ฟันสัตว์เลี้ยงลูกด้วยนมสมัยไพลสโตซีนตอนปลาย จากแหล่งเพิงผาถ้ำลอด อำเภอปางมะผ้า จังหวัดแม่ฮ่องสอน

นายสว่างพงษ์ วัฒนะพิทักษ์สกุล

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LATE PLEISTOCENE MAMMAL TEETH FROM THE THAM LOD ROCKSHELTER, AMPHOE PANG MAPHA, CHANGWAT MAE HONG SON

Mr.Sawangpong Wattanapituksakul

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ฟันสัตว์เลี้ยงลูกด้วยนมเป็นหลักฐานที่พบเป็นจำนวนมากในแหล่งโบราณคดีสมัยไพลสโตซีนตอนปลาย เป็นข้อมูลที่สำคัญในการจำแนกชนิดของสัตว์เลี้ยงลูกด้วยนม ซึ่งถิ่นที่อยู่อาศัยของสัตว์แต่ละชนิดเป็นส่วนสำคัญที่ใช้บ่งชี้ถึงสภาพแวดล้อมในอดีต ในยุคไพลสโตซีนตอนปลายหลายพื้นที่ของโลกรวมถึงบริเวณตอนในของภูมิภาคเอเชียตะวันออกเฉียงใต้ ดังเช่นแหล่งโบราณคดีเพิงผาถ้ำลอด ได้รับอิทธิพลต่อการเปลี่ยนแปลงจากยุคน้ำแข็งมาสู่โฮโลซีนที่อบอุ่นกว่า การศึกษานี้จึงมีวัตถุประสงค์ คือ จำแนกชนิดสัตว์โดยใช้ฟันและนำชนิดสัตว์มาวิเคราะห์หาสภาพป่าในอดีต โดยศึกษาลักษณะทางสัณฐานวิทยาและขนาดของฟันของสัตว์เลี้ยงลูกด้วยนม เนื่องจากฟันเป็นส่วนที่มีความชัดเจนและสมบูรณ์กว่ากระดูกส่วนอื่นๆ สามารถใช้จำแนกสัตว์ในระดับสกุลและชนิดได้อย่างชัดเจน ซึ่งจะทำให้ทราบสภาพแวดล้อมได้ชัดเจนยิ่งขึ้น นอกจากนี้ลักษณะทางสัณฐานของฟัน เช่น ขนาดที่มีการเปลี่ยนแปลง อาจบ่งชี้ถึงการเปลี่ยนแปลงของสภาพแวดล้อมได้เช่นกัน ซึ่งการศึกษานี้เป็นการศึกษาเพื่อตอบคำถามว่าสภาพแวดล้อมบริเวณรอบๆ แหล่งโบราณคดีเพิงผาถ้ำลอด ในสมัยไพลสโตซีนตอนปลายเป็นอย่างไร ในมุมมองทางบรรพชีวินวิทยา

การจำแนกจากลักษณะทางสัณฐานวิทยาและขนาดของฟันของสัตว์เลี้ยงลูกด้วยนมในหลุมขุดค้นที่ 1 (S23 W10) เพิงผาถ้ำลอด อำเภอปางมะผ้า จังหวัดแม่ฮ่องสอน ซึ่งมีจำนวนชั้นดินทั้งหมด 8 ชั้น อยู่ในช่วง 35,000-2,900 ปีมาแล้ว ซึ่งจัดอยู่ในช่วงสมัยไพลสโตซีนตอนปลายถึงโฮโลซีน พบฟันที่สามารถจำแนกได้ (NISP) จำนวน 2,003 ตัวอย่าง หรือนับเป็นจำนวนตัวสัตว์ที่น้อยที่สุด (MNI) จำนวน 218 ตัว จำแนกเป็น 31 ระดับทางอนุกรมวิธาน แบ่งเป็น 11 วงศ์ 13 สกุล 6 ชนิด สัตว์ที่มีปริมาณมากที่สุด ได้แก่ สัตว์ในวงศ์กวาง (Cervidae) หมูป่า (*Sus scrofa*) สัตว์ในวงศ์ย่อยวัว (Bovinae) สัตว์ใต้อันดับกวาง-วัว (Pecora)

การแปลความหมายสภาพแวดล้อมโบราณจากสัตว์ที่มีถิ่นที่อยู่อาศัยเฉพาะ (specialized habitat) พบว่า เมื่อ 35,000 ถึง 22,000 ปีมาแล้ว ปรากฏ สัตว์ในวงศ์อ้น (Rhizomyidae) สัตว์ในสกุลอ้น (*Rhizomys* spp.) อ้นเล็ก (*Cannomys badius*) สัตว์ในสกุลหนูพุก (*Bandicota* spp.) หนูพุกใหญ่ (*Bandicota indica*) หมีควาย (*Ursus thibetanus*) ควายป่า (*Bubalus* sp.) และสัตว์ในสกุลเลียงผา-กวางผา (*Naemorhedus* spp.) ซึ่งบ่งชี้ถึง ป่าเบญจพรรณ ป่าดงดิบเขา ป่าไผ่ ป่าหินปูน ป่าโปร่งหรือทุ่งหญ้า และหนองน้ำ ต่อมาในช่วง 22,000 ถึง 10,000 ปีมาแล้ว ยังปรากฏชนิดสัตว์ที่เหมือนในช่วงที่ผ่านมา ซึ่งบ่งชี้ถึงชนิดป่าส่วนใหญ่ไม่มีการเปลี่ยนแปลงจากในช่วงที่ผ่านมา นอกจากนี้ยังปรากฏ สัตว์ในวงศ์แรด (Rhinocerotidae) ขึ้น บ่งชี้ถึงป่าที่หนาแน่นขึ้นในช่วงนี้อีกด้วย จากสัตว์ที่มีถิ่นที่อยู่อาศัยเฉพาะเจาะจง ดังเช่น สัตว์ในสกุลอ้น (*Rhizomys* spp.) สัตว์ในสกุลหนูพุก (*Bandicota* spp.) สัตว์ในวงศ์แรด (Rhinocerotidae) ที่พบนั้น บ่งชี้ถึงสภาพป่าบริเวณเพิงผาถ้ำลอดไม่มีการเปลี่ยนแปลงตั้งแต่สมัยไพลสโตซีนตอนปลายถึงปัจจุบัน จากการวิเคราะห์ขนาดฟันของสัตว์บางชนิด เช่น สัตว์สกุลกวางผา-เลียงผา (*Naemorheus* spp.) พบว่ามีขนาดใหญ่มาก โดยเฉพาะฟันที่พบในช่วง 35,000-22,000 ปีมาแล้ว จะใหญ่กว่าที่พบในช่วงถัดมา (22,000-10,000 ปีมาแล้ว) รวมถึงฟันที่พบในปัจจุบันอย่างชัดเจน การลดขนาดของฟันอาจเกิดจากหลายปัจจัย ได้แก่ การลดลงของปริมาณอาหาร อากาศที่อบอุ่นขึ้น และการแก่งแย่งแข่งขันระหว่างชนิด ซึ่งเป็นผลมาจากการเปลี่ยนแปลงของสภาพอากาศและสภาพแวดล้อมในช่วงต่อระหว่างไพลสโตซีนตอนปลายและโฮโลซีน

ภาควิชา..........ธรณีวิทยา.......... ลายมือชื่อนิสิต..........
สาขาวิชา..........โลกศาสตร์.......... ลายมือชื่ออาจารย์ที่ปรึกษา..........
ปีการศึกษา..........2549.......... ลายมือชื่ออาจารย์ที่ปรึกษาร่วม..........

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KEYWORD: MAMMAL TEETH / LATE PLEISTOCENE / PALEOENVIRMENT / THAM LOD ROCKSHELTER

Mr. SAWANGPONG WATTANAPITUKSAKUL: LATE PLEISTOCENE MAMMAL TEETH FROM THE THAM LOD ROCKSHELTER, AMPHOE PANG MAPHA, CHANGWAT MAE HONG SON. THESIS ADVISOR: ASSIST. PROF. THASINEE CHAROENTITIRAT, Ph.D., THESIS CO-ADVISOR: ASSIST. PROF. RASMI SHOOCONGDEJ, Ph.D., 283 pp. ISBN 974-53-2802 -2.

An enormous mammal teeth discovered in the late Pleistocene archaeological site plays an important evidence identifying mammalian species which its habitat is fundamental information in reconstructing paleoenvironment. In the late Pleistocene, some regions of the world including the inner part of Southeast Asia e.g. the Tham Lod Rockshelter was also affected by the environmental change. The aim of this research is to identify mammalian species and to use mammalian species to reconstructing forest by the morphology and size classification of mammal teeth. As teeth are clear character and well preserved part than other bone, they can be clearly identified to genus and species taxa and applied for paleoenviroment interpretation. Moreover, some dental morphological feature such as size can assist to interpret the paleoenviromental change. This research is focused on paleontological aspect which will help to interpret the paleoenviroment at Tham Lod rockshelter in the late Pleistocene epoch.

According to the morphology and size classification of mammal teeth from area 1 (S23 W10) in the Tham Lod Rockshelter, Amphoe Pang Mapha, Changwat Mae Hong Son, consist of 8 layers dated during 35,000 to 2,900 BP or late Pleistocene to Holocene, the total amount of the mammal teeth are 2,003 number of identified specimens (NISP) or 218 minimal number of individual (MIN). These can be classified into 31 taxa and divided into 11 families 13 genus 6 species. Most of them are Cervidae, *Sus scrofa*, Bovinae and Pecora.

The palaeoenvironment interpretation from the specialized habitat can be confirmed that the existence of Rhizomyidae, *Rhizomys* spp., *Cannomys badius*, *Bandicota* spp., *Bandicota indica*, *Ursus thibetanus*, Bubalus sp., *Naemorhedus* spp. around 35,000 to 22,000 BP has been observed. These animals indicate the mixed deciduous forest, hill evergreen forest, bamboo forest, lime stone forest, open forest/grass field and swamp. They also existed until 22,000 to10,000 BP. Thus, it can be assumed that the forests was similar from 35,000 to 10,000 BP. Furthermore, Rhinocerotidae was discovered, and it indicates the dense forest. According to these specialized habitat-mammals such as Rhizomyidae, *Rhizomys* spp., *Cannomys badius*, Rhinocerotidae etc. indicate that the forests around of Thamlod rockshelter are still the same from late Pleistocene to present. According to the teeth size of *Naemorheus* spp. dated 35,000 to 22,000 BP in the study area are obviously larger than the teeth found in another period (22,000 to 10,000 BP) including the teeth of recent animals. The cause of changing the size are due to decreasing amount of food, the warmer climate and/or interspecific competition which might be affected by the change of environment in the terminal Pleistocene period.

Department..........................Geology........................ Student's signature.......Sawangpong Watta...........

Field of study....................Earth Scienc..................... Advisor's signature.......T. Charoent...........

Academic year.....................2006....................... Co-advisor's signature......Rasmi Sh...........

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ACROMYN AND SYMBOLS

C	Canine
Ch	Cheek teeth
CH	Crown height
Dp	Deciduous premolar
Holo	Holocene
I	Incisor
M	Molar
MNI	Minimum Number of Individual
NISP	Number of Identified Specimens
L	Left side
LMR	Length of molar row
Lo	Lower jaw
LPR	Length of premolar row
L Pleis	Late Pleistocene
LTR	Length of teeth row
P	Premolar
R	Right side
Un	Unspecified position
Up	Upper jaw

Taxonomic symbols

incertae cedis	Uncertain affinity
sp.	Species
spp.	Species (plural)

CHAPTER I

INTRODUCTION

Late Pleistocene epoch (during 125,000-10,000 BP: Orchiston and Siesse, 1982) is the last glacial period that displayed the different environment from Holocene epoch (10,000 BP to the recent: Geological society of America: GSA, 1999). In this period, the glacial and ice sheets covered in the Northern hemisphere (Vrielynek and Bouysse, 2003). On worldwide scale of late Pleistocene epoch, the temperature and sea level were lower than the recent (Petit, et al., 1999; Vrielynek and Bouysse, 2003). In addition, environment especially terrestrial forest was different from the recent such as the gymnosperm forest in the tropical zone which its habitat is recently higher than 1,000 m above mean sea level, has ever been distributed at 200 m during late Pleistocene (Flenley, 1998). In Holocene epoch, the glacial and ice sheets melted, temperature increased and sea level raised (Vrielynek and Bouysse, 2003). According to these environment change influenced to mammalian adaptation especially in Southeast Asia such as extinction of orangutan from inland Southeast Asia which is recently only found in Borneo and Sumatra (Kahlke, 1972), losing of giant pangolin from Borneo (Medway, 1977) etc.

The Tham Lod rockshelter located in Amphoe Pang Mapha, Changwat Mae Hong Son which is an important archaeological site. Because it is one of earliest site discovered in Thailand during late Pleistocene to Holocene epoch or 35,000 BP to 2,900 BP. Lots of evidences for example, human bone, a large number of stone tools, shell, shred etc., including numerous mammalian teeth (Shoocongdej et al., 2003a, 2007; Khaokhiew, 2004; Shoocongdej, 2006) have been found. Numerous mammalian teeth inform huge data paleoenvironment especially terrestrial habitat in the Tham Lod rockshelter and adjacent area in the past. Although almost discovered mammalian evidences were hunted, selected and accumulated by prehistoric hunter-gatherers (Shoocongdej et al. 2003a, 2007; Khaokhiew, 2004), their diversity and abundance reflect the paleoenvironment and change around the archaeological site, have not been clearly known. This research is focused on paleontological aspect which will help to interpret the paleoenviroment in late Pleistocene epoch.

This chapter allows 4 main topics. The first main topic displays the purpose and scope of this research. The second main topic shows the data of study area including the accessibility to the site. The third main topic presents the methodology which use in this research such as the method of dental morphological features study, dental measurement of mammal, counting samples method, and interpretation-reconstruction method of paleoenviroment. The last main topic is shown the literature review in aspect of paleoenvironment and mammal study in late Pleistocene epoch.

1.1 Purposes and scope

The main purposes of this research are to apply the paleoenvironmental methodologies in order to study archaeological data at the Tham Lod rockshelter, a prehistoric sites in Amphoe Pang Mapha, Changwat Mae Hong Son as follows:

1.1.1 To identify mammalian species by teeth. The mammalian teeth are an important proxy data for reconstructing the mammalian diversity. They are very different to bone in their biology. The large degree of variation in their shape and form makes them readily identifiable and teeth play a major in the identification of mammal (Hillson, 1990).

1.1.2 To use mammalian species to reconstructing the paleoenvironment at the Tham Lod rockshelter. Each mammal species represented in a mammalian assemblage indicates procurement in the habitat where are particular type of local environment occupied by mammal. The habitat of mammal is fundamental issue in the reconstructing paleoenvironment including late Pleistocene environment in terrestrial or inland site which informs characteristic of forest and temperature.

On the scope of research, this research aims to study mammal teeth in area 1 (S23 W10) from 3 excavated areas of the Tham Lod rockshelter because it contains a large number of Pleistocene mammals and dating result. The animal remains in area 1 were discovered from the surface to the depth of 323 cm from total depth of excavated pit of 450 cm (Klaowkamput, 2003). The result of dating by the AMS radiocarbon dating and Thermoluminescence (TL) dating method gave the age ranging from late Pleistocene to Holocene or about 35,000 BP to 2,900 BP (Shoocongdej et al., 2003, 2007; Khaokhiew, 2004; Shoocongdej, 2006).

1.2 Study area

The study area is located at the rockshelter, called “Tham Lod rockshelter” on base of the over hanging limestone in the Tham Lod Nature and Wildlife Education Centre, North Lum Nam Pai Wildlife Sanctuary at Ban Tham Lod, Amphoe Pang Mapha, Changwat Mae Hong Son. The Tham Lod rockshelter is situated at 19°34' N and 98°16' E, displaying in the topographic map scale 1:50,000 of the sheet 4648II, series L1708, edition 4-RTSD, Doi Pak Kud (Royal Thai Survey Department, 1991). The elevation of this rockshelter is approximately 640 m above the present mean sea level. The accessibility to this site can be undertaken via the highway number 107 and 1095 from Changwat Chiang Mai to Amphoe Pang Mapha, Changwat Mae Hong Son (see Figure 1.1) and follows the local road about 10 km to the north to the Tham Lod Nature and Wildlife Education Centre at Ban Tham Lod (Figure 1.2). The rockshelter locates far about 250 m from the entrance of Tham Lod Nature and Wildlife Education Centre. Three excavated areas lie to north-south of the site. The study area, area 1, locates close to rockshelter (Figure 1.3).

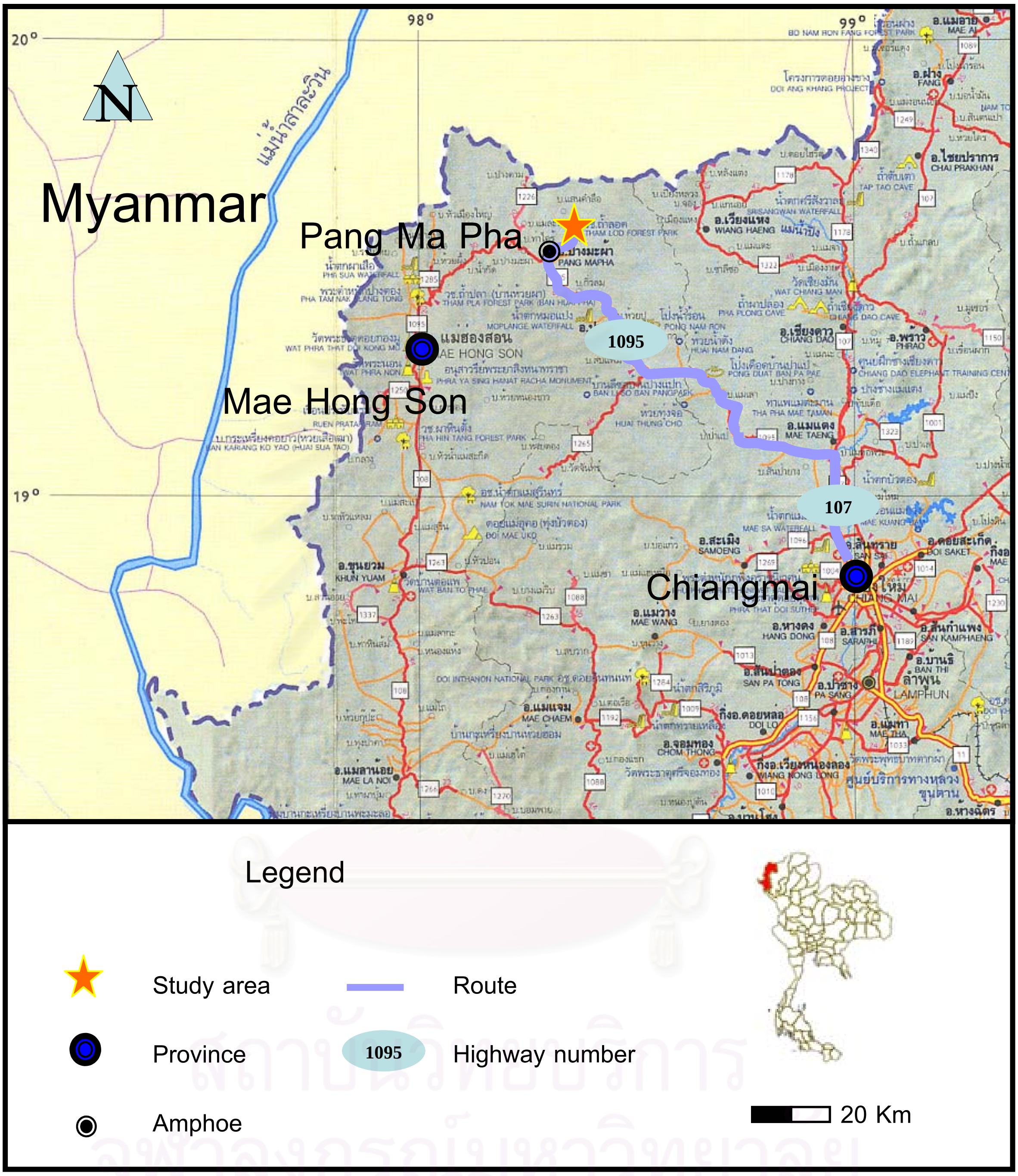


Figure 1.1 A route map of northwestern of Thailand showing the accessibility to study area (from www.doh.mot.go.th).

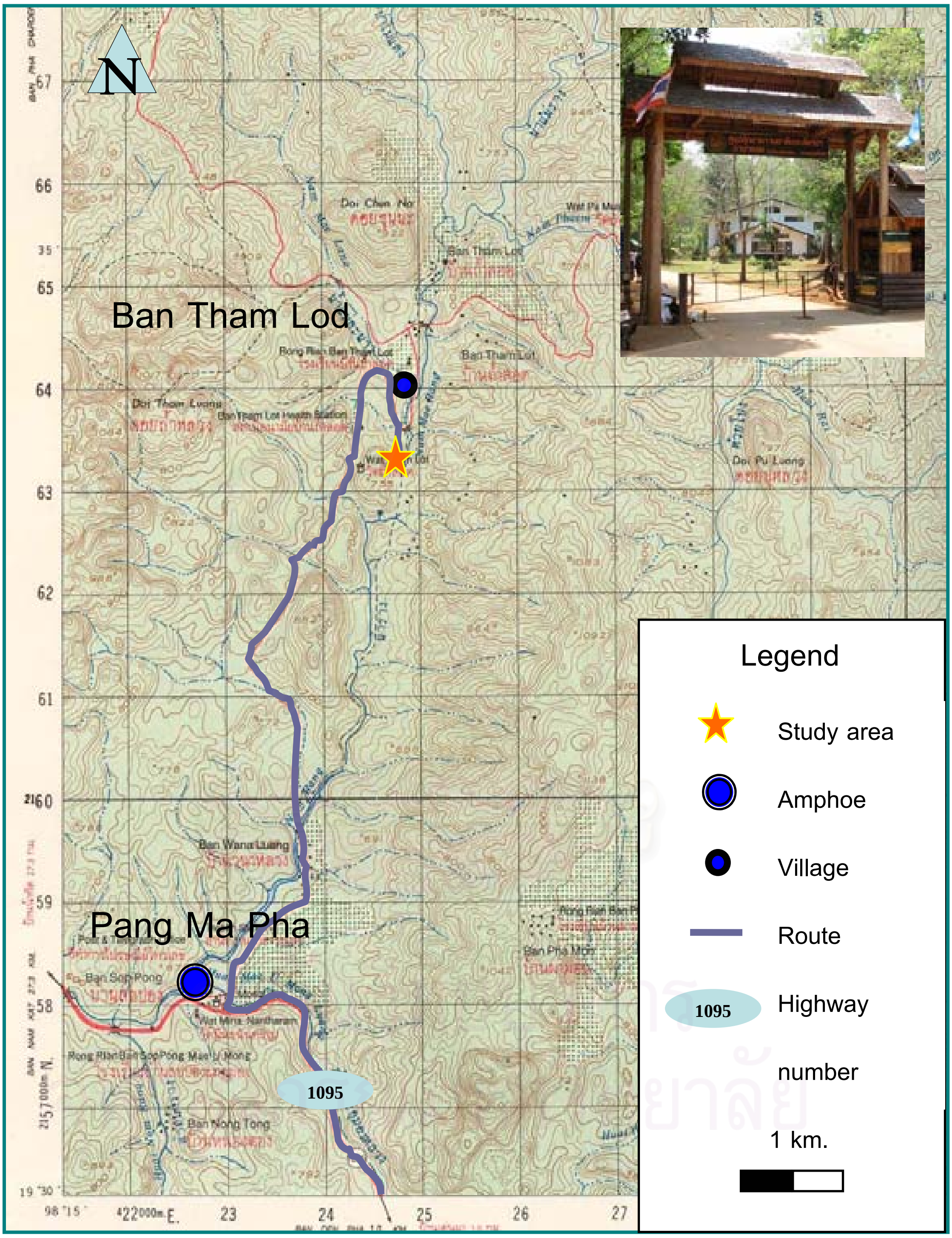


Figure 1.2 Topographic map of the study area in Ban Tham Lod, Amphoe Pang Mapha and inset picture shows the present entrance of the Tham Lod Nature and Wildlife Education Centre (Royal Thai Survey Department, 1991).

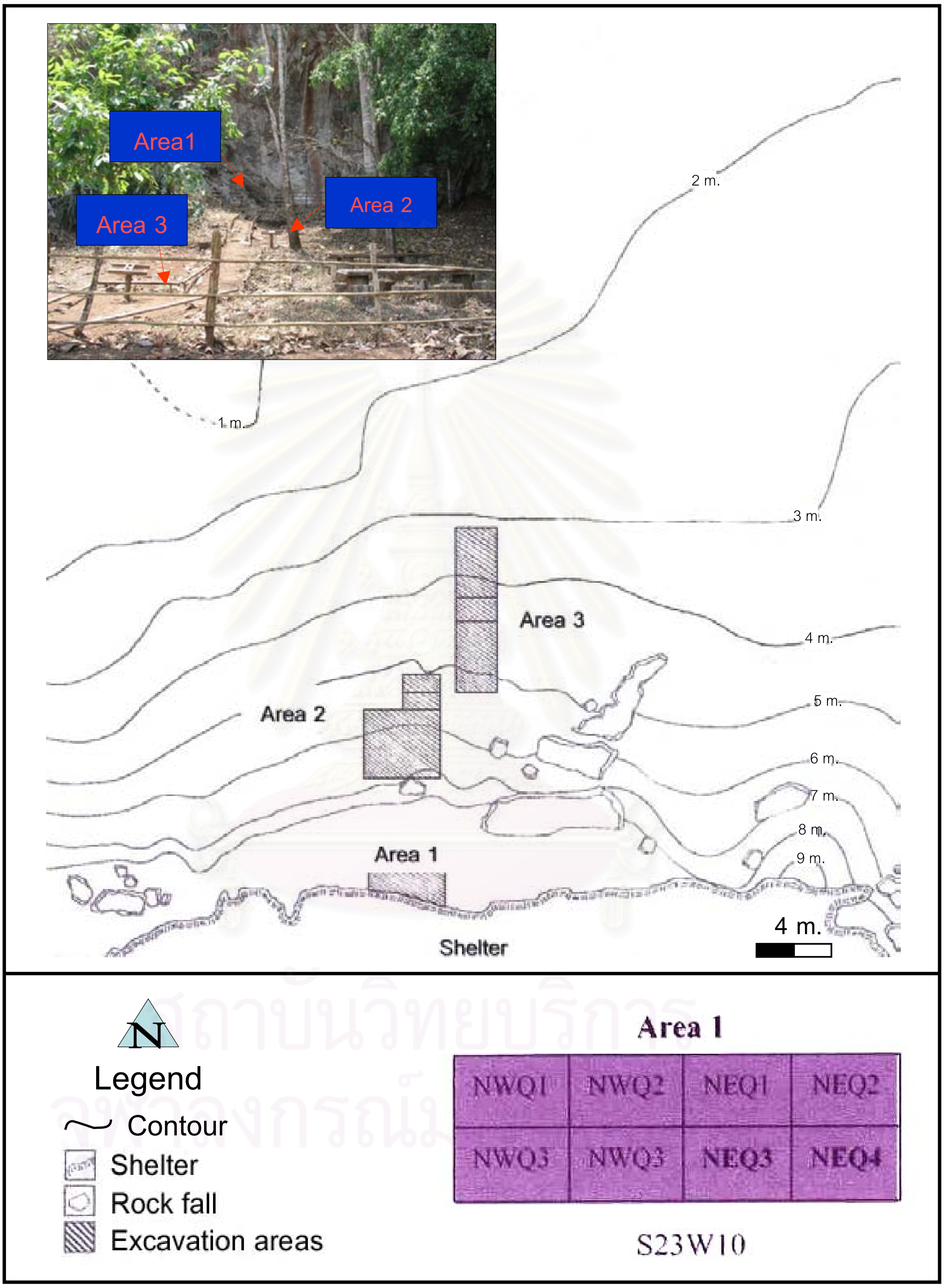


Figure 1.3 Chart of the Tham Lod rockshelter and Grid reference of Area 1 (Klaowkamput, 2003; Shoocongdej, et al., 2003a).

1.3 Methodology

In this study, the methodology under the investigation can be categorized into three main aspects: the literature review, laboratory work, and interpretation. The summarized flowchart shows methods of the study in Figure 1.4 and 1.5.

1) Literature review

It is to review the previous works such as geology at the Tham Lod rockshelter, late Pleistocene environments, and mammals in Thailand.

2) Laboratory work

In laboratory work include separation of teeth from other bones, preparation of specimens, taking photographs, measurement, description, and identified of mammal teeth were done.

For this research, 2 ways of identification of mammal teeth consist of the dental morphological features and measurement. In each species, the teeth are particular morphological features and have fairly specific value of dental size. These dental characteristic is useful for identification into mammalian taxon.

After that, each mammalian taxon from identification was compared to recent mammals in order to use the habitat of recent mammal to reconstructing paleoenvironment such as the forest and temperature characteristic, see detail of paleoenviroment reconstruction in next topic.

This topic displays the methodological detail of dental morphological features, measurement, and counting samples, follow as:

2.1) Dental morphological features

On the dental morphological features, the recent mammal specimens help for identification are from the museum collection from Thailand such as the museum of Natural History, Chulalongkorn University and the Natural History Museum, National Science Museum; the cranial pictures from the National Museum of Natural History, Paris taken by Dr.Prasit Auetrakulvit; the dental measurement data of mammals in Medway (1969); the cranial data of *Dicerorhinus sumatrensis* in Grooves and Kurt (1972), and the cranial figures illustrated in Lekagul and McNeely, 1988.

Unfortunately, all recent specimens which use in this research are lost the important collection data such as age, sex etc. Thus, the age determination consider to only replace of the deciduous and permanent teeth including worn of teeth surface. Deciduous teeth support the juvenile age. The adult is confirmed based on permanent teeth.

2.2) Dental measurement

Dental measurement in (mm) is taken in a straight line between two points of both the isolated teeth and teeth row. Dental measurement methods follow von den Driensch (1976); Hilson (1990); and Martin, Pine, and DeBlase (2001).

Length of tooth is the distance between the points of contact with other teeth in the row, taken parallel occlusal plane (Figure 1.6A).

Wide of tooth is the distance between buccal side to lingual side (Figure 1.6B).

Teeth crown height is the height from top of crown to cervical (Figure 1.7A).

Some specimens display complete series in premolar teeth row or molar teeth row or teeth row. The length of them clearly indicates those that are taken on most species (von den Driensch, 1976; Martin et al., 2001).

Premolar teeth row length is the length from anterior edge of first premolar to posterior edge of last premolar which measure along the alveoli on the buccal side (Figure 1.7B).

Molar teeth row length is the length from anterior edge of first molar to posterior edge of last molar which measure along the alveoli on the buccal side (Figure 1.7C).

Teeth row length is the length from anterior edge of first cheek tooth to posterior of last tooth which also measure along the aveoli on the buccal side (Figure 1.7D).

2.3) Counting samples

After identification, gross counting techniques used in the quantifier of animal bones are the number of identified specimens (NISP) and minimum number of individuals (MNI). In this research, definition of both NISP and MNI techniques follow Reitz and Wing (1999).

Number of identified specimens (NISP), the method is commonly used to estimate the relative frequency of taxa that describes the actual number of specimens present in the samples studies. NISP is related to the number of identifiable elements in each animal and site formation processes (Reitz and Wing, 1999: 191-192).

Minimum number of individuals (MNI) is the smallest number of individuals which is related to the number and identifiability of elements in each animal. Unlike NISP, MNI estimates should not be interpreted as actual individuals; more actual individuals may have been used at the site, or only portions may have been used. MNI estimates are related to the number of identifiable symmetrical or singular axial elements. To estimate MNI it is necessary to consider not only identifications and elements represented, but also age, sex, and measurement. This is a much more complex counting than NISP (Reitz and Wing, 1999: 194-195).

3) Interpretation-reconstruction paleoenviroment

Each species represented in a mammal assemblage indicates procurement in the habitat which are the important data for reconstructing paleoenvironment. Habitat defines to the locality, site and particular type of local environment where a particular species lives and grows through their life (Lincoln, Boxshall, and Clark, 1998: 132).

The most abundant mammals in a fauna assemblage in archaeological site are those most frequently used by hunter-gatherer, which were selected from the complete local life assemblage. Among these mammals are one with specific habitat requirements and others that are widely distributed among diverse habitat (Reitz and wing, 1999). Clearly, those that survive only under very specific conditions provide more detailed information about the habitats exploited and which presumably existed in close proximity to the dwelling site (Reitz and wing, 1999).

Reconstruction and analysis of past environment relies on present-day knowledge of mammalian habitat. The recent knowledge of mammalian habitat used in this study are those of mammalian studies in Thailand and the adjacent areas such as Medway (1969), Lekagul and McNeely (1988), WWF Thailand programme office (2000), and Parr (2003).

Besides change of fossil and subfossil size is one of physical characteristic which is the paleoenviroment indicators. According to the research of various size of mammalian specimens in many countries: Indonesian archipelago such as Borneo, Java, and Sumatra (Hooijer, 1949; Medway, 1977); Israel (Davis, 1981; Davyan et al., 1991) etc. including Thailand (Chaimanee and Jaeger, 1993; Chaimanee et al., 1993), they explained that the difference in mammalian specimen size between Pleistocene epoch and Holocene depend zoogeography theories. Base on zoogeography theories, many main factors influence various size of mammalian specimens such as the interspecific competition, temperature, and food (Davis, 1981). The detail in each theory follows as:

3.1) Interspecific competition

One phenomenon effecting to various size of body is the interspecific competition or character displacement (Brown and Wilson, 1956). Brown and Wilson (1956) used the term character displacement to refer to the phenomenon where differences among similar species whose distribution overlap geographically are accentuated in regions where the species co-occur but are minimized or lost where the species distribution do not overlap. This pattern results from evolutionary change driven by competition among species for a limited resource (e.g. food).

3.2) Food supply

Food supply is one factor which influences size of body including teeth. Under limited food supply such as in tundra and desert (Rosenzweing, 1968 cited in Davis, 1981), limited food supply such as in island (Foster, 1964 in Davis, 1981) is factor causing size decrease of mammals.

3.3) Temperature

Low temperature during late Pleistocene may be influence larger mammalian body (including their body part e.g. teeth) than the recent which may be explain by Bergmann's rule. Bergmann's rule is a principle that correlates environmental temperature with body mass in warm-blooded animals (Bergmann, 1847 cited in Davis, 1981 and Davyan et al., 1991). This rule operates as larger animals have a lower surface area to volume ratio than smaller animal, so they radiate less body heat, and stay warmer in cold climates (Davis, 1981). On the other hand, warmer climates impose the opposite problem: body heat generated by metabolism needs to be dissipated quickly rather than stored within. Thus, the higher surface area-to-weight ratio in hot and dry climates facilitates heat loss through the skin and help cooling of the body (Davis, 1981). A change of body size should rather be viewed as one of several strategies whereby an mammal can adapt to different temperature regimes (Davis, 1981).

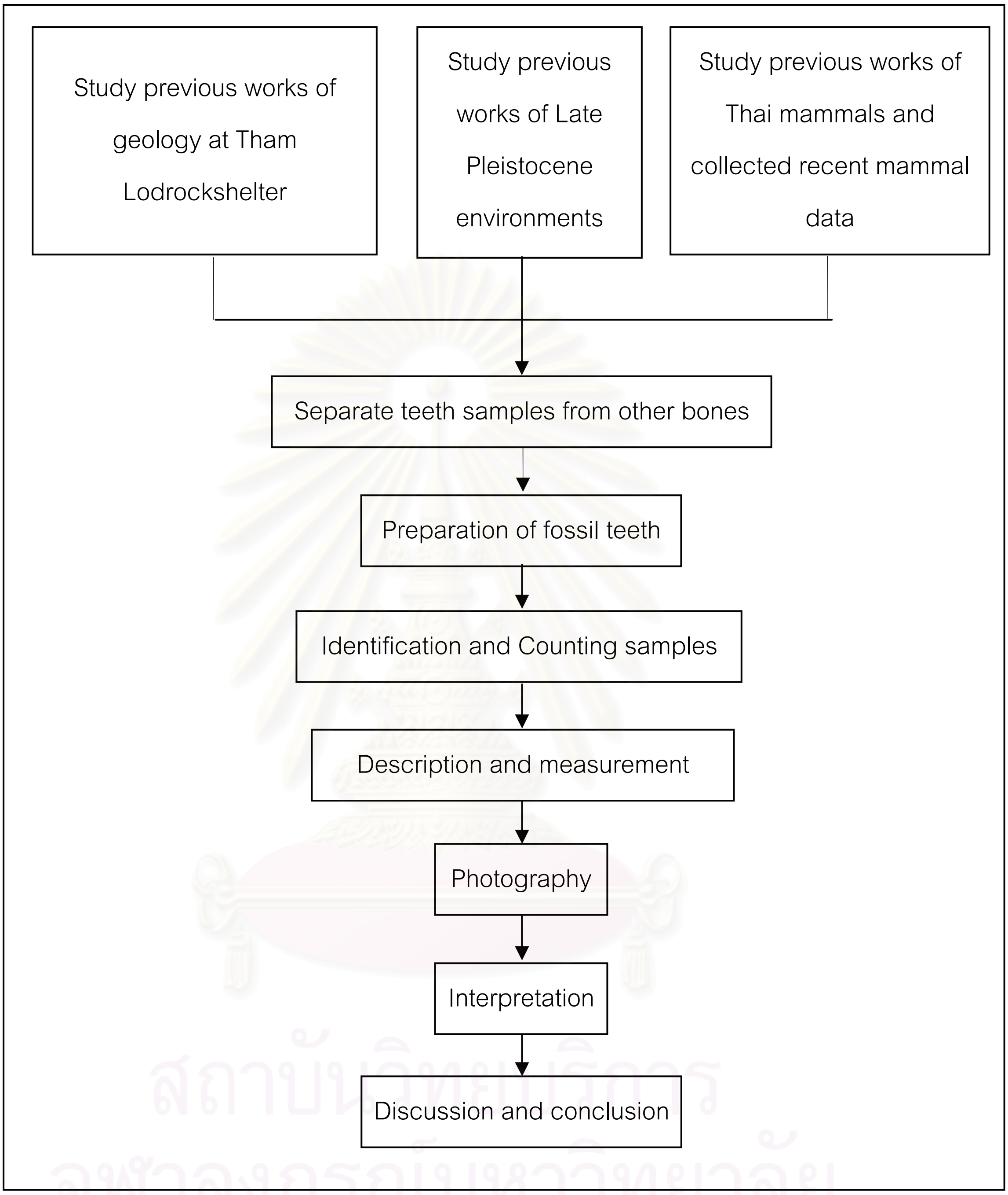


Figure 1.4 Flowchart showing the methods of the study.

