UK SPELEOLOGICAL EXPEDITION TO HAWAI'I ISLAND 1979

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Abstract:

This expedition, which lasted for seven weeks in the summer of 1979, involved seven UK cavers with four other occasional visitors, and had the stated objectives:

- To locate, explore and map as completely as possible the drained segments of the Mauna Ulu (Kilauea) tube system as a basis for morphometic analysis and interpretation of the dynamics on the emplacement of this type of lava flow,
- To investigate generally the occurrences and forms of lava tube systems (as identified in lava tube caves) on the volcanoes Mauna Loa and Kilauea.

under the leadership of the late Dr Chris Wood.

Prior contact/liaison with both the National Park HQ and Hawai'ian Volcano Observatory provided permission to stay and work in the Park throughout the visit, often in areas prohibited as dangerous to normal visitors.

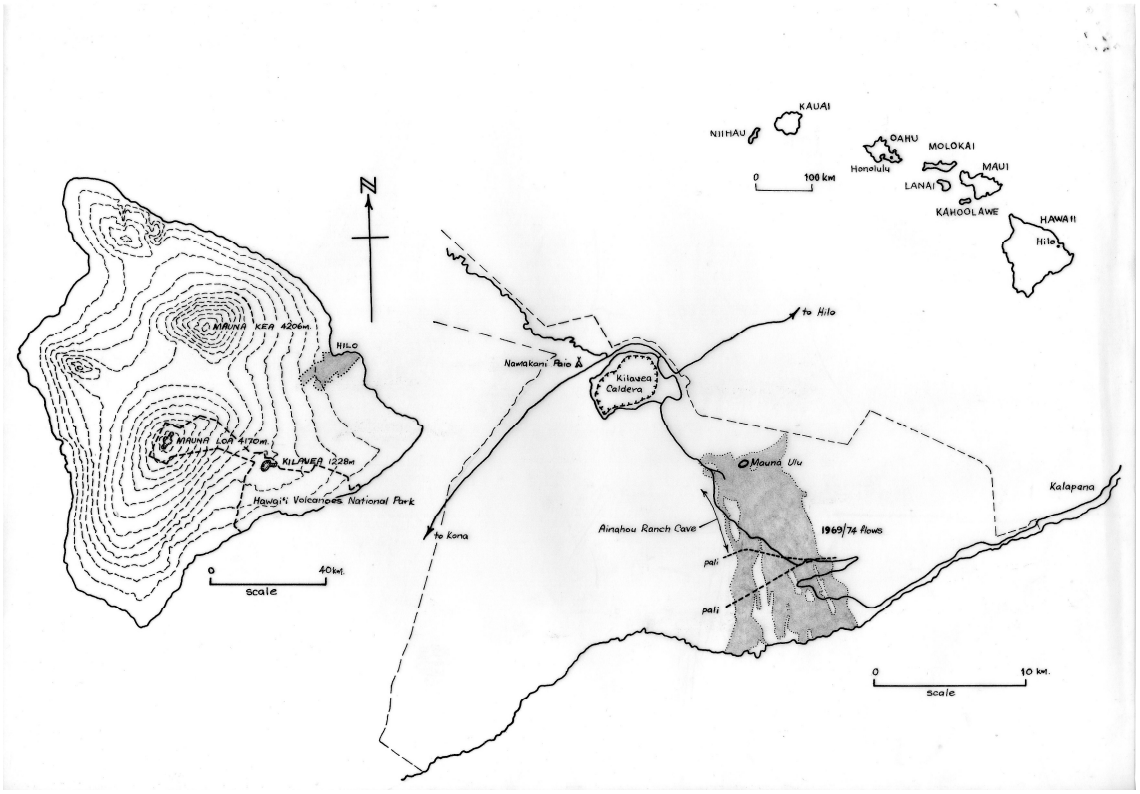
Many days were spent walking the 1972/74 flows from Mauna Ulu crater to the coast and examining its features. Near the coast a large entrance led to 1.3 km of lava tube containing the most spectacular display of lava formations. It was named Apua Cave.

Ainahou Ranch Cave, which had previously been partially explored for about a mile and was still going, was located and extended (including the discovery of a 200 year old human skeleton) and surveyed with 22 entrances/collapses to 7.11 km with a vertical range of 352 meters.

Kazamura Cave was located and surveyed to 11.55 km length and 260 meters vertical range.

In all 20 caves were visited, 22.4 km surveyed and a further 3.9 km visited/checked out.

