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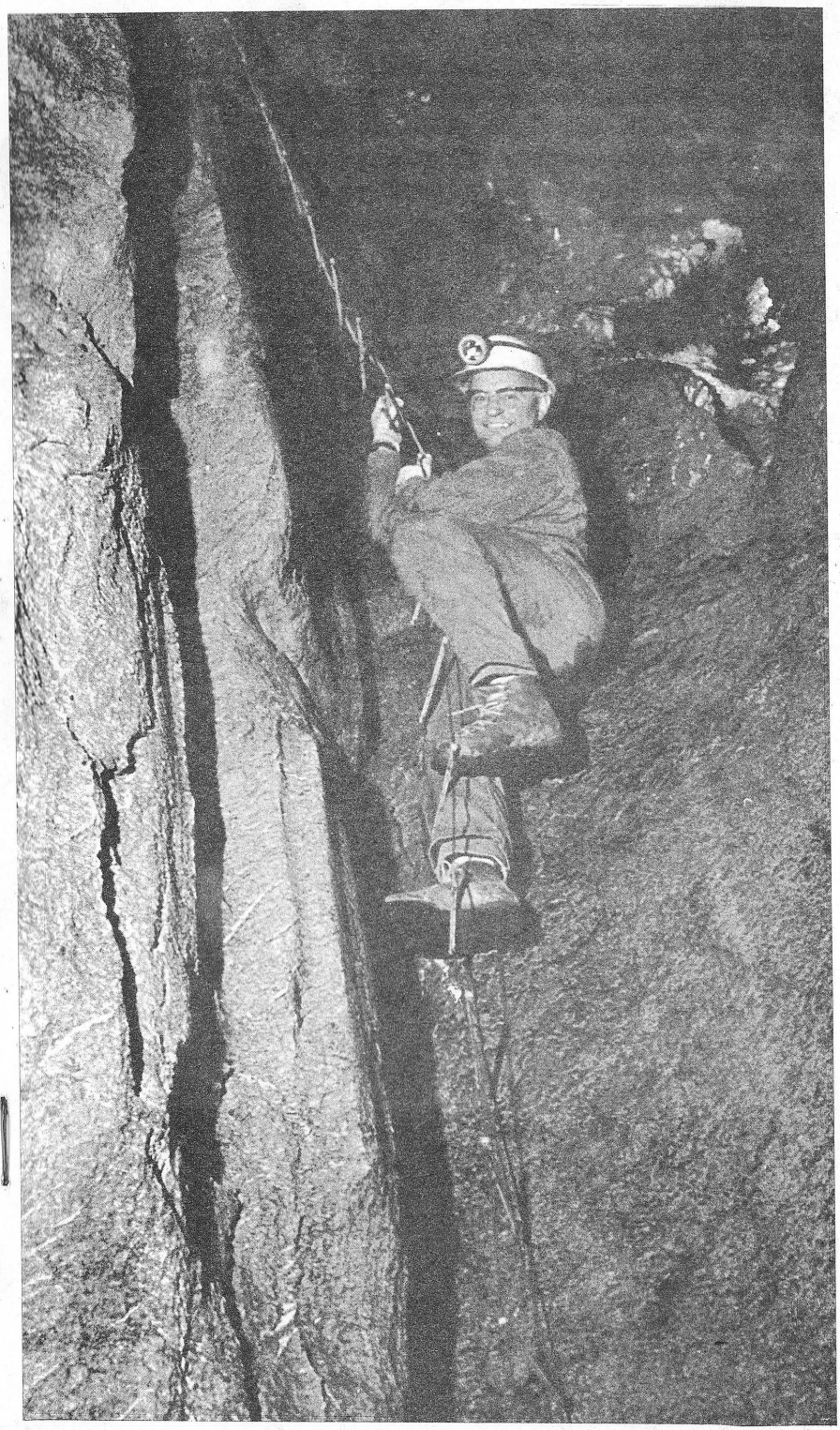
NIUGINI CAVER



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Contents

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New Contributors

David Holdsworth is a lecturer in Chemistry at UPNG Port Moresby. David's involvement in caving comes from his interest in pre-history and the fact that in PNG many caves are archaeological sites.

Willi Grimm is a Swiss speleo who has visited many cave areas in the world and is well known in Australia. Along with Thomas Kesselring, he wrote the article on Hölloch in this issue.

* * *

Cover Photograph
Prof. A. Bögli on a ladder pitch in Burgerschadt, Hölloch, Switzerland. Prof. A. Bögli is responsible for extensive research on Hölloch.
Photograph by Pali Berg (AGH).

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TOKTOK BILONG EDITA

Recently a team of four speleologists from the Papua New Guinea Cave Exploration Group spent just over a week working with geologists of the Geological Survey of Papua New Guinea on the Ok Menga, a tributary of the Ok Tedi. The speleologists were assisting the geologists in gaining access to the interior of a narrow overhanging limestone gorge to enable them to determine the suitability of the gorge for a hydro-electric scheme to supply power to the proposed Ok Tedi copper development. Without the speleologists and their specalised skills and equipment, the geologists would have had great difficulties in gaining access to the interior of the gorge.

This is not the first time that the Papua New Guinea Cave Exploration Group cavers have assisted the government. In May - June, 1973, Mike Bourke previously of D. A. S. F. and G. Jacobson joined a Commonwealth Department of Works party conducting a preliminary investigation for a hydro-electric scheme on the Waga River, a tributary of the Kikori River. The cavers were investigating for caves and karst features which will cause problems of water leakage from water storages constructed on the river.

These investigations where speleologists are asked to participate show that caving has useful applications in Papua New Guinea where so much of the terrain is of limestone with mostly underground drainage. Usually cavernous limestone is regarded as a nuisance to hydro-electric schemes as the underground hydrology cannot be easily defined. However, in those countries where speleology is a well established science, the knowledge of speleology has enabled many hydro-electric schemes to tap underground streams originally discovered by speleologists in their explorations.

It is to be hoped that the activities of speleologists in Papua New Guinea will be encouraged by the authorities. Explorations carried out both by locally based cavers and overseas caving expeditions that come to the country and whose results are published, produce information which will be of value to the government of Papua New Guinea. On specific karst problems, the assistance of the Papua New Guinea Cave Exploration Group is always available and it is hoped that the chance to assist in the future will be forthcoming.

* * *

CAVES OF KIRIWINA, TROBRIAND ISLANDS, PAPUA NEW GUINEA

C. D. Ollier* and D. K. Holdsworth**

Introduction

The Trobriand group of coral islands is situated 160km off the northeast coast of Papua and north of the D'Entrecasteaux Islands. The largest Island, Kiriwina, is 50km long and 15km across at its widest point.

The population of Kiriwina, about 12,000 people, presents a very great variety of physical types but all speak Kiriwini, and neither Pidgin or Motu are much used. The Trobrianders are famous for their woodcarving, and their social customs are well known from the writings of the anthropologist B. K. Malinowski.

The authors have visited Kiriwina on several occasions from 1967. Guides were recruited from local villages. Communication was sometimes difficult, though teenages with some schooling usually had a fair grasp of English. In 1968 payment in cash was rarely appreciated and stick tobacco with newspaper proved more welcome. Guides prefered to be paid just before reaching their home village, otherwise they were obliged to give most away to their eager neighbours. The gift of a stick or two of tobacco to the village chief proved diplomatic.

Caves were surveyed using 30m tape and compass. Human bones, wherever found, were photographed and left undisturbed for later anthropological and archeological research. Most caves contained fresh clear water and the villagers utilise small caves for their normal water supply. The grass-skirted women and girls often walk for kilometres with an assortment of water containers on their heads. A concrete pad outside one cave was evidence that the US or other Allied Force pumped water from the cave during the war.

Selai Cave

(Nearest village, Labai. See Figures 1,2)

This appears to be a sacred cave, and Mr. Ward estimated that perhaps only half a dozen Europeans had been in the cave previously. At one time the villages had decided, or had been advised by a misguided contact to ask for two hundred dollars to show people over the cave. Unless you share the superstition of the islanders themselves, it is certainly not worth this amount.