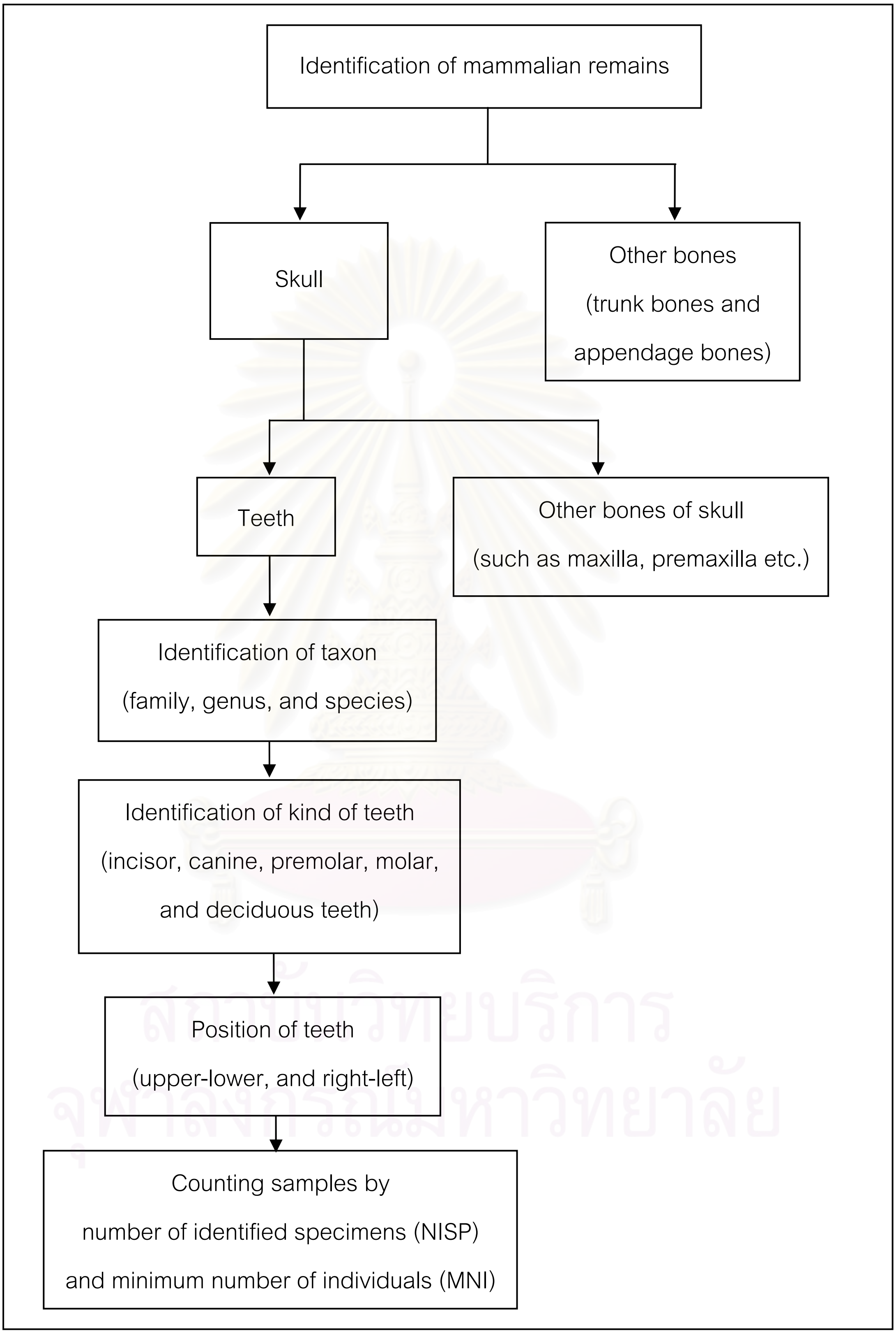
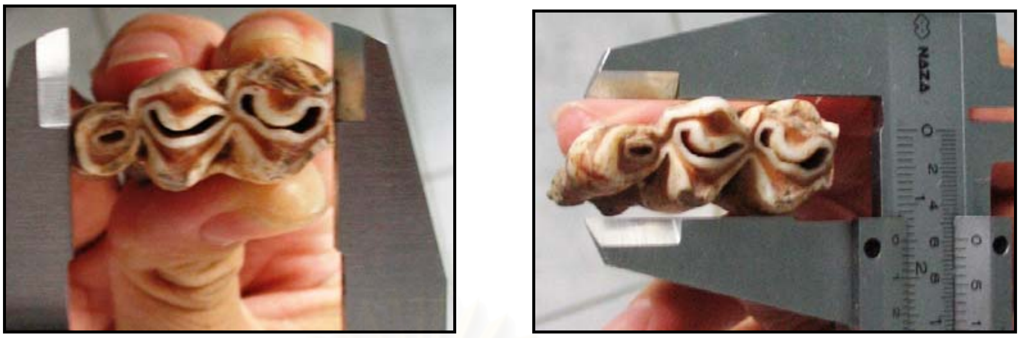


Figure 1.5 Flowchart showing the process of mammalian teeth identification.



A B

Figure 1.6 Cervids mandibibular teeth, length (A) and width (B)

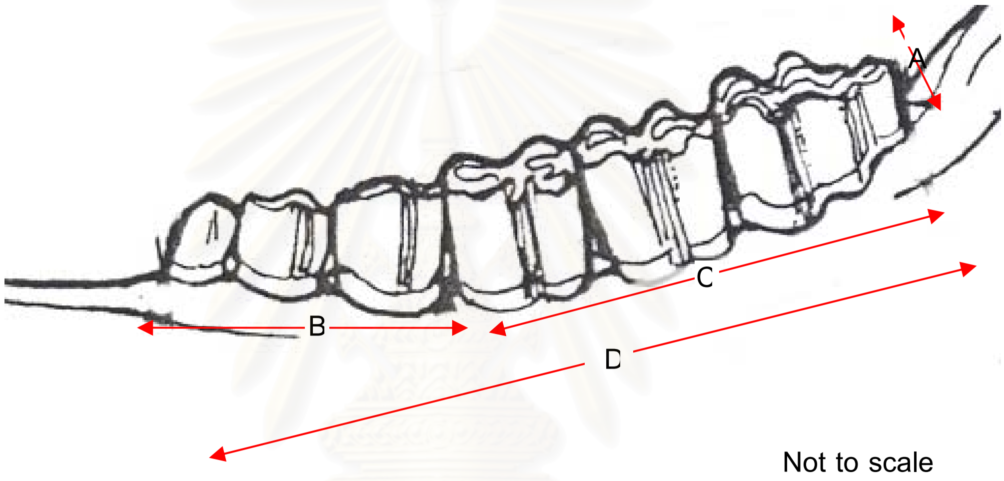


Figure 1.7 Cervids mandible in buccal view shows measurement position of teeth crown height (A), premolar teeth row length (B), molar teeth row length (C), and teeth row length (D), modified from von den Driensch (1976).

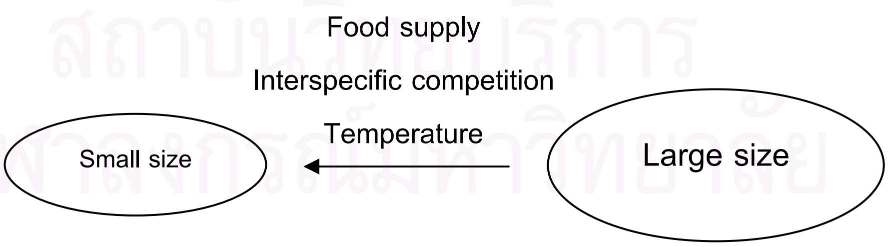


Figure 1.8 Flowchart showing factors which influencing decreasing mammal size.

1.4 Literature reviews

In this topic is divided into 5 parts. First, it proposes to review late Pleistocene epoch concept and the general global characteristic in late Pleistocene epoch focused on temperature, environment, and fauna. The second part provides information on previous paleoclimate and paleoenviroment (focused on forest characteristic and sea level change) in each part of Thailand during late Pleistocene. The next part focuses on diversity and distribution of the Thai mammalian fossil or sub-fossil in the before late Pleistocene and late Pleistocene period. The fourth part presents the mammalian biogeography of Thailand in the recent time. The last part displays the basic knowledge mammalian teeth such as dental anatomy, replacement and general kinds of teeth in order to understand into dental identification.

1.4.1 Late Pleistocene paleoclimate and paleoenviroment in the world

The Pleistocene epoch is the best-known glacial period (Ice Age) of the earth's history. This epoch ranged during 1,800,000-10,000 BP (Geological society of America: GSA, 1999).

Characters of Pleistocene epoch are the glacial and ice sheets covering in the Northern hemisphere, about 52 million km^2 of the Northern part of the continents in late Pleistocene and low in global temperature (Vrielynek and Bouysse, 2003). This glaciation during the Pleistocene epoch was not continuous but consisted of several glacial advances interrupted by interglacial stages, during which the ice retreated and global temperature warmed. Less 4 times of major glacier and about 20 times of minor glacier were appeared in this epoch. The continuous oxygen-18 (^{18}O) and deuterium (D) recorded along the 420,000 BP of the core at Antarctica. It indicated the temperature in glacial period was lower than the recent and displayed 4 climate cycles through 420,000 BP (Petit, et al., 1999).

The boundaries land and sea are very different from the present-day coastline based on the world wild map during the Pleistocene (Vrielynek and Bouysse, 2003). Especially, the Southeast Asia, the landmass of recent Sunda shelf including Malaysian peninsular, Sumatra, Java, Borneo, Palawan, and other small islands were connected into **Sundaland** during late Pleistocene, based on archaeological and paleoenviromental studies (e.g. Dunn and Dunn, 1977) and Southeast Asia paleogeographic map (Voris, 2000), see Figure 1.9.

An epoch following Pleistocene is Holocene, ranged during 10,000 BP to the recent (Geological society of America: GSA, 1999). The environment of this epoch is opposite characteristic with Pleistocene: warm climate; melted the glacial and ice sheets in Northern hemisphere; and sea level rise.

Pleistocene was divided to 3 divisions: early Pleistocene, middle Pleistocene, and late Pleistocene. Late Pleistocene or last maximum glacial (LMG) ranged 125,000-10,000 BP (Orchiston and Siesse, 1982: placed the aging of the late Pleistocene epoch by dating of hominid fossil in Java) was a period of remarkable forest and fauna change especially South China and Southeast Asia.

On forest characteristic in Southeast Asia during late Pleistocene, the low lands were dominant by hill evergreen or mountain vegetation such as *Dacrycarpus*, *Pinus*, and *Quercus* etc., which recently habitat is higher than 1,000 m above mean sea level. During 126,000 to 10,000 BP, the low land covered by hill evergreen vegetations in many countries such as South China (Zheng, 2000), South China sea (Sun et. al., 2000), Thailand (Penny, 2001; White et.al., 2004), Java (Stuijts, 1993; van der Kaars and Dam, 1995), and Borneo (Anshari, Kershaw, and ven der Kaars, 2001) etc. Flenley (1998) reported that large amounts of hill evergreen vegetation occurred at lowland sites aging before 10,000 BP of South-East Asia and the West Pacific, Tropical Latin America and Tropical Africa which indicated a depression of some 200 to 1,900 m in montane vegetation zones during the Pleistocene.

Besides a north-south savanna did exist through lowland of the continent of Sundaland through late Pleistocene at time of lowered sea level (covering from recent gulf of Thai through to Java sea and South China sea). It supported by a range of evidences from geomorphology, palynology, biogeography, and vegetation/climate modeling in Southeast Asia (Bird, David, and Hunt, 2005).

Based on the vegetation data in some local area which dated a long time through late Pleistocene (between 125,000 to 10,000 BP) supported unstable vegetation change in micro scale, for example southern of Guangdong, South China (Zheng, 2000), Bandung basin, west Java (van der Kaars and Dam, 1995) etc.

In Guangdong, South China during late Pleistocene, the fagaceous monsoon evergreen forest was dominance during 125,000-65,000 BP based on a lot of *Quercus* pollen. Between 65,000-29,000 BP, the presence of so many temperate taxa such as *Pinus*, *Altingia* etc. suggests a stronger depression of hill evergreen forest boundary as much as 1,000-800 m After that, the hill evergreen forest was strongly reduced and transformed to grassland or savanna vegetation such as Poacea and *Artemisia* during 29,000-15,000 BP. In the last period, between 15,000 to 10,000 BP, the pollen assemblage shows the resurgence of hill evergreen forest and the disappearance of savanna formation (Zheng, 2000).

During last Pleistocene epoch, the intra-mountain in Bandung basin, west Java was dominance by the freshwater swamp vegetation from 126,000 to 81,000 BP. Around 81,000 BP, freshwater swamp forest was replaced by the open swamp vegetation dominated by grasses and sedges. *Asplenium* ferns were strongly reduced from 81,000 to 74,000 BP while increased numbers during 74,000 to 47,000 BP. From 47,000 to approximately 20,000 BP, the vegetation in Bandung basin supported the depression of the hill evergreen vegetation zones and reduction fern taxa (van der Kaars and Dam, 1995).

In the end of the late Pleistocene epoch, global temperature was changed from cool and dry to warm and moisture, ice sheet in northern hemisphere were melted and the sea level rose which effected to environmental change such as the extension of the evergreen and mangrove forests and retread of glass land and temperate forest (Adams and Faure, 1997).

In mammal research, it support that the environment especially forest change in a terminal Pleistocene epoch which effected to disappear or extinction of some mammalian specie in local or regional scale such as *Pongo pygmaeus* (orangutan), *Stegodon trigonocephalus* (pigmy stegodon) etc.

Moreover, environment factors also effected to physical characteristic of mammal such as size of animal remains. They are larger than the recent form. This phenomenon occur in many mammal species, for example *Rhinoceros sondaicus* (Java rhinoceros), *Dicerorhinus sumatraensis* (Sumatran rhinoceros), *Tapirus indicus* (trpir) etc.

Pongo pygmaeus (orangutan) which recently habits in Borneo and Sumatra, had ever been distributed in South China, Laos and Vietnam during late Pleistocene to early Holocene, based on discovery of orangutan fossil and subfossil through South china and Southeast Asia (Kahlke, 1972). It indicates to rain forests in all height, from low-level swamps to mountainous areas 1,500 m in elevation (Kahlke, 1972).

Based on late Pleistocene mammalian data from Nganong and Punung in Java island, it supported the extinct mammals such as *Stegodon trigonocephalus* (pigmy stegodon) and *Elephas hysudrindicus* (extinct elephant) etc. habiting in this area until the end of the late Pleistocene epoch (van den Bergh, Vos, and Sondaar, 2001). Moreover, many mammalian species such as *E. maximus* (Asiatic elephant), *Pongo pygmaeus* (orangutan) which recently live in inland of Southeast Asia and adjacent island, also had ever been lived at Nganong and Punung (van den Bergh et. al., 2001). They indicated to moisture open wood land (van den Bergh et. al., 2001).

Besides the direct paleoenviromental reconstruction by teeth, change of fossil and subfossil size is one of physical characteristic which is paleoenviromental indicators. Specimens of any mammal species in Southeast Asia display larger size than the recent which are mammalian adaptation under environmental change during Pleistocene. For example, fossil and subfossil of Pleistocene mammals in Borneo, Java, and Sumatra such as *Rhinoceros sondaicus* (Java rhinoceros), *Dicerorhinus sumatraensis* (Sumatran rhinoceros), *Tapirus indicus* (trpir), *Hystrix brachyuran* (Malayan porcupine) and *Penthera tigris* (tiger) are larger than those of the recent form (Hoojer, 1949).

The specimens from Niah cave in Borneo show that giant pangolin survived from middle Pleistocene into the last glaciation (Medway, 1977). Alongside its remains, bones of the smaller *Manis javanica* (Malay pangolin) were found in relatively greater number. *M. javanica* recently is still abundant in Borneo, frequenting a wide range of habitats from plantation to forest. According these specimens suggest that its smaller size is a factor that allowed this species to survive through the late Pleistocene when its larger congener apparently disappeared (Medway, 1977).

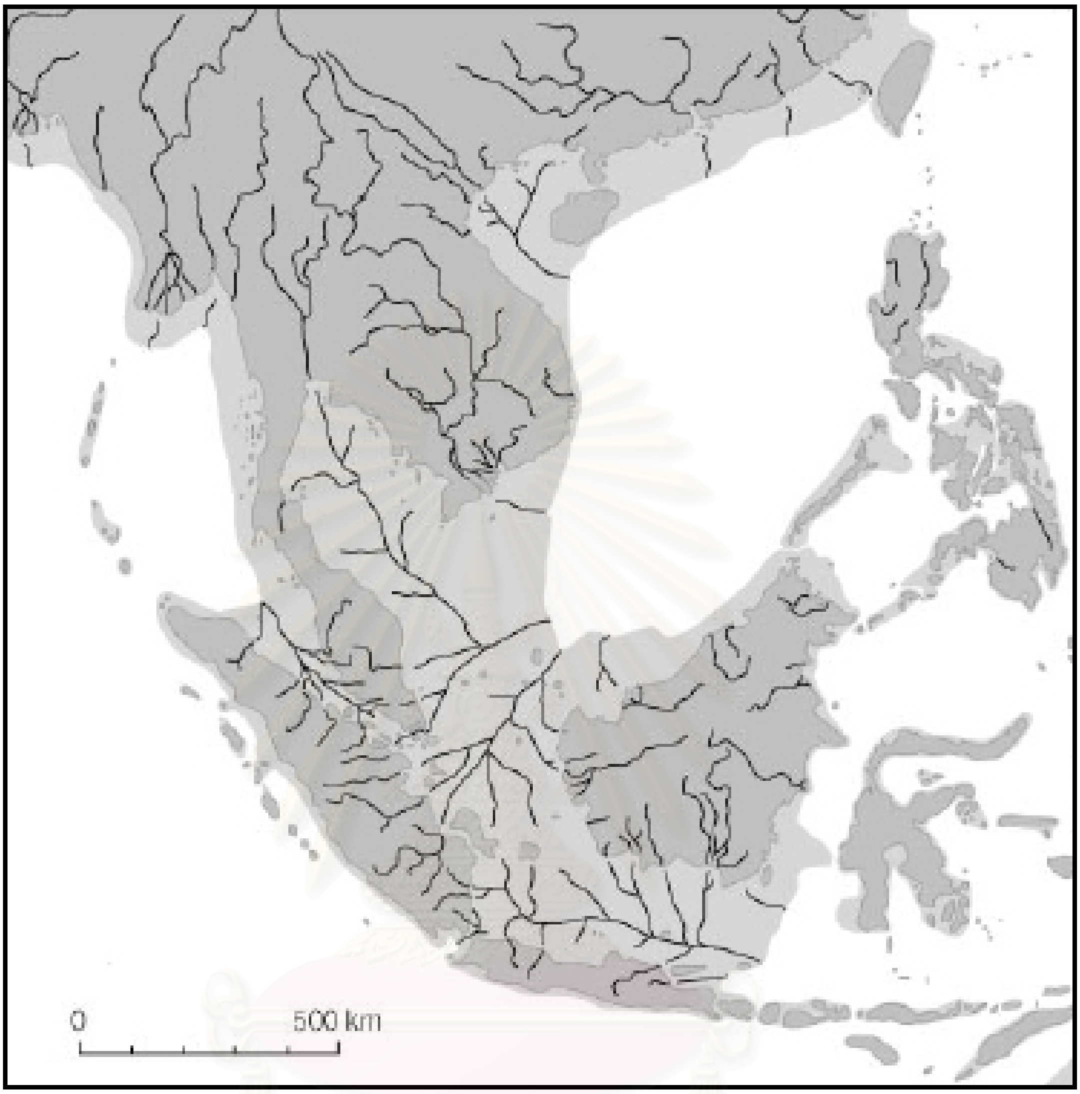


Figure 1.9 Maps of Southeast Asia showing present land (dark shade area), the extent of Sundaland during late Pleistocene with sea level at -120 m (light shade area), and the major river systems on Sundaland (dark line) (Voris, 2000).

1.4.2 Paleoclimate and paleoenviroment in Thailand

The changing of ice sheets in the northern hemisphere and worldwide-fluctuated sea level were effected to the late Pleistocene climate and environment of Thailand.

The environment data before late Pleistocene, there are a few researches done on this period such as the middle Pleistocene mammals study in Snake cave or Tham Wiman Nakin, Chaiyaphum province (Gigsberg et al., 1982 and Chaimanee and Jaeger, 1993) etc. The some fossils discovered in these sites such as *Crocuta crocuta ultim* (spotted hyena), *Aliuropoda melanoleuca fovealis* (giant panda), and *Pongo pygmens* (orangutan) indicated the open habitat, mountain forest with the dense temperate bamboo.

The late Pleistocene environment data, there are a many researches which cover all area of Thailand, including geological researches (e.g. Sinsakul, 1985; Dheeradilok, 1995; Choowong et. al., 2003 etc.), archaeological researches (e.g. Anderson, 1990; Pookajorn, 1993; Shoocongdej, 1996; Auetrakulvit, 2004, 2005 etc.), paleontological researches (e.g. Chaimanee; 1993 etc.), and palynological researches (Penny, 2001; White et.al., 2004).

In this topic, it focuses on the forest characteristic and sea level change. The late Pleistocene environments in each region of Thailand follow as:

1.4.2.1 The southern of Thailand

Based on late Pleistocene sediment of South Thailand, the deposits are mainly sand, clay, and gravel layers of colluvial and fluvial origin (Chotikasathien and Kohpina, 1993; Dheeradilok, 1995; Department of mineral resources, 2001 etc.). Several lateritic layers can be found in this sequence especially Andaman coastal area (Dheeradilok, 1995; Department of mineral resources, 2001). The lateritic layers within the colluviun and fluvial sediment are believed to be a result of Pleistocene climate changes (Dheeradilok, 1995). The weathering took place during the late Pleistocene to produces the laterite or oxidize zone on the surface of stiff clay. It occurred during a long period of relatively warm climate (Dheeradilok, 1995). On the shoreline area, the lateritic layers within the colluviun and fluvial sediment under lies Holocene sediment which origin from marine and terrestrial deposition (Department of mineral resources, 2001). Moreover, Holocene marine fossil or subfossils found in both Andaman and Gulf of Thailand supported this phenomenon such as mangrove and estuarine shellfish species in Lang Rongrien rockshelter, Krabi province (Anderson, 1990); bivalves, fish teeth, and foraminifera from Chian Yai district, Nakhon Si Thammarat (Jumnongthai and Meesook, 2001); marine fossil from Sa Roi Yod National park, Prachuap Khiri Khan (Choowong, 2004) etc. Some remains of the marine species *Mytilus* sp. from Lang Rongrien rockshelter indicate the least marine transgression established by about 9,000 BP (Anderson, 1990).

The excavation at the Moh Khiew cave, Krabi province aged range from late Pleistocene to Holocene, many mammals were discovered such as *Helarctos malayanus* (sun bear), *Muntiacus muntjak* (barking deer), *Sus* sp. (wild pig) etc. (Chaimanee, 1993) and shells (Pookajorn, 1993). These faunas indicate that late Pleistocene environment was the tropical evergreen and mangrove forests which are similar to the present day forests (Chaimanee, 1993; Pookajorn, 1993).

Auetrakulvit (2004, 2005) studied the animals in the archaeological sites at Moh Khiew II, Krabi province which date to late Pleistocene and Holocene. He suggested that there has been no distinctive changes of fauna until the present day. *Tapirus indicus* (Asian tapir) and Rhinocertidae (rhinoceros) indicate to the dense rainforest and swamp environment (Auetrakulvit, 2004, 2005).

Late Pleistocene core sections from Nong Thale Song Hong, Trang province were dated as 17,500 BP. They lack of the continuous pollen evidence but indicate the present of open forest (dominance by *Castanopis* sp.), with sufficient standing water to permit relatively high values of the aquatic plant *Nymphoides* (White et al., 2004). The charcoal data in Nong Thale Song Hong displayed the lowest values of arboreal indicators and the highest values of burnt charcoal occurring in late Pleistocene period, possibly a result of a climate considerably dryer and more seasonal than today (White et al., 2004).

1.4.2.2 The central of Thailand

According to geological research in the central of Thailand such as Nutalaya and Rau (1981), Dheeradilok (1995), Choowong et. al. (2003), Department of mineral resources (2001) etc., they supported that the land in the lower central plain extended into the Gulf of Thailand during late Pleistocene then marine transgressed into the land in Holocene based on sediment data. In the recent time, the marine Bangkok Clay Formation that covers most of the lower central plain accumulated during Holocene. On the chemical qualification of Bangkok Clay Formation, it displays brackish water characteristic which indicated to accumulation of marine sediment. Besides, this formation is highest in thickness at area near the sea. Then its thickness gradually decreases and disappears in inland area, ending approximately at Ang Thong and Sing Buri province (Dheeradilok, 1995; Choowong et. al., 2003; Department of mineral resources, 2001). The marine Holocene Bangkok clay Formation was deposited during the marine transgression and subsequent stable sea level (Dheeradilok, 1995). The postglacial marine transgression occurred over the central plain inland as far as Ayutthaya during 11,000 to 300 BP as sea level rose in response to warmer climates (Nutalaya and Rau, 1981). Moreover, it overlies on the Bangkok stiff clay which is hard clay sediment mixing to yellowish-gray sand. According to physical qualification of Bangkok stiff clay, it accumulated of sediment flowing by fluvial process in terrestrial area (Choowong et. al., 2003; Department of mineral resources 2001). This layer divided to late Pleistocene epoch and dated around 50,000-40,000 BP (Nutalaya and Rau, 1981).

1.4.2.3 The western of Thailand

In the West of Thailand, Shoocongdej (1996) reported the archaeological excavations at the Lang Kamnan cave, Kanchanaburi province. The mammals found in the late Pleistocene layers, estimated around 30,000 to 10,000 BP, consist of *Muntiacus muntjak* (common baking deer), *Cervus unicolor* (sambar deer), *Cervus eldi* (Eld's deer), *Bos Javanicus* (banteng), wild *Bubalus babalis* (water buffalo) etc. These cervids and bovids indicated the open or mixed deciduous forest which is similar to the recent time but the forest in the past (considering in Pleistocene epoch) was denser (Shoocongdej, 1996).

1.4.2.4 The northern and northeastern of Thailand

The studies of late Pleistocene pollen from many sites in the northern and northeastern part such as Nong Pa Kho, Udon Thani province (Penny, 2001), Nong Han Kumphawapi, Udon Thani province and Kwan Phayao, Phayao province (White et.al., 2004) indicated that the region supported the *Pinus* spp. (pine) or *Quercus* spp. (oak) vegetation, occurring around 40,000 to 10,000 BP. It is similar to contemporary vegetation described from southwestern of China. Climatic conditions were cooler and probably drier than present day climates (Penny, 2001; White et.al., 2004). Besides, a lot of charcoal display that levels of biomass burning are relatively high throughout this period (Penny, 2001; White et.al., 2004). At the Pleistocene/Holocene boundary (12,000 to 10,000 BP), the tropical broad-leaf deciduous forest becomes dominant with the fragmentation of pine (*Pinus* spp.) or oak (*Quercus* spp.) vegetation in response to the increasing temperatures (Penny, 2001; White et.al., 2004).

In conclusion, the late Pleistocene climate in Thailand generally was cooler and dryer than the recent. The southern part and costal of lower central plain of Thailand were influenced by the sea level change. Pine (*Pinus* spp.)/oak (*Quercus* spp.) vegetation distributed to the north and northeast of Thailand through late Pleistocene and was replaced by the tropical broad-leaf deciduous forest at Pleistocene/Holocene boundary.

1.4.3 Late Pleistocene mammals in Thailand

First mammal fossil research from Pleistocene time was done by Lekakul (1949) who reported the discovery of hippopotamus, *Stegodon insigmis* (mastodon) and *Buballus* sp. (buffalo). After that, there were the discoveries of Pleistocene mammals in many areas of Thailand. These researches indicated to diversity and mammal paleogeography knowledge through Pleistocene period (sea table 1.1-1.3).

In Thailand, there are many mammal sites before late Pleistocene; early and middle Pleistocene which displayed the change of diversity and paleogeography. The age of sites was during early to middle Pleistocene for example the sites at Tha Chang, Nakhon Ratchasima province (Nakaya et al., 2003; Thasod and Ratanathien, 2005), Nakornsawan province (Lekakul, 1949; Koenigswald, 1959), Snake cave (Gigsberg, Ingault, and Sen, 1982; Chaimanee and Jaeger, 1993; Tougard et al., 1996) etc.

The extinct of mammals such as Hippopomatidae (hippopotamus), *Stegodon insigmis* (mastodon) in Lekakul (1949) and Koenigswald (1959); several mastodonts such as *Stegodon* sp., *Sinomastodon* sp. A, and *Sinomastodon* sp. B in (Nakaya et al., 2003; Thasod and Ratanathien, 2005); *Crocuta crocuta ultima* (hyena), *Aliuropoda melanoleuca fovealis* (giant panda), *Pongo pygmens* (orangutan) in Gigsberg et al. (1982) and Chaimanee and Jaeger (1993); *Niviventer gracilis*, *Ratchaburimys ruchae Saidomys siamensis*, *Prohadromys varavudhi Prohadromys varavudhi*, *Leopoldamys minutus*, and *Rattus jaegeri* in Chaimanee et al. (1996) and Chaimanee (2003) occurred during early and middle Pleistocene.

Some fauna showed the relationship of paleogeography from one to another areas for examples *Stegodon insigmis* from Nakhon Sawan province closely related to the Siwalig fossils from India (von Koenigswald, 1959). In Snake cave, 3 species that relate to adjacent area: *Crocuta crocuta ultima* and *Aliuropoda melanoleuca foveali* found in China; and *Pongo pygmens* found in Lao PDR. has a close wood land to the ones in Sumatra and Borneo (Gigsberg et al., 1982; Chaimanee and Jaeger, 1993). Tougard et al. (1996) reported that the distribution of the *A. m. baconli* followed the temperate bamboo during middle and late Pleistocene. On the rodents studies from 20 localities including Khao Panam and Khao Takla in Lampang province, Kao Noh in Nakhon Sawan province, Khao Anghin, Ratchaburi province, and Ban Nasan in Surat Thani province etc, they display the diversity change during early to middle Pleistocne, example of *Ratchaburimys ruchae*, *R. ruchae*, found at Khao Samngam, Khao Anghin, and Khao Khlongwan, have extinct from Thailand in the present-day that be correlated with the recent Myanmar rodents (Chaimanee et al., 1996; Chaimanee, 2003). These evidences show a northerly or southerly distribution through Pleistocene which was related to change of forest and climate.

In addition, some Pleistocene mammals displayed larger size than the recent mammals such as *Sus scrofa* in snake cave (Chaimanee and Jaeger, 1993) and rodents from 20 localities (Chaimanee et al. 1993; Chaimanee, 2003).

Late Pleistocene mammals found from Moh khiew, Krabi province (Chaimanee, 1993), Lang Kamnan, Kanchanaburi province (Shoocongdej, 1996), Moh Khiew II, Krabi province (Auetrakulvit, 2004, 2005), Ban Rai, Mae Hong Son Province (Ampunsri, 2006a, 2006b), and Tham Lod rockshelter, Mae Hong Son Province (Ampunsri, 2005a, 2005b, 2006a, 2006b, 2007) were food remain and accumulated by prehistoric hunter-gatherers.

In Moh Khiew cave, there are only cultural level 1-2 which was dated in late Pleistocene. It showed many kinds of mammal (Chaimanee, 1993). The discovered mammals consist of *Presbytis* sp. (langur), *Macaca* sp. (macaque), *Ursus malayanus* (Asiatic black bear), *Arcrtonyx collaris* (hog badger), *Arctogalidia trivirgata* (three-striped palm civet), *Aonyx cinera* (oriental small-clawed otter), *Cynocephalus variegates* (sunda Colugo), *Sus* sp. (pig), *Muntiacus muntjak* (red muntjac), *Tragulus javanicus* (lesser oriental chevrotain), *Bos* sp. (ox), *Callosciurus* sp. (squirrel), *Leopoldamys* sp., *Rhizomys* sp. (bamboo rat) and *Hystrix* sp. (porcupine). These mammal indicated to the tropical evergreen and mangrove forest. The mammal habiting at tree such as *Callosciurus* sp., *Presbytis* sp. and *Macaca* sp. represent large number which indicated to the hunting strategy, shooting tool example of dart. (Chaimanee, 1993).

Mammal bones from the Lang Kamnan cave are composed of *Muntiacus muntjak*, *Cervus unicolor* (sambar deer), *C. eldi* (Eld's deer), *Bos Javanicus* (bateng), *Bubalus babalis* (wild water buffalo), *Hylopeters phayrei* (Phayre's flying squirrel), *Rhizomys* sp., unidentified small cervids and unidentified small rodents, occurring during late Pleistocene. They were similar to those of the present-day mammals and indicated to seasonal forest such as the mixed deciduous forest which was denser than the recent form (Shoocongdej, 1996).

Auetrakulvit (2004, 2005) reported that the discovery of Tragulidea (chevrotain), *Manis javanicus* (sunda pangolin), *Arctictis binturong* (binturong), *Ursus malayanus* (Asiatic black bear), *Panthera pardus* (leopard), *Sus scrofa* (Eurasian wild pig), *Cervus* *unicolor* (sambar deer), *Tapirus indicus* (Asian tapir), Rhinocerotidea (rhinoceros), and *Naemohedus sumatraensis* (serow) etc. in layer dating to late Pleistocene to early Holocene (Auetrakulvit, 2005). *Tapirus indicus* (Asian tapir) and Rhinocertidae (rhinoceros) indicate to the dense rainforest and swamp environment. These mammals showed no distinctive changes of fauna in the peninsular Thailand until recent. (Auetrakulvit, 2005).

Ampunsri (2006a, 2006b, ,2007) reported to 6 taxa found in late Pleistocene layer (layer 4-7 in area 1, layer 4-5 in area 2, and layer 6 in area 3) of Banrai area. They consist of medium Cervidae, *Muntiacus* sp., *Naemorhedus sumatraensis*, Cerophithecidae (old world monkey), Bovidae, and Rodentia. Thus, these discovered mammal indicated to similar to the adjacent site, Tham Lod rockshelter, consisting of grassland, bamboo, mixed deciduous, hill evergreen, limestone (Ampunsri, 2006a, 2006b, 2007).

In the former research of the Tham Lod rockshelter, Ampunsri (2005a, 2005b, 2006a, 2006b, 2007) primary identified and analyzed in archaeological method. He found mammals in late Pleistocene layers of 3 areas containing of medium and small *Sus scrofa* (wild pig); large, medium and small *Cervus* sp (deer); *Muntiacus* sp.; large and medium Bovidae (buffalo or cow); *Naemorheus sumatraensis* (serow); Rhinocerotidae (Rhinoceros); Ursidae (bears); Felidae (cats) etc. According to these mammal taxon, they indicate the paleoenvironment of the Tham Lod rockshelter: grassland, bamboo, mixed deciduous, hill evergreen, limestone, and dense forest, which was quite similar to the present forest in these site (Ampunsri, 2005a, 2005b, 2006a, 2006b, 2007).

However, most of mammals from the former researches of the Tham Lod rockshelter were classified into large taxon such as family and genus. For this thesis, the data on dental morphological feature and measurement has been used in order to identified into species. It may be informed more data of forest and temperature data, see Chapter III and IV.

In the summary, these recent data, mammals discovered in late Pleistocene time are similar to the ones at present time. They show no changing as the diversity and geography of mammals until nowadays. Moreover, the diversity during late Pleistocene is less than early to middle Pleistocene. It indicates that the early to middle Pleistocene mammals such as *Stegodon insigmis* (mastodon), *Crocuta. crocuta ultim*a (spotted hyena), *Aliuropoda melanoleuca fovealis* (giant panda), *Pongo pygmens* (orangutan), might be lost from Thailand during the transition between middle and late Pleistocene.

However, the recent mammalian data in these archaeological sites show that the mammals were governed by hunting behavior and hunting strategy of prehistoric hunter-gatherers. Thus, the absence of few mammal species in these sites might be a disfavor animal for hunting which plays an important for the change of late Pleistocene mammals in Thailand.

During late Pleistocene period, the majority of mammal (especially Artiodactyla) were found through Thailand, however, some species for example *Cynocephalus variegates* (sunda colugo), *Cervus eldi* (Eld's deer), and *Hylopeters phayrei* (Phayre's flying squirrel) indicates that different diversity between north and south area of Thailand. *Cynocephalus variegates* from Moh Khiew cave was found only in the south. *Cervus eldi* and *Hylopeters phayrei* in Lang Kamnan cave lived in northern, northeastern, western, and central of Thailand. The distribution of these mammals was influenced by climate and vegetation.

Table 1.1 List of mammal study sites of Thailand taken into consideration in this study.

