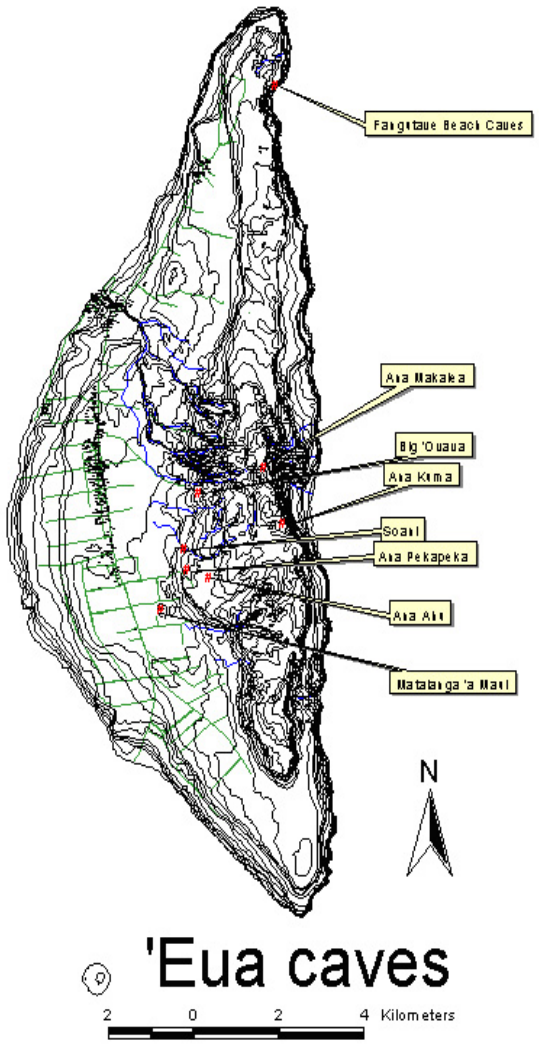
CAVES OF ‘EUA, KINGDOM OF TONGA

- Dave Smith

In mid winter 2002, ACKMA members Dave Smith and Ian Millar had to spend two weeks on a beautiful friendly tropical island full of caves. Selflessly they went forth….

Background

The New Zealand government, through the Ministry of Foreign Affairs and Trade, offers development assistance (NZAID) to a number of countries, particularly in the SW Pacific. One aspect of this programme is aimed at helping to develop nature-based tourism in the Kingdom of Tonga. Managed by Tourism Resource Consultants NZ (TRCNZ), one of the programme’s target areas is ‘Eua, an island in the southern group. 'Eua has intact forest areas, a large national park and some guiding, diving and accommodation available. In 1999 TRC proposed that the caves of ‘Eua be assessed for their suitability for tourism, particularly regarding the potential conservation impacts of any such development. TRCNZ arranged for two staff from the Department of Conservation (New Zealand), to carry out an assessment of the caves of 'Eua.



Physical environment of 'Eua

‘Eua (pronounced eh-wah) is a small island just east of Tongatapu in the southern group of Tongan islands. The island is about 20km long by up to 7km wide. A north-south spine (up to 312m high) divides the island, with a series of fertile terraces (three major) gently descending to the west, while cliffs and steep slopes fall quickly down to the east. The underlying geology is mostly limestone (of various ages), with small areas of cave-bearing volcanogenic sandstone and igneous basement.

Just east of the island is the Tonga trench, the second deepest bit of water in the world. The island is built upon an old volcano which has had various sediments, mostly limestones, laid down on its flanks over the years. The formative process is similar for other islands in Tonga and the Pacific. The volcanic hotspot line has migrated west and north from 'Eua over time, while plate boundary activity has uplifted 'Eua as a tilted block.

The volcanic basement of the island is an early Eocene andesitic (which forms a base to some cave passage). A diagenetically altered Eocene-Oligocene limestone overlies the basement and is mostly exposed on the higher parts and eastern flanks of the island. It is fairly hard and composed of foraminifera-mollusc-echnoid parts. In this limestone, karst topography, including many dolines and most of the good caves, are found. There is evidence that this limestone was karstified at some stage before it was overlain by younger sediments. Most of the island's groundwater resources flow through this stratum.