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The cave is said to be the place from which the original Trobriand woman emerged. We did not discover the origin of the men. Inside the cave is a featureless and insignificant stalagmite which is said to be the baby, left behind by the first woman. It falls far short of the the imaginary personalities common in many show caves, but perhaps when the legend started it had a greater resemblance to a baby than now and continued accretion may have spoiled the image.

The cave is difficult to depict on a map, being roughly spiral. The entrance leads into a large chamber, from which one route leads down to a lake, and another up to a bone passage which is, in part, directly above the lake. Much of the cave is due to collapse, and the long straight north eastern wall is the side of a straight collapse tunnel of arcute cross section.

This cave contains many small bats, living in a chamber above the water, and in the water a black crayfish was seen (known locally as kiu) and 300mm long eels (known as Tobuadi).

The guides were somewhat unwilling to show us the bone passage, though other bone caves we had seen were treated with no respect at all. Some of the skulls showed holes and double holes. The bones, especially the teeth, looked comparatively fresh, but a few bones were found stuck together by calcrete.

A large clam shell was present in the cave. There is a leggend, told by our guides, that in ancient times 13 men were lost in this cave and never returned. The same legend seems to be attributed also to Origiveka Cave.

Origiveka Cave

(Nearest village, Kwabwaga. See Figure 1)

This is probably the largest cave on the island, and one of the most difficult to negotiate. We were not able to survey it. A few ropes and helmets are recommended for future exploration. The cave is probably at least 180m long and over 30m wide. The ceiling is high, and the floor is covered by fallen blocks, some of which are the size of houses. There are many bats, and there is a stream or long pool on the eastern side. Some large stalactites and columns are present, but decoration is not the dominant feature of this cave.

There is said to be a hidden passage leading from somewhere on the leftside of the entrance to a very extensive cave, and it is said that an early missionary spent a whole day exploring this cave. The legend of the 13 men who entered the cave and never returned is also attributed to this cave.

A more modern story is that the American forces stored materials in the cave, and one version is that the entrance may have been blasted to hide their cache, and incidentally possibly blocking the entrance to the extensive passages. It is possible that when the Americans left they hinted about useful things left inside, because a craze developed for digging inside the cave. When one man dreamed of digging with a magic hoe and finding the treasure, something very like a cargo cult developed, and the Administration was obliged to stop all digging in the cave.

Our limited exploration failed to find any sign of blasting, of a hidden passage, of any cargo, or even any indication of much digging.

Tuweria Cave

(Nearest village, Moligilagi. See Figures 1 and 3)

An elliptical collapse hole leads down to the three chambers that make up this cave. The main part is about 90m by 30m, but was not accurately surveyrod because we could not safely descend the steep wall shown on the section. There many bats in the cave and deep,slippery guano makes the going treacherous. As in other caves there was quite a lot of flowstone, but evidence of large scale collapse was particularly evident here.

Tumwalau Cave (Kumwalau)

(Nearest Village, Moligilagi. This cave is a few hundred metres south of Tuweria. See Figures 1 and 4)

The cave is reached by a road that is almost driveable, and outside the entrance is a large, concrete pad, the base of a pumping station used during the Allied wartime occupation.

The entrance chamber is large and high, with many stalactites on the roof. The floor consists of fallen blocks covered with flowstone, clay and guano. Beyond this is a pool about 20m across which must be swum to gain access to the cave beyond. The further parts of the cave consist of long and relatively narrow passages and rifts, sometimes with several interconnecting "roads" running roughly parallel to each other.

There is a dominant horizontal structure in the limestone reflected in the form of the cave. Some chambers are "platy" with thin sheets or plates of limestone projecting into the cave. Phreatic spongework is well developed, butpockets and pressure tubes have elliptical cross section with horizontal long axes. Instead of the common pendants between solution pockets, there are near horizontal projections of rocks which we called "salients". Vertical joints are well exposed in many of the rifts and clearly dominant in the plan.

There is quite a lot of life in this cave, including cave crabs. Some large ones are red, but others are small, white and almost transparent. There are white fish in the pool. Long legged insects are said to be fairly common, but we did not see any. Both flying foxes and small bats live in the cave. Native names for these animals are: red crabs = lakum; white crabs = pwaku; small bats = sigunoguna; flying foxes = migiaweda. No archaeological remains have been found in this cave.

Kuvwau Cave

(Nearest Village, Okaiboma. See figures 1 and 5)

The cave is reached by walking about a kilometre south of Okaiboma along the beach and then cutting inland, where a number of shelves and shallow caves are found in the cliffs.

This small cave has an entrance almost blocked off by a grill of dripstone columns, making it almost a cage. Chockstones have been artificially placed between the columns in an effort to close up the cave. Inside the cave are a great many human bones. These are lying in disorder and no complete skeletons or even limbs can be determined. Several skulls had neat holes in the crown.

Mwagai Cave

(Nearest Village, Kwabula. See Figures 1 and 6)

This is one of the most decorated caves and would be a possible tourist cave if access was not so difficult. It can be reached only after a long walk across a bush covered, coral ridge strewn with irregular and sharp edged boulders.

The eastern half of the cave is an irregular and fairly narrow dry chamber with a certain amount of stalactite and stalagmite formation and a red earth floor instead of the guano and rock found in most of Kiriwina caves. In the west is a large chamber with some splendid decoration. In the northwest corner is a pool which appears to sump within a short distance, and in the southwest is another dry passage, where a few bones were found. This cave has an opening in the roof, an irregular round hole surrounded by stalactites.

Kodawa Cave

(Nearest Village, Kwabula. See Figures 1 and 7)

This feature is not a true cave but a centote, similar to the so-called "caves" of the Mt. Gambier region of South Australia. It is a roughly elliptical hole about 30m by 12m, with steep walls plunging beneath the water. The walls are often overhanging, and about 6m high above the water surface. The walls appear to slope outwards below the water level, and the water is estimated to be about 12m deep. It is fresh, extremely clear and still, and contains small black fish.

An interesting feature is the shelf at one end of the cenote. This is about 2m above the present water level, with a notably flat floor about 1.6m wide. It was formed presumably by some kind of undercutting when the lake was higher than at present.

Obaturum Cave

(Nearest Village, Wawela. See Figures 1 and 8)

The cave is divided into three chambers by a large mass of stalagmite. At the north is an entrance chamber, with a slippery downward sloping floor; in the south is a low ceilinged chamber with a lake a metre deep that probably sumps; and in the east is a dry chamber.

This was originally a bonecave though few bones are present now. We also found a large shell and two fragments of old pottery that might come from urns.

Siku Cave

(Nearest Village, Kumilabwaga. See Figure 9)

It is a typical collapse cave, fairly large, with the form of an irregular tunnel, and contains several lakes of fresh water. Many bats live in the cave, which is largely floored by guano. Speleothem decoration is extensive, some being white and active. No archaeological material such as bone, shell or pottery was found.

Neguya

(Nearest Village, Kumilabwaga. See Figure 10)

The cave descends steeply, is much modified by collapse, and contains abundant stalagmite formation. A rift at the base of the main chamber leads to a second pool in an uncollapsed chamber. The entrance to the cave is an oval sink hole with an imcomplete rim, the missing side facing the sea.

No bats or other living things were noted. A few sea shells and pottery fragments were found, but no bones, although a longer search could probably turn up a few. There is one crypt consisting of a chamber under a large fallen block, partly barricaded by a wall built of chunks of coral. This is very like the crypts we have found elsewhere, and was used to conceal or protect burials (see, for instance, p. 45 in Ollier, Holdsworth and Heers, 1971a). These features clearly indicate that the cave was formerly used as a place for interring the bones of the dead, a custom described in our earlier papers.

Our guides explained that the crypt was the house of Doknikani, a legendary giant reputed to eat people. The guides could not be persuaded to go inside by any means, and tried hard to stop us going in. However C.D.O. climbed into the small chamber without ill effect. Inside were a few pottery fragements and also a broken bottle! Evidently this was not the first time the crypt had been entered.

Bobu

This is a small waterhole at Kumilabwaga Village.