<table>
<tr><th>Locality</th><th>References</th><th>Remark</th></tr>
<tr><td colspan="3">Pliocene to Early Pleistocene</td></tr>
<tr><td>Tha Chang, Nakhon Racha Sima province</td><td>Nakaya et al. (2003) and Thasod and Ratanathien (2005)</td><td>Paleontological site</td></tr>
<tr><td colspan="3">Early Pleistocene to Middle-Pleistocene</td></tr>
<tr><td>Nakhon Sawan province</td><td>Lekakul (1949) and Koenigswald (1959)</td><td>Paleontological site</td></tr>
<tr><td>Snake cave, Chaiyaphum, province</td><td>Gigsberg et al. (1982) and Chaimanee and Jaeger (1993)</td><td>Paleontological site</td></tr>
<tr><td>Ban Nasan, Surat Thani province</td><td rowspan="15">Chaimanee et al. (1993, 1996) and Chaimanee (2003)</td><td rowspan="15">Paleontological site</td></tr>
<tr><td>Kanchanaburi province</td></tr>
<tr><td>Khao Anghin, Ratchaburi province</td></tr>
<tr><td>Khao Chong Krachok, Prachaup Khiri Khan province</td></tr>
<tr><td>Khao Klongwan, Prachaup Khiri Khan province</td></tr>
<tr><td>Khao Naphung, Krabi province</td></tr>
<tr><td>Khao Noh, Nakhon Sawan province</td></tr>
<tr><td>Khao Panam, Lampang province</td></tr>
<tr><td>Khao Rupchang, Songkla province</td></tr>
<tr><td>Khao Samngam, Ratchaburi province</td></tr>
<tr><td>Khao Singto, Prachinburi province</td></tr>
<tr><td>Khao Takla, Lampang province</td></tr>
<tr><td>Khao Tinpet, Chumporn province</td></tr>
<tr><td>Khao Toi, Phang Nga province</td></tr>
<tr><td>Saraburi province</td></tr>
</table>

Table 1.1 List of mammal study sites of Thailand taken into consideration in this study (continued).

Late Pleistocene		
Moh khiew, Krabi province	Chaimanee (1993)	Archaeological site
Lang Kamnan, Kanchanaburi province	Shoocongdej (1996)	Archaeological site
Moh Khiew II, Krabi province	Auetrakulvit (2004, 2005)	Archaeological site
Ban Rai, Mae Hong Son Province	Ampunsri (2006a, 2006b, 2007)	Archaeological site
Tham Lod rockshelter, Mae Hong Son Province	Ampunsri (2005a, 2005b, 2006a, 2006b, 2007)	Archaeological site

Table 1.2 List of Pleistocene mammal species (except order Rodent) of Thailand from earliest to youngest site.

Kind of mammals	Age	Before late Pleistocene									Late Pleistocene				
	Locality	Tha Chang[1]	Nakornsawan[1]	Snake cave[1]	Khao Noh[1]	Saraburi[1]	Khao Singto[2]	Kanchanaburi 2[1]	Khao Samngm[2]	Khao Rupchang[2]	Moh khiew[3]	Moh Khiew II[3]	Lang Kamnan[4]	Ban Rai[4]	Tham Lod[4]
Order Insectivora: insect-eating mammals															
Insectivora (insect-eating mammals)					✓	✓		✓	✓	✓		✓			
Hylomys sp. (gymnure)										✓					
Hylomys suillus (lesser gymnure)				✓											
Crocidura fulginosa (Southeast Asia white-toothed shrews)				✓											
Order Chiroptera: bats															
Chiroptera (bats)					✓	✓	✓					✓			
Pteropus sp. (flying fox bat)				✓											
Pteropdidae *gen.* (bats)												✓			
Order Primates: Primates															
Pongo pygmeus (orangutan)				✓											
Rhinopithecus breliehi tingianus				✓											
Cerophithecidae (old world monkey)														✓	✓
Macaca sp. (macaque)											✓				
M. facicularis (long-tailed macaque)												✓			
M. nemestrina (pig- tailed macaque)				✓								✓			
Colobinae (langur)															✓
Presbytis sp. (langur)											✓				
P. obscura (dusky langur)				✓											
Hylobatidae (gibbons)												✓			

Table 1.2 List of Pleistocene mammal species (except order Rodent) of Thailand from earliest to youngest site (continued).

Kind of mammals	Age	Before late Pleistocene									Late Pleistocene				
	Locality	Tha Chang[1]	Nakornsawan[1]	Snake cave[1]	Khao Noh[1]	Saraburi[1]	Khao Singto[2]	Kanchanaburi 2[1]	Khao Samngm[2]	Khao Rupchang[2]	Moh khiew[3]	Moh Khiew II[3]	Lang Kamnan[4]	Ban Rai[4]	Tham Lod[4]
Order Pholidota: pangolin															
Manis javanicus (Malayan pangolin)												✓			
Order Carnivora: meat-eating mammals															
Canivora (meat-eating mammals)									✓		✓				✓
Ursidae (bear)															✓
Ursus thibetamus (Asiantic black bear)				✓											
U. malayanus (Malayan sun bear)											✓	✓			
Aliuropoda melanoleca fovealis (giant panda)				✓											
Crocuta crocuta ultima (hyena)				✓											
Felidae (cat and tiger)															✓
Panthera pardus (leopard)				✓											
P. tigis (tiger)												✓			
Melogale personata (burmese ferret badger)				✓											
Arctonyx collaris (hog badger)											✓	✓			
Arctogalidia trivirgata											✓				
Arctictis binturong (binturong)												✓			
Aonyx cinera (small-clawed otter)											✓				
Viverra zibetha (large Indian civet)												✓			

Table 1.2 List of Pleistocene mammal species (except order Rodent) of Thailand from earliest to youngest site (continued).

Kind of mammals / Age	Before late Pleistocene									Late Pleistocene				
Locality	Tha Chang[1]	Nakornsawan[1]	Snake cave[1]	Khao Noh[1]	Saraburi[1]	Khao Singto[2]	Kanchanaburi 2[1]	Khao Samngm[2]	Khao Rupchang[2]	Moh khiew[3]	Moh Khiew II[3]	Lang Kamnan[4]	Ban Rai[4]	Tham Lod[4]
Paradoxurus sp. (three-striped palm civet)											✓			
Order Dermoptera: flying lemur														
Cynocephalus variegates (Malayan flying lemur)										✓				
Order Proboscidea: Elephants														
Stegodon sp. (mastodont)	✓									✓				
Stegodn insigmis (mastodont)		✓												
Sinomastodon sp. A (mastodont)	✓													
Sinomastodon sp. B (mastodont)	✓													
Elephans sp. (elephant)	✓													✓
E. maximus (Asiatic elephant)			✓											
Order Perisodactyla: odd-toed ungulates														
Tapirus indicus (Malayan tapirs)										✓	✓			
T. indicus cf. *indicus* (Malayan tapirs)			✓											
Rhinocerotidae (rhinoceros)			✓								✓			✓
Dicerorhinus sumatraensis (Sumatra Rhinoceros)			✓											
Hippopomatidae (hippopotamus)		✓												
Order Artiodactyla: even-toed ungulates														
Sus sp. (pig)										✓				✓

Table 1.2 List of Pleistocene mammal species (except order Rodent) of Thailand from earliest to youngest site (continued).

Kind of mammals / Age	Before late Pleistocene									Late Pleistocene				
Locality	Tha Chang[1]	Nakornsawan[1]	Snake cave[1]	Khao Noh[1]	Saraburi[1]	Khao Singto[2]	Kanchanaburi 2[1]	Khao Samngm[2]	Khao Rupchang[2]	Moh khiew[3]	Moh Khiew II[3]	Lang Kamnan[4]	Ban Rai[4]	Tham Lod[4]
Sus scrofa (common wild pig)			✓								✓			
Tragulus javanicus (lesser mouse deer)											✓			
Cervidae (dears)										✓	✓		✓	
Muntiacus sp. (barking deer)													✓	✓
M. muntjac (common barking deer)			✓							✓	✓	✓		
Cervus sp. (deer)														✓
Cervus cf. *leptodus*			✓											
Cervus unicolor (sambar deer)			✓								✓	✓		
C. eldi (Eld's deer)												✓		
Bovidae (buffalo or ox)											✓		✓	✓
Bos gaurus (gaur)			✓											
B. javanicus (banteng)												✓		
Buballus sp. (water buffalo)		✓												
B. bubalis (wild water buffalo)												✓		
Naemorhedus sumatraensis (serow)													✓	✓
Antilope cf. *cervicapra*			✓											

Remarks: [1] Paleontological site in Indochina subregion.

[2] Paleontological site in Sundaic subregion.

[3] Archaeological site in Sundaic subregion.

[4] Archaeological site in Indochina subregion.

Table 1.3 List of Pleistocene mammal species in order Rodent of Thailand from earliest to youngest site.

Kinds of mammals	Age	Before late Pleistocene																		Late Pleistocene		
	Locality	Snake cave[1]	Kao Panam[1]	Kao Takla[1]	Khao Noh[1]	Saraburi[1]	Khao Singto[1]	Kanchanaburi I[1]	Kanchanaburi II[1]	Kao Samngam[1]	Kao Anghin[1]	Khao Chongkra[1]	Khao Klongwan[1]	Khao Tinpet[2]	Ban Nasan[2]	Khao Toi 1[2]	Khao Toi 2[2]	Khao Naphung[2]	Kao Rupchang[2]	Moh Khiew[3]	Lang Kamnn[4]	**Tham Lod**[4]
Rodentia																						✓
Callsciurus finlaysonii (variable squirrel)		✓							✓		✓	✓								✓		
Menetes berdmorei (Indochinese ground squirrel)		✓							✓	✓												
Tamiops cf. *mcclellandi* (Burmese striped tree squirrel)																✓						
Petaurista petaurista (giant flying squirrel)		✓								✓						✓				✓		
Petinomys sp. (flying squirrel)					✓																	
P. setosus (white-bellied flying squirrel)																✓	✓					
Iomys horsfieldi																✓						
Nannosciurus melanotis																✓						
Hylopetes pharei (Phayre's flying squirrel)		✓	✓	✓				✓	✓	✓				✓		✓						

Table 1.3 List of Pleistocene mammal species in order Rodent of Thailand from earliest to youngest site (continued).

Kinds of mammals (Age / Locality)	Before late Pleistocene																		Late Pleistocene		
	Snake cave[1]	Kao Panam[1]	Kao Takla[1]	Khao Noh[1]	Saraburi[1]	Khao Singto[1]	Kanchanaburi I[1]	Kanchanaburi II[1]	Kao Samngam[1]	Kao Anghin[1]	Khao Chongkra[1]	Khao Klongwan[1]	Khao Tinpet[2]	Ban Nasan[2]	Khao Toi 1[2]	Khao Toi 2[2]	Khao Naphung[2]	Kao Rupchang[2]	Moh Khiew[3]	Lang Kamnn[4]	Tham Lod[4]
Hylopetes spadiceus (flying squirrel)	✓	✓	✓				✓	✓	✓				✓		✓		✓	✓			
Menetes berdmorei (Indochina ground squirrel)			✓																		
Belomys pearsonii (hairy-fooded flying squirrel)		✓	✓					✓								✓					
Rhyzomidae																					✓
Cannomys badius (bay bamboo rat)	✓																				
Rhizomys sp. (hoary bamboo rat)																			✓	✓	
Vandeeuria oleraea (long-tailed cane mouse)	✓								✓									✓			
Chiromyscus chiropus (fea's tree rat)	✓																				
Hapalomys sp.									✓												
Hapalomys delacousi	✓																				
H. logicaudatus (marmoset rat)	✓												✓		✓						

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Table 1.3 List of Pleistocene mammal species in order Rodent of Thailand from earliest to youngest site (continued).

Kinds of mammals	Age	Before late Pleistocene																		Late Pleistocene		
	Locality	Snake cave[1]	Kao Panam[1]	Kao Takla[1]	Khao Noh[1]	Saraburi[1]	Khao Singto[1]	Kanchanaburi I[1]	Kanchanaburi II[1]	Kao Samngam[1]	Kao Anghin[1]	Khao Chongkra[1]	Khao Klongwan[1]	Khao Tinpet[2]	Ban Nasan[2]	Khao Toi 1[2]	Khao Toi 2[2]	Khao Naphung[2]	Kao Rupchang[2]	Moh Khiew[3]	Lang Kamnn[4]	**Tham Lod**[4]
Hapalomys khaorupchangi																			✓			
Chiropodomys giliroides (pencil-tailed tree mouse)		✓	✓	✓	✓		✓	✓		✓		✓			✓		✓		✓			
C. maximus														✓								
Vandeleuria leracea														✓								
Pithecheir parvus														✓	✓							
Muridea (mouse and rats)		✓																				
Bandicota savilei (lesser bandicoot rat)		✓								✓							✓					
Mus sp. I (mouse)		✓																				
Mus sp. II (mouse)		✓																	✓			
M. shortridgei (shortrdge's mouse)		✓	✓	✓	✓				✓	✓			✓		✓			✓				
M. pahari (gairdner's sherw-mouse)		✓														✓						

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Table 1.3 List of Pleistocene mammal species in order Rodent of Thailand from earliest to youngest site (continued).

Kinds of mammals — Age	Before late Pleistocene																		Late Pleistocene		
Locality	Snake cave[1]	Kao Panam[1]	Kao Takla[1]	Khao Noh[1]	Saraburi[1]	Khao Singto[1]	Kanchanaburi I[1]	Kanchanaburi II[1]	Kao Samngam[1]	Kao Anghin[1]	Khao Chongkra[1]	Khao Klongwan[1]	Khao Tinpet[2]	Ban Nasan[2]	Khao Toi 1[2]	Khao Toi 2[2]	Khao Naphung[2]	Kao Rupchang[2]	Moh Khiew[3]	Lang Kamnn[4]	**Tham Lod**[4]
Mus cervilor	✓	✓		✓		✓	✓	✓									✓				
M. cookie (Cook's mouse)	✓	✓					✓		✓		✓			✓			✓	✓			
M. caroli (ryukyu mouse)	✓								✓												
M. cf. *niviventer*	✓																✓				
M. surifer (tallow rajah rat)	✓								✓						✓			✓			
Niviventer sp.					✓																
N. bukit (chestnut rat)	✓																				
N. confuianus (white-bellied rat)	✓																				
N. fulvescens						✓		✓						✓	✓			✓			
Rattus sp.	✓				✓			✓													
R. argentiventer (rice field rat)	✓																				

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Table 1.3 List of Pleistocene mammal species in order Rodent of Thailand from earliest to youngest site (continued).

Kinds of mammals	Age	Before late Pleistocene																		Late Pleistocene		
	Locality	Snake cave[1]	Kao Panam[1]	Kao Takla[1]	Khao Noh[1]	Saraburi[1]	Khao Singto[1]	Kanchanaburi I[1]	Kanchanaburi II[1]	Kao Samngam[1]	Kao Anghin[1]	Khao Chongkra[1]	Khao Klongwan[1]	Khao Tinpet[2]	Ban Nasan[2]	Khao Toi 1[2]	Khao Toi 2[2]	Khao Naphung[2]	Kao Rupchang[2]	Moh Khiew[3]	Lang Kamnn[4]	Tham Lod[4]
Ratus jaegeri										✓	✓											
R. rattus (roof rat)		✓																				
R. kortensis		✓																				
R. sikkimensis			✓	✓	✓				✓						✓	✓			✓			
Leopoldamys sp.											✓									✓		
L. minutus										✓												
L. sabanus (noisy rat)		✓						✓	✓					✓		✓						
Haromys humei			✓		✓													✓	✓			
Rhinosciurus laticaudatus										✓												
Ratchaburimys ruchae						✓				✓	✓		✓									
Prohadromys varavudhi										✓												

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Table 1.3 List of Pleistocene mammal species in order Rodent of Thailand from earliest to youngest site (continued).

Kinds of mammals	Age	Before late Pleistocene																	Late Pleistocene		
	Locality	Snake cave[1]	Kao Panam[1]	Kao Takla[1]	Khao Noh[1]	Saraburi[1]	Khao Singto[1]	Kanchanaburi I[1]	Kanchanaburi II[1]	Kao Samngam[1]	Kao Anghin[1]	Khao Chongkra[1]	Khao Klongwan[1]	Khao Tinpet[2]	Ban Nasan[2]	Khao Toi 1[2]	Khao Toi 2[2]	Khao Naphung[2]	Kao Rupchang[2]	Moh Khiew[3]	Lang Kamnn[4]	**Tham Lod**[4]
Saidomys siamensis										✓			✓									
Pithecheir penisularis																			✓			
Hystrix sp. (porcupines)																				✓		✓
H. hodgosoni		✓																				
H. hodgosoni subcristatus		✓																				

Remarks: [1] Paleontological site in Indochina subregion.

[2] Paleontological site in Sundaic subregion.

[3] Archaeological site in Sundaic subregion.

[4] Archaeological site in Indochina subregion.

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1.4.4 Recent biogeographical context of Thailand

According to Sclater (1858) and Wallace (1876), the world today is divided to 6 zoogeographic regions. Faunas ranging in South Asia, Southeast Asia, and South China have been divided into the Oriental zoogeographic region which was divided to 4 subregions. Thailand straddles 2 subregions which have Kra isthmus being boundary: Indochina and Sundaic subregion. The Indochina subregion is the northern part locating upon Kra isthmus which covers northern part of Thailand, Myanmar, Cambodia, Loas, Vietnam, and South China. In addition, the Sundaic subregion locates below Kra isthmus and covers the southern part of Thailand, Malaysia, Sumatra, Java, and Borneo (Lekagul and McNeely, 1988), see Figure 1.10.

The wild animals in northern Thailand including the around the Tham Lod rockshelter are divided into the Indochina subregion (Lao Yi Pa and Tacumma, 2000). Indochina subregion displays presently 198 species of Thai mammals, nearly 80% of the total 249 species (Lekagul and McNeely, 1988). Lekagul and McNeely (1988) reported that Indochina endemic mammals include *Dendrogale murina* (smooth-tailed treeshrew), *Pteropus lylei* (Lyle's flying fox), *Craseonycteris thonglongyai* (Kitti's hog-nosed bat), *Rhinolophus thomasi* (Thomas' horseshoe bat), *R. luctus* (great horseshoe bat), *R. marshalli* (Marshall's horseshoe bat), *R. paradoxolophus* (Bourret's horseshoe bat), *Hipposideros lekaguli* (Boonsong's roundleaf bat), *Myotis rosseti* (thick-thumbed bat), *Eptesicus pachyotis* (thick-eared bat), *Presbytis phayrei* (Phayre's langur), *Hylobates pileatus* (pileated gibbon), *Callosciurus finlaysoni* (variable squirrel), *Tamiops rodolphei* (Cambodian stripped tree squirrel), *Bandicota savilei* (lesser bandicoot rat), *Ratus berdmorei* (lesser white-toothed rat), *R. hinpoon* (limestone rat), *R. mackensiei* (Kenneth's white-toothed rat), *R. neilli* (Neill's rat), *Mus cookie* (Cook's mouse), *M. shortridgei* (Shortridge's mouse), *Petaurista alborufus* (red and white giant flying squirrel), *Cervus schomburgki* (Schomburgk's deer), and *Bos gaurus* (gaur).

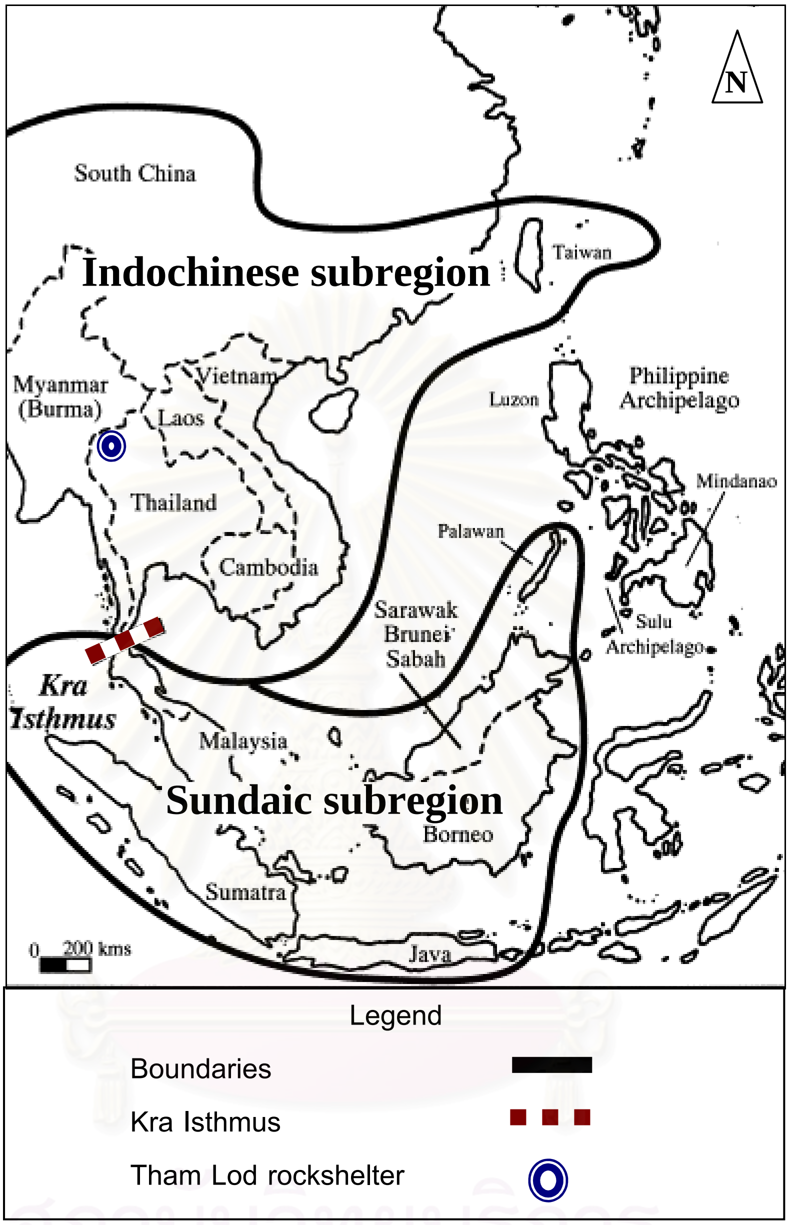

Figure 1.10 Map of Southeast Asia showing the boundaries of the Indochina and Sundaic subregion, Kra isthmus being terrestrial boundary between these subregions, and position of the Tham Lod rockshelter (modified from Tougard, 2001).

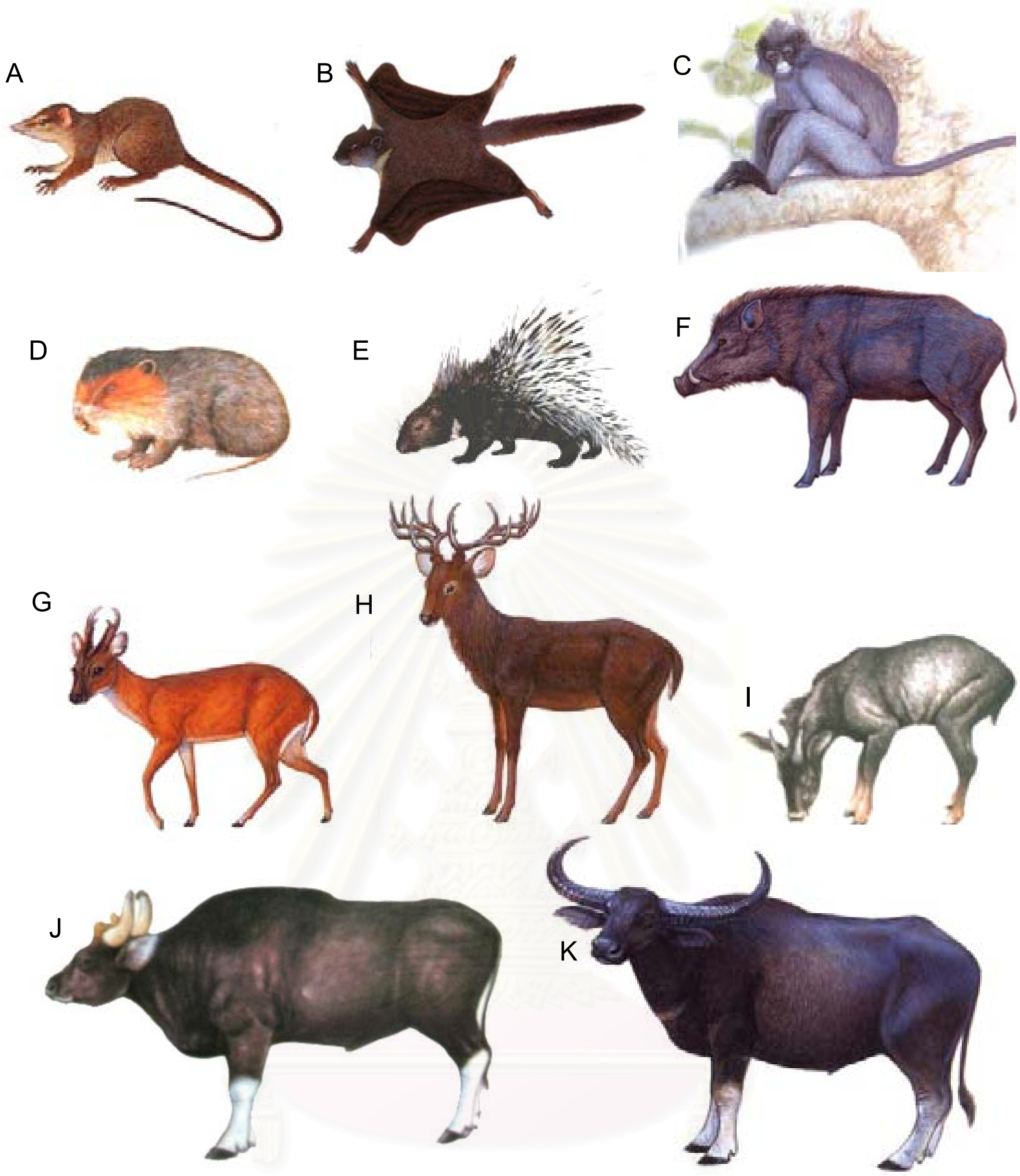

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Figure 1.11 Example of mammals found in Indochina subregion which covering northern of Thailand, A: *Dendrogale murina* (Northern Smooth-tailed Treehrew), B: *Hyloetes alboniger* (parti-coloured flyin squirrel), C: *Semnopihecus cristaus* (Phayre's langur),D: *Rhizomys proinosus* (large bamboorat), E: *Hystrix brachyuran* (East Asian procupine), F: *Sus scrofa* (wild pig), G: *Muntiacus muntjak* (red muntjac), H: *Cervus schomburgki* (Schomburgk's deer), I: *Naemorhedus sumatraensis* (Southern serow), J: *Bos gaurus* (gaur), and K: *B. bubalis* (wild water buffalo). A-C and H are endemic species of Indochina subregion.

1.4.5 Basic Knowledge of mammal teeth

Basic knowledge of mammal teeth in this study follows Hilson (1990) and Martin, Pine, and DeBlase (2001) which show in below.

1.4.5.1 Tooth anatomy and replacement

Tooth consist of 2 main elements, crown and root (or roots), see Figure 1.11. The **crown** is the only part actually protruding into the mouth. The crown may become wider, taller, or flatter. It may include extra mounds, known as the **cusps**. There are the **gums** or the **gingivae** that are gathered up around the base of the crowns.

The **roots** are firmly held in the bony sockets of the jaws, the **alveolus**. The **cervical** region or neck of the tooth is the point where crown meets root. In many teeth, the crown bulges out just above this point.

The major portion of each tooth is made up of a bonelike material called the **dentine**. The crown has a thin crystalline tissue layer of hard, usually white, the **enamel**, covering the dentine, and a layer of bonelike the **cementum** covers the root. The central, living portion of a growing tooth, the **pulp**, is supplied with blood vessels and nerves through one or more opening in the base.

Tooth sockets are enclosed in heavily built bony jaw structures. The upper jaw is composed of extensions of the maxillae and premaxilae, bones making most of the face or sides of the snout, as well as the palate. Bones called the mandibles (Figure 1.12 and 1.13) form the lower jaw in mammals.

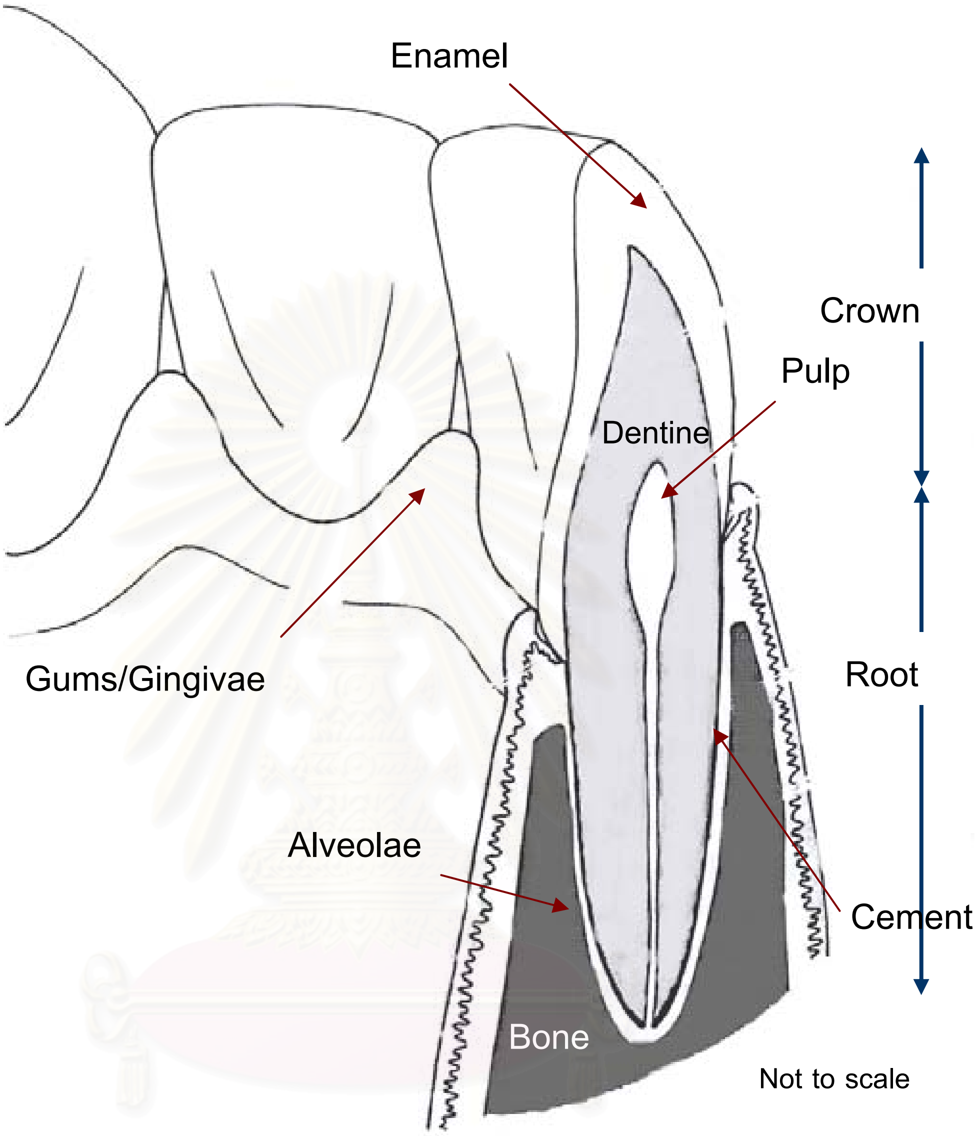

Figure 1.12 Diagrammatic cross section of mammalian incisor tooth, (Hilson, 1990).

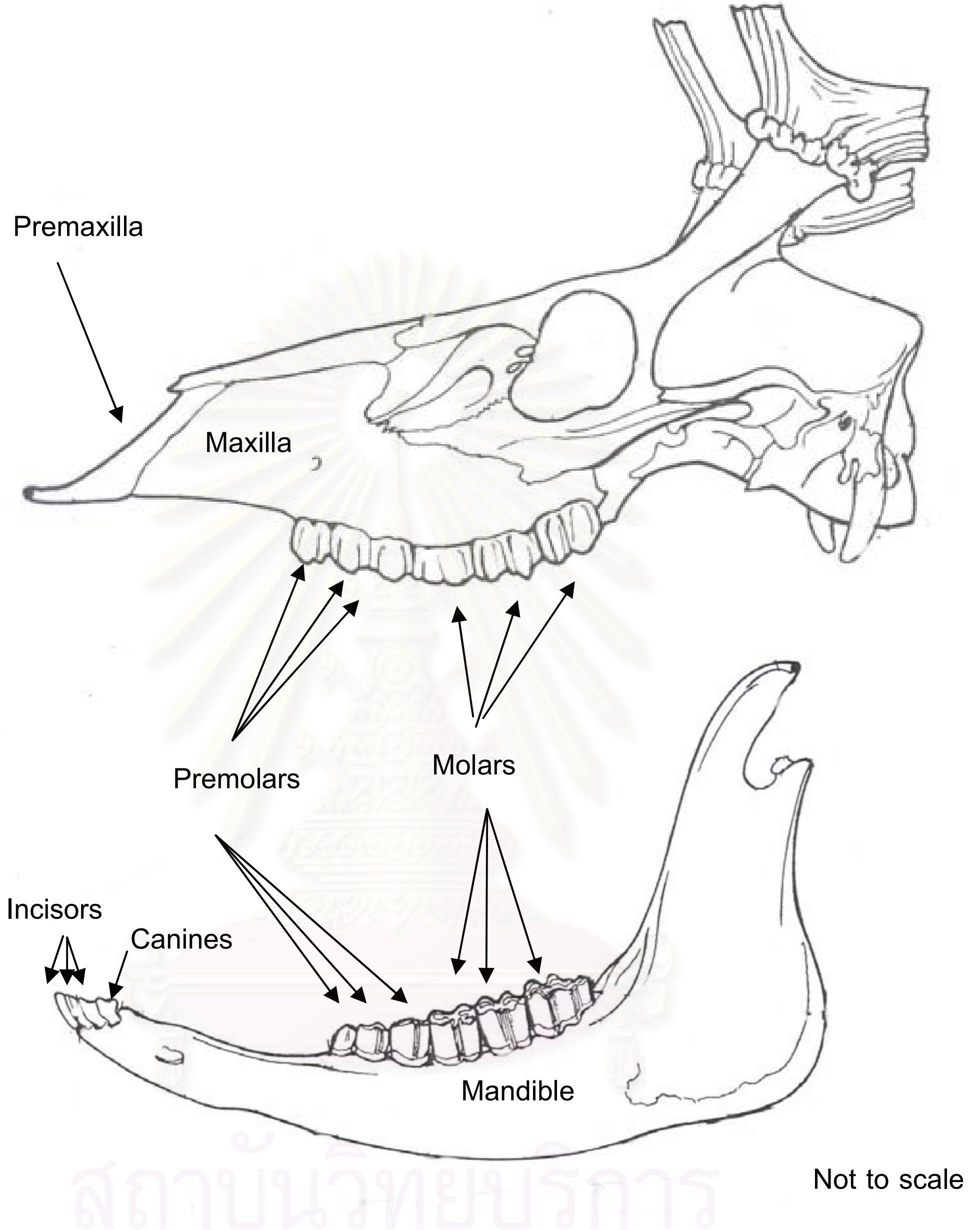

Figure 1.13 Teeth position on cranium and mandible of deer (*Cervus* sp.), lateral view (von den Driensch, 1976).

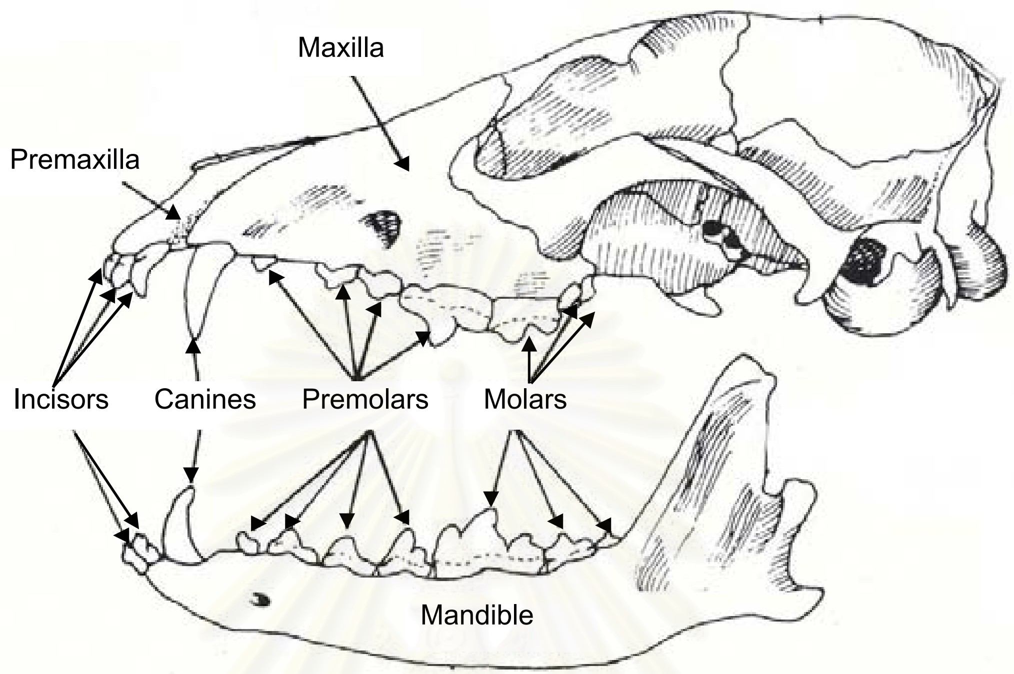

Figure 1.14 Teeth position on cranium and mandible of dog (*Canis* sp.), lateral view (Lekagul and McNeely, 1988).

