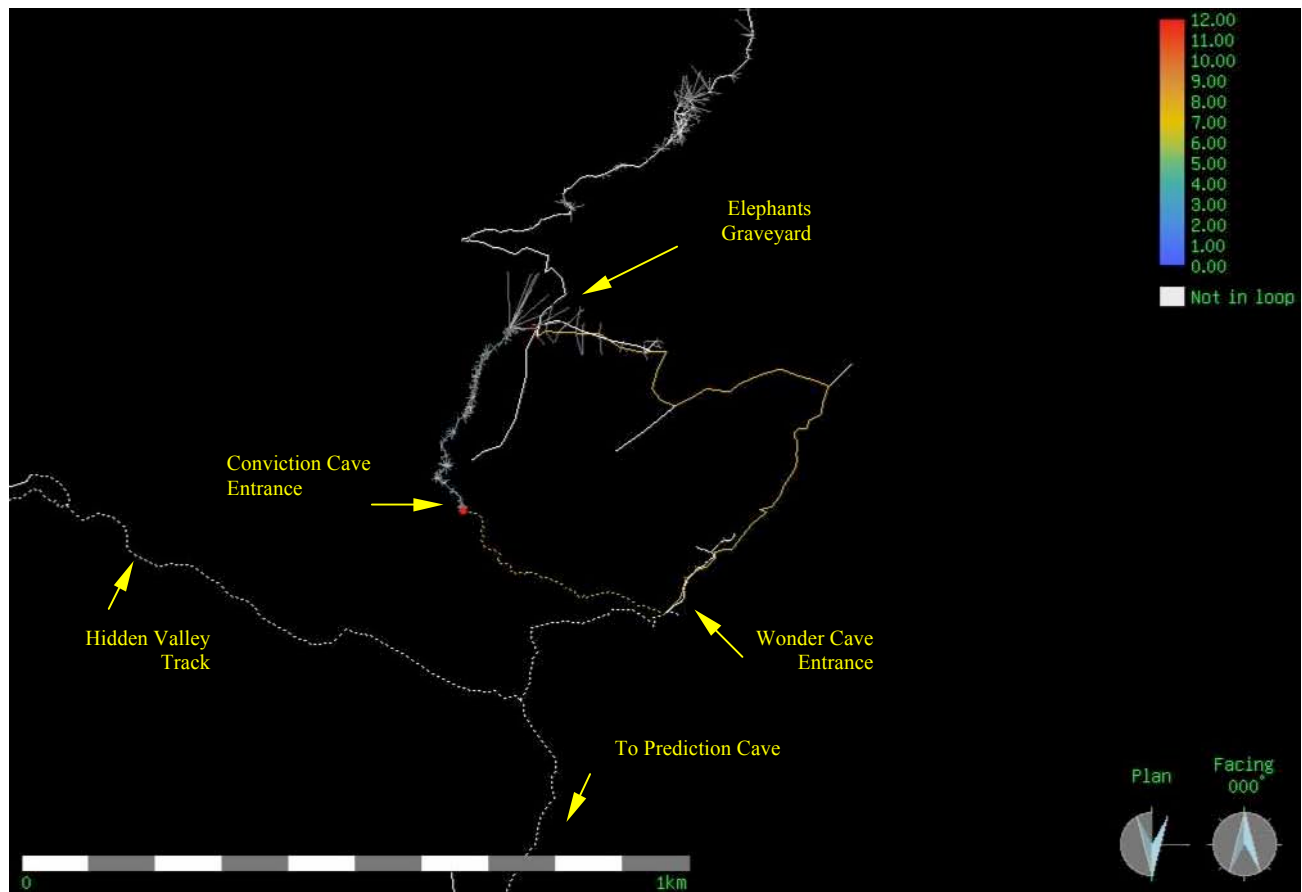


Figure 23 – SurveX plan of Wonder Cave and the surface legs

The laser guided distoX side of things remained the same as for previous expeditions to Mulu and the distoX2 wasn't employed this time round. Calibrations were done in the field as is normal with the electronic distance/compass/clino set up.

Unlike previous trips where 'Pocket Topo' was the software of choice for the PDA, this time 'TopoDroid' was used as an alternative mainly due to the fact that it operates on an 'Android' based operating system. This greatly increases the choice of PDA's available, indeed the possibility of not even requiring a PDA. The solution, as with many things these days ended up in the form of a mobile phone, namely the iDream Z6. A smaller and cheaper, option to a PDA with a larger screen as well as being waterproof to IP68, in addition its ruggedised design is well suited for caving use. Using this unit on 'air plane' mode we found the battery life using the built in lithium iron cells proved a great improvement over the alternatives. Another very useful addition was the ability to take photographs with the Z6, albeit not top quality. Any pictures of the stations using a function in

Topodroid makes it possible to attach that photograph to the survey station in question, thus reducing the possibility of confusion at a later date when trying to relocate a station at an offset for example. Finally equipped with wifi and Bluetooth it was easy to share files and export data without the need for cables or removing SD cards in the field.

Back at Mulu park headquarters all the data gathered in the field was exported from Topodroid into a .svx file and added to the Mulu master database. Likewise all the drawing was exported to a series of AutoCAD files enabling the draftsmen to work on the final drawing.

By the time the expedition had departed from Sarawak the majority of the survey work was complete, back in the UK the path to completing the survey led down the familiar route of several large mugs of tea, opening Freehand and joining it all together. Given that we weren't surrounded by a multi leveled 200+km cave like Clearwater Cave this task was actually very simple compared to some of the drawings of Whiterock and Creedence in recent years.

conviction				
203	18.76	86.8	64.5	[>]
203	1.92	3.2	-66.2	[>]
203	35.45	154.9	37.8	[>]
203 204	13.16	63.6	-8.0	[>]
	13.16	63.1	-8.8	[>]
	13.16	63.7	-8.0	[>]
204	2.53	322.7	2.2	[<]
204	6.24	115.7	17.1	[>]
204	15.35	20.4	76.8	[>]
204	4.83	31.7	-70.1	[>]
204 205	16.82	47.5	-1.6	[>]
	16.81	47.5	-1.5	[>]
	16.81	47.5	-1.5	[>]
205	3.57	287.9	24.5	[<]
205	2.28	88.7	16.1	[>]
205	13.76	326.0	79.4	[<]
205	1.50	296.5	-64.4	[<]
205	20.96	277.1	38.1	[<]
205	10.02	17.1	-6.1	[>]
205	10.01	351.9	-10.1	[<]
205 206	17.29	2.0	-12.3	[>]
	17.40	1.9	-13.2	[>]
	17.40	1.9	-12.1	[>]
206	1.83	270.4	18.2	[<]
206	1.48	66.5	-1.4	[>]

Typical data received and displayed in Topodroid.



Manual drawing built around the mainline data.

BIOSPELEOLOGY AND GEOLOGY

By Dave Nixon

Cave life

Unlike nearly all other caves in Mulu national park the Conviction / Wonder Cave system is one of very few which populate virtually no species within it's known extent. The reason being that their entrance series contain extremely small passage dimensions in Mulu terms, this has had the effect of preventing any type of airborne access. Consequently the much larger and typical Mulu style passages beyond the entrances are bereft of life. Furthermore it is reasonable to assume that there are no other passages that lie unknown and easily lead back out to the Hidden Valley providing an alternative to the two known restricted entrances. Therefore absolutely no guano was encountered and likewise none of the hierarchy of creatures in that particular food chain.

All the biospeleology was observed in the entrance series of both caves and amounted to a few cockroaches and very small ground based insects.

Further into Wonder Cave at various locations small bird and/or bat bones were present but these were likely to have been washed in by inlets from above. Some of the bones being heavily calcited, suggesting at relatively ancient events.

Geology

Green mineralisation, location: Elephants Graveyard

This was found on the boulder floor in a large chamber and took the form of a geode type feature within a broken piece of limestone. The bright green deposit is thought to be of high nickel content.

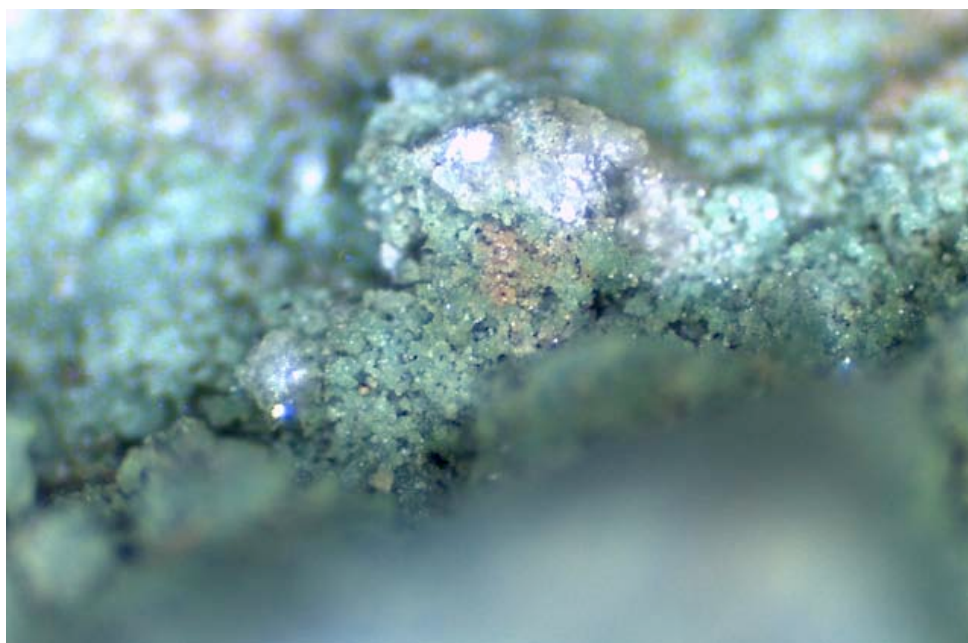


Figure 24 - Macro image of green mineral deposit found in Wonder Cave – Photo by Rob Eavis

Yellow deposit, location: Generation Gap

In several localised areas a vivid yellow deposit was present mainly visible on walls and roof and predominantly on bedrock. It appears to be a thin coating to the limestone and can be seen flaking off at one site. It has a distinct visual similarity to the deposits noted in Benarat Caverns in Sid Perou's film 'Hollow Mountains of Mulu' although no fieldwork on this or the Benarat site is currently available. Whether this is something that had leached out of sediment that once occupied the passage and had since been removed or has originated from the bedrock is as yet unknown.



Figure 25 - Typical style of deposition of Yellow mineralisation in Wonder Cave – Photo by Rob Eavis

Needle Crystallisation, location: Rhino Canyon

At the beginning of the vadose trench named the Rhino Canyon on high on the shoulder of the passage a very localised area of needle shaped crystals was found. No more than 2mm thick but sometimes up to 100mm long they appear to be growing out of a section of detached wall lying on a thin mud floor. These are thought to be selenite (calcium sulphate) being white or translucent and having very little rigidity, no further research was done at the time.



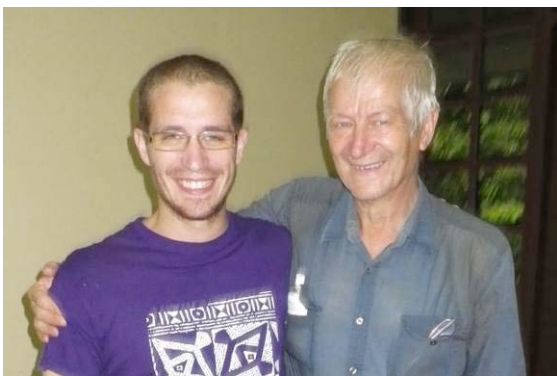
Figure 26 - Needle mineralisation deposits in Rhino Canyon – Photo by Rob Eavis

EXPEDITION MEMBERS

From the UK: Andrew Eavis (Leader), Colin Boothroyd, Robert Eavis and David Nixon.

From Sarawak: Veno Enar,

From Australia: Tony White.



Rob & Andy Eavis



Dave Nixon



Tony White



Colin Boothroyd



Veno Enar

HIDDEN VALLEY 2015 – CONCLUSIONS

By Dave Nixon

The reconnaissance trip was an immense success, we came away with all the answers to the questions we'd generated and in the process unearthed more of the magical underworld of Mulu. It wasn't so much the quantity but rather the quality of the two kilometres of cave discovered that energised all of us. Our inspiration was truly overshadowed by the ramifications of what had unfolded, which almost certainly has opened up a new big area of significance within Gunung Api.

The bare facts speak for themselves, we commenced with the highest cave entrance in Mulu, by some distance and by the time we finally retreated, that point was the deepest part of any cave in Mulu, by some distance. Having open leads almost 1.3km directly under the summit of Gunung Api, heading north is a truly ground breaking piece of exploration. Notwithstanding this, there's the certain existence of a northerly continuing level 100m above the current one and probably an active level at a lower elevation, draining under the hidden valley.

Our understanding of the higher level speleogenesis in Mulu is growing rapidly. The development horizon of the main route explored in *Conviction/Wonder Cave* is a precise match of that in the *Creedence* extensions 4km to the southwest. By the same token, on the opposing side of the Hidden Valley, *Red Leaf Monkey Cave* obeys the same principle. Furthermore, 5km to the north in Gunung Benarat, *Hole of the Moon Cave* and *Upper Tiger Cave* conform likewise. It's easy to draw a linear perspective encompassing all these sites, which includes pretty much all the high regions of limestone in Mulu. Cave passages or entrances in or beyond this two dimensional element are highly likely to have had the same influence, i.e. the Melinau and Melinau Paku plain governing the cave formation just as the current plain level is controlling the *Whiterock River* passage for example.

Into the bargain the demonstration that the typical 'Western Api' cave development of steeply dipping beds and ramps connecting levels doesn't seem to apply to *Conviction/Wonder Cave*. A classically incised keyhole vadose trench indicates more variety to come from the 'eastern Api' geology.

Connecting with *Wonder Cave* wasn't part of the plan, however in hindsight it has ultimately assisted us in our understanding and potential for the future. It's also ruled out any idea anyone would ever have of accessing the cave via the lower entrance. Now standing at 7km *Wonder Cave* is surely poised to climb up into double figures.

All this didn't come without its cost both to health and finances. The rescue incident serves as a reminder to all entering into the far reaches of the park that a moment of bad judgement can immediately throw you and your team-mates into a fight for life. The tools and facilities we have immediately available in the field are vital in managing the type of situation we faced. Lessons learnt from the 2015 incident were basic but fundamental, in that manpower and equipment needs to be ready for immediate deployment. Any future expeditions, pay heed.

Even with a relatively small team in the field an underestimation of communications and the supply chain from headquarters meant the logistics for porters was much greater than initially expected. However the establishment of what can only be considered as a first class base campsite at *Prediction Cave* lessened the burden massively on life in general in the Hidden Valley.

Should anyone decide to hire a helicopter in Mulu, the installation of GoPro cameras on the underside ought to be a mandatory procedure. The instinct, the belief, the conviction of that small black shadow being a cave was a very well calculated strategy.

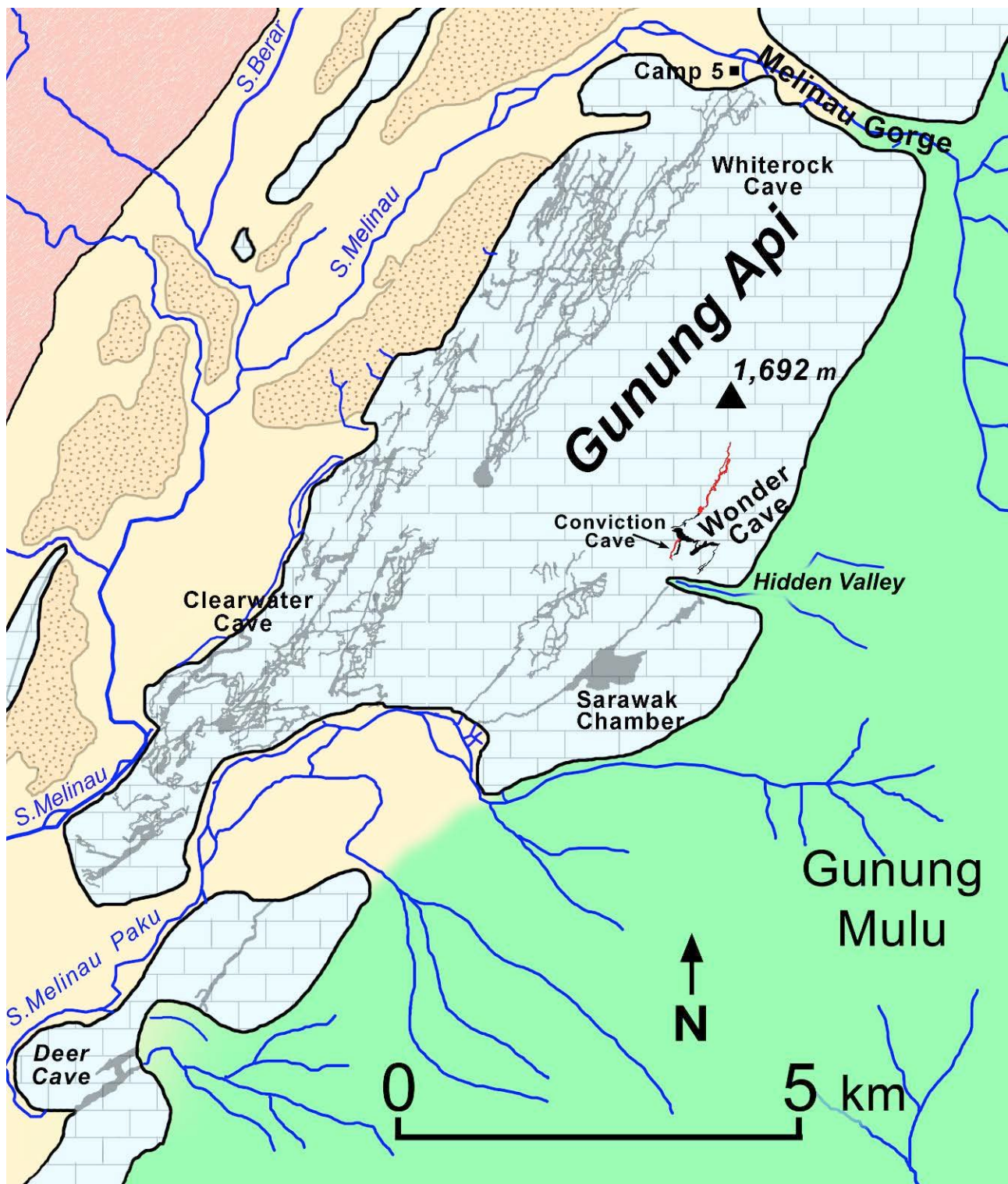


Figure 27 - Extent of the exploration in Mulu as of 2015

ACKNOWLEDGEMENTS.

Members of the Mulu Caves 2015 expedition are grateful for the support of the following.

IN SARAWAK

The Chief Minister of Sarawak
The Sarawak Secretary of State The Director of Forests
Sarawak Protected Areas & Biodiversity Conservation Unit
Sarawak Forestry Corporation
The Sarawak Ministry of Planning and Resource Management
The Resident, Miri Division
The Sarawak Immigration Department
The Sarawak Police Department
Gunung Mulu National Park Management & Staff
Brian and Sue Clark
Alison Pritchard
Veno Enar and all the porters
The rescue team led by Paris Wan

IN THE UK

Ghar Parau Foundation
Mark Brown for organization & logistics
Matt Kirby for support and advice
Hugh St Lawrence and Jerry Wooldridge for maps and graphics
Lyon Equipment c/o Mark Wright Training for hardware
Five Ten for sponsorship on footwear

SPONSORSHIP

Many of the team heading out to Mulu this year were equipped with footwear recommended by other individuals as being one of the leading range of specialised boots. Aimed primarily for canyoning the attributes in the design make it an easy step towards the similar requirements for caving in Mulu as well. Mulu veteran Colin Boothroyd goes into detail:

“The Canyoneer boots almost seems to have been designed and made with caving in Mulu in mind.

The soles provided excellent grip on the slippery forest terrain and seemed to be equally at home on the wet rocks, steep mud sediments banks and the piles of bat guano that lie underfoot within the cave passages. The lacing system ensured a good level of tightness at all times and the upper materials both drained and dried nice and quickly.

I have a wide foot so I was very pleasantly surprised that the width of the boot meant that I did not have to spend my first week covered with blisters and plasters as I customarily do as I 'break-in' new pairs of boots.”



Figure 28 - Colin ready for action in his new Five Ten Canyoneers

FURTHER READING

Briggs J. 1988.

'Mountains of Malaysia', Longman, Malaysia

Brook D. B. & Waltham A.C. (editors) 1978.

'Caves of Mulu', Royal Geographical Society, London.

Eavis A.J. (compiler) 1981.

'Caves of Mulu '80', Royal Geographical Society, London.

Eavis A.J. (compiler) 1985.

'Caves of Mulu '84', British Cave Research Association. UK.

Fogg P. (editor) 2000.

'Benarat 2000 Expedition Report', Benarat 2000

Kirby M.J. (editor) 1989.

'Mulu Caves '88 Expedition Report', Cave Science, Volume 16, No. 2. British Cave Research Association. UK.

Kirby M.J. (editor) 1990.

'Mulu Caves '89 Expedition Report'. Mulu Caves '88.

Kirby M.J. (editor) 1992.

'Mulu Caves '91 Expedition Report'. Mulu Caves '89.

Kirby M.J. (editor) 1993.

'Hidden Valley '93 Reconnaissance Expedition Report'. Hidden Valley '93.

Kirby M.J (editor) 1998

'The Caves of Hidden Valley', Mulu Caves '96 & '98 Expeditions Report. Mulu Caves '96 & '98

Kirby M.J. (editor) 2008.

'Mulu Caves '07 Expedition Report'. the Mulu Caves Project.

Kirby M.J. (editor) 2009.

'Mulu Caves '09 Expedition Report'. the Mulu Caves Project.

Kirby M.J. (editor) 2010.

'Mulu Caves 2010 Expedition Report'. the Mulu Caves Project.

Kirby M.J. (editor) 2011.

'Mulu Caves 2011 Expedition Report'. the Mulu Caves Project.

Willis R.G. (editor) 2012.

'Mulu Caves 2012 Expedition Report'. the Mulu Caves Project.

St. Lawrence H. (editor) 2014.

'Mulu Caves 2014 Expedition Report'. the Mulu Caves Project.

Meredith/Wooldridge/Lyon 1992.

'Giant Caves of Borneo', Tropical Press Sdn. Bhd., Kuala Lumpur.

Smart P. & Willis R.G. (compilers) 1982.

'Mulu', Cave Science, Volume 9, No. 2, British Cave Research Association, UK.

St. John S. 1862.

'Life in the Forests of the Far East', Smith Elder & Co., London. Reprinted by the Oxford University Press, 1986.

Weight A. (editor) 1990

'Gunung Api Connection Expedition Report', Gunung Api Connection 1990

Willis R.G. (editor) 2003.

'Benarat 2003 Expedition Report', Benarat 2003

Willis R.G. (editor) 2005.

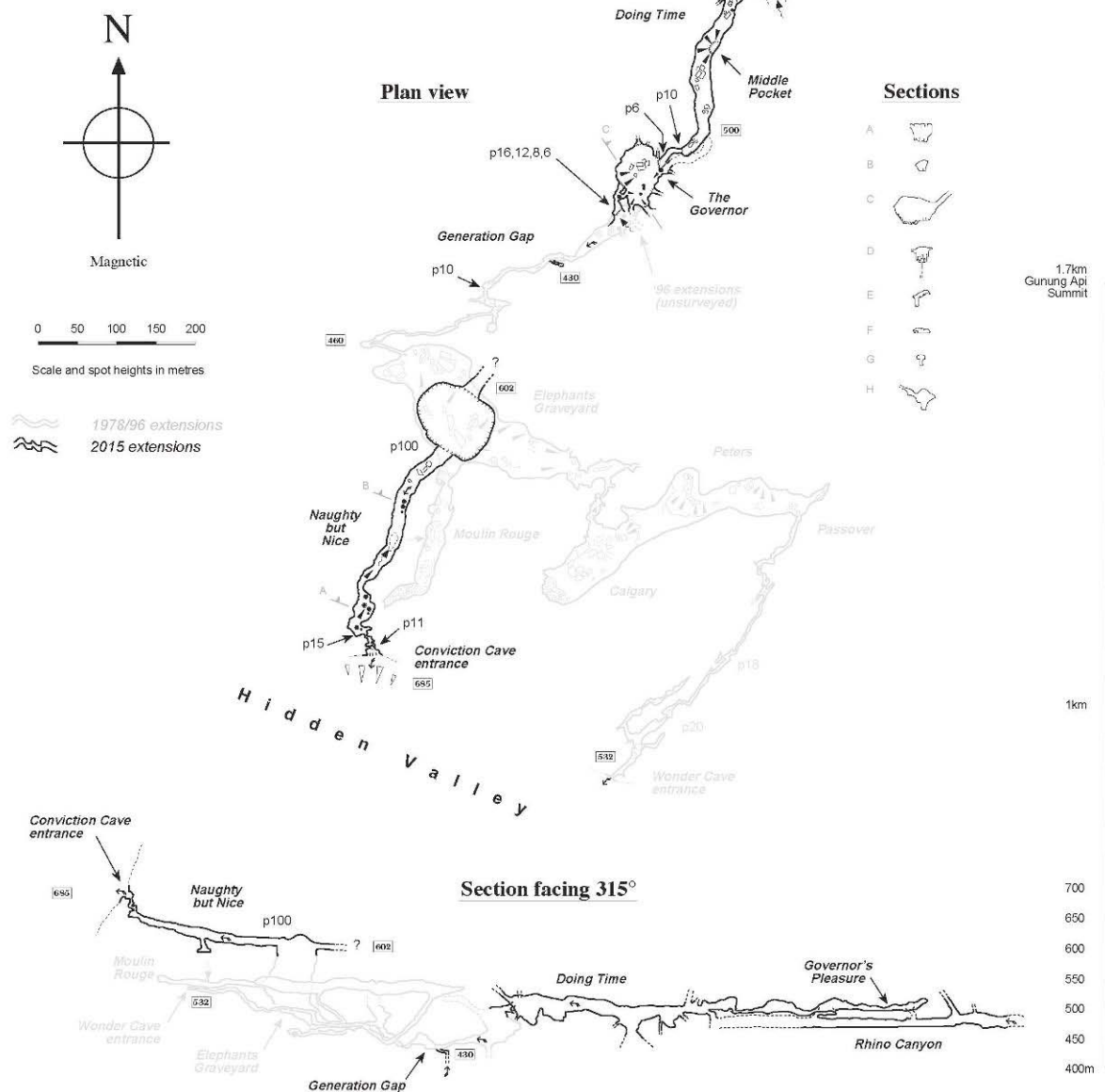
'Benarat 2005 Expedition Report', Benarat 2005

APPENDIX 1: CONVICTION / WONDER CAVE SURVEY

Hidden Valley

BCRA grade 5

Drawn by: D. Nixon



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APPENDIX 2: COLIN'S VERY NAUGHTY STEP

By Colin Boothroyd - Day One

The Objective:

A simple aim, get to objective 'B'. The three of us (Moose, Rob and I) set off from the *Prediction Cave* camp quietly confident that the task in front of us was not too onerous.

Two days earlier we had found the entrance to *Conviction Cave*, originally known as objective 'A', in a day. We had been braced for some very difficult terrain to get us on to the '*Naughty Step*', the large cliff rimmed platform sitting on the north flank of Hidden Valley and about 200m above the valley river level. Moose had climbed and scrambled his way over some vertical sections leaving us with just a small rope ascent to get to the top of the cliff section. A further fight through difficult terrain and we had reached *Conviction Cave*.

Objective 'B' was considered to be a relatively straightforward target. Careful study of the aerial imagery suggested that it was a 'cave like' feature 100 -200m to the west of *Conviction Cave*. So, simply continuing the marked route that we had established between *Conviction Cave* and *Prediction Cave*, we set off on our route further westwards. The theory that we would be simply traversing around the base of a cliff until we came to a large gaping entrance soon evaporated. The *Naughty Step* platform never reveals any flat ground and the zone that we were traversing into was extremely steep. We traversed around very cautiously, forever on the lookout for easier ground ahead and bypasses to the very steep or vertical sections that we were encountering. The terrain got even steeper though we could make out a prow ahead after which we surmised there would be easier ground and a possible climb down to a gully-like feature that we postulated would head up towards objective 'B'.

Rob and Moose were traversing towards the prow about 10m above me and I was taking what I thought was a better line below them. I had a 2m traverse across a vertical rock section to get to the prow that I was confident would lead to easier ground. I gave a short tug upon two hanging roots in my left hand and a fingery hold for my right hand. And then I made my step across the short face.

Falling:

The next thing I recall was the first bounce. I have no recollection of either handhold or foothold failing or the sudden realisation I was falling. I do, however, have dreamlike recollection of the first and second bounces off ledges and my effort to stop myself falling down any further ledges after the third ledge. In total I fell 35m before coming to a stop on a ledge above another drop. Although the drops were almost vertical the ledges and the vegetation had contributed to reducing my overall speed as I tumbled down the cliff.

I buried my fingers into and around the vegetation on the small ledge I was balanced on and clinged on with my lower legs hanging over the drop. I could hear Moose and Rob shouting from above but I was completely unable to produce any response whatsoever. I was completely winded. For the next few minutes all I could produce was loud guttural expressions of pain. My mind very slowly started to piece together the situation. I gingerly moved each of my legs – no pain. One arm – no pain. Furthermore a cursory visual examination revealed to my amazement, no blood. I managed to convey this to Rob and Moose and also to advise that my left shoulder and arm were very painful and that I had strong chest pains.

The Rescue:

Above me, Rob and Moose, who had witnessed the brief glimpses of my falling body with flailing arms, were convinced that I would be a jumbled heap of blood and bones at the base of the cliff. Thankfully they had a 60m rope with them so with it quickly tied to a tree Moose started his descent down to me while Rob set off to *Conviction Cave* to collect an underground first aid kit that we had left at the entrance earlier.

Moose quickly clipped me into his harness and then started examining me. No sign of head injuries (I hadn't been wearing my helmet) and no immediate indication of internal organ injury. My back, legs and one arm were OK. He then carefully felt my arm and shoulder. My collarbone was badly broken and he declared 'it's the end of your expedition, you are on your way home'. I had already worked that out but it was painful, on more than one level, to hear my thoughts so clearly ratified.

Once Rob joined us on the ledge with the first aid kit Moose sped up the rope to set up the 3:1 mechanical advantage hauling system and Rob fed me painkillers and helped get me in a more comfortable position. Thankfully Moose had both a long rope and all the equipment on him so was in a good position to put his years of rescue training into good practice. The ascent was slow and extremely hard for Moose. Rob carefully assisted me position myself and also reduced the pulling load for Moose. I was able to use my legs to balance myself away from the rock faces. I was hauled up to Moose and then lowered down on a diagonal line to the ledge from which I had originally fallen. I then collapsed in a nauseous heap on the ledge. Every time we stopped I felt a wave of nausea overcome me – probably a consequence of a cocktail of exhaustion, adrenaline, pain, and reaction to the painkilling drugs.

The aim was to get me to *Conviction Cave* for the night. It was probably less than 150m away from the point I fell from but getting me there took about 7 hours. I had to be supported for every step and if there were vertical or steep sections over half a meter Moose and Rob set up the rope to ensure that I was safely supported at all times. Each time we stopped I almost slipped into a coma and Rob was fantastically buoyant and caring as he fed me regular gulps of water and did his best to keep my spirits raised and not lose consciousness.

With darkness falling fast I was gingerly moved over the blocks guarding the entrance to *Conviction Cave* and nestled into my resting place for the night.

The Distress Call:

We had unfortunately failed to pick up the two-way radio when we set off from *Prediction Cave* earlier in the day. So when my accident happened we had no way of communicating to the people at *Prediction Cave*. Furthermore Andy and Tony were in *Prediction Cave* and Veno and the porters were trying to locate the entrance to *Wonder Cave*. The deep whooping sound that we use to indicate our presence in the forest would carry across the valley but it was far too far to shout any clear words. Besides we were fairly confident that no one was there anyway.

Shortly after the accident Moose started conveying his whoops in the form of SOS in morse code: three short whoop, followed by three long whoops and then three short whoops. For many hours there was no response. Eventually when there was it came only as a simple single whoop response. The guys at the *Prediction Cave* camp hadn't picked up on the significance of the call sequence so Moose simply continued in an increasingly hoarse fashion.

When Andy and Tony emerged from their trip in *Prediction Cave* it was some time before they too recognised the significance of the unusual series of calls. But once they realised the simple distress signal they stepped into action. A bag was filled with a full first aid kit, long ropes and, most critically, the radio. Veno and Jimmy quickly started on the route to *Conviction Cave*. They free climbed the rock to avoid the free hanging rope as they did not have any SRT equipment and then found their way to *Conviction Cave* and the further short distance to Moose, Rob and I. For an hour and a half, from first distinguishing the SOS message, Andy's head was in emotional turmoil. He was finally released from his anguish when the radio call from Moose came through: the accident was not life threatening and the injured caver was Colin, and not his son, Rob.

With radio communication established it was determined that the first night should be spent in the *Conviction Cave* entrance and that a basic selection of bedding and cooking equipment needed to be sent to *Conviction Cave*. Rob, Moose and I spent a very uncomfortable and almost completely sleepless night squirmed between rocks in the chilling cave draught reflecting on what had happened and planning for the days to come.

Day Two

The Lower Off:

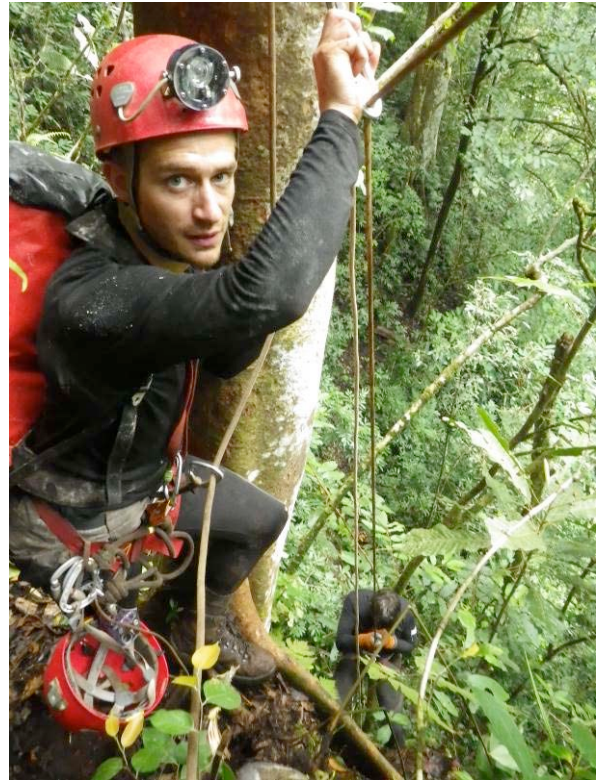
My progress up until that point had been extremely slow and there was a serious concern that the pain I was suffering in my ribs and chest could be related to internal injuries. It was considered that helicopter evacuation was a serious possible requirement. Andy and Moose discussed the possibilities and it was agreed that Andy would go to the ridge above the Paku first thing the following morning and make a radio call to Mulu park headquarters.

His call to park headquarters alerted both the caving team and the key park staff. It was quickly determined that helicopter evacuation should be avoided at almost all cost for number of reasons and that all resource should be focused upon getting me back to civilisation overland with a strong rescue team.

I don't recall much of that second day. I guess the realisation of how lucky I had been to get away with so little injury, the pain and the thought of the days ahead were dominant in my mind – together with the side effects of the painkillers that were keeping me afloat. We were now joined by Tony and some of the porters and I was supported all the way either by the pulling or lowering rope or Rob's strong hands. It took us the full day to cover the usual 1.5 hour route between *Conviction Cave* and *Prediction Cave*. To make matters worst the weather had broken and we were in the middle of a torrential downpour. This now placed further pressure on us as we had to get to the river crossing before it became impassable, it was a daunting prospect getting across the slippery rocks in normal water levels never mind in flood conditions and all smashed up.

Andy came down from the ridge and joined us. He advised that a team was on its way from park headquarters with a chainsaw in readiness to prepare the overgrown Hidden Valley helipad that had been last used in 1996. My good progress that day and the fact that my health had not worsened coupled with the actions already underway at park headquarters diminished any further consideration of helicopter evacuation. I was going to have to make my own way out overland. It was estimated that the walk back to park headquarters would take three days. Three days of unrelenting pain was on my horizon but my head was ok with it – I knew what was coming and that each step I took was a step closer to a hospital and a doctor.

Figure 29 – Rob Eavis guiding Colin in the lower off. Photo by Tony White



Day Three

Farewell to the Hidden Valley:

The team with the chainsaw arrived in the middle of the night. They were advised in the morning that they should remain at the *Prediction Cave* camp on standby. Only if my condition seriously worsened or if another accident occurred were they to proceed with the clearing of the helipad.



With an early start, both Andy and Veno headed back to park headquarters. Myself, Moose, Tony, Rob and our small band of porters set off towards the ridge overlooking the Paku. Progress was slow but definitely faster than the previous days, which was encouraging. As the route started to gain in steepness we were met by Paris Wan and his team who were tasked with escorting me all the way back to park headquarters. Paris immediately adopted full responsibility for getting me to the top of the ridge. He placed one person below me who was responsible for holding the back of my sit harness and keeping me in balance. Paris was positioned immediately in front of me pulling me up by my cowstails. Paris was attached to a rope that was being hauled by four of his helpers higher up the hillside. So although my legs were keeping me balanced they did little else and I was able to progress at a good pace up to the 900m high ridge.

Figure 30 - Content Colin, drugged up at base camp - Photo by T. White

Following a short rest it was time to shake hands with Moose, Rob and Tony and they made their way back to *Prediction Cave* and to return to following the cave exploration objectives.

We felt encouraged that we had reached the ridge in good time and now planned to descend to a temporary river crossing camp before it got dark – if we could make it then the park headquarters would be in our sights for the following day. The descent from the ridge was more difficult for me than the ascent. The slope wasn't as steep and there was a lot of ground where walking and scrambling had to be adopted as opposed to simply being lowered. I was unable to make a step drop of more than 200mm with each of my strides so with each small rock or log that crossed my path I had to be picked up and carefully manhandled over the obstacle.

Progress was desperately slow, but steady, and thankfully we arrived at the camp at nightfall.

Once I had some food and painkillers inside me the lads prepared my bed. I was carefully laid out on my inflatable sleeping mat that had been positioned in the stretcher. All was well for half an hour and then the deep chest pain became too much to bear and I tried moving to a more comfortable position. I couldn't find one. For three hours I worked with the lads who carefully moved me into all possible sitting and lying positions but to no avail. There was no position that we could find that would be comfortable enough for me to possibly sleep. We gave up trying, I swallowed some more painkillers and then simply lay in the stretcher and hoped the painkillers would somehow do a better job. It was the longest night of my life: very little relief from the pain and no chance of any sleep.

Day Four

As daylight started to make its way through the trees the lads started to busy themselves around me. 15 minutes of changing angles and methods we finally found a way of getting me sitting upright and propped against a tree. Following a welcome bowl of noodles we were ready to set off and I was gently dressed in my boots and harness and raised to a standing position.

The first river crossing took us 15 minutes to cover 15m. I had four people around me who kept me upright and placing my feet around the slippery boulders. Walking was desperately slow as the pain in my chest was screaming at me with anything other than the gentlest of movements.

The two-way park radio was passed to me and Andy was on the other end. He wanted to check logistics and communication arrangements, which he was making with my wife and daughter. The pain I was in, compounded with the anxiety and the sleepless night totally overrode any clear thoughts I could have had. On the verge of tears all I could say and repeat was 'send stronger painkillers'.

Thankfully that was my low point. As the morning progressed the debilitating pain from my ribs subsided, I was able to move faster, and I could feel the pain in my collarbone more acutely. The collarbone break was very striking. If I positioned my upper arm slightly towards my back I could line up the two broken bones and relieve that pain. This was fine until I moved and then the bones clicked back to a painful position whereby they crossed over each other. We tried various straps to brace the upper arm but none worked and in the end I came to the conclusion that I simply needed to push on through the pain driven by the knowledge that genuine relief was getting closer with each step.

When we got to the camp one trail I was greeted by Torben and Frank who had been patiently waiting for me and we plodded onwards together. Arrival at the Deer Cave boardwalk was the finish line for me – I was home. Andy met me and we both shared a tearful hug. I knew that through my whole ordeal Andy, probably more so than any other, was carrying some of my pain also upon his shoulders.

A quick trip to the Medical Centre in Batu Bungan, calls home to Jane and Kelda and then an early night ready for the morning flight to Miri and the hospital.

X rays confirmed that I had a fractured collarbone and three broken ribs.



Figure 31 – The Governor guarding the new extensions of Wonder Cave – Photo by Rob Eavis