AUSTRALIAN SPELEOLOGICAL FEDERATION
PROCEEDINGS 10TH BIENNIAL CONFERENCE

SECTION 4
CHILLAGOE - AREA, AIMS AND ACTION

OBSERVATIONS OF THE GEOMORPHOLOGY OF THE CHILLAGOE LIMESTONES

P.A. Wilson*

INTRODUCTION

Because Chillagoe is distant from the centres of population most of the scientific work of a purely academic nature carried out in the area, has been done by interested amateurs. And this is how I see myself, as I have no formal qualifications in geomorphology. My main contribution to the study of the geomorphology of the area is that I have been able to spend two years in Chillagoe making observations.

Chillagoe lies at the southern end of the Cape York Peninsula and is approximately 130 km west of Cairns. This is hilly country where the Great Dividing Range sweeps down to the Gulf of Carpentaria towards which the area drains. The height above sea level is 390 m. The mean annual rainfall is 800 mm and the seasonally arid climate exhibits very well defined wet and dry seasons. The wet season lasts from the end of December until the beginning of April.

FEATURES OF THE MAIN LIMESTONE OUTCROPS

The limestone lies in a belt about 5 km wide in places and 45 km long and is bounded in the east by the Almaden Granite and to the west by the Palmerville Fault. It is often fossiliferous and represents coral reef deposits of Upper Silurian or Lower Devonian age (De Keyser and Wolff, 1964). The bedding is at first difficult to determine but can be seen in highly contorted, vertically bedded chert bands, found for example near the Donna Cave. In one instance north of Mungana the dip is approximately 70^{o} and to the north-east. The bedding is always steep and can vary from east to west in direction.

Large masses of dark grey limestone protrude from the plain in tall vertical towers rising up to 65 m high. These are usually lens-shaped or boat-shaped in plan, aligning themselves approximately N.W. - S.E.; thus an apt description is "an aligned tower karst". Interleaved with the limestone towers are steep rounded hills of cherts and quartz greywackes often over 100 m high, and again, the bedding where seen (2 km west of Zillmanton rail crossing, 0.3 km east of the Donna Cave), is dipping between vertical and 60^{o} and is highly contorted and faulted.

The main towers to the west rise up sheer in places to sharp needles of rock. There is a considerable amount of collapse, producing scree slopes at the bases of the towers and fallen blocks of rock on top of the towers. Jointing is always well defined but variable; some areas with more joints appear to have more collapse. Solution along the joints has produced grikes and corridors varying from a few centimetres in width to the really large grikes in the Queenslander area which are 10 m wide and 30 m deep. Box valleys occur in a few instances such as in the Royal Arch area, and smaller raised box valleys with level floors some 10 to 15 m above the general plain level are common - behind the Donna Cave, at the Disney Cave and the Spring Cave.

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CHILLAGOE - P.A. Wilson

SURFACE SOLUTION FEATURES

The usual tropical Karren solution features are well developed. The Rillenkarren of about 1 - 2 cm across drain down the tower faces into Rinnenkarren up to 30 cm deep and 30 m long. Flat solution pans, or Kamenitsa, are very common on the tops of the towers and these always have a Karren-type outlet draining down the outside of the tower or into fissure caves.

Limestone pavements occur, and vary from narrow pediments (approximately 20 m wide), covered with scree material, at the bases of the towers (Royal Arch area), to large pavements which can be seen further to the east. A large pavement at Zillmanton is an undulating surface drained by two surface streams (in the wet season) and strongly dissected by grikes. Pavements can also be seen along the railway line by the smelters and at Dome Rock, (the Lion's Head Rock referred to by Danes). On many of the pediments the results of solution within the soil cover can be seen. By the aboriginal paintings at Mungana, owing to poor surface drainage, the water table rises above the surface of the limestone pediment in heavy wet seasons. The water lying in the large pool formed thus attacks the bases of the towers and has in three cases caused small towers to topple over.

THE DEVELOPMENT OF CAVES

The larger caves are in general highly complex tight systems, often developed along parallel joints. The survey of the Queenslander system (Chillagoe Caving Club 1973) demonstrates this very well. In many cases caves consist of inter-connected daylight chambers or sometimes open solution corridors. On examination, phreatic features are common, even at the tops of the tallest towers, though they are often disguised by collapse and large quantities of formations and cave coral. Contrary to the implications in Danes' paper (1911), vadose development is limited mainly to Karren-type formations on cave walls although some scalloping was found at the bottom of Christmas Pot.

