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THUNGYAI NARESUAN CAVE SURVEY PROJECT

FINAL REPORT

AUTHORED BY
DEAN SMART - JUNE 2002

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Abstract

Thungyai Naresuan East Wildlife Sanctuary (TYE) encompasses part of a vast tract of limestone/dolomite karst in western Thailand. Topographic maps reveal that karst landforms are present over much of the area. Theoretically, an abundance of caves should also be present. However, due to the remote, harsh nature of the terrain, TYE remained virtually unknown speleologically. This project aimed to correct this situation through systematically exploring, mapping and documenting caves and other sites of speleological interest in TYE. A prolonged and sustained effort over 2 years located a total of fifty-six previously unrecorded sites and produced 9152m of surveyed cave passage. Some of the sites proved highly significant for geological and hydrological reasons with classic examples of multi-level caves, paragenetic caves, swamp notches, active corrosion plains and complex sedimentary relationships being found. The fauna of the caves proved interesting with observations of possible troglobitic invertebrates, a reconfirmation of the rare bat *Ia io*, and the discovery of an unusual rat. Archaeological and palaeontological artifacts proved rare and disappointing, the exception being a single, unbroken cord-marked pot. Measurements of cave environmental factors were also taken. The data collected by this project is presented in this report and establishes a new, elevated baseline of information for TYE. Future speleological exploration and research can use this data to direct efforts and funds more accurately. Suggestions for areas that require further work are given, together with logistical information to aid in its planning.

Project members and sanctuary staff were trained in cave exploration and survey techniques largely through direct experience. Some of these people have continued on and are now carrying out speleological work in other areas of Thailand.

In parallel to the fieldwork, a computerised database for caves was also developed. The incoming, fresh data from TYE formed a foundation for this database and enabled continuous evaluation and testing of the format and the various input/output systems. Details of the final, working database are outlined in this report. The database has been deliberately designed to be easy to operate by non-technical users. The interface is user friendly and pleasing to the eye. Data input minimises text descriptions by utilising drop-down, option boxes wherever possible. Extraction and viewing of the data is enabled via a 1 or 2 parameter search system, based on choices given by the user. Cave surveys can be opened and viewed by clicking on the link provided. Two copies of the database are being maintained - one by the Royal Forest Department, Bangkok, and the other by the author. It is anticipated that, in the future, the database will be expanded to include all the known caves of Thailand.

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1. Introduction

A vast expanse of limestone karst lies in Western Thailand. It covers 12,000km^2 and stretches from Kanchanaburi in the south to Mae Sot in the north. Exploration over a number of years has discovered many caves around the edges of the karst. Some of these caves are of global significance. Maps of the interior of the area show the presence of dramatic karst topography with many large dolines and sinking streams. Unfortunately, very few speleologists had ever ventured there to see what could be found and virtually nothing was known.

The Thungyai Naresuan Cave Survey Project was created to rectify this. It ran for 30 months from November 1998 to April 2001 and had four main objectives:

1) Find, explore and survey caves within Thungyai Naresuan East Wildlife Sanctuary.
2) Create a computerised database for caves using the data gained.
3) Train co-workers and project staff in cave exploration and surveying techniques.
4) Disseminate the information gained.

Armed with 2.5 million Baht of funding from the Thailand Research Fund, some 56 caves and sites of interest were found, explored and surveyed. None of these caves had been documented before and they are all described here for the first time. Some of the caves found are extremely interesting and require further study. Some may prove to be of national and maybe even global importance. Time will tell. Project and Royal Forest Department staff were trained in cave exploration and surveying techniques and gained valuable first hand experience during the course of the fieldwork. Some of these people are now conducting their own exploration in other parts of Thailand. The Thailand Caves Database was created and tested using the fresh data gained from Thungyai Naresuan. The database continues to expand healthily as data from other sources is gathered and entered. With nearly 4,000 caves already known, this expansion will take some time and, if the finding of new caves continues unabated, it may never reach a conclusion! We can only trust that it will not.

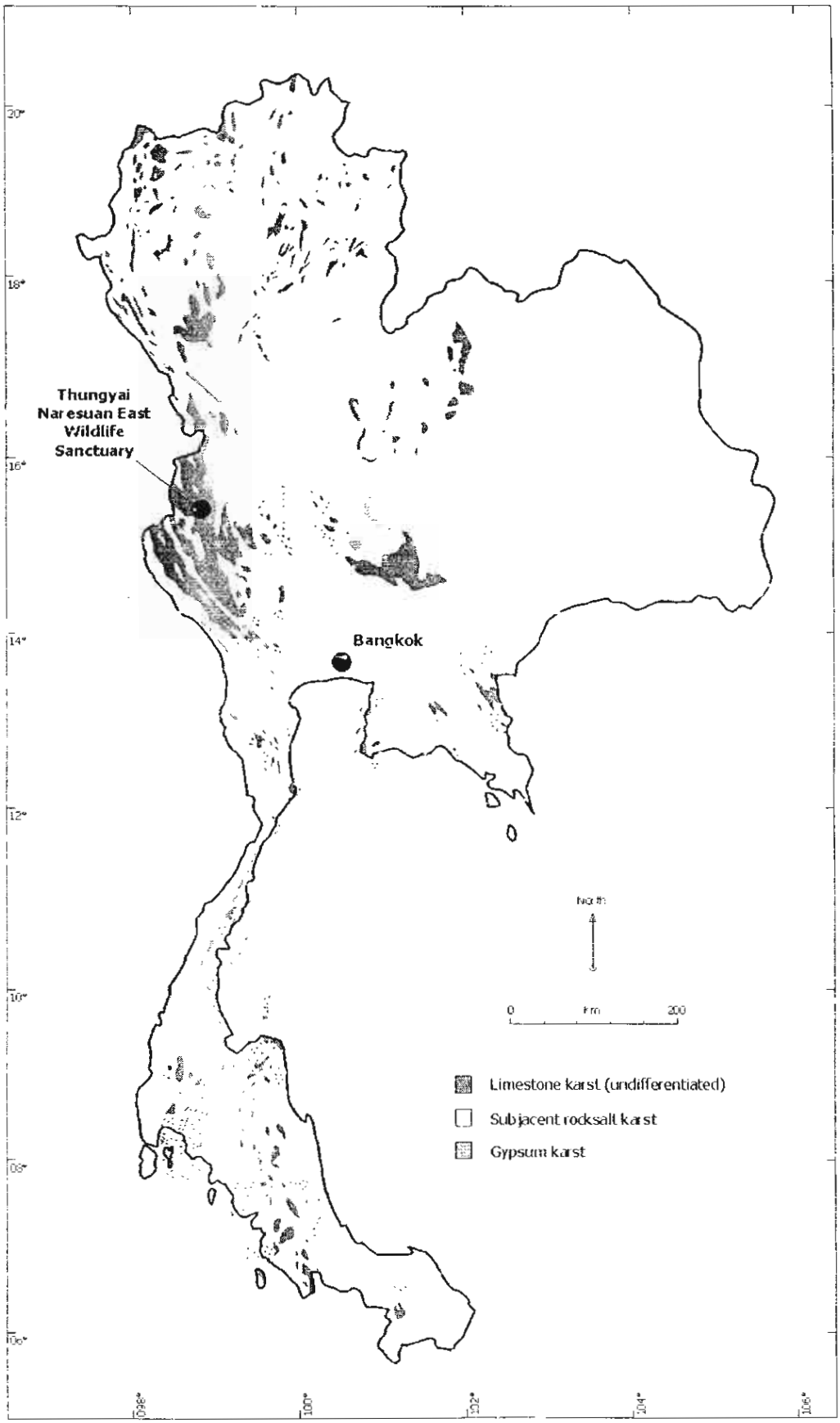
It is hoped that this is not the end of cave exploration in Thungyai Naresuan and that more projects will be forthcoming. There are many unexplored areas remaining and the prospects for discovering highly significant caves are still excellent. This project broke the ground for the area and it is now up to others to continue on.

Scientific researchers now have the opportunity to begin studying the caves of Thungyai Naresuan using the location details and basic information provided by this survey. Research conducted before such a baseline existed would have been haphazard at best and hardly worth attempting. Now there is no excuse for such work not to be carried out.

Fortune favours the brave.

Dean Smart
Bangkok, June 2002

Figure 1. Thailand Karst Map and Location of Thungyai Naresuan Wildlife Sanctuary.



2. Thungyai Naresuan East Wildlife Sanctuary.

2.1 General Description

Thungyai Naresuan Wildlife Sanctuary comes under the jurisdiction of the Royal Forest Department of Thailand and was formally declared a protected area in 1974. It is located in the Tenasserim Mountains of Western Thailand and partly borders Burma (Figure 1). The sanctuary is divided into two parts, 'East' and 'West', along the provincial boundary between Tak Province (East) and Kanchanaburi Province (West). Together, the East and West areas cover a total of 3,647km^2 and contain some of the most inaccessible and undisturbed forests in Thailand.

The sanctuary is part of the 'Western Forest Complex' comprising 11 National Parks and 6 Wildlife Sanctuaries which at 18,730km^2 represents one of the largest contiguous protected areas in the region (Figure 2). In 1991, UNESCO designated the adjoining sanctuaries of Thungyai Naresuan and Huai Kha Khaeng as a World Heritage Site.

Work carried out by this project concentrated on Thungyai Naresuan East Wildlife Sanctuary and for the rest of this report only this area will be described.

Thungyai Naresuan East is remote and difficult to access with just a single, unsurfaced road into the area. It is characterised by a high plateau around 900m in altitude, deeply dissected by the Mae Khlong River and the broader Nam Mae Chan valley. Forest cover on the high plateau is dominantly dry evergreen with patches of hill evergreen on the highest peaks. Lowland valley areas are mostly mixed deciduous forests with patches of dry dipterocarp. Pine forest is restricted to a few tiny patches on the highest summits. See Nakhasathien & Stewart-Cox, 1990, for a fuller account. Downstream of Thung Nar Noi ranger station is an area of wetland forest characterised by large, buttressed trees (personal observation).

Human population of the area is sparse with a few villages restricted to the Nam Mae Chan valley. In 1988 there were 16 villages with 1,137 inhabitants (Kanchanagama, 1988). Previously, there were villages on the plateau as well, but these were removed from the area as a conservation measure. The ranger stations for the sanctuary are built on the sites of former villages. Disused fields can still be recognised as they are dominated by the fast growing 'Elephant' grass and contain non-native plants. The indigenous people still in the sanctuary are of Karen descent and practise rotational, subsistence farming. Sources of potentially more severe impacts come from outside the area. Tourism emanating from Umphang is already encroaching on the sanctuary with trekking trips to Lake Lakatu being openly advertised. This is in spite of the fact that it is illegal under Section 37 of the 1992 Wild Animal Reservation and Protection Act. Hunting and some logging (especially for bamboo to make tourist rafts) still occur despite increased efforts by the Royal Forest Department to stop them. Fires burn through the sanctuary every few years and are usually deliberately set.

Threats to the caves of Thungyai Naresuan East are very limited. There is evidence of guano extraction having been carried out at some sites in the past, but even this threat has now gone. The greatest potential problems lie with increased tourism activity and the possibility of developing some caves for visitation. This threat needs to be firmly thwarted before it can start.

2.2 Geology

The geology of the area is complex with many different rock types of various ages folded and faulted together into a series of NW–SE oriented belts with interspersed igneous intrusions (Figures 3 and 4). This complexity is the result of a long history of tectonic movement related to the breakup of Gondwanaland, subsequent collision of what is now SE Asia with China and the uplift and formation of the Tenasserim mountain range. For a more complete account, refer to Bunopas, 1981.

Pre-Cambrian basement rocks form the mountains to the east of Thungyai Naresuan East. This thick sequence has been metamorphosed to amphibolite facies and consists of gneiss, schist and quartzite with some marble. The rocks were uplifted and deeply eroded before Cambrian sediments were deposited on top. Large discontinuous outcrops of Cambrian quartzite and schist lie along the eastern edge of Thungyai Naresuan East. Stratigraphically overlying this is several hundred metres of thinly bedded argillaceous limestone of Ordovician age. The Ordovician forms extensive karst areas to the south of the sanctuary, though little, if any, within. A sequence of shale and sandstone that has been partly metamorphosed was deposited next, stopping at the base of the most important karst supporting rock in Thailand - the massive, pure limestone of the Permian. With a known thickness of 900m, the Permian outcrops over wide areas forming prominent karst landforms with many caves. Limestone deposition continued on into the Triassic becoming dolomitic during the Jurassic. The limestones and dolomites of the Mesozoic cover the majority of the area within and to the north of the sanctuary. Outcrops of Tertiary sediments are confined to lowland valleys often overlain by quaternary river deposits. Intrusion of large masses of granitic rock began during the late Permian and ended in the Triassic. Small dikes of basic rock are also present.

Structurally, the western part of the area is controlled by a series of sub-parallel strike slip faults - the Sri Sawat Fault system. These faults splay off the larger Three Pagodas Fault to the south and head NW through the heart of the sanctuary creating the long, narrow banded outcrop pattern seen on the map. To the East, a core of Pre-Cambrian gneiss provides structural stability and large scale faulting is not seen. Deformation regimes have changed through time with some rocks being severely folded (e.g. the Silurian-Devonian) and others less so (e.g. the Ordovician). Bedding dip angles range from horizontal to vertical with some overturning in the Pre-Cambrian and with dip directions of either SW or NE in line with the general NW-SE strike of the area. Only the rocks of Tertiary age and younger display little or no deformation.

There is no evidence that the end of Permian palaeokarst episode affected the area. The limestone breccias, cavity fills and karstified upper surface of the Permian limestone seen elsewhere in Thailand are not present. The fact that the overlying Jurassic and Triassic formations are also largely carbonaceous suggests that limestone deposition was more or less continuous and no major stratigraphic break occurred. Elsewhere in Thailand, the Jurassic and Triassic are arenaceous and represent a major shift in the sedimentary regime.

At least 80% of Thungyai Naresuan East consists of carbonate rocks. This is just part of a more extensive carbonate karst stretching from Kanchanaburi in the south to Mae Sot in the north (Figure 2). This vast karst area, the 'Western Karst Complex', is the largest in Thailand and covers at least 12,000km^2 with additional, large contiguous extensions in Burma of undetermined size. The majority of the karst is limestone of Ordovician, Permian and Triassic ages with Jurassic dolomites. There are also small outcrops of Pre-Cambrian marble. This project concentrated on exploring and surveying caves in the Permian and Triassic formations.

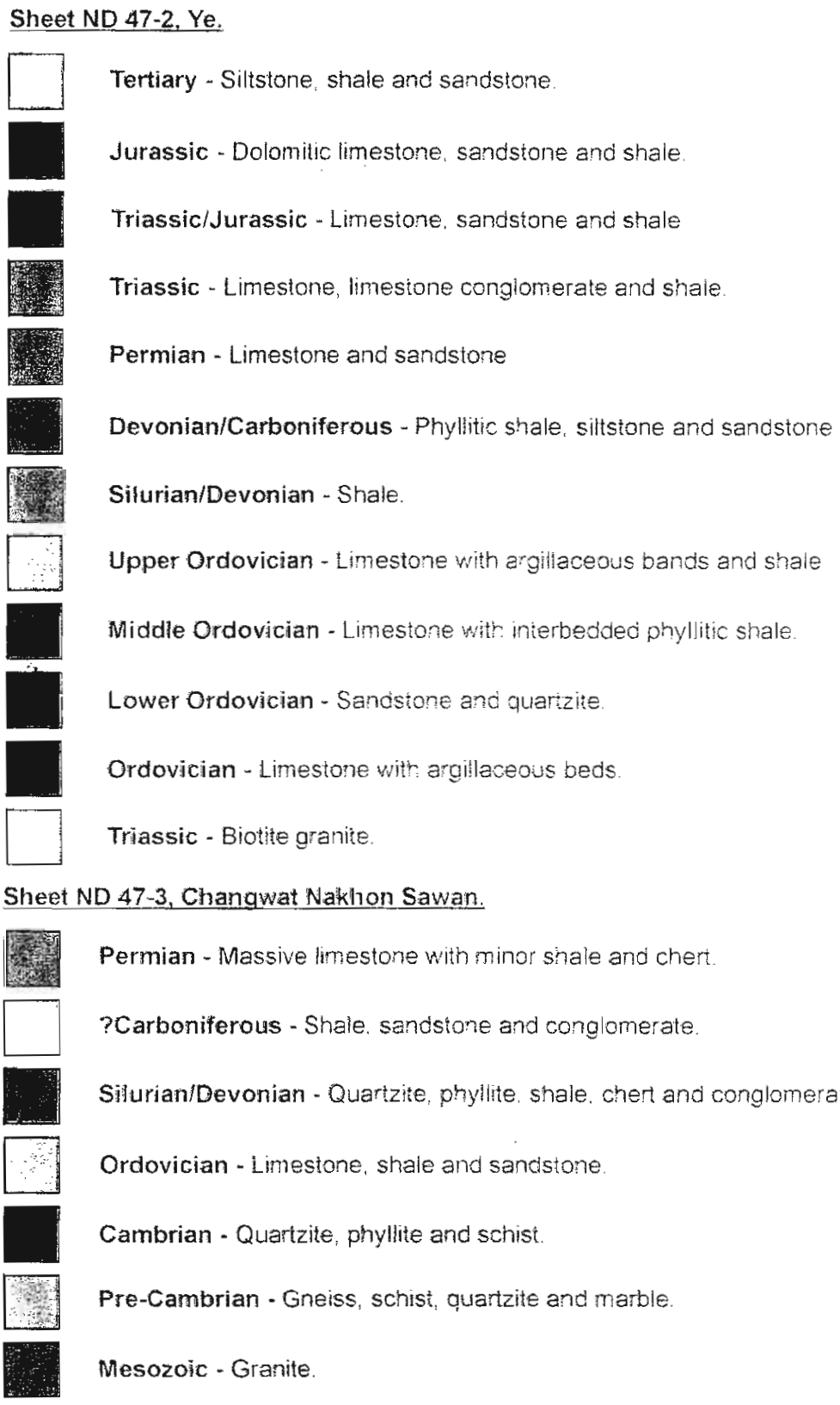
Figure 3. Geological map of Thungyai Naresuan East Wildlife Sanctuary.

Geology from 1:250,000 maps supplied by the Department of Mineral Resources, Bangkok.
Sheet ND 47-2, Ye, Geological Survey Division, 1985.
Sheet ND 47-3, Changwat Nakhon Sawan, Geological Survey Division, 1976.
For colour key, see next page.

Geological boundary — Faults, known and inferred

Border of Thungyai Naresuan East Wildlife Sanctuary

Figure 4. Key to the Geological Map.



Information from 1:250,000 maps supplied by the Department of Mineral Resources, Bangkok
Sheet ND 47-2, Ye, Geological Survey Division, 1985.
Sheet ND 47-3, Changwat Nakhon Sawan, Geological Survey Division, 1976.

2.3 Geography

Altitudes for the sanctuary (Figure 5) range from 220m.a.s.l. at the lowest point (floor of Mae Khlong valley at the Southern border) up to 1,430m.a.s.l. at the highest (summit of Khao Yu Yee on the eastern border).

More than two-thirds of the area consists of a generalised plateau over 800m in altitude. This plateau is rugged and punctuated by hundreds of limestone towers and other hills up to 200m high. Many of the towers have vertical sides and are very difficult to explore. Dolines are also common and range in size from a few tens of metres in diameter to broad flat areas several square kilometres in size. Depths also vary from a few metres to 200m. Some 330 dolines and stream sinks can be counted on the 1:50,000 maps of both East and West Thungyai Naresuan, although this figure is much higher in reality.

The rest of Thungyai Naresuan East consists of the broad floodplain floor of the Nam Mae Chan and (in part) the Mae Khlong River valleys. The altitude averages between 300m and 600m.a.s.l.

There is a definite NW-SE trend shown by landforms. The valleys of Nam Mae Chan, Huai Bi, Huai Tilaku and Huai Phra follow it, as does most of the Mae Khlong valley. Positive landforms of the plateau are aligned in ridges to the same orientation. This topographic trend is a consequence of the NW-SE trending general strike of the area caused by large scale faulting. Slope changes and cliff lines of a few to several tens of kilometres in extent result from the faults themselves (e.g. the Mae Khlong River valley upstream of Huai Bi and the Permian limestone ridges between Utakhi and Ka Ngae Khi). Lithological changes have effected landforms on a local scale (e.g. the flat floor of the Huai Nam Khieo doline comprises thinly bedded, shaley limestone while the towers are massively bedded, pure limestone).

Whilst the dominant trend is overwhelmingly NW-SE, there seems to be a minor trend orientated NE-SW. The Mae Khlong River valley between Huai Bi and Nam Mae Chan, for 5km downstream of Huai Tilaku and for 2km downstream of Huai Phra trends NE-SW. The Utakhi valley and some cliff lines also follow this trend. A secondary geological structure, most likely faulting, is postulated.

2.4 Hydrology

Drainage for Thungyai Naresuan East is part of the Mae Khlong River system (Figure 6). Most of the major streams of the area, e.g. Nam Mae Chan, Huai Bi, Huai Tilaku and Huai Phra flow directly into this river within the boundary of the sanctuary itself. One stream, the Huai Mae Lamung Tai, drains the Northeast corner of the sanctuary before flowing into the Huai Kha Khaeng River and joining the Mae Khlong further South at the Sri Nakarind reservoir.

The Mae Khlong River flows through the heart of the sanctuary. It follows an angled route from the Northern to the Southern border, alternating direction between SW and SE. The river flows through deep gorges up to 500m deep where it has bisected the mountainous plateau and meanders gently in a broad, flat valley where it meets the Nam Mae Chan.

The larger streams of the sanctuary (e.g. Nam Mae Chan, Huai Bi, Huai Tilaku, Huai Phra, Huai Mae Lamung Tai and Huai Mortener) are perennial. They collect on non- calcareous rocks and flow on the surface for considerable distances before either joining the Mae Khlong or sinking on contact with limestone, e.g. Huai Mortener.

Figure 5. Elevation Map of Thungyai Naresuan East.

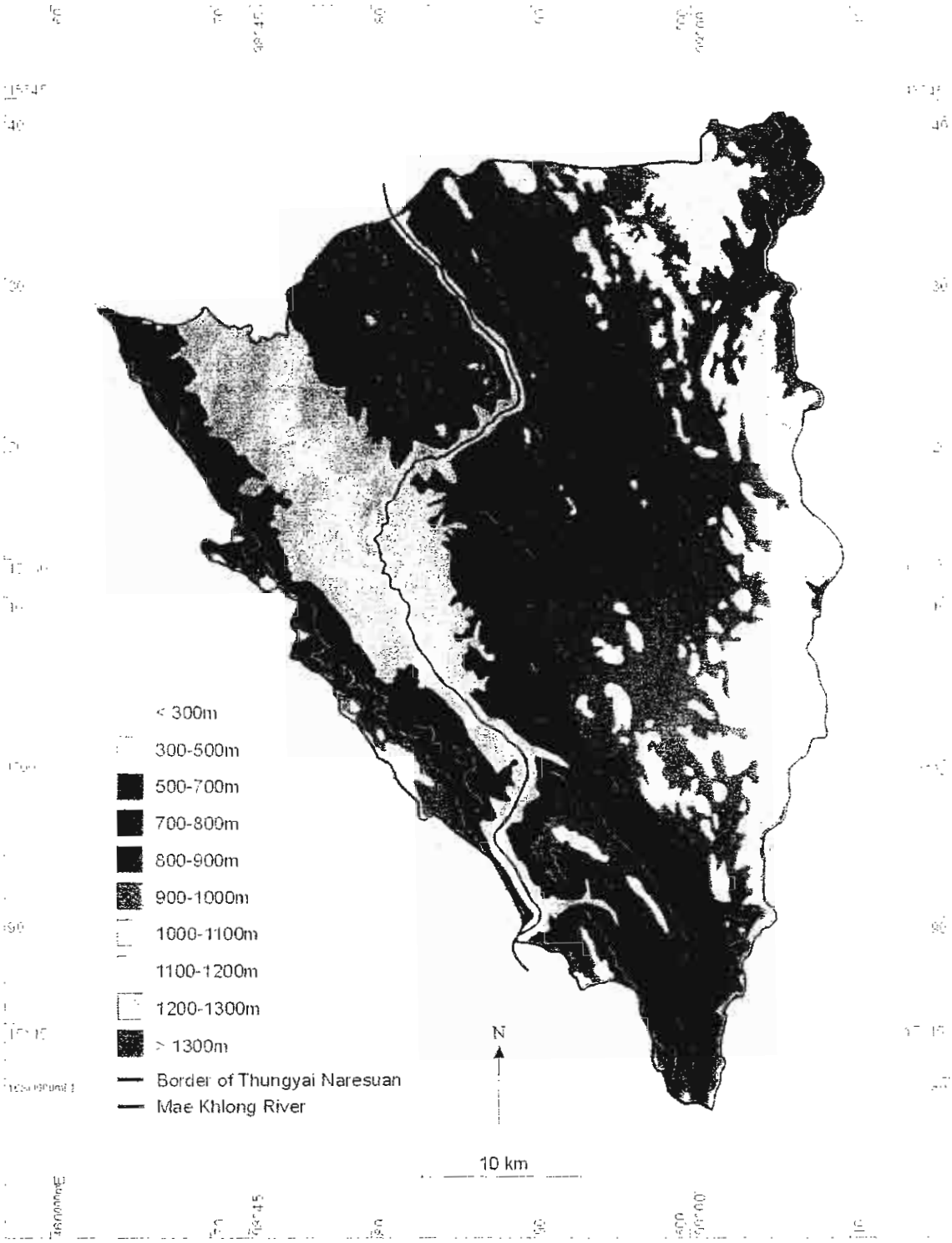
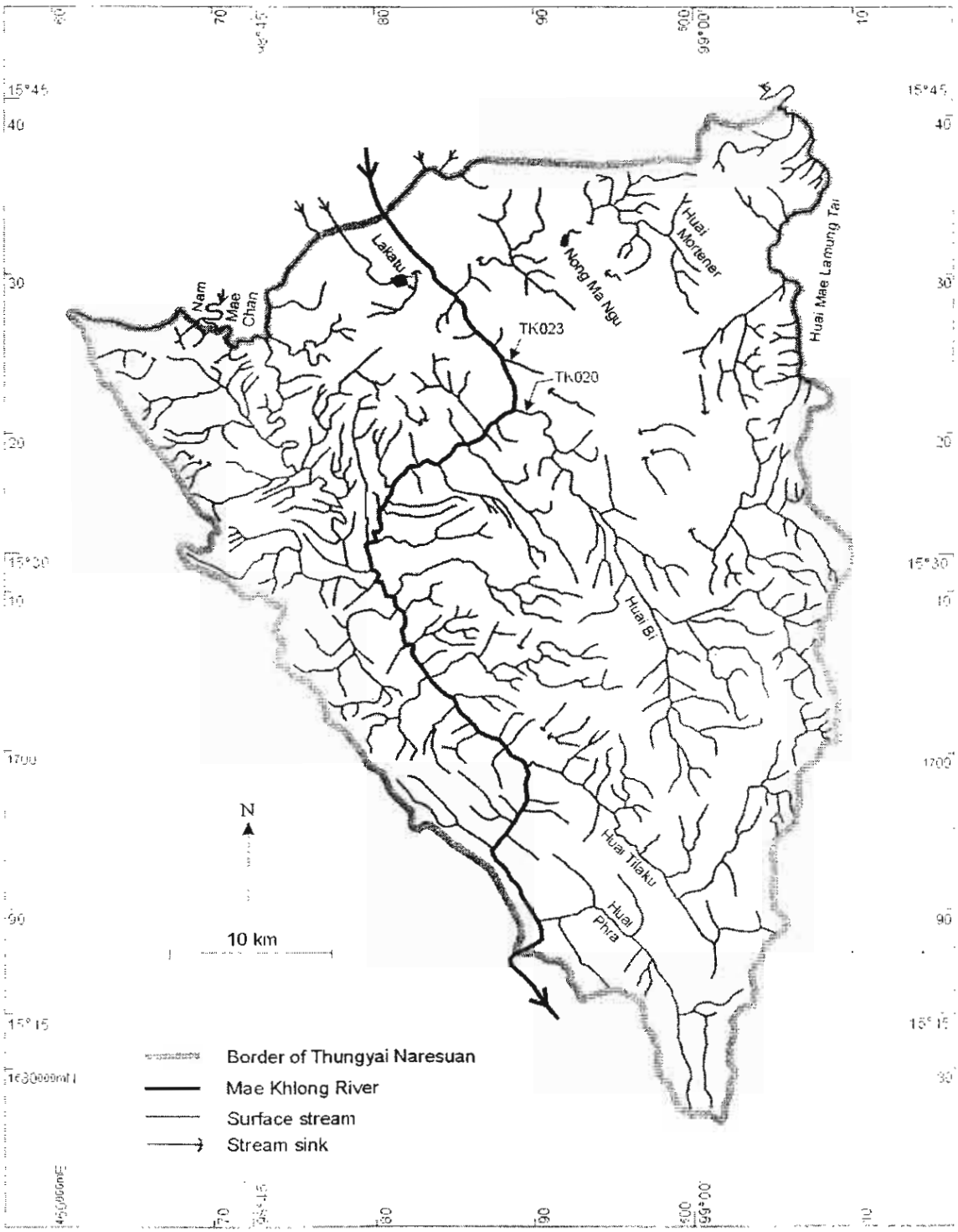


Figure 6. Hydrological Map of Thungyai Naresuan East.



During the dry season, Huai Bi sinks into extensive tufa deposits on the valley floor and rises again a short distance downstream. The majority of smaller streams, especially those found in the limestone areas, carry water only in the rainy season.

Underground hydrology for most of the sanctuary is poorly known at present as extensive cave systems have yet to been found and no tracing has been carried out. It appears that the Mae Khlong River valley is the destination for most of the water sinking at the edge of and within the limestone of the study area. Significant resurgences have been found here, e.g. TK020 and TK023 and undoubtedly more exist. None of the resurgences or stream sinks of the area can be explored very far before a sump is met indicating the possibility that the water rest level is not far beneath the surface of the limestone plateau and that most drainage is phreatic. The shallow depth (20m to 40m) and very flat floors of the larger dolines, e.g. Huai Nam Khieo and Pha Fa supports this view. They probably formed as corrosion plains at the water rest level (see TK048, TK079 and TK082). Even today, the doline floors become marshy lakes in the rainy season, implying that the water rest level is still not far below surface. A few, permanent surface water bodies, such as Lake Lakatu and Nong Ma Ngu give further evidence.

2.5 Access and Logistics

Thungyai Naresuan East is located just 300km NW of Bangkok, but access to the area is much further. As the road from Kamphaeng Phet to Umphang is not yet finished (or due to be), the only way to reach the sanctuary by road is via Mae Sot to the North.

The 480km distance from Bangkok to Mae Sot takes about 8 hours on mostly four lane highways. The road between Mae Sot and Umphang is surfaced, though not very well, and very twisty (reputed to have over 1,000 bends). Although only 150km in distance, it takes 5 hours to travel. From Umphang a further drive South of 1.5 hours, on progressively worsening roads and then tracks, reaches the headquarters of the sanctuary at Ka Ngae Khi which is located on the Northern border of the sanctuary. Alternatively, a helicopter can reach the headquarters from Nakhon Sawan airport (c.250km North of Bangkok) in about 1 hour.

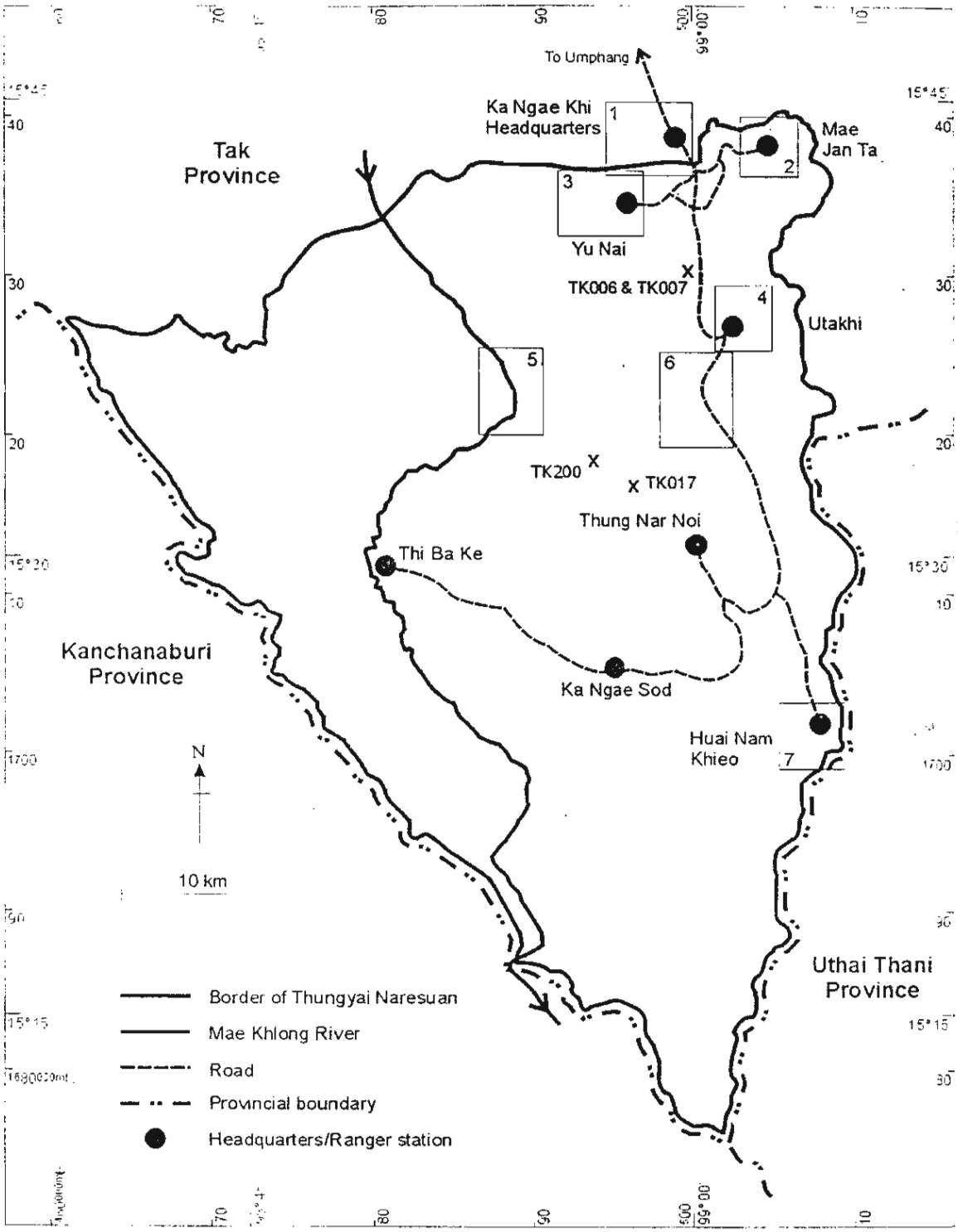
Once the headquarters of Thungyai Naresuan have been reached, the real access problems begin. Table 1 gives the distances by road from the headquarters to outlying ranger stations and Figure 7 shows their location.

Table 1. Distances and Travel Times to Outlying Ranger Stations.

Ka Ngae Khi to:	Distance, km.	Dry season time, hours
Mae Jan Ta	8	0.5
Yu Nai	9	0.5
Utakhi	14	0.75
Thung Nar Noi	50	2
Huai Nam Khieo	56	2.5
Ka Ngae Sod	60	3
Thi Ba Ke	80	6?

Note: the last 5km to Thi Ba Ke cannot be driven and must be walked.

Figure 7. Ranger Stations, Roads and Area Detail Maps of Thungyai Naresuan East.



None of the roads within the sanctuary are surfaced and most are only driveable in the dry season. Many small streams are crossed via tree trunk bridges that often need repairing en route due to elephants breaking them. During drier periods of the rainy season, a good 4WD vehicle can reach the outer stations, but due to many unforeseen stops, travel times can increase 3-4 times. The sanctuary kindly let this project use sanctuary vehicles for travel to and from Umphang and within the sanctuary. This arrangement worked well for a while, but due to mechanical breakdowns the number of available vehicles dropped and those still running were required for sanctuary work. Travel around the sanctuary and, subsequently, exploration and survey were severely curtailed. Any future projects in this area would be well advised to supply their own 4WD vehicle.

Away from the ranger stations and the roads, there are very few well-trodden footpaths. The forest has reclaimed most of those that existed in the past. The difficulties of prospecting for caves are often compounded by thick, prickly and itchy undergrowth. Navigation through the forest is best accomplished through the use of a 1:50,000 map (see Figure 8 for map sheet numbers), compass and GPS utilising any section of elephant path heading in the right direction. Large bush knives can quickly deal with thick undergrowth and annoying plants. Caves near to ranger stations were found with the help of rangers who knew the location. For further afield, guides are not available.

Walkable footpaths that do survive run from Yu Nai Ranger Station Westwards down-valley to the Mae Khlong River, from Thung Nar Noi along Huai Bi to the Mae Khlong River and from Huai Nam Khieo to the TK0012/TK0025/TK0036 area. The Nam Mae Jan valley contains several villages occupied by local Karen people. Well-used footpaths probably criss-cross this area, but it was not visited by the project.

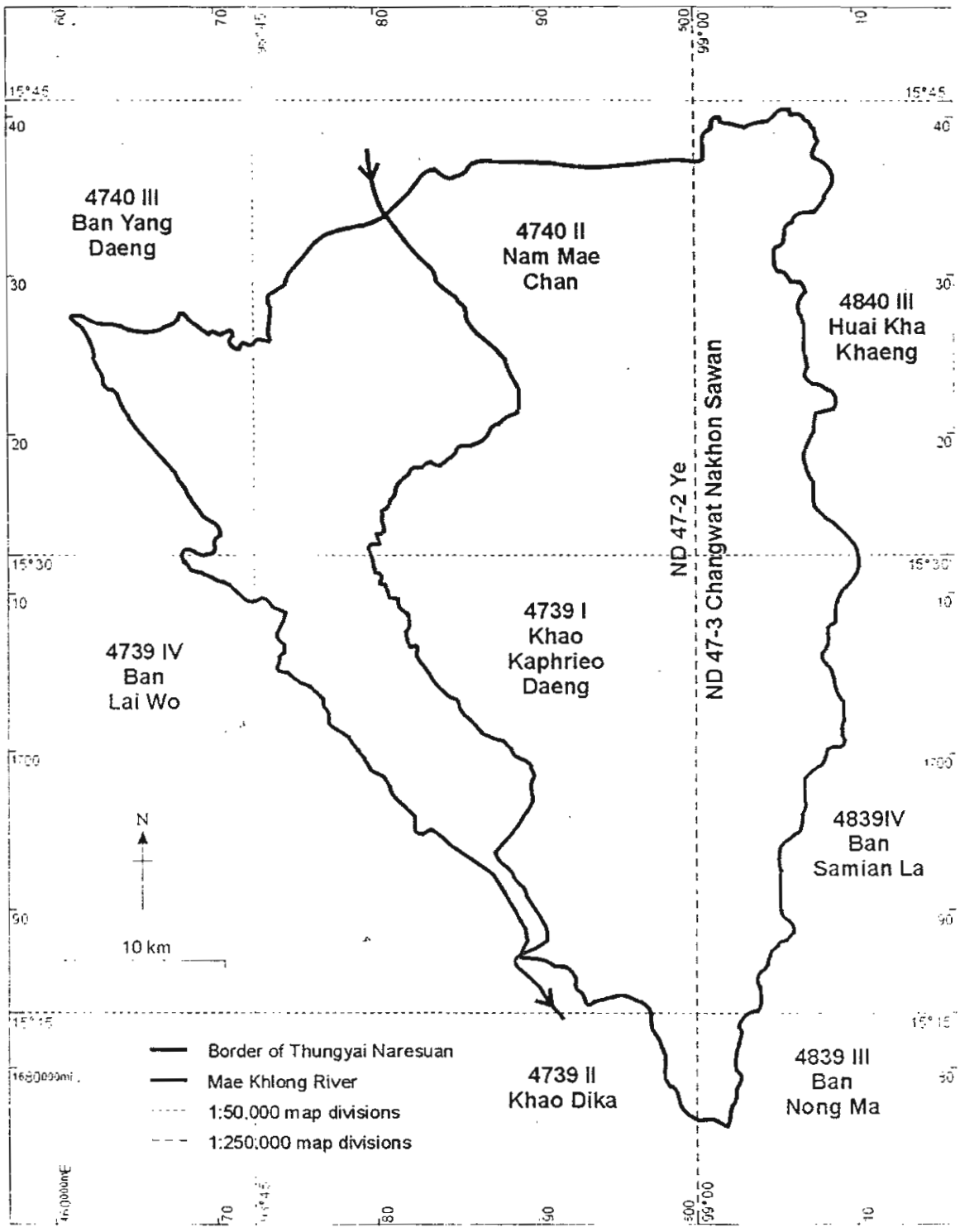
Clothing needs to be of thick enough material to withstand prickly plants and sharp grass. Ex-army long sleeved shirts and long trousers made from cotton proved the best. A hat helps prevent insects and dirt falling down the back of the neck and gloves are sometimes useful. Although hot to wear, the protection afforded by these clothes more than compensates. Wellington boots with good soles are great for short walks and caving, with walking boots used for longer distances. Some workers used anti-leech socks, others found them a nuisance and preferred to stop and 'de-leech' every so often.

Water is not a problem outside of the more expansive karst areas. Carrying 1 litre per person per day was sufficient as perennial streams can be found with ease. Boiling and iodine tablets were used for purification. No surface water can be found in the larger limestone areas (e.g. the area bounded by the Mae Khlong River, Yu Nai, Thung Nar Noi and Pha Fa) during the dry season and little exploration was carried out here. It would require a major expedition to access and explore here.

Rice, fresh vegetables and meat and preserved foods bought from Umphang provided sustenance when at a ranger station or in the forest. Fresh food tended to go off quickly without refrigeration and was cooked and eaten first saving the 'preserved' foods such as kun chiang (sweet sausage), tinned fish or dried noodles for later. During camping trips, open fires were used for cooking.

The purchase of hammocks fitted with mosquito nets made camping in the forest much more convenient. These are lighter and smaller in size than sleeping mats and reduce the risk of disturbance by nocturnal animals, ants, etc. A sleeping bag is necessary all year round, two during the cold season. Sheets of thin plastic tied above the hammocks keep most of the rain off during the rainy season.

Figure 8. 1:50,000 and 1:250,000 Map Sheets covering Thungyai Naresuan East.



2.6 Dangers and Annoyances

Thungyai Naresuan is a huge tract of little disturbed sub-tropical forest and consequently most of the hazards encountered during exploration are of natural origin.

Evidence of large mammals is everywhere. Footprints, claw marks and dung of elephants, gaur, tigers, bears and pigs are common. Of these, only pigs were actually seen and then from a safe distance. Fresh, bear faeces was found in several caves and, if met underground, would represent perhaps the most dangerous large animal.

Snakes were rarely seen and no one was bitten during this survey. Only one poisonous snake was identified, the Mountain Pit Viper *Trimeresurus monticola*. Although we did not carry one, an anti-venom could keep a bitten person alive until the hospital at Umphang can be reached.

Invertebrates are the biggest annoyance and danger in Thungyai Naresuan. Mosquitoes are common and it is a malarial zone. Several sanctuary staff caught malaria while the project was under way. Even though preventing infection is always better than cure, it is very difficult to completely avoid being bitten and anti-malarial medicine may be needed to give an infected person time to reach the hospital. Due to the long time span of the project, prophlaxis medicine was not taken. Ticks are also common and inhabit the grasslands and caves. TK008 is particularly badly infested. Tick borne diseases such as encephalitis are known from Western Thailand. One cave, TK017, contains significant quantities of porcupine faeces harbouring hookworms. These small burrowing worms cause itching and irritation but are not dangerous and disappear in time. Ants, bees, wasps and the multitudes of other biting and stinging insects in Thungyai Naresuan are annoying at times. For allergy sufferers they can be dangerous and strong anti-histamine pills should be carried at all times. Leeches are very common in the rainy season and are occasionally found in caves, e.g. TK007. Whilst not dangerous themselves, their bites are slow to heal and can become infected. Anti-leech socks work, but are cumbersome. The best solution found was a local remedy using the fruit from teak trees. The juice from these small, round fruit is rubbed over boots, socks and lower trousers and repels leeches very effectively.

Fungal infections and other skin complaints can become irritating and require medication. Taking a shower at least once a day using a cleansing soap like Asepso helps to prevent them.

Prickly and stingy plants and sharp grasses seem to be everywhere. Some plants, especially palms can be armoured with vicious spikes 2cm long, the tips of which break off under the skin and become infected. Brushing through the tall, elephant grass causes many tiny cuts on bare skin. One plant called the 'Screaming Elephant' plant, common around Huai Nam Khieo, stings rather like a nettle but the sting takes a week to recover. It has become something of a celebrity with visiting foreign cave explorers. Thick, protective clothing is obviously essential.

The border with Burma is poorly demarcated and sometimes fighting on that side spills over into Thailand. Landmines are also planted in Burmese forests. Thungyai Naresuan East is a reasonable distance from the border (10km at the nearest point) and problems of this kind seem unlikely, though not impossible.

3. The Caves of Thungyai Naresuan Wildlife Sanctuary.

3.1 Previous Work.

Dunkley, 1995, described the general area as "a larger expanse [karst plateau], as yet unexplored, is located in the remote, upper reaches of the Mae Khlong River". He also suggested the presence of numerous depressions of all sizes and an underground drainage system based on the study of available maps.

Large dolines or sinkholes are shown on maps given by Nakhasathien and Stewart-Cox, 1990. They also stated that "none have been surveyed or properly mapped".

Some forty caves have been recorded around the Nam Jone area and one survey of a stream cave published (Odell and Odell, 1984). The exact location of any of the caves is not given and details are scant. The Nam Jone area appears to be centred on a section of the Mae Khlong River to the South and outside of Thungyai Naresuan East.

Tham Mae Nam Yough is a large cave (although short), taking the Mae Nam Yough stream underground (Delannoy, 1982). Note: Mae Nam Yough is the local Karen name for Mae Khlong River. The location map for the cave is very poor, but the cave is believed to lie just within the Northern border of Thungyai Naresuan East as rafting trips from Umphang leave the Mae Khlong at this point and have never reported the cave. On the same map, to the West and South of Tham Mae Nam Yough, many dolines are shown. Delannoy notes that the Mae Khlong River flows through a limestone gorge and numerous springs can be seen. One particularly large one discharges between 5 and 7 cumecs of water (October), but further details are not given. He also suggests that the Nam Mae Chan sinks at some point though this has never been confirmed.

Three species of cavernicolous fish have been recorded from the Mae Khlong River system and all are endemic to the area. They are: *Nemacheilus troglocataractus* (Kottelat and Gery, 1989), *Schistura jarutanini* (Kottelat, 1990) and *Pterocryptis buccata* (Ng & Kottelat, 1998). The caves in which the fish are found all lie in Kanchanaburi Province, to the South of Thungyai Naresuan East.

The sanctuary is also home to many species of bat, some of which are known to inhabit caves (Yenbutra and Felton, 1986). Forty-one caves and rock shelters of Thungyai Naresuan West and Huai Kha Khaeng Wildlife Sanctuaries were studied by Robinson, et al, 1994, for bats and the remains of small mammals. A total of 69 species were recorded, 23 of which are new for the area. Only very brief descriptions of the caves were given which exclude entrance locations and surveys. Reported phrases such as "large cave" and "a stream 2m to 3m wide ran the length of the cave" suggest that some of the sites are significant for more than biological reasons. Kitty's Hog-Nosed Bat, *Craseonycteris thonglongyai*, has apparently been 'heard' in Thungyai Naresuan West using a bat detector (Surapon Duangkhae, pers. com.), but a confirmed sighting has yet to be made (Nakhasathien and Stewart-Cox, 1990 and Robinson, et al, 1994).

Two archaeological surveys have been conducted in the area as a result of the proposed building of a dam. The first, undertaken between 1979 and 1980, found four caves in the area of Nam Jone (Thungyai Naresuan West), two of which contained artifacts (Kanchanagama et al, 1988). Tham Suwat and Tham Stit were habitation sites for people of the Mesolithic and Neolithic periods who produced stone tools, flakes and pottery. A map of the cave locations is given in the report. The team made the interesting observation that Huai Tong Thai is "a perennial stream which flows under the ground surface for a distance of about 4km".

A large number of caves were discovered by the second study in 1988, which covered an area of 142km^2. However only the sites of interest, 4 caves and 2 rockshelters, were described with simple plan surveys (Kanchanagama, 1988). Tham Chedi, Tham Thi Nao Khao, Tham Chedi Devada and a rockshelter at Ban U-Ni all contained prehistoric remains consisting of stone tools and potsherds. Tham Ka Kata and the other shelter were recently used as communist hideouts. Tham Chedi is described as an important site worthy of further investigation. Neither study carried out archaeological excavation of the cave floor deposits, preferring instead to simply note surface remains.

Many coffin caves have been discovered in the mountain belt running from Kanchanaburi to Mae Hong Son (e.g. Sorensen, 1974; Kiernan et al, 1988). None have been reported within Thungyai Naresuan (East or West), although this probably reflects a lack of exploration in the area and not a lack of sites.

No research concerning sediments, speleothems, geomorphology or hydrology of caves in Thungyai Naresuan Wildlife Sanctuary (East or West) has been carried out to date.

3.2 This Work

This project initially attempted to systematically locate caves by selecting a small area and thoroughly searching it before moving on to the next. This quickly proved to be inefficient, unpleasant and not particularly successful. A new approach was adopted that selected points of interest from the map and then making every effort to reach there. Points of interest selected were stream sinks, large dolines and resurgences. Any caves found en route were treated as a bonus.

When a cave entrance was found, it was marked with a small metal tag. Onto this tag was stamped the survey number of the cave, the date of exploration and the initials 'TCKG' to identify surveyors - the Thailand Cave and Karst Group. The survey numbers were based on the format TKXXX, starting at TK001 and rising in sequence with each new cave found. To make the tags easy to see, they were painted orange. All major entrances for each cave were marked, so a cave with several entrances would have several survey numbers associated with it. Numbered entrances are indicated on the cave surveys. The survey numbers must not be confused with the database codes, which are simple integers.

Table 2 summarises the caves explored and surveyed by this project. A total of 56 caves in 7 key areas (see Caving Areas chapter) were explored and surveyed for a total of 9,152m. The total explored length of cave was several hundred metres more than this. The longest cave found is Tham Than Lot, TK012, at 1,866m (explored length = 2,000m). This cave also has the greatest height range, +/- 28.2m. Several other notable caves are Tham Mor (TK049) = 1,139m, +/- 15.5m; Tham Seua (TK034) = 952m, +/- 27.3m; Tham Molakot (TK025) = 921m, +/- 22.5m and Tham Phet (TK036) = 801m, +/- 21.5m. All these caves occur in the same area, Huai Nam Khieo. Even though the caves of other areas proved somewhat challenged with respect to size, some of them proved to be no less interesting.

Details for every cave and site found are given in the appendix together with surveys. This information is taken from the Thailand Caves Database, developed in tandem with the surveying in Thungyai Naresuan. See the database chapter for details.

Location and access details together with a general description are given for each cave. More specific details concerning scientific disciplines, culture, management, etc. are only given for those caves where measurements were carried out, artifacts were

Table 2. Explored Caves Summary.