> "There are persistent rumours of caverns many miles long on the island of Hawaii. There the caves are largely unexplored and almost wholly unmapped because of their veneration as tombs of ancient royalty – and the grand-parents of commoners still living"
>
> (Bill Halliday, 1966)



Location map

INTRODUCTION

Back in 1968 little did I realise when I put the case for the Shepton Mallet Caving Club going to Iceland in 1970 to investigate lava caves as being something "different", how much I was subsequently to be involved with this other 'variety' of caves. Prior to 1979 I had visited more than 45 different lava caves in Iceland, Tenerife, United States and Kenya and surveyed over 15.7klm of lava cave. On Tenerife in 1973 we had extended and surveyed Cueva del Viento from a length of 6181m to 7422m which at that time was reckoned to be the longest known lava cave in the world. Why this interest in caves of which we have none in the UK, I find difficult to explain. However, enduring the trials and rigours that this involved, in 1979 brought an invitation from the late Chis Wood and a just reward of a trip to Hawai'i to investigate yet more lava caves – it has to be said and many will have noticed this – that one of the consolations of lava tube caving is that they are often found in relatively attractive locations. A decade earlier we had learnt there were lava cavers in Hawai'i (Thurston Lava Tube being the most often mentioned) – not for one moment did I ever expect to be going there. Thus much the world had shrunk over the decades. It also satisfactorily resolved the question of a honeymoon, for as Kirsty pointed out not everyone gets a honeymoon in Hawai'i – albeit on a caving expedition!

General

The party comprised (primarily) five Shepton Mallet Caving Club members and two Chelsea Speleological Society members with 4 other visitors joining us at various times, and lasted seven weeks with people there for between three and five weeks (in our case four weeks) apart from Chris Wood who as leader was there throughout. The result was that, except for the final week, we always had at least four cavers present.

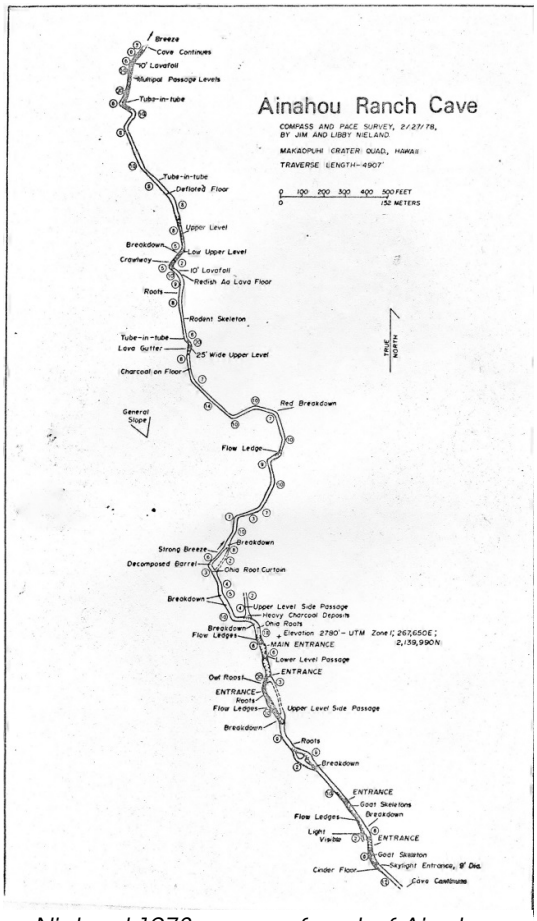
The stated objectives were

(i) to locate, explore and map as completely as possible the drained segments of the Mauna Ulu (Kilauea) tube system as a basis for morphometric analysis and interpretation of the dynamics on the emplacement of this type of lava flow;

(ii) to investigate generally the occurrences and forms of lava tube systems (as identified in lava tube caves) on the volcanoes of Mauna Loa and Kilauea.

Mark Twain described the islands as "the loveliest fleet of islands that lies anchored in any ocean". Of the climate Robert Louis Stevenson said it "sweetens one's bones" and, incidentally, the Hawai'ian language has no word for weather.