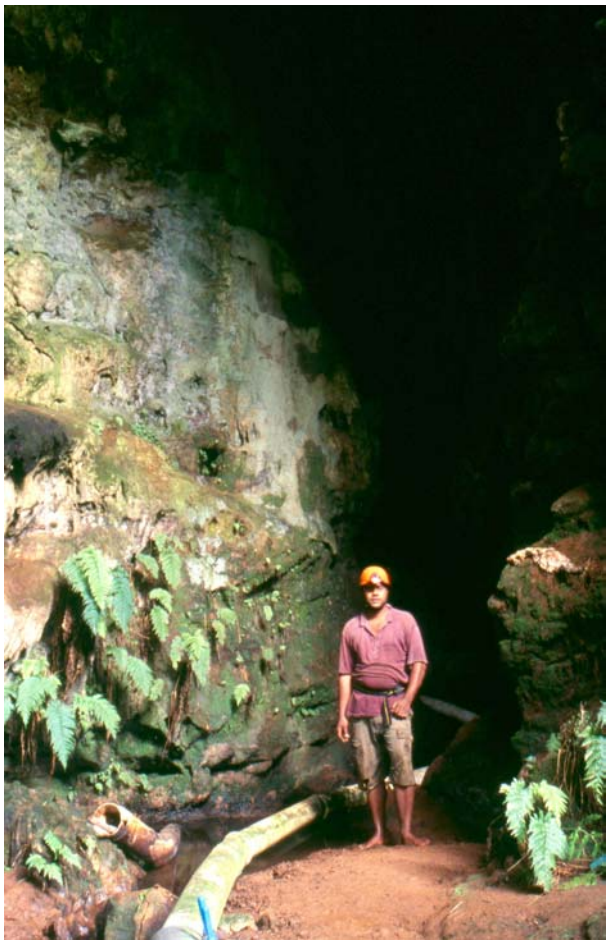
A dark brown Miocene volcanogenic sandstone was next off the blocks, found at mid-elevation on the west of the island. Steeply incised gulleys characterise the sandstone that also contains a number of significant caves. The sandstone runs out against the main island terraces that are all thick Pliocene-Quaternary limestone terraces. They appear to be free-draining as few surface streams and few caves are evident - down on the coast numerous minute pores discharge freshwater around sea level.

Soils are mostly tephra-derived and rainfall is about 2700mm. Rainforest vegetation is still intact on some parts of the island and Tonga’s first national park (450ha) has been established to protect the main remnant. 'Euan fauna include both mega- and microbats, and the famous koki or red shining parrot. The microbat population is potentially interesting as it seems quite common on 'Eua while the species is reputedly in decline in the rest of the Pacific. Migrating humpback whales can be seen from shore.

People of 'Eua

The island’s population is around 5000 in 14 villages spread along a road that spans the island on the western terraces. Power, phone, reticulated water, hospital, and schooling are all available. The island is serviced by daily ferry (a rough journey) and 10min flights from Tongatapu. Throughout the island there are many well-attended churches. Fantastic singing comes forth from the churches (and eyebrows would be raised at the thought of people caving on a Sunday). Like the rest of Tonga, the people are all Polynesian.

Entrance to Ana Pekapeka ('Cave of the Swiftlets' – pekapeka = swiftlet) which is used as a major part of the water supply for the island (hence the pipe). The chap in the photo is one of the local water board workers. Photo: Ian Millar.



Most of the cleared land is divided into a series of 'api (allotments) – under the constitution every male over 18 is entitled to an 'api of 8 acres. Many 'api are used for subsistence cropping though there is a growing agricultural export economy (e.g. vanilla). In some areas of the island larger areas are cropped with squash and exports loaded direct to Japan. Large areas of the northern island are owned by the Monarchy.

Other Tongan karst

Outside of 'Eua a number of other karst areas are found in the Tongan group of islands. The main island, Tongatapu, has very little relief but quite a few caves are found near the coast. One of them, Anahulu, is partially developed and amenable to tourism.