Lupwaneta

This is a group of overhangs and small caves in what appears to be a fossil cliff above a raised beach about 1½km south of Wawela. It contains many bones.

Kalopa (Figure 11)

This cave is about 3km north of Wawela and is reached by walking along the shore (and through the sea) from Wawela village. The cave is about 4m above the beach and consists of a small chamber about three metres square, absolutely littered with bones. It is the greatest accumulation of bones encountered in any of the many bone caves we have investigated. The bones are in a complete jumble and we could find no indications of orderly burial. No shells or pottery were discovered.

Bwaga and Kaukausi

For the benifit of future explorers, we record that a cave is reputed to be near the village of Bwaga, and one or two caves near Kaulausi village. We were unable to persuade the local people to show us these caves.

The Bones

Many of the Kiriwina caves contain numerous human bones, in such circumstances as to indicate that the caves, in the past, have been used as charnel-houses. Whether these were sacred or otherwise is not clear, but the balance of evidence rather suggests the former.

Limbs, pelvic bones and skulls predominate, and there seems to be a shortage of ribs, vertebrae and finger bones. The bones are occasionally with large shells or pots, and in some caves the bones appear to be in "bundles" with a rough parallelism among the long bones.

A number of skulls have neat, round holes in the crown, about a centimetre across, and some have two holes about five centimetres apart. These could possibly be wounds made by something like a club

with a nail through it (or possibly two nails), possibly something like a star club. Alternatively the holes could have been made after death to remove the brains, or perhaps more simply to put the skull on a thread or impale it on a stick. Another suggestion is that the holes were made in attempts at trepanning; if this is so, the operations seem to have been uniformly unsuccessful for there is no sign of any healing. One skull has an irregular fracture on the side, probably quite enough to have killed the man. The teeth seem quite well preserved, still shiny white, and do not appear to be very old. The natives report that the bones are of "people before", and were definitely present when men now old were children. They do not appear to have any clear idea about when the bones were placed in the cave. In Selai, a few bones were slightly cemented together by dripstone.

Our guides gave various stories about the bones. The simplest idea is that they are the remains of people killed in battle or massacre. A determination of the age and sex distribution of the bones might help to resolve this. We saw a few skulls that appeared to belong to children. Another story is that before the Europeans came the natives buried their dead in the centre of the village, but the Europeans disapproved of this for reasons of hygine, so the bodies were dug up and placed in caves. This does not account for the holes in the skulls and people are, in fact, still buried close to the villages, though now mainly just outside.

The absolute litter of bones in Kalopa is something we have not encountered previously. Could this be something different from the usual accumulation of bones made over a long period from separate and distinct interments?

The great jumble could suggest a mass burial following a massacre or some other exceptional circumstance. Our untrained observations seemed to indicate the usual deficiency in the number of small bones present, suggesting the common two-staged interment, but the deposit requires examination by somebody more expert on bones.

The local people could tell us nothing about the origin of the bones and seemed to think that they were the remains of the victims of Doknikani, the legendary man-eating giant. No stories of cave burials were volunteered. This is somewhat surprising in view of the stories we obtained in Kitava (Ollier, Holdsworth and Heers, 1971b) of cave burials of people from Wawela who had raided Kitava. On our expedition in southern Kiriwina we did not have the services of a good interpreter, which could account for our failure to obtain more information.

Austen (1939) reports that it was a custom of the Trobrianders to bury their dead for a time and later exhume them and transfer the bones into the caves, sometimes in pots or clam shells. In Kuvwau, we found one large clam shell, and another in Labai. Fragments of pottery were found in Obaturum Cave, Wawela. Funerary pots, if originally present, would very probably have been stolen by now. There are reports that this happened many years ago at Labai Cave. There are said to be caves in the south of the island that still contain pots. Exhumation and re-location of bones would account for the scarcity of small bones mentioned earlier, and for the fact that the bones appear to be in "bundles" in some caves.

The bones we saw were of normal size, but there are reports of very large bones, which may fit with other stories of a race of giants who lived on Kiriwina before the present inhabitants.

Geomorphology

Kiriwina was once a coral atoll. Uplift relative to sea level caused the atoll to emerge and form the present island; the old lagoon is now the swampy, low-lying centre of the island, and the old reef makes a ring of hills rising to over 50m around the edge of the island.

When coral islands are of sufficient size they hold a lens of fresh water, and solution tends to be concentrated at the surface of the watertable, where primary caves are formed. Subsequently, these may be modified by collapse and growth of speleotherms. Such appears to be the origin of the Kiriwina caves.

We had thought that coral island caves might be distinctive, even possibly retaining initial cavities from the time when the island was still a reef. In fact, we were unable to detect any such features, and the caves appear to be normal karst caves.

That the caves were initiated near the watertable seems obvious from their present position and from the fact that many caves still contain water. However, we rarely saw much indication of the original solutional form because of the great amount of subsequent alteration due to collapse, and the extensive deposits of flowstone on walls.

A fairly common feature of coral island caves generally is the development of major flow lines that eventually form tunnel shaped caves leading towards the sea. On Kiriwina, only Tumwakau even approximates to this type of cave, and no large cave opens onto the shore. Perhaps the coral of Kiriwina is more prone to collapse than the average. The existance of a cenote (Kodawa) is interesting. This sort of feature is typical of young karst generally, but we had not expected to find one on a coral island.

Apart from the shelf on one wall of Kodawa, none of the caves shows any evidence of a number of distinct stages in development. From the cave evidence, it would seem that the island was uplifted fairly rapidly and that there has been only one main period of cave formation.

The geomorphology of Tumwalau poses special problems. Coral islands may be uplifted by earth movements in several distinct stages, and at each stage a new reef grows at the new sea level. With successive uplifts, the island comes to have a series of steps or terraces (Figure 12). This is most obvious on Kitava Island, which has a least five terraces, clearly visible from the sea. The situation on Kiriwina is not so obvious, but there is a bench at about 30m above sea level, clearly indicating at least two periods of uplift of the island.

The entrance to Tumwalau is at the junction of this bench and the hill inland from it, and Tumwalau appears to be an old cave largely associated with the old sea level at the time of the 30m terrace formation. Other caves on Kiriwina are more likely to be associated with the present day level.

Another unusual feature is the dominantly horizontal structure of the inner parts of Tumwalau. This reflects horizontal features in the rock structure, and suggests that this cave is formed in horizontally thin bedded limestones of a lagoonal facies.

Growing coral lives on the outer side of the reef and grows outwards, and upwards if possible without permanent emergence. Breaking waves batter the reef and eroded coral debris falls down the side of the reef, accumulating with a steep slope. In the lagoon, limestone accumulates quietly and is frequently thin-bedded in nearly horizontal strata (Figure 13). This mode of formation of coral islands produces three kinds of limestone or facies - the fore-reef which has steeply dipping bedded limestone, the reef facies which is generally unbedded and contains a lot of coral in position of growth, a lagoon facies which is horizontally bedded.

Nearly all the Trobriand Island caves are formed in the reef facies. But Tumwalau appears to be one cave that has extended into the lagoon facies, which accounts for its horizontal structure. More mystifying than the structure, however, is the extensive development of phreatic features, that is solutional features developed beneath a watertable. One might have expected that caves formed high on the island would be most likely to develop vadose features, that is formed above the zone of water saturation, but the reverse is the case. The best development of phreatic features is found in the caves

at high levels, such as Tumwalau, but also including some of the high caves on the island of Kitava. The best development of vadose features is found in caves close to the present sea level, such as Bwabwatu cave on Kaileuna Island.

This anomalous suitation is difficult to explain. One can only surmise that any phreatic caves being formed at the present time are inaccessible to exploration, and that in the older, higher caves, collapse and modification has rendered the phreatic portions accessible.

Acknowledgments.

For help in locating, reaching and exploring the Kiriwina caves we wish to thank Mr. M. J. Eden, Mr. T. Ward, Mr. T. Cosgrove and Mr. B. Egloff. Tumwalau was throughly explored before our visits by Mr. R. Lawton, who made his extensive knowledge of the system available to us. We also wish to thank G. Heers who assisted the authors and R. Lawton in surveying the cave.