Different types of teeth are arranged into rows. The complete set is called a dentition. In plan, the tooth rows for an arch or loop in each jaw, the dental arcade (Figure 1.14). Each tooth series is more or less symmetrical on each side. A tooth from the left side is mirror image of the equivalent t tooth on the right side. So, as in the rest of the vertebrate body, it is possible to divide the dentition into two halves, equal, but opposite in form. The imaginary surface separating the two halves is called the **median sagittal plane**. In each jaw, the direction along the dental arcade that is towards the sagittal plane is called the **mesial**. The opposite direction, round the arcade away from the sagittal plane is the **distal**. So, one tooth can be described as distal to another, and its distal surface can be pointed out. In the same way, the **lingual** means the side next to the tongue inside the arcade (palatal may be used instead of lingual in the upper jaw). The **Buccal** or the **labial** refer to the side facing the cheeks or lips respectively. The remaining surface, facing the teeth in the other jaw, is called the **occlusal**.

Most mammals are diphyodont, having two dentitions. The first is called the **deciduous dentition** into the mouth before birth, or shortly afterward. The **permanent dentition** is growing in the jaws beneath. Gradually, teeth from this second series replace the deciduous whose roots are resorbed and crowns shed into the mouth. No all mammals have a deciduous dentition. Many rodents, for example, do not have a function one.

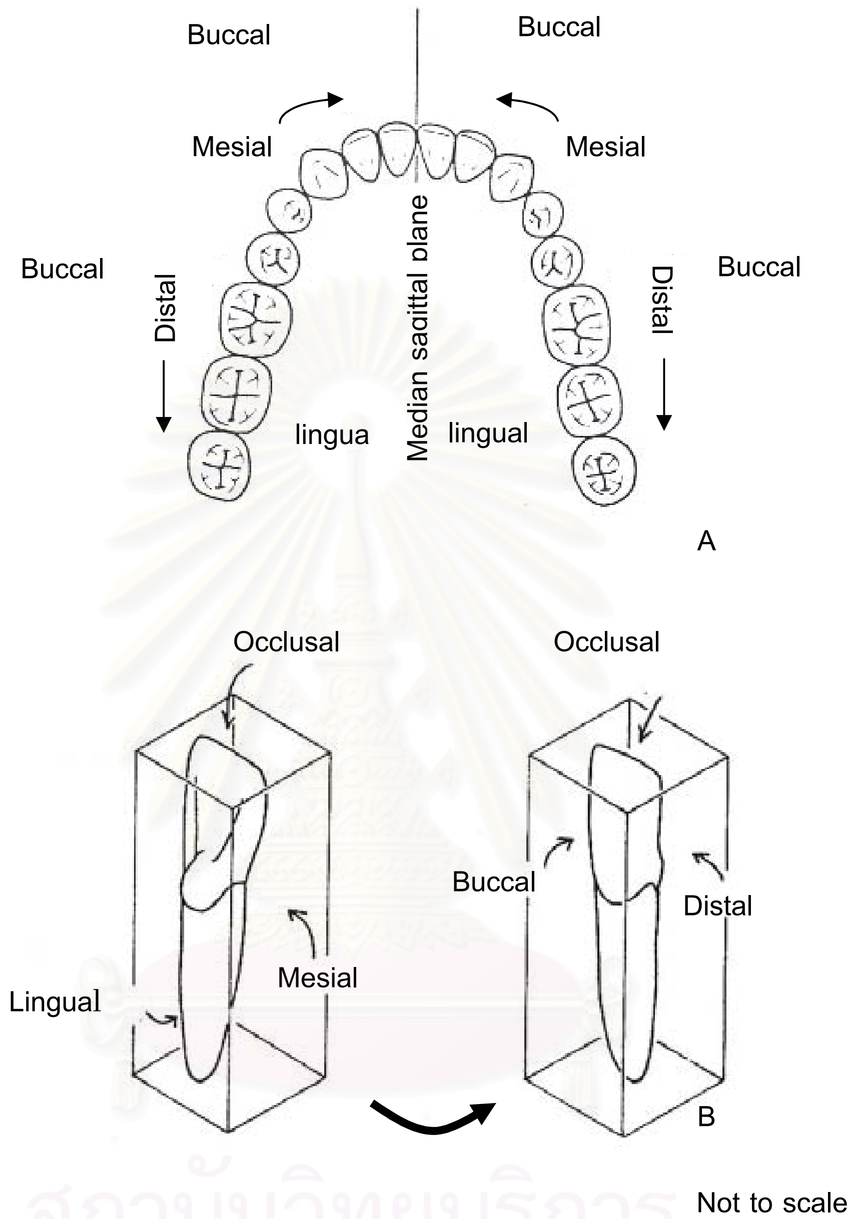

Figure 1.15 A and B The dental arcade (Hilson, 1990).

1.4.5.2 The Kinds of teeth

In mammals, four basic kinds of teeth are compose of incisors, canines, premolars, and molars (Figure 1.15).

1) Incisors (I)

Incisors are the teeth rooted in the premaxillae and the corresponding teeth in the lower jaw. Almost mammals, especially placental mammals, never have more than three incisors in each jaw quadrant. These are usually the unicuspid teeth with a single root, but in some groups of mammals, accessory cusps, additional roots or both may be present. Incisors are generally chisel-shaped teeth that function primarily for nipping (e.g., a human biting an apple or horse cropping grass). In ruminant, this nipping action has been modified by loss of the upper incisor. In rodents, the number of incisors has been reduced.

2) Canines (C)

Canines are the most anterior the teeth rooted in the maxillary bone and the corresponding teeth of the lower jaw. They never number more than one per quadrant. Canines are usually long, conspicuous, unicusps teeth with a single root. Canines are usually used to capture, hold, are kill prey. In herbivorous species, they are frequently reduced or absent. Frequently canines and/or other teeth are absent, leaving a wide space between the anterior teeth and the cheek teeth. Any such wide gap between teeth is termed a **diastema**.

3) Premolars (P)

Premolars are situated just posterior to the canines. They may have one, two or more roots and may have simple or highly complex crowns. Premolars often take on the form of molars but they usually are smaller than molars and have fewer cusps

4) Molars (M)

Molars are situated posterior to the premolar. They usually have several roots and complete crowns.

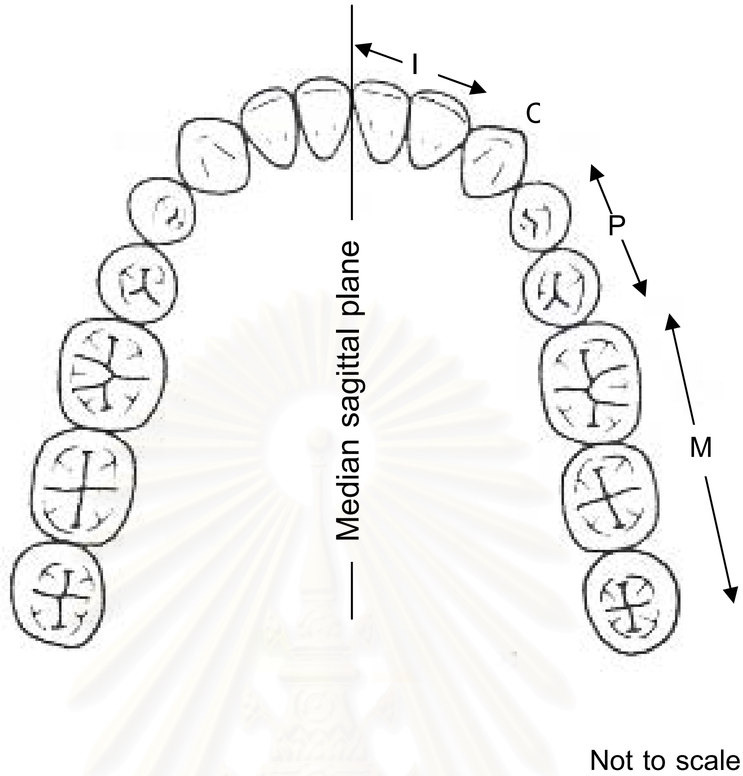

Figure 1.16 Occlusal view of human teeth, showing the general position and characteristic of incisor (I), canine (C), premolar (P), and molar (M) in occlusal view (Hilson, 1990).

Premolars and molars frequently are referred to together as **cheek teeth**, **postcanine teeth**, or **molariform** teeth. Because cheek teeth do the major job of masticating food, they are the teeth that exhibit the greatest diversity correlated with diet. These teeth usually have the greatest degree of specialization in cusp patterns and ridges associated with a particular feeding niche that are one of the most important criteria in mammalian classification. Bunodont, lophodont, slenodont, hypsodont, and carnassial are main specialization of cheek teeth.

In occlusal view of cheek teeth, the upper and lower teeth row is different in feature and position of cusps. The cusp of upper is named hypocone, metacone, paracone, and protocone and lower is entoconid, hypoconid, hypoconulid, metaconid, and protoconid.

4.1) Bunodont

The bunodont is teeth that characterize the rounded cusps. It is quadrate, frequently low-crowned teeth and has four major rounded cusps, (see Figure 1.16). An alternative to cutting up food by shearing of sharp crests is crushing or grinding between sets of bunodont molars. So the bunodont tooth is found in many mammals that are omnivorous such as primates, bears, and pig. In addition, some generalized carnivores within family Mustelidae, Viverridae, and Canidae have some bunodont teeth, or bunodont elements of teeth, used for crushing bone and other hard tissue. Some bunodont displays minor cusp between hypoconid and metaconid in lower jaw, named hypoconulid

4.2) Lophodont

Many herbivorous mammals have lophodont teeth in which cusps fuse to form elongated ridges, termed **lophs.** These ridges create elongated abrasive surfaces for the grinding of plant materials. In addition, they are variable in shape and may be transversely oriented. The animals have lophodont that are rodents, elephant, and rhinoceros (see Figure 1.17 and 1.18).

4.3) Slenodont

A selenodont (Figure 1.19) tooth has function in much the same manner with lophodont but in it each ridge is formed by the elongation of a single cusp, that a loph of slenodont called **infudibulum**. The ridges of selenodont teeth are always crescent-shaped and longitudinally oriented. In these teeth, the hard ridges of enamel wear away more slowly than the surrounding tissues and provide a grinding surface similar to that of a millstone. All mammals of family Cervidae that is group of deer display slenodont teeth.

4.4) Hypsodont

In mammals that tend toward an herbivorous diet, the cheek teeth are frequently **hypsodont.** The abrasive action of plant material quickly erodes teeth, so the higher the crown, the longer the tooth will last. Some herbivorous mammals, particularly grazers, have cheek teeth that are rootless and continue to grow throughout life as they are worn away at the top. A Hypsodont tooth is discovered in family Bovidae; group of cattle, sheep and goat and family Equidae; group of horse, see Figure 1.20.

4.5) Carnassial

Carnassial is cheek teeth modified for a carnivorous diet that is reduced secondarily to two major cusps. The upper and lower teeth working together, provide a scissors action for shearing flesh. The term carnassial has two meanings: the **carnassial** or the **secoundont dentition** is the general type of dentition found in mammals whose main diet is flesh. The **carnassial pair** or the **carnassial teeth**, found only in order Carnivora, are the two teeth on each side that do most of the shearing. In living carnivores, these teeth are the fourth upper premolar and the first lower molar in the adult dentition and the third upper and the fourth lower premolars in the milk dentition (Figure 1.21)

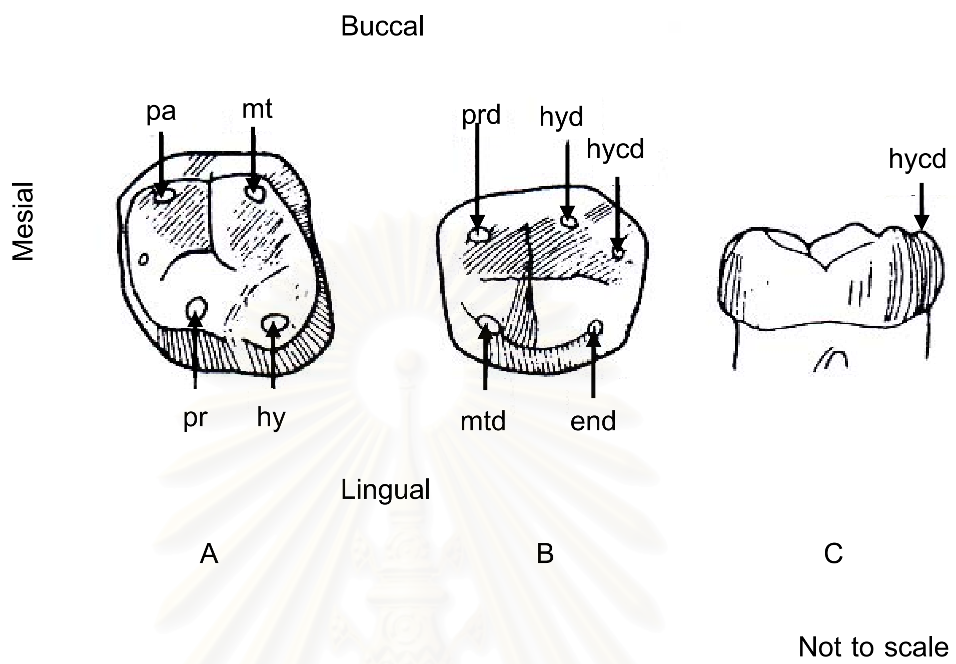

Figure 1.17 Bunodont of human (*Homo sapiens*), occlusal view of left upper molar (A) and occlusal view and buccal view of right lower molar (B and C): hyp, hypocone; mt, metacone; pa, paracone; and pr, protocone, Lower: end, entoconid; hyd, hypoconid; hycd, hypoconulid; mtd, metaconid; and prd, protoconid (Martine et. al., 2001).

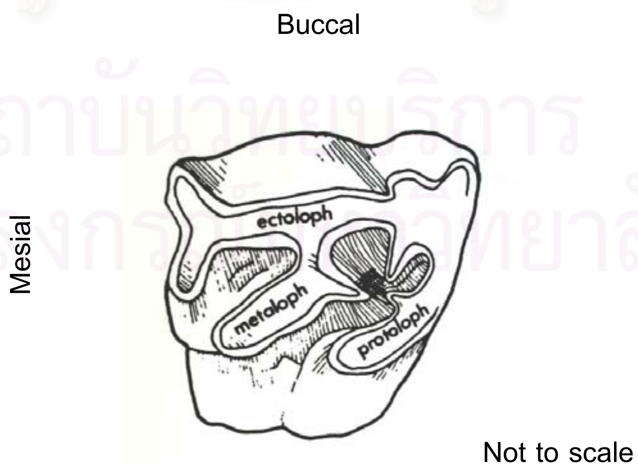

Figure 1.18 Lophodont molar tooth of a rhinoceros (order Perisodactyla), occlusal view (Martine et. al., 2001).

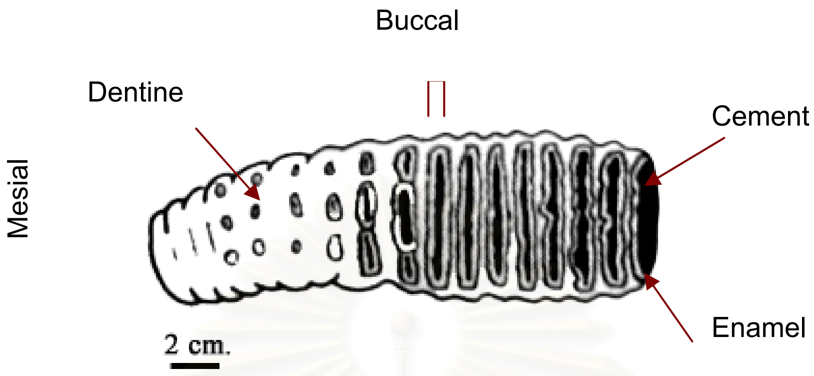

Figure 1.19 Occlusal view of an Asian elephant (*Elephanus maximus*), with a lophodont surface (Hilson, 1990).

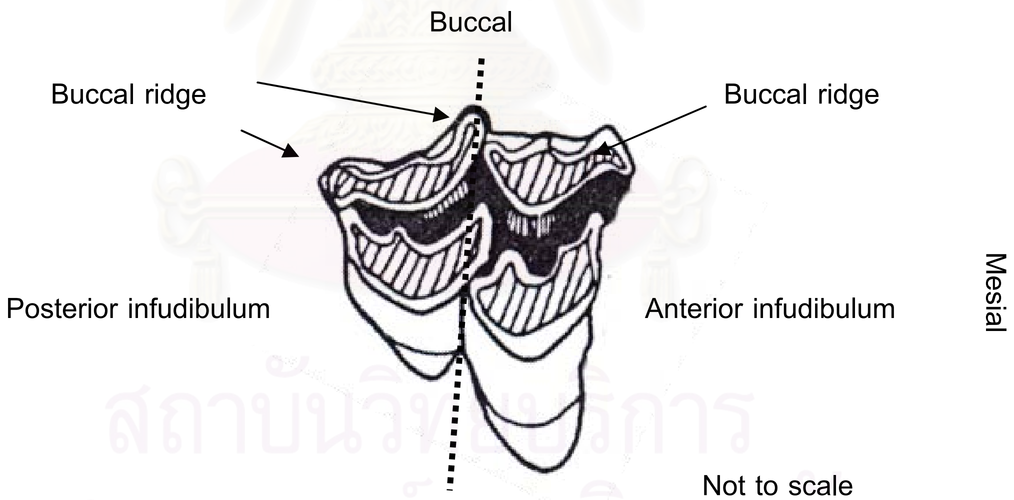

Figure 1.20 Occlusal view, slenodont upper molar tooth of roe deer or *Capreolus capreolus* (Martine et. al., 2001).

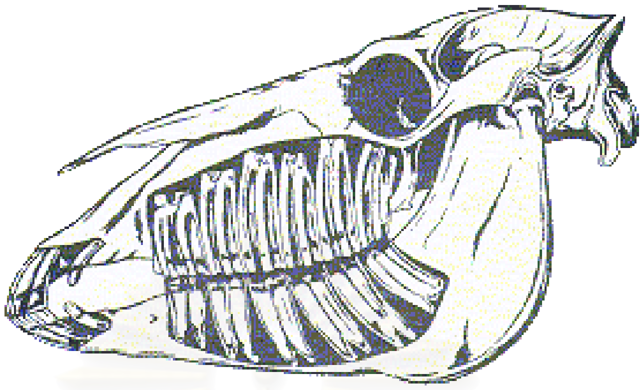

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Figure 1.21 Hypsodont of horse or *Equus* sp. (Available from http://www.vet.purdue.edu/horses/teeth\).

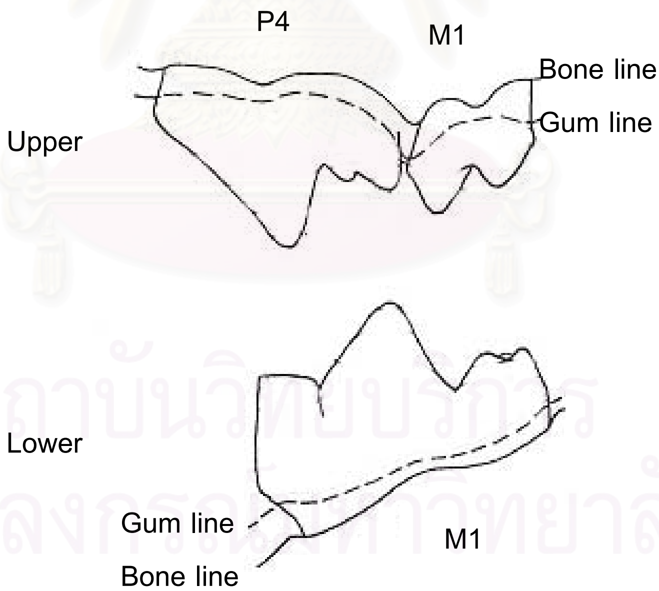

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Figure 1.22 Carnassial teeth of wolf or *Canis* sp., buccal view (Available from http://www.wolfsongalaska.org/graphics/age/teeth_schematic2.jpg)

CHAPTER II

GEOLOGY AND PRESENT ENVIRONMENT AT THE THAM LOD ROCKSHELTER

The tham Lod rockshelter locates at Pang Mapha district, Mae Hong Son province, northwestern of Thailand which is one of oldest site in Thailand. The Highland Archaeology Project in Pang Mapha district, Mae Hong Son Province Phase I (supported by the Thailand Research Fund) was discovered and excavated this site in 2001 and 2002 respectively. Geographically, the Tham Lod rockshelter is in the Lang river basin which has also been well known for the spectacular mountainous surroundings and wildlife resource. Furthermore, the natural environment including climate, forest, mammal, and topography are also very diverse.

This chapter provides background on data of geology, excavation and environment in the Tham Lod rockshelter and adjacent area in order to use to reconstruction environment. It is divided into 2 major topics. First topic focuses on geological study in local scale, excavation and dating analysis at the Tham Lod rockshelter including evidence analysis (e.g. palynological, shell, and former mammal research). Last topic provides information on climate, forest, and mammal in the recent time.

2.1 Geology of the Tham Lod rockshelter area

2.1.1 Geographical overviews

The topography of the Tham Lod rockshelter displays approximately 90% high mountainous and 10% valleys. This area is characterized by rugged topography with elevation ranging 600 to 1,170 m above mean sea level. The highest mountain in this area is Doi San Kai about 1,170 m above mean sea level. The study area is a part of the Thanon Thongchai mountain ranges that extend along a north-south orientation from the Shan States in Burma to the Malaysian peninsular.

From the geographical perspective, the Tham Lod rockshelter is located at base of an over-hanging Permain limestone cliff, which is approximately 20 m high. The floor of the rockshelter is a flat area that is about 10 m across and extends about 4 m from base of the cliff to the drip-line, and is interspersed with large boulder. The site is currently less than 100 m away from the Lang River, the main river in the area, and is over 20 m above the highest water level.

Lang River lies north-south along mountainous orientation, passes the Tham Lod rockshelter site through the Tham Lod cave and then heads southwest. It is described as a component of the greater Salawin River catchment area. Within the study area, Lang River is approximately 5-10 m wide. During the rainy season, it drains a lot of water and flow swiftly.

2.1.2 Geological setting and geomorphology

Khaokhiew (2004) interpreted geological setting and geomorphology at the Tham Lod rockshelter by aerial photos and investigation. According to aerial photo interpretation, fault line in north-south direction was interpreted as contact boundary between clastic and non-clastic rock mountain (Figure 2.1).

Permain limestone exposes in the western part of Lang River. Generally, the limestone is easily eroded and highly weathered making the karst topography, cave, rockshelter, and doline. Based on this morphologic feature, the cave and rockshelter are landscapes which the prehistoric people often used as habitation site. For the study area, it is situated in a collapse open doline (not closed depressions), nearly circular shape (about 100 m of diameter) with the elevation ranging from 600-640 m above mean sea level. Beside, the sediment was deposited in doline which formed in non-soluble rock. Non-soluble rock was caused by solution of a buried karst mixed with a thick high terrace deposit.

In the east of Lang River, the clastic rocks are composed of sandstone mudstone, shale and chert, and referred to Permo-Carboniferous age. On the geomorphologic characteristic, they are characterized by the high mountain ranges with north to south trending. The elevation of mountain ranges from 600-1,070 m above mean sea level, and is called by local people “Doi San Kai”. From the geological investigation on this unit, a lot of stone tools were found on the top of the mountain.

Quaternary sediments appear as small area along Lang River. The sediments are semi-consolidated and unconsolidated such as sand, silt, clay, gravel etc. Sediments formed as terrace and flood plain deposits in the western part along Lang River. Terrace deposits are recognized as unpaired terrace which consists of high, middle and low terrace. Whereas, floodplain deposits are composed of gravel, sand, and sandy silt (see Figure 2.2).

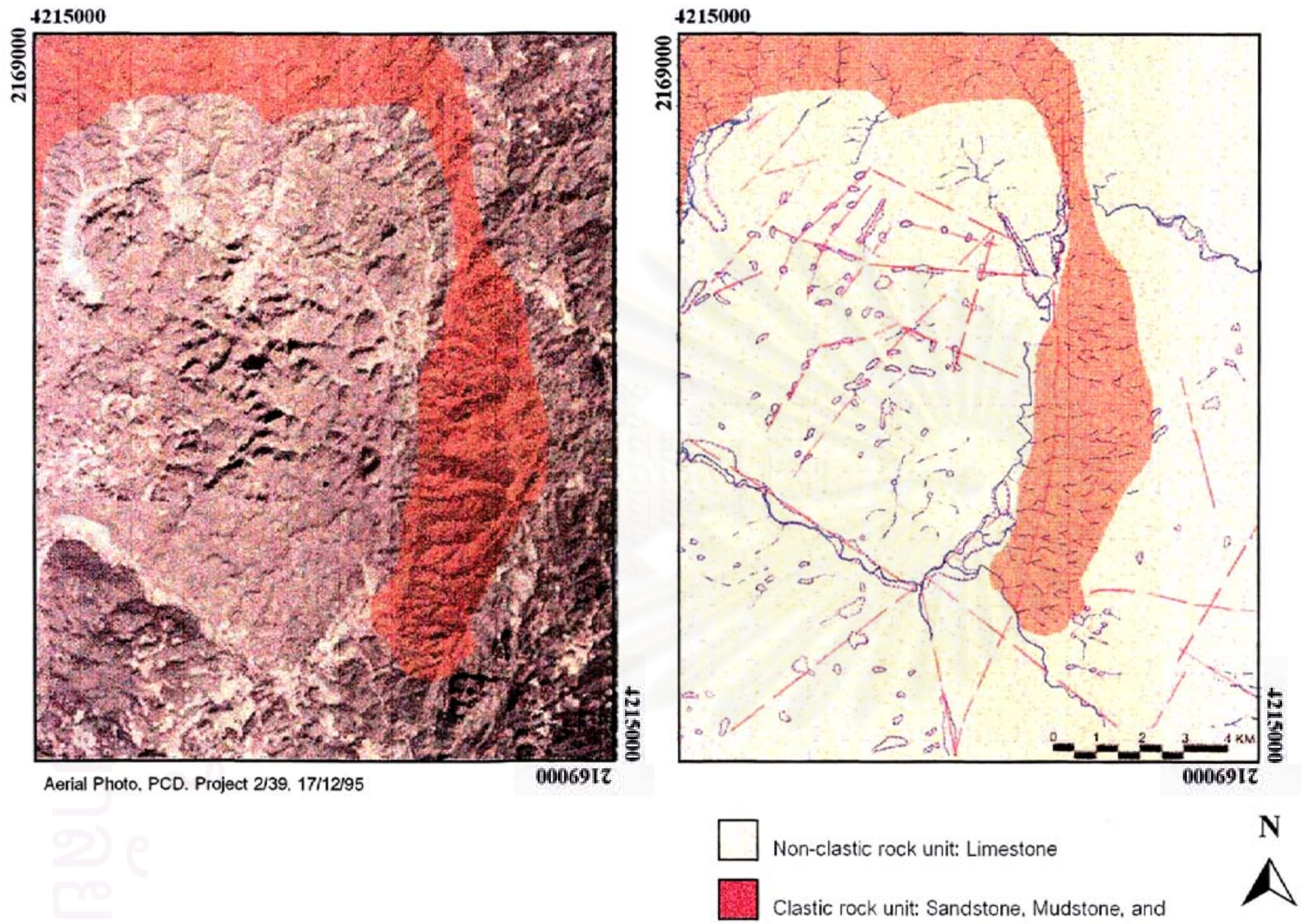

Figure 2.1 Geologic map from aerial photo interpretation showing the distribution of limestone and clastic rock units (Khaokhiew, 2004).

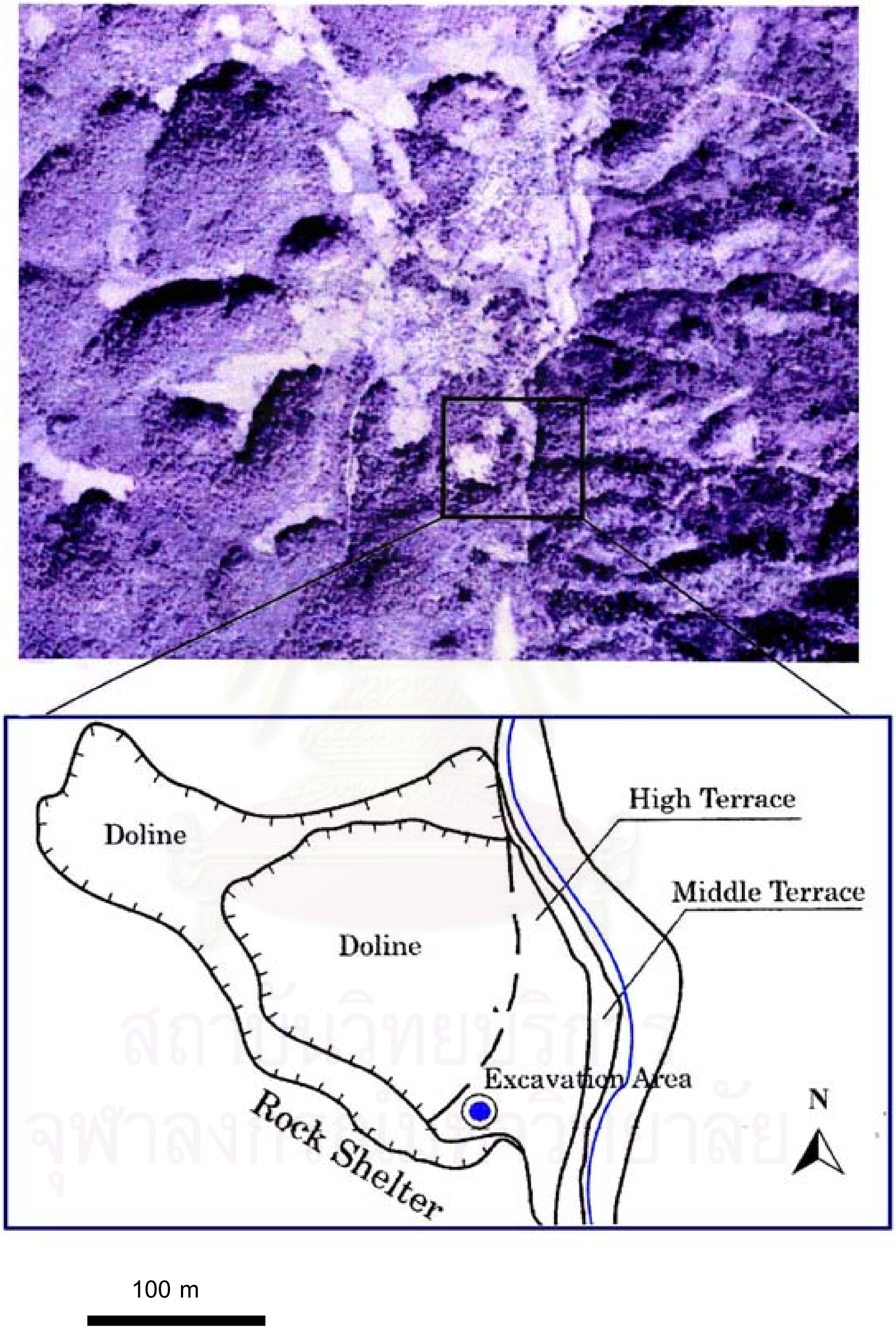

Figure 2.2 Showing the geomorphological feature such as terrace, doline in the study area (Khaokhiew, 2004).

2.1.3 Excavation and analysis at the Tham Lod rockshelter

In 2001, the Highland Archaeology Project in Pang Mapha district, Mae Hong Son Province Phase I (supported by the Thailand Research Fund) discovered many archaeological evidences such as stone tools, shred fragments, animal bones spread on surface at the Tham Lod rockshelter and firstly presumed temporary settlement of the ancient human (Shoocongdej et al., 2003b). Then in 2002, the Tham Lod rockshelter was excavated 3 areas by the Highland archaeology project I, a large number of evidence were found which indicated that these areas especially area 1 were the most usable area such as the temporary settlement and functions as food preparation area, lithic workshop, burial area etc. Alongside, the other areas (area 2 and 3) were considered as being the food preparation area and lithic workshop (Shoocongdej et al., 2003a; Klaowkamput, 2003). A horizontal grid system was employed by establishing base lines to the north-south of the site for detail trenching (Shoocongdej et al., 2003a). The area 1 was divided to 8 stratigraphic layers (Shoocongdej et al., 2003a and Klaowkamput, 2003).

The age of the Tham Lod rockshelter dated from during late Pleistocene to Holocene. (Shoocongdej et al., 2003, 2007; Khaokhiew 2004; Shoocongdej, 2006). The oldest one is around 35,000 BP and the youngest one is around 2,900 BP. based on Radiocarbon (Accelerator Mass Spectrometric: AMS) and Thermoluminescence dating (TL dating) (Khaokhiew 2004; Shoocongdej, 2006; Shoocongdej et al., 2007).

Klaowkamput (2003 in Shoocongdej et al., 2003), Sirabut and Ampunsri (2004a, 2004b) and Ampunsri (2005a, 2005b, 2006a, 2006b, 2007) identified and analyzed all animal bones in 3 areas. Majority of discovered faunas was mammals, 71.28% of total numbers in only area 1 and 81.69% of total numbers in all 3 areas (Ampunsri, 2004a, 2004b).

Ampunsri (2005a, 2005b, 2006a, 2006b, 2007) primary identified and analyzed in archaeological method. He found medium and small *Sus scrofa*; large, medium and small *Cervus* sp; *Muntiacus* sp.; large and medium buffalo or cow in family Bovidae; *Naemorheus (Capricornis) sumatraensis*; Rhinoceros in family Rhinocerotidae; bears in family Ursidae; cats in family Felidae; medium and small carnivores in order Carnivora; monkeys in order Primate; langurs in subfamily Colobinae, elephants in order Probosidea; porcupines in family Hystricidae; bamboo rats in family Rhyzomidae; and other rodents in the layers. They were in late Pleistocene. According the discovered mammals in area 1 indicates the vegetative cover during late Pleistocene such as the grassland, bamboo, mixed deciduous, hill evergreen, and limestone forest that cloud be more dense than open forest on base found Rhinoceros. Therefore, the paleoenvironment of the Tham Lod rockshelter was quite similar to the present forest in these site (Shoocongdej, 2003, 2007; Ampunsri, 2005a, 2005b, 2006a, 2006b, 2007).

The discovered fauna at the Tham Lod rockshelter showed high diversity of fauna and variety of kind of bone through late Pleistocene, however, cervids are highest numbers of specimens (Ampunsri, 2007). These fauna evidences were indicated to the generalized subsistence strategy and specialized encounter hunting strategies (Ampunsri, 2007). They refer to ancient human hunted the targeted animal especially cervids and used all part of fauna body (Ampunsri, 2007).

The other paleoevironmental studies in the study area are shell study (Krajaejun, 2007) and the palynological studies (Pumichumnong, 2003, 2007; Treekanchanawattana and Pumichumnong, 2005).

In 2006, Sakboworn Tumpeesuwan identified some kinds of shell in the Tham Lod rockshelter including 3 gastropods: *Rhiostoma* sp. (snorket snail), *Meguastenia* sp. (semi-slug), and *Cyclophorus* sp. and 2 freshwater bivalves: *Margaritanopsis laosensis* and *Brotia baccata* (Krajaejun, 2007). They indicate environment in both terrestrial and fluvial environments. These gastropods are recently found in limestone forest. On freshwater bivalve, *Cyclophorus* sp. informs to small rapid river in ravines. Nowadays, all discovered shell is found in Northern of Thailand and Northern of Myanmar. However, *Margaritanopsis laosensis* and *Brotia baccata* may be lost from the recent river in Amphoe Pang Ma Pha which may be ones of paleoenvironment indicator (Krajaejun, 2007).

For palynological studies, Pumichumnong (2003) discovered the spore in family Poaceae from layer 3 and family Fagaceae from layer 3 and 5. After that, Treekanchanawattana and Pumichumnong (2005) founded *Pinus* sp., *Calocedrus* sp., family Cyperaceae, family Poaceae, family Polypodiaceae, family Pteridaceae, *Cyathea* sp., and *Ophioglossum* sp. with some plankton such as *Concentricystes rubinus* in the upper part of layer 3. These discovered pollens indicated that the paleoenvironment in the late Pleistocene is quite similar to the recent. However, the *Pinus* sp. may be indicated the cool temperature during late Pleistocene (Treekanchanawattana and Pumichumnong, 2005; Pumichumnong, 2007).

Figure 2.3 The excavation of the Tham Lod rockshelter; A. Before excavation, B. Excavation during April to July 2002, and C West profile of area 1 after finish excavation (http://highland.trf.or.th; Khaokhiew, 2004)

2.1.4 Stratigraphy and dating analysis

Shoocongdej et al. (2003a, 2007), and Klaowkamput (2003) reported excavation and sediment characteristic of the Tham Lod rockshelter including dating analysis. Totally 19 dating values from 2 dating methods consist of the Accelerator Mass Spectrometry (AMS) radiocarbon (11 values) and Thermoluminescence (TL) method (7 values), see Table 2.1-2.3.

Area 1 (S23 W10) was divided into 8 layers (see Figure 2.4, 2.5, and 2.6). The descriptions of all layers are given from top to bottom as follows:

Layer 1 is a thin layer varied 10 cm in thickness. It partially covers area 1. The character of this layer is brown-gray unconsolidated soil and small number of granule to pebble sizes of limestones. Discovered organic matter is scraps of leaf that mixed in this layer. The archaeological evidences such as potsherds and stone tools were recognized. Animal remains were firstly discovered in this layer and has totally 69 elements. Besides, the present objects were discovered such as fragments of glasses and fragments of can.

Layer 2 is 30-40 cm in thickness and characterized by heterogeneous sediments such as brown unconsolidated soil, granule sizes of limestones, and pebble to cobble size of other stones. This layer is composed of many evidences: beads, shells, stone tools, animal bones, and potsherds. Number of animal bones was increased from layer 1, totally 639 elements. Moreover, little pieces of calcrete spread in lower part of this layer. Although, this layer was not directly dating, however, it was estimated at 2,933±83 BP based on Akita-TL5 samples by TL dating method from the same layer in area 2 at 23-37 cm depth from surface or 460-470 cm dt. (Khaokhiew, 2004; Shoocongdej, 2006, Shoocongdej et al., 2007).