Trevor Worthy, Kevan Wilde, and Dave Williams studied the cave many years ago, and made recommendations for further development but little progress is evident (see *New Zealand ACKMA Team in Tonga*. D. Williams. ACKMA Journal No. 4, December 1989. P 20-21 – Ed.).

This is quite a pity as the cave is very close to a road end and electricity supply. Abundant formation and beautiful deep blue pools line the route through this large horizontal cave. Another remarkable feature, and a highlight of Tongatapu, are the Mapu'a 'a Vaca blowholes of the west coast. These are constructional features in the reef limestones. In the right sea conditions one can look along five kilometres of spouting holes, a fantastic sight.

The northern group of islands, the Vava'u group, are famous for their game fishing, sea-kakaying, and as a focus for yacht cruisers. A number of caves are reported including the tourist destination Mariner's Cave.

The rest of Tonga (the uninhabited southern island of Ata, the low-lying middle Ha'apai group, and the northern outlier Niua islands) is not known for any substantial karst.

Previous exploration and information

Most importantly for our visit, two small British caving expeditions (1986 and 1987) produced very thorough expedition reports from a systematic exploration of the central part of the island. As well as describing a number of caves, the reports also considered cave fauna and geology and proposed a speleogenesis (cave development) process.

A number of caves sites are briefly described, located, and advocated in tourism literature (such as Tonga Visitor Bureau brochures and maps, Forestry Dept maps and Lonely Planet and more obscure guidebooks) Much of this is cross-sourced and is of variable quality.

General prospects for cave tourism

The tourism merits of caves largely relate to their form. Several types of cave are found on 'Eua:

(i) deep shafts and shaft systems on the higher parts of the island, up to 200m deep, some of which lead to horizontal stream passages
(ii) more or less horizontal stream resurgence caves along the 150m contour on the western side of the island
(iii) short clefts and passages amongst blocks collapsing off eastern cliff faces
(iv) sea caves formed by wave action, including many now uplifted above current sea level

The discovery of caves suitable for tourism has different probabilities of success amongst the types listed above. The steeply descending shaft systems, by their nature, present physical barriers to tourist use. While they are passable with the right equipment, advanced technical and physical skills are needed.

The stream caves discovered to date are either small and sporting (limited general appeal) or large and home to bats and swiftlets (guanic – very limited general appeal). The cleft and collapse type of caves are never likely to be extensive or attractive.

Limits on technical skills and equipment and the availability of rescue back-up for serious accident or injury impose significant limits on the types of caves that can presently be considered for tourism. Tours would need to be achievable using hand-held lighting and would need to be of quite limited duration.

Ana Makalea is an impressive shaft near island's summit. The view is from a side entrance, with Dave Smith in the shaft. Photo: Ian Millar

In the event, none of the karst caves we investigated met these requirements. However the complex of sea caves at Fangutave beach offer a fine alternative that could easily be made the central focus of a day visit to this very attractive site.

These are well decorated (unusually so for sea caves), accessible and reasonably robust. Further exploration on the east coast is needed. A number of cave entrance and collapse features are worth visiting, perhaps not as destinations in themselves, but integrated into day tours that visit multiple features.

Conservation
Conservation issues identified in 'Euan caves are not particularly different from other karst areas that contain relatively short, non-arid caves. No issues are apparent that, with good management, will particularly constrain tourism:

Speleothems - ubiquitous massive calcite speleothems are found in most caves on 'Eua and cannot be considered locally rare. One set of unusual helectites was found.

Cave entrance zones - larger cave entrances contain soft speleothems and fragile arrays of ferns and algae. These are readily and visibly damaged; and very slow to recover. These zones need to be managed carefully. They are also good indicator sites for tourism impacts.

Cave fauna - cave fauna disturbance (cave bat and swiftlet populations, guano piles and their invertebrate communities) is an issue at many sites. The nature of the karst and caves on the island suggests that it is unlikely that any cave-inhabiting species would be endangered (at the population level) by use of selected sites for tourism.

Cave sediments and bone deposits - laminated sediment layers were noted in a few places, particularly in back corners of the Fangatave beach caves. Fossil bird deposits have been recovered from 'Euan caves. As with many of the issues above, the sites can be managed if the guides are sufficiently trained.

Burial sites – sites associated with human burial are a particular issue. Burial in caves is practiced in other Polynesian cultures and sites are usually considered sacred ("tapu" in New Zealand, "kapu" in Hawai'i). Cave burial probably also occurred on 'Eua (one site is known and apparently occasionally visited by tourists near Houma).

Several sources suggested that the 'Euan people are not concerned about this issue, however one suggested that there may be some latent disquiet amongst the older people. As a matter of respect and precaution sites containing remains should not be visited.

Safety
The 'Euan caves contain most of the usual suspects. Uneven and loose terrain, flood potential (a couple of the caves have multiple roof sniffs), steep slopes, shaft edges and rockfall are all possible. Good guiding, particularly in decision making, should deal with the problems. It is not known whether Tongan bat populations are reservoirs for any communicable diseases.

There is a maxim occasionally used in outdoor tourism that guides should only operate at "30%". This means that they should use one-third of their "energy" (including skills, physical ability etc) to look after themselves, one-third to look after their clients and keep one-third in reserve for crises.

Guides who are not familiar with caves and caving, and not confident in that environment, could easily find themselves working at "80%" on an extended adventure cave tour. This is currently the case in 'Eua, where the guides generally have limited background in outdoor recreation and caving in particular.

Helictites in a side passage of Ana Makalea. Note that the larger stals beside them have been smashed. Photo: Ian Millar.

A particular issue in 'Eua is emergency response. At the time of our visit there was probably no suitable stretcher or trained personnel on the island. This is in fact less of an issue for caves than for the steep tracks to the remote beaches in the east of the island. Since our visit some basic exercises have been held.

Like the conservation issues, safety does not provide unsurmountable problems for caves on 'Eua. It does, however, support the short-term restriction of ‘Euan guided cave experiences to shallow, limit-of-daylight type excursions.

Specific assessments of ‘Euan caves and tourism

Assessments were produced for most of the twenty or so cave visited, including all those promoted in the tourist literature.

Below are a cross-section of examples of some of the assessment summaries. Full summaries and text descriptions are in the main report, including those for a number of caves with no tourism future.

Fangutave Caves	Remarkable series of sea caves at the remote northern end of the island, slightly elevated in bush behind the beach. Numerous corroded, algae encrusted speleothems in twilight zone. Clasts embedded in ceiling.
Tourism merit:	High (aesthetic, adjacent beach)
Conservation:	Some speleothems and sediments are vulnerable to damage; can be managed. Bats and possibly pekapeka in darker side passages; can be managed.
Safety issues:	Access route has some climbs and scrambles on sharp, weathered limestone involved (manageable), so site not suitable for everyone.
Other:	On Royal Estate
Summary:	Very worthwhile visit in conjunction with Fangutave Beach

Ana Makalea	A shaft, large chamber and passage near the highest point of the island. Spectacular view from side entrance.
Tourism merit:	High (visual experience); future potential for descending into cave
Conservation:	None for viewing. Fragile flora and some vulnerable speleothems in deeper cave. (Guide skills needed if this section visited.) Some bat guano in side passage, but no recent sign of habitation.
Safety issues:	Avoid close approach to top of hole for viewing; safety is manageable for viewing from the side entrance. Difficult steep handline required to access deeper cave.
Other:	Some graffiti and litter in deeper cave.
Summary:	Add to existing National Park tour and view from side entrance. Potential for future use of deeper cave dependent on developing guide technical skills or engineering solution.

Ana Ahu	A large sheer shaft 70m deep, deep in forest doline. Steam rising often (means smoke cave)
Tourism merit:	High (surface viewing of spectacular shaft with waterfall)
Conservation:	Large numbers could damage forest and soils on approaches.
Safety issues:	Need guide management to keep group back from edge.
Other:	Best views probably in cloudy conditions; strong sunlight makes the dark features of the shaft more difficult to see.
Summary:	Needs to combine with other attractions in area e.g. largest banyan tree nearby, and possibly Matalanga ‘a Maui. If high numbers, manage access routes.

Matalanga ‘a Maui	
Tourism merit:	Medium - quite spectacular feature for viewing; potential to descend into it
Conservation:	No issues for viewing. Floor of feature is fragile behind overhang driplines; easily managed
Safety issues:	No issues for standard guided approach to feature. Simple handline required, and some guide skills, for descent
Other:	Distant from existing tourism resources.

Summary:	Recommended if guides available that can manage handline

Ana Kuma (Rat Cave)	Currently popular cave about 10m long that leads out into eastern cliff face.
Tourism merit:	Medium (leads to ledge with good views of east coast)
Conservation:	No issues
Safety issues:	Climb onto ledge is dangerously exposed to cliff
Other:	Signposted, promoted and on existing routes
Summary:	Not recommended without climb protection (e.g. handline); if guided, experienced guide should go down first.

Ana Peka Peka (Telefoni Rd)	
Tourism merit:	Low (guano, wet, slippery, pipeline in cave)
Conservation:	Fauna disturbance (microbats and swiftlets). Manageable
Safety issues:	Exposure to guano, difficult waterfall climb, slippery
Other:	Perceptual conflict with water supply; potential damage to pipeline
Summary:	Not recommended

In summary

'Eua has many fantastic caves but in the end there are few sites suitable for development as classic show caves or deep adventure caves. The caves are limited by safety issues and mostly lack the merit necessary for a major tourism site.

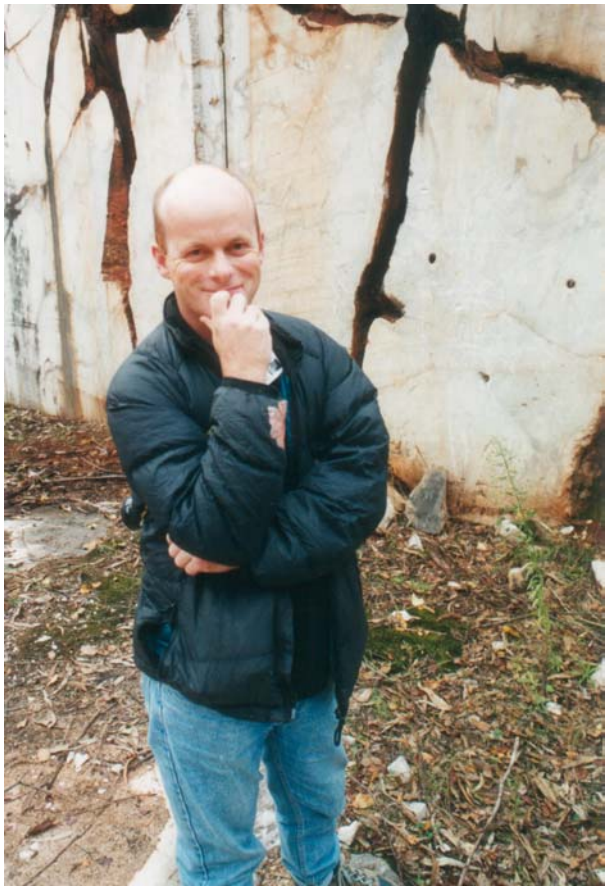
A number of cave entrance and collapse features are worth visiting, not as destinations in themselves, but integrated into day tours that visit multiple features.

This is the current style of tour on the island, a day or half a day that takes in a number of features in either the central, National Park or southern part of the island. Most of these tours could be modified to take in entrance/twilight area viewing of a number of fine-looking cave and collapse features.

The complex of sea caves at Fangatave beach offer a fine new site that could easily be made the central focus of a day trip to the northern end of the island.

They are well decorated (unusually so for sea caves), accessible, robust and in the forest just behind a beautiful beach (as a postscript the Fangatave beach and cave tour is now one of the most popular on the island.

In a follow-up trip guides were given some specific training on using the sea cave complex).



Dave Smith in the Wombeyan Marble Quarries.
Photo: Kent Henderson