Cave floors are generally fairly flat and consist of cave earth, guano, tree roots and accumulations of bat bones and snail shells. The water table often rises above the cave floors in the heaviest wet seasons and these obviously lie within the para-phreatic zone. That there is an active phreatic zone between depths of 10 m and 120 m is suggested by De Keyser and Wolff (page 66) in the statement:
"The presence of supergene sulphides at a depth of 400 feet, although ground-water level is only 30 feet below the surface, may be explained by the *free water circulation afforded by solution channels in the limestone*." (my italics).

This is further born out by local contractors who claim that drilling companies have encountered large water-filled cavities at considerable depths. Despite the obvious phreatic origins of the caves only three caves (Ti-tree Cave, Narahdarn Cave, Christmas Pot) are known to descend into the phreatic zone. Of these Narahdarn Cave was dived to a depth of 15 m without a floor being reached.

Direct solution in the paraphreatic zone is also an important contributor to cave development. Examples of partly redissolved cave coral and other formations are common. The extent of solutional activity below the cave floors remains to be investigated.

THE CONTRIBUTION OF FLOODWATERS IN HEAVY WET SEASONS TO CAVE DEVELOPMENT

Observation of the behaviour of moving water in the heaviest wet seasons is important to an understanding of how the caves develop. Hamilton-Smith suggests

that scree rubble dams back accumulated infiltration waters from within the towers (Jennings 1969). Jennings (1966) suggests that the "impounding of flood waters behind these barriers might be the cause of the formation of the network of caves". However the piles of scree material are not a significant barrier to the movement of floodwaters. Water is able to flow out of, for example, the Royal Arch Cave underneath the scree and within the solid pediment.

The main controlling factor over water movement appears to be the levels of the surface streams which are always lower than the flat earth floors of the caves. Chillagoe Creek, Redcap Creek and Ryans Creek all flow, in part, all the year round, and in the driest periods, source in springs in the limestone bedrock. The water probably derives from the main mass of water stored in the phreatic zone. In the wettest periods rain water pouring into the caves raises the water table into the paraphreatic zone and this water attempts to find its way out to the main surface drainage. The only real variable is the rate at which it does this.

In the Royal Arch system water reaches the cave floor only two or three minutes after the onset of a storm and at least half the system drains towards the entrance. In a normal wet season it lies in still pools while gradually seeping downwards into the mud. However in the very heavy wet season of 1974 when 1950 mm of rain fell, the water in the entrance chamber was 2.5 m deep and the water flowed through small passages under the scree into a tributary of Chillagoe Creek outside the cave. The cave emptied in about three weeks.

In the Donna Cave in 1974 a different situation occurred when the water in the main chamber reached a depth of over 9 m by mid-March, and it did not empty until 14 weeks after the rain ceased. For about half this time water seeped out of the base of the tower on the opposite side to the Donna's entrance. Chillagoe Creek flows on limestone some 800 m away and the intervening country is a silt-covered plain.

Other caves near Mungana gave similar indications: The Markham (often referred to in the past as "The Mungana Caves"), the Ryan Imperial Cave and the Giant Causeway Cave all still had water to a considerable depth 20 weeks after the rain had stopped. In each case local surface drainage is almost non-existant. However the Ryans Creek Cave had completely drained by before June 15th - 13 weeks after the rain had stopped; and the New Southlander and the Cathedral Cave (Queenslander system) had almost drained by this date. The Ryans Creek Cave has excellent local surface drainage and the Queenslander/New Southlander area has moderate drainage.

The obvious inference is that the proximity of local surface drainage directly affects the rate of outflow of water from the paraphreatic zone.

THE LITHOLOGY OF THE CHILLAGOE LIMESTONES

While exploring the limestones around Chillagoe I have noticed considerable variation in limestone types which, for convenience, I have classified into four general groups. As each type of limestone has physical characteristics peculiar to itself it is clear that any further study of the geomorphology must include a study of the lithology. I shall follow with a brief description of the four types.

1. Sparite

This is a dark grey, compact, hard crystalline limestone which occurs mainly (but not exclusively) on the western side of the limestone belt. It is often fossiliferous. It produces tall, pinnacled towers with very well developed Karren solution features and collapse. To quote a tourist (in bare feet) - "The rocks are sharp, aren't they?". Pediments, where they occur, are small in

area and often feature small towers. This type of limestone is responsible for all the really large cave systems and most of the other caves.