The boundary between layers 2 and 3 contains a lot of mud which indicating flood of the Paleo-Lang River (Khaokhiew, 2004). Khaokhiew (2004) discussed that this boundary is the hiatus between late Pleistocene and Holocene layer. In area 1, none of dating method was analyzed in the hiatus. However, this hiatus also occurs in area 2 and 3. According TL dating of quartz in area 3 showed the age of this hiatus around 10,582±49 BP (Akita-TL4) at 530-540 cm dt. (Khaokhiew, 2004).

Layer 3 is the medium to thick layers and varied 40–100 cm in thickness. It consists of quite dense unconsolidated soil, granule size of limestones, and sediments of pebble to cobble size. In addition, the calcium carbonate with animal bones inside were discovered near the wall of rockshelter. The important evidences in this layer are 2 burials such as burial 1 and 2. They were buried at 40-46 and 64-94 cm depth from surface respectively. Other evidences such as shells, stone tools, and animal bones were increased in amount from layer 2. In addition, totally 7,545 elements of animal bones are discovered. Two dating methods were used in this layer: AMS radiocarbon and TL dating. AMS radiocarbon dating showed 12,100±60 BP (Beta-168223) on organic sediment near tibia of burial 1 at 50 cm depth from surface or 190-196 cm dt. and 13,640±80 BP (Beta-168224) on organic sediment near hip bone of burial 2 at 70 cm depth from surface or 214-234 cm dt. (Shoocongdej et. al., 2003a, 2007; Shoocongdej, 2006). In addition, the TL dating displays 13,422±541 BP (Akita-TL7) on calcrete at 80-90 cm depth from surface or 230-240 cm dt. (Khaokhiew, 2004; Shoocongdej, 2006; Shoocongdej et. al., 2007).

Layer 4 is medium layer varied from 40-50 cm in thickness and composed of brown unconsolidated soil, granule to boulder size of limestones, and small pieces of calcrete. Number of granule to pebble size of limestone were decreased from former layer. According AMS dating method divided it in late Pleistocene epoch with date of 24,920±200 BP (Beta-194122) on shell associated with burnt animal bones, flakes and core at 270-280 cm depth from surface or 420-430 cm dt. (Shoocongdej et al., 2003a, 2007; Shoocongdej, 2006). However, it overlay on the former layer; layer 5 that has younger yield of both AMS and TL dating methods: 22,190±160 BP (Beta-172226) on shell and 22,257±154 BP (Akita-TL12) on quartz sediment. The yield of dating in this layer was consider to erroneous data which was interrupt by rock fall. Thus, the yield of AMS dating method in layer 4 is not considered in the research. According to this layer lay between layer 3 that have 2 AMS dating methods: 12,100±60 BP (Beta-168223) and

13,640±80 BP (Beta-168224) and layer 5. Therefore, layer 4 estimated between 22,190±160 BP (Beta-172226) to 13,640±80 BP (Beta-168224). Evidences such as shells, stone tools, and animal bones were discovered in this layer and increase in number from the upper layer. There are totally 9,897 elements of animal bones.

A large number of calcrete and granule to boulder size of limestone occurred in layer 3 and 4 in area 1 and same layers in area 2 that range between 20-100 cm in thickness (Khaokhiew, 2004), see Figure 2.7. Khaokhiew (2004) explained that it was clearly a product of geological process by limestone blocks or spalls accumulated on the floor of the rockshelter. It indicates the rock fall event in the past. None of dating was undertaken in them. However, they is overlying layer 3 which was dated from organic sediment by AMS and calcrete sediment by TL dating and overlain by layer 5 which was dated from organic sediment by AMS and calcrete sediment by TL dating. Therefore, it is suggested that rock fall was deposited sometime between 22,190±160 BP (Beta-172226) to 13,640±80 BP (Beta-168224).

Based on the evidence of rock fall, it is suggest that neo-tectonic may be the main process making rock fall (Khaokhiew, 2004). According to Charusiri et al. (1998, cited in Khaokhiew, 2004), Thailand has long been recognized as more than 4,000 small to moderate quakes detected in Thailand and nearby. In addition, the Northwestern of Thailand including the study area represented the high density of earthquake since 1983 to 2000. Khaokhiew (2004) discussed that, in the past during late Pleistocene epoch may have intensive of earthquake event seemed to occur in the area. If they were occurred high earthquake may affect for limestone rock fall (Khaokhiew, 2004).

Layer 5 is thin to thick layers and varied from 10-90 cm in thickness. The character of this layer is the hard dense unconsolidated soil mixing with granule sizes of limestones and pieces of calcrete. The archaeological evidences are similar to the one of layer 4. Among all evidences, there are totally 95,352 elements of animal bones. This layer is dated to 22,190±160 BP (Beta-172227 MHSTLAR1-1665) on shell by AMS dating method at 270-280 cm depth from surface or 420-430 cm dt. (Shoocongdej et. al., 2003a, 2007; Shoocongdej, 2006) and 22,257±154 BP (Akita-TL12) on quartz sediment by TL dating methods at 230-240 cm depth from surface or 380-390 cm dt. (Khaokhiew, 2004; Shoocongdej, 2006; Shoocongdej et. al., 2007)

Layer 6 is thin to middle layers and varied from 10-30 cm in thickness. It is characterized by hard dense brown unconsolidated soil mixing with a few amounts of other sediments; granule sizes of limestone, pieces of calcrete, and pebble stones. The discovered evidences such as shells, stone tools, and animal bones were decreased in amount from layer 5. There are totally 142 elements of animal bones. TL dating methods occupying in this layer represented 32,380±292 BP (Akita-TL 10) on calcrete at 300-310 cm depth from surface or 450-460 cm dt. (Khaokhiew, 2004; Shoocongdej, 2006; Shoocongdej et. al., 2007).

Layer 7 is thin layers varied from 10-30 cm in thickness. It consists of quite dense hard unconsolidated and granule-cobble sizes of particle grain. This layer contains a few evidences such as shells, stone tools, and animal bones. There are totally 9 elements of animal bones.

Layer 8 is the bottom layer and varied from 10-150 cm in thickness. Two characteristic of sediments consisted of sticky unconsolidated soil and particles grain in pebble-cobble size in the upper part and lateritic soil in the lower part. None of evidences was found in this layer. AMS dating method occupying in this layer displayed 16,750±70 BP (Beta-17227 MHSTLAR1-1665) on ash at 320-330 cm depth from surface or 470-480 cm dt. However, this layer underlie the layers 6-7 which showed older yield with date of 32,380±292 BP (Akita-TL 10) in layer 6 (Shoocongdej, 2006; Shoocongdej et. al., 2007). Therefore, the yield of AMS dating method from layer 8 is considered to erroneous data because interruption by under water. However, this layer was considered to 35,782±266 BP (Akita-TL 1) based on TL dating method on quartz sediment from level 750-760 cm dt. at layer 4 in area 3, the continuous layer.

Both of layer 7 and upper part of layer 8 are represented by granule-pebble-cobble sediment showing upwards sequences. The sediments are mostly well sorted and sub rounded to rounded grains indicating their depositional environment was once from an old stream passing through the rockshelter (Khaokhiew, 2004).

According to the dating data of each layer, the stratigraphic horizons can be grouped and described into 2 stages of geological time scale at the area 1 (Shoocongdej et. al., 2007), see Table 2.1:

1. Holocene Epoch: the layers 1 to 2.
2. Late Pleistocene Epoch: the layers 3 to 8.

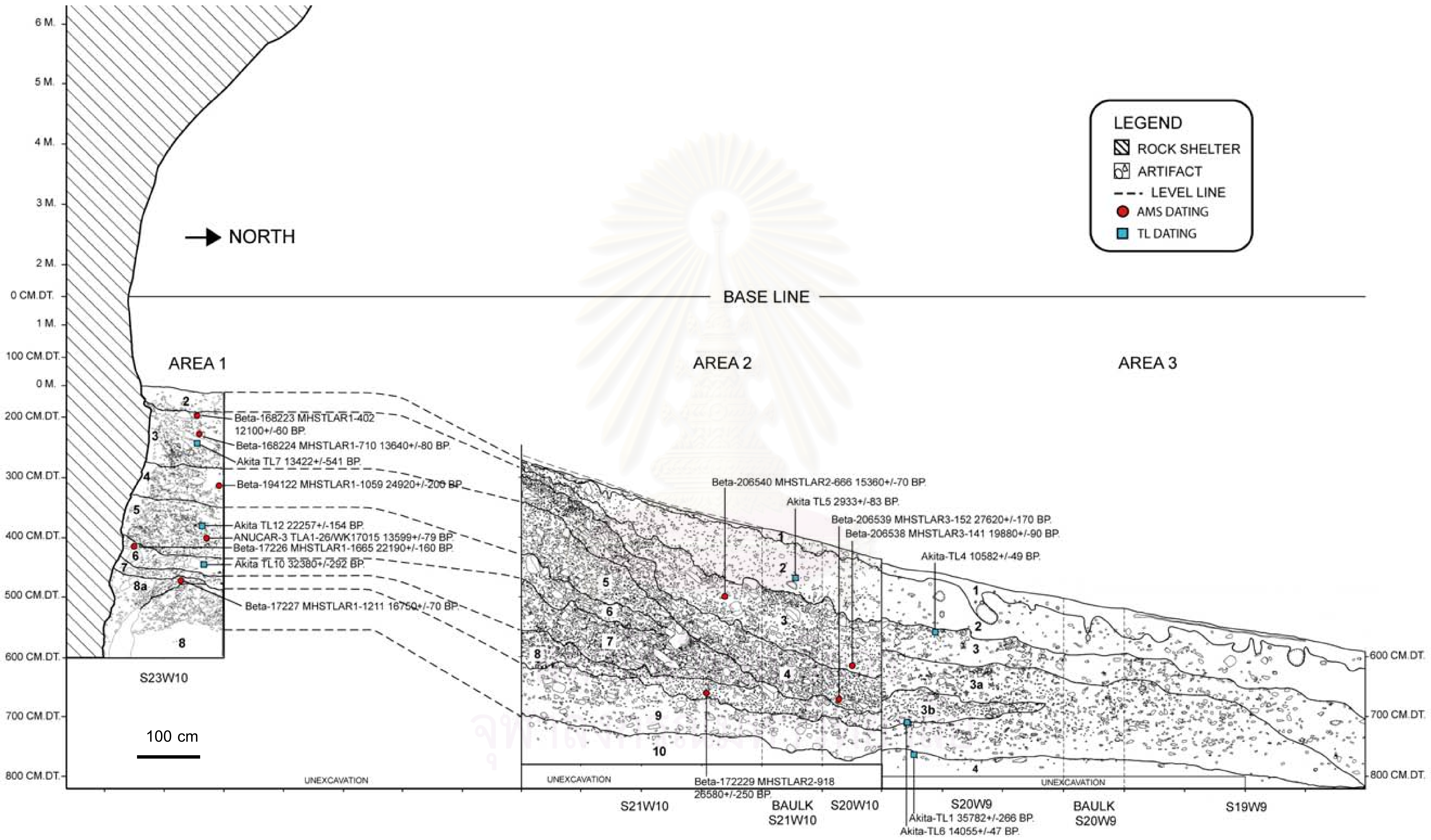

Figure 2.4 West profile of 3 areas of the Tham Lod rockshelter (Shoocongdej et al., 2007)

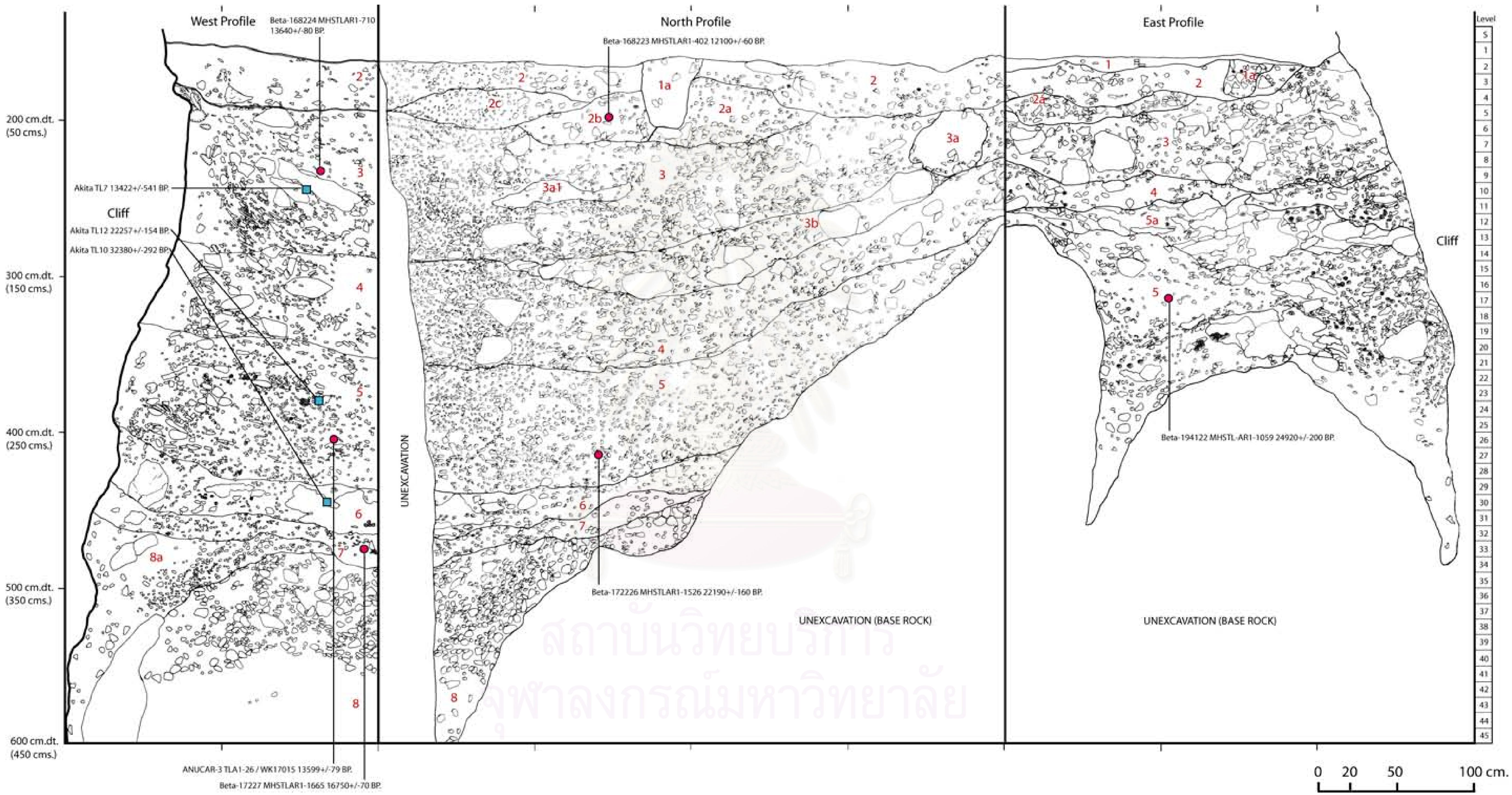

Figure 2.5 Profile of area 1 at the Tham Lod rockshelter (Shoocongdej et al., 2007)

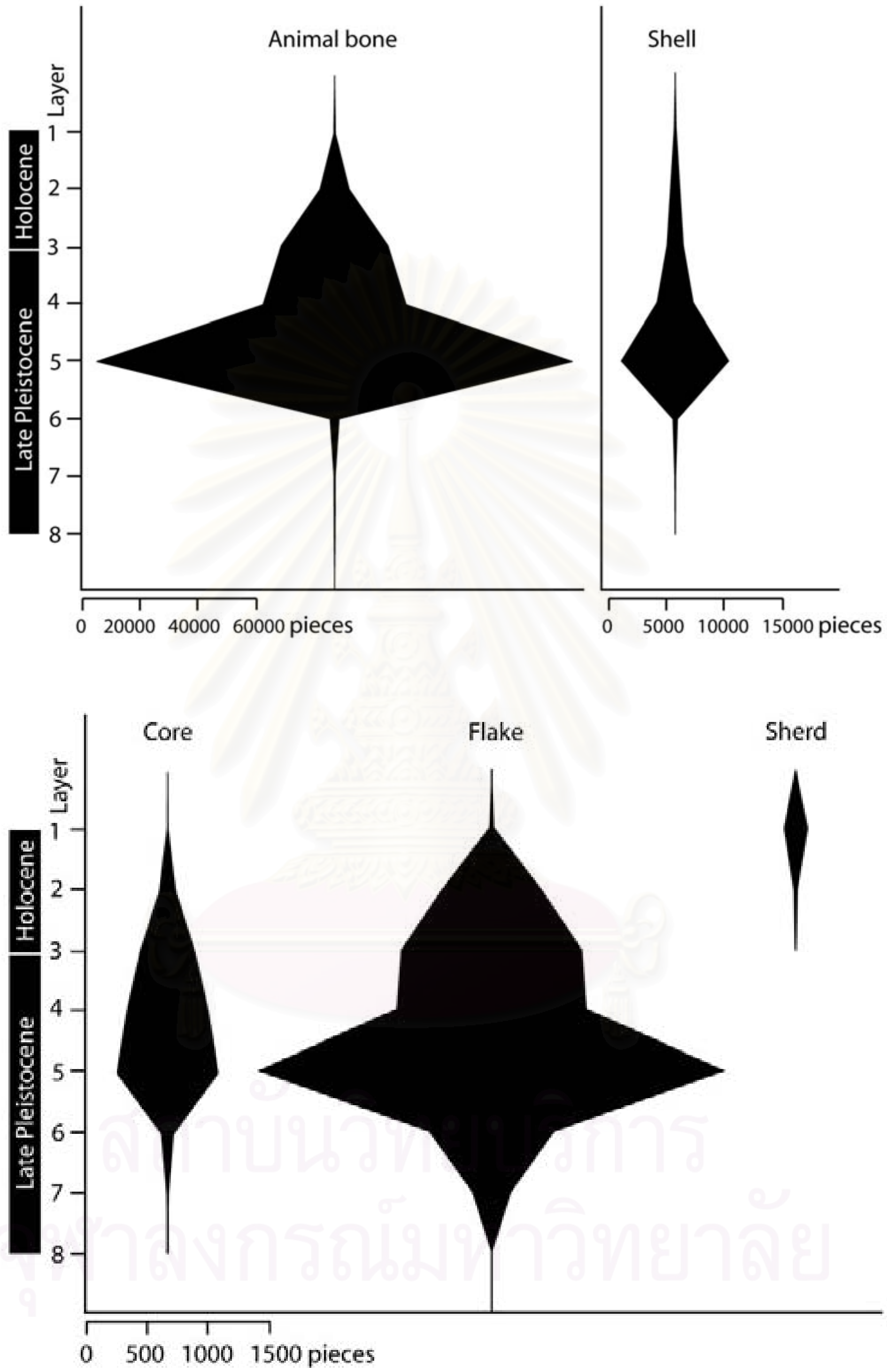

Figure 2.6 Ship graph showing number of animal bones, shells, stone tool (e.g. core, flake), and sherd evidences (Shoocongdej et al., 2007).

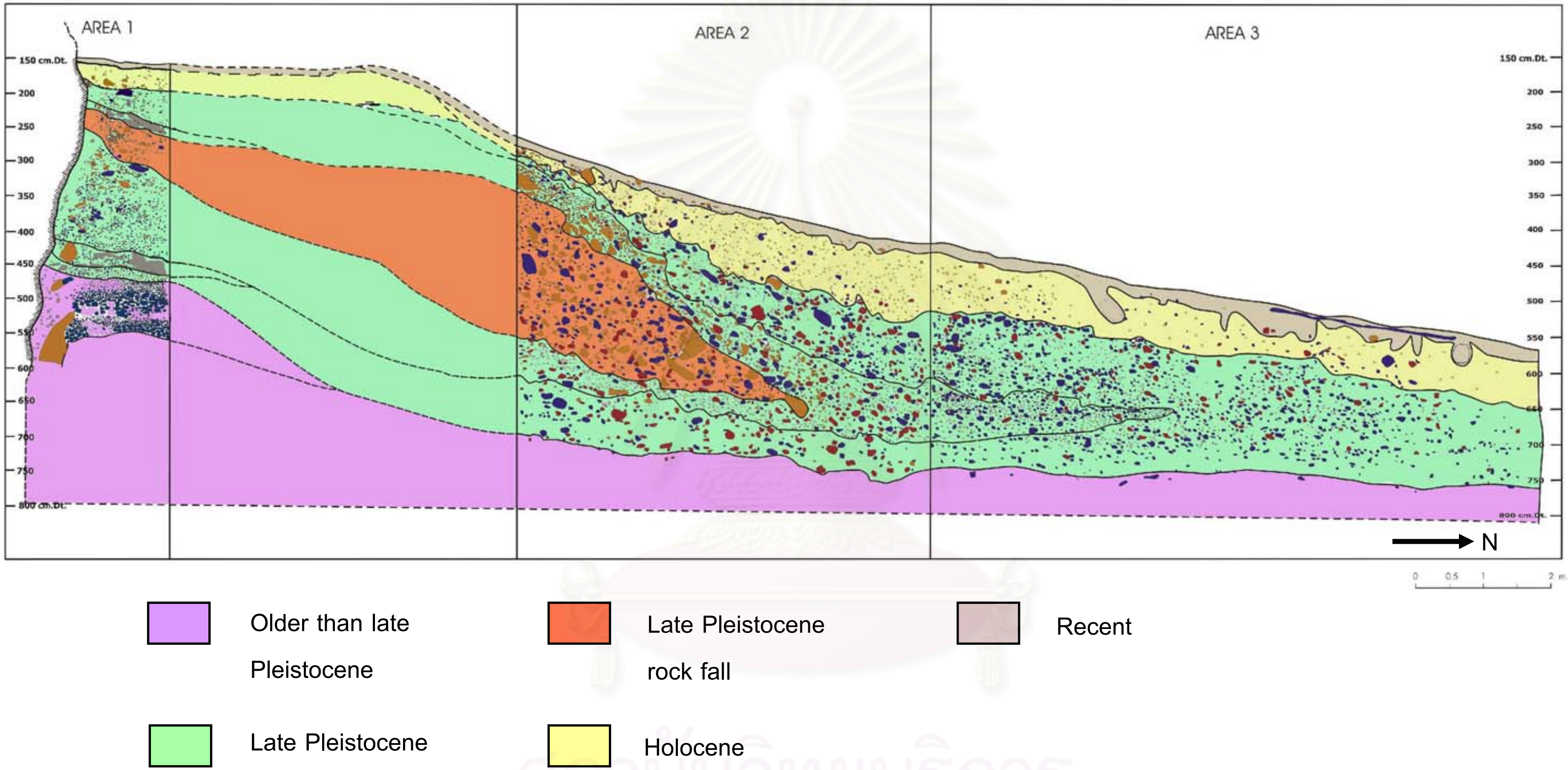

Figure 2.7 Stratigraphic units of 3 areas at the Tham Lod rockshelter in west profile (Klaowkamput, 2003).

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Table 2.1 Radiocarbon (AMS) and Thermoluminescence determination in 3 areas of the Tham Lod rockshelter.

Sample No.	Lab No.	Area/ Layer	Material and Context	Conventional Age BP (±1 s.d.)	Calibrated Age Range BP (±2 s.d.)	Measured Radiocarbon Age	Method	Remark
1	Akita[1]-TL5	Area 2 Layer 2	Organic sediment, depth 460-470 cm dt.				TL	2,933±83
2	Beta[2]-206541 MHSTLAR2-731	Area 2 Layer 2	Organic sediment from NE quadrant of unit of S21 W10, level 23: 520-540 cm dt.	11,550±40	13,8300-13440 (BC 11,880-11,480)	11,630±40	AMS	
3	Beta[2]-168223 MHSTLAR1-402	Area 1 Layer 3	Organic sediment from feature 5 near tibia of burial 1, depth 190-196 cm dt.	12,100±60	15,220-14,710 (BC 13,270-12,760) 14,330-14,020 (BC 12,380-12,070) 13,970-13,830 (BC 12,020-11,880)	12,100±60	C14	

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Table 2.1 Radiocarbon (AMS) and Thermoluminescence determination in 3 areas of the Tham Lod rockshelter (continued).

Sample No.	Lab No.	Area/ Layer	Material and Context	Conventional Age BP (±1 s.d.)	Calibrated Age Range BP (±2 s.d.)	Measured Radiocarbon Age	Method	Remark
4	Beta-168224 MHSTLAR1-710	Area 1 Layer 3	Organic sediment from feature 6 near hip bone of burial 2, depth 214-234 cm dt.	13,640±80	16,820-15,980 (BC 14,870-14,030)	13,640±80	C14	
5	Akita-TL7	Area 1 Layer 3	Organic sediment depth 230-240 cm dt.				TL	13,422±541
6	Beta-206540 MHSTLAR2-666	Area 2 Layer 3	Charred bone organic from NE quadrant of unit S21 W10, level 21: 490-500 cm dt.	15,360±70	18,810-17,930 (BC 16,860-15,980)		AMS	
7	Beta-206542 MHSTLAR2-831	Area 2 Layer 3	Organic sediment from NE quadrant 1 of unit of S21 W10, level 25: 560-580 cm dt.	21,370±110	Result is outside of the calibration range	21,350±110	AMS	
8	Akita-TL4	Area 3 Layer 3	Organic sediment depth 530-540 cm dt.				TL	10,582±49

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Table 2.1 Radiocarbon (AMS) and Thermoluminescence determination in 3 areas of the Tham Lod rockshelter (continued).

Sample No.	Lab No.	Area/ Layer	Material and Context	Conventional Age BP (±1 s.d.)	Calibrated Age Range BP (±2 s.d.)	Measured Radiocarbon Age	Method	Remark
9	Beta-194122 MHSTLAR1-1059	Area 1 Layer 4	Chachoal samples were taken from NEQ3 quadrant corner of level 17: 310-320 cm dt.	24,920±200	Result is outside of the calibration range	24,890±200	AMS	Mistaken data because of interrupting by rock fall
10	Beta-206539 MHSTLAR3-152	Area 3 Layer 3a	Charred material from SW quadrant of unit S 20 W 9, level 14: 680-700 cm dt.	27,620±170	Result is outside of the calibration range	27,330±170	AMS	
11	Akita-TL6	Area 3 Layer 3b	Organic sediment depth 690-700 cm dt.				TL	14,055±47
12	Beta-206538 MHSTLAR3-141	Area 3 Layer 3b	Charred bone organic from SW quadrant of unit S20 W9, level 11: 620-640 cm dt.	19,880±90	Result is outside of the calibration range	19,700±90	AMS	
13	Beta-172226 MHSTLAR1-1526	Area 1 Layer 5	Shell midden from NW quadrant 4, level 28: 420-430 cm dt.	22,190±160	Result is outside of the calibration range	21,860±160	C14	

Table 2.1 Radiocarbon (AMS) and Thermoluminescence determination in 3 areas of the Tham Lod rockshelter (continued).

Sample No.	Lab No.	Area/ Layer	Material and Context	Conventional Age BP (±1 s.d.)	Calibrated Age Range BP (±2 s.d.)	Measured Radiocarbon Age	Method	Remark
14	Akita-TL12	Area 1 Layer 5	Sediment Quartz depth 380-390 cm dt.				TL	22,257±154
15	Akita-TL10	Area 1 Layer 6	Organic sediment depth 450-460 cm dt.				TL	32,380±292
16	Beta-172227 MHSTLAR1-1665	Area 1 Layer 8a	Ash taken from the midden of NW quadrant1, level 33: 470-480 cm dt.	16,750±70	20,430-19,490 (BC 18,480-17,540)	16,730±70	AMS	Mistaken data because of interrupting by ground water.
17	Beta-206543 MHSTLAR2-903	Area 2 Layer 8	Organic sediment from SE quadrant 4 of unit of S20 W10, level 32: 700-720 cm dt.	24,900±160	Result is outside of the calibration	24,720±160	AMS	

Remark: C14 dates were calibrated using the CALIB 1998 by Stuiver *et al.* (1998). See more information on Thermoluminescence dates in Table 2.2.

Akita[1] = Research Institute of Material and Resources, Akita University, Japan (Khaokhiew, 2004; Shoocongdej, 2006; Shoocongdej et al., 2007)

Beta[2] = Beta Analytic, Inc. (Shoocongdej, 2006; Shoocongdej et. al., 2007)

Table 2.2 Thermoluminescence dates from west profile, the Tham Lod rockshelter (Khaokhiew, 2004; Shoocongdej, 2006; Shoocongdej et al., 2007)

TL Samples*	U (ppm.)	Th (ppm.)	K (%)	%W	Anual dose (mGy/yr)	Paleo dose (Gy)	Age (BP)
Sample# 1 TL1: Area3 Sediment Quartz from level 750-760 cm dt. Layer 4	3.00	16.41	1.12	3.4	1.29	46.16	35,782 ±266
Sample# 2 TL4: Area 3 Sediment Quartz from level 530 – 540 cm dt. Layer 3	6.42414	19.4789	4.7332	2.36	2.37	25.08	10,582 ±49
Sample # 3 TL5: Area 3 Sediment Calcite from level 460-470 cm dt. Layer 2	11.8241	25.8717	9.9332	2.2	6.014	17.64	2,933 ±83
Sample # 4 TL6: Area 3 Sediment Quartz from level 690 – 700 cm dt. Layer 4	3.42414	15.7787	1.7332	5	1.08	15.18	14,055 ±47
Sample# 5 TL2: Area 1 Sediment Quartz from level 380–390 cm dt. Layer 5	3.065	16.724	1.133	4.8	1.01	22.48	22,257 ±154
Sample # 6 TL7: Area 1 Calcreate (Calcite) level 230-240 cm dt. Layer 3	2.783	3.9879	1.8648	5.6	0.768	10.32	13,422 ±541
Sample # 7 TL10: Area 1 Calcreate (Calcite) level450-460 cm dt. Layer 6	0.837	1.95796	0.5248	4.1	0.378	12.24	32,380 ±292

Remark: * Research Institute of Material Resources, Akita University, Japan

Table 2.3 Radiocarbon (AMS) and Thermoluminescence determination from area 1, the Tham Lod rockshelter which used in this research.

Layer	Geological time scale	AMS radiocarbon Dating		TL Dating	
		Age	Source	Age	Source
1	Holocene				
2				2,933±83 BP (Akita-TL 5) [2]	Calcite sediment (dated from area 2)
3	Hiatus during 10,000-9,000 BP, dated from area 3 (Khaokhiew, 2004)				
	Late Pleistocene	12,100±60 BP (Beta-168223) [1] and 13,640±80 BP (Beta-168224) [1]	Organic sediment near skeleton of burial 1 and 2	13,422±541 BP (Akita-TL 7) [2]	Calcrete
4					
5		22,190±160 BP (Beta-172227) [1]	Shell	22,257±154 BP (Akita-TL 12) [2]	Quartz sediment
6				32,380±292 BP (Akita-TL 10) [2]	Calcrete
7					
8				35,782±266 BP (Akita-TL 1)	Sediment Quartz (dated from area 3)

Remark:

[1] Akita: Research Institute of Material and Resource, Akita University, Japan (Khaokhiew, 2004; Shoocongdej, 2006; Shoocongdej et al., 2007)

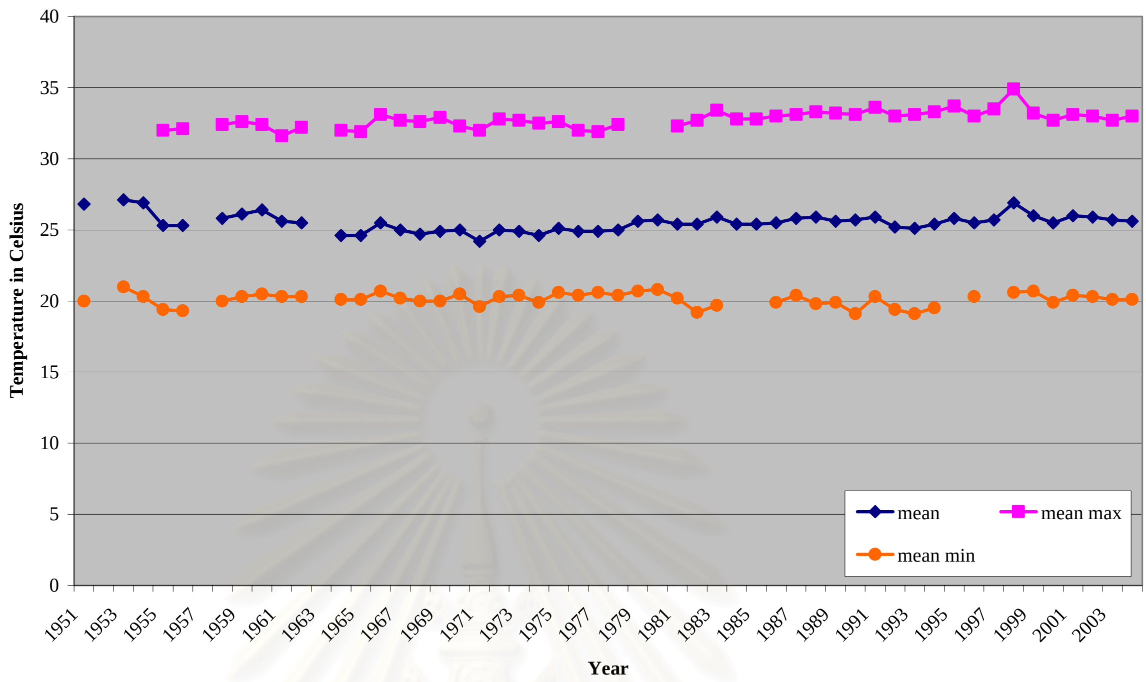
[2] Beta: Beta Analytic, Inc. (Shoocongdej, 2006; Shoocongdej et. al., 2007)

2.2 Recent climate and vegetation covers in the Tham Lod rockshelter

2.2.1 Recent climate

Climatically, the Tham Lod rockshelter, Mae Hong Son province lies within the tropical monsoon climate of the northern hemisphere, there are 3 seasons: the rainy season, lasting from May until October; the cool dry season, lasting from October until February; and the hot dry season, lasting March until May. The climatological data in Mae Hong Son province during 1951 to 2004 from the Meteorological Department displays 25.5 °C of an average yearly temperature and 74.16% of an average yearly relative humidity (see Figure 2.8 and 2.9). January, the coldest month, the climatic has a minimum of average temperatures, 14°C and a maximum as 38.2°C in the hottest month, April. Monthly average of relative humidity at Mae Hong Son from 1951 to 2003 displays quite high humidity (around 65 to 84% of average relative humidity) except the dry season that shows low of humidity. The lowest of average of relative humidity is 54% in April (source: Computer Section, Climatology Division, Meteorological Department, 11th November 2005).

In conclusion, the recent climate of Mae Hong Son province is fairly cool and moisture humidity.



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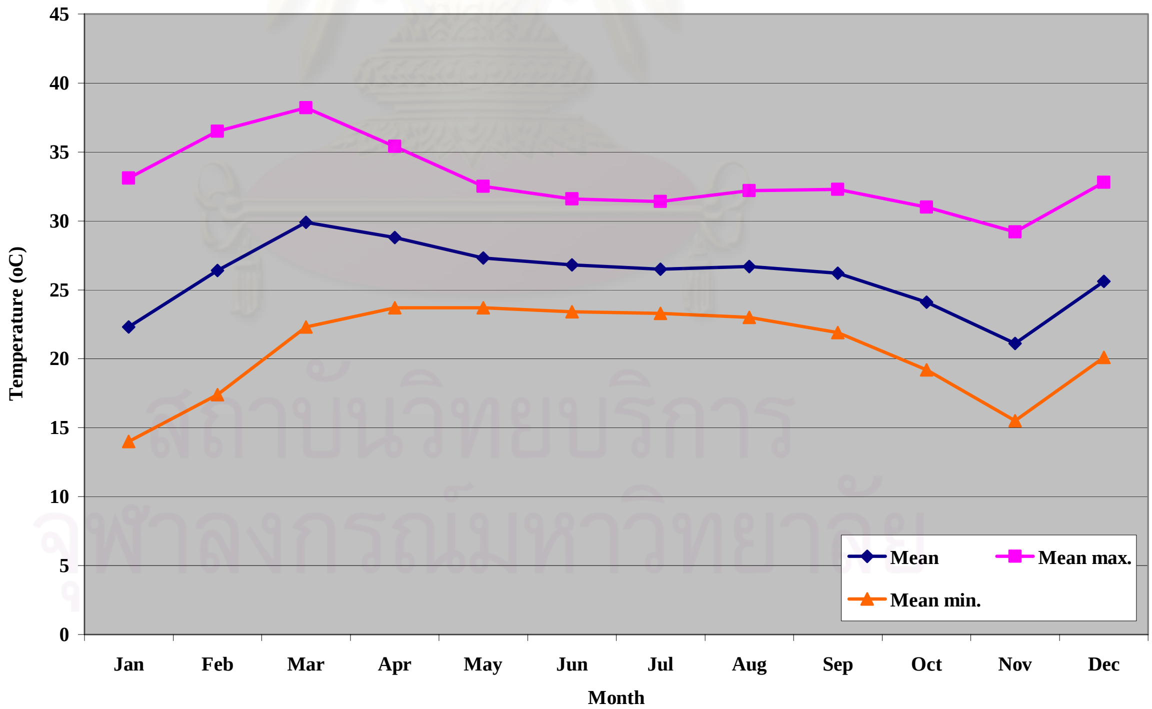
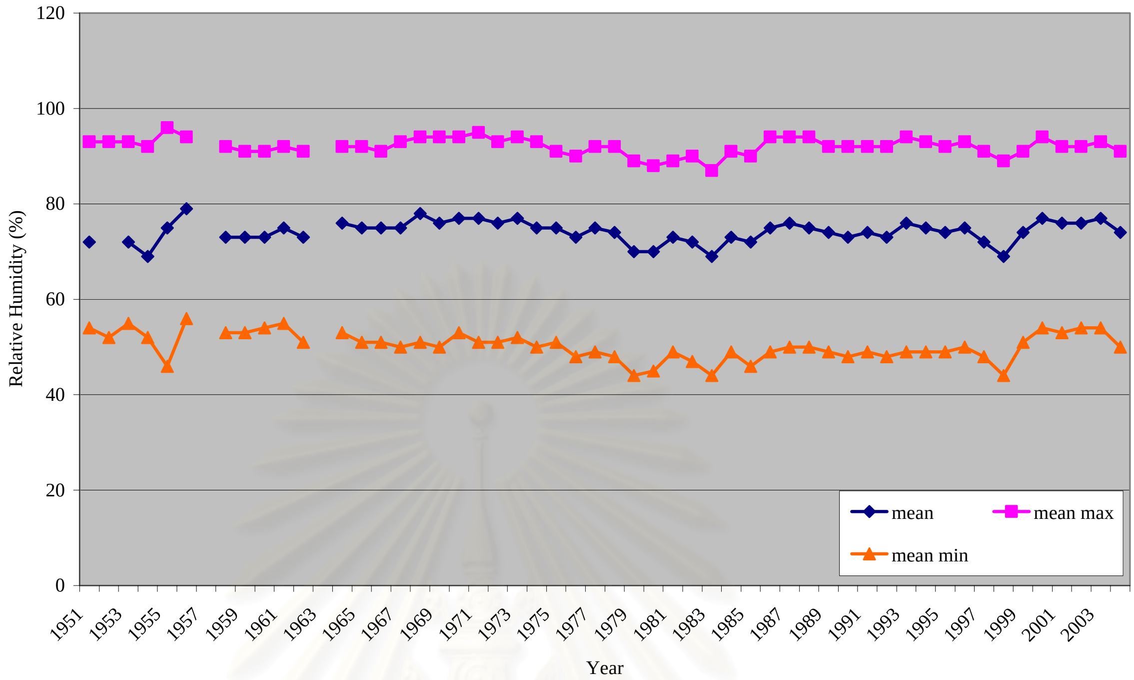


B

Figure 2.8 Annual average (A) and monthly average (B) of temperature at Mae Hong Son from 1951 to 2003 (Source: Computer Section, Climatology Division, Meteorological Department, 11th November 2005).