Area - Cave Name	Code	UTM		Map	Length	Depth	Alt
Mae Jan Ta							
Tham Tasukhi 1	1	505112	1737571		108	4.4	920
Tham Tasukhi 2	2	505083	1731610	4840	185	14.0	950
Tham Tasukhi 3	3	505107	1737519	III	0	0	920
Tham Phi Ma	4	503650	1738510		174	9.3	900
Yu Nai							
TK005	5	493507	1734819		43	14.1	910
TK006	6	499038	1735918		35	3.6	970
Tham Khang Khao Yu Nai	7	499074	1735664		244	6.0	970
TK079	48	491485	1733600	4740	114	5.8	920
TK081	52	491889	1733324	II	26	12.1	940
TK082	53	491484	1733498		163	3.0	920
Yu Nai Sinks	44	492500	1735700		0	0	660
'Hohlen'	176	492746	1734259		15	15	960
Nong Ma Ngu Sink	177	491901	1733302		10	0	910
Overflow Sink - Yu Nai	178	493576	1734527		0	0	910
Utakhi							
Tham Khang Khao Utakhi	8	501246	1727885	4840	162	27.1	950
Tham Nam Mut Utakhi	9	501975	1728406	III	384	21.2	890
TK010	10	501975	1728406		0	0	890
Huai Nam Khieo							
Tham Khang Khao HNK	11	506574	1702926		151	18.9	1090
Tham Than Lot	12	505509	1702168		1866	28.2	1080
Tham Molakot	21	505235	1701597		921	22.5	1090
TK031	24	506588	1702447		69	8.8	1120
TK032	25	506588	1702447		66	14.8	1100
TK033	26	506644	1702471		36	9.7	1100
Tham Seua	27	506546	1702173	4839	952	27.3	1100
Tham Phet	28	504832	1701436	IV	801	21.5	1090
Tham Tao	29	505732	1701593		100	7.2	1080
TK047	30	506421	1701544		26	6.2	1080
TK048	32	506184	1701516		125	2.5	1080
Tham Mor	33	504972	1702613		1139	15.5	1070
TK203	49	504716	1702900		0	0	1070
TK201	50	505906	1701540		0	0	1055
Pha Fa							
TK050	33	497850	1724677		150	10.0	880
TK051	34	498400	1723677	4740	25	8.6	900
TK052	35	498400	1723677	II	50	0	920
TK202	51	499750	1720800		0	0	930
				Total	**8,140**	**-337**	

Table 2. Explored Caves Summary - Continued.

Area - Cave Name	Code	UTM	Map	Length	Depth	Alt
Mae Khlong						
TK017	13	493405 1717119		158	4.3	860
TK018	14	488537 1722405		13	2.5	320
Tham Chang	15	488537 1722405		35	0	320
Tham Huai Bi	16	488537 1722405		195	4.4	320
Tham Yuthana	17	488050 1725258	4740	51	17.0	370
Tham Wichian	18	487808 1725533	II	41	7.8	370
TK023	19	487908 1725611		0	0	390
TK024	20	488074 1725477		30	0	440
TK026	22	488217 1722262		20	11.4	320
TK027	23	487537 1721796		80	12.6	310
Huai Bi Sink	45	490989 1721129		0	0	940
Ka Ngae Khi						
Tham Me Hark	36	497338 1740238		10	0	990
TK062	37	497162 1739945		144	14.0	950
Tham Phran	38	497550 1740450		4	0	1000
TK071	39	496860 1738987	4740	12	0	1030
TK072	40	496860 1738987	II	17	0	1030
Tham Takharp	41	496860 1738987		30	22.0	1030
TK074	42	--		21	14.2	--
TK076	46	497016 1739323		30	18.0	990
TK077	43	--		17	3.2	--
TK078	47	496900 1738800		104	12.0	1010
			Total	1,012	143	
			Grand Total	**9,152**	**480**	

found, or where there is some relevant significance. For the caves surveyed by this project the reader can assume that if, for example, a cave appears in the archaeology section, it does so because of the presence of artifacts or some other archaeological significance. If a cave does not appear however, that cave can be assumed to be of low archaeological significance with no artifacts found. The information is given under the following headings, in this order: Geology, Hydrology, Biology, Palaeontology, Archaeology, Culture, Environment and Management.

Several caves have great geological significance, especially those in the Huai Nam Khieo area. These caves reveal a complex evolutionary history of repeated formation, sediment infill and re-excavation coupled with phreatic, vadose and paragenetic episodes at multiple levels. The fascinating Tham Than Lot displays the best suite of features indicating this complexity. There are examples where formation of a single cave has been influenced by lithology changes in the limestone, structural discontinuities such as faults and the strike of the bedding, for example, Tham Phet. Cave sediments are varied both through space and time. Older sediments found at higher levels tend to be sandy whereas more recent and modern sediments are gravels or reworked cobbles. Within Tham Than Lot there is a situation where the gravels can be seen to cut through the older sands. Speleothems are, on the whole, of common types and mineralogy. Tham Than Lot has a small patch of boxwork formed in sediment and

several caves display small straws, helictites and false floors. The sediments of TK011 contain small vesicles lined with unusual crystals. Aesthetically, the speleothems of Tham Nam Mut Utakhi are the most pleasing. The broad, flat dolines that characterise the karst plateau of Thungyai Naresuan East contain active corrosion plains that are forming caves and modifying existing ones. This situation is rare in Thailand, as most plains have been turned into rice paddies and no longer function. The examples around Nong Ma Ngu and Huai Nam Khieo are among the finest in the country.

Biological observations were carried out on a casual basis coincidentally to surveying. Those made include the reconfirmation for the area of the very rare Great Evening Bat, *Ia io*, in TK048. Several other, more common species were also identified. Large, grey rats were discovered to be living in various caves. Investigations revealed them to probably belong to a new species of the genus Leopoldamys, though this has not yet been finalised. Some very interesting white creatures were found in TK062 including isopods and mites that may prove to be troglobitic. Fossil and sub-fossil bones were not common. TK031 has a bone stuck in old sediments, as are teeth in TK011. Tham Tao is named after the near complete carapace of a turtle found inside. This is most likely to be modern though. One limb bone found in Tham Seua had been sharpened at one end. It is not certain if this was a deliberate action by a prehistoric person or caused by an animal gnawing.

Thungyai presents a fairly hostile environment for people to inhabit. The high elevations, high rainfall, low temperatures, thick forest and wild animals make living here an unpleasant experience, especially when more hospitable, lowland valleys can be found nearby. This is reflected in the near lack of archaeological and cultural material. The little that was found probably reflects the passage of migrants through the area and not permanent habitation. The complete cord-marked pot of TK052 was the best find. Other artifacts included more pottery and crude stone tools as found in Tham Mor and Tham Seua.

Measurement of environmental factors was limited to temperature, humidity and pH due to equipment constraints. The results of this work are given in the Cave Environment chapter. Most caves conformed well to the temperature-altitude connection where higher altitude caves are cooler than lower altitude ones. Those that did not (TK020 and TK021) are located in the bottom of the 400m deep Mae Khlong valley where available sunlight is less than on the plateau and where forest cover is limited (Tham Tasukhi 2). Humidity is generally high, above 85%. Cave streams were all slightly alkaline with pH values of 7+. The marsh water at TK079 was the only acidic measurement with a pH of 6.7.

3.3 Future Work

Obviously, much remains to be explored and investigated in the vast karst area of Western Thailand. Even within Thungyai Naresuan East itself there are certainly many more caves waiting to be discovered. Continuing on where this project left off, continuing to locate, survey and document previously unknown caves must be regarded as the primary action.

Areas that warrant further exploration are:

- Mae Khlong River valley
- Yu Nai
- Huaī Nam Khieo
- Pha Fa
- Karst plateau on east bank of the Mae Khlong
- Plateau around Lake Lakatu
- Ridge west of Nam Mae Chan

Rewarding research could be carried out in many fields. Study of the geology and evolution of the Huai Nam Khieo caves would reveal a complex history related to climate changes and mountain uplift. Cave sediments are varied and widespread over a range of elevations. A palaeoenvironmental reconstruction for western Thailand could be created though study would have its difficulties due to complex relationships. Samples of the minerals found in the sediments of TK011 can be taken for identification. Active corrosion plains are not common in Thailand. Studying the plains of Thungyai may help understanding of such things as tower formation in Ratchaburi and Phangnga Bay.

Hydrological work should rely on the continued physical exploration of caves initially. In the event that this is not possible, for example where the water table is at or near the surface, dye tracing would be needed to reveal flow routes and times. However, for this to be successful all resurgences need to be located and sampled - a very difficult task logistically.

The assemblage of surface fauna and flora in Thungyai Naresuan East is unique and consequently, it would be safe to say that the cave fauna is equally unique. A biological survey is needed to document what lives where and will likely discover many rare and endemic species. Certain caves appear to contain troglobitic fauna and TK062 near the Ka Ngae Khi presents an obvious choice for study. The cave dwelling rats require further research to confirm whether or not they do represent a new species, as seems probable at this time. Not a great deal of fossil and sub-fossil material was seen although no excavation of cave sediment was attempted. Caves where such methods may be rewarded are Tham Seua and TK079.

Given the rarity of artifacts, it seems that other areas of Thailand have greater significance archaeologically and culturally. It would therefore seem more appropriate to study those places before coming to Thungyai Naresuan East.

Environmental study of the caves should be concurrent with continued exploration. More detailed analysis of the high carbon dioxide/low oxygen phenomenon would be interesting, though other areas present better prospects, e.g. Chiang Mai, Kanchanaburi.

Overall, the work carried out by the Thungyai Naresuan Cave Survey Project was just the beginning. The cave location details, descriptions and basic information gained here will provide a springboard of opportunity for future explorers and scientists to delve into a world where little is known or understood.

4. Caving Areas

Refer to Figure 7 for the location of each area detail map within the wildlife sanctuary.

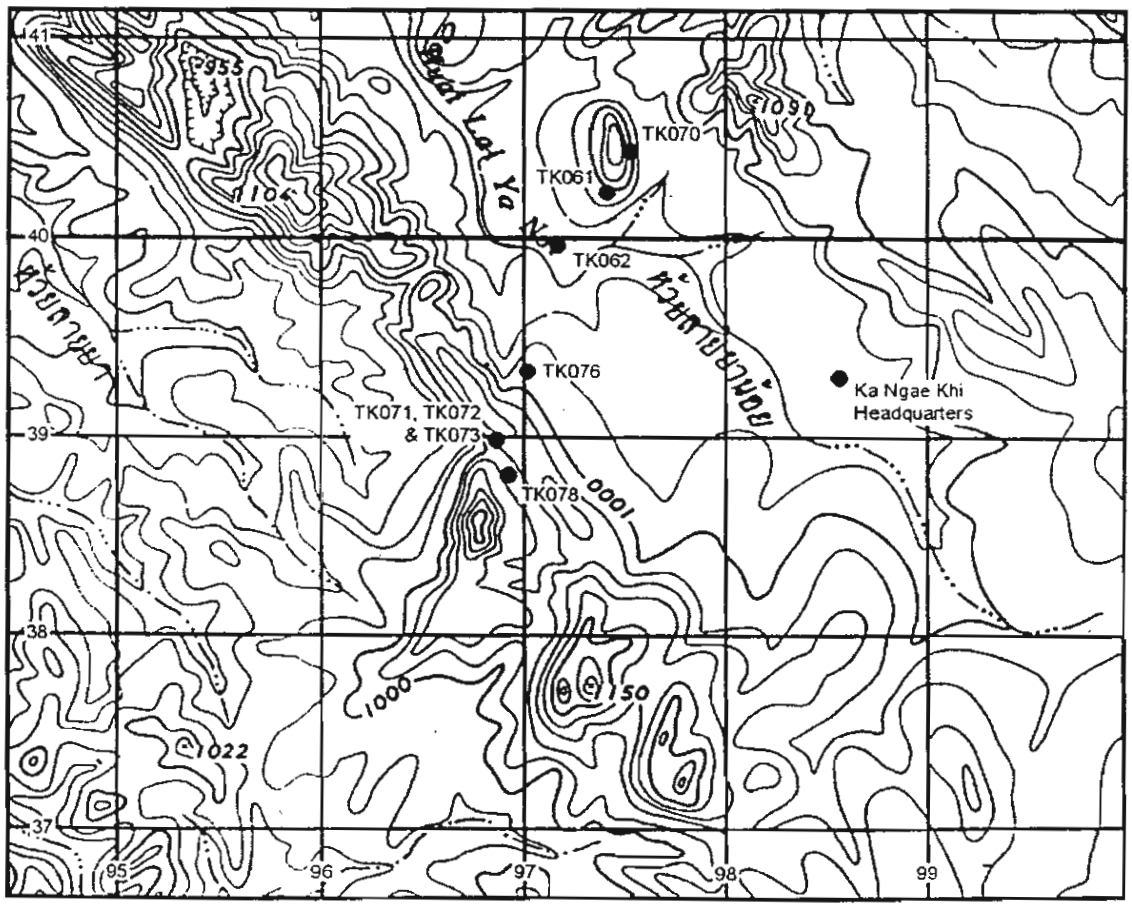
4.1 Ka Ngae Khi - Sanctuary Headquarters (1)

The headquarters at Ka Ngae Khi are located on the northern border of the sanctuary and are the first facilities reached when travelling from Umphang. A base of operations was made at Ka Ngae Khi for planning trips to outlying areas, equipment storage and somewhere to work during the rainy season when other places were inaccessible. In the surrounding area, several caves were found. Most are small and difficult to find.

Just before Ka Ngae Khi is reached, an obvious limestone mountain, Doi Rot Me, is passed by the road. Two small caves were found here, Tham Me Hark (TK061) and Tham Phran (TK070). The biologically interesting stream sink cave of TK062 lies to the SW. Further to the west is a long, prominent limestone ridge containing many small caves. This area was only partially explored.

Walking around the area is relatively easy, utilising old footpaths and open patches of forest.

Figure 9. Cave Locations around Ka Ngae Khi.

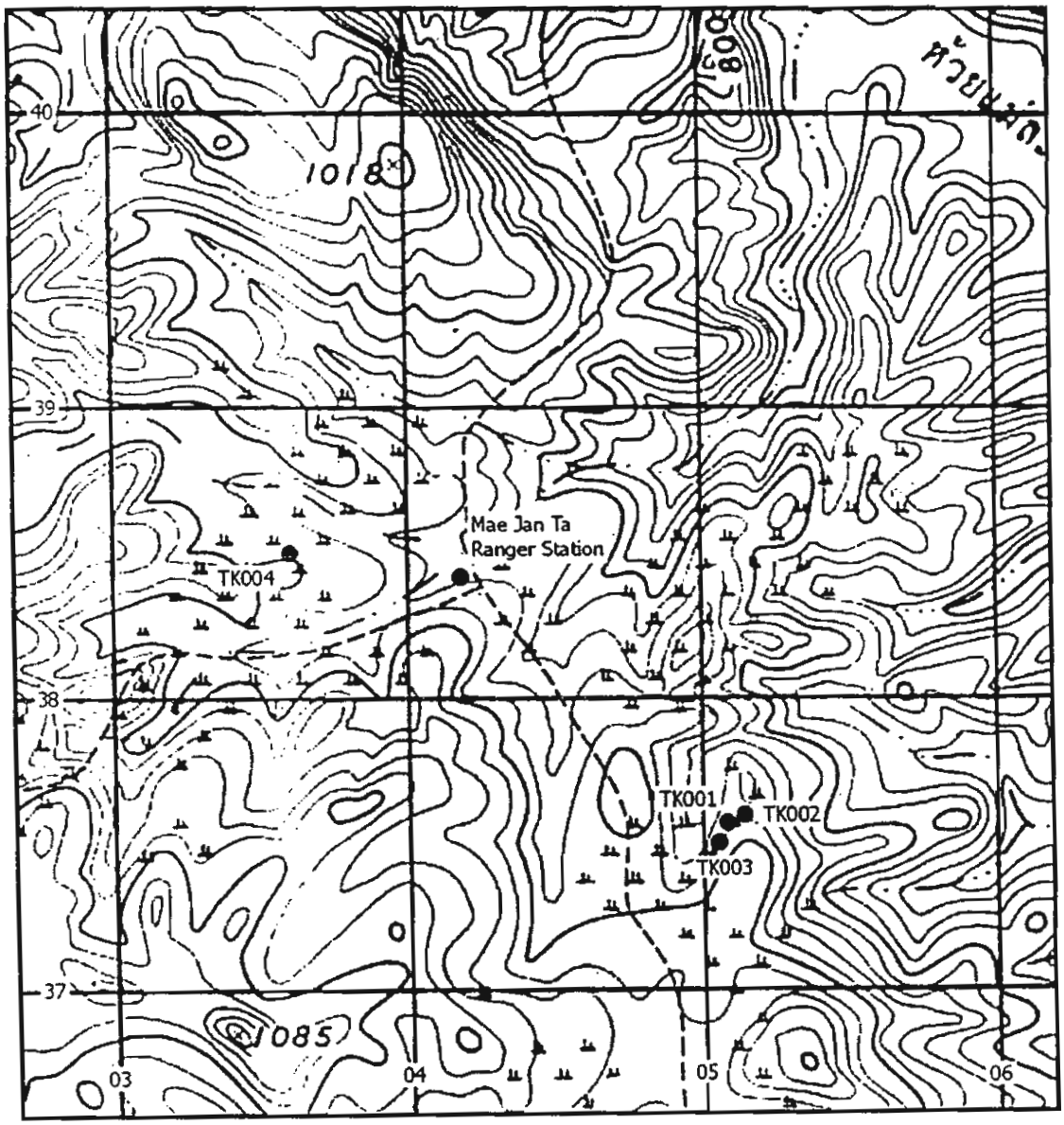


4.2 Mae Jan Ta Ranger Station (2)

This area has limited limestone outcrop and was only visited once. Four sites of interest were surveyed - Tham Tasukhi 1, 2 and 3 (TK001, TK002 and TK003 respectively) and Tham Phi Ma (TK004). It is doubtful that many more caves remain to be explored in the immediate vicinity.

To the west however, between Mae Jan Ta and Ka Ngae Khi is a long limestone ridge. This has not been checked for caves.

Figure 10. Cave Locations around Mae Jan Ta.



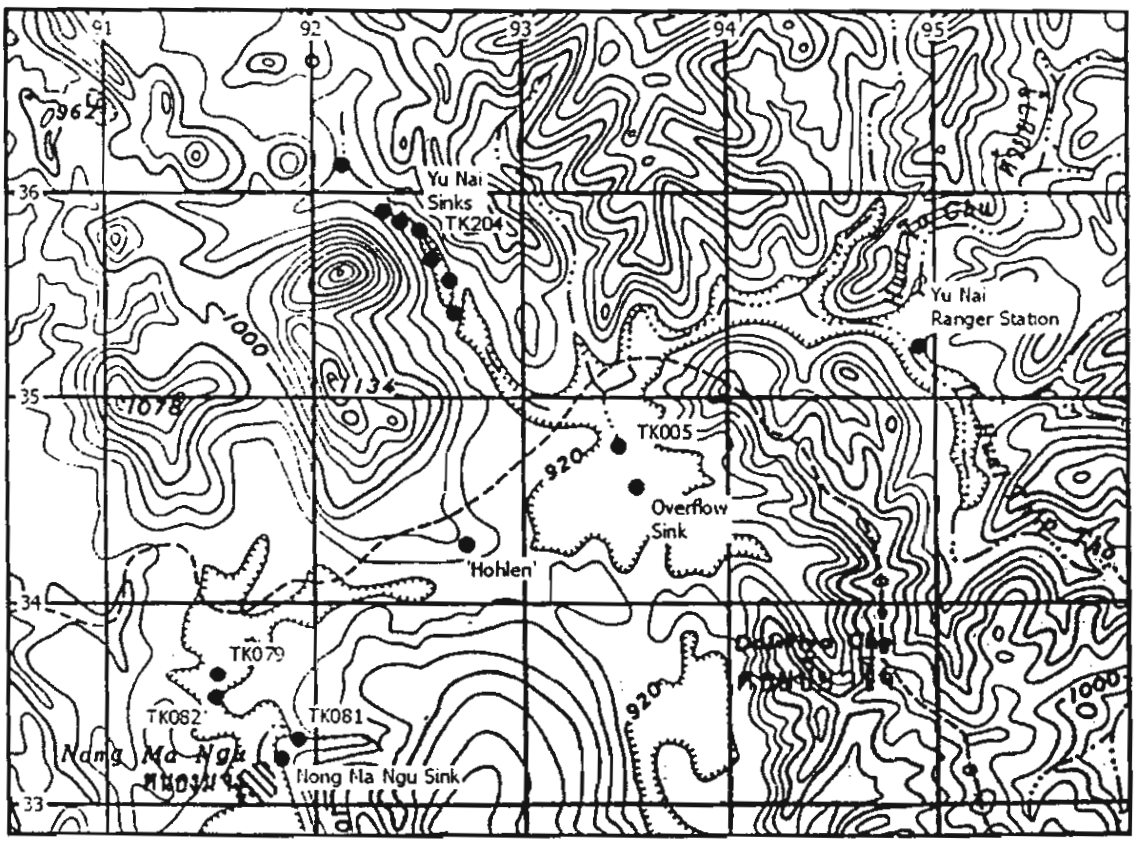
4.3 Yu Nai Ranger Station (3)

Yu Nai ranger station sits amongst shale and sandstone hills. One hours walk downstream encounters a dramatic scenery change where the limestone is met. This is the northeastern edge of the huge limestone area forming the east bank of the Mae Khlong valley.

Many caves and sites of interest were found in the karst to the west of Yu Nai. The Yu Nai stream itself disappears into a short cave (TK005) with an associated overflow sink. Seven, spectacular seasonal stream sinks were found in the valley NW of TK005 although only one had accessible cave, which was short. Further west, the footpath passes by a 15m deep shaft that remains undescended ('Hohlen') and eventually reaches the Nong Ma Ngu. This and other marshes in the area lie in the bottom of broad, flat dolines forming an active corrosion plain. Limestone towers and ridges rise out of the plain with caves at the base that are heavily modified by swamp notches. With more exploration, the Yu Nai area could reveal many, interesting caves. Only stream sinks were found during this survey and the resurgence(s) for the area are unknown. It is possible a large cave exists here although the presence of the active corrosion plain suggests that the water table is located at or near the surface and the cave may be flooded.

The path from Yu Nai is well trodden and easy to follow. Away from the path, the undergrowth is thick in places and difficult to get through. The marshes sometimes force long detours around to the other side.

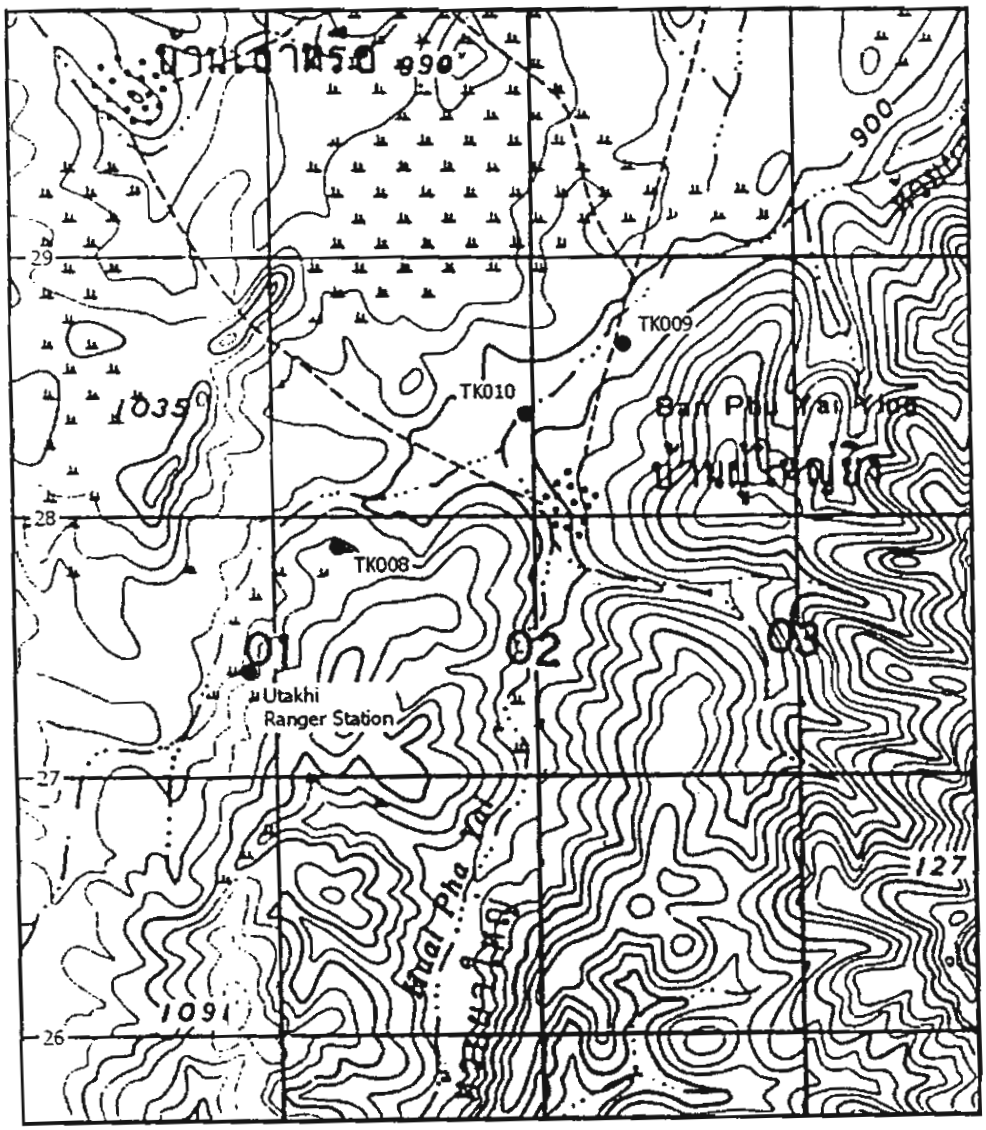
Figure 11. Cave Locations west of Yu Nai.



4.4 Utakhi Ranger Station (4)

Down the valley from Utakhi ranger station are small patches of limestone reached via a reasonable path. The first outcrop contains Tham Khang Khao Utakhi (TK008) with its bad air and ticks. Further to the NE the Utakhi stream falls over a waterfall before sinking at TK010 and rising again just before Tham Nam Mut Utakhi (TK009). The resurgence for this cave is reported to be just over the other side of the ridge. The limited amount of limestone in the area means that few caves remain to be found.

Figure 12. Cave Locations at Utakhi.



4.5 Mae Khlong Valley (5)

The part of the Mae Khlong valley investigated by this project is a difficult 1.5 days walk northwest of Thung Nar Noi ranger station at the point where Huai Bi meets the main river. The walk follows Huai Bi along a footpath that disappears and reappears constantly with long stretches of jungle bashing in between. At the end is a very steep 250m descent down to river level. Once the Mae Khlong is reached, shelter can be taken under a spacious overhang next to Huai Bi, 400m upstream from the confluence.

Huai Bi flows out of a cave of the same name (TK020) at the head of a narrow gorge. Downstream of here, Tham Chang (TK019) and TK018 can be found. Caves were found in the main river valley both upstream and downstream of the confluence. About 4km upriver, a significant resurgence is met at Huai Wak (TK023). Near here are the small caves of TK022, TK023 and TK024. Down river are 2 small caves and another resurgence at Huai Kaet (TK027).

This area is very important and requires much more exploration. TK023 appears to be draining the large karst area east of the Mae Khlong and might reveal a significant cave. Other resurgences and caves are likely to be found on either side of the river. The logistics of reaching the area however, make exploration very difficult.

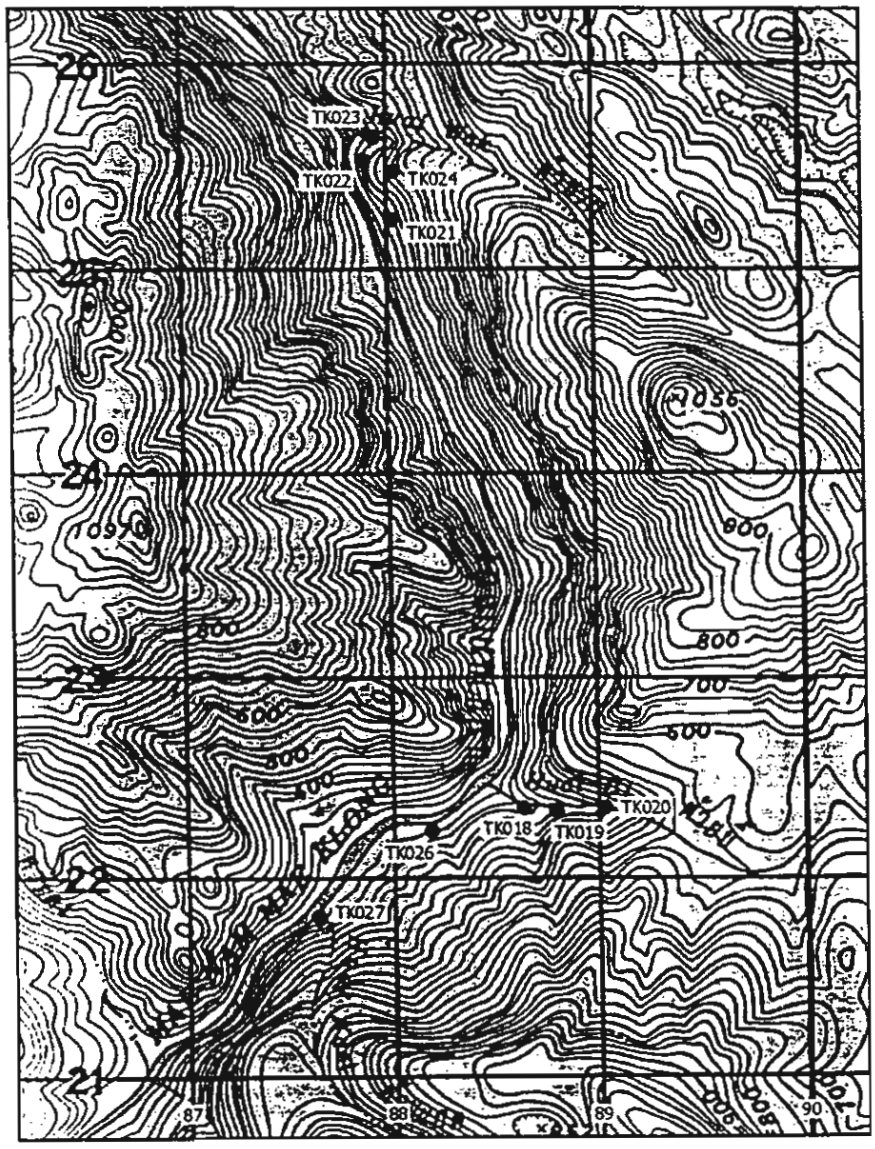


Figure 13. Caves of the Mae Khlong Valley and Huai Bi.

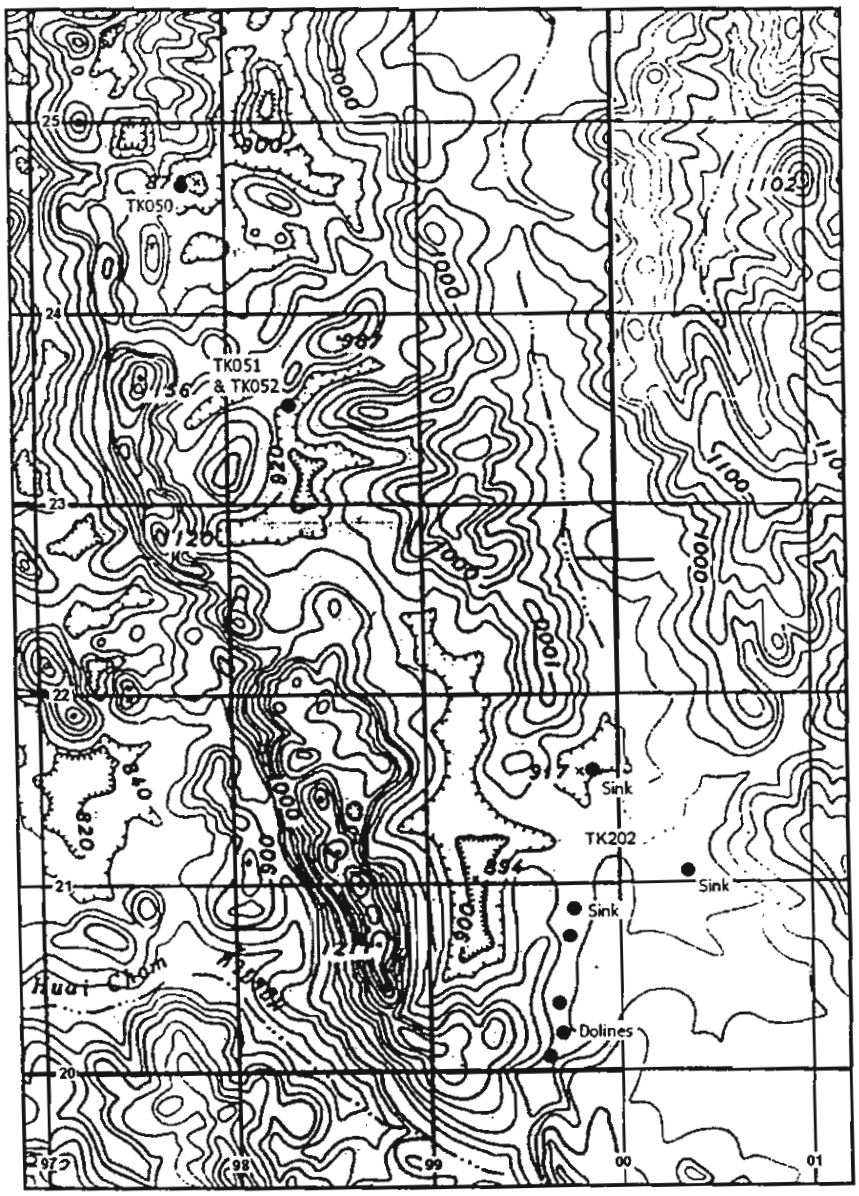
4.6 Pha Fa (6)

Pha Fa is the name of a huge limestone cliff some 10km south of Utakhi ranger station. Streams flowing off the shale/sandstone hills to the east sink where they meet the limestone. The only way to explore this area is to camp out in the forest next to the 2nd bridge from Utakhi, where there is permanent water.

There are 3 sinks in the Pha Fa area itself (TK202), 2 are seasonal and the third takes the permanent stream flowing under the 2nd bridge. Many small dolines pockmark the area as well. They and the sinks are all choked. To the north are two perennial stream sinks in small valleys (TK050 and TK051). Both caves are short.

The resurgence(s) for the area are unknown. It or they could be on the opposite side of the ridge, or alternatively, the TK023 resurgence is 10km away in the Mae Khlong valley. Future exploration should concentrate on locating the destination of the water. There may also be other, dry caves in the area and some may contain archaeological material as shown by that found in TK052.

Figure 14. Caves of Pha Fa.



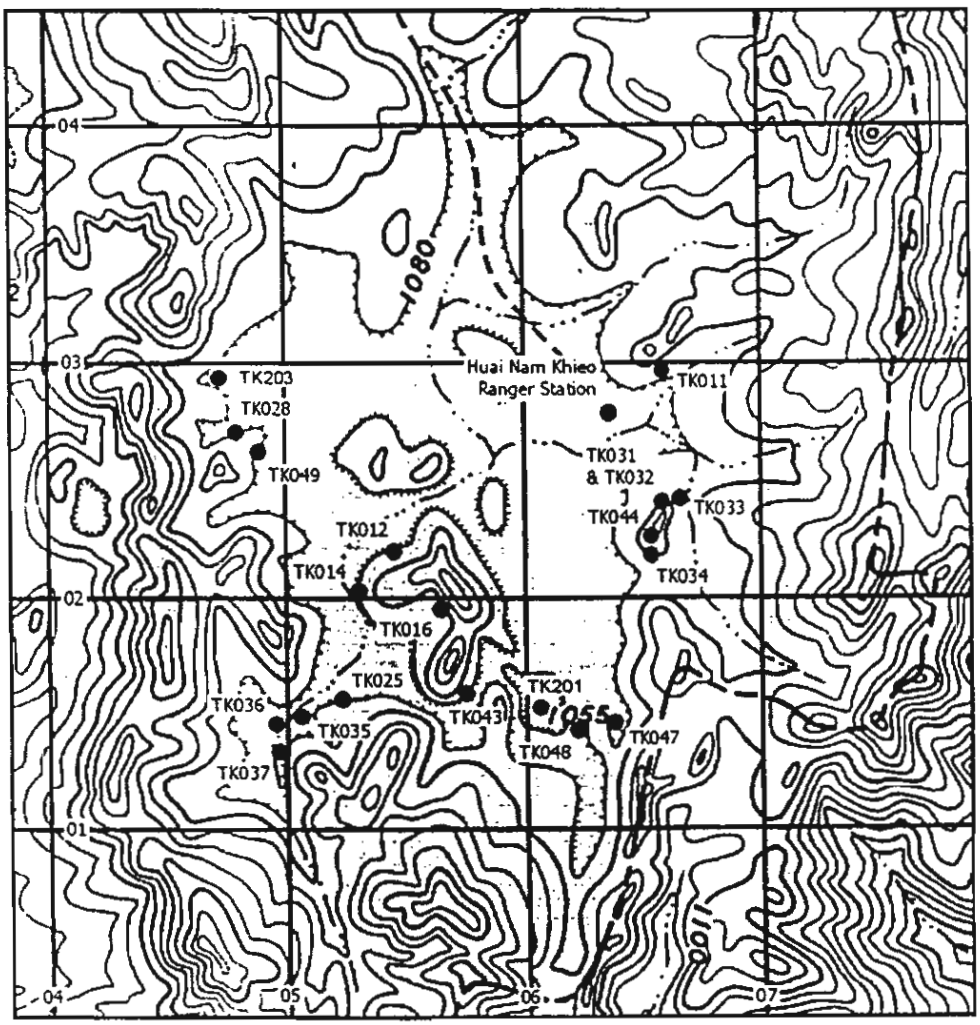
4.7 Huai Nam Khieo Ranger Station (7)

Located nearly 60km from the headquarters, the area around Huai Nam Khieo proved the most productive. The area comprises a broad, flat doline with protruding limestone towers and ridges. All of the caves are found in these hills and the longest are all active stream caves at base level. Some caves have been formed/modified by swamp notching.

To the SW and W of the ranger station, are the biggest caves - Tham Than Lot (TK012), Tham Molakot (TK025), Tham Phet (TK036) and Tham Mor (TK049). Many, other smaller caves were also found here. Immediately south of the station is a small tower containing Tham Seua (TK034) and a few other smaller caves. Within the doline itself, there is still the possibility of finding new caves although most have probably now been surveyed. Extending known caves, especially Tham Than Lot, would seem the best approach. Exploration further afield, away from the doline would almost certainly be worthwhile. Rainwater collecting in the doline sinks into at least 2 low points without enterable cave. The destination of the underground water is a complete mystery. Some archaeological material was found in some of the caves.

The area contains much thick forest that hampers exploration. A few paths (some made by elephants) cross the area and are useable.

Figure 15. Cave Locations around Huai Nam Khieo.



5. Cave Environment

5.1 The Climate of Western Thailand

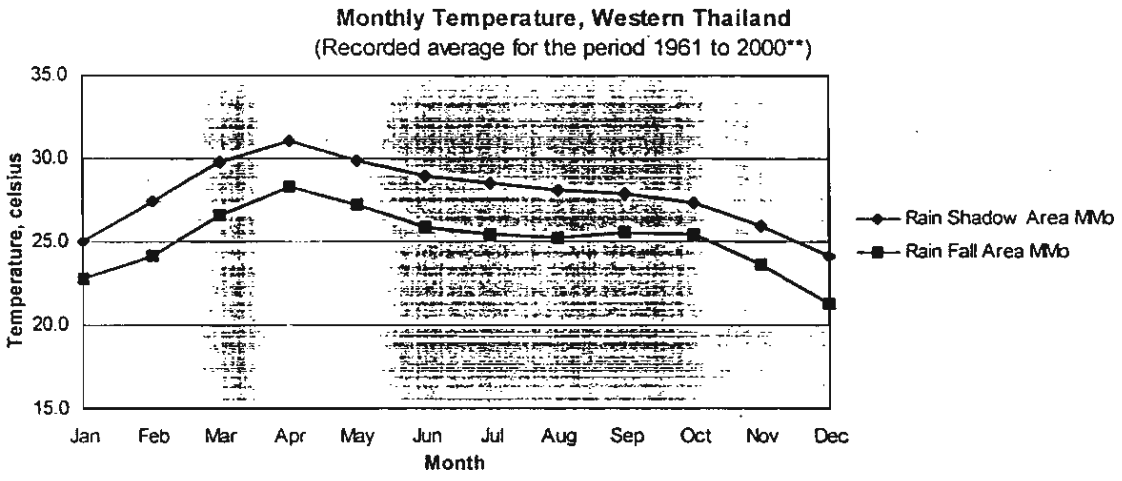
Eight climatic measuring stations, maintained by the Meteorological Department of Thailand, are located near to the study area. They are Umphang, Thong Pha Phum, Mae Sot, Tak, Kamphaeng Phet, Nakhon Sawan, Suphanburi and Kanchanaburi. Averaged measurements of temperature and rainfall, made by these stations over the period of 1961 to 1998/2000 (or as indicated) are shown in Figures 16 and 17. It is unfortunate that similar data is not available for Burma.

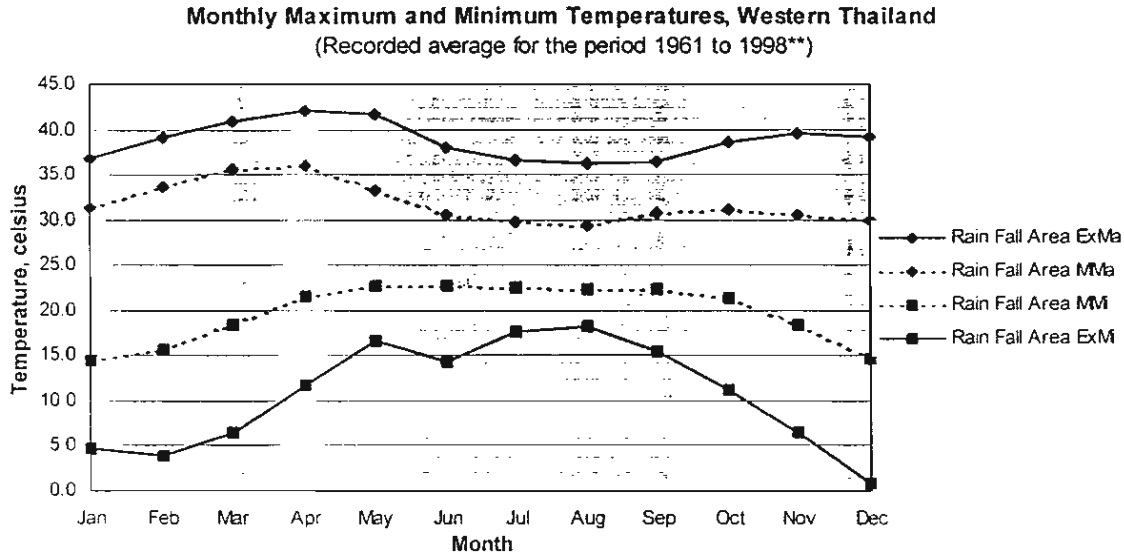
Western Thailand has a strongly seasonal climate divided into 3 seasons: cold and dry (Nov to Feb), hot and dry (Feb to May) and rainy (May to Oct). Mean temperature ranges from 23°C in the cold season to 30°C in the hot season with absolute minimum and maximum temperatures of 1°C to 44°C. Daily fluctuations in temperature are most acute during the cold season with changes of 35°C+ not uncommon. Temperatures in the western parts are generally around 2°C cooler than in the east, most likely due to higher altitudes of those parts. Rainfall varies across the region with most rain falling in the western part. Two distinct areas can be recognised and are here referred to as the 'Rain Fall Area' (Umphang, Thong Pha Phum, Mae Sot) and the 'Rain Shadow Area' (Tak, Kamphaeng Phet, Nakhon Sawan, Suphanburi, Kanchanaburi). Total rainfall per year is 1,400mm to 1,800mm in the Rain Fall Area and 1,000mm to 1,300mm in the Rain Shadow Area. About 90% of the total rainfall occurs during the rainy season. In the Rain Fall Area, rainfall rises steadily both in terms of total amount and number of days with rain. It peaks in August when there is over 300mm of rain falling in 27 days. The Rain Shadow Area shows two peaks of total rainfall in May and September, but never climbs above 250mm. The number of days with rain is quite stable at about 15 days. Extreme rainfall events occur in both areas. The single highest daily maximum was recorded in July in the Rain Fall Area at 207mm. During the rest of the year, daily maxima in this area are consistent at about 50mm to 100mm. In the dryer Rain Shadow Area, two peaks of intense rainfall are seen in May and October (175mm and 188mm respectively) corresponding with the peaks shown by total rainfall.

The nearest climatic monitoring station to Thungyai Naresuan East is Umphang, c.45km away. The data recorded here probably best reflects the climate for the sanctuary although an altitude difference of around 500m+ makes direct correlations impossible. The suggestion that an altitude gain of 1,000m equals a reduction in temperature of 5°C (Medway, 1964) would imply that Thungyai Naresuan is some 3°C cooler. Recorded data for Umphang is given in Figure 18.

Monthly mean temperature varies from 19°C in the cold season to 26°C in the hot season. Maximum and minimum temperatures are 41°C (April) and 1°C (December). Daily fluctuations are nearly 35°C in the cold season, becoming less, 17°C, in the rainy season. A total of 1,400mm of rain falls per year. Monthly rainfall peaks in August with 250mm of rain though it is fairly consistent and lacks any truly extreme events. Daily maximums of just over 100mm have been recorded. It does rain often though with 4 months receiving 25+ days of rain. Relative humidity increases during the rainy season to over 80%. During the hot season, relative humidity drops to around 65%. Average wind speeds are low throughout the year at 1 knot or less. This wind blows from the west for much of the year (Figure 19) bringing moist air from the Andaman Sea. The mountains around Umphang, Thungyai Naresuan and the rest of the Rain Fall Area are the first high ground this air meets resulting in relatively higher rainfall (Kutinatra & Bhumpakkapun, 1989, Nakhasathien & Stewart-Cox, 1990).

Figure 16. Temperature Data for Western Thailand.





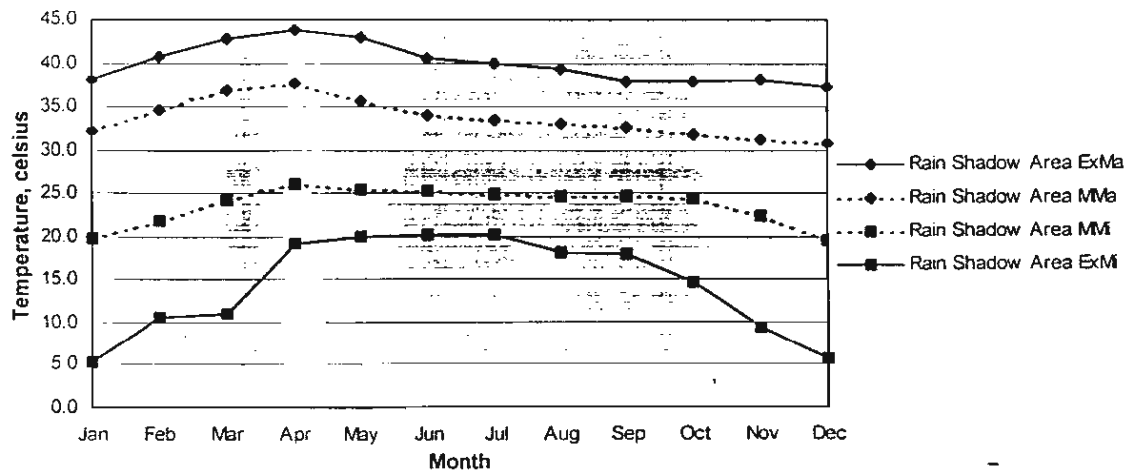


Figure 17. Rainfall Data for Western Thailand.

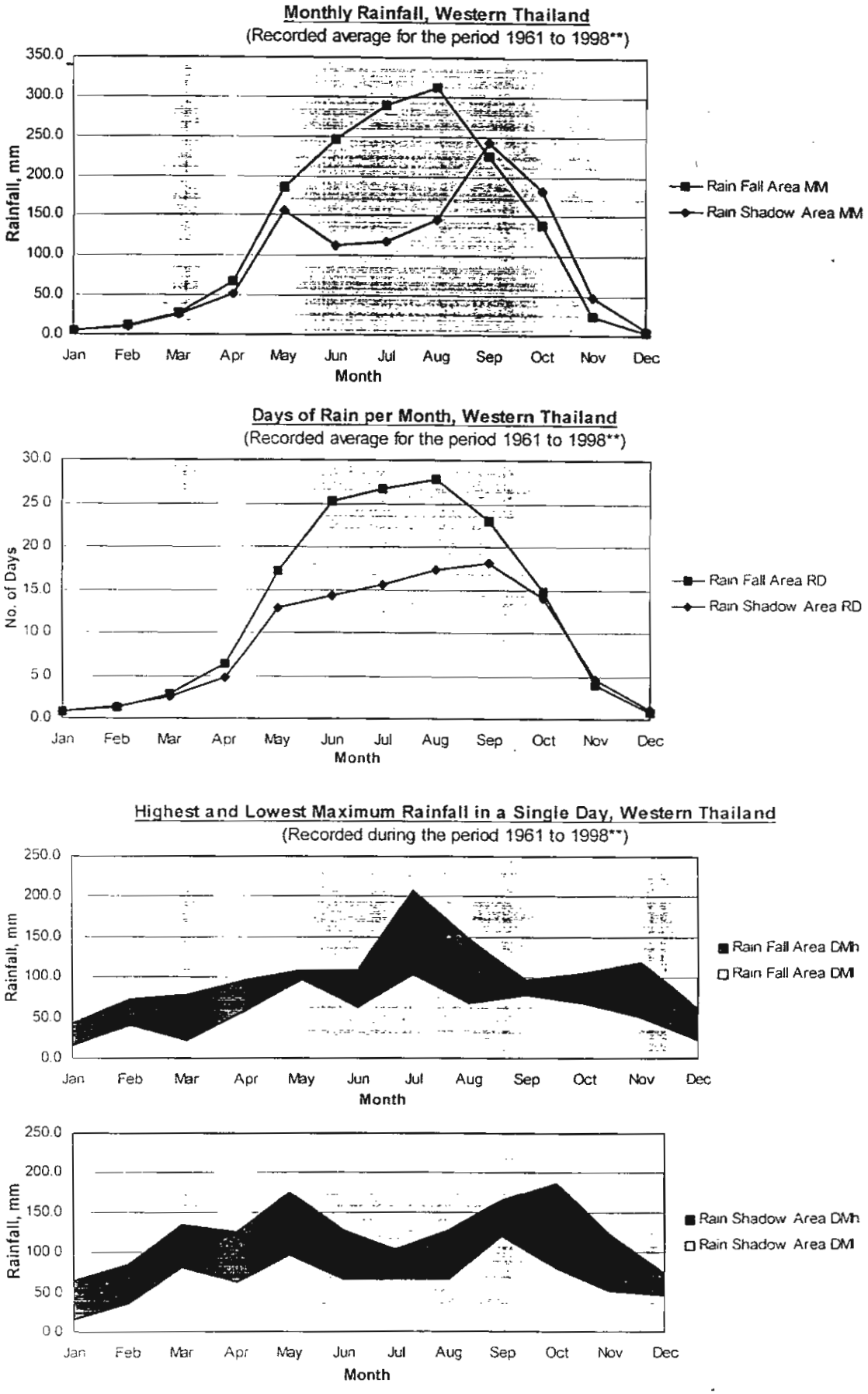


Figure 18. Climatic Data for Umphang.