Departing on Friday 13th July from Edinburgh, Scotland, by train was asking for trouble and about ten minutes out the train broke down – however this was but a foretaste. Being grant-aided it was felt we should fly the cheapest route rather than direct, thus we were due to fly Heathrow – New York – Seattle – Hilo. Our route being through Seattle enabled us to stay overnight with Bill Halliday at 1117 36th Avenue East(?). He had laid on a reception for us and his Cascade Grotto specialists were there with a view to a firm agreement on measuring lava tube caves. We had always differed with the Americans on this, basically if there is one or more collapses/entrances part way along the length of the cave they regarded each section as a separate cave, irrespective of (as we saw it) the whole cave being formed at the same time with the roof collapsing either at the time of formation or subsequently. The fact that it was also 5.00 am our time probably didn't help; however WRH did give us a photocopy of an account 'Visiting Hawaiian Caves' by Libby and Jim Nieland from the Oregon Speleograph Sept. 1978 of a trip to Hawaii in February 1978, including a description and part survey of Ainahou Ranch Cave which had been explored for just under a mile and was still going both up and down flow. After more adventures, by Royal Hawaiian Airlines, we made Honolulu and then had two additional island 'hops' on Aloha airlines to get to Hilo, where after 59 hours travelling we had arrived 48 hours later.



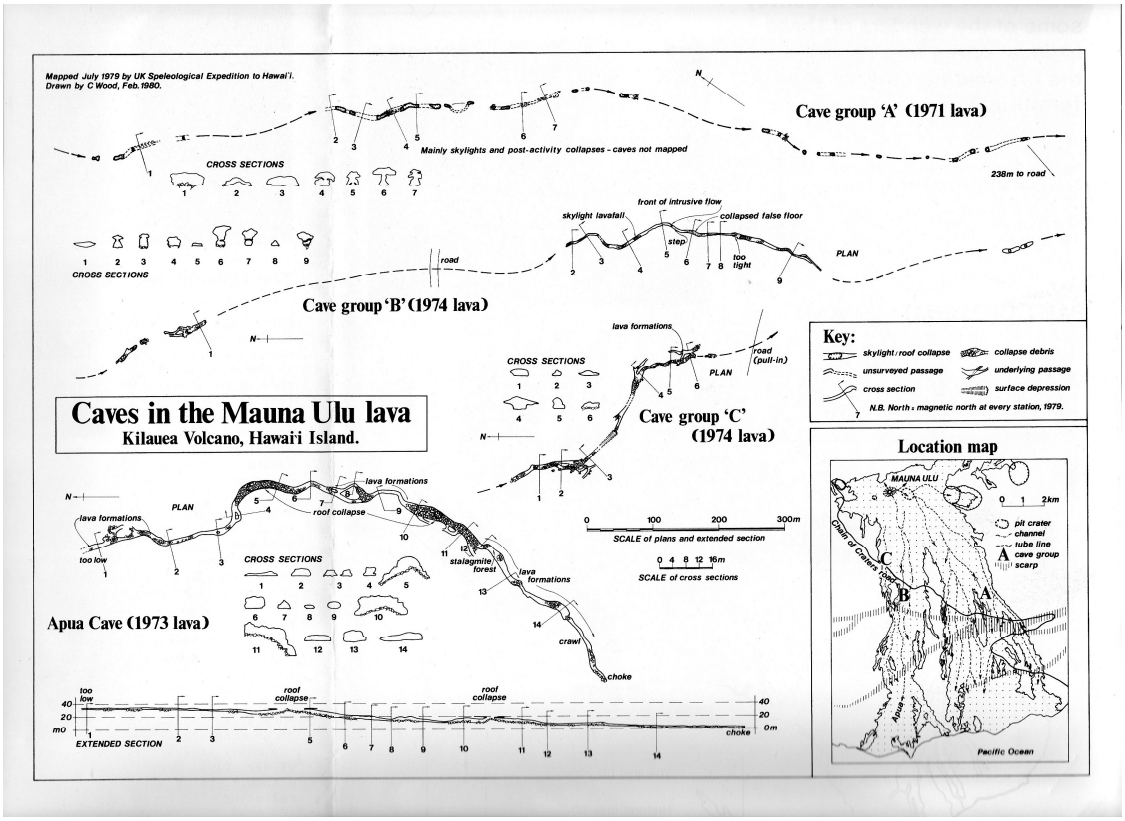
Nieland 1978 survey of part of Ainahou Ranch Cave

Picking up our hire car we piled in and started off up to the Hawaii Volcanoes National Park some 40km distant. We were dismayed to find it was raining (except it was warm rain) and surprised to find when we checked in that we had booked our cabins from the next day, so we had to go off and find a campsite for the first night! After a deep sleep, the following morning we went off to the National Park Headquarters and Hawaiian Volcano Observatory to introduce ourselves as we had permission to stay and work in the Park throughout

Polynesian style camping cabin. Photo M Mills

our stay, often in areas prohibited as dangerous to normal visitors. Then we moved into our two Polynesian style camping cabins at Namakani Paio campsite (altitude 1250m) and on one occasion experienced a 4.8 earthquake.