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INTERNATIONAL CONFERENCE IN TURKEY

The Speleological Society of Turkey is organising an international speleological congress for the period September 3rd - 24th, 1978. There will be field trips in Turkey after the conference. This could be very interesting as there are extensive karst areas in Turkey. Correspondence should be addressed to:

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P.K. 229 Bakanliklat,
Ankara,
TURKEY.

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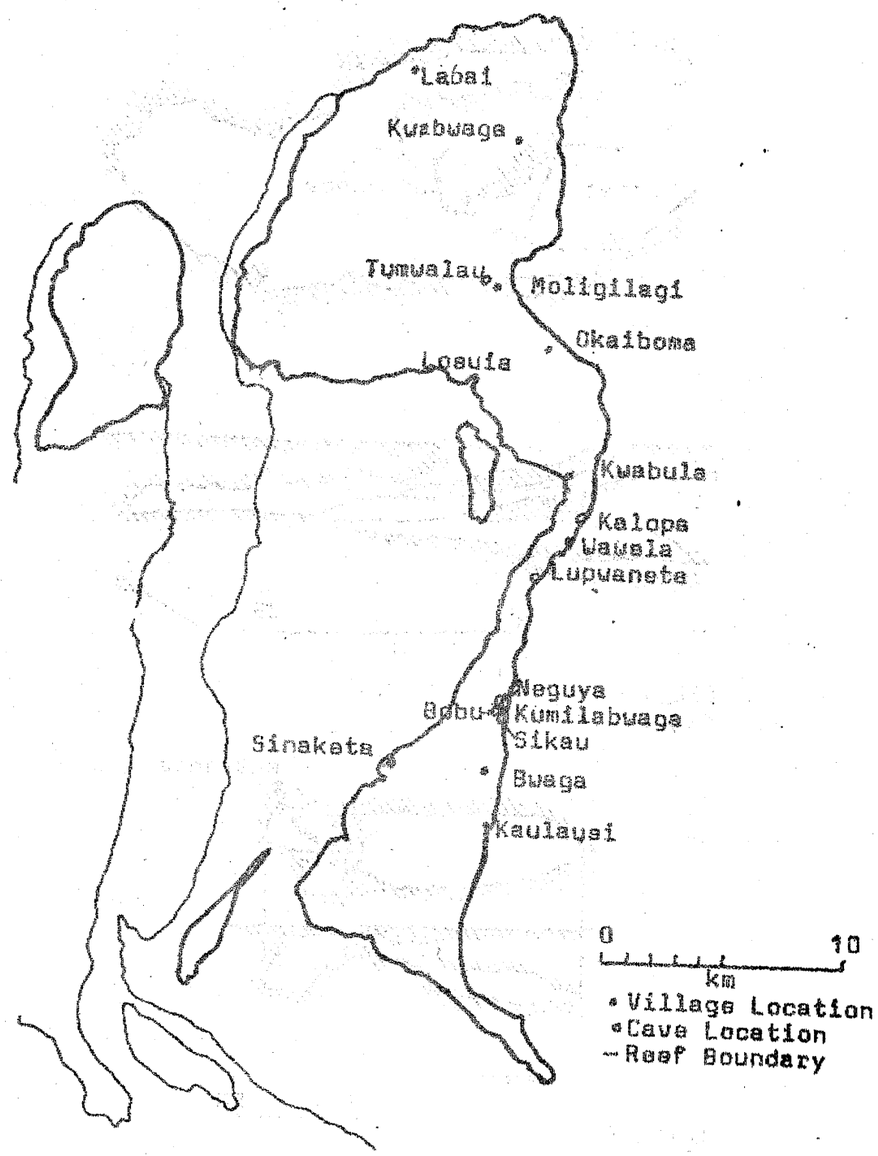
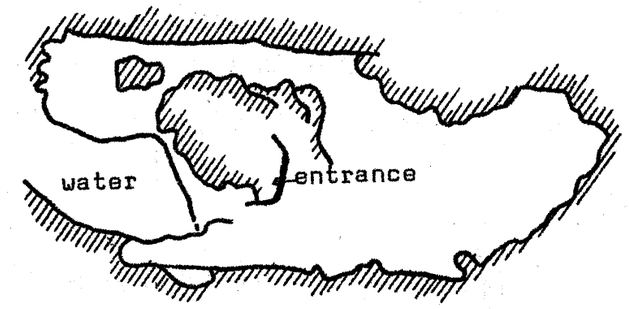
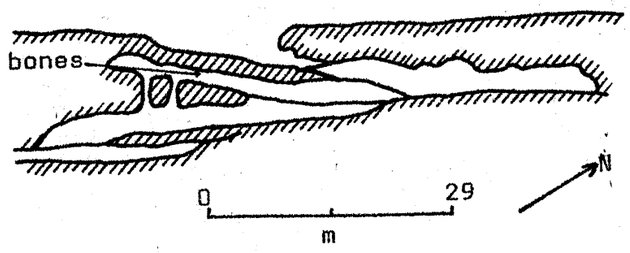
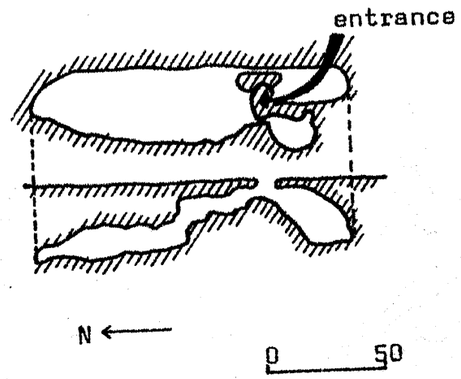


KIRIWINA ISLAND Cave and Village Locations
Figure 1





SELAI
figure 2



TUWERIA
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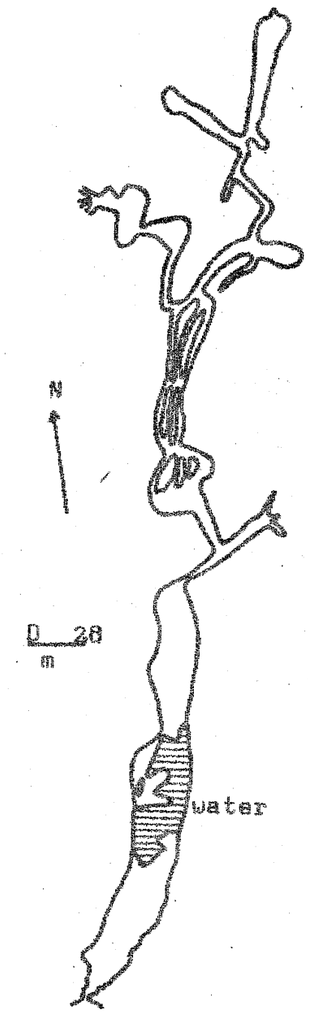
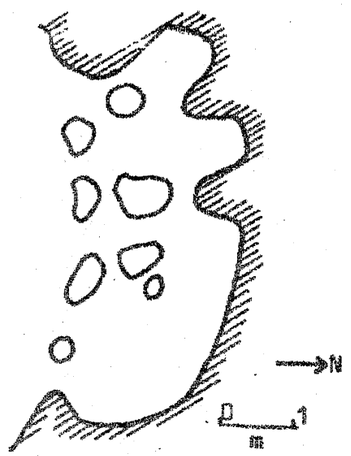
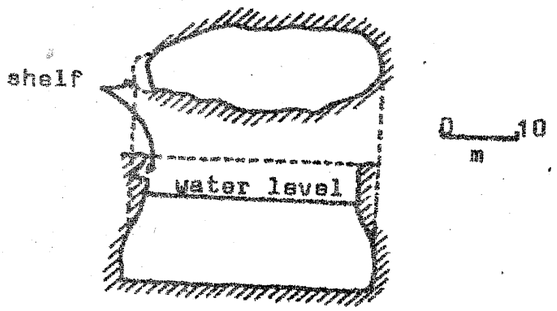


TUMWALAU
figure 4



KUVWAU
figure 5



KODAWA
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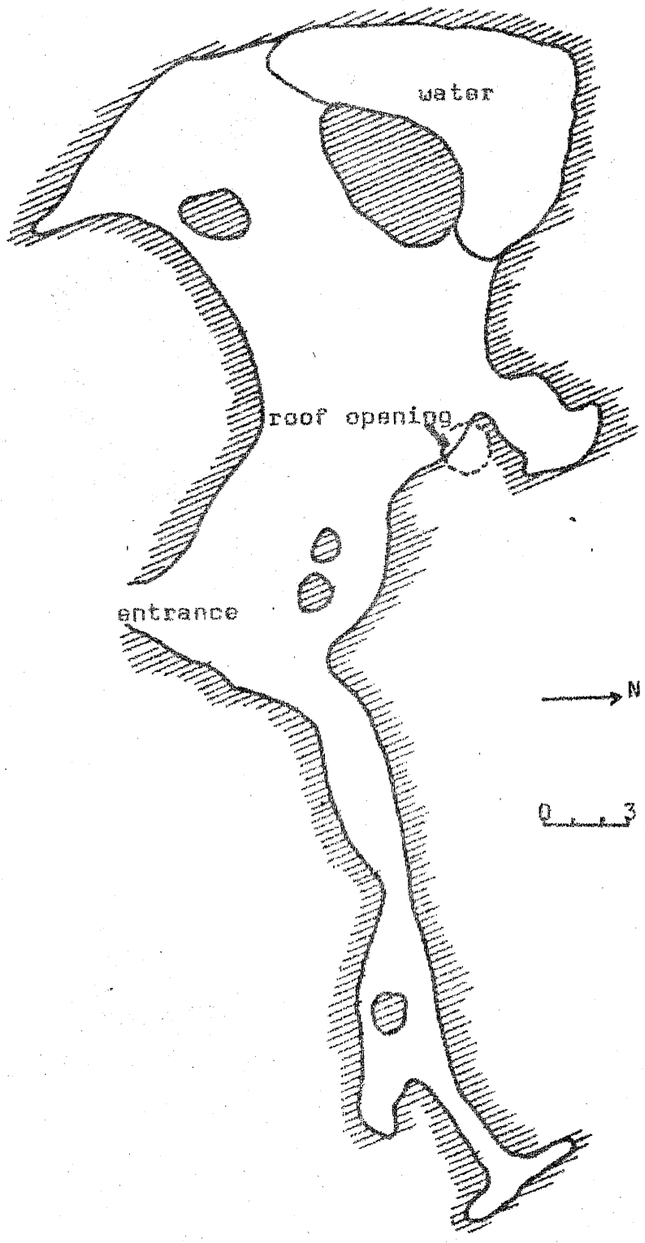

MWAGAI
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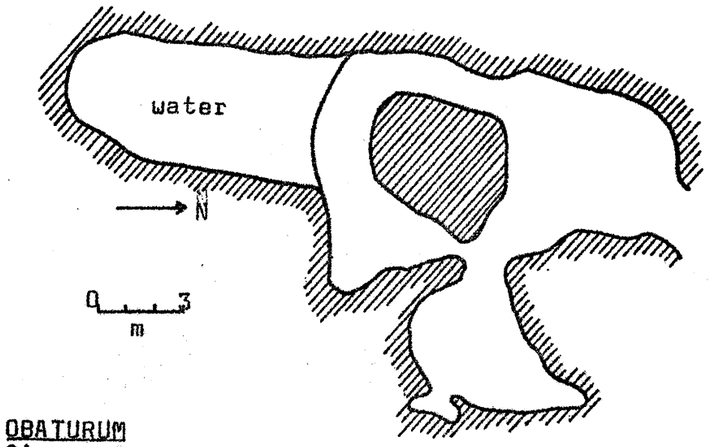
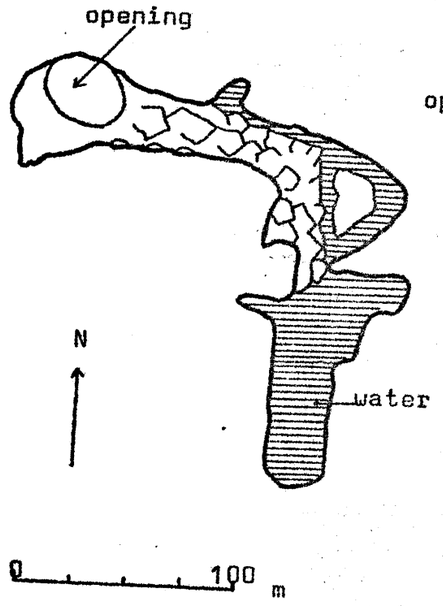
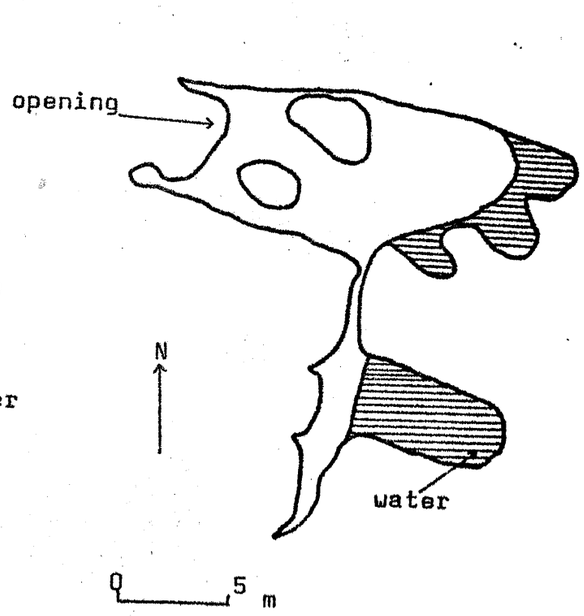


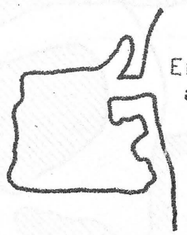
OBATURUM
Figure 8



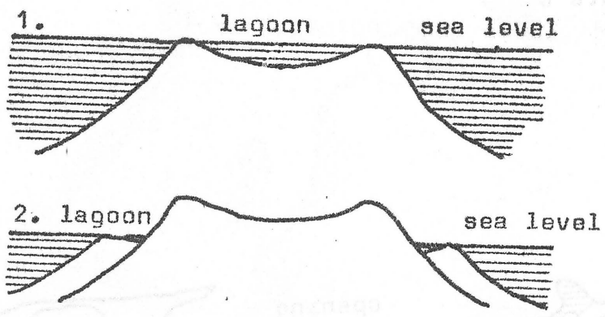
SIKAU
Figure 9



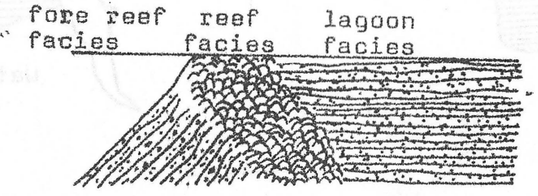
NEGUYA
Figure 10



KALOPA
figure 11



Successive stages in uplift of a coral island.
figure 12



Distribution of facies in a coral reef
figure 13

TWO PHOTOGRAPHS OF HUMAN BONES IN KALOPA CAVE.

HÖLLOCH - EUROPE'S LARGEST CAVE

Thomas Kesselring* and Willi Grimm**

History

Hölloch (Hell-hole) is situated in the middle of Switzerland. At the moment the largest cave of Eurasia and within world ranks, only the Flint Ridge - Mammoth Cave is exceeding it. There is just one entrance which gives access to more than 130km of passages. It takes two days of travelling underground to reach the remotest regions of Hölloch. However this is only possible, when all the needed equipment (ropes, ladders and rubber dinghies) are set in place. In the speleologicial scene of Europe, Hölloch is a unique phenomenon. The following article should give the Papua New Guinean caver some information on this, the largest cave in Switzerland.

Situation, Karst Hydrology and Geology

Hölloch lies in the Muotatal (Muota Valley), in the canton of Schwyz, 15km east of Vierwaldstättersee (lake of Lucerne). In comparison with the huge cave system of Hölloch, the karst area where it is situated is rather small. The water in Hölloch comes from a surface of only 22 km². Yet, the annual rainfall is very high: an average of 2400mm. All this water emerges from a spring on the valley floor. The discharge in winter is 300 litres per second, and in summer 1000 to 5000 litres per second. The resurgence lies about 640 m above sea level. The highest point of the collecting surface is 2314m a.s.l.. Hölloch's lowest point is a short distance beyond the entrance in a side passage. Here a siphon with its surface at the same level as the valley resurgence was dived 15m below this level. Hölloch's highest point is to be found deep within the cave system, at the top of an aven, about 30m under the surface. Hölloch is in Europe, one of the few caves where passages mount many hundreds of metres upwards. Its entrance is at 734m a.s.l., and the passages between 625 and 1450m a.s.l.. Today we distinguish three parts which are connected with each other.

a) The major system, starting from the entrance goes 6km (beeline) into the mountain, ranging in altitude from 640 to 1000m a.s.l.. It dips from south to north, where the passages submerge at the groundwater level. To reach the ends of this major system one walks about 10km of tunnels, mostly steeply ascending or downdipping. Altogether one climbs about 700m difference in height,

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only to be at the same level again as one started.

b) Another system lies between 980 and 1450m a.s.l.. It overlies most of the first half of the major system. Up to now over 30km are surveyed in this part of the cave, known as "Hochsystem" (High System).

c) The third system also lies at about 300m above the major system. However, it overlies the passages towards the end of the major system: "Göttergang" and "Blockgang" (Passage of the Gods and Passage of the Boulders) lie at 1000 to 1250m a.s.l..

These three parts are suitated in the "Schratten" limestone of the lower Cretaceous. The major system passes through the "Silbern" formation. They are separated by an impermeable stratum. The systems in the two formations are connected at two points: "Regenschlot" (a 90m high aven) and "Wassergang" (a tight artificially enlarged squeeze). To pass through it, one lies in water at 4.5°C.

Exploration Teams

The Hölloch Research Group (HRG) is the body co-ordinating all the exploration. Its scientific leader is Prof. Dr. Alfred Bögli (Professor of Karst Phenomena, Department of Geography, University of Frankfurt D, and Professor of Karst Hydrology, Teachers College, Hitzkirch CH). Although A. Bögli and other cavers belong to the Swiss Society of Speleology, HRG remains an autonomous organisation, independent of SSS. Its founders came originally from the Swiss Alpine Club, but, HRG is independent of this organisation as well. For the last 10 years however, a group of SAC Bern members have worked under Peter Bürgisser and Res Wildberger. They push very difficult leads in the region of "Regenschlot" and in the western high system, in loose association with HRG.

History of Exploration

Hölloch seems not to have been known before 1870. Even though its entrance is suitated at the end of a chasm, close to a village, the first entry did not take place until 1875. The discoverer, Alois Ulrich, is a native of Muota Valley. Up to 1901 the cave was not explored beyond 900m where a 40m high vertical wall, "Böse Wand" barred the way. It was January 1902 when this obstacle was mastered and some 3600m were mapped. In 1907 a single caver penetrated two more kilometres but mapping was not carried on. A Belgique Society Ltd. commercialised some 600m for tourists. Unfortunately, high water flooded this part every year and the electric instalations were torn away. Disappointed, the cave was neglected for several years. In 1949 a new exploration period started. It

It was the SSS (leader André Grobet) and the SAC (leader Hugo Nünlist) who recommended a serious survey. In 1950 Prof. Alfred Bögli and three fellow cavers were trapped by high water, cut off from the outside for ten days. The news swept across Europe and made Hölloch a quite famous cave. Since this accident, the exploration period is restricted to winter only, December until February.

The major system was basically explored and mapped in 1959, its 70th kilometre mapped in 1960. At this time, Hölloch was the largest cave in the world. Besides the tunnel like passages (w = 10m, h = 5m), numerous small and narrow tubes were known. Many of them in places, subjected to the yearly flood. Penetrating further is dangerous, even in winter. Elliptical profiles prevail in the major system. Even though this part of the cave yields an impressive variety of shapes, it does not show any dripstone formations and only a few lakes and creeks.

Since 1965 this has changed. With the aid of up to 12m long scaling poles, avens and chimneys were conquered. In this manner promising leads were found. After blasting away a chocking rock, the way was open to the high system. At the same time, Max Gubser discovered the "Göttergang" in the remotest part of the cave. Hölloch was no longer a single system ; there were two more to be explored.

Since 1966 HRG works in small groups and members interchange freely. The long stays underground climax in well sitated bivouacs. The first was set up in 1951, two years later the second. In 1966 seven, and today even 12 bivouacs. Some of the keen explorers have sleeping bags deposited in various places. Even in the fifties, it was common to stay 5 to 8 days underground. The peak of exploration is between Christmas and the third of January. With the break through to the high system, it became necessary to erect bivouacs deeper within the cave. Without them it would have been impossible to reach virgin passages unless 3 days were spent underground. The group of Paul Berg's was the first to realise several long duration expeditions in the same winter. Some cavers spent more than 500 hours (21 days!) in the one season in Hölloch. The longest stay in a row was 19 days.

What are the Results?

a) High System

From the two bivouacs placed in the high system (1966) 4 to 7km were mapped each year. In 1969 results decreased and the leads seemed to become hard to push. Yet, it was in this time, some of Holloch's most beautiful passages were found. In an upper floor of the high system, 200 - 250m underneath the surface (400 - 500m above the entrance) an intricate tunnel was discovered, bit by bit. Flowstone formations normally rare in Holloch are abundant and very colourful. At the same time a series of creeks and huge underground canyons were surveyed, totalling more than 5km. Holloch contains several impressive streams in the upper levels, some 300m above the dry passages of the major system where every drop has to be searched for.

"Regenschlot" (rainy aven) rigged in 1970 is a new access to the high system. Both routes would create some difficulties should there be an accident. The passages are very narrow for long distances. Working here is the group of Pedro Ghelfi in a new section about 300m above the high system. It is here that one has reached the highest point in Hölloch - only 30m below the surface. Here too, the first live bat was recorded in 1976!

There is not much hope of gaining more kilometres up here. The few passages still to be explored are difficult and a long hazardous way leads to them. Yet, three spots are only 60m below the surface. A lot of chemines should be checked, mainly in the region of the "Ostschächte" (Pits in the East). Here in an area 140x70m, two kilometres of passage has been mapped: 70% vertical, 20% very steep and the remaining 10% horizontal. A promising lead is an almost 100m long tube, 30 - 40 cm high, 10 cm of it cold ($4\frac{1}{2}^{o}$C) water. Although a strong breeze blows, nobody was keen enough to negotiate further.

b) "Göttergang" and "Blockgang" Systems

In February 1967, 12km away from the entrance, a 50m high aven was climbed artifically. Its continuation was a six metre high fissure passage. Here the remotest bivouac was erected. Only 2minutes away Holloch's top attraction waits: The "Schwarzer Dom" (Black Dome), a caverm 106 by 66m and up to 80m high. Its entrance well up an overhanging wall, 50m above the floor. This giant room will be up to a third under water each summer. A second entrance into it was found in February 1976 in its ceiling. Up there another fissure passage was mapped a few metres above the ceiling. It contains some of the most beautiful dripstone formations Switzerland has to offer. The end of this fissure passage, reached at New Years Eve 1976, is blocked by rocks. On the other, is most likely the "Blockgang". The "Blockgang" was conquered after months of digging through sand and mud and after climbing a hundred metre almost vertical passage. Should the two passages "Göttergang" and "Blockgang" be joined together, it would mean a second high system with two entrances. Here two difficult avens are still unexplored. Today Hölloch's total length is 135km.