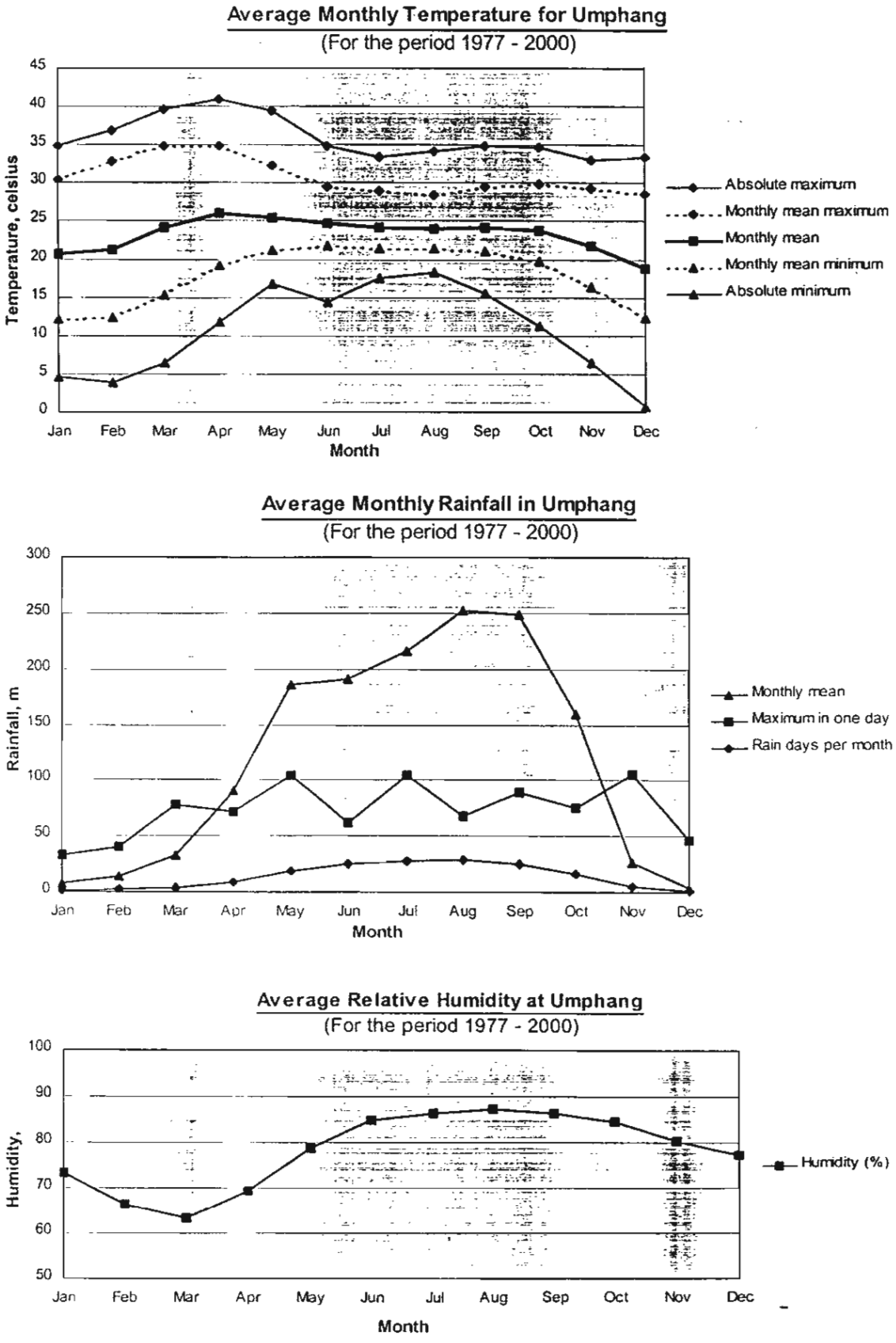
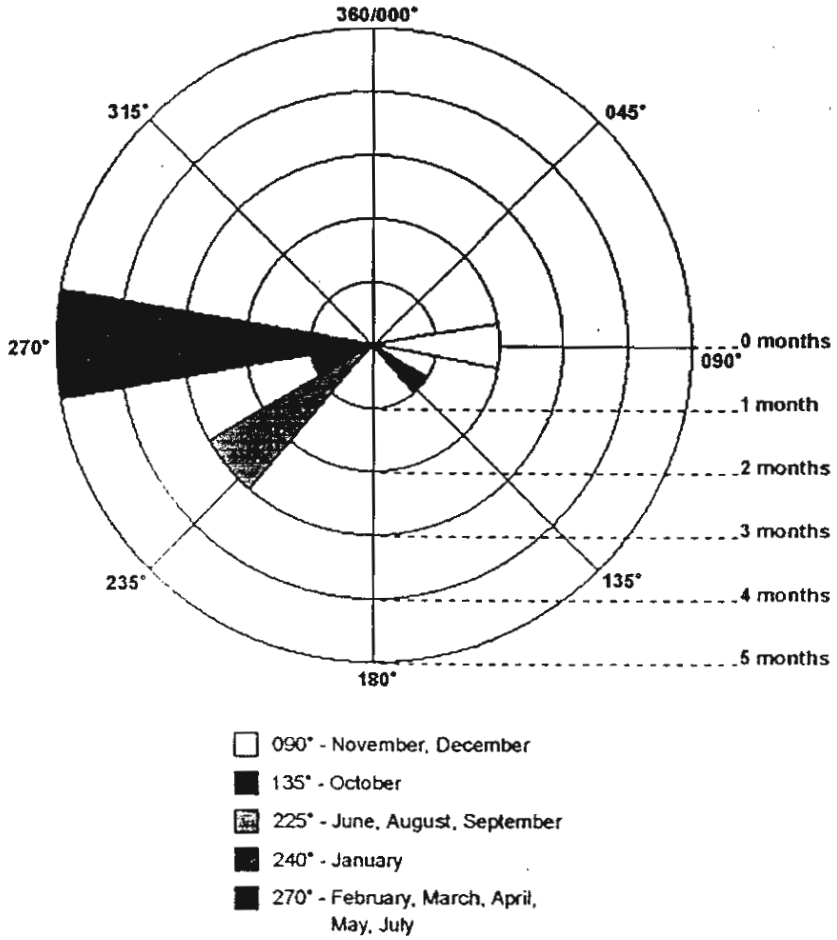


Figure 19. Wind Direction Data for Umphang.



5.2 Cave Environment Measurements in Thungyai Naresuan

Environmental measurements for caves in Thungyai Naresuan are shown in Table 3. The air temperature in caves reflects the local annual mean temperature for the outside (Moore & Sullivan, 1978). Temperature ranges from 16°C to 24°C with an average of 19-20°C. The mean annual temperature for Umphang is 23°C and the difference of 3-4°C corresponds well Medway's suggestion of 5°C change per 1,000m of altitude (Medway, 1964). The relationship of cave air temperature and altitude is shown in Figure 20. Thungyai Naresuan maintains a very consistent altitude of 900-1,100m.a.s.l. producing a very flat relationship with temperature. However, the graph does clearly show that a decrease in altitude equals an increase in temperature. Two sites, TK020 and TK021, do not fit this general trend. They are much cooler than their altitude suggests (21.5and 20°C at 350m.). These two caves are located in the bottom of the 400m deep gorge of the Mae Khlong River. Only a few hours of sunlight each day reaches this locality creating a small microclimate, much cooler than expected.

Relative humidity is very consistent across all sites at an average of 85-95%. The relationship between humidity and altitude suggests a slight increase in humidity with increasing altitude. As with temperature, this relationship is very flat due to most measured sites being of a similar altitude. The notion that highland areas have higher moisture levels (Gardner, Sidisunthorn & Anusarnsunthorn, 2000) is backed by this data.

A comparison of temperature and humidity to number of entrances and whether the cave is active or inactive was attempted (Figure 21). The data collected contains a bias towards several measurements taken in a few sites during certain seasons and so an accurate relationship cannot be given yet. Many more measurements are needed to confirm or disprove any possible relationships. The results are presented here in the hope that more data will be collected.

The thermal conductivity of water is lower than that of air. Thus cave streams would tend to provide temperature measurements that reflect outside seasonal variations (Moore & Sullivan, 1978). Table 3 shows the results of 13 measurements. Generally cave water temperatures are lower than air temperatures by about 1°C. Not enough measurements have been made yet to show seasonal or annual variations.

Water pH measurements reveal that most cave streams in Thungyai Naresuan are neutral to slightly alkaline (pH = 7.2 to 8.3) thus indicating they are probably saturated with respect to calcium carbonate. One measurement of 6.7 was taken in TK079. This water is not a stream rather it is stagnant water from a nearby marsh.

Table 3. Cave Environment Measurements.

No.	Date of Measure	Cave	No. of Entrances	Active ?	Altitude m.a.s.l.	Air Temp	Humidity %	Water Temp	pH
1	16/11/98	TK001	1	1	920	22	91	20.5	7.5
2	16/11/98	TK002	1	2	950	24	75		
3	17/11/98	TK005	2	1	910	21	86	19	8.1
4	17/11/98	TK007	2	2	970	20	91		
5	18/11/98	TK008	1	2	940	22.5	91		
6	18/11/98	TK008	1	2	925	22	91		
7	19/11/98	TK009	1	1	880	21	95	20	8.3
8	22/11/98	TK012	2	1	1080	18.5	95	18	7.8
9	28/11/98	TK017	2	2	860	20	95		
10	08/01/99	TK020	1	1	320	21.5	95	20.5	7.2
11	09/01/99	TK021	1	2	370	20	81		
12	15/01/99	TK032	1	2	1100	20.5	86		
13	18/01/99	TK012	2	1	1080	19	95		
14	19/01/99	TK025	2	1	1090	17	90	16	8.2
15	21/01/99	TK036	2	1	1090	17.5	90	17	8.3
16	21/01/99	TK036	2	1	1090	17.5	85	16.5	8.2
17	21/01/99	TK036	2	1	1090	17	95		
18	21/01/99	TK025	2	1	1090	17	95	16.5	8.1
19	21/01/99	TK025	2	1	1090	17	95	16.5	8.2
20	22/01/99	TK034	2	2	1100	16.5	89		
21	22/01/99	TK034	2	2	1100	17	85		
22	23/02/99	TK034	2	2	1100	16.5	95		
23	24/02/99	TK034	2	2	1100	16	89		
24	24/02/99	TK034	2	2	1100	17	85		
25	24/02/99	TK034	2	2	1100	17	90		
26	24/02/99	TK034	2	2	1100	17	90		
27	25/02/99	TK011	1	2	1090	19.5	86		
28	26/02/99	TK034	2	2	1100	16.5	95		
29	26/02/99	TK034	2	2	1100	17.5	90		
30	21/04/99	TK049	2	1	1070	22	82	20	
31	01/05/99	TK011	2	2	1090	19	97		
32	02/05/99	TK049	2	1	1070	20	100		
33	03/05/99	TK012	2	1	1080	19.5	97	20	
34	22/08/99	TK062	1	1	950	22	95		
35	03/12/99	TK082	1	1	920	20	95		
36	05/12/99	TK079	2	1	920	20	93	18	6.7

Number of Entrances

1 = Single entrance

2 = Multiple entrances

Active?

1 = Active cave

2 = Inactive cave

Figure 20. Cave Air Temperature and Humidity vs. Altitude.

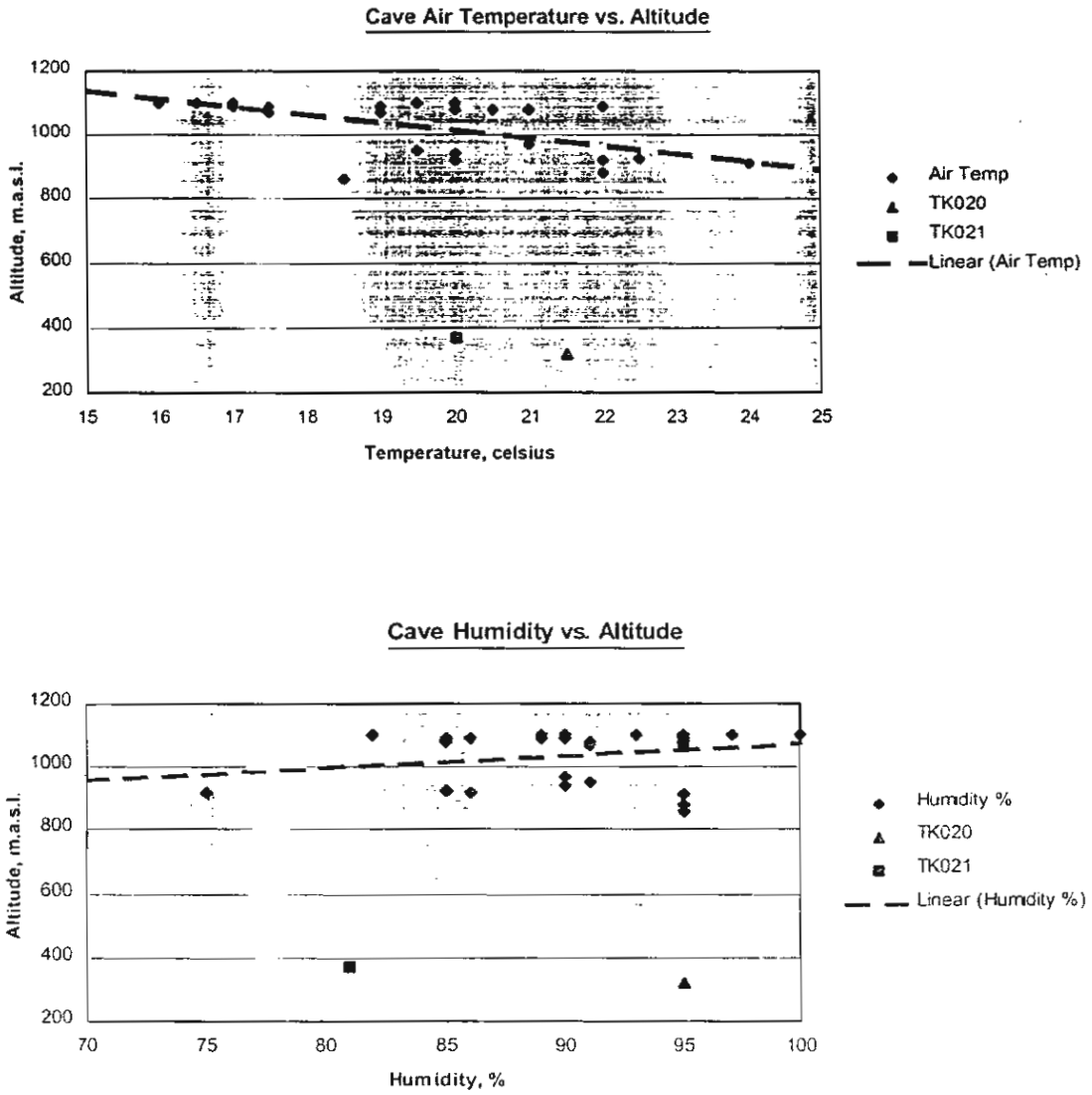
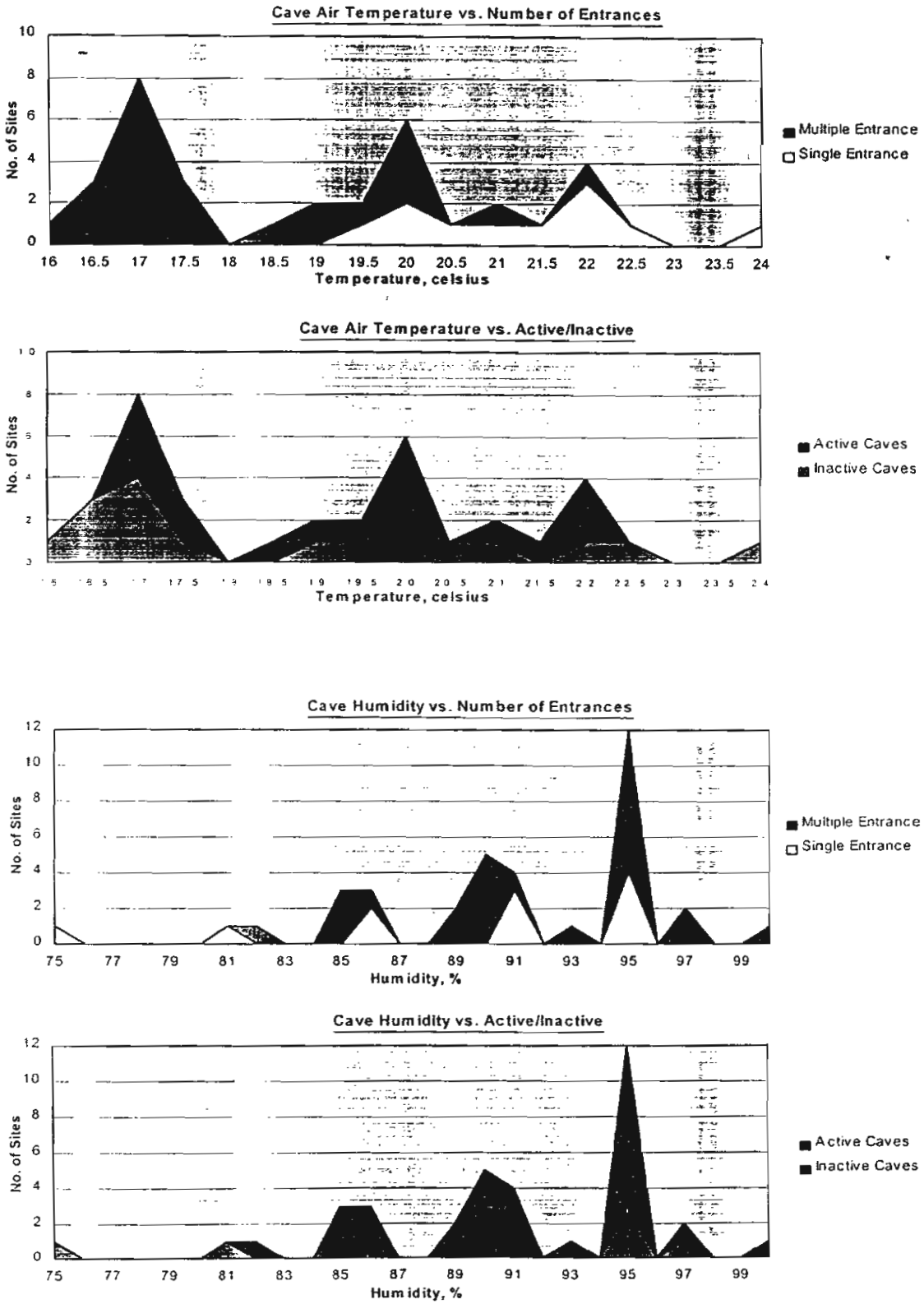


Figure 21. Cave Air Temperature & Humidity vs. No. of Entrances & Active/Inactive.



6. Cave Geology

6.1 Cave Passage Orientation

Of the caves explored and surveyed, six are of sufficient length to make a study of the overall passage orientation worthwhile. These six caves are Tham Nam Mut Utakhi (TK009), Tham Than Lot (TK012), Tham Molakot (TK025), Tham Seua (TK034), Tham Phet (TK036) and Tham Mor (TK049). Passage orientation diagrams based on total length of passage are shown in Figure 22.

An analysis of cave passage orientation has also been carried out for caves in Mae Hong Son (Kiernan, 1988). The conclusion drawn from this area is that some caves follow the strike of folded bedding planes and others follow no more than 3 or 4 principal joint trends. A situation not dissimilar to caves in Thungyai Naresuan.

To make the following interpretations the cave surveys, the morphology of the cave passages and field measurements have been also used in conjunction with the orientation diagrams.

Tham Nam Mut Utakhi (TK009).

This cave shows a very strong preferred orientation of 085-265 with a second, minor trend towards 005-185. A major, structural discontinuity such as a fault(s) is inferred to have guided development of much of the cave in the 085-265 direction. Where the cave does trend 005-185, the stream passage is smaller and tends to sump, i.e. at the entrance, in the middle of the cave and at the downstream sump. It is likely that these parts follow the bedding of the limestone between the inferred fault(s). The trend of 135-315 is hardly represented in the cave.

Tham Than Lot (TK012).

The surveyed length of this cave is 1,866m and the passages show a broad orientation around 165-345 (range = 090-270 to 240-060). There is a distinct lack of passages orientated 075-255. Structural discontinuities in the form of small faults and joints guide the central part of the cave in a 165-345 to 195-015 trend. The larger passages of the Western and Eastern sectors have a variable orientation with long, sweeping bends indicating development along the strike of folded bedding planes. The general strike of the bedding would be approximately 140-320.

Tham Molakot (TK025).

This cave exhibits at least three sets of passage orientation. The main trend is 040-220 and includes the downstream half of the cave and it's associated upper levels. These passages are guided by a large fault. On the SE side of this fault, bedding dips 25° NE with a strike of 120-300. On the NW side, it dips 22° N and strikes 075-255. In the middle of the cave, the trend changes to 120-300. A second, nearly perpendicular fault is inferred. A smaller, third trend is noticeable about 150-330. This includes the small inlet near the resurgence entrance that is developed along the strike of the bedding.

Tham Seua (TK034).

This very complex cave shows very little preferred orientation. No confident deductions can be made about geological control except that passages orientated around 065-245 are less frequent. The cave has formed phreatically along any and every available discontinuity, later developing a vadose overprint.

Tham Phet (TK036).

Two strong trends orientated 000-180 and 135-315 characterise this cave. Both the stream passage and the upper levels follow these trends. Two series of small faults/joints, angled at 45° to each other, are inferred with the cave alternating between them. In places short sections of passage have utilised the strike of the bedding at 045-225 to jump across. There is a lack of passages trending 070-250.

Tham Mor (TK049).

A very complex cave that exhibits a strong orientation centred on 120-300 with another, minor trend along 000-180. The major trend is shown by the stream passage and associated upper level. These passages follow a virtually straight line along an inferred large fault or other kind of fracture. The rest of the cave consists of upper levels with a less clear orientation pattern, although the diagram suggests a weak 010-190 preference. A set of small faults or joints is probably responsible for this trend. Passages orientated 065-245 are lacking.

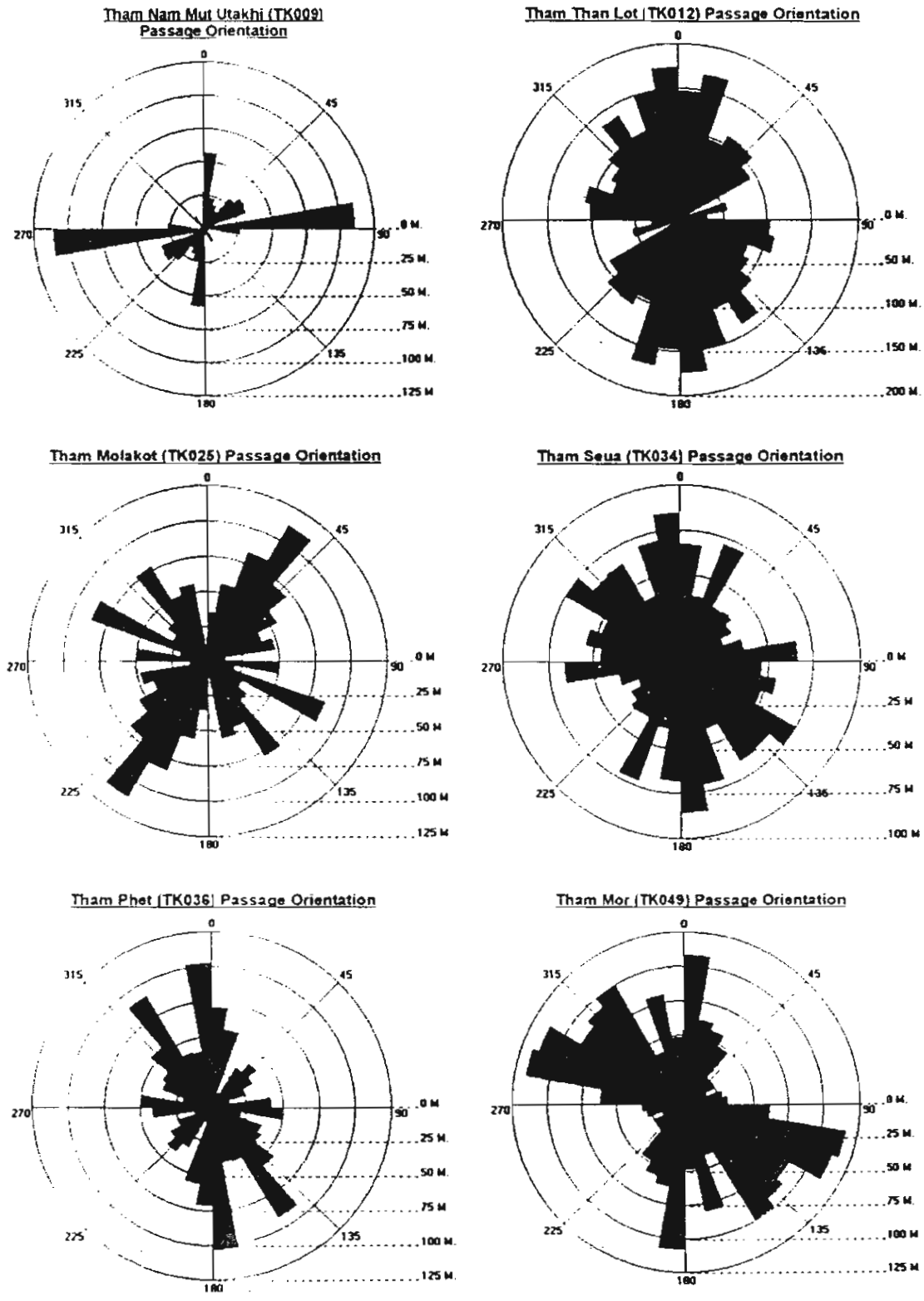
Comparison Between Caves.

Five of the caves (Tham Than Lot, Tham Molakot Tham Seua, Tham Phet and Tham Mor) are located in the same Huai Nam Khieo area. Any similarities between passage orientations may represent the geology of that area as a whole.

A trend centred on 000-180 is seen in 4 of the 5 caves. These passages are developed along a set of small, parallel joints/ faults. Another similar set may be shown by the 150-330 trend of all the caves though this is less clear. The major fault of Tham Molakot (040-220) is not seen in any of the other caves and is assumed to be a singular feature. The second fault of this cave, orientated 120-300, is paralleled by a similar feature in Tham Mor suggesting the possible presence of a series of widely spaced, larger parallel faults. Bedding dip and strike measurements vary widely across the area making broad interpretations difficult.

Four of the five caves show a distinct lack of passages orientated 065-245 to 070-250. The geology of the area therefore lacks structural discontinuities with this trend.

Figure 22. Passage Orientation Diagrams for Total Passage Length of Selected Caves..



7. Thailand Caves Database

7.1 Aims

This database is intended to fulfil a dramatic and obvious need in the field of speleology in Thailand. It was developed using the Visual Basic for Access programming language in Microsoft Access 97.

Much information already exists concerning Thai caves making Thailand speleologically one of the better known of the SE Asian countries. However, this data is spread through numerous reports, technical essays, magazine articles, newspaper stories and television reports. The data lacks consistency in both quality and content and is difficult to access due to the various authors' use of different languages, style and intention. The main aim of this database is therefore to bring all existing data together into a single, consistent entity. A standard data input format has been devised to help achieve this by eliminating subjectivity as much as possible and offering the user data input options. Hopefully this format will also influence how raw field data is collected in the future. Once data has been entered, it is very simple to edit, add or delete. Access to the stored data is via a fully user defined search system based on one or two parameters. Retrieved data can be viewed, printed or sent to other applications. The database has an interface that is visually pleasing and is easy to navigate through.

Three groups of people are the conceived users of the database - land managers, researchers and general interest groups. Land managers, especially the Royal Forest Department, will be able to determine where a particular cave stands in terms of significance, vulnerability and potential in a local and/or national context. Decisions concerning protection or development can then be made more objectively than they are at present. The data, though basic, will provide scientists with possible research opportunities and study sites and hopefully will stimulate ideas for new areas of investigation. General interest groups may include journalists, tour guides, adventurers and local people.

7.2 Database Operation

A shortcut with icon to the database is stored on the desktop. Double clicking on this will open the database at the Welcome Screen (Figure 23).

This screen displays the following features:

- Welcome message
- 'Input New Cave' button
- 'Edit Known Cave' button
- 'View Cave Data' button
- Logos of the developers, sponsors, etc
- Total Caves
- 'Players' button

Clicking one of the 'Input', 'Edit' or 'View' buttons will open the appropriate page for the required action. These sections are described in detail later. The 'Players' button opens a small page displaying a very brief description of the project and database and the names of the people involved (Figure 24). It also contains contact details if the user has suggestions, comments, data to add or changes to make. 'Total Caves' is a running total of the number of caves currently stored in the database. This updates automatically

when a new entry or deletion is made. The standard 'Menu Bar' toolbar provided by Microsoft Access appears at the top of each page to aid working with this application. The Print Preview Page also contains the 'Print Preview' toolbar. All other toolbars have been removed although they can be easily recalled if required. Running along the bottom is a status bar that contains messages explaining how to use the database.

Figure 23. Welcome Screen.

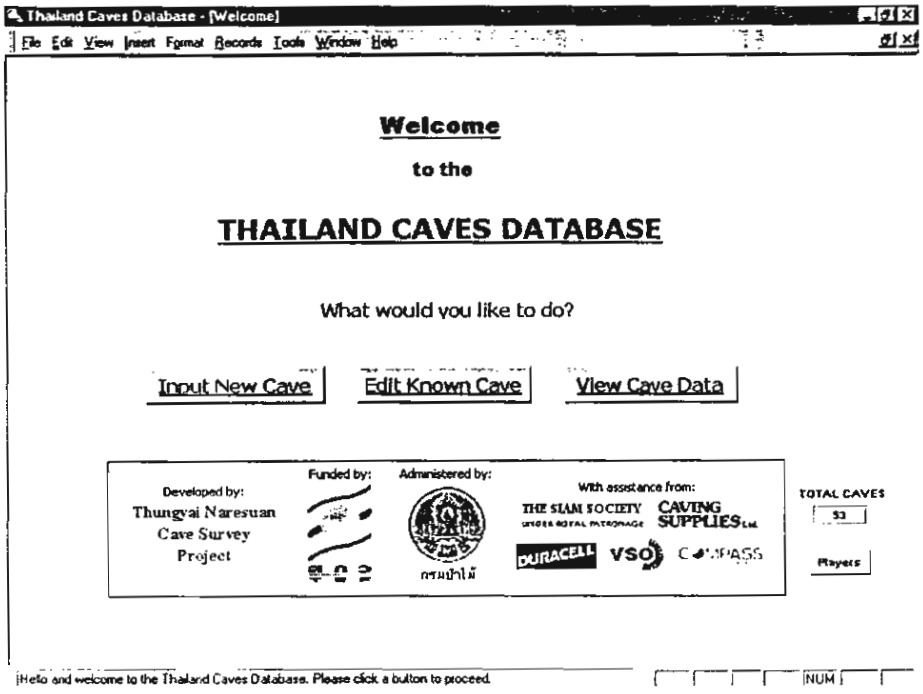
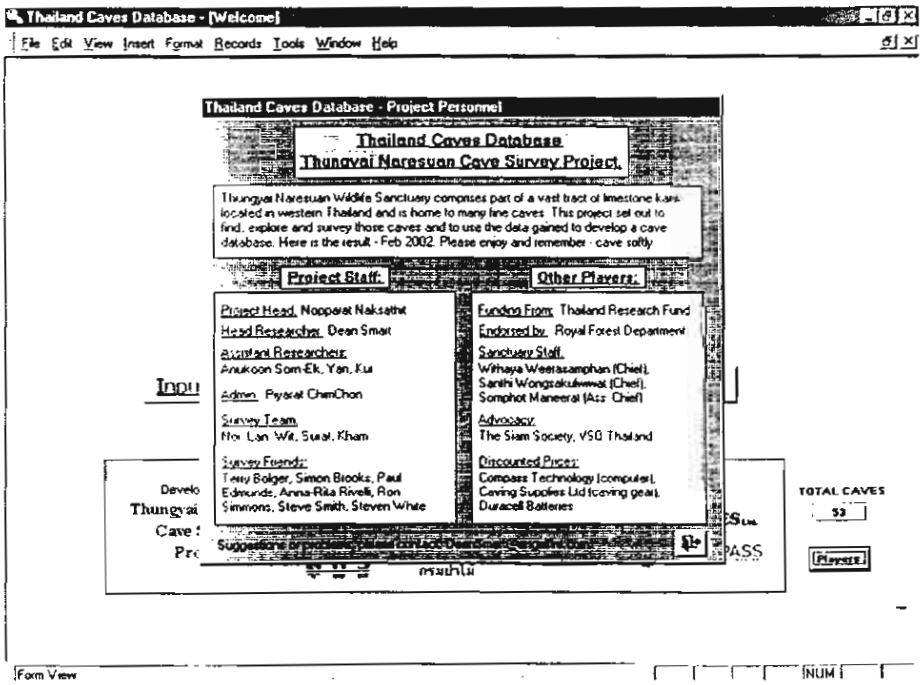


Figure 24. 'Players' Screen.



7.3 Data Input, Editing and Viewing

7.3.1 The Data

The pages for input, editing and viewing data are all based on the same template. They have different colours to help the user distinguish them easily - grey for input, light blue for editing and orange for viewing.

The top section of the pages is occupied by the page title, the unique site code for the cave, the name of the cave in English and Thai, the location details and a box of navigation buttons. The navigation buttons make it convenient to change between the various pages, save data, delete data, print and close the currently displayed page.

The lower portion contains a series of sub-pages for a variety of data subjects. The different subjects can be selected by clicking on the appropriate tab displayed along the top of the section. Subjects offered are Description, Geology, Hydrology, Biology, Palaeontology, Archaeology, Culture, Environment and Management.

A description of the data fields by subject follows in Table 4.

Table 4. Details of Database Data Fields.

- **Location** (Details of the cave location, displayed on all data pages)

Site code	Unique code for each cave, automatic	Auto
English Names	Name or names of cave in English	Text
Thai Names	Name or names of cave in Thai	Text
Province	Name of Province, select from drop-down list	Text
District	Name of District, select from drop-down list	Text
Protected Area	Name of Protected Area, select from drop-down list	Text
Zone	Zone of Thailand, e.g. north, south, northeast, etc.	Text
UTM Zone	UTM zone, e.g. 47P	Text
Easting	UTM eastings coordinate	Number
Northing	UTM northings coordinate	Number
Latitude	Latitude coordinate	Number
Longitude	Longitude coordinate	Number
Elevation, m	Elevation above sea level in metres	Number
Mapsheet	1:50,000 map sheet number, e.g. 4839 IV	Text
Length, m	Length of cave in metres	Number
Depth, m	Depth of cave in metres	Number
Survey	Hyperlink to cave survey file	Link

Table 4. Details of Database Data Fields – Continued.

- **Description** (Description of general aspects)

Access Description	How to get to and find the cave entrance	Text
General Description	Route finding and difficulties inside the cave	Text
Technical Description	Equipment required to explore the cave	Text
Dangers	Causes of injury or death during exploration	Text
Outstanding Values	What makes the cave significant	Text
References	Code numbers of references to the cave	Text

- **Geology** (Description of geological aspects)

Geology Description	Description of the geology, morphology, etc	Text
Rock Type	Type of rock the cave formed in. Choose from list	Text
Rock Age	Age of rock the cave formed in. Choose from list	Text
Sediments	Description of sediment in the cave	Text
Speleothems	Description of speleothems in the cave	Text
Further Data	Any further geology data not included above	Text

- **Hydrology** (Description of hydrological aspects)

Hydrology Description	General description of the hydrology	Text
River System	Name of river the stream joins. Choose from list	Text
Stream Name	Name of stream flowing through the cave	Text
Catchment Area, km2	Size of catchment area in square kilometres	Number
Flow Rate, cumec	Amount of water flowing in cumecs	Number
Traced To/From	Names of caves dye traced to or from this cave	Text
Further Data	Any further hydrology data not included above	Text

- **Biology** (Description of biological aspects)

Biology Description	General description of the biology	Text
Identified Species	Names of species ordinary found in the cave	Text
Unusual Species	Names of rare, endemic, troglobitic, etc. species	Text
Food Supply	Types of food supply routes. Choose from list	Text
Further Data	Any further biology data not included above	Text

Table 4. Details of Database Data Fields – Continued.

- **Palaeontology** (Description of palaeontological aspects)

Palaeontology Description	General description of the palaeontology	Text
Species List	Names of the species found	Text
Age Range	Age range of the material found	Text
Further Data	Further palaeontology data not incl. above	Text

- **Archaeology** (Description of archaeological aspects)

Archaeology Description	General description of the archaeology	Text
Artifacts List	List of artifacts found in the cave	Text
Excavated Who + When	Name of excavator and date	Text
Age Range	Age range of material found	Text
Further Data	Further archaeology data not included above	Text

- **Culture** (Description of cultural aspects)

Cultural Description	General description of the cultural uses	Text
Artifacts List	List of artifacts found in the cave	Text
Type of Use	How the cave was used, e.g. temple, hideout, etc.	Text
Date of Use	Time of usage	Text
Further Data	Any further cultural data not included above	Text

- **Environment** (Description of environmental aspects)

Environment Description	General description of the environment	Text
Air Temp, C	Average air temperature, degrees Celsius	Number
Humidity, %	Average relative humidity, %	Number
Water Temp, C	Average water temperature, degrees Celsius	Number
Water pH	Average acidity of the water, pH	Number
CO2, High %	Highest measured carbon dioxide level, %	Number
O2, Low %	Lowest measured oxygen level, %	Number
Other Measurements	Any other measurements carried out	Text
Further Data	Further environment data not included above	Text

Table 4. Details of Database Data Fields – Continued.

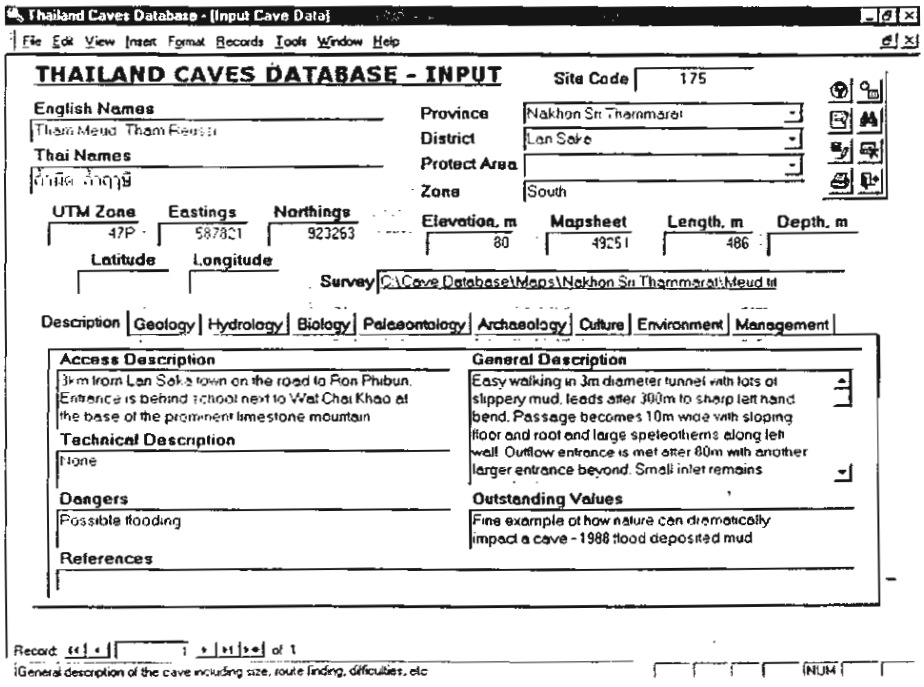
- **Management** (Description of management aspects)

Management Description	General description of the management	Text
Classification	Management classification. Choose from list	Number
Special Purpose	Reason for classifying under special purpose	Text
Comparison Site	Site code of elected comparison site	Number
Energy Rating	Energy rating of the cave. Choose from list	Text
Manager	Name of manager of cave. Choose from list	Text
Impacts	List of impacts inflicted upon the cave	Text
Impact Source	Source of those impacts	Text
Development	Description of infrastructure inside or outside	Text
Further Data	Further management data not included above	Text

7.3.2 Input Data

Clicking the 'Input New Cave' button on the Welcome page or the 'New Cave' button on the navigation box opens the Input Page (Figure 25). This page is coloured grey and opens with every field blank except for "(AutoNumber)" written the Site Code field. This code is automatically selected by the database when the first data is entered and is not user definable.

Figure 25. Data Input Page.

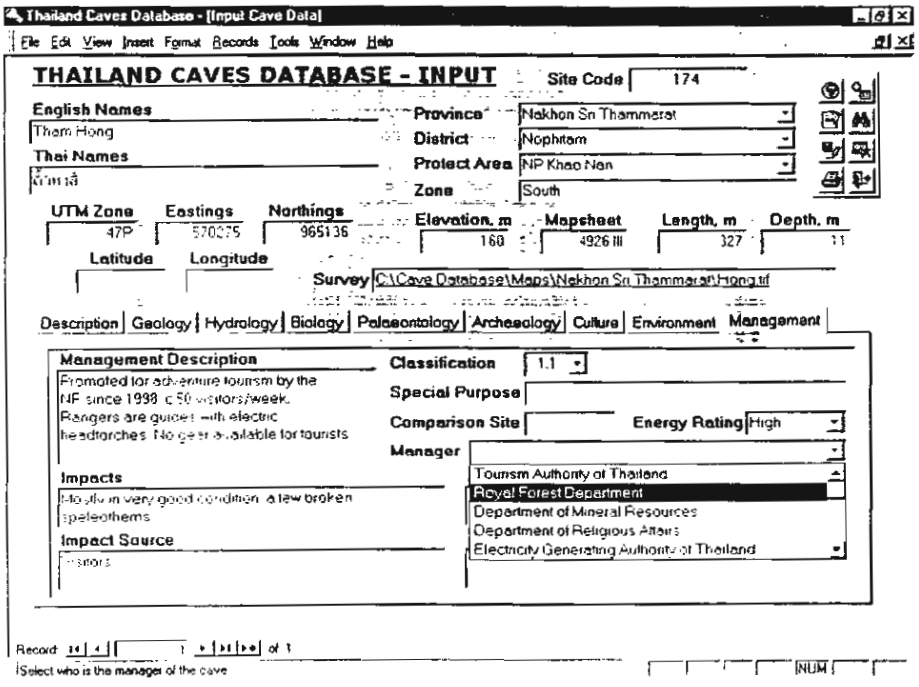


None of the fields are required to have data in order to make an entry. However, it is strongly recommended that the absolute minimum data for a valid entry would be:

- Name
- Province
- Protected Area
- UTM zone and coordinates
- Elevation
- Length
- Depth
- Survey hyperlink
- Access Description
- General Description
- Technical Description
- Dangers
- Outstanding Values

To aid input and to help standardise the data, drop-down 'combo' lists have been used wherever possible (Figure 26). These offer a choice of the most commonly used names or terms for the data concerned. Input is not restricted to the choices offered by the list, although most eventualities have been catered for and every attempt should be made to adhere to them. Some fields require just a number input, for example, Elevation and Air Temperature. All numbers use metric units, i.e. metres, degrees Celsius, percent and pH. The units are displayed on the page and do not need to be entered as data, in fact they can't be. Description fields use text as data. Most descriptions are restricted in size to 255 characters to force the user to make brief, informative inputs and also to limit the amount of data stored. Stored data for the caves of Thungyai Naresuan East provide style and composition examples of how descriptions should be written.

Figure 26. Example of a Drop-Down Combo Box - Manager Name.

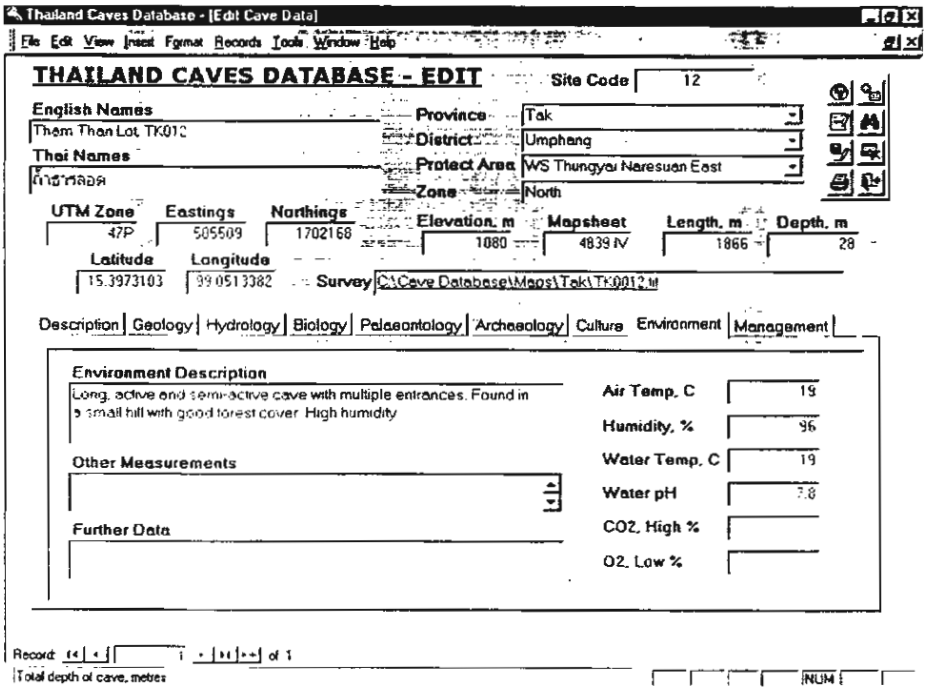


After the data has been entered into the page, the cave must be saved into the database. Clicking on the 'Save Cave' button in the navigation box will open a small box asking for confirmation on the save action. Click 'OK' to proceed and save the entry. The input page will now be cleared of data awaiting input of a new cave.

7.3.3 Editing Data

The Edit Page is pale blue in colour and is used to edit data already saved in the database (Figure 27).

Figure 27. Edit Data Page.



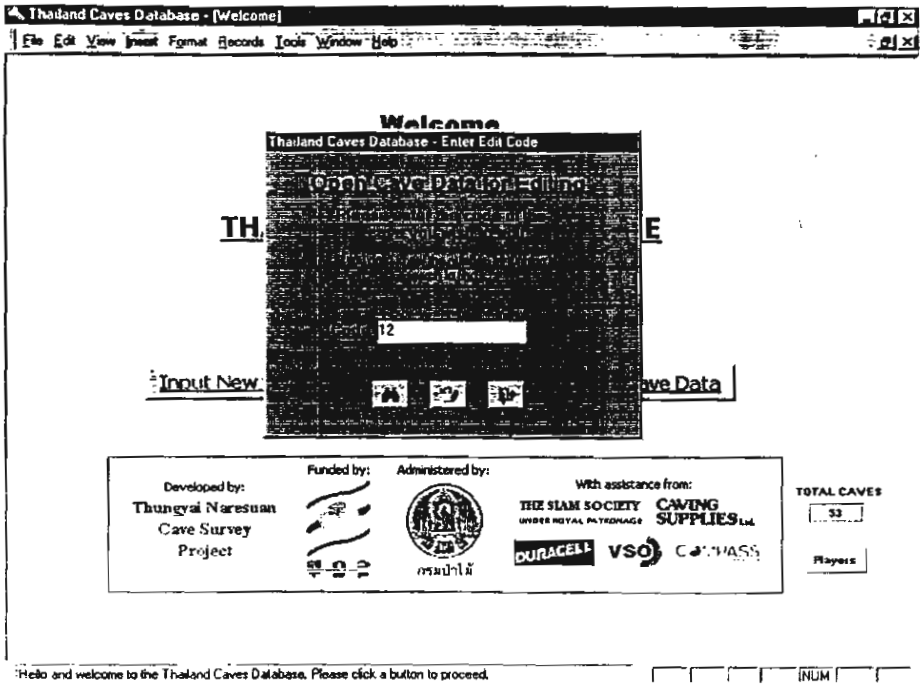
Access to the Edit Page can be made in three ways. Two of these require knowing the unique site code of the cave concerned. Clicking on the 'Edit Known Cave' button of the Welcome Page or the 'Edit Cave' button of the navigation box opens a small page asking for input of the site code (Figure 28). Simply type in the number, click the search button and the Edit Page will open displaying all of the stored data for that particular cave.

If the site code is not known, the data can be accessed via the Search and View pages. Open the Search Page and enter criteria that is likely to find the cave to be edited. Look through the results of the search and when the required cave is found, click the 'Edit Cave' button on the navigation box. The Edit Page will open displaying the data for that cave and editing can begin. The procedure for searching and viewing is explained in more detail below.

Once the edits have been completed, the cave needs to be saved by clicking on the 'Save Cave' button on the navigation box.

To delete an entire cave, open it in the Edit Page and click the 'Delete Cave' button on the navigation box. The user will be asked to confirm the deletion before the action is carried out. Note that all data, including the Site Code will be lost.

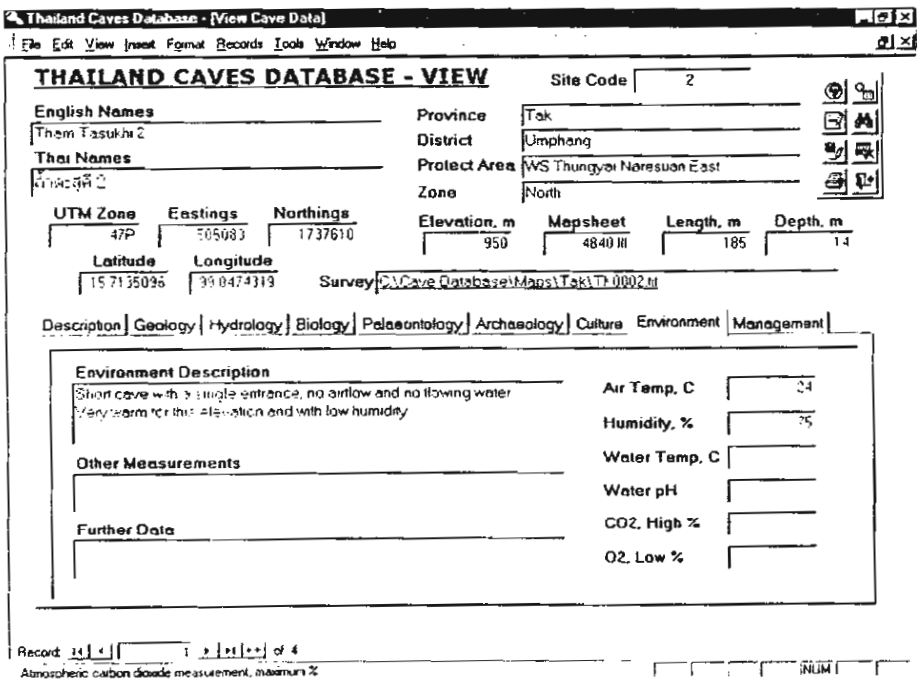
Figure 28. Enter the Site Code of the Cave to be Edited.



7.3.4 Viewing Data

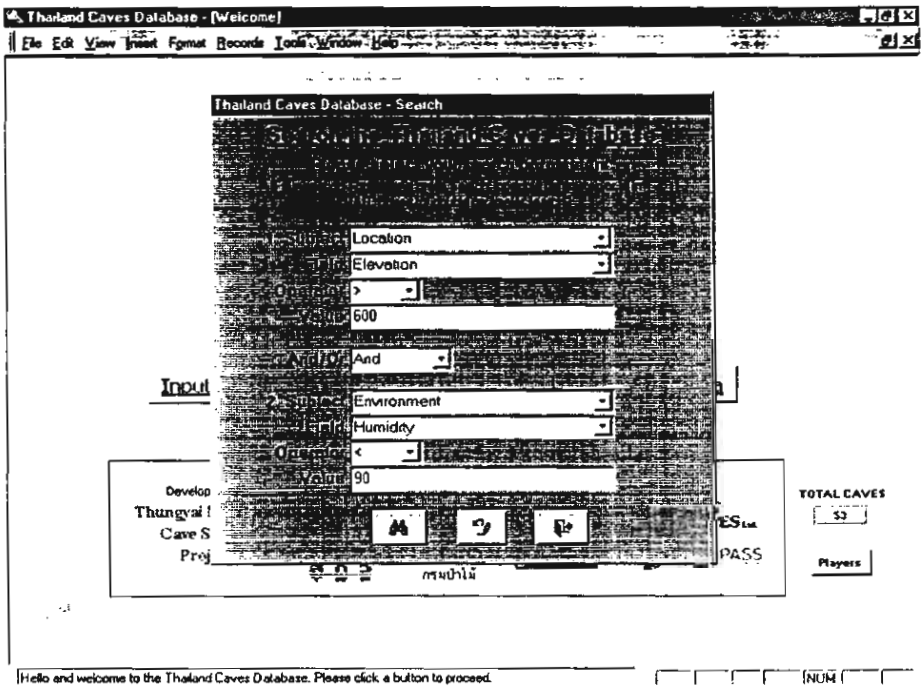
The View Data Page is orange in colour and displays data for viewing and printing purposes only (Figure 29). No inputs, deletions or edits can be made.

Figure 29. View Data Page.



To view the data, a search needs to be carried out. The search is based on either one or two criteria selected by the user and can be very effective in narrowing down the number of caves displayed. Begin a search by clicking the 'View Cave Data' button of the Welcome Page or the 'Search' button of the navigation box. The Search Page will open (Figure 30).

Figure 30. Enter Search Criteria for Viewing Cave Data.



Search criteria are selected using the Subject-Field-Value system of the database itself. A subject is chosen from the first drop-down combo box provided. Subject titles are Location, Description, Geology, Hydrology, Biology, Palaeontology, Archaeology, Culture, Environment and Management. Next a data field is chosen for that particular subject from the second drop-down combo box. As each subject contains a different set of data field types, only the titles of the fields stored within the chosen subject are displayed. For example, if the subject Hydrology is chosen, the data field choices would be Hydrology Description, River System, Stream Name, Catchment Area, Flow Rate, Traced To/From and Further Data.

Following selection of subject and data field, an operator is required which is chosen from a drop-down combo box provided. Text field operators are '=', '<>' and 'Like' and number field operators are '=', '<>', '<' and '>'. The operator drop-down combo box automatically displays the appropriate operators for the selected data field.

A value is now entered to restrict the search to the required limits. Obviously a text data field requires a text value and a number data field requires a number value. If 'Like' is chosen as the operator, the text value should include bounding asterisks or the search will be the equivalent of a '=' search. For example, '*Tham*' would search for and find 'Tham' anywhere in the chosen data field, whereas 'Tham' would find only caves where the entire data field entry is simply 'Tham'.

To begin the search, click the 'Search' button at the bottom of the page. For a single criterion search, only section 1 needs to be completed before pressing the 'Search'

button. For a two criteria search, section 2 also needs to be completed and an 'And/Or' type of search chosen.

The 'And/Or' selection decides how the two criteria relate to each other during the search. Chosen from a drop-down combo box, 'And' finds caves where both criteria 1 and criteria 2 are satisfied coincidentally. 'Or' finds caves that satisfy either criteria 1 or criteria 2. For example, a search for 'Location, Province = Tak' - '**AND**' - 'Location, Length > 1000' would find only caves longer than 1km that are found in Tak Province. Alternatively the same search, using '**OR**', would find all caves in Tak Province together with all caves longer than 1km in the entire country.

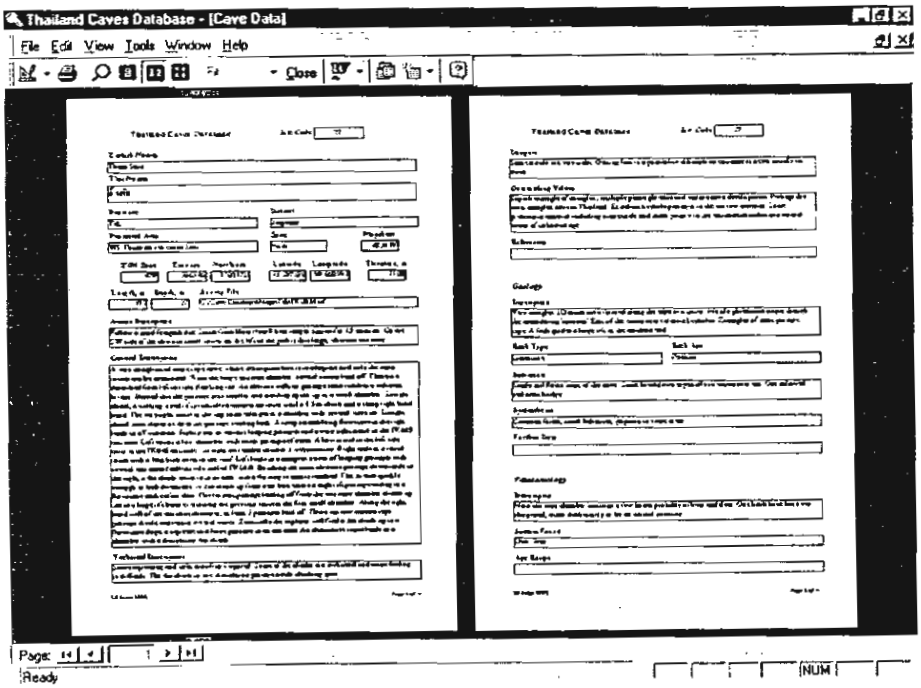
After the search has finished, a small, dialog box opens displaying the number of caves found. If the number is acceptable, clicking 'OK' will open the View Data Page at the first cave found. If the search returns too many caves, the user can click 'Cancel' and return to try to narrow the search a bit more. If zero caves are found, a different dialog box opens suggesting that a new search be tried.

Once the View Data Page opens, the caves can be scrolled through using the selector bar at the bottom of the page. Subject data are displayed by clicking the appropriate tab along the top of the subject sub-page. Note that only data fields containing data will display information. The rest will appear blank. In the event of a subject not containing any data, that subject's sub-page will appear without any data fields.

Once the cave of interest has been reached, the data can either be edited by clicking the 'Edit Cave' button (see earlier) or printed out by clicking the 'Print' button. Both buttons are on the navigation box.

Clicking the 'Print' button opens the Print Preview Page (Figure 31).

Figure 31. Print Preview Page.



The data is displayed in a form that is ready to print. Subjects that do not contain any data will not appear on the printout.

7.4 Censorship of the Data

Some of the data to be contained within the database is considered sensitive. Distribution of this data may lead to certain caves and their contents being damaged, lost or even destroyed. This data includes information about the location of certain caves, valuable archaeological material and rare and endangered species. Current management provisions are inadequate to prevent the damage from happening if the data were to be in the public domain, so restrictions on access to the data need to be made.

Censorship is not an intrinsic part of the database and once inside, all of the data is available for viewing. This problem has been solved by installing the database on just two computers - one held by the Wildlife Conservation Division of the Royal Forest Department and the other by the author of this report. Requests for information are sent to one of the database trustees and a decision to fulfil the request is made on an individual merit basis and on the nature of the data required. For example, an antique dealer would not be given data on archaeological artifacts and an adventure tour company would not receive access details for a particularly vulnerable cave, etc. Another advantage of using this limited number of access terminals method is that updates can be easily and quickly transferred over. There will also always be another exact copy should one be lost.

8. References

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8.1 Maps

1:50,000 Topographic Maps

Khao Khron Do, *sheet 4639I*, series L7017, edition 1-RTSD, Royal Thai Survey Dept., Bangkok, 1969.
Amphoe Sangkhlaburi, *sheet 4639II*, series L7017, edition 1-RTSD, Royal Thai Survey Dept., Bangkok, 1969.
Khao Bo Ngam, *sheet 4738I*, series L7017, edition 2-RTSD, Royal Thai Survey Dept., Bangkok, 1980.
Ban Tha Madua, *sheet 4738IV*, series L7017, edition 2-RTSD, Royal Thai Survey Dept., Bangkok, 1980.
Khao Dika, *sheet 4739II*, series L7017, edition 1-RTSD, Royal Thai Survey Dept., Bangkok, 1969.
Khao Kaphrieo Daeng, *sheet 4739I*, series L7017, edition 1-RTSD, Royal Thai Survey Dept., Bangkok, 1969.
Ban Thi Mong Tha, *sheet 4739III*, series L7017, edition 1-RTSD, Royal Thai Survey Dept., Bangkok, 1969.
Ban Lai Wo, *sheet 4739IV*, series L7017, edition 1-RTSD, Royal Thai Survey Dept., Bangkok, 1969.
Nam Mae Chan, *sheet 4740II*, series L7017, edition 1-RTSD, Royal Thai Survey Dept., Bangkok, 1969.
Ban Yang Daeng, *sheet 4740III*, series L7017, edition 1-RTSD, Royal Thai Survey Dept., Bangkok, 1969.
Ban Nong Ma, *sheet 4839III*, series L7017, edition 1-RTSD, Royal Thai Survey Dept., Bangkok, 1969.
Ban Samian La, *sheet 4839IV*, series L7017, edition 1-RTSD, Royal Thai Survey Dept., Bangkok, 1969.
Huai Kha Khaeng, *sheet 4840III*, series L7017, edition 1-RTSD, Royal Thai Survey Dept., Bangkok, 1969.

8.2 Other Maps

Ye, *sheet 47-2*, series U542, edition 1-RTSD, Royal Thai Survey Dept., Bangkok, 1966. 1:250,000 topographic map.
Changwat Nakhon Sawan, *sheet 47-3*, series 1501 S, edition 2-RTSD, Royal Thai Survey Dept., Bangkok, 1984. 1:250,000 topographic map.
Ye, *Sheet ND 47-2*, Geological Survey Div., Dept. of Mineral Resources, Bangkok, 1976. 1:250:000 geological map.
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8.3 Laws

Wild Animal Reservation and Protection Act (WARPA). B.E. 2535 (1992). (Unofficial English Translation by Reik, D. 1996. Nordic Consultings Group)

APPENDIX

Cave Descriptions and Surveys

Taken from the

THAILAND CAVES DATABASE

Thailand Caves Database

Site Code 1

English Names

Tham Tasukhi 1, TK001

Thai Names

ถ้ำตะสุคี 1 TK001

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4840 III	47P	505112	1737571	15.717399	99.047706

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
920	108	4	C:\Cave Database\Maps\Tak\TK0001.tif

Access Description
Walk c.3km SE of Mae Jan Tha ranger station. Entrance is in boulders where stream sinks at the edge of disused fields

General Description
Seasonally active stream sink. Short climb down through boulders reaches easy walking in large passage. This ends at a choke.

Technical Description
None

Dangers
Floods severely in wet weather

Outstanding Values
Impressive mud banks

Geology

Description
Phreatic origin along faults. Thick sediment deposits mask the passage shape

Rock Type	*Rock Age*
Limestone	Triassic

Sediments
Extensive mud banks up to 3m high deposited by ponded water

Speleothems
Common types

Hydrology

Description
Stream sink cave with presumed resurgence about 500m to the NE

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong		0.5	0

Further Data
date – November

Thailand Caves Database — Site Code 1

Biology

Description
Much sediment and vegetation brought in by floods. Large mudbank community with some bat guano

Identified Species
Cricket; worm; fly; web-spinning spider; Glyphillus; opilione; bat - >3 sp. Hipposideros larvatus, H. sp; Scutigera; crab; cave racer snake; frog

Unusual Species
Gecko - R

Food Supply Routes
Stream, Guano

Environment

Description
Short cave with a single entrance and no airflow. Small flowing stream. Quite warm for this elevation.

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
22	91	20.5	8.5		

Further Data
date: November

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed. Sedimentation from nearby fields has ceased

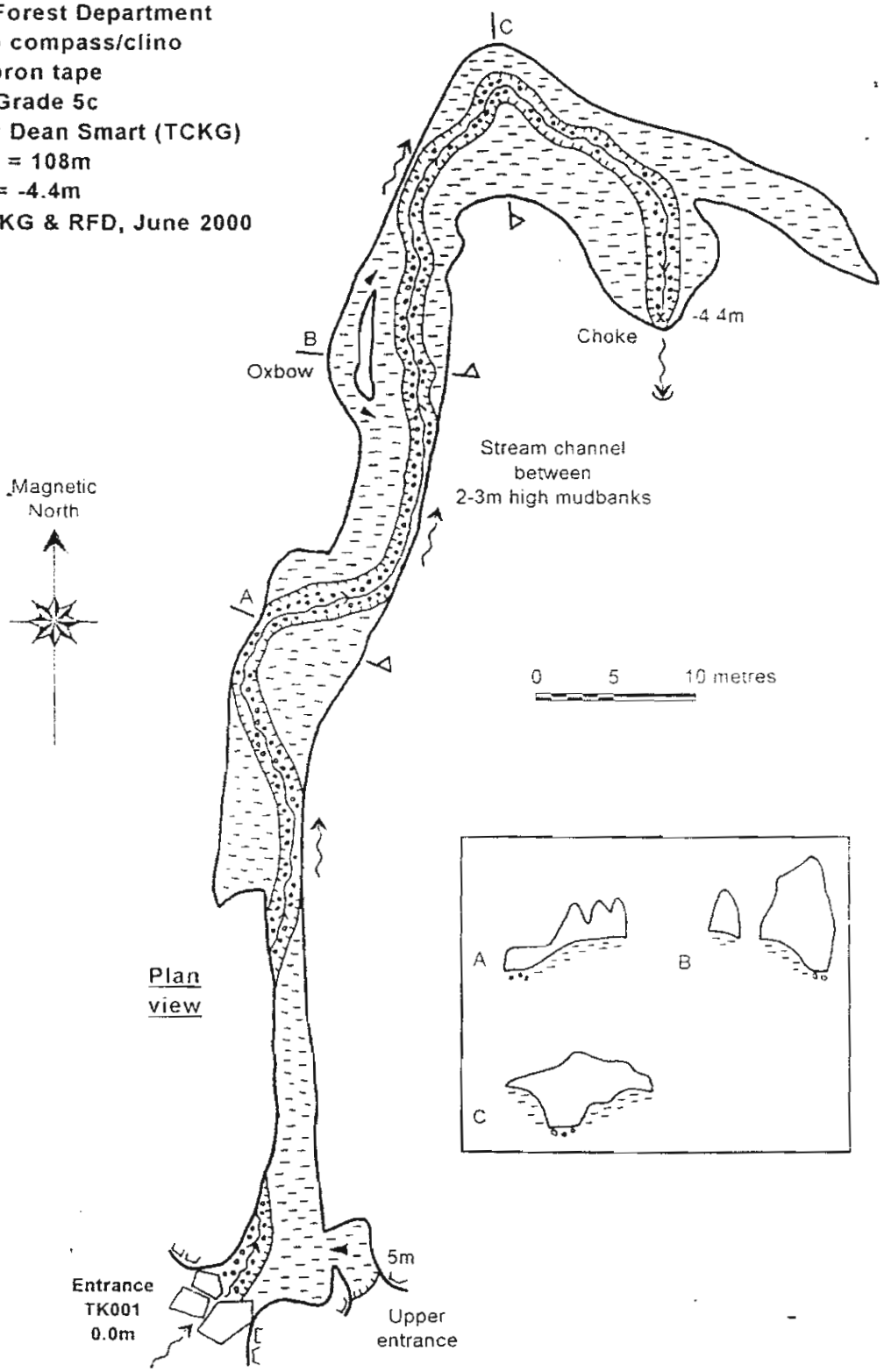
Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
Increased Sediment

Impact Sources
Deforestation; Agriculture

Tham Tasukhi 1 (TK001)

Mae Jan Tha, Thungyai Naresuan W.S.
Tak Province, Thailand
Surveyed 08/04/1997 by
Thailand Cave and Karst Group
Royal Forest Department
Suunto compass/clino
30m fibron tape
BCRA Grade 5c
Map by Dean Smart (TCKG)
Length = 108m
Depth = -4.4m



Thailand Caves Database — Site Code 2

English Names	*Thai Names*
Tham Tasukhi 2, TK002	**ถ้ำตะสุคี 2 TK002**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4840 III	47P	505083	1737610	15.713509	99.047431

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
950	185	14	C:\Cave Database\Maps\Tak\TK0002.tif

Access Description
Walk c.3km SE of Mae Jan Tha ranger station. Small entrance is half way up hillside. 50m above Tham Tasukhi 1

General Description
Ancient phreatic cave developed on faults. Mostly easy walking passages with some short climbs. Ends too low

Technical Description
None

Dangers
None

Outstanding Values
Phreatic rift passages developed on faults

Geology

Description
Rifts of ancient phreatic origin guided by small faults. Bedding is seen in walls of rifts dipping 60 degrees to WNW

Rock Type	*Rock Age*
Limestone	Triassic

Sediments
Silty soil floors with guano and flowstone layers

Speleothems
Common forms

Thailand Caves Database — Site Code 2

Biology

Description
A few bats provide guano. Little fauna with no predators. Used by porcupines and serow

Identified Species
Cricket; porcupine; serow; bat - Hipposideros sp.

Food Supply Routes
Guano

Environment

Description
Short cave with a single entrance, no airflow and no flowing water. Very warm for this elevation and with low humidity.

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
24	75				

Further Data
date – November

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed. Guano extraction has now ceased

Classification	*Energy Rating*	*Manager*
3.1	Low	Royal Forest Department

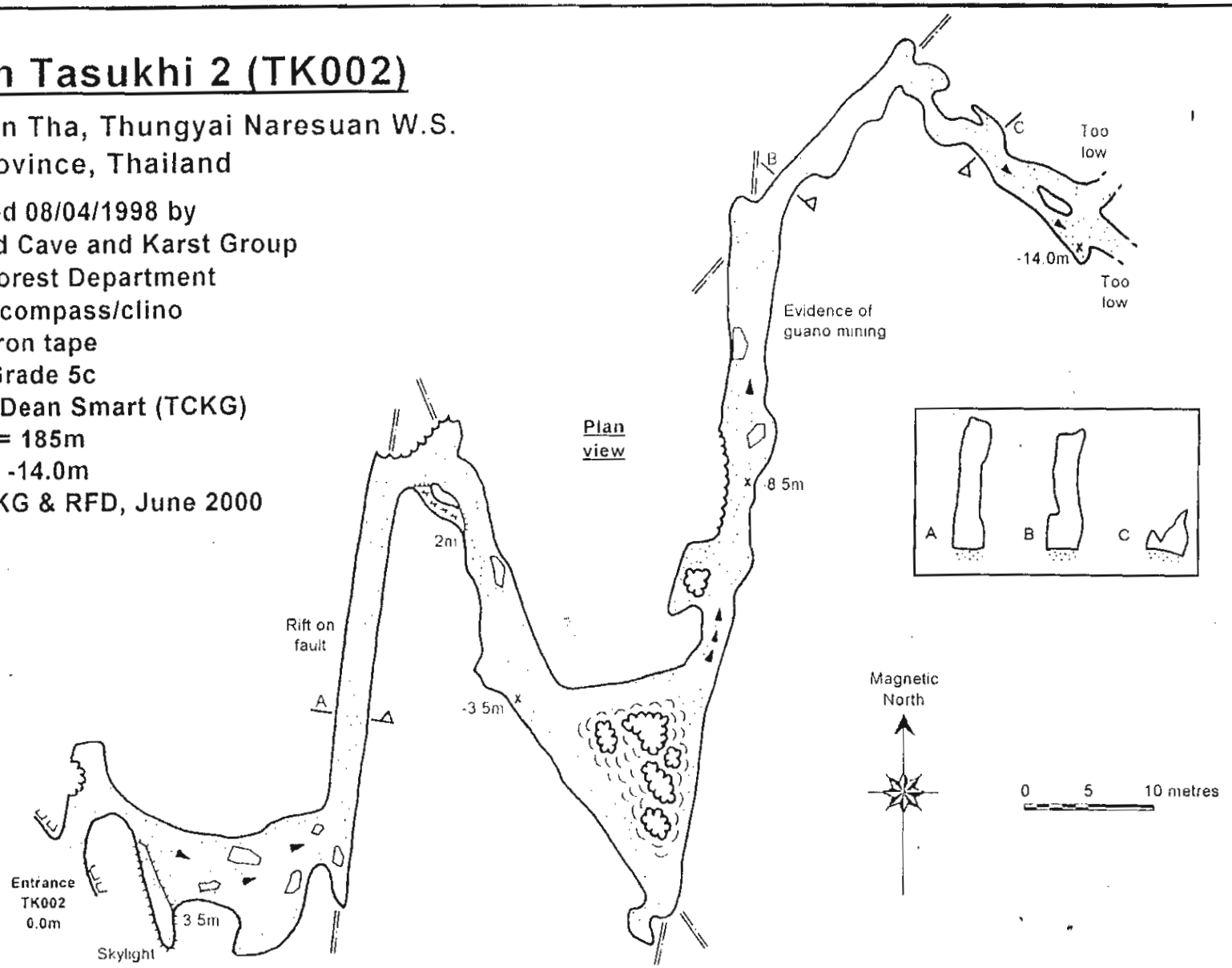
Impacts
Sediment Disturbance

Impact Sources
Resource Extraction

Tham Tasukhi 2 (TK002)

Mae Jan Tha, Thungyai Naresuan W.S.
Tak Province, Thailand

Surveyed 08/04/1998 by
Thailand Cave and Karst Group
Royal Forest Department
Suunto compass/clino
30m fibron tape
BCRA Grade 5c
Map by Dean Smart (TCKG)
Length = 185m
Depth = -14.0m



Thailand Caves Database — Site Code 3

English Names	*Thai Names*
Tham Tasukhi 3, TK003	**ถ้ำตะสุคี 3 TK003**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4840 III	47P	505107	1737519	15.716930	99.047668

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
920	0	0	n/a

Access Description
Walk c.3km SE of Mae Jan Tha ranger station. Stream sink is at the edge of disused fields 50m South of Tham Tasukhi 1

General Description
Seasonal stream sink blocked by boulders. Above is a narrow rift c.4m deep to soil floor. Needs boulder removing for access. About 6m above sink is narrow, undescended shaft.

Technical Description
None

Dangers
None

Outstanding Values
None

Hydrology

Description
Seasonal stream sink, resurgence unknown possibly the same as Tham Tasukhi 1

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong		0.5	0

Further Data
date – November

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

Thailand Caves Database — Site Code 4

English Names	*Thai Names*
Tham_Phi Ma, TK004	**ถ้ำผีมา TK004**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4840 III	47P	503650	1738510	15.725890	99.034072

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
900	174	9	C:\Cave Database\Maps\Tak\TK0004.tif

Access Description
On the East side of an obvious tower right next to the track 1km before Mae Jan Tha ranger station

General Description
Fossil phreatic maze cave with many entrances. Short walking passages connect small chambers. Some short climbs and one squeeze

Technical Description
None

Dangers
None

Outstanding Values
None

Geology

Description
Complex maze of ancient phreatic rifts and tubes with oxbows. Passages guided by two joint/fault sets at E-W and NE-SW

Rock Type	*Rock Age*
Limestone	Permian

Sediments
soils with breakdown in doline entrance

Speleothems
common forms

Thailand Caves Database — Site Code 4

Biology

Description
Strong draughts between entrances provide airborne food supply. Mainly surface derived fauna

Identified Species
Opilione; glyphyllus; porcupine

Unusual Species
Gecko - R

Food Supply Routes
Aerial; Guano

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed. Graffiti is old and not increasing

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

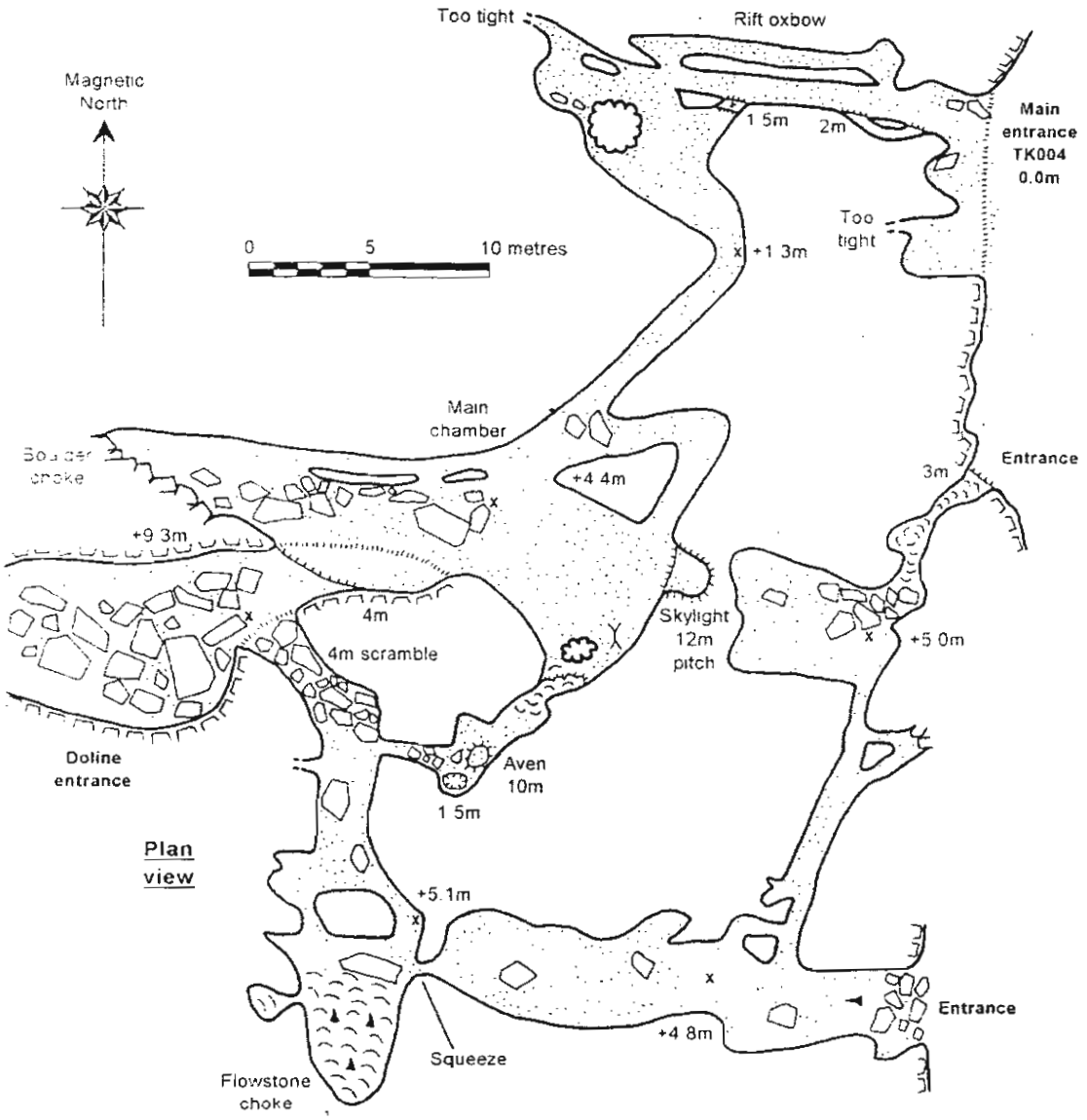
Impacts
Graffiti

Impact Sources
Uncontrolled Visitors

Tham Phi Ma (TK004)

Mae Jan Tha, Thungyai Naresuan W.S.
Tak Province, Thailand

Surveyed 16/11/1998 by Thailand Cave and Karst Group, Royal Forest Department & Orpheus Caving Club. Suunto compass/clino 30m fibron tape.
BCRA Grade 3c. Length = 174m Height range = +9.3m
Map by Dean Smart (TCKG). © - TCKG, RFD & OCC, June 2000



Thailand Caves Database — Site Code 5

English Names	*Thai Names*
TK005	**TK005**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	493507	1734819	15.692520	98.939407

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
910	43	14	C:\Cave Database\Maps\Tak\TK0005.tif

Access Description
1 hours walk downstream of Yu Nai ranger station at obvious stream sink

General Description
Up and to the right of the stream sink, a small hole (usually choked with bamboo) drops into a muddy crawl. This leads to a short, though big stream passage sumped at both ends with a skylight entering from above.

Technical Description
10m ladder required for skylight. Belay to tree.

Dangers
Floods completely in rainy season

Outstanding Values
None

Geology

Description
Very short cave with large mudbanks

Rock Type	*Rock Age*
Limestone	Permian

Sediments
Large 4m high mud banks deposited by ponded floodwater

Speleothems
large flowstone sumps downstream end

Hydrology

Description
Large perennial stream sink. During floods, the stream overflows along a channel to a choked sink 1km to the West. The rising is unknown

River System	*Stream Name*	*Catchment, km2*	*Flow, Cumec*
Mae Khlong	Huai Mortener (Huai Thip Tho)	32	- 0.8

Further Data
date - November

Thailand Caves Database — Site Code 5

Biology

Description
Many predators, especially spiders. Stream and air based

Identified Species
Spider - Huntsman & web spinning; cricket; crab; bat - Hipposideros larvatus; frog

Food Supply Routes
Stream; Aerial; Guano

Environment

Description
Small cave with significant airflow and flowing water.

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
21	86	19	8.1		

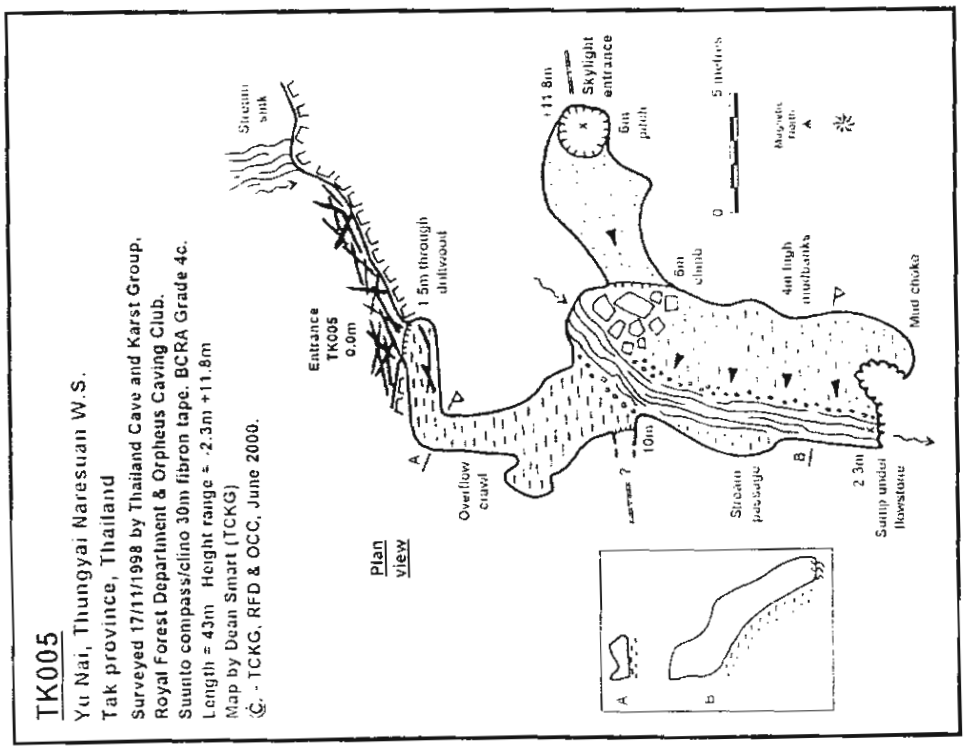
Further Data
date – November

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	Ultra-High	Royal Forest Department

Impacts
None



Thailand Caves Database — Site Code 6

English Names	*Thai Names*
TK006	**TK006**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	499038	1735918	15.702460	98.991020

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
970	35	4	C:\Cave Database\Maps\Tak\TK0006.tif

Access Description
5km South of the Yu Nai turn off the track to Utakhi passes through an area of limestone and old fields. Walk 5 minutes to the West from the given UTM. Difficult to find

General Description
Easy walking and stooping leads to a narrow rift becoming too tight

Technical Description
None

Dangers
None

Outstanding Values
Good false floors

Geology

Description
Small cave with good false floors in roof

Rock Type	*Rock Age*
Limestone	Permian

Sediments
False floors in roof formed of cemented gravel and sand

Speleothems
Reasonable straws, flowstone & stalactites

Thailand Caves Database — Site Code 6

Biology

Description
Mainly surface fauna. Many predators compared to prey

Identified Species
Opilione; glyphyllus; spider - huntsman & web spinning; cricket; Scutigera; Scolopendromorph; porcupine; bat - Rhinolophus sp

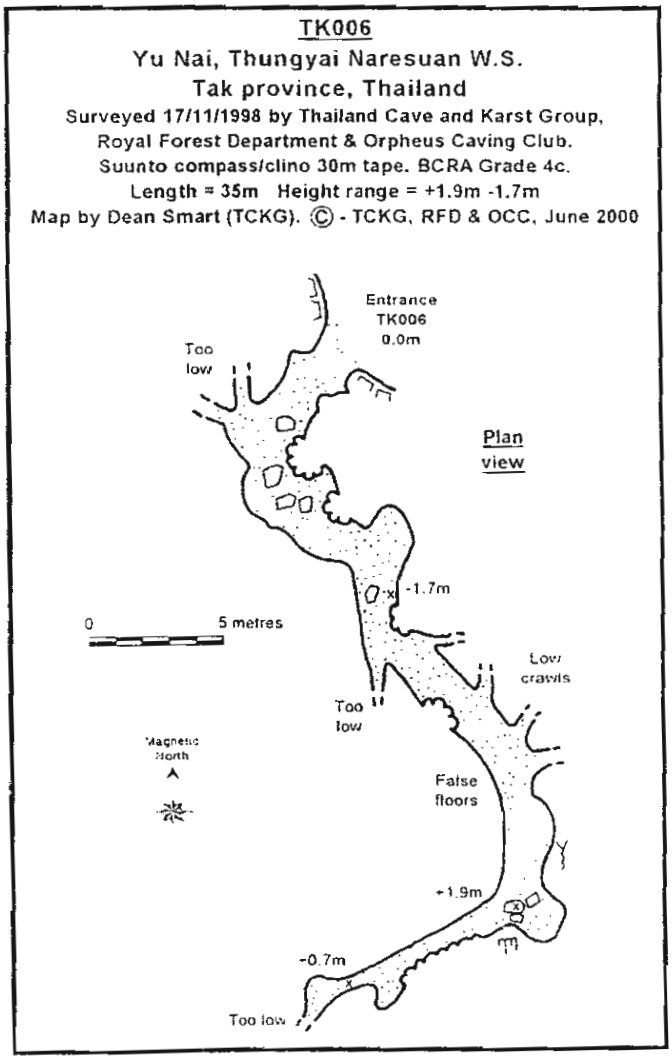
Food Supply Routes
Near Surface; Guano

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	Low	Royal Forest Department

Impacts
None



Thailand Caves Database

Site Code 7

English Names	*Thai Names*
Tham Khang Khao Yu Nai, TK007	**ถ้ำค้างคาวยูไน TK007**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	499074	1735664	15.700160	98.991363

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
970	244	6	C:\Cave Database\Maps\Tak\TK0007.tif

Access Description
5km South of the Yu Nai turn off, the track to Utakhi passes through an area of limestone and old fields. Walk 10 minutes to the West from the track. Difficult to find

General Description
Stooping entrance leads down to a chamber with a huge boulder. Right leads via big passages to small chambers and crawls ending at other entrances or too low. Left from the huge boulder is walking into another chamber. A 15m climb into the roof leads to an entrance in the cliff. A short climb gains a small hole, traverse and scramble down into a muddy chamber with an aven

Technical Description
None

Dangers
None

Outstanding Values
Reasonable speleothems, especially helictites and straws

Geology

Description
Formed parallel to the cliff-line. Ancient phreatic origin. Medium sized chambers formed by breakdown of huge boulders

Rock Type	*Rock Age*
Limestone	Permian

Sediments
Partial rainy season flooding deposits mud on floor. Much large scale breakdown up to 8m in size

Speleothems
Common forms; good helictites and straws; some curtains

Thailand Caves Database — Site Code 7

Biology

Description
Complex biology and rich fauna due to variety of food sources and habitats. Seasonal floods. Leeches probably feed on bats and roots penetrate the cave

Identified Species
cricket; centipede; glyphyllus; bat - Hipposideros larvatus, Aselliscus stoliczkanus, Rhinolophus sp; porcupine; slug

Unusual Species
Leeches - R; white isopod - T

Food Supply Routes
Guano: Near Surface; Stream; Roots

Environment

Description
Moderate sized cave with multiple entrances. Cave runs along the side of a forested hill and is near to surface throughout.

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
26	91				

Further Data
date - November

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

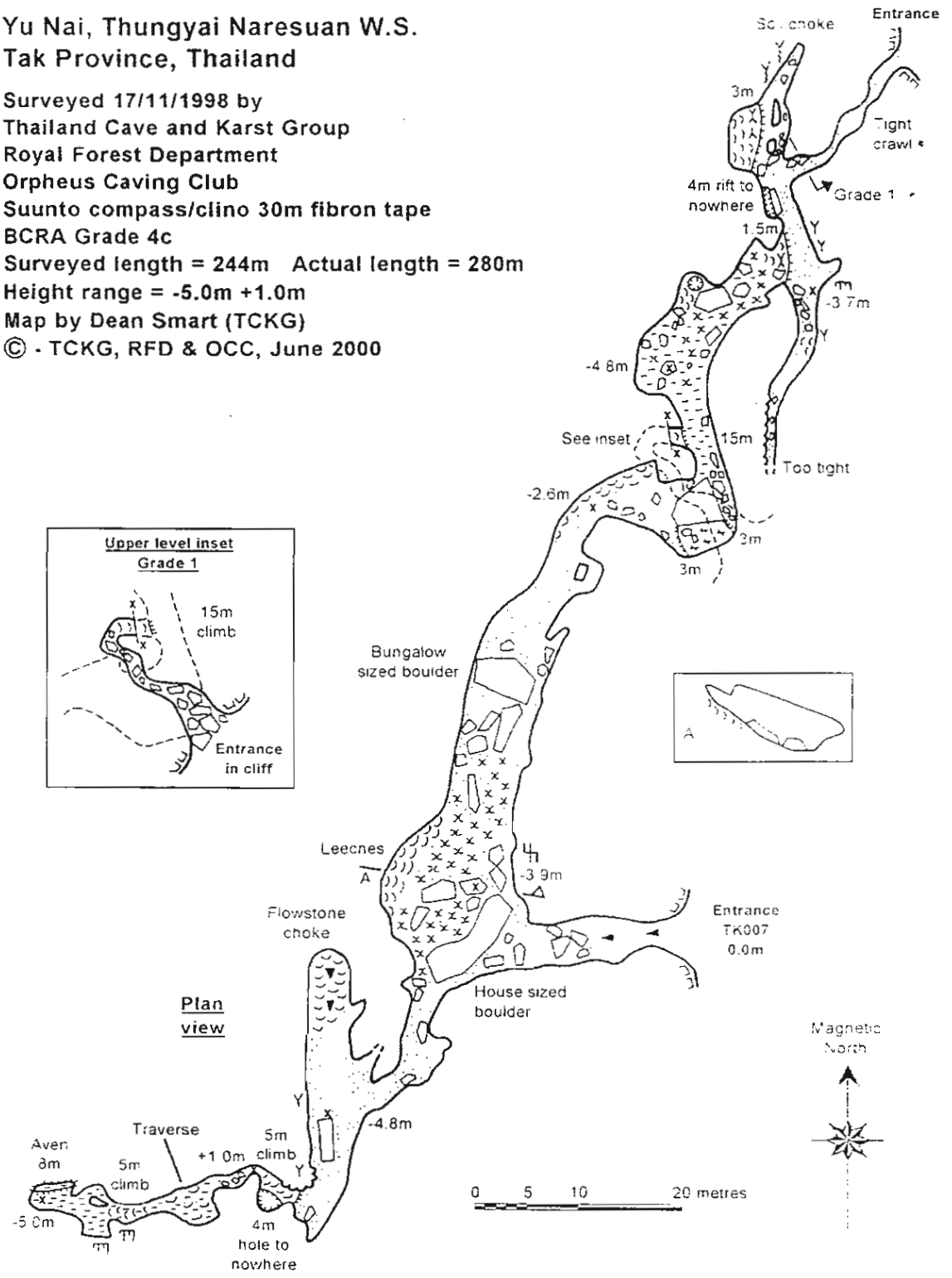
Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

Tham Khang Khao Yu Nai (TK007)

Yu Nai, Thungyai Naresuan W.S.
Tak Province, Thailand

Surveyed 17/11/1998 by
Thailand Cave and Karst Group
Royal Forest Department
Orpheus Caving Club
Suunto compass/clino 30m fibron tape
BCRA Grade 4c
Surveyed length = 244m Actual length = 280m
Height range = -5.0m +1.0m
Map by Dean Smart (TCKG)



Thailand Caves Database — Site Code 8

English Names

Tham Khang Khao Utakhi, TK008

Thai Names

ถ้ำค้างคาวอุตะคี TK008

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4840 III	47P	501246	1727885	15.629830	99.011619

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
950	162	27	C:\Cave Database\Maps\Tak\TK0008.tif

Access Description
Walk down valley from Utakhi ranger station for 15 mins. Entrance is in small tower next to path

General Description
Climb down of 8m from the entrance leads to a chamber with 3 passages off. Left ends at a choke. Straight ahead ends at an aven. Right is a large passage past a hole in the floor to the stream passage to a chamber with a floor steeply sloping down to the left. Climbing down here enters low muddy crawls and chambers. Climbing down the hole drops into a vadose rift with a seasonal stream. Heading upstream passes an awkward squeeze to larger passage and a small inlet. A low crawl filled with large worms emerges in the doline entrance, South of the main entrance.

Technical Description
Some climbing required. One tight awkward squeeze

Dangers
High CO2 and low O2 in lower chambers. Squeeze in stream passage is tight and awkward

Outstanding Values
Extensive guano based fauna. Rat living in cave. Stream passage is good example of vadose

Geology

Description
Ancient phreatic cave with a vadose overprint. Wide variety of passage types with good examples of vadose canyon. The maze like 'upper' level follows several joint sets. 'Lower' streamway is phreatic tube with a vadose canyon cut by an underfit stream

Rock Type Rock Age
Limestone Permian

Sediments
Mostly inwashed soil sediments in the upper levels and near surface locations. Good layering in places. Mud in lower parts.

Speleothems
Common forms; small straws in lower streamway

Thailand Caves Database — Site Code 8

Hydrology

Description
Small seasonal stream in 'lower' level. Origin unknown. Resurgence also unknown, likely to be in the valley below

River System	*Stream Name*	*Catchment Area, km2*	*Flow , Cumec*
Mae Khlong			0

Further Data
date – November

Biology

Description
Large amount of fauna based on guano and washed in soil. Surface species near entrances. Many invisible ticks

Identified Species
Cricket - >2 sp: cockroach; Scutigera; bat - Rhinolophus sp; porcupine; earthworm; tick

Unusual Species
Rats - n.sp; tiny white insect - T

Food Supply Routes
Guano: Near Surface

Environment

Description
Fairly warm cave, probably due to lack of forest cover on the small tower it is found in. Low O2, high CO2 in lower parts (not measured)

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
22	91				

Further Data
date – November

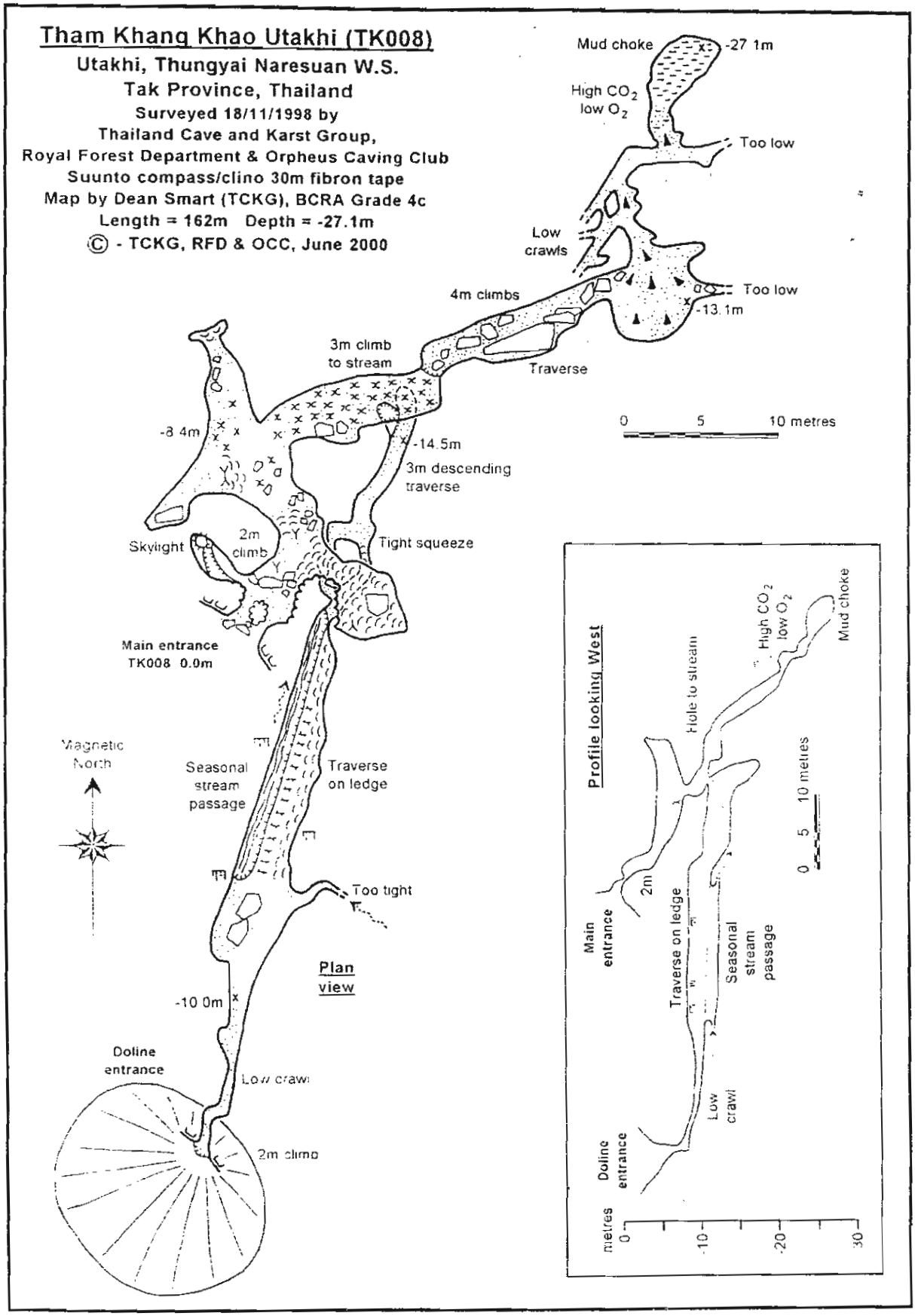
Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed. Guano extraction has now ceased

Classification	*Energy Rating*	*Manager*
3.1	Low	Royal Forest Department

Impacts
Sediment Disturbance

Impact Sources
Resource Extraction


Tham Khang Khao Utakhi (TK008)
Utakhi, Thungyai Naresuan W.S.
Tak Province, Thailand
Surveyed 18/11/1998 by
Thailand Cave and Karst Group,
Royal Forest Department & Orpheus Caving Club
Suunto compass/clino 30m fibron tape
Map by Dean Smart (TCKG), BCRA Grade 4c
Length = 162m Depth = -27.1m
© - TCKG, RFD & OCC, June 2000
Mud choke
-27.1m
High CO_2 low O_2
Too low
Low crawls
4m climbs
Too low
-13.1m
3m climb to stream
Traverse
0 5 10 metres
-8.4m
-14.5m
3m descending traverse
Skylight
2m climb
Tight squeeze
Main entrance TK008 0.0m
Magnetic North
Seasonal stream passage
Traverse on ledge
Too tight
Plan view
-10.0m
Doline entrance
Low crawl
2m climb
Profile looking West
Mud choke
High CO_2 low O_2
Hole to stream
2m
Main entrance
Traverse on ledge
Seasonal stream passage
Low crawl
Doline entrance
0 5 10 metres
metres
0
-10
-20
-30

Thailand Caves Database — Site Code 9

English Names	*Thai Names*
Tham Nam Mut Utakhi, TK009	**ถ้ำน้ำมุดอุตะคี TK009**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4840 III	47P	502325	1728692	15.637129	99.021690

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
890	384	21	C:\Cave Database\Maps\Tak\TK0009.tif

Access Description
Obvious stream sink entrance, 1 hours walk down valley from Utakhi ranger station

General Description
Large, active stream cave. At the entrance, the stream drops down a 2m waterfall and sumps. Bypass this via the obvious dry upper level to an awkward 2.5m climb down to the stream. Downstream passes a large skylight in the roof and leads via rapids and a climb over a rock bridge to a deep pool. This is bypassed on the right via an upper level. The stream sumps again and a traverse high in the roof through large speleothems leads to a 3m rope climb back to the stream. More rapids lead to a final deep pool with no airflow and probable sump. An upper level at the end ends too tight.

Technical Description
10m rope required on climb. Some climbing and traversing

Dangers
Cave floods quickly and severely in rainy season. Traverses are easy but require care.

Outstanding Values
Nice sporting cave with a variety of difficulties. Well decorated with large speleothems

Geology

Description
Large stream passage follows a fault trending ENE-WSW with rapids and a 20m high roof. Shorter sections trending NNE-SSW are low gradient and often sump. They are probably bedding controlled

Rock Type Rock Age
Limestone Permian

Sediments
Varied sediments with gravel in stream passage, sands in seasonal bypasses and breakdown in upper levels

Speleothems
Common forms with good stalagmites & columns; straws: small helictites: flowstone on rapids in stream

Thailand Caves Database — Site Code 9

Hydrology

Description
Huai Pha Yai sinks into this cave and presumably resurges on the other side of the ridge about 1km to the NE

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong	Huai Pha Yai (Huai Utakhi)	24	0.5

Further Data
date – November

Biology

Description
Permanent stream provides food to a rich and varied fauna. Many aquatic species

Identified Species
Cricket - >2 sp; huntsman spider; fish - Danio, Glyptothorax; frog; shrimp; porcupine; bat - 2 sp

Unusual Species
White isopod - T

Food Supply Routes
Stream

Environment

Description
Active stream cave in low, forested ridge.