Work on the Flows



Caves in the Mauna Ulu Lava, drawn by C Wood.1980

An eruption astride the rift zone began on 24 May 1969 and ended in mid-October 1971, creating and building up the parasitic shield volcano at Mauna Ulu (Hawaiian for Growing Mountain) some 2km across, 120m high, the summit being at an altitude of about 1050m. At the height of the volcanic activity, lava was produced at over 200,000m³ a day with a peak of 1,000,000m³ an hour, and resulted in 40.5km² of bush and forest being covered by lava flows up to 90m thick. Tubes are a primary means of volcanoes transporting lava long distances from the vent to the extremities of the advancing flow, in this case in September 1970 some 12 km to the Pacific Ocean to extend the area of the island by 0.8km². The Halina fault system produces scarps (called pali) 120 – 180m high between the vent and the ocean, lava tubes even extended down these at an inclination of 60^0. Volcanic activity resumed in February 1972 until 1974. The whole of the activity was the first long-term duration flank eruption to be witnessed in detail, and was observed by Peterson & Swanson who in 1974 published in "Science of Speleology" their findings, which at the time was the best account and certainly the finest illustrations to date of lava tube formation. Through skylights in the roof of tubes they were able to measure the temperature of the molten lava flowing in tubes at 1150^0C, its speed of flow at varying between 1 and 6km per hour, and temperature drop of the molten

Tony Jennings and Chris Wood inspecting the lava flows. Photo M Mills

lava as only 10 – 20 ^{0}/c in over 10km travel distance. New plant life was observed on the lava flows within three months.

Our first week was spent walking down the flows, from the vast smoking crater nearly 200m deep above the perched lava pond on the volcano's flanks, looking for anything we could get into. Although the tube system were only 6 to 8 years old and had not been examined since they were formed, we quickly found that the 1972/4 flows had covered the 1969/72 flows, no doubt obscuring many of the caves. In our searching of the flows we were greatly assisted by the Chain of Craters Road, which runs across the flows, having been re-opened just two weeks before our visit – it had been closed when invaded by flows in 1969 and had since been reconstructed.

John Cooper on surface below Poli o Keawe Pali.

The first day we walked from the Chain of Craters Road like veritable mad dogs and Englishmen the 10km or so to the coast, descending two pali (like petrified coke heaps) en route. Walking on the fragile glassy surface of pahoehoe flows in temperatures of 85^{0}F (29.5^{0}C) in the shade (except there was none) fanned by a strong Trade Wind was rather like walking in an ungreased frying pan. Near the coast we found some very large entrance collapses that necessitated a further visit. At the coast we then faced a walk of similar distance to the nearest point on the road. Meanwhile Kirsty, who had turned back at the head of the upper pali to take the car down to the coast, fared even worse as we had the water bottle! Walking in from the road she was slightly ahead of us in time, failed to find us, and so returned to the car and was reduced to drinking the only available water in the car windscreen washer bottle! Pahoehoe flows which we had been walking over are relatively smooth, however these were frequently interspersed by Aa flows which are like clinker, and much more difficult (and painful) to cross. The natives used to weave ti leaves into sandals for crossing Aa flows, and leave a stone wrapped in a ti-leaf at the entrance of any caves they visited as a symbolic "thank you" to the volcano goddess Pele. The ti plant was a symbol of divine power to the people of old, and was considered a charm against evil spirits.

Walking across lava features on the flow. Photo M Mills

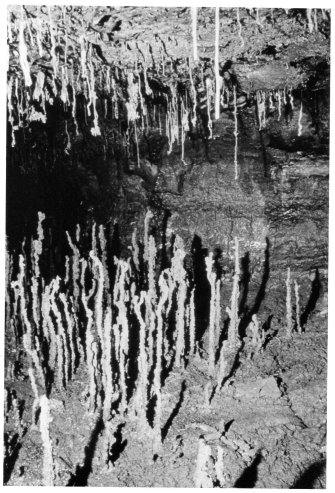
Descending Holei Pali. Photo M Mills

After our somewhat epic first experience on the flows, especially our reactions to heat/water (or the lack of it) we were rather more careful and left our return visit to the very large entrance collapses found near the coast until we had adjusted/acclimatised slightly better. Apart

from these the longest cave found was only 275m long, although there was a remarkable line of 27 surface features/entrance collapses over a distance of 1.5km.

