

ST CUTHBERT'S SWALLET



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Introduction

Less well-known than many of Mendip's other major cave systems, St. Cuthbert's Swallet offers much to those whose interest extends beyond mere sporting activity. Not only does it contain fine pitches and streamways but it has numerous large chambers, some beautifully decorated, intricate phreatic mazes and up to seven distinct levels. It is without doubt Mendip's most complex cave system and, not generally realised, it contains perhaps the finest and greatest variety of formations in the area. Among its displays are found magnificent calcite groups such as the 'Curtains', 'Cascade', Gour Hall with its 20ft high gour, 'The Beehive', Canyon Series and the 'Balcony' formations in September Chamber, all of which are without peer in the country. There are also superb mini-formations including floating calcite crystals, over twenty nests of cave pearls, and delicate fern-like crystals less than four millimetres long; a variety that few other caves can boast. Access is strictly controlled by the Bristol Exploration Club (ref. Appendix 3 for details).

The BEC, formed in 1935, is today one of Britain's foremost caving clubs. It has been responsible for the discovery of a number of caves in various parts of the British Isles and overseas including Mendip, South Wales, Yorkshire, Ireland, Australia, Austria, France, Mexico, New Zealand, and Norway. It was largely through some of its then current membership that the Cave Diving Group was formed in 1946. Membership of the BEC is national in character and many members are actively engaged in most fields of speleological interest, national caving organisations and the Mendip Rescue Organization. Soon after the Second World War the BEC built their headquarters close to the St.Cuthbert's Minery and, due to the hydrology of the area, it was natural that they should investigate the potential of the valley known as the St. Cuthbert's Depression. In 1953 they met with success after several digging attempts.

Conservation was the prime reason for wishing to control access to the cave. To achieve this aim it was decided by the BEC at their 1955 Annual General Meeting to introduce a leader system. St. Cuthbert's Swallet was one of the first caves in the country to be so protected. This action has often been the centre of controversy. However, the fact remains that, after thirty years, the cave is essentially still in pristine condition and proven justification for the leader system.

It is the writer's intention to present and describe this fascinating cave, highlighting the important features, and hopefully unravel its more complicated zones. The use of left and right in Chapter 3 is always viewed in the direction of travel as described.

The data included in this publication has been compiled from published sources or items written especially for it. Most of the previously published items have been out of print for a great number of years and, even then, were only of very limited circulation. It was felt that these sources could be fully utilised, suitably edited and up-dated, without seeming to reprint them for their own sake. The presentation of the cave survey is largely novel and hopefully will encourage other surveyors to investigate new clarification techniques.

Chapter 2 has drawn heavily on material published in 1968 (Irwin, Stenner & Tilly). Chapter 3 has used material from various parts of the partially published BEC Caving Report No.13 (Craig, Irwin & Stenner, 1982; Irwin & Turner, 1970; Bennett, Irwin, King & Stenner, 1982). Other sources of information have been fully referenced in the text.

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Photographs

Roy Bennett(5); John Eatough(11,12); E.D.Evens(6); Chris Falshaw(8); Pete Glanvill (front & back covers, frontispiece, 1, 2, 9, 13, 14, 17, 18, 22, 25, 27, 28, 31, 32, 37, 39, 41-45, 47-49, 52-55); Martin Grass (10, 15, 16, 23, 24, 26, 33, 34, 50); Dave Irwin(30, 36, 38, 40, 46, 51); Kangy King (7); J.Harry Savoury (3, 4); Dave Turner (19-21, 35); Martin Webster (29).

Dave Irwin, Priddy, March 1991

Abbreviations

All abbreviations used throughout this publication are given on page 74.



1. Railway Tunnel.

1. Location

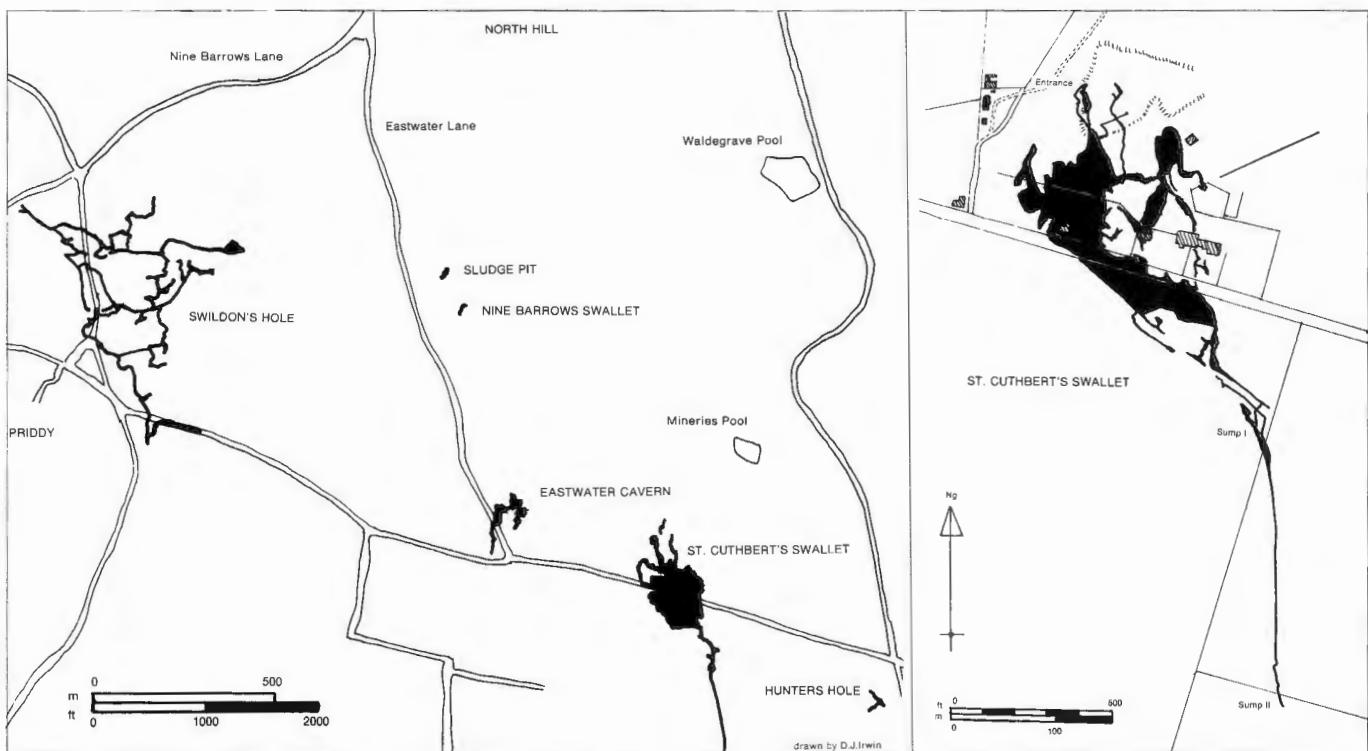


Fig. 1/2 Major Priddy caves related to the surface.

NGR: ST/5430. 5050
 Altitude: 789ft (240.5m)OD
 Length: 22,300ft (6800m)
 Depth: 477ft (145.5m)
 First entered: 4th September 1953

The cave has been scheduled a Site of Special Scientific Interest (S.S.S.I.) as defined within the 1981 Wildlife and Countryside Act. This gives the site statutory protection against potentially damaging activities. The care and maintenance of the cave is vested in the Bristol Exploration Club by agreement with the landowners, the Inveresk Paper Group.

St. Cuthbert's Swallet is among the known swallets at Priddy that resurge at Wookey Hole Cave together with Swildon's Hole, Eastwater Cavern, Cuckoo Cleeves, Nine Barrows Swallet, Sludge Pit, and the Hillgrove Swallets [Fig. 1]. The water catchment of the Wookey Hole Cave system extends from the village of Priddy (2 miles to the north-west of Wookey Hole Cave) to the Biddlecombe Valley, north of Wells. The three longest Mendip cave systems are included in this group — Swildon's Hole (30,000ft/9150m), St. Cuthbert's Swallet (22,300ft/6800m) and Wookey Hole Cave (12,000ft/3660m).

The gated entrance to the cave lies at the base of a low cliff near the southern end of an elongated valley [Fig. 2], much modified by mining activity during the 19th century. The ruins of the Priddy or St. Cuthbert's Minery (mine workings) lie on the eastern boundary of the valley. From the BEC Headquarters, The Belfry (NGR 542. 505), follow the well worn footpath leading to the Mineries Pool for 300ft. Take the right hand path at the fork, crossing the Fair Lady Well stream, and climb down steeply to the floor of the valley. The locked cave entrance is to the left.

The entrance lies at an altitude of 789ft OD. The overall length of the known system is approximately 22,300ft and the depth is 477ft terminating at Sump II at an altitude of 312ft OD. The height of the resurgence at Wookey Hole Cave is 201ft OD.

The source of the surface stream is about 1.5km north of the cave, some 700ft to the south of the Miners Arms (NGR 546.523). From there the stream flows down a wide, shallow valley between North Hill, to the west, and Stock Hill lying to the east. The stream encounters large artificial ponds some 400 yards to the south of the

source, the outflow from which forms the St. Cuthbert's Stream that flows down the valley to the cave entrance. The ponds were originally dug by the miners to store water for buddling purposes at the Chewton and Priddy Mineries. It is because of these ponds that the cave is rarely subjected to flash flooding. Following heavy rain the huge storage capacity of the Waldegrave and the Minery Pools enables the water to rise gradually. Some days after the rain, streams entering the cave will eventually reach their peak. Thus the water remains in semi-spate long after other caves, subject to flash flooding, have returned to their normal levels.

As a result of a High Court injunction granted to the Wookey Hole Cave paper mill (Hodgkinson v. Ennor, 1863), preventing contamination of the swallet water by lead mining activity, the land to the north and east of the cave entrance, generally known as The Plantation, was purchased by the owners of the mill, the Hodgkinson's, after the closure of the Priddy Minery in 1908. The injunction is still in force and forms part of the conditions of the access agreement between the paper mill and the BEC.



2. Helictite.

2. Discovery and Exploration

1944-1953: Digging

Following the closure of the leadworks on 23rd March 1908, interest in the area remained dormant for several years. Dismantling of the machinery left the buildings as empty shells which soon became ruins. A considerable amount of the rubble was used for building materials by the Priddy villagers.

H. E. Balch had observed the stream sinking at Plantation Swallet but his prime attention was focused upon Swildon's Hole and Eastwater Swallet (Balch, 1948, p. 135). The entrance to Plantation Swallet was modified about 1900 by the miners in an attempt to drain the water from the bottom of the large valley, including what was known as the South Swallet, that lay to the west of the minery. The remains of the miners' shoring can still be seen. By working the floor of the valley to such a low level the miners caused the stream that flowed into the South Swallet (now known as the Maypole Sink) to alter course and sink at a more southerly point. The South Swallet was left high and dry. The clay and boulders forming the floor of the valley at the new sink restricted the water flow. This caused near permanent flooding of the valley floor, often to a depth of one metre. A photograph of the flooded depression shows the Plantation Stream flowing into the South Swallet. Today we know that this sink drains directly into the Maypole Series.

In 1927 the lake, which was then a regular feature, disappeared in a matter of a few days, reforming subsequently for short periods only during the winter months. A decade later a collapse occurred near the stream sink in the form of an open hole but this was soon filled as it was a danger to both man and beast. This event was photographed by E. D. Evans, a Bristol photographer on Coronation Day 1937 (see photo 6, page 5). Evans also photographed Plantation Swallet as early as 1924 together with views of Eastwater Cavern and Swildon's Hole.

The first recorded effort to enter the cave system was at Plantation Swallet by Balch, Savory and others during 1920 and 1921 (Savory, 1989, page 120, 126-127 and 132). The UBSS were next in 1944 and following discussions with Jack Duck and Bert Russell, sought permission on the 24th June to excavate the site from Mr. Beacham, the landowner. Permission was granted and having inspected the site (3rd July) it was decided to commence work. At their August Bank Holiday camp the UBSS started work at Plantation Swallet and the following extract from their caving log gives an account of their activities.

...reached Priddy by 12 noon ... camp pitched in Farmer Blackham's field behind the old mine workings.

Plantation Swallet prospected and fencing put up ... it was found that the boulder which originally blocked the way on at the bottom of the wet swallet had sunk and it was now possible to gain access to a small chamber beyond, the floor was composed of mud and from the roof led a small rift presumably leading up to a sink hole in the field which it was proposed to dig. It was therefore decided to make the main effort on the wet swallet.

Sunday 6th. Aug. Work commenced on a pit ... when a small rift was entered. This was disappointingly small and the roof found to be very loose, so that work on it was temporarily abandoned.

Much excrement was removed from the wet swallet until it was found that the boulder was making work harder. A five inch hole was drilled in the top of it and 1½lb. of R.D.X. with a 2oz. fillet of Nitro was inserted, plastered and detonated from above. The rock was satisfactorily shattered and the top of it removed. Subsequent digging revealed a small crack to the right hand side of the boulder, but it was too small to enter.

Aug. 7th. Digging at Plantation continued. A rift on the far side of the boulder which had previously shown great promise was found too narrow on all sides; the back of the boulder was shattered with 2ozs. of Nitro but there was still found to be too little space in which to dig. A crowbar driven 3 feet into the mud choking the rift was found to encounter solid rock in all directions; all other possibilities of gaining access to the cave having been thoroughly examined and found impossible it was decided to give the dig up.

The shaft opposite the old mine workings was also examined and found unpromising.

In the immediate post-war years the BEC established their headquarters in the vicinity and it was natural that they became interested in the Plantation Swallet site. During 1949 several members of the club including J. and R. Ifold, Innes and Stanbury, made further attempts to open Plantation Swallet but to no avail. During the course of the next twenty years several further excavations were made but nothing of note was found due to the very tight and impenetrable rift joints. The earliest digs near the current cave entrance were undertaken in 1947 and 1949. The latter attempt by Collins and Rice, was on the site of the New Entrance and a depth of 15ft reached — only a yard or so from the passage that today leads to the Entrance Rift. Fear of reprisal from the landowners caused digging to be on a limited scale.

In 1951 a further dig was started against the rock outcrop to the south of the previous attempts, in a shallow gully. Bennett had noticed that the flood water sank against this face, but the diggers were faced with continual bank slip and only tight bedding planes



3. Stream entering Plantation Swallet, c. 1917.

were seen. During the winter of that year the depression flooded to an unusually high level and, by the spring the water had receded leaving an accumulation of flood debris at the foot of the exposed rock face. The fact that water had sunk at this point was sufficient encouragement for Bennett, Jones and Lamb to commence digging there. It was thought that by following the solid rock face, the collapses experienced by the previous diggers could be avoided.

The dig was started as a narrow shaft and, at a depth of about 6ft, air spaces and a draught were met. Sheerlegs were erected using three old railway lines fetched from Gibbet's Brow quarry on a motor cycle. The diggers worked unaided until the summer, when enthusiasm had begun to wane. Collins joined the diggers and, with the benefit of his greater experience, large boulders began to be removed. Eventually, explosives were needed and Coase, who had the necessary licence, joined the diggers. Waddon noted (1960):

... the cliff had been followed through red clay to a depth of 10ft. The clay contained charcoal from the 'old mine' higher up the valley. The spoil was used to build a barrier between the top of the shaft and the



4. Collapse near cave entrance, 1921.

pool, but in January 1953 the water had risen and it was lapping the top of the bank. In order to relieve the pressure on the shaft, a channel was cut through the clay bank. When the break was made the water rushed down into the shaft with a resounding gurgle, and the water level fell considerably.

During June 1953 it became necessary to widen the shaft and install shoring. This was the shaft used by visitors to St. Cuthbert's Swallet for the next eleven years. Waddon continues:

Further deepening of the shaft involved the removal of a mass of jammed rocks, but from a small hole in the floor of the shaft could be heard the sound of running water.

Collins' diary shows the date to be 25-26th July 1953. It was soon possible to get in under a large boulder, of uncertain stability, at the side of the shaft leading to a short crawl ending at the top of a 6in wide fissure.

Water from St. Cuthbert's Pool [wrote Waddon] gushed through a small tunnel on the left and poured down the pitch. Now came the tedious part of widening the rift and many manhours were spent with hammer and chisel, helped occasionally by the use of explosives.



5. Flooded depression, 1951.

Until August 1953 part of the Plantation Stream flowed into the valley. To reduce the volume of water entering the dig, a channel, known as Browne's Cutting, was made under the aqueduct directing the full stream down into Plantation Swallet. This was completed by September 1953. On the 30th August the small rift had been cleared sufficiently to allow Bennett and Marriott to descend to a depth of 15ft and on the 4th September the first full descent of the rift was made. Bennett and Brown were among the smallest cavers in the BEC at that time and were the first to bottom the pitch and explore to the head of a 25ft pitch opening out into a large chamber — Arête Chamber. The BEC caving log entry states:

V. Brown and R. Bennett got through. Rift opens into a small chamber with a chimney in the roof. Exploration continued to the top of a 30ft pitch.

1953: Discovery and exploration of Old Route

Excitement rose when Bennett and Brown returned from their preliminary investigation and confirmed that there was cave passage below. The 'Battle of the Bulge' had begun. By 20th September the Entrance Rift was wide enough to permit a caver of average size to descend it. Waddon wrote (1960),

...The Bulge was further attacked until evening when sufficient had been removed to permit the passage of an average sized man. So, three of us, armed with several lengths of lightweight ladder, descended to inspect the new cave. Roy Bennett squeezed down the rift first, then after a couple of vain attempts I managed to fit my body in the one spot wide enough to allow me to slither down to join him and Don Coase followed. For some time Don Coase was to be the broadest figure that could descend (and even more important, climb up) the Entrance Rift. We were in a narrow passage, with shale bands and chert nodules protruding from the limestone walls, with here and there specimens of the fossil coral (*Michelina*) looking like black honeycomb. Stepping carefully over the black void in the floor, we traversed over the false floor of large rocks and entered a small boulder chamber. Climbing down a ladder through one of the spaces between the boulders, we landed on the edge of a large block 20ft. below, which was aptly named "The Arête". The stream poured down into the Arête Chamber and divided into two, part disappearing over the boulders near the foot of the Arête, and part flowing into a passage to the north. Coase followed this second stream, but was

soon halted when it plunged down a steep and awesome pot. Meanwhile I had followed the other part of the stream through the floor of the Arête Chamber and found myself looking down into an impressive large stream passage. Guided by my voice, the others joined me and soon we had descended two short ladder pitches of 10 and 15 feet respectively (which we named the Ledge Pitches) and stood in a streamway, being sprayed by a waterfall from above.

Thrilled by the knowledge that ahead lay a virgin cave system awaiting exploration, we hastened triumphantly down a 60ft. high passage with water lapping our ankles, excitedly pointing out to each other various points of interest. Here were some fine botryoidal stalagmites of a dark red colour; there were many fossils jutting out of the limestone. We now entered a 2ft. wide rift with the floor descending steeply to a point where the water plunged down yet another drop which we named Waterfall Pitch. We had no further ladder with us, so Roy and I quickly traversed across this fearsome looking gulf getting occasional glimpses of white foaming water smashing against the black rocks below. Once across we realised that Coase had not joined in this enterprise, but had stopped and was looking at the traverse dubiously. "It looks ... dicey" he yelled. It was impossible not to agree, since the main holds in the traverse were afforded by bands of soft decaying shale standing proud of the eroded limestone. The traverse back against the natural dip of the strata promised to be an interesting operation. Bidding Coase adieu for the moment we pressed ahead along the rift, which now became much narrower. We crawled along a small stream passage but stopped when to go further would have meant crawling over a flow of pure white stalagmite. This we were unwilling to despoil until we had ascertained, by further exploration, that there was no other way past it. Later we discovered that this passage provided an alternative route via a 15ft. pitch to the Mud Hall Series of large chambers. The traverse back across the top of the Waterfall Pitch to rejoin Coase was accomplished thankfully without accident, but it was obvious that the rock would soon wear so smooth as to provide only insecure holds and we resolved that the traverse should not be repeated unless a lifeline was used. Much later a steel wire was erected, to provide a continuous handhold, across the traverse, and we named it the Wire Rift. There was little more to be done on this trip and so we returned to the surface. The climb up the narrow entrance rift was the most difficult part of all and could only be accomplished by holding onto the rope ladder with one foot and one hand, while thrusting the rest of the body up the rift until it jammed. The hold on the ladder was now shifted up to the next rung and process repeated, all the time with a cold shower of water pouring down...

Soaked to the skin, and very tired, we emerged into the night air exultant that we had been privileged to make the first descent of what promised to be a very large system. In view of the vertical nature of the cave which we had seen so far, we decided that the name of St. Cuthbert's Pot was appropriate, but later we changed it to St. Cuthbert's Swallet.

The following weekend (26th September) Bennett, Brown, Marriott, Paine and Waddon, returned to Waterfall Pitch — a wet descent of 20ft — to find another of 15ft immediately below. This they named Wet Pitch.

Waddon continues:

As the first man was climbing down the pitch (Waterfall Pitch), which fell vertically for 20ft, he looked up and saw to his horror that two large boulders, which had become dislodged by his descent, were held against the rock face by the ladder rungs, threatening to crash down on his head at any moment. Finding some convenient handholds, he leaned well back from the ladder which he then hauled towards him allowing the offending rocks to hurtle down out of harm's way.

Marriott and Brown stayed at the head of Waterfall Pitch to lifeline the rest of the party down. After the second pitch the party

...entered a steeply descending bedding plane. Seeing a black void between two boulders overhead I climbed up and put my head up into a large chamber and climbed into the inky blackness. The roof of this chamber was beyond the range of my carbide lamp. We later called this Mud Hall, but at the moment there was no time to explore so I hastened on downstream to catch up the other three. We found that the bedding plane led to an active stream passage with ways on both upstream and downstream. Moving downstream towards the boom of a waterfall we found that the stream plunged down a steep slope for some 15ft. We promptly named this the Water Chute and one after another slid down it with shouts of laughter. The gradient of the stream passage was now less steep and we walked across several pools and an area of deep continuous mud until we reached a circular chamber, 50ft high with a small waterfall falling from a passage high in the roof. The main stream disappeared in a choke of mud and gravel under the far wall of the chamber, which we named Traverse Chamber due to a narrow sloping ledge by which it was possible to traverse up into a sloping false bedding plane. An interesting feature which we saw here was a number of mud patterns from 2" to 4" high each surmounted by a piece of charcoal. At some time in the distant past flood water had apparently swept the

charcoal from the lead smelting works into the cave. Each piece of charcoal had subsequently shielded the mud immediately beneath it from the steady washing action of the water continually dripping from the cave roof.

It was time to return and we soon were standing at the bottom of the Water Chute looking up at the smooth rocks and considering how we could climb up this torrent of water down which we had slid so gleefully. Bennett and I climbed up the steep face at one side of the Water Chute and clinging precariously at mud covered holds we were able to assist the other two.

We decided that the next time we descended the Water Chute we would leave a rope to help us climb back up. At 11 pm on that Saturday night, after 9 hours underground we emerged into the wet night air just as our friends were getting anxious.

1953: Exploration of New Route

A fortnight later, on 11th October, Bennett, Coase and Setterington were in the cave again, this time to descend the "steep and awesome pot" found by Coase on the first trip. All available ladder, which was then not much, was taken and the pitch rigged. Although it was over 60ft in depth, only 40ft of ladder was required as at this depth a step-off ledge was found. A short traverse led to a vantage point (The Pulpit) and a further climb of about 10ft led to the base of the pitch. With Bennett lifeling, the party soon reached the bottom of the pitch, soaked to the skin by the small waterfall. The way on led through a high but gradually narrowing rift ending at a 20ft waterfall that presented no difficulties with a ladder (Gour Passage Pitch). Below this pitch the roof dropped to a height of 10-12ft and the stream now flowed over a number of gours followed by a series of small waterfalls until the explorers found themselves at the head of the Water Chute. This they named New Route. Since it only involved two pitches from Arête Chamber and was a much easier route technically, New Route was used regularly until fixed tackle was installed in 1955.

With the increasing number of pitches the tackle situation became rather an embarrassment as considerable quantities were being



6. Collapse near cave entrance, 1937.

borrowed from other clubs until new ladder had been built by the BEC. Waddon noted:

... All our spare time was now occupied in making more tackle since the amount of ladder required was progressively greater on each trip. We constructed some ultra-lightweight ladder of strong steel wire and very narrow aluminium rungs, so compact when rolled that 25ft could easily be carried in a boiler suit pocket. About this time we evolved a climbing aid which we christened a Knobbly Dog, consisting of a length of wire with wooden or aluminium blocks at intervals along it. This device took up very little space when coiled and provided an admirable method of negotiating short drops or obstacles like the Water Chute, which although not steep enough to warrant use of ladders, nevertheless required a climbing aid of some form.

1953: Exploration of the lower cave

A bypass to the choked streamway had not been found. So, with this in mind, on 25th October Coase once again led a party down Pulpit Pitch and on to Water Chute. Bennett located a small crawl through boulders to the east of Traverse Chamber that shortly regained the main streamway; this later became known as Bypass Passage. A sudden change took place in the passage scenery — the stream flowing silently through a trench cut in thick mud ran into a narrow, though lofty, rift with several short waterfalls. After about one hundred yards the stream again ran onto a gravel bed and the passage size increased and became distinctly solutional in character. A chamber that was to become Dining Room, both in name and function, was first noticed on the right, as were several holes in the left-hand wall, but the sound of yet another waterfall urged the explorers on. The stream ran into an impassable slot among great banks of mud covered stalagmite. At this point the explorers took the now commonly used route down the bypass rift and the duck at the bottom, though later a handline across the top of Stalagmite Pitch became the norm for several years. The explorers fastened a ladder to a doubtful-looking belay and gained the streamway below. The way on was over gour pools to a low passage of liquid mud, a passage later christened Sewer Passage, though today one might wonder at the name, the mud having been swept downstream by

the passage of cavers. At the end of Sewer Passage a large inlet stream, far greater than the stream that they had been following, was met. The only sink in the area on the surface with such a volume of water as this was the Plantation Stream. Though Coase doubted that this was the same water, it was not until 1961 that the Plantation Stream connection was rightly proved by chemical means. Downstream they went, over two large stalagmite barriers, until further progress was stopped by an awkward descent from an immense gour for which they had no tackle. This was located in a large chamber, Gour Hall, from which they viewed an enormous rift disappearing into the blackness. Convinced that they were on the verge of further considerable extensions they reluctantly retraced their steps for the long plod back to the surface.

The following week (31st October) Coase again organised a party of Bennett, Brown, Collins, Falshaw, Sandall and Waddon. This was to be one of the many long exploratory trips to be made into the system, lasting over 14 hours. The cave was entered at 4 pm but Collins failed to get down the Entrance Rift and so had to back out. Falshaw wrote the following description of the trip in his personal caving log:

...At the bottom [of the Entrance Rift] Don [Coase] and Roy [Bennett] went ahead to ladder the Arête Pitch... From the bottom of Pulpit Pitch we carried on down to a 20ft water slide and a rawlbolt inserted. On this was placed a length of chain and a knobbly dog. Passing on down we came to the first sump [The Choke] and passed it by climbing a shale slope and passage around it, re-entering it on the far side [Bypass Passage]. We journeyed on down the stream some way then left our kit and entered the right hand fork to look at some earthy stalagmites. This gave rise to a passage and a sandy crawl which entered a large chamber — 8.30 Chamber [Falshaw uses this name to describe Everest Passage, Boulder Chamber, Curtain Chamber and Upper Traverse Chamber] with many fine stals and other formations. Carbide was running low so we pressed on out to our kit. Then proceeding downstream to the next 20ft pitch [Stalagmite Pitch] we found a small chamber where we prepared a couple of tins of hot soup cooked on a Primus. Don and Roy put a rawlbolt in at the head of Stalagmite Pitch whilst Jack [Waddon] and I explored the muddy passages off the Dining Room. There were some fine solution passages and an aven [Mud Ball Chamber].



7. Don Coase in the Old Entrance, c. 1957.



8. A brew-up in the Dining Room.

We descended the pitch and entered the 'Sewer' an 'orrible passage ending in a short climb to a fair size chamber with a good stal. boss [Beehive Chamber]. We climbed a stalagmite cascade in the far corner with the aid of a knobbly dog and found ourselves at the top of a series of gours, one being especially large. After fitting another 'dog' we scrambled down the side of the large gours and rejoined the stream. This continued in a straight passage for about 150ft and ended unpleasantly in a sump. Roy climbed up a rift at the end and reported a passage leading off but was partially blocked with stalagmite pillars [The Bank Grill]. This seems to be the only way of passing the sump dry.

With expectations running so high the meeting of the sump (The Duck) was a great disappointment to the party. The sump was to be passed by Coase three years later only to gain a further, but very important, 150ft of passage.

The BEC kept no early records of the exploration of the cave. The first mention of the cave appeared in Belfry Bulletin No.79 in March 1954, seven months after the first descent (Alfie, 1954a).

1953: Dining Room — the explorers' base

It had become a regular practice to have some refreshment in Dining Room before setting off to explore the upper levels of this complicated system. The time and energy spent on getting into the system by means of conventional ladders meant that trips of 20 hours or longer were commonplace. The Dining Room was found to be an ideal base for these exploratory trips and was equipped with emergency food and cooking utensils. It became the practice to take canned food to Dining Room and place the cans at one end of the line of tins. If members of the party were intent on eating they would take a tin from the other end which would now be without labels. The resulting brew could be most stimulating!

To relieve the monotony of the 'cave colour', the walls of Dining Room were even painted with white distemper, the remains of which can be seen today. For some time after the walls were also used as a 'blackboard', the messages being written with carbide lamp smoke.

As a further aid to people working in the cave, a telephone wire was laid connecting Dining Room with The Belfry (a later extension was made to the SMCC hut). The work was undertaken by Prewer and completed on 4th April 1956. The phone worked for three years, finally being removed on 13th June 1959. The phone and the Primus stove made the Dining Room a friendly refuge during many a long trip in those years.

1953: The cross connections

On 12th December, Bennett, Dobbs, Falshaw, Petty and Waddon went to the Dining Room and immediately organised a brew-up of soup and tea. Whilst refreshing themselves with tea, a noise similar to that of a barking dog could be heard from the chamber above. At the time it was thought to be small stones falling on hollow stalagmite but is now known to be caused by water dripping into mud pockets and producing a hollow 'ploop' sound. The chamber was christened Cerberus Hall.

They made their way to Boulder Chamber and on to Upper Traverse Chamber where a hole in the boulder floor was located leading to

an abandoned streamway. Although less than 100ft long it entered the roof of Bypass Passage enabling a quick route to be made to and from both cave levels. This short passage was named Sentry Passage because of the upright boulder past which one has to squeeze.

Retracing their steps, a 15ft drop was laddered to gain a large chamber in the floor of Upper Traverse Chamber encountering another sizeable stream (Maypole Stream) at the foot of the ladder. Petty climbed up an awkward 10ft pitch but was halted by a sheer wall, over 25ft high, that had the stream pouring down it. It was another four years before this wall, Maypole Pitch, was scaled. Downstream of the ladder, the way on led very quickly to a 30ft wet pitch leading the explorers back into Traverse Chamber.

Back in Upper Traverse Chamber a climb to the top of the chamber led Falshaw and Petty into High Chamber. They returned to Dining Room for some more soup and Pemmican, a tin of which Waddon had obtained from the manufacturers for testing under cave conditions. No directions were supplied, so the party consumed the entire contents — a quantity which must have amounted to several man-days each! It was a rather sick party that finally returned to the surface after attempting some further exploration.

At the end of 1953 an agreement was drawn up between the BEC and the Wookey Paper Mills that empowered the former to control access to the cave and indemnify the landowners against all claims that might arise. The most important clause set in the agreement was that the water flowing through the cave was to be kept clean and unpolluted. As a result it was decided at the 1955 BEC Annual General Meeting that a leader system be set up for the following three reasons: to conserve the cave; to deal with the complexity of the system; to prevent general pollution of the waterways.

Though these proposals were vigorously opposed by certain members of the club, Coase won the day and it is largely due to his foresight that the cave system is still in the superb condition that it is today. There are no contemporary cave passages on Mendip as well preserved as those of St. Cuthbert's Swallet.



9. Water Chute.



10. Wire Rift.

1954: Rocky Boulder Passage and Cerberus Series

One further trip took place before the winter flooding prevented regular access until the spring; this was on 16th January 1954. Coase and his party including Bennett, Petty and Waddon, made another probe in the Mud Hall area and its associated passages including part of Rocky Boulder Series. Behind the column and stalagmites of Pillar Chamber, a small chamber and boulder ruckle were found. The ruckle did not go at this point, though Waddon found a poorly preserved mammoth tooth here. The passage from the chamber led to a 15ft deep pitch which was laddered after a certain amount of gardening had taken place (Rocky Boulder Pitch). This gave access to a ledge upon which stood a rock pillar that moved alarmingly when touched. This amusing feature gave the series its name. It was later pushed off by a visitor who lacked a sense of humour! Below this, some tubes were entered and a 20ft pitch — Oubliette Pitch — was found and believed to be choked at the bottom. However, in 1988 short extensions were found from this shaft — the oublie was no more! Beyond this series a fair-size boulder chamber, with a soft mud floor indicating recent flooding, was also pushed; the trip lasted over 20 hours.

The longest trip yet into the system took place on 20-21st March, one of 24 hours. The party consisted of Coase, Bagshaw, Bennett, Knibbs, Petty and Stafford. Substantial finds were made during this trip — Rat Run, Lake Chamber and the connection from Rat Run into Everest Passage. This was first passed by Stafford who found that he had a difficult squeeze to pass in the roof of the passage and at the same time was menaced by a small boulder bouncing against his nose that was just a little too big

to be snuffed aside! Today, after the passage of many cavers, the squeeze — although good fun — is about twice its original size. On the return journey to the surface Bennett explored a tributary passage above Water Chute at a small waterfall known as the Drinking Fountain — this was followed for over 200ft.

Further exploration of the Cerberus Series took place on 15th April when Coase, Petty and Falshaw also made the round trip from Mud Hall, via Pillar Chamber down to Boulder Chamber. Whilst tea was brewing in Dining Room, Petty decided to look at the now blocked off 'Harpic Hole' — the old carbide dump. He descended quite easily but the return was quite different. He became stuck and had to take off his old fireman's jacket. After much struggling and caustic comment from the rest of the party (Petty wasn't much into Anglo-Saxon English!) Petty dropped the jacket and couldn't make the descent again to retrieve it. In Falshaw's words, "Joe Soap had to descend and collect it. The hole was then re-named Fireman's Folly."

1954: Rabbit Warren Extension

A later trip (3rd July) marking the end of the initial exploration found Rabbit Warren Extension. Falshaw, Petty, Stafford and Waddon (Falshaw, pers comm)

...had a look round the Rabbit Warren and entered a passage previously un-explored via a 'semi squeeze' over a stal. floor [Rabbit Warren Extension]. This gave rise to a new series of passages with some good formations, notably stal. flows, helictites and a mud floor, paper thin and cracked. A passage was entered that gave rise to a long bedding plane [Continuation Chamber] containing the Plantation Stream.

1955: Installation of fixed tackle

Early trips into the cave were very long and strenuous. The vast improvement in caving gear since, especially the introduction of wet suits, makes it hard to realise the difficulties that had to be overcome. The soaking received in the Entrance Rift was a serious obstacle, and only in very dry weather would careful use of the surface dam dry that pitch. Various ingenious devices were made to ward off exposure. King (1967) wrote:

...Oilskins with hoods were employed in the perpetual stream of the Entrance Rift... Food was usually taken to be cooked in the Dining Room, and oh!, those bellyfuls of hot grub... Coase and Bennett donned drip deflectors (a small piece of metal attached at 90 degrees to the top rim of the carbide lamp reflector), camouflage oilskins and gas cape hoods ...

To cut down the time and effort needed to reach any part of the cave and thereby make working trips more useful, Coase and others



11. "Put the dam in!", c. 1956.

decided to install fixed tackle in Old Route — chosen because it was the dry route avoiding the two wet pitches of New Route then in general use. Steel ladders were cut to a maximum negotiable length and drilled and marked on the surface. In mid-February 1955 Bennett, Coase, King and a team of Sandhurst cadets fitted the ladders on the Arête, Ledge and Mud Hall pitches during a twelve-hour trip. Later that year an overhead wire for carrying tackle and a hand climbing line (Knobbly Dog) were fitted in the Wire Rift — hence its name. Wire Rift could be a frightening and dangerous obstacle, and there were to be several narrow escapes before it was decided that a steel ladder be placed across the top of Waterfall Pitch. This was done at the end of July 1957. The hand climbing line was renewed several times before it was replaced by a chain; this being finally removed some eight years later. A 30ft ladder was all that was now needed for parties visiting the cave. Originally it was the intention to remove the fixed tackle when all exploration and scientific work in the cave could be said to be complete. The ladders are still in use and although a group of cavers feel that they should be removed, there are still many thankful for their presence.

Coase, suffering from a serious heart condition, Bennett's National Service and Waddon's increasing interest in cave diving combined to drain the exploration of it's impetus. The final sump (The Duck) presented a seemingly impossible obstacle — it was badly choked with obstructions that prevented its approach.

1955: Initial surveying

By 1955 most of the large, accessible passages and chambers had been explored. A survey was being made by Coase and Collins starting at The Duck to what was then considered the highest standard possible. Collins (1960) remembered that the intention was

...to complete a continuous open traverse all the way to the entrance as a first step. From this point Coase intended to complete a series of closing traverses, which would fill in the remainder of the main routes through the cave and also check the accuracy of the original traverses.

1955: Discovery of Coral Series

The other major find during this period was the Coral Series (now part of Rocky Boulder Series), which was found on 12th December 1955 by Bennett and Jenkins. In Bennett's words (pers comm):

...From a promising recess in the N. W. corner of Boulder Chamber a rift was climbed to a small chamber with mud splash formations [Annexe Chamber]. After an abortive attempt to enlarge a tiny connection to something sizeable, a way round was found to a deep rift [Fracture Rift]. The right hand end of this led to a pitch, and the left hand to further extensions of the rift with overhanging boulders and some marks of recent falls. A hole in the side [Coral Squeeze] looked as if it might go and the spare carbide was left while we went for a quick look round. The way led past some corals to the side of a chamber [Coral Chamber] with a small stream which disappeared at the bottom. A small hole gave access to a bit of a chamber and a further descent took us to a final chamber recognised as the bottom of Rocky Boulder Series. Our lights were very low by this time and we found our way out with some difficulty, assisted in the lower section by some cairns erected on the way down. In this we were rather lucky as a subsequent trip into Rocky Boulder Series failed to find the connection into the series from Coral Chamber.

1955-1957: Other activities

Other discoveries in 1955 were the connection between Wire Rift and Mud Hall (20th November), the passing of Bank Grill in Gour Rift by Dunn, King and Prewer (9th September), and the link between Mud Ball Chamber and Lake Chamber (11th October). In the following year Bennett was able to extend the Coral Series, and also found Long Chamber but it was not until between 1962 and 1964 that the full potential of this part of the cave was exploited.

On the scientific side, Falshaw and Jenkins found the skull of a vole in Disappointment Passage in October 1955 and a small collection of fauna in the cave was made by Jenkins on 17th December 1955 (Hazelton, 1960). In November of that year Bennett measured stream temperatures at Plantation Junction which gave further evidence in support of the theory that the stream came from Plantation Swallet but this was not proved for several more years.

The first report of the system (Bennett, et al, 1956) was published in the BEC Caving Report series. A leader system was catering for tourist trips and details of access to the cave had been published by the club. The problem of rescue from the Entrance Rift had been solved by King (1957), but it was then the general opinion that rescue from the cave would not be successful for a seriously injured caver.

A second vigorous phase in the exploration of the cave began when Coase returned to partial health. The next chapter of exploration concentrated on three major areas of the cave, The Sump, Maypole Series and Rabbit Warren Extension. The thorough searching of the boulder falls off High Chamber and the upper reaches of Rabbit Warren Extension resulted in a connection between the two being made, Catgut Series, and culminated with the discovery of a number of beautifully decorated chambers called September Series. All this work commenced on 12th January 1957 in an 11 hour trip. Part of the party accompanying Coase descended to the then terminal sump (The Duck), the remainder continued surveying in Railway Tunnel after all had had a brew-up in Dining Room. This comprised a mug of tea, Christmas pudding and 'Cuthbert's Surprise' soup.

1957: The Sump

On 12th January 1957, the same day as the exploration of Maypole Series, after experiments in stream damming, much rock was removed in the sump pool (The Duck), including the big flake of rock which had formerly bisected the pool. The rock was found to be very brittle, and the sledge hammer and crowbar were very effective. The problems of passing the sump had been solved, but drier weather was needed.

Six months later Buxton and Coase with a strong support party dived the sump (The Duck) on 9th June 1957. Finding the next sump so soon afterwards was the second great disappointment Coase had in the cave (Coase, 1957):

...On a previous trip, John Buxton, with a misplaced sense of humour, got very wet in the sump probing around and, after dredging some of the gravel and mud out of the bottom of the pool with an empty paint tin, said he could get his feet up into a small air space a couple of feet beyond the right hand wall of the sump. A certain amount of hammering removed some of the obstructing rock but lack of a suitable crowbar slowed progress.

On Whitsunday, the assault was resumed, two crowbars being carried down. Buxton and Coase had the same idea and brought along diving dress. An hour and a half's work dredging the bottom under the sump produced a hole big enough to get through. The roof was knocked about a bit as well, but although a way was chiselled to within inches of the air surface on the other side, the remainder of the rock was not possible to remove without a lot of labour.

The airspace beyond was quite sizable enough to get one's head above water so Buxton and Coase had a polite chat persuading each other that he should go first. Coase eventually won on the basis that he had been first through Stoke Lane and therefore Buxton could have the honour ?? of Cuthbert's sump.

Not having a suitable reply, Buxton took a deep breath and disappeared. Within thirty seconds he returned, reported that it looked as if there was a way on and what was Coase waiting for? So back Buxton went followed by Coase and then started what must have been a worrying vigil for the support party (especially as the water was rising rapidly behind the temporary dam in Gour Hall). It was not for a quarter of an hour that the two returned and called for a crowbar, sledge and shovel. A further three quarters of an hour passed before they finally returned, having lowered the water level three inches and making the sump into a duck with three inches of airspace — just enough to get through on one's back with nose and mouth above water.

...[The sump is] not very promising although it may be possible for the gravel floor to be dug out to give room for a diver to investigate further.

It could be argued that St. Cuthbert's Swallet has four sums along the principle stream route, two of which can be bypassed. However the first two have adopted feature names (i.e. The Choke and The Duck) and the name Sump I is now given to that at the end of Sump Passage.

Coase took the first non-diving party, King and Miller, through The Duck on 28th July. King climbed into all the holes in the roof and Coase, maintaining hand contact, immersed himself into Sump I feet first. On the same trip a traverse wire was fitted on Stalagmite Pitch.



12. Maypoling to Hanging Chamber, 1958 cf. photograph 23.

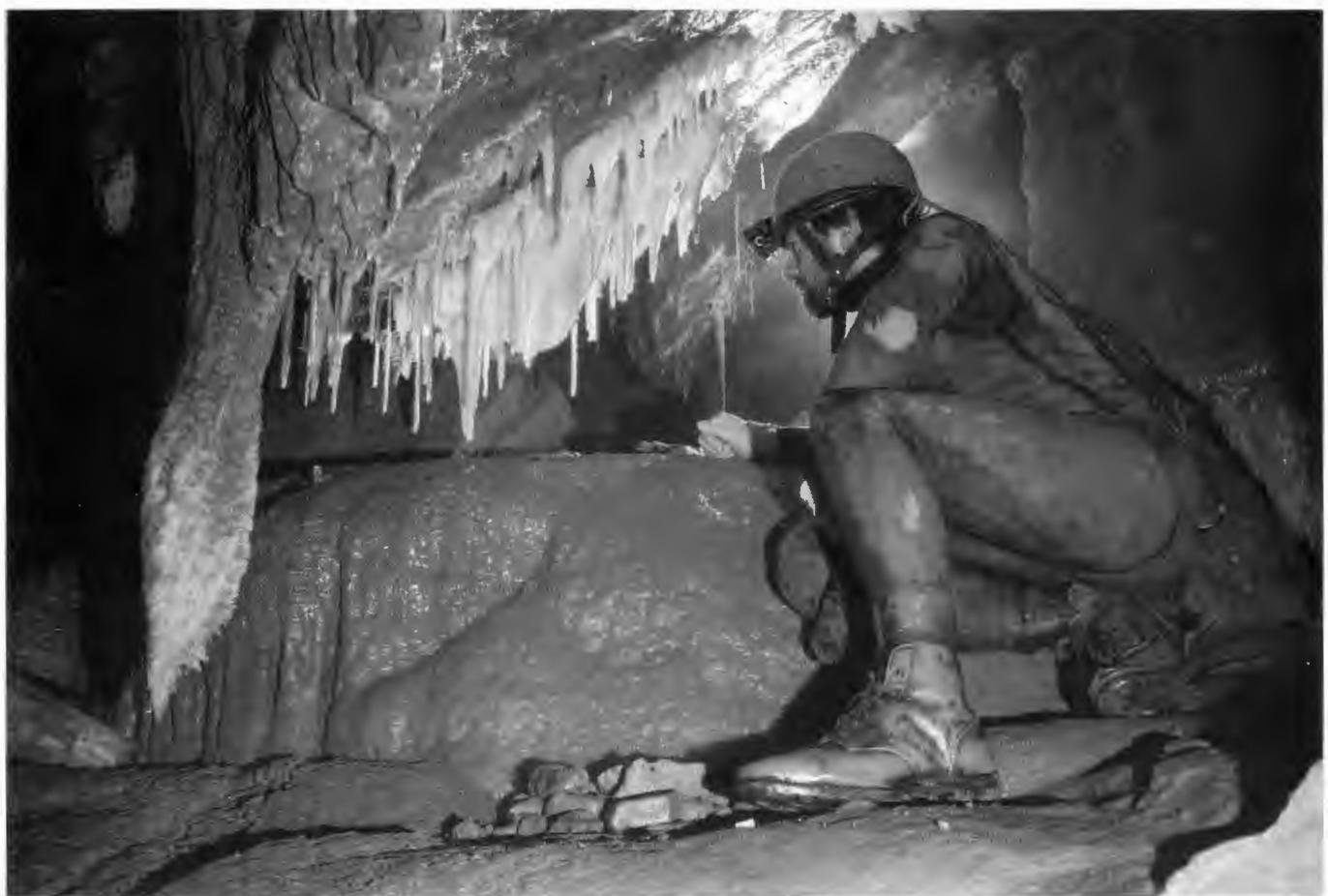
Later the original sump was bypassed by breaking through stal to give the present squeeze a yard or so upstream from the diving site.

1957-1958: Maypole Series and Hanging Chamber

On 12th January 1957, whilst Coase and Buxton were exploring Sump Passage, survey work was being carried out in the Railway Tunnel area. Breaking away from the surveying party, Jenkins and Rich climbed from Upper Traverse Chamber to what is now known as Maypole Pitch. They were halted by the 25ft waterfall that had stopped Petty more than three years earlier.

A month later (16th February), Coase (limited to one 'gentle' trip a month) was back at Upper Traverse Chamber with King, Petty, Rich and Stenner. Two nine-foot sections of the maypole were used to try to reach the top of the waterfall, but it was too short. King attempted to climb the waterfall and on up to Hanging Chamber but failed. The party retired very wet, cold and disappointed, but it was clear that with a third section of maypole the top would be reached.

A very strong party, Bennett, Coase, Jenkins, Petty, Rich and Waddon, assembled a few weeks later. The third section of maypole was fitted and, although the pole curved alarmingly, the top of the pitch was soon reached by Bennett. The rest of the party followed and the maypole was hauled up. The maypole was too long to get it around the corner to the next pitch and the spanner needed to dismantle it was back at the bottom, so the maypole was lowered down again. With everybody at the top of the pitch there was almost a calamity when the bottom of the maypole started to slide away down towards Short Chain Pitch. Petty and Waddon together grabbed the top of the maypole just in time! The spanner was fetched and soon the party had climbed Long Chain Pitch, then Chockstone Pitch. Pulley Pitch was finally reached. Rich climbed the ladder first, and instead of securing the top of the maypole he dashed off leaving Coase at the bottom — furious. Anger was replaced with concern when the crash of falling boulders was heard, but a few minutes later Rich reappeared at the top of the pitch to say that the end had been reached. This was confirmed by the others and the party maypoled back out. The impressiveness of the new



13. Formations in 'T' Junction Chamber.

Maypole Series had excited the party and further extensions were expected.

During the next two months Maypole Series was explored without further success by Coase, King, Rich, Sandall and Tuck. A collapse which travelled along the passage gave Escalator Passage its name. Charcoal found by Sandall in the boulder chamber at Terminus Chamber, and a large black beetle found by Tuck, led the party to believe they were close to the surface. Plans were made to survey the series to find the distance from the surface. This was carried out by King in 1958 who produced a line survey from Maypole Series to the cave entrance (King, 1958). Fixed tackle was installed by Rich, helped by Chamberlain, Coase, Ellis, Jenkins, Stenner and Tuck.

One of the enticing features of the Maypole Series was a high level hole 40ft above Maypole Pitch known as Hanging Chamber. King and others eventually explored this on 17th August 1958 by a masterly manœuvre. Davies' entry in the SMCC log (Biddle & Ellis, 1970, p.35) describes it:

Fred Davies joined five BEC members on a trip into St. Cuthbert's. Carrying quite a load of ladder and rope made our way to the Maypole Series. At the fixed steel ladder [Maypole Pitch] work started, climbed up then traversed back well above it. A piton hammered in and Pete Miller and I safely (in fact, not in feeling) ensconced on steeply sloping ledges in rope cradles. Maypole pushed across horizontally until the far end rested on floor of Hanging Chamber. Kangy (King) climbed the ladder from below, had difficulty in leaving it, anxious moment when pole slipped. Ladder belayed to Rawlbolt, pole removed and we all joined Kangy. I led up a fairly easy 15' climb of stal. flow, faced by another 15' vertical, the maypole dragged up for use on this. I led to a small pocket 5' diameter, mud floor, solid rock roof and walls. THE END. But many beautiful decorations can be seen. We retreated leaving the ladder hanging...

The huge aven in the roof above the entrance to Hanging Chamber has never been attempted. King, still in maypoling mood, on 3rd August 1958, attempted to climb a high level inlet (Maypole Alpha) parallel with, and on the western side of, Maypole Series in Upper Traverse Chamber. The passage was believed to approach Hanging Chamber, but the maypoling was not pushed to a conclusion because of a lack of equipment. This was later explored and the Hanging Chamber connection proved by Tilbury et al in 1982.

1957-1958: Rabbit Warren Extension and Catgut

Falshaw was available to resume work in the cave, and started digging in Rabbit Warren and Rabbit Warren Extension. With Coase, Ellis, Hudson (Mrs. Falshaw), King, Miller, Tuck and many others he spent much time and effort here during the summers of 1957 and 1958.

To bring together the work being done in Rabbit Warren Extension Coase, Eatough, Falshaw and King went there on 27th July 1957. Soapflake Pool was looked at, sadly destroying the soapflakes which have never returned. Three sites thought to be worth digging were noted. These were to be called Tin Mine (where water had been heard earlier), Octopus Chamber and Sausage Machine. The meagre finds here bore no relation to the efforts made (Coase & Falshaw, 1957).

Erratic Chamber was discovered on 4th August 1957 by Coase, Falshaw and four friends. The ends of this short passage were located by blowing tobacco smoke through it. A high level passage at Plantation Junction was noted, but not pushed until ten years later to a disappointing conclusion.

This appears to be the last trip made by Coase. His illness prevented any further trips and he died at Frenchay Hospital on 31st January 1958. As a tribute to him the club commissioned Daphne Towler to carve a memorial plaque. The plaque was taken to the Dining Room by Hill, Petty and Stenner on 28th February 1960 and was fixed into position on the east wall of Cerberus Hall. The work was completed on 3rd June 1961. Coase had been the driving force behind much of the work done in the cave and his influence is still felt today. He was acutely aware of the Club's responsibility to preserve the unique beauty of the cave.

During the winter of 1957 digging continued spasmodically. On one of these trips, on 29th December 1957, the Sausage Machine dig (so-called because a caver emerged from it extruded with a



14. Pillar Chamber.

smooth skin of mud) was abandoned when (Biddle & Ellis, 1970, p. 21):

...After some hours work in very restricted position we had progressed some four feet, then Fred [Davies] heard voices ahead ...

(and to his disgust came face to face with Kangy who had squeezed up another passage)

Tin Mine was the next discovery (14th June 1958), when the explorers broke through to find two streams flowing though it. A sump was attacked by Falshaw and Sandall on 5th July and a large high chamber was entered, but no outlet for the water was found. The dig had been named Tin Mine after a digging session there by Dawe (SMCC) — a Cornishman — earlier in April.

Falshaw switched his attention to High Chamber on 21st September 1957. In Tuck's words (pers comm):

...after a series of weekends digging in the Rabbit Warren Extension (Pressure Chamber) a party consisting of Chris [Falshaw], Pete Miller, Jim Goodwin and myself were having a thoroughly good look round in the bedding plane chamber to the right of High Chamber. Down on the left of the normal route through the bedding plane numerous Coase dog-ends indicated that a thorough exploration had already drawn a blank. Chris, who had been moving rocks at the top end of the chamber, announced that he had found a mansized hole. The four of us then went into the small chamber with its holes in the floor and pondered the way on ... a few large chockstones bit the dust (or rather the mud) as we descended. The bottom of the rift was full of slimy viscous mud, as were the deep grooves in the bedding plane at its end. It was indeed a worthwhile end to the trip to see the fine formations at the far end of the bedding plane, later ruined when the way through from T-Junction Chamber was forced. The name 'Catgut' was coined as a tribute to the enormous amount of mud and slime in the rift and bedding.

Ellis and Falshaw started to survey Rabbit Warren Extension on 6th August 1958 and were encountered by Francis and King who remarking, "We bet we can find cave faster than you can survey it.", forced a choked squeeze between Rabbit Warren Extention and Catgut Series. This was called Cross Legs Squeeze because that is what it does. The link with High Chamber enabled a large closed traverse to be completed later.



15. Entrance to Maypole Series.

1957-1958: Miscellaneous areas

Many smaller discoveries were made. Bennett found Hidden Chamber, a small bedding plane chamber that lies below Long Chamber, on 11th June 1957. Burt twice climbed in High Chamber, the more successful climb being on 9th June 1957. Petty, Prewer and Fincham dug open Ochre Rift (now blocked) while making more room at the bottom of the Entrance Shaft (to ease the shunting needed to reach the top of the Entrance Rift). Petty was physically too long to get into the new passage and Prewer and Fincham explored Ochre Rift on 24th July 1958 (Giles, 1964, p.53). Falshaw found some oxbows in Traverse Chamber on 24th May 1958, and on 3rd August he and Ellis maypoled Disappointment Pot, at the end of Disappointment Passage, to find about 100ft of very tight passage (Biddle & Ellis, 1970, p.34). On the same day Petty commenced digging a mud choke at Beehive Chamber; this became waterlogged and was abandoned, although several half-hearted attempts were made to rework the site during the 1960s and 1970s. Falshaw and Bennett explored the boulder complex between Boulder Chamber and the Railway Tunnel on 20th September.

Maypoling by King in Curtain Chamber on 13th July 1958 reached a high level passage from Upper Curtain Chamber to The Cascade (this passage was re-entered by Grimes in 1967, climbing an aven near Strike Passage).

Surveys were made of Maypole Series (King), Rabbit Warren Extension and Catgut Series (Ellis and Falshaw), and Railway Tunnel to Main Stream (Coase; Ellis and Falshaw). Water tracing (Ellis and Falshaw), water temperature work (Burt, Coase and Petty), experimentation with a portable V-notch weir (Falshaw), and sampling for chemical analysis (Coase, Ellis, Falshaw and Fowler) were all undertaken in this period.

1958: Discovery of September Series

In August 1958 work proceeded at the High Chamber end of the Catgut boulder ruckle and after moving a few boulders the explorers were able to penetrate some 50ft (Falshaw and Hudson). The next day Wheadon and Palmer were able to follow up Falshaw's suggestion and searched through the boulder ruckle of the Catgut Series to try to find its depth and, if possible, what lay beyond it. Wheadon and Palmer (pers comm) remember that:

After pressing two devious routes through the ruckle to nowhere a way was found into a chamber of quite large dimensions. From the ruckle a view of a large stalagmite boss gave the name Cone Chamber. At this stage only the downstream passage was explored, as far as the sump. The passage was originally nicknamed P.W. [Palmer-Wheadon], but since the later discovery of the present route through the ruckle this part of the series is now only rarely visited.

The explorers were now extremely keen, and evening parties of Wheadon, Palmer, Prewer, Francis, Neil combinations attempted to press the upstream section, terminating at Illusion Chamber and Paperweight Chambers. At this stage it appeared that this was the extremity of the series. However, on the 21st September 1958 Dawe (SMCC) recorded in the caving log (Biddle & Ellis, 1970, p.38):

Trip to St. Cuthbert's with Mike Wheadon. Supposed to be tourist but made a magnificent discovery. The route was to the sump, back via the 'tin mine' thro' cat-gut and Cat-gut Extension [later named the September Series] to High Chamber... Part of the way along the ruckle is a small chamber with a couple of passages leading off which Mike has previously noticed. So we went along about 20' of passage, up a 10' chimney and entered a new, huge chamber... As good formations as any in St. C. except perhaps for the great Cascade ... Its amazing tho'. Hours of work have often produced nothing, yet we almost blundered into this place.

There was time to view the 'Balcony' formations and make notes for further exploration.

Evening trips on 22nd and 23rd September by the same team combination pushed the series to its present limits. Names followed later, beginning with Nelson's Column because of the column at the lower end of September Chamber and the proximity of 21st October. This was followed by Victory Passage and the Strand, the whole series being named September Series.

It was hoped that there would be a possibility of finding the extremity of the boulder ruckle, and further trips were made. On one of these the present route was found and provided a bypass for

Cone, Illusion and Paperweight Chambers. The previous opening of the Rabbit Warren Extension to Catgut connection made the round trip to September possible, and many people probed the series hoping to extend it. Trafalgar Aven provided one hope. Beyond Cone Chamber the downstream sump was probed and found to be heavily silted. A later trip (1967) to the site, however, showed it to be no longer a sump but a heavily silted duck, its position having moved some 10ft downstream.

Further small finds were made by Roberts on 12th and 19th March 1961 and Giles, Luckwill and Pyke on 25th February 1962. Rifts in Victory Passage were probed by Francis, Palmer and Wheadon on 27th July 1962, and found nothing more than a small series of oxbows.

1958-1961: Digging here and there

Many of the leaders who had been working in the cave moved away from the area. Falshaw and King returned to being students; Ellis, Prewer, Tuck and Wheadon were called up to start their National Service; Rich went to Canada. The leaders were no longer a closely knit part of the club working together with common objectives in the cave. There were grumbles about lack of care with the preservation of the cave, and it became necessary for the leaders to meet formally. The first leaders meeting was in November 1961. Marriott published the first leaders' Newsheet in January 1962.

On 8th November 1958 a member of a tourist party led by Stafford dislodged a boulder that jammed in the Entrance Rift, closing the cave to tourists for a time. The boulder was disintegrated by Price, assisted by Prewer, on 10th January 1959. In doing so part of the 'Bulge' was removed at the same time.

The complexities of Rocky Boulder Series caused Francis, Wheadon and Wright to spend a baffling time in the boulder complex under Quarry Corner on 5th April 1959. Later a small passage, found on 19th March 1961 by Baker and Stenner, was investigated on the 10th April by Baker and Giles. During the examination the passage, formed by layers of gravel, collapsed quite literally and excitingly. The find was called Sugar Bowl Chamber. The chamber was later visited by Francis, Palmer and Wheadon on the 7th July 1962. The entrance to the chamber had completely collapsed and a boulder ruckle leading back to Quarry Corner took its place. Sugar Bowl Chamber was re-discovered by Irwin and Turner on a 1971 surveying trip in Rocky Boulder Passage near Oubliette Pitch. Bennett with Attwood, K & P Franklin and King climbed a short wall at the top of Coral Chamber on 18th July 1961 and discovered Far Chamber. On 3rd June 1961 a dig was started by Marriott and the Franklin brothers in Main Stream Passage just upstream of Dining Room entrance. The diggers were helped by Miller and Tuck the following weekend, and then the dig was abandoned. The site was dug later by Large and others revealing a small chamber under Dining Room. The stream was diverted into the dig and it swallowed the whole of the stream, which it still does in low water conditions. Water from the dig was later traced to a pool under Cerberus Hall and to the lake, but the hydrology here remains very much a mystery.

Eatough and King discovered Purgatory Passage and Echo Chamber, probing to the right just before reaching High Chamber from Upper Traverse Chamber. Baker and Cornwell dug in the Cerberus Series on 29th June 1962 and Eatough, C. and V. Falshaw and Petty started the dig in the passage at the downstream end of Bypass Passage on 24th September 1961. The latter dig was later continued by Petty and Meadon becoming known as '100ft-a-day-passage'.

1959-1962: Research and surveying

Scientific work continued in the cave. The use of an accurate aneroid barometer as an aid to surveying in the cave was investigated by Stenner (1959). Luminescence noticed by photographers in September Series was investigated by Luckwill (1962) and Ford worked on the geomorphology of the system involving seven trips during the summer of 1961 (Ford, 1963a, 1964b, 1964c). Water tracing experiments were carried out by Ellis, and the connection between Plantation Swallet and Plantation Junction was finally proved (Ellis, 1961, 1962a, 1962b).



16. Balcony formations, September Chamber.

Surveying was continued by various people. It was hoped that someone would continue the accurate survey started by Coase. Collins and Rollason (Tuck) started to survey from the Entrance using a modified astro-compass as favoured by Coase, on 12th April 1959 but they were unable to use this instrument to survey down the Entrance Pitch! Using the same instruments Stenner and Hobbs attempted to continue the survey from Coase's last station on 14th June 1959. Stenner concluded that the instrument was unsuitable for making an accurate survey of the cave. Meanwhile Ellis's 'less accurate' survey was continuing. He surveyed Upper Traverse Chamber and Rabbit Warren from 1959 to 1961 and New Route to Traverse Chamber with the passage to Mud Hall in 1961. In connection with his geological work, Ford made a survey from the Duck to the Entrance in 1961. The route was the stream passage to Everest Passage, across Boulder Chamber to Old Route. Accuracy of the centre line was similar to that obtained by Ellis. As a result of decisions made at the first leaders' meeting a survey of September Series was made by Roberts (December 1961 – March 1962), and of the Cerberus Series by Marriott et al. (February 1962). All of these various surveys were combined into one whole by Ellis and published as a preliminary survey of the cave (Ellis et al, 1962a). A survey of Waterfall Pitch route was started by Stenner later in 1962.

1960: Rescues

There were two incidents in the cave in 1960; on 24th January and 27th August. On both occasions the Fire Brigade was called to pump the water from the depression. Describing the January incident Holland recorded that the cave was very wet and (Giles, 1964, p 64):

...Upon arrival [at the Belfry], we were greeted with a scene of great speleo pandemonium; it would appear that a number of the GSS [Gloucester Spel. Soc.] party were trapped below the entrance rift (which was very wet and horrid). The MRO were summoned at 7.45 pm. The Fire Service was summoned to pump the stream into Plantation Swallet. After an hour or so the stream dried up completely and the task of persuading the blokes that 10 inches was not too tight to squeeze through

and at 2.00 am. the last man was out... The Press, BBC and ITV were there in hordes, not to mention Police and Firemen...

Brief details from the Mendip Rescue Organization records of official call-outs for St. Cuthbert's Swallet are given in Appendix 4.

As a result of these rescues the BEC decided to dig a culvert to control drainage in the depression during wet weather. This was not carried out until the summer of 1965 and, since that time, the cave has only been closed on rare occasions during the winter months. On 24th September 1961 Stenner made a survey of the passages in the entrance to enable a correct alignment of the culvert to be made. It was at once obvious that a second entrance to the cave could be dug here since the wooden entrance shaft, in constant use since the opening of the cave, was becoming increasingly unsafe. Stenner's survey was checked by Collins, Giles and Setterington on 3rd June 1962. Digging started and on the 30th July contact with the passage below was made. 'Chemical persuasion' was needed and this was supplied by Giles and Thompson on 16th September 1961, who then made the first 'through trip'. A concrete pipe shaft was fitted into position but for a while the stability of the new entrance fluctuated. The work upset the jammed boulders in the Entrance Pitch and falling debris was an added discomfort during August and September 1962. Both entrances were in regular use by the summer of 1963. The Old Entrance was finally filled-in during 1964.

1959-1968: Work at Sump I

Sump I regularly attracted diggers and divers. After Coase's initial examination of the sump discovering that it was badly choked discouraged divers from making further attempts. However the possibilities of digging the choke at the side of the stream path gave sufficient encouragement to believe that all was not lost. Boon (SMCC) having re-opened the Duck, Sump I was inspected again by Marriott, Thompson and Whealon on 2nd May 1959, and a dig was started to the left of the sump pool on 6th June 1959 by Falshaw, Marriott and Thompson. This was a short lived attempt and it was not until four years later, on 30th July 1963, Thompson (SMCC),

Giles and Miller re-commenced digging at the sump. Giles wrote (Giles, 1964, p.93):

...The sump was probed with a rubber ball on a string, fed into the sump on a rod but the ball was lost. It was hoped that the ball could be floated on through and thus an idea of its length gained...

A few weeks later (17th August) Giles returned to the site with Hart to make another attempt at finding out the length of Sump I. This time the float was made of a short length of weighted plastic tubing so that it acted as a 'fishing float' being inserted into the sump on the end of an eight foot long pole and then released by an electrical device. The WCC log contains the following account of the trip (Giles, 1964, pp.94-95):

...The float was electrically connected to an ammeter ... by means of a long flexible and very light insulated wire. The end of the wire connected to the float was bared, and whenever the float floated upright (as it would with free water surface) the end of the wire was clear of the water ... Thus airspaces could be detected and their distance away corresponds to the length of wire paid out ... After several unsuccessful attempts ...

Although ingenious, the device did not work and Giles surmised that Sump I was short but possibly changed direction underwater or the angle of the bedding prevented the float from working. On 18th August, a party including Wynne-Roberts, Cleave and Cornwell attacked the sump again by diving. The sump was open for 6ft and Wynne-Roberts reported that underwater digging was possible. Though the supporting cavers dug at the left side of the sump, it was generally agreed that the main probe should be the sump itself. Thompson, Wynne-Roberts and Davies continued to dig under appalling conditions excavating a passage claimed to be 14ft in length — as events were to turn out they were very close to success. The WCC Hillgrove Log Books contain a sketch of the divers problems (Giles, 1964, p.93).

In 1966 Cornwell turned his attention to the Gour Rift and Sump Passage area. After several vain attempts at digging at the sump and near The Duck, he concluded that a series of dams to hold back the water, and then bailing the sump, would be the only way that cavers without diving equipment would pass the obstacle. This work at Sump I stirred the interest of three BEC members of the Cave



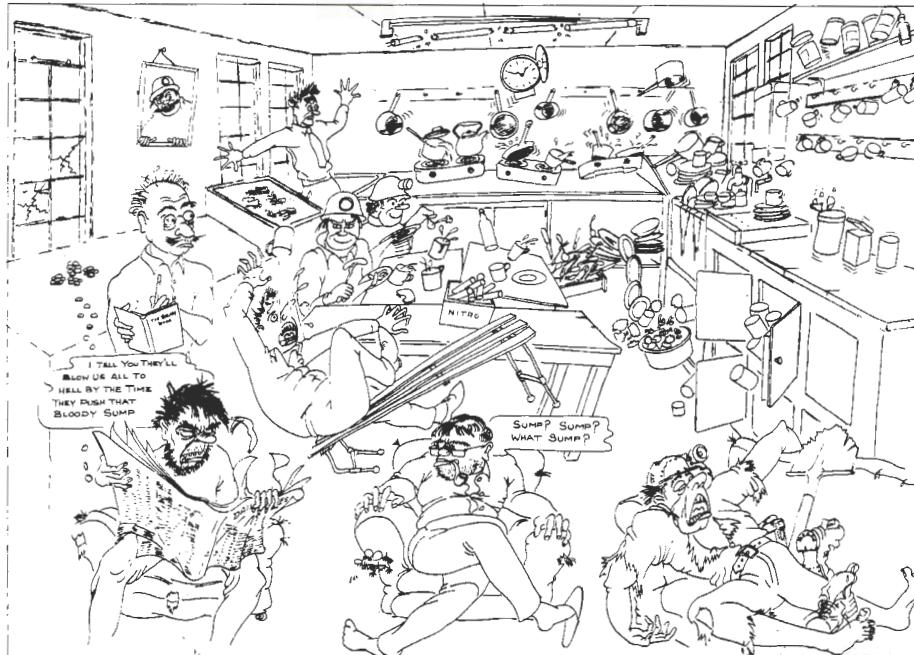
17. Victory Passage.

Diving Group (Jeanmaire, Kingston and Lane). After discussion with the divers, Bennett and Irwin organised groups of cavers to take part in a massive round-the-clock digging operation to be held over the weekend of 5th-7th February 1967. The CDG members encouraged many divers to be present. Enthusiasm grew even greater when Drew's water tracing results (Atkinson et al, 1967, p.14) indicated that St. Cuthbert's Swallet had great potential beyond the terminal sump. For the occasion, Mineries Pool was dammed at the outlet and so prevented from draining into Plantation Swallet and the stream flowing down the valley to the cave entrance was prevented from entering the cave by another series of dams. Support for this project was tremendous and never had Mendip seen such co-operation on a single operation. Over 60 cavers were involved in a round-the-clock digging operation, each group broken down into either bailing or digging teams. The CDG members involved organised themselves during the course of the event and remained on standby, at the sump, until it was practical for them to dig under water. The amazing thing is that the diggers kept to the programme timetable whatever the time of day. The writer on one occasion returning to the surface met an SMCC party descending the Ledge Pitches at 5 o'clock in the morning right on time to the digging programme. It was a fantastic operation. The weekend, however, did not produce the result hoped for. Due to several factors the project collapsed during the early hours of Sunday morning. Kingston (1967) wrote:

...This operation was based on two sets of teams — the digging and the diving teams. The job of the diggers was to clear the trench into the sump and to enlarge it as far as they could reach. When this limit had been reached, the divers would then set about digging underwater and the diggers would remove the spoil into Gour Rift. ... The first digging team then dug a trench into the sump and widened the sump passage. The first diving team assembled and tested the 'surface demand' breathing apparatus and then helped with the digging. Digging continued on until two o'clock on Sunday morning when it was decided that the diggers were of no further use, and the teams from there on were reduced in size. Three men were retained to assist the divers, who were carrying on digging underwater. The digging became subject to setbacks caused by the undermining of the silt banks by the stream and resulted in their collapse. Diving continued until two o'clock when the increased water coming into the cave, and the extremely cold conditions under which the divers worked during their ten minute submersions, resulted in the abandonment of the diving. All that remained was to retrieve the gear ... From the diving point of view, the surface demand B.A. was found to be too expensive on air and diving tended towards the use of self contained sets. The actual digging under water was carried out by means of a small garden trowel which was used to push spoil into the sides of the sump. The final distance into the sump reached during the weekend was nine to ten feet.

The problems associated with this attempt had not been met before by Mendip cavers. It was the largest event ever to take place and for the first time, the effort was a multi-club affair which finally broke down the stupid 'them and us' attitude that had reigned supreme for years. The digging, principally by Kingston, Lane and Priddle, gave a good insight to the character and shape of the sump. They dug into it for a distance of 9ft discovering a mini-rift feature in the roof. This they followed to the left for about 5ft until they encountered a sandbank which prevented any further easy progress. Kingston (pers comm) stated that beyond this barrier he could wave a stick around which indicated a caveable size but sumped passage. The work of that weekend encouraged the divers to sustain the momentum by continuing to dig underwater throughout that year. The floods of July 1968 put paid to any further work as all the effort by the divers had been destroyed overnight by the volume of water re-choking the sump with gravel. The mini-rift was found again during the 1969 sump dig.

The next sequence of discoveries occurred on the western side of the cave in the Long Chamber and Coral Chamber areas. For years



Jok's impression of the 1967 Sump dig.

cavers had been puzzled about this complex zone — in some cases making the same discovery on several occasions. The first major event was the discovery of Long Chamber Extension.

1962: Discovery of Long Chamber Extension

On 1st April 1962, after pushing passages above Fracture Rift without success with Eatough, K. Franklin and Marriott. Baker found a 20ft blind pothole at the top of Coral Chamber – Coral Pot. Due to lack of tackle the first descent was not until the 6th May when Bennett, Baker, Eatough, Grimes and the Franklin brothers laddered the shaft but found no way on. Whilst the rest of the party went out, Bennett and Eatough went back to Long Chamber. Probing The Slabs south of Long Chamber they worked their way through the boulders at the far side and discovered Long Chamber Extension; thus began another important phase of the exploration of the cave. This work was to fulfil a forecast by Ford (1962) who wrote:

...the main water supply ... came ... from the Rocky Boulder area. This should 'go' much more than it has done, back up to the surface. However I won't guarantee that it is not (a) solidly choked, (b) collapsed anyway.

After the descent of Coral Pot, Bennett and Eatough (1962) moved to Long Chamber on reaching the conclusion

...that further passages probably lay above the then known limits of Coral Series, and so a systematic search was made. During this search many small holes were probed. In Long Chamber, I [Eatough] managed to find a way into a boulder ruckle, and pushed through into what was obviously a very large chamber. I immediately went back for Roy and together we made a preliminary investigation. This large chamber was found to lie along the fault which forms the western limit of the St. Cuthbert's system, in a position between Curtain Chamber and Coral Series and thus fills a gap in the survey. We found that the chamber was of considerable size and in places was divided into smaller chambers by a tremendous confusion of boulders lying against the hanging wall of the fault. We went into the boulders at the north end of the chamber into a further large chamber, then into more boulders that have so far halted progress to the north. We left a cairn at this point.

Back in the second boulder ruckle we entered, we found a pile of stones which after much discussion, we decided might be a cairn left by another party but a careful search revealed that no previous party had entered the new system by the way we had entered it. We decided that further investigations were required.

On the way out of this chamber we had a quick look at the boulder ruckle at the south end of the chamber, noting a small passage that was not entered, but we did see a fine nest of cave pearls and quite a lot of good formations. Following the discovery of this chamber I made two more trips to the area, this time accompanied by John Attwood and Kangy [King]. During these trips, we pushed on in several directions and found quite a lot of passage including a finely decorated solutional passage which ascended steeply to a stalagmite barrier. This was sixty feet up.



18. Great Gouge.

While Kangy was having a look at the barrier and the chamber beyond, I managed to find a parallel passage and bypass the obstruction. After a flat out squeeze, I got into the richly decorated chamber ...

The discovery of Long Chamber Extension encouraged more people to visit the area resulting in many feet of passage being found. In the new chamber Cornwell explored the short 1962 Extension and Luckwill and Miller explored a useful connection between Long Chamber Extension and Coral Chamber (Ruckle Passage). Roberts too, discovered Straw Chamber but this was 'lost' until it was re-located by Irwin and Kingston in 1964. Many discoveries were not well recorded in the club log and consequently a considerable duplication of 'discoveries' occurred. This was later sorted out by a few leaders during 1964 and the results published in 1965 (Irwin, 1965a)

1962-1966: Bugs, surveying and practice rescues

Following the publication of the 1962 survey (Ellis et al. 1962a), Stenner commenced a survey of the Mud Hall area. During the course of the next four years, he surveyed over 1500ft of passage in this area to CRG Grade 6. In 1966 Irwin and Stenner commenced work on a completely new survey at as high a grade as possible — mainly CRG Grade 6. It was intended to use as much as possible of Ellis' preliminary survey, but the lack of permanent survey stations made this impractical and a complete new survey was the only answer. An intensive period of surveying followed lasting until July 1967 when most of the main routes in the central part of the cave had been completed. This formed the basic framework of the whole survey being produced for this report. During the course of surveying, several hundred metres of new passage was found in various parts of the cave, in the Mud Hall area, under Railway Tunnel, and the connections between Traverse Chamber and the Maypole Series. In August 1967 a passage was forced near Lake Chamber and a useful route was discovered in September Series between Victory Passage and Cone Chamber.

Until 1964 little serious work had been carried out by the club in the field of flora and fauna, although occasional specimens had been collected by individuals and a collection was made by Roberts in 1962, but this was lost in the post on its way to the CRG for identification. During 1964 N.L.(Tommy) Thomas commenced an outline survey to show the distribution of the many species found in the cave and in 1967 Maypole Series was closed to all cavers for an indefinite period so that study of cave life in this part of the cave could be made. This project failed because the 1968 floods on Mendip washed out the specialised life-forms known to exist there. They were not found anywhere else in the downstream sections of the cave. This section of the cave was re-opened in 1970. New techniques were developed by Stenner to trace the streams flowing into the cave (Stenner, 1966).

On 8th June 1965 A. Thomas (1965) carried out a psychological experiment by camping at the entrance to Rabbit Warren Extension and remaining there for 30 hours in complete darkness. He had two aims. The first was to discover how effectively a caver could function in total darkness and to determine the effect of these conditions on the ability to estimate time. A mechanical recording machine was taken into the cave as part of Thomas' kit to record his estimated times but this failed after a few hours. During the time that the machine was recording, Thomas' time estimates had lost 3 hours in a period of 13 hours.

Practice rescues had become a regular feature of the leaders' activities. During the years 1964-1966 there was a full scale practice each year to enable the most suitable rescue routes to be determined. A route was finally worked out, but even now is subject to change. From 1966 several smaller practices were held and it was shown that Wire Rift was a practical route for all rescues except those involving the more seriously injured. In addition, smaller practices were arranged to obtain information on rescue routes from other parts of the cave. The value of these practices was borne out by the results of three incidents (two were official call-outs) during 1966. All but one of the injured were able to get out under their own steam but the experience of the practices made each rescue an extremely smooth operation.

1963: Discovery of Upper Long Chamber and Chandelier Passage.

Shortly after the discovery of Long Chamber Extension, Cornwell located several shaky rifts and passages on the south side of the chamber, but little else of note was located in this area until December 1963. On the same trip Cornwell entered a beautifully decorated passage, Chandelier Passage. Among the formations is a superb cluster of heligmites, each of clear, transparent calcite about 2 inches long. The following weekend found parties under Cornwell's leadership exploring the area more fully, but little of note was found (Irwin, 1964a). Later work there discovered Bell Chamber, Upper Stream Passage, with its connection to Pillar Chamber Extension and a beautiful, but small, pink stalagmitic chamber off one of the dicey bedding planes above Chandelier Passage.

At this time Irwin, Kingston and others set out to locate all that was known in the area and sort out the confusion once and for all. After 50 or more trips, a report and a two-sheet sketch survey were prepared by Irwin (1965a) including details of fresh discoveries under Coral Chamber and above Pillar Chamber.

1964: Discovery of Marble Hall area

The discovery of Ruckle Passage and a large inclined rift by Luckwill and Miller was followed up by Irwin et al. At the lower end of the rift Irwin (1964b)

...found a hole at the lower end of the rift that led to a tight descending rift ending in a small boulder chamber ... Several small holes were noticed under the only solid wall and closer inspection showed that another chamber existed below. Several feeble attempts were made to remove a key, but medium sized boulder but we couldn't get sufficient leverage to get it out ... The only way ... was to remove the pile of boulders at the side ... this blocked the keystone, but revealed a choked rift. By digging through the fill we broke into the lower chamber ... Bill Smart noticed a small hole in the floor ... [squeezing through] I landed on a ledge some twenty feet above the floor level ... The chamber was about forty feet long by some twenty to twenty five feet wide and about forty feet high. The right hand wall was absolutely smooth for the full height of the chamber thus giving an impression of height far more than it really was ... it appeared that we were in the upper reaches of the Gour-Lake Fault — only this time we were looking at it in its original un-waterworn state. ... The 'white' limestone we had climbed down was an eight foot wide band of breccia.

Passages were found below the chamber ... were choked with a coarse infill ... Before leaving we discussed a suitable name ... and finally arrived at Marble Hall.

Irwin, accompanied by Lane and N. Thomas, returned on August 9th 1964 to photograph Marble Hall, when it was noticed that the far choke in the chamber above Marble Hall comprised of small boulders covered with a thin coating of stalagmite. Stones dropped through the small openings indicated space below. The following Saturday, armed with a hammer and accompanied by Kingston and Luckwill, the choke was smashed and the way on entered a small but well waterworn chamber at the lower end of which was an extremely tight tube leading downwards. Irwin wrote:

...This led to another squeeze in the floor and a shaft, some three to four feet in diameter. The shaft, once completely choked with a coarse infill, dropped away for nearly thirty feet ending in a choke. A tight squeeze led to a side chamber that only Phil [Kingston] could enter. On the floor a tight phreatic tube was noticed with several fist sized holes in the floor of the tube. Small stones were dropped down the holes and the sound of them falling indicated a further space below ...

The return through the squeeze is extremely difficult for any large sized caver as A.R. Thomas found out a few weeks later. On the return trip from the bottom of the pothole, after a digging spell with Irwin, he jammed halfway up. After many blue words he returned to the bottom, stripped off all his clothes except for his boiler suit and made the second attempt. This time he was lucky and after much struggling, tinged with a certain loss of humour, he made the top.

1964-1967: Climbs, digging and maypoling.

Many fine climbs were accomplished during this period, which produced several interesting discoveries. Several early attempts had been made by Bennett, Coase et al. (c.1954-56) to scale the wall behind the Great Gour in Gour Hall. They succeeded in reaching

the second ledge and first noticed the downstream side of the Pyrolusite sump. The next recorded attempt was in 1964 when Lane and Wynne-Roberts climbed to a height of nearly 80ft. From a vantage point they spotted a passage continuing downstream. Early in 1966 the Taylor brothers repeated the climb and confirmed that the hole did exist and that a 30ft maypole would be required. The climb was made a third time by Richards in March 1968 who reported that the 'hole' was just a steeply sloping rift heavily coated with stal. The problem was finally resolved on 18th September 1976. A party consisting of Wilton-Jones, Dukes and Sparrow 'Jumared' up to the hole — it did not go!

The most interesting exercise was carried out by Giles, Hart (WCC) and Wynne-Roberts (SMCC) on 9th February 1964. Wynne-Roberts (1964) wrote:

Not far from the formation known as Nelson's Column in Trafalgar Chamber of the September Series the roof rises as an almost perfectly circular aven, the top far out of range of the normal caving lamps, which immediately appealed to me as an interesting climb.

The first serious attempt to ascend the aven was made on the 25th January 1964, but aborted as a result of the small quantity of maypole then available.

The party for the second attempt on 9th February was Jim Giles, Nick Hart and myself. We were fairly heavily loaded with poles, ladders and ropes as we struggled through the boulder choke to September Series.

Once at the aven we assembled our full 28 feet of pole and Nick climbed a ladder hanging from it to the first ledge. Two precarious footholds, one of which is needed to support the base of the pole in the next stage of the operation. Twenty-eight feet of maypole proved very difficult to handle and eight feet had to be removed before Nick succeeded in pulling the pole up and resting its butt on the first ledge. This new position of the pole enabled me to climb up the ladder to the Second Ledge, a sloping triangle of flowstone two feet wide at the base, and again raise the pole. I found a belay of sorts, to prevent the butt from slipping off the ledge and then continued up the ladder hanging from the pole.

At the full height of the maypole there was not a convenient ledge but the angle of the aven had eased somewhat and I was able to take to the rock and force my way up a stal slope to where the aven had degenerated into a rift which could be climbed by backing up.

A search for possible exits proved fruitless though explosives may, carefully used, give access to the Inaccessible Grotto, and perhaps more cave. The obstruction is a chockstone well cemented with calcite ...

Further probes were made in the Pillar Chamber area in July 1964. On one trip the younger Coase brother, Alan, with Irwin and members of the WSG, located several high level chambers that eventually led to a narrow, but well decorated rift. Just before leaving, Irwin noticed a hole in the far side of a bedding plane. Peering into it he saw a passage some 10ft below — or so he thought! As he slid through his back brushed against a stone that



19. Gour, Canyon Series.

fell and clattered away for some distance. Quickly backing out, Irwin looked again and saw, to his horror, a drop of over 50ft down a well defined pothole. This was immediately laddered and climbed by Coase only to find that the passage eventually reconnected with Upper Long Chamber. On a later trip, Irwin and MacSharry climbed the pitch and thoroughly explored the bedding planes below, but little of note was found. A piece of bone coated with stalagmite was found in the gravel floor of a side passage in the uppermost chamber in Pillar Chamber Extension; it was too small a fragment to be identified (Sutcliffe, pers comm).

Maypoling accounted for several discoveries but none were major finds. On 4th July 1964, Giles (BEC MS Caving Log) and party

... took 22 feet of maypole to Lake Chamber to explore the aven above it. The Lake was found to be full. Lengths of maypole were erected below the large aven and a climb was made to the stal ledge [which] forms the false roof to the lake. A ladder was then made fast to the next ledge and with the aid of a skilful lasso throw, this was climbed. A further climb was then made to the top of the aven, which unfortunately closed after a short horizontal passage was followed for about ten feet.

The other aven was then tackled from the second ledge, again using the lasso technique, but this also closed up. Yet another aven, much shorter than the others, was tackled, but this followed suit. The resulting score was thus, Cuthbert's 3, Jim Giles nil.

The following day Irwin, Mansfield (SMCC) and party maypoled the 'Hole in the Roof' of Coral Chamber only to find that it connected with Rocky Boulder Passage above the 15ft Rocky Boulder Pitch. The same weekend, Kingston and Drake maypoled a hole in the roof of Pillar Chamber, which soon closed down.

The finest climb of 1965 was without doubt that made by Wynne-Roberts (SMCC), Mills (SMCC) and Grime aided by several other cavers. Previously, High Chamber had defied all attempts to climb to the roof. On this occasion the climb started over the huge boulder pile and then up over a steeply sloping cascade of stalagmite. Wynne-Roberts finally reached the top, closely followed by Grime, at a height of 200ft. The end was in boulders containing a few possibilities of small extensions, but none looked very promising. Shortly after, Prewer, aided by a small team in the cave, established the position of the floor of High Chamber in relation to the surface topography, using a magnetic transmitter.

Early in 1966 (January) Bennett, Kingston and Meadon with others dug a side passage off Mud Ball Chamber and broke into 50ft of rift passage but the dig was abandoned when oral contact was made with Dining Room Dig.

Petty had known of an aven for over ten years, located off Strike Passage, and eventually he climbed it in 1966 with Kingston, K. Franklin and others. Having reached the top they found themselves in a large rift overlooking The Cascade opposite Vantage Point; this

was not, as had been thought, the top of the formation but only one third of the way up! The total height of this stalagmite flow being about 140ft. From the ledge they continued upwards by chimneying the left hand wall and entered a beautifully decorated passage over 100ft long.

1965: Discovery of Canyon Series

The last major discovery in the Long Chamber area was made by Luckwill in January 1965. Exploring the southern end of Long Chamber Extension, he spotted a high level hole. On close examination it was to be found only to be blocked with small boulders. Once clear, he was able to squeeze through and enter a small series of phreatic tubes. A low passage led to the brim of a very large and obviously deep shaft into which hung huge stalagmite drapes. A week later the same party accompanied by Irwin, paid another visit and hung a plumbline down the shaft as it was suspected (and later proved) to be the top of Curtain Chamber — the depth being 110ft. With the aid of binder twine, faith,

hope and friction, Luckwill traversed over the shaft and entered a deep vadose trench which he followed for some 50ft until the way on lay through sheets of white stalagmite. The walls were decorated with magnificent flows and the floor with fine gour pools. The following weekends saw the new series extended by a considerable amount (Luckwill, 1965a, 1965b).

The discovery of new passages had become increasingly more difficult and workers resorted to methods such as digging, maypoling and climbing. During the course of this period several hundred yards or so of new passage was being discovered each year usually in areas where there was already a complicated network of passages and chambers.

During 1965-1969 work in the cave concentrated on digging, cave diving, surveying and scientific work. Most of the digging, both above and under water, has been in an effort to pass or bypass either the then terminal Sump I or the Gour-Lake fault (this name being a shortened version of Gour Rift-Lake Chamber fault).

A further maypoling exercise took place on 13th May 1967 when Hart (WCC) made a 35ft climb to a passage above the cave pearls in High Chamber. This resulted in some 200ft of heavily decorated passage. During the same month Grime, Irwin and Witcombe carried out a maypoling exercise commencing in Upper Traverse Chamber and investigating all known avens and high level holes in the main chambers and Rabbit Warren areas. The first trip, combined with surveying work lasted over 16 hours. The programme continued over the next few weekends but met with little success.

1965-1970: Dining Room Dig

Most of the cave has been found by exploring open passages or probing boulder falls; little has resulted from digging. Over the years several digs have been attempted with little success. In 1963 Marriott and others commenced a dig near Dining Room in an attempt to cross the Gour-Lake Fault which forms the western boundary of the system. The diggers excavated a passage for over 30ft only to end in a short open passage running parallel with the major fault. A local survey by King on 11th April 1964 which related the dig to other passages confirmed this. Thus disheartened, the diggers temporarily abandoned the site. In 1965 MacGregor noticed a buried arch just below the gravel floor at the digging face. The following weekend Irwin and two members of the MNRC dug for a short while and established that the dig was in fact continuing at right angles to the fault line. A short, but open, passage was forced the following week by Kingston and others, but developments in other parts of the cave prevented any further digging until it was restarted by Irwin in May 1967.

During the next two years regular Tuesday evening digging took place, the diggers mainly from BEC and SMCC. The small crawl passage became too long for practical working and several weeks were spent in opening up the site to allow easy digging. Gradually the length extended to over 100ft. About 10 minutes was the regular time to reach the dig and by 9 o'clock Craig was ready to down tools and would yell "pub-time!" and was a flash up the streamway. A tremendous effort had been put into this site by many diggers, including Craig (SMCC), Irwin, Riley, Turner, Webster and Woodward (SMCC) and many others, but interest was waning after two years solid work. The dig was abandoned when Whitsun Passage was discovered in 1970, as this seemed to represent the lower section of the same passage separated by over 100ft from the dig site.

1968: The July flood

The long talked about event of 1968 was the great flood on 10-11th July when up to 7 inches of rain fell over sections of Mendip within



20. Sump I soon after the breakthrough into Cuthbert's II.

a 12 hour period. Many changes were noted in the Charterhouse, Burrington and Priddy caves (Wig, 1968a). Systems such as GB Cave and Swildons Hole fared worse than others because they were both subjected to great accumulations of water at their entrances. St. Cuthbert's did not receive such a surge, as the water was held back at the Mineries Pool. The depression was flooded but the chokes at the entrance prevented a great flow of water entering the cave. The changes in the cave were minimal but Sump Passage and Gour Rift were flooded to a depth of 10ft and resulted in blocking the underwater passage in the sump so painstakingly dug by Kingston and Priddle. Following the discovery of St. Cuthbert's II in 1969 the digging apparatus of early attempts at Sump I was found littering the St. Cuthbert's II streamway. At Sump II a cigarette packet was found clinging to the wall some 12ft from the floor.

1969: Source of the Dining Room stream

Irwin, Luckwill and Riley extended the upper section of Cerberus Rift in an attempt to find the source of Dining Room stream (June 1969). After two hours digging they broke through into a small chamber off which ran a steeply sloping, but heavily stalagmitized, inlet passage. Entrance to the chamber was described by Riley (1969) as being one of the most 'orrible places in the cave, being slightly reminiscent of First Mud Sump in Swildon's! The small stream and draughting inlet passage was later attacked by Searle but the quantity of stalagmite to be removed forced the diggers to abandon the site.

1969: Discovery of St. Cuthbert's II

The much needed breakthrough came on Halloween Night 1969 — St. Cuthbert's II was discovered. Though only 900ft long, it was a major find as far as Mendip discoveries are concerned. For the previous eighteen months plans were afoot to attack Sump I again after the abortive attempt made in 1967. Dams were being built at points that would provide the maximum storage of water. One of the first to be constructed was over five foot high at the entrance to Traverse Chamber masterminded by Butcher and members of BEC and SMCC. Digging at the Dining Room site had reached a point where a re-appraisal was needed to decide whether to continue or look for another site. A new diversion came just at the right time. During September 1969 the weather had been extremely dry and the stream flow through the cave had dropped dramatically. A chance visit to Sump I found that the stream flowing to the sump had diminished to a small trickle. Digging at Dining Room Dig was abandoned and the diggers attention switched immediately to the sump. Bennett (1969) wrote:

The plan was to implement a scheme mooted by several people and pushed by Dave Irwin to dam up the stream and pump out and excavate the sump. Dams had already been built at the Mineries ... and in the Main Stream Passage, but the crucial one in Gour Rift was only just above stream level. Work was started to make this into a strong reliable structure as a failure would be very dangerous to any one working in the sump. The foundations were dug down to the stalagmite gours ... Even though the stream levels at the bottom of the cave were very low, it was thought that the opportunities afforded by the dry summer had been missed ...

The diggers thought that this 'goodluck' could only last for a couple of weeks at least — in fact it lasted until the end of October — and a great effort was made to build a dam to a reasonable height to enable several hours supply of stream water to be stored giving the diggers a worthwhile digging time. During the building of the dam, two members of the team put the bung in the dam and went to inspect the sump. To their amazement the sump pool had completely drained away leaving an exposed gravel bed. This change at the sump was, according to Bennett, a stroke of luck of a kind that comes but rarely. Digging commenced on or around the 30th September — would the weather remain settled?

Fortunately, the approach passage to Sump I was big enough to allow the diggers to bag the spoil at the sides and great progress was made. By the 25th October the floor of the sump had been lowered by nearly 5ft and had penetrated into it by some 10-12ft. The 'rift-feature' recorded by Kingston was found but not the open section beyond; this had obviously been disturbed by the 1968 flood. To the right the roof appeared to rise and on Friday 31st October 1969 the diggers broke through into airspace. A body-sized hole was dug up through the gravel infill and St. Cuthbert's II was entered. Craig (1969c) wrote of the actual breakthrough in the SMCC Journal:

... He [Mills] noticed a two inch gap between the top of the gravel and the roof of the Sump and the roof appeared to be rising as he dug ... soon there was room to get a head between the top of the gravel and the roof. Urged on by the others Martin groped up against the bank and peering over the top he described the view as "momentous" ...

The Belfry Bulletin report by Bennett (1969) stated that:

... after a quick look at the dams the party set off ... to the beginning of a high rift passage with a slippery floor obviously usually occupied by the stream. Near the sump the passage was quite wide with a 'tide mark' of red mud about 5ft high. Everywhere the walls were coated with thick deposits of soft brown mud which could only have been left by standing water. The dullness was lighted by various stalagmite deposits ... The rift was narrower further down, but remained high most of the way. A 10ft pot was reached and climbed down, and the passage continued narrower again until a mud coated stalagmite barrier was reached. The passage clearly continued further, but it was decided to turn back at this first check to easy progress, because of the lateness of the hour and the risk of being cut-off.

The next day, Saturday, a strong party of BEC and SMCC cavers descended the cave at about 10 o'clock in the morning. The stalagmite barrier which had stopped the party the night before was easily passed but, to everyone's disappointment, only a further 40ft of open passage remained before Sump II was reached.

Every accessible hole was inspected by the party. Webster climbed the 100ft long side rift a little downstream of Sump I and, on the opposite side of the passage, a dig was started at a promising site in the hope of tracing the stream that soaked away at the sump; this dig was later to be successful in opening up Whitsun Passage. Irwin and Luckwill produced a rapid CRG Grade 4 survey which was drawn up in time for the pub that evening! The passage was heading south which was unexpected.

Following the discovery of St. Cuthbert's II, work continued to open Sump I and to improve the downstream water flow by lowering the gravel floor to prevent the water backing-up in the sump. The diggers were frequently hampered by high water conditions and quite often during November 1969–February 1970 the cave was in flood and so blocking off regular access into the new passage. Even if Sump I could be drained, the dams would be full in about twenty minutes when the streams were running high. This resulted in the excavated passage through the sump (at the time of discovery well over 3ft high) gradually resiltling itself with gravel. The fear of permanent closure was sufficient encouragement to continue the work of lowering the stream floor downstream. Although there is a natural 'soak-away' in the floor of Sump I, there were numerous

occasions when this did not work. The passage of cavers and the settling of fine silt probably was to blame for this. Whilst the work downstream continued, a pipe was installed through the sump (slung to the sump roof) to allow the water to flow through leaving the sump dry. Though a novel idea it was a decidedly dicey affair, the joints leaked and the whole pipe assembly was attached to a leaking mud and boulder dam in Sump Passage!

Leaking dams, particularly the one in Sump Passage, were the greatest worry. On two occasions the writer and his companions returned to Sump I finding that it had refilled leaving just a couple of inches of airspace. Craig and Palmer (11th November 1969) had an even more dramatic experience. Returning to the surface, most of the digging party had passed through the sump with the pair still on the downstream side. Then the sump dam plug broke and Craig was partially trapped in the sump with the water rising rapidly; Palmer was still on the downstream end. Craig pushed through and partly free-dived the remaining few feet to safety. What had happened to Palmer? The team frantically re-plugged the dam and commenced bailing. Airspace was soon regained and, to the relief of the diggers, voice connection was made with the trapped man who eventually made a safe return.

In April, after many weeks of preparation, a replacement pipe system of fibreglass pipes, each 8 inches diameter by 5ft long, and joined with lorry inner-tube seals, was installed (Craig & Mills, 1970). Meanwhile the Sump Passage dam had been completely rebuilt and a strong attachment made to connect the pipe assembly. The 'snake' ran from the Sump Passage dam through the sump and well down the St. Cuthbert's II passage resulting in over 50ft of pipe! This kept the sump permanently open. Lowering of the downstream gravel floor eased the problem of silting in the sump itself and eventually it was reduced to the level where the sump remained permanently open with an airspace, without the need for the pipe system.

During May 1970, Irwin, Bennett and Hodgson having completed the CRG Grade 6 survey through the new passage, were making their return to find Sump I had flooded itself due to a leaking plug in the Sump Passage dam. Irwin entered the sump to find that



21. Upper streamway, St. Cuthbert's II

there was about 2 inches of airspace along most of the straight section towards the uphill bend into Sump Passage. The sump had by this time choked itself resulting from the winter floods, leaving a 12 inch high passage. Fun and games followed. Bennett: "Are you alright?". Irwin (losing his presence of mind, his mouth underwater), "Gloob, gloob, Yes". Bennett, not hearing him clearly, grabbed his feet and started pulling. Irwin yelled "Let go you bloody fool!" and pushed forward to the bend. The remaining section of the upward passage was now nearly sumped due to the increasing water flow and in a successful "Hell!, I'm not going back now" attempt he made it to the Sump Passage dam. Sealing the dam and a short session of bailing opened the sump sufficiently to enable the other two to pass safely. The problems with the sump were not to be underestimated — it could be a very dangerous obstacle.

Work continued in St. Cuthbert's II with the maypoling of all high level holes, including that below the 10ft pot which was found to be choked with mud and stalagmite. This work, carried on by Bennett, Craig (SMCC), Riley and Webster throughout 1970-1971, resulted in little new passage but that is not to belittle the enormous effort carried out with stubborn determination to force every conceivable lead.

Sump II was probed soon after its discovery, but it appeared to be heavily choked. This was confirmed when it was dived again on February 15th 1970 by Parker (CDG). It was also noticed that, once the stream was prevented from entering the sump, the water was still draining away at the downstream end lowering the water level by about 1ft in a short time. This confirmed the belief that the sump was a true siphon draining through gravels at the downstream end. Over a long period during 1970 — 1972, Bennett, Craig, Hauan and members of the Tuesday night diggers attacked Sump II with chisels and other persuasive means. It was found that an airbell existed some 20ft from the sump entrance, and access to it was possible following a short spell of bailing back into the dam. To ease bailing, Bennett constructed a special tray which acted as a chute to the top of the dam and a diaphragm pump was employed but was only a partial success as the grit in the water soon punctured the diaphragm. Two dams were built by Craig and others during 1971 (Large, 1972b).

The airbell, about 10ft high, was reached by a low crawl through sticky mud. On the downstream end of the airbell are two small phreatic tubes lying along a line of weakness. It was reasoned that these might just follow the choked lower water passage. However, this was abandoned as the task was just too great and dangerous due to the entrance crawl having a knack of silently filling with water possibly leaving the diggers trapped inside. Several near misses were experienced and on numerous occasions the diggers had to return, partially free-diving their way back — not the most pleasant of places!

1970-1977: Whitsun Passage and continued digging

During April 1970, Craig, Irwin and others commenced digging at the downstream end of Sump I in the hope that the open passage reported by the divers in 1967-1968 could be gained but it soon became obvious that this had been fully re-sealed by the 1968 flood. In May 1970 a return was made to the dig site just downstream of Sump I. A mixed team of diggers from BEC and SMCC recommenced digging at the site and by the 19th, having dug through thick layers of mud, air space was found. Craig (Craig & Mills, 1970) wrote:

After an hours digging the excitement grew as air space was struck once more and a strong draught emerged. Ahead the passage could be seen to grow higher, but it was impossible to tell whether or not it was high enough to crawl along ... Friday 22nd ... The open passage they were chasing was proving a little elusive ... The following day ... the passage was pushed a further 6-8 feet in conditions that were turning everything into a slurry, making it difficult to recognise one's neighbour ...

Further digging attempts pushed the digging face forward and a false alarm was created when the diggers entered the base of a 20ft high arch. A couple more digging trips took place when everything was looking promising; the more cynical among the diggers, saying that these promising signs had been with them since the start of the dig, but the signs really did look good. Eventually (24th May) Large squeezed through and entered a 30ft high chamber. The ascending



22. Lower streamway, St. Cuthbert's II.

passage led steeply upwards and, after a tightish squeeze, a small but nicely decorated grotto was entered. The following day the rest of this short series was fully explored. Later it was realised that this was probably the lower end of Dining Room Dig the two ends separated by about 150ft. This series was named Whitsun Passage.

During 1971 Irwin, convinced that St. Cuthbert's II was a gigantic oxbow, jokingly christened it 'Cuthbert's 1'! Together with Stuckey he turned his attention to the end of Gour Rift. Bennett had worked the end of the rift in January 1970 and concluded that it did not extend further along the current stream level. Was the way on lower down in the choked section? With the aid of the Gour Rift dam, the water could be shut off and the pool at the end of the rift bailed into Sump Passage. Over a period of several months during 1972-1973 the pit became deeper and the bailing took longer. Towards the end of the exercise, bailing the pool took twice as long as the actual digging sessions. However, the stalagmite gours at the end of the rift dropped steeply and at a depth of some 12ft the wall extended into a well formed pothole, the exit of which appeared to be to the right towards Sump Passage. Probing of the minor side rift by The Duck showed that the rock wall was in fact a greatly extended arch. The water had gone into Sump Passage after all! During the course of the dig an ingenious self-propelled water bailing device was constructed by Knops in an attempt to keep the dig dry. The theory was good but the materials, particularly the seals, failed due to the grit in the water. Another example of great effort with little reward.

Still convinced that Sump I held further secrets the diggers persisted with this area of the cave. The BEC diggers commenced digging what is now known as The 'Man Trap'. A few feet downstream of Sump I the floor of the passage is choked with gravel before reaching the rock floor of the streamway. Mills recorded (1975):

... The basis behind the dig had been that possibly [St. Cuthbert's] II being on the opposite side of the Gour Rift fault from the remainder of the cave was not the way on and since upon first discovery there was no active streamway it was possible that II was merely an abandoned oxbow ... this suggested that where the [St. Cuthbert's] I stream originally sank in Sump I might produce the way on. It had been observed previously that when the Gour Rift and Sump Passage dams in I were

put in and the II streamway allowed to drain away, the water in the streambed just down stream of Sump I sank away under the left wall.

The SMCC diggers took over the dig and the hole rapidly gained depth. Numerous set-backs occurred. On one occasion a large boulder slumped into the dig preventing any further work. This obstacle was eventually demolished and work continued, but now flooding and the problems of bailing came to the fore. In between digging sessions, the muddy water having cleared, it became an interesting trap for the unwary! To overcome the danger of cavers injuring themselves and to reduce the bailing time great imagination came into play. Necessity being the Mother of Invention, the SMCC constructed an aqueduct over the dig site. This exercise was completed in January 1973, and during the course of that year the dig reached a depth of about 15ft. At this point the rift narrowed and the digging activity was discontinued.

During 1976-77 Irwin, Turner and Workman returned to Sump I and this time a determined effort was made to dig the area just upstream of Sump I. Here the walls were sloping away to the left and, as the mud layers in the sump appeared to be sloping back upstream, it was reasoned that the water flow had, at some time, drained at a point close to the upstream side. The dig was inconclusively abandoned after about a year's work.

Survey work was carried on through the years 1969-1972 including Rabbit Warren Extension, Pillar Chamber Extension, Long Chamber Series and Far Chamber area. The old argument over removing tackle from the cave often came to the fore. Feelings were mixed; one even called it 'The Castrated System'! (Durston, 1978). In 1971 the leaders agreed to remove fixed tackle from, and suitably re-rig, the pitches in Maypole Series, this series having been re-opened after a three-year closure for a biological exercise that was ruined during the 1968 floods. The Arête ladder was removed in 1970 for repair and re-installed some time later in 1973. A new ladder was prepared (1983) and this replaced the old one that had been in the cave nearly twenty years. Stenner carried out further hydrological work and Priddle commenced digging in Rabbit Warren and Cone Chamber. The Choke downstream of Traverse Chamber was dug open in December 1970 but lack of use causes it to partially re-silt.

Further practice rescues were organised including a full scale attempt from Gour Hall to the Entrance in December 1970. Mendip Rescue Organization, ever conscious of their responsibilities to the caving community by ensuring that they held the best equipment possible, had purchased a collapsible, tubular and canvas constructed Paraguard stretcher. In an attempt to try it out through a twisting passage, a group of MRO Wardens (Bennett, Craig, Irwin, Large and Prewer) tucked Howell into the stretcher and carried him from Lower Mud Hall to Water Chute (13th April 1975). The practice was surprisingly successful considering the difficult manoeuvring required by the Wet Pitch rift (Irwin, 1975). Surveying continued in September Series, Long Chamber Series, Canyon Series and Rabbit Warren Extension by Irwin and Stenner. Disappointment Passage and Drinking Fountain required the 'thin men of Mendip' and their surveys were produced by Mills and Mansfield.

On 27th November 1976 a further water tracing exercise took place when fluorescein was placed in the Maypole Sink on the surface. The dye was placed in the stream at 7.45 a.m. and reached the end of Gour Rift at 9.30 a.m.

1974: 21st Anniversary of the discovery of the cave

On 4th September 1974 a large party, including many of the original explorers, descended the cave to meet in Dining Room for a 21st Anniversary party organised by King. An account in the Belfry Bulletin (Wig, 1974d) recorded that the party descended the cave by the original Old Route including Waterfall and Wet Pitches, and on through Bypass Passage to congregate in Dining Room. Bennett entered in the caving log:

... The assembled cream of Mendip deep cave explorers + 2 bottles of Champers descended by the classical route ... to New Route Stream and thence to the Dining Room. Frenzied excavations then ensued to find the table. Then the Champers was (were?) consumed with toasts [to St. Cuthbert] and the assembled cream attempted in spite of various infirmities to rush out to the pub ...

1975-1980: Marble Pot Extensions

In November 1975 Large turned his attention to the possibility of more passage below Marble Pot, previously reported by Irwin. Early visitors to the bottom of the pothole had heard stones falling away below the gravel choke. With Slade, Large visited the site and noticed a hole some 15ft above the choke. A short spell of digging enabled him to descend through a tight rift to an open 15ft long passage, 14ft below the entrance and blocked with pebbles. Below the entrance climb, a tight bedding plane was attacked a week later and this entered the base of a 35ft high aven and a 15ft descending rift pushed by Jarratt. Two years later Large returned to the site and proved the connection at the top of the 35ft aven with the bottom of Marble Pot. In all some 70ft of passage was discovered after a period of hard work (Large, 1980). Long Chamber Series also received more attention and on 20th October 1979 Large, Wilton-Jones, and others extended Pearl Passage, connecting it with a lesser parallel side passage; the whole terminating up-dip in an impassable descending rift.

1981: Hanging Chamber again!

During December 1981 a further attempt was made at Maypole Alpha, a high narrow rift in the roof of Upper Traverse Chamber. Previous attempts had given up because of friable rock. On this attempt, Grass, Large and Tilbury succeeded in reaching the top to find a visual connection with Hanging Chamber about half-way up. At the same time J. Clarke, Dukes, Smart, Wilton-Jones and Harper succeeded in climbing to Hanging Chamber. At first, Dukes failed to pass the overhang. On a further attempt, Harper (Anon, 1981-1982, p.9) :

... completed the climb with some daring, totally unprotected moves, and now a ladder has been hung down the top section of the climb.

Confirmation of the connection between Hanging Chamber and Maypole Alpha was made, and subsequently an oxbow from Hanging Chamber to the main Maypole streamway above Pulley Pitch was discovered — Jerusalem Oxbow. Further interesting discoveries were made on 18th April 1982 when Sparrow and Cave



23. Climbing to Hanging Chamber, 1981 (cf. photograph 12).

(1982) extended a passage in the roof of Long Chamber Extension by some 200ft.

1982-1985: Attacking Sump II

In 1982 the attention of Butcher (SMCC) and McManus returned to Sump II. Ideas were discussed and plans were afoot to repeat a similar exercise to that of 1967. Rock drills had been used several years previously, but new attempts were made in 1982 to blast a way across the top of the sump. This very slow procedure forced the diggers to re-consider the situation. The conclusion reached was that the most effective way to overcome the problem was to bail Sump II and remove the infilling. The number of dams in the cave was reassessed. The 1977 dam remained at Sump II but an additional one would be required. So, in April 1982, the sand-bag dam was built doubling the storage capacity to about 4,000 gallons. Trial digs were attempted; the Mineries dam would be inserted some three weeks before the event and the Plantation Stream diverted into the St. Cuthbert's Depression, allowing the water to flow down into Maypole Sink and overflow into the floor of the depression. The surface dams prevented most of the water flowing into the cave entrance. The general idea was to drain the 'spongey' ground over which the surface Plantation Stream flowed. However, as on previous occasions, this storage medium held far too much water and, although Plantation Stream had been diverted from Plantation Swallet and was flowing into the valley, too much water from the 'sponge' was flowing into the cave at Plantation Junction long after the dams had been put in.

With the dams operating in the cave holding back the water draining into the system, the sump bailing teams were able to empty Sump II to the infill level. When the stream is prevented from flowing into Sump II the sump partially drains itself reducing the water level by some 1.5ft. It took a dozen cavers about eight hours to drain the sump of water. All this effort allowed an inordinately short time for digging. It was realised that the greater the volume of infill removed, the greater would be the volume of water to be bailed on subsequent occasions. Continued digging pushed the choke face still deeper. To make matters worse bad air formed because of the large numbers of cavers working in such a confined space.

The ingenuity of Mendip diggers never fails to amaze the onlooker. To overcome the problem of bailing the sump and reduce the volume of water, hundreds of plastic bottles were obtained and placed in the sump making the place look, to quote one caver, more like a "Moroccan bazaar than a cave passage". The use of the bottles and two 1500 gallon double diaphragm handpumps gave some success but the actual digging time was still only an hour or so. With only a couple of men operating the pumps the foul air problem was considerably reduced.

A 'big-push' was arranged for the summer of 1985. This time, ideas of driving a 110v submersible pump took shape. 3,000ft of cable would be required. With this in mind, all the dams were refurbished, both on the surface and underground and a 5ft third dam — The Kariba — was built close to Sump II, designed to hold back a further 4,000-5,000 gallons of water! By the autumn of 1984 the Mendip Rescue Organization was preparing for the 1985 National Cave Rescue Conference to be held on Mendip. Suggestions were made that it might be possible to borrow sufficient fire hose from the Somerset Fire Brigade to convey the necessary air to drive a submersible centrifugal pump at Sump II. The Chief Fire Officer, Nigel Musslewhite, agreed and the tremendous task of transporting 60 fire hoses into and eventually out of the cave was a major task in its own right. The logistics for the event were considerable and included the setting up of kitchen facilities, laying of telephone cables and the transportation of the pump. McManus (pers comm) wrote:



24. Main Stream, duck below Stalagmite Pitch.

With everybody keeping an eye on the weather the Mineries dam was inserted ... to reduce the water retained in the catchment area ... The operation was probably the biggest pumping operation that had been carried out by cavers at that time, a case of the BEC 'doing it to excess' again.

Suffice to record the air-driven pump worked successfully on 18th May 1985. The pumping capacity was extremely high (more than 16,000 gal/hr) and the sump was drained in less than thirty minutes! Digging now commenced within an hour of the start of pumping! On the first day over eighty cavers went to the dig site in teams of six. The initial task, once the sump had been drained was to remove the hundreds of plastic bottles that had been placed in the sump during the course of the previous year. This took a couple of hours though it had taken a year to put them in!

Once the water had been pumped out digging commenced. The infill being removed consisted mainly of lead tailings from the washing operations of the miners. Water was continually draining back from the downstream end of the sump. Consequently it was necessary to keep the pump running in order to keep the digging face reasonably free of water.

So successful was the weekend's activity that it was agreed to repeat the entire operation weekly until the sump had been passed. However, though great strides had been made the choke was not cleared. By the middle of July 1985 digging had to come to an end when the borrowed pumping equipment had to be returned. However Sump II had been excavated to a depth of 25ft and 65ft in length but still with no indication of the roof rising.

1988: Still more in Rocky Boulder!!

Early in 1988 several small but unexpected discoveries were made by Grass, Smart, Wilton-Jones and MacNab [jnr]. Surprise Passage was extended into a wide, but low bedding chamber (Surprise, Surprise) which connected with Rocky Boulder Passage and Pillar Chamber Extension. Two minor passages were explored leading off Oubliette Pitch. One, half way down, was found to be blind, but that leading from the base of the pitch emerged above the entry into Coral Chamber. The 'Oubliette' was no more!

What of the future? Will Cuthbert's III be found by digging through Sump II — it seems likely that this is going to be a long haul. Or is there somewhere a hole that everyone has seen but not probed that will make St. Cuthbert's Swallet give up its secrets?

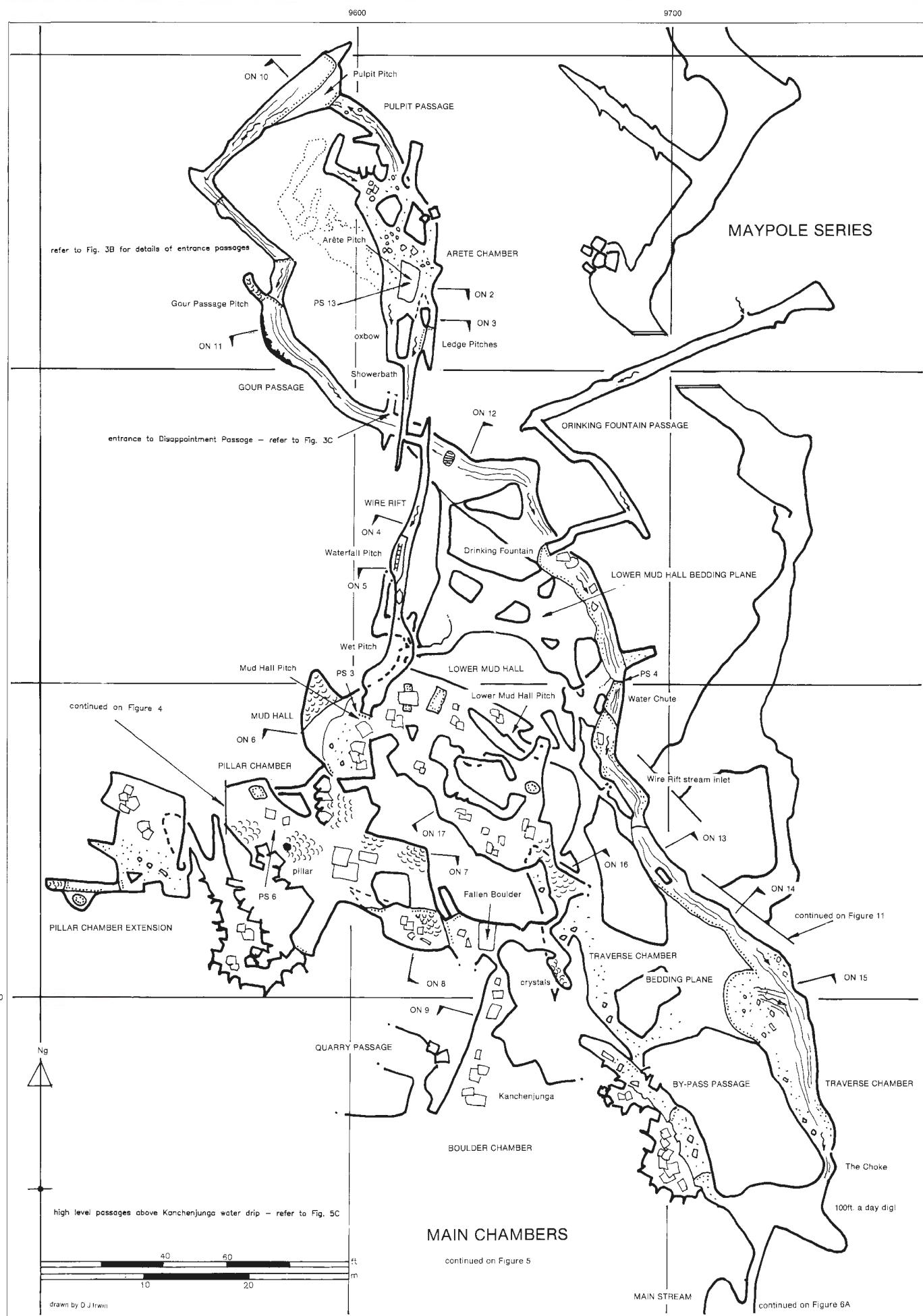


Fig. 3 Plan of New and Old Routes.

3. General Description

From its entrance the cave trends to the south towards Wookey Hole Cave, its proven resurgence. The cave is bounded by a faultline to the west running northwest — southeast and to the east an undetermined north-south boundary has controlled the limits of the eastward development within the system. To complicate matters, the cave is formed on an anticlinal fold, whose southernmost extent within the cave is at Plantation Junction; hence individual passages display a varying dip alignment depending upon their location in the cave. For the first 200ft of its depth, the cave is effectively a vertical system consisting of a series of pitches of up to 60ft in depth. Furthermore, it is predominantly vadose in character resulting in high rift passages. Unlike most other Mendip engulfment caves the initial section has plunged deep into the limestone shales and, by close inspection of the walls at the Ledge Pitches and Pulpit Pitch areas, the interlaminated strata are clearly seen. From this point the cave descends along the dip plane (about 35-40°) to Plantation Junction, except where two thrust planes have controlled the formation of Rocky Boulder Series in the Pillar Chamber to Water Chute and Coral Chamber areas.

The cave can be divided into a number of zones, many of which are distinctly phreatic in character. South of New and Old Routes, a series of large chambers extend across the cave from east to west, bordered on either side by a complicated series of passages: September Series to the east, Long Chamber and Rocky Boulder Series to the west. It is in the latter areas that the various complexes are located resulting from considerable boulder fall or cavern collapse sequences.

The cave is bounded to the west by a fault known as the Gour-Lake Fault which has given rise to some of the largest features in the cave: Gour Rift, Gour Hall, Cerberus Hall, Mud Hall and Lake Chamber. The northwestern limits of the cave display further examples of fault-controlled features including the rift chamber at the end of Lower Rocky Boulder Passage, Long Chamber Extension and Marble Hall area. Below New and Old Routes, extending under Long Chamber Series, lies the complex Rocky Boulder Series. South of the chambers is the complex series of phreatic tubes and bedding planes known as the Rabbit Warren, situated on the west side of the anticline, bounded by Cerberus Series to the west and Rabbit Warren Extension to the east, situated on the west slopes of the anticlinal fold. Rabbit Warren has been formed on two levels: the upper section having taken water from the Railway Tunnel, the lower, above the two stal-

agmite banks, having taken water from the lower end of the higher level September Series. From Plantation Junction, the lowest point of Rabbit Warren, the cave continues for approximately 1400ft, falling in depth by only a further 70ft to the terminal Sump II. The major stalagmite deposits are to be found in the central zone of the cave.

The Cave

The cave entrance is located some 150m east of the Bristol Exploration Club headquarters, 'The Belfry'. It lies at the southern end of a shallow valley, known as the St. Cuthbert's Depression, close by an obvious rock outcrop. The entrance is artificial and is covered with a locked steel capping plate below which is a 15ft deep shaft of concrete pipes. The free-climb descent of the entrance shaft gives way to a low crawl passage emerging at the head of a small chamber in the floor of which gapes the infamous Entrance Rift, some 25ft deep. Originally this chamber was largely choked with debris which was hauled out by the original diggers via the Old Entrance, a wooden framed shaft, which became unsafe and was eventually

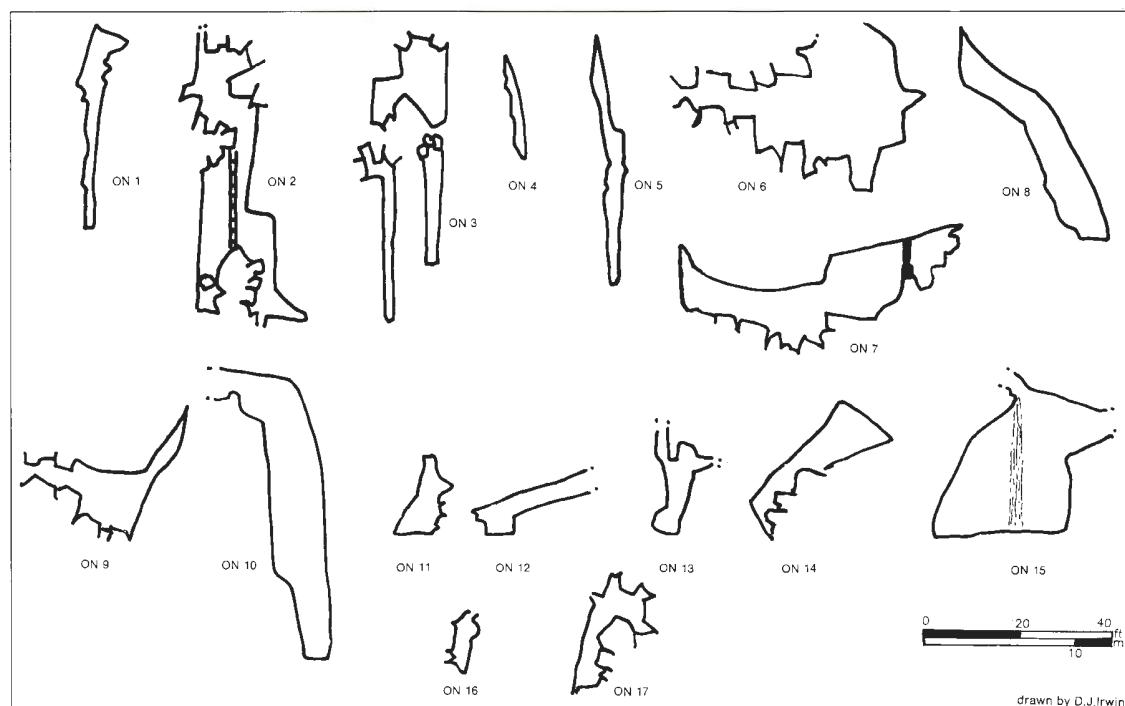


Fig. 3A New and Old Routes passage sections.

filled in 1964. The original entrance can still be peered into at the top of the stacked deads opposite the point of entry, and it may now be possible to regain the 'lost' Ochre Rift, a set of narrow rifts heavily coated with ochreous mud. The Entrance Rift too, was choked and considerably narrower than it is today. The judicious use of 'bang' opened it for all the initial exploration party to pass, though it did not suit larger members of the club at the time! A belay point for a ladder is located on the wall of the chamber, though under normal conditions this is not strictly necessary as the rift can be free-climbed. During high water conditions, however, a ladder is vital for an inexperienced party. When the stream is in spate the Entrance Rift can be an extremely strenuous undertaking.

At the foot of the Entrance Rift, a short but high rift gives way to a jumble of boulders through which an obvious route can be followed into a boulder-floored chamber. A large, dangerously suspended boulder, lodged just below the roof, is sufficient to warn the casual observer to keep well clear, and parties should not congregate below it. A hole in the floor is the head of the 25ft descent into Arête Chamber, made easy by a fixed steel ladder at Arête Pitch. The chamber, roughly triangular in shape, is some 30ft by 25ft and over 30ft high, and is dominated by a massive boulder, The Arête, whose upper edge gives the chamber its name. Part of Main Stream enters here, either falling from a slot high above the ladder or flowing down the wall to the north, which is coated with black pyrolusite.

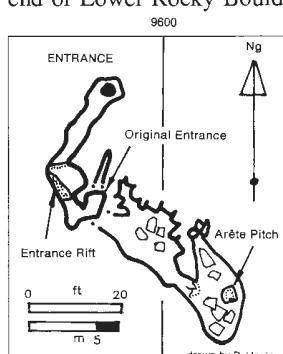


Fig. 3B Displaced plan of entrance passage.

In high water conditions, overflow streams flow out of the blind rift lying in the eastern wall. From Arête Chamber the stream route divides. To the north, a low archway leads to Pulpit Passage and after 60ft, Pulpit Pitch itself. To the south of the steel ladder a descent through a hole in the floor of the chamber leads to the start of Old Route.

Old Route

Below the hole in the floor of Arête Chamber, a narrow rift opens abruptly onto another, parallel, larger rift over 50ft high. A double descent down fixed steel ladders, Ledge Pitches (10ft and 15ft), gains the floor of the 6ft wide rift, the walls of which are lined with prominent, sloping, cherty ledges interlayered with thin shale and limestone bands. Opposite the lower Ledge Pitch ladder, the stream, having flowed from Arête Chamber along an oxbow passage, enters the rift through a small hole 10ft above the floor. This is the Showerbath. In wet conditions the water strikes the opposite wall drenching all who pass under it! Upstream the rift closes down, but a wet climb here gains the upper rift passage forming an alternative route bypassing Ledge Pitches. About 25ft downstream the rift closes down, but a stooping-height slot, to the left, enters Wire Rift, a narrow, 25ft high rift. In winter months it is here that one first feels the warm air of the cave. The stream tumbles down a series of short potholes before plunging down the double pitches, Waterfall (20ft) and Wet Pitches (15ft), on its way to the New Route. Near the roof of the rift, fragments of false flooring may be seen indicating the extent of previous choking in this section of the cave. Continuing down the rift and over the top of Waterfall Pitch, by traversing the obvious ledges, an awkward shuffle to a chockstone is reached. The way on twists and turns to the head of Mud Hall Pitch, rigged with a 15ft rigid steel ladder. In the floor of the Wire Rift, a few metres beyond the chockstone, a small hole leads down and eventually emerges in the side of the bedding plane below Lower Mud Hall enroute to Water Chute — a once only delight for the very thin!

Mud Hall and Lower Mud Hall

Mud Hall, like Arête Chamber, is spacious and of similar size. Largely devoid of any formation the chamber is floored with large boulders and mud which is common in the upper section of this cave. The fragment of an old pothole, Mud Hall features a massive collapsed southern wall while the western wall rises some 30ft to open into Pillar Chamber. To the east, the floor touches the steeply sloping roof separating it from the lower section of the chamber, known as Lower Mud Hall, which is reached by climbing down to the left of the steel ladder and on down a narrow, steeply sloping trench. Lower Mud Hall is the key to entering the various routes of the Rocky Boulder Series.

Lower Mud Hall, smaller than Mud Hall, has essentially three exits, one rarely passed by cavers though it does provide an interesting detour. There are four if one enjoys sky-diving! From the chamber entrance the stream from Wire Rift can be heard falling down Wet Pitch on the left, and a crawl through stalagmitized boulders in the left (north) wall eventually leads to the Water Chute. In the boulder strewn floor, two large holes lead down to Rocky Boulder Series; these are described later. At the extreme far right of the chamber, at the lowest point, Lower Mud Hall Pitch (15ft deep) can be reached enabling a quick, and unusual, route to Traverse Chamber Bedding Plane. The fourth exit lies at the foot of the far wall about half way along, great care is needed as, in a very short distance, the end of the hole suddenly, without warning, exits 30ft up in the wall of the pothole adjacent to the Water Chute — best avoided!

The commonly used route to the Water Chute is via a short crawl through stalagmitized boulders close to the stream falling down Wet Pitch and immediately the route divides yet again. The stream from Wet Pitch can be seen cascading into a narrow rift and, to the right, the way on follows a wide and winding tunnel, potholed with muddy pools, emerging into a low, but very wide bedding plane. Following an obvious shallow trench leads to the head of a 6ft climb down to rejoin New Route streamway near the head of the Water Chute. To the left of the trench is a wide bedding plane, the upper end of which allows a return trip to the Wire Rift. At the lower end,

along the strike, are various points where New Route streamway can be regained close by the Drinking Fountain.

The route from Lower Mud Hall Pitch leads directly to Traverse Chamber Bedding Plane passing two junctions, both on the left, enroute. The first leads directly to the base of the pothole adjacent to the Water Chute and an awkward 5ft drop gains New Route. The second junction also gains New Route streamway after a 15ft scramble.

Pillar Chamber

Returning to Mud Hall, Old Route continues up to Pillar Chamber, reached by climbing the west wall via a narrow slot between the wall on the right and stalagmitized boulders to the left. Pillar Chamber is dominated, as its name suggests, by the 10ft high column, cracked at its base through the floor settling. The roof of the chamber slopes steeply at about 30° and the floor is comprised of large scattered boulders. Around the sides of the chamber several stalagmite groups may be seen, and the rocks are covered with large quantities of botryoidal stalagmite, rarely found in such profusion in Mendip caves. Above the entry from Mud Hall is a short section of inlet passage.

There are three exits from Pillar Chamber, each worth taking in turn if variety interests the visitor. These exits enable the explorer to continue down the cave to Boulder Chamber, enter Rocky Boulder Passage, or gain the upper chambers known as Pillar Chamber Extension from which, if so desired, entry to Long Chamber Series can be made by way of the Fifty-four Foot Pitch.

The way on to Boulder Chamber is at the southern end and lowest point of Pillar Chamber, through a slot in the floor, to enter a large vadose trench some 10ft wide and eventually reaching 25ft in height. The floor, composed of boulders, drops away for 10ft, above which a nicely decorated oxbow reconnects with Pillar Chamber. Below this drop the entrance to a short rift extension may be seen 15ft high in the left hand wall. The route to Boulder Chamber continues past a large fallen boulder, propped against the left-hand wall, and enters the chamber by a huge limestone block known as



25. Lower Ledge Pitch.

Kanchenjunga. It is interesting to note that some of the features in the central area of the cave have been given Himalayan mountain names. In 1953, when the cave was first discovered, many of the cavers were also keen climbers. In that year Mount Everest had been climbed after many heroic attempts and, understandably, the famous Himalayan peaks were good candidates for naming features in the cave.

Above and beyond the Pillar Chamber column, the chamber narrows down and forces the caver to crawl into a small hole in order to gain Rocky Boulder Passage. Climbing down via large ledges, the passage forms a deep vadose trench some 20ft high and wide. It was here that the mammoth tooth was found in 1956. The passage continues for some 100ft to the short Rocky Boulder Pitch (15ft). The complex of passages beyond are dealt with later in the Rocky Boulder Series description.

Pillar Chamber Extension

This short and slightly hairy diversion is a series of ascending chambers forming the upper boundary of the 'cavern collapse' zone in the western part of the cave. Near the lower exit from Pillar Chamber, an alcove to the west gives access to an inclined squeeze at roof level. A small boulder chamber is reached, followed by a zig-zag route which enters a low, wide bedding plane extending upwards from the point of entry. A voice connection with Upper Long Chamber can be made in the zig-zag passage via an impassable rift. At the upper end of the bedding plane there are two possible routes to follow. To the left an awkward 6ft climb gives access to the upper chambers and, to the right and against the wall, a climb up through dangerously loose boulders that block an old fossil pothole gives access to the Upper Stream Passage above Upper Long Chamber.

At the top of the 6ft climb, the floor is covered with coarse gravel and breccia choking a pothole in the floor (the upper part of the pothole to be seen entering the upper section of Rocky Boulder Passage). Climbing up some 20ft a squeeze through loose boulders is encountered, through which it is necessary to pass to enter the upper chamber. The upper, un-named chamber is roughly square in floor plan and some 20ft across. Great care must be exercised, for in the roof is a huge slab some 10ft by 4ft by 2ft hanging from its longest side as a 'Sword of Damocles' par excellence! Further hazards are loose boulders in the floor at the corner diagonally opposite the entrance. These appear to be suspended over a void but no-one, to the writer's knowledge, has ever crossed or penetrated them. Moving up-dip through the chamber there are two other areas of interest. The first is an extension under the hanging wall giving access to a steeply inclined rift engraved with pronounced vadose trenches. Secondly, to the right of the rift, about 6ft above the floor level, a tight squeeze allows access to the continuation of the rift. Beyond the squeeze the rift is wider and some 10ft up on the left is a broad ledge at the back of which is the small hole forming the top of the Fifty-four Foot Pitch down into Upper Long Chamber. The end of the rift is dominated by a beautiful white stalagmite flow. A boulder suspended in the rift is an aid to climbing the rift and can also be used as a belay to descend the pothole.

New Route

Pulpit Passage is entered via the low arch under the northern wall of Arête Chamber and is an easy-going passage for 80ft to the head of Pulpit Pitch. Part of the stream in Arête Chamber flows down Pulpit Pitch whilst the remainder follows the oxbow to Ledge Pitcheson the Old Route. The Pulpit Passage stream is augmented by an additional stream entering from packed boulders at the top of a steeply inclined and entrenched bedding plane lying to the north of the passage.

The top of Pulpit Pitch is deceptively small. The stream flows down a gully and plunges down the 60ft drop to ledges below. The ladder is best attached to the bolt on the right-hand wall and belayed over the rock barrier, ensuring that it hangs over the large, jammed, flake in a 'rock cup' just below the lip of the pitch. This flake can be a menace for, although it is firmly wedged in the 'rock cup', it rocks sideways causing the ladder to slip under its sides. If this happens the climber has to leave the ladder and climb up over the boulder!

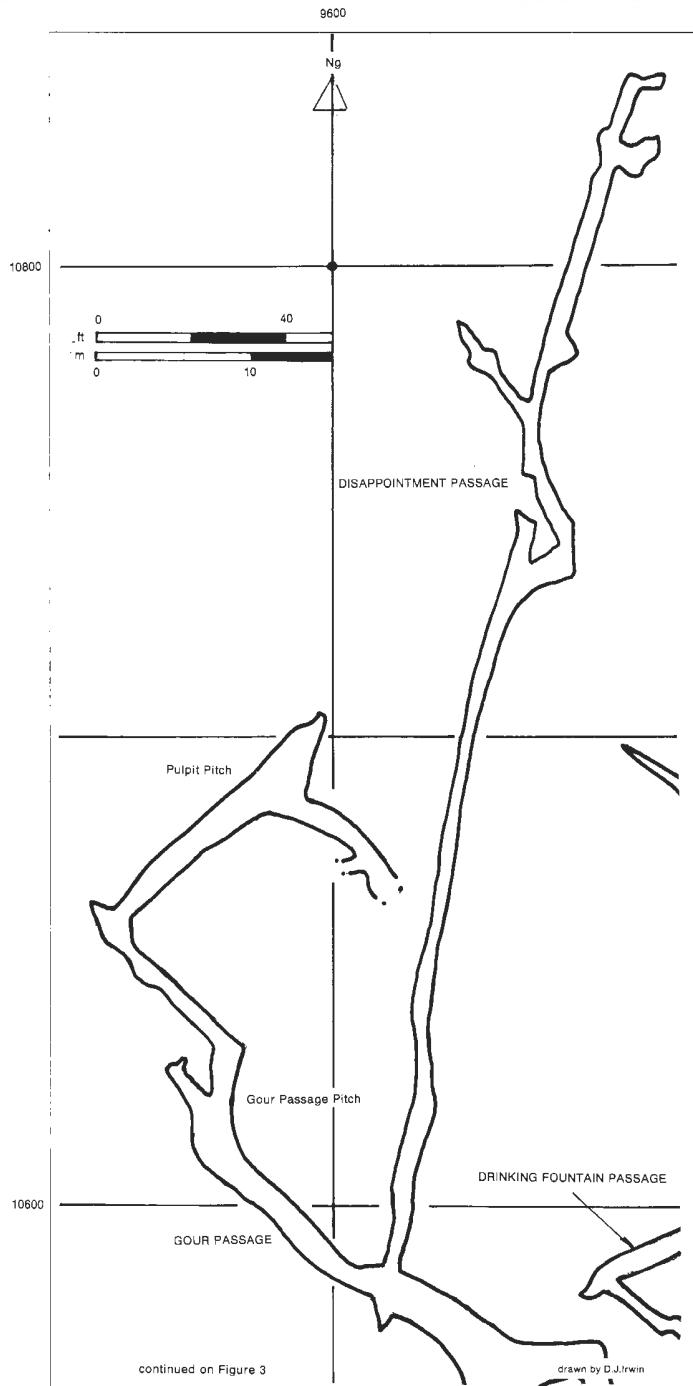
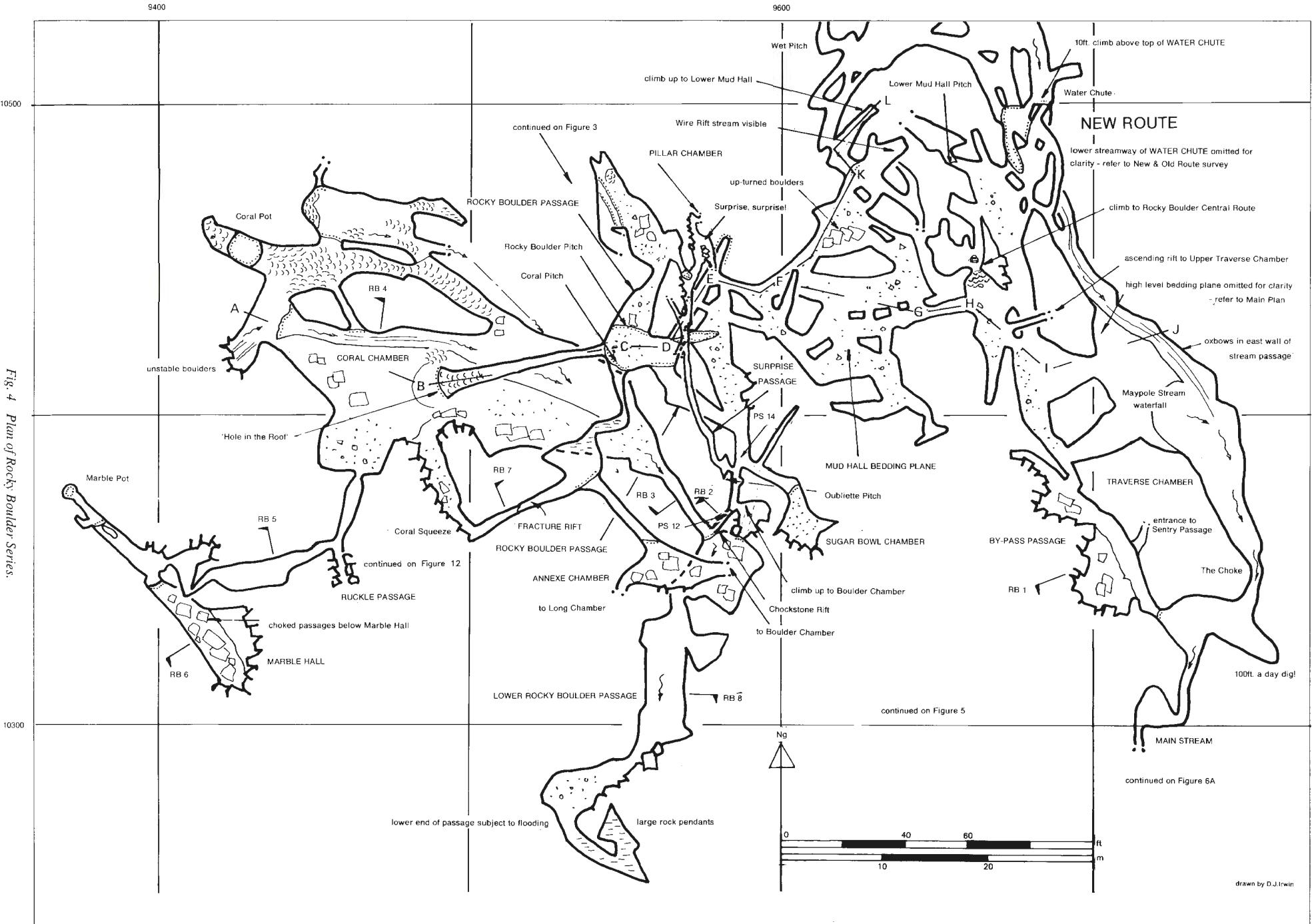


Fig. 3C Displaced plan of Disappointment Passage.

The climb is impressive, for the pitch is formed along a great rift; the far wall tapering away from the climb, reaching a maximum width near the bottom of 20ft. Though the climb is only just over 40ft to reach a narrow ledge, the floor, some 20ft below rapidly falls away down a series of short steps creating a fine impression of great depth and width. From the ledge, the descent is over a series of steeply sloping ledges or, alternatively, the ladder may be left and the ledge traversed to the left (facing the wall) to gain the Pulpit, an alcove at the head of the rift enabling the caver to reach the rift floor via an easy 10ft climb.

The stream, tumbling down the steps of the rift passage, shortly reaches Gour Passage Pitch, 18ft deep, to penetrate a large phreatic passage whose upstream section is blocked with flows of stalagmite. In contrast to the high rift above the pitch, the passage section now changes dramatically to a distinctly rounded phreatic form, the floor of which is covered with a yellowish layer of thick stalagmite (Gour Passage) over which the stream quietly flows.



Disappointment Passage

A few metres along Gour Passage an obvious inlet on the left may be seen. This is Disappointment Passage which, in the form of a rift, ascends a series of steps terminating at a final vertical climb reaching an impenetrable boulder choke. The whole passage is formed in the same joint as Wire Rift some 100ft above.

Drinking Fountain

Continuing downstream along Gour Passage a second inlet is reached — Drinking Fountain — the stream from this inlet emerging from a narrow slot. The zig-zag passage may be followed for some 200ft.

Water Chute

Immediately beyond Drinking Fountain, a slide down boulders reaches the gravel streambed and, after a few metres the head of Water Chute is reached. The Water Chute is a narrow trench descending at about 45° for some 20ft; though free-climbable a 40ft handline may prove useful. To the right of Water Chute a huge pothole rises high above to be cut into by the bedding plane descending from Lower Mud Hall. Above the entrance to the Water Chute, a difficult climb to a high level hole gives access to passages leading to the upper levels of Traverse Chamber and Lower Mud Hall.

Traverse Chamber and Bypass Passage

From the bottom of Water Chute, the high, wide passage continues until Traverse Chamber is reached. Part way along, Wire Rift stream enters at roof level, joining Main Stream. Traverse Chamber is a large, roughly circular chamber some 40ft high, from the roof of which Maypole Stream enters. The Main Stream flows across the gravel floor of the chamber into a narrowing phreatic passage closing down at a gravel choke (The Choke). This has been excavated and the connection made with the lower section of the streamway but it tends to silt up. Above and to the west (right) of the chamber, an extensive bedding plane, Traverse Chamber Bedding Plane, intersects the entire length of the chamber and part of the approach stream passage. Climbing up into the bedding plane, which borders onto part of the complex Rocky Boulder Series, is a commonly used route to bypass The Choke.

Ascending into the bedding plane, the route to Bypass Passage is initially upwards and then to the left, passing large boulders jammed between the roof and floor. The whole area is liberally coated with mud and gravel and almost devoid of any formation, giving the place a slightly oppressive atmosphere. Bypass Passage is in the left-hand wall of the bedding plane and entry is by crawling over small boulders to a downward descent through a letterbox entering a well-defined vadose passage choked with boulders at its upper end. Moving down the passage, the roof rises to a boulder choke, the top of which forms the floor in the lower section of Upper Traverse Chamber. The floor of Bypass Passage falls away in the

form of two short climbs. At the head of the first, about 10ft up in the left wall, is the entry to Sentry Passage, enabling a connection to be made with either Maypole Series or Upper Traverse Chamber. Sentry Passage is reached by climbing the obvious ledges on the right hand wall followed by a bold step into its steeply sloping exit. Below the climbs, Main Stream passage is entered.

Rocky Boulder Series

This complex and often confusing series of passages extends to Coral Chamber and Marble Hall area to the west, borders onto Main Chambers to the south, and Lower Mud Hall and Traverse Chamber to the east. The whole area is devoid of stalagmite deposit except where it has been uncovered by the removal of infill. There are at least six ways of entering this area and to attempt describing all known passages in a meaningful manner is clearly impossible. An outline of the main routes and an indication of the side passages will be given. The best starting point is Lower Mud Hall.

In the floor of Lower Mud Hall are two large holes. The first, approached from Mud Hall, is a 20ft deep rift and only climbable with tackle. However, the second hole allows the explorer to descend an easy scramble, to where the bottom of the first rift enters the right hand wall. A further short, but awkward, 5ft drop enters a similar, parallel passage, at the upper end of which a short section of Wire Rift stream may be seen by all, but only 'thimmen' are able to follow the stream to the point where it joins New Route, getting a trifle wet and uncomfortable in the process!

From the 5ft drop, the way continues down the passage for a short distance, passing a number of up-turned boulders, and enters an extensive bedding plane, Lower Mud Hall Bedding Plane, ascending to the right. The extent of the bedding plane is not at first appreciated, it being broken up into zones by rock 'pillars'. Old stalagmite deposits and gravel floor complete the picture at the junction. To the left (south) is a horizontal traverse across the lower section of the bedding plane. At the far end of the bedding begins a short, ascending passage which gains the upper section of Traverse Chamber Bedding Plane giving quick access to Bypass Passage and the Main Stream.

Rocky Boulder Passage

Moving upwards from the junction by the up-turned boulders, always keeping to the right, under the exit of a steeply inclined, blind rift in the roof, a large, open, entrenched bedding plane is reached. To the right, a high rift, Rocky Boulder Aven, rises under the floor of Pillar Chamber. Ascending the muddy and often slippery bedding, a 25ft high passage is reached — Rocky Boulder Passage. This is actually an intersection of several high level passages that have formed an open pothole. Facing the end wall, at roof level a hole, partially hidden by a ledge, is the upper end of the 'Hole in the Roof' in Coral Chamber; to the right above the 15ft Rocky Boulder Pitch is the upper section of Rocky Boulder Passage leading back to Pillar Chamber. To the left, the 10ft high Coral Pitch leads through a muddy passage to the eastern end of Fracture Rift.

A large passage on the left, the lower section of Rocky Boulder Passage, is entered by a short step-up. It continues down-dip to a three way junction. To the left a phreatic tube leads to a blind rift on the left, and ahead gives access to Sugar Bowl Chamber, long thought to be lost following a collapse during digging in the upper reaches of Boulder Chamber. An oral connection with Quarry Passage may be made from here. When it was rediscovered a number of bat skeletons were found here partially buried in the banks of gravel.

To the right at the three-way junction, a short crawl reaches the head of the originally blind shaft — Oubliette Pitch (20ft). Traversing out over the pitch and moving to the right, Surprise Passage can be followed up-dip for about 120ft emerging in a wide but low bedding chamber (Surprise, Surprise) leading into Pillar Chamber Extension and, to the left, into Rocky Boulder Passage. Descending Oubliette Pitch, a bedding plane is encountered half-way down. This eventually continues towards Chockstone Rift but only a voice connection may be made. At floor level a strike passage leads off, and after about 25ft it turns down-dip to emerge in the up-dip wall above the entrance crawl into Coral Chamber.

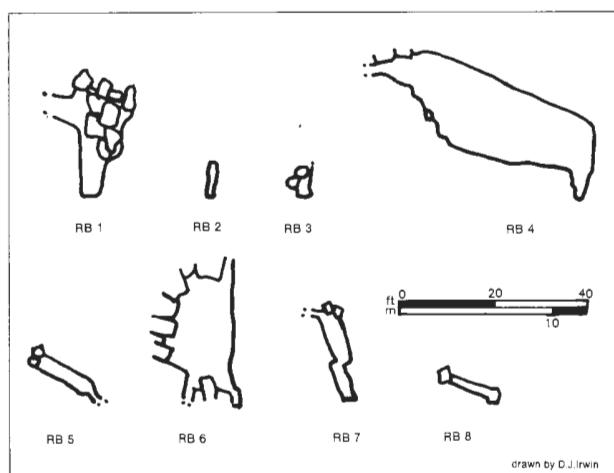
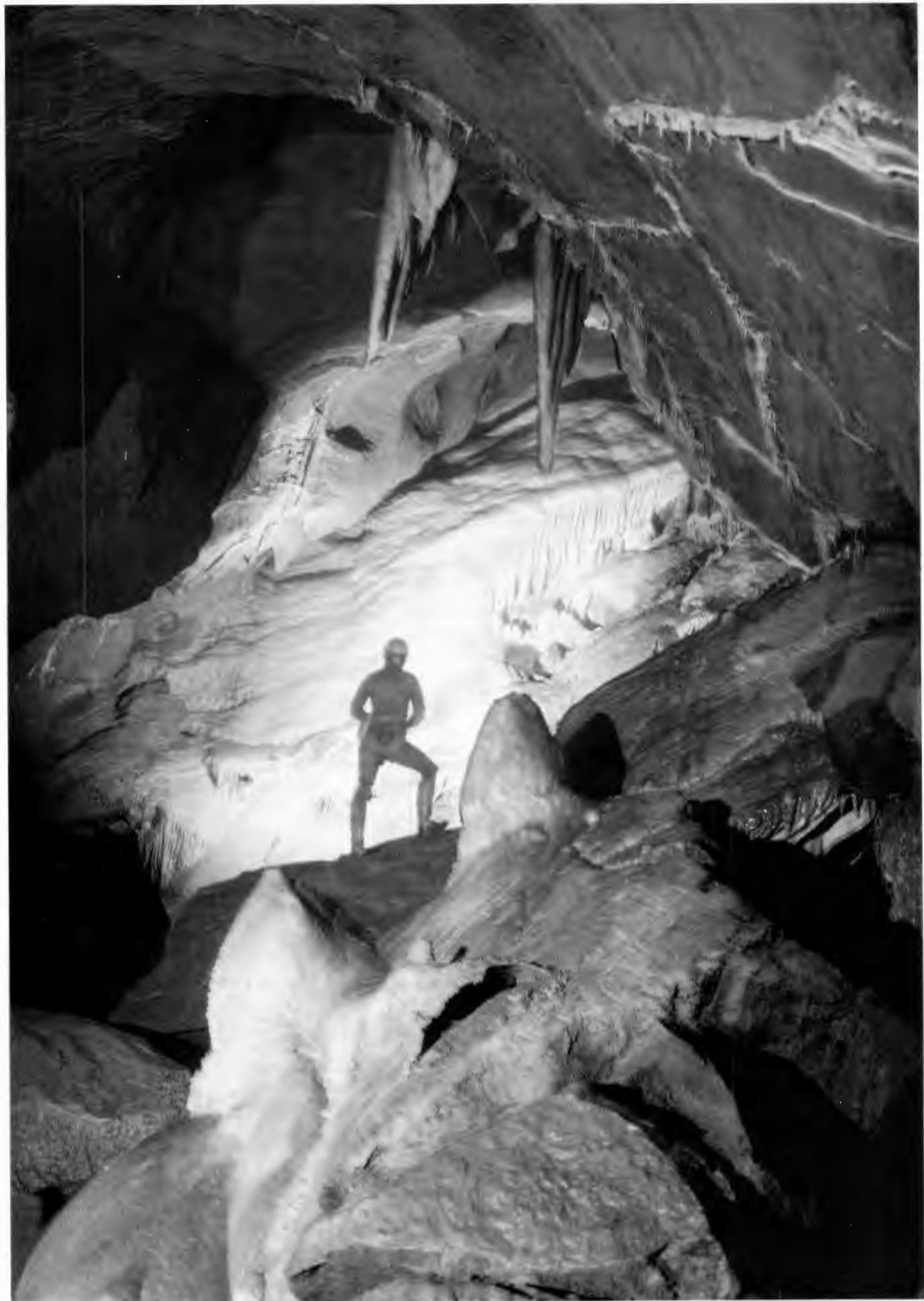


Fig. 4A Rocky Boulder Series passage sections.



26. *Cascade Chamber.*

Ahead at the three way junction the main route continues via a tight rift passage to enter a small boulder chamber. There are two ways on from here. A 15ft climb up obvious chert ledges (great care is required at the top because of loose boulders) enters the north-eastern end of Boulder Chamber; in the floor, the tight and awkward Chockstone Rift leads downwards to yet another junction. Opposite the lower exit from Chockstone Rift, a short ascent gives immediate access to the hidden Rocky Boulder Chamber, whilst to the right a low-level, sandy-floored crawl leads into the lower reaches of Coral Chamber.

Rocky Boulder Chamber

Rocky Boulder Chamber, a large void under Boulder Chamber, leads into a descending bedding passage, Lower Rocky Boulder Passage, entered by a hole in the boulder floor of the chamber and finally emerging, after 100ft, at an impressive rift. This is the upper limit of the great rift that is also seen in Gour Hall and continues through Cerberus Series, though there is no known connection with the latter area from this point. The lower end of this rift occasionally floods, but if the water is low, a fine display of large rock pendants may be seen. The flooding here is associated with the water level in Lake Chamber only a few metres away.

Coral Chamber

Coral Chamber, so-named because of the exposures of fossil coral to be found there, is perhaps the longest chamber in the cave and up to 50ft wide. It is, unusually, formed across the end of the dip plane and thus is steeply inclined at about 40° and over 200ft long. A small, intermittent stream, from the Fair Lady Well stream flows down the entire length of the chamber, mostly along the base of a deep vadose trench, and continues on through Rocky Boulder Chamber and Lower Rocky Boulder Passage to the end rift. The bedding plane section of the chamber is bounded by boulders to the south, while to the north an ascending, stalagmite-floored side passage runs parallel with Coral Chamber, re-emerging at the top of Coral Chamber close by the 30ft deep Coral Pot. From the top of this large pothole, which is coated with thick layers of stalagmite, can be seen an enticing passage on the far side but this is short and completely blocked with stalagmite — don't bother! To the south, across the top of Coral Chamber, lies a pile of haphazardly poised boulders jammed onto a steeply ascending floor — these are best avoided, although a dangerous route through them leads to Horror Chamber and Long Chamber Extension.

About halfway up Coral Chamber side passage a cross-road is reached: to the left a narrow rift reconnects almost immediately with Coral Chamber; to the right an awkward climb enters a side chamber through which a small stream occasionally flows re-emerging from tight bedding cracks in the lower section of Coral Chamber to form a tributary to Coral Stream.

The 'Hole in the Roof' is to be found approximately half-way up Coral Chamber. This is a large, gaping hole that quickly closes down to flat-out and tight squeezes leading to a 30ft long phreatic tube, the far end of which overlooks Rocky Boulder Pitch.

Coral Squeeze and Fracture Rift

To the left of the 'Hole in the Roof' a scramble over boulders leads to a short inclined 'rift' passage and the partially hidden Coral Squeeze at the far right hand side. Coral Squeeze, a tight upward squeeze between a large jammed boulder and the roof of a phreatic tube, gains Fracture Rift. This is truly a remarkable feature for here the right hand wall has slumped away from the left side leaving negative images on both walls. Traversing upwards and along the rift one reaches a junction. Ahead ends at Coral Pitch, and to the right a climb down sloping ledges reaches Annexe Chamber, a chamber adjacent to Boulder Chamber and under Long Chamber, both of which may be gained from here.

Moving up Coral Chamber from the 'Hole in the Roof', the south wall recedes to form a large alcove to the left. A scramble to a small hole at roof level is the start of Ruckle Passage (leading to Long Chamber Extension) and Marble Hall Area.

Marble Hall Area

The start of Ruckle Passage is in the form of a small chamber. The route to Long Chamber Extension is directly ahead. In the right hand wall (west) a 4ft high slot leads to an extensive inclined bedding plane. At the far end, a hole at floor level leads down a winding route, basically through boulders, to enter a 15ft long, narrow chamber. To the left a hole through boulders, at floor level, gives access to Marble Hall; to the right, at the opposite end of the chamber, are two near-vertical phreatic tubes, the left-hand one of which can be passed to reach the top of Marble Pot.

Marble Hall, some 40ft long and high and about 20ft wide is floored with large boulders. The 10ft climb down into the chamber is over a 4ft wide band of pink coloured fault breccia. The major feature of the chamber is the un-waterworn fault wall displaying Blackrock Limestone heavily mineralised with calcite banding. There are fine displays of fossils in the rocks including Productus shells and the coral Michelina. Under the left-hand wall of the chamber lies the way on to a lower, short series of gravel floored passages; none are extensive. A number of routes are known through the boulders at the far end of the chamber, including three small 'boulder' chambers, some of which re-connect with the inclined bedding plane at the start of the series.

Marble Pot is one of the great delights for the cave passage collector. Descent is via the near-vertical phreatic tube at the end of the upper chamber. From the bottom of the tube, a further climb down a 10ft deep rift leads to the floor. To the left, a short alcove contains a few stalagmite decorations. Forward, a squeeze at floor level leads immediately to the head of Marble Pot, 30ft deep. Once heavily choked with debris, the walls of the pothole are still covered with its remains including stalagmitized pebbles and gravel. Marble Pot is free-climable, though care should be taken as rescue from this point would be extremely difficult, if not impossible. About half-way down the pothole a slot in the wall leads to the hard-fought for Marble Pot extensions. The slot leads to a tight, descending rift intersecting a 30ft long bedding plane. Below this point a further, extremely tight rift may be descended to a choke.

Rocky Boulder Central Route

A central route, quite isolated from the rest of Rocky Boulder Series, may be entered from either Mud Hall or Lower Mud Hall. Imagine, if you will, a long sloping roof with the floor below touching it in a number of places forming separate chambers down its length. This is what happens in the Pillar Chamber and Mud Hall area. From the upper end of Pillar Chamber Extension, Pillar Chamber, Mud Hall, Lower Mud Hall and the continuation bedding plane below, the roof extends down to Water Chute. A similar situation occurs on a smaller scale to the south of these chambers, the area being bounded by Boulder Chamber and Upper Traverse Chamber.

This section is best entered, for ease of route finding, from Mud Hall. Facing the way to Pillar Chamber, a route through boulders under the left hand wall of Mud Hall leads to a small boulder chamber. Lower Mud Hall may be reached from here. Ahead, another, even smaller, chamber is reached, forming the inevitable junction. To the right, a short rift leads to the top of a beautiful stalagmite cascade some 15ft high. A careful descent to the right of this enables Old Route to be reached near the 'fallen boulder'. There are two other features in this passage: the first a low level passage on the left that finally emerges in Upper Traverse Chamber, and secondly, just before the exit out into Old Route, a short detour to the left gives access to a very small alcove containing beautiful sword shaped crystals.

Back at the junction in the smaller of the two chambers, a descent to the left gives access to an ante-chamber and a final climb down a decaying stalagmite bank enables the explorer to reach the bedding plane in Traverse Chamber.

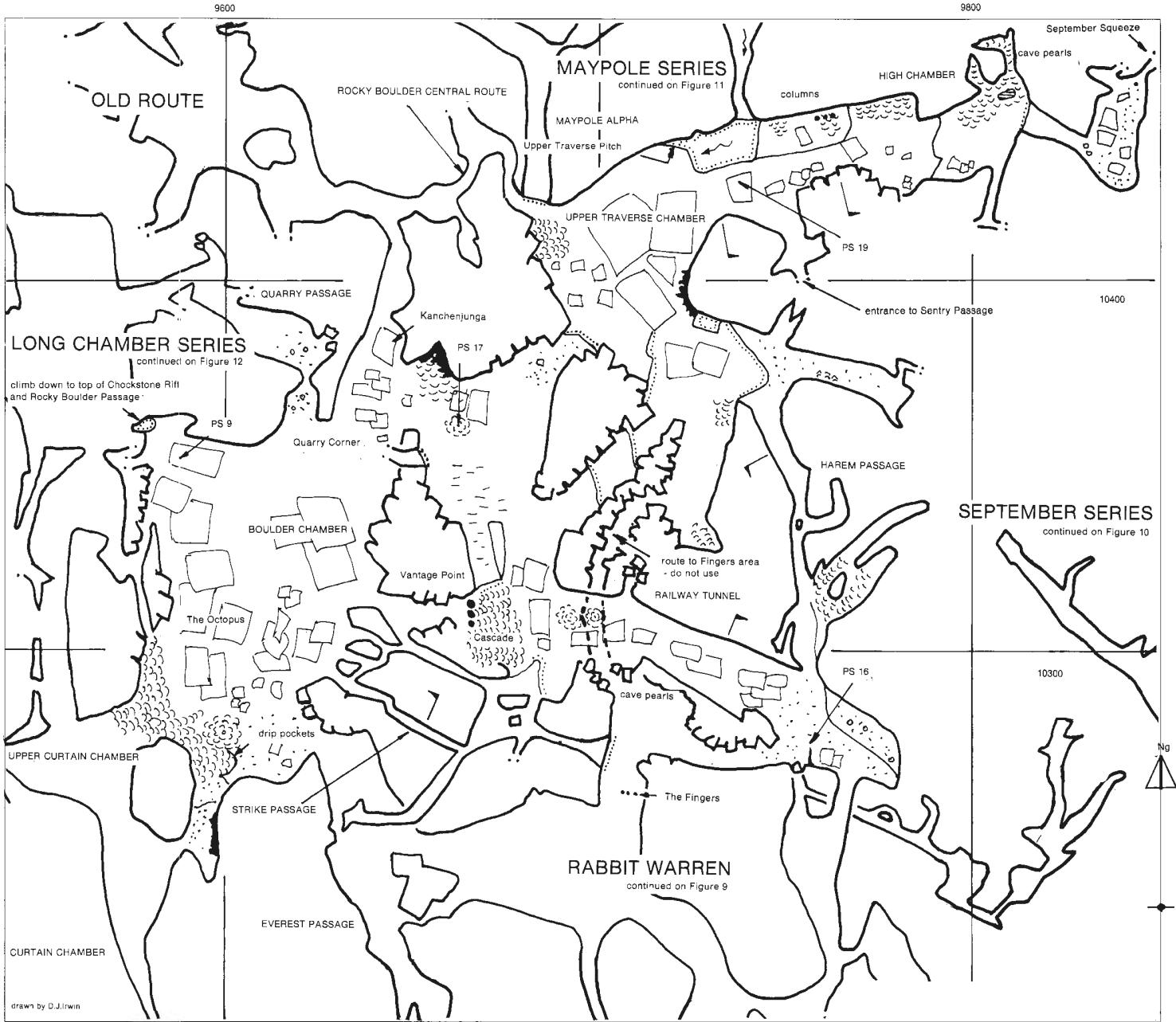


Fig. 5 Plan of Main Chambers.

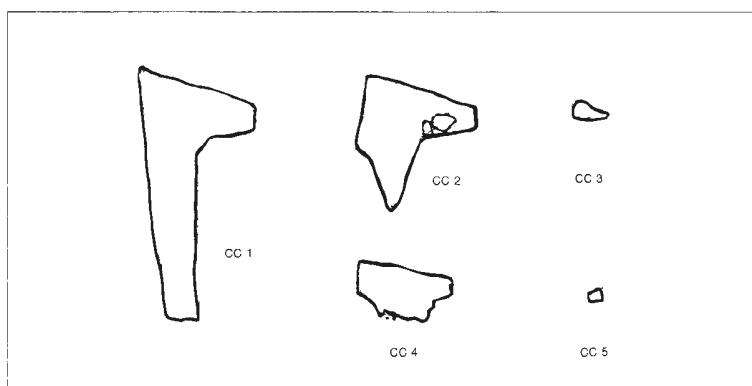


Fig. 5A Main Chambers passage sections.

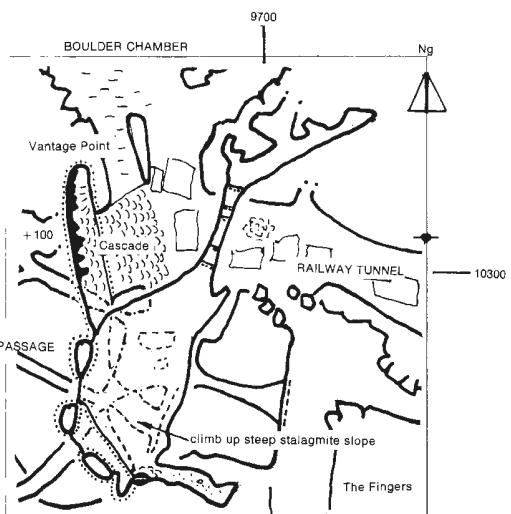


Fig. 5B Displaced plan of passage over Cascade.

Main Chambers

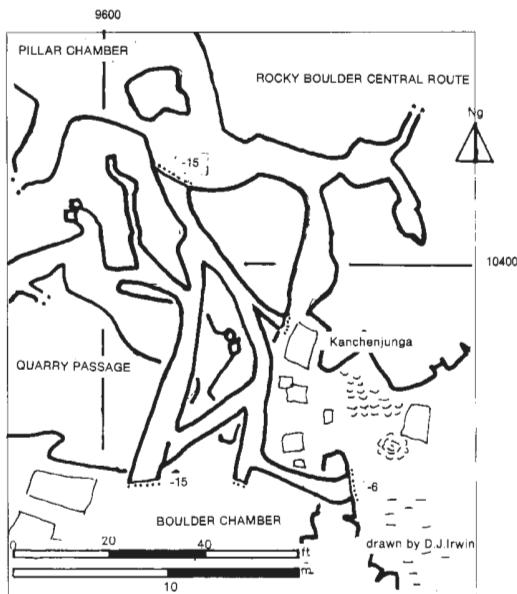


Fig. 5C Displaced plan of passages above Kanchenjunga.

Boulder Chamber

Boulder Chamber forms the parting of the ways between the remainder of the lower cave and side series such as September Series, Rabbit Warren Extension, Long Chamber and Canyon Series. Arriving at Kanchenjunga, Boulder Chamber extends in all directions. To the right (west) the far boulder wall is reached leading to either Rocky Boulder Series or Long Chamber Series whilst to the left (east) following the vague outline of the chamber, an inclined rift leads to a short climb down into Upper Traverse Chamber. About 50ft from Kanchenjunga, to the east, a slide down a muddy slope ends at a fine vantage point overlooking a magnifi-

cent white stalagmite flow, over 150ft high — The Cascade (*do not descend from this point*). Hanging from the roof above the flow, a superb, purplish coloured curtain can be seen.

Everest Passage and Curtain Chamber

Everest Passage and Curtain Chamber From Kanchenjunga, heading down Boulder Chamber and past isolated formations (one commonly known as 'The Octopus') and huge boulders, the chamber narrows and the way on to Everest Passage lies under the left hand wall through partially choked arches. At this point, one of the longest free hanging stalactites in the cave may be seen above a suspended false stalagmite floor which displays many fine examples of drip pockets on its underside.

To the right, immediately beyond the false floor, a high rift, upwards of 40ft in height, leads past nests of cave pearls and stalagmite drip pockets into one of the most spectacular sights in the cave — Curtain Chamber. This superb rift chamber, some 110ft high, displays a truly impressive cluster of curtain formations most of which are over 15ft long. How many there are is impossible to say as each curtain interlocks with another. Pass these formations with great care, keeping as far to the right as possible. The curtains form the lower section of a stalagmite flow over 30ft high including a number of reddish-brown columns.

The author makes no apology for the superlatives used to describe The Cascade and Curtains for they are truly among the great spectacles of British cave scenery.

Upper Traverse Chamber

Entering Upper Traverse Chamber from Boulder Chamber is an impressive sight. Huge limestone blocks are strewn across the floor, some up to 20ft long (the largest is known as K2). Keeping to the left the lower section of Maypole Series can be overlooked at the head of the 15ft deep Upper Traverse Pitch, but an alternative route gains Maypole Series without the need for any tackle via Sentry Passage. Above this gulf a high rift aven — Maypole Alpha — has been scaled for 100ft and a visual connection made with Jerusalem Oxbow in Maypole Series.

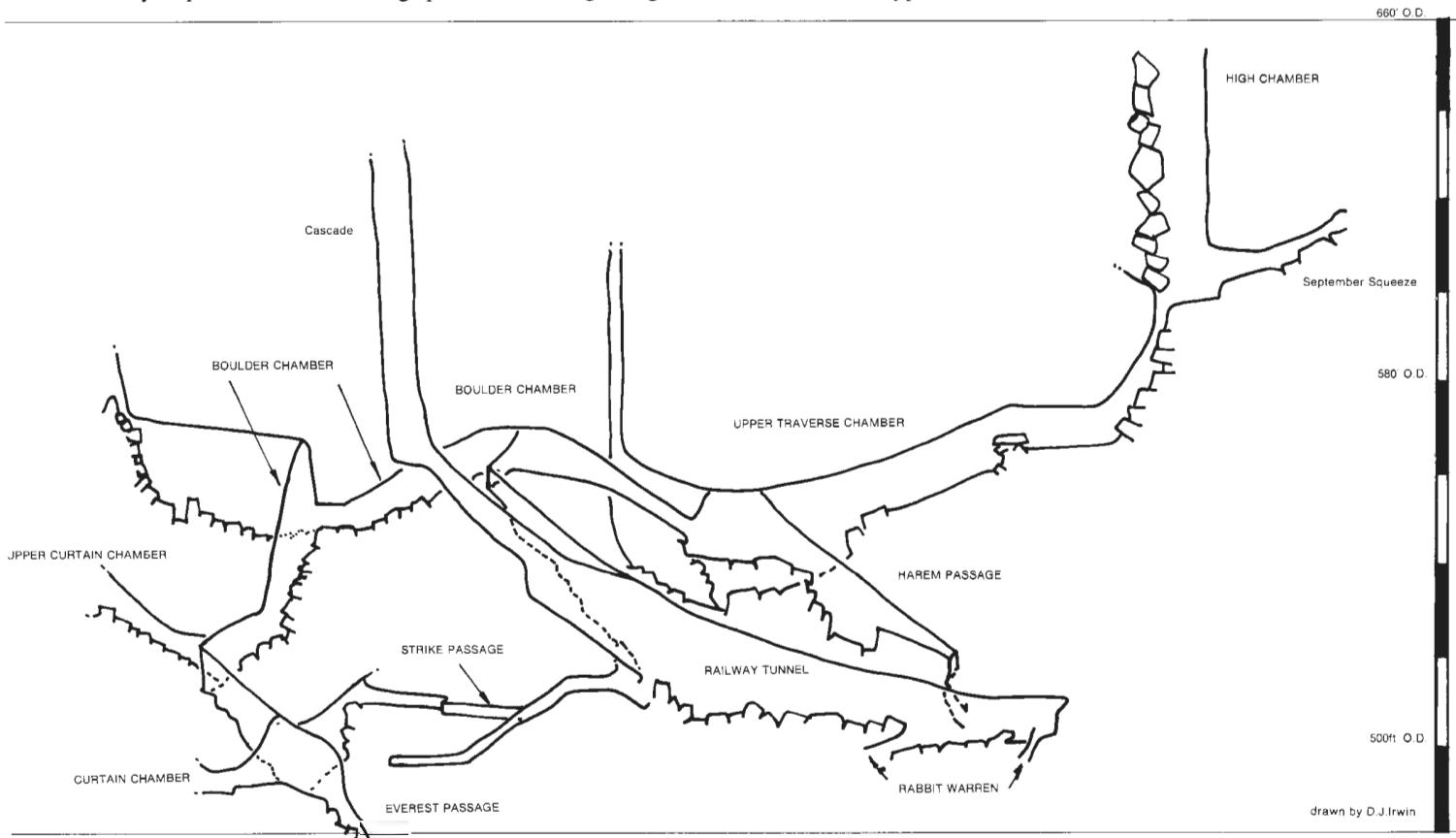


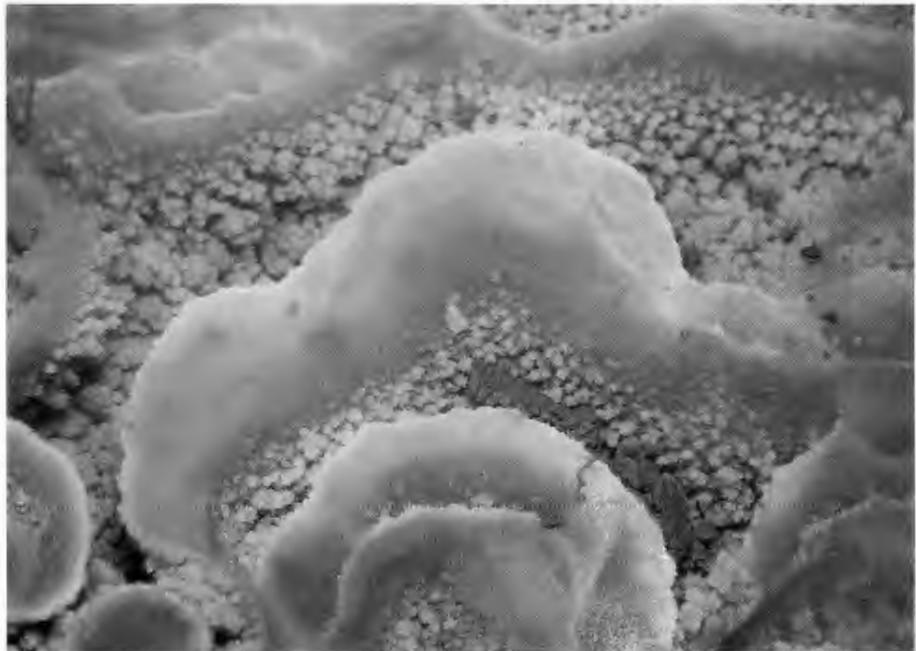
Fig. 5D East-West projected elevation of Main Chambers.

A climb over boulders at the north end of Upper Traverse Chamber leads to a bold step into the large vadose inlet passage — Maypole Alpha. A short scramble leads to a 12ft climb followed by a further short section and the base of a 8ft pitch. Above the pitch a bolt has been placed there for ladders and rope. Ahead is a heavily stalagmitized area and the base of a 15ft climb. A very tight squeeze is encountered at the top of the climb, which is entered through a stalagmite grill. Beyond the squeeze, lies a stalagmitized grotto with fine gours and a nest of cave pearls. The rift continues for a further 70ft, the floor rising over stalagmite banks until the way on is blocked by stalagmite. The visual connection with Jerusalem Oxbow is through a small hole in the stalagmite grotto.

High Chamber

Climbing over the large boulders in Upper Traverse Chamber, the traverse is reached giving an awe inspiring view into the Maypole Series rift. Opposite, against the far wall, a fine cluster of columns decorate the general scene. Upwards, along the traverse and scaling two boulder climbs, High Chamber is reached giving access, through a passage at the far right, to Rabbit Warren Extension and September Series. High Chamber is roughly square at floor level and over 200ft high. A climb up the boulder wall above the point of entry will gain a small chamber with fine helictites. Above this, up the steeply-sloping bedding plane floor followed by a traverse to the right, a 15ft pitch is reached leading to an obvious ledge; this is the top of the west wall of High Chamber. A further 15ft climb leads to a free-climbable rift ending in a jumble of stalagmitized boulders. From the north-western corner of the chamber an ascending passage gives a fine view of the large cave pearls set in a floor of pure white calcite. There are numerous other nests of cave pearls below the floor of the chamber.

In the southeast corner of the chamber an awkward rift, Purgatory, leads to Echo Chamber. This is the upper section of the oxbow from Upper Traverse Chamber. The lower section is entered at the vantage point overlooking Maypole Series in Upper Traverse Chamber and follows the main route to High Chamber (vulnerable formations — do not pass). An oxbow, originating under the right



27. Gours near First Stalagmite Bank, Rabbit Warren.

hand wall at the start of the traverse, in Upper Traverse Chamber, connects with Echo Chamber.

Sentry Passage

By the entry from Boulder Chamber the lower section of Upper Traverse Chamber can be reached by descending the steep boulder slope to the right. At the bottom an obvious hole to the left gives access to Sentry Passage connecting with Bypass Passage, passing the upright boulder known as The Sentry at the lower end. Following Sentry Passage up-cave a crawl through a muddy pool leads to the start of Maypole Series close to Short Chain Pitch.

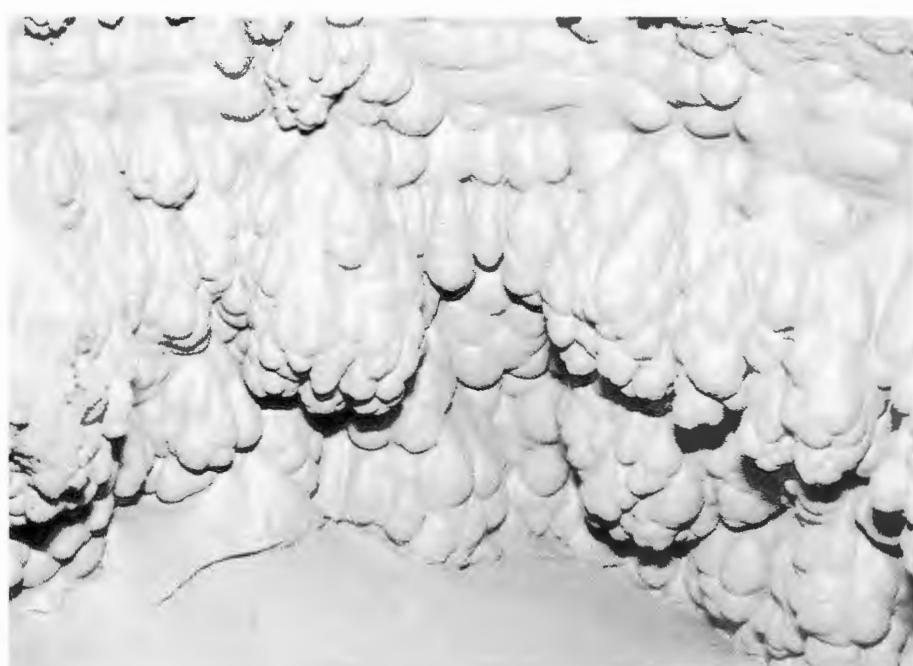
Harem Passage

Moving across the lower section of Upper Traverse Chamber a ledge is gained leading to two exits. The left is blind and closes down after 50ft though for the thin-men a short tight section of passage may be entered at roof level at the end. To the right of the first passage, is Harem Passage, so called because of the shape of the portal where it joins the Railway Tunnel.

Before leaving Upper Traverse Chamber, to the right of the ledge a wide but low alcove off the chamber may be seen, mainly sandy floored interspersed with large boulders, ending at a pool and a few scattered stalactite formations. A route through the boulders on the right gains an obvious passage that connects with The Fingers area (*do not attempt to reach The Fingers from this route as considerable damage will be done to the cave pearl nests*). Various routes down through the dangerously loose boulders give access to Bypass Passage.

Railway Tunnel

Railway Tunnel, lying roughly east–west and some 60ft in length, ends at a large cobble and gravel choke that shows clearly the sequence of infill deposition in this area of the cave. To the east The Cascade is reached and the area is floored with large stalagmitized and sand-covered boulders, the whole scene being dominated by the enormous cascade of pure white calcite.



28. Mud formation, Rabbit Warren.

Strike Passage

To the left, at the foot of the Cascade, a small hole at the top of a rising ridge enables Strike Passage to be entered. The route reaches the lower section of Boulder Chamber and is followed by keeping to the right. The first left hand passage en-route through Strike Passage leads to a short descent to the foot of a steeply sloping rift. A 30ft climb, made extremely difficult by the distinct lack of handholds, gains a ledge opposite the Vantage Point overlooking The Cascade. It is from here that the whole pure white stalagmite flow can be seen. Below, the flow descends to Cascade Chamber (at the end of the Railway Tunnel) and above, for what is new to most cavers, The Cascade continues up an almost vertical rift to a height of 100ft disappearing into a tantalising hole in the roof. (***This section of the cave must remain inviolate.***)

Behind and traversing over the sloping rift, a 10ft climb up leads to a small hole and an ascending bedding plane running up-dip for some 100ft, again gaining a magnificent view of The Cascade.

Rabbit Warren

Rabbit Warren forms the lower 'middle section' of the cave and is bounded by Railway Tunnel to the north, Rabbit Warren Extension to the east while Everest Passage and Main Stream forms the high and low level boundary on the west side. The series is one of the most complicated groups of passages in the system; the others are Long Chamber Series and Rocky Boulders Series. Rabbit Warren differs from the other complex areas in that it is essentially a phreatic network with little vadose modification other than the removal of infilling and it is free from collapse.

There are many points of entry, most being from the northern and western boundaries, i.e. the Railway Tunnel, Main Stream and Everest Passage. The following description will trace the commonly used route from the Railway Tunnel to Plantation Junction via the First and Second Stalagmite Banks. Side passages will be noted and referred to later in the text. The passage junctions are located by their co-ordinates so that a quick reference can be made to the relevant plan of the cave.

Railway Tunnel to Plantation Junction.

At the eastern end of the Railway Tunnel, past the large curtain on the right wall, a phreatic tube at floor level descends down-dip. The passage section at this point is typical of this area, the roof and walls being basically circular while the floor extends beyond the walls along the bed. After 20ft the passage widens at a junction where a lower passage enters from the right (Passage A). A trench occurs at the convergence of the two passages leading down to a choked tube. To the right is a small oxbow. The main passage continues in a southerly direction for a further 15ft, where a low arch on the left connects with a parallel passage. A short slide follows ending at another passage junction with a sandy floor and a sizable passage entering from the right (Passage C). The way on, to the left, enters a low but wide bedding plane extending well to the left (east). At the entrance to this bedding plane, a small hole, some 3ft above the floor can be seen (Passage B). The bedding plane, some 20ft wide, is dominated by two pure white stalagmite flows that emerge from small holes at the upper end of the bedding plane. Following the right (south) wall of the bedding plane another junction is reached. Several good examples of stalagmitized, pebbly infill may be seen in the roof at this point. A low passage leading to the right is partially blocked by a large gravel bank (Passage D). Continuing along the main route, the roof (which is low at the junction) remains level but the floor drops rapidly and is covered with very wet mud ensuring that the caver reaches the bottom faster than he had anticipated! The passage height reaches some 7ft in the lower reaches and the floor



29. Rabbit Warren bedding plane.

is covered with large boulders. Low on the right, a very tight, tubular passage will be seen heading back up-dip, but the way through is barred by a fine white stalagmite flow on the floor. The upper end of this passage may be entered from Passage D. South of the entry to this small passage, oral connection may be made with a branch passage near the commonly used route from Dining Room to Second Stalagmite Bank.

To the left, a muddy stalagmite flow emerges from a hole in the roof — First Stalagmite Bank. A climb over the stalagmite barrier enters



30. Mini formations in Rabbit Warren Extension.

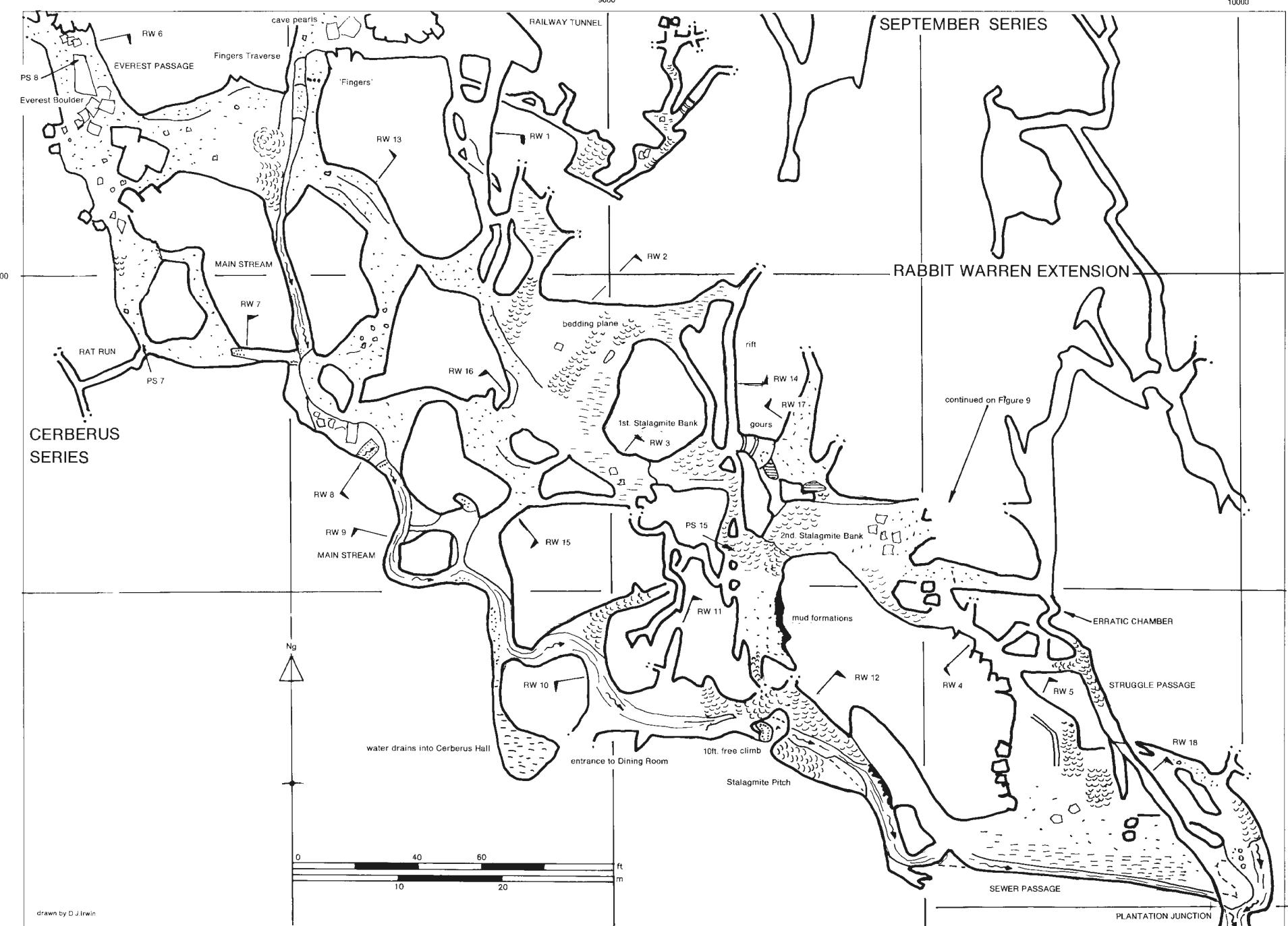


Fig. 6 Plan of Rabbit Warren.

a 'chamber' containing massive stalagmite banks from the top of which are two passages leading back up-cave (Passages E and F). The main route leads south again, to the right of the stalagmite flows and swings sharply to the right. The floor dips steeply and enters a short stretch of passage up to 8ft high. Many delicate mud formations may be noted at floor level along the lower section of the passage and a number of large rock pendants are to be seen. This point is yet another passage junction. A narrow 4ft high slot to the right leads to a passage ending at the Main Stream opposite the entrance to Dining Room (Passage C).

Beyond this junction, a chamber is entered. To the left is another, but larger stalagmite bank — Second Stalagmite Bank, while to the right more fine mud formations are to be found at floor level. Great care should be taken to ensure that these formations are completely avoided. At the lower end of the 'chamber' a stream may be heard but not seen. This is in fact a small trickle that leads down to the head of Stalagmite Pitch. A tiny hole, low on the left hand side of the 'chamber' closes down in a very short distance.

A climb over Second Stalagmite Bank enters a very wide passage. The roof slopes down steeply from a maximum height of 8ft on the left to some 2ft on the right. Two climbs, leading to an inner chamber, may be made immediately above Second Stalagmite Bank over further large banks of stalagmite. The inner chamber contains one notable feature — a 3ft deep pool with many delicate mud formations clinging to its walls. A steep scramble up a scree slope leads to an abandoned dig. To the north of the pool several very fine gours may be seen in a short link passage connecting with Passage F; the way through is taped in order to preserve the formations. Above the pool, a 30ft high aven may be seen; this has been climbed but only revealed a very short length of passage.

Moving from Second Stalagmite Bank, the passage trends in an easterly direction until two phreatic passages lead off to the left (north-east) both passages uniting after about 10ft. This single passage continues upwards and eventually leads to a low, sandy floored bedding plane. There is a very fine, though small, 'soap-flake' pool near the entrance of the bedding plane. The area beyond is blind and access to it is barred for fear of damage to the pool.

Past the junction with the two passages, the main route turns sharp right and then left. To the right is a low bedding plane, on the floor of which are many mud-covered gours which should not be crossed. A few metres further ahead is a beautifully proportioned passage that leads to Rabbit Warren Extension. At this point, a low hole in boulders will be seen at floor level to the right of several pools, and leads to a high passage which shortly ends at the head of an enormous, steeply inclined bedding plane. Just before this point, on the left, are the entries to Struggle Passage. By descending the first section of the bedding plane, an obvious traverse is followed along the base of several stalagmite flows. The bedding plane soon degenerates into a narrow passage and the sound of a stream can be heard roaring away in the 'distance'. After a few metres is the head of several stalagmitized mud banks in a large passage and a stream can be seen emerging from under a false stalagmite floor. This is the Plantation Stream which runs for a short distance before joining

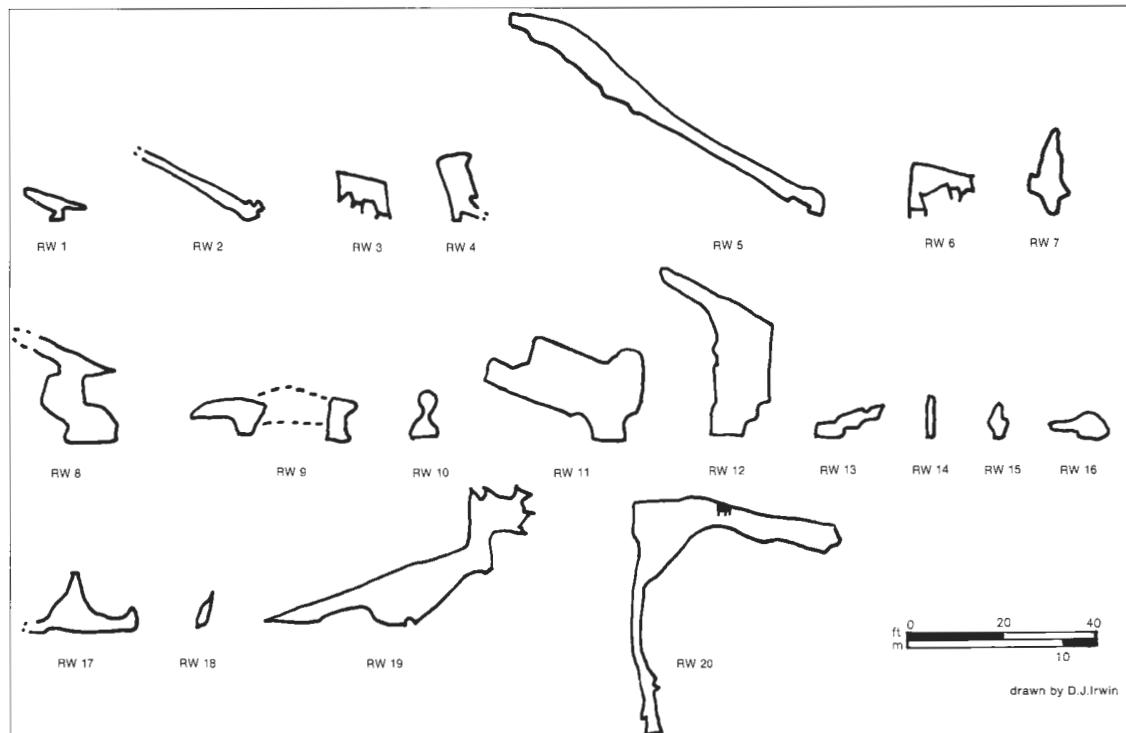


Fig. 6A Rabbit Warren passage sections.

the Main Stream flowing quietly out of Sewer Passage at Plantation Junction.

Above the point where Plantation Stream makes its appearance, a hole in the wall leads to two possible dig sites. Further to the north east, at the head of the steep mud slope, a very low hole re-connects with the bedding plane mentioned above.

A little downstream from the Plantation Stream 'rising', a 6ft high ledge leads to a sizable platform which is the lower exit from Struggle Passage.

Route from Bypass Passage to Plantation Junction

Below the climb from Bypass Passage the stream can be seen emerging from a low bedding plane. Here the water has cut into the mud to form a narrow trench. Immediately opposite the exit from Bypass Passage is '100ft a Day Dig'. This dig is of particular interest in that considerable quantities of charcoal have been found there and the passage trends south-east under the Rabbit Warren. The stream runs into a lofty, though narrow, rift, tumbling into several small potholes until a level section of stream bed is reached. It is interesting to note that this is the last section of the natural rock floor in Main Stream; in fact, the rock stream bed is not seen

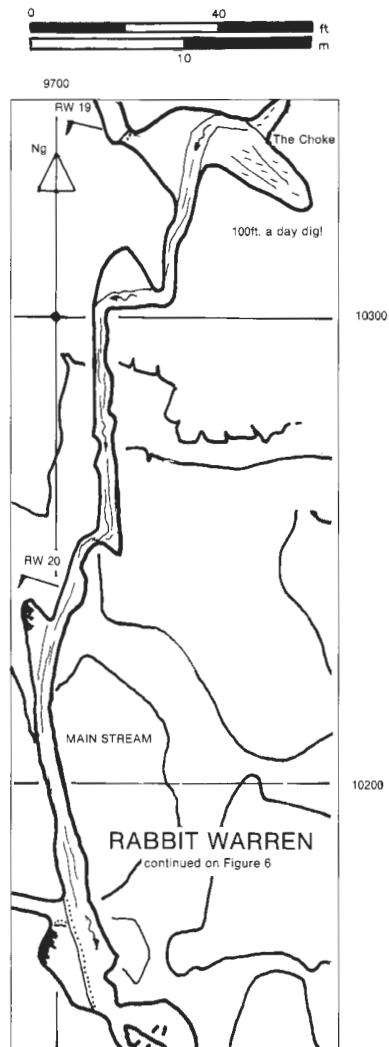


Fig. 6B Displaced plan of Main Stream from Bypass Passage.

again until 150ft downstream of Sump I. After some 300ft the passage widens. The lower end of Everest Passage is on the right and may be entered by climbing a ledge which runs along the side of Main Stream to a point where the stream disappears under an overhanging wall. The overhanging roof above the streamway is false, and the upper floor leads to a small hole which is the lower end of Passage C. At the junction of Everest Passage and the Main Stream, a high rift, from which emerges a very fine white stalagmite flow, soon closes down. Continuing downstream over a number of boulders, the stream is regained, now flowing in a trench with a gravel floor. The roof at this point displays many rock pendants, and above the boulder pile a flood line of a different shade of coloured mud may be seen. As a result of rapid drying, the mud covering the walls has cracked and curled into a maze of flakes.

The stream trench forms the base of a 20ft high 'T' shaped passage, the upper left lobe forming a bedding plane that is entered from Passage D. Small tubes in the right wall, at the end of this section of streamway, soon close down. At this point the roof is partially blocked with a coarse pebbly infill forcing the caver to crawl in the stream. A high level oxbow, to the left of the streamway, may be used to avoid a wetting! The streamway now begins to meander and a large passage enters from the left (Passage D). The passage bears sharply south for about 20ft and, at times of drought, the stream may be seen flowing into an old dig site. This is now frequently a pool that drains part of Main Stream into a chamber under Cerberus Hall; the water is thought to mingle with water saturating the local boulder infill and is associated with Lake Chamber. The Main Stream now trends in an easterly direction until it reaches Plantation Junction. From the streambed dig and continuing along the Main Stream another junction is reached where a passage enters high in the left wall giving access to Second Stalagmite Bank in Rabbit Warren. About 10ft downstream, in the right wall, a steeply rising tube will be seen with an old stalagmite flow spilling from its mouth. This ascends for about 25ft to where its floor drops steeply to form part of the false roof of Dining Room. Dining Room itself

may be entered by crawling under the stalagmite flow; this is the usual route into Cerberus Series.

Some 40ft downstream of Dining Room entrance, the Main Stream runs into the base of a massive stalagmite barrier. The water disappears into an impassable slot and plunges downwards for some 20ft. To the right, a narrow slot may be passed to the head of a heavily stalagmitized pothole. An awkward climb leads down to the bottom of the waterfall and a short duck gains the base of Stalagmite Pitch. An alternative way of passing this barrier is by climbing to the left of the stream and belaying a 30ft ladder from a Rawlbolt. From the bottom of Stalagmite Pitch, the streamway floor is composed of gours, with stalagmite flows on the left wall. Moving towards Sewer Passage, a couple of small choked tubes will be seen in the right-hand wall. Following the stream under a low arch reaches Sewer Passage, once extremely muddy but the passage of cavers has removed most of the very fine silt revealing a number of small gours. Sewer Passage is the lower end of the bedding plane which is traversed when entering from the Rabbit Warren and it ends at Plantation Junction.

Route from Boulder Chamber to the Main Stream via Everest Passage

At the lowest point on the west side of Boulder Chamber, near the entrance to Curtain Chamber, several holes under the hanging wall lead into Everest Passage. A short slide and Everest Boulder is reached—the 20ft long boulder being much more sporting to climb than to slide down! The way on is down a roomy passage with an exit in the left wall leading to the Railway Tunnel via Fingers Traverse (see below). At the bottom, holes in the floor, between boulders, lead into a short stretch of passage. High in the left wall is a short oxbow, some 40ft in length, which re-enters Everest Passage just before joining Main Stream Passage. Everest Passage itself diminishes in size and soon reduces to a crawl through a fine phreatic tube. The small hole to the right, commonly known as



31. *The Fingers.*

Stafford's Boulder Problem, leads into Cerberus Series via the Rat Run. Ahead, the crawl passage becomes a lofty rift and shortly joins Main Stream. In the base of the trench, some 10ft from the Everest–Main Stream junction, a very tight hole has been pushed for several metres until it closes down, but there is an audible connection with Rat Run.

Route from the Railway Tunnel to Everest Passage via The Fingers

Moving through Railway Tunnel from The Cascade, the route to The Fingers is via the 40ft long low bedding plane on the right just before a large isolated curtain on the right hand wall. A sizable chamber is reached with boulders forming the north wall. To the left of the boulders a small passage will be seen with several clusters of cave pearls in the stalagmite floor. This passage must not be entered; the far reaches of it may be located in the lower section of Upper Traverse Chamber. To the left again, a climb through boulders leads to Cascade Chamber, but is not advised because of the chance of dislodging small stones and mud that will fall onto the cave pearls below. High on the western wall (opposite the way in) a phreatic tube may be seen that joins with Strike Passage. To the south of the chamber the floor drops away into a narrow trench, eventually opening into a rift that leads down to Main Stream, some 40ft below. On the left is the group of stalactites and stalagmites known as The Fingers. To the right is Fingers Traverse, a narrow sloping ledge leading to yet another bedding plane. There are now three possible routes on — one via a traverse along sloping ledges down to Main Stream and the other two leading off to the right into Everest Passage. Opposite Fingers Traverse a large hole may be seen — this is the western end of Passage C.

Passage A

Leaving the main route through Rabbit Warren, Passage A heads back up-cave [N:10250; E:9758] for some 20ft until the way on is found to be blocked with stalagmite and boulders forming the floor of the Railway Tunnel. However, low on the right, a small phreatic passage can be followed to a very low bedding plane, the floor of which is heavily stalagmitized. Diagonally opposite the point of entry, over wet, muddy and steeply sloping stalagmite, an extremely muddy passage heads off to the east ending at a choke. A few feet from the choke, a tight tube leads up-dip to a muddy chamber, the lower side of which has its floor decorated with minute spherical crystal clusters. An up-dip passage leads off entering an inner chamber, again very muddy, with two passages leading off. The most obvious is decorated with a series of fine-lipped gours; the would-be explorer should not bother to pass the gours as the passage closes down 3ft from the corner 20ft further on. The other passage, to the left and running up-dip, closes down into a series of very tight passages that are too small to enter and are blocked with small boulders. A guide tape has been laid across the outer chamber to prevent the crystal clusters from being damaged and, as a result, the inner chamber has been 'barred' to cavers. Those who feel that they **must** set eyes on the gours are asked to remove all their footwear and muddy clothes **before** crossing the pure white stalagmite floor connecting the two chambers.

Passage B

This passage may be entered from the two points mentioned above in the main Rabbit Warren description [N:10220; E:9764 and N:10200; E:9760] and it continues up-dip to a very low bedding plane never more than 10 inches high. The upper end leads to very small tubes now blocked with boulders and mud.

A passage to the right, leading from the bedding plane, re-connects with the eastern side of the Rabbit Warren bedding plane.

Passage C

Following the passage to the west from the sandy junction [N:10200; E:9750], another junction is immediately reached. By keeping to the right, along the larger passage, progress is soon halted when the floor slopes steeply into the open Main Stream rift below The Fingers. Keeping to the right and traversing along the

ledge one is able to scramble down into the chamber above The Fingers formation. This route is not advised due to the possibility of damage to the formations.

Returning to the sandy junction and following the smaller passage, the Main Stream is soon reached at Everest–Main Stream junction.

Passage D

Passing the low arch [N:10150; E:9770] a bedding chamber is reached. To the right is a narrow tube to a vantage point above the Main Stream where a 10ft ladder would be needed for the descent. A narrow hole near the drop to the stream connects with Passage C. Bearing left in the bedding chamber a large, steeply descending phreatic tube is entered which drops down to the Main Stream.

Passage E

Easily entered above First Stalagmite Bank, this passage connects with the east side of Rabbit Warren bedding plane. Great care should be taken to protect the straw cluster from any damage.

Passage F

This is best located above First Stalagmite Bank to the right of Passage E. Past the gours at the edge of the inner chamber above Second Stalagmite Bank, the passage rises steeply in the form of a rift. The roof in the upper reaches is of stalagmite and may be associated with Strand Passage in September Series some 70ft above. The rift closes down into two very tight holes formed in the gravel infill. A very muddy flat-out crawl connection may be made to the Rabbit Warren bedding plane by leaving the rift passage through the low hole in the left wall just before the end.

Passage G

This route is the quickest way of regaining the Main Stream from the Second Stalagmite Bank area. Entering the slot, to the right, the passage zig-zags to a junction (N:10110; E:9838]. The streamway is regained by bearing left. Straight ahead, the passage lowers and becomes choked with boulders through which an oral connection may be made with the First Stalagmite Bank area. Immediately above the junction, a very small hole near the roof may be entered, leading to an even tighter passage that divides after 20ft to end in sand and pebble chokes. The downstream end of these passages may be seen when standing at the entrance to Dining Room in the Main Stream.

Struggle Passage Oxbow

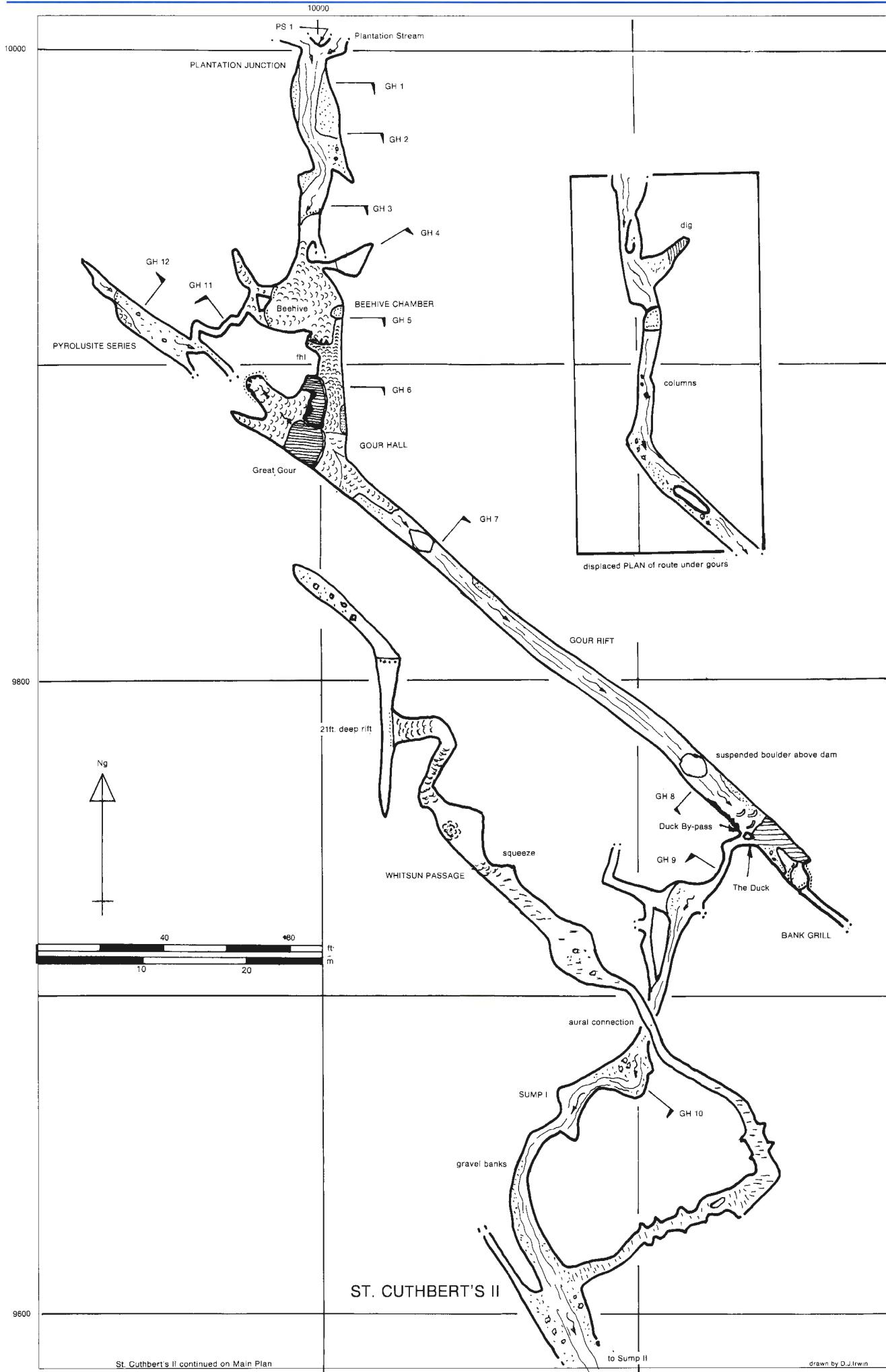
[N:10082; E:9924] This small, high level passage is a tight oxbow that connects with Struggle Passage, the usual entry to this being only some 10ft further down the passage.

Struggle Passage

[N:10076; E:9930] 10ft from the large entrance, a short climb over a stalagmite barrier leads to a passage junction. Great care should be exercised at this point, as in the roof, just to the left of the entry, is one of the largest helictites in the cave. Although not large by comparison with those in other caves it exceeds 6in in length. The passage to the left quickly closes down, to a small cavity (Erratic Chamber) though the view of the fine helictites is now denied as some vandal passed through this section and destroyed them, c.1970. If any masochist wishes now to push through he will find himself at the start of Rabbit Warren Extension.

Heading down-dip from the junction, the passage shape changes rapidly into a narrow 'V', which is easy to descend but quite another matter when travelling in the opposite direction! A high level hole near the roof closes down after 15ft. The lower end of Struggle Passage emerges on a platform above Plantation Junction. An easy climb from this point reaches the streamway.

St. Cuthbert's Swallet



Plantation Junction to Sump I

Most of this section of cave has the combined Plantation and Main Stream running through it. The plan is simple, consisting mainly of a single passage with the occasional side passage leading off.

At Plantation Junction, the Main Stream is joined on the left by a larger passage containing Plantation Stream which cascades over clean calcite veined rock. Downstream, the left-hand wall is overhung by a steeply descending terrace, from which can be seen a small blind hole in the roof. Just beyond the lower end of the terrace, a climb up the right-hand wall of the passage leads to a blind passage from which emerges a stalagmite flow.

A short distance downstream, the stream flows into an impassable slot, and a 6ft climb must be made to a large stalagmite pillar. This marks the beginning of a section containing massive stalagmite flows which would seem to be unmatched in thickness by those in any other Mendip cave.

Beehive Chamber

A further climb on the right hand wall leads directly to Beehive Chamber, while the stream may be regained from behind the pillar. There is a flooded, abandoned dig to the left of the stream and a choice of a wet crawl or a short climb to Beehive Chamber. This takes its name from the large rounded mass of stalagmite which covers most of the floor. At its upper end, a 10ft climb up a flowstone wall leads to Pyrolusite Series; a ring and lightweight line has been installed at the climb similar to the rigging for the Maypole Series pitches. To the left, in the corner of the chamber, there are some stalagmite formations with a hole above, which also leads to the same series but is not used as a route. At the bottom of the chamber the stream appears for a short distance only, and the roof above contains a rift which closes down.

Gour Hall, Gour Rift and Sump I

The stream may be followed along a sporting crawl to emerge below Gour Hall at the foot of the Great Gour. Gour Hall may also be reached by a climb over stalagmite from Beehive Chamber, aided by a fixed chain. When the chamber is reached, one gains an immediate impression of its spaciousness and of the extent of the stalagmite infill. To the left at the point of entry, a short climb below an old water line goes into a chamber in the stalagmite which has no extensions. The descent ahead leads to the Great Gour, some 15ft across, mud choked and shallow. It is thought to be the largest in the country. Behind it is the straight, vertical wall marking the fault which, more or less, bounds St. Cuthbert's to the west, and which also appears in Cerberus Series and at various points in Long Chamber Series. To the right, the chamber is bounded by large well-watered stalagmite flows, with solid rock visible in only a few places. It may be climbed from the left-hand end, where a flowstone groove leads to a platform and a choked descending passage. A short second pitch leads out to the right, around loose blocks of calcite-veined fault breccia, to a large ledge. An attractive little grotto at the back of this contains a small sump pool which connects with Pyrolusite Series. The ledge gives an impressive view of the chamber, with its hanging roof giving it a cross-section of an enormous

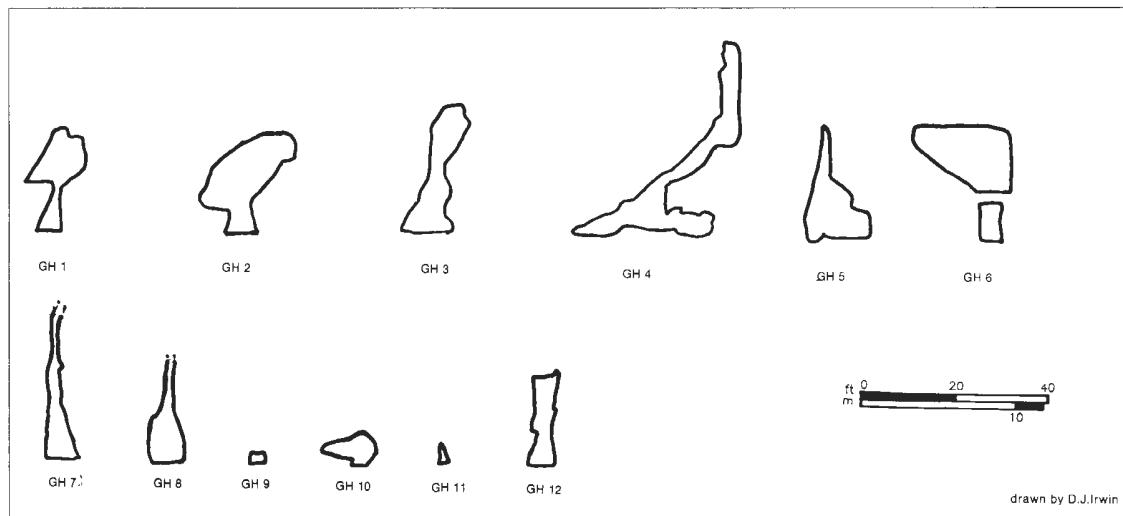


Fig. 7A Gour Hall area passage sections.

'M'. It shows several small and inaccessible holes. The climb continues with increased difficulty for about 40ft up an obvious stalagmite wall to a final stance. There is an open hole opposite this which has been entered only to close down after a few metres.

From the Great Gour a climb down over stalagmite leads past subsidiary gours to the stream and the beginning of Gour Rift. This is the longest feature to be developed along the fault line and is high and wide over all of its 175ft length. There are numerous gours on the floor, many of which appear to have been recently re-excavated. From the two jammed boulders at the start of the rift, a ledge along the left-hand wall leads to a climb to some small passages which close down. At the far end of the rift, the stream now flows out via an excavated hole into Sump Passage. It originally went a little further to The Duck (still passable at times). This consisted of a shallow pool, separated by a rock curtain with a small airspace from a constricted rift which runs back up-cave into Sump Passage. These alterations have been made to facilitate digging and work in the far reaches of the cave. Above this point the upper walls converge into a narrow rift which closes down. Beyond The Duck pool, the floor was bailed and extensively dug during the early 1970s and a depth of some 15ft reached. The walls of the dig showed that the water once flowed down over the gours by The Duck, dropping steeply and flowing away to the right through the now choked arch under the right-hand wall of Gour Rift. The only open section is The Duck. Beyond the pool a short climb leads into a wet cherty chimney. The Bank Grill, a small inlet passage at the top, can be followed for about 50ft before becoming too tight.

Sump Passage begins with a low section leading to a more roomy passage and, after 120ft, Sump I, now reduced to a duck. There are four climbable holes in the roof. At the top of the first climb, a dig leads up-dip for a short distance, while a climb from the first oxbow passage ends in an impassable rift which has an oral connection with Whitsun Passage (see below).

Pyrolusite Series

Pyrolusite Series takes its name from the deposits of manganese dioxide found there. The entrance climb, described previously, continues to the right as a steeply ascending passage which eventually closes down. The correct route is through a slot on the left at the top of the climb. This leads over the hole to Beehive Chamber into an ascending, stalagmitied passage. This ends in a squeeze into a roomy rift containing a small stream which flows down to a muddy, impassable sump. Almost opposite the squeeze, there is a boulder-choked rift with an unclimbed chimney above it. Upstream, a climb over stalagmite leads to a point where the water enters, and the rift is almost blocked by flowstone. Further progress can be made most easily by climbing back over a stalagmite flow, until a point above the chimney near the original entry squeeze is reached. There is a small hole in the roof at this point which could be entered if it were enlarged.

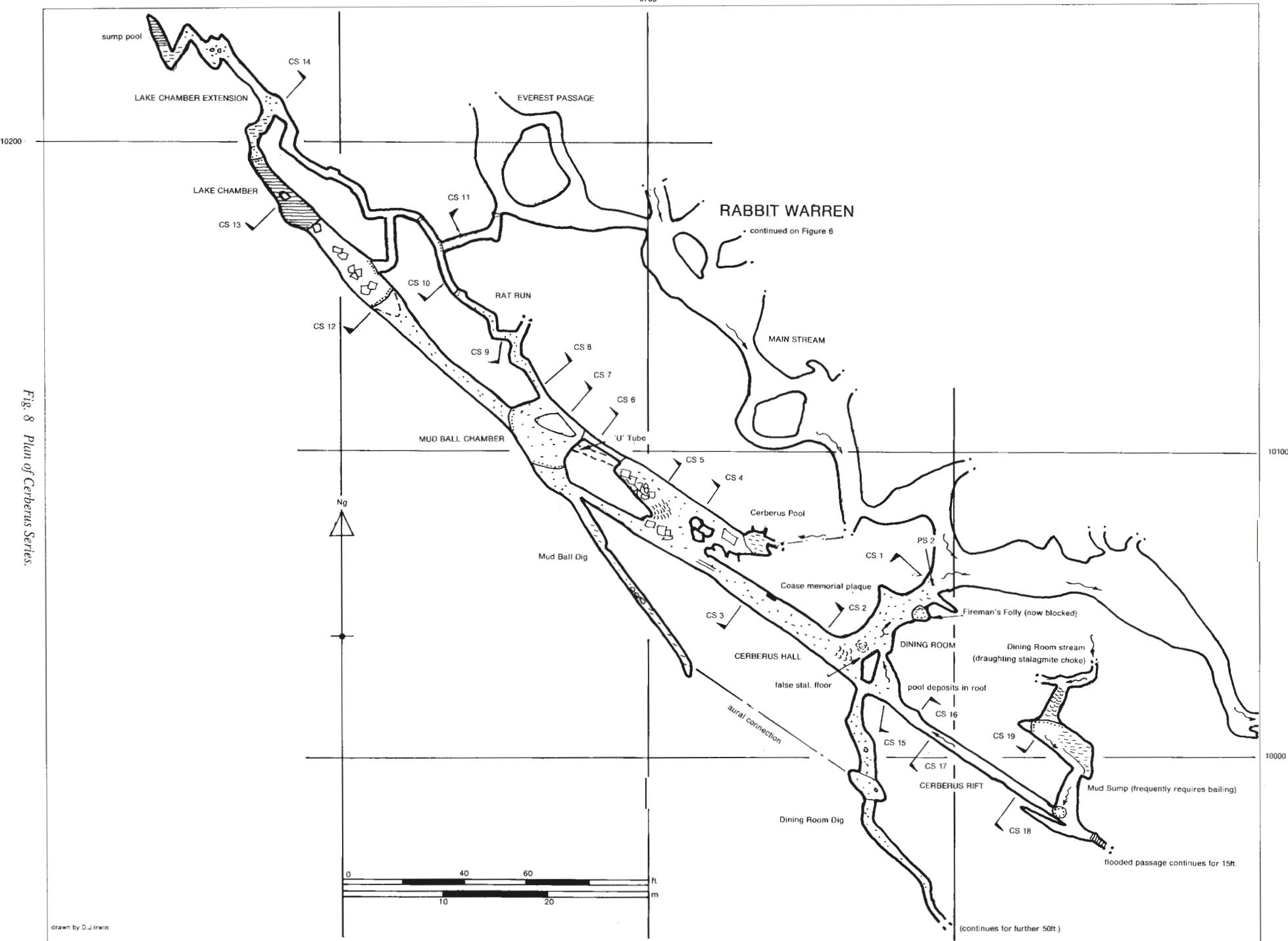


Fig. 8 Plan of Cerberus Series.

St. Cuthbert's II

Since its discovery, St. Cuthbert's II has yielded little of note over its 900ft of passage except Whitsun Passage. The gradient of the St. Cuthbert's II streamway is low and only in two relatively short sections does it flow over the exposed rock floor.

The 15ft crawl through Sump I is low and, in times of high water, rather sporting. 6ft into the duck, a left-hand turn has to

be negotiated to emerge at a downstream pool. Moving out of the pool, the explorer enters a 40ft high rift with a large gravel infill bank against the right wall. The stream floor has been artificially lowered to ensure the sump crawl remains open. In the floor is the site of The 'Man-Trap', dug in the 1970s. A few metres of easy going passage enters a large chamber over 20ft wide and 40ft high roofed with large boulders. On the left is a large phreatic tube, the entrance to Whitsun Passage whilst opposite this a steeply inclined, narrow rift leads up-cave to small bedding planes. A fine monocline may be seen in the wall to the right of Whitsun Passage entrance.

Beyond this point, the streamway forms a 10ft square tunnel with mud banks along the left wall. The stream gradient is slightly steeper than that in Gour Rift, and for a short section, the rock floor is exposed. For most of the II streamway, however, the stream flows over gravel and only makes a major change in beds at the Ten Foot Waterfall. Over the 900ft of its length there are few formations, the largest being The Stalagmite Barrier, that forces the caver to crawl for 20ft approximately halfway along the passage. From this point the passage is in the form of a tall, narrow rift up to 40ft high, at the top of which is a 6-8ft diameter ascending phreatic tube. This tube ends at a high level chamber 80ft above the 10ft Waterfall. Some 200ft from Sump II, a short series of cascades are encountered and the wet, free-climbable Ten Foot Waterfall adds to the sport. Below this obstacle, the passage quickly changes character and becomes an inclined and narrowing rift passage forcing the caver to crawl. Again, after a few metres, a second stalagmite blockage is encountered but is easily bypassed by a short up-and-over climb in order to regain the stream. 40ft ahead, Sump II is reached. This has been the site of sporadic, at times intensive, digging during the last 15 years. The sump itself has now been excavated some 65ft and a depth of 25ft by pumping water into a complex of dams — but it still remains stubbornly choked with gravel, mud and lead tailings.

Whitsun Passage

50ft downstream of Sump I a large phreatic tunnel on the left quickly diminishes to a series of short, muddy squeezes to enter Whitsun Passage, an up-dip inlet. The passage lies parallel with the Gour Rift. About half-way up a squeeze is encountered leading to a nicely decorated grotto — care required. After 130ft the passage ends at the top of a 20ft pitch (handline required) down into a choked rift. Above the pitch, a short extension becomes choked; this is thought to be the downstream end of the now abandoned Dining Room Dig, separated by about 100ft of more or less choked passage.

Cerberus Series

Cerberus Series lies to the west of the Main Stream and runs from Everest Passage to the Dining Room.

The entrance to the latter is on the right-hand side of the streamway, 50ft before Stalagmite Pitch and under a brown stalagmite flow. It consists of a gravel floored chamber with a high inclined roof of stalagmitised false flooring, accessible from the Main Stream. It was formerly used as a base for exploratory trips into the cave and was

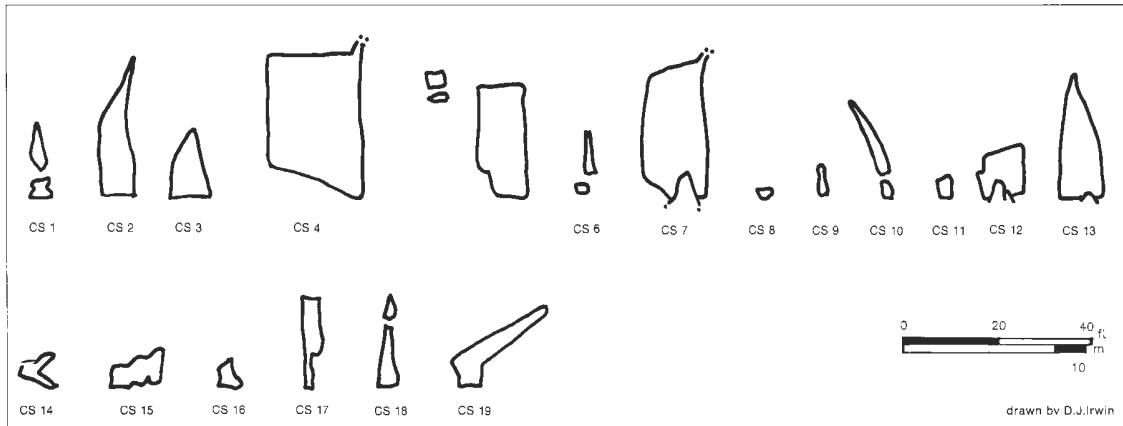


Fig. 8A Cerberus Series passage sections.

equipped with emergency food supplies and cooking facilities. A small choked shaft on the left was used for rubbish and was filled in with spoil about 1968; it was once known as 'Fireman's Folly'. Except under dry conditions, there is a small flow of water at the rear of the chamber.

The unconsolidated bank to the right is overhung by a piece of false flooring, a collapsed portion of which lies nearby. A hole to the left under the stalagmite leads to a small chamber containing botryoidal stalactites and flowstone. From this, an ascending passage, Cerberus Rift, leads to a small muddy chamber, the entrance to which is often sealed with mud and water. A steep bedding plane leads to a small stream blocked with stalagmite; from this emerges the stream that flows through Dining Room to join the Main Stream. To the right of the entrance to the chamber, a short climb gives access to a sump pool which may be siphoned to yield a further 15ft of tight passage.

A climb over the false floor leads to a high rift lying at the same level as the section just described. This can be climbed to a stalagmite pool and a short side passage.

Further right, under the false floor, a hole leads off to the abandoned Dining Room Dig. Prior to the passing of Sump I, this site was of particular interest as it lay on the far side of the Gour-Lake faultline which forms the western boundary of the cave.

Turning right from the rear of Dining Room, Cerberus Hall may be entered. The chamber has the form of a high, wide rift passage with several holes in the roof and a large slump pit in the sandy floor. It is formed along the Gour-Lake Fault and good exposures of brecciated rock in the roof at the northern end of the chamber may be seen. Towards this point, two entrances under the right-hand wall lead down to where there is usually a pool, fed from a sink in the Main Stream. The water in the pool merges with the water in the saturated zone under Mud Ball Chamber and that in Lake Chamber. Where this water escapes is unknown and it is believed it is not seen again in the known system. The chamber contains a plaque to the memory of Don Coase who, until his death in 1958 was the driving force behind most of the early work in the cave.

At the far end of Cerberus Hall, a climb down a rift to the right allows easy access to Mud Ball Chamber. The lowest of these routes, the 'U' Tube, has been known to flood and sump in very wet conditions; alternatively, a tight rift in the right wall allows a dry route through. Recently (1984) the 'U' Tube and the entrance to Lake Chamber have been continuously flooded for almost a year. Normally this route is dry but it confirms the view that the infill gravels in this area reflect the level of the lake and are normally saturated a few metres below the surface. A passage to the left, behind a cluster of formations, leads to an infill platform overlooking this same chamber. A small hole on the left of this point leads, via a former dig (Mud Ball Dig), to a muddy rift with a small water inlet. This is also beyond the main fault but was abandoned when it was found to have an oral connection with Dining Room Dig. Climbing out over the edge of the platform a 15ft vertical climb gives access to a 15ft long blind passage.

Mud Ball Chamber, so called because of the small lumps of mud originally covering the floor, is a large rift chamber located between

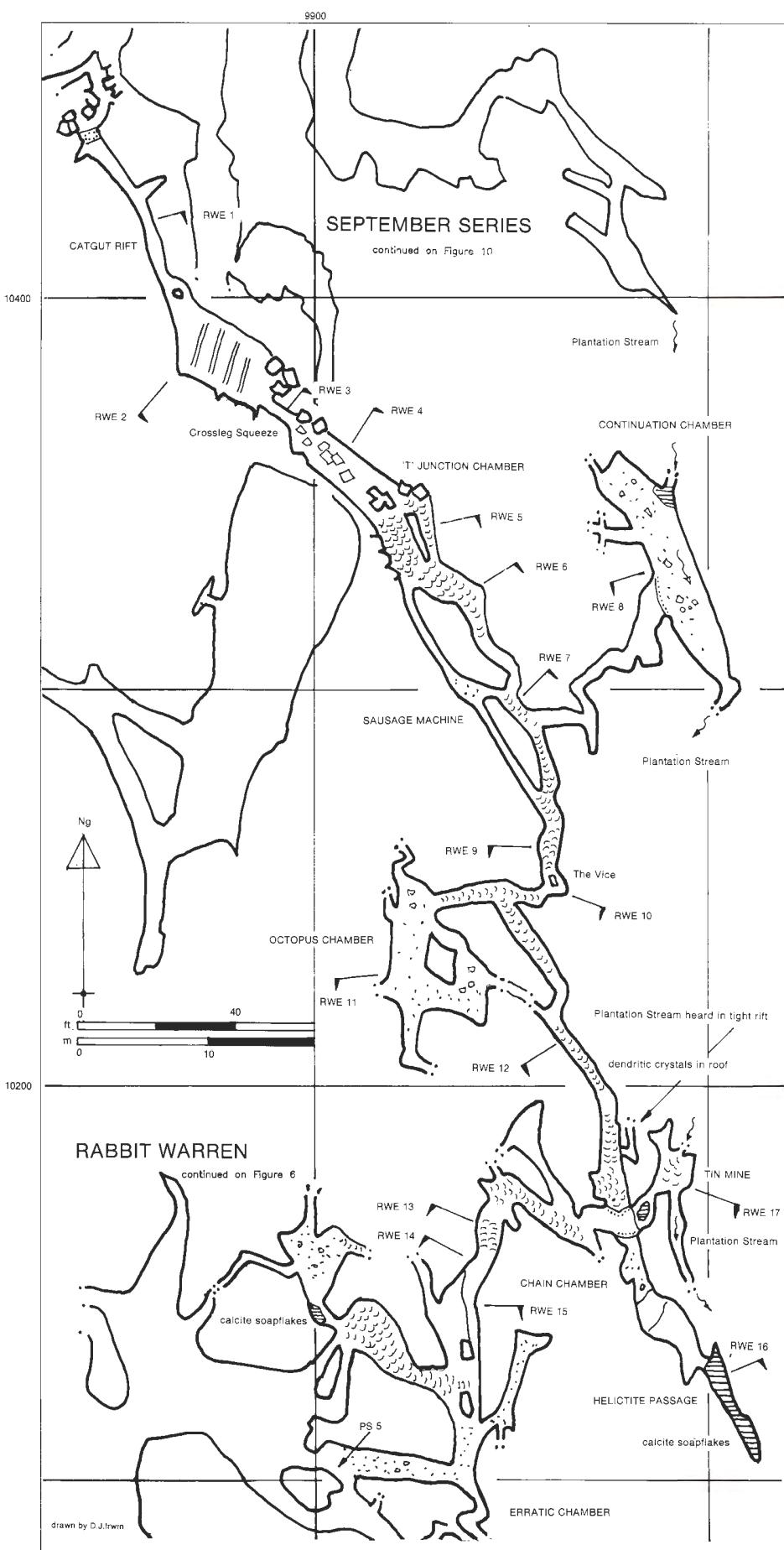


Fig. 9 Plan of Rabbit Warren Extension.

Lake Chamber and Cerberus Hall. A high level connection to Lake Chamber at the north-western end of Mud Ball Chamber may be climbed using maypoling equipment. There are several holes in the southern wall which connect with Cerberus Hall, while at floor level near the point of entry a small hole leads to Rat Run.

Rat Run commences as a small tube followed by a roomier section containing a few straws and helictites. A hole in the right-hand wall leads to an awkward climb into Everest Passage; the climb is now made more interesting as one of the crucial footholds has been broken off! Continuing along Rat Run, a short climb over gravel infill leads to a junction. Lake Chamber downslope to the left, while, straight on, a tight, muddy tube terminates at a sump after some 100ft. Lake Chamber is an irregularly floored chamber usually containing a lake in the lower part. The water level has a maximum range of 20ft but this has not been proved to vary with rainfall; it may be empty or the height of the lake may be above the entrance to the chamber. When the lake is low, a route from the muddy tube mentioned above leads to a 30ft pitch into the chamber. Two avens above the normally inaccessible section of the chamber have not been explored. Other avens in the near section of the chamber have been explored and found not to 'go'. Both Lake and Mud Ball chambers are situated on the line of the main fault.

Rabbit Warren Extension

The Rabbit Warren Extension connects with September Series at its northern end and with the Rabbit Warren above Sewer Passage. The passage form is mainly phreatic zig-zagging alternately along the dip and strike. A notable feature of this series is the absence of infilling and collapse that typify many of the upper series passages in the cave. Plantation Stream is met briefly in two places but cannot be followed for any distance.

Catgut

After entering the boulder ruckle near High Chamber a number of holes in the floor of the route to September Series lead, via squeezes, to a distinct passage through boulders. This passage ends in a 6ft drop into Catgut Rift. The entry is at the top of the rift which is here 25ft deep and 4ft wide, with a jammed boulder roof. The rift gets narrower and lower at its southern end. Halfway along the rift, a cross-rift has opened a pocket on the right-hand wall and a blind passage on the left leading to the base of the boulder ruckle. The inclined rift may be traversed down along the right-hand wall, via the pocket, and after 30ft the floor is reached. The left-hand wall opens into a 2ft high bedding plane containing well-defined vadose trickle grooves in the floor and rock pendants in the roof. The bedding plane is closed at the top and bottom with stalagmite and boulders. At the base of the bedding plane, diagonally opposite the point of entry, a low, 10ft long passage is partially blocked by a stalagmitized boulder which may be passed with difficulty on either side (Cross Leg Squeeze) giving access to 'T' Junction Chamber.

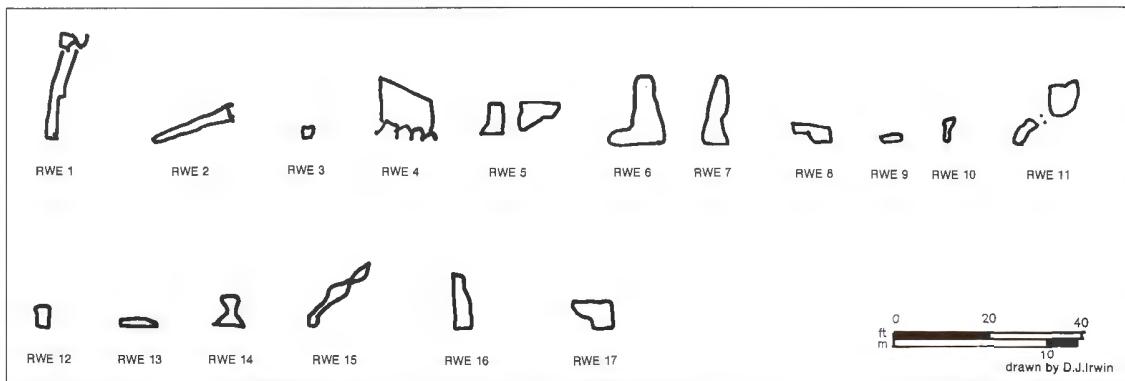


Fig. 9A Rabbit Warren Extension passage sections.

'T' Junction Chamber is inclined along the dip and becomes larger at the lower end, where holes through boulders in the floor lead to a continuation of the chamber. There are few stalagmite formations here, but the most interesting feature is the group of stalactites undergoing re-solution giving the appearance of slowly rotting away. The lower section of 'T' Junction Chamber has a floor of flowstone and contains a large, though dry, crystal pool with a fine crystalline rim. Descending the upper section of the chamber, the route lies past the crystal pool (care required). To the right at the bottom, a small side passage, known as the Sausage Machine, forms an oxbow and rejoins the main route after 50ft.

Continuation Chamber

Below 'T' Junction Chamber, the meandering main route narrows, but the caver can still move with ease. Great restraint should be exercised as, very soon, the passage is partially blocked with a large symmetrical stalagmite flow that descends from a small hole 6ft from the flow. Beyond, the passage takes on a typically phreatic rift character when it reaches another 'T' Junction. The left branch leads to a 5ft drop onto a gravel floored passage which soon opens into a bedding chamber — Continuation Chamber. Here, part of Plantation Stream may be seen where it enters through a narrow rift and sinks in a small pool immediately below. On occasion the stream has been known to flow down the chamber and sink in a gravel choke to the left at its lower end.

At the 'T' Junction, the right-hand passage lowers to a crawl over wet stalagmite and the roof then rises at The Vice. This sporting squeeze is a partial blockage of stalagmite leaving a wedge shaped hole which is awkward rather than tight. Beyond The Vice the passage continues down-dip and two passages enter from the right, both leading to Octopus Chamber, aptly named, having many blind passages leading from it; all become too tight or are choked with gravel infill.

Continuing down-dip, a low opening at the foot of the left-hand wall, almost opposite a group of fine white stalagmite flows, leads to a 15ft chimney, at the top of which a very narrow rift leads back up cave and after 50ft splits into two and becomes too tight for further progress. Plantation Stream can be heard from the upper of the two passages. In the roof are a number of mini-formations not found anywhere else in the cave. They are 0.15 inches long 'fern leaves', once thought to be gypsum, they have since been proven to be calcite.

On the main route a low crawl to the left of a rock pendant avoids the formations and the stalagmite floor drops 8ft into Chain Chamber. This chamber was formed by the intersection of two cross passages at different levels. On the left a hole in the floor gives access via a short crawl to Tin Mine where the Plantation Stream is met again. The stream flows from a small stalagmitized hole in the roof and can be followed down a side passage for 40ft before the passage becomes too low to follow. South of Chain Chamber, Helictite Passage continues past a fine group of helictites and the remains of a very thick false stalagmite floor to a pool once containing calcite crystal flakes, Soap-flake Pool (**this pool should not be crossed**). Beyond the pool a tight duck leads to a continuation which ends at a stalagmite choke after about 15ft. Above the pool two avens lead up to small up-dip passages which soon close down.

The main route through this section leads off to the right at Chain Chamber, the roof lowering to a flat-out crawl. Beyond the crawl the roof rises and the passage, now a fine phreatic tunnel, leads upwards past a fine group of 'lipped gours'. Opposite the gours a hole at the foot of the right-hand wall leads upwards for 20ft ending in a small gravel choked

chamber. Along the route another flat out crawl over wet stalagmite leads to a steeply inclined bedding plane, with a large stalagmite flow connecting with high level passages in the Rabbit Warren. At floor level a low opening on the left leads to a small, sandy floored passage heading downwards towards Chain Chamber. A gravel floored 'chamber' is soon reached, from which a low squeeze gives access to Erratic Chamber (where the once fine helictites have been destroyed by vandals). The main exit from the 'chamber' is a gravel floored passage leading right and soon joins the Rabbit Warren near the Second Stalagmite Bank.

September Series

September Series, with its many fine stalagmite deposits, forms the eastern boundary in the northern reaches of the cave. This area was formed mainly by solution and subsequent cavern collapse resulting in the formation of one of the largest chambers in the cave.

Access to September Series may be gained from two directions. From Rabbit Warren Extension it may be approached by traversing to the top of Catgut Rift and climbing up through boulders which



32. The Vice, Rabbit Warren Extension.

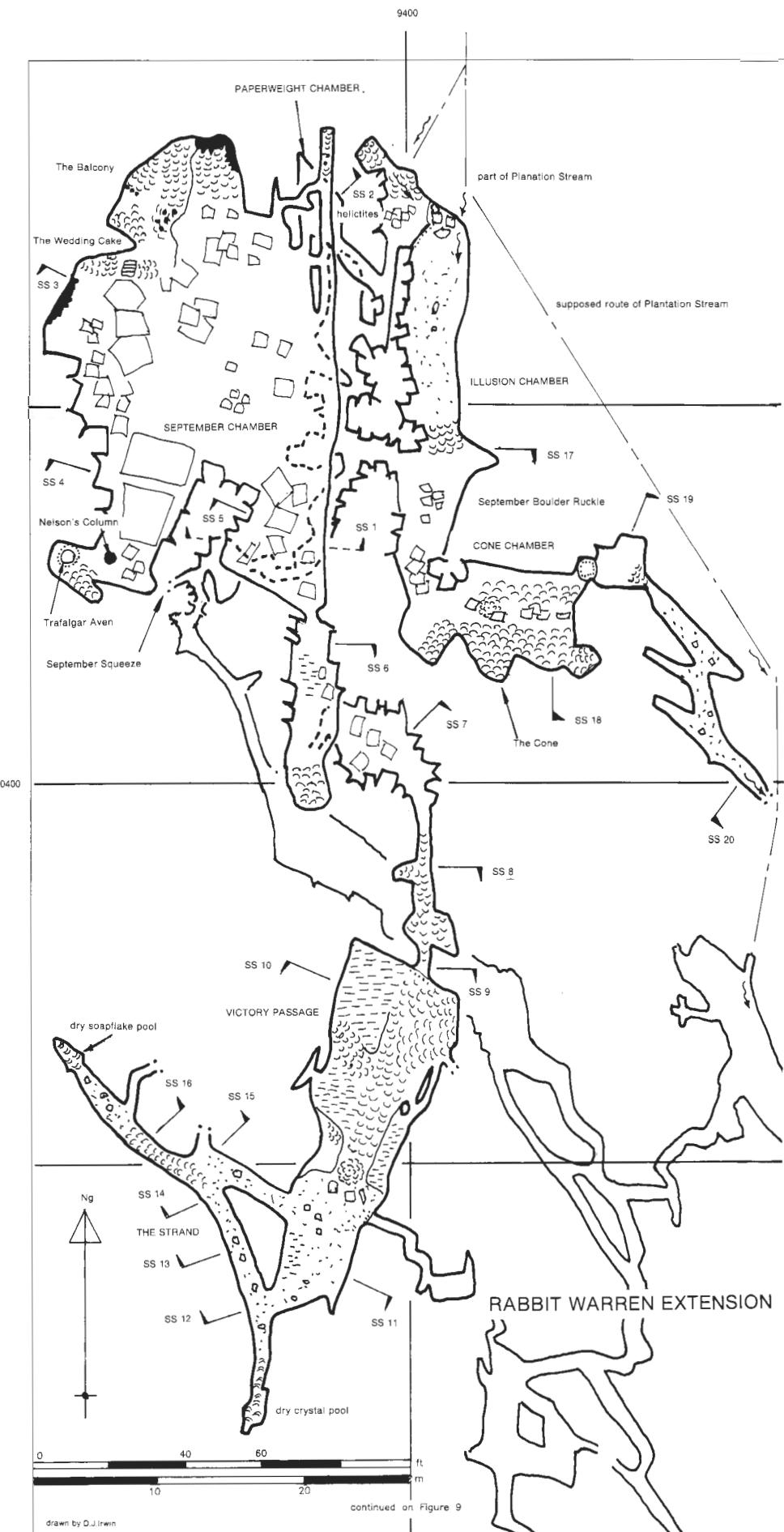


Fig. 10 Plan of September Series.

mark the start of the September Boulder Ruckle. The easier route is from High Chamber by following the obvious passage to the south of the chamber, which bears to the east. At the end of a short, inclined bedding plane, a triangular squeeze leads to the start of the ruckle.

Beyond the squeeze, Rabbit Warren Extension may be gained by descending the boulders in the floor to the right. The way on to September Series is up a small, inclined, boulder trench opposite the squeeze. From here, the way on is through boulders, first forwards and then downwards to the right, then curving to the left. Ahead, a stooping passage continues for about 25ft to an obvious left turn. The route now becomes rather complicated and offers two possibilities. By bearing right, an overhanging wall is reached and an awkward 10ft climb down leads into Cone Chamber. Alternatively, a large inclined boulder, near floor level, is the clue to the usual way on. Crawling upwards over this obstacle and through the 'letter box' at the top, a narrow route to the right gives access to a small chamber with a pronounced sloping wall on the left and a pile of boulders on the right.

The exit from the ruckle is reached by climbing through a window to the right in the boulders some 6ft from floor level about half way along the chamber. At the end of the chamber lies a boulder-filled rift which is in a very unstable condition.

Illusion and Cone Chambers

Beyond the window, a 'T' Junction is reached, the nearside forming the boundary of the boulder ruckle whilst the far wall consists of a solid bed of limestone sloping at 20° to the vertical. To the right, the passage quickly degenerates into an impassable boulder choke. Taking the left-hand passage, a climb down over steep boulders leads to Illusion Chamber, about 10ft high and wide and 20ft long, the roof tapering to meet the floor at the upper end, and eventually Cone Chamber. The far wall of each chamber is bounded by the same bed of limestone mentioned above. Illusion Chamber is the further north and narrower of the two chambers and is really a continuation of the passage forming Cone Chamber. Access to several well decorated grottoes can be gained in both areas.

Cone Chamber, which earns its name from a 1.5ft high conical stalagmite boss near the centre of the chamber, is roughly circular and some 20ft across. The floor of the chamber drops away and, at its lower end, an awkward climb down through boulders for 10ft, leads to a well decorated chamber with an abundance of flowstone at the lower end. A further chamber is reached by climbing down

the slope from this point and, although smaller in size, it too is well decorated. An intermittent stream (part of Plantation Stream) emerges through small boulders on the far side of the chamber and runs down a narrow rift. The descent of this rift leads to a low passage which rather abruptly diminishes in size and ends up in a heavily silted sump. The water re-emerges in Continuttion Chamber.

September Chamber

September Chamber is usually approached from the far end of the boulder ruckle by following the boundary of the ruckle to the left until an ascending passage is seen. A short climb gives access to a small boulder-floored chamber, Paperweight Chamber, and an obvious 10ft climb, to the left, leads to the lower end of September Chamber.

September Chamber is one of the largest chambers in the cave, being about 200ft long and 50ft wide. The roof rises to a height of 60ft above the entrance hole in a series of inverted steps along the steeply sloping beds of limestone. At the highest point, The Balcony, some of the finest formations in the cave can be seen, being particularly notable for their whiteness. There are great banks of stalagmite, columns, helictites and curtains in profusion — a photographers paradise. At the top of the entrance climb a hole to the left leads to an ascending rift that soon becomes blocked with white stalagmite, fine clusters of large, transparent helictites and sandy infilling. A number of small holes have been noted but none are extensive, although one does lead back into a continuation rift in the lower part of the chamber.

Many very fine formations may be seen by following the right-hand wall along from The Balcony and a climb down from this point leads to the southernmost section of the chamber. The right-hand section ends below the 100ft high Trafalgar Aven. The aven is almost circular at its lower section and gradually converges into a rift which is choked with stalagmite at the top. The bottom of the aven is dominated by a large stalagmite column known as Nelson's Column.

Victory Passage

At the lower left-hand section of the chamber is a small muddy hole in the floor which reveals the opening to Victory Passage. This passage, starting about 4ft high, descends steeply over a 40ft long, slippery, mud floor at the bottom of which a 'down-and-under' hole leads to a squeeze which is followed immediately by a 8ft drop through stalagmitied boulders. A route to the left can be followed through the boulders to Cone Chamber and the 'window' in the ruckle, but is little used.



33. Nelson's Column, September Series.

Victory Passage continues as a hands-and-knees crawl, and great care is needed to protect the delicate formations. The crawl is quite short and the roof soon rises to reveal stalagmite formations on a yet grander scale, and a floor of sparkling flowstone. In the left-hand wall a small hole may be seen and can be followed through a series of right-angled bends to its termination in a very tight rift. A few metres further along the main passage, a 'T' junction is reached with ways on to the left and the right — neither of the routes are extensive. The passage — The Strand — is of great beauty, the floor being covered with pure white stalagmite. Both ends are choked with white stalagmite flows and crystal pools.

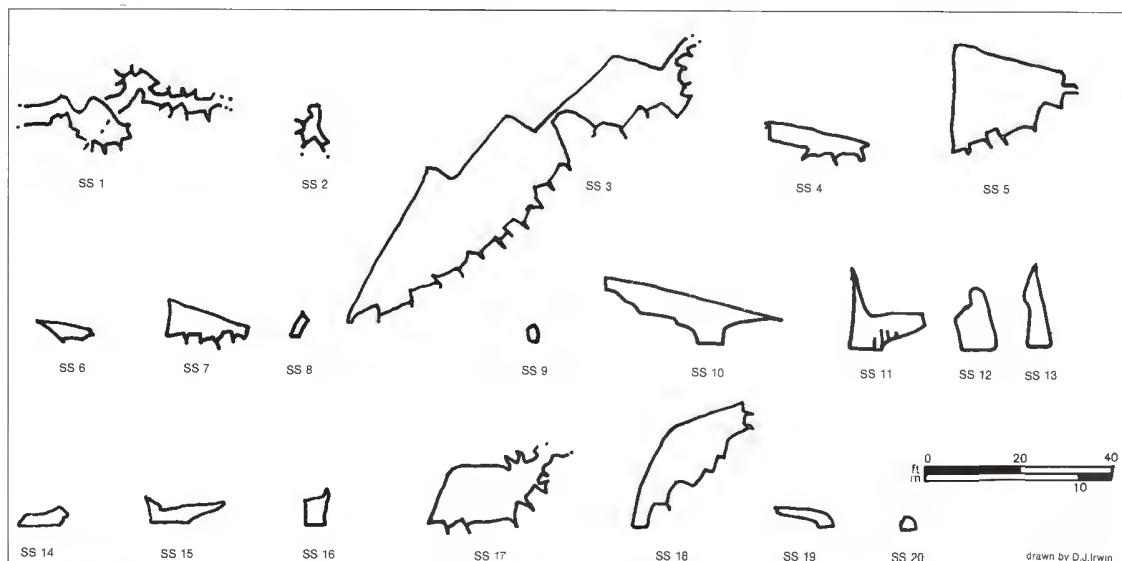


Fig. 10A September Series passage sections.

Maypole Series

From Upper Traverse Chamber, a stream can usually be heard. This is the stream which follows the steep gradient of Maypole Series and eventually joins the Main Stream as a waterfall into Traverse Chamber. The most direct way into the series is via a muddy pool in the upper section of Sentry Passage. Alternatively, the 10ft Upper Traverse Pitch can be used. This is located at the foot of the northern wall of Upper Traverse Chamber at the point where the floor steepens to the top of a large stream passage. A Rawbolt will be found on the wall, for use as a ladder belay. Maypole Stream can

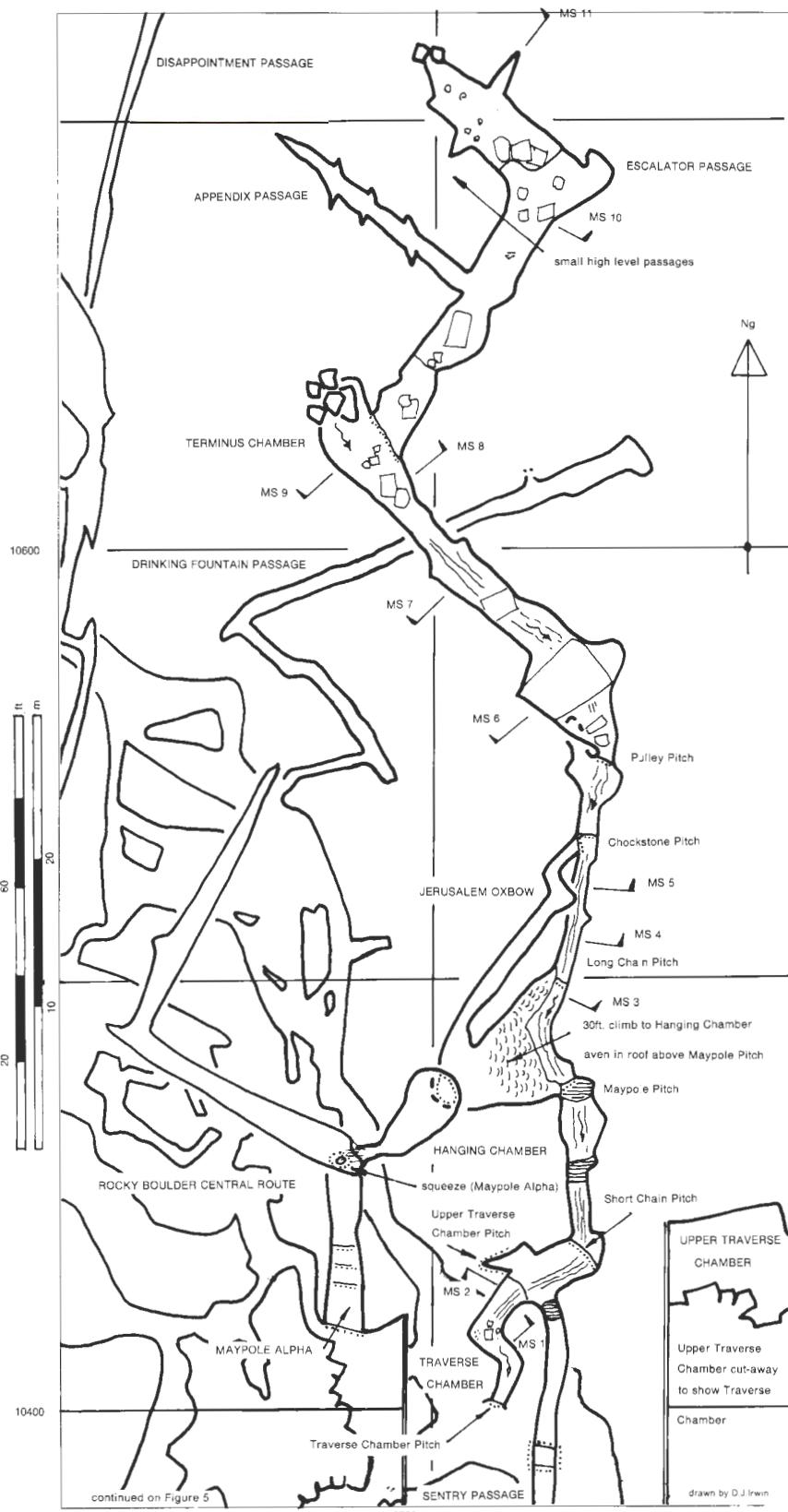


Fig. 11 Plan of Maypole Series.

be followed downstream for a short distance until it encounters the 30ft deep Traverse Chamber Pitch into Traverse Chamber on the New Route.

The upstream section is known as Maypole Series, a steeply ascending passage involving a number of pitches. The first to be reached is the 15ft Short Chain Pitch, so-named after the artificial aid which once assisted the climb.

Ahead lies the old impasse of Maypole Pitch. This 25ft high wall, originally surmounted by maypoling, now has a double rope hanging through a steel ring belay. This rope must not be used to carry any load; its strength cannot be guaranteed after several years in the cave. It is used simply to pull a rope through the steel ring. To the end of this rope is attached the 25ft ladder required to scale the pitch. The first man to reach the top attaches the ladder to the belay provided. The procedure is reversed for the descent. Alternatively, the descent may be a double rope abseil. Bailing the pool at the top will reduce the water flow for a short time, which enables the ladder to be climbed in relative comfort. The stalagmite bank to the left can be climbed back over Maypole Pitch to look into Hanging Chamber (see below).

Three more pitches remain above Maypole Pitch. Firstly there is a 20ft pothole called Long Chain Pitch which is fitted with a second double rope system. This is followed by a free climb, at Chockstone Pitch, through a shower-bath to another well formed pot called Pulley Pitch, which, as its name implies, was the prototype for the rigging system used on the two previous pitches.

Above Pulley Pitch, a narrow way leads under large blocks to the right and then the general run of the passage becomes more level. Formations may be seen, the most noteworthy of which is the black edged 'Streaky Bacon' drapery (probably stained by pyrolusite).

The active stream passage ends at Terminus Chamber in what appears to be a boulder choked pothole. The cave at this point is about 40ft from Arête Chamber. The boulder ruckle has been probed and charcoal found.

To the east, just before the abrupt end of the stream passage and at right angles to it, is a large, clean-cut passage. This leads gradually upwards until it peters out at Escalator Passage. The end of the passage is a low and very narrow rift. Other passages which lead off mostly terminate in unstable boulders and are dangerous. An interesting branch is Appendix Passage which has many fossils protruding from its walls.

High in the roof at the upper end of Escalator Passage, a small series of passages exists, extending south to the boulder choke in Terminus Chamber.

Hanging Chamber

An interesting feature of Maypole Series, is Hanging Chamber. By standing at the foot of Maypole Pitch and facing the waterfall, a hole can be seen about 50ft up in the left-hand wall. The chamber is well decorated with stalagmite flows and the view from it provides one of the more spectacular sights of St. Cuthbert's Swallet; upwards, interpenetrating the arch of the roof, is the beginning of a large aven which seems likely to remain inviolate. To the east of the chamber, a voice connection may be made with Maypole Alpha. To the north, a short bolt-aided climb to a ledge is the entrance to Jerusalem Oxbow, a 2-3ft wide, gently meandering, vadose rift. The passage, floored with stalagmite, terminates after some 100ft, overlooking the passage above Pulley Pitch.

Long Chamber Series

To the west and above Boulder Chamber, lies Long Chamber Series. One of the more complex zones in the cave, Long Chamber Series is still little known to cavers

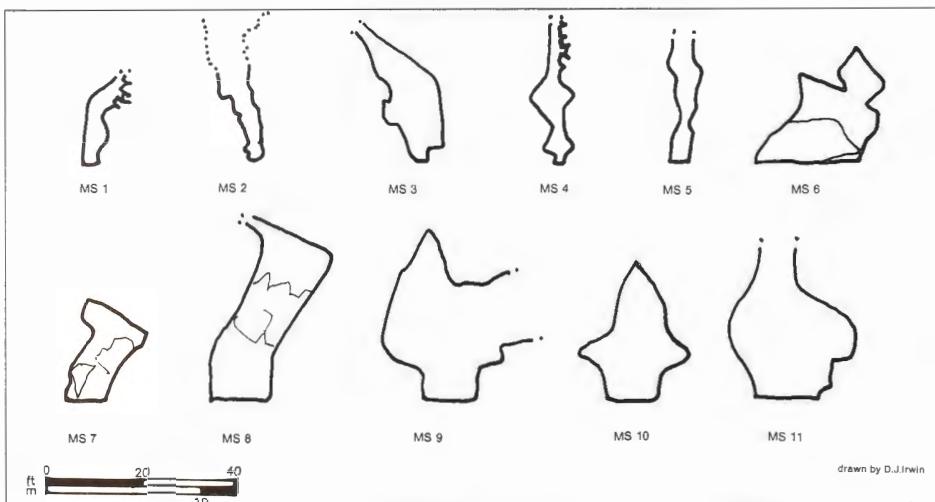


Fig. 11A Maypole Series passage sections.

and has much to offer the inquisitive explorer — provided that care is taken in the boulder ruckles.

Briefly, the series is one of extensive bedding chambers separated by boulder collapse, while to the south, above the great rift of Curtain Chamber, Canyon Series forms an independent inlet lying on the dip plane high above Boulder Chamber.

Long Chamber

Although there are several points of access to this series the easiest is from Boulder Chamber by climbing the slope of great boulders lying against the west wall of the chamber. Traversing across the top of the boulders will lead to a cluster of dry curtains. At this point, a hole low on the right descends to a 15ft pitch to gain a short section of rift passage that overlooks Upper Curtain Chamber and Boulder Chamber. Just prior to this point, a hole in the right boulder wall allows access to Hidden Chamber, situated under Long Chamber and sloping up-dip, the floor of which comprises a series of vadose grooves.

From the curtain cluster, following the hanging wall to the right brings one to Long Chamber, some 20ft wide and 50ft long. The floor deposits are fine, but the whole scene is dominated by one the loveliest curtains in the cave — some 10ft long, the beautifully folded curtain is tinged with purple and has a blackish-brown outer edge. From Long Chamber there are three exits. To the north, a triangular hole at the base of the boulder pile leads to Upper Long Chamber. To the south, extensive bedding planes, The Slabs, give access to both Long Chamber Extension and Upper Curtain Chamber. Finally, in the floor of the alcove under the west wall, a hole over unstable boulders gives access to a lower chamber, Annexe Chamber, in Rocky Boulder Series.

Long Chamber Extension

The Slabs, two parallel and extensive bedding planes, are a remarkable feature, being formed completely by collapse with no visible sign of water action. From the first bedding plane, a gap in the right-hand wall connects with a second, larger bedding plane at a slightly higher level. A traverse, across the upper end, leads via a steep climb through boulders to Long Chamber Extension. The chamber, 60ft long by 30ft wide, is dominated by a massive wall of fractured limestone blocks still in their bedrock position.

A climb over muddy stalagmite flows to the south leads to a steeply ascending passage that gains access to a vantage point overlooking the chamber. Near the top of this passage a small phreatic tube in the east wall can be entered and, after arriving at a junction, continuing along the left-hand passage leads to a small but well-decorated chamber. A way on at the upper end of this chamber has proved too tight, but a decorated bedding plane in the east wall of the chamber may be entered. This trends up-dip to a slot on the left leading to 40ft of more confined passage that ends at a 20ft chamber, the floor of which is encrusted with white stalagmite and crystal

pools. Beyond the chamber is a 20ft climb up a decorated rift ending in stalagmite chokes or an awkward crawl and squeeze into a final bedding chamber — 1982 extension.

Facing south at the vantage point, an obvious traverse over the descending passage leads to a bedding plane above a deep rift. Above the rift, to the right of the bedding plane are two avens, the furthest of which emits a strong draught but is blocked, at the top, with unstable rocks. The avens have never been thoroughly explored. This is known as the 1962 Extensions.

At the northernmost end of Long Chamber Extension, a large boulder-filled rift follows the hanging wall (at which point the direction changes to the north-west), to where a low, 6ft wide arch can be seen. A short hands-and-knees scramble leads to a roomier section and, bearing left, the

top of Fracture Rift can be reached. A traverse over loose boulders, on the right, enables the explorer to cross the top of the rift and continue along a narrow strike rift. An up-dip bedding plane converges into a tube at its upper limit, bearing to the right, allowing entry to Upper Long Chamber.

Straw Chamber and Pearl Passage

Retracing the route to the low archway in Long Chamber Extension the way on is a roughly horizontal route through boulders, leading to a sizable chamber, 40ft across the chamber, the passage appears to terminate in a pile of tightly packed boulders. At the point of entry the chamber appears as a high rift and climbing the left wall by a series of short, but obvious, climbs will enable the explorer to zig-zag upwards to a gravel floored passage. A group of obvious



34. Curtain, Long Chamber.



Fig. 12 Plan of Long Chamber and Canyon Series.

boulders on the way up should be avoided by traversing out to the left over the rift. The gravel passage is short, but three ways can be followed to Pearl Passage, Straw Chamber and a parallel set of passages west of Pearl Passage.

The first and most obvious is Pearl Passage. The entrance is under the overhanging roof and an awkward climb over boulders leads to a vadose trench rising up-dip. At this point a small pool containing several clusters of cave pearls may be observed. The passage ends at a boulder choke but a climb at this point, up the left wall, gives access to a parallel passage which may be entered a few feet further along the right-hand wall beyond the entry to Pearl Passage. At the

upper end of Pearl Passage a climb up the left-hand wall gives access to a parallel set of passages. The upper end closes in a tight, descending rift. The lower end emerges in the hanging wall a few metres west of the entrance to Pearl Passage. The 'gem' of this area is Straw Chamber; at the far end of the gravel floored passage at the top of the climb, a duck under the hanging roof of the passage to the left is the entrance to the chamber. At the top of the collapse that extends downwards through Long Chamber Extension to Coral Chamber, 150ft below, a large decorated chamber dominated by straws up to 4ft long may be viewed. Entering the chamber should be carefully executed as one is forced to crawl near a group of

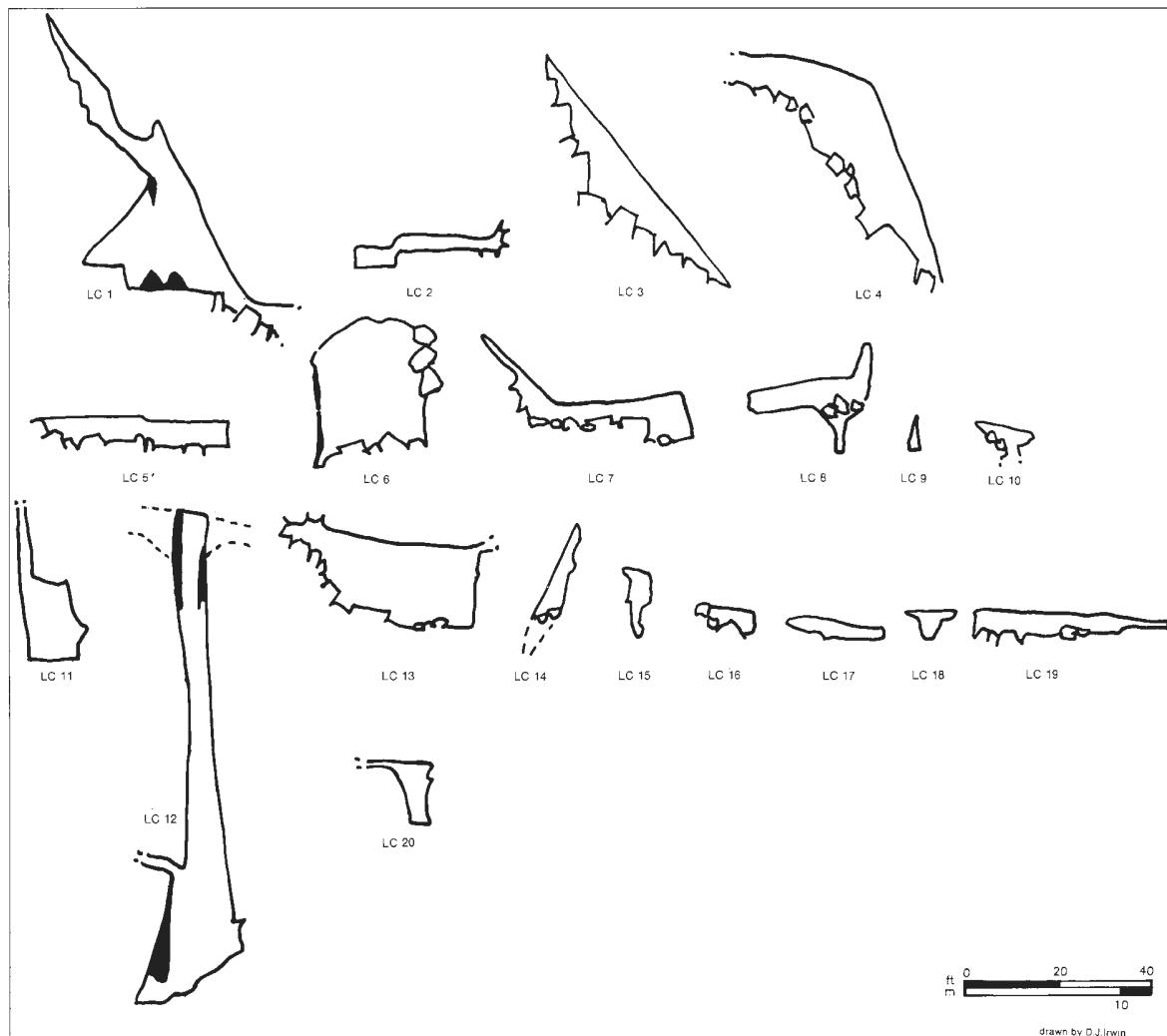


Fig. 12A Long Chamber and Canyon Series passage sections.

beautiful formations. The main floor of Straw Chamber is dominated by a stalagmite flow covered with a lovely lacework of gold-coloured micro-gours. To the east, the chamber contains a group of small but nicely decorated grottoes. To the west, the chamber narrows and an extraordinary stalactite with irregular stalactites and straws growing from its sides has been given the name 'The Skinned Rabbit'. Beyond this formation, a hollow in the boulder floor towards the end of the chamber gives access to an 60ft long up-dip passage with a nice cream coloured stalagmite flow. The passage becomes too tight to push further. At the western end of Straw Chamber, a route down through the boulders gives direct access to the main section of Long Chamber Extension, but is not advised due to the instability of the boulder pile. Above the entrance to Straw Chamber, an obvious bedding plane leads to two small tubes, the left one being nicely decorated with crystal pools which have not been crossed; to do so would severely damage the formations and only add a few extra metres in an inlet passage with little

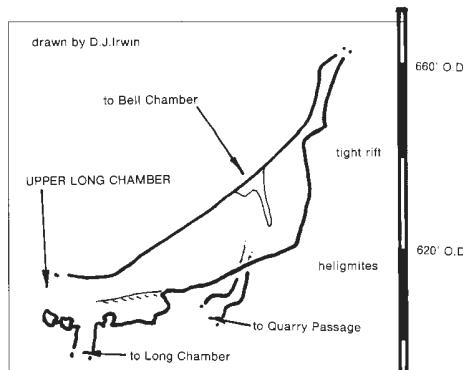
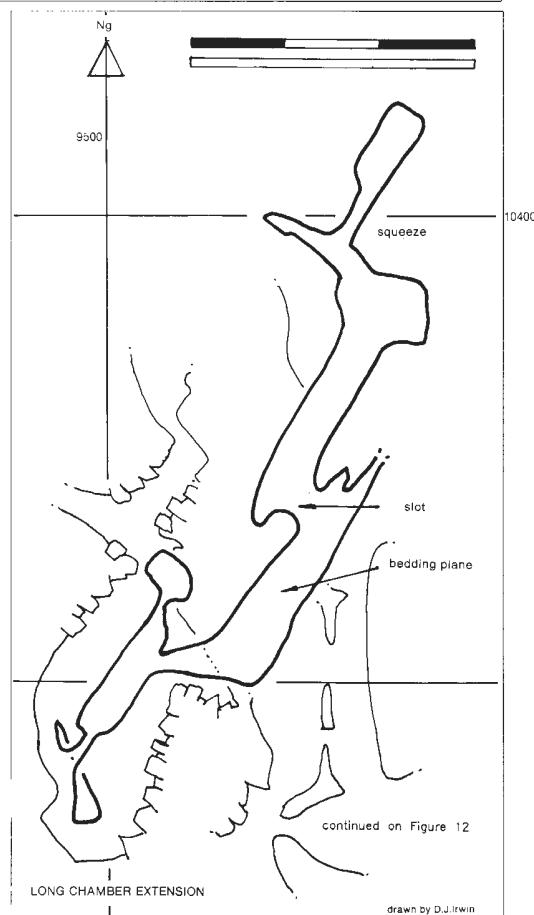
Fig. 12C East-West projected elevation.
Chandelier Passage

Fig. 12B 1982 Passage over Long Chamber Extension.

potential as the height is close to the permafrost breakdown level at -150ft below the cave entrance.

At the base of the climb to Straw Chamber and Pearl Passage in the chamber in Long Chamber Extension, the impression is that the way on ends at this point. In fact, there are three ways on to two quite different areas of the cave — one of which enables a round-trip to be made through Coral Chamber below.

Far Chamber area

Between the rift and the apparent end of the chamber the left-hand wall is, in fact, a boulder pile. About half way along an obvious boulder with very prominent calcite banding is the entrance to Ruckle Passage leading to Marble Hall area and Coral Chamber in Rocky Boulder Series. To gain the bedding planes and Far Chamber, head for the boulder wall at the end of the passage. A short alcove to the right of the compacted rocks leads to a small split-level hole though boulders. The *lower hole should be avoided* as this leads to Horror Chamber; the upper hole gives easy access to the bedding planes.

Horror Chamber is a void in the boulders below the bedding plane leading to Far Chamber. The left wall of this chamber is so crushed that the rock, still in-situ, has been split into building-brick size blocks. The far end narrows and the explorer emerges among huge boulders which are supported by a very steeply entrenched floor at the upper, southern end of Coral Chamber. Inspection of these boulders shows that they are only locked in position by jamming against the steep floor!

Entry to the bedding planes via the upper hole, leads up-dip for 60ft to a roomier section and the ascent to an upper chamber is via a steep climb to a hole in the roof. The upper chamber is gravel-floored and a terminal rift may be followed for over 100ft. To the left of the roomier section, a parallel, descending 10ft wide bedding plane leads downwards to the entrance of Far Chamber. This is a high rift chamber forming the continuation of Long Chamber Extension and lying close to the Gour–Lake Fault. The western wall contains a boulder-filled rift and is entered under two enormous, suspended boulders. This has been explored by entering the boulders at various levels but only short sections of inlet passage have been found. At the entrance to Far Chamber, a hole in the boulder floor may be entered and a route followed to a climb down into Coral Chamber.



35. Calcited drip pockets near Curtain Chamber.

Upper Long Chamber, Chandelier Passage and Bell Chamber

The area to the north is most easily gained by returning to Long Chamber. At the northernmost end of Long Chamber, a small hole can be entered at the base of a boulder pile jammed between the bedrock walls. A 15ft twisting climb leads into Upper Long Chamber and the entrance to Chandelier Passage.

Upper Long Chamber is a steeply inclined bedding chamber some 80ft long and 30ft wide. From this chamber there are thirteen known exits, some connecting with other parts of the cave. As most lie through loose boulders, only seven are mentioned.

West of the entrance to the chamber, beyond the low roof, a parallel high rift passage quickly closes down to a small tube leading to Long Chamber Extension, via the top of Fracture Rift. The lower section of this rift ends in a finely decorated section overlooking Long Chamber. At the northern end of Upper Long Chamber there are several ways on, none of which are very extensive or important. A hole in the roof, for example, leads to a dead-end but slightly decorated chamber; the way on at the north-west corner of Upper Long Chamber leads to the bottom of the Fifty-four Foot Pitch leading out of Pillar Chamber Extension in the Old Route. A third route gains Chandelier Passage and another, a useful diversion, is Quarry Passage.

Chandelier Passage, a dip-aligned, vadose trench, heads eastwards from the top of the climb from Long Chamber and requires care when entering to avoid the beautiful stalagmite flow on the left wall. A few metres along this passage a 10ft climb leads to a widening of the passage with a narrow rift entering from the north. The rift leads to a boulder-filled, vadose trench and the inevitable boulder ruckle. This area is best entered from Bell Chamber. Continuing upwards in the main passage, a formation high on the right-hand wall, The Chandelier, gives the passage its name. Behind the marker tape, a fine transparent cluster of heligmites can be viewed. The low level passage under the left wall leads to Quarry Passage but a 30ft handline is advisable for the 10ft overhanging climb. Opposite The Chandelier, a climb to the roof of the passage, via a tight rift, leads to Bell Chamber — a small chamber dominated by a magnificent flow that overhangs a 10ft deep pothole which, in turn, leads to an inclined bedding plane forming the roof of Chandelier Passage.

Formations in this section of the cave are unusual. The two main stalagmite flows (entrance to Chandelier Passage and Bell Chamber) all display tassels in the form of a 1 inch diameter x 2-3 inch long stalactite with a 1 inch long straw at the end.

From Bell Chamber, the way on is via an awkward, steeply inclined, gravelly trench to the left of the formation. At the top is a parting of the ways. The route to the west is an open bedding plane leading to a boulder-filled vadose trench, Upper Stream Passage. This passage gains access to a small chamber having various excursions in the boulders. Part-way up the passage, an alcove on the left leads via a boulder-filled pothole to Pillar Chamber Extension. The remainder are not known to lead out of the area or connect with other series of passages. Several chambers have been reported in this area but it is thought that they are already known, but were approached by unusual routes from Upper Long Chamber and are not described here. Suffice to repeat that there are thirteen exits from this chamber — only seven have been described! From the cave survey it is difficult to imagine that there are more unrecorded chambers in the remaining 'rock'!

To the east of the climb out of Bell Chamber leads to a complex of bedding planes and short passages that form the upper reaches of Chandelier Passage. At the top of Chandelier Passage, the floor is covered with a fine set of mini-gour pools and a stalagmite column. It should be remembered that the climb back to Chandelier Passage should not

be made, in order to protect the heligmites below.

In Upper Long Chamber, slightly north of Chandelier Passage entrance, a large pit in the floor can be descended — though great care crossing the stalagmite floor is required. At the lowest point, a short route through boulders gains access to Quarry Passage and a way into a small series of rift passages under Upper Long Chamber. From the lowest point, it is possible to return to Boulder Chamber under Quarry Corner. Quarry Passage gives access to a minor complex of rift passages above the Kanchenjunga water drip. These may be entered via a small tube just above the squeeze beyond the right-hand bend in the passage. To the left of the tube a steeply inclined tube soon closes down. To the right, a parallel set of rifts may be entered. The left-hand rift gives access to the top of the Kanchenjunga water drip, and, if followed, the passage leads to a difficult climb down into Boulder Chamber near the mud slide to the Vantage Point by the Cascade. The right-hand rift leads to two phreatic tubes that end abruptly overlooking Boulder Chamber above Quarry Corner. At the entrance to Quarry Passage in Upper Long Chamber, an unclimbed aven exists in the roof, from which there is generally a heavy water drip.

From the large bedding planes south of Long Chamber, The Slabs, a climb down at the lower westerly corner of the higher of the two levels may be made into Upper Curtain Chamber; at this level there is a fine view of the Curtains. An obvious climb down into Curtain Chamber should not be made as it consists of a steep slope of loose gravel and stones which, if carelessly moved, would damage the curtains. The eastern wall of the chamber displays a fine, coloured flow above which a bedding plane may be entered by maypoling, and a rising phreatic passage followed to a vantage point overlooking the side of The Cascade some 80ft above the base of this huge formation.

Canyon Series

Returning to the lowest point in the Long Chamber bedding planes, a short climb through boulders in an upward direction will give way to a rift chamber roofed with boulders at the northern end. The floor drops quickly to a tight rift that suddenly closes down except for a small hole some 10ft above floor level which leads to a very small blind chamber.

Near the point of entry to the rift chamber, a route on the right-hand wall, initially along an obvious ledge, leads to a climb up the wall to a squeeze at the top left which marks the start of the 900ft long Canyon Series. The squeeze, in turn, gives way to a short series of decorated phreatic tubes. The tubes terminate at the head of a deep shaft some 10ft wide and 20ft long, down which hang some of the longest and largest stalactites in the cave; this is the roof of Curtain Chamber. Though it is tempting to ladder this pitch of over 100ft, it is requested that cavers refrain from doing so as the potential danger to The Curtains immediately below is great.

Using a lifeline, the traverse over the head of Curtain Chamber can be made to the left of the shaft. A short climb up and over a hanging block leads to a 15ft deep vadose canyon. The passage is decorated with fine floor deposits and wall flows; ribbon curtains abound. A route, initially along an obvious traverse to the left and then a crossing of the passage to the right, over pools, leads up and over a series of potholes to a well-decorated bedding plane. Near here is the entrance to Forbidden Chamber. At this point a marker tape warns the visitor of a superb group of crystals on the floor and of a magnificent crystal pool lying tucked away in a narrow rift to the north. The bedding plane extends up-dip and the caver is prevented from continuing far due to the white stalagmite sheet and 'Pagoda' type column. Crossing the bedding plane at its lowest point, a high level passage is reached descending down-dip from the left, floored



36. Crystals, Canyon Series.

with a fine stalagmite flow and terminating at a large crystal pool. To the right is a second bedding plane, 20ft wide and low. Descending this, a phreatic tube, some 8ft in diameter, is reached, ascending to an awkward squeeze, and in turn leading to a steeply ascending canyon passage — one of the finest features in the entire cave. The passage, The Canyon, ascends in a series of steps and is a classic example of a phreatic bedding plane development, later cut down by vadose stream action. The roof height drops to about 2ft at the upper end, at the entrance to a steeply inclined bedding chamber over 50ft long. At the upper end of the chamber, a short vadose trench displays a single formation — a breathtaking, almost translucent curtain. To the left of the entrance to the chamber a group of formations will be seen, and among these is a fine gour pool. By following the east wall, a scramble over or through boulders gives access to a parallel bedding plane, at the top of which is a grey but massive, tiered column surrounded by a sheet of pure white stalagmite.

In the chamber, there are a number of minor side passages mainly in boulders, although at several points in this area, including The Canyon, one can see into an apparently extensive bedding plane to the east but access to it is too tight.



37. Helictites, Railway Tunnel.

4. Geology

P.J.Romford and C.M.Smart

The geology of the Mendip Hills was very simply described by the famous author Thomas Hardy as 'a range of limestone hills stretching from the shores of the Bristol Channel into the middle of Somersetshire'. More recent studies, including the current district Memoir of the Geological Survey (Green & Welch, 1965), have left this very simple approach and found both the rocks and stratigraphic structure to be highly complex. However, the geology of the area surrounding St. Cuthbert's Swallet can still be studied in a simplified form.

Over the area of St. Cuthbert's Swallet the relief consists of a high, steep-sided plateau with an average height of approximately 800ft above sea level. The summits of North Hill and Pen Hill attain 1000ft and are composed of sandstones and conglomerates. These impervious rocks form the catchment for the streams that drain to the Priddy Mineries ponds. To the north of St. Cuthbert's Swallet, the topography becomes increasingly more dissected and, to the south, the plateau abruptly drops to the low-lying alluvial wetlands of the Somerset Levels.

The detailed topography of the plateau is related to both the lithology of the underlying rocks and past tectonic deformation. Beneath the plateau surface, the rocks exhibit complex folds and faults, although initially these rocks were laid down under near-horizontal conditions over millions of years. However, towards the end of the Palaeozoic Era, the Mendips experienced the effects of the Variscan Orogeny. This mountain building episode produced chains of great mountains in Europe, the ripples of which caused the buckling of the Mendip strata, resulting in a series of large folds. The line of the major Mendip axis curves approximately north-west to south-east and is split into four periclinalen echelon. These, today, form the summits of the Mendip Hills. The folding was not symmetrical, and North Hill and Pen Hill both demonstrate vertical bedding and an overturning of the strata on their northern limbs.

The Variscan Orogeny created tremendous stress on the rocks which has resulted in a variety of structural forms and, in some places, instead of folding, the rocks have fractured to form faults. The Geological Survey consider that the major faulting has been closely related to the folding in that many of the faults are of southerly dipping thrusts which are aligned roughly parallel to the fold axes; for example the Miners Arms Thrust which places the Carboniferous Limestone directly onto the Old Red Sandstone, thereby cutting out the expected beds of Lower Limestone Shales, the Emborough Thrust between Pen Hill and North Hill and the Ebor



38. Marble Hall showing Gour-Lake fault.

Thrust to the south of Pen Hill. The Priddy fault, which runs south-west from North Hill, may have been the result of the tension generated towards the crest of the North Hill pericline. The Stock Hill and Biddle faults to the east are essentially tear faults. Therefore the block of limestone containing St. Cuthbert's Swallet has been down-faulted. An additional complication is caused by the movement of some of these faults on more than one occasion. The Biddle fault is one example of such re-activation, as there is evidence of its movement both as a result of the Variscan Orogeny and the later Alpine Orogeny.

The oldest rocks present in the Mendip Hills are the lavas and volcanic ash deposits of Silurian age (430 million years old) which are found near Stoke Lane. In the St. Cuthbert's Swallet area, the stratigraphic column begins with the Old Red Sandstone which is of Devonian age. This was not laid down as a result of marine sedimentation but in an arid environment. Deposition would have occurred in a low-lying desert that would have been crossed by giant seasonal rivers from the northwest. The arid conditions led to iron oxidation which has stained the minerals red. The Old Red Sandstone consists of grey, pink and brown sandstones with conglomerate bands. The Old Red Sandstone is now exposed as the eroded cores of the two periclinalen that make up the smooth and gently contoured summits of North Hill and Pen Hill.

The Carboniferous rocks on Mendip have been divided into four major groups, viz: the Lower Limestone

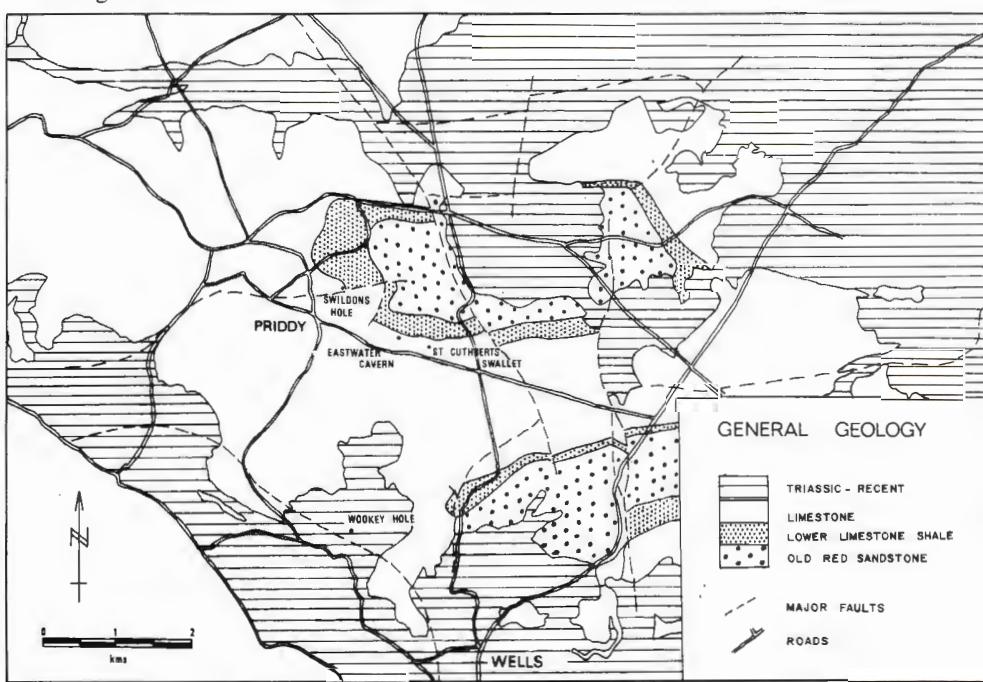


Fig. 13 Geological map of Priddy area.

Shales, the Black Rock, the Clifton Down, and the Hotwells Groups. In the Priddy area, the Lower Limestone Shales consist of approximately 450ft of grey and black shales, sandy shales and siltstone, with interbedded limestones characterised by their purity and their fossiliferous nature. The Black Rock Group is made up of dark grey to black, rather fine-grained limestone and is the most fossiliferous formation of the Carboniferous Limestone of Mendip. Crinoidal fragments are particularly common. The Clifton Down Group includes the Burrington Oolite, the Vallis Limestone and the Clifton Down Limestone. It demonstrates a sequence from light grey oolite and oolitic crinoidal limestone (Vallis Limestone) to the grey to black limestones and calcite-mudstones of fossiliferous, massive, grey, crinoidal and oolitic limestones.

St. Cuthbert's Swallet lies entirely within the Carboniferous Limestones, predominantly Black Rock Limestone and Burrington Oolite. The surface stream sinks close to the boundary with the underlying shales. In the upper sections of the cave — in the Old and New Routes, Maypole Series and Long Chamber Series — the passages penetrate 50ft into the Lower Limestone Shales. These exposures are best seen in the Pulpit Pitch and Ledge Pitch areas. It is just possible that the Vallis Limestone occurs in the farther reaches of St. Cuthbert's II. In both the Black Rock Limestone and the Burrington Oolite, much chert banding is evident and may be seen in the cave at several points, e.g. Wire Rift, Gour Rift and St. Cuthbert's II.

To the north of the cave entrance lie the Lower Limestone Shales. These, being essentially impermeable, cause surface run-off in the upstream catchment. In the locality of the cave entrance, surface run-off is made more complex by the storage of water in the old Priddy and Chewton Mendip Mineries areas, which include ponds and spoil heaps.

The Carboniferous rocks were conformably deposited onto the Old Red Sandstone. This represents a transition from the arid land environment of the Devonian through the Lower Limestone Shales, laid down under shallow, muddy marine conditions, as the seas advanced from the south, through to the clearer waters of the coral



39. Quarry Corner, Boulder Chamber.

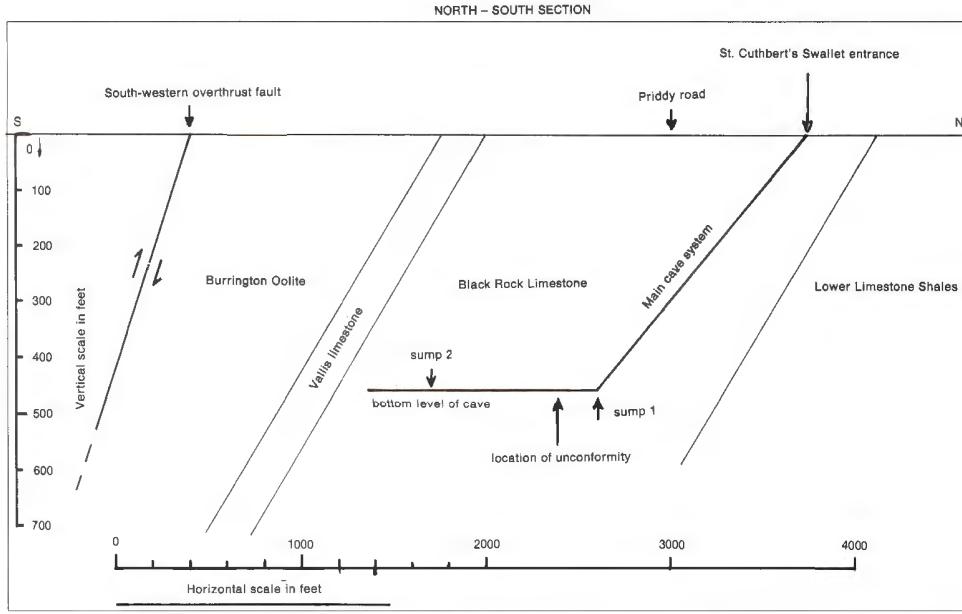


Fig. 14 Geological section.

drawn by P.J. Romford

seas and coastal lagoons suitable for the deposition of the massive Carboniferous Limestone.

From a hydrological viewpoint, both the Old Red Sandstone and the Lower Limestone Shales are of immense importance. The surface streams flow across these impermeable rocks, and sink within a short distance of meeting the permeable Carboniferous Limestone.

The Upper Carboniferous beds are not present in the St. Cuthbert's area and the nearest rocks of the Millstone Grit and the Coal Measures outcrop in the Hope Wood Valley at Ebbor owing to faulting. At Priddy, the Triassic marls and conglomerates of the Mercia Mudstone Group rest unconformably on the folded basement rocks. They appear to infill a deep pre-Triassic valley that developed along the Stock Hill fault. Boreholes close to the Castle of Comfort Inn have revealed over 300ft of marls and conglomerates, obviously filling a pre-Triassic gorge. These Dolomitic Conglomerates are again rocks of a non-marine origin, and are evidence of the retreat of the seas at this time. Rocks of the Lower Lias cover much of the plateau to the north of North Hill, and these consist of a thin band of clays, shales and chert.

Structure in the St. Cuthbert's Swallet area

The cave lies in the southern flank of the North Hill Pericline which is an anticline whose axis is parallel to the major northeast — southwest trend of the Mendip Hills. The beds dip from about 20 to 35°, and a well defined joint structure is evident throughout the cave. The major Priddy and Stock Hill faults of Permo-Carboniferous age, being nearby, have influenced the structure in which the cave lies. It appears, from observations, that a minor anticlinal fold whose approximate southerly plunge lies nearly perpendicular to the North Hill Pericline has affected the development of the cave (cf Chapter 5 Geomorphology). This fold is probably contemporary with the down-faulting of the limestone block in the Priddy area. In the cave one can see faults subsidiary to the north-south fold which govern the cave development. Commensurate with the local minor folds and faults are well defined tension cracks infilled with calcite; these are clearly seen in Gour Hall and Marble Hall.

Mineralisation

The entrance to St. Cuthbert's Swallet lies at the southern end of a small valley, much modified by 19th century lead mining activities close by the well known St. Cuthbert's Mineries. Sump II has abundant deposits rich in lead; these tailings having been washed into the cave as a result of the buddling process on the surface. Pyrolusite deposits may be found in a number of areas of the cave, e.g. Pyrolusite Series, Gour Hall and Arête Chamber. Iron minerals, such as limonite, can be seen in small quantities elsewhere. Calcite, which pre-dates the cave formation, can be seen infilling joints and tension cracks in all parts of the cave.

Structure in the Ebbor Gorge–Wookey Hole Cave region

To the south of the St. Cuthbert's Swallet study area, lies a folded and faulted zone in which Ebbor Gorge is incised. The Ebbor Thrust fault displays a stratigraphic throw of about 2,000ft to the northeast, with the Black Rock Limestone faulted against the Lower Coal Series. To the north the Ebbor Fault, having a normal throw of about 1,000ft, passes into a steep anticlinal fold to the northwest. The most northerly major fault is the Southwest Overthrust fault which is aligned at about northwest–southeast.

Between the three major Permo-Carboniferous faults the highly compressed rocks have faulted into a complex series of slices. This parallel series of faults cuts across the known drainage line from St. Cuthbert's Swallet to Wookey Hole Cave. Clearly, the groundwater movement is greatly influenced by the location of major and minor faults. At Wookey Hole Cave, the Triassic topography has been infilled by a coarse conglomerate in which part of Wookey Hole Cave lies. Wookey Hole Cave is, of course, important to this case

study, since it is the resurgence point of the waters from St. Cuthbert's Swallet and other major Priddy caves such as Swildon's Hole and Eastwater Cavern.

Conclusion

The Southwest Overthrust has had a significant bearing on the cave groundwater drainage. The findings of the water tracing exercise in 1967 (Atkinson et al., 1967) suggested that the three major cave systems in the Priddy area drained discretely to join together very close to the Wookey Hole Cave system. Irwin (1978) and Romford, independently, suggested that this may not be the case, and that the water tracing times obtained in the 1967 experiment were simply a function of distance. If this were the case, then there was a high probability that Swildon's Hole and Eastwater Cavern streams drained east and joined the stream from St. Cuthbert's Swallet north of the Southwestern Overthrust fault. The combined streams flowed into the Wookey Hole Cave system via a common breach of the fault (cf. Chapter 6 Hydrology).

It is most likely that the lowest extremities of St. Cuthbert's Swallet represent what may be described as a saturation zone. If one considers the gradient from Sump II to Wookey Hole Cave Sump 25, which is only 0.75° , then clearly, the water courses beyond Sump II are very likely to be flooded and possibly of phreatic fissure development. However, this should not be considered a totally negative judgement on further pushing downstream. Indeed, it is probable that there may be an old, high-level, fossil series to follow.



40. Curtain Chamber.

5. Geomorphology

St. Cuthbert's I

Dr. D.C. Ford*

This account is based on a study made on Mendip during 1960 and 1961, which aimed at determining the mode and sequence of development of St. Cuthbert's Swallet, and was then compared to similar studies made of Swildon's Hole, GB Cave, the Gough's group of caves at Cheddar, and Wookey Hole Cave (Ford, 1963a).

In many respects, St. Cuthbert's proved to be the most complex and interesting of these caves. This is partly because it is the oldest (the sequence of events at GB Cave, for example, is much shorter) and partly because, in the past, it drew its water from an unusually large surface basin with a varied assemblage of rocks. Today, the cave drains something less than 0.5-mile² of adjacent parts of Stock Hill and North Hill but, in former times, it took water from well north of the Miners Arms via the Stock Hill–North Hill valley.

This narrative gives a sequential description of the creation of modern scenery in the cave. It omits almost all the evidence, for the sake of brevity.

Its history is divided into phases and sub-phases, distinguished by greater or lesser changes in the prevailing dynamic conditions. These phases are listed in Table 1 where it will be seen that they can be grouped into three major stages of development: Phreatic Erosion, Vadose Infill and Vadose Re-excavation.

Morphological Sub-Divisions of the Cave

For the purpose of this description, the cave may be divided into four areas having distinctly different forms (Fig. 15):

First is a central complex of partly collapsed chambers, extending to form Long Chamber and Coral Chamber in the west, to the September Chambers in the east. These chambers rest on, or close to, the base of the limestones which are lying on shaly, transitional strata sloping at about 38° to the south-southeast. The chambers follow the bedding planes and several systems of joint and fault fractures, which coalesce in this area, creating a very tangled structure.

Second is the Gour Rift. This is one of the biggest passages in the cave, following a major, vertical fault. The original Gour Rift of the explorers is only the south-eastern end of it. To the north-west, Cerberus Hall, Mud Ball Chamber and Lake Chamber are further accessible parts, separated from each other by places where stream laid fill and stalagmite reaches the roof.

Third is the Rabbit Warren Area. This includes all the passages between the central complex and the Gour Rift–Everest Passage, the Fingers, the Rabbit Warren, the Railway Tunnel, the Main Stream Passage, the Warren Extension and the Tin Mine. All are comparatively small and were developed to convey water from the big chambers to the north, to the Gour Rift.

Fourth is a series of comparatively recent inlet passages which developed to feed to the central complex, or beneath it long after it had been first expanded by water from other sources. The inlets are the Arête (Old Route), Pulpit (New Route) to Lower Traverse Chamber, Maypole Series and High Chamber.

Sequence of Development

1. The Phreatic Expansion

About two thirds of the volume of the known cave can be attributed to solution under phreatic conditions or to collapse which followed immediately after that fill was drained. There are two distinct phases of phreatic expansion:

(a) Phreatic bore passage phase

In this phase, water entered the known cave through Rocky Boulder and the collapsed area at the north-west corner of Upper Traverse Chamber. The contemporary water table was at, or above, 660ft OD. A series of long, narrow rift chambers was opened below it, between Coral Chamber and Upper Traverse Chamber. They were drained into Gour Rift by a remarkable system, the Rabbit Warren 'bore passages'. Using this term means a very efficient conduit, with minimum wall friction and little or no wastage of the solvent power of the water in eroding large blind alleys. The Rabbit Warren bores were very efficient, being nearly circular in cross section (a circular pipe has least friction) and following fairly direct linear courses. There are four principal bores, all conveying flow to the east-southeast, and arranged in a tier — the highest to the north. The highest drained the southern end of Upper Traverse Chamber and may be followed east from the junction of that chamber and Harem Passage, to a stalagmite choke. The second was the Railway Tunnel, draining an early rift in the area of the Cascade and the south-east part of Boulder Chamber. It spilled some water south (down-dip) through lesser bore passages. Due to this loss of water, the dimensions of the Railway Tunnel are progressively reduced. The third was the smallest. It ran from Everest Passage, through the Fingers and the centre of the Rabbit Warren, to the top of Sewer Passage and Plantation Junction. It received many tributaries from the Railway Tunnel and distributed water from the fourth bore. The latter is the oldest part of the Main Stream Passage. It began at the head of Everest Passage, drawing water from the precursors of Everest, Boulder and Curtain Chambers, spilled a little into the Rat Run and then meandered east-southeast to turn into its discharge, the Gour Rift, at the Dining Room. Here, the roof of Cerberus Hall is exceptionally high, being driven upwards by the erosive power

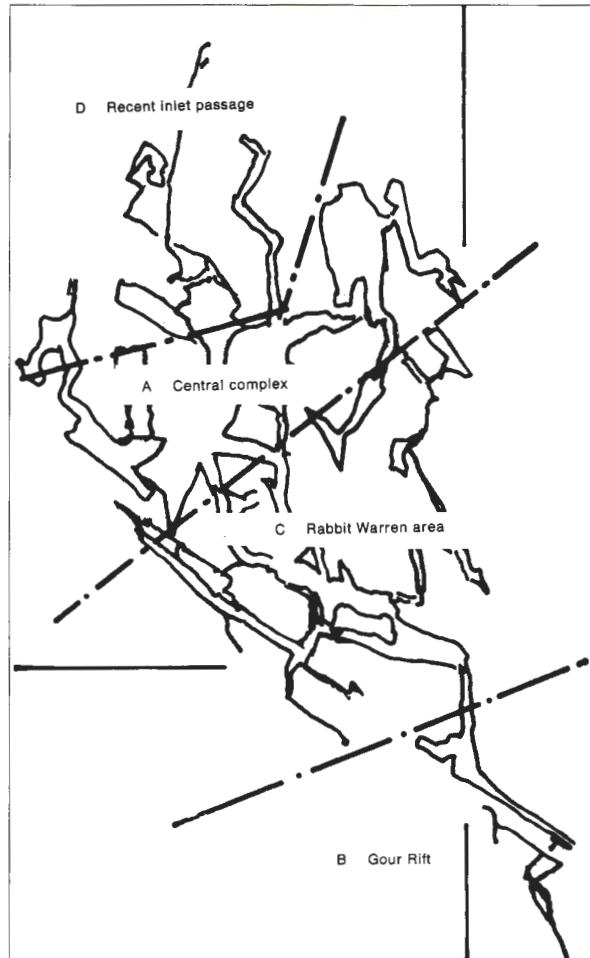


Fig. 15 Geomorphological zones of the cave.

* Previously published in 1964 (Ford, 1964b & c). Additional discussion notes have been added by D.J.Irwin.

of waters delivered into its base with some force. These waters then moved south-east towards Sump 1.

The three higher bores all fed into Plantation Junction. East of their terminal chokes, the Upper Traverse and Railway Tunnel bores (the two largest), split into a series of distributaries, which can be seen almost entirely choked with stalagmite, crossing the extension passage at its floor level. Beyond it they turned south, developing the choked passage which the Plantation Stream follows today and reaching the junction at some place beneath the great sand and stalagmite bank there. From the junction, the water cut a fine, elliptical bore passage straight to Beehive Chamber where it turned steeply upwards (Pyrolusite Series) to enter the highest gours. The modern route from Beehive Chamber to the rift is a subsequent bore passage, also climbing up to its outlet. As at Cerberus Hall, the roof of Gour Hall is highest over these points of input.

The dimensions of individual bore passages remain nearly constant between tributaries and distributaries. Thus, making some assumptions, it is possible to calculate the velocities of the formative flow through them. Velocities were very low, despite the efficient flow cross-sections of the passages. The picture is one of water moving slowly through a mesh of pipes from one system of semi-static reservoirs (the central complex) to another (Gour Rift). Correspondingly, the water table was exceptionally flat and stable, and the time to expand the cave thus far was possibly as long as all the later phases combined.

(b) Phreatic disintegration phase

A change in the dynamics of flow, or chemistry, of the groundwater then tore much of the efficient mesh of bore passages apart and greatly increased the volume of the cave. The water table remained at 660ft. Most of the bore passages developed in bedding planes, the line of the plane bisecting the tube. Disintegration took the form of a wide expansion along the plane, on one or both sides of the

tube. Often the lower half of the tube was destroyed altogether. This can best be seen along the direct traverse from the Fingers to the Sewer. Most of Sewer Passage is the result of this phase. So is the manner in which the south wall of the extant of the Railway Tunnel is torn out along the guiding plane. To the west, the roof of the tunnel can be traced curving up to join a great joint surface over the foot of the Cascade. The floor here was entirely dissolved away.

There was much expansion of size in the central complex. The most important development was a direct connection between the complex and the rift, short circuiting the old flow lines, through Long Chamber and Curtain Chamber, joining the rift at roof level at the choked point between Lake and Mud Ball Chambers. These two chambers are largely a product of this phase.

A new phreatic stream from an independent sink entered the system during this phase. It opened the September Series and thus impinged on the eastern end of the bore passage mesh. This was overloaded, and as a result, the extension passages below Cross Leg Squeeze were developed as remarkable sub-water-table overflow channels. In many parts it will be found that their course is not controlled by any notable fractures at all.

(c) Fall of the water table

At the end of the second phase, the water-table fell from above 660ft OD to a little below its present level of 380ft OD. The rate of fall was slow at first, but there were no prolonged stands above 380ft OD. The vertical amplitude of the drop — at least 280ft — is greater than any detected in the other central Mendip caves [that Ford studied] and requires explanation.

The fall of the water table in a Mendip inlet cave, such as St. Cuthbert's, is caused by a fall of roughly equal proportions at the outlet. In the simplest terms, falls at the outlet caves, such as Wookey and Cheddar, can be attributed to fall in the level of a past



41. Stalagmitic cobbles in roof of entrance to Dining Room.



42. St. Cuthbert's II Lower Streamway.

sea filling the Somerset moors to the south. There have been several such falls from a maximum level above 500ft OD. The vertical amplitude of each fall was around 100ft or less.

St. Cuthbert's shows only one fall, its amplitude as big as the aggregate of the four in Swildon's Hole*. This is because its outlet lies amidst an unusual geological complexity, called the 'Ebbor Thrust Zone' (Welch, 1929, p.45). During the phreatic phases, St. Cuthbert's discharged its water through caves in the Ebbor Gorge. Cave remnants can be seen at the steepest point there. The level of discharge was above 500ft. It was held at this height by a block of impermeable rocks, quartzitic sandstones of Millstone Grit (lower coal measures age) infaulted across the mouth of the gorge. These functioned as a subterranean dam and held the water up at Ebbor during several falls of sea level on the downstream side. Finally, when the sea level stood at somewhere around 240ft OD, the pressures exerted by the groundwater held above 500ft caused a leak to develop around the side of the dam. Wookey Hole Cave is the downstream end of this underground leak. The breakout at Wookey drained St. Cuthbert's via the present Sump Passage. During the phreatic phases, the water left via large phreatic tubes to the south [St. Cuthbert's II].

When the water table first began to fall in the cave, a new swallet developed at the surface, close to the modern entrance. Once underground, its stream bifurcated. The larger part opened the Arête and Wire Rift passages, though not to their modern dimensions, whilst the smaller passed into the Maypole Series, joining the accessible passage there at the highest right-hand bend (going upstream). A tall but very narrow rift was opened; the great potholes being later features.

Three vadose streams now ran into the central complex. One of these (Rocky Boulder Passage and Wire Rift water) flowed through

Boulder Chamber into the head of Everest Passage where it undermined the phreatic honeycomb of the disintegration phase, causing a great deal of collapse, which remains as the base of a long sequence of deposits.

The second of these streams (north-west corner of Upper Traverse Chamber and Wire Rift), flowed into the Railway Tunnel and through the Fingers to join the first. It too, caused collapse all along its route. The combined streams entrenched the floor of the lowest bore passage (Main Stream passage) but did not follow its old exit through the Dining Room into the Gour Rift. Instead, the flow broke laterally into the Sewer. This lay at a lower elevation, causing a waterfall and the abandoned plunge pool which is now Stalagmite Pitch. There was also entrenchment between Plantation Junction and Gour Rift. At the cavers entrance to the rift it is 20ft deep and thoroughly choked with later stalagmite. The third stream (September Series) precipitated much of the collapse there. Rockfall has been so heavy in this part of the cave that little detail can be distinguished.

2. The Main Fill Period

The rest of the history of the cave is a sequence of alternating phases of erosion and various kinds of deposition by vadose waters. During the first half, deposition predominated and the cave was pretty thoroughly plugged up to 640ft OD. This period may be called the 'main fill'. It had many phases and sub-phases.

In the central and south-eastern parts of the cave, the first phase alone was significant. Fast streams from Boulder Chamber and Upper Traverse Chamber plugged the terminal stream passage with an unsorted mixture of silt, sand, pebbles and good sized stones. Much of the material comes from erosion of the North Hill side of



43. "Key-hole" shaped passage in Main Stream.

* Ed. note: Dr. Ford had concluded that Swildon's Hole resurged at Cheddar. The 1967 water tracing exercise proved conclusively that both Swildon's Hole and St. Cuthbert's Swallet resurged at Wookey Hole Cave. Therefore there has to be a different explanation for there being four phreatic zones in Swildon's Hole and apparently, only one in St. Cuthbert's, having the same depth as the aggregate of the four in Swildon's Hole.

The sequence of development in St. Cuthbert's Swallet		
	Phase	
Phreatic phase	1	Phreatic Erosion — bore passages
	2	Phreatic erosion — expansion — disintegration of bore passages
Cave drained of phreatic water		
Main fill period	3a	Stream deposition — coarse deposits, followed by finer sediments
	3b	Stalagmite deposition
	4a	Stream deposition (as in 3a)
	4b	Stalagmite deposition
	5a	Stream deposition (as in 3a)
	5b	Stalagmite deposition
	6	Stream deposition (as in 3a)
	7	Stream deposition (as in 3a)
	8a	Vadose erosion — Mud Hall pothole
	8b	Stalagmite deposition
	9a	Vadose erosion — High Chamber
	9b	Stalagmite deposition
Re-excavation period	10	Stream deposition — Sand Phase
	11a	Vadose erosion — Maypole and Pulpit
	11b	Stream deposition
	11c	Recent stalagmite
	12	Vadose erosion — recommencing (modern phase)

Stock Hill and places further north. It filled back to Plantation Junction and then choked the entire Rabbit Warren, Everest Passage and Main Stream area. Much of it can still be seen. For instance, it comprises most of the west wall of Everest Passage; a few feet below Plantation Junction, remains are jammed in the roof, 18ft overhead.

The filling of this first phase stopped when the accessible parts of Railway Tunnel were about one third full. Two later phases of coarse stream deposition can be recognised in the remains preserved along the north wall there. The central deposit has few of the cobbles, which distinguishes it from those above and below. At the close of the third phase, the farther parts of the Railway Tunnel were fully choked also.

The streams thus clogged their first vadose route to Gour Rift. As a result, they spilled through the abandoned phreatic short circuit into Lake Chamber and Mud Ball Chambers. From here, to the south-east, the floor gradient of the rift was evidently much lower than gradients elsewhere in the cave. This permitted sequences of gradation deposits to be laid upon it. The long series of phase and sub-phases of the main fill shown in Table 1 is largely derived from analysis and correlation of two exposures of this rift fill. One is seen in the south-east corner of Mud Ball Chamber, the other is the climb up from the Dining Room to Cerberus Hall. These two sections are more complex than any other that has yet been described at sites deep within British caves.

Rhythm is characteristic of their sequence. Any one phase begins with the deposition of the unsorted, coarse stream fill described above. Then follows a layer of small pebbles and sand, indicating a reduction of rate of flow of the stream and, almost certainly, its volume. The next is finer still, of sand and clay only, and this is followed by a layer of stalagmite.

Stalagmite sub-phases are common throughout the vadose history of the cave. The evidence is quite clear that, when they occurred, there was no proper stream flow into the cave. The only water underground was that permeating tiny cracks, becoming saturated with solutes in them, and so depositing calcite when it reached

larger cave spaces. It must not be supposed that calcite deposition by permeating waters goes on continuously in an air-filled Mendip cave, spilling into the big stream channels if these are temporarily abandoned by their erosive waters. Small forms may be continuous but otherwise the record is again quite clear in all the caves mentioned. Periods of vigorous stream flow are periods when the permeating waters erode away the formations that they have earlier deposited.

The depositional phase described is thus one of progressively reduced stream flow, terminating in a cessation of flow and general stalagmite deposition. The next phase may begin with some vigorous erosion of the stalagmite by a renewed stream. Coarse deposits follow before there has been much clearance then a reduction of flow, with sand deposition, and so on. In the western half of the rift, the record shows five of these gradational phases, the first correlating with that which plugged up the Rabbit Warren. The last is incomplete, being halted when the fill reached the roof between Mud Ball Chamber and Cerberus Hall. It may be presumed that there were further depositional phases in the higher parts of the cave, but no certain evidence is preserved. At its peak, the main fill extended to choke up most of Wire Rift (remains can be seen in two high false floors there). There can only have been little open cave below.

The Rabbit Warren Extension was choked, first by fill carried down the Rabbit Warren passages which cross it, then by the September stream itself. The original phreatic passage (Continuation Chamber to Plantation Junction) remains largely choked with the coarse fill. In the Rabbit Warren Extension passage, the most striking feature of the fill is the great depth of stalagmite layers. The best section can be inspected near the entrance to Helictite Passage. A stalagmite floor there is 3ft thick; it rests on coarse fill burying an earlier stalagmite. The floor was deeply entrenched on the west side by a stream which then filled the entire passage with coarse deposits. Filling extended up to the top of the extension passage (Cross Leg Squeeze). Continuation Chamber was also quite choked. A good stratigraphic section is exposed at the climb down into it.

No other Central Mendip cave has been so clogged with stream debris as St. Cuthbert's. This is because it had a much larger catchment basin during the main fill times, including a great deal of easily erodible Mesozoic rocks.

Discussion on the geomorphology of the cave

D.J.Irwin

Ford's examination of the cave was undertaken during 1961-62 and subsequent discoveries by and large bear out his general thesis. However, it would appear that the genesis of the system was more complicated than has been suggested.

Full examination of the survey and selected sites in the cave suggest that the greater part of St. Cuthbert's I is formed, not on a monocline, but a local anticline which can be observed in the cave as far south as Plantation Junction. The axis of this anticline is aligned approximately 340-160° and forms a line through Upper Traverse Chamber and Plantation Junction (see Fig. 16). Consequently the development of St. Cuthbert's I probably began as a cave on the west side of the anticline, but the opening of upstream swallets caused the water to sink and flow along and down the eastern slopes of the folded rocks. The distribution of the streams on the surface continued development. Later the passages joined to become a single system at Upper Traverse Chamber and at the Second Stalagmite Bank. The phreatic water that formed Victory Passage bored its way through to the lower reaches of Rabbit Warren and out into Upper Traverse Chamber via the large rift, Strand. Later invasion of vadose water made further cross-connections from September Chamber into High Chamber and on down to Upper Traverse Chamber.

The earliest passages in the cave occur in the upper beds some 150ft above the area of the Cascade in the Canyon Series, Long Chamber Extension and to the west of Boulder Chamber to the north of Upper Long Chamber. The effect of these early streamways was to form phreatic bedding plane developments trending down-dip to inter-

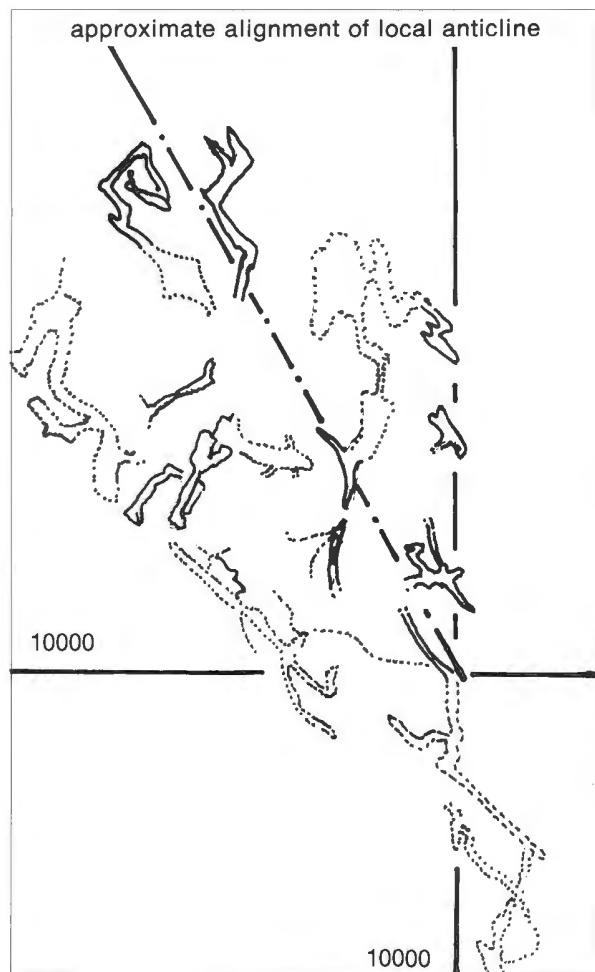


Fig. 16. Diagrammatic survey illustrating form of local anticline.



44. Railway Tunnel showing infill bank.



45. Top of Maypole Pitch.

sect the Gour–Lake Fault and eventually developing the lower phreatic sections of the cave such as those which exist in the lowest points of the Marble Hall area and Rat Run. Adjacent to or near the faultline, utilising local faults and weakened joints, the water opened deep rift potholes such as the Cascade rift, Curtain Chamber, and Lake Chamber subsequently draining along or near the Gour–Lake faultline. Later the inlets retreated to areas above Rocky Boulder Passage and eventually drilled potholes that may be seen at the upper end of Rocky Boulder Passage and Mud Hall areas. These interim inlet passages were Upper Stream Passage, Pillar Chamber Extension and the bedding planes above Far Chamber. Later stages of phreatic flow created the network of passages now exposed in the wall and roof of Boulder Chamber and to the south Everest Passage, and the upper parts of Rabbit Warren, and form part of the phreatic disintegration.

The location of these very high inlets indicate typical upstream retreats of the surface swallets; Rocky Boulder Passage being the youngest. A further phreatic passage would appear to pre-exist the formation of Pulpit Pitch and Gour Passage Pitch. This great rift from the base of Pulpit Pitch, a relatively modern development, entered the pre-existing phreatic passage at Gour Passage Pitch, the remains of which may be seen between Gour Passage Pitch, Water Chute and at The Choke.

Further retreat of the surface swallets led the water to sink in the region east of the axis of the anticline and initially large bore passages found in September Series such as Victory Passage spilled out in the Strand to form the lower reaches of the Rabbit Warren by drilling a large pothole north of the Second Stalagmite Bank and eventually forming the lower Rabbit Warren Extension and its associated, though mainly choked passages, at the eastern boundary of the cave, typified by Continuation Chamber and Tin Mine. The northern end of Strand Passage also shed its water into the lower section of Upper Traverse Chamber and hence down into Bypass Passage, Fingers, Main Stream and the upper reaches of Rabbit Warren including the now stalagmitised inlets in Harem Passage, the rift above the First Stalagmite Bank and the small complex of chambers below Railway Tunnel.

St. Cuthbert's II.

The discovery of St. Cuthbert's II, in 1969, confirmed the southerly trend of Sump Passage. For its 900ft length it is a major joint opened principally by vadose down-cutting. Initially the water escaped from the southeastern end of Gour Rift across the Gour–Lake Fault. At this point the water drilled a pothole at least 15ft deep, and swept off to the south through the fault wall into Sump Passage. During the stalagmite deposition stage in Gour Rift, a stalagmit layer, in the form of gour pools, was formed throughout the length of the rift and continued down into the pothole at the end of the rift forming a large stalagmite cascade.

The Sump Passage is now relatively small as a result of infilling, but the archway through the fault wall is at least 12ft wide, and the down cutting of the passage at Sump I itself indicates this area to be the upper section of a much larger and deeper streamway. This has been observed during various digging activities in the Sump I area. The water plunged downwards by Sump I and flowed along a lower route continuing the bore tube which is now heavily choked with gravel infill. This bore passage rose immediately beyond The Stalagmite Barrier, some 600ft along the Cuthbert's II streamway, and continued upwards for a further 40ft to a point above the Ten Foot Waterfall. It then descended to the second stalagmite blockage, 40ft upstream of Sump II and on to the terminal Sump II. The bore tube dimensions are similar to that between Beehive Chamber and Gour Hall, being some 6-8ft in diameter. In its later stages, downward drilling above the 10ft Waterfall created a 15ft diameter pothole, the floor of which is now choked with coarse gravel. During a stalagmite deposition phase, that which laid the massive deposits at Stalagmite Bank and Gour Hall, the stream-borne sediments choked the lower passage and formed an upper, overflow passage, the current streamway. The section of this later passage between Sump I and The Stalagmite Barrier is a large phreatic passage, modified by vadose water, which connected with the earlier bore tube. This new large passage was probably greatly influenced by intermittent flood pulses as collapse has occurred producing the roughly square sectioned passage we know today. Beyond the Stalagmite Barrier, the passage forms a high, narrow, vadose rift downcut from the original floor line of the bore passage. It is suggested, in view of the lack of stalagmite deposition for the greater length of the St. Cuthbert's II streamway, that this upper passage was formed at a similar time to the formation of the modern inlets of Wire Rift, Disappointment Passage, Drinking Fountain and Maypole Series.

Whitsun Passage forms the only significant inlet into St. Cuthbert's II, though there are minor rifts entering Sump Passage and immediately downstream of Sump I. Dining Room Dig, the only known breach of the Gour–Lake Fault in the upper sections of St. Cuthbert's I, has been opened up by excavating the gravel infill to a length of over 100ft and Whitsun Passage appears to be the phreatic downstream section, currently separated by about 100ft of choked passage. The lower section of Whitsun passage flowed out into the wide, now collapsed section of the upper St. Cuthbert's II streamway. Later, a small stream, from Dining Room Dig, drilled downwards to a now choked phreatic tube at the 20ft pitch.

6. Hydrology and sediment analysis

The present catchment area of the water entering St. Cuthbert's system has been estimated at 0.8km.² (0.35ml.²) (Ford, 1965a). Ford has suggested that in the past the catchment area could have been as much as 8.1km.² (3.5ml.²) but this has been reduced due to the upstream swallet development such as Plantation Swallet, Waldegrave Swallet etc. The water entering the cave resurges at Wookey Hole Cave and the trace time between sink and rising varies from 10.5 hours to well over 100 hours depending upon the weather and groundwater conditions. During the 1967 water tracing exercise the water flowing into St. Cuthbert's Swallet had the fastest travel time for the three major swallet caves in the Wookey catchment (Atkinson et al, 1967).

The cave is entered at 789ft OD and the lowest point is the extremity of Sump II at 312ft OD. The stream, which rises near the Miners' Arms, is prevented from flowing directly into the cave by two large buddling (settling) ponds constructed by the 19th century miners. Consequently, except under very heavy rainfall conditions or when the lower pond (Mineries Pool) has been accidentally blocked causing it to overflow, flood pulses are rare by comparison to other swallets in the area. In general the water rises steadily but remains at a fairly constant rate of flow several days after the other cave streams have returned to their normal levels. The average rate of flow into the cave has been estimated (Ford, 1965a) at 13 l./s. (0.45ft³/s.).

During the Ennor-Hodgkinson legal battle red vanadium dye was placed in the stream (c.1860) at the St. Cuthbert's Minery, which is reported to have been seen later at Wookey Hole Cave (Ashworth, 1956). During the 1920s, the large pool that was to be found there drained away in a period of three days. In 1937, a large collapse occurred near the old entrance but was quickly filled. All these events pointed to a potential site of speleological interest. The UBSS dug at Plantation Swallet, a site that had been observed by Balch, in 1944, but they met with little success. As caving grew in popularity after the Second World War it was natural that the site would receive attention from local cavers.

After the breakthrough, in 1953, the explorers were faced with an immediate hydrological problem on encountering an important inlet at Plantation Junction. What was the source of this larger and obviously important stream? Initial tests by taking water temperatures (by Coase et al.) indicated that the Plantation surface stream could be the source, though Coase (Petty & Coase, 1957) had reservations. Not until 1961 was it conclusively proved to be the Plantation Swallet stream (Ellis, 1961).



46. St. Cuthbert's stream sink.

Confirmation that the water from St. Cuthbert's Swallet resurged at Wookey Hole Cave came in 1967. The University of Bristol Department of Geography undertook a five-year research project, with the financial assistance and co-operation of the Bristol Avon River Authority, Somerset River Authority and Bristol Waterworks Company. There were three phases of activity, each being centred on the drainage basins feeding the main resurgences or risings of Mendip. During Phase 2, the feeders of the Cheddar and Wookey Hole Cave risings were traced. Among them were the well known swallets of Swildon's Hole, Eastwater Cavern and St. Cuthbert's Swallet (Atkinson et al, 1967). Of the many methods of tracing water, it was decided to use the spore of the club moss, *Lycopodium clavatum*. The spore is readily identifiable under the microscope and approximately 30 microns in diameter. Large numbers can be placed into a sink, and providing there is a connection with the resurgence, only one spore needs to be identified in the catching nets.

Little sustained work has been carried out to reveal the variation of the chemistry of the stream water. Burt, Ford, Petty, Stenner and Thomas have all contributed in part. A summary of their results is given in Appendix 5.

The Surface Streams

From the southernmost pond, Mineries Pool, the water escapes to form two streams, the Plantation Stream and St. Cuthbert's Stream. The latter stream flows down the 1300ft length of a valley, known as the St. Cuthbert's Depression, much altered by mining activity in the 19th century. The stream sinks at two points close to the cave entrance: the 'main sink' and the Maypole Sink. The St. Cuthbert's Stream disappears into a choked sink under the bank alongside the current entrance, though most of it now flows through drainage pipes into the base of the cave entrance shaft. The separated stream eventually congregates in the Arête Chamber area. The Maypole Sink, is some 250ft up-valley from the cave entrance, at a point where the stream forms a large, marshy area. The water flowing down the depression overflows and sinks here in wet weather to eventually reappear in Maypole Series and Disappointment Passage in New Route forming tributaries to Main Stream (Stenner, 1967).

The Plantation stream escaping from the Mineries Pool remains above the valley in an artificial trench and flows into an independent sink known as Plantation Swallet. This stream reappears in the lower section of the September Series some 1,000ft to the south and 230ft approximately below the surface; having travelled along currently undiscovered passage formed along the east side of a local anticline that controls much of St. Cuthbert's I. This stream, known locally as Plantation Stream, was artificially diverted by the 19th century miners in an effort to prevent excessive flooding in the floor of the depression; as a result, the Plantation Swallet entrance was artificially enlarged. This site has been dug on a number of occasions, but only small, impenetrable rifts have been encountered.

A third stream rises to the west of Mineries Pool known locally as Fair Lady Well stream. Until recent times this stream, which is a small spring unconnected with the Mineries Pool, was the principal source of water for the eastern section of the village of Priddy. Part of the Fair Lady Well stream sinks and re-appears in Coral Chamber. The point of the sink is unknown (Stenner, 1972b); Stenner suggests that the stream is leaking in its bed. Since the Priddy villagers now receive their water from the mains system there is no longer need to annually seal or puddle the streambed of the Fair Lady Well stream, to ensure a full flow of water to the village.

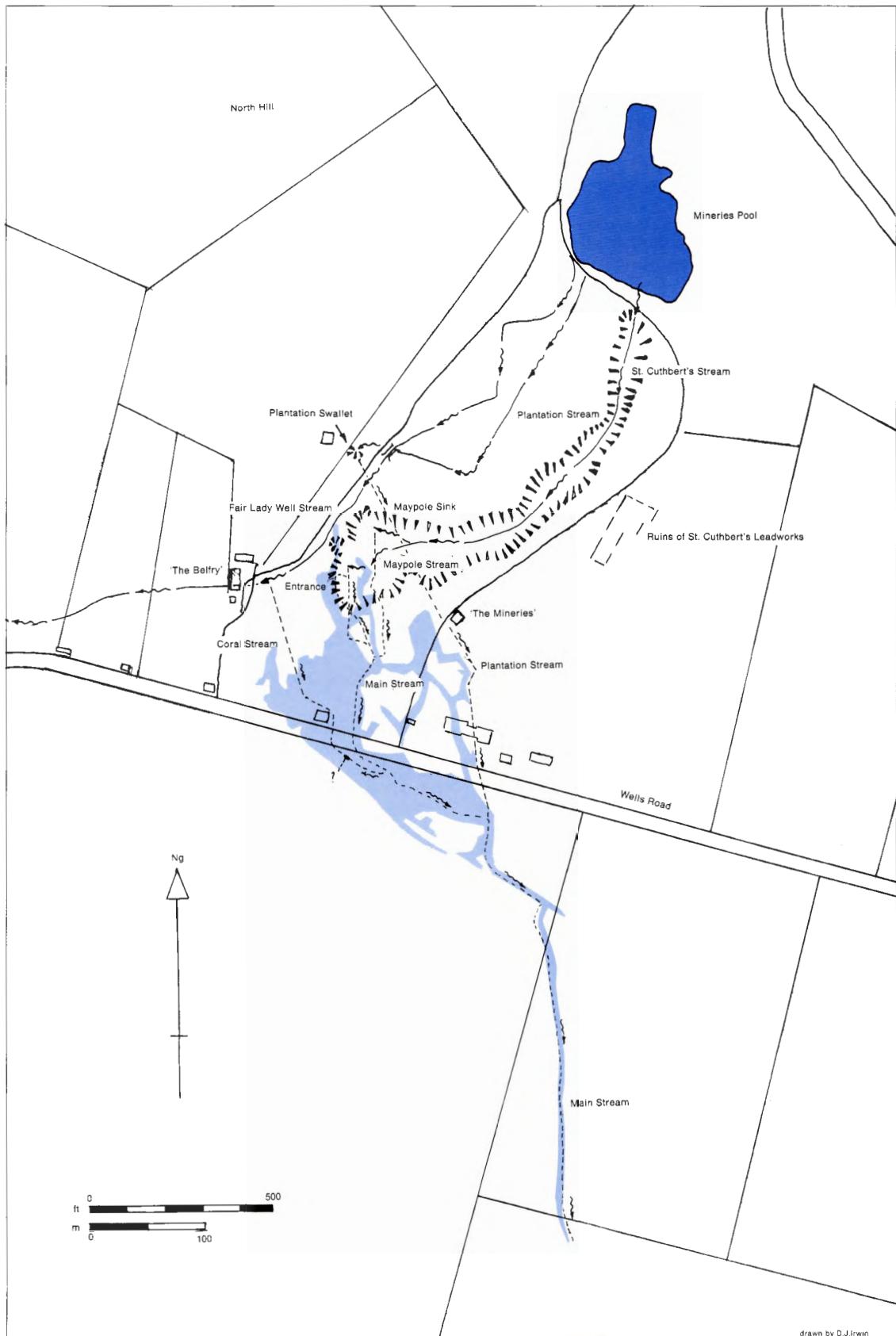


Fig. 17 Hydrology of St. Cuthbert's Swallet.

Streams in the Cave

The Main Stream, previously the St. Cuthbert's Stream on the surface, appears in several places before it reaches the Arête Chamber area. This is partly because of the flood prevention conduit taking most of the water and the remainder soaking away in the sink itself. On reaching Arête Chamber and Pulpit Passage the streams divide a second time, part flowing down Pulpit Pitch and New Route and the remainder tumbling down part of Old Route eventually to join New Route stream below the Water Chute. The Maypole Stream and other inlets form tributaries to Main Stream along New Route.

In the boulder ruckle between the surface and Arête Chamber, limestone solution was found to be taking place with uptake of CO₂ and limestone by the stream — the only place in the cave where this was observed by water analysis (Bridge et al, 1977).

The Plantation Stream cannot be followed for much of its underground route along the eastern boundary of the cave. However, it is seen briefly in Illusion Chamber, Cone Chamber, Continuation Chamber and Tin Mine before joining Main Stream at Plantation Junction.

The combined streams, now quite sizable, flow through the remainder of the cave to resurge at Wookey Hole Cave. In times of spate the water takes about 10·5 hours to travel the 2·5km (1·5 miles) from sink to resurgence contributing to the average flow of 2·3Ml./day (500,000gal./day) flowing from Wookey Hole Cave. The potential depth of St. Cuthbert's Swallet is 588ft, 477ft of which is through the known cave.

Plantation Stream

The time for the water entering Plantation Swallet to reappear at Plantation Junction has not been determined with certainty but it is known to be considerably faster than the Main Stream sinking at the cave entrance. Its underground route is largely unknown though the few points where it can be seen in the cave indicate its general flow line. As it is first seen in September Series, the route from the swallet must lie in a south direction, which enables it to avoid contact with passages associated with New and Old Routes. It descends rapidly to a depth of 225ft to intersect with Illusion Chamber. From September Series the Plantation Stream is then only observed in Continuation Chamber and Tin Mine and may be heard roaring away in a series of tight rifts in the Rabbit Warren Extension, just north of Chain Chamber. The small sections of passage that are known to contain Plantation Stream are heavily stalagmitized, particularly the stream bed, and little erosion of this has taken place. This may indicate that the stream has been flowing through these passages for a relatively short period of time.

The underground route of Plantation Stream represents a distance of about 1300ft and, if the travel rate is constant at 0·61m./s. (120ft./min.) (which is the estimated flow rate of the stream in Tin Mine obtained by the writer) then the travel time would be about 10-12 minutes. This would explain the reason for the problem facing Coase in 1957. He did not believe that the stream that sank at Plantation Swallet could be the stream appearing at Plantation Junction: both Main Stream and Plantation Stream had descended the same vertical range, but the latter would have travelled a shorter distance. However, it had only lost 0·3°C in the measured temperatures of 10·6°C at the sink and 10·3°C at Plantation Junction. The faster travel time of this stream into the cave is the principal reason, of course, but this was unknown to Coase. Not all agreed with him. In December 1957 (refer Appendix 6 for results) Petty and Burt (1958) carried out a repeat exercise.

...the air temperature outside the cave had recently risen considerably, so that it was well above the temperature of the stream entering the cave. Under these conditions, the larger the volume of the stream and the more rapid its flow, the lower would be its temperature when it entered the cave. Thus the Plantation Swallet Stream entered the ground 0·9°C cooler than the slower, smaller St. Cuthbert's Stream. As no other stream as large as these inlets enters the ground in the area, it seems likely that other water entering the system would be seepage water at a temperature close to that of the St. Cuthbert's Stream or higher...

Plantation Stream was positively traced by Ellis (1961, 1962a, 1962b) using Rhodamine B and treated cotton hanks. On several occasions, cavers have dammed the source of Plantation Stream at

Mineries Pool, but have not succeeded in stopping the flow of the stream in the cave. To some, this had suggested that there was an additional, unknown inlet feeding this stream; to others this merely meant that the ground upstream of Plantation Swallet was saturated and this water was still draining long after the dam at the Mineries Pool had been plugged. In November 1971 (Stenner, 1972a), concentrated pyranine was placed in the Plantation surface stream well away from the swallet. At the time the stream had been diverted into the depression and none of it was flowing into the swallet itself. Detectors were placed in the Main Stream and Plantation Stream, both upstream of Plantation Junction. The result showed both detectors to be positive, which meant that Plantation Stream was the stream sinking at the surface and it had little or no other inputs. The conclusions drawn from additional temperature and hardness measurements substantiated the water trace result.

Main Stream

The St. Cuthbert's Stream divides near the entrance, part flowing into Maypole Sink, becoming Maypole Stream, and part sinking near the cavers entrance either at a mud choke or through an artificial conduit into the base of the entrance shaft becoming Main Stream. Underground, the Main Stream divides into a number of routes but reunites either in Arête Chamber, or in the area lying west of Pulpit Passage. In Arête Chamber the stream again divides and part flows into Wire Rift, via an oxbow, and the remainder down Pulpit Pitch along New Route. The Old Route stream re-joins the New Route stream some 50ft downstream of the Water Chute. The Main Stream has been recorded to take 1·5 hours to reach the end of Gour Rift, having traversed some 1700ft.

Maypole Stream

This has been proven (Stenner, 1967) to sink in the marshy ground some 200ft north of the cave entrance at the Maypole Sink. The stream sinks into a mud and boulder zone and then directly through a boulder collapse into Maypole Series some 100ft below. The stream flows down the steeply inclined Maypole Series, where it is known as Maypole Stream, to join the Main Stream in Traverse Chamber near The Choke.

In high water conditions, the St. Cuthbert's Stream overflows into the Maypole Sink and forms a reservoir, below ground in the mud. During prolonged high water conditions this mud becomes saturated and the stream overflows into Disappointment Passage joining the Main Stream along Gour Passage in the New Route. This was confirmed by Stenner (1972a), who noticed that, when the Maypole Sink was dry Disappointment Passage was a mere trickle, and vice versa. In dry conditions Disappointment Passage stream is just a trickle, suggesting that this is mainly percolation water. He also noted that the Drinking Fountain stream can be seen flowing strongly even when the Maypole Stream is dry, implying that there is more than one source for this water.

Coral Chamber Stream

This is an intermittent stream, high in coliforms, and is seepage from the Fair Lady Well stream. The actual surface sink point is unknown but is likely to be the marshy ground just west of the BEC Headquarters. This stream flows through Rocky Boulder Chamber and eventually joins the flooded rift at the end of Lower Rocky Boulder Passage, close to Lake Chamber.

Dining Room Stream

Dining Room Stream is an intermittent stream emerging from a heavily stalagmitized bedding-plane high above Cerberus Hall. It is probably percolation water and rises quickly in wet conditions. Also located at the top of Cerberus Rift, is a static pool that overflows in wet weather; this is probably from the same source as Pyrolusite stream.

Pyrolusite Series Stream

This water probably derives from the same source as Dining Room Stream and rises quickly in wet weather.

Gour Rift Inlet

This intermittent stream emerges from The Bank Grill. In times of wet weather, the quantity of water flowing into the cave is high. It responds quickly to changes in surface weather conditions.

Lake Chamber

This site is an enigma. The lake does not appear to rise and fall with changes in surface weather conditions. Today, part of Main Stream sinks in an excavated phreatic tube near Dining Room, allowing the water to flow into Cerberus Pool (under Cerberus Hall) and seep away back up-cave to end up in the lake. Stenner (1968a) did some work here and concluded that, though Main Stream is now a major feeder, there must be another percolation source. There is always a heavy drip from the avens in the roof of the chamber to add to its supply and, less well known, Coral Stream flows through Rocky Boulder Chamber to sink in a mud choke close to the flooded rift, this being only some 50ft from the lake. It is likely that the Coral Stream and part of Main Stream flow into a saturated zone of which the lake forms part. The 'U' Tube between Cerberus Hall and Mud Ball Chamber often floods when the water level in the cave is high. The level of the saturated zone fluctuates by some 20ft as has often been demonstrated by the level of the lake. When the lake is empty a short, gravel-choked passage may be seen. Stenner concluded that it would be difficult to prove whether the water from the lake resurged into streamway below Stalagmite Pitch because of filtration and dilution problems.

Water Tracing the Priddy Swallows

The 1967 (1st January) water tracing exercise was unique in that the major caves of the Priddy and Charterhouse areas were traced simultaneously to determine the Cheddar and Wookey catchments. The caves were Ramspit, Longwood Swallet, Manor Farm, Swildon's Hole, Eastwater Cavern and St. Cuthbert's Swallet. The weather on that New Year morning was wet, and heavy rain had fallen the previous day. The streams had been in spate though the

water levels were falling when the lycopodium spores were placed in the water. To identify the source of the lycopodium spores, each batch had been dyed a different colour. At mid-day the spores were placed in the entrance streams. Inspection of the nets at the numerous resurgences in the area commenced 10 hours later, each site being checked in strict order. The first check at Wookey Hole Cave was undertaken 11 hours after input of the spores. The samples were returned to a central point and then back to the laboratory for examination. Each resurgence was checked at regular intervals of four hours during the following few days.

The results clearly showed that the streams flowing through the Priddy caves resurged at Wookey Hole Cave. Similarly the streams entering the Charterhouse caves resurged at the Cheddar risings. On this occasion the trace times for the principal Priddy caves were as follows:

Swildon's Hole	25 hours
Eastwater Cavern	16 hours
St. Cuthbert's Swallet	11 hours

The spore counts from samples collected at each visit to the retrieving nets were plotted (Atkinson et al, 1967). Since the curves for each cave were different it was concluded that the flow channels for each site were separate until they reached a point close to Wookey Hole Cave itself. Further, the authors of the report concluded that each cave displayed a differing type of streamway in the unknown section between the end points of the known caves. Briefly, the predictions were that Swildon's Hole would be a frequently sumped passage, Eastwater Cavern choked and St. Cuthbert's Swallet principally an open vadose streamway.

The travel times were recorded on this occasion during falling high water conditions. Stanton and Smart (1981) have shown that the travel time through a system is inversely proportional to the resurgence output. Stanton has carried out a repeated number of checks on the through-time for the St. Cuthbert's-Wookey Hole Cave system and found that it varies from about 10 to well over 100 hours.



47. Lake Chamber.

The discovery of St. Cuthbert's II confirmed the southerly trend of the stream passage once the Gour-Lake fault had been breached. Based upon the 1967 water trace results, it has been determined that the length of the unknown streamway between St. Cuthbert's Sump II and Wookey Sump 25 is approximately 7200ft (Irwin, 1978). The measured distance between the two end points is about 7000ft, indicating that the stream route is effectively a straight line and it passes through the Ebbor Thrust and not around it.

This leads one to speculate that the spore travel times for the other two caves in the area, Swildon's Hole (25 hours) and Eastwater Cavern (16 hours), do not necessarily indicate discrete channel flow to the resurgence. Instead, the variation of travel time could simply be a function of the distance travelled, suggesting that water from Swildon's Hole flows along the northern side of the Ebbor Thrust, to be joined by a tributary stream from Eastwater Cavern. This sizable stream forms a tributary to the older stream route of St. Cuthbert's Swallet close to the breach point of the Ebbor Thrust (cf. Chapter 4).

Heavy Metal Contamination in Streambed Sediments

Lead ore has been found in the sediments and may be divided into two groups. The first is that originating from the mining activity on the surface and the second that of the presence of a natural mineral, cerrusite, in the cave mud.

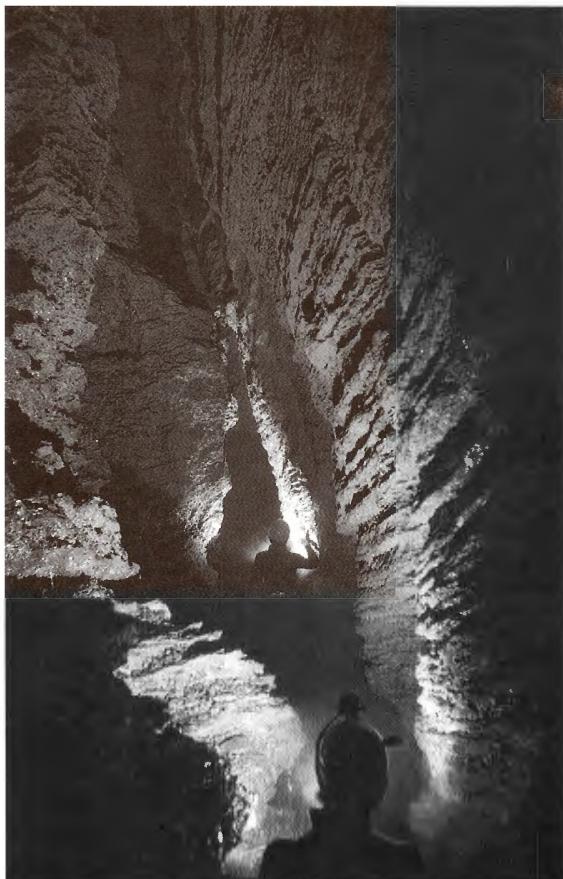
Owing to the long presence of the lead mining industry in the immediate area of the cave entrance it is not surprising that high levels of lead tailings would be identified in the cave sediments, particularly in the active streamways. Much of this waste material has been found in various parts of the cave.

Sediments from an archaeological dig in the Fourth Chamber of Wookey Hole Cave showed high levels of lead and zinc contamination that pre-dated the artifacts found there (250-280 AD). This, together with the fact that pollution of the River Axe occurs, supports the theory that the lead in contaminated deposits at Wookey Hole Cave came via St. Cuthbert's Swallet (cf. Appendix 5c).

The presence of cerrusite (basic lead combine) was reported by Stenner (1978a, 1978b). He found that the sediments in the Entrance Rift and Arête Chamber areas contained over 33% cerrusite. The level of contamination appears to decrease with distance from the cave entrance. **As a precaution all caving clothes should be washed as soon as possible after the caving trip. Do not breathe in the dust from these garments.**

Flood Levels in the Cave

Under high water conditions, the Entrance Rift can become a severe undertaking. Water flows along the entrance passage and plunges directly into the rift. Large quantities of water seep from the wall opposite the top of the rift and, some 6ft down the rift, a strong jet of water emerges from the right-hand side. This can be slightly disconcerting when ascending the rift and meeting this additional hazard. The rift under these conditions is easily passable by persons well acquainted with its moods, but to the first-time visitor to the cave it can be an overwhelming experience not quickly forgotten! The Arête Chamber area is fun. Waterfalls are to be seen everywhere. The Showerbath at the base of Ledge Pitches is a thunderous roar; the force of the water emerging from the hole is such that it strikes the far wall before bouncing back towards the floor. So too, is Wire Rift. Here, under spate conditions, the potholed steps in the



48. Below Pulpit Pitch.

floor are hidden by an almost continuous white sheet of foaming water. The roar of so much water makes communication with other members of the party almost impossible. The New Route too, can be fun, but below the Water Chute the stream becomes quieter and the only indication that the cave is in spate is that the water level is a couple of inches deeper than normal.

Sometime in the recent past the cave has been flooded to such an extent that a tide-mark has been left along the passage of the Main Stream between Everest Passage–Main Stream junction and Dining Room. The tide-mark can be seen some 5ft above the streambed, and the walls are coated with a thick deposit of reddish mud. The water must have been static for some time to have allowed this quantity of mud to be deposited along the walls. The blockage was probably at Stalagmite Pitch. Below the pitch the tide-mark can no longer be seen. However, it is seen again along the far reaches of Gour Rift implying a blockage at The Duck and at various points along St. Cuthbert's II. It is possible that this occurred when the St. Cuthbert's Pool disappeared in 1927. Since this event the deposit has dried, and the outer coat of mud has cracked and curled into irregular flakes.

The effect of the 10th July 1968 flood upon the Mendip caves has been recorded in detail elsewhere (Craig, 1968; Hanwell & Newson, 1970; Irwin, 1968d). The effect on St. Cuthbert's Swallet was little as the water had ponded and was stored in the Waldegrave Pool, Mineries Pool and the waste heaps. There was minor ponding at the cave entrance but the drain pipes at the base of the entrance shaft allowed the water to drain fairly quickly. In Sump Passage the water had reached a depth of 3ft and the divers channel cut into the Sump I floor had been blocked. The water reached a depth of 10ft, as evidenced by a cigarette packet stranded up the wall. Various digging items were found strewn along the Cuthbert's II streamway suggesting that Sump I had opened and the flow taken the plastic bags, various rods and digging implements that had been placed in the sump along the downstream passage. When the water diminished, the sump choked itself with a gravel infill.

Air Circulation

Little work has been carried out on this subject. Early attempts to determine the air temperature of the cave were made in 1957 but the carbide lamp flame being in close proximity to the thermometer gave inaccurate readings. In an attempt to avoid the heat problem the temperature of static pools in the Rabbit Warren were measured instead. It was reasoned that the water temperature would be close to the air temperature. Later, Stenner was to show that the water temperature in still pools was influenced by small changes in the temperature of the surrounding rock which are subject to seasonal variation (cf. Appendix 5).

A few checks were made by the writer during early surveying trips (c.1968-1969) and the general air-flow pattern emerged as follows:

The flow of air in the single passage section between the entrance and Arête Chamber frequently reverses during the time when ambient temperature outside the cave is at or close to the cave temperature. The general air flow pattern is down the New Route and the Main Stream and up the high level routes of the cave, i.e. via the Rabbit Warren, Rabbit Warren Extension, the Old Route via Wire Rift. Quite often in winter the warm air of the cave is first met at the top of Wire Rift.

7. Biology

Jane M. Wilson

By British standards, St. Cuthbert's Swallet has a rich and varied fauna. This is a reflection of an unusual combination of features. It has a great variety of habitat types which are provided by its wide diversity of passages, boulder ruckles, streams, pools and so on. The main stream flowing through the cave is sufficiently large to import food in the form of vegetable debris, but not large enough to scour the cave clean. This also washes in many surface species which can survive in the cave for a short time. Cave species cannot live in low temperatures (Walton, 1944), but Mendip is situated in the relatively warm south-west where cavernicole can thrive.

Animals which live and breed exclusively in caves are termed **Troglobites**. To the non-specialist, British troglobites might seem unspectacular as they are all small invertebrates, the largest being shrimps. They are, however, a relic of an ancient fauna and show remarkable adaptation to their dark but constant environment where food is at a great premium. St. Cuthbert's, with three species of shrimp and one collembolan, boasts a fair representation of the British troglobitic fauna.

Troglophiles are surface animals which favour high humidity refuges such as under stones or leaf litter; they are also able to complete their active life cycles in caves. They are not as well-adapted as troglobites to withstand starvation, but they are often dominant when food is abundant as it may be after floods. St. Cuthbert's is home to a good number of troglophiles.

The third important group of animals found in the cave are the **Accidental** visitors. In St. Cuthbert's, many of these are animals which live in the stream above the swallet and are washed in accidentally. Some will live for a while, but they inevitably fall prey to troglobites or troglophiles.

The distinction between troglophiles and accidentals can be blurred. For example, a population of lightly pigmented freshwater shrimps, *Gammarus pulex* can be seen in the stream at the bottom of the Entrance Rift. They seem to thrive there on detritus washed in by the stream. The large female can often be seen swimming clasping the smaller male between her legs; they are obviously making enthusiastic efforts to maintain their population, although Hazelton (1975) writes that this shrimp is unable to breed beyond the fourth generation underground. Presumably, fresh *Gammarus* arrive every so often and the subterranean population is thus supplemented.

Systematic and comprehensive collections of animals from all parts of the cave have not been completed; this is hardly surprising when one realises how long this would take in such a complex system. However various enthusiasts have collected specimens throughout the cave over the last thirty years. The following list probably includes most species regularly encountered in the cave.

Animals collected from the cave's dark zone.

Turbellaria

Planariidae

Polyclelis felina: Accidental

Flatworms

Gastropoda

Zonitidae

Oxychilus helveticus: a carnivorous species which is also able to survive on plant debris; probably an Accidental; specimen found dead.

Endontidae

Discus rotundatus: Accidental; specimen found dead

Mollusca

Collembola [Springtails]

Onychiuridae

Onychiurus fimetarius: Troglophil — a blind species which is commonly found in soil outside caves (Walton, 1944).

Onychiurus schoetti: Troglobite — a blind species restricted to caves.

Insects

Isotomidae

Isotoma notabilis: Troglophil.

Folsomia quadrioculata sp.: Troglophil.

Neelidae

Neelus (Megalothorax) sp.: a blind species.: Troglophil.

Plecoptera [Stone flies]

Nemouridae

Nemoura cambrica larva: Accidental — these stream-dwelling larvae are often washed into caves in floods; the adults usually die before they can breed.

Hemiptera

Veliidae

Velia caprai: Accidental.

Coleoptera [Beetles]

Staphylinidae

Ancyrophorus aureus: Troglophil.

Diptera [true flies]

Culicidae

Dixa sp.: Accidental — the only record in any Mendip cave,

Simuliidae

Simulium (Eusimulium) latipes: Accidental — the aquatic larvae are often washed into caves during floods; adult females bite!

Mycetophilidae [fungus gnats]

Speleolepta leptogaster: Troglophil — the larvae build 'runways' on cave roofs looking like spiders' webs.

Exechia subulata: Troglophil — found in damp places especially on rotting vegetation, excrement or fungi,

Sciaridae

Bradyisia sp.: ?Troglophil — larvae which are known as Army Worms also feed on manure; adults are less than 4mm long.

Scatopsidae

undetermined minute fly.

Crustacea

Isopoda

Asellidae

Asellus (Proasellus) cavaticus: Troglobite — despite its primitive 'nuptial crochet' on the fourth pereiopod of the male, this species reproduces and proliferates well in caves and in crevices in limestone. Adult specimens from Mendip are very small (only 3-5mm); about the same size as juveniles collected in South Wales caves. They are eaten by *Niphargus*

Amphipoda

Gammaridae

Gammarus pulex: ?Troglophil/Accidental — a ubiquitous shrimp which seems to thrive in caves; it often loses pigment but never its sight.

Niphargus fontanus and *Niphargus kochianus*: Troglobites — of very ancient origin, originally marine species which took to caves in the Tertiary period.

Arachrida Acari (Mites)

Rhagidia intermedia var.: Troglophil — an important predator.

Nanorchestidae

Speleorchester ventricosus: Troglophil — feeding habits of these tiny mites are unknown.

Mites are difficult to see and so are probably under-collected from this cave.

Rodentia

Muridae

Arvicola sp. (cf of *terrestris*): Accidental — presumably this Vole fell into the cave and died there; the cavernicole must have thought it was Christmas!

Mammalia

This provisional species list was compiled from Biological and Hypogean Records compiled by Hazelton (1960 et seq; Smith & Drew, 1975) with help from N.L. Thomas and from my own collections and observations.

Animal remains found in the Cave

D.J.Irwin

Few animal remains have been found in this cave. What has been found consists mostly of teeth and bone fragments of bos (c.1956), in the gravel infill, and thought to be of modern origin. A fragment of bone coated with stalagmite was found in the upper chamber of Pillar Chamber Extension (1965, lost in the Belfry fire of 1969); like the others this was found in sandy infill.

The most interesting relic was a tooth of Elephas, which was found lying amongst pebbles of Old Red Sandstone at the top of Rocky Boulder Passage (Bennett et al, 1956, p.13). The tooth was thought to be that of Elephas Primigenius and was probably a 'derived fossil' having been washed out of a gravel deposit and subsequently transported to the location where it was discovered.

Skeletons of the Lesser Horseshoe Bat have been found in Sugar Bowl Chamber (c.1970) and a skeleton of a vole was found in Disappointment Passage in 1955.

Various animals have been found in the cave. The Common Frog (*Rana temporaris*) and Common Toad (*Bufo bufo*) have been frequently recorded, having been washed in by high water and found lying at the bottom of the Entrance Rift, cavers often rescuing the unfortunate creatures by bringing them back to the surface.

Occasionally the Lesser Horseshoe Bat has been sighted. A frequent haunt for this mammal is in Pillar Chamber and the lower reaches of Boulder Chamber, usually when it is hibernating in the winter months. A bat has been seen flying through the September Boulder Ruckle!

On at least two occasions adders (*Vipera berus*) have been found at the bottom of the entrance shaft. One was at the bottom of the old entrance shaft, about 1966 and later, in 1984, another specimen was found at the bottom of the new entrance. The 'tough' cavers involved were powerless to pass these beautiful creatures! Newts have been seen at various points in the cave but none positively identified.



49. Curtain, Railway Tunnel.

8. Notes on the Survey

The survey commenced in earnest in June 1966 and, after an intensive round of surveying trips, was largely completed by 1969. Detailing was finished by 1972. The surveying of various minor side passages finally completed the whole work in 1976. It was one of the first complicated British caves to be intensively studied from a surveyors point of view, introducing new techniques particularly with respect to calibration and distribution of errors throughout a multiple closed traverse network. A further spin-off was the subsequent multiple traverse closure study (Irwin & Stenner, 1973a, 1973b, 1975), indicating the expected values of a failure to close related to the traverse length and survey grade adopted.

Warburton, in his now classic appraisal of surveying techniques, said "The thought of doing a Grade 6...survey of St. Cuthbert's would cause most individual surveyors to seek an excuse to go fishing at Weston..." (Warburton, 1963). At that time, the cave was probably, for its size, the most complicated system in the country and worthy of a serious study of surveying techniques whilst carrying out a useful resurvey of the cave. Since 1963, many larger, complicated systems have been discovered, and with the modern use of radio location techniques, problems of traverse closure have been partially overcome, at least in the survey plan.

In 1955 Coase commenced surveying from the then terminal sump (now The Duck) to the cave entrance. His untimely death in 1958 brought this work to a close, having only reached the Railway Tunnel on his last surveying trip. Coase was an innovator. He attempted to adapt pieces of equipment for cave surveying, one development, which he called the 'cave theodolite', was a modified ex-RAF astro-compass combined with an ex-RAF gunsight. With this arrangement, using vernier scales, he had hoped to produce a higher standard of survey precision than could be produced by the usual compass and clinometer combination. The equipment was tested on the surface and Coase claimed that the instrument was capable of readings to 0.2° on the horizontal scale and 0.5° in the vertical plane where readings could be estimated to 0.25°. He used a 100ft copper tape and this remained in the cave where he had left it (on a rock shelf in the Railway Tunnel) following his last surveying trip. Recently it has been removed for cleaning and renovating and it will be replaced in the cave to his memory.

For the first report on St. Cuthbert's Swallet (Bennett et al., 1956) Coase produced sketch surveys of the known cave. Bearing in mind the complexity of the main central part of the system, Coase's sketch surveys were particularly accurate examples of low grade surveying. He also produced sketch elevations of the entrance rift and the Wire Rift, indicating the steep development of the inlet passages. King produced a survey of the Maypole Series in 1958 to CRG Grade 4. The line survey commenced at the upper end of Maypole Series and was traversed to the cave entrance, so that the series could be related to surface features. The field-work was carried out using a prismatic compass, 100ft copper tape and clinometer, though none of the instruments were calibrated (King, 1958). Between 1959 and 1961, a determined effort was made by several leaders to complete the survey—at least to finish the central section of the cave. By 1961 over 5,000ft of passage had been surveyed and the work was sufficiently advanced for Ellis to draw up a plan and extended elevation (Ellis et al., 1962c). The idea was that other sections of the cave that still required surveying would be completed at a later date, and then each section published as a separate add-on sheet to the 1962 compilation. Only the September Series plan was published in this manner—a CRG Grade 4 survey by Roberts.

In 1962, in an attempt to survey the Rocky Boulder Series complex under Mud Hall, Stenner commenced a CRG Grade 5-6 survey and worked on it at odd intervals until 1965. During this period he completed a survey of some 1500ft of passage.

King surveyed the Dining Room Dig in 1964 so that it could be tied into the anticipated main survey.

After completing a sketch plan of Long Chamber Series and the Coral Chamber area of Rocky Boulder Series in 1964 (Irwin, 1965a), Irwin began toying with the idea of completing the insert sheets for the already available plan and elevation. By 1966, all work on the survey had stopped. The problem with the existing

survey was that there were discrepancies in the New and Old Route area, preventing the fitting of the Mud Hall and Rocky Boulder survey prepared by Stenner between 1960 and 1966. Problems were further compounded by the lack of permanent survey stations. In 1966 Irwin and Stenner agreed to make a fresh start dividing the cave between them and commencing work on a completely new survey. This was to the highest grade possible using the compass, (at that time CRG Grade 6d, similar to BCRA Grade 6d).

Fieldwork credits

A. Butcher & A. Knibbs	September Series (part); Sump II
C. Clark & M. Hauan	Lake Chamber extension and Tin Mine
D. J. Irwin	Main Chambers; Long Chamber and Canyon Series; Rabbit Warren; Rabbit Warren Extension and Catgut; Plantation to Sump II; September Series (part); Rocky Boulder Series (part) and Marble Hall Area; Cerberus Series and Pyrolusite Series (part)
P. MacNab [jnr.]	Surprise, Surprise!
J. Manchip	Pyrolusite Series (part)
M. Mills	Disappointment Passage; Drinking Fountain; Whitsun Passage
A. Sparrow	1982 Passage
R. D. Stenner	New Route; Old Route; September Series (main lines); Maypole Series; Rocky Boulder Series (part)
G. Wilton-Jones et al	Alpha Aven and Jerusalem Oxbow (Maypole Series)
S. Wynne-Roberts	Trafalgar Aven (September Series)

Space does not allow the inclusion of the names of the dozens of cavers who accompanied the surveyors on the many trips to gather the data required. Cavers involved came from Bristol Exploration Club, Wessex Cave Club, Shepton Mallet Caving Club, Westminster Speleological Group, University of Bristol Spelæological Society, South Wales Caving Club, Mendip Nature Research Committee, Mendip Caving Group, and London University Caving Club among others.



50. Organ Pipes, Cascade, from Vantage Point.

Instruments

The instruments used for this survey were an ex-WD Prismatic Compass, a Japanese manufactured clinometer and, on occasions, a homemade clinometer with a very long sighting tube; 100ft steel tape and, later, 100ft fibron tapes graduated in decimals of a foot. Knibbs used a 6 inch diameter ex-RAF Medium Landing prismatic compass, and a clinometer hand-held against rock points (part of September Series) and Stenner used the home-made clinometer for sections of Old and New Routes and Maypole Series. To ensure precision on pitches, a plumb-bob was used made from a half-ounce lead weight and a 0.02 inches diameter monofilament nylon fishing line.

The compass and clinometer were assembled onto a small, aluminium base-plate, similar to the idea of the surveying unit devised by Ellis (1970c). The surveying unit, mounted on a tripod, had several great advantages including that the reading of steep inclines were simpler, requiring only one sighting through the clinometer. The compass, having rotated on the baseplate, required a single reading only enabling the surveyors to maintain the requirements of CRG Grade 6.

Ex-WD wooden theodolite tripods were used. They were assembled together with brass screws and fittings. Though heavy they were ideal for use with the surveying unit. Two of the tripods were modified by having the length of the legs reduced from 4ft to 1.5ft to deal with low passages. Though the tripods were cumbersome, they were eminently durable for cave survey work. Some rather weak aluminium photographic tripods with 'flip-out' legs were used, but these soon showed signs of severe wear.

Method of Surveying

The survey lines were produced by using the 'leap-frog' technique. The main advantage of this technique is that 50% of the line survey points are features in the cave and so are left as 'permanent' survey stations. Generally permanent stations were marked, or their locations recorded, enabling detailing offsets or extensions to the lines to be made at a later stage. For the centre line, the compass and clinometer were read to the nearest 0.5° and the tape to the nearest 0.05ft. Details of the permanent survey stations are given in Appendix 6.

Passage detail was taken at all survey stations. Wherever necessary, passage detail was obtained by the 'raying' technique from a station or at intermediate points between the stations. In some cases (e.g. Boulder Chamber and September Chamber), the profile was obtained by creating an extension to the main centre line and surveying around the chamber profile). The 'rays' were read to the nearest 0.5°

for both compass and clinometer, except where the elevation was less than 5° when the clinometer reading was not recorded. It was felt that, because of the ease of reading the instruments (particularly with the compass mounted on the survey unit), it was in fact quicker to read the instruments in the usual manner, rather than approximating the observed value to the nearest 5° recommended by various authorities.

Calibration

An initial problem was calibration of the instruments, particularly the compass. Several attempts to calibrate this instrument were made in the immediate locality of the cave entrance, but the presence of farm implements and buried ironwork prevented this. Eventually a point was found near the Hunters Lodge Inn (NGR 548-503). Along the road lay a convenient wall junction and, after a number of detailed checks, the site was found to be satisfactory. Overhead telephone cables on the north side of the road were also checked in case they caused any deviation to the compass reading. Now satisfied that the point was suitable, the survey

field work commenced. It later occurred to the writer that, if calibration points were set up in the cave, this would negate the problems of calibrating at night in the pouring rain! Though the major lines had been completed this was in fact done in the closing stages of the fieldwork. Two calibrating points were set up, one in Boulder Chamber and another in Lower Mud Hall. A considerable amount of time was spent establishing these points, but it was much more convenient.

Several re-check surveys were made in 1967 because the closures with other sections of the cave appeared not to be of the standard set by the surveyors. However, since that time it has become apparent that the main cause of the 'large' misclosures was due to poor calibration. The overall straight-line distance between the start and finish points on each line of the first and repeat surveys were very close to each other when the co-ordinates were compared. When establishing the traverse closures and creating the survey framework, it became even more apparent how important calibration is as a surveying topic.

Survey grading

The overall grading of the St. Cuthbert's Swallet survey is to the requirements of CRG Grade 6d or BCRA Grade 6d. A number of minor side passages were surveyed to CRG Grade 1-5. These are mainly in the Long Chamber and Rabbit Warren areas but, because of their minor nature, it is felt that the overall grading for the survey remains unaffected.

Calculations

All instrumental readings for the survey line taken in the cave were computed using four-figure logarithmic tables and a desk calculating machine (before the days of the home computer!). The final figures were expressed as co-ordinates based on a northing of 10,000ft and easting of 10,000ft given to the permanent survey station at Plantation Junction. This was to ensure that, whatever future extensions were made, the resurgence cave would be included in the positive section of the grid. The height of the entrance was based on 788.725ft OD determined by members of WCC during an extensive levelling exercise of the Priddy caves (Church, 1971).

When sufficient data was available, an extensive exercise by the writer began to assess the many closed traverses. After some two years, the main network was closed. Details of the sequence of closure of the network is given below. Late in this exercise, too late for the results to be included in the final draft layout of the cave, both surveyors independently stumbled on a very simple method of solving the closure of a multiple traverse network. This has been extensively described in Irwin and Stenner (1975). Where passage details were obtained by 'raying' the data was treated in a similar manner to the survey line and presented as co-ordinates.

Traverse Closure Sequence for Main Lines

The closure of the main network took place after checking most of the possible individual and local multiple traverses. A local multiple traverse closure may be illustrated by the Rabbit Warren. This series contains a large number of closed traverses, and combining it with Cerberus Series and Rabbit Warren Extension, virtually the whole of the lower half of the cave could be checked quickly for any apparent gross errors. A similar exercise took place in the upper half of the cave, and then the main lines were constructed through the major routes of the whole cave. Each traverse was again analysed and any dubious section of line omitted from the main closures. The final route chosen for the closed traverse, which was to be the survey framework of the whole cave is as follows:

Plantation Junction (gr13) — Stalagmite Pitch — Dining Room (cs1) — Main Stream (ms13) — Everest Passage (lc1) — Boulder Chamber (lc11) — Rocky Boulder Passage (via Oubliette Pitch) (L4) — Rocky Boulder Pitch — Pillar Chamber — Mud Hall (c5) — Water Chute (g5) — Traverse Chamber (I9) — Upper Traverse Chamber (UTCS) — Rabbit Warren Extension (gr19) — Plantation Junction (gr13).

Slope length = 2712.33ft. Number of legs = 174 Average leg length = 15.6ft.

The traverse failed to close in the three planes by:

Horizontal:	12.30ft	(0.46%)
Vertical:	0.87ft	(0.03%)
Slope:	12.33ft	(0.46%)

A number of traverses could now be added to the survey framework. Irwin, whose task this was, then added the Rabbit Warren. After a number of checks the closed route commenced at the Rabbit Warren Extension junction with the main Rabbit Warren line near the 2nd Stalagmite Bank. From here, the line ran via the Stalagmite Banks to the Railway Tunnel, across Fingers Traverse to Everest Passage.

The closure at Everest Passage (near Everest Boulder):

	Northings	Eastings	Height
lc6 (corrected on survey framework)	10274.60	9624.55	76.17
Rabbit Warren closure	10274.60	9623.65	75.80

The differences were small and the three-dimensional errors distributed by eye during plotting.

The next major closure was from Everest Passage-Main Stream Junction (ms13) to Traverse Chamber (I9) via Bypass Passage.

	Northings	Eastings	Height
I9 (corrected on survey framework)	10410.58	9723.81	62.88
Main Stream closure	10409.83	9724.77	60.37

Again, the differences were small, except in the vertical range, and were closed by eye during plotting.

The cross passages of the Rabbit Warren joining the Main Stream, Struggle Passage and Struggle Passage Oxbow could now be closed. Rabbit Warren was then completed by the addition of the open traverse passages such as the chamber behind 2nd Stalagmite Bank and the rift above 1st Stalagmite Bank.

The next area to be added to the survey framework was Boulder Chamber, Upper Traverse, Sentry Passage, Strike Passage, Harem Passage and Railway Tunnel completing the 'central complex'. All survey lines associated with these passages were closed onto the now-established lines of the survey framework and Rabbit Warren. September Series and Maypole Series were open traverse lines and could be fitted immediately. Plantation Junction to Sump I, including Pyrolusite Series, was also added; only one small closed traverse existed here — the route under Gour Hall from Beehive Chamber to Gour Rift. St. Cuthbert's II was added later.

Cerberus Series was next. The co-ordinates for both ends of this series were already established on the survey framework. The series starts at the Dining Room (cs1) and ends at the junction of Rat Run with Everest Passage (lc1). The closure of the Cerberus Series line onto Everest Passage was as follows:

	Northings	Eastings	Height
lc1(corrected on survey framework)	10180.90	9652 .24	42.73
Cerberus Series closure	10179 .39	9649.07	45.81

The fairly large vertical misclosure was a surprise. From individual closure checks in the Cerberus area, including the Main Stream, there were extremely good vertical range results. Two surveys exist of Cerberus. Both closed well with the Main Stream, and so the vertical error was thought to be due to calibration of the clinometer in one of the two surveys from Plantation Junction to the Dining Room. A second possibility was that there were faulty readings at the lower side of Stalagmite Pitch, as the line from Plantation Junction via Sewer Passage was made before the surveying unit had

been built, thus making the instruments difficult to read on the steep incline downstream of the obstacle.

The next major section to be similarly treated was the complicated Long Chamber Series and the Coral Chamber area of Rocky Boulder Series. The route ran from Boulder Chamber (lc11) to Long Chamber, Long Chamber Extension, down through Ruckle Passage to Coral Chamber and returning through Coral Squeeze, Fracture Rift, Annex Chamber and back into Boulder Chamber (lc11). This traverse is not typical of the remainder of the traverses as it closed onto its own starting point. The traverse length was 381·15ft. and the failure to close values were:

Horizontal	1·01ft
Vertical	-0·05ft
Slope	2·35ft

There were other routes that could have been closed but these generally displayed an error in the vertical plane located in the lower section of Coral Chamber (between the 'Hole in the Roof' and Chockstone Rift). This was later confirmed by Cowlishaw when he independently closed the main network on the IBM mainframe computer at Winchester. The lower section of Coral Chamber was closed onto the established network from the main station in Coral Chamber, near the 'Hole in the Roof', and Boulder Chamber (lc11) via Chockstone Rift. Also added at this time, were the open traverse lines from Rocky Boulder Chamber through Lower Rocky Boulder Passage, Far Chamber and its associated bedding planes, Pearl Passage and Straw Chamber, Marble Hall area and Canyon Series. Additional loops were connected to the closed network as it then stood, completing the western side of the cave. These included: Long Chamber to Curtain Chamber via Upper Curtain Chamber; Long Chamber—Upper Long Chamber—Quarry Passage to Boulder Chamber and the loop passage between Upper Long Chamber and Long Chamber Extension via the top of Fracture Rift. Further open traverse lines were also added in the Upper Long Chamber area such as Chandelier Passage, Bell Chamber, Upper Stream Passage,

The final area to be considered was the remainder of Rocky Boulder Series (north of Boulder Chamber), and the New Route and Old Routes. The latter would finally connect the cave to the surface and the height of each survey station relative to the entrance could be established throughout the cave.

The northern section of the cave, from Mud Hall, Wire Rift to the entrance, and Pulpit Pitch to Water Chute was treated as open traverses. At the time, the line for New Route, commencing in Arête Chamber, had not been completed, and so was added later. An error exists in the Arête Chamber—Water Chute line as can be demonstrated in the failure to close values at the Water Chute (probably a calibration error):

Horizontal:	-1·59ft.
Vertical:	-9·96ft.
Slope:	-6·52ft

The length of this line was 462·32ft. This magnitude of error may have been compensated if the combined lines from Mud Hall to Arête Chamber and Pulpit Pitch to the Water Chute had been treated as a loop. This, however, was not done.

All that remained was the closure of the Rocky Boulder Series, located within the survey framework line at Mud Hall, Water Chute, Lower Traverse Chamber to the east and Pillar Chamber, Coral Chamber and Rocky Boulder Passage to the west. Here, Stenner had created a large number of closed traverses linked to Mud Hall, Water Chute, Traverse Chamber running across the Lower Mud Hall Bedding Plane of Rocky Boulder Series linking either Rocky Boulder Passage or the line from Pillar Chamber to Kanchenjunga. Additional passages, all open traverse lines, were finally added, such as Drinking Fountain and Disappointment Passage.

Final analysis

Having connected the links and distributed the errors, it was necessary to determine how good these results really were. Of particular interest, was the general orientation of the whole cave.

The first check was to determine the location of Gour Hall in relation to the surface. This was done in 1969 by the early use of a magnetic transmitting device. The co-ordinates of the Great Gour were plotted onto a 1/2500 (25 inch = 1 mile approximately) map of the area and its location marked on the surface by measuring the location from the field boundaries. Davies, Riley and the writer placed the aerial on wooden floats and laid the whole structure on the large gour pool in Great Hall. Prewer and his helpers assembled on the surface at the point where the wooden peg had been placed in the ground. The transmitter was switched on, and the receiving aerial had to be relocated by 15ft from the peg to the true location. The survey had passed the critical test! A surface traverse to the magnetically-located spot, to effectively close the plan traverse, was attempted but the amount of magnetic disturbance in the area made this impossible.

The next test was to confirm the errors located in the line in the Upper Boulder Chamber-Rocky Boulder Passage area and the Water Chute area. The uncorrected data of the principal stations was given to Cowlishaw in order that he could close the main network in any manner he chose.

For this work, he was given the junction to junction co-ordinate data for the survey framework: the Rabbit Warren to Boulder Chamber (via the Railway Tunnel), the Railway Tunnel to Upper Traverse Chamber (via Harem Passage), Long Chamber to Coral Chamber and out via the Coral Squeeze and Chockstone Rift. The New and Old routes and the Main Stream (through Bypass Passage to Everest Main Stream Junction) were also included. The final results for each of the station co-ordinates were within 2·5ft of the hand calculated values.

Presentation

The writer has held strong views on the presentation of cave surveys and many of these were published (Irwin, 1969b & c, 1970a). In presenting this survey of St. Cuthbert's Swallet, he runs the risk of criticism that even he cannot achieve his own standards. It is hoped that the new departure from the usual approach will give food for thought to other surveyors.

A complex system such as St. Cuthbert's Swallet is clearly impossible to present on one sheet of paper. There are too many levels to enable the draughtsman to present the survey clearly. Instead, the main plan has been slightly simplified and one series displaced — Rocky Boulder Series lying under



51. Radio locating High Chamber, 1968.



52. Short Chain Pitch, Maypole Series.

the Old Route, Long Chamber Series and part of Main Chambers.

The elevations presented an even more difficult problem. The whole cave lies in about a 100ft thick band of limestone dipping at about 30-40° and, in the elevation, with as many as ten different sets of passages appearing one upon the other. A single elevation was clearly impossible. Five attempts have been made to draw the elevation and the final, the sixth (!), has broken the whole into four basic parts (plus a number of intermediate elevations where foreshortening is marked) using the New Route and Main Stream passages to form the datum. No attempt has been made to add floor or wall detail, or notes to the overall plan and elevation, as the result would have been inconsistent, and no less, a cluttered mess. The plan annotation has been limited to the name of each series, and for the elevation important names have been added to enable a link-up with the series plans.

To enable a comprehensive set of passage data and nomenclature to be added, together with the great number of passage sections (only a few have been included for space reasons), additional surveys have been produced for each series, accompanying the general description of that area of the cave. The choice of whether to include an additional detail elevation is purely a subjective assessment by the writer. There are a number of locations in the cave that are not, or cannot be, well presented on the main plan or elevations (which lie on the north-south line); thus, additional elevations have been included with the series description or in the main elevations, where it is thought to be useful.

Apart from sketches produced on graph paper, no real drawing work of the finished survey commenced until the survey framework of the system had been constructed by closing the major traverses. A working plan and elevation of the cave was prepared and all lines were added to it, producing a master drawing. From the masters the detailed surveys for each series were abstracted as soon as the lines and initial passage detail became available. In addition, numerous plots of miscellaneous elevations and traverse sections were produced to assess which was the best way of presenting the principal features of each series.

The drawing of the final plan, elevation and the series surveys was by tracing the lines and outline passage detail from the master plan and elevation. This was done in soft pencil onto stable plastic drawing sheets (e.g. Permatrace), and the passage sections and final passage detail added at this stage. Various intermediate tracing operations took place from the series survey to the main plan. The elevations, where common to the main elevation and the series survey, were traced one from the other. When the passage outline was complete, the floor detail and diagrammatic features were then added. The inked lines were produced by ink-pens such as Rapid-o-Graph. The final, and most tedious, task was the addition of the nomenclature. Initially, for the surveys previously published of various parts of the cave, the written information was added by the use of Letraset but for this final presentation by pre-printed labels.

The originals were drawn at the scale of 1/240 (the first drawing of Cerberus Series was 1/120), and the intermediate surveys published as part of BEC Caving Report No.13 were photographically reduced to 1/480. The surveys presented with this report have been photographically reduced to the same scale. A suitable scale bar has been included with each survey. The addition of stick-on labels to annotate the final surveys is not amenable to the dyeline printing process and so it is not possible to include the existing originals in the Mendip Survey Scheme collection currently held at Taunton. To achieve this, the originals will require photographing and new positives prepared, which will prove expensive.

A bibliography of all known sketches and surveys (including part surveys) published of the cave is to be found in Appendix 2, with the exception of those included in Ford's Ph.D. thesis (Ford, 1963a). It is intended that the survey originals will be lodged in a suitable library by the writer in the near future.

Special Symbols

Many minor passages had to be omitted from the main plan and where this has been done, the passage end is broken and drawn as in Fig.18. It can also mean that the passage closes down.

The elevation has been presented strictly from the available data, i.e. the station point, floor and roof heights relative to the survey station. From these data, it is not possible to draw the passage width.

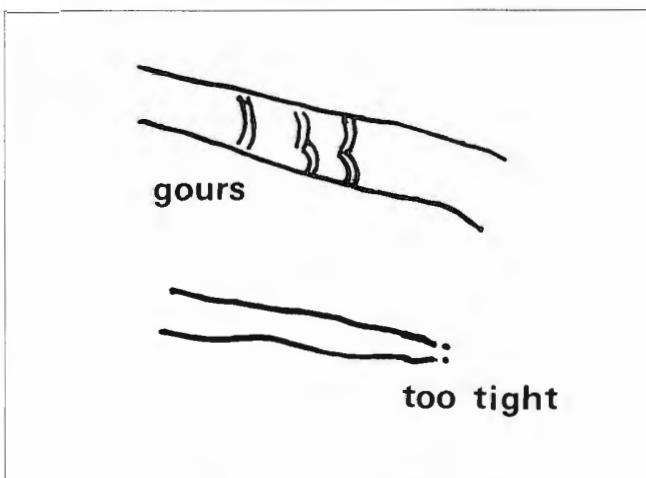


Fig. 18 Survey special symbols.

The elevation has been depicted as a 'strip' of paper folded to show the twists and turns of the passage in and out of the plane of the paper. Any passage intersecting another is shown with the roof connected to the roof and similarly, the floor to the floor. Many other surveys show the roof of the passage elevation joining the floor of the passage above — this is clearly impossible and obviously wrong!

Appendix 1

Bibliography

Introductory notes

This bibliography is a comprehensive coverage of papers published about or related to the cave. It is known not to be complete and other sources are recommended. These include caving logs of various Mendip Clubs and national publications. Each reference is laid out in accordance with other speleological bibliographies, i.e. author / year / title / publisher / publication / volume / publication number / page number. Information contained within square brackets, [. . .], has been added by the compiler, e.g. where the author's name is known but it does not appear in the original article.

Papers by multiple authors are to be found below the main listing of the first named individual.

Abbreviations

Abs	Abstract
BCRA	British Cave Research Association
BEC	Bristol Exploration Club
Bel Bul	Belfry Bulletin
Bul	Bulletin
Cav Rep	Caving Report
Cong	Congress
CDG	Cave Diving Group
CRG	Cave Research Group
CSCC	Council of Southern Caving Clubs
disc	Discovery/discovered
ed	Editor/edited by
edn	Edition
fig	Figure
Geo	Geological
Hydrogeol	Hydrogeological
illus	Illustrations/illustrated
Int	International
Jnl	Journal
LUCC	London University Caving Caving Club
MCG	Mendip Caving Group
MNRC	Mendip Nature Research Committee
ng	no grade
ns	no scale
Nitr	Newsletter
NSS	National Speleological Society [of U.S.A]
Occ	Occasional
Proc	Proceedings
pseud	Pseudonym
Pub	Publication
ref	Reference
rev	Revised
Spec	Special
Spel	Speleological
SMCC	Shepton Mallet Caving Club
Trans	Transactions
UBSS	University of Bristol Spelæological Society
Univ	University
WCC	Wessex Cave Club

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- 1964d Plan [Upper Long Chamber and Chandelier Passage] BEC Bel Bul (194)9 [5.5" x 7"; 1" = 20ft; CRG Grade 2] Sketch plan of Upper Long and Boulder Chamber area]
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- 1965b 100' a day passage. BEC St. Cuthberts Newsheet (4)1 [4" x 2"; ns; ng] Plan of dig.
- 1965c [Cerberus Rift dig] BEC St. Cuthberts Newsheet (4)1 [3" x 1.5"; ns; ng] Plan of breakthrough.
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- 1969a St. Cuthbert's Swallet — Rabbit Warren BEC Cav Rep (13E) insert [14.4" x 10, 13" x 9.5" (2 sheets); 1" = 40ft; CRG Grade 6d] Plan, elevation and passage sections
- 1969b St. Cuthbert's Swallet — Gour Hall Area BEC Cav Rep (13F) insert [15" x 12"; 1" = 40ft; CRG Grade 6d] Plan, elevation and passage sections
- 1969c Plan of Dining Room Dig... BEC Bel Bul (254)70 and SMCC Jnl Series 4 (7)5 [8" x 10"; ns; ng — extracted from CRG Grade 6 survey] Plan of area
- 1969d Dining Room Dig relative to the adjoining parts of the cave. BEC Bel Bul (254)68 and SMCC Jnl Series 4 (7)6 [8" x 10"; 1" = 100ft; CRG Grade 6d] Plan of lower section of the cave to Sump 1
- 1969e Sketch transverse section through the central chambers of St. Cuthbert's Swallet. BEC Bel Bul (256)118 [6" x 3.5"; ns; ng]
- 1969f St. Cuthbert's Swallet related to the ground overhead. BEC Bel Bul (261)228 [8" x 10"; 25" = 1 mile; CRG Grade 4-6 Plan (based on Grade 4-6d survey) see also Mills (1969a)

Appendix 2

Survey Bibliography of St. Cuthbert's Swallet

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- 1956c Arete and Ledge Pitches BEC Cav Rep (2) insert [7.5" x 10"; 1:1500; CRG Grade 1] Annotated elevation
- 1956d Section from Entrance to Upper Mud Hall BEC Cav Rep (2)insert [10" x 8"; not to scale; CRG Grade 1] Annotated elevation
- 1956e Section through Entrance Pitch looking west. and Section looking through Entrance Shaft looking west BEC Cav Rep (2)insert [10" x 8"; 1:100 approx; ng] Annotated elevations
- 1957a Rough sketch of Main Stream Extension. BEC Bel Bul (114)6 [8.5" x 7.5"; scale 1" about 25ft; CRG Grade 1] Plan and cross sections from the Duck to Sump 1
- 1957b Rough sketch of part Rabbit Warren & Rabbit Warren Extension, St Cuthberts Swallet. BEC Bel Bul (116)5 [10" x 7.5"; scale 1" = 40ft; CRG Grade 1] Plan
- 1957c Sketch of present hydrological system of St. Cuthbert's Swallet BEC Bel Bul (118)4 [7 x 7.5; ns; ng] Line section of streams showing points where water temperatures were taken.

- 1969g** Extensions above Cerberus Rift. BEC Bel Bul (261)204 [7" x 3.5"; ns; ng] Plan of Cerberus Rift and extensions based on CRG Grade 6d survey.
- 1970** no title [Rabbit Warren] CRG Trans. 12(3)157 [4.7" x 3" & 4.2" x 3"; ns; ng] Comparison of plan of Rabbit Warren from preliminary and new survey.
- 1972a** St. Cuthbert's Swallet — Cerberus Series BEC Cav Rep (13G) insert [14" x 11.5"; 1" = 40ft; CRG Grade 6d] Plan, elevation and passage sections
- 1972b** St. Cuthbert's Swallet — Rabbit Warren Extension & Cat-gut BEC Cav Rep (13H) insert [11.5" x 14.5"; 1" = 40ft; CRG Grade 6d] Plan, elevation and passage sections
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- 1975b** St. Cuthbert's Swallet — September Series BEC Cav Rep (13I) insert [11.5" x 7.25, 11" x 11" (2 sheets); 1" = 40ft; CRG Grade 6d] Plan, elevation and passage sections based on surveys by Stenner, Knibbs, Clarke, Irwin and Butcher
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- 1980b** Elevation of Marble Pot Extensions BEC Bel Bul (381)10 [8" x 6"; 1" = 18ft.; BCRA Grade 1]
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- 1969b** St. Cuthbert's Swallet in relation to surface features SMCC Jnl Series 4(8)11 [8" x 10"; 1" = 200ft. approx; ng] Plan including St. Cuthbert's II based on Ellis, 1962 and Irwin, 1969
- 1970a** St. Cuthbert's II — a new extension SMCC Jnl Series 4(9)34-35 [8" x 10" 2 sheets; 1" = 40ft; CRG Grade 6c] Plan and elevation of Whitsun Passage added to Irwin, 1969b
- 1970b** St. Cuthbert's Swallet published as separate sheet [30" x 21.5"; 1" = 80ft; CRG Grades 1-6] Plan of cave based on surveys by Ellis (1962), Irwin (1964-1969) and Mills (1970)
- 1976a** Disappointment Passage SMCC Jnl Series 6(1)7 [8" x 11"; 1" = 30ft; CRG Grade 6D] Plan and extended section
- 1976b** Drinking Fountain Passage SMCC Jnl Series 6(1)8 [8" x 11"; 1" = 30ft; CRG Grade 5C] Plan, extended section and passage cross sections.
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- 1968c** The Hydrology of St. Cuthbert's Swallet. CRG Trans. 10(2)53 [8.3" x 12.5"; 1" = 85ft approx; ; ng but based on Ellis, 1962] Part diagram and plan showing stream routes in cave.
- 1978a** [sketch map of surface sites adjacent to St. Cuthbert's Swallet entrance] BCRA Trans 5(2)116 [3"x6"; 2.2cm = 30M; ng] sketch map
- 1978b** Simplified plan of St. Cuthbert's Swallet. BCRA Trans 5(2)117 [4"x7"; 2.6cm = 100M; ng; based on Irwin, 1969f] Sketch map
- Wilton-Jones, G. & Tilbury, B. **1982** Maypole Alpha, Hanging Chamber and Jerusalem entrance BEC Bel Bul (408-409)22-23 [7" x 9"; BCRA Grades 1 and 3] Sketch elevation and plan
- Wynne-Roberts, S. **1964** Trafalgar Aven — vertical section. SMCC Jnl Series 3(7)13 [6" x 8"; 1" = 13ft approx; CRG Grade 1] Elevation and cross sections



53. Arête Pitch.

Appendix 3 Access Procedure.

Access to St. Cuthbert's Swallet is controlled by the *Bristol Exploration Club* on behalf of the landowners, the *Inveresk Paper Group*. The agreement states that entry to the system will be strictly supervised. To this end a leader system is operated. Water entering the system is used by the Wooley Paper Mill and also for domestic purposes and therefore must not be contaminated or polluted.

All parties must be accompanied by an authorised leader. The B.E.C. have agreements with other Clubs who have their own leaders to the system. The BEC will provide leaders for organised parties from other clubs throughout the country and requests for trips should be made to the Caving Secretary, Bristol Exploration Club, The Belfry, Wells Road, Priddy, Nr. Wells, Somerset, BA5 3AU. At least **six weeks** notice should be given and parties are limited to five people plus the leader.

No novice will be allowed in the cave under any circumstances and all individuals must have adequate personal gear. Carbide lamps are not permitted. A tackle fee is levied to defray costs of maintaining the entrance and fixed equipment.

Application for leadership

In an effort to conserve the cave, parties must be accompanied by an approved leader. Anyone wishing to become a leader must first apply to the BEC Caving Secretary.

A prospective leader having received an application form will then need to familiarise himself with the cave in the company of a current leader. A minimum of 15 trips must be made and evidence of the visits, signed by an approved leader, must be made in the form of a log-book. These trips will include leading tourist parties. The prospective leader will then be expected to show parts of the cave to at least two approved leaders. This test of knowledge will be carried out during two trips into the cave. The approved leader will ask the candidate to show him various parts of the cave. Knowledge of the routes through the cave is not the sole qualification to become

a leader. Management of tourist parties and attitude to conservation of the system will be taken into account. All visitors (including leaders) must remember:

1. Tourist parties are limited to 6 including the leader.
2. All visitors must have two forms of lighting.
3. All must be adequately dressed for the trip.
4. No carbide lighting is permitted.
5. All formations (including calcite, mud and other deposits) must be protected at all times.
6. The trip should be curtailed if any of the party show signs of undue fatigue or incompetence.

Appendix 4

Rescue Routes and Flood Control

Since the cave was first opened the accident record is extremely good. At the time of writing there have been only six formal call-outs requesting the aid of Mendip Rescue Organization, the first on 31st January 1960. A party of 10 Gloucester Speleological Society were trapped by flood water making the Entrance Rift impassable. The Wells Fire Brigade helped reduce the water flowing into the cave by pumping the water from above the main dam into Plantation swallet. A similar incident occurred later that year when a summer storm on 24th August again prevented a surveying party from ascending the Entrance Rift. The assistance of the Fire Brigade was required again and later was also needed at Swildon's Hole. Five further rescues involved experienced cavers — fortunately none serious. These occurred on 27th February 1966, 20th August 1966, 11th October 1970, 21st August 1971 and 31st January 1985.

Over the past twenty years a number of practice and actual rescues have established the most practical routes to bring a victim out of the cave. In places rawlbolt holes have been left for bolts to be positioned when required to aid hauling the injured person or transporting gear.

Of the many routes through the central cave area the established route for carrying an injured person from the bottom zone is via Plantation Junction up to the Second Stalagmite Bank and down to the streamway, avoiding Stalagmite Pitch. Up the streamway to Everest Passage and Boulder Chamber. Here there is a choice of two main routes. If the injured person is able to help himself by use of, for example, his arms, then the Wire Rift is a practical but slightly slower route. However, if the injured man is unconscious and has to be carried the descent into Traverse Chamber via the Maypole stream waterfall is recommended. The route from Traverse Chamber is via the New Route to Pulpit Pitch and out of the cave. For either route allow 3.5-4 hours from Gour Hall to the entrance shaft once the carry has commenced. To assist the haul up the Entrance Rift a specialised piece of equipment, the 'baby bouncer' harness, has been devised so that the stretcher can be slung from the top to avoid jamming in this narrow section of cave. A steel 'I' beam at the top of the rift can be used for the pulley so that the hauling party can be sited conveniently in the entrance passage.

Exits from the side series of the cave are all practicable without any undue difficulty. The route through the near side of the September Ruckle has always proved difficult and requires careful positioning of the carry party. Catgut Rift is possible with the stretcher brought out via High Chamber.

The most difficult part of the cave from which to extract an injured person is Coral Chamber. Chockstone Rift, Coral Squeeze and the 'Hole in the Roof' are quite impractical, all being too tight. The proven route is to bring the stretcher to the bottom of Coral Chamber and into Rocky Boulder Chamber. In the north wall of the chamber exists a partially blocked pothole. The boulders at the top are of dubious stability and so great care must be exercised in the next move. The hauling gear should be set up in the small boulder chamber above Rocky Boulder Chamber and Chockstone Pitch and the victim hauled out through the loose boulders. The next haul is up into Boulder Chamber. A Rawlbolt hole has been provided to enable hauling gear to be attached immediately above the chert

ledge climb in Boulder Chamber. The alternative and much more dangerous route is via Ruckle Passage which is more spacious but contains a huge boulder pile of unknown stability.

Flood Control

Due to the possibility of the Entrance Rift being made impassable by flooding, a drainage system (not greatly altering the natural waterways) has been installed and recently improved. This system is intended to hold back the flood water if the occasion arises again in the future that a party is trapped below the Entrance Rift. The pipes that have been laid allow the water free access into the entrance passages preventing the water backfilling the lower sections of the depression forming a deep lake outside the entrance to the cave.

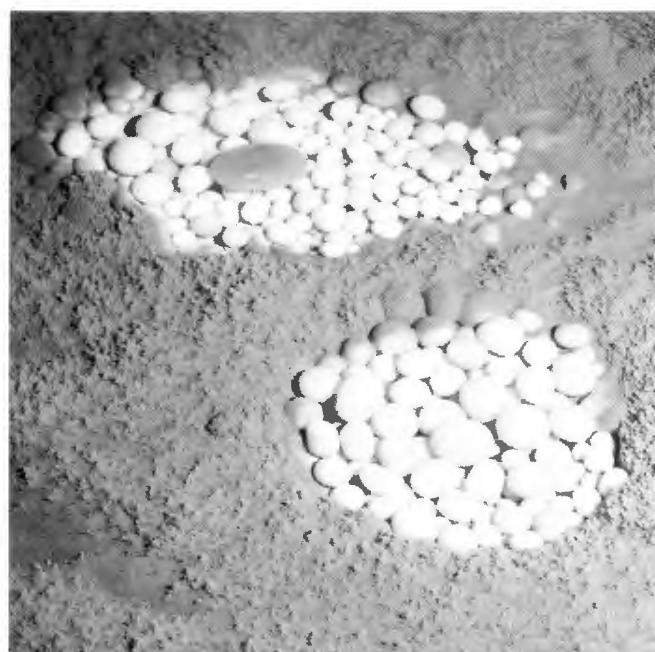
Previously the natural sink, under high water conditions, caused the water to form a lake due to its inability to take more water than a small stream. The water then found its way through the new entrance passage converting the Entrance Rift into a 'vertical sump'. Often during winter months the cave would be closed to all cavers for long periods of time. In the event of flooding:

- 1 Dam the outlet of the 'Upper Lake'
- 2 When the water in the lower pond has drained into the cave to a safe level close the stop valve.
- 3 After about 5 minutes members of the trapped party can ascend the Entrance Rift in relatively dry conditions. At the same time relieve the 'Upper Lake' thus refilling the lower section.
- 4 When the Entrance Rift is clear, release the 'Lower Lake' and dam the 'Upper Lake'.
- 5 Repeat the operation until the whole party is out of the cave.
- 6 If this method fails call the MRO as it is likely that help from the Fire Brigade may be required.

Cave Rescue Callout

Go to the nearest telephone and dial 999 and ask for Police, Cave Rescue. Give the number of telephone and location. Wait at the telephone until you are contacted by an MRO warden. Give information clearly and concisely.

Do not use the emergency number for general enquiries. i.e. overdue parties, etc. Use the following numbers Mendip area: Yeovil Police (0935) 75291



54. Pearl nests in Pearl Passage.

Appendix 5a

Stream Water Temperatures and Analyses

No long term temperature and chemical analysis of the St. Cuthbert's Swallet streamways has been published. All that exists are a collection of random readings taken over the last thirty years.

Stream Temperatures / (Air Temperatures) (°C)				
Location	1957 5th October	1957 7th December *	1965 30th August	1965 27th December
OUTSIDE CAVE				
St. Cuthbert's stream sink	11.70	8.10/(10.0)	12.55/(10.0)	2.75/(0)
Plantation stream	10.60	7.20	12.40	4.25
OLD ROUTE				
Below Entrance Rift			10.30	5.60
Arête Chamber inlet			10.50	5.85
Ledge Pitch (Showerbath)	10.00	8.90/(10.1-10.2)	10.15	7.65
Below Showerbath			9.90	6.22
Top Waterfall Pitch			9.90	
Bottom of Wet Pitch (inlet)			9.50	
Bottom of Wet Pitch (stream)			9.70	
Wire Rift stream at junction with Main Stream			9.40	7.17
NEW ROUTE				
Arête channel			9.85	dry
Main inlet Arête Chamber			11.05	6.22
Minor inlet Arête Chamber				7.95
Small inlet Arête Chamber			10.90	6.22
Small inlet Arête Chamber			dry	7.72
Stream in Arête Chamber			10.90	6.50
Stream at top of Pulpit Pitch	10.00	9.00/(10.1-10.2)	10.10	6.77
Stream at bottom of Gour Passage Pitch			9.45	
Upstream of Drinking Fountain			9.35	
Drinking Fountain Inlet			8.65	
Downstream of Drinking Fountain			9.30	
Bottom of Water Chute			9.30	8.65
Below Wire Rift stream inlet			9.30	8.18
Stream above Maypole inlet			9.30	
Maypole inlet		9.10/(10.1-10.2)	9.05	8.28
Traverse Chamber Choke				8.28
Downstream of Choke				8.28
MAIN STREAM (below CHOKE)				
Everest/Main Stream Junction				8.28
Outside Dining Room	9.20			
Main Stream upstream of Plantation Junction		9.10/(10.1-10.2)		
DOWNSHIFT OF PLANTATION JUNCTION				
Downstream of Plantation Junction		8.40/(10.1-10.2)		
The Duck		8.60/(10.1-10.2)		
MISCELLANEOUS SITES				
Great Gour		9.50/(10.5)		
Pool above Second Stal Bank	9.20	9.20/(10.5)		
Wookey Hole rising		10.00/(10.1-10.2)		

* During the December 7th 1957 trip air temperatures were taken at all measuring points. These were consistently 10.10 to 10.20 except for two sites. A pool above 2nd Stal. Bank in Rabbit Warren and the Great Gour pool gave readings of 10.50. (Burt & Petty, 1957)

Appendix 5b

Coliform count and mineral content

On the 2nd September 1964 N.L. Thomas sampled six sites within the cave for their coliform count and mineral content. The results are given below:

Coliform count and mineral content								
Sampling point	T.V.C/ml. 37°C	Presumptive Coliform 100ml.	Type Coliform	pH	Ca ppm.	Mg ppm.	Fe ppm.	Pb ppm.
Entrance stream	5,400	1,600	absent	7.5	28	12.90	<1	0.20
Plantation Swallet	550	130	present	7.5	49	4.10	<1	0.20
Arête Chamber	1,000	nil	absent	7.10	42	7.50	<1	0.20
Maypole stream	>20,000	7	present	7.20	38	13.80	<1	0.20
Coral Chamber stream	1,800	1,800	present	7.70	32	14.30	<1	0.30
Downstream of Choke	2,100	170	present	7.40	39	3.80	<1	0.30

Appendix 5c

Heavy metal contamination in the sediments of associated streams

Heavy metal contamination in the sediments of associated streams (Stenner 1978b)				
(ppm. in dry sample)				
Site	Cadmium (Cd)	Copper (Cu)	Lead (Pb)	Zinc (Zn)
SURFACE STREAMS				
Plantation Stream				
Mineries Pool, Priddy	1.5	15	14500	620
Near exit from Mineries Pool	7.5	35	47000	4000
Plantation Swallet	2.0	35	34000	1700
Fair Lady Well Stream				
Spring	2.5	16	7300	1500
50m downstream of spring	1.6	25	37500	850
Near Plantation Swallet	2.5	30	38500	2000
St. Cuthbert's Stream				
Maypole sink	5.0	85	51000	3100
Pool by cave entrance	4.5	72	55000	1400
River Axe, Wookey Hole (resurgence)				
Upstream of Paper Mill	2.3	25	7500	1300
Wookey Hole car-park	4.0	35	1400	500
UNDERGROUND				
St. Cuthbert's Swallet				
Bottom of Entrance shaft	7.2	43	64000	1800
Side rift below Entrance Rift	5.7	107	330000	2500
Arête Chamber (east inlet)	1.9	20	17500	1200
Arête Chamber (northwest inlet)	2.7	28	32000	1500
Arête Chamber (second west inlet)	16.0	70	132000	4200
Mud Hall	3.6	56	24000	1600
Lower Mud Hall (old infill)	1.6	83	35000	2200
Rabbit Warren (opposite Fingers)	0.8	8	270	74
Main Stream (near Dining Room) at stream level	2.8	45	21000	1800
Main Stream (near Dining Room) 3m above stream level	0.6	11	890	160
The Sewer at stream level	5.0	95	33000	3800
Beehive Chamber at stream level	4.0	56	24000	1600
Whitsun Passage, high level oxbow	3.7	11	520	1500

Appendix 6

Permanent survey stations

Permanent Survey Stations in St. Cuthbert's Swallet Each permanent station is given an identification number. This number appears on all the series plans or main elevations of the cave. Note: Imperial measurements are used throughout.

Station	Description	Northings	Eastings	Ht. (ft. O.D.)	
gr13	Plantation Junction- on north wall chert nodule approx.5ft off floor	10000.00	10000.00	403.64	PS 1
cs1	Smoke mark on longest stalactite in roof of crawl into Dining Room	10060.07	9796.60	429.18	PS 2
c5	Centre of bottom rung of fixed ladder in Mud Hall	10488.92	9599.30	571.05	PS 3
g5	Rawlbolt location at top of Water Chute	10501.67	9680.95	497.92	PS 4
gr19	Smoke mark on wall at start of Rabbit Warren Extension	10109.69	9902.56	467.26	PS 5
L4	Top of small stalagmite above Pilar in Pillar Chamber	10451.58	9577.83	608.24	PS 6
lc1	Chisel mark in roof of Everest Passage 4ft. from entrance to Rat Run	10180.90	9652.24	446.37	PS 7
lc6a	Uppermost point of Everest Boulder	10269.88	9633.32	477.15	PS 8
lc11	Top of large boulder in NW corner of Boulder Chamber right of pathway to climb to Chockstone Rift	10355.11	9589.20	552.81	PS 9
lc17	Top of prominent stalagmite boss in lowest part of Long Chamber	10345.69	9569.71	578.28	PS 10
lc23	Roof of entrance crawl from Long Chamber	10313.23	9517.00	599.53	PS 11
lc47	Top of Chockstone Rift	10365.80	9583.13	526.70	PS 12
n9	Centre of ladder marks top of Arête Boulder	10623.26	9614.12	688.30	PS 13
rb1	Roof of passage near entrance to Oubliette Pitch.	10396.00	9582.00	538.87	PS 14
rw10a	Base of large rock pendant near 2nd. Stal. Bank and junction of passage to Dining Room	10117.10	9841.32	458.04	PS 15
rw20a	Railway Tunnel — small stalagmite below large curtain	10275.14	9756.64	500.37	PS 16
rw30	Boulder Chamber — 2ft. high stalagmite at top of mud slide to Cascade	10362.24	9661.27	563.72	PS 17
u12	Entrance to Chandelier Passage, 2ft from floor	10355.80	9573.56	604.89	PS 18
UTCS	Upper Traverse Chamber on large flat slab overlooking entrance to Maypole Series	10426.63	9738.30	452.83	PS 19



55. 'Sword Crystals' near Kanchenjunga.