Surface Exploration

Each summer Professor Bögli conducts scientific research on the karst above Hölloch, without much success until summer 1975. Two small caves of about a hundred metres length and a 70m deep pit were found. The big surprise came after blowing up a bottle neck in a narrow tube with a strong breeze. A series of up to 70m deep shafts led underground. In summer 1976 several kilometres of passage was mapped and long stretched halls were discovered. The major hazard is the tempor/ flooding of parts of the system. It was early this year when cavers could follow down the summer flood ways to a depth of 371m. "Mammut - Münster" (Mammoth Dome) was found, a gigantic room of 110 x 85 m and a height of 77m! Its volume being about 260,000^{3}m. Today, 5,671.5m are mapped. 1.5km more are known. This cave is called "Schwyzerschacht" (Pit of Switz - Switz is the canton in which Hölloch lies and "Schwyzer-schacht" is explored by cavers from Switz). "Schwyzerschacht" is only 2km from Hölloch. It is not impossible to connect the two caves in the area of "Göttergang" or "Blockgang". However, some 300m in elevation change has to be overcome.

Caving Equipment Necessary

In all parts of the cave where exploration is going on, ropes and even ladders are left in place. Many of these spots are visited every year. Some wire ladders have been the cause of accidents because of total corrosion. Thus, they have to be replaced frequently. A caver once fell 40m, due to a ladder rip-off but miraculously was not severly injured (the body belay also failed).

Until a few years ago all the exploring groups of AGH (HRG) used ropes and wire ladders. However, since 1972 the group of Paul Berg has also used jumars, rappel racks and other related devices. Many of the avens have been conquered with the aid of scaling poles. They consist of 2m long aluminium tubes joined together by sleeves to give 12m poles. The three lakes which have to be crossed are equipped with solid plastic boats. Previously, inflatable rubber dinghies were used. Over two more lakes a tyrollienne is set.

The AGH (HRG) today has 70 members. Many of them are active mountaineers, others have specialised in speleology. So it comes, that different methods of climbing and even rappeling are practised. Dedicated mountaineers climb whenever possible, and descend in a Swiss seat. Dedicated cavers climb with pitions and descend with the rack or similar gear. Each year a technical training camp is on the programme to introduce novices. A search and rescue group is well organised. The result of a severe accident in January 1969 in the "Göttergang" : A caver with a broken leg after a rock fall. The rescue went on for 5 days and convin ed every member of the necessity for such an organisation.

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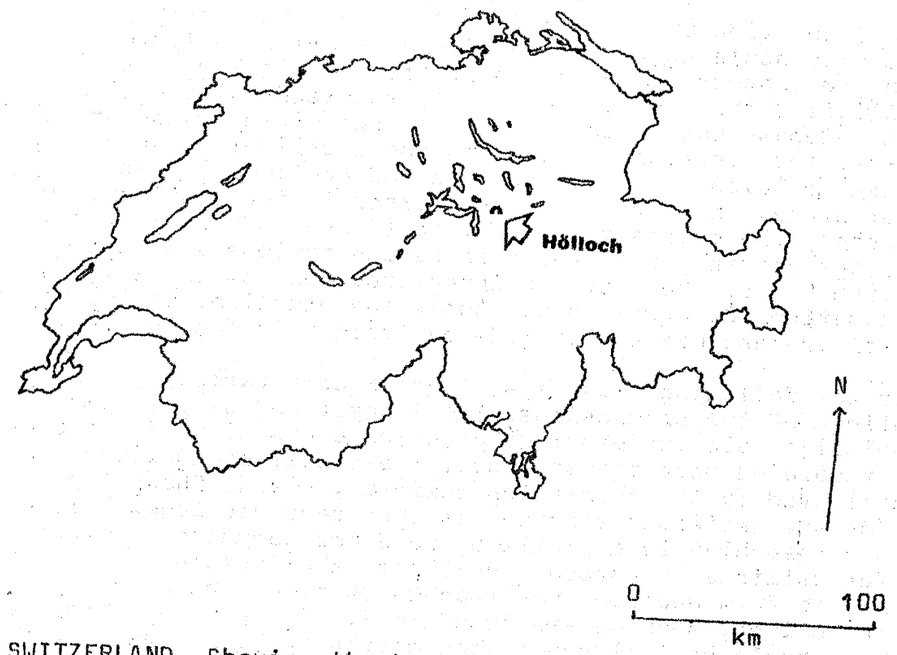

SWITZERLAND Showing the Location of Hölloch

IMPRESSIONS OF THE 7TH INTERNATIONAL SPELEOLOGICAL CONGRESS

R. Michael Bourke*

The 7th International Speleological Congress was held at the University of Sheffield, England in September, 1977. At the week long congress, papers were presented at 10 sections and 7 specialist seminars, such as karst morphology, hydrogeology, documentation and mountain karst. Meetings of the 12 commissions of the International Union of Speleology were also held and the 4th International Cave Rescue Conference met. Caving and tourist excursions were organised during the days, and the evenings were devoted to slides and movies. Caving camps and excursions in Yorkshire, Wales and Ireland were run before and after the Sheffield meeting, and certain specialist symposia met at various places in Britain after the meeting. There were some 750 delegates from 28 countries at the congress. Papua New Guinea was represented by Michael Bourke** and Tim Sprod. Most delegates came from Europe, but there was also a large contingent from the United States, and smaller groups from Australia, Canada and other countries.

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** I am grateful to the University of Queensland Student's Union for a grant of $A40 to Jean and myself to attend the Congress. This was organised by the University of Queensland Speleological Society.

At any one time there were from five to nine meetings in progress, so one person's appreciation of the Congress would be quite different to another person's. Apart from the lack of translation facilities, the Congress was well organised. At registration, each delegate was given an envelope containing, amongst other things, the Congress proceedings and excellent guidebooks of the Yorkshire Dales, Southern England and South Wales, and Irish karst areas. The first day was devoted to the usual opening speeches, the presidential address ("Then and Now") by Dr. Tratman of Great Britian, and papers on caving regions and caving in the British Isles. The last mentioned provided useful background information for overseas visitors. The highlight of the presidential address was a film made by Tratman in the 1930's.

Over the following five days, I attended a variety of papers and meetings of the commissions. The longest and deepest caves commission held two meetings at which conventions for surveying and recording were thrashed out. These will be published and distributed by the commission chairman, Claude Chabert of France. One of the decisions reached was that cave development length rather than plan length will be used for purposes of records. The former utilises traversed cave length and includes the height of avens. No firm decision was reached as to whether the depth of large dolines, such as are found in P.N.G. and other tropical areas, should be included in the depths of caves that are found at the bottom of the doline. However the concensus seemed to be that for vertical walled dolines, such as the enormous doline near Tuke Village, New Britian, the depth would be included in the cave depth.

Country by country lists of the longest and deepest caves in the world were compiled by Chabert and published in a special edition of Spelunca in time for the Congress (Chabert et al., 1977). These lists show that there are 45 caves from 12 countries surveyed as longer than Selminum Tem, half of them being in the United States. There are 97 caves from 15 countries documented as deeper than Bibima, 74 of which are in France, Italy, Spain or Austria. The largest river cave noted in this report, apart from Tobio in the Southern Highlands, is in Dumanli Cave in the Taurus Mountains of Turkey. The resurgence of this cave has a mean flow of about 50 m^3/sec (Chabert et al., 1977). If the estimated river flow in Tobio (85-113 m^3/sec) is accurate, the record for the largest cave river is held by Papua New Guinea.

I attended two sessions on karst. At one of these (tropical karst) Dave Brook of England gave the only paper on Papua New Guinea. In an interesting presentation, Brook traced the development of Selminum Tem and related this to uplift and glaciation. Dr. Balazs of Hungary, in his paper "The Optimal Geo-climatic Provinces of Karstification", defined three regions where karst development is likely to be greatest. These are the Appalachian-Caribbean

Province, the European Province, and the South-east Asian and Pacific Province. The last named has the greatest area of the three provinces and includes the islands of the Bismarck Archipelago, New Guinea, the Indonesian Archipelago, Malay Peninsula and parts of mainland Asia that include Indochina, Thailand, Burma, Southern China and the Himalayas. It is also the least known karst region in the world.

Using some of Balazs' data, S. Lang of Hungary demonstrated a linear relationship between annual rainfall and karst denudation. The highest figure for both parameters was from New Britian. From a paper by G. A. Brook (U.S.A.) and D. C. Ford (Canada), I was interested to learn of a form of tower karst discovered in 1971 in northern Canada. Tower karst is not restricted to the humid tropics it seems.

My most interesting day was spent at the Cave Rescue Conference. Papers on cave rescue organisation in Wales and Yorkshire and on a new Swiss stretcher were presented, amongst others. A demonstration of particular relevance to Papua New Guinea cavers showed techniques whereby a caver could help a companion in trouble on a single rope without the help of other cavers. The techniques utilized equipment that would normally be carried, such as karabiners and slings. I came away from the day with a greater awareness of the risks taken in earlier days, particularly on reconnaissance trips in isolated areas.

There were numerous other interesting papers presented and these and others can be read in the Congress Proceedings which are available from B. Ellis, 30 Main Road, Westonzoyland, Bridgewater, Somerset, TA7 0EB, England for about £12. Fortunately most papers are in English with some in French, German and Spanish . The requirement for pre-publishing the proceedings means that brief abstracts only are given for some papers. Most of the papers in the proceedings concern caves and karst of Europe including the U.S.S.R.. There are a limited number covering North America (Canada and U.S.A.), Australasia (Australia, New Zealand and P.N.G.), the Caribbean- Central American region, Africa and Western Asia. Personally I would have liked to have seen fewer scientific contributions from Europe, and more papers of the "Caves of Mindanao Island" or "Our Expedition to Peru" variety.

There was a lot of interest in P.N.G. and Irian Jaya at the Congress. For many people, the latter is the last great unknown. I spent many hours with French, Swiss, Austrian, Belgian and English cavers discussing prospective expeditions to Papua New Guinea. I presented about 50 slides from P.N.G. with a few from S.E.Asia, New Caledonia and Australia one evening. The slides that received the best reception, both at Sheffield and elsewhere, were those of the giant dolines of New Britian.

People were incredulous that nobody has descended the spectacular doline near Tuke Village (see cover photo Nuigini Caver 5(1)). Another evening Sid Perou showed rushes from the New Guinea 75 film together with slides. I could not attend, but heard that the film is very good and was well received.

After the Congress, we went to the Yorkshire Dales on one of the official camps. This was attended by American, German, Australian and Canadian cavers together with the English guides. The Dales is a beautiful area. I was especially taken with the limestone fences. A tiny village with two caving supply shops and a caver's pub wasn't hard to get used to! The accommodation was at Clapdale Farmhouse, a medieval fortified manor house that has been modernised by the Lancaster University Speleological Society. It even boasted a drying room. I did through trips of four systems: Gaping Gill (11km passage lenght, 156m deep) that included a winch ascent of the 103m main shaft; a 10 hour trip in the complicated Ease Gill Cavern (33km long) where we were lost for some time at one stage; a through trip from Swinsto Hole to Valley Entrance in the West Kingsdale System (8km long), memorable for the beautiful abseils down wet, clean pitches and the wet canals; and a quick trip through Short Drop Cave (2.4km long, 55m deep). In the latter we learnt that a Yorkshire caver's definition of a "dry" cave means you only get wet half way to your knees. (Lengths and depths follow Brook et al., 1972-1976).

The field trip and Congress were enjoyable and I renewed old friendships and made new ones. It was especially good to meet cavers from Europe and the U.S.A. with whom I had corresponded but never met. As always at such gatherings,the informal meetings were as valuable as the formal ones. We were almost overwhelmed by the hospitality of the English cavers who had been in P.N.G. in 75 - repayment for the hospitality they had received there, they explained. Any Papua New Guinea caver can be assured of a good reception Yorkshire. The next Congress will be in the U.S.A. in 1981. If the American cavers we met in Sheffield are any indication, it should be good fun.

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THE CAVING SCENE

Karst Investigation. Kevan Wilde, Jim Farnworth, Alan Goulbourne and Malcolm Pound spent from the 24th September - 2nd October working in the Ok Menga gorge near the Ok Tedi Copper Mine project. They were investigating a steep walled limestone gorge for the Geological Survey of P.N.G.. An article appeared in the Post Courier of Monday, 14th November on the trip and an article will appear in Nuigini Caver in due coura .

Overseas Expeditions. It seems that Papua New Guinea will be receiving a steady number of expeditions from overseas over the next few years. Plans for the Spainish expedition reported in N.C.5(1) are well advanced. A ten member team (9 men, 1 woman) from Barcelona plans to visit the Muller Range and hopes to co-operate with "Atea 78", the Australian Expedition that will be in the area at the same time. The Spanish team will be away from Spain for about six weeks from mid - July to late August. The Chimbu has been chosen as an alternative area in case logistic or financial problems prevent them getting to the Muller Range.

The aims of the Spainish expedition are mainly sporting. A comprehensive prospectus has been produced; much of the necessary funds are on hand; and training in the Pyrenees has been underway for some time. Michael Bourke, who is currently in England, did a four day trip to Barcelona in September to advise on Papua New Guinea conditions. Mike reportsthat, following the briefing, the expedition members have a greater appreciation of the likely logistic problems.

The second continential expedition to P.N.G. is from France. An invitation for participants appeared in Spelunca, journal of "La Federation Francaise de Speleologie". Aims are both sporting and scientific. The target area has yet to be decided, but they are interested in the giant river caves and dolines on New Britain, and the Saruwaged and Hindenburg Ranges. A 10 - 12 member party is envisaged. A reconnaissance trip may come out in 1978 and the main expedition the following year.

Also planned for 1979 is a Swiss expedition organised from Geneva. A ten member team is planned and the aims will be mainly scientific. The area to be visited is yet to be decided, although the Lelet Plateau of New Ireland is one possibility being considered.

A joint Austrian-Belgian expedition is being planned for 1980. A ten member party in the field for six months is envisaged. They are mainly interested in exploring vertical caves. The target area has not been decided yet. Finally there is talk of of the British returning to the Hindenburg Range in 1980.

Most of these expeditions are seeking local cavers as members to assist preparations from the P.N.G. end and help with Melanesian Pidgin in the field. Papua New Guinea cavers interested in joining any of the expeditions can obtain contact addresses and more information from Malcolm Pound or Michael Bourke(10A Rosslyn Hill, Hampstead, London, N.W.3, England).

North Solomons Province. Hans Meier reports the addition of Bill Streeter to the active group of cavers in the North Solomons. More survey work in Taroku has brought the efflux length to 1346m and the inflow length to 211m. They are not hopeful of joining the two sections. Several trips to the Borvei area has failed to find any caves or limestone but there are a couple of places still to be looked at.

British New Guinea Expedition. David Brook, a PhD student in textile physics, will be presented with the Cuthbert Peek Award, at a reception organised by the Royal Geographical Society, for the speleological expedition which he led to Papua New Guinea in 1975. The Award which carries with it an honorarium of £50 will be presented by Sir Duncan Cumming, President of the Royal Geographical Society. The members of the expedition have chosen to donate the £50 to the Ghar Parau Foundation which exists to promote future caving expeditions.

The New Guinea expedition is described by David Brook, President of the University's Speleological Association for the past ten years, as the most ambitious caving expedition ever attempted. The five month expedition took two years to organise, and when the 24 members of the team set off in July 1975, they took with them 14 tons of equipment. Reconnaissance groups visited 1,000 square miles of limestone terrain varying in altitude from 2,000 to 13,000ft between the Star Mountains and the Strickland Gorge. Areas containing caves of world class depth potential were located and a multitude of caves were explored. Surveying eventually confirmed that in Selminum Tem they had stumbled upon the longest and most impressive cave system in the Southern Hemisphere.

As a result of gaining this award, David Brook and three other members of the expedition have been asked to join the Royal Geographical Society's main expedition for 1977/78 which will be a 15-month expedition to Borneo in which 40 leading British and Malaysian scientists will be taking part for periods ranging from a month to over a year. The location is to be the recently gazetted Gunong Mulu National Park in Sarawak which contains some of the most remarkable and diverse tropical rain forest in existance. The task of the four cavers will be to explore as far as possible the river outlets from the 5,000 foot mountain of limestone where there are known to be four or five big river caves. The four will be setting off in March 1978 and returning in the summer. From Reporter No 105 April 25th, 1977.

(Leeds Uni)

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