On Puna Coast Trail walking towards Apua Cave with Don Peterson of USGS in the rear. Photo M Mills

When the day came for our return to the very large entrance collapses found near the coast we were joined by Don Peterson, former Chief Scientist at the Volcano Observatory (part of the U.S Geological Survey). Upflow of the upper collapse the cave rapidly became too low, but downflow and beyond a second entrance collapse we encountered a 'forest' of about a hundred 1m high lava 'mites, thought to be the most spectacular display of lava formations yet found in any lava cave. In addition, there were straight and erratic rod and straw lava 'tites up to 50cm long, lava 'mites up to 30cm high and lava "roses" on the floor. This cave, which we named Apua Cave, because of its proximity to Apua Point, ended in a choke after 1.3km. Apart from the protection afforded it by being situated in the National Park, this cave also has the natural protection provided by its distance from the road. The entrance collapses do not appear on aerial photos taken in 1974 and it is believed they were opened by a subsequent earthquake – more could reveal themselves.

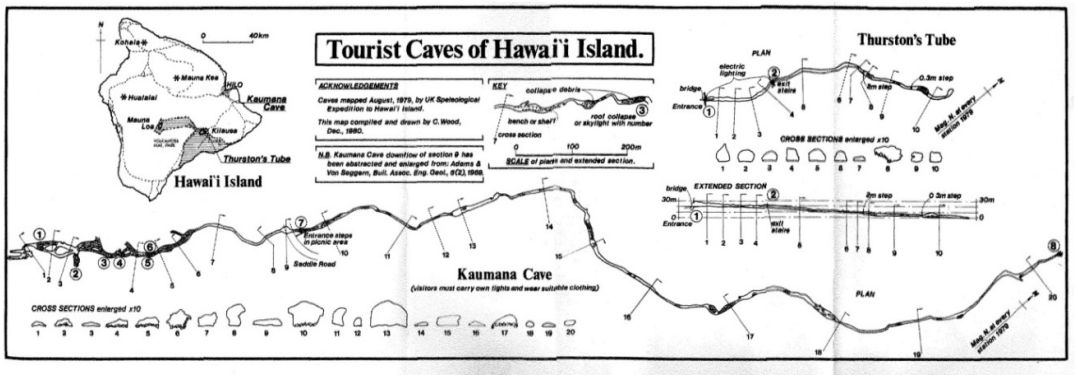


Examples of lava 'mites in Apua Cave. Photo A C Waltham

Party relaxing outside Apua Cave. Don Peterson USGS sitting at the back. Photo M Mills

After a warm day's caving we invariably took ourselves to either the Queen's Bath near Kalapana, a natural basalt rift filled with fresh water; the black sand beach at Kalapana which will disappear through erosion in 2 – 3 centuries; or Volcano Store for a hamburger and iced coke, and perhaps in the evening to Volcano House, the only hotel in the National Park, for an iced beer. The hotel maintained 'perpetual fire' in the fireplace to remind visitors of the possibility of an eruption, and commands an unrivalled view into Kilauea Caldera which had last erupted in 1974.

Other Caving



Tourist Caves of Hawaii Island, drawn by C Wood, 1980

On the outskirts of Hilo city we found Kaumana Caves County Park which comprised a parking lot, a couple of picnic tables and the cave. We did a rapid 45 minutes through trip downflow from the main entrance to a lower entrance, which is virtually the trade route. Appetites whetted, this cave was later visited and upflow from the main entrance nearly 1km of passage was surveyed, ending in a complex network of low, rubbish-filled crawls which appear to sump in wet weather.