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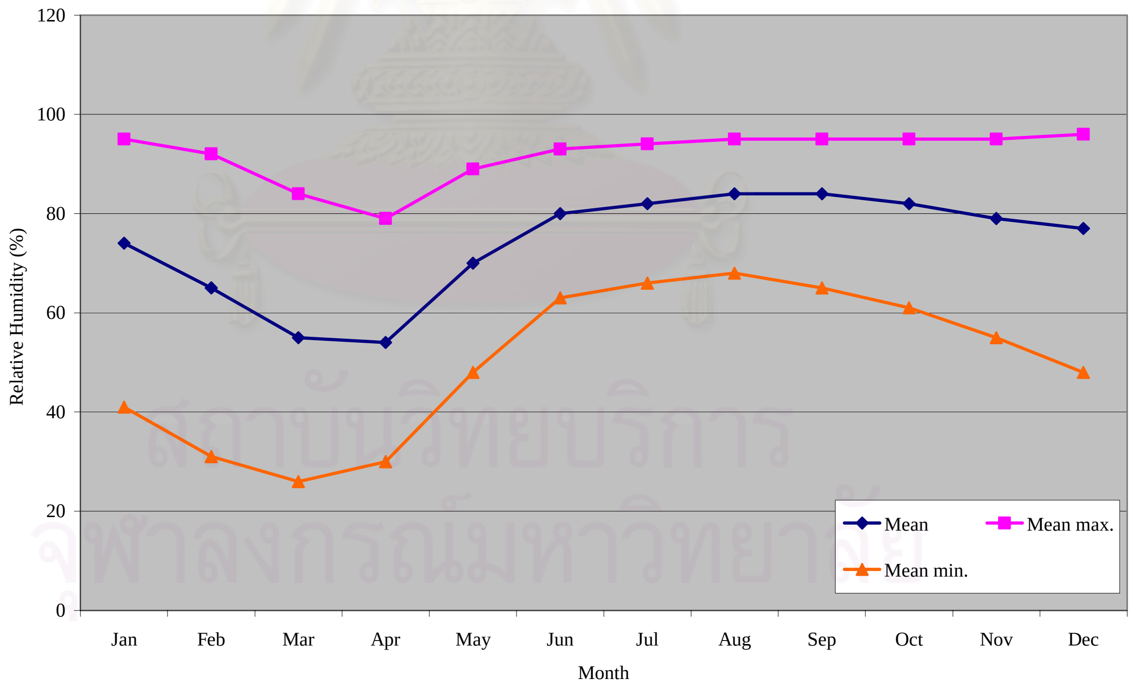

B

Figure 2.9 Annual average (A) and monthly average (B) of Relative humidity at Mae Hong Son from 1951 to 2003 (Source: Computer Section, Climatology Division, Meteorological Department, 11th November 2005).

2.2.2 Recent forest at Amphoe Pang Mapha

The present forest of the Tham Lod rockshelter is covered by the basin of Lang River located at eastern part of Amphoe Pang Ma Pha, Mae Hong Son Province. The Remote Sensing and Geo-informatics System Centre (1998) and Lao Yi Pa (2000) described that the basin of Lang River and the adjacent areas consist of 6 kinds of forest, as follows:

1) Mixed deciduous forest

The mixed deciduous forest discovered in this basin is dense forest which is always found in plentiful water areas at 300-900 m above mean sea level. It is composed of vegetations shedding leaves in the summer. The dominant floras in this forest are *Tectona grandis* (teak), *Shorea obtuse* (siamese sal), *S. siamensis*, *Xila xylocarpa*. Nevertheless and some places having dense bamboo species.

2) Dry dipterocarp forest

The dry dipterocarp forest is the deciduous forest and most arid forest. It is often found the wild fire. The height above mean sea level of this forest is less than 800 m Dominant floras are *Shorea obtuse*, *S. siamensis*, and *Dipterocerpus tubercubatus*. In basin of Lang River, dry dipterocarp forest sometime was discovered at 1,100 m above mean sea level with *Pinus merkusii* and *P. kesiya* (the Remote Sensing and Geo-informatics System Centre, 1998).

3) Hill evergreen forest

The hill evergreen forest located at 900-1,500 m above mean sea level shows the dominant flora in 2 families: Fagaceae; *Catanopsi acumintisima*, *C. diversifolia, C. indica, Quercus kingiana, Q, mespilifoliodes* etc. and Pinaceae; *Pinus merkusii* and *P. kesiya*

4) Semi-evergreen forest

The semi-evergreen forest spreads at bank of Lang River which is rather high moisture. This vegetative is located at 250-900 m above the present mean sea level. The dominant plants in this forest are composed of many species in family Dipterocarpaceae such as *Diperocarpus turbinatus* etc.

5) Bamboo forest

The bamboo (family Poacea) generally distributes in many kinds of forest such as mixed deciduous forest, semi-evergreen forest, and dry dipterocarp forest. Bamboo forest often replaces these forests as secondary forest after occurrence of the wild fire or cultivation. Bamboo was found in the basin of Lang River, for example *Bambusa arudinacea, B. nutas*, *Cephalostachyum pergracile, C. virtum, Dendrocalamus giganteus, D. hamiltomii* etc.

6) Limestone forest

The limestone forest is discovered in karst topography which is a major geological structure in the basin. It is generally composeds of the xerophyte (such as *Dracera loureiri*, *Eupobia sp.*), grass, and bamboo.

Figure 2.10 Recent forest in Ban Tham Lod:

A. The limestone forest, dominated by *Dracera loureiri*, *Eupobia sp.*

B. The limestone forest mixing bamboo forest, showing *Dracera loureiri*, *Eupobia sp.*, bamboo.

C. The Mixed deciduous forest, in this picture displaying *Tectona grandis*, *Lannea* sp. in family Anacardiaceae.

D-E. The plain floras in the mixed deciduous forest displaying *Smilax* sp. in family Smilacaceae.

2.2.3. Recent mammals at Amphoe Pang Mapha

The wild animals in northern Thailand and in the basin of Lang River were divided into the Indochina subregion (Lao Yi Pa and Tacumma, 2000). The mammal diversity in this area is similar to both Myanmar and Indochina (Par, 2003).

Srikosamart et. al. (1999), Lao Yi Pa and Tacumma (2000), and Wangwacharakul et al. (2000) interviewed with local people and surveyed in the basin of Lang River and adjacent areas. They reported 67 mammal species such as *Elephas maximus* (Asian elephants), *Bos gaurus* (gaur), *B. javanicus* (banteng), *Panthera tigris* (tiger), *P. pardus* (leopard or panther), *Muntiacus muntjak* (common barking deer), *Cervus unicolor* (sambar dear), *Naemorhedus sumatraensis* (Southern serow), *N. Caudatus* (long-tailed goral), *Sus scrofa* (Eurasian wild pig), *Arctonyx collaris* (hog badger), *Macaca* sp. (macaque), *M. mulatta* (rhesus macaque), *Presbytis* sp. (langur), *Hylobates* sp. (gibbon), *H. lar* (white-handed gibbon), Viverridae (civets), *Paradoxurus hermaphroditus* (common palm civet), Felidae (medium and small wild cats), Muridae (rats and mice), Sciurinae (squirrels), *Cynocephalus variegatus* (sunda colugo), *Tupaia belangeri* (northern tree shrew), and Chiroptera (bats).

The majority mammals were found such as *Macaca mulatta*, *Hylobates lar*, *Paradoxurus hermaphroditus*, *Sus scrofa*, *Muntiacus muntjak*, *Cervus unicolor*, and *Naemorhedus sumatraensis* (Wangwacharakul et al., 2000).

At the present, large mammals such as *Elephas maximus*, *Bos gaurus*, *B. javanicus*, *Panthera tigris*, and *P. pardus* were not recognized from this basin (Lao Yi Pa and Tacumma, 2000; Wangwacharakul et al., 2000). On the interviewing, local people have seen them about ten years ago. The cause of extinction of these large mammals in the basin of Lang River and adjacent area is human activities such as forest industry, hunting, and settlement (Lao Yi Pa and Tacumma, 2000; Wangwacharakul et al., 2000).

CHAPTER III

RESULTS

3.1 Introduction

The importance issue for paleoenviromental reconstruction to is consider based on the evidence of mammals found in the Tham Lod rockshelter. According to the former research in the Tham Lod rockshelter, the 20 taxa of late Pleistocene mammals belonging to 6 order, 9 families, 5 genus, and 2 species have been reported (Ampansri, 2005a, 2005b, 2006a, 2006b, 2007 in Shoocongdej et al., 2007). They include large and small *Sus scrofa*; large, medium and small *Cervus* sp; *Muntiacus* sp.; large and medium Bovidae; *Naemorheus (Capricornis) sumatraensis*; Rhinocerotidae; Ursidae; Felidae; medium and small Carnivora; Primate; *Semnopithecus* sp.; Probosidea; Hystricidae; Rhyzomidae; and Rodentia. However, most taxa have been considered only morphological features of element. Some taxa can be classified into lower taxa which is given more details of diversity.

This chapter is shown the results of dental identification in each layer which was consider based on 2 characteristic of teeth: dental morphological features and dental size, see the systematic description in chapter IV. Furthermore, the other data including the detail of stratigraphy (Shoocongdej et al., 2003a, 2007; Klaowkamput, 2003; Khaokhiew, 2004), dating analysis (Shoocongdej et al., 2003a, 2007; Khaokhiew, 2004; Shoocongdej, 2006) and other archaeological data (shell, stone tool etc.) in each layer according to chapter II were also presented.

The counting of mammalian teeth displays in the number of identified specimens (NISP) and minimum number of individuals (MNI). For MNI counting techniques is necessary to consider not only identifications and teeth represented, but also age. For this research, some taxa in the Tham Lod rockshelter display both permanent teeth (indicating adult mammal) and deciduous teeth (indicating young mammal). Some were found only permanent teeth. Therefore, MNI counting techniques displays different detail in each taxa. Unlike MNI, NISP represents only number of actual identifiable teeth.

3.2 Detail description of layers

Area 1 is adjacent to the rockshelter wall at 150 x 400 cm unit was excavated to over a depth of approximately 450 cm which concludes 8 natural stratigraphic layers. The natural stratigraphy of area 1 consists of 8 layers which are divided into 2 units: the late Pleistocene epoch and the Holocene epoch.

A total of 2,003 mammalian teeth (NISP) or 218 MNI have been classified and identified specimens from totally 113,658 mammalian bones (including unidentified bones and other identifiable bones such as long bones etc.) were recognized. The results of mammalian teeth classification of all layers will be given from bottom to top as follows (see Table 3.1, 3.2 and Figure 3.1):

3.2.1 Layer 8

Layer 8 consists of sticky unconsolidated soil and pebble-cobble particles grain in the upper part and lateritic soil in the lower part (Shoocongdej et al., 2003a, 2007; Klaowkamput, 2003). Unfortunately, the yield of dating in this layer is error. However, it was estimated to be 35,782±266 BP (Akita-TL 1) based on TL dating method on quartz sediment from level 750-760 cm dt. at layer 4 in area 3, the continuous layer. None of evidences was found in this layer including mammalian teeth. It was divided in late Pleistocene epoch (Shoocongdej et. al. 2007)

3.2.2 Layer 7

In layer 7, sediments is fairly dense hard unconsolidated and granule-cobble size of particles grains (Shoocongdej et al., 2003a, 2007; Klaowkamput, 2003). This layer was determined between 35,782±266 BP (Akita-TL 1) and 32,380±292 BP (Akita-TL 10).

The evidences discovered in this layer are stone tool and shell. In addition, animal bones were also first found with 14 elements. They were classified into 10 mammalian teeth (NISP) or 4 MNI belonging to 3 taxa, including Cervidae (8 NISP; 2 MNI: adult 1 MNI, juvenile 1 MNI), Pecora (1 NISP; 1 MNI), and *Sus scrofa* (1 NISP; 1 MNI). The largest NISP of this layer was Cervidae.

3.2.3 Layer 6

Layer 6 is characterized by hard dense brown unconsolidated soil, granule size of limestones, pieces of calcreate, and pebble stones (Shoocongdej et al., 2003a, 2007; Klaowkamput, 2003). This layer was divided in late Pleistocene epoch with date of 32,380±292 BP (Akita-TL 10) on calcreate at 310 cm depth from surface or 450-460 cm dt. (Khaokhiew, 2004; Shoocongdej, 2006; Shoocongdej et al., 2007). The number of the discovered evidences is slightly increased from the lower layer which is composed of shells, stone tools, and animal bones.

A total of 142 elements of animal bones was discovered in this layer which contained 23 NISP or 6 MNI of mammalian teeth. The diversity of mammal is also slightly increased, with 6 taxa. Rodentia (3 NISP; 1 MNI), Rhizomyidae (2 NISP; 1 MNI), *Sus scrofa* (2 NISP; 1 MNI), Cervidae (8 NISP; 1 MNI), Bovinae (3 NISP; 1 MNI), and *Naemorheus* spp. (4 NISP; 1 MNI) have represented in this layer. Cervidae was the largest number in this layer.

3.2.4 Layer 5

In layer 5, the character of the layer is hard dense unconsolidated soil mixing with granule size of limestones and pieces of calcreate (Shoocongdej et al., 2003a, 2007; Klaowkamput, 2003).It is estimated between 22,190±160 BP (Beta-172227 MHSTLAR1-1665) on shell by AMS dating method at 280 cm depth from surface or 420-430 cm dt. and 22,257±154 BP (Akita-TL12) on quartz sediment by TL dating methods at 240 cm depth from surface or 380-390 cm dt. (Khaokhiew, 2004; Shoocongdej, 2006; Shoocongdej et al., 2007). The kinds of evidence consist of shells, stone and animal bones which still increased in number from the former layer.

A total of 95,352 elements of animal bones contains 1,088 mammalian teeth (NISP) or 96 MNI. For mammalian diversity, this layer has represented the highest diversity of mammals, with 29 taxa which consist of Cercopithecidae (14 NISP; 1 MNI), *Macaca* spp. (9 NISP; 2 MNI), Colobinae (2 NISP; 1 MNI), Rodentia (70 NISP; 5 MNI), Rhizomyidae (23 NISP; 5 MNI), *Rhizomys* spp. (2 NISP; 2 MNI), *Cannomys badius* (7 NISP; 5 MNI), *Bandicota* spp. (1 NISP; 1 MNI), *Bandicota indica* (1 NISP; 1 MNI), Hystricidae 1 (25 NISP; 2 MNI), Hystricidae 2 (4 NISP; 2 MNI), Carnivora (25 NISP; 5 MNI), *Ursus thibetanus* (6 NISP; 3 MNI), *Ursus* spp. (31 NISP; 3 MNI), *Actonyx collaris* (1 NISP; 1 MNI), Carnivora 1 (1 NISP; 1 MNI), Carnivora 2 (1 NISP; 1 MNI), *Elephas* sp. (5 NISP; 1 MNI), Perisodactyla (1 NISP; 1 MNI), *Sus scrofa* (123 NISP; 9 MNI: adult 7 MNI, juvenile 2 MNI), Pecora (64 NISP; 9 MNI: adult 5 MNI, juvenile 4 MNI), Cervidae (554 NISP; 23 MNI: adult 21 MNI, juvenile 2 MNI), *Cervus unicolor* (2 NISP; 1 MNI), Bovinae (86 NISP; 4 MNI), *Bubalus* sp. (2 NISP; 1 MNI), *Bos* spp. (5 NISP; 2 MNI), *Naemorheus* spp. (73 NISP; 3 MNI), Bovidae (1 NISP; 1 MNI) and *incertae cedis* (1 NISP; 1 MNI). The largest number is Cervidae.

3.2.5 Layer 4

In layer 4, is composed of brown unconsolidated soil, granule to boulder size of limestones, and small pieces of calcreate (Shoocongdej et al., 2003a, 2007; Klaowkamput, 2003). The age of this layer is estimated between 22,190±160 BP (Beta-172226) to 13,640±80 BP (Beta-168224). Unlike the layer 5, shells and stone tools extremely decrease in number from the former layer.

In addition, animal bones have also greatly decreased, with 9,897 elements of animal bones. It consists of 403 NISP or 41 MNI of mammalian teeth in 18 taxa: Cercopithecidae (3 NISP; 1 MNI), *Macaca* spp. (4 NISP; 1 MNI), Rodentia (20 NISP; 5 MNI), Rhizomyidae (2 NISP; 1 MNI), *Cannomys badius* (2 NISP; 1 MNI), Hystricidae 1 (2 NISP; 1 MNI), Hystricidae 2 (1 NISP; 1 MNI), Carnivora (6 NISP; 1 MNI), *Ursus thibetanus* (1 NISP; 1 MNI), Rhinocerotidae (2 NISP; 1 MNI), *Sus scrofa* (29 NISP; adult 2 MNI, juvenile 1 MNI), Pecora (51 NISP; 5 MNI: adult 3 MNI, juvenile 2 MNI), Cervidae (213 NISP; 9 MNI: adult 8 MNI, juvenile 1 MNI), *Muntiacus* spp. (1 NISP; 1 MNI), *Cervus unicolor* (1 NISP; 1 MNI), Bovinae (32 NISP; 3 MNI), *Bubalus* sp. (3 NISP; 1 MNI), *Bos* spp. (2 NISP; 1 MNI), and *Naemorheus* spp. (27 NISP; 3 MNI). Cervidae is still the largest number in this layer.

3.2.6 Layer 3

Layer 3 consists of quite dense unconsolidated soil, granule size of limestones, and sediment grains in pebble to cobble size (Shoocongdej et al., 2003a, 2007; Klaowkamput, 2003). Two dating methods were dated from this layer: AMS radiocarbon dating results yield 12,100±60 (Beta-168223) on organic sediment near tibia of burial 1 at 50 cm depth from surface or 190-196 cm dt. and 13,640±80 BP (Beta-168224) on organic sediment near hip bone of burial 2 at 70 cm depth from surface or 214-234 cm dt. (Shoocongdej et. al., 2003a; Shoocongdej, 20006); and TL dating displays 13,422±541 BP (Akita-TL7) on calcreate at 90 cm depth from surface or 230-240 cm dt. (Khaokhiew, 2004; Shoocongdej, 2006; Shoocongdej et al., 2007). The important evidences in this layer are 2 burial: burial 1 and 2. Other evidences still are shells, and stone tools bones which slightly decrease from layer 4.

Moreover, elements of animal bones have fairly decreased with totally 7,545 elements of animal bones which contain 355 NISP or 50 MNI of mammalian teeth. In contrast, mammalian diversity has increased from the former layer (20 taxa), belonging to Colobinae (2 NISP; 1 MNI), Rodentia (25 NISP; 6 MNI), Rhizomyidae (1 NISP; 1 MNI), *Cannomys badius* (1 NISP; 1 MNI), Hystricidae (1 NISP; 1 MNI), Hystricidae 2 (1 NISP; 1 MNI), Carnivora (1 NISP; 1 MNI), *Ursus thibetanus* (3 NISP; 1 MNI), *Ursus* spp. (3 NISP; 1 MNI), *Elephas* sp. (1 NISP; 1 MNI), Rhinocerotidae (2 NISP; 1 MNI), *Sus scrofa* (9 NISP; 1 MNI), Pecora (31 NISP; 4 MNI: adult 2 MNI, juvenile 2 MNI), Cervidae (186 NISP; 12 MNI: adult 10 MNI, juvenile 2 MNI), *Cervus unicolor* (2 NISP; 1 MNI), Bovinae (47 NISP; 4 MNI), *Bubalus* sp. (2 NISP; 2 MNI), *Bos* spp. (4 NISP; 2 MNI), *Naemorheus* spp. (26 NISP; 5 MNI), and *incertae cedis* (1 NISP; 1 MNI). Cervidae is still the largest number.

3.2.7 Layer 2

Layer 2 is characterized by heterogeneous sediments such as brown unconsolidated soil, granule sizes of limestones, and pebble to cobble size of other stones (Shoocongdej et al., 2003a, 2007; Klaowkamput, 2003). Unfortunately, this layer did not have direct dating in area 1. However, the TL dating method has been done at the same layer in area 2 at 2,933±83 BP (Akita-TL5) on calcite sediment at 23-37 cm depth from surface or 460-470 cm dt. (Khaokhiew, 2004; Shoocongdej, 2006; Shoocongdej et al., 2007). This layer is in the Holocene Period (Shoocongdej et. al., 2003a, 2007; Khaokhiew, 2004) and composed of many evidences: beads, shells, stone tools, animal bones and potsherds.

Number of animal bones is very small in comparison with the former layer, a total of 639 elements which contain 69 NISP or 17 MNI of mammalian teeth, with 11 taxa: *Macaca* spp. (1 NISP; 1 MNI), Rodentia (2 NISP; 1 MNI), Carnivora (7 NISP; 2 MNI), *Ursus thibetanus* (5 NISP; 2 MNI), *Ursus* spp. (8 NISP; 2 MNI), *Sus scrofa* (4 NISP; 1 MNI), Pecora (18 NISP; 3 MNI: adult 2 MNI, juvenile 1 MNI), Cervidae (15 NISP; 2 MNI), *Cervus unicolor* (4 NISP; 1 MNI), Bovinae (3 NISP; 1 MNI), and *Naemorheus* spp. (2 NISP; 1 MNI). Pecora first is the largest number.

3.2.8 Layer 1

In Layer 1, the character sediment is brown-gray unconsolidated soil and small number of granule to pebble sizes of limestones. In addition, the discovered organic mater is scraps of leaf that was mixed in this layer (Shoocongdej et al., 2003a, 2007; Klaowkamput, 2003). This layer is in the Holocene Period (Shoocongdej et. al., 2003a; Khaokhiew, 2004; Shoocongdej et al., 2007). The archaeological evidences such as potsherds and stone tool were recognized. Besides, the present objects were discovered such as fragments of glasses and fragments of can.

Number of animal bones have decreased from the lower layer, with total of 69 elements that are divided into 5 mammalian teeth (NISP) or 3 MNI, belonging to 3 taxa: Hystricidae 1 (1 NISP; 1 MNI), Pecora (1 NISP; 1 MNI), and Cervidae (3 NISP; 1 MNI). Cervidae is the largest number in this layer.

Table 3.1 Showing dental identification of mammal at area 1 of the Tham Lod rockshelter in number of identified specimens: NISP and minimum number of individuals: MNI.

Kind of mammals	Layer																								Total NISP	Total MNI
	Holocene						Late Pleistocene																			
	1			2			3			4			5			6			7			8				
	NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI			
		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		
Order Primate																										
Cercopithecidae										3	1		14	1											17	2
Macaca spp.				1	1					4	1		9	2											14	4
Colobinae							2	1					2	1											4	2
Order Rodentia																										
Rodentia				2	1		25	6		20	5		70	5		3	1								120	18
Rhizomyidae							1	1		2	1		23	5		2	1								28	8
Rhizomys spp.													2	2											2	2
Cannomys badius							1	1		2	2		7	5											10	8
Bandicota spp.													1	1											1	1

Table 3.1 Showing dental identification of mammal at area 1 of the Tham Lod rockshelter in number of identified specimens: NISP and minimum number of individuals: MNI (continued).

Kind of mammals	Layer																								Total NISP	Total MNI
	Holocene						Late Pleistocene																			
	1			2			3			4			5			6			7			8				
	NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI			
		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		
Bandicota indica													1	1											1	1
Hystricidae 1	1	1					1	1		2	1		25	2											29	5
Hystricidae 2							1	1		1	1		4	1											6	4
Order Carnivora																										
Carnivora				7	2		7	2		6	1		25	5											45	10
Ursus thibetanus				5	2		3	1		1	1		6	3											15	7
Ursus spp.				8	2		3	1					31	3											42	6
Actonyx collaris													1	1											1	1
Carnivora 1													1	1											1	1
Carnivora 2													1	1											1	1

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Table 3.1 Showing dental identification of mammal at area 1 of the Tham Lod rockshelter in number of identified specimens: NISP and minimum number of individuals: MNI (continued).

Kind of mammals	Layer																								Total NISP	Total MNI
	Holocene						Late Pleistocene																			
	1			2			3			4			5			6			7			8				
	NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI			
		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	juvenile		Adult	Juvenile		Adult	Juvenile		
Order Probosidae																										
Elephas sp.							1	1					5	1											6	2
Order Perisodactyla																										
Rhinocerotidae							2	1		2	1														4	2
Perisodactyla													1	1											1	1
Order Artiodactyla																										
Sus scrofa				4	1		9	1		29	2	1	123	7	2	3	1		1	1					169	16
Pecora	1	1		18	2	1	31	2	2	51	3	2	64	5	4				1	1					166	23
Cervidae	3	1		15	2		186	10	3	212	7	1	554	21	2	8	1		8	1	1				986	50

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Table 3.1 Showing dental identification of mammal at area 1 of Tham Lod rockshelter in number of identified specimens: NISP and minimum number of individuals: MNI (continued).

Kind of mammals	Layer																								Total NISP	Total MNI
	Holocene						Late Pleistocene																			
	1			2			3			4			5			6			7			8				
	NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI		NISP	MNI			
		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		Adult	Juvenile		
Muntiacus spp.										1	1														1	1
Cervus unicolor				4	1		2	1		1	1		2	1											9	4
Bovinae				3	1		47	4		32	3		86	4		3									171	13
Bubalus sp.							2	2		3	1		2	1											7	4
Bos spp.							4	2		2	1		5	2											11	5
Naemorheuss spp.				2	1		26	5		27	3		73	3		4	1								132	13
Bovidae													1	1											1	1
incertae cedis							1	1					1	1											2	2
Total	5	3	0	69	16	1	355	45	5	401	37	4	1140	88	8	23	6	0	10	3	1	0	0	0	2003	218

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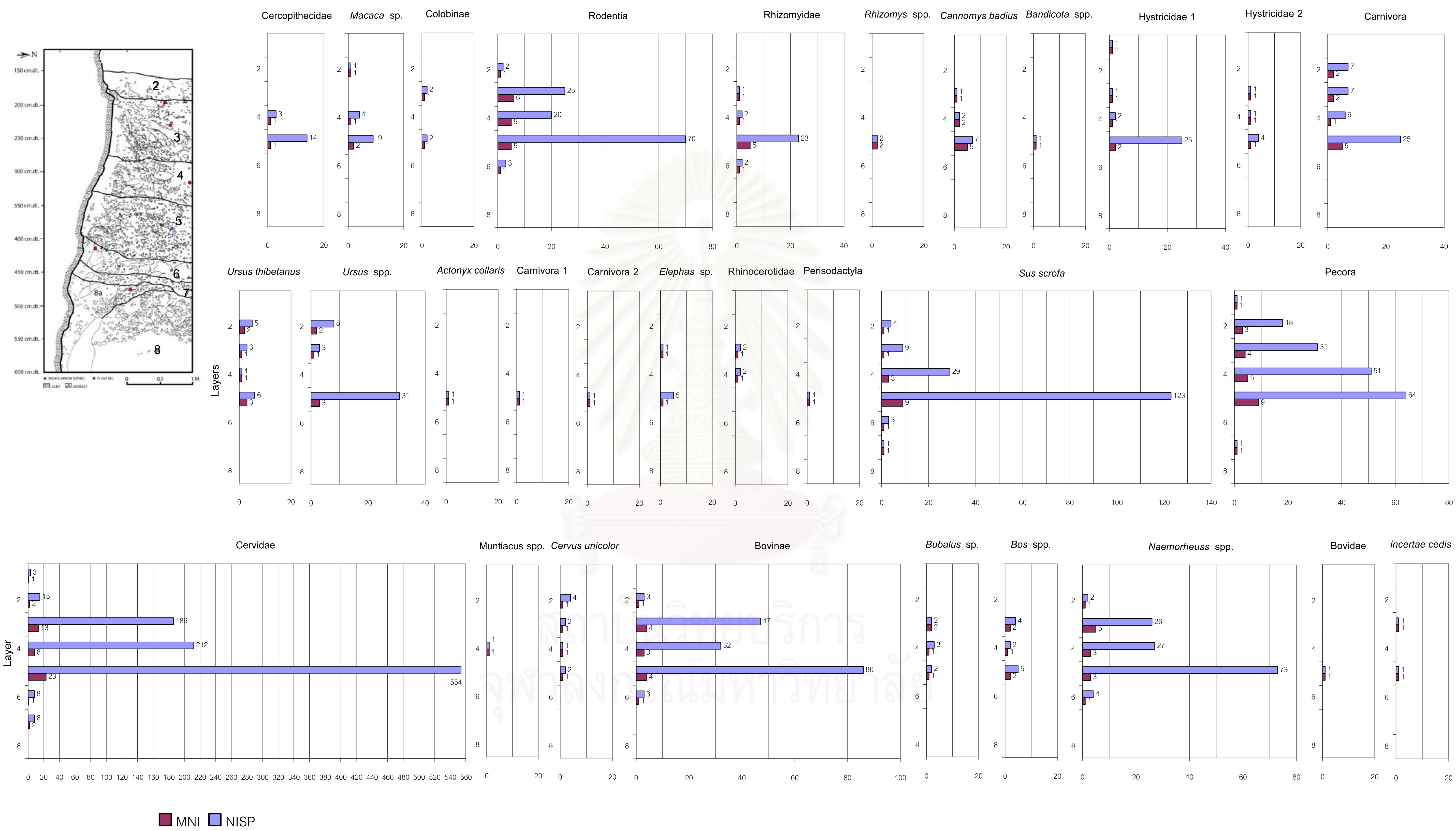


Figure 3.1 West profile of area 1 and graph that showed NISP and MNI of each taxon.

CHAPTER IV

SYSTEMATIC DESCRIPTION

According chapter III, totally 2,003 mammalian teeth (NISP) in area 1 consist of totally 30 taxa which classified and identified into 6 orders, 11 families, 12 genera, and 6 species including 6 indeterminate families and 6 indeterminate genera and species. Each taxon displays different both morphological teeth and habitat.

This chapter describes dental morphological feature and habitat in each identifiable mammalian taxon. The systematic classification and morphological terms used in this study are those of Medway (1969), Lekagul and McNeely (1988), Hillson (1990), and Groves and Kurt (1972). In addition, mammalian habitat in the research follows the recent mammalian research including Medway (1969), Lekagul and McNeely (1988), WWF Thailand programme office (2000), and Parr (2003).

In this chapter, measurement data displays the identifiable specimens in the Arithmetic mean (Mean), Standard deviation (S.D.), Maximum (Max), and Minimum (Min). All linear measurements of specimens are in millimeters (mm). The descriptions of mammalian teeth in the research are shown below:

4.1 Order Primates Linnaeus, 1758

Suborder Anthropoidea Pocock, 1918

Infraorder Catarrhini É. Geoffroy, 1812

Superfamily Cercopithecidae Gray, 1821

4.1.1 Family Cercopithecidae Gray, 1821

Cercopithecidae

(Plate 1, Figure 1)

Common name: Old world monkey

Dental formula: I 2/2, C 1/1, P 2/2, M 3/3

Materialss: A total of 17 NISP (2 MNI) are found in 2 layers, 3 NISP (1 MNI) in layer 4 and 13 NISP (1 MNI) in layer 5 (see more detail at Appendix A, Table 1).

Description: The majority of elements are incomplete teeth. Incisors (including upper incisor 1, lower incisor 1-2) are spatulate. Lower canines are prominent and pointed. The cheek teeth (including molar and premolar) are incomplete teeth that lost the specific feature. They are bunodont. Their cusps well developed and may be arranged into buccal-lingual fold. Premolars compose of 2 lophs while molars have 4 lophs.

Discussion and comparison: The morphological features of these elements are similar to mammals in family Cercopithecidae as cusp of premolar and molar arranged into buccal-lingual fold and shape of incisor being spatulate. Unfortunately, the majority of these elements is fragment and lost the specified feature so that, they cannot identified into lower taxon.

Habitat: They live in many kinds of forest such as the bamboo, dry dipterocarp forest, hill evergreen, mixed deciduous, limestone, and semi-evergreen (Lekagul and McNealy, 1988; WWF Thailand programme office, 2000).

4.1.1.1 Subfamily Cercopithecinae Gray, 1821

Genus *Macaca* Lacepede, 1799

Macaca spp.

(Plate 1, Figure 2-4)

Common name: Macaques

Dental formula: I 2/2, C 1/1, P 2/2, M 3/3

Materialss: A total of 14 NISP (5 MNI) from 3 layers, 1 NISP (1 MNI) in layer 2, 4 NISP (1 MNI) in layer 4 and 9 NISP (2 MNI) in layer 5.

Description: Upper incisor 2 is spatulate and paddle-like shape that is the general morphological feature of monkey's incisor. Generally, the cheek teeth of *Macaca* spp. are bunodont and rounded cusps arranging into buccal-lingual folds, except lower premolar 3. Lower premolar 3 is usually developed into a pronounced cutting blade. Lower premolar 4 has 2 main cusps. Lower molar1 and 2 are compound of 4 cusps and a small accessory cusp in distal side. Two inner cusps are higher than other cusps. The lower molar 3, the longest molar, compose of 4 cusps with large accessory cusps in distal side (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
		Width	Length	Crow height
Lower incisor 2	1	4.9	5.7	13.9
Lower premolar 3	1	4.9	6.1	
Lower premolar 4	1	5.6	7.4	6.1
Lower molar 1	2	5.7 (5.7-5.7)	4.4 (4.4-4.4)	3.9 (3.9-3.9)
Lower molar 2	2	5.8±2.8 (7.8-3.8)	7.6±2.4 (9.3-5.9)	4.7±2.3 (6.3-3.1)

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
		Width	Length	Crow height
Lower molar 3	4	6.4±1.0 (7.8-5.8)	10.5±1.3 (11.9-9.2)	5.0±1.6 (6.4-3.5)
Lower molar row (M1-3)	1		24.6	

Discussion and comparison: The feature and size of these teeth are similar to recent *Macaca* sp. as rounded bunodont teeth with rounded cusp arranging into buccal-lingual folds (see the measurement data of recent specimens in Appendix B, Table 1). However, the data of recent specimens of macaques are quite lack, the specimens are not complete. Moreover, their lower molar 3 that is important teeth for identification in species taxon often lost or broken. According to above reason, these elements can be identified to only genus taxon.

Habitat: Based on recent *Macaca* spp. in Thailand, they live in many kinds of forest that consist of the mixed deciduous, dry dipterocarp, and monsoonal evergreen forest (Parr, 2003).

4.1.1.2 Subfamily Colobinae Jordon, 1867

Colobinae

(Plate 1, Figure 5)

Common name: Langur.

Dental formula: I 2/2, C 1/1, P 2/2, M 3/3

Materialss: Totally 4 NISP (2 MNI) are found in 2 layers, 2 NISP (1 MNI) in layer 3 and 2 NISP (1 MNI) in layer 5 (see more detail at Appendix A, Table 3).

Description: The teeth of langur that found in the site are cheek teeth. The general characteristic of these cheek teeth is similar to *Macaca* spp. which are bunodont and consist of 2-4 cusps arranged into buccal-lingual folds. The specific feature is shape-angled cusps (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
		Width	Length	Crown height
Lower premolar 2	1	4.1	6.3	3.9
Lower molar 1	2	4.8±0.4 (5.1-5.4)	5.3±0.1 (5.4-5.2)	3.5±0.5 (3.8-3.1)
Lower molar 2	2	5.0±0.7 (5.5-4.5)	5.6±0.4 (5.9-5.3)	2.7±1.0 (7.4-2.0)

Discussion and comparison: The characteristics of these specimens are similar to recent langur in both genus *Presbytis* and *Semnopithecus* by the angled cusps. Based on the measurement data, their teeth sizes are similar to the recent specimens (Auetrakulvit, 2004, see Appendix B, Table 2) and quite smaller than *Macaca* spp.