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
21	95	20	8.3		

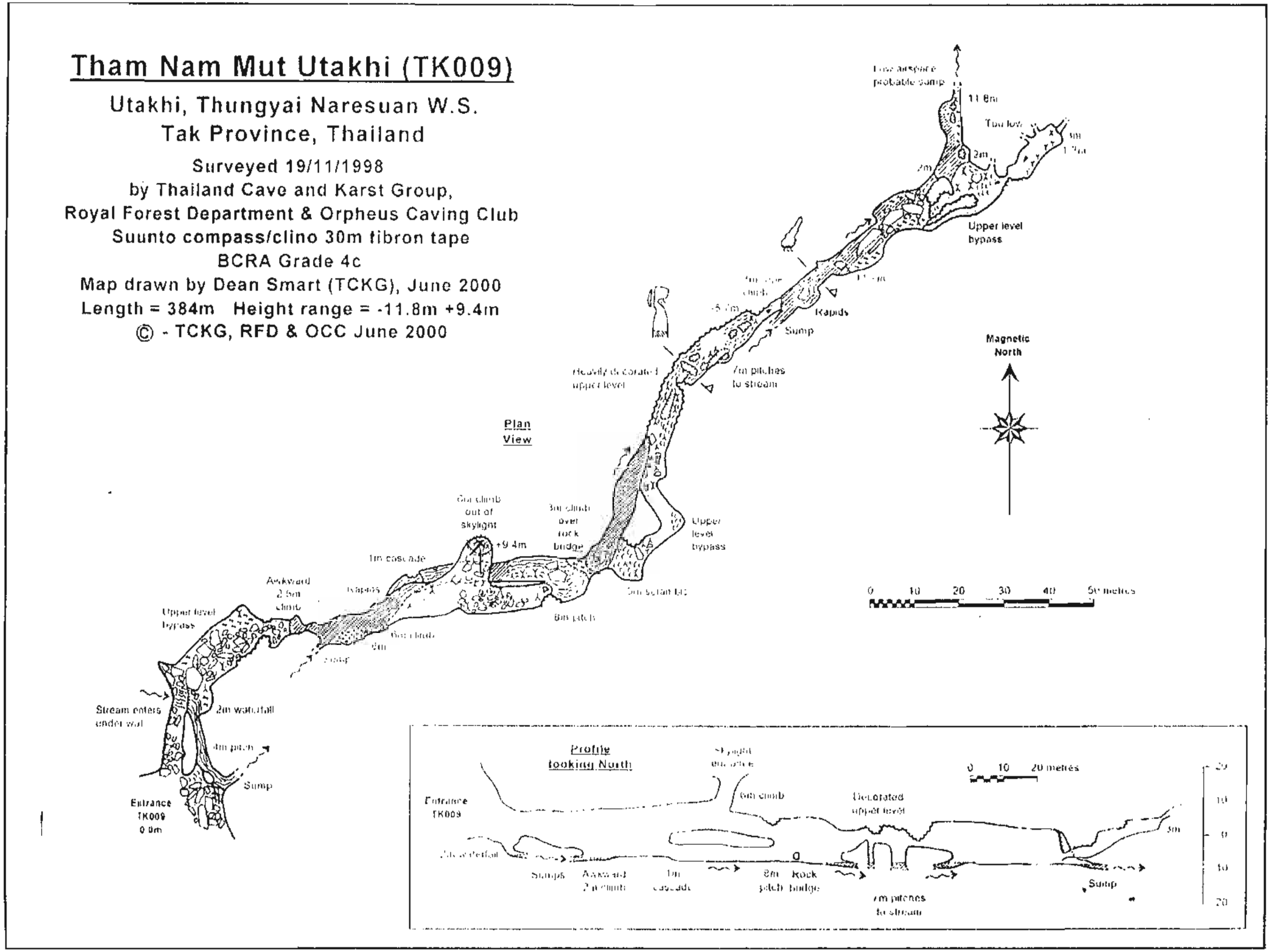
Further Data
date – November

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None


Tham Nam Mut Utakhi (TK009)
Utakhi, Thungyai Naresuan W.S.
Tak Province, Thailand
Surveyed 19/11/1998
by Thailand Cave and Karst Group,
Royal Forest Department & Orpheus Caving Club
Suunto compass/clino 30m fibron tape
BCRA Grade 4c
Map drawn by Dean Smart (TCKG), June 2000
Length = 384m Height range = -11.8m +9.4m
© - TCKG, RFD & OCC June 2000
Plan View
Magnetic North
0 10 20 30 40 50 metres
Entrance TK009 0.0m
Stream enters under wall
2m waterfall
4m pitch
Sump
Upper level bypass
Awkward 2.5m climb
1m cascade
6m climb out of skylight
+9.4m
3m climb over rock bridge
Upper level bypass
8m pitch
Heavily decorated upper level
7m pitches to stream
Sump
Rapids
Upper level bypass
Too low
2m
11.8m
Profile looking North
0 10 20 metres
Entrance TK009
6m climb
Decorated upper level
Sumps
Awkward 2m climb
1m cascade
8m pitch
Rock bridge
7m pitches to stream
Sump
3m

Thailand Caves Database

Site Code 10

English Names	*Thai Names*
TK010	**TK010**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4840 III	47P	501975	1728406	15.634539	99.018432

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
890	0	0	C:\Cave Database\Maps\Tak\TK0010.tif

Access Description
Between Nam Tok Utakhi and Tham Nam Mut Utakhi, Huai Utakhi sinks and rises again. No enterable cave

General Description
Stream sink and resurgence for Huai Utakhi. No enterable cave

Technical Description
None

Dangers
None

Outstanding Values
Good example of dry/active valley dependant on water flow

Hydrology

Description
1km long section of seasonally dry karst valley between Utakhi waterfall and Tham Nam Mut Utakhi

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong	Huai Pha Yai (Huai Utakhi)	23	0.5

Further Data
date – November

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

Thailand Caves Database — Site Code 11

English Names

Tham Khang Khao Huai Nam Khieo, TK011

Thai Names

ถ้ำค้างคาวห้วยน้ำเขียว

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4839 IV	47P	506574	1702926	15.404159	99.061256

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1090	151	19	C:\Cave Database\Maps\Tak\TK0011.tif

Access Description
Walk 5 minutes East of Huai Nam Khieo ranger station and turn North up the hill to an obvious entrance

General Description
Basically a single large chamber divided by large speleothems. To the left from the entrance, a low passage leads down to the lowest part of the cave. A climb up from the entrance chamber enters a chamber sloping upwards to the highest point.

Technical Description
None

Dangers
Some large boulders may be unstable

Outstanding Values
Rats live in the cave.

Geology

Description
Single large chamber formed on near vertical bedding and small mineral veins. Much breakdown

Rock Type Rock Age
Limestone Permian

Sediments
Main chamber floored with large breakdown. Patches of cemented gravel stuck to wall with crystal lined cavities

Speleothems
Common forms; serrated curtains; large eucladioliths in back entrance

Biology

Description
Surface and guano (rat, bat & porcupine) based biology with many predators. Daylight fills most of the cave.

Identified Species
cricket; hairy mary; spider - huntsman, small white sp; opilione; glyphyllus; bat - Hipposideros sp, Rhinolophus sp; Porcupine

Unusual Species
Rat - n.sp

Food Supply Routes
Guano; Near Surface

Palaeontology

Description
Main chamber contains a few bones, probably rib and limb bones of a deer.

Species Found
Deer?

Archaeology

Description
Ideal habitation site near permanent stream. Small pottery sherds, possibly recent, found under large boulders. Animal remains may be natural. Disturbed by guano extraction

Artifacts
burnished pottery; animal remains

Environment

Description
Large single chamber with short side passages entering the dark zone with no draught and high humidity

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
20	93				

Further Data
average of 2 measurements - February, May

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed. Guano extraction has now ceased although use of campfires continues

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

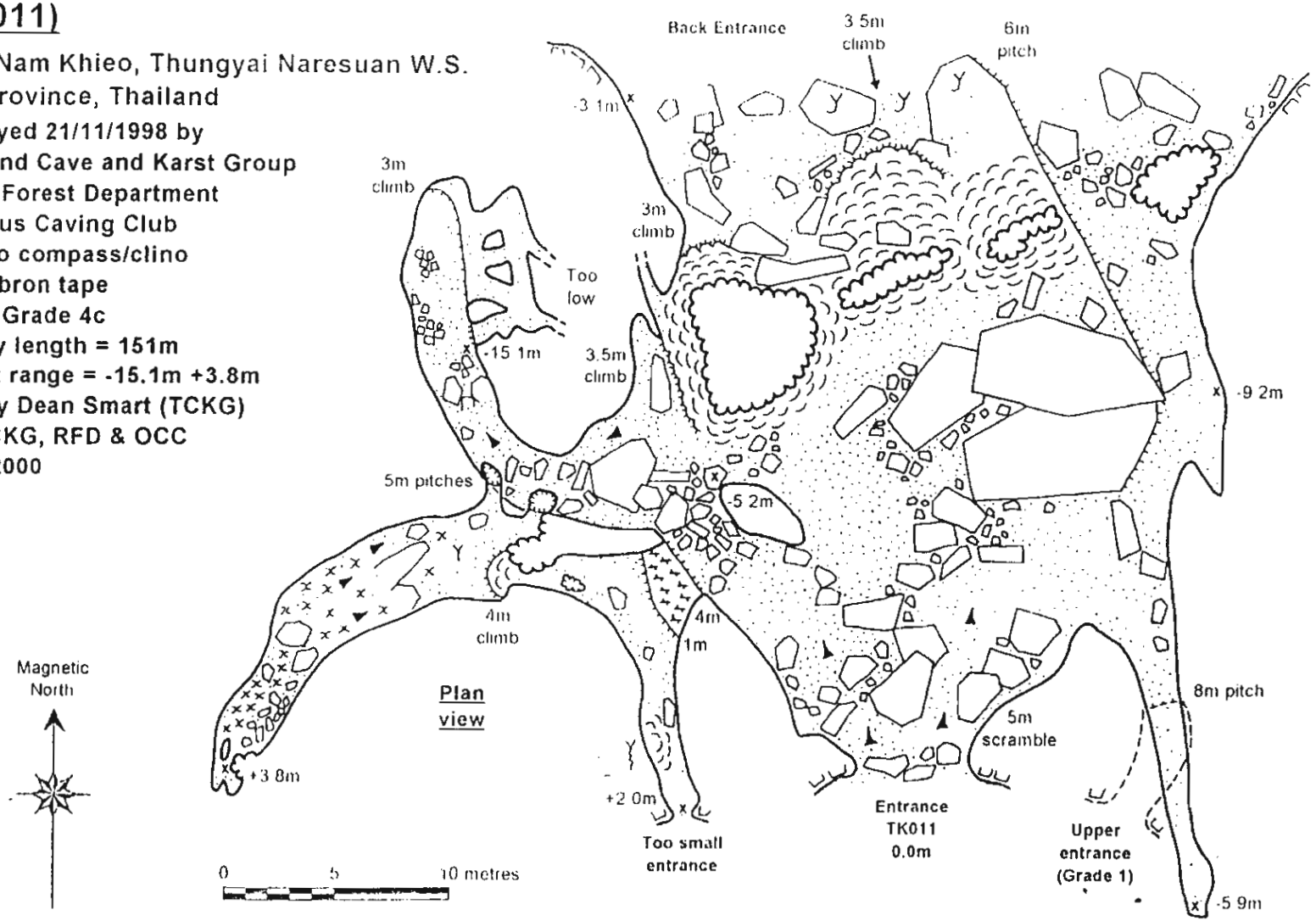
Impacts
Environmental Disruption; Sediment Disturbance

Impact Sources
Uncontrolled Visitors; Resource Extraction; Campfires

Tham Khang Khao Huai Nam Khieo (TK011)

Huai Nam Khieo, Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 21/11/1998 by
Thailand Cave and Karst Group
Royal Forest Department
Orpheus Caving Club
Suunto compass/clino
30m fibron tape
BCRA Grade 4c
Survey length = 151m
Height range = -15.1m +3.8m
Map by Dean Smart (TCKG)

June 2000



Thailand Caves Database Site Code 12

English Names

Tham Than Lot, TK012

Thai Names

ถ้ำธารลอด TK012

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4839 IV	47P	505509	1702168	15.397310	99.051338

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1080	1866	28	C:\Cave Database\Maps\Tak TK0012.tif

Access Description

Walk on good footpath for 30 minutes to SW from Huai Nam Khieo ranger station. Entrance is on NW side of obvious tower after crossing a stream

General Description

Large, complex cave with active, seasonal and fossil passages. Scrambling down inside the TK012 entrance drops into a passage going left and right. Walking to the right leads to a sharp right hand bend with a low crawl heading off left. In the roof here, is a series of low crawls and small chambers. Continuing along the main walking passage passes two minor entrances on the left and reaches a large junction with a stream emerging from the left. Turning left opens into a chamber with the stream entering from a low passage. Straight ahead continues in large passage to another junction. Turning left here meets the stream again which can be followed to a low crawl and another entrance. Soon after the junction, the TK013 entrance is found on the left. A low bedding crawl becomes tighter before popping out at the TK014 entrance. A passage from here heads back to rejoin the main cave at roof level near TK013. Going left from TK012 quickly meets a T junction. Left ends in a boulder choke near to the flood resurgence while right continues through phreatic maze type rifts and small chambers. After some 300m, a narrow rift becomes a low crawl over gour pools and eventually breaks out into the largest passage in the cave. This dry upper level goes both left and right. Left is very easy walking in a passage 5m square passes through a large chamber to the TK015 entrance. A series of chambers and crawls leads off from the large chamber. Turning right after the gour pool crawl climbs up into a big, dry upper level. This leads to passage carrying a seasonal stream. This eventually ends at a flowstone blockage with the stream emerging from a draughting, muddy crawl that becomes too low. The streamway can be followed downstream to a muddy crawl that loops around to the gour pool crawl. Going off the dry, upper level is a low crawl. This leads to a series of small chambers and the TK016 entrance.

Technical Description

None

Dangers

Cave may flood quickly in rainy season. Complex hydrology could unexpectedly sump some areas.

Thailand Caves Database — Site Code 12

Outstanding Values
Superb example of complex cave hydrology. Stream flow is divided and directed in different directions depending on flow rate. Good passage vadose and phreatic morphologies. Reasonable speleothems, especially boxwork, straws, helictites and gour pools. Rats live in the cave.

Geology

Description
Fine examples of most major types of geological control, passage and morphology, particularly joint controlled rift maze, meandering paragenetic canyons, anastmoses and pendants. Upper levels are phreatic and present day underfit streams are vadose

Rock Type	*Rock Age*
Limestone	Permian

Sediments
Highly complex suite showing variety of types, flow direction, deposition, relationships, ages, etc. Example of later sediments cutting older ones. Requires study. Mud, sand and gravel in stream passages, sandy soil in upper levels. Partly cemented

Speleothems
Common forms: boxwork in sediments; shield in main passage; straws

Hydrology

Description
Complex and fine example of diverging flow. Two streams flow through small passages maybe resurging to South. In flood, streams overpower small passages and resurge to the North. Water derives from Tham Molakot and area to East

River System	*Stream Name*	*Catchment Area, km2*	*Flow Rate, Cumec*
Mae Khlong		3	0.3

Further Data
date - November

Biology

Description
Complex and varied biology based on streams, guano and draughts. Rich in fauna with many invertebrate predators. >3 species of bat. Used by rats, porcupines, wild dogs and a Mountain Pit Viper

Identified Species
crickets - >2 sp; Scutigera; Opilione; huntsman spider; Glyphyllus; bat - Aselliscus stoliczkanus,
Taphozous sp, Rhinolophus sp; porcupine - Atherurus macrourus; fish - Schistura sp, Danio sp; crab - 2 sp; shrimp; Mountain Pit Viper (Ovophis monticola)

Unusual Species
Rat - n.sp; Wild Dog - R

Food Supply Routes
Stream; Guano; Aerial

Thailand Caves Database Site Code 12

Environment

Description
Long, active and semi-active cave with multiple entrances. Found in a small hill with good forest cover. High humidity

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
19	96	19	7.8		

Further Data
average of 3 measurements - November, January, May

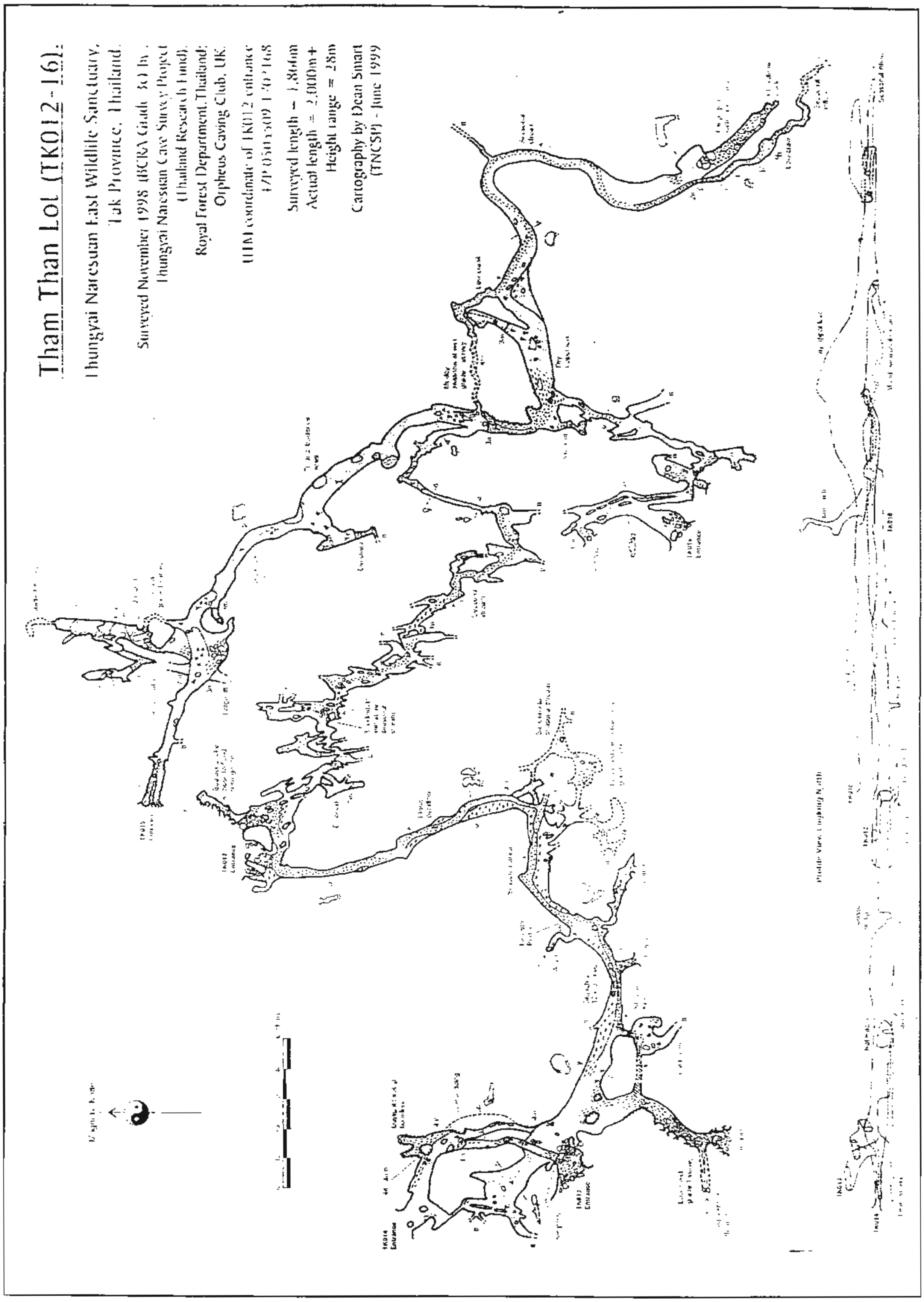
Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed. Possible sedimentation from nearby fields has now ceased

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
Increased Sediment

Impact Sources
Deforestation: Agriculture


Tham Than Lot (TK012-16).
Thungyai Naresuan East Wildlife Sanctuary, Tak Province, Thailand.
Surveyed November 1998 (BCRA Grade 3c) by: Thungyai Naresuan Cave Survey Project (Thailand Research Fund), Royal Forest Department, Thailand; Orpheus Caving Club, UK.
UTM coordinate of TK012 entrance
Surveyed length = 1,866m
Actual length = 2,000m+
Height range = 28m
Cartography by Dean Smart (TNCSP) - June 1999
Profile View, Looking North

Thailand Caves Database

Site Code 13

English Names	*Thai Names*
TK017	**TK017**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	493405	1717119	15.532489	98.938499

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
860	158	4	C:\Cave Database\Maps\Tak\TK0017.tif

Access Description
Walk downvalley from Thung Nar Noi ranger station for 4km. Footpath passes by the entrance in the obvious limestone hill.

General Description
Large entrance closes down to a short crawl. This opens into a high rift passge eventually becoming too low. Turning right midway along the rift leads to crawls, a doline entrance and a small chamber. Large passage gets lower to a crawl through porcupine faeces and a squeeze over a rock to return to the entrance.

Technical Description
None

Dangers
Hookworms in porcupine faeces, occupied by bears.

Outstanding Values
Phreatic rift passage

Geology

Description
Maze-like phreatically formed rifts contolled by at least 3 joint sets. Small, low chambers have formed independent of the joints. Present day stream is seasonal underfit

Rock Type	*Rock Age*
Limestone	Triassic

Sediments
Sandy soil on floors with much porcupine guano

Speleothems
Common forms

Thailand Caves Database — Site Code 13

Biology

Description
Porcupine guano ecosystem. Simple with crickets and huntsman spiders. Many hookworms and used by bears

Identified Species
cricket; huntsman spider; porcupine; bat; bear
Unusual Species
Hookworms - R

Food Supply Routes
Guano

Environment

Description
Near the floor of a heavily forested large, broad valley. Several entrances.

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
20	95				

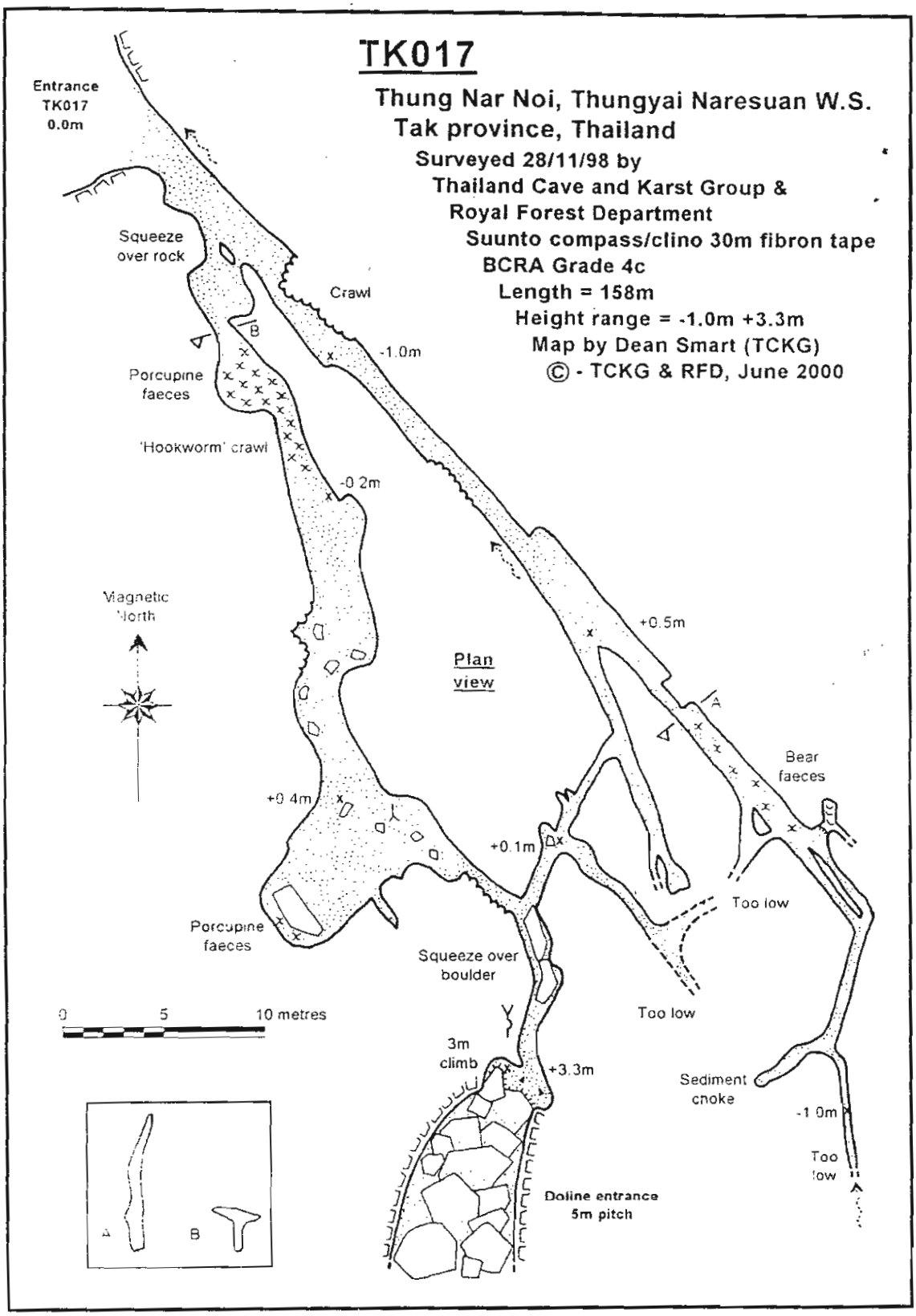
Further Data
date - November

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None


TK017
Thung Nar Noi, Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 28/11/98 by
Thailand Cave and Karst Group &
Royal Forest Department
Suunto compass/clino 30m fibron tape
BCRA Grade 4c
Length = 158m
Height range = -1.0m +3.3m
Map by Dean Smart (TCKG)
© - TCKG & RFD, June 2000
Entrance
TK017
0.0m
Squeeze
over rock
Crawl
-1.0m
Porcupine
faeces
'Hookworm' crawl
-0.2m
Magnetic
North
Plan
view
+0.5m
Bear
faeces
+0.4m
+0.1m
Too low
Porcupine
faeces
Squeeze over
boulder
Too low
0
5
10 metres
3m
climb
+3.3m
Sediment
choke
-1.0m
Too
low
Doline entrance
5m pitch
A
B

Thailand Caves Database

Site Code 14

English Names	*Thai Names*
TK018	**TK018**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	488702	1722314	15.580260	98.893081

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
320	13	2	C:\Cave Database\Maps\Tak\TK0018.tif

Access Description
Walk down the Huai Bi valley for 1.5 days to the Mae Khlong Gorge. At the Mae Khlong/Huai Bi confluence (see UTM) walk up Huai Bi for 150m. Entrance is stream sink on West side of gorge

General Description
Stream disappears down tiny cracks. Above is a single, choked chamber.

Technical Description
None

Dangers
Completely flooded in rainy season

Outstanding Values
None

Hydrology

Description
Half of Huai Bi sinks into impenetrable cracks in the SW bank. Resurgence unkown

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong	Huai Bi (Huai Lathaboeng)	180	0.5

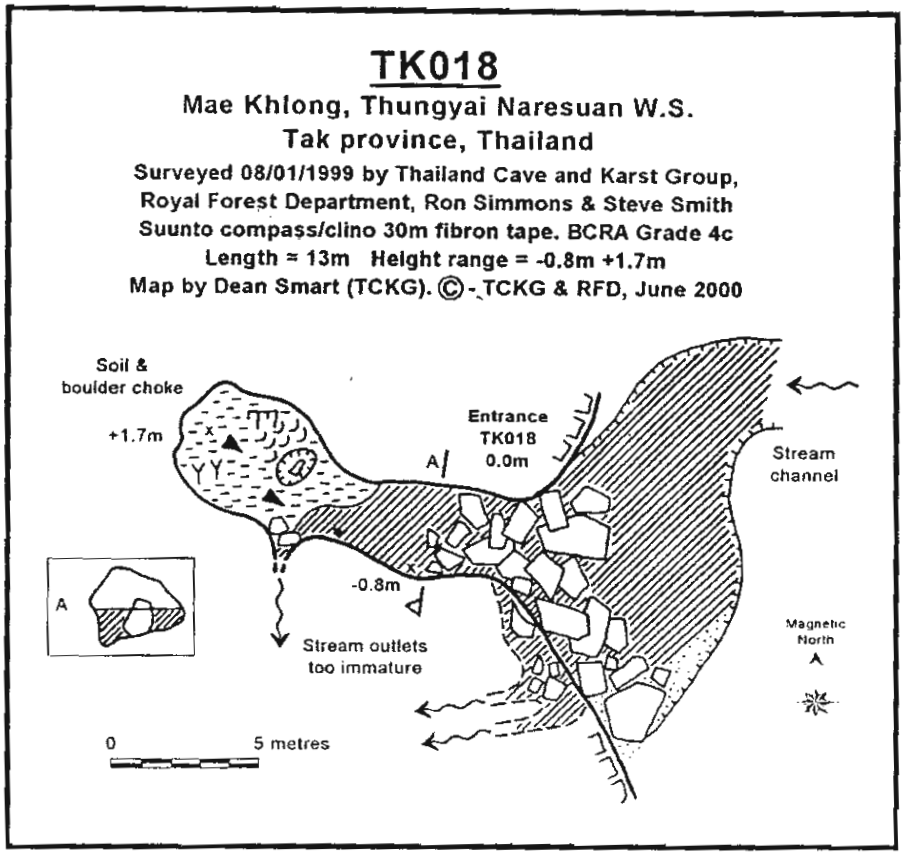
Further Data
date - November

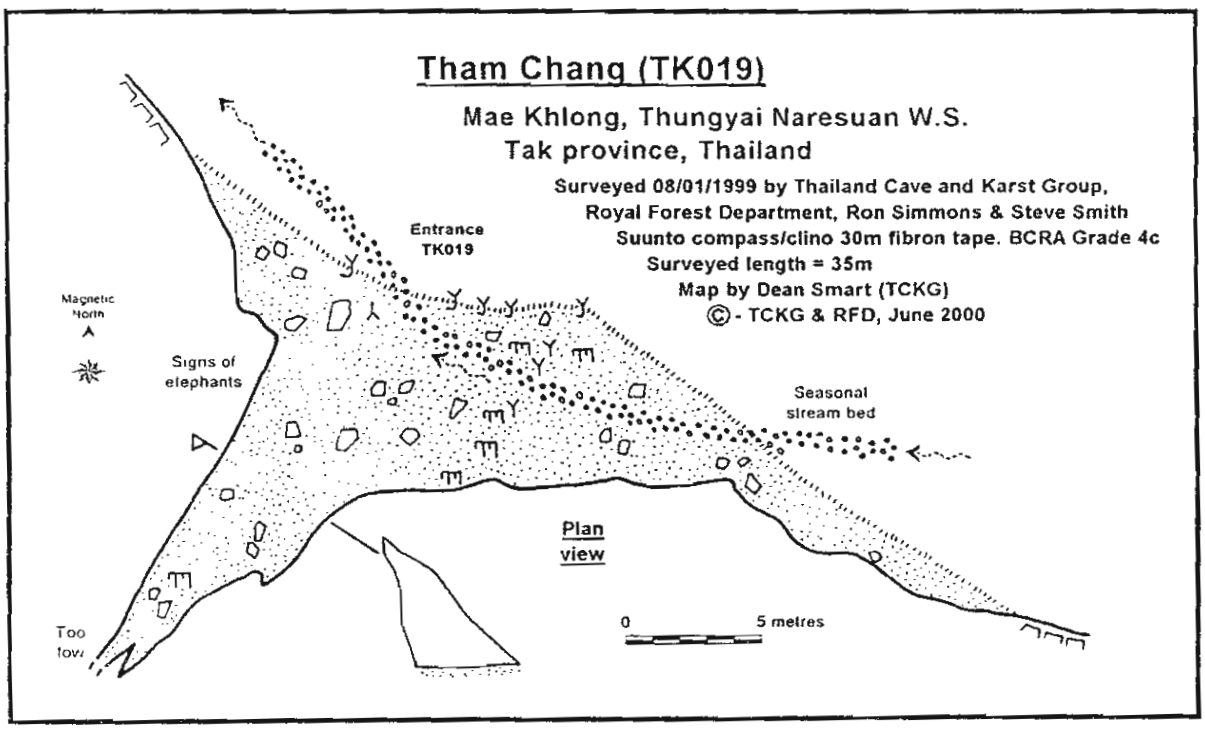
Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None


TK018
Mae Khlong, Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 08/01/1999 by Thailand Cave and Karst Group,
Royal Forest Department, Ron Simmons & Steve Smith
Suunto compass/clino 30m fibron tape. BCRA Grade 4c
Length = 13m Height range = -0.8m +1.7m
Map by Dean Smart (TCKG). © - TCKG & RFD, June 2000
Soil & boulder choke
+1.7m
Entrance TK018 0.0m
Stream channel
-0.8m
Stream outlets too immature
Magnetic North
0
5 metres


Tham Chang (TK019)
Mae Khlong, Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 08/01/1999 by Thailand Cave and Karst Group,
Royal Forest Department, Ron Simmons & Steve Smith
Suunto compass/clino 30m fibron tape. BCRA Grade 4c
Surveyed length = 35m
Map by Dean Smart (TCKG)
© - TCKG & RFD, June 2000
Entrance TK019
Magnetic North
Signs of elephants
Seasonal stream bed
Plan view
0
5 metres

Thailand Caves Database

Site Code 15

English Names

Tham Chang, TK019

Thai Names

ถ้ำช้าง TK019

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	488792	1722272	15.580260	98.893081

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
320	35	0	C:\Cave Database\Maps\Tak\TK0019.tif

Access Description
Walk down the Huai Bi valley for 1.5 days to the Mae Khlong Gorge. At the Mae Khlong/Huai Bi confluence (see UTM) walk up Huai Bi for 250m. Entrance is obvious rock shelter on West side of gorge

General Description
Large rockshelter. At the back, a crawl is too low

Technical Description
None

Dangers
None

Outstanding Values
Some stone tools found. Used by elephants

Archaeology

Description
Possible habitation site next to permanent stream. Seasonal flooding may remove or bury artifacts. Stone tools are crude and limestone

Artifacts
stone tools

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

Thailand Caves Database

Site Code 16

English Names

Tham Huai Bi, TK020

Thai Names

ถ้ำห้วยบี้ TK020

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	488897	1722236	15.580260	98.893081

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
320	195	4	C:\Cave Database\Maps\Tak\TK0020.tif

Access Description
Walk down the Huai Bi valley for 1.5 days to the Mae Khlong Gorge. At the Mae Khlong/Huai Bi confluence (see UTM) walk up Huai Bi for 400m. Obvious entrance where Huai Bi resurges at the base of a dry tufa waterfall

General Description
Active stream cave. Wading and scrambling over boulders lead upstream to a high level passage on the left. Continuing up rapids reaches a long deep pool requiring swimming. The stream rises up from a deep sump at the end. Straight ahead enters dry, muddy crawls ending in static sumps. The upper level leads to a small chamber with several tight crawls off.

Technical Description
Some swimming

Dangers
Cave probably floods quickly and severely

Outstanding Values
Active vadose stream cave

Geology

Description
Youthful vadose stream passage guided by small faults with good examples of vadose morphologies, e.g. scallops. A single, short upper level

Rock Type Rock Age
Limestone Triassic

Sediments
Breakdown forms rapids in the stream and mud floors the upper levels

Speleothems
Common forms

Thailand Caves Database — Site Code 16

Hydrology

Description
Significant resurgence with large catchment area. Normally, Huai Bi sinks 1km to the East though in the rainy season the stream sink is overpowered and the stream falls down tufa waterfalls to the river 300m below

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong	Huai Bi (Huai Lathaboeng)	180	1

Further Data
date - January

Biology

Description
Active stream cave with large fish. Not studied.

Identified Species
fish - Channa sp

Food Supply Routes
Stream

Environment

Description
Active stream cave shaded in the bottom of a gorge with cool temperature. No airflow.

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
22	95	20.5	7.2		

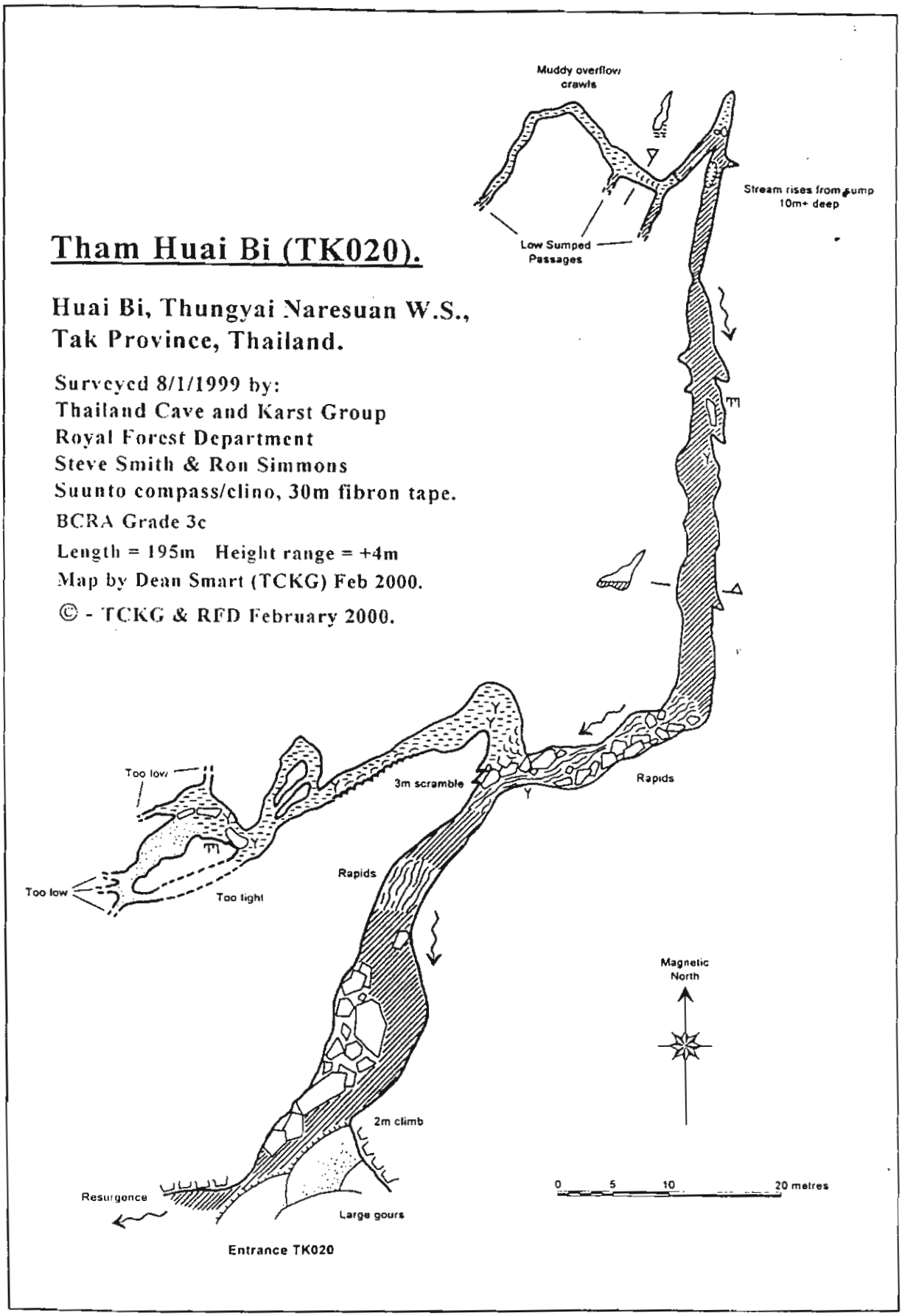
Further Data
date - January

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None


Tham Huai Bi (TK020).
Huai Bi, Thungyai Naresuan W.S.,
Tak Province, Thailand.
Surveyed 8/1/1999 by:
Thailand Cave and Karst Group
Royal Forest Department
Steve Smith & Ron Simmons
Suunto compass/clino, 30m fibron tape.
BCRA Grade 3c
Length = 195m Height range = +4m
Map by Dean Smart (TCKG) Feb 2000.
© - TCKG & RFD February 2000.
Muddy overflow crawls
Stream rises from sump 10m+ deep
Low Sumped Passages
Too low
3m scramble
Rapids
Too low
Too tight
Rapids
Magnetic North
2m climb
Resurgence
Large gours
0 5 10 20 metres
Entrance TK020

Thailand Caves Database

Site Code 17

English Names	*Thai Names*
Tham Yuthana, TK021	**ถ้ำยุทธนา TK021**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	488050	1725258	15.606049	98.888526

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
370	51	17	C:\Cave Database\Maps\Tak\TK0021.tif

Access Description
2 days walk from Thung Nar Noi ranger station and located on the East bank of the Mae Khlong River. Walk down the Huai Bi valley to that stream's confluence with the Mae Khlong. Follow the East bank upriver for 2km. The cave is c.500m before the Huai Wak waterfall and c. 50m above the river. Entrance is large but easily missed.

General Description
Large entrance opens out into the Mae Khlong valley. The cave descends quickly down a slope with a short climb to a mud choke. Water backs up c.13m deep in the rainy season.

Technical Description
None

Dangers
None

Outstanding Values
None

Geology

Description
Large inactive cave formed phreatically

Rock Type	*Rock Age*
Limestone	Triassic

Sediments
Inwashed soil and boulders becoming increasingly muddy with depth

Speleothems
Common forms; large flowstone boss

Thailand Caves Database — Site Code 17

Biology

Description
Rain washes soil into the cave. Used by porcupine and serow

Identified Species
porcupine; serow; cricket

Food Supply Routes
Near Surface; Guano

Environment

Description
Large inactive cave with a single entrance. Cold temp due to shaded location in the bottom of a deep gorge.

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
20	81				

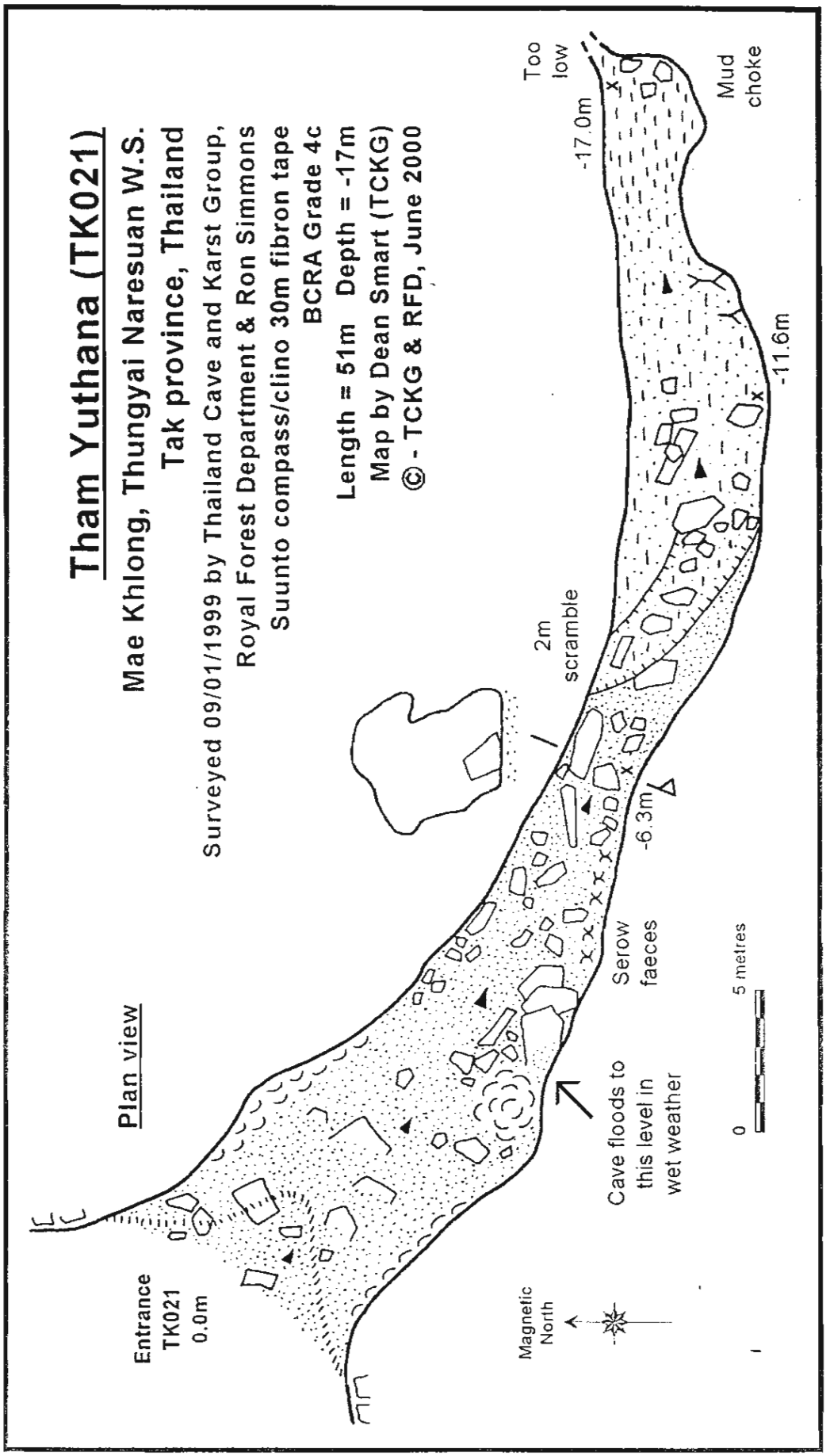
Further Data
date - January

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None


Tham Yuthana (TK021)
Mae Khlong, Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 09/01/1999 by Thailand Cave and Karst Group,
Royal Forest Department & Ron Simmons
Suunto compass/clino 30m fibron tape
BCRA Grade 4c
Length = 51m Depth = -17m
Map by Dean Smart (TCKG)
© - TCKG & RFD, June 2000
Plan view
Entrance
TK021
0.0m
Magnetic
North
Cave floods to
this level in
wet weather
Serow
faeces
-6.3m
2m
scramble
Too
low
-17.0m
Mud
choke
-11.6m
0
5 metres

Thailand Caves Database — Site Code 18

English Names	*Thai Names*
Tham Wichian, TK022	**ถ้ำวิเชียร TK022**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	487808	1725533	15.608539	98.886268

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
370	41	8	C:\Cave Database\Maps\Tak\TK0022.tif

Access Description
2 days walk from Thung Nar Noi ranger station and located on the East bank of the Mae Khlong River. Walk down the Huai Bi valley to that stream's confluence with the Mae Khlong. Follow the East bank upriver for 3km. The cave is near the confluence of Huai Wak and the Mae Khlong. Small entrance is difficult to find.

General Description
A small cave with several entrances in a cliff face. Main entrance is small and opens into a room. Left climbs up to more entrances, right leads up a 4m climb to a low crawl. Becomes too low.

Technical Description
None

Dangers
None

Outstanding Values
Some bones, possibly deer or serow inside.

Geology

Description
Small inactive cave formed along a single joint/fault

Rock Type	*Rock Age*
Limestone	Triassic

Sediments
Sandy soil with some breakdown

Speleothems
Flowstone

Biology

Description
Small cave used by surface mammals

Identified Species
Porcupine; serow

Thailand Caves Database — Site Code 18

Palaeontology

Description
Several vertebrae of possibly a small deer

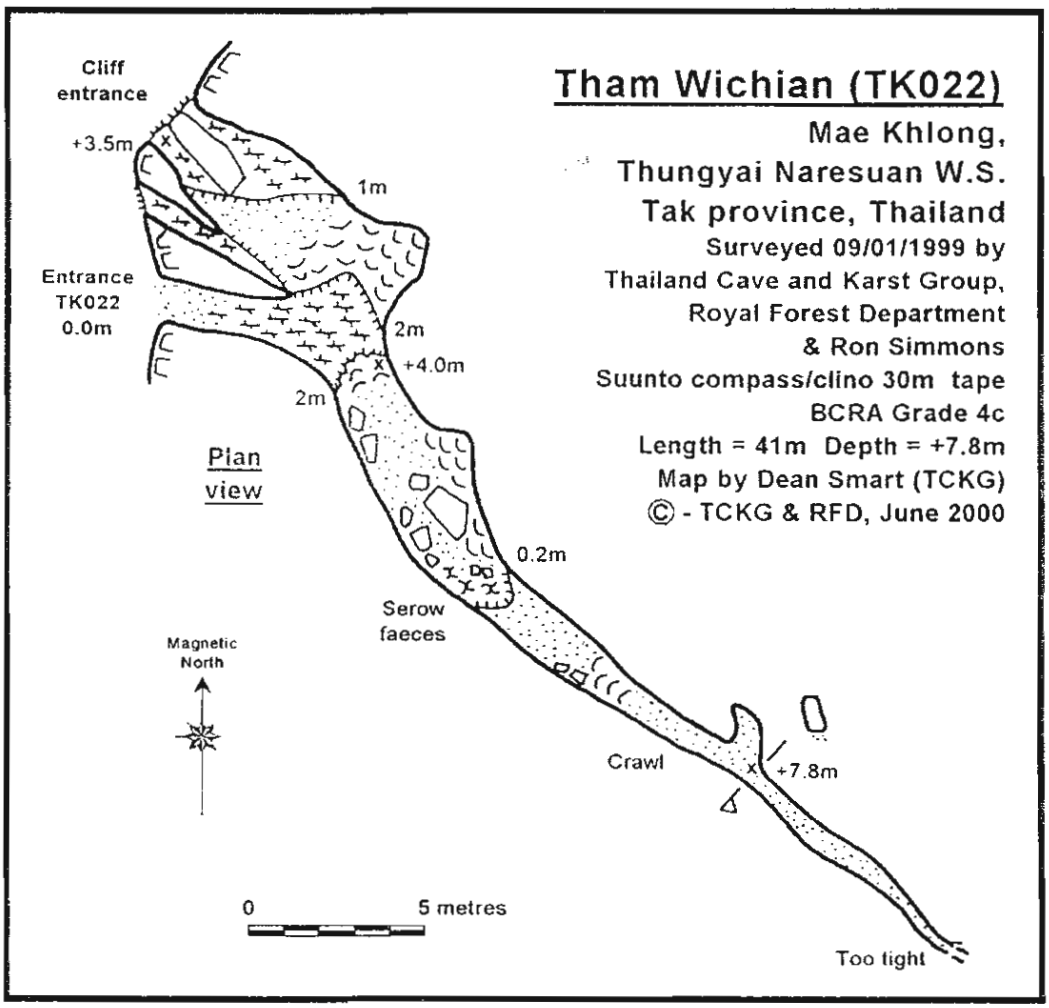
Species Found
Small deer?

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	Low	Royal Forest Department

Impacts
None



Thailand Caves Database — Site Code 19

English Names	*Thai Names*
TK023	**TK023**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	487908	1725611	15.609239	98.887199

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
390	0	0	n/a

Access Description
2 days walk from Thung Nar Noi ranger station and located on the East bank of the Mae Khlong River. Walk down the Huai Bi valley to that stream's confluence with the Mae Khlong. Follow the East bank upriver for 3km. This large spring feeds the Huai Wak waterfall - c. 30m high and terraced by tufa. Follow that stream up until the resurgence is met.

General Description
Large active resurgence, presumably draining the plateau to the East. Water emerges from several places, the highest can be entered by swimming for 30m to a boulder choke.

Technical Description
Swimming necessary

Dangers
Probably prone to flooding

Outstanding Values
Very large resurgence thought to be draining a large area of karst.

Geology

Description
Large resurgence possibly located on a large fault entering the Mae Khlong valley

Rock Type	*Rock Age*
Limestone	Triassic

Hydrology

Description
Very significant resurgence thought to drain the large karst plateau to the East. Water emerges from several places making flow rate difficult to measure. Catchment area size is estimated

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong	Huai Wak	100	1

Further Data
date – January. Estimated catchment area and flow rate

Thailand Caves Database — Site Code 19

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

Thailand Caves Database

Site Code 20

English Names	*Thai Names*
TK024	**TK024**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	488074	1725477	15.608030	98.888748

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
440	30	0	C:\Cave Database\Maps\Tak\TK0024.tif

Access Description
2 days walk from Thung Nar Noi ranger station and located on the East bank of the Mae Khlong River. Walk down the Huai Bi valley to that stream's confluence with the Mae Khlong. Follow the East bank upriver for 3km. The obvious cave entrance is found in a cliff face, c.100m above the Mae Khlong and c.200m before the Huai Wak waterfall.

General Description
Obvious square entrance in a cliff face reached by a 4m climb. The cave reaches a small room with a large canopy and a red clay floor. A boulder choke is soon reached at the top of a further 3m climb.

Technical Description
Entrance climb is a little tricky

Dangers
Falling off the entrance climb may result in a roll and fall of several hundred metres!

Outstanding Values
None

Geology

Description
Formed in thinly bedded (up to 10cm thick) limestone thin red-grey mudstone layers between. Bedding dip is 42 degrees to SW

Rock Type	*Rock Age*
Limestone	Triassic

Sediments
red clay covers the floor

Speleothems
One large flowstone

Thailand Caves Database — Site Code 20

Biology

Description
Fresh bat guano on floor

Identified Species
Bats

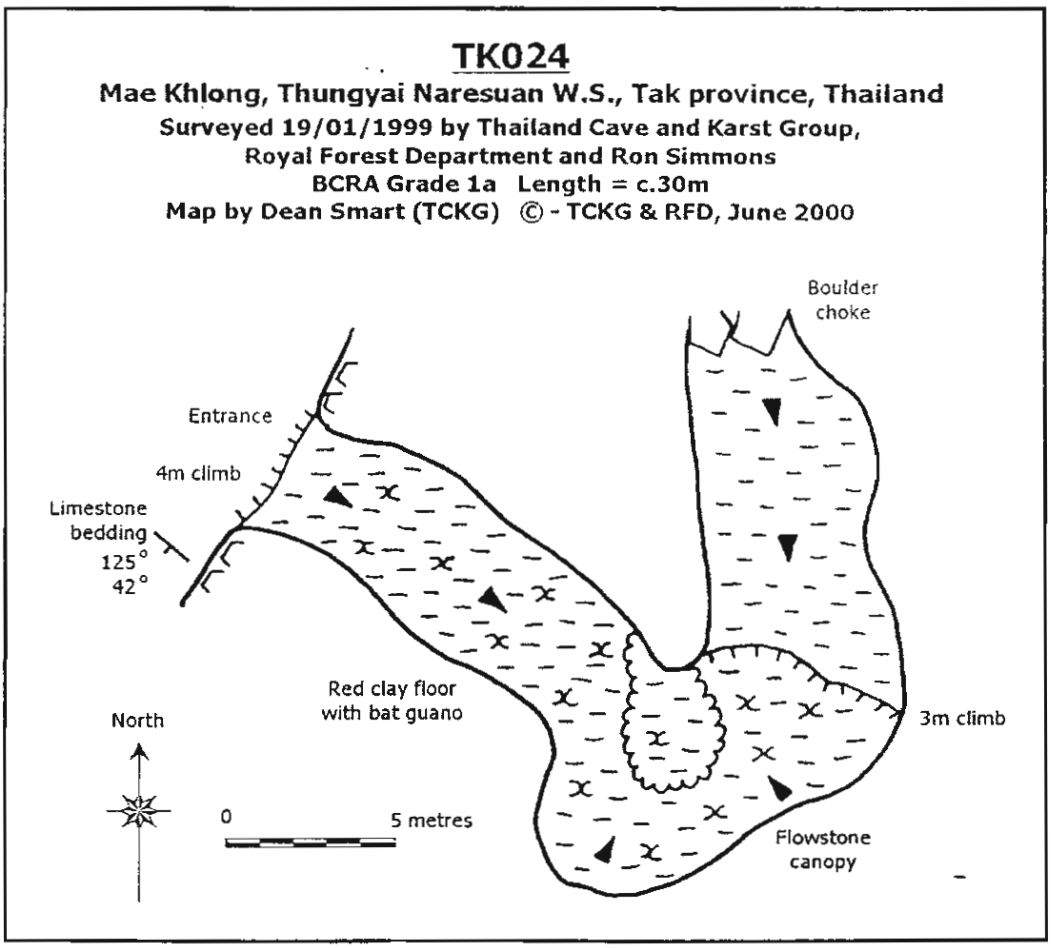
Food Supply Routes
Guano

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	Low	Royal Forest Department

Impacts
None



Thailand Caves Database — Site Code 21

English Names

Tham Molakot, TK025

Thai Names

ถ้ำมรกต TK025

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4839 IV	47P	505235	1701597	15.392149	99.048782

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1090	921	22	C:\Cave Database\Maps\Tak\TK0025.tif

Access Description

Walk on good footpath for 30 minutes to SW from Huai Nam Khieo ranger station. Find and enter the TK012 entrance of Tham Than Lot located on NW side of the obvious tower after crossing a stream. Walk through that cave and exit via the TK013 entrance on the West side of the hill. Walk a further 30 minutes to the West until a permanent stream is met. Walk upstream to find this huge resurgence entrance.

General Description

Large active stream cave with significant upper levels. The resurgence entrance (TK025) is some 15m high and wide with the stream emerging from the right hand side and flowing across the entrance at the base of a large soil mound. At the top of this mound is an upper level and inlet series. Easy walking upstream passes upper level windows and balconies. Just after scrambling over a small boulder pile, a flowstone on the left can be climber up to a small inlet passage and a crawl to an entrance. Easy walking continues up the main stream passage on gravel banks to a large chamber with the stream entering from under a large flowstone. Climbing up to the right reaches a balcony overlooking the main stream. To follow the main stream, either crawl under the flowstone or (easier) scramble up large gour pools to an awkward 2m climb down the other side. More easy walking follows to the confluence, a junction of two streams and upper level. Daylight entering the main stream sink entrance (TK035) is seen to the left. Straight ahead, a narrow though very tall inlet passage leads to another entrance (TK042). At the top of the soil slope on the left is the entry to an upper that loops around to a balcony overlooking the TK035 entrance. Some good fossils and an outcrop of basic, igneous intrusion are found at the confluence. Climbing up the high soil slope at the resurgence entrance reaches a large upper level with holes back down to the stream. Traversing past these enters a chamber 20m above the stream with an entrance (TK030). The obvious passage straight ahead ends in a flowstone choke with a loop around to return to the chamber. A smaller hole can be climbed to an upper level oxbow 7m above the stream. Near the top of the soil slope an unlikely looking passage drops into an inlet series that ends too low after 50m.

Technical Description

Ropes/ladders needed for the pitches between the various levels, although all can be bypassed.

Dangers

Floods quickly after rain.

Thailand Caves Database — Site Code 21

Outstanding Values
Example of multiple phases of development, the upper levels being phreatic and the lower levels vadose. Outcrops of igneous intrusive rocks and good fossils (gastropods and bryozoans) in the limestone. Large speleothems with eg's of flowstone, columns and gour pools. Some straws.

Geology

Description
Excellent example of a phreatic/vadose multi-level cave. Lithology change at 7m from overlying massive to dark, thinly bedded limestone marks change from phreatic to vadose. 2 intersecting faults guide the cave. Basic igneous intrusions at stream level

Rock Type	*Rock Age*
Limestone	Permian

Sediments
Multi-level cave with varying sediments over a height of 20m. Gravel at stream level with some breakdown. Upper levels have sandy soil mixed with guano.

Speleothems
Large columns in upper levels; straws; popcorn; large gour pools form a bridge over the stream; common forms

Further Data
Bedding dips 25 degrees to north; Brachiopod, Gastropod & coral fossils in limestone

Hydrology

Description
3 separate streams enter and join inside this stream through cave. 1st flows from Tham Phet, 2nd from forest N of the cave and join near the TK035 entrance. 3rd stream enters at resurgence, source is unknown. Stream flows on to Tham Than Lot

River System	*Stream Name*	*Catchment Area, km2*	*Flowe, Cumec*
Mae Khlong		2	0.1

Further Data
date - January

Biology

Description
Rich fauna, especially aquatic species. Most are surface derived with ecology based on stream food supply. Very similar to Tham Phet. Serow use the cave

Identified Species
Shrimp; Fish - Nemacheiline, Balitoridae, Danio & Barb; Serow; Cave Racer Snake; few bats

Unusual Species
Rat - n.sp

Food Supply Routes
Stream; guano

Thailand Caves Database — Site Code 21

Environment

Description
Perennially active through cave in a well forested ridge.

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
17	93	16.5	8.2		

Further Data
Average of 3 measurements - January

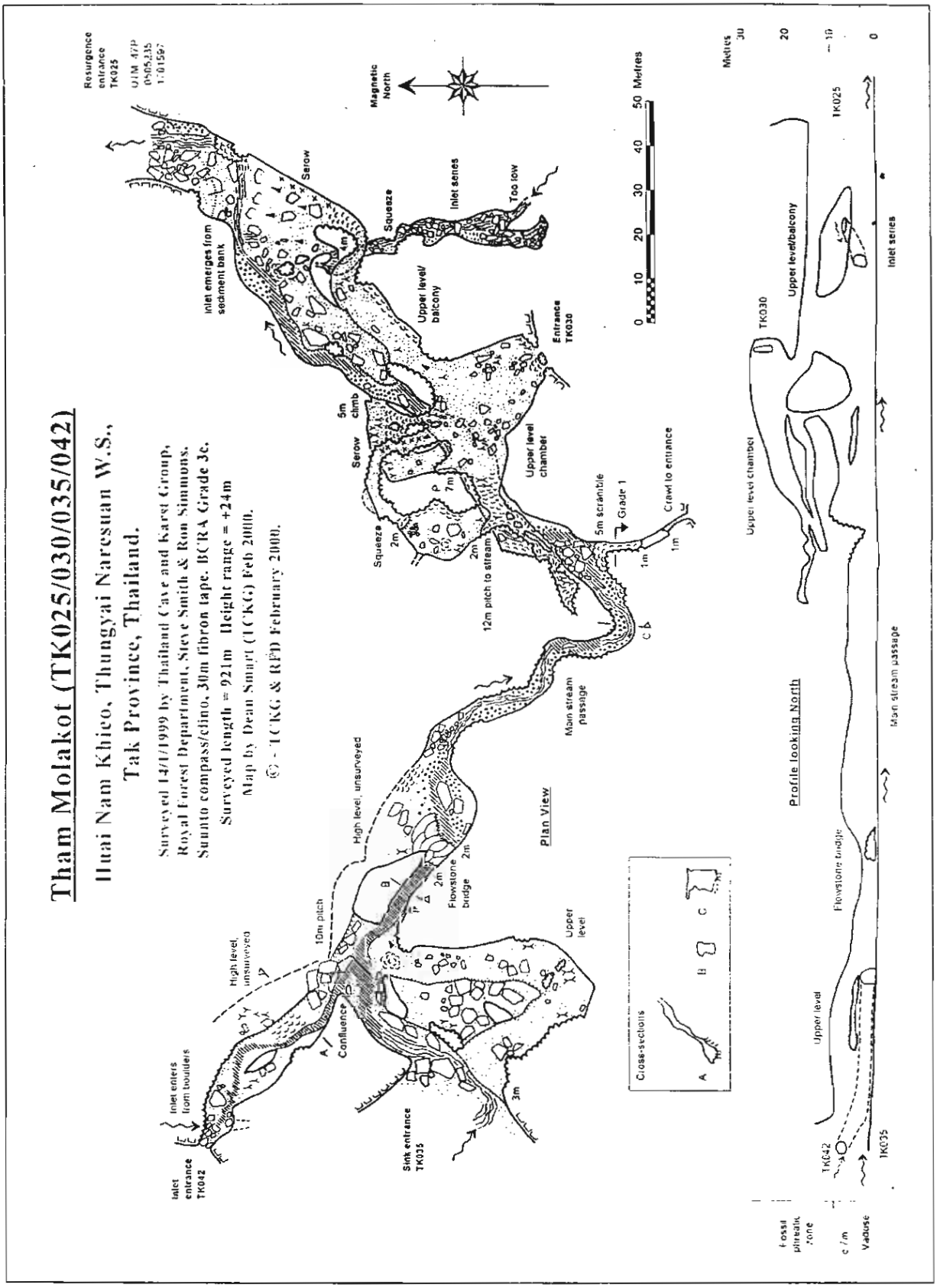
Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed. Possible sedimentation from nearby fields has now ceased

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
Increased Sediment

Impact Sources
Deforestation; Agriculture


Tham Molakot (TK025/030/035/042)
Huai Nam Khieo, Thungyai Naresuan W.S.,
Tak Province, Thailand.
Surveyed 14/1/1999 by Thailand Cave and Karst Group,
Royal Forest Department, Steve Smith & Ron Simmons.
Suunto compass/clino, 30m fibron tape. BCRA Grade 3c.
Surveyed length = 921m Height range = +24m
Map by Dean Smart (TCKG) Feb 2000.
© - TCKG & RFD February 2000.
Resurgence entrance TK025
Magnetic North
Serow
Squeeze
Inlet enters from sediment bank
Inlet series
Too tow
Upper level/ balcony
Entrance TK030
5m climb
Upper level chamber
12m pitch to stream
5m scramble
Grade 1
Crawl to entrance
Main stream passage
High level, unsurveyed
10m pitch
Flowstone bridge
Upper level
Inlet enters from boulders
Inlet entrance TK042
Confluence
Sink entrance TK035
Plan View
Close-sections
Profile looking North
Upper level chamber
Upper level/balcony
TK030
TK025
Inlet series
Flowstone bridge
Main stream passage
TK042
TK035
Vadose
Fossil phreatic zone
0 10 20 30 40 50 Metres
Metres
20
0

Thailand Caves Database — Site Code 22

English Names	*Thai Names*
TK026	**TK026**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	488217	1722262	15.578969	98.890098

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
320	20	11	C:\Cave Database\Maps\Tak\TK0026.tif

Access Description
2 days walk from Thung Nar Noi ranger station and located on the South bank of the Mae Khlong River. Walk down the Huai Bi valley to that stream's confluence with the Mae Khlong. Follow the Southern bank downriver for 500m. The large entrance is found in c.30m above the main river.

General Description
Very small cave with a seasonal stream flowing in a skylight at the back and out of the main entrance.

Technical Description
Ropes needed for the skylight pitch.

Dangers
None

Outstanding Values
None

Geology

Description
Formed on the side of a valley

Rock Type	*Rock Age*
Limestone	Triassic

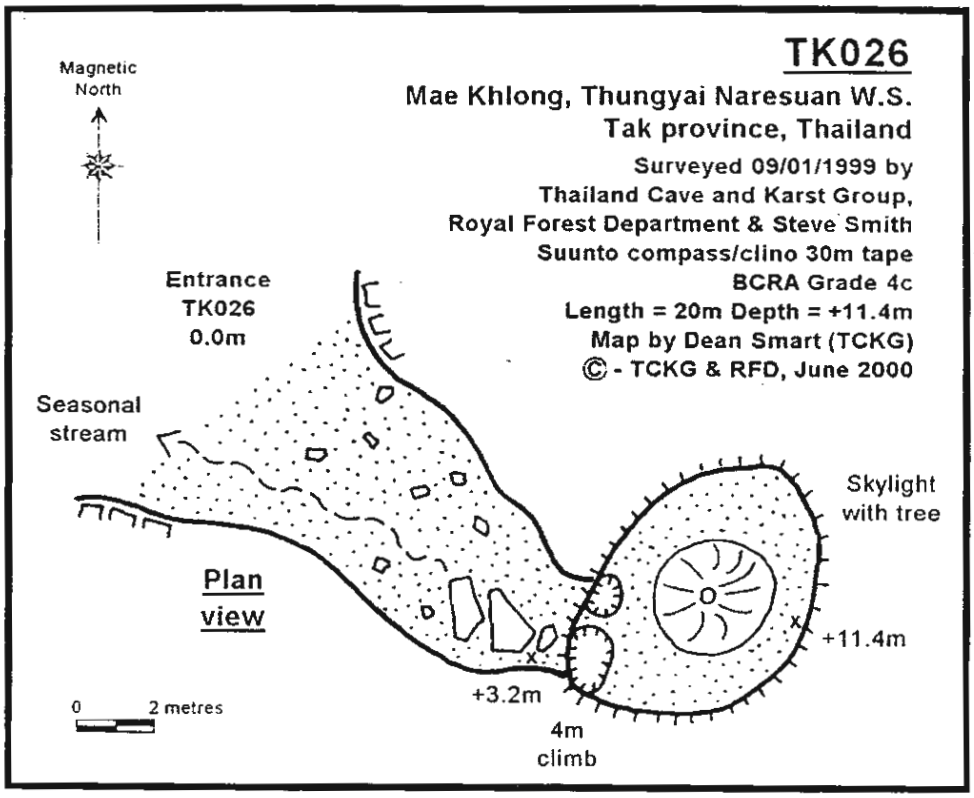
Sediments
Inwashed soil

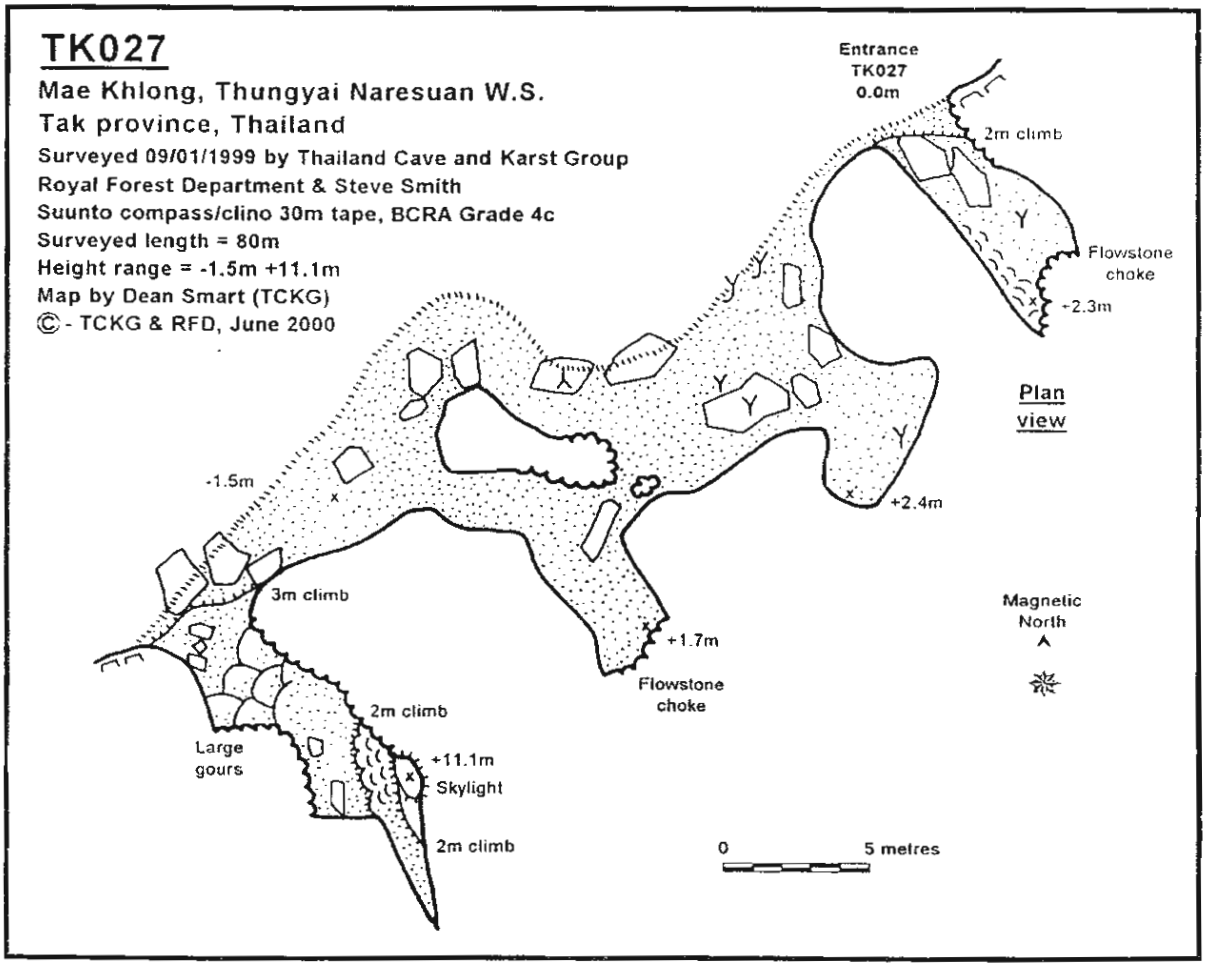
Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None


TK026
Mae Khlong, Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 09/01/1999 by
Thailand Cave and Karst Group,
Royal Forest Department & Steve Smith
Suunto compass/clino 30m tape
BCRA Grade 4c
Length = 20m Depth = +11.4m
Map by Dean Smart (TCKG)
© - TCKG & RFD, June 2000
Magnetic North
Entrance
TK026
0.0m
Seasonal stream
Plan view
Skylight with tree
+11.4m
+3.2m
4m climb
0
2 metres


TK027
Mae Khlong, Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 09/01/1999 by Thailand Cave and Karst Group
Royal Forest Department & Steve Smith
Suunto compass/clino 30m tape, BCRA Grade 4c
Surveyed length = 80m
Height range = -1.5m +11.1m
Map by Dean Smart (TCKG)
© - TCKG & RFD, June 2000
Entrance
TK027
0.0m
2m climb
Flowstone choke
+2.3m
Plan view
-1.5m
+2.4m
3m climb
+1.7m
Flowstone choke
Magnetic North
2m climb
Large gours
+11.1m
Skylight
2m climb
0
5 metres

Thailand Caves Database

Site Code 23

English Names	*Thai Names*
TK027	**TK027**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	487537	1721796	15.574749	98.883758

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
310	80	13	C:\Cave Database\Maps\Tak\TK0027.tif

Access Description
2 days walk from Thung Nar Noi ranger station and located on the South bank of the Mae Khlong River. Walk down the Huai Bi valley to that stream's confluence with the Mae Khlong. Follow the Southern bank downriver for 1km. This cave is located directly above a small resurgence at Huai Kaet.

General Description
Series of small caves located above a resurgence. Two caves end at flowstone chokes, while the third ends at a small skylight.

Technical Description
None

Dangers
None

Outstanding Values
Some large gour pools

Geology

Description
3 small caves with large flowstones and gour pools. Formed above an active resurgence.

Rock Type	*Rock Age*
Limestone	Triassic

Sediments
Inwashed soil and large breakdown

Speleothems
Large gour pools; common forms

Hydrology

Description
Small resurgence for Huai Kaet, located below the cave. Source of water unknown

River System	*Stream Name*	*Catchment Area, km2*	*Flow , Cumec*
Mae Khlong	Huai Kaet		

Thailand Caves Database — Site Code 23

Environment

Description
Cool and dry. Near the floor of a deep valley and near surface

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
22.5	66.5				

Further Data
date - January

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

Thailand Caves Database — Site Code 24

English Names	*Thai Names*
TK031	**TK031**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4839 IV	47P	506588	1702447	15.399829	99.061393

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1120	69	9	C:\Cave Database\Maps\Tak\TK0031.tif

Access Description
Follow a good footpath South from Huai Nam Khieo ranger station for 15 minutes. On the N side of the obvious small tower on the left of the path are two obvious entrances, one above the other. TK031 is the upper cave.

General Description
The single meandering passage slopes gently uphill, eventually becoming too low.

Technical Description
None

Dangers
Bears use the cave

Outstanding Values
None

Geology

Description
A single phreatic passage following the same fault as TK032 though 20m above

Rock Type	*Rock Age*
Limestone	Permian

Sediments
Sandy soil with guano

Speleothems
Common forms

Biology

Description
Little fauna. Bears use the cave and a rat nest was found

Identified Species	*Unusual Species*
Bear; bat	Rat - n.sp

Food Supply Routes
Guano

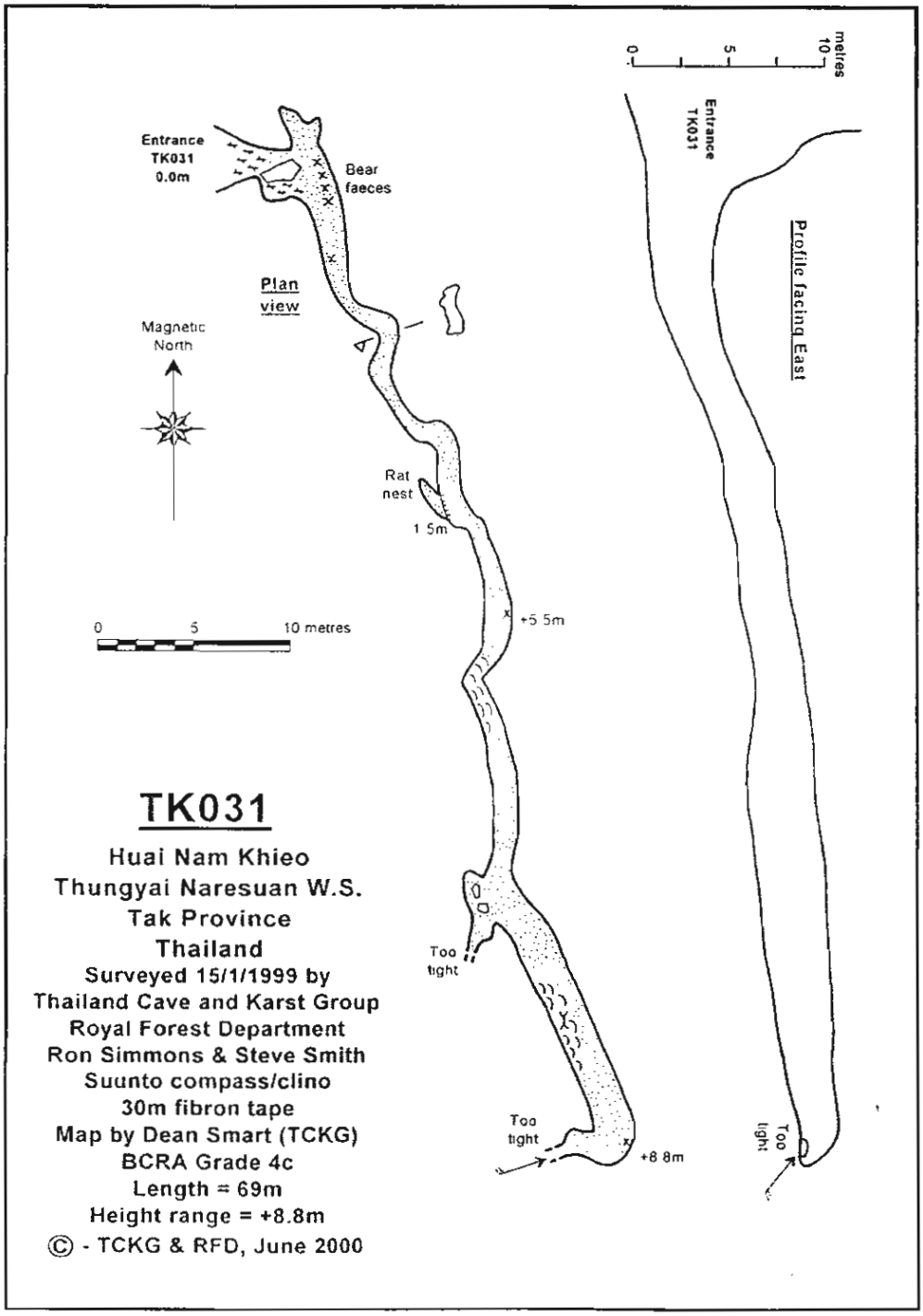
Thailand Caves Database — Site Code 24

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	Low	Royal Forest Department

Impacts
None



Thailand Caves Database — Site Code 25

English Names	*Thai Names*
TK032	**TK032**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4839 IV	47P	506588	1702447	15.399829	99.061393

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1100	66	15	C:\Cave Database\Maps\Tak\TK0032.tif

Access Description
Follow a good footpath due South from Huai Nam Khieo ranger station for 15 minutes. On the N side of the obvious small tower on the left of the path are two obvious entrances, one above the other. TK032 is the lower cave.

General Description
15m inside the large rift type entrance, the cave turns to the right and climbs uphill. The tall rift continues with oxbows in the left wall to where it closes down at a flowstone cascade. Squeezing past this leads to more tall rift ending at two climbs up of 3m and 5m. These have not been climbed.

Technical Description
None

Dangers
None

Outstanding Values
sub-fossil bones in sediment

Geology

Description
A single phreatic passage following the same fault as TK031 though 20m below. Some short oxbows. Bedding dips 30 degrees to SSW

Rock Type	*Rock Age*
Limestone	Permian

Sediments
Sandy soil with guano, some stuck to the wall at the end of the entrance chamber. Large breakdown in the entrance.

Speleothems
Large flowstone

Thailand Caves Database — Site Code 25

Biology

Description
Guano based ecology with tree roots at the entrance

Identified Species
Bat - Aselliscus stoliczkanus
Food Supply Routes
Guano; roots

Palaeontology

Description
One sub-fossil bone in sediment stuck to the wall in the entrance chamber. Species unidentified

Environment

Description
Short, dry cave near the summit of a small tower with little forest. Cave has one entrance.

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
20	86				

Further Data
date - January

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

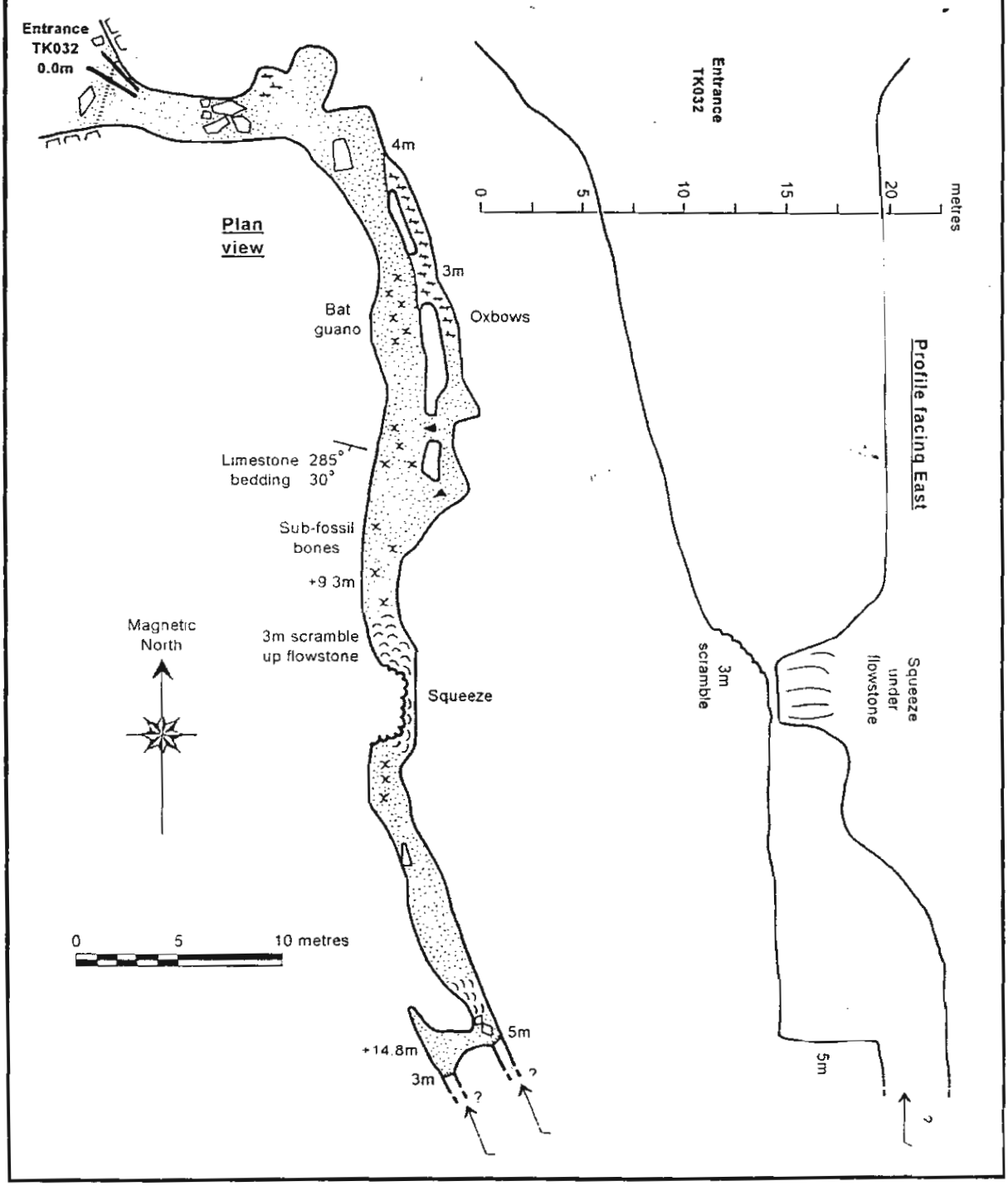
Classification	*Energy Rating*	*Manager*
3.1	Low	Royal Forest Department

Impacts
None

TK032

Huai Nam Khieo, Thungyai Naresuan W.S., Tak Province, Thailand

Surveyed 15/1/1999 by Thailand Cave and Karst Group, Royal Forest Department, Ron Simmons & Steve Smith. Suunto compass/clino 30m fibron tape.
Map by Dean Smart (TCKG) June 2000. BCRA Grade 4c.
Length = 66m Height range = +14.8m. © - TCKG & RFD, June 2000



Thailand Caves Database — Site Code 26

English Names	*Thai Names*
TK033	**TK033**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4839 IV	47P	506644	1702471	15.400050	99.061920

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1100	36	10	C:\Cave Database\Maps\Tak\TK0033.tif

Access Description
Follow a good footpath due South from Huai Nam Khieo ranger station for 20 minutes. On the S side of the obvious small tower on the left of the path is this large cave entrance.

General Description
To the right side of the broad, low entrance, a scramble down boulders leads to a 4m climb in a rift. At the bottom is a low bedding plane chamber that finishes in breakdown.

Technical Description
None

Dangers
None

Outstanding Values
Used extensively by porcupines

Geology

Description
Entrance rift formed along a fracture behind the cliffline. Drops into wide, low bedding plane

Rock Type
Limestone

Rock Age
Permian

Sediments
Much breakdown in lower level and at entrance

Speleothems
Common forms

Biology

Description
Small cave used extensively by porcupines, much guano. Many large snail shells in lower level. Roots near the entrance

Identified Species
Porcupine; land snail

Food Supply Routes
Guano

Thailand Caves Database — Site Code 26

Management

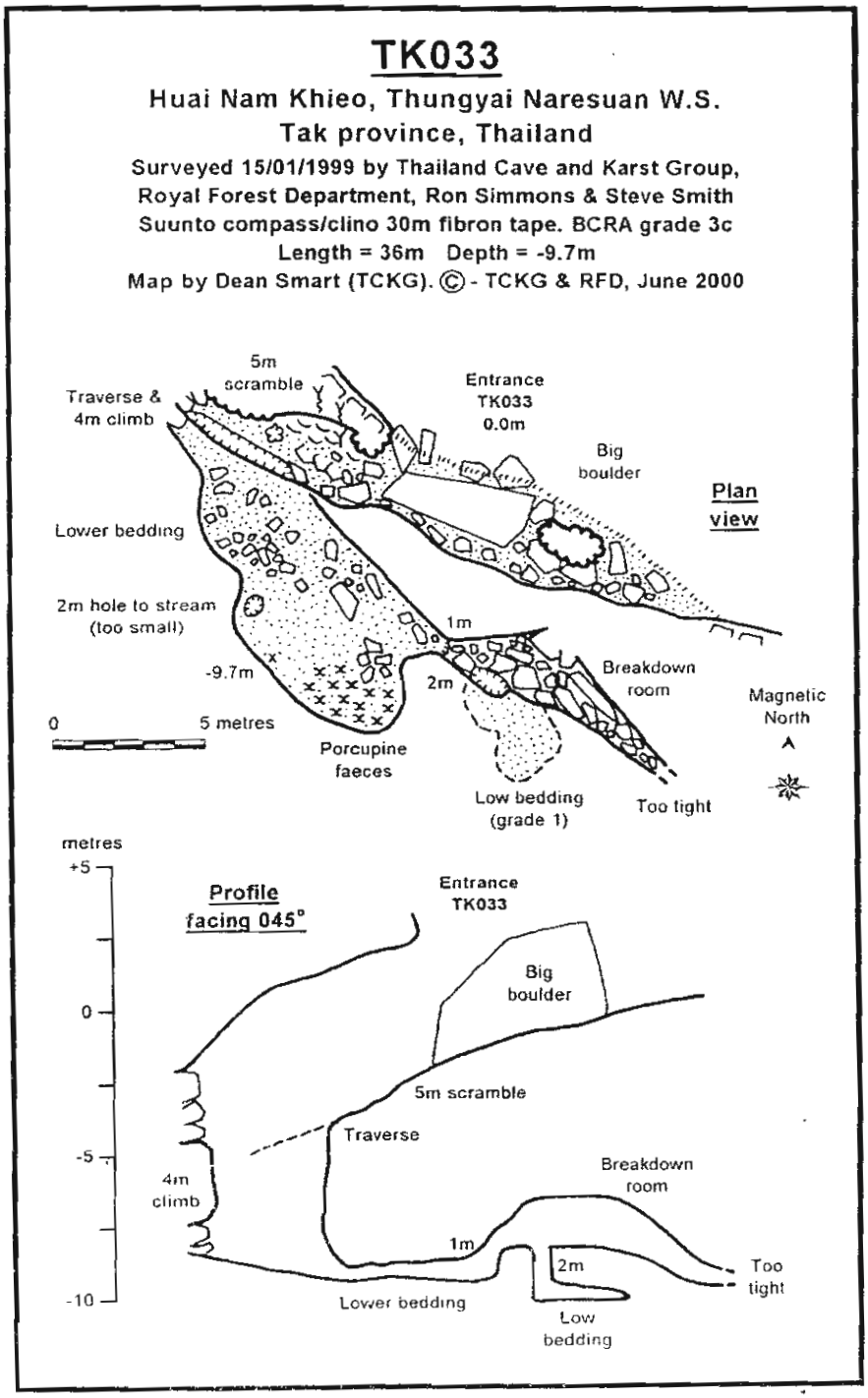
Description

Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	Low	Royal Forest Department

Impacts

None



Thailand Caves Database — Site Code 27

English Names	*Thai Names*
Tham Seua, TK034	**ถ้ำเสือ TK034**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4839 IV	47P	506546	1702173	15.397350	99.060997

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1100	952	27	C:\Cave Database\Maps\Tak\TK0034.tif

Access Description
Follow a good footpath due South from Huai Nam Khieo ranger station for 15 minutes. On the SW side of the obvious small tower on the left of the path is this large, obvious entrance.

General Description
A very complicated maze type cave whose description here is inadequate and only the main routes can be mentioned. From the large entrance chamber, several routes lead off. These are described from left to right (looking in). An obvious walking passage soon reaches a sediment bridge. Beyond this the passage gets smaller and crawling opens up at a small chamber. Straight ahead, a walking sized rift gradually becomes narrower until a 1.5m climb and a sharp right hand bend. The very tight crawl at the top soon enlarges at a chamber with several ways on. Straight ahead soon closes as does the passage leading back. A steep scramble up flowstone to the right leads to a T-junction. Right goes to various looping passages and a very tight crawl to the TK045 entrance. Left enters a low chamber with much porcupine faeces. A low crawl in the left side exits at the TK046 entrance. Straight on reaches another 3 way junction. Right ends at a round room with a 10m high aven in the roof. Left leads to a complex series of looping passages with several entrances (collectively called TK044). By taking the most obvious passage downwards to the right, a 4m climb down into a room with a flowing stream is reached. The stream quickly sumps in both directions. A 2m climb up from near here enters a high rift passage ending in a flowstone choke after 40m. The largest passage leading off from the entrance chamber climbs up 3m in a large rift before rejoining the previous route at the first small chamber. Along the right hand wall of the entrance chamber, at least 5 passages lead off. These narrow canyon type passage divide and rejoin several times. Eventually the explorer will find a 3m climb up to a flowstone slope, a squeeze and large passage to an entrance. An alternative route leads to a chamber with a draughting 4m climb.

Technical Description
Some squeezing and tight crawling required. Some of the climbs are awkward and route finding is difficult. The 4m climb to the draughting passage needs climbing gear.

Dangers
Some crawls are very tight. Getting lost is a possibility although an entrance is never usually far away.

Thailand Caves Database — Site Code 27

Outstanding Values
Superb example of complex, multiple phase phreatic and vadose cave development. Perhaps the most complex cave in Thailand. Excellent keyhole passages in the narrow canyons. Some prehistoric material including stone tools and some pottery in the entrance chamber and animal bones of unknown age.

Geology

Description
Very complex 3D maze cave formed along the edge of a tower. Mostly phreatic in origin though the meandering 'canyons' East of the entrance are classic keyholes. Examples of most passage type. A fault guides a large rift at the northern end

Rock Type	*Rock Age*
Limestone	Permian

Sediments
Sandy soil floors most of the cave. Some breakdown especially in entrance areas. One calcified sediment bridge.

Speleothems
Common forms, small helictites, popcorn in some areas.

Hydrology

Description
Small stream flows through part of the cave, sumped at both ends. Origin & destination unknown

River System	*Stream Name*	*Catchment Area, km2*	*Flowe, Cumec*
Mae Khlong			0

Further Data
date - January

Biology

Description
Little studied biologically. Fair number bats and porcupines provide guano. Strong draughts between the many entrances. Very short section of stream with catfish

Identified Species
Bats; porcupine - Atherurus macrourus, catfish

Unusual Species
Rat - n.sp; White isopods - R

Food Supply Routes
Guano: draughts; stream

Thailand Caves Database — Site Code 27

Palaeontology

Description
Main entrance chamber contains a few bones probably of bear and deer. One limb bone has been sharpened, either deliberately or by an animal gnawing

Species Found
Deer; Bear

Archaeology

Description
Large dry entrance chamber with a watersource 1km away. >20 crude limestone tools and small pottery sherds from several pots found. Bear and deer remains. One limb bone was sharpened at the end.

Artifacts
stone tools; cord-marked pottery; burnished pottery; animal remains

Environment

Description
Long, complex cave with many entrances, located in a hill with little forest cover. Cool air temperatures reflect cold season timing.

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
17	89				

Further Data
average of 9 measurements - January, February

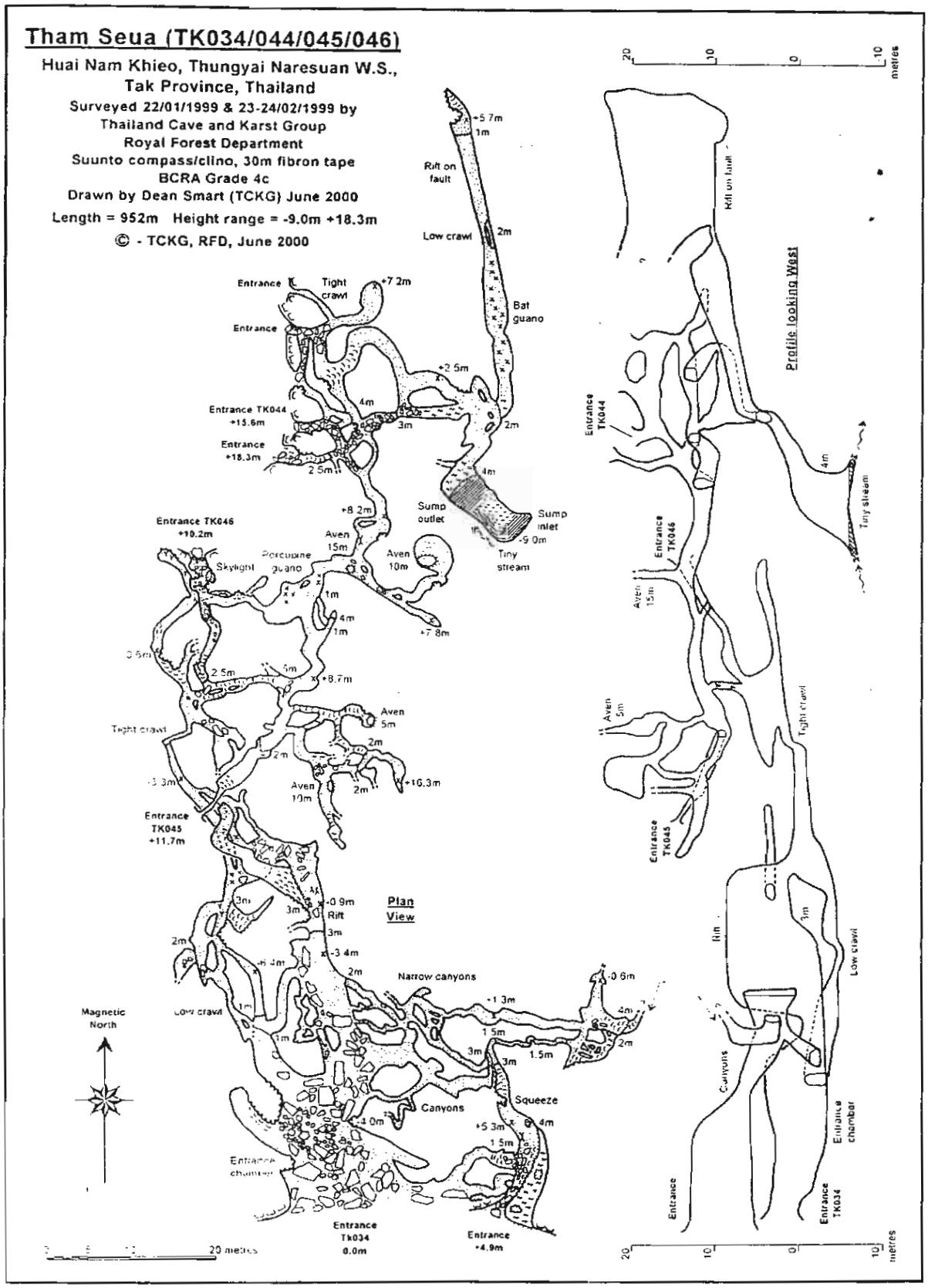
Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed. Guano extraction has now ceased

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
Sediment Disturbance

Impact Sources
Resource Extraction


Tham Seua (TK034/044/045/046)
Huai Nam Khieo, Thungyai Naresuan W.S.,
Tak Province, Thailand
Surveyed 22/01/1999 & 23-24/02/1999 by
Thailand Cave and Karst Group
Royal Forest Department
Suunto compass/clino, 30m fibron tape
BCRA Grade 4c
Drawn by Dean Smart (TCKG) June 2000
Length = 952m Height range = -9.0m +18.3m
© - TCKG, RFD, June 2000
Plan View
Profile looking West
Entrance TK034 0.0m
Entrance +4.9m
Entrance TK045 +11.7m
Entrance TK046 +10.2m
Entrance TK044 +15.6m
Entrance +18.3m
Entrance Tight crawl +7.2m
Rift on fault
Low crawl
Bat guano
Sump outlet
Sump inlet -9.0m
Tiny stream
Aven 15m
Aven 10m
Porcupine guano
Skylight
Tight crawl
Aven 5m
Rift
Narrow canyons
Canyons
Squeeze
Entrance chamber
Magnetic North
20 metres
20 10 0 10 metres

Thailand Caves Database — Site Code 28

English Names	*Thai Names*
Tham Phet, TK036	**ถ้ำเพชร TK036**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4839 IV	47P	504832	1701436	15.390689	99.045028

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1090	801	22	C:\Cave Database\Maps\Tak\TK0036.tif

Access Description
Walk on good footpath for 30 minutes to SW from Huai Nam Khieo ranger station. Find and enter the TK012 entrance located on NW side of the obvious tower after crossing a stream. Walk through that cave and exit via the TK013 entrance on the West side of the hill. Walk a further 30 minutes to the West until a permanent stream is met. From here, either follow the stream up, through TK025 and TK035 to this resurgence entrance at the upstream end of the big doline. Or, cross the stream and climb up and over the hill on a good footpath before dropping down the stream in the doline and finding this resurgence entrance.

General Description
A large active stream through cave with extensive upper levels. From the resurgence entrance, TK036, easy walking in a passage 5m high and wide, leads around a bend to where the passage enlarges dramatically to 20m high and 10m wide. The upper levels enter here 6m above the stream. Continuing at stream level meanders around several bends for some 150m to a flowstone bridge. Soon after crawling over this the stream passage becomes a low wet crawl before exiting at the sink entrance of TK037. At the start of the wet crawl is a 2m climb on the right. This leads to an upper level and a large entrance beside the sink. From the upper level, a 3m climb up enters another level, from which a further 3m climb reaches the main upper levels. Straight ahead opens up into the main upper level chamber and the TK041 entrance. Right is easy walking past a passage on the left leading back to the main chamber, to an entrance, TK038. Scrambling down to the left here reaches a small chamber with several passages heading off and the TK039 entrance. One passage climbs 4m up boulders to TK040. The other passages soon end. Off the main chamber, a low bedding plane can be entered that becomes too low after 25m. At the bottom end of the main chamber, the stream is seen flowing along a canyon 6m deep. The ledge above this peters out, but a large passage to the right reaches another balcony further downstream. Scrambling up and left from here oxbows around back to a 15m pitch into the main chamber. Walking along the balcony, the cave opens up at a breakdown room and a point where it is possible to climb down to the stream. Huge flowstone forces the explorer down to the edge of the balcony and a slippery traverse on flowstone leads to a small room with termites. To the left of the stream sink entrance, a narrow rift can be entered. Tight crawls and a squeeze eventually open up after 40m into a small chamber - the Lair of the Porcupine.

Thailand Caves Database — Site Code 28

Technical Description
A lot of climbing is required between the levels. Some pitches require ropes or ladders. A few tight squeezes.

Dangers
The streamway floods quickly and dramatically. Care is needed on some of the climbs. The Lair of the Porcupine is tight.

Outstanding Values
Excellent example of a multiple phase cave. The upper levels are phreatic and the present streamway is vadose. Varied sediments in all levels.

Geology

Description
Excellent e.g of multi-level cave, 5 levels +. Lithology change at 6m from overlying massive to dark, thinly bedded limestone marks change from phreatic to vadose. N-S fault guides cave. E-W bedding strike influence at stream level. Pinnacles in TK041 ent

Rock Type	*Rock Age*
Limestone	Permian

Sediments
Found at every level of the cave and variable ranging from large cobbles to sand in the lower levels and reddish soil in the higher parts.

Speleothems
Common forms; large flowstone; straws; flowstone bridges in stream passage and Lair of Porcupine

Further Data
Bedding dips 20 degrees to SE. Small basic dike in stream bed 30m downstream from TK036.

Hydrology

Description
Through stream cave carrying water collected on sedimentary rocks to the West. Water flows on to Tham Molakot

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong		1.5	0.1

Further Data
date - January

Thailand Caves Database — Site Code 28

Biology

Description
Rich fauna, especially aquatic species. Most are surface derived with ecology based on stream food supply. Very similar to Tham Molakot. Roots enter the Lair of the Porcupine and termites inhabit one room with red soil. Used by serow

Identified Species
Shrimp; fish - 2 loach sp, Danio; Scutigera; porcupine; serow; bats - Rhinolophus sp, Aselliscus stoliczkanus; termite

Food Supply Routes
Stream; guano; draught; roots

Environment

Description
Perennially active through cave in a well forested ridge.

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
17	90	16.8	8.3		

Further Data
Average of 3 measurements - January

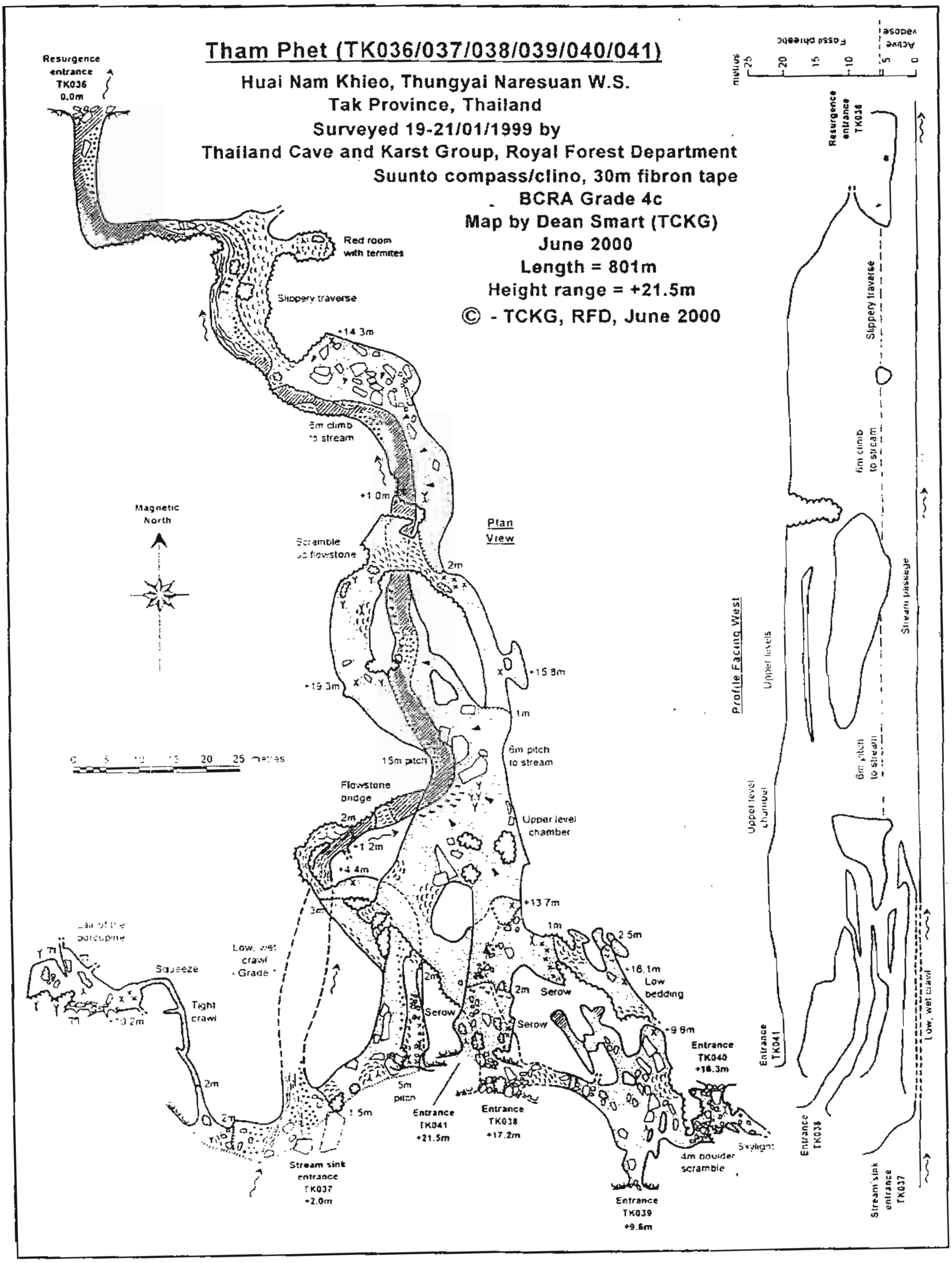
Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed. Possible sedimentation has now ceased

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
Increased Sediment

Impact Sources
Deforestation; Agriculture


Tham Phet (TK036/037/038/039/040/041)
Huai Nam Khieo, Thungyai Naresuan W.S.
Tak Province, Thailand
Surveyed 19-21/01/1999 by
Thailand Cave and Karst Group, Royal Forest Department
Suunto compass/clino, 30m fibron tape
BCRA Grade 4c
Map by Dean Smart (TCKG)
June 2000
Length = 801m
Height range = +21.5m
© - TCKG, RFD, June 2000
Resurgence entrance TK036 0.0m
Red room with termites
Slippery traverse
+14.3m
6m climb to stream
+1.0m
Magnetic North
Scramble up flowstone
Plan View
2m
+15.8m
+19.3m
1m
6m pitch to stream
15m pitch
0 5 10 15 20 25 metres
Flowstone bridge
2m
+1.2m
Upper level chamber
+4.4m
+13.7m
3m
1m
2.5m
Low, wet crawl - Grade 1
Squeeze
+16.1m
Low bedding
2m
Serow
Serow
Serow
Tight crawl
+9.6m
Entrance TK040 +16.3m
2m
5m pitch
1.5m
Entrance TK041 +21.5m
Entrance TK038 +17.2m
Skylight
4m boulder scramble
Stream sink entrance TK037 +2.0m
Entrance TK039 +9.6m
Profile Facing West
Active vadose
Fossil phreatic
metres 25 20 15 10 5 0
Resurgence entrance TK036
Slippery traverse
6m climb to stream
Stream passage
Upper levels
6m pitch to stream
Upper level chamber
Low, wet crawl
Entrance TK041
Entrance TK038
Stream sink entrance TK037

Thailand Caves Database — Site Code 29

English Names	*Thai Names*
Tham Tao, TK043	**ถ้ำต่า TK043**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4839 IV	47P	505732	1701593	15.392109	99.053421

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1080	100	7	C:\Cave Database\Maps\Tak\TK0043.tif

Access Description
Walk on good footpath for 30 minutes to SW from Huai Nam Khieo ranger station. Find and enter the TK012 entrance located on NW side of the obvious tower after crossing a stream. Walk through that cave and exit via the TK013 entrance on the West side of the hill. Walk a further 30 minutes to the South around the large tower. This cave is found on the S side just above a small stream sink and old field.

General Description
Really two caves located next to each other. The left hand, obvious entrance drops down large boulders to a room partitioned by columns (The Turtle). Passing through these the cave lowers to a crawl ending in a stalactite grill with a strong draught. A hole in boulders at the left side of this entrance climbs down 3m into a chamber with breakdown (Beneath the Turtle). 10m to the right of the obvious entrance is a small hole in boulders. Scrambling down here reveals a larger room with many large speleothems (Beside the Turtle). A crawl at the back becomes too low. By squeezing down through a hole, a lower chamber is reached with low passages leading off (Bottom of the Turtle).

Technical Description
None

Dangers
Some of the boulder are loose

Outstanding Values
Complete turtle carapace and many bones of other animals

Thailand Caves Database — Site Code 29

Geology

Description
Small cave with geology masked by massive speleothem growth and breakdown. Low, wide bedding planes

Rock Type	*Rock Age*
Limestone	Permian

Sediments
Large breakdown in entrance; sand covering floor of upper parts with more muddy soils in lower levels

Speleothems
Heavily decorated for a small cave; common forms; large flowstones and columns in 'Beside the Turtle'; straws in lower parts

Hydrology

Description
Tiny stream flowing from forest to SW sinks just below cave. Impenetrable and destination unknown

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong		0.5	0

Further Data
data - January

Palaeontology

Description
Many bones and teeth of a variety of animals in entrance chamber though no skulls. Also, a near complete carapace of a large tortoise (CL = 45cm)

Species Found
Deer; Small Cat; Rodent; Bat; Asian Giant Tortoise - Manouria emys

Management

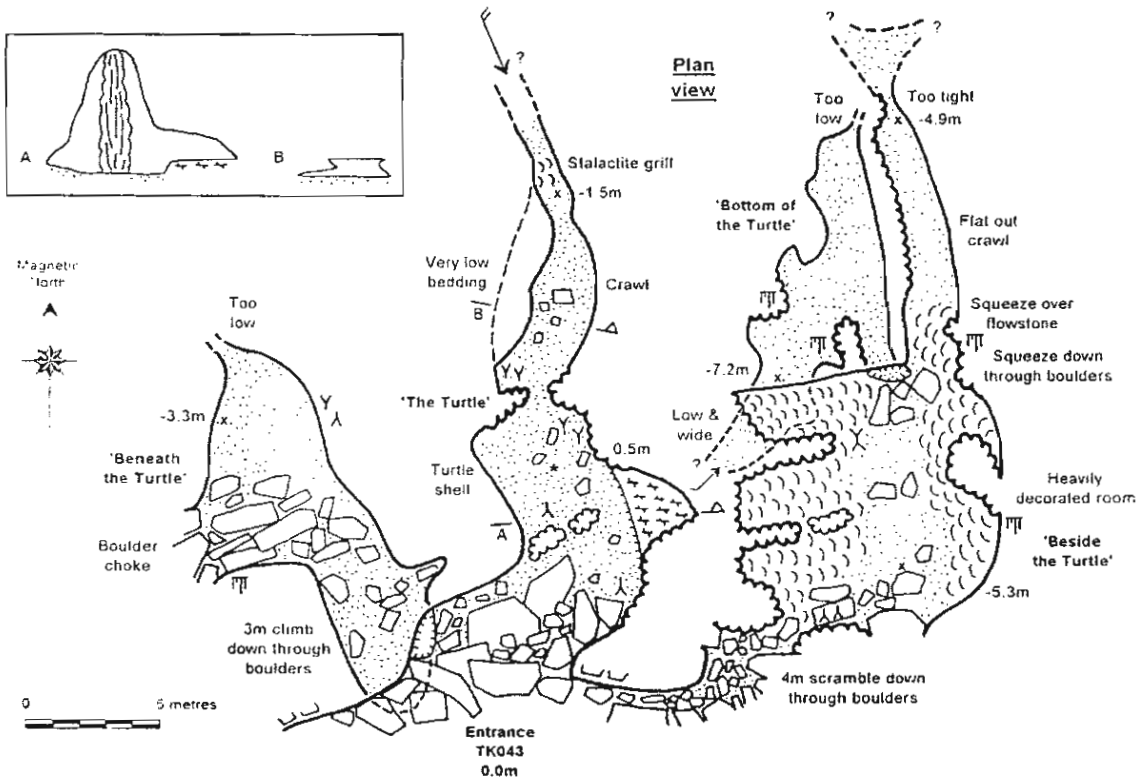
Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	Low	Royal Forest Department

Impacts
None

Tham Tao (TK043)

Huai Nam Khieo, Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 21/01/1999 by
Thailand Cave and Karst Group & Royal Forest Department
Suunto compass/clino 30m fibron tape. BCRA grade 4c
Length = 100m Depth = -7.2m
Map by Dean Smart (TCKG). © - TCKG & RFD, June 2000



Thailand Caves Database

Site Code 30

English Names	*Thai Names*
TK047	**TK047**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4839 IV	47P	506421	1701544	15.391670	99.059837

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1080	26	6	C:\Cave Database\Maps\Tak\TK0047.tif

Access Description
Follow the good footpath South from Huai Nam Khieo ranger station. After c.1 hours walk a low
limestone ridge is met. This small cave is found on the East side.

General Description
Straight in from the entrance ends quickly. Right leads to a climb and a crawl ending in flowstone.

Technical Description
None

Dangers
None

Outstanding Values
Sediment roof and large snail shells.

Geology

Description
Tiny cave with interesting sediments stuck to the roof. Broken speleothem breakdown

Rock Type	*Rock Age*
Limestone	Permian

Sediments
inwashed soil stuck to the roof and on floor; breakdown is blocks of broken speleothem

Speleothems
flowstone

Palaeontology

Description
Small cave with hundreds of large snail shells in sediments stuck to the roof.

Species Found
Land Snail

Thailand Caves Database — Site Code 30

Management

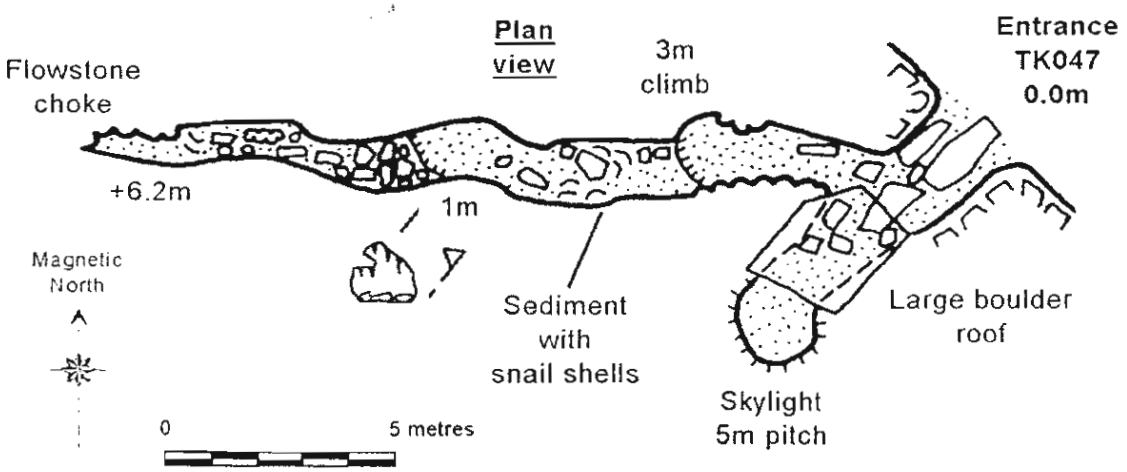
Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	Low	Royal Forest Department

Impacts
None

TK047

Huai Nam Khieo, Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 26/02/1999 by
Thailand Cave and Karst Group & Royal Forest Department
Suunto compass/clino 30m tape. BCRA Grade 3c
Length = 26m Depth = +6.2m
Map by Dean Smart (TCKG). © - TCKG & RFD, June 2000



Thailand Caves Database

Site Code 31

English Names	*Thai Names*
TK048	**TK048**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4839 IV	47P	506184	1701516	15.391409	99.057632

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1080	125	2	C:\Cave Database\Maps\Tak\TK0048.tif

Access Description
Follow the good footpath South from Huai Nam Khieo ranger station. After c.1 hours walk a low
limestone ridge is met with grassland surrounding it. This large, obvious entrance is on the West side of the ridge.

General Description
Very wide entrance gains an equally wide bedding passage that oxbows around and out of the cliff 30m beyond. A small stream outlet is too immature.

Technical Description
None

Dangers
None

Outstanding Values
Elephants use the cave

Geology

Description
Formed by near static, very aggressive marsh water. At least 5 different levels of notching with the wide, low bedding plane main passage being 1 level. Geological structure is of secondary importance to marsh level. The present stream is underfit

Rock Type	*Rock Age*
Limestone	Permian

Sediments
Stream channel is floored with small gravel and runs between sand and mud banks 1m high.

Speleothems
Common forms; some small straws and helictites

Thailand Caves Database — Site Code 31

Hydrology

Description
Seasonal stream sink for water flowing from hills to south. Stream is underfit and its destination is unknown

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong		0.75	0

Further Data
date - February

Biology

Description
Surface based fauna. The rare bat, Ia io roosts here and the entrance is used by elephants

Identified Species
elephant

Unusual Species
bat - Ia io (R)

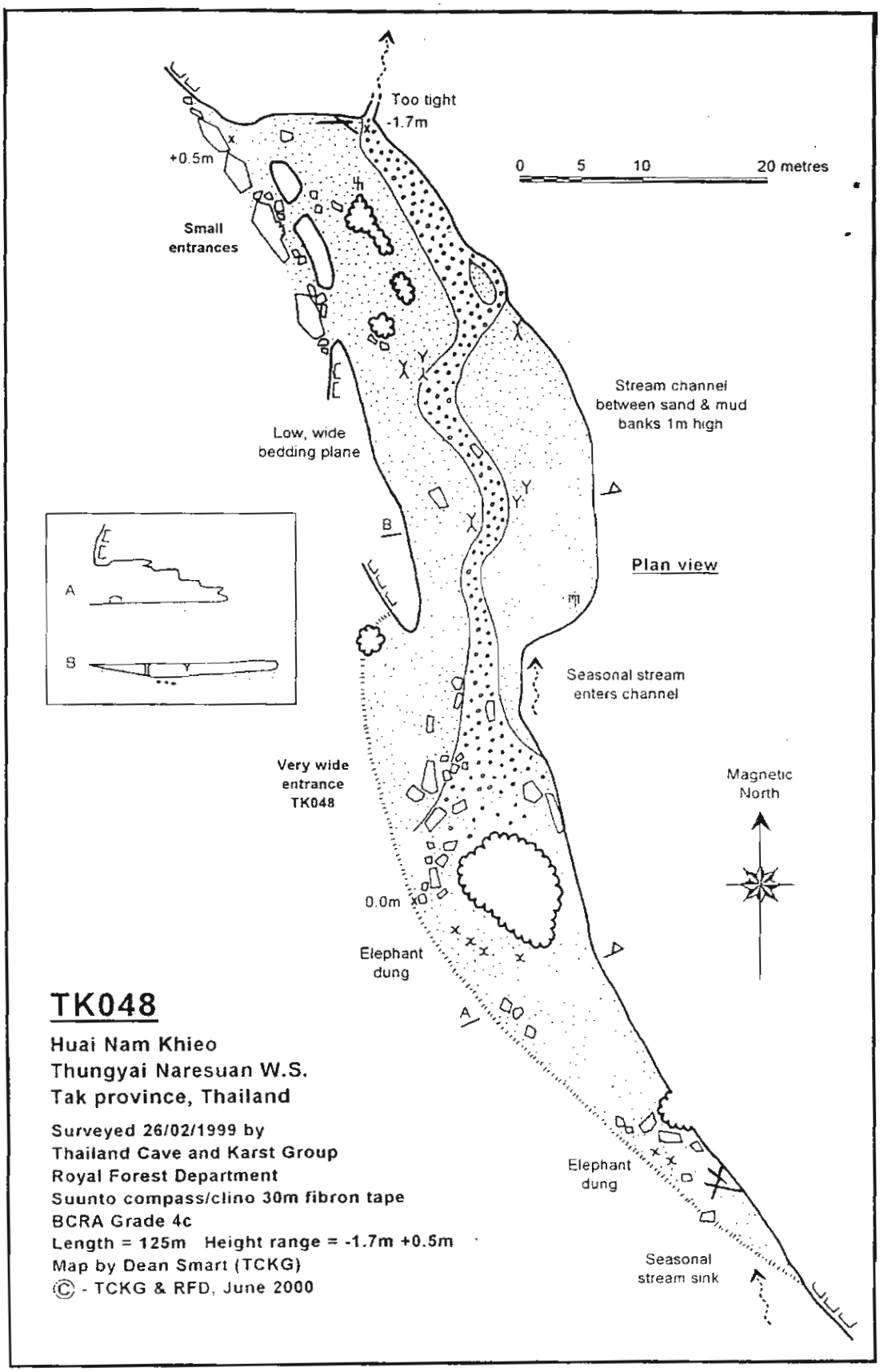
Food Supply Routes
Stream; near surface

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None



TK048

Huai Nam Khieo
Thungyai Naresuan W.S.
Tak province, Thailand

Surveyed 26/02/1999 by
Thailand Cave and Karst Group
Royal Forest Department
Suunto compass/clino 30m fibron tape
BCRA Grade 4c
Length = 125m Height range = -1.7m +0.5m
Map by Dean Smart (TCKG)

Thailand Caves Database

Site Code 32

English Names	*Thai Names*
Tham Mor, TK049	**ถ้ำหม้อ TK049**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4839 IV	47P	504972	1702613	15.401339	99.046333

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1070	1139	16	C:\Cave Database\Maps\Tak\TK0049.tif

Access Description

Walk on good footpath for 30 minutes to SW from Huai Nam Khieo ranger station as for TK012. Upon reaching that cave, turn right and walk North for a further 30 minutes. Find the obvious seasonal stream gulley and follow it downstream to this stream sink entrance.

General Description

Seasonally active stream cave with very complex upper levels. The stream sink entrance, TK049, has an upper level entrance and a lower rift taking the stream. The stream passage continues straight and narrow for 50m. A short series of parallel rifts opens up again into tall rift passage following the same fault as before. The stream passage now becomes smaller and meanders a little until a large upper level breaks into the roof and the TK028 entrance appears. The upper levels are very complex and only a brief description is given here. Entering via TK049, a passage on the left leads to TK055. Straight ahead and right, drops down a 2m climb to a very wide passage. This passage becomes wider and turns a bend before reaching the TK029 and TK054 entrances. At the bend, a 3m climb enters a very tight crawl leading to another entrance, TK058, and a 5m pitch to a short lower level. At the start of the wide passage, opposite the 2m climb down, a 1m climb up opens out into a chamber above the stream passage. Twin 8m pitches drop down to stream level. Going off left, 2 routes meet at TK056 and a short loop to TK057. By entering the other passage at TK057 a series of rifts and squeezes rejoin the roof of the main stream passage some 50m downstream of the chamber. Stepping across to the balcony on the other side reveals a walking sized passages and a 4 way junction. Left ends at the TK053 entrance, straight ahead ends at a flowstone filled room with a skylight and right contains a tight crawl and a 4m climb down into the chamber above the stream passage. The rest of the upper levels are accessed from the downstream end of the cave. 30m in from the entrance a small passage on the right opens up to reveal TK059. The upper level continues for another 30m to where an 8m pitch into the stream passage stops progress. Some prehistoric pottery was found here.

Technical Description

Vertical equipment is needed on the pitches between levels, although all can be bypassed. A 10m ladder is needed for the 5m pitch into the lower level at TK058. Squeezing and crawling is required, some of it very tight.

Thailand Caves Database — Site Code 32

Dangers
The stream passages flood quickly in wet weather. Route finding in the upper levels is difficult, although it would be difficult to get lost. Some of the squeezes are very tight, especially the crawl to TK058.

Outstanding Values
Excellent example of a cave with multiple phases of development, both phreatic and vadose. The phreatic upper levels reach a maze-like complexity and display good examples of phreatic morphology. Contains a single (broken) prehistoric pot.

Geology

Description
Very complex cave with phreatic and vadose passages. Strong NW-SE fault guides the main phreatic upper level and vadose stream passage which form a classic keyhole. Maze-like away from the fault, lacking any trend. At least 2 levels of development

Rock Type	*Rock Age*
Limestone	Permian

Sediments
Gravel floors the streamway. Upper levels have sand and inwashed soil. Some good false floors in upper side passages. Large scale breakdown in entrances.

Speleothems
Common forms; large gour pools and flowstone bridges; some straws

Hydrology

Description
Normally dry. In very wet weather, floodwater diverted North from Tham Than Lot flows through this cave

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong		4	0

Further Data
date - April

Biology

Description
Not fully investigated. Stream based ecology in lower level, with guano and wind based in upper parts. Many bats. Used by porcupines and serow.

Identified Species
Porcupine; serow; bats - Aselliscus stoliczkanus, large Vespertilionid (Ia io?)

Food Supply Routes
Stream; guano; draught

Thailand Caves Database — Site Code 32

Archaeology

Description
Single, large cord-marked pot (c.50cm rim diameter) on a ledge in the upper level. Broken into several large sherds, some having fallen into the stream passage below.

Artifacts
cord-marked pottery

Environment

Description
Seasonally active through cave located in a thinly forested ridge in a lowland area with poor drainage. 100% humidity

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
20	100				

Further Data
average 2 measurements - April, May

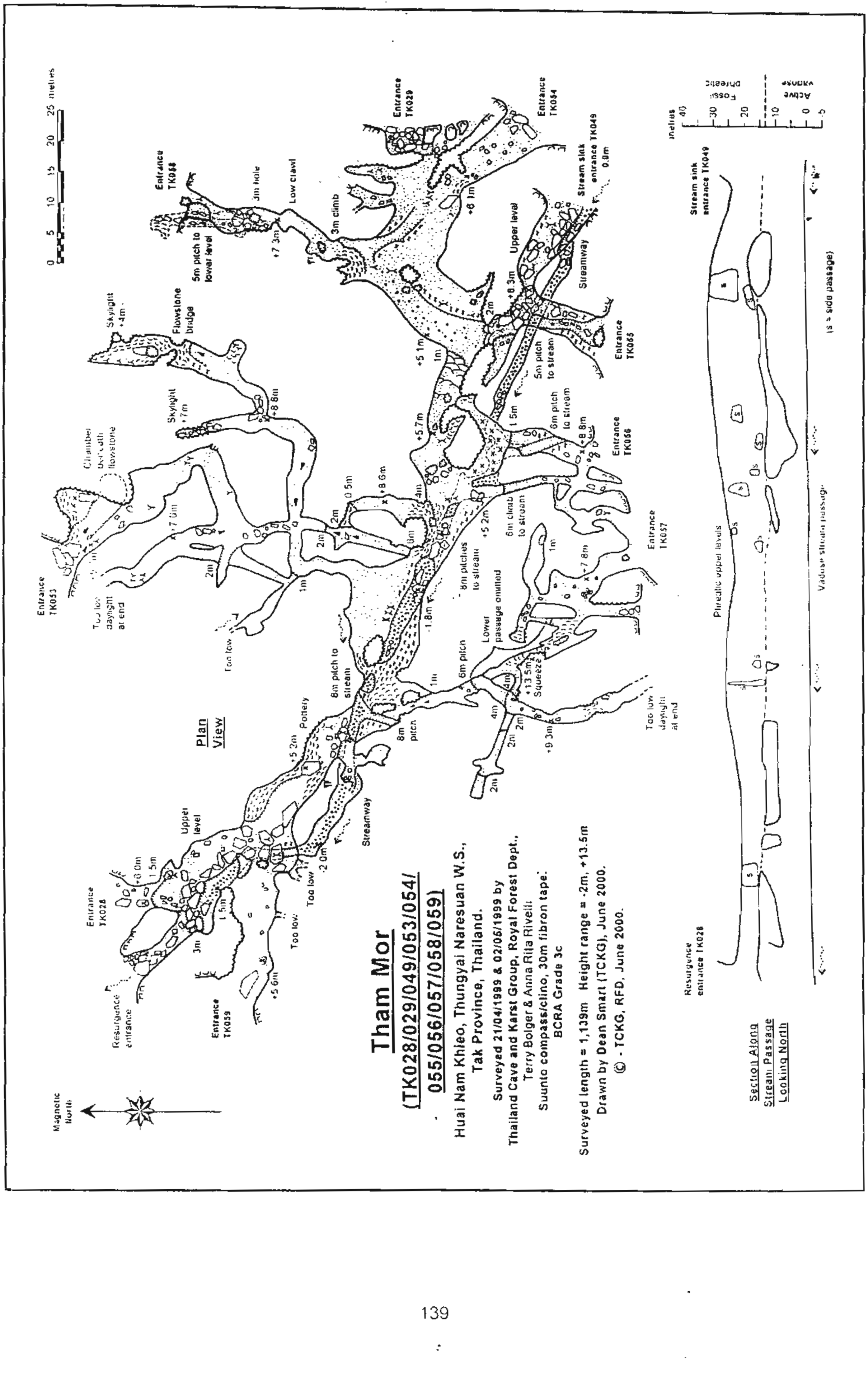
Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed. Possible sedimentation from nearby fields now ceased

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
Increased Sediment

Impact Sources
Deforestation; Agriculture


Tham Mor
(TK028/029/049/053/054/
055/056/057/058/059)
Huai Nam Khieo, Thungyai Naresuan W.S.,
Tak Province, Thailand.
Surveyed 21/04/1999 & 02/05/1999 by
Thailand Cave and Karst Group, Royal Forest Dept.,
Terry Bolger & Anna Rita Rivelli
Suunto compass/clino, 30m fibron tape.
BCRA Grade 3c
Surveyed length = 1,139m Height range = -2m, +13.5m
Drawn by Dean Smart (TCKG), June 2000.
© - TCKG, RFD, June 2000.
Plan View
Magnetic North
Section Along Stream Passage Looking North
(s = side passage)
Phreatic upper levels
Vadose stream passage
Resurgence entrance TK028
Stream sink entrance TK049
Fossil phreatic
Active vadose
metres
Entrance TK028
Entrance TK029
Entrance TK053
Entrance TK054
Entrance TK055
Entrance TK056
Entrance TK057
Entrance TK058
Entrance TK059
Resurgence entrance
Streamway
Upper level
Pottery
Too low
Skylight +4m
Skylight +7m
Flowstone bridge
Chamber with flowstone
5m pitch to lower level
3m hole
Low crawl
3m climb
8m pitch to stream
8m pitch
6m pitch
Lower passage omitted
6m climb to stream
5m pitch to stream
6m pitch to stream
Squeeze
Too low daylight at end

Thailand Caves Database

Site Code 33

English Names	*Thai Names*
TK050	**TK050**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	497850	1724677	15.600830	98.979942

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
880	150	10	C:\Cave Database\Maps\Tak\TK0050.tif

Access Description
Drive South along the track from Utakhi ranger station. Where the track reaches to top of the hill after 4km, walk to the West heading for an obvious saddle in the hills. Upon reaching the saddle, drop down the steep hill into the stream valley on the other side. This cave is the sink for the stream in the valley and is found by following the stream down for 1km.

General Description
The stream sinks into mud and rocks. To the left is an overflow channel leading to two cave entrances. The first entrance quickly pops out into a doline where the stream is met again on the other side of a low ridge. The stream quickly sinks again. At the end of the doline is a large overflow sink that can also be reached from the second entrance. Walking passage leads to a crawl and a 10m high skylight. The passage turns sharp right and drops down an awkward 4m climb. Another 4m climb follows after 30m and drops into a room. To the right passes an aven to reach a duck. Just beyond the stream enters from a low passage on the right and exits immediately down a tight hole on the left. Ahead a short muddy crawl opens into a larger boulder filled room, incompletely explored and draughting.

Technical Description
One 4m climb is awkward and requires bamboo

Dangers
Floods completely in wet weather

Outstanding Values
Fine example of immature, active passages with larger, semi-active overflows.

Thailand Caves Database — Site Code 33

Geology

Description
Fine example of immature, active lower passages and larger seasonal overflows. Largely phreatic in origin formed along small faults and strike of the bedding.

Rock Type	*Rock Age*
Limestone	Permian

Sediments
Mud deposited where water ponds, i.e. final chamber and dips in passages. Large breakdown in final room and entrance.

Speleothems
Very few; small common forms

Hydrology

Description
Perennial stream sink cave. Stream flows through immature passages with larger, flood overflows above. A lot of water sinks here in the rainy season. The rising is unknown, though Huai Wak resurgence (TK0023) is 10km to the West

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong		3	0.1

Further Data
date - April

Biology

Description
Not fully investigated. Stream based ecology with a few bats.

Identified Species
A few bats - Rhinolophus luctus?; small snake

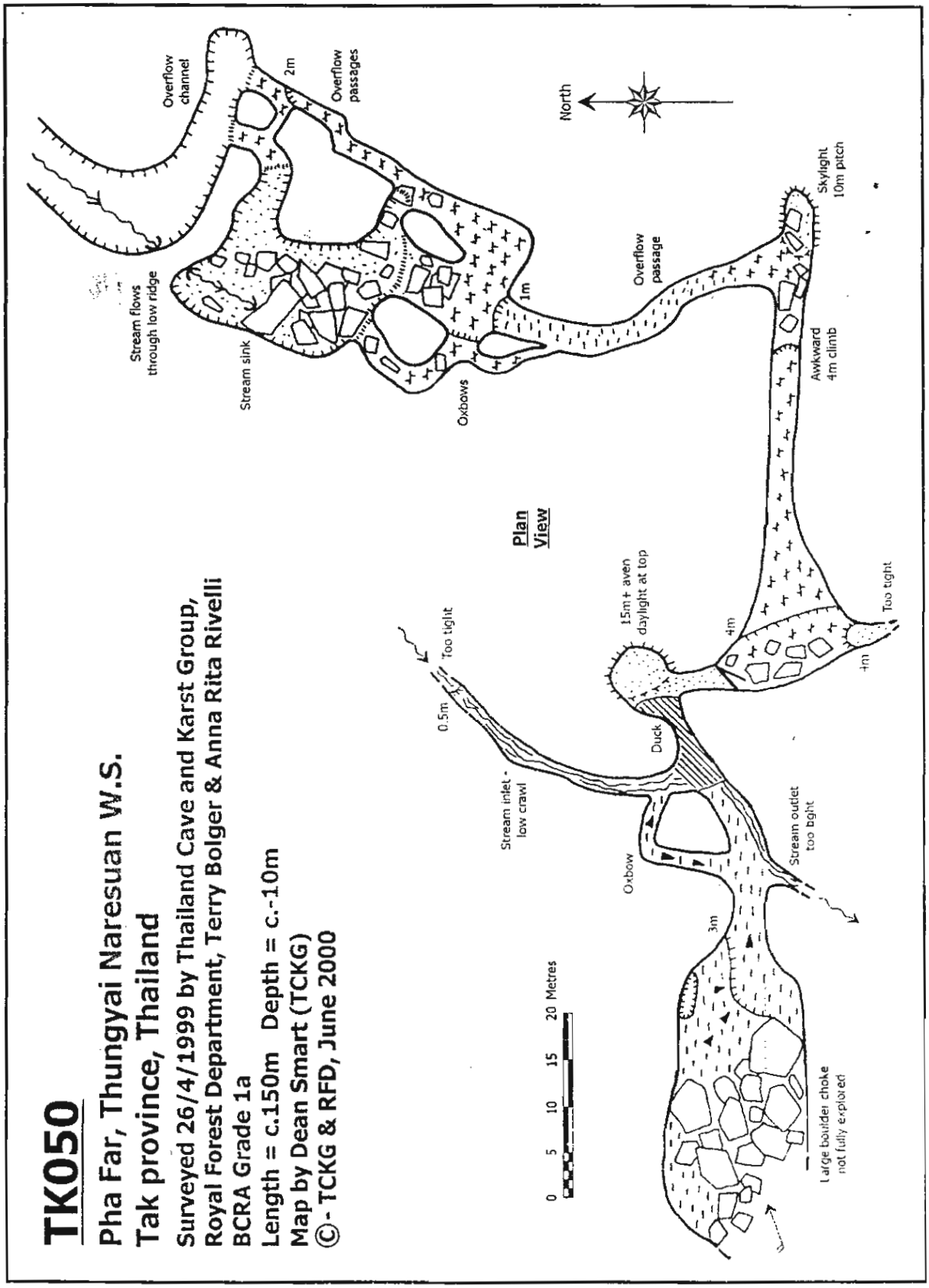
Food Supply Routes
Stream

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None


TK050
Pha Far, Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 26/4/1999 by Thailand Cave and Karst Group,
Royal Forest Department, Terry Bolger & Anna Rita Rivelli
BCRA Grade 1a
Length = c.150m Depth = c.-10m
Map by Dean Smart (TCKG)
©- TCKG & RFD, June 2000
Plan View
North
Overflow channel
Stream flows through low ridge
Stream sink
2m
Overflow passages
1m
Oxbows
Overflow passage
Skylight 10m pitch
Awkward 4m climb
Too tight
0.5m
Too tight
Stream inlet - low crawl
Duck
15m+ aven daylight at top
4m
4m
Oxbow
3m
Stream outlet too tight
Large boulder choke not fully explored
0 5 10 15 20 Metres

Thailand Caves Database — Site Code 34

English Names	*Thai Names*
TK051	**TK051**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	498400	1723677	15.591790	98.985076

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
900	25	9	C:\Cave Database\Maps\Tak\TK0051.tif

Access Description
Drive South along the track from Utakhi ranger station for c.5km. About 1km after the track has started descending the other side of the hill, walk to the West for 1km. Upon reaching the top of the ridge opposite drop down the steep hill into the stream valley on the other side. This cave is the sink for the stream in the valley and is found by following the stream down for 500m.

General Description
Entrance is a 4m climb down through boulders. The walking passage at the bottom descends to a sump.

Technical Description
None

Dangers
Raised CO2 levels at the end and floods completely in the rainy season

Outstanding Values
None

Geology

Description
Small overflow cave formed along fault and strike of bedding. Bedding dips 45 degrees to NE

Rock Type	*Rock Age*
Limestone	Permian

Sediments
Gravel and breakdown. Sand choke at end

Speleothems
Few, small common forms

Thailand Caves Database — Site Code 34

Hydrology

Description
Short cave acting as a flood sink and ending in a sump. Perennial stream sinks just up valley. Resurgence unknown, though Huai Wak resurgence (TK0023) is 10km to the West

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong		1.5	0.1

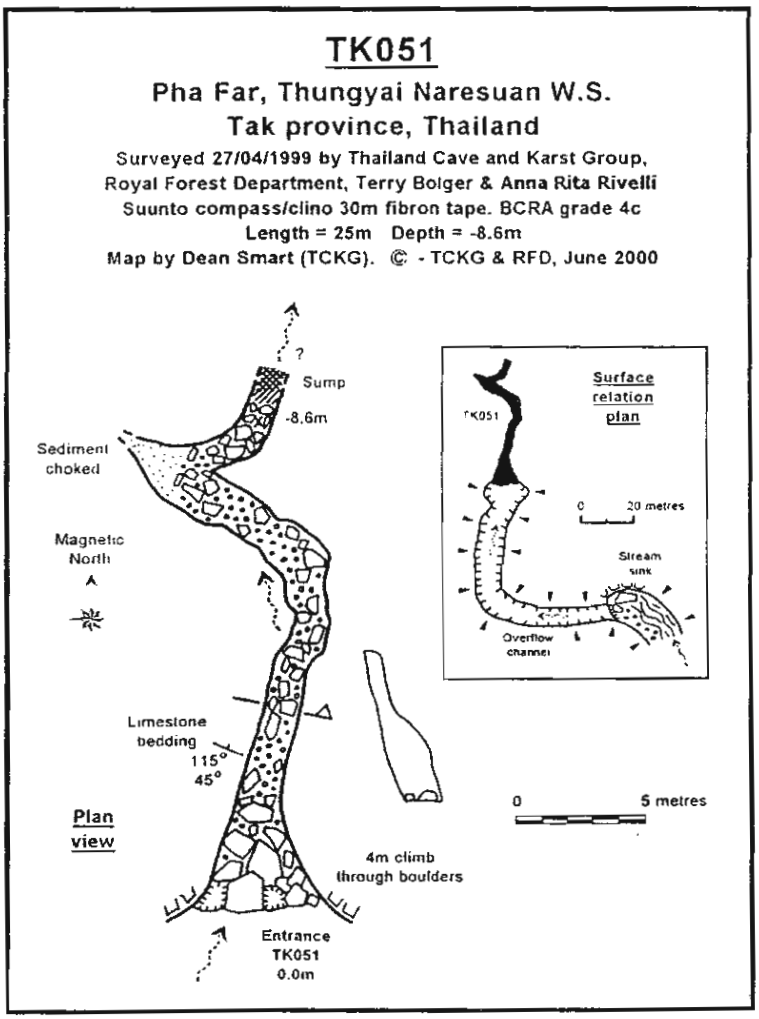
Further Data
date - April

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None



Thailand Caves Database — Site Code 35

English Names	*Thai Names*
TK052	**TK052**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	498400	1723677	15.591790	98.985076

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
920	50	0	C:\Cave Database\Maps\Tak\TK0052.tif

Access Description
Drive South along the track from Utakhi ranger station for c.5km. About 1km after the track has started descending the other side of the hill, walk to the West for 1km. Upon reaching the top of the ridge opposite drop down the steep hill into the stream valley on the other side. This cave is found in the cliff above the sink for the stream in the valley. Follow the stream down for 500m to find the sink.

General Description
A 5m climb up the cliff reaches this obvious entrance. Inside the cave follows the cliff line to the left and right. Several other side entrances are revealed and connected by a terrace outside. A passage at the left hand end ascends to a round room with bats. To the right is an undescended 15m hole in the floor.

Technical Description
Ropes needed for the hole.

Dangers
None

Outstanding Values
A complete cord-marked pot was found in a low side chamber.

Geology

Description
Ancient phreatic cave with high aven and deep shafts in the floor. Bare limestone shelf runs along cliff at entrance level

Rock Type	*Rock Age*
Limestone	Permian

Sediments
sandy soil with guano covers floor

Speleothems
Some large, old flowstone

Thailand Caves Database — Site Code 35

Biology

Description
Surface fauna. Serow use the cave and bats (unidentified) roost in a small side chamber

Identified Species
Serow; bat

Food Supply Routes
Near surface; guano

Archaeology

Description
Large dry cave near a permanent stream contains a single, small cord-marked pot (12cm rim diameter) in a dark alcove. Pot is unbroken

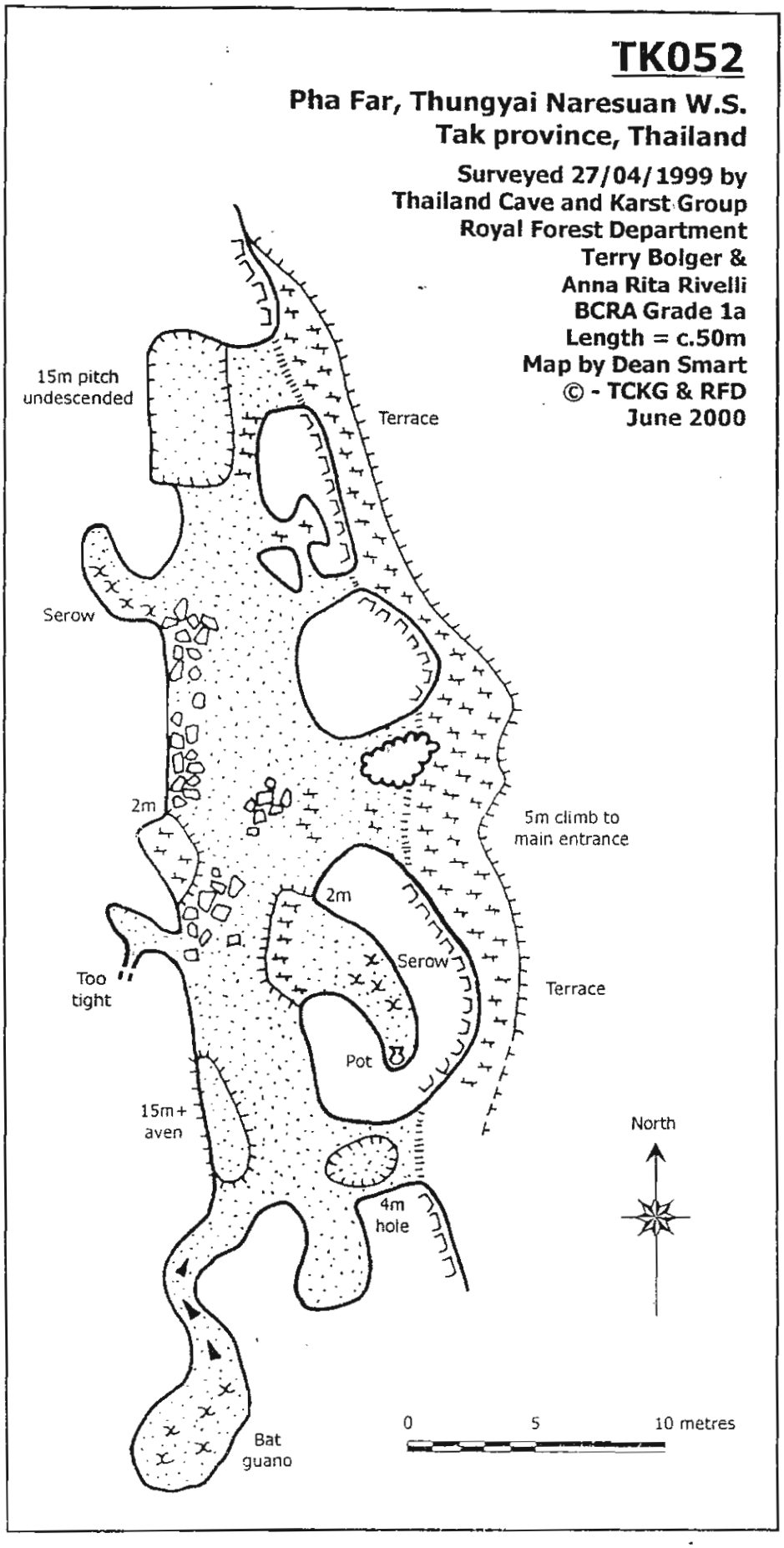
Artifacts
cord-marked pottery

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	Low	Royal Forest Department

Impacts
None


TK052
Pha Far, Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 27/04/1999 by
Thailand Cave and Karst Group
Royal Forest Department
Terry Bolger &
Anna Rita Rivelli
BCRA Grade 1a
Length = c.50m
Map by Dean Smart
© - TCKG & RFD
June 2000
15m pitch undescended
Terrace
Serow
2m
5m climb to main entrance
2m
Serow
Too tight
Terrace
Pot
15m+ aven
4m hole
North
Bat guano
0
5
10 metres

Thailand Caves Database — Site Code 36

English Names	*Thai Names*
Tham Me Hark, TK061	**ถ้ำแมะฮาก TK061**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	497338	1740238	15.741519	98.975151

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
990	10	0	C:\Cave Database\Maps\Tak\TK0061.tif

Access Description
2km along the track North of Ka Ngae Khi headquarters, there is an obvious limestone mountain on the left - Doi Rot Me. This cave is on the SW side of the mountain and difficult to get to due to undergrowth.

General Description
Very small cave, definitely not worth visiting. Small entrance leads to a small 'room' with another entrance to the right. A small passage loops back to 2m above the floor at the main entrance.

Technical Description
None

Dangers
Prickly & stinging plants, sharp limestone, death from exhaustion and disappointment

Outstanding Values
None

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

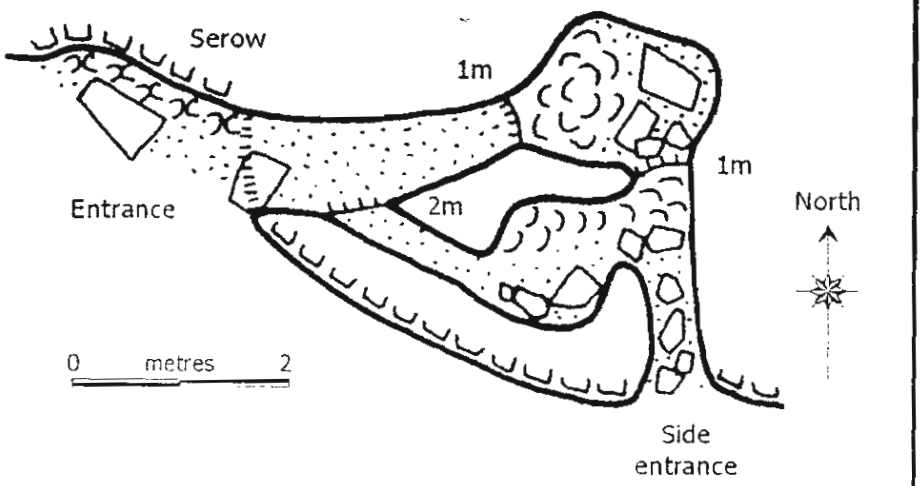
Classification	*Energy Rating*	*Manager*
3.1	Low	Royal Forest Department

Impacts
None

Tham Me Hark (TK061)

Ka Ngae Khi, Thungyai Naresuan W.S.
Tak province Thailand

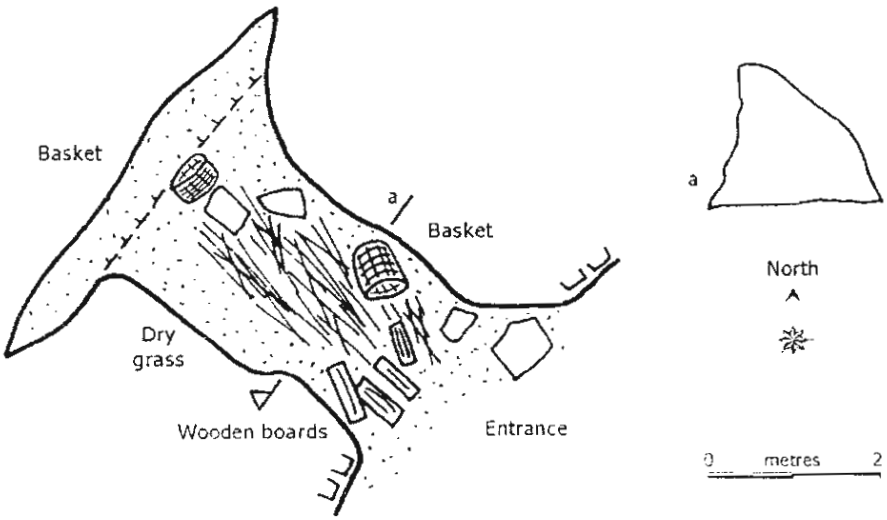
Surveyed 20/08/1999 TCKG & RFD
BCRA Grade 1a Length c.10m
Map by Dean Smart © - TCKG & RFD, 2000



Tham Phran (TK070)

Ka Ngae Khi, Thungyai Naresuan W.S.
Tak province, Thailand

Surveyed 02/09/1999 by TCKG & RFD
BCRA Grade 1a Length = 4m
Map by Dean Smart © - TCKG & RFD, June 2000



Thailand Caves Database — Site Code 38

English Names	*Thai Names*
Tham Phran, TK070	**ถ้ำพราน TK070**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	497550	1740450	15.743430	98.977127

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1000	4	0	C:\Cave Database\Maps\Tak\TK0070.tif

Access Description
2km along the track North of Ka Ngae Khi headquarters, there is an obvious limestone mountain on the left - Doi Rot Me. This cave is on the East side of the mountain and is an obvious entrance at the base of a cliff.

General Description
Tiny cave used by hunters as a shelter. The triangular entrance leads to a cross rift and no way on.

Technical Description
None

Dangers
None

Outstanding Values
None

Culture

Description
Small cave used by hunters for shelter.

Type of Use	*Time of Use*
Shelter	Recent, last 20 years

Artifacts
Bedding; Baskets

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

Thailand Caves Database — Site Code 37

English Names	*Thai Names*
TK062	**TK062**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	497162	1739945	15.738869	98.973510

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
950	144	14	C:\Cave Database\Maps\Tak\TK0062.tif

Access Description
From Ka Ngae Khi headquarters, an obvious footpath heads West and then North through old fields. Walk along this path for 45 minutes to where it drops down off a low ridge. This stream sink is located on the other side of the fields, near to Doi Rot Me.

General Description
Seasonal stream sink can be entered by climbing down boulders to a low crawl. This opens quickly to walking passage that turns right and closes down after 30m. The stream outlet is too small. Straight ahead at the right hand bend, an upper level series is entered. Two large breakdown rooms lead to a crawl becoming too low after 25m. At the entrance to the first room, a low crawl to the right descends a series of short steps to meet the seasonal stream again. Tight crawling follows to where the stream exits down a tiny hole. Straight ahead is very tight crawl to a small chamber and boulder choke.

Technical Description
Some tight crawls.

Dangers
Slightly elevated CO2 in the lower stream passage. Some boulders may be loose and bears use the cave. Floods to the roof in wet weather

Outstanding Values
Very interesting fauna with many, pale invertebrates.

Geology

Description
Formed in thinly bedded (0.2-2m) dipping limestone with inclined breakdown rooms floored with slabs. Passages are guided partly by joints cutting through the bedding and the strike and dip (to NE) of the bedding

Rock Type	*Rock Age*
Limestone	Triassic

Sediments
Large breakdown slabs in upper chambers with mud on floor. Streamway is floored with small gravel with lining sand banks

Speleothems
Good curtains on sloping rooves of chambers; small popcorn common; common forms

Thailand Caves Database — Site Code 37

Hydrology

Description
Seasonal stream sink draining old fields to south and west. Destination of water unknown

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong		0.5	0

Further Data
date - August

Biology

Description
Very interesting and varied fauna based on stream input. May have several troglobitic species. Requires more study. Bears and porcupines use the cave.

Identified Species
Bat - Rhinolophus sp (c.10); Scutigera; Huntsman spider; cricket; cockroach; porcupine; bear; long-legged, brown opilione

Unusual Species
Small, white isopod - T; tiny, white mite(?) - T; rat - n.sp.

Food Supply Routes
Stream; guano

Environment

Description
Stream sink cave in semi-forested/semi-grassland area. Seasonal stream sink with one entrance, no draught and high humidity

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
22	95			1.2	

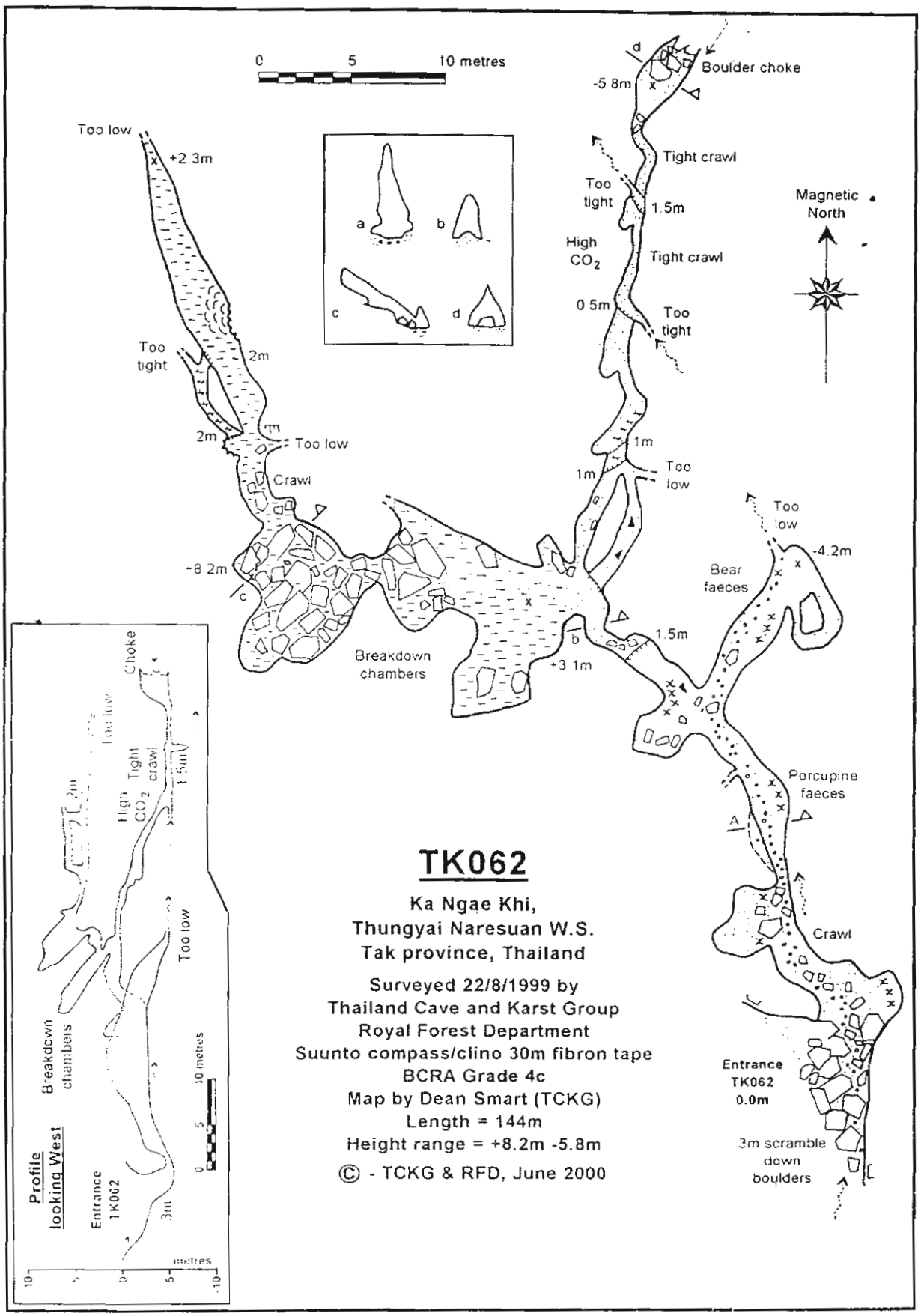
Further Data
date - August

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None


0 5 10 metres
Too low
+2.3m
Too tight
2m
2m
Too low
Crawl
-8.2m
Breakdown chambers
Boulder choke
-5.8m
Tight crawl
Too tight
1.5m
High CO_2
Tight crawl
0.5m
Too tight
1m
1m
Too low
Too low
-4.2m
Bear faeces
1.5m
+3.1m
Porcupine faeces
Crawl
Entrance TK062 0.0m
3m scramble down boulders
Magnetic North
a
b
c
d
Profile looking West
Choke
Too low
High CO_2
Tight crawl
1.5m
Too low
Breakdown chambers
Entrance TK062
3m
10 metres
metres
TK062
Ka Ngae Khi,
Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 22/8/1999 by
Thailand Cave and Karst Group
Royal Forest Department
Suunto compass/clino 30m fibron tape
BCRA Grade 4c
Map by Dean Smart (TCKG)
Length = 144m
Height range = +8.2m -5.8m
© - TCKG & RFD, June 2000

Thailand Caves Database — Site Code 39

English Names	*Thai Names*
TK071	**TK071**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	496860	1738987	15.730210	98.970687

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1030	12	0	C:\Cave Database\Maps\Tak\TK0071.tif

Access Description
Walk on the footpath heading West and then North from Ka Ngae Khi headquarters. After passing TK062, head across the fields to the base of the large ridge opposite. Walk SouthEast along the base until climbing up into a large hidden doline after 1km. This cave is found in the rocky area on top of the saddle at the far side of the large doline.

General Description
Tiny cave with a single passage ending at a small skylight.

Technical Description
None

Dangers
None

Outstanding Values
None

Geology

Description
Typical small boneyard cave, formed phreatically in the sub-soil zone. Many others in area.

Rock Type	*Rock Age*
Limestone	Permian

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

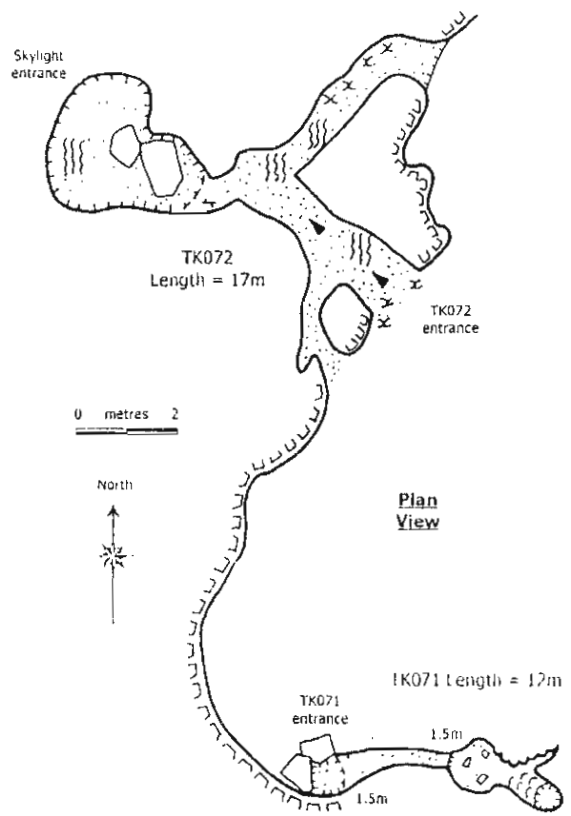
Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

TK071 & TK072

Ka Ngae Khi, Thungyai Naresuan W.S.
Tak province, Thailand

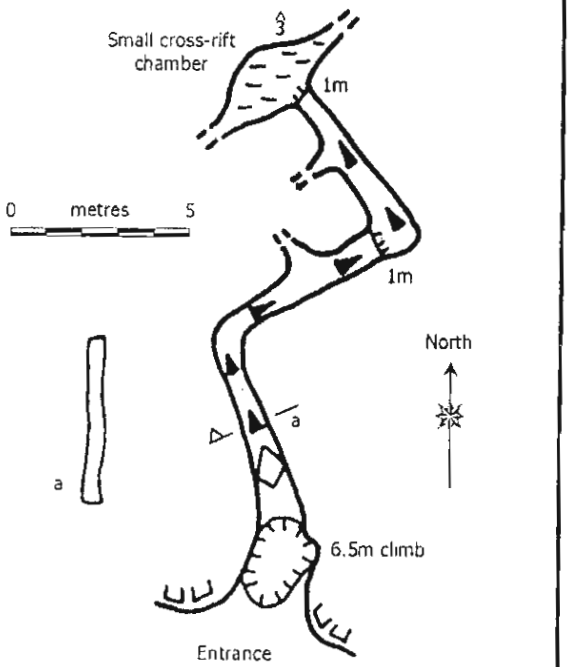
Surveyed 30/11/1999 by Thailand Cave and Karst Group
Royal Forest Department & Orpheus Caving Club
Suunto compass/clino, 30m tape BCRA Grade 4c
Total length = 29m
Map by Dean Smart © - TCKG, RFD & OCC, June 2000



Tham Takharp (TK073)

Ka Ngae Khi, Thungyai Naresuan W.S.
Tak province, Thailand

Surveyed 30/11/1999 by Thailand Cave and Karst Group
Royal Forest Department & Orpheus Caving Club
BCRA Grade 1a Length c.30m Depth c.-22m
Map by Dean Smart © - TCKG, RFD & OCC, June 2000



Thailand Caves Database — Site Code 40

English Names	*Thai Names*
TK072	**TK072**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	496860	1738987	15.730210	98.970687

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1030	17	0	C:\Cave Database\Maps\Tak\TK0071.tif

Access Description
Walk on the footpath heading West and then North from Ka Ngae Khi headquarters. After passing TK062, head across the fields to the base of the large ridge opposite. Walk SouthEast along the base until climbing up into a large hidden doline after 1km. This cave is found in the rocky area on top of the saddle at the far side of the large doline.

General Description
Small cave with two entrances joining just inside and leading to a large skylight.

Technical Description
None

Dangers
None

Outstanding Values
None

Geology

Description
Typical small boneyard cave, formed phreatically in the sub-soil zone. Many others in area.

Rock Type	*Rock Age*
Limestone	Permian

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

Thailand Caves Database — Site Code 41

English Names	*Thai Names*
Tham Takharp, TK073	**ถ้ำตะขาบ TK073**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	496860	1738987	15.730210	98.970687

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1030	30	22	C:\Cave Database\Maps\Tak\TK0073.tif

Access Description
Walk on the footpath heading West and then North from Ka Ngae Khi headquarters. After passing TK062, head across the fields to the base of the large ridge opposite. Walk SouthEast along the base until climbing up into a large hidden doline after 1km. This cave is found just below the top of the rocky saddle at the far side of the large doline.

General Description
A narrow rift at the bottom of the 6.5m entrance climb bends right and then left before dropping into a small cross-rift room. No way on.

Technical Description
Entrance climb is slightly awkward.

Dangers
None

Outstanding Values
None

Geology

Description
Typical small boneyard cave, formed phreatically in the sub-soil zone. Many others in area.

Rock Type	*Rock Age*
Limestone	Permian

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	Low	Royal Forest Department

Impacts
None

Thailand Caves Database — Site Code 42

English Names	*Thai Names*
TK074	**TK074**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	?	?		

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
?	21	14	C:\Cave Database\Maps\Tak\TK0074.tif

Access Description
Located in the prominent limestone ridge 2km West of the headquarters. Hard to find and no co-ordinates available.

General Description
Small cave with two entrances. Climbing down two 1.5m steps enters a small room with an 8m deep hole to an overtight passage.

Technical Description
The 8m climb can be descended without equipment

Dangers
None

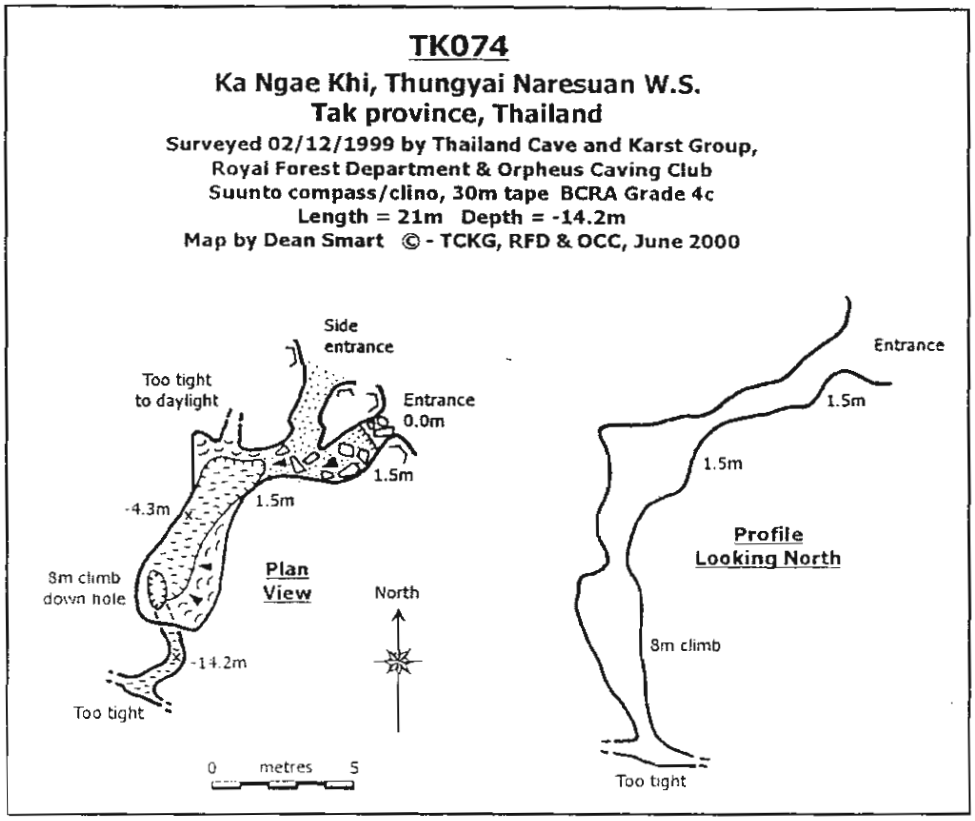
Outstanding Values
None

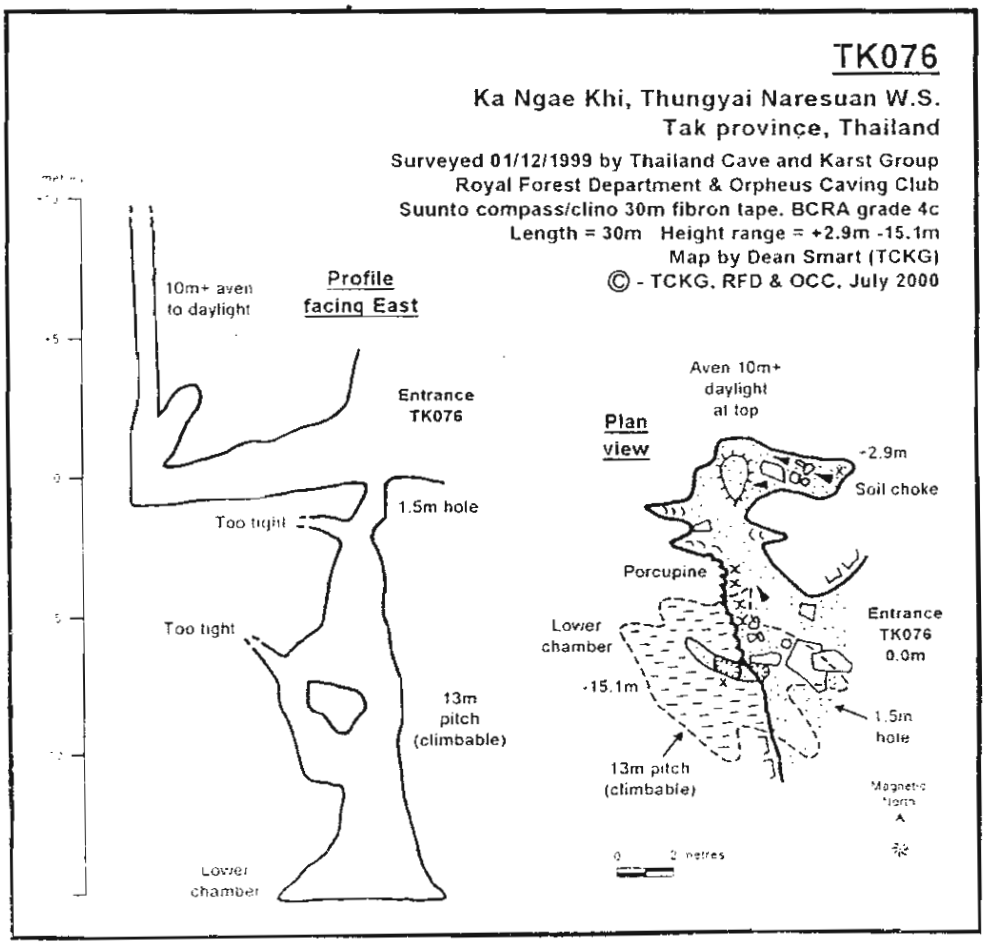
Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None


TK074
Ka Ngae Khi, Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 02/12/1999 by Thailand Cave and Karst Group,
Royal Forest Department & Orpheus Caving Club
Suunto compass/clino, 30m tape BCRA Grade 4c
Length = 21m Depth = -14.2m
Map by Dean Smart © - TCKG, RFD & OCC, June 2000
Side entrance
Too tight to daylight
Entrance 0.0m
1.5m
1.5m
-4.3m
8m climb down hole
Plan View
North
-14.2m
Too tight
0 metres 5
Entrance
1.5m
1.5m
Profile Looking North
8m climb
Too tight


TK076
Ka Ngae Khi, Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 01/12/1999 by Thailand Cave and Karst Group
Royal Forest Department & Orpheus Caving Club
Suunto compass/clino 30m fibron tape. BCRA grade 4c
Length = 30m Height range = +2.9m -15.1m
Map by Dean Smart (TCKG)
© - TCKG, RFD & OCC, July 2000
10m+ aven to daylight
Profile facing East
Entrance TK076
1.5m hole
Too tight
Too tight
13m pitch (climbable)
Lower chamber
Aven 10m+ daylight at top
Plan view
+2.9m
Soil choke
Porcupine
Lower chamber
-15.1m
Entrance TK076 0.0m
1.5m hole
13m pitch (climbable)
0 2 metres

Thailand Caves Database — Site Code 46

English Names	*Thai Names*
TK076	**TK076**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	497016	1739323	15.733240	98.972152

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
990	30	18	C:\Cave Database\Maps\Tak\TK0076.tif

Access Description
Walk on the footpath heading West and then North from Ka Ngae Khi headquarters. After passing TK062, head across the fields to the base of the large ridge opposite. Walk SouthEast along the base until this obvious entrance is reached after 500m at the base of a cliff.

General Description
The large entrance leads in, turns right and finishes at a soil choke. A 10m high aven has daylight at the top. At the entrance, a small hole to one side opens into a free-climbable 13m pitch. The chamber at the bottom is choked with mud. Formed in Permian limestone.

Technical Description
13m climb requires care

Dangers
None

Outstanding Values
None

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

Thailand Caves Database — Site Code 43

English Names	*Thai Names*
TK077	**TK077**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	?	?		

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
?	17	3	C:\Cave Database\Maps\Tak\TK0077.tif

Access Description
In the limestone ridge 2km West of the HQ. Hard to find and no co-ordinates available.

General Description
Tiny cave climbing up to a flowstone choke.

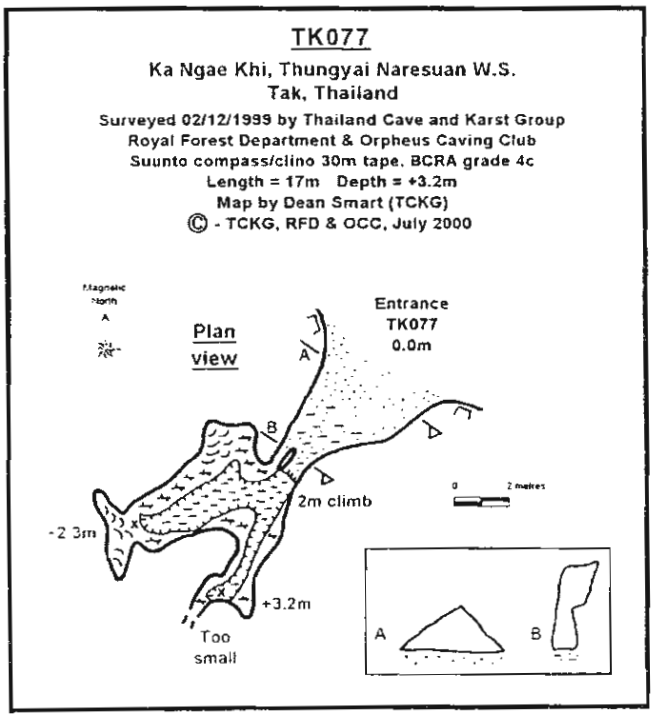
Technical Description	*Dangers*	*Outstanding Values*
None	None	None

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None



Thailand Caves Database — Site Code 44

English Names

Yu Nai Sinks, TK204

Thai Names

ที่น้ำมุดยูไน TK204

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	492500	1735700		

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
660	0	0	n/a

Access Description
Walk downvalley from Yu Nai ranger station for 1 hour to TK005. From here head NW for 1km to an obvious valley where the sinks are located.

General Description
A series of 7 spectacular, seasonal stream sinks in dolines 20m deep formed in a valley floor at the contact of Permian limestone and sedimentary rocks. Most are choked at surface, one has a small cave that is choked after 30m. Not labelled.

Technical Description
None

Dangers
The dolines would flood rapidly in heavy rain.

Outstanding Values
None

Hydrology

Description
Series of 7 seasonal, choked stream sinks in a valley NW of TK005. Their resurgence(s) are unknown. Catchment area is for all 7 sinks combined and comprises the non-carbonate hills to east.

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong		1	0

Further Data
date - December

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

Thailand Caves Database — Site Code 45

English Names

Huai Bi Sink, TK200

Thai Names

ที่น้ำมุดห้วยปี้ TK200

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	490989	1721129		

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
940	0	0	n/a

Access Description
Walk down the Huai Bi valley from Thung Nar Noi ranger station for nearly 1 day. The footpath passes right past a series of large dolines in tufa and mud where the stream sinks.

General Description
Series of small to medium dolines in soil and tufa. The Huai Bi sinks here to rise again 1km further downvalley. Not labelled.

Technical Description
None

Dangers
Whole valley floor may become flooded very quickly.

Outstanding Values
Example of underground stream flowing through Quaternary tufa

Geology

Description
Valley is floored with extensive tufa. Stream sinks into this in dry season and flows underground for c.1km.

Rock Type	*Rock Age*
Tufa	Quaternary

Speleothems
Most of the valley floor is made of tufa deposits

Hydrology

Description
During the dry season, the Huai Bi sinks into the valley floor and resurges again c.1km to the N. Floods overpower the sink and flow on the surface

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong	Huai Bi (Huai Lathaboeng)	175	0.25

Further Data
date - November

Thailand Caves Database — Site Code 45

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

Thailand Caves Database — Site Code 47

English Names	*Thai Names*
TK078	**TK078**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	496900	1738800	15.728509	98.971061

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1010	104	12	C:\Cave Database\Maps\Tak\TK0078.tif

Access Description
Walk on the footpath heading West and then North from Ka Ngae Khi headquarters. After passing TK062, head across the fields to the base of the large ridge opposite. Walk SouthEast along the base until climbing up into a large hidden doline after 1km. This cave is found in the bottom of the doline. The entrance is in the base of a cliff above a bouldery area.

General Description
Big entrance behind boulders leads down a flowstone slope to a chamber and rift to the lower stream passage. A crawl to either left or right meet at another chamber with a steeply sloping flowstone floor. The rift descend steepply to a 2m climb and the stream. The inlt is too tight. The outlet starts as walking size, but soon requires a scramble up boulders. A climb down the other side regains the stream and some tight squeezes, eventually becoming too tight.

Technical Description
None

Dangers
None

Outstanding Values
Very large speleothems with some straws and helictites

Geology

Description
Massive speleothems mask the geology in the entrance chamber. Lower stream level is formed by gaps between massive boulders at the base of the entrance cliffline

Rock Type	*Rock Age*
Limestone	Permian

Sediments
Muddy in lower streamway with sandy soil and large breakdown in the entrance chamber

Speleothems
Massive columns and flowstone. Reasonable helictites and straws in entrance chamber and curtains on sloping roof

Thailand Caves Database — Site Code 47

Hydrology

Description
Very small stream flows through lower part of the cave. Origin and destination unknown though water is heard in boulders 50m NW of cave.

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong			0

Further Data
date - December

Biology

Description
Varied invertebrate fauna, all surface forms. A few bats and porcupines. No aquatic fauna was noted. Near surface ecosystem.

Identified Species
Opilione - 3+ sp; cricket; Scutigera; Huntsman spider; Glyphylus; pond skaters; bat - Rhinolophus sp; porcupine; gecko

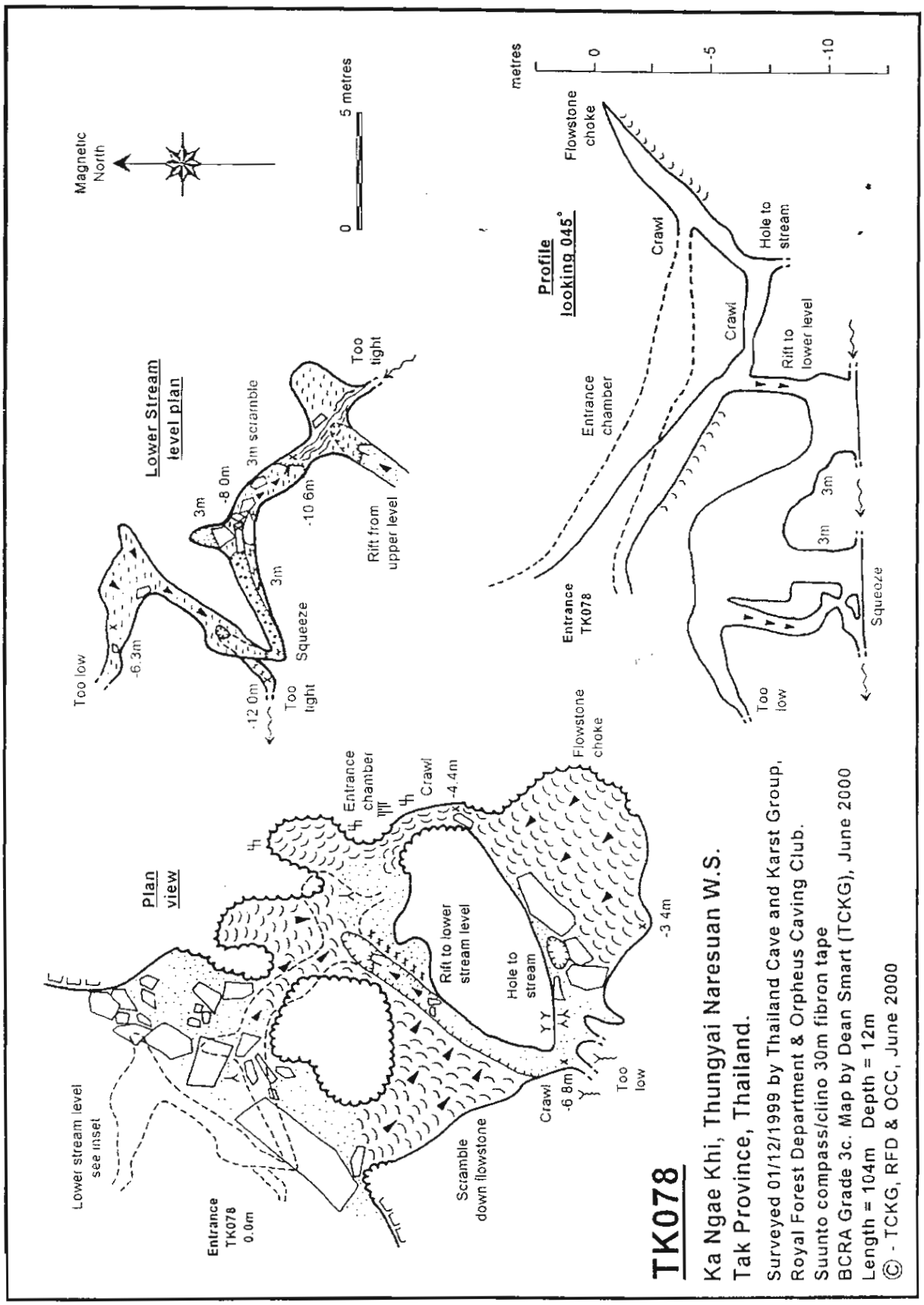
Food Supply Routes
Near surface; guano; stream; roots

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None


Plan view
Lower stream level see inset
Entrance TK078 0.0m
Scramble down flowstone
Crawl -6.8m
Too low
-3.4m
Rift to lower stream level
Hole to stream
Entrance chamber
Crawl -4.4m
Flowstone choke
Lower Stream level plan
Too low
-6.3m
-12.0m
Too tight
Squeeze
3m
3m scramble
-8.0m
-10.6m
Too tight
Rift from upper level
Magnetic North
0
5 metres
Profile looking 045°
metres
0
-5
-10
Entrance chamber
Entrance TK078
Too low
3m
3m
Squeeze
Rift to lower level
Crawl
Crawl
Hole to stream
Flowstone choke
TK078
Ka Ngae Khi, Thungyai Naresuan W.S.
Tak Province, Thailand.
Surveyed 01/12/1999 by Thailand Cave and Karst Group,
Royal Forest Department & Orpheus Caving Club.
Suunto compass/clino 30m fibron tape
BCRA Grade 3c. Map by Dean Smart (TCKG), June 2000
Length = 104m Depth = 12m
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Thailand Caves Database — Site Code 48

English Names	*Thai Names*
TK079	**TK079**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	491485	1733600	15.681489	98.920539

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
920	114	6	C:\Cave Database\Maps\Tak\TK0079.tif

Access Description
2 hours walk from Yu Nai ranger station. Follow the good footpath down the valley past the sink of TK005. The path climbs up a ridge and drops down the other side. Cross through grass fields and follow the obvious stream gulley down to a small lake. The 3 entrances to this cave are found 100m-150m beyond the huge entrance of TK082.

General Description
The 'main' entrance leads to a 2m climb down into swamp water and low airspace. The swamp entrance reaches low airspace almost immediately. The Elephant entrance is a large chamber with some smaller passages off at the back. To the left is a walking passage descending to a pool. A climb up and over flowstone reaches two small entrances and swamp water with low airspace. A voice connection links the low airspaces in each cave.

Technical Description
None

Dangers
None

Outstanding Values
Possible habitation site owing to location and large chamber. Interesting sediments. Elephants use the cave.

Geology

Description
3 small interconnected caves of ancient phreatic origin modified through notching by marsh water. Interesting sediments

Rock Type	*Rock Age*
Limestone	Triassic

Sediments
Floor is covered by mud deposited by rising marsh water. Stuck to the walls at back of main chamber are poorly sorted, rounded to sub-rounded cobbles (20cm diameter) to small gravel in red clay matrix. No fabric. Provenance unknown, maybe 3km to NE

Speleothems
Few common forms; large flowstones

Thailand Caves Database — Site Code 48

Palaeontology

Description
A few animal remains - small antler, teeth of small cat and bamboo rat. Most likely modern

Species Found
Small deer; small cat; bamboo rat

Archaeology

Description
Ideal habitation site near permanent water. One small pottery sherd found. Animal remains are probably natural. Seasonal flooding may have buried most artifacts under mud.

Artifacts
cord-marked pottery; animal remains

Environment

Description
Series of 3 small caves partly filled with marsh water (low pH). High humidity due to proximity of marsh

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
20	93	18	6.7		

Further Data
date - December

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

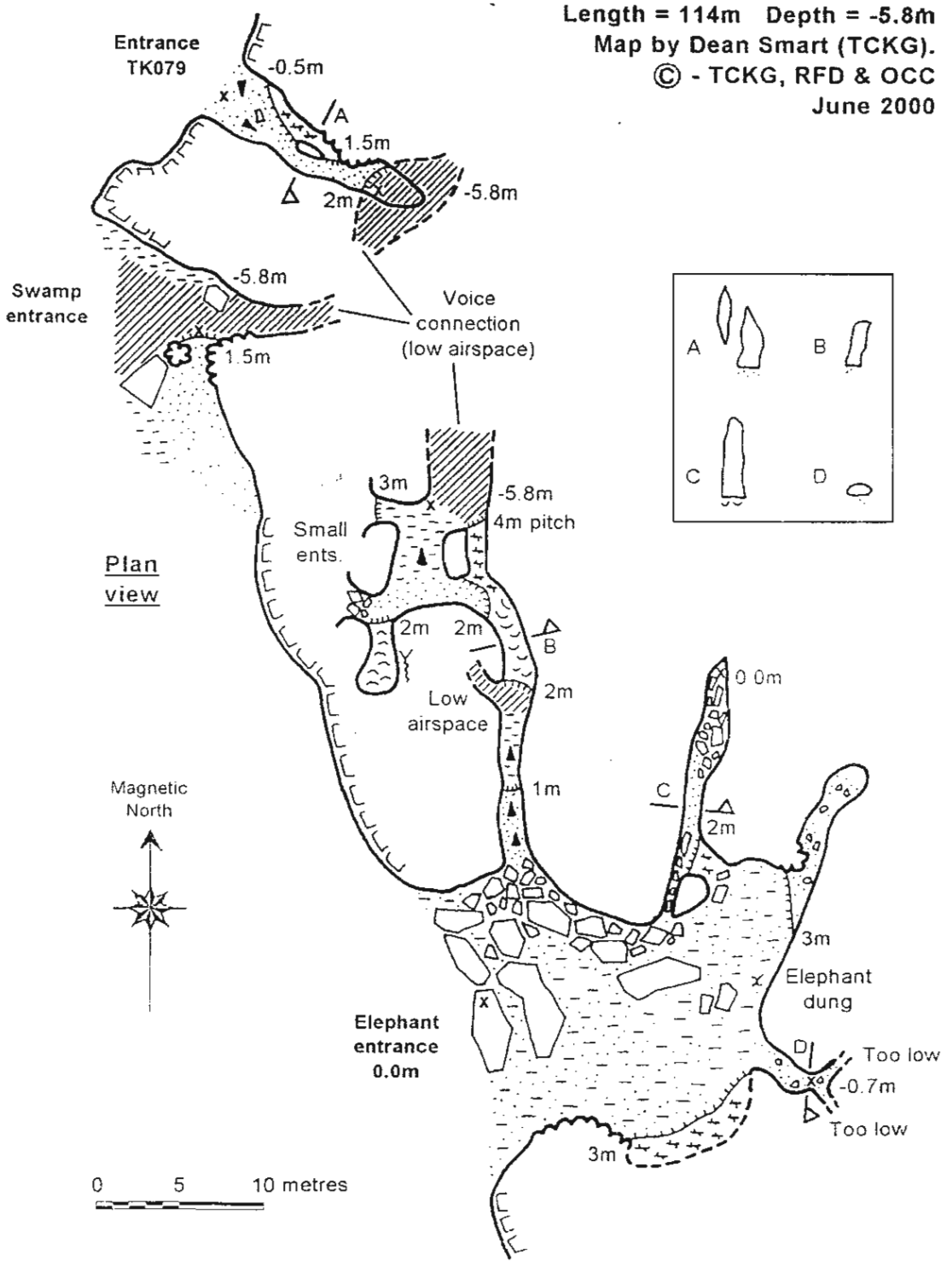
Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

TK079

Yu Nai, Thungyai Naresuan W.S.
Tak province, Thailand

Surveyed 05/12/1999 by Thailand Cave and Karst Group, Royal Forest Department & Orpheus Caving Club
Suunto compass/clino 30m fibron tape
BCRA Grade 4c
Length = 114m Depth = -5.8m
Map by Dean Smart (TCKG).
© - TCKG, RFD & OCC
June 2000



Thailand Caves Database — Site Code 49

English Names	*Thai Names*
TK203	**TK203**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4839 IV	47P	504716	1702900		

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1070	0	0	n/a

Access Description
Best found by walking to TK049 sink, going through that cave and onto the sinks 500m beyond. To reach TK049, walk on good footpath for 30 minutes to SW from Huai Nam Khieo ranger station. Upon reaching TK012, turn right and walk North for a further 30 minutes. Follow the obvious stream gulley down to the TK049 entrance. Go through the cave, emerge at the resurgence (TK028) and follow the stream gulley to the sink.

General Description
Seasonal stream sink in a series of dolines formed at a low point in a very broad doline floored with Permian limestone. All dolines are choked. Not labelled.

Technical Description
A ladder is needed to descend some of the dolines.

Dangers
Floods rapidly in very wet weather.

Outstanding Values
None

Hydrology

Description
Downstream of TK049, the seasonal stream flowing through that cave sinks into a series of choked dolines. The rising is unknown

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong		5	0

Further Data
date - April

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

Thailand Caves Database — Site Code 50

English Names	*Thai Names*
TK201	**TK201**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4839 IV	47P	505906	1701540		

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
1055	0	0	n/a

Access Description
Best approached via TK012 and TK043. Walk on good footpath for 30 minutes to SW from Huai Nam Khieo ranger station. Find and enter the TK012 entrance located on NW side of the obvious tower after crossing a stream. Walk through that cave and exit via the TK013 entrance on the West side of the hill. Walk a further 30 minutes to the South around the large tower to TK043. Continue beyond for about 500m, find a small stream and follow it down to the sink area.

General Description
The lowest point (marked 1055m) in the very broad Huai Nam Khieo doline is a large. flat boggy area where a perennial stream sinks into the Permian limestone floor. Not labelled.

Technical Description
None

Dangers
None

Outstanding Values
None

Hydrology

Description
The lowest point in the Huai Nam Khieo doline takes a small stream flowing from the hill containing TK012. It sinks into a flat, boggy area. Rising unknown

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong		3	0.1

Further Data
date - February

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

Thailand Caves Database — Site Code 51

English Names	*Thai Names*
TK202	**TK202**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	499750	1720800		

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
930	0	0	n/a

Access Description
Stop at the 2nd bridge along the track after Utakhi ranger station (a distance of c.7km). Walk Westwards towards the huge limestone cliff (Pha Fa). After 1km of elephant paths through grassland and old fields, a perennial stream is met. Follow this downstream to the sink.

General Description
A perennial stream sink that is choked. Just beyond, the stream is seen again in the floor of another doline, but cannot be followed. There are other dolines in the valley to the South - all choked. Two other seasonal stream sinks, one to the North, the other to the East are both choked. Formed at the contact of shale/sandstone and Permian limestone. Not labelled.

Technical Description
None

Dangers
None

Outstanding Values
None

Hydrology

Description
Series of 3 stream sinks at Pha Fa. One is perennial, two are seasonal. The resurgence(s) are unknown. Catchment area size is for all 3 sinks combined.

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong		7	0.1

Further Data
date - April

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None

Thailand Caves Database — Site Code 52

English Names	*Thai Names*
TK081	**TK081**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	491889	1733324	15.678990	98.924308

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
940	26	12	C:\Cave Database\Maps\Tak\TK0081.tif

Access Description
2 hours walk from Yu Nai ranger station. Follow the good footpath down the valley past the sink of TK005. The path climbs up a ridge and drops down the other side. Just after passing through an area of large pinnacles, climb up the ridge to the left and walk down into the small valley running parallel to the large valley with the footpath. This obvious rift entrance is in the floor of the valley.

General Description
Basically a single, straight rift passage descending to end in a sediment choke at the bottom. Too tight to follow at roof level.

Technical Description
None

Dangers
None

Outstanding Values
None

Geology

Description
Narrow, high rift guided by a fault. Bedding dips 10 degrees to east

Rock Type	*Rock Age*
Limestone	Triassic

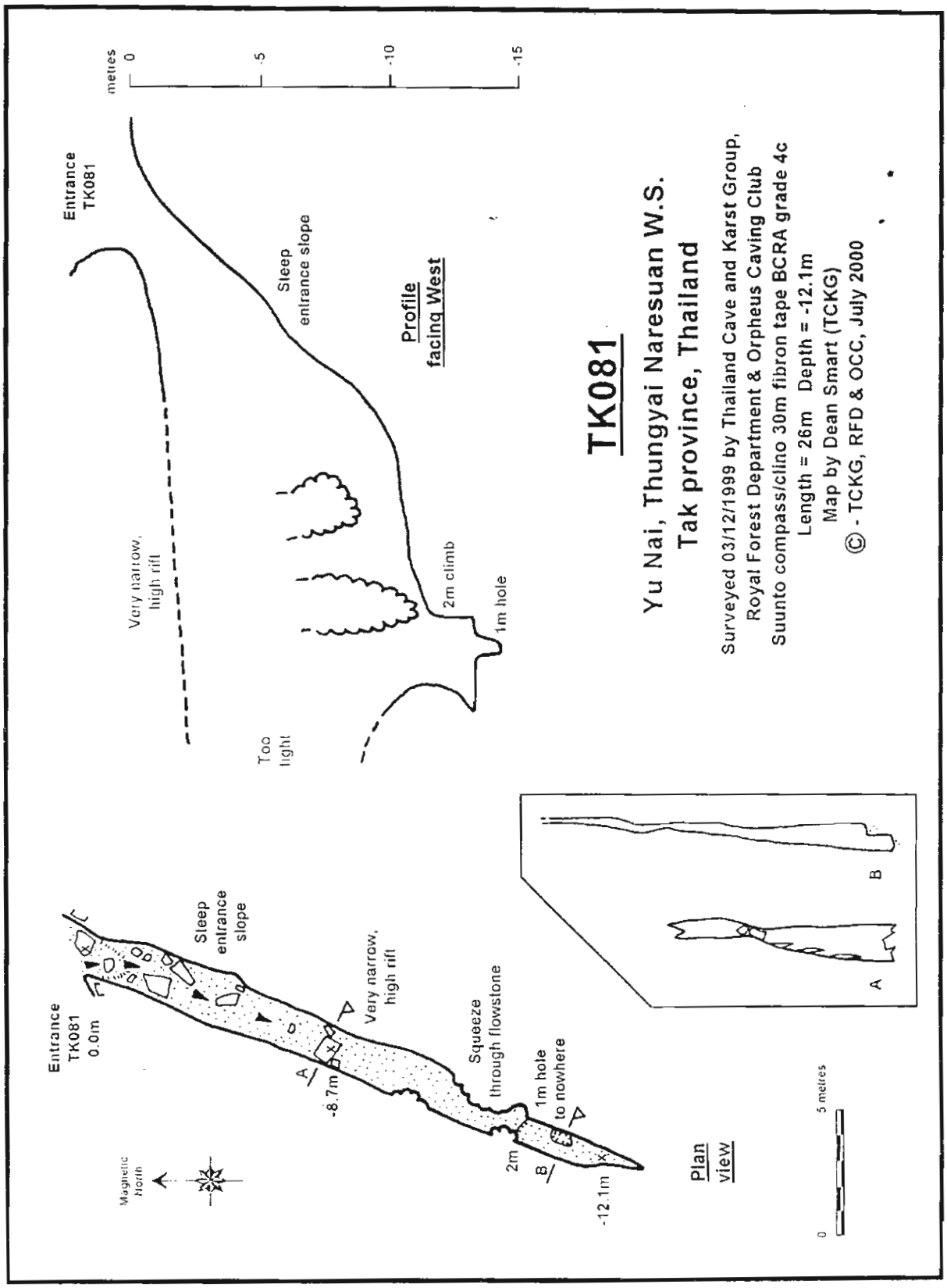
Sediments
Inwashed soil at entrance with choke of reddish clay at bottom

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	Low	Royal Forest Department

Impacts
None


TK081
Yu Nai, Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 03/12/1999 by Thailand Cave and Karst Group,
Royal Forest Department & Orpheus Caving Club
Suunto compass/clino 30m fibron tape BCRA grade 4c
Length = 26m Depth = -12.1m
Map by Dean Smart (TCKG)
© - TCKG, RFD & OCC, July 2000
Profile facing West
metres
0
-5
-10
-15
Entrance TK081
Steep entrance slope
Very narrow, high rift
Too tight
2m climb
1m hole
Plan view
Entrance TK081 0.0m
Steep entrance slope
Very narrow, high rift
-8.7m
Squeeze through flowstone
1m hole to nowhere
2m
-12.1m
Magnetic North
A
B
5 metres
0

Thailand Caves Database — Site Code 53

English Names	*Thai Names*
TK082	**TK082**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	491484	1733498	15.680569	98.920532

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
920	163	3	C:\Cave Database\Maps\Tak\TK0082.tif

Access Description
2 hours walk from Yu Nai ranger station. Follow the good footpath down the valley past the sink of TK005. The path climbs up a ridge and drops down the other side. Eventually a stream gulley is reached with grass fields. Follow the stream gulley down to a small lake and this massive entrance.

General Description
Very large entrance reduces in height to a meandering walking sized passage. An oxbow is passed at roof level on the right and a keyhole passage leads to a shard left hand bend. Walking continues for another 20m and the roof lowers. Hands and knees crawling over mud gets progressively lower until it becomes impossible to go further.

Technical Description
None

Dangers
Floods quickly in wet weather

Outstanding Values
Nice passage geomorphology

Geology

Description
Complex history. Originally phreatic with a vadose phase creating keyholes. Much sediment and a half-tube suggests some paragenesis. Marsh water has enlarged the entrance through notching. 2 intersecting faults guide the cave, SE then NE.

Rock Type	*Rock Age*
Limestone	Triassic

Sediments
Gravel floored stream channel with low sandy bank becomes increasingly muddy into the cave. End in mud choke. Sand in upper levels

Speleothems
Few, small common forms

Further Data
Bedding dips 10 degrees to east. Good vadose morphologies in cave

Thailand Caves Database — Site Code 53

Hydrology

Description
Large seasonal stream sink, resurgence unknown

River System	*Stream Name*	*Catchment Area, km2*	*Flow, Cumec*
Mae Khlong		1	0

Further Data
date - December

Biology

Description
A few bats provide guano, though ecology is mostly stream based.

Identified Species
bat - Megaderma lyra (c.15); cricket; Opilione

Food Supply Routes
Stream; guano

Environment

Description
Seasonal stream sink located near to a marshy area with subsequently high humidity

Air Temp C	*Humidity %*	*Water Temp C*	*Water pH*	*CO2 High %*	*O2 Low %*
20	95				

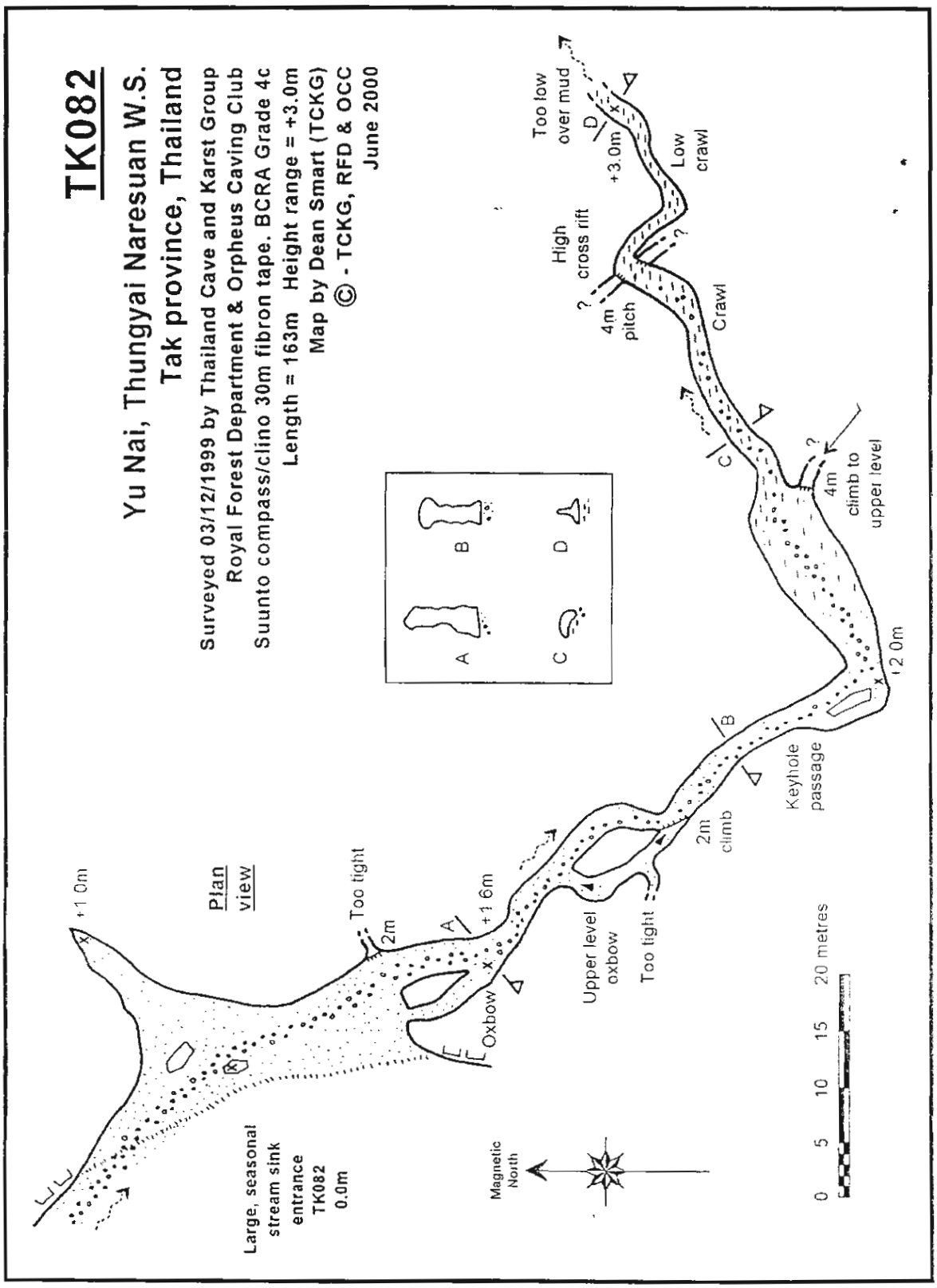
Further Data
date - December

Management

Description
Remote, within a wildlife sanctuary and protected. Very unlikely to be developed.

Classification	*Energy Rating*	*Manager*
3.1	High	Royal Forest Department

Impacts
None


TK082
Yu Nai, Thungyai Naresuan W.S.
Tak province, Thailand
Surveyed 03/12/1999 by Thailand Cave and Karst Group
Royal Forest Department & Orpheus Caving Club
Suunto compass/clino 30m fibron tape. BCRA Grade 4c
Length = 163m Height range = +3.0m
Map by Dean Smart (TCKG)
© - TCKG, RFD & OCC
June 2000
Plan view
Large, seasonal stream sink entrance TK082 0.0m
+1.0m
Too tight
2m
A
+1.6m
Oxbow
Upper level oxbow
Too tight
2m climb
B
Keyhole passage
4m climb to upper level
+2.0m
C
Crawl
High cross rift
4m pitch
+3.0m
D
Too low over mud
Low crawl
A
B
C
D
Magnetic North
0 5 10 15 20 metres

Thailand Caves Database — Site Code 176

English Names	*Thai Names*
'Hohlen'	**'โหเล็น'**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	492746	1734259		

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
960	15	15	n/a

Access Description
Next to the path from Yu Nai to Nong Ma Ngu lake, c.2 hrs walk from the station.

General Description
Undescended 15m deep shaft, 3m in diameter

Technical Description
Ropes or ladders required to descend. Belay to trees or boulders

Dangers
Vertical aspect requires care

Thailand Caves Database — Site Code 177

English Names	*Thai Names*
Nong Ma Ngu Sink	**ที่น้ำมุดหนองมางู**

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	491901	1733302		

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
910	10	0	n/a

Access Description
On the east side of Nong Ma Ngu marsh at the base of a small cliff. 3 hours walk to the west of Yu Nai ranger station

General Description
Small stream sink taking a trickle of water from the marsh. Sumps after 10m. Rising unknown and not surveyed.

Technical Description
None

Dangers
Floods completely in wet weather

Thailand Caves Database — Site Code 178

English Names

Overflow Sink - Yu Nai

Thai Names

ที่น้ำมุดแห้งยูไน

Location

Province	*District*	*Protected Area*	*Zone*
Tak	Umphang	WS Thungyai Naresuan East	North

Mapsheet	*UTM Zone*	*Eastings*	*Northings*	*Latitude*	*Longitude*
4740 II	47P	493576	1734527		

Elevation, m	*Length, m*	*Depth, m*	*Survey File*
910	0	0	n/a

Access Description
Walk 1 hour west of Yu Nai ranger station to the perennial sink of TK005. Continue along seasonal overflow channel above for 500m and this overflow sink is at the base of a small cliff where the channel ends

General Description
Flood overflow sink for Tham Nam Mut Yu Nai. Completely choked with bamboo and logs. No draught. There may be other overflow sinks in the area. The rising is unknown

Technical Description
None

Dangers
Floods severely

Outstanding Values
None