The next time the prospect of a spare day from work on the flows loomed, Ainahou Ranch Cave came to mind, so armed with the photocopy of the article Bill Halliday had given us, we set off to locate the cave in an area covered by forest and scrub in Kampua'a flow about 350 – 500 years old and mentioned in Hawaiian legends. After an hour or so thrashing about in the bush two entrances were found simultaneously. Dumping the 'sacs we set off down the cave, surveying as we went, it was predominantly large passage of at least 8m diameter with long sections of breakdown boulder piles which made for slow precarious going, apart from the surveying hazard of thick curtains of tree roots; however, 85 stations and 1.7km later towards late afternoon hunger got the better of us (we had left the lunch in the 'sacs) so surveying was abandoned for the day. To ensure that the cave did not close down just round the corner form the final station, we had a quick recce and found within a short distance a lava fall that required a hand line to descend. With enthusiasm for the cave running high, we returned the following day and divided into two parties. The first retraced steps to the terminal point of the previous day and continued downflow, descending two lava falls and passing several more entrances (one being a roost of Pueo, Hawaiian short-eared owl) after a further 770m the cave terminated at Poli o Keawe Pali from which entrance could be plainly seen on the flow at the foot of the pali, further entrance collapses – these await further investigation. The second party commenced surveying upflow and after finding some water calabashes were

View from lowest entrance of Ainahou Ranch Cave looking down over the pali. Note chain of collapses on next level. Photo M Mills

Lowest entrance of Ainahou Ranch Cave looking out over Poli o Keawe Pali. Photo M Mills

startled when Kirsty came upon a human skeleton; however they had surveyed a further 1.78km that day. As in the UK the finding of human remains should be reported to the law enforcement authority, so the skeleton was reported in the evening to the Chief National Park Ranger, who detailed a Ranger, Brian Goring, to accompany us on the 'morrow to check out the remains. He concluded that the skeleton was possibly 200 years old and may have crawled into the cave to die or been killed for disobeying Kapu (sacred laws), but warned us of booby-traps in caves protecting important burial chambers, such as precariously perched boulder piles with a tripping mechanism, hopefully now set off by earth tremors. The cave was undoubtedly used as a hidden routeway through which warriors could move unnoticed by the enemy as was indicated by the amount of torch charcoal on the floor throughout the cave. The same day a further 1.65km of passage was surveyed as far as the top entrance. When the remaining side and upper level passages were completed, the cave had 16 entrances (one containing outstanding petroglyphs), a length of 7.11 km and a vertical range of 352m, making it at that time the second deepest lava cave in the world.

Petroglyphs in Entrance 6, Ainahou Ranch Cave. Photo M Mills

Kazamura Cave was first reported in 1972 at 6km length, and in 1975 at 10km with 15 known collapse holes and sections reported, as yet unexplored. As no subsequent reports had appeared we were anxious to visit the cave and so wrote to Frank Howarth, at that time the only resident caver in the islands (though he lived in Honolulu) and source the original reports. However, he was doing continuing fauna studies in the cave and declined to tell us its location, but offered to join us from 9th – 21st August during which he would show us the cave. At Kaumana Cave we had noted outside the entrance a nuclear fall-out shelter sign, and subsequently several others during our travels around the island. From the Civil Defence Office in Hilo a map showing the location of all the shelters on the island was obtained, on the reverse of which was printed brief details of each, including whether it was a cave or other form of shelter. Amongst which were details of Kazamura Cave. After a preliminary recce where we walked over 5km down this unitary tube of about 10m diameter, passed 4 entrances and 2 or 3 boulder chokes, it was surveyed following our departure by those remaining to 11.55km with a vertical range of 260m to make it the longest lava tube cave in the world at that time known. It had very few side passages, extensive breakdown in the lower section, ends in a draughting choke, had

Chris Wood in Kazamura Cave. Photographer unknown

Kazamura Cave passage Photo unknown.

been used by ancient Hawaiians as a burial site with two burial chambers, several complete skeletons present, and the lowest entrance contained the remains of a great stone structure interpreted to be a heiau (temple platform) – a religious tradition of old timers has it that if these are photographed, spirits will fog the film.

Kirsty Mills at Thurston Lava Tube with warning sign. Photo M Mills

Thurston Lava Tube which was open as a self-guided cave, the first 120m lit by electricity and at the entrance had a sign stating "Caution: Reduced Light, Low Ceiling Ahead, Remove Dark Glasses". This was surveyed on our last evening to 539m length in just 20 minutes, using two survey teams.

Conclusion

The total cave consumption of the trip was over 20 caves visited, nearly 22.4km of passage surveyed, including Kazamura Cave at 11.55km, longest in the world, and Ainahou Ranch Cave at 7.11km (now the fifth longest and second deepest in the world), and a further 3.9km visited/checked out, including Blair Cave, Dr. Bellou Cave, Hawaiian Acres No. 1 Cave, Bird Park Cave and Ainahou Ranch No. 2 Cave. Ten years later in 1989 the Hawaii Speleological Survey was founded.

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