Habitat: *S. phayrei* inhabits the lower hill evergreen, mixed deciduous, bamboo dominance, and limestone forest (Parr, 2003).

4.2 Order Rodentia Bowdich, 1821

Rodentia

(Plate 2, Figure 1)

Common name: Rodents

Dental formula: I 2/2, C 1/1, P 2/2, M 3/3

Materialss: Totally 120 NISP (18 MNI) are found in 4 layers, 2 NISP (1 MNI) in layer 2, 25 NISP (6 MNI) in layer 3, 20 NISP (5 MNI) in layer 4, 70 NISP (5 MNI) in layer 5 and 3 NISP (1 MNI) in layer 6 (see more detail at Appendix A, Table 4).

Description: These elements are isolated incisors that almost are fragment teeth, lost in occlusal or root side. They are arc-shape. The distal end of each incisor that displays occlusal surface is chisel-edged.

Discussion and comparison: Rodent incisors cannot be identified to lower taxa because many families have similar characteristic. In addition, the most incisors that were found in Tham Lod rockshelter are incomplete teeth.

Habitat: They live in many kinds of forest such as the bamboo, dry dipterocarp forest, hill evergreen, mixed deciduous, limestone, and semi-evergreen (Lekagul and McNealy, 1988).

Suborder Myomorpha Brandt, 185

Superfamily Muridae Illiger, 1811

4.2.1 Family Rhizomyidae Winge, 1887

Rhizomyidae

(Plate 2, Figure 2)

Common name: Bamboo rats.

Dental formula: I 1/1, C 0/0, P 0/0, M 3/3

Materialss: A total of 28 NISP (8 MNI) are found in 4 layers, 1 NISP (1 MNI) in layer 3, 2 NISP (1 MNI) in layer 4, 19 NISP (5 MNI) in layer 5 and 2 NISP (1 MNI) in layer 6. (see more detail at Appendix A, Table 5).

Description: These elements are isolated cheek teeth or incomplete cheek teeth row that covered by the thick calcreate. They are flat lophodont crown with sigmoid and island outline on occlusal surface.

Discussion and comparison: Identification of dentition in family Rhizomyidae requires dental characteristic feature of each tooth, comparison of size among molar 1-3, and the teeth row length. Unfortunately, these elements are isolated teeth or incomplete teeth row that covered by calcreate which they cannot be identified into lower taxa.

Habitat: They live in many kinds of forest. They prefer to live in bamboo forest (Lekagul and McNealy, 1988; WWF Thailand programme office, 2000).

Genus *Rhizomys* Gray, 1831

Rhizomys spp.

(Plate 2, Figure 3)

Common name: Bamboo rats.

Dental formula: I 1/1, C 0/0, P 0/0, M 3/3

Materialss: Only 2 NISP (2 MNI) in layer 5, a right lower jaw fragment with molar 1-3 (A5101) and a left lower jaw fragment with molar 2-3 (A5439), see Appendix A, Table 6.

Description: In the upper jaw element, the surface slanted outward. Each tooth is smooth and rounded especially the molar 3 are circle shape in occlusal view. They are lophodont, high crowned, cylindrical, and s-like lobe in the top view. For the dental size, the upper molar 1 are rather longer than molar 2, molar 3 is shortest teeth. It is opposite in width, molar 1 is narrowest in upper jaw. Almost lower incisors 2 are not incomplete teeth which lost at tip. They have triangle shape. Unlike upper teeth, the surface of lower teeth row slanted in opposite direction; inward. All molars are similar to upper teeth including lophodont, high crowned, and cylindrical. Lower molar 1, a smallest tooth in teeth row, is slightly triangular form with island outline on occlusal view. Lower molars 2 are slightly rounded with one groove (not dominant). The occlusal display sigmoid and island outline. Lower molars 3, largest teeth, are similar to molars 2 in characteristic feature. On the comparison to *Cannomys badius*, teeth row lengths of *Rhizomys* spp. are clear longer. Moreover, the morphological features are more rounded than *C. badius* (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
		Width	Length	Crown height
Upper molar 1	1	2.1	4.9	
Upper molar 2	1	3.4	3.8	
Upper molar 3	1	3.9	1.9	
Upper molar row (M1-3)	1		14.1	
Lower incisor	2	5.5±0.3 (5.7-5.3)	4.1±0.4 (4.4-3.8)	
Lower molar 1	1	3.3	3.3	3.1
Lower molar 2.	2	3.7 (3.7-3.7)	3.4±1.1 (4.2-2.6)	2.9 (2.9-2.9)
Lower molar 3	2	3.8 (3.8-3.8)	4.1±0.3 (4.3-3.9)	2.6 (2.6-2.6)
Lower molar row (M1-3)	2		15.0±0.9 (16.0-14.6)	

Discussion and comparison: These elements require some consideration of the limited lower jaw of *Rhizomys* sp. specimen. For upper jaw, the length of molar row are 14.1 mm are similar to *R. sumatrensis* (Raffles, 1821) or large bamboo rat: 14.0-15.2 mm (Lekagul and McNealy, 1988). However, dental size in each tooth is different. Lekagul and McNealy (1988) explained upper molar 1 and molar 2 are nearly the same size. By contrast to the specimen from Tham Lod rockshelter, molar 1 is longer and narrower than molar 2. In lower teeth, the dental feature of them are similar to *Rhizomys* sp. based on the picture of lower teeth row of *R. pruinosus* Blyth (1851) or hoary bamboo in

Lekagul and McNealy (1988). However, they cannot be concluded based on the recent data.

Habitat: Two recent *Rhizomys* sp. in Thailand are *R. pruinosus* and *R. sumatraensis* (Raffles, 1821) or large bamboo rat. *R. sumatraensis* live in the mixed deciduous and bamboo forest and *R. pruinosus* lives in the bamboo forest in the hill evergreen forest that located in more than 1,000 m over sea level (Parr, 2003).

Genus *Cannomys* Thomas, 1915

Cannomys badius (Hodgson, 1841)

(Plate 2, Figure 4)

Common name: Bay bamboo rats.

Dental formula: I 1/1, C 0/0, P 0/0, M 3/3

Materialss: A total of 10 NISP (8 MNI) in 3 layers, 1 NISP (1 MNI) in layer 3, 2 NISP (2 MNI) in layer 4, and 7 NISP (5 MNI) in layer 5 (see more detail at Appendix A, Table 7).

Description: All incisors in both upper and lower jaw are lost the upper part especially occlusal part or tip. They also display triangular shape like *Rhizomys* spp. Almost cheek teeth display rounded lophodont teeth except lower molar 1, clearly sigmoid texture on occlusal surface and 2-3 grooves in lateral side. The surface of the upper molars is slanted outward while the surface of the lower molar slanted correspondingly inward. On teeth row length (molar 1-3), lower molar rows are larger than upper molar rows. Upper molars 1 have 3 lophs that are fused in sigmoid shape with 1 groove on buccal surface. Upper molars 2 are similar to upper molar 1 but are smaller and more number of grooves. They have a groove in buccal side and a groove in lingual side. Upper molars 3, smallest teeth in upper jaw, composed of 2 lophs that are separated by groove. On the lower teeth, molars 1 are triangular teeth and have 3-4 lophs that fused in sigmoid texture. They display a groove in buccal side and a groove in lingual side. The characteristic of lower molar 2 are similar to upper molars 2. Lower molar 3 have 3 lops, 2 fused lops and 1 separated lophs. Unlike *Rhizomys* spp., teeth of *C. badius* are shorter in teeth row length and more triangular than *Rhizomys* spp. (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
		Width	Length	Crown height
Upper incisor2	2		2.5±0.4 (2.7-2.2)	
Upper molar 1	3	2.4±0 (2.4-2.4)	2.5±0.1 (2.5-2.4)	
Upper molar 2	3	2.3±0.4 (2.7-2.0)	2.5±0.1 (2.5-2.4)	
Upper molar 3	3	2.3±0.2 (2.4-3.1)	1.6±0.1 (1.7-1.5)	8.4±0 (8.4-8.4)
Upper teeth row (M1-3)	3		8.9±0.1 (8.9-8.8)	
Lower incisor 2	8	2.5±1.1 (4.3-1.3)	2.0±0.6 (2.7-1.3)	
Lower molar 1	9	2.5±0.7 (3.9-1.7)	2.5±0.5 (3.4-2.1)	9.8±0.8 (10.4-8.8)
Lower molar 2	8	2.9±0.7 (3.8-2.1)	2.5±0.5 (3.4-2.1)	13.3±6.2 (17.8-6.0)
Lower molar 3	7	2.8±0.9 (3.9-1.8)	2.5±0.9 (3.8-1.6)	10.9±1.2 (12.3-9.9)
Lower teeth row (M1-3)	9		11.1±2.6 (15.8-9.0)	

Discussion and comparison: These upper and lower jaw elements are different to *Rhizomys* spp. in more dominate sigmoid texture and quite smaller. Their features are similar to *Cannomys badius*, the recent *Cannomys* in Thailand, based on description of Lekagul and McNealy (1988). On measurement, the elements, which display upper teeth row length, are similar to *C. badius*; 8.8 to 11.7 mm (Lekagul and McNealy, 1988). In summary, these jaw elements are relative to *C. badius*.

Habitat: *C. badius* occurs in the bamboo forest in the mixed deciduous and hill evergreen forest (Lekagul and McNealy, 1988; Parr, 2003).

4.2.2 Family Muridae Illiger, 1811

Subfamily Microtinae Gray, 1821

Genus *Bandicota* Gray, 1873

Bandicota spp.

(Plate 2, Figure 5)

Common name: Bandicoot rat.

Dental formula: I 1/1, C 0/0, P 0/0, M 3/3

Materialss: Only 1 NISP (1 MNI), a left upper jaw fragment with molar1-3 (A5611) in layer 5, see Appendix A, Table 8

Description: Upper molar 1 is the largest tooth of this element and composes of three laminas that separates by two grooves. Molar 2 has two laminas that separates by one grooves. And molar 3, the smallest teeth, consists of two laminas that is similar to molar 2. The morphological feature of *Bandicota* spp. are more complex than rodents in family Rhizomyidae, however it is smaller in teeth size. In comparison to *Bandicota indica*, both *Bandicota* spp. and *B. indica* are quite similar. But *Bandicota* spp. are rather smaller in each teeth size and teeth row length (dental measurement, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm)		
		Width	Length	Crown height
Upper molar 1	1	2.8	2.2	1.6
Upper molar 2	1	2.5	1.2	1.4
Upper molar 3	1	1.7	0.9	0.7
Upper teeth row (M1-3)	1		9.8	

Discussion and comparison: The characteristic feature of this upper jaw element is similar to recent teeth of recent *Badicota* in Thailand, lesser bandicoot or *B. savilei* Thomas, 1916 and great bandicoot or *B. indica*, Bechstein, 1800. However, the size of upper teeth row is not similar *B. savilei* and *B. indica.* Lekagul and McNealy (1988), displayed the teeth row length (unspecified upper or lower): *B. savilei* is less than 9.2 mm and *B. indica* is more than 10.0 mm. In addition, Medway (1969) showed the upper teeth row length: *B. savilei* is 7.9-8.5 mm and *B. indica* is 10.4-11.3 mm. For the upper teeth row length of the element from Tham Lod rockshelter, it is 9.8 mm. At the conclusion of this discussion, this upper jaw element is closely related to recent *Badicota* in Thailand but can not be identified into lower taxa.

Habitat: *Badicota* is found in grassland (Medway, 1969; Lekagul and McNealy, 1988).

Bandicota indica (Bechstein, 1800)

(Plate 2, Figure 6)

Common name: Greater bandicoot rat.

Dental formula: I 1/1, C 0/0, P 0/0, M 3/3

Materials: Only 1 NISP (1 MNI), a right lower jaw fragment with incisor 2-molar 3 (A4641) in layer 5 (see Appendix A, Table 9).

Description: The characteristic of lower molars are similar to upper molar of a left upper jaw of *Bandicota* spp. but are larger (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm)		
		Width	Length	Crown height
Lower molar 1	1	2.9	3.8	
Lower molar 2	1	2.7	2.2	
Lower molar 3	1	2.5	2.0	
Lower teeth row (M1-3)	1		10.3	

Remark: crown height is not prominent.

Discussion and comparison: **Based on description of** Lekagul and McNealy (1988), the characteristic feature and teeth row length of this lower jaw element is similar to *B. indica* which the teeth row length is more than 10.0 mm (Lekagul and McNealy, 1988) and 10.4-11.3 mm (Medway, 1969). In conclusion, this lower jaw element should be used to *B. indica*.

Habitat: In recent time, *B. indica* live in grass field (Medway, 1969).

Suborder Hystricomorpha Brandt, 1855

4.2.3 Family Hystricidae Fischer de Waldheim, 1817

Hystricidae 1

(Plate 2, Figure 7)

Common name: Large porcupine.

Dental formula: I 1/1, C 0/0, P 1/1, M 3/3

Materials: A total of 29 NISP (6 MNI) in 4 layers, 1 NISP (1 MNI) in layer 1, 1 NISP (1 MNI) in layer 3, 2 NSP (1 MNI) in layer 4, and 25 NISP (2 MNI) in layer 5, see more detail at Appendix A, Table 10.

Description: All these elements are isolated teeth and jaw fragments. Upper teeth have 2-3 infoldings in the buccal side, the most distal often curving distally. On the lingual side is a single fold that often communicates with the middle fold of the buccal side. The folds become infudibulums with wear, so that one of the characteristic of porcupine is enamel 'islands' in occlusal surface. On upper premolar, it is quite similar to upper molar but less complex. Lower cheek teeth have a similar arrangement, but in reverse. Their sizes are similar to upper teeth (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
		Width	Length	Crown height
Upper premolar 4	1	5.2	6.7	
Upper molar 1	3	5.8±1.2 (6.5-5.2)	7.1±0.5 (7.5-7.3)	15.8 (15.8-15.8)
Upper molar 2	2	5.9±0.9 (6.5-5.2)	7.4±0.1 (7.5-7.3)	17.9 (17.9-17.9)
Lower premolar 4	2	5.9±1.1 (6.7-5.1)	7.9±0.7 (8.4-7.4)	
Lower molar 1	2	6.4±0.1 (6.5-6.3)	6.8±1.1 (7.6-6.0)	
Lower molar 2	2	6.5±0.3 (6.7-6.3)	7.2±0.2 (7.3-7.0)	
Lower molar row (M1-M3)	2		29.8	
Lower teeth row (P4-M3)	1		31.8	

Discussion and comparison: Dental size of these teeth elements; more than 4.7 mm in width and 6.6 mm in length, indicated to large porcupine own. Unfortunately, the recent large porcupine in Thailand is Malayan porcupine or *Hystrix brachyuran* Linnaeus, 1758 although their dental size in each tooth is lack. The only its dental size data is the upper teeth row length; 27-34 mm (Lekagul and McNealy, 1988). From its upper teeth row length, the average length of each upper tooth is approximately 6.7-8.5 mm. These teeth elements of large porcupine may be related to *Hystrix brachyuran*. However, these elements cannot clearly identified to porcupine in genus *Hystrix* based on the recent data.

Habitat: It is found in all forest of Thailand such as the bamboo, dry dipterocarp forest, hill evergreen, mixed deciduous, limestone, and semi-evergreen (Lekagul and McNealy, 1988; Parr, 2003).

Hystricidae 2

(Plate 2, Figure 8)

Common name: Small porcupine.

Dental formula: I 1/1, C 0/0, P 1/1, M 3/3

Materials: A total of 6 NISP (4 MNI) from 3 layers, 1 NISP (1 MNI) in layer 3, 1 NISP (1 MNI) in layer 4, and 4 NISP (2 MNI) in layer 5 (Appendix A, Table 11).

Description of teeth: Dental characteristic of these teeth elements are similar to large porcupine but are smaller; less than 4.7 mm by less than 4.4 mm by less than 4.9 mm (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
		Width	Length	Crown height
Upper premolar 4	1	4.4	3.3	
Upper molar 1	1	4.4	4.3	
Upper molar 2	2	3.8±0.1 (4.0-3.8)	3.7±1.4 (4.7-2.7)	
Upper molar 3	1	3.9	3.6	
Lower molar 2	1	3.9	3.6	
Lower molar 3	3	4.0±0.6 (4.4-3.3)	3.6±0.7 (4.3-3.0)	
Lower teeth row (P4-M3)	1		16.9	

Remark: crown height is not prominent.

Discussion and comparison: Dental size of these teeth elements indicated to small porcupine own. Unfortunately, they are isolated teeth that lost specified character such as teeth row length. The recent small porcupine in Thailand is *Atherurus macrourus* (Linnaeus, 1758); bush-tailed porcupine that has approximately 3.2-4.0 mm in the average length of each upper tooth based on the upper teeth row length; 15 -16 mm (Lekagul and McNealy, 1988). As suggest by this average length of each upper tooth, teeth element from the rockshelter are similar to *A. macrourus* in size. So, these teeth elements of small porcupine may be related to *A. macrourus*. However, these elements cannot clearly be identified to porcupine in genus *Atherurus* based on the recent data.

Habitat: It live in many kind of forest of Thailand such as the bamboo, dry dipterocarp forest, hill evergreen, mixed deciduous, limestone, and semi-evergreen etc. (Lekagul and McNealy, 1988; Parr, 2003).

4.3 Order Carnivora Bowdich, 1821

Carnivora

(Plate 3, Figure 1-4)

Common name: Meat-eating mammals.

Materials: Totally 45 NISP (10 MNI) from 4 layers, 7 NISP (2 MNI) in layer 2, 7 NISP (2 MNI) in layer 3, 6 NISP (1 MNI) in layer 4, and 25 NISP (5 MNI) in layer 5 (Appendix A, Table 12).

Description: These elements are incisors, fragments of canine, and fragments of cheek teeth. Incisors are most unspecified position. Their characteristics are chisel shape. Canines often are lost enamel and some lost root. For cheek teeth, they are very broken that lost specified feature.

Discussion and comparison: The characteristic of incisors are general carnivore cannot use for identification. In addition, canine and cheek teeth are lost specified characteristic. They cannot be so identified into lower taxa.

Habitat: It is found in many kind of forest, for example the bamboo, dry dipterocarp forest, hill evergreen, mixed deciduous, limestone, semi-evergreen etc. (Lekagul and McNealy, 1988; Parr, 2003).

4.3.1 Family Ursidae G. Fischer de Waldheim, 1817

Genus *Ursus* Linnaeus, 1758

***Ursus* spp.**

(Plate 3, Figure 5-6)

Common name: Bears.

Dental formula: I 3/3, C 1/1, P 4/4, M 2/3

Materials: A total of 42 NISP (6 MNI) from three layers, 8 NISP (2 MNI) in layer 2, 3 NISP (1 MNI) in layer 3, and 31 NISP (3 MNI) in layer 5 (Appendix A, Table 13).

Description: The upper incisor 3, the canine-like incisor, is larger and longer than other incisors. These lower incisors 1-3 have one main point, with low accessory cusps to mesial and to distal. The lower incisors 3 are larger than other in these series and incisors 1 are smallest. The Canines (in both upper and lower) are incomplete and often lost enamel. They are powerful, elongated and sharp. Their accessory cusps or a prominent cingulum is absent. Canine roots are long and thick. The premolar 4 is less recognizable as a carnassial, but the blade is replaced by broad cusps. It is triangular shape on occlusal and composed of 3 cusp; 2 high cusps in buccal side and low cusps in lingual side (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
		Width	Length	Crown height
Upper incisor 3	2	10.7±4.7 (14.0-7.3)	8.8±0.5 (9.1-8.4)	
Upper canine	1		25.3	12.2
Upper premolar 4	4	9.5±1.0 (11.1-8.5)	9.9±4.7 (13.0-3.1)	6.3±1.5 (7.5-4.5)
Upper molar 1	6	12.7±3.5 (18.9-10.0)	13.8±3.7 (18.8-8.0)	6.3±2.2 (8.8-2.5)
Lower incisor 1	4	6.4±1.1 (8.0-5.7)	4.7±0.4 (4.9-4.1)	6.0±1.1 (7.4-.1)
Lower incisor 2	6	7.3±0.3 (7.6-6.9)	5.5±0.8 (6.9-4.7)	8.4±1.1 (9.7-6.9)
Lower incisor 3	3	8.1±1.0 (8.8-6.9)	8.3±0.8 (9.0-7.4)	10.2±6.2 (14.5-.5.8)
Lower canine	1	8.4	20.1	
Lower premolar 4	1	6.2	8.5	3.2

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
Lower molar 1	2	10.9±1.1 (11.6-10.1)	15.5±2.3 (17.1-13.9)	4.6±2.8 (6.5-2.6)
Lower molar 2	1	14.5		5.2
Lower molar 3	1	7.9		

Discussion and comparison: These elements cannot be classified to species level because their characteristic features are similar to both *Ursus thibetanus* and *U. malayanus* Raffles, 1821 (sun bear). The majority dental sizes of these elements are similar to *U. thibetanus* and *U. malayanus*. On conclusion, these elements have intermediate characteristic between two bears. However, some element displays upper premolar 4, upper molar 1, and lower molar 1 are clearly smaller the recent specimens (see the measurement data of recent specimens in Appendix B, Table 2-3).

Habitat: *Ursus* spp. lives in many forest: the bamboo, dry dipterocarp forest, hill evergreen, mixed deciduous, limestone, semi-evergreen etc. (Lekagul and McNealy, 1988; WWF Thailand programme office, 2000).

Ursus thibetanus G. Cuvier, 1823

(Plate 3, Figure 7)

Common name: Asiatic black bear.

Dental formula: I 3/3, C 1/1, P 4/4, M 2/3

Materials: A total of 15 NISP (7 MNI) from 4 layers: 5 NISP (2 MNI) in layer 2, 3 NISP (1 MNI) in layer 3, 1 NISP (1 MNI) layer 4, and 6 NISP (3 MNI) in layer 5 (see more detail at Appendix A, Table 14).

Description: The upper molars 1, the rectangular teeth, consist of four cusps. On observation, 2 cusps in buccal side are higher than 2 cusp in lingual side. For the Upper molars 2, they are the long flat rounded teeth and consist of short 4 main cusps and a flat accessory cusp. On the lower jaw, all lower cheek teeth are usually narrower than upper cheek teeth. The premolar 3 is small and rounded that similar to upper premolar 3. The lower premolar 4, is short rounded tooth, has a main point, with low accessory cusps in lingual side. The lower molars 1 are wide, short, and narrow. They compose of 4 main cusps with many accessory cusps. The lower molars 2, consist of 4 main cusps and a accessory cusp, are similar to lower molars 1 but are quite wider and flatter. In contrast, lower molars 3 are flat and rounded. Their cusps are not prominent (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
		Width	Length	Crown height
Upper molar 1	3	13.8±0.3 (14.2-13.5)	19.0±0.5 (19.7-18.4)	7.8±1.2 (8.6-6.9)
Upper molar 2	1	15.9±0.9 (16.8-15.1)	28.4±1.4 (30.0-27.4)	5.5±1.6 (6.6-4.4)
Upper molar row (P4-M3)	1		62.0	
Lower premolar 3	1	9.4	12.9	6.3
Lower premolar 4	1	5.4	8.9	5.1
Lower molar 1	2	8.4±0.1 (8.5-8.3)	20.2±0.6 (20.6-19.7)	6.0
Lower molar 2	4	1.2.1±1.3 (13.6-11.2)	20.3±.9 (22.9-18.4)	4.2-5.6
Lower molar 3	4	12.0±0.7 (12.8-11.1)	20.3±0.3 (22.9-18.4)	2.8-4.8
Lower molar row (M1-3)	2		57.3-59.5	
Lower teeth row (P4-M3)	2		67.9-75.4	

Discussion and comparison: These elements show many characteristic features as the feature of upper molar 2; long, flat, and rounded with 4 short cusps and a flat accessory cusp. They similar to Asiatic black bear or *Ursus thibetanus* G. Cuvier, 1823 which recently raging in Northern Thailand, as suggested by 2 specimens from the Natural History Museum of Chulalongkorn University, National Science Museum (NSM) and description in Lekagul and McNealy (1988). Almost of these elements are also similar to *U. thibetanus* in size of upper molar 2, teeth row length, and molar row length. However, some are quite larger (see the measurement data of recent specimens in Appendix B, Table 2-3).

Habitat: *U. thibetanus* prefers a high land and cold climate including the mixed deciduous and lower mountain forest, but may also be found at lower levels. (Lekagul and McNealy, 1988; WWF Thailand programme office, 2000; Parr, 2003).

4.3.2 Family Mustelidae G. Fischer de Waldheim, 1817

Subfamily Melinae Bonaparte, 1838

Genus *Actonyx* F. Cuvier, 1825

***Actonyx collaris* F. Cuvier, 1825**

(Plate 4, Figure 1)

Common name: Hog badger.

Dental formula: I 3/3, C 1/1, P 4/4, M 1/2

Materials: A fragment of right lower jaw with premolar4-molar2 (A6751) in layer 5, see Appendix A, Table 15.

Description: Almost surface of this element is covered by thick calcrete with grain of sediment. The lower premolar 4 is narrow and triangle shape in lateral view. Moreover, it has a short pointed main cutting blade. The lower molar 1 is a long carnassial tooth that has a mesial cusp clearly separated from the flatter distal area by a waist. A mesial cusp is developed to a high pointed main cutting blade. In addition, distal area is composed of 5 small cusps around a waist. The lower molar 2 is quite rounded and has a waist in central crown on the occlusal surface.

Kind of teeth	Number of teeth	Dental measurement (mm)		
		Width	Length	Crown height
Lower premolar 4	1	2.9	5.7	
Lower molar 1	1	6.8	15.3	
Lower molar 2	1	4.9	4.9	
Lower molar row (M1-2)	1		22.5	

Remark: crown height is not prominent.

Discussion and comparison: The dental characteristic feature in this element is similar to description of Hog badger or *Actonyx collaris* F. Cuvier, 1823 (Lekagul and McNealy, 1988) and two skull specimens of *A. collaris* from Museum of Natural History, Chulalongkorn University. Each tooth is smaller than recent specimens but its lower molar row length is longer (see the measurement data of recent specimens in Appendix B, Table 5-6).

Habitat: *Actonyx collaris* habits in all forest including, e.g. the bamboo, dry dipterocarp forest, hill evergreen, mixed deciduous, limestone, semi-evergreen etc. (Lekagul and McNealy, 1988; WWF Thailand programme office, 2000; Parr, 2003).

Carnivora 1

(Plate 4, Figure 2)

Common name: Uknown carnivore 1

Dental formula: Unknown

Materials: One NISP (1 MNI), a lower jaw fragment with premolar 4 and molar 1 that can not be specified side (A6094) in layer 5 (see Appendix I, Table 16).

Description: Unfortunately, both premolar 4 and molar 1 are incomplete teeth that cannot be measured. It measures 14.7 mm in length, 5.5 mm in width, and 2.7 mm in height. It is covered by few calcrete. The premolar 4 is broken and lost importance feature. The lower molar 1 has a waist around by 5 small obtuse cusps. In contrast, the lower molar 2 is lost but it remains its alveolus. This alveolus shape displays the shape of lower molar 2 as quite long and rather smaller than lower molar 1.

Discussion and comparison: This element is similar to lower jaw of many families in order Carnivora. As suggest by the size of element and alveolus shape of molar 2, this element may be related to some species in Mustelidae and Viverridae. Unfortunately, their specimens are very rare.

Carnivora 2

(Plate 4, Figure 3)

Common name: Unknown carnivore 2.

Dental formula: Unknown.

Materials: A lower jaw fragment with a canine that can not be specified side (A3346) in layer 5 (Appendix A, Table 17).

Description: This element is cover by thick calcreate. Lower jaw fragment is rounded and elongated. Accessory cusps or a prominent cingulum do not represent. Unfortunately, its tip is lost and strained by black chemical Materials on crown.

Discussion and comparison: These material show the characteristic of the animal belonging to Carnivora which described above, there are unable to identify to lower categories because they are fragments and their roots are lost.

4.4 Order Proboscidea Illiger, 1811

4.4.1 Family Elephantidae Gray, 1821

Genus *Elephas* Linnaeus, 1758

Elephas sp.

(Plate 4, Figure 4-5)

Common name: Elephant.

Dental formula: I 1/0, C 0/0, P 3/3, M 3/3

Materials: A total of 6 NISP (2 MNI) from 2 layers: a tusk fragment (A1491) in layer 3, 4 tusk fragment (A3155-8) and a cheek teeth fragment (A5943) in layer 5 (see Appendix A, Table 18,).

Description: Five tusk fragments have rectangle shape with rectangular fracture on the surface that measure about 20.0-30.0 mm in length, about 10.0-20.0 mm in width, and less than 5.0 mm in thickness. Cheek teeth fragment is a high, narrow loph fragment (measured 4.0 mm in length, 3.5 mm in width, and 25.0 mm in length) and display erupted crown on occlusal surface. On the occlusal view, it represents black dentine enclosed by curved white enamel.

Discussion and comparison: These tusk fragments remain very small piece that is difficult to identify to genus or species level. For a loph fragment, it is an important sample that displayed specified dental characteristic feature of genus *Elephas*. Although it loss cementum, hold it together with other lophs, and cannot be specified position. In genus *Elephas*, the cheek teeth are composed of a series of flat plates; lophs are cemented together to form small, narrow wavy loop which run parallel to each other on the grinding surface of the teeth (Lekagul and McNeely,1988).

Habitat: *Elephas* sp. is found in main kind of forest, for example the bamboo, dry dipterocarp forest, hill evergreen, mixed deciduous, limestone, semi-evergreen etc. (Lekagul and McNeely,1988).

4.5 Order Perissodactyla Owen, 1848

4.5.1 Family Rhinocerotidae Gray, 1821

Rhinocerotidae

(Plate 4, Figure 6-8)

Common name: Rhinoceroses.

Dental formula: I 0-1/0-2, C 0/0-1, P 3-4/3-4, M 3/3

Materials: Only 4 NISP (2 MNI) from two layers, concluded a lower jaw with left complete premolar (A505), an almost complete lower molar (A731) in layer 3, and an unspecified cheek tooth fragment (A1896) and an upper cheek tooth fragment (A2234) in layer 4 (Appendix A, Table 19).

Description: On generally observation, almost lower teeth elements are larger (or estimated to larger) than the upper tooth element. For an upper cheek tooth, it is a slightly worn and is hypsodont and lophodont teeth with E-shape on occlusal view. In addition, it represents to curved three lophs (paracone, protocone, and metacone) and small crochet. Unfortunately, it is broken in mesial side and crown below. In contrast, lower molar is almost complete. It is large smooth curved hypsodont teeth with 2 large roots and display very worn on occlusal surface. For an unspecified cheek tooth fragment, it is buccal or lingual surface fragment of large curved hypsodont. The occlusal surface displays lustrous black dentine enclosed by thick white enamel. For the last sample, a left complete premolar in a lower jaw is cover thick calcreate with grain sediment. This premolar is narrow curved hypsodont with opaque black dentine surrounded by shiny gray enamel (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Dental measurement (mm)		
	Width	Length	Crown height
Upper cheek tooth (A2234)	8.8	<9.4*	<18.8*
Lower premolar (A505)	10.3	13.7	8.9
Lower molar (A731)	27.7	39.3	13.8
Cheek tooth fragment (A1896)	24.1	17.6	29.2

*Incomplete teeth

Discussion and comparison: Specimens require some consideration of the limited complete specimens. Unfortunately, this discussion will be based exclusively on upper jaw especially the upper molar, as the lower jaw of Rhinocerotidae is limited to recent Rhinocerotidae description. For upper cheek tooth sample, it quite closely relates to *Rhinoceros* as curved 3 lophs and small crochet (Hillson, 1990; Groves and Kurt, 1972).

However, upper cheek tooth lost the important characteristic feature such as mesial side and crochet (Hillson, 1990; Groves and Kurt, 1972).

Habitat: Rhinoceroses habit in dense forest, swamps and low-lying forest, though some have been found at high attitude; hill evergreen forest (Lekagul and McNeely, 1988).

Perisodactyla

(Plate 4, Figure 9)

Common name: Unknown Perisodactyla.

Dental formula: Unknown.

Materials: Only a isolated incisor that has complete crown and broken root (A4987) in layer 5 (Appendix A, Table 20).

Description: This isolated Incisor is measures 8.0 mm in width, 15.7 mm in length, and 20.7 mm in crown height. Its crown displays ovule shape with shallow furrow on buccal surface and composes of a thick hollow root.

Discussion and comparison: This incisor is considered to order Perisodactyla by the present of above characteristic. Moreover, its size is larger than order Artiodactyla and near same order Perisodactyla. It is more closed to family Tarpiridae than the other family in order Perisodactyla. In family Tarpiridae, lower incisor 1-2 (in worn stage) are large chisel-shape with shallow furrow on buccal surface based on a specimen of *Tapirus indicus* Desmarest, 1819 (Asian or Malayan tapir) from Museum of Natural History, Chulalongkorn University and the dental description in Lekagul and McNeely (1988). However, the incisor from Tham Lod rockshelter is ovule shape and clearly larger than the recent tapir in length and crown height (see more detail in Table 4, Appendix B). As suggest by the recent data, this incisor cannot be clearly identified to family Tarpiridae.

4.6 Order Artiodactyla Owen, 1848

Suborder Suiformes Gray, 1868

Infraorder Suina Gray, 1868

4.6.1 Family Suidae Gray, 1821

Genus *Sus* Linnaeus, 1758

Sus scrofa Linnaeus, 1758

(Plate 5, Figure 1-4)

Common name: Eurasian wild pig.

Dental formula: I 3/3, C 1/1, P 4/4, M 3/3

Materialss: A total of 169 NISP (16 MNI) from 6 layers, 4 NISP (1 MNI) in layer 2, 9 NISP (1 MNI) in layer 3, 29 NISP (3 MNI) in layer 4, 123 NISP (9 MNI) in layer 5, 3 NISP (1 MNI) in layer 6, and 1 NISP (1 MNI) in layer 7 (Appendix A, Table 21).

Description: The lower incisors 1-3 are long and narrow, projecting forward almost horizontally with one to two long and very small grooves. All canine fragments are rather thick and flat fragments in vary size. Some displayed the angle part of triangular canines. The upper unspecified premolar is similar to the lower premolars 1-3 by low crown, their cusps being gathered together into a blade-like structure, and aligned along the jaw. However, the upper unspecified premolar has 2 small cusps in lingual side. The lower premolars 1-3 are not present lingual cusp and flatter than upper premolars. The size of lower premolar 1-3 increases from first to third. For molar, all are markedly bunodont which consist of four main cusps with many accessory cusps. Number of cusps and their size increase from first to third. On observation in molar 2, its occlusal surface is much worn; their accessory cusps erupt and lost. Four main cusps are prominent. For upper molars 3, they is triangular shape on the occlusal view and composes of 4 main cusps with 5 accessory cusps: 1 accessory cusp surrounded by 4 main cusps and 4 accessory cusps group at distal area. The upper molar 3 are large in comparison with upper molar 1-2. For lower molars 2, they usually are similar to upper molar 2 but are larger. The lower molars 3, the longest teeth, are quite similar to upper molar 3. They displayed highest number of cusp that composed of 4 main cusps with 6 accessory cusps (on unworn occlusal surface): 1 accessory cusps is among four main cusps and 5 accessory cusps locate at distal area (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
		Width	Length	Crown height
Upper incisor 3	1	4	7.1	
Upper premolar 3	2	10.9±0.4 11.4-3.5	15.9±0.1 (15.9-15.8)	11.9-12.9
Upper molar 2	1	4.2±1.0 (4.9-3.5)	11.5±1.8 (12.7-10.2)	4.4
Upper molar 3	2	17.4	44.1	8.2-13.2
Lower incisor 1	1	9.4	4.7	
Lower incisor 2	1	7.9		
Lower incisor 3	3	3.6±2.3 (6.2-1.9)	6.2±0.6 (6.7-5.6)	
Lower deciduous premolar 3	2	4.2±1.0 (4.9-3.5)	11.5±1.8 (12.7-10.2)	5.7
Lower deciduous premolar 4	5	6.4±3.1 (9.1-1.0)	20.7±1.3 (22.0-19.4)	2.5-7.2
Lower molar 1	4	10.9±1.6 (12.3-9.3)	16.4±0.4 (16.7-16.1)	4.2-7.9
Lower molar 2	7	12.2±1.9 (15.5-9.2)	17.8±1.9 (21.6-16.0)	9.0-15.7
Lower molar 3	12	17.9±1.6 (20.3-15.5)	41.6-7.3 (49.0-25.0)	8.0-20.6
Lower molar row (M1-3)	1		86.0	

Discussion and comparison: These elements are similar to recent wild pig *Sus scrofa* base on Lekagul and McNeely (1988) and the specimens from the Museum of Natural History, Chulalongkorn University and the Natural History Museum, National Science Museum. Almost elements are larger than the recent especially upper molars and lower molar 3 (see the measurement data of recent specimens in Appendix B, Table 7-8). Some Late Pleistocene molars represent large size in comparison with their recent homologues.

Habitat: *S. scrofa* is found in many kinds of forest such as the bamboo, dry dipterocarp forest, hill evergreen, mixed deciduous, limestone, semi-evergreen etc. but prefers the area, near water supply (Lekagul and McNealy, 1988 and Parr 2003).

Suborder Ruminantia Scopoli, 1777

Infraorder Pecora Linnaeus, 1758

Pecora

Common name: Ruminants.

Dental formula: I 0/3, C 0-1/0, P 3/3, M 3/3

Materials: A total of 166 NISP (23 MNI) are discovered from 6 layers: 1 NISP (1 MNI) in layer 1, 18 NISP (3 MNI) in layer 2, 31 NISP (4 MNI) in layer 3, 51 NISP (5 MNI) in layer 4, 64 NISP (9 MNI) in layer 5, and 1 NISP (1 MNI) in layer 7 (Appendix A, Table 22).

Description: 166 NISP are compose of 5 kinds of teeth in both upper and lower jaw such as deciduous premolar, incisor, canine, premolar, and molar. They are fragment teeth and covered by calcreate that lost specific feature.

Discussion and comparison: The morphological features of these elements are similar to both family Cervidae and Bovidae which is chisel-shaped teeth in incisors and canine and slenodont teeth or hypsodont teeth in cheek teeth. However, they are covered by calcreate and lost specific feature of each order, so that, these elements cannot be identified into lower taxa.

Habitat: It is found in many kind of forest, for example the bamboo, dry dipterocarp forest, hill evergreen, mixed deciduous, limestone, semi-evergreen etc. (Parr, 2003; Lekagul and McNealy, 1988).

4.6.2 Family Cervidae Goldfuss, 1822

Cervidae

(Plate 6, Figure 1-5 and Plate 7, Figure 1-4)

Common name: Cervids.

Dental formula: I 0/3, C 0-1/0, P 3/3, M 3/3

Materials: Totally 987 NISP (51 MNI) are found in almost layer except layer 8: 3 NISP (1 MNI) in layer 1, 15 NISP (2 MNI) in layer 2, 186 NISP (13 MNI) in layer 3, 213 NISP (9 MNI) in layer 4, 554 NISP (23 MNI) in layer 5, 8 NISP (1 MNI) in layer 6, and 8 NISP (2 MNI) in layer 7 (Appendix A, Table 23).

Description: These elements may be belonged to mammals in family Cervidae, probably *Muntiacus* sp. (mouse deer) and *Cervus* sp. (deer). General characteristic of their teeth are quite similar which cause to hardly identification. The kinds of teeth that discovered are deciduous premolar, incisor, canine, premolar, and molar in both upper and lower jaw (incisor and canine display only lower jaw because upper incisor and canine of ruminate generally absent replace by a horny pad). Upper premolars are slenodont that have a infundibulum. On occlusal surface, they appear in the worn surface as a crescentic island. Upper molars are also slenodont as two premolar element jointed side by side. The overall occlusal outline quite is squarish. In generally, lower incisors (including incisors 1 and 2) are chisel-shaped teeth and depressing in buccal-lingual side, incisors 1 display largest incisor. Lower canines develop to incisor-like teeth. Both lower incisors and lower canines are grouped together in a semicircle. Lower premolars 2 are smallest premolar and display unclearly occlusal outline. Lower premolars 3 are compose of 3 lophs in F-shape pattern. Lower premolars 4 generally have 3 lophs that display less 2 forms that are different characteristic feature: F-shape pattern and the linking of 2 lophs as infundibulum-like. Lowers molars are like upper teeth but are narrower. Some lowers molars have pli-anterior in buccal side. The lower molar 3 has 2 infudibulums with pronounced distal ridge. It is the largest tooth in the dentition. On deciduous dentition, they generally are similar to permanent teeth, except lower deciduous premolars 4. Upper deciduous premolars 3-4 are similar to upper permanent molars. Lower deciduous premolars 4 have 3 infudibulums.

Discussion and comparison: There are fairly a lot of recent specimen in several species such as *Muntiacus* sp., *M. muntiacus* and *Cervus unicolor*. However, data or specimen of other species such as *C. porcinus*, *C. eldii*, and *C. schomburgki* are a little or absent. Almost of recent specimens are rare in lower jaw that have specified feature especially molar 3. On conclusion, the majority of data of recent mammals in family Cervidae are quite incomplete. Besides, most elements that are found in the site are fragment teeth and covered by calcreate. It is difficult to clear identification, as suggested by recent data, although, elements are abundant.

Habitat: Mammals in family Cervidae generally habit in all kind of forests, for example the bamboo, dry dipterocarp forest, hill evergreen, mixed deciduous, limestone, semi-evergreen etc. (Lekagul and McNealy, 1988; WWF Thailand programme office, 2000).

Genus *Muntiacus* Rafinesque, 1815

Muntiacus spp.

(Plate 6, Figure 6)

Common name: Barking deer or Muntjac.

Dental formula: I 0/3, C 1/1, P 3/3, M 3/3

Materialss: Two NISP (1 MNI) is discovered in layer 4 which conclude a fragment of left lower jaw with premolar 3-4 (A1916) and a fragment of left lower jaw with molar 1-3 (A1915), see more detail in Appendix A, Table 24. They can joint together, so they may be from same individual.

Description: These elements are small cervid teeth which display general upper molar characteristic of family Cervidae, slenodont teeth. On specific characteristic of this taxa, All lobe of premolar 3-4 and molar 1-3 in lingual side are more round than *Cervus* *unicolor* elements and general cervid's teeth (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
		Width	Length	Crown height
Upper premolar 3	1	6.7	7.5	9.5
Upper premolar 4	1	6.4	6.9	9.4
Upper molar 1	1	9.8	10.0	6.9
Upper molar 2	1	9.3	11.3	10.4
Upper molar 3	1	8.7	11.5	11.2
Upper molar row	1		35.5	

Discussion and comparison: The dental characteristic feature of these elements are similar to the recent *Muntiacus* form. Moreover, dental measurement are similar to recent *Muntiacus* teeth, especially the upper molar teeth row (see the measurement data of recent specimens in Appendix B, Table 9-10). According to the upper molar teeth row (molar 1-3) of recent *Muntiacus* teeth, they range between 29.7 to 40.1 mm while the element from the site is 35.5 mm.

Habitat: *Muntiacus* spp. occurs in all types of forest (e.g. the bamboo, dry dipterocarp forest, hill evergreen, mixed deciduous, limestone, semi-evergreen etc.) and may be the most common deer in Thailand (Lekagul and McNealy, 1988; Parr, 2003).

Genus *Cervus* Linnaeus, 1758

Cervus unicolor Kerr, 1792

(Plate 7, Figure 5)

Common name: Sambar deer.

Dental formula: I 0/3, C 0/1, P 3/3, M 3/3

Materialss: A total of 9 NISP (4 MNI) is discovered in four layers: 4 NISP (1 MNI) in layer 2, 2 NISP (1 MNI) in layer 3, 1 NISP (1 MNI) in layer 4, and 2 NISP (1 MNI) in layer 5 (Appendix A, Table 25).

Description: Upper dentition (including premolars 3-4 and molar 1-3) are like Cervidae On lower dentition, only molar 3 discovered which are also like Cervidae as 2 infudibulums with pronounced distal ridge (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
		Width	Length	Crown height
Upper premolar 3	1	14.9	14.4	
Upper premolar 4	1		12.5	
Upper molar 1	3	17.6±1.2 (19.0-16.9)	17.5±1.3 (18.9-16.4)	9.4±0 (9.4-9.4)
Upper molar 2	3	16.0±5.3 (21.4-10.8)	21.5±1.9 (23.7-20.0)	
Upper molar 3	2	17.5±4.7 (21.6-12.4)	21.9±0.5 (22.5-20.8)	
Upper molar row	2		57.1-62.0	
Lower molar 3	3	13.2±1.5 (14.7-11.8)	30.0±2.6 (32.9-28.0)	

Discussion and comparison: These elements are similar to recent data of *Cervus unicolor* based on 2 craniums from the Museum of Natural History, Chulalongkorn University and the Natural History Museum, National Science Museum and pictures of specimen from the National Museum of Natural History, Paris that was taken photo by Dr.Prasit Auetrakulvit. Some elements are smaller than the recent in width. While, other measurements such as length, premolar row length, and molar row length are quite similar to the recent (see the measurement data of recent specimens in Appendix B, Table 9-10).

Habitat: *Cervus unicolor* is found in a wide variety of habitat such as the bamboo, dry dipterocarp forest, hill evergreen, mixed deciduous, limestone, semi-evergreen etc. It seems to prefer wooded areas, including dense jungle (Lekagul and McNealy, 1988; WWF Thailand programme office, 2000).

Superfamily Bovoidea Gray, 1821

4.6.3 Family Bovidea Gray, 1821

Subfamily Bovinae Gray, 1821

Bovinae

(Plate 8, Figure 1-2, 4, and 6)

Common name: Bovids.

Dental formula: I 0/3, C 0/1, P 3/3, M 3/3

Materialss: Totally 171 NISP (13 MNI) are found from 5 layers: 3 NISP (1 MNI) in layer 2, 47 NISP (4 MNI) layer 3, 32 NISP (3 MNI) in layer 4, 86 NISP (4 MNI) in layer 5, and 3 NISP (1 MNI) in layer 6 (Appendix A, Table 26).

Description: The majority of elements are incomplete teeth and covered by thick calcreate and grain sediment. The lower incisors are generally similar to *Cervus* spp. as chisel-shaped teeth and depressing in buccal-lingual side that are grouped together in a semicircle. However, they are clearly more robust than *Cervus* spp. Generally, cheek teeth in both upper and lower jaw are slenodont and hypsodont teeth. Their heights of crowns are larger than root as 2:1 and covered by organic matter. On upper jaw, premolars (including premolar 2) consist of a robust infudibulum with 2 dominated buccal ridge. Upper molars (including molar 1-2) are like 2 premolar element jointed side by side and often have lingual ridge between 2 infudibulums. On lower jaw, premolars 2 are low complex that consist of 2-3 lophs. Lower premolars 3-4 are often found in very worn stage and covered by thick calcreate. They are F-shape teeth that consist of less 3 lophs. Molars 1-2 have 2 robust cylinder infudibulums. Molars 3 also have 2 robust infudibulums but their distal ridge are pronounced and varied. Unfortunately, they usually are covered by thick calcreate and fragment teeth. They cannot be used to identify in lower taxa.

Discussion and comparison: Although, the elements of mammal in subfamily Bovinae are abundant, they cannot be classified to lower taxa because the recent mammal data is lack. In addition, the elements are incomplete, covered by thick calcreate, and very erupted in some element that lost specified part. Observation, lower molar elements have two clearly different sizes; larger and smaller teeth. The teeth in the larger teeth group are robust, 11.6-20.1 mm in width and 24.3-38.1 in length. The smaller teeth group is slender, 5.7-13.1 mm in width and 14.0-21.6 mm in length. The sizes of the larger teeth group are quite similar to *Bubalus* sp. and *Bos* spp. while the smaller teeth group is slender and narrower. Based on this observation, the elements of Bovinae cannot be classified to generic and species level in this time.

Habitat: The mammals in Subfamily Bovinae are able to adapt to a wide range of food plants in various habitat such as mixed deciduous, dry dipterocarp forest etc. They are found in forests of all elevation, from the lower plains up to high mountain (Lekagul and McNealy, 1988; Parr, 2003).

4.6.3.1 Tribe Bovini Gray, 1821

Genus *Bubalus* Smith, 1827

***Bubalus* sp.**

(Plate 8, Figure 5 and 7)

Common name: Water buffalo.

Dental formula: I 0/3, C 0/1, P 3/3, M 3/3

Materialss: Only 7 NISP (4 MNI) are discovered from 4 layers: 2 NISP (2 MNI) in layer 3, 3 NISP (1 MNI) in layer 4, and 2 NISP (1 MNI) in layer 5 (Appendix A, Table 27).

Description: These elements usually lost at cervical. So, they don't have crown length measurement. The general cheek teeth are hypsodont and robust teeth with covered by organic matter. Lower premolars 2 display low details which consist of 2-3 unclear lophs. Lower premolars 3 are F-shape which compose of 3 main lophs and a large buccal ridge at distal end. Lower premolars 4 are similar to premolars 3 as 3 main lophs and a large buccal ridge at distal end. However, their lophs are larger especially middle lophs. Lower molars 3 consist of 2 symmetric rounded infudibulum with the bulb-shaped distal ridge (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
		Width	Length	Crown height
Lower premolar 2	2	7.1±2.0 (8.5-5.7)	10.4±2.0 (11.8-9.0)	
Lower premolar 3	3	10.6±2.0 (12.7-8.8)	19.4±1.9 (20.9-17.3)	18.9±0 (18.9-18.9)
Lower premolar 4	1	7.2		
Lower molar 3	2	15.7±0.9 (16.3-15.0)	37.0±7.9 (42.6-31.4)	
Lower premolar row	2		42.3±3.3 (44.6-39.9)	

Discussion and comparison: These specimens requires some consideration of the limited of lower jaw of the recent specimen. However, the characteristic feature of premolars and molars 3 are similar to *Bubalus* sp., as suggested by the picture illustrated in Hillson (1990).

Habitat: *Bubalus* sp. prefer open forest or glass near swamps, where they can have a frequent mud bath (Lekagul and McNealy, 1988).

Genus *Bos* Linnaeus, 1758

Bos spp.

(Plate 8, Figure 3, and 8)

Common name: Wild oxen.

Dental formula: I 0/3, C 0/1, P 3/3, M 3/3

Materialss: Totally 11 NISP (5 MNI) are discovered from 2 layers: 4 NISP (2 MNI) in layer 3, 2 NISP (1 MNI) in layer 4, and 5 NISP (2 MNI) in layer 5 (Appendix A, Table 28).

Description: These elements often lost lower part. They are hypsodont teeth with often covered by organic matter. Upper premolars are quite robust and consist of an asymmetric infundibulum. They cannot classified to position between 3 and 4. Lower premolars 3 display F-shape consist of 4 slender lophs. The feature of lower premolars 4 is similar to premolars 3. However, their lophs are quite larger than premolars 3. Lower molars 3 have 2 triangular infundibulum with the straight distal ridge (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
		Width	Length	Crown height
Upper premolar 3	1	16.6	21.7	
Lower premolar 3	2	11.8±0.8 (12.3-11.2)	23.0±0 (23.0-23.0)	
Lower premolar 4	2	19.5±5.2 (19.5-12.2)	31.2±5.9 (35.5-22.4)	
Lower molar 3	5	12.0±2.0 (14.4-8.8)	31.2±5.9 (35.5-22.4)	8.1±0.4 (8.3-7.8)

Discussion and comparison: These elements are slender and narrower than *Bubalus* sp. They are similar to *Bos* sp. based on pictures of specimen from the National Museum of Natural History, Paris that was taken photo by Dr.Prasit Auetrakulvit.

Habitat: The feeding habits of mammal in genus *Bos* are open area; the mixed deciduous, dry dipterocarp forest and grassy plains (Lekagul and McNealy, 1988; WWF Thailand programme office, 2000; Parr, 2003).

Subfamily Caprinae Gray, 1821

4.6.3.2 Tribe Rupicaprini (Brookes, 1828)

Genus *Naemorhedus* Smith, 1827

Naemorhedus spp.

(Plate 9, Figure 1-6)

Common name: Serow and goral.

Dental formula: I 0/3, C 0/1, P 3/3, M 3/3

Materialss: A totally 132 NISP (13 MNI) from 5 layers: 2 NISP (1 MNI) in layer 2, 26 NISP (5 MNI) in layer 3, 27 NISP (3 MNI) in layer 4, 73 NISP (3 MNI) layer 5, and 4 NISP (1 MNI) in layer 6 (Appendix A, Table 29).

Description of teeth: All upper teeth are curve and narrow hypsodont crown with pronounced buccal ridges. The upper premolars have a rectangular infundibulum. Almost upper molars elements are similar characteristic feature, composed of 2 triangle-like infudibulums except molars 3. Upper molars 3 are quite smaller, distal infudibulum is small. Lower cheek teeth are absent ridge and quite falter than upper. Lower premolar 2 is quite similar to upper premolar but is smaller. In lower premolar 3, infudibulums absent, however, 3 lophs represent on the lingual side, giving a characteristic F-shaped pattern with wear. Lower premolar 4 is a narrow triangular infundibulum with extra distal triangular elements. Lower molar (including lower molar 1) generally are rounded and flat teeth that consist of 2 infudibulums. Lower molar 3 have 2 rounded infudibulum with an extra distal triangular cusp (dental measurement of identifiable teeth in kind of tooth, see a below table).

Kind of teeth	Number of teeth	Dental measurement (mm) Mean±SD. (Max-Min)		
		Width	Length	Crown height
Upper molar 3	9	7.3-10.3	13.3-15.2	
Upper unspecified premolar	4	6.9-17.6	8.1-15.1	
Upper unspecified molar	35	6.7-14.1	11.1-20.6	10.5
Lower premolar 2	1	6.2	9.3	
Lower premolar 3	4	4.9-5.8	7.8-9	
Lower premolar 4	4	4.9-16.1	8.9-16.7	13.6-18.8
Lower molar 2	3	9.9	12.3-16.1	
Lower molar 3	22	6.2-11.8	12.6-24.0	
Lower unspecified premolar	2	5.9-6.0	11.5-12.3	15.1
Lower unspecified molar	47	4.7-14.4	11.9-17.7	
Lower premolar row (P2-4)	2		23.9-25.8	

Discussion and comparison: These *Naemorheus* elements require some consideration of the limited lower jaw of recent specimen. These upper elements are similar to the recent *Naemorheus* such as *Naemorheus sumatraensis* (Bechstein, 1799) or serow and *Naemorhedus caudatus* (Hardwicke, 1825) or goral, as suggested by Lekagul and McNealy (1988) and the cranium specimen from the museum. The majority of these elements have size between *N. sumatraensis* and *N. caudatus*. (see the measurement data of recent specimens in Appendix B, Table 11). These characteristic of the teeth indicated to *N. sumatraensis* and *N. caudatus* although they cannot clearly classified. Observation, the size of these teeth elements tends to decrease through Late Pleistocene especially upper molar and premolar. Some of them display very larger than the recent such as A4208; the upper unspecified molar and A3708; the upper unspecified premolar from the layer 5. Besides a lower premolar 4 such as A1364 in layer 3 display extremely larger than other premolar 4. These elements may be belonged to other *Naemorheus* sp. or abnormal mammals own which having the large body.

Habitat: *Naemorheus* sp. is discovered in all forest, for example the bamboo, dry dipterocarp forest, hill evergreen, mixed deciduous, limestone, semi-evergreen etc. However, it prefer to habit in the limestone and hill evergreen forest (WWF Thailand programme office, 2000; Parr, 2003).

Bovidae

(Plate 9, Figure 7)

Common name: Unknown bovid.

Dental formula: Unknown.

Materialss: A left lower molar 3 (A3340) in layer 5 (Appendix A, Table 30).

Description:. This element is narrow hypsodont teeth and rootless with many ridges in lingual side. The upper part of teeth displays the black strain. The extra distal element is quite large and crescentic-like. It measures 18.5 mm in length, 7.8 mm in width, and 27.6 mm in height of crown.

Discussion and comparison: This element is specified characteristic feature. Their side is similar to *Naemorhedus* but its lingual ridge is prominent. In addition, the recent Thai bovids do not pronounce ridges in lingual side of molar 3. It may be belonged to other bovids that extinct from the recent forest of Thailand. As suggested by the recent data, this lower molar cannot be clearly classified.

4.7 *incertae cedis*

(Plate 9, Figure 8-9)

Common name: Unknown mammal.

Dental formula: Unknown.

Materials: Only 2 fragment teeth (2 NISP or 2 MNI) that cannot be specified to kind of teeth and position; A1501 in layer 3 and A5592 in layer 5, see Appendix A, Table 31.

Description of teeth: They are similar in dental characteristic feature and dental size. These teeth are rounded teeth in occlusal view and compose of two curve cusps with sharp point. Unfortunately, their roots are lost. Moreover, their crowns are covered by the black glossy strain (fragment measurement, see a below table).

Kind of teeth	Measurement (mm)		
	Width	Length	Crown height
Unknown element (A1501)	9.6	7.0	5.7
Unknown element (A5592)	5.9	4.9	

Discussion and comparison: These materials display the characteristic which are not similar to recent mammalian specimens, there are unable to identify to lower categories because they are fragments.

CHAPTER V

DISCUSSIONS AND CONCLUSIONS

According to the former chapter (chapter III and IV), the results of mammalian identification are provided. This chapter will discussed and concluded the result of this research through an examination on mammalian taxa and their habitat including other data from the Tham Lod rockshelter.

This chapter is divided into 2 major topics. The first topic displays the discussion on diversity of mammals, mammalian distribution, and paleoenvironment. It focuses on 2 scales: the local scale as well as the regional scale. The local scale comprises of the Tham Lod rockshelter whereas the whole regions of Thailand has been considered as the regional scale. The second topic shows a summary of mammalian analysis and paleoenvironmental reconstruction of the Tham Lod rockshelter during late Pleistocene epoch.

5.1 Discussions

According to the identification by dental morphological feature and measurement of teeth in area 1, a total of 2,003 mammalian teeth (NISP) or 218 MNI can be classified. Although, it is only 1.76% of a total of 113,658 mammalian bones (including unidentified bones and other bones such as long bones etc.). But 31 identified taxa (belonging to 6 orders, 11 families, 13 genera, and 6 species) represent higher diversity than the previous researches (Ampunsri 2005a, 2005b, 2006a, 2006b, 2007, see Table 5.1). Ampunsri (2005a, 2005b, 2006a, 2006b, 2007) had classified mammalian evidences into 20 taxa, dividing into 6 orders, 9 families, 5 genera, and 2 species through the morphological analysis on both bone and teeth covering 3 areas in the Tham Lod rockshelter. It supports that the measurement is one of the important identification methods. Moreover, the identification in this research can provide more the habitat information which is needed for the paleoenvironmental analysis.

Table 5.1 Comparing of the late Pleistocene mammals in area 1, the Tham Lod rockshelter between previous studies and this research.

Order	Ampunsri (2005a, 2005b, 2006a, ,2006b, 2007): 20 taxa	This research: 31 taxa
Primate	Primate *Semnopithecus* sp.	Cercopithecidae *Macaca* spp. Colobinae
Rodentia	Hystricidae Rhyzomidae Rodentia	Rodentia Rhizomyidae *Rhizomys* spp. *Cannomys badius* *Bandicota* spp. *Bandicota indica* Hystricidae 1 Hystricidae 2
Canivora	Ursidae Felidae Medium Carnivora Small Carnivora	Carnivora *Ursus thibetanus* *Ursus* spp. *Actonyx collaris* Carnivora 1 Carnivora 2
Probosidea	Probosidea	*Elephas* sp.
Perissodactyla	Rhinocerotidae	Rhinocerotidae Perisodactyla

Table 5.1 Comparing of the late Pleistocene mammals in area 1, the Tham Lod rockshelter between previous studies and this research (continued).

Order	Ampansri (2005a, 2005b, 2006a, 2006b, 2007): 20 taxa	This research: 32 taxa
Artiodactyla	Medium *Sus scrofa* Small *Sus scrofa* Large *Cervus* sp. Medium *Cervus* sp. Small *Cervus* sp. *Muntiacus* sp. Large Bovidae Medium Bovidae *Naemorhedus sumatraensis*	*Sus scrofa* Pecora Cervidae *Muntiacus* sp. *Cervus unicolor* Bovinae *Bubalus* sp. *Bos* spp. *Naemorhedus* spp. Bovidae
Unknown		*incertae cedis*

This topic will be discussed in 3 parts including the diversity of mammals and interpretation of paleoenviroment; distribution of late Pleistocene mammals; and paleoenvironment of Thailand and adjacent area, as follow:

5.1.1 Diversity of mammals and interpretation of paleoenviroment

In each period, the mammalian samples are fluctuated in the diversity. They inform the important proxy data for reconstructing paleoenvironment (Table 5.2). Detailed information on the mammal is presented below:

Late Pleistocene layers (layers 3-7: during more than 35,782±266 BP Akita-TL 1 to 10,582±49 BP Akita-TL4) have totally 1,929 NISP or 198 MNI which identified 31 taxon belonging to 6 orders, 11 families, 13 genera, and 6 species.

Layer 7 (between 35,782±266 BP Akita-TL 1 to 32,380±292 BP Akita-TL 10), the low density of evidences in the layer indicated that small group of the prehistoric hunter-gatherers use the rockshelter for the short time. Only 3 mammal taxa were found in this period: Cervidae (cervids), Pecora (ruminants), and *Sus scrofa* (Eurasian wild pig). In generally, they were able to adapt to a wide range of food plants in various habitat.

Layer 6 (between 32,380±292 BP Akita-TL 10 to 22,257±154 BP Akita-TL12), this layer represents that the activities in the hunter-gatherer's settlement is higher than the former layer based on the slightly increasing of the mammalian teeth and other evidences in the layer. Moreover, the mammalian diversity was increased, with 6 taxa such as Rodentia (rodents), Rhizomyidae (bamboo rats), *Sus scrofa* (Eurasian wild pig), Cervidae (cervids), Bovinae (bovids), and *Naemorhedus* spp. (serow and goral). The majority of mammals represented the generalized habitats except 2 taxa that having specialized habitat: *Naemorhedus* spp. and Rhizomyidae. They indicate the limestone, hill evergreen forest, and bamboo forest.

Layer 5 (between 22,257±154 BP Akita-TL12 to 22,190±160 BP Beta-172227 MHSTLAR1-1665), the rockshelter was highly frequently visited by the prehistoric hunter-gatherers, as suggested by the high density of evidences and mammal bones discovered in the layer. The mammalian diversity has increased to 29 taxa. In addition, 6 taxa found in the former layer were recognized.

Some mammals live in the specialized habitat, for example, *Rhizomys* spp. (bamboo rat) and *Cannomys badius* (bay bamboo rat) live in the bamboo forest in the mixed deciduous and hill evergreen forest. Rodents in genus *Bandicota* including *Bandicota* spp. (bandicoot rat) and *Bandicota* indica (greater bandicoot rat) live in grass field. *Ursus thibetanus* (Asiatic black bears) prefers a high land and cold weather including the mixed deciduous and lower hill evergreen forest. *Bubalus* sp. (water buffalo) prefers open forest or glass near swamps, where they can have a frequent mud bath. In summary, these mammals from this layer indicate to the mixed deciduous, hill evergreen, bamboo, and limestone forest with open forest or glass field near swamps.

Moreover, size of upper molars of *Naemorhedus* spp. in layer 6 and 5 displays larger than other layers including the recent forms such as *Naemorhedus sumatraensis* and *N. caudatus* (see Figure 5.1). Alongside its remain, bones of smaller *Naemorhedus* spp. are similar in size with the recent forms and found in relatively a lot of number. Mammals in genus *Naemorhedus* is still abundant in the basin of the Lang River which range in limestone habitat, the major topography of this area (Wangwacharakul et al., 2000).

On consideration in sex different, the recent skull specimens in genus *Naemorhedus* are rare. Moreover, there are no specimen records, such as sex, age etc. providing in Thai museums. However, Lekagul and Mc.Neely (1988) reported that genus *Naemorhedus* found in Thailand such as *N. sumatraensis* displays similarity in body size or shape between the sexes (Lekagul and Mc.Neely, 1988). Thus, the large dental forms of *Naemorhedus* spp. in Tham Lod rockshelter had not influenced by sex different.

In *Naemorhedus* spp. case, it is similar to giant pangolin from the Niah cave, Borneo island which was discovered alongside the smaller Malay pangolin, *Manis javanica* (Medway, 1977). Medway (1977) suggested that its smaller size form is a factor that allowed this form to survive through the late Pleistocene when its larger congener apparently disappeared.

Numerous factors have been suggested to govern disappearing of larger mammal: food supply, interspecific competition, and temperature (Davis, 1981).

1) Food supply: It appears from the northern of Thailand environmental evidence that a reduction of the environmental carrying capacity at the end of the Pleistocene has occurred. At the Pleistocene/Holocene boundary, the hill evergreen forest has reduced and replaced by mixed deciduous which support to losing or decreasing of some plant, food supply for *Naemorhedus* spp. (Penny, 2001; White et.al., 2004).

2) Interspecific competition: Two closely related species like mammal in genus *Naemorhedus* including *N.* sumatraensis and *N. caudatus* occupy the same region which competed the consuming in same food supply. Then the environment change, food supply lost or decrease have effected to mammalian size (Brown and Wilson, 1956; Davis, 1981).

3) Temperature: These facts reinforce Bergemann's observation that latitude (e.g. temperature) and body size are inversely correlated within species or groups of closely related species of warm-blooded vertebrate (Bergemann,1847). A small body size with relatively large surface area would be better able to ventilate body heat in a warm environment which support the disappearing of larger form (Bergemann,1847).

Layer 4 (between 22,190±160 BP Beta-172226 to 13,640±80 BP Beta-168224), the amount of all evidences including animal remains were extremely decreased. It indicates that there were probably not many hunter-gatherers habitations in the rock shelter. A total of 18 taxa closely resembles to the former layer indicate that almost of characteristic of forest is not changed. Except Rhinocerotidae (rhinoceroses) that was first appeared in this layer which may be indicated to first occurring of the dense forest during 22,190±160 BP (Beta-172226) to 13,640±80 BP (Beta-168224).

Layer 3 (during 13,422±541 BP Akita-TL7 to 10,582±49 BP Akita-TL4), prehistoric hunter-gatherers still settled extensively at the rockshelter, moreover, they also used the rockshelter for the burial. The number of all evidences were fairly increased including mammalian teeth. Accordingly, the diversity of mammal was slightly increased, with 20 taxa. Besides, *incertae cedis* (unknown mammal) reappeared in this period. In generally, the majority of mammals appeared in this period shows that generalized habitat except less 4 taxa. They were specialized habitat including Rhizomyidae, *Ursus thibetanus*, Rhinocerotida, and *Naemorhedus* spp. whose the habitats indicated the main kinds of forest were still similar to the former period.

Based on palynological researchers such as Treekanchanawattana and Pumijumnong (2005) and Pumijumnong (2007) who discovered *Pinus* sp., *Calocedrus* sp., family Cyperaceae, family Poaceae, family Polypodiaceae, family Pteridaceae, *Cyathea* sp., and *Ophioglossum* sp. with some plankton such as *Concentricystes rubinus* in the upper part of layer 3. They indicate that there were the mixed deciduous, hill evergreen, bamboo, limestone forest etc. which are similar to the recent forest data such as the mixed deciduous, dry dipterocarp forest, semi-evergreen forest, hill evergreen, bamboo, and limestone forest (The Remote Sensing and Geo-informatics System Centre, 1998; Lao Yi Pa, 2000). Moreover, the discovered plankton informed the occasional flood plain (Treekanchanawattana and Pumijumnong, 2005; Pumijumnong, 2007) and the *Pinus* sp. which was found in this layer indicated the cool temperature.

Layer 1 and 2 (Holocene layers: lower than 2,933±83 BP Akita-TL5), the evidence shows the settle of prehistoric hunter-gatherers in the rockshelter. The rockshelter was occasionally used based on the low amount of all evidences including mammalian teeth in the layer. Furthermore, the mammalian diversity is also low (only 10 taxa). The habitats of majority of mammals are unspecified. Only 2 taxa have specific habitat such as *Ursus thibetanus* and *Naemorhedus* spp. which indicate the mixed deciduous forest, hill evergreen forest, and limestone forest.

Sakboworn Tumpeesuwan (in Krajaejun, 2007) classified some kinds of shell through late Pleistocene to Holocene layer in the Tham Lod rockshelter. Based on the discovered gastropod such as *Rhiostoma* sp. (snorket snail), *Meguastenia* sp. (semi-slug) and *Cyclophorus* sp. indicated the limestone forest (Krajaejun, 2007). *M. laosensis* is largest discovered shell in the Tham Lod rockshelter and disappear from the Lang river (Krajaejun, 2007).

In summary, the diversity of mammal indicates that the mixed deciduous, hill evergreen, bamboo, and limestone forest, with the sub- environment, such as dense forest, open forest or glass field, swamps and low-lying forest during late Pleistocene which is relatively similar to the present environment. The decreasing of dental size of *Naemorhedus* spp. and palynological evidences such as *Pinus* sp. showed a change of some vegetation condition and the rising temperature in the boundary of late Pleistocene and Holocene.

Table 5.2 Showing of habitat of mammals that found at the Tham Lod rockshelter.

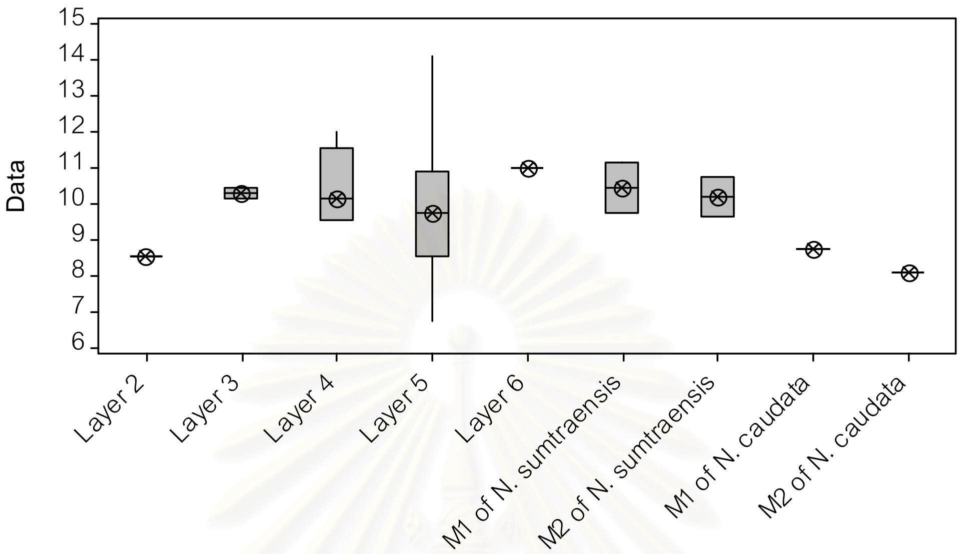
Forest / Kind of Mammal	Mixed Deciduous	Dry Dipterocarp	Hill evergreen	Dry Evergreen	Bamboo	Limestone	Remark
Cercopithecidae							
Macaca spp.	✓	✓	✓	✓	✓	✓	
Colobinae	✓	✓	✓	✓	✓	✓	
Rodentia							
Rhizomyidae	✓		✓		✓		
Rhizomys spp.	✓		✓		✓		
Cannomys badius	✓		✓		✓		
Bandicota spp.							Grass land
Bandicota indica							Grass land
Hystricidae 1							
Hystricidae 2							
Carnivora							
Ursus thibetanus	✓		✓				
Ursus spp.	✓	✓	✓	✓	✓	✓	
Actonyx collaris	✓	✓	✓	✓	✓	✓	
Carnivora 1							
Carnivora 2							
Elephas sp.	✓	✓	✓	✓	✓	✓	
Rhinocerotidae							Dense forest, Swamp
Perisodactyla							
Sus scrofa	✓	✓	✓	✓	✓	✓	

Table 5.2 Showing of distribution of mammals that found at the Thamlod rockshelter (continued).

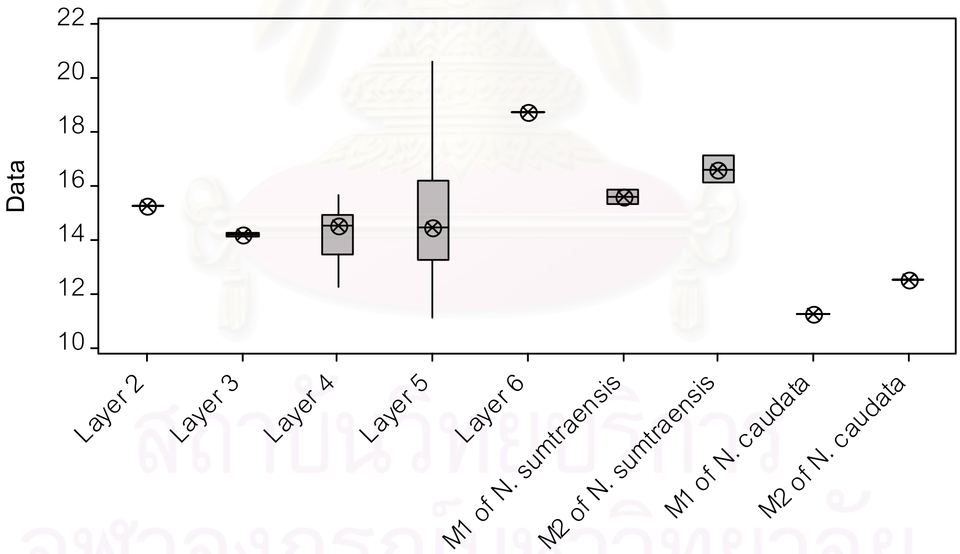
Kind of Mammal \ Forest	Mixed Deciduous	Dry Dipterocarp	Hill evergreen	Dry Evergreen	Bamboo	Limestone	Remark
Pecora							
Cervidae	✓	✓	✓	✓	✓	✓	
Muntiacus sp.	✓	✓	✓	✓	✓	✓	
Cervus unicolor	✓	✓	✓	✓	✓	✓	
Bovinae	✓	✓	✓	✓	✓	✓	
Bubalus sp.	✓	✓		✓			Open forest and swamp
Bos spp.	✓	✓	✓	✓	✓	✓	
Naemorhedus spp.	✓	✓	✓	✓	✓	✓	Favorite to the hill ever green and limestone forest
Bovidae							
incertae cedis							

Source: Lekagul and McNeely (1988); WWF Thailand programme office (2000); and Parr (2003)

A. Width of upper molar 1-2



B. Lenght of upper molar 1-2



Median symbol Interquartile range box

Figure 5.1 Graph displaying width (A) and length (B) of upper molar 1-2 of *Naemorhedus* spp. in each layer and recent form such as *N. sumatraensis* and *N. caudata*.

5.1.2 Distribution of late Pleistocene mammals

On zoogeography, the range of each species has been differentiated. The distribution of mammals depends on geology, climate, fauna history, vegetation, and human (Lekagul and McNeely, 1988).

This topic discusses about the zoogeography of mammals through the comparison between the Tham Lod rockshelter and other sites as well as the recent mammals. It focuses on 2 scales: the local scale and regional scale.

On the local scale, mammals from the Tham Lod rockshelter are similar to the assemblages from the adjacent site at Ban Rai, Mae Hong Son province. These taxa include Cervidae, *Muntiacus* sp., *Naemorhedus sumatraensis*, Cerophithecidae, Bovidae, and Rodentia. Futhermore they are similar to the recent mammals in Mae Hong Son province. In terms of environment, late Pleistocene mammals indicated the mixed deciduous, hill evergreen and limestone forest which was also similar to the recent forest containing the mixed deciduous, dry dipterocarp, hill evergreen, