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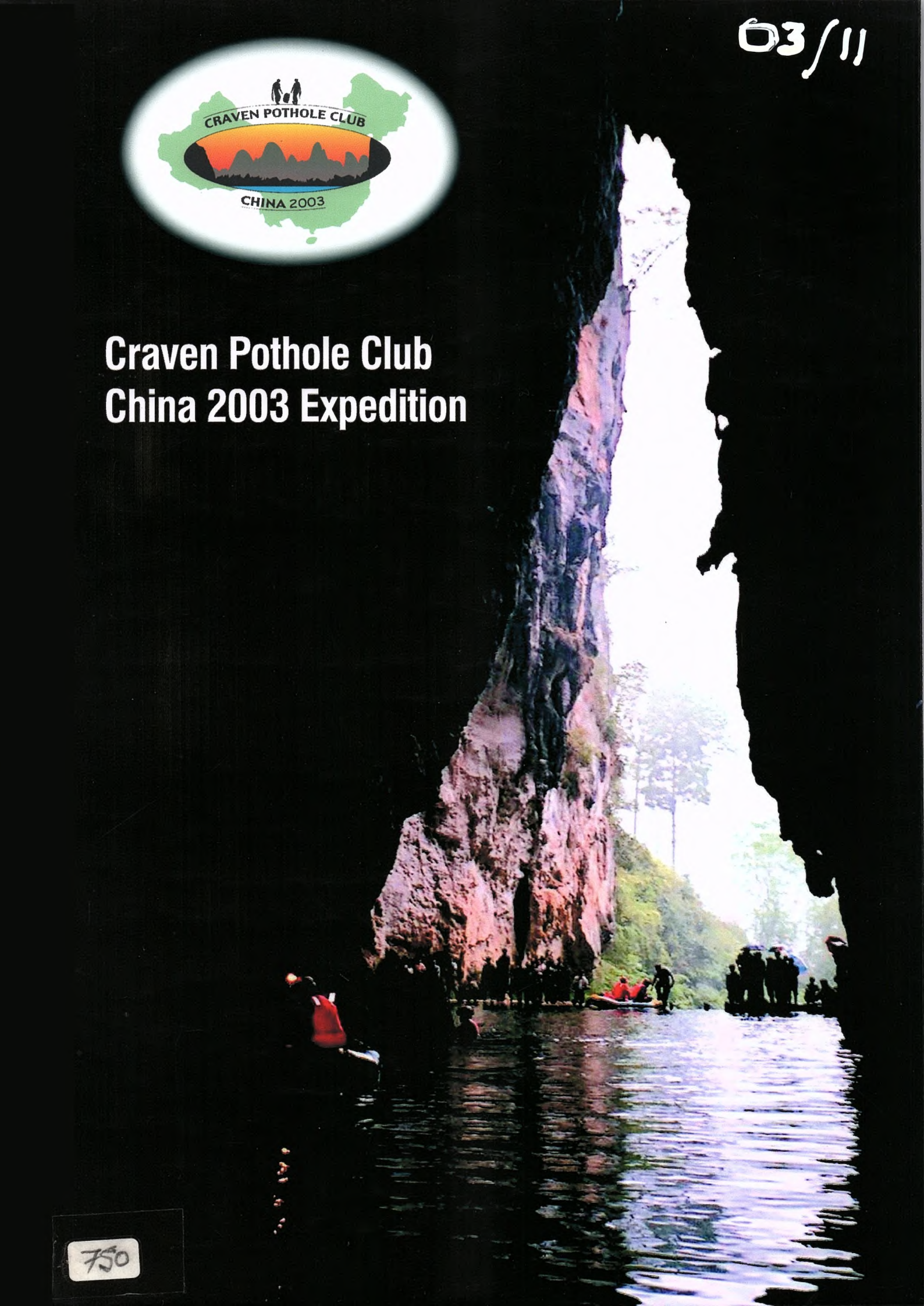

Craven Pothole Club
China 2003 Expedition

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Eds. Patrick Warren and Emma Porter

May 28th, 2004

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Front cover: The entrance to Wang Long Dong, Duo Ji village, Jingxi.

Typeset with LaTeX 2_ϵ and RevTeX 4.0.

I. SUMMARY

The Craven Pothole Club China Expedition returned on April 5th 2003 after four weeks in the field, with around 22 km of cave surveyed and some 50 cave sites visited in two counties in Guangxi province. The fourteen expedition members were Tracey Beasley, Nick Blundell, Mike Bottomley, Arthur Champion, Mike Clayton, Kevin Gannon (leader), Pete Jones, Karen Lane, Dave Milner (treasurer), Paul Norman, Brian Norton, Emma Porter, Patrick Warren (deputy leader), and Mike Whitehouse.

In Jingxi county, the principal explorations included two magnificent river caves, Wang Long Dong (4.1 km) and Dark Cave (0.8 km), in the north-west of the county; an interesting river cave Yin Quan (2.4 km) in cone karst very close to the Vietnam border; and the spectacular Wo Long Dong (0.5 km) containing two large well decorated chambers ($20,000\,m^2 + 15,000\,m^2$) not far from the county town of Jingxi. Elsewhere, 23 other sites were explored and a total of 14.2 km of passage surveyed.

The second part of the expedition was spent in Pingguo county 110 km east of Jingxi. Here a small team explored an area of dolines some 30 km east of Pingguo county town (Long Yang village). In parallel, an extensive and beautiful cave Long Ma Yan (3.2 km) was surveyed close to Bang Xi, the old county town some 60 km to the north of Pingguo. This cave included sections of river passage as well as significant dry series and chambers with spectacular decorations. It is planned for this system to become a show cave. A number of other sites near Bang Xi were reconnoitred including a deep river valley 20 km to the west which was followed north through dramatic cone karst into increasingly significant cave development where river sinks and fragments of enormous relic cave passage were encountered right on the northern border of Pingguo county (Bai Feng village). A total of 21 sites were explored in Pingguo with 7.2 km of surveyed cave passage.

Personal recollections and a summary of the expedition findings including some surveys have been published in the CPC Record Number 71.

II. THE CRAVEN POTHOLE CLUB EXPEDITION TO CHINA

It is an aim of the Club to encourage and organise the exploration of other caving regions of the world. Since the Club was founded in 1929, Club members have undertaken expeditions to countries such as Norway, Papua New Guinea, Iran and more recently, New Zealand. In 2002, it was suggested that the Club organised a trip to China, a country fast becoming recognised as having huge potential for unexplored caves of record-breaking size.

The objectives of such an expedition would be to explore, document, survey and photograph new caves. The expedition members would also be working alongside Chinese cavers, helping them to locate sites with show cave potential.

A. The China Caves Project

It has been known for centuries that China contains very spectacular limestone scenery. There are not many places on Earth that feature the same unusual Karst scenery that has now made Guangxi, and in particular, the city of Guilin, a very popular holiday destination for both the Chinese and the Western world. However, it was not until 1982 when Andy Eavis and Tony Waltham visited the region, that China's potential as an important caving region was finally realised.

With the help of Majorie Sweeting and both the Guizhou Normal University and the Guilin Karst Research Institute, a ten-man reconnaissance was organised for 1985. The cavers spent six weeks in their chosen region and returned with exciting news of China's vast areas of limestone. In Guangxi, Guizhou and Yunnan alone, limestone spans an area of approximately half a million square kilometres. It was evidence like this that confirmed what many people already believed, that China heralded a new era in cave exploration.

The China Caves Project was formed soon after, and since 1985, cavers from all parts of the world have travelled out to work with the Chinese to discover, survey, photograph and document caves all over China. This successful co-operation between the Chinese and the Western world benefits both sides considerably. While Western cavers are given the chance to explore amazing caves and experience a fascinating culture, Chinese cavers are given the assistance needed to find potential show caves and sites for hydroelectric schemes, both of which benefit the country greatly.

B. Geography

The main port of entry to SW China is Hong Kong. An internal flight connects to Guilin which is a rapidly growing city, catering in part to the rapidly growing tourism market. Our main destination was the county of Jingxi which lies 450 km SW of Guilin and shares a border with Vietnam. A secondary objective was Pingguo about 100 km E of Jingxi. In both areas we would have a main base in the county town, and make various extended field excursions. Fig. 1 shows the main cities and towns relevant to the expedition.

C. Geomorphology

One of the most useful textbooks, *Karst in China: Its Geomorphology and Environment* by Marjorie Sweeting, is unfortunately very difficult to get hold of. In addition, although several members of the expedition are familiar with basic geology and with geomorphology of limestone areas, no-one could really be said to be a proper geologist. This discussion is therefore a bit superficial!

Estimates of the extent of karst topography in China span $(1.2\text{–}3.4) \times 10^6\,\mathrm{km}^2$. The massive limestone and dolomite sequences of SW China have a cumulative thickness of perhaps 3000 m, and range in age from the Devonian to the Triassic. This area appears to have undergone a slow uplift during the more recent Tertiary period and the spectacular karst features appear to have developed by erosion during this time.

Two main types of karst morphology are encountered: tower karst, known as *fenglin* by the

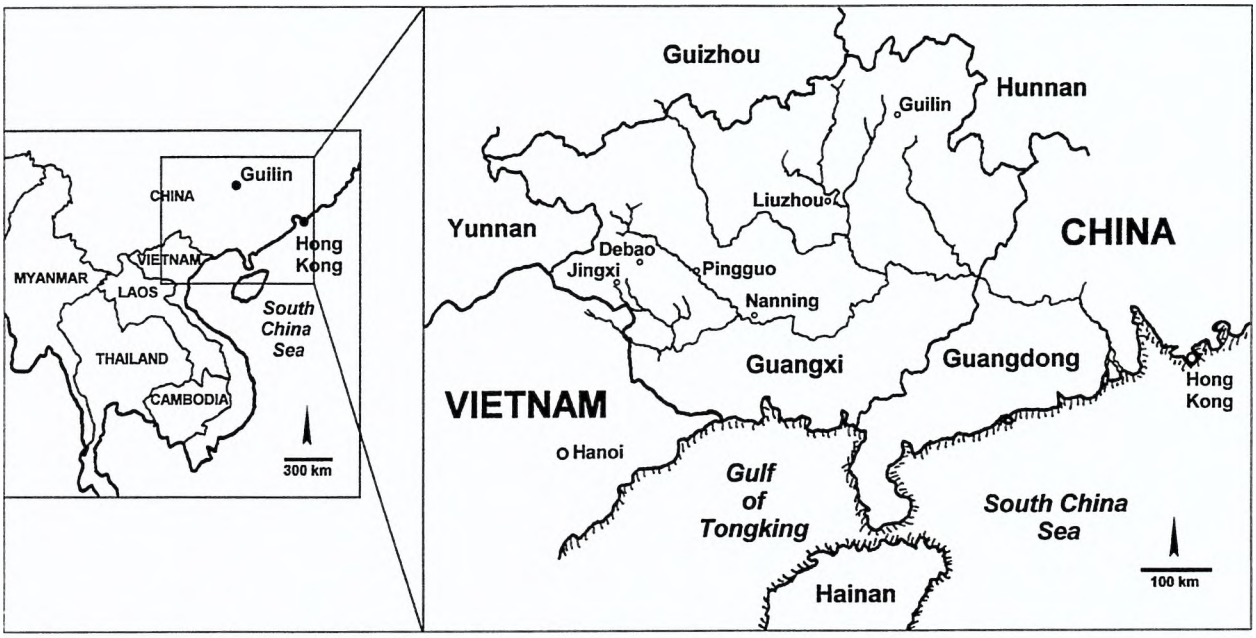


FIG. 1: Geography of SW China.

Chinese; and cone karst, known as *fengcong*. Examples are shown in Fig. 2. Tower karst is also known as 'peak forest' and consists of numerous steep-sided towers. It is particularly splendid around Guilin although examples can be found all over the country. Caves in tower karst tend to be fragments of fossil systems. Cone karst comprises of a network of peaks and depressions and is of greater speleological interest since significant underground drainage systems can develop. The Li river excursion, a popular tourist trip from Guilin, passes through a large area of cone karst. A variant of cone karst is known as needle karst or sometimes 'pen' karst where the allusion is to a rack of pens in the Chinese tradition of calligraphy. It might be thought that tower karst represents a later stage of erosion of cone karst, but Chinese studies suggest tower karst may be the same age as cone karst, and does not have to pass through a cone karst stage.

Elsewhere we noticed that what was not limestone seemed to be shale, as a rule. This has its own distinctive morphology which consists of gentler hills with uniformly angled hillsides. Intriguingly, in Jingxi we also came across clear evidence of granite underlying and post-dating the limestone deposits. We do not know much about this apparent plutonic intrusion although perhaps it coincides with the period of Tertiary uplift.

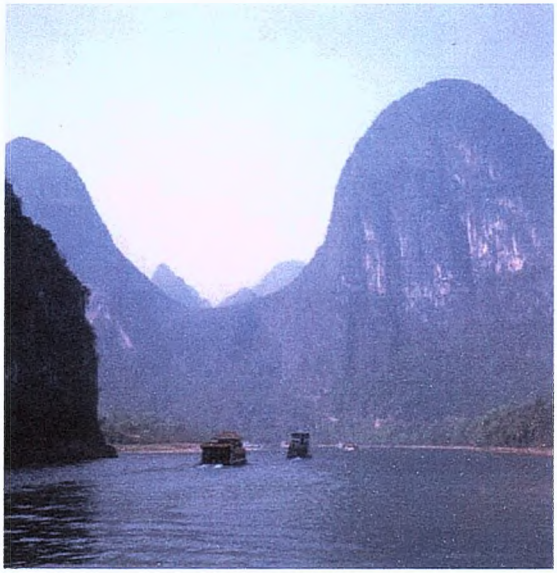


FIG. 2: Spectacular tower karst on the road to Jingxi (top). Cone karst at the start of the Li River excursion (bottom left). A variant of cone karst known as needle karst forms the backdrop to Duo Ji village in Jingxi (bottom right).

III. EXPLORATIONS IN JINGXI

The county of Jingxi lies in the far W of this part of China and shares a border with Vietnam. Our base was a hotel in Jingxi itself, the county town. From there outings were made to locations as information came in from local officials and local people. A separate camp was established to explore the major river caves of the Duo Ji valley. A large number of smaller caves were explored; often these were fragments of fossil passages typically only a few hundred metres in length. However the excellent active cave of Yin Quan near the Vietnam border was explored over a couple of days. Towards the end of our stay in Jingxi, information came in about what was reputed to be the largest chamber in the county. This cave, Wo Long Dong, also occupied most of the team for a couple of days.

Around Jingxi itself are fine examples of tower karst and one has to travel to get into areas of cone karst. The county is also distinguished by the presence in the S of steep gorges and river canyons, such as Tongling Grand Canyon. Some of these are very spectacular and are being developed for their tourist potential.

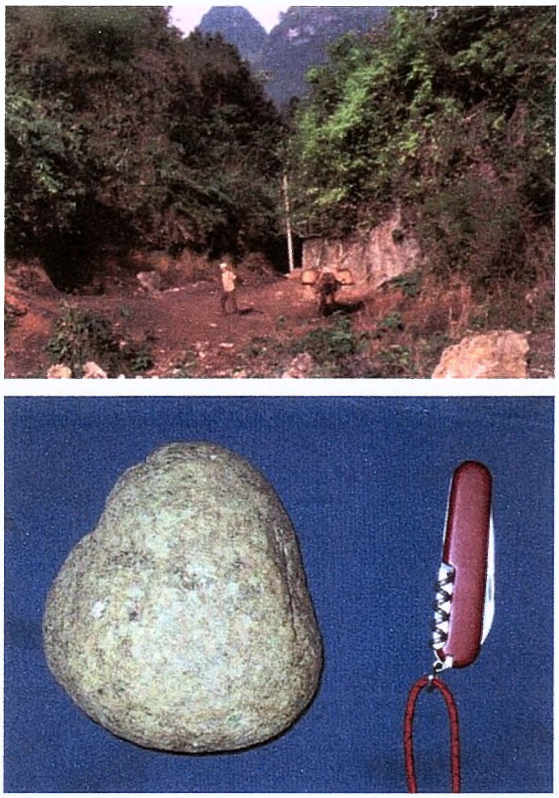


FIG. 3: The boundary between shale (to the left of the path) and limestone (to the right) is very distinct in Duo Ji (top). A typical granite cobble found at the start of the inlet series in Wang Long Dong (bottom).

A. Duo Ji caves

Duo Li village lies in a valley trending NE–SW, in the NE part of Jingxi county. A major river rises from an imposing rift entrance on the NW side, Wang Long Dong, or Cave of a Million Dragons. This crosses the valley for a distance of about 0.5 km and sinks after passing under a road bridge near an even more imposing dry arched entrance known locally as Dark Cave, but which has also been named as Nong Wang Dong, or Dragon King Cave. The Dark Cave entrance cannot clearly be seen until one is on the other side of the valley. The road bridge over the river sink is at GPS N 23° 01′ 44.7″ E 106° 44′ 03.7″; this was taken as a zero datum (see Fig. 4). The river rises again at another entrance in another village about 0.5 km to the East. This lower entrance is also called Dark Cave and was known by the local people to connect through to the upper entrance. The valley is in a region of steeply dipping limestone developed as cone karst or needle karst (see Fig 2), and is generally bound to the SW by shales (Fig. 3 which have been extensively mined for manganese. Above the valley floor are several fossil caves with excellent formations, due to lack of time only a couple of these were explored and surveyed. As well as a continuation of the river cave, there is no doubt much more fossil cave to be found in Duo Ji including rumours of shafts.

Wang Long Dong. The entrance to the cave is at GPS N 23° 07′ 28.5″ E 106° 36′ 07.5″. The survey of the cave is included as an A3 insert at the end of the report. An imposing rift entrance leads to an extensive river cave, which is about 2 km long and passable by boat to an upstream entrance. About half way through, a significant inlet system enters from the true left; this is also

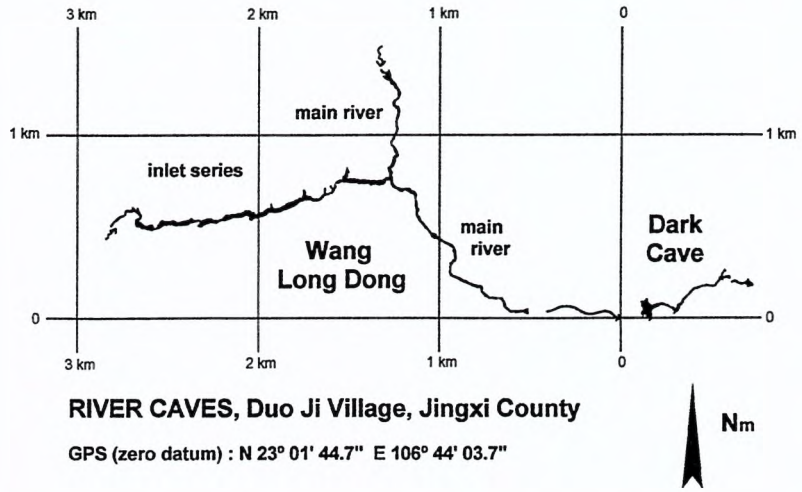


FIG. 4: Overview of the Duo Ji river caves. The zero datum is the road bridge over the river next to the river sink feeding Dark Cave, in the valley bottom.

about 2 km long with several short side passages. A notable feature of the inlet is the presence of large amounts of granite boulders in the alluvial deposits (Fig. 3), and towards the top end of the inlet, there is evidence of marble in the bedrock, suggesting the nearby presence of a plutonic intrusion underlying the limestones at this point. The hydrogeological map indicates an island of igneous rock on the surface several km W of the point of furthest exploration in the inlet. The total length of the Wang Long Dong system is 4.1 km.

The lower part of the main river cave is flooded and contains a lake held back by a flow dam at the entrance. This provides water for irrigation via a couple of leats. Proceeding upstream in boats from the entrance, the first obstacle is a gour barrier at 500 m, beyond this, the river continues to be navigable by boat (Fig. 7) until the first rapids is reached, where the river runs over shingle at 1.1 km. This is the upstream limit of the flooded section of the cave. More boating follows briefly, but soon the inlet passage is reached in a region of alluvial deposits. Just before this point are two magnificent flowstone formations. Upstream, more rapids and narrows make the remaining 800 m of the main river more difficult to navigate. Beyond the series of rapids the stream levels out and further paddling ensues, the passage remained large with a high roof. This breaks into the side a large chamber with the river flowing down the left hand side. Continuing with the river, the roof slowly drops to end at a small sump.

Back in the chamber a large rubble heap can be ascended, with flood debris at the apex. Descending the far slope leads to a lake with an opening where a cascade enters from a deeply incised tree lined gorge. The river emerges from a further cave most likely now in Debao county. To the right of the lake is a small sump and alcove with large quantities of organic matter and mud giving off noxious smelling gas. From the apex of the boulder slope to the right there is a window into a large parallel chamber again containing a large rubble heap with deep voids around the edges and a strong smell of ammonia.

The inlet passage runs for 300 m in fine style to a point where a couple of large chambers break out on the true right bank. At the top of these chambers, which are quite well decorated, there is evidence of a fossil phreatic route; at least the limit of passable passage carries an inward draft. Continuing upstream in the inlet, 100 m of breakdown is next encountered, involving a duck, climbs and a short crawl to regain the continuation of the large inlet passage. At least two side passages run off in this region, to the true right, and towards the chaos, but both prove to be oxbows. Further up the main passage, an

FIG. 5: Two views of the spectacular top entrance to Dark Cave. This can be contrasted with the relatively peaceful entrance to Wang Long Dong at the start of what was named the 'Serene River Passage' shown on the front cover.

inlet enters from the true right carrying muddy water, but sumps after a couple of dog legs. The main stream passage now gains in dimensions and has a selection of fine white flowstone formations. At one point a breakdown chamber can be entered in the roof, and in the floor at this point appears to marble in the bedrock, evidence of the proximity to the contact with the presumed underlying granite intrusion (marble fragments were in evidence in the alluvium also). The passage continues through a low section, over a boulder ruckle, and finally the roof lowers past several sump pools on the true left until the main route itself reaches a sump. This point is 1.5 km from the end of the breakdown and nearly 2 km from the junction with the main river. Due to the amount of debris in the passage, we suspect this is not far from an opening to the surface.

Dark Cave. The survey of this cave is on page 9. The imposing entrance to this cave is reached by continuing along the track over the road bridge at the river sink, underneath the entrance itself, to a path which runs back and climbs towards the entrance. The entrance is located at GPS N 23° 01′ 48.2″ E 106° 44′ 07.9″. The path leads up the slope to a short section of stooping passage which opens out after a few metres on the inside of the entrance slope. The entrance is an enormous daylight chamber maybe 100 m by 75 m in area and estimated to be 80 m high (Fig. 5). The main river rises from a (probable) sump pool on the right hand side, flows across the chamber floor, and runs down a series of rapids and cascades to disappear in a tall rift passage on the left hand side. Opposite the daylight entrance, a terraced slope with guano climbs to a huge and ancient calcite boss.

To gain the downstream river passage, one can bypass the rapids and cascades on the true

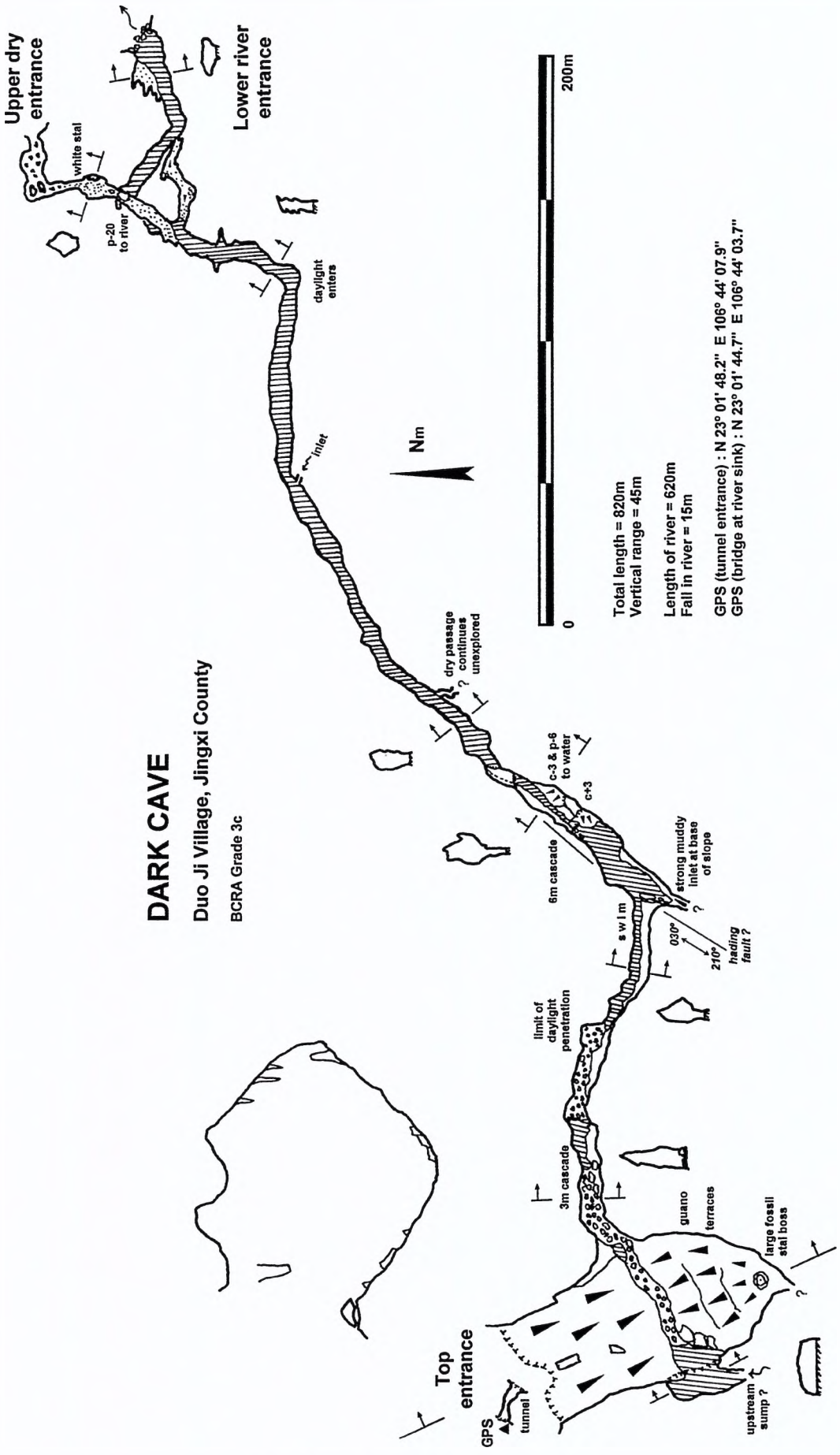
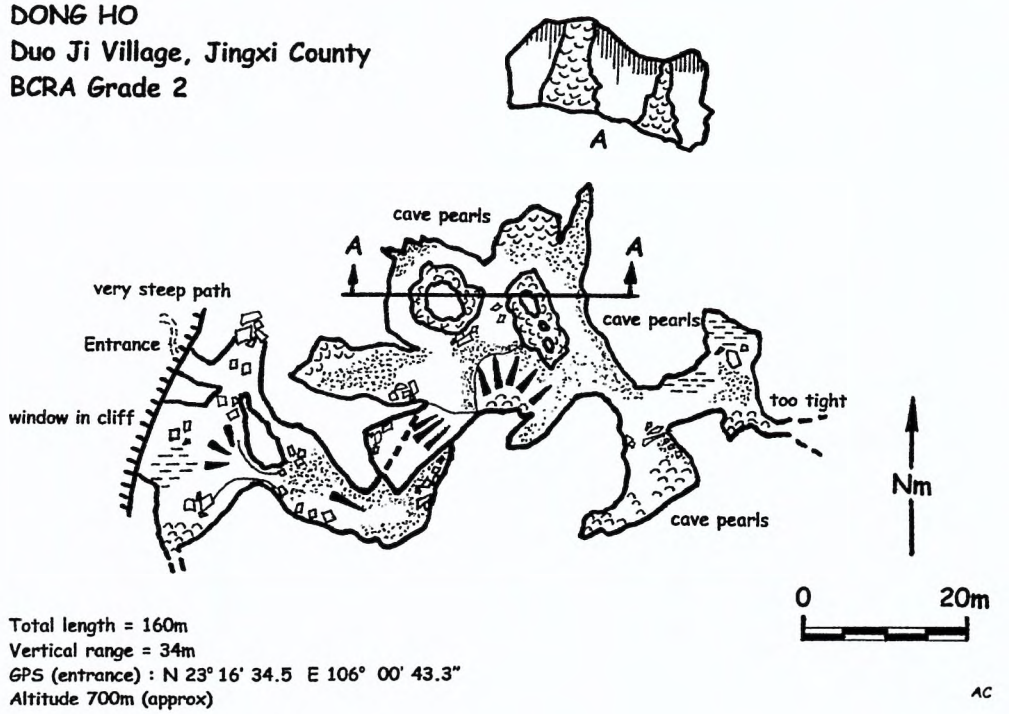


FIG. 6: Dark Cave, Duo Ji village, Jingxi.

FIG. 7: River caves in Duo Ji: swimming across the lake above the 6 m cascade in Dark Cave (top), and two people in a boat in Wang Long Dong near the end of the flooded section of the cave (bottom).



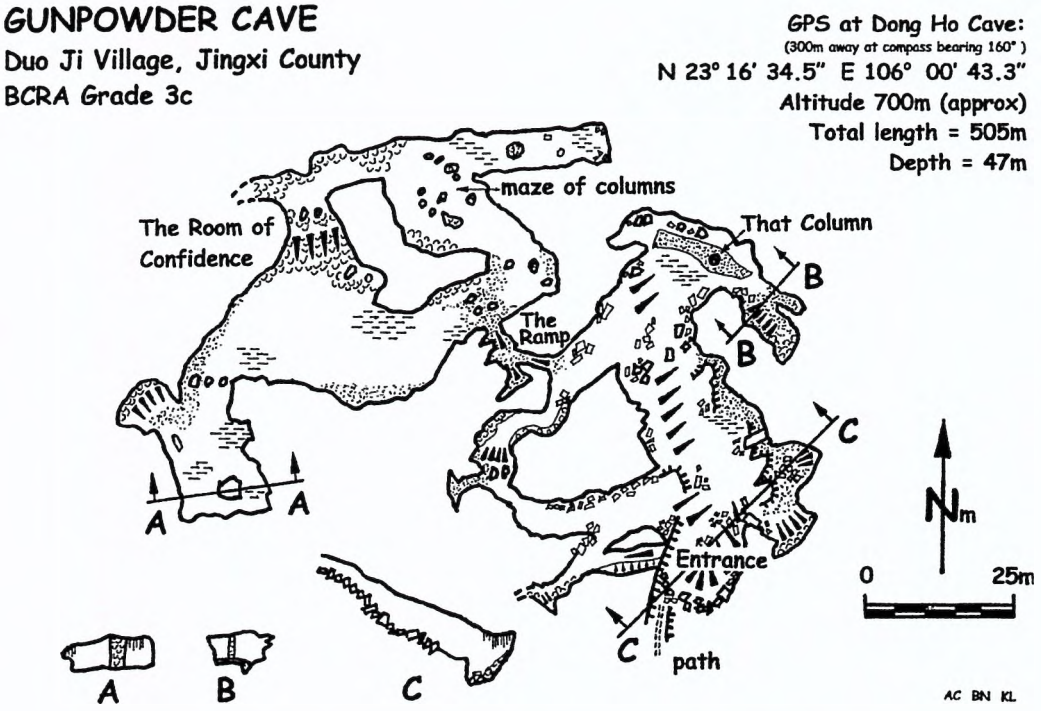


FIG. 8: The fossil caves of Duo Ji.

left bank to reach a section where a roped traverse would be prudent in anything but low water conditions. This is about the limit of daylight penetration. Beyond this, about 50 m of swimming follows to a chamber running NE–SW. This chamber must also be swum (Fig. 7). At the SW end of the chamber, a steep and extremely greasy slope would require bolting but may lead to a passage at the top. At the base of this slope, a strong muddy inlet enters underwater. The outlet from the chamber is at the NE end and is a noisy 6 m cascade. This can be bypassed by a climb past an impressive solitary flowstone pillar, through a window on the true left hand side, to a 6 m pitch back into the river (alternatively a more involved traverse can be made on spectacularly eroded limestone to reach a ledge on the true right hand bank; from which point a short section of flowstone bridging the river passage may be reached). The river continues below the pitch as a lengthy swim of 300 m or so to the downstream entrance, alternatively this point can be reached by boat following the river up from the downstream entrance. The cascade chamber appears to be guided by a hading fault on 030° – 210°.

At the downstream entrance, a high level series can be reached by climbing the hillside on the true right hand bank of the river. This leads past formations in a dry chamber to a hole down to the river passage about 20 m below. Traversing over the hole leads to a large balcony overlooking the river passage beyond which there is no more high level passage. A short section of dry passage at river level on the true left hand side can also be entered in the vicinity of the river entrance.

The total length of surveyed cave is about 850 m, and the main river itself is 620 m from upstream sump to resurgence. The vertical range is 45 m, most of which is contained in the slope into the upstream entrance chamber (the river itself drops 18 m from upstream sump to resurgence).

Fossil caves. Two fossil caves high above the valley floor in Duo Ji were also explored. One of these was named Gunpowder cave (apparently it was used for storing gunpowder), and the local name for the other was Dong Ho. The surveys are on page 11. Both caves were extensively decorated, and Gunpowder cave in particular was a complex maze between large columns. Dong Ho contained cave pearl deposits not unlike those found later in Wo Long Dong.

B. Vietnamese border region

The road towards the Vietnamese border from Jingxi runs through increasingly spectacular cone karst until the town of Long Bang is reached just before the border crossing itself. The road into the border region is guarded by a military checkpoint but that did not prevent us (as part of an official expedition) from entering, apart from one occasion when we were halted apparently the result of lack of communication. Westerners however are not allowed across the land border into Vietnam. The Chinese have constructed an excellent paved road just within the border, presumbably to facilitate military operations. Again there was no problem accessing this highway. From this, the cave of Yin Quan could be reached. This is a superb, well decorated, clean cave with both active streamways and a fossil series; it was an excellent find and a delight to explore.

Yin Quan. The entrance to Yin Quan is a cultivated depression from the base of which two ways on are found. To the E, a steep descent gains a streamway. This can be followed downstream in fine style for 500 m until a muddy inlet on the true right is reached just before a sump. The inlet can be followed as a low passage for about 100 m until the inlet rises from a small sump. Back at the entrance depression, the main river passage can be followed upstream for 300 m past formations until the water rises from another sump.

The other way out of the base of the entrance depression is to the W and leads into a fossil gallery. This runs for 600 m negotiating a couple of greasy climbs past formations before opening out into an impressive section of passage with a flat mud floor. At the far end, a climb up a slope leads to a level section opening onto a large chamber with the main stream running between mud slopes at the base. Parts of the fossil series are well decorated, in particular there is a

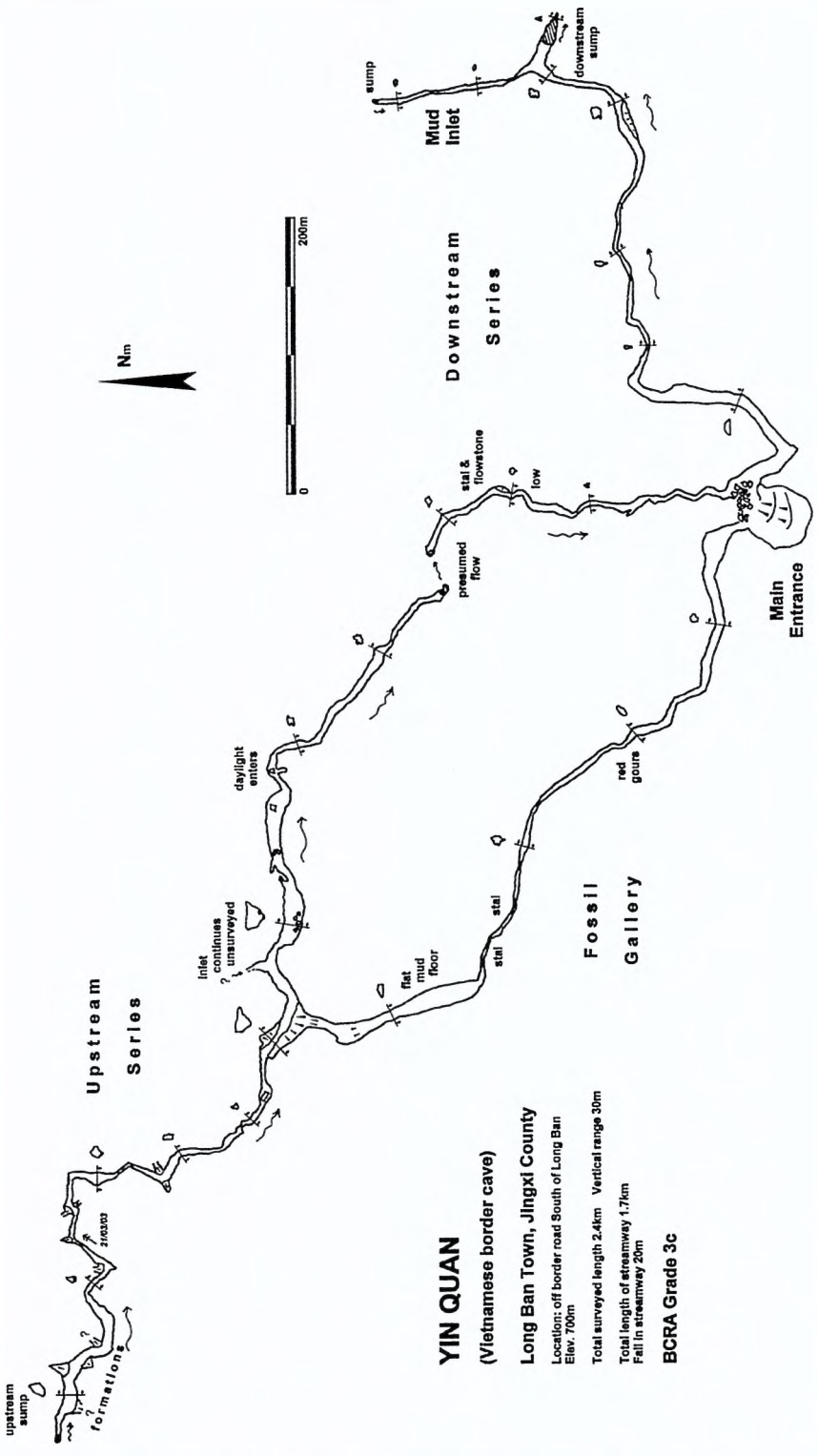


FIG. 9: Yin Quan cave, near Long Bang town, Jingxi.

short section with remarkable red gours, stained presumably by iron.

The main stream is regained at the end of the fossil gallery and can be followed downstream for 350 m past a point where daylight enters to end at a sump. As the survey on page 13 shows, the downstream sump of this upper main streamway is close to the upstream sump of the lower main streamway. Before this point, another inlet passage was noted. This was explored briefly for a few tens of metres before being left. Unfortunately this passage was not surveyed or pushed due to a misunderstanding of its location; it therefore remains an open lead.

Upstream from the point where the fossil gallery enters leads in varied going for 500 m into a region which is dominated by large cross rifts. Hardly any of these were explored although at one point a strong draft was noticed under a low arch across the stream way. It is possible that this indicates a higher level series that was missed (perhaps a continuation of the fossil gallery), otherwise it is always possible that the draft is circulating. Just before the final upstream sump is reached, there are some excellent formations including a fine crystalline column. On the true left an intriguing opening was noted at the top of a vertical muddy bank, but lack of time and climbing aids prevented access.

The total length of Yin Quan is 2.4 km and the length of the streamway is 1.7 km. The survey is on page 13. The presence of the draft in the top end of the cave may indicate that we missed a high level continuation beyond the upstream sump, possibly the opening noticed just back from the sump. It also seems likely that more can be found by surface exploration in the locality, although if the downstream part of the cave runs into Vietnam, official exploration will be discouraged. Our understanding is that Yin Quan itself is now being turned into a show cave.

Other caves. The road to the border passes a number of sites of speleological interest. Due to lack of time only very few of these were examined.

Arch Cave was explored over a couple of days by dogged enthusiasts, and surveyed to a total length of about 1 km. The obvious entrance is located off the road from Jingxi about 12 km before Long Bang town, just 150 m up the side track where a stream enters an anticline of heavily folded limestone at the entrance in small hill. The entrance is 10 m wide by 10 m high and contains some vegetation. The easy stream passage can be followed for 100 m to a point where the stream sinks in the mud floor but a 1 m step up leads into a continuation of the passage. After another 100 m there is a 2 m climb down into a large muddy passage. Lots of smelly rubbish from the nearby village spoils the atmosphere in what would otherwise be a fine cave. A further several hundred metres of easy going leads over brown and heavily scalloped rock. A short section of narrow vadose trench follows including a squeeze and 3 m climb. The passage opens into a large chamber soon followed by formations and a sump pool on right. A route to the left side of the chamber reaches a complex area containing a fine canal passage and what is probably another sump. A smaller passage continues over a couple of holes going down to water level, and a hands and knees crawl leads into a small chamber with nearby mark on the wall "1971/03/04". The outward draft continues through a diminishing passage which was pushed for a few metres as a flat-out crawl. A second entrance to Arch Cave is located some 300 m along a minor road and enters part way along the large muddy passage.

At another point further down the road, a river flows under a road bridge and immediately runs into an imposing cave entrance. After driving past this several times, eventually the driver was persuaded to stop. Unfortunately the cave, Mo Ding, sumps after less than 100 m (see Fig. 10). For future reference, the river bridge was located to be at GPS N 22° 59′ 27″ E 106° 21′ 17″.

C. Wo Long Dong

Information about cave sites in Jingxi continued to come in during our stay there, perhaps encouraged by the almost nightly reports of our activities on the local television news (facilitated by footage from Chen). Late one evening we heard about what was supposed to be the largest

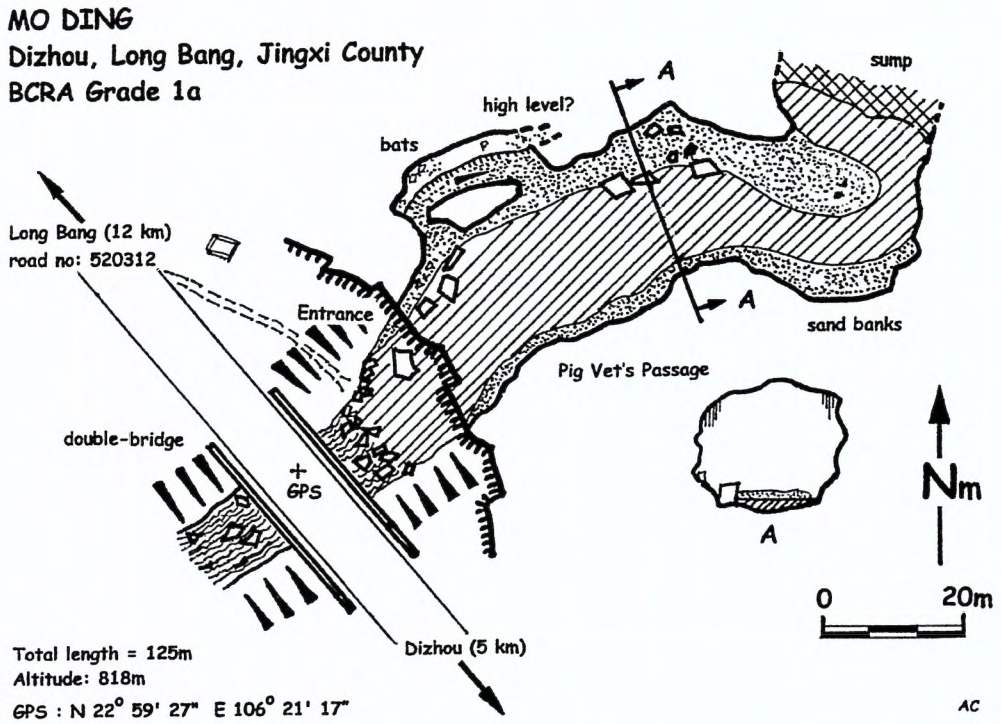


FIG. 10: Mo Ding cave lies next to the road between Jingxi and Long Bang.

chamber in the county, in a cave that eventually became known as Wo Long Dong.

Wo Long Dong was explored, photographed, and surveyed in two trips. Unlike previous caves we had visited, it required about an hour and half walk in over two mountain passes (not difficult) followed by a steep descent into a deep valley in the cone karst. The passes separated shale hillsides from steeper limestone, and again the geomorphological contrast was very marked. On early part of the walk in from Tong De village, we passed some small entrances which were clearly flood resurgences, and once we gained height we could look down on a likely sink for these in a large doline, however time and the call of the large chamber prevented further exploration.

The entrance to Wo Long Dong is a very inconspicuous little stream sink located at GPS N 23° 07′ 28.5″ E 106° 36′ 07.5″ and would undoubtably have been ignored without the benefit of local knowledge. Additional entertainment was provided by the presence of leeches in the vicinity of the entrance (this was the only occasion we saw leeches). After a few twists and turns, the entrance passage lowers to a near-crawl over a pool with a large bamboo pole in the middle, before enlarging again to walking size. Not long after, the right hand wall disappears and one enters the first of the two very large chambers in Wo Long Dong. By continuing along the left hand wall, the stream can be followed into a section of smaller passage which ends in a boulder choke, however a way up can easily be found and this emerges into the second of the very large chambers although this was not the route followed initially.

In the first large chamber, one can climb up past a pool and into a region of breakdown in a large square passage which became known as 'Tumbledown Ridge'. A slightly awkward 4 m climb down leads into a continuation of the passage, with a mud floor, before enlarging again at the second of the very large chambers. This chamber has some extremely large flowstone columns and gour pools and was soon named the 'Hall of Giants' (Fig. 13). Suitably impressed, the first explorers ran a survey line out through the entrance, briefly investigating the confusing S side of the first large chamber,

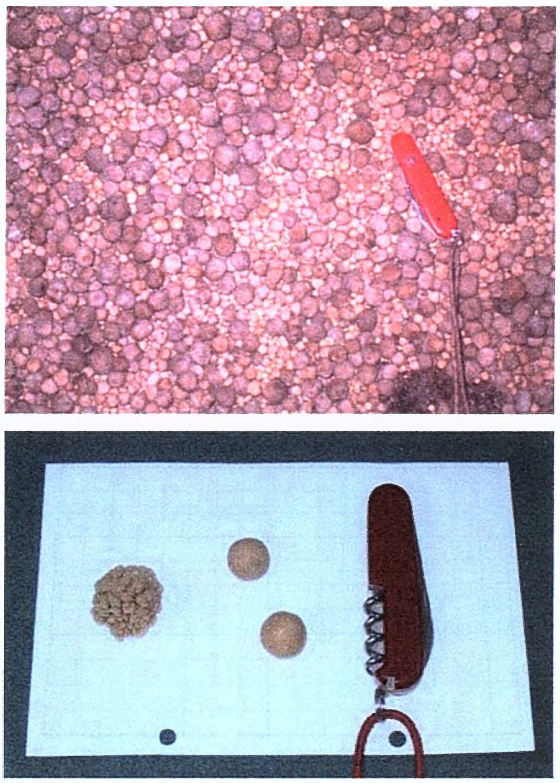


FIG. 11: Cave pearls were found in vast quantities in Wo Long Dong (top), and in various kinds ranging from coarse crystalline balls to fine grained spheres (bottom). Penknife is 80 mm in length. CHECK THIS.

and reported back to base. Most of the team took part in the second visit on the following day, with one group photographing, and two groups surveying. The two survey groups followed opposite walls and met much later on in the Hall of Giants, with what proved to be a satisfying small misclosure error.

Wo Long Dong shows much evidence of local visitors, with the occasional blackened fire ring and scattered amounts of rubbish. The far end of the Hall of the Giants is comprised of a massive boulder ruckle and virtually none of the possible outgoing leads were examined (indeed there was later a rumour that a second entrance exists at this point). At this end also are large amounts of cobbles and river bed deposits which seem quite inconsistent with the stream in the entrance, so perhaps these were laid down by water entering via another route.

Similarly, the S wall of the first chamber

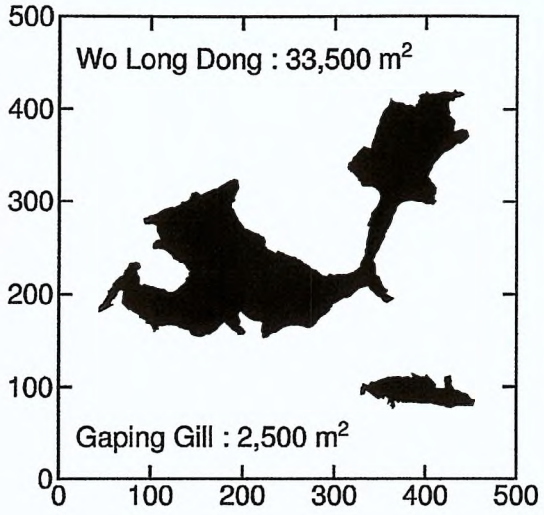


FIG. 12: Floor areas of the two chambers in Wo Long Dong compared to Gaping Gill main chamber.

was at times extremely hard to follow, being a confusing maze of enormous pillars, columns, and boulder piles. Only the most obvious alcoves were pushed including one which led in a loop back into the main chamber (this loop was not closed by surveying though, due to lack of time). The S side of this chamber has some truly spectacular fluted flowstone columns, but perhaps the most striking were vast deposits of cave pearls in places, 'wheel barrow loads' was the phrase used at one point. These ranged from small highly regular marble-like spheres, to much rougher coarse crystalline balls. Fig 11 hopefully gives an indication of these remarkable formations.

The first explorers ran a survey line back from the Hall of Giants out through the entrance but due to an oversight no passage details were recorded for the entrance series, hence BCRA grade 3a has been assigned to this part. On the second trip, the chambers were surveyed by following the walls in a circuit that was 1.35 km in length. The survey is on page 18. The floor areas of the two chambers were worked out afterwards to be $20,000\,m^2$ and $15,000\,m^2$. If it could be claimed that the system comprised one chamber, albeit with a peculiar shape, the total floor area of $35,000\,m^2$ would place Wo Long Dong in the top twenty largest underground chambers in the world, slightly larger than the Big Room in

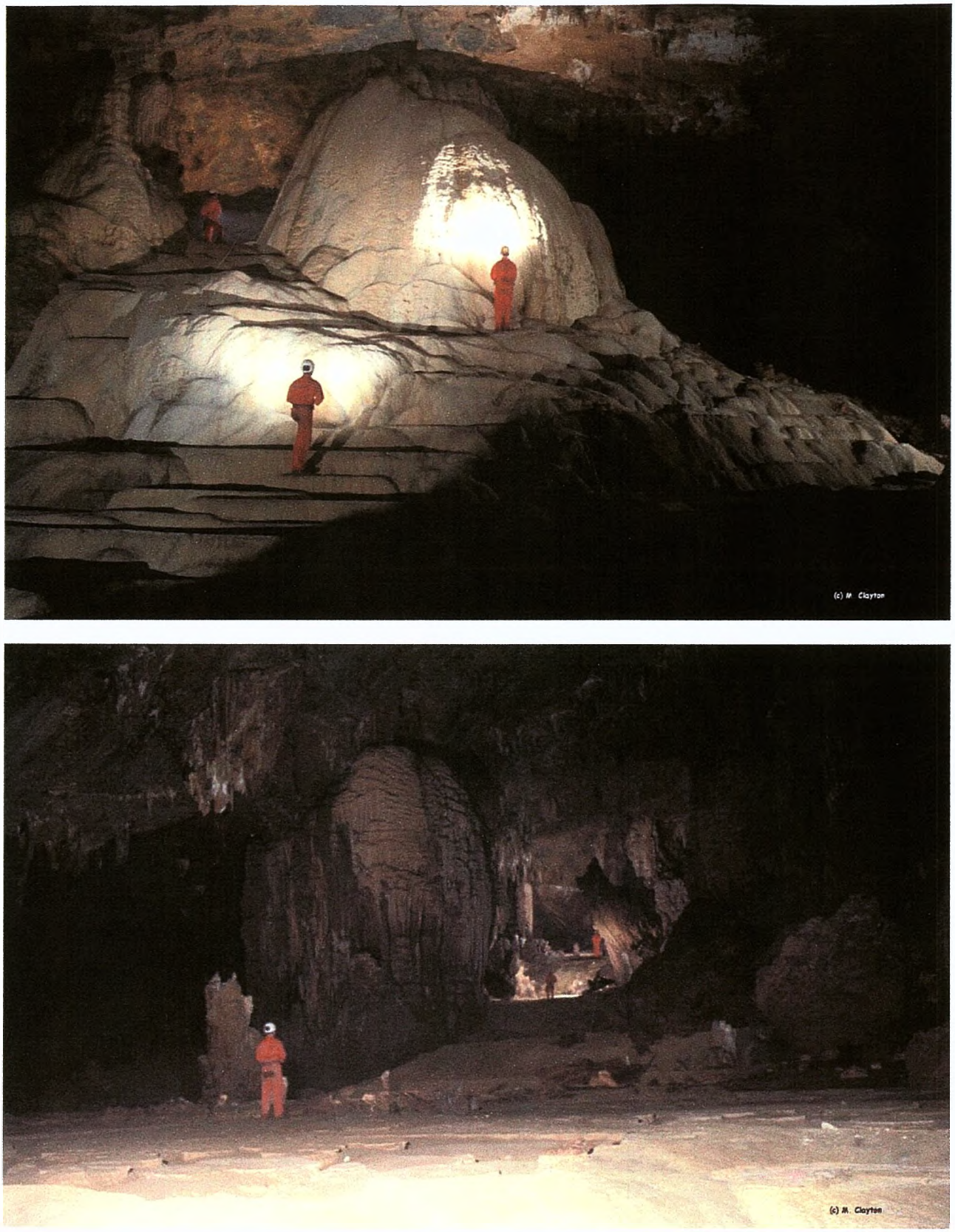


FIG. 13: Formations in the Hall of Giants, Wo Long Dong, Jingxi.

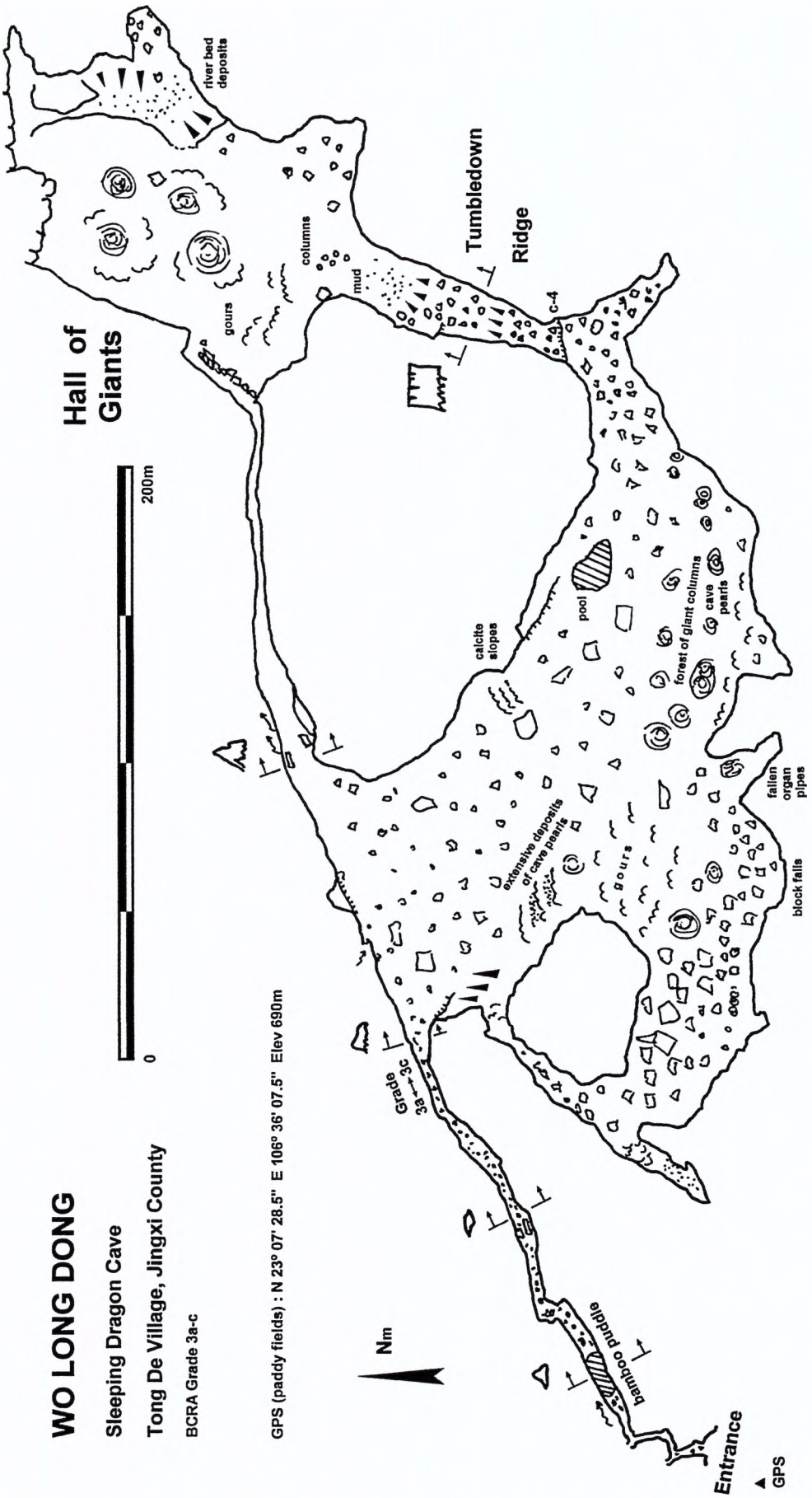


FIG. 14: Wo Long Dong cave, Tong De village, Jingxi.

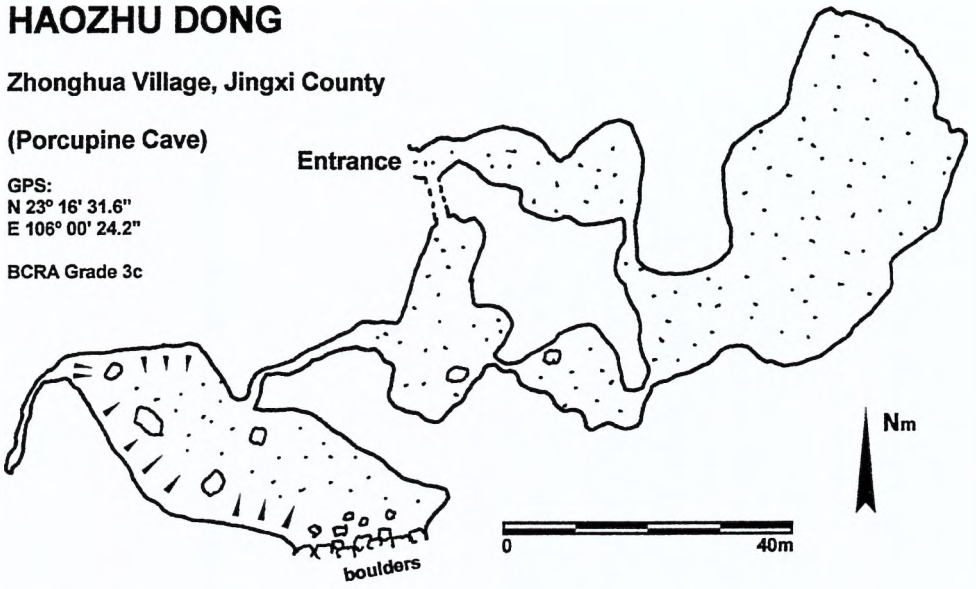


FIG. 15: Haozhu Dong or Porcupine Cave is a typical fossil cave found in Jingxi.

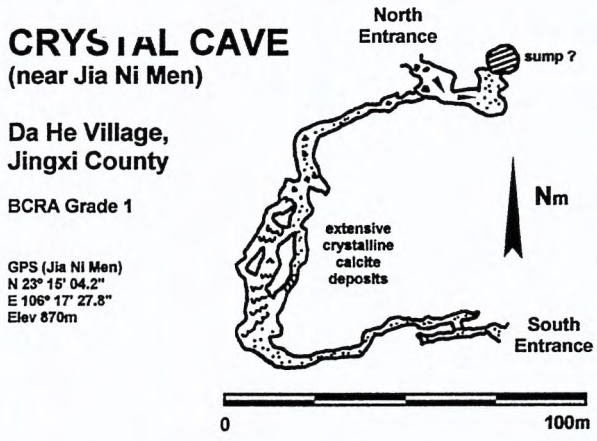


FIG. 16: Cave near Jia Ni Men with fine crystalline formations.

Carlsbad Caverns in the US, and enough to swallow more than thirteen Gaping Gills (the standard CPC unit for measuring areas), as Fig. 12 shows.

D. Other localities in Jingxi

A large number of less significant caves were explored (full details are available on request). Most turned out to be fossil fragments. An example is Haozhu Dong located near Zhonghua village, which also became known as 'Porcupine Cave' to the exploration team. Haozhu Dong has a large fortified entrance with a stone wall across the mouth of cave containing a small doorway. A further doorway leads into the cave and on to a large chamber with a central column of calcite. An eyehole leads in to a further large chamber with a number of impressive formations. At the lowest point in the chamber a small passage leads to a section of passage which ends in a small alcove. In the mouth of the cave a short climb on the left leads to a short section which soon ends in a calcite blockage. The survey is shown in Fig. 15.

Another feature that seemed to be frequently observed was that caves clearly flooded during the wet season and the water table did not seem to be very deep even in the dry season and in mountainous cone karst. An interesting example of this is Jia Ni Men which was explored over a couple of days. This cave is located high in the mountains near Da He village at an altitude of 870 m, with a position GPS N 23° 15′ 04.2″ E 106° 17′ 27.8″. Jia Ni Men starts with a couple of chambers showing obvious signs of occupation before leading off as walking passage under a daylight shaft and into a section with rather fine formations and gour

pools. Initial exploration was stopped at a 4 m pitch. On the next visit the pitch was rigged as a rope climb, and at the base an easier climb back up led over a flat section to open out into a very large chamber. Some time was spent surveying this chamber which contains fine stal formations, before surveying out of the main cave. The chamber at the end is distinguished by steep mud slopes, evidence of flooding in the wet season. Jia Ni Men is 480 m long and 20 m deep. The survey is on page 21.

Close to Jia Ni Men, another smaller cave, named by us 'Crystal Cave', was explored following a draft (Fig. 16). The draft proved to be a consequence of the cave having two entrances, but (perhaps as a result of the draft), the cave possessed some exquisite crystalline calcite formations, including a fine 'skin' of calcite crystals floating on a pool in one section of the passage. The far end of the cave dropped to reach water at a probable sump. Two holes below Jia Ni Men also dropped to water, which we took to indicate the level of the water table.

FIG. 7: River caves in Duo Ji: swimming across the lake above the 6 m cascade in Dark Cave (top), and two people in a boat in Wang Long Dong near the end of the flooded section of the cave (bottom).

IV. EXPLORATIONS IN PINGGUO

After about two and a half weeks in Jingxi, we moved to a second base in Pingguo about 100 km further E. Looking back, everyone agrees that it was a mistake to try to cover two centres even for a relatively large expedition such as ours. There was enough in Jingxi, or in Pingguo, to keep the expedition happy for the whole period.

Pingguo is a much more developed city than Jingxi, and is graced by the presence of a vast aluminum works. The main karst regions are to the N of the city, and part of the team established a secondary base at the old county town of Bang Xi about 60 km to the N. It was generally observed that the karst features were becoming more and more dramatic the further N one went, perhaps representing a steady change in the extent of erosion.

A. Bang Xi

A separate base was established in the old county town of Bang Xi. The town was engaged a road widening scheme the like of which none of us had seen before, but the backdrop to the town was a superb view into extensive cone karst to the N (Fig. 18). Several km from the town, the Red Forest club had found an extensive cave, Long Ma Yan, which was going to be developed as a show cave. Interestingly this cave is developed in rather insignificant low karst relief compared to the cone karst further N.

A number of other sites were investigated around Bang Xi (details available) but the main thrust was around a spectacular river valley 20 km W of Bang Xi, and running N into the cone karst. Cave development seemed to increase the further N one travelled. The limestone started with very massive horizontal beds at the start of the valley, tilting to a dip of 5–10° over 10 km or so N.

About 5 km N of start of the rough track which follows the valley, a spectacular large rock arch is seen very high to true right bank. After another 5 km or so, the road and river pass through an even more spectacular rock arch with a span of about 70 m (Fig. 19). A water-driven pumping station for irrigation was on the far side. Above the arch, a 30 m rock climb (probably Severe) gains an imposing entrance, however Chen had already investigated this and apparently it does not go anywhere. Just beyond this point the river swings left, to sink in boulders in the true right hand bank (a small amount of water continues down the valley). Above here is a cave known as White Rock Cave or Arch Cave in the field notes. The valley beyond this point is characterised by fragments of huge cave passage, with the river taking a much more immature underground course in the present dry season (probably flowing on the surface in the wet season).

Some 5 km further on, the road passes through one of cave passage relicts, called by us Road Cave. About 300 m up valley (ie S) is a major flood rising. This was entered to mud banks with the main river rising from a sump to sink immediately again in the mud and boulders. The village near here is called Bai Feng and is located at GPS N 23° 41′ 23.0″ E 107° 47′ 57.9″.

Continuing on, the river is picked up again and can be followed to a huge entrance called Dragon Eye cave. This was entered for about 300 m to a sump. Apparently a hydroelectric scheme operates where the river rises again, but this is in the next county N.

White Rock Cave. Just past the 70 m arch a descending slope over remains of a quarry gains a large tunnel entering the hillside. The passage starts with blockfall but soon develops into a fine walking route between mud banks. The roof lowers and the cave ends in a pool and a slope up to a small chamber. From the pool, a loop passage leads back to the R (facing in) to a chamber and a window back into the main passage. In the region of the boulder fall, two side passages gain access to a complex of smaller passages carrying a large stream (the inlet series). The upstream end of this inlet series is about 4 m below the level of the river sink and the water is believed to be a portion of the main river. The total length of underground passage is 530 m and the depth is 33 m. The survey is on page 25.

FIG. 18: The peaceful rural scene outside the town of Bang Xi (top) contrasts with the chaos of the road widening scheme (bottom). Note the backdrop of cone karst in the top picture.

FIG. 19: The 70 m arch in the river valley near the village of Bai Feng. The river swings right and sinks at the bottom of this picture. The prominent fossil passage above and to the right of the arch was entered on a previous trip by Chen but does not go far.

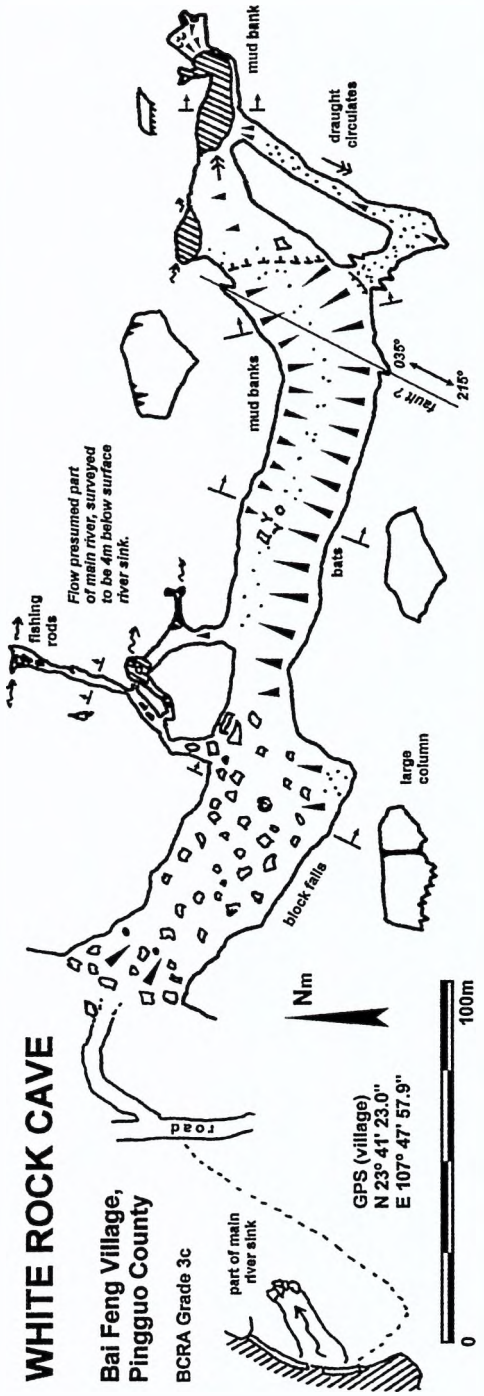


FIG. 20: White rock cave, near 70m arch, Bai Feng village, Pingguo.

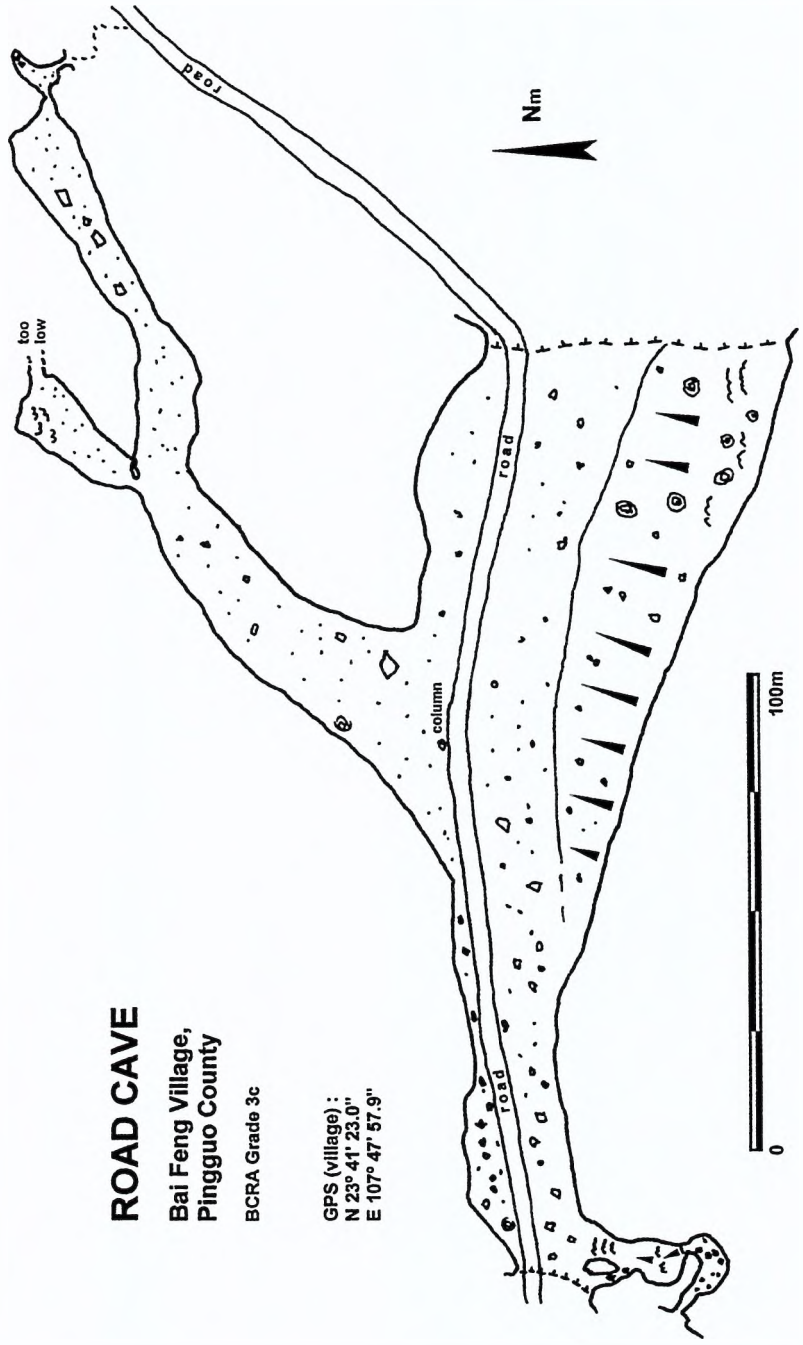


FIG. 21: The road passes through a cave relict, Bai Feng village, Pingguo.

Road Cave. This is where the road goes through a very large segment of old passage. Part way through, a side passage leads off W then turns N to emerge at an insignificant side entrance in the hillside just above the road again. At the S end, a stepped climb up calcite slopes on the E side gains a balcony used by the locals for ancestral remains. The total length of underground passage is 465 m. The survey is on page 26.

Other caves. A number of other fossil fragments were surveyed in the vicinity of Bai Feng village and these are shown on pages 28 and 29.

B. Other localities in Pingguo

It is worth mentioning two other locations that were visited in Pingguo county. The first of these were some excessively large dolines about 3 hours drive north west of Pingguo into mountainous terrain. A small group stayed in the village of Long Yang to examine these. This was the only place that serious SRT would be required to descend all the shafts, however it appears that these shafts are all likely to be blind, as copious amounts of mud on the walls indicates they flood from below in the wet season. The largest doline was known locally as Long Fan doline and was used as source of water for the village. The bottom could therefore be reached by a precarious traverse and descent, although this was not realised until a 60 m pitch had been rigged to reach the same point. Off the side of the pedestrian descent route was another drop into a large black space. This was rigged as a 45 m pitch and gave access to a large (Gaping Gill sized) flooded chamber with no obvious exit (Fig. 22). This chamber had remarkable acoustics, with a reverbation time of many tens of seconds. There was a persistent rumour that this area had already been visited by another group, entering from further west. If Long Fan is ever revisited, look out for the 8mm thru-bolt placements.

The second area was a curiousity. Long Bian village lies 15 km due South of Pingguo and the road map indicates a river sink at that point. This spot was duly visited on a spare half-day. The river sink marked on the map was a dry river river bed at the time of visit, ending in a 10m slope down to a mucky sump. However about 0.25 km north of the sink was a pumping station in the entrance to a canyon passage, with a canal 15 m below surface level. One can see on for about 10 m and the passage likely continues as a flooded canyon. About 2km further north in the true left hand bank of the valley was a stepped entrance descending in a spiral for 30 m down to a short (20 m) section of low passage carrying a small stream; downstream ends in a sump and upstream is too low. This was used as a source of water. The area investigated comprised low limestone hills apparently in very late stage of development or erosion, perhaps representing yet a different kind of karst morphology.

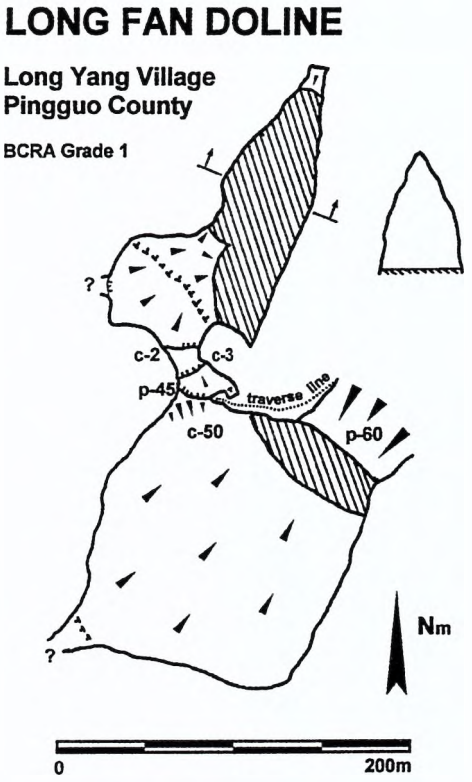


FIG. 22: The largest of the dolines near Long Yang village.

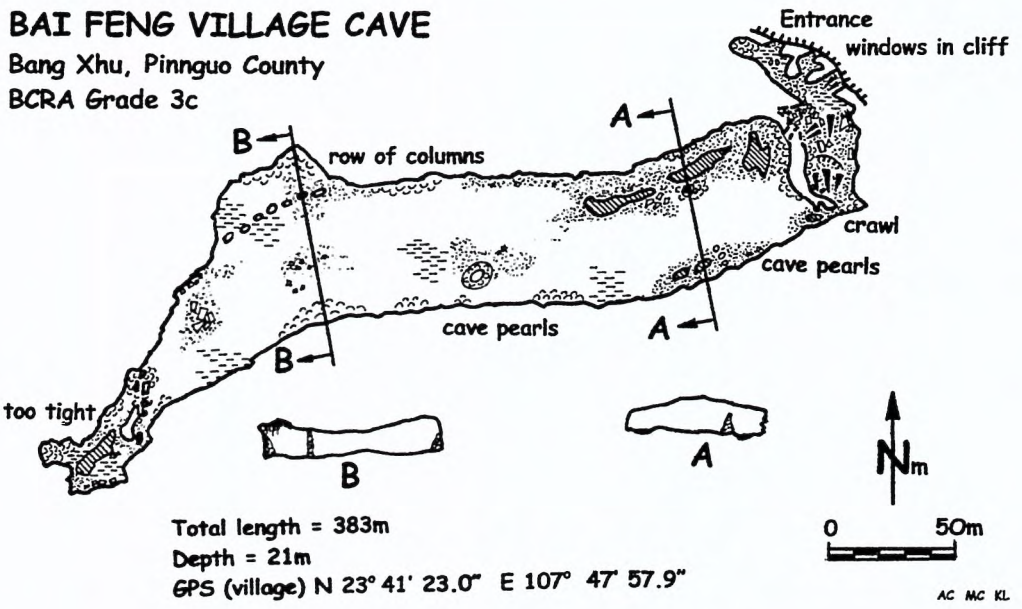
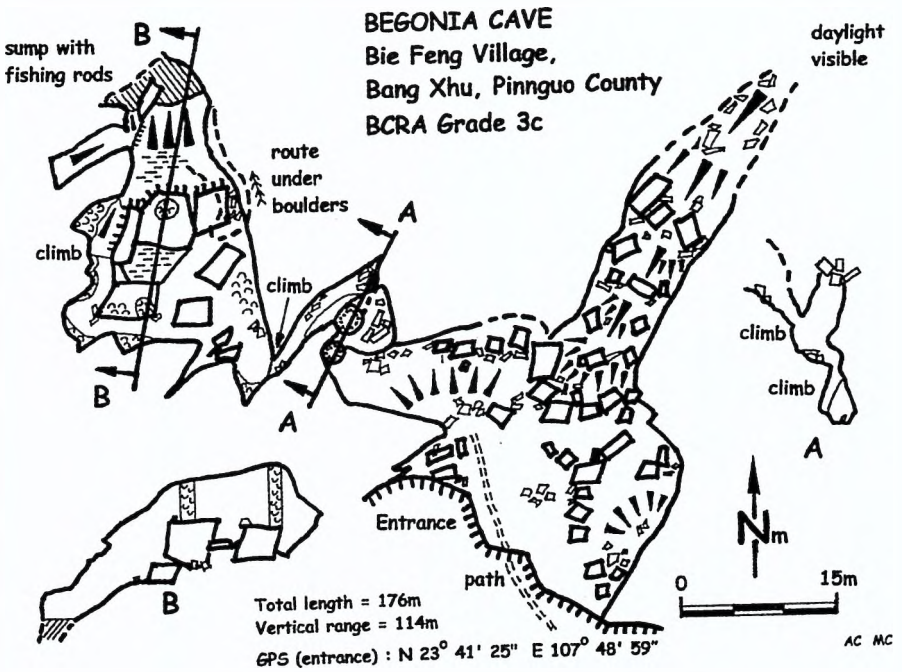


FIG. 23: A fossil cave near Bai Feng village, Pingguo.



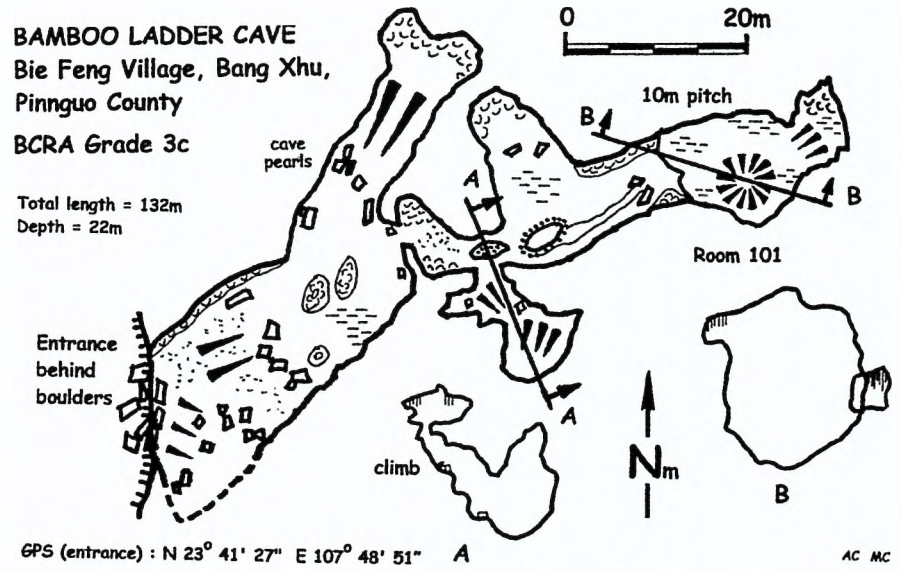


FIG. 24: **Other** fossil caves near Bai Feng village, Pingguo.

V. ACKNOWLEDGEMENTS

Funding is gratefully acknowledged from the Ghar Parau Foundation, the Mount Everest Foundation, and the Craven Pothole Club. Support in kind came from Cathay Pacific, Computeach International Ltd, Jordans, Kelloggs, LifeSystems, Total Access Systems, Weatherwriter and Zurich. Details are given on 38 of the appendices.

We are grateful to members of the Red Team Outdoor Club for their caving companionship, especially Chen for his superlative cinematography. Thanks are also due to Cherry and Julia for translating, and for providing entertainment at just the right moments.

Enormous thanks go to Zhang Yua Hai and Professor Zhu Xue Wen of the Karst Research Institute in Guilin for their dedicated advice and guidance, and to Andy Eavis and the China Caves Project for their strong support.

None of this would have happened without the initial impetus given to the project by Howard Beck and John Whalley of the CPC, and we thank both them and other members of the Club (you know who you are!) for their support.

Finally we thank the people of Jingxi and Pingguo for their generosity and help.

Duo Ji, do your peaks look down as the buffalo turns the field,
Do your dragons sleep peacefully underneath the mountains now,
Or in the dusk, as the gentle dragon's breath stirs the waters,
Can one still hear a faint echo as a girl sings of the jasmine flower.

VI. APPENDICES

A. Local conditions

After the caves, the experience of Chinese culture is perhaps the thing that will be remembered most by everyone. Yet China is changing rapidly. The China of 15 years ago when the China Caves Project was started is not the same as the China of today. Western tourists are increasingly welcomed, and as many people are starting to discover, it is possible to 'just go caving' in China, exploring new sites, with very little in the way of official arrangements. Doing it this way requires sufficiently familiarity with Chinese language and customs, and enough time to sort things out on the ground. Our trip followed the traditional route of leaving local organisation in the capable hands of our colleagues (especially Zhang Hai) of the Karst Research Institute. More expensive maybe... but likely saving a lot of time and effort.

Officialdom. In both Jingxi and Pingguo, we were greeted by official receptions. It is quite clear that the business of developing show caves is taken very seriously by the Chinese, and this is probably the main interest of the local officials. Officials come in various guises: members of the Communist Party of China (another CPC), local officials such as mayors and other leading figures, and representatives from the Karst Research Institute. Professor Zhu was held in very high regard for his expertise, and Zhang Hai also, for being the key Chinese organiser from the point of view of officialdom. As leader, Kevin was also in demand for various official functions such as making speeches, from which he could not escape.

Food. In general food was very good. We noticed that, the further into the backwaters we travelled, the better albeit more basic became the food. At its most basic, eggs, pork, chicken, rice and corn porridge are available; enough to live healthily but not a very inspiring diet.

Transport. Our transport was mostly laid on for us, in the form of minibuses and 4-wheel drive vehicles where the roads required it. Driving on main roads in China is quite a nightmare. It was said that the highway code consists of only one rule: 'try not to bump into anything'. In the cities, motorised rickshaws known locally as tricycles are available and very cheap. On one occasion we needed to use public transport. A sleeper bus was duly flagged down to take us back into the city.

Accommodation. We stayed in tourist hotels in the main centres of Jingxi, Pingguo, and Bang Xi, and camped out in government-owned meeting rooms in both Duo Ji and Long Yang. Whilst camping proper was mooted at one point (and would have been nice), we did not really have the equipment to do this. A useful (luxury?) item would have been a cheap stove, which might be fairly easily obtained from the markets in the larger towns and cities. Another bought item that made conditions more bearable was a cheap umbrella, good for keeping off both the rain, and the sun.

Rural environment. China is a country of great contrasts. The centre of Guilin resembles a 21st century European capital, yet the agricultural practices in the surrounding countryside are perhaps 19th century. Migration from rural areas into the relatively rich cities of the coast is said to constitute the greatest mass movement of people in history, and it is going on right now. Similarly, with the growth of the economy, comes growth in the internal tourism market, a key driving force behind the development of tourist caves. Thus the chance to see the rural environment in China may not last for very long. Agriculture was very labour intensive. It was not uncommon to see several hundred people in the fields by the side of the road, and the field were noticeably smaller and more irregular than is found in our European countryside. In Long Yang where the Pingguo dolines are located, every available scrap of land had been planted. In Duo Ji, we were amazed at the sophistication of the irrigation systems to flood and drain paddy fields at will. The agriculture might be 19th century, but the technology in this context is very highly developed. Another striking thing was that paths in rural areas are there because the local people need them, to gain access to the fields, or go between villages. The contrast with

the debates about public rights of way in the UK could not have been more marked, yet the network of paths in Britain has surely developed for exactly the same reasons that can be seen on the ground in rural China right now.

B. Caving equipment

Although it might be presumed that everyone who goes on an expedition to a country like China is well versed in the caving techniques, it is worth making a few remarks.

For caving in fossil passages, only light-weight gear was needed, such as T-shirt, shorts, wellies or other sturdy footwear, with kneepads and gloves as required. Unless your feet are exceptionally small, don't count on being able to get suitable footwear in China to fit. Everyone also had a lightweight boilersuit but these were not always used. The caves are not that cold and crawling fortunately not often required. Most people also took wet suits, these could be full wet suits or a 'shorty' (ie short arms and legs), plus wetsuit socks. A neofleece will presumably also do. Wet suits proved invaluable for swimming in the river caves not so much because the water is cold, but rather because they provide additional buoyancy.

In the big river caves in Duo Ji we were fortunate to have the use of excellent 'government' inflatable boats borrowed from a show cave project near Jingxi. We also took out to China flotation aids (life jackets), and in the China Cave store there are also flotation aids and some inflatable rubber rings (inner tubes) and a couple of smaller boats. With the inflatable rings, one needs to check carefully that the valves are working properly, before moving away from the big city to rural areas where repairs might not be possible.

We borrowed a large amount of rope and other equipment from the China Cave store, which is located in the Karst Research Institute in Guilin, although in the event very little vertical caving was encountered. The major vertical caving was done in the dolines in Pingguo. For rigging, when natural anchors are not available, we used a cordless power drill to place

FIG. 25: For bolting we used 8 mm thru-bolts with standard anchor plates.

8 mm thru-bolts (see Fig. 25). With a power drill, these have an advantage over spits (self-drilling anchors) because the holes can be over-drilled (ie drilled longer than the length of the bolt) without worrying about the exact depth, and they do not require finishing by hand. In the UK we experimented to find that holes for thru-bolts can be drilled by hand using a drill bit in a 'rock pecker', although obviously it pays to make sure the drill bit has been properly sharpened. If drilling by hand, one might revert to spits since they have the advantage that each anchor has a freshly sharp cutting bit, but on the other hand a separate tool in addition to the 'rock pecker' must be carried to place spits. In the end, we did not take any spits to China, and relied solely on thru-bolts. A very useful source of information concerning rigging and other caving practices is the recently translated book *Apline caving techniques* by Marbech and Tourte.

For lighting, there was also some debate before the trip. Carbide can be obtained in China but it is of variable and often poor quality. An oft-quoted advantage of carbide is that the generator is a good source of warmth, but in the caves we were visiting this was not important. Batteries (AA) can also be bought cheaply but these are also not very good. Most people therefore ended up caving on electric light powered by rechargeable AA batteries. A lightweight AA charger can be combined with a lightweight mains adapter makes an easily portable system, and a number of these were taken out. One can also get a 12 V adapter to run the charger from a car battery. Most importantly, several mains

extension cables with British mains sockets are available in the China Cave Store. Mains electricity was available even in remote districts, although it may require 'plumbing in' and may only work for a few hours each day. We were also on occasion able to borrow very high intensity rechargeable lights from Chen, who was using them for filming. These proved to be extremely useful to inspect the very large chambers of Wo Long Dong, and the flooded chamber in the Long Fan doline. We would recommend that any future expedition consider taking one or two such lights out.

C. Photography

On any expedition, most team members will take their own cameras and camcorders but due to the strict restrictions on weight allowance for the flight it was decided to elect two individuals to take official expedition photographs on behalf of the team. The official team photographers took both transparencies and digital photographs.

The expedition photography kit list comprised:

- Olympus OM1 camera
- 28 mm lens
- Cullman tripod
- 2 cable releases
- Camera care kit
- Metz 45CT-4 flashgun
- 2 Vivitar 285 HZ zoom flashguns
- Starblitz 3000 BT twin flashgun
- Centon FG30D flashgun
- 5 Firefly 2 slave units
- Home made slave for flash bars
- 2 flash bars
- 5 spare batteries for Firefly 2 slave units
- 35 Ni-MH AA rechargeable batteries
- 36 Duracell ultra AA cells
- Uniross ultra fast charger (with 12V adaptor)
- Large Pelican case
- Medium Pelican case
- 7 Ortlieb clear waterproof map cases

Fujichrome 400 and 200 was used for the majority of the underground photography.

Cave photography, apart from entrance shots, is totally dependent on the light sources that are taken in by the caver and the methods adopted for the photography on the expedition vary depending on the situation. A recommended book for underground and flash photography techniques is *Images Below* by Howes.

The first major cave system we had to photograph was Wong Long Dong, the river cave near the village of Duoji. All the kit was carried in waterproof cases such as the cases made by Pelican which proved to be very reliable and durable despite the rigours of the caves. Further, the Pelican cases proved useful as a swimming float in Dark Cave. Once out of the case, where the equipment was potentially liable to get wet or damp, the flashguns were housed in clear Ortlieb map cases which again proved very successful and helped with battery conservation as the flash could be turned off through the material. The use of the gear while bobbing about in a boat was interesting to say the least. The use of the flashes in two Ortlieb bags under the water also produced interesting effects on some of the shots, especially when carried by a swimming model in Dark Cave (Fig. 7). We were however very fortunate in the later parts of the trip to be operating in fossil passages which meant we were able to use the kit as it stood with little need for waterproofing.

The images taken in the areas of the cave which allowed normal methods of flash photography proved to be fairly straightforward. However, one of the difficulties encountered was that in some of the caves there was a sooty dark coating left by previous visitors to the caves using burning torches. Another factor, which proved to be a very frustrating issue during some of the photography sessions, was the misting of the camera lens. The only option was to be patient and allow the equipment to fully acclimatise. Additional problems came when we entered the massive chambers and passages of the Wo Long Dong and attempted to photograph these and 'do them justice'. None of the expedition team had ever tried to take images in such big voids and we resorted to trial and error using large amounts of film, experimenting with different approaches. Our final approach was to use the camera on a B (Bulb) setting and us-

ing multiple flash techniques. Each shot was repeated using more or less flashes with the models acting as slaves, firing the guns repeatedly once fully recharged. The results were on the whole acceptable but could probably have been improved by the use of flash bulbs to gain more light in the big passages which just soaked up the electronic flashes.

D. Medical

Usually, what an expedition can expect to carry, in terms of first aid facilities and medicines, is dependent on where the expedition is to take place and the requirements of the individual team members. The present expedition was to be based in towns, where medical support would be available for the treatment of injuries or illnesses. However if an injury was sustained underground, rescue processes could conceivably take a matter of hours, if not days, therefore the expedition had to be prepared for such an eventuality. It was also vital at an early stage, to establish the medical requirements of the group including medical conditions and allergies / intolerance to basic medicines and foods. Such medical requirements are established early on to ensure that everyone is suitably prepared for the potential consequences of medical conditions such as anaphylactic shock, epilepsy etc. The China expedition was fortunate in that only one member of the group suffered from a food allergy (nuts in this case) and no one had serious, long-term medical conditions.

The plan was also to regularly split the group into two main parties, therefore all medical equipment required equal doubling up. Four further, basic 'underground' kits were assembled to cover minor injuries for individual parties when out and about. All kits were stored in waterproof containers.

There were two base first aid kits equipped as follows:
- Tweezers
- Thermometer
- Sterile sharps kit
- Scissors
- Surgical gloves
- Basic resuscitation masks
- Antiseptic wipes
- Plasters
- Surgical tapes (Micropore, Zinc Oxide and Hyperfix)
- Wound closure strips
- 'Gaffa' tape
- Antihistamine tablets
- Antibiotics (Metronidazole, Erythromycin)
- Pain killers (Codeine based, Ibuprofen based, Paracetamol)
- Loperamide capsules
- Oral rehydration sachets
- Cotton wipes
- Cotton ended sticks
- Gauze wipes
- Sterile eye pads
- Bandages
- Triangular bandages
- Ambulance dressings (med. and large)
- Melolin dressings (5×5 and 10×10)
- Inodine dressing (antiseptic impregnated gauze dressing)
- Tampons
- Saline sachets
- T-sept Sachets
- Iodine Tincture (water purification and antiseptic)
- Large 'Daren' Drum container, clearly labelled

Four 'underground' first kits were also assembled containing:
- Surgical gloves
- Melolin dressings
- Ambulance dressing
- Saline Sachets
- 'Gaffa' tape
- Waterproof pouch

The expedition also carried one emergency dental kit and a set of lightweight 'SAM' splints.

Training. Recommended reading for advice on expedition medicine would have to include the *First Aid Manual*, published by Dorling Kindersley, and *Expedition Medicine*, edited by Warrell and Anderson, published by the Royal Geographical Society. The *First Aid Manual* gives clear explanations of the treatment of a broad range of injuries and illnesses, where *Expedition Medicine* provides an insight into planning for expeditions to remote areas and is bi-

ased towards medical conditions associated with severe environments (especially tropical).

It is also recommended that every member of the expedition has had, at a minimum, a two-day introductory first aid training. From experience, the courses that cover First Aid at Work concentrate on ensuring the basic skills are imparted, including life support via CPR, but other, potentially valuable techniques are not taught. The basic premise of First Aid at Work is to ensure the survival of the casualty for a brief timeframe (10–20 minutes) prior to the attendance of an ambulance / paramedic etc. On expedition, you may have to ensure the survival of a casualty until evacuation is achieved. With many first aid courses it is possible for the training to be tailored to the needs of the group. It would not be recommended here to have only selected expedition members trained in basic first aid because they may be the ones requiring medical attention.

Wound Management. First aid teaches the importance of preventing the deterioration of the casualty (be they conscious or unconscious) and promoting healing. This means being prepared for, and competent to handle a broad spectrum of injuries especially cuts, burns, breaks and crushes (in any order or combination) and the associated issues of shock. To add further complexity to this, the environment will play a major role in how sustained injuries, and the casualty, are treated.

Many medical tapes loose adhesion in cold or wet environments and this may have major implications for wound management, and alternatives may have to be found. Ambulance dressings, being equipped with their own bandages, are ideal for initial protection of a broad spectrum of wounds. However, further techniques may be required to close wounds more permanently. Wound closure strips (such as Steristrips etc) can be ideal if the skin surrounding the wound is clean and dry, if it is not, alternatives may have to be found. All first aid kits contained ample equipment to clean wounds (saline and T-cept sachets) and dress them (ambulance dressings and a Melolin type pads). Each kit also contained a roll of 'gaffa' type tape. Gaffa tape can be used to fabricate adhesive dressings, including simple plasters and wound closure strips and, if necessary, the roll itself can be used to protect objects projecting into, or out of, open wounds. Each team was also carried lightweight SAM splints, to be applied in the event of breakage. Each kit also contained antiseptic impregnated 'Iodine' gauze dressings, for application directly to the wound, under an absorbent dressing. These dressings are particularly useful in reducing infection, especially in unfavourable environments.

Pain relief. The expedition took the strongest, non-prescription painkillers, available. These do contain codeine however, which many people are biologically unable to process and therefore ibuprofen tablets and paracetamol tablets were also taken. Expedition medicine books extol the virtues of stronger and prescriptive, non-oral painkillers such as nubain. These however, should only be administered by a medically competent individual and unsurprisingly, many expeditions, including the China expedition, are refused such medication.

Antibiotics. The expedition carried a limited supply of prescriptive antibiotics for the treatment of minor infections and dysentery. Care was taken to ensure that the antibiotics available were suitable for the entire expedition team. Most people were also able to obtain a small personal supply of prescription antibiotics after consultation with their local GP.

Personal Care. The prevention of illnesses is always preferable to treatment, therefore inoculations were recommended. Extra vaccines advisable are for Japanese Encephalitis and Rabies. The Rabies vaccine is not a preventative measure against the disease, but instead slows the onset of illness following infection and provides a critical seven / ten day window to locate effective medical treatment. The expedition was highly likely to experience bats and there is now evidence to suggest that rabies may be contractible not only through bite injuries, but also through the inhalation of the infected guano dust.

Insect repellent was well advised as many biting insects were present and on several occasions their presence was felt. Most bites cleared quickly but some did develop into painful, minor infections despite rapid interven-

tion. Mosquitoes were apparent in rural areas, especially during the evenings and mosquito nets were a must in these locations.

Anti-malarial drugs were a subject of many debates and the team was split on this issue. Many took anti-malarials and some did not. Whilst the southern reaches of Guangxi Province does carry a malaria warning, the expedition was not attending in malaria season. Many team members took the decision that seasons are highly variable and it would a good precaution.

Everyone also took their own 'sharps' kit (clean needles etc), which is strongly recommended for all travellers in China. Such items must travel as hold baggage on airplanes, but at least a basic first aid kit including sharps should be moved into hand baggage, as soon as the flying part is finished. Travelling from Guilin to Jingxi, the hold baggage was transported separately in a truck. It soon became apparent that travel on the roads in China is potentially more dangerous than any of the caves and we realised we had made a possible mistake in becoming separated from our the medical kit.

On any expedition, drinking water is the greatest blessing and also the biggest curse. Clean water is vital to good health and must be constantly available. The expedition carried purification systems including chemical agents (each base kit carried iodine tincture) and pump / filter based systems which was capable of producing potable water from most available sources. During the expedition however, bottled water was almost always available and therefore water purification was largely unnecessary. However we would recommend that at least one water filtration pump be taken on an expedition such as this. Ours proved invaluable in Duo Ji where bottled water supplies were not so easy to get hold of.

Personal hygiene is of significant importance on expeditions, especially in hot and humid climates where bacteria growth is accelerated. Thorough cleansing regimes should be regularly followed both for the body and for clothing. The China expedition was lucky in that bathing was available in many base locations; certainly the government rest houses used all featured showering facilities and, more often than not, hot running water. The washing of clothes must also be considered, especially if away from 'normal' services. Generally, soaps and shower gels, if suitable for cleansing the body, will also be suitable for washing clothes. Hair conditioner is very similar to fabric conditioner and can be used as a substitute if required.

During the expedition, only minor injuries were sustained (cuts and bruises), although one incident (damaged knee ligaments resulting from a rock fall) did stop a team member caving for a week. Two minor infections were picked up, but these were both treated at the local hospital facility. Stomach upsets were not as common as expected, although every team member did experience some issues with this, although for the majority this cleared after 24 / 36 hrs. Several members however did experience longer-term problems, although it did not significantly impede their activities within the expedition.

It may be argued that, with hindsight, the expedition was over prepared for what was encountered, but only because the expedition experienced no major incidents. It is considered far safer to apply the adage 'expect the worst and you will not be disappointed', especially when it concerns other peoples' well being.

E. Surveying

For details of basic cave surveying practices we refer to *Cave Surveying* by Day. There are certainly a few tips to pass on though.

Lighting for the standard SUUNTO compass and clino was provided by a button-operated LED circuit powered by a small cell, the whole lot embedded in resin block (these were built by Paul Norman). The block is held against the instrument body by rubber bands. The LED is on the inside of the block and lights the instrument card, whilst the button is readily accessible on the outside of the block. The resin block design is completely watertight by design, and effectively disposable since the battery cannot be replaced, although in practice the battery will long outlast the duration of the expedition. For lighting the compass, it is important to use a non-ferrous battery.

Surveying from boats in river caves proved to be an interesting challenge. An efficient method was soon worked out involving four people split between two boats. The two boats were tied together by 60 m of float cord (ie the maximum length of the survey tape). The front boat would row ahead running out the tape until a convenient anchor point on the wall was found. A measurement was then taken from the back boat. Then one person in the back boat would pull on the float cord until the front boat was reached, with the other taking in the tape. This eliminated the need to row the back boat and speeds things up considerably.

Make sure each survey sheet is clearly numbered and identified by the date and the cave name. The first sheet should also record who was doing what in the team, and which instrument set was being used, because instrument corrections can depend on both the instrument and the person using it. Be clear when sketching passage details and make sure that survey stations are clearly marked on the drawing. We often found that extra stations were required (eg '1a', '1b' etc for stations down a side passage) but this is absolutely fine since modern survey software can easily cope with arbitrary station names.

We discovered to our consternation that left and right measurements in the LRUD data are ambiguous unless careful note is made of the direction the person was facing when they were recorded. This was important because some of our centrelines were surveyed with back bearings. The problem can be sorted out by careful study of the positions of the survey stations marked on the sketched passage details.

Review the data as soon as possible after the trip, so that any ambiguities can be resolved. This is especially important if multiple survey trips have to be tied together. For the same reason, get the data into a computer as soon as possible, and inspect the centreline plot (this will usually show up gross errors). Avoid the temptation to modify the data after entering it onto the computer, for instance don't be tempted to flip back bearings etc (which can be done too easily with the COMPASS software). The reason is that it is crucially important to be able to compare the computer data against the recorded data. You may end up doing this many months afterwards, so having as close a match as possible between the notes and the computer data is vital. At the very least, the details of any alterations should be noted in the computer data file, for example, for the occasional back bearing, swap the 'from' and 'to' stations and add a note to the effect that this is intentional. For the same reason, keep the station numbering identical to that used on the notes, and use the features of the survey software to distinguish between stations which happen to have the same numbers but are in different parts of the cave.

Cave surveying software: COMPASS and SURVEX were both used; COMPASS has a somewhat easier data entry system and can display passage walls using LRUD data, but one can prefer also SURVEX because it works with flat text files which can carry arbitrary notes. By way of aside, it is not always easy to associate LRUD data (a property of survey stations) with survey legs (which connect pairs of survey stations).

In expedition work, keeping a proper cave log is important. Arguably, a computer database system would be the best, if one could decide what information was necessary. For instance, in alpine karst areas where there are huge numbers of similar-looking, un-named cave entrances, the different entrances in an area receive a unique number, and are maybe even photographed with the number visible in the frame on A4 sheets. We didn't need anything as sophisticated as this in China because we were looking at obvious, named entrances. The minimum information that should be recorded is a GPS for the entrance, the local cave name (be aware that this may change as more information comes in), the local village name, and possibly a representative entrance photograph. As the cave is explored, make additional notes of the trips including dates, people, and details of surveying parties. At a later point, more information can be added such as the cave length, depth, etc. It is important to keep the field notes as up-to-date and complete as possible, otherwise sorting them all out later is much harder.

There is something to be said for drawing up the surveys in the field, but it is not that easy to get to publication quality. Thus such field-

drawn surveys are really only useful as guidance for drawing up final versions. On returning to the UK, all the original survey notes were collected together and scanned systematically, before being distributed to people to draw up final surveys.

The accuracy of the survey data can be judged where there are closed loops. In our case, two large closed loops exist, in different caves, and surveyed by various teams. In Wo Long Dong, the circuit around the walls of the large chambers was 1.35 km (55 legs) with a misclosure of 10 m (less than 0.8%). In Yin Quan, a loop can be built assuming a common water level for both sides of the middle sump. This gives another 1.35 km circuit (73 legs) with a vertical misclosure of less than 8 m (less than 0.6%). These errors seem acceptable for the claimed BCRA Grade 3c for the surveys.

F. Sponsorship

We are grateful for financial support from the following organisations:
- *Ghar Parau Foundation* The Foundation was originally set up in the 1970s using surplus funds from the Ghar Parau Expedition. The Foundation makes awards to caving expeditions all over the world in the spirit of true exploration.
- *Mount Everest Foundation* The Mount Everest Foundation was instigated after the ascent of Everest in 1953 and exists to encourage exploration of the mountain regions of the earth.
- *Craven Pothole Club* The Club made a very generous contribution to the expedition.

The following companies provided us with goods or services either free of charge or at considerably reduced rates:
- *Cathay Pacific* The airline gave us a very generous luggage allowance on our flights at no additional cost and which we surely needed as between fourteen of us we had half a tonne of equipment!
- *Computeach International Limited* Computeach was established in 1964 to provide IT training, and provided the expedition with boilersuits, pens for our Chinese friends and printing facilities.
- *Jordans* The largest UK owned breakfast cereal manufacturer and established for almost 150 years, W Jordans Cereals kindly provided us with a box of Frusli Raisin and Hazelnut cereal bars.
- *Kelloggs of GB Limited* Kelloggs sent us travelling with over 700 cereal bars which were an invaluable energy source whilst caving. It was a close call as to which bars were the most popular, Cocoa Pops, Rice Crispies, Blueberry Nutragrain, Ginger Elevenses, but the winner was the Special K bars!
- *Lifesystems Limited and Lifeventure Limited* For 15 years, Lifesystems and Lifeventure have been providing travel healthcare equipment for explorers, expeditions and travellers for across the globe adventures and gave us a substantial discount.
- *Total Access (UK) Limited* A leader in height safety support services for over 14 years, specialising in industrial rope access, Total Access kindly provided training facilities at their headquarters in Eccleshall, Staffordshire and assisted us in purchasing equipment at preferential rates.
- *Weatherwriter* Weatherwriter is a supplier of weatherproof writing boards and related accessories, and ensured that we were fully equipped with waterproof paper and folders which proved essential.
- *Zurich* Financial and investment experts Zurich, donated a pair of gloves for every expedition member for our caving activities.

G. Accounts

Table I shows income and expenditure for the expedition. We opted for an all-inclusive deal with the Karst Research Institute where $40 per person per day would cover all accommodation, food and transport costs on the ground. Insurance was arranged through the BCRA scheme as it operated at the time. Miscellaneous field expenses included phone-line internet access at

Expenditure	£	*Income*	£
Flights	10,248.00	Ghar Parau	600.00
Insurance	1,326.00	Mount Everest	750.00
Visas	420.00	CPC	1,400.00
Travel & accommodation	9,800.00	Team members	25,867.00
Misc. field expenses	437.00		
Innoculations	1,680.00	Equipment sale	362.50
First aid	280.00		
Equipment	1,848.00		
Photography	239.00		
Admin	137.50		
T-shirts	254.00		
Publication (est.)	900.00		
TOTAL	27,569.50		28,979.50

TABLE I: Expedition expenditure and income. Publication costs of £900 are an estimate at this stage. The excess of income over expenditure, £1410, is being held as cash in hand to cover publication costs. Any remaining surplus after publication will be distributed equitably back to the team members.

our main base hotels in Jingxi and Pingguo (this proved fairly straightforward to set up, thanks to Paul). Admin costs were incurred in the UK for several newsletters before the trip. T-shirts were printed not only for team members but also to give to our Chinese colleagues and local officials. Equipment included 600 m of 10 mm static rope to replenish the China Cave store, and quite a lot of gear (karabiners, tape for slings, etc) in a bulk order from Lyon equipment. Some of the equipment costs were recovered in a sealed-bid auction back to team members after the trip.

H. Expedition members

Tracey Beasley. Tracey joined the Club in 1994 and has caved across the world from New Zealand to Macedonia. She is not a fan of wet caves but enjoys cave photography, string trips and leading the Gaping Gill Winch Meet. She is currently a primary school teacher and found caving in China 'an amazing experience'.

Nick Blundell. Nick was introduced to caving in the early eighties by a school adventure club. He continued caving with both the Scout Association and friends until joining the Coventry University Caving Club, Wessex Caving Club and Northern Caving Club in the 90's. Nick joined the CPC in 1999, and an interest in international caving was fostered when he went on the club trip to the Gouffre Berger in 2000. He works as an engineer within the automotive engineering sector, and his other hobbies include walking, canyoning and 4×4 driving.

Mike Bottomley. The youngest member of the expedition, Mike was introduced to caving by his father (also a member of the CPC), and joined the Club in 2002, although he has taken part in Club caving meets since the age of 12 as a guest. Mike has caved extensively in the Yorkshire Dales, and has enjoyed one caving trip to Derbyshire. He is also a keen walker, and has completed the Tour du Mont Blanc twice (1998, 2001).

Arthur Champion. Arthur was introduced to the CPC whilst a Venture Scout living in Skipton, and joined in 1968. Since then he has caved extensively both in Britain and abroad. He has taken part in caving expeditions to Ireland (1970 and 1979), Iran (1972), Gouffre Berger and Yugoslavia (1973), Sardinia and PSM (1975), Ecuador (1976) and USA (1982). Arthur is also a keen explorer, and has made many extensions in many Yorkshire caves. He also co-wrote the book "Caving and Potholing" with David Judson.

Mike Clayton. Mike joined the CPC in 2000 and is a member of the Dudley Caving Club in the Midlands, where he is the training officer. Mike has caved in various locations around the

world including America, Middle East and Europe, usually with Emma Porter. He works in the Industrial Rope Access industry, running the training department for a company in the Midlands.

Kevin Gannon. The leader of the expedition, Kevin joined the CPC in 1996 after many years of caving, both in Britain and abroad, with clubs such as the Wessex Cave Club, and the Chelsea. Kevin was a key member of the club's trip to the Gouffre Berger in 2000. He is also an experienced mountaineer with many trips to the Alps, the Himalayas, and elsewhere.

Pete Jones. Pete, presently a Youth Worker, joined the CPC in 1993 and has been on trips from New Zealand to Macedonia. He enjoys any type of caving but prefers to avoid big rope trips, as he hates heights. He particularly likes cave photography and would like to go back to China as his main motivation is exploration. His caving activities in the UK reflect this, as sport caving seems to have taken a back seat as he spends his time digging.

Karen Lane. Karen joined the CPC in 1996 and has caved in France including the 2000 Berger trip, Mallorca, Ireland, and most recently Thailand and Laos, as well as extensively in the UK. Whilst she often says she is 'only a gardener', her knowledge of Chinese shrubs, trees and flowering plants was much appreciated by many members of the expedition.

Dave Milner. Dave joined the CPC in 1967 soon after his 16th birthday. He became hooked on caving after a trip down Bull Pot of the Witches. Since then, he has caved extensively in the Yorkshire Dales, and has enjoyed trips to Southern Ireland and Wales, as well as the Gouffre Berger in 2000. Dave has also played an active part on the Club's committee, and is a member and former secretary of the Upper Wharfedale Fell Rescue Association, which he joined in 1971. Dave acted as expedition treasurer.

Paul Norman. An all-round enthusiast with many years experience of caving, Paul joined the CPC in 1976. His experience gained on CPC trips to Sarawak was put into good use and he was able to contribute greatly on the technical side, putting much effort in before the expediton started. In particular, Paul's expertise in computers allowed him to let fellow CPC members back home know what was going on with regular updates on the expedition progress to his web site (believed to be one of the first times for a caving expedition in the field).

Brian Norton. Brian, also known variously as Dylan or Dillon, joined the CPC in 1980, and has also caved with the Wessex Cave Club. As well as caving trips in France, he has long enjoyed hill walking, scrambling and climbing, and has made many visits to the Pyrenees and Alps, and has also visited the Himalayas. He runs his own business, as a 'builder with distinction to people with taste'.

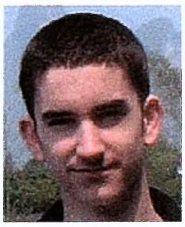
Emma Porter. Emma's first real caving trip was with Guides to P8 in Derbyshire reaching Sump 4 (drought conditions!) and then as a student, joining Wolverhampton University as it had a caving club, as well as offering law. Emma has caved extensively throughout Britain and Europe, as well as the USA and the Middle East. She currently manages an in-house legal department in her role as Company Secretary, for a group of companies in the Midlands and London.

Patrick Warren. Patrick started caving at an early age and joined the CPC in 1982. He has spent much time caving in the UK, and in Europe. After a period trying to bag 'big hills', he turned towards expedition caving with two trips to New Zealand in 2001 and 2002. Patrick was the deputy leader for the China expedition.

Mike Whitehouse. Mike was introduced to caving by his father (also a member of CPC), and joined the CPC in 1998, although he has taken part in Club activities for most of his life. He has caved extensively in the Yorkshire Dales, and has enjoyed caving trips to South Wales, Derbyshire and the Gouffre Berger in 2000 (which he also visited in 1994). Mike is currently a student at Bradford University, studying Electronic Image and Media Communication. His interests range from reading to Ten-Pin Bowling.


Tracey Beasley


Nick Blundell


Mike Bottomley


Arthur Champion


Mike Clayton


Kevin Gannon


Pete Jones


Karen Lane


Dave Milner


Paul Norman


Brian Norton


Emma Porter


Patrick Warren


Mike Whitehouse

FIG. 26: The official photograph and the expedition members.

I. The Craven Pothole Club

The Craven Pothole Club was founded in 1929 and since then has grown into one of the largest caving clubs in Britain. There are currently about 200 members from different parts of the country, with a small minority from other parts of the world including France, Germany and New Zealand.

The main objectives of the Club are still the same, to encourage and organise, for the benefit of members, the exploration of caves and potholes, fell walking, rock climbing, skiing and other similar outdoor pursuits.

The normal Club calendar consists mainly of regular trips to the caves and potholes of the Yorkshire Dales, as well as other popular caving areas, notably South Wales, Derbyshire and Ireland. The Club has also organised trips to many well-known caves outside of the British Isles, including the Gouffre Berger and the Reseau de la Pierre Saint Martin. Other popular meets include walking trips to other areas of the Dales and the Lake District, as well as digging and cycling meets.

One major annual event is the Gaping Gill Winch Meet, where for ten days in August, members of the public can be lowered 340 ft into the largest known underground chamber in Britain. This is organised and run by Club members, and provides an excellent opportunity for Club members to work together as a team and get to know each other.

The Club has its main headquarters and library in Skipton. This is where the monthly committee meetings take place. These meetings are vital to the successful running of the Club. A quarterly publication, *The Record*, keeps members informed of Club activities and general caving news.

The field headquarters of the Club, situated at Horton-in-Ribblesdale, comprises of: Ivy Cottage, a hostel sleeping approximately twenty-seven; Riverside, another cottage ideal for family use; outhouses with a tackle store and drying room and a private car park. The cottage is an ideal meeting point for both Club and private meets, being situated in the heart of the Yorkshire Dales and close to many important caving areas such as Penyghent and the Allotment.

The Club has a policy of keeping abreast of developments in the caving world, both on a local and national scale. This policy is achieved by Club representation on the Council of Northern Caving Clubs (CNCC), and by members who have served within the British Cave Research Association (BCRA) and the National Caving Association (NCA), and will no doubt contribute to the newly formed British Caving Association (BCA)

The Craven Pothole Club is also committed to the conservation of caves, and takes an active part in the restoration and maintenance of, for example, cave entrances etc.

The Craven Pothole Club,
Ivy Cottage,
Horton-in-Ribblesdale,
North Yorkshire,
BD24 0HF, UK.

J. Selected bibliography

The following articles and books may be of some use:

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WANG LONG DONG

Duo Ji Village, Jingxi County

GPS (downstream river entrance)
N 23° 07′ 28.5″ E 106° 36′ 07.5″

Total surveyed length 4.1km

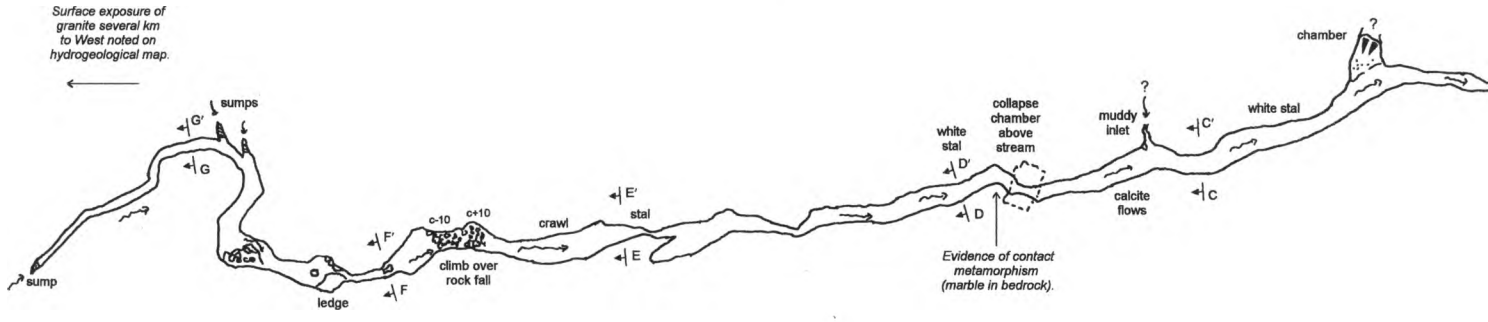
Length of main river = 1958m
Fall in main river (to base flow dam) = 17m

Length of inlet = 1933m
Fall in inlet = 6m

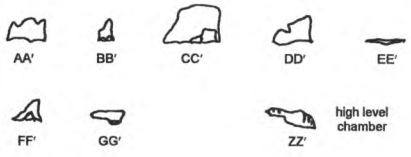
BCRA Grade 3c

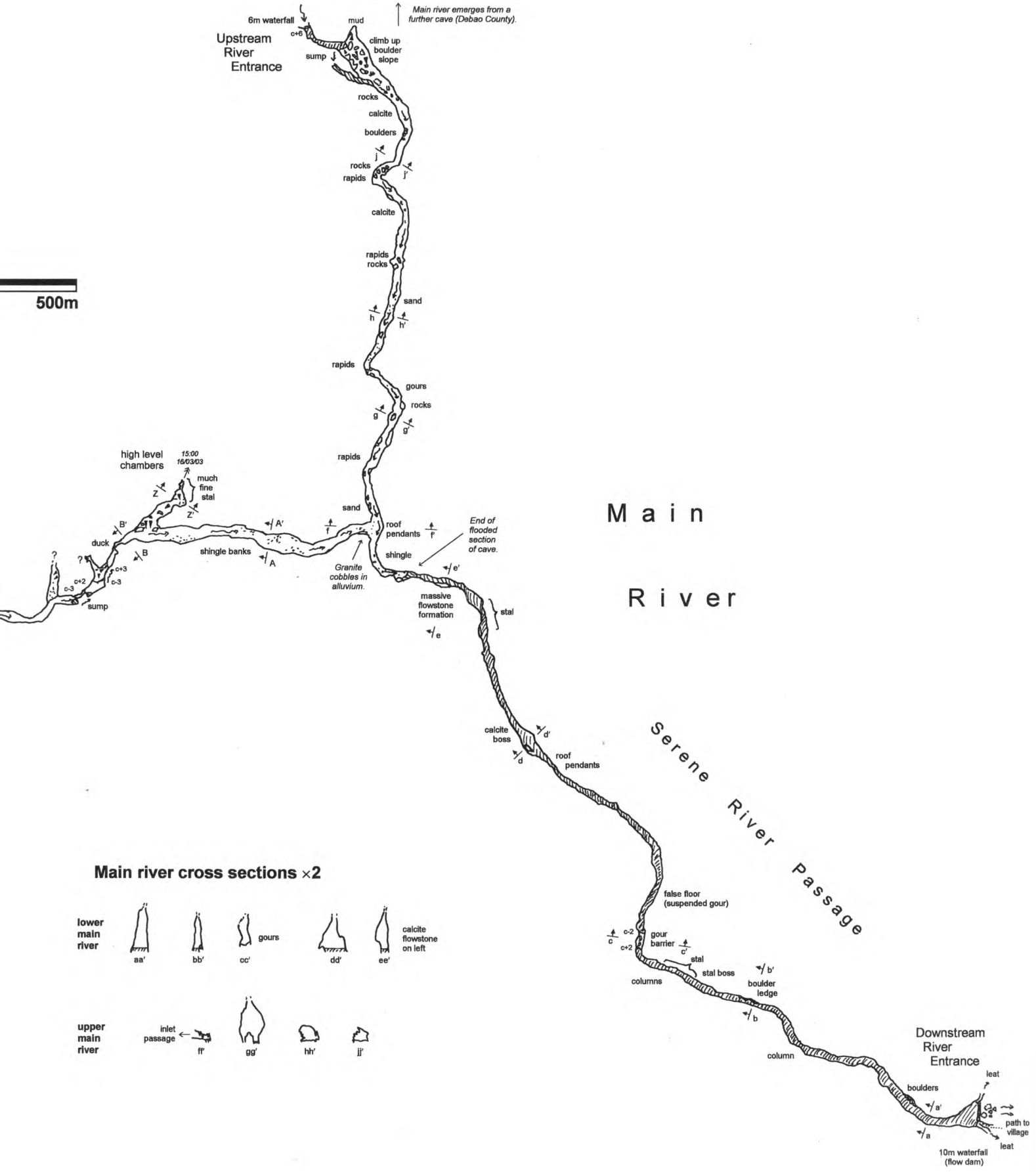
0

Inlet Series



Inlet cross sections ×2




Main river emerges from a further cave (Debao County).
6m waterfall
mud
Upstream River Entrance
c+6
sump
climb up boulder slope
rocks
calcite
boulders
rocks
rapids
calcite
rapids
rocks
500m
sand
rapids
gours
rocks
high level chambers
15:00 16/03/03
much fine stal
rapids
sand
roof pendants
End of flooded section of cave.
duck
shingle banks
shingle
Granite cobbles in alluvium.
massive flowstone formation
stal
sump
Main
River
calcite boss
roof pendants
Serene River Passage
false floor (suspended gour)
gour barrier
stal
stal boss
columns
boulder ledge
column
Downstream River Entrance
leat
boulders
path to village
leat
10m waterfall (flow dam)
Main river cross sections ×2
lower main river
aa′
bb′
cc′
gours
dd′
ee′
calcite flowstone on left
upper main river
inlet passage
ff′
gg′
hh′
jj′