2. Banded limestone

This is a paler, blue/grey striped limestone which is moderately hard and crumbles under hammer blows. The stripes produce a pretty effect inside the Donna Cave. It produces low, rounded towers of smooth appearance although Karren solution features do develop. An important mode of weathering is exfoliation. The only sizeable caves known to occur are the Donna and the Trezkinn and in fact the largest outcrop is in this area, close to town. Quite large pavements occur (at Zillmanton) and also outcrops of highly contorted chert bands.

3. Sugarstone

This is an aptly named white limestone which crumbles easily into separate calcite crystals in a fashion similar to decomposed granite. Patches of Iceland Spar occur and bands of large crystals betray the bedding in an otherwise massive rock. It outcrops to the east of the limestone belt, following the railway line from town to Dome Rock. Also a junction between this and the banded limestone can be seen on a tower 1 km north of the smelters. The rock exfoliates and only occasionally are Karren features found. The only caves to occur are small phreatic tubes and widened joints. It mainly forms large pavements and well rounded outcrops.

Neither the banded limestone nor the sugarstone contain fossils.

4. Limestone breccias

Several different types of breccias can be found both inside and outside caves. The most noticeable type consists of a whole range of cave breccias having a matrix of calcified cave earth, or of tufa, containing limestone boulders of varying size which are often, surprisingly, well rounded. Also contained in the matrix are bat bones, snail shells and sometimes angular chert fragments. However there is another breccia (on the surface at the Walkunder Cave, The Ramparts and 1 km north-west of the racecourse, and underground in the Ryan Imperial Cave, the New Southlander and Rift Pot). This is a matrix of pink limestone containing angular pieces of grey limestone which usually match each other very neatly. There is never any observable differential weathering between the matrix and the contained boulders. De Keyser and Wolff (1964, page 22) propose that "The limestone breccia-conglomerate ..... is here regarded as a wave-platform breccia overlying local unconformities and disconformities", although the appearance of the breccias shown in cave walls suggest that they are collapse breccias formed within already existing cave passages.

Clearly the origins of breccias deserve further study and accurate dating may reveal much information about rejuvenation and earlier karst phases.

THE GEOMORPHOLOGY OF THE DOME ROCK AREA

To conclude this paper I shall discuss a proposal by Danes (1911) that "the Lion's Head (Dome Rock) and its surroundings owe their shape to the vigorous action of running water in some remote period". He refers to the bed of a "short ancient river". He bases his arguments on the smooth surface rock and, in his later paper, on the existence of "fluvial potholes" (Jennings 1966). However the limestone here is of the sugarstone variety which exfoliates, accounting for the smooth surfaces. The "fluvial potholes" have the appearance of solution tubes aligning themselves along joints, and in a random sample of 24 holes, 11 disappeared out of sight, 13 contained leaves and rounded pieces of sugarstone and 1 also contained fragments of gossanous ironstone probably derived from a small outcrop some 5 m away, uphill. I crawled into one large tube which led into a small phreatic cave developed along two joints.

CHILLAGOE - P.A. Wilson

A list of caves referred to in the text

Cathedral Cave	CH15
Christmas Pot	CH144
Disney Cave	CH45, CH112
Donna Cave	CH2
Giant Causeway Cave	CH78
The Markham	CH10
Narahdarn Cave	CH34
The New Southlander	CH81
The Queenslander	CH51, CH55, CH85
Rift Pothole	CH127
Royal Arch Cave	CH9
Ryan Imperial Cave	CH4
Ryans Creek Cave	CH123
Spring Cave	CH12, CH60
Ti-tree Cave	CH43, CH101
Trezkinn Cave	CH14

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PROCEEDINGS 10TH BIENNIAL CONFERENCE

VISITOR ACCESS AND FACILITIES

CARLSBAD CAVERNS (U.S.A.) AND CHILLAGOE CAVES (QLD.)

H.S. Curtis*

ABSTRACT

Carlsbad Caverns in the United States contain some excellent features in the work done to provide visitor access and facilities and especially in the standard of illumination provided. Some aspects of this work are discussed. Mention is also made of work being done at the Chillagoe Caves in Queensland.

CARLSBAD CAVERNS

The Carlsbad Caverns National Park, over 70 square miles in area, is located in south-eastern New Mexico in the United States. Some 13 miles of caverns have been explored of which about 3 miles are open to the public. The largest chamber is 2,000 feet long and up to 200 feet high.

I inspected the Caverns in 1972, firstly going through just as a member of the public to gain a general impression and then returning later with the Park's Electrician who explained and showed me the work which had been done. Two features of this work impressed me greatly -

.. The full length of the pathway is illuminated and visitors are permitted to walk through at leisure, thus being free from the sense of regimentation which is inevitable with supervised guided groups.

.. In the total length of over 3 miles of pathway, at no point was any of the wiring or the actual lights themselves directly visible.

Protection of Cave Formations

It was pleasing to note a complete absence of any obvious signs of damage to the natural formations of the cave. Park visitation for 1968 was 668,401 and no doubt has been increasing. To achieve such a high standard of protection without obvious constraints on visitor freedom is a major achievement. Constructed paths with smooth surfaces are provided with minimum illuminations sufficient for a person whose eyes have become dark-adjusted to walk in comfort and safety. The cave floor away from the path is kept dark and this in itself is sufficient to discourage people from leaving the pathway. All visitors are briefed at the entrance so that they know what to expect, where to go, what to do - and what not to do. Rangers are on continuous patrol throughout the cavern.

Visitor Safety

This is achieved through such obvious measures as avoiding danger spots in the initial location of the path, and provision of safety rails, hand rails, steps etc., but also through the initial briefing and the presence of the Rangers on patrol, and adequate emergency lighting.

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CHILLAGOE - H.S. Curtis

Park Interpretation

Apart from the initial explanation at the entrance, the patrolling Rangers provide an excellent interpretative service. One never has long to wait, or far to walk, to find a Ranger to answer questions and explain what the visitor is seeing. Where at particular points certain descriptive information is considered appropriate this is provided by means of back-illuminated signs, produced after considerable research, to be easy to read but to not affect the visitor's dark-adjusted vision as would a normal sign illuminated from the front.

Cave Illumination

This has been done superlatively well and reflects great credit on the park service, and especially the Chief Electrician, Horace T. Morelli and his staff.

For the most part the whole cave is illuminated by a soft diffuse light giving a most beautiful effect. Special lights are then used for cave formations of particular beauty or interest. A variety of lights - fluorescent tubes, flood-lights, blue "daylight" bulbs etc., are used and are chosen and placed with great care to give the best and most natural effect.

And again I wish to emphasise that nowhere is any of this work directly visible from the pathway. It was only when Mr. Morelli took me on a tour of inspection and we moved from the path that I could see under his direction where wiring had been concealed and the actual fixtures that were providing the light. Every effort was made to place wiring in naturally concealed positions but where this was not possible, loose material from the cave floor was cemented into place with such care, - artistic care is perhaps the right description, - that only when it was pointed out to me did it become noticeable.

Emergency Lighting

An obvious problem under the system of unescorted visitation is that of a failure in the power supply. This is covered in three ways -

.. firstly throughout the cave there is a system of battery operated emergency lights. The batteries are kept charged by the normal power supply and the emergency lights come on automatically if there is any failure of the main lights.

.. secondly the park maintains a complete emergency generating plant with sufficient capacity to run not only all the cave illuminations but also all the ancilliary park service facilities, staff residences and a neighbouring village.

.. finally all Rangers in the cavern carry flashlights.

CHILLAGOE CAVES

A number of cave systems in the Chillagoe/Mungana area have been afforded National Park status and consolidation and expansion of the present parks is under active consideration, though it is unlikely that anything approaching the Carlsbad Caverns National Park area of 46,000 acres could be achieved (at Carlsbad not only the area encompassing the caverns, but a viable sample of the desert landscape with its plants and wildlife are included).

Although the Chillagoe Caves have long been known, there has been a major expansion of interest in them in recent years. In no small measure this has been due to the interest and initiative of Mr. V. Kinnear who, initially in a purely honorary capacity, guided people through some of the caves, tidied up the worst of the litter and generally helped to protect the area. Later he was

employed in a care-taker capacity by the Department of Forestry and then as active work to provide visitor facilities got under way he was permanently employed to take charge of the operations.

The work done to enable visitors to inspect the caves had consisted mainly of the construction of pathways and steps, largely of concrete, and the provision of ship-type ladders, handrails and safety rails. In a few cases narrow passage-ways between caverns have been enlarged to facilitate access. Some details of the work done may be of interest.

Royal Arch Caves located some 6 kilometres from Chillagoe has a system of caverns extending for about 3,500 metres. The section open to visitors takes in 21 caverns, and a full tour involves a distance of approximately 1,000 metres. To provide this walk in comfort some 600 metres of concrete path has been constructed, 15 ladders, 9 bridge walks with hand rails and some 120 metres of hand and safety rails installed. Caverns are up to 50 metres long, 20 metres wide and 25 metres high.

Donna Cave about 2 kilometres from Chillagoe, is a smaller cave system with a total tour distance of about 600 metres. A steep descent from the entrance to the bottom level of the cave has been provided by means of 86 concrete steps. Seven ladders and six bridge walks have been established. There is also a concrete path and handrail of about 45 metres from car park to cave entrance.

Ryan Imperial Cave is some 18 kilometres from Chillagoe not far from the old town of Mungana. The toured distance in the cave is relatively short but again includes a bridge walk, ladders and concrete steps. Outside the cave, about 700 metres of walking track takes the visitor to the balancing rock.

Tourist Industry

For reasons of public safety and to prevent vandalism the entrances of the developed caves are closed off, and guided parties are taken in by National Parks staff. At present no charge is made for these guided tours but it is likely that eventually this will have to be done.

Interest in the caves is growing rapidly - approximately 13,000 visitors came to the Chillagoe area during 1972/73 financial year and 10,808 visitors were taken on guided tours of the caves.

During the last 5 years major business expansion has occurred in Chillagoe. The Imperial Hotel has been rebuilt and has had motel accommodation added. The Chillagoe Caves Lodge has been established providing a shop, cafe, cabin and motel type units as well as caravan and tent accommodation. The old Post Office Hotel continues to operate. A caravan park has been established as well as a new store, a new butcher shop and a Community Hall. Reticulated electric power has been connected to the town and the main street has been sealed. Major improvements in the road access to Chillagoe are being undertaken with complete new road construction in the Almaden/Chillagoe section since the 1974 floods. Road improvements are expected to make Chillagoe more accessible to tourist buses.

The Department of Forestry has constructed two residences in Chillagoe for its staff. Additional residences and administration headquarters, including visitor information facilities, are likely future developments.

The Department has had reticulated electric power extended to Donna Cave and an electrician is permanently employed to install and maintain cave illumination. In this work valuable advice and guidance have been given by the Electricity Board.

It is pleasing to note that private enterprise, the Mareeba Shire Council, the Cairns Regional Electricity Board, the Department of Main Roads and the Department of Forestry are all combining to cater for the ever-growing stream of visitors to this interesting region.

AUSTRALIAN SPELEOLOGICAL FEDERATION
PROCEEDINGS 10TH BIENNIAL CONFERENCE

CAVE EXPLORATION AND CAVING POTENTIAL IN THE CHILLAGOE AREA

T.W.L. Robinson*

In the closing decade of the last century, a noted English botanist and painter, Mrs. Ellis Rowan, visited the area under review, as guest of the pioneering Atherton family on Chillagoe Cattle Station. Later in her book "A Flower-hunter in Queensland and New Zealand" published by John Murray - London in 1898, she recorded the following impression:

"I was driven there in a small one horse trap, the material of which needed to be of the strongest for the road was an exceedingly rough one, being for the most part over broad beds of rock and pebbly ground. The whole country is a vast undulating plain, dotted with rugged masses of curiously outlined limestone ridges rising to many hundreds of feet straight out of the ground, giving the landscape a stern and oppressive grandeur. The deep fissures of these towering walls are filled with gnarled and hoary trunks of trees, striking and grasping the massive fragments with their rootlets and creeping and twisting in and out of crevices. Below, the huge blocks of stone are overgrown with an intricate wilderness of shrubs and creeping plants, while high above, these dark and towering walls are destitute of any living thing, and their stricken, shattered looking peaks, networks of sharp pinnacles with needle like points, stand grey and arid looking against the intense blue of the sky".

Today, after three-quarters of a century of mining and pastoral activity, the visitor to Chillagoe can still experience the thrill and fascination of this unique landscape and also the discomfort of that rough road which still has sixty miles of unsealed surface with numerous creek fords and corrugations. Few who make the journey go away dissatisfied. Chillagoe can offer something for everyone.

Apart from the scenic grandeur, the follower of history can fossick around the old derelict mines and smelters or browse through the museum at the Post Office. The geologist can study the multi-stratered and mineralised rocks of the Palmerville Fault and ponder the explosive influences which gave birth to the topography of the area. The "rock hound" can find specimens and those interested in fossils can have a field day among the remains of the inhabitants of a long lost Silurian-Devonian sea, or the bone breccias of the more recent past in some of the caves.

Camped by Chillagoe Creek, the holiday maker can just relax and enjoy life far from the rushing crowds of the cities.

The speleologist can have a field day!

Here we have a limestone belt some 60 km long, with a width of 1-6 km, broken in places with granite intrusions and beds of chert. The area is dotted with bluffs, some large, some small, and the general belief is that few lack caves. Because of the inaccessibility from major centres of population, the area from a caving point of view is still relatively unknown. Many of the more accessible bluffs have been looked at superficially by interested people but records were seldom kept. In the mining boom days guided tours of a few of the major caves were organised for keen tourists who bumped over the road to see them. Some attempt was made to improve access by walking tracks, but with the collapse of the mining period, and the decline in the population of the area, most fell into disrepair, and with the exception of one or two caves, visitors seldom reached some of the more impressive areas.

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CHILLAGOE - T.W.L. Robinson

One of the major tasks for a speleological club here will be that of rediscovery and documentation. Even so there is still plenty of virgin territory to be opened up by using more sophisticated methods of scaling, laddering and of course the opening up of "digs".

Following representations, National Park status was given to parts of the area in 1943. Honorary rangers were appointed to establish the locality of caves and by 1966, the Forestry Department, National Parks division recognised the need for a full time ranger and appointed Mr. Vince Kinnear, to co-ordinate development work in and around the National Park and to organise conducted tours of selected caves for the growing tourist traffic.

The geology of the area has unfortunately provided a conflict of interests with other governmental departments, notably the Mines Department, and because mining is not allowed on a National Park, the park as we know it today consists of isolated parcels of land, containing the more impressive limestone bluffs. Between them lies land subject to mining leases. Extension of the park boundaries will come as a result of exploration and co-operation in research by the government departments concerned and in this field of discovery and documentation of cavernous areas, speleological clubs can play a vital role.

Such documentation was begun early in 1960 by a few interested individuals and the Queensland Forestry Department, National Parks section. Apart from the job done by Mr. Vince Kinnear, mentioned earlier, recognition must also go to the assistance given by Frank Trezsise, Peter Freeney, John McKeegan and Allan Cummins for much of the early work. Then, between 1966 and 1970, the Sydney Speleological Society visited the area and produced several maps, including a limited area map from aerial photography, and also an Occasional Paper "Communications No. 3". Surveys were also done of several of the major more accessible caves, including the Royal Arch, the Donna, Markham, Spring, Haunted and the Ti-tree. The latter contains a very interesting bone breccia from which the remains of the extinct Diprotodon have been recovered. The formation of the Chillagoe Caving Club in 1973 enabled local cavers to co-ordinate their efforts.

Club membership is drawn from a wide range of age groups, and includes some with overseas caving experience, and others with disciplines of a nature which add expertise and guidance for the less experienced. Seasonal and road conditions have posed problems. The area was inaccessible for five months during the last wet season. Because of the problems of getting there, members prefer to have as long a stay as possible.

The longer holiday weekends in Queensland all fall in the wetter half of the year when planned meets are liable to be washed out by impassable roads or flooded caves. During the drier season locals are generally too busy with occupations of a seasonal nature which limit time away from the job. Meets at Christmas and the May-June period have been the most popular, while individual members have made visits whenever they could spare the time during the rest of the year.

Co-operation with the Forestry Department has been excellent. All are keen cavers and the major office bearers of the club. Since its formation the club has built up a supply of electron ladders and ropes for use by members and visitors. A limited supply of helmets are available but in the main, head gear, foot gear and lighting are a personal responsibility. As 240 volt mains supply of electricity is now available at Chillagoe the charging of accumulator type batteries is no problem, provided of course that you camp in Chillagoe!

Prior to the establishment of the club, the index of known caves stood at 120. Despite adverse seasonal conditions the index has now been increased to 150, while numerous entrances have been found to previously known caves. Work has begun on extending the area map produced by the Sydney Speleological Society to include the magnificent bluffs on Rookwood Station continuing to the Walsh River at the N.W. end, and to the Ootan-Almaden area in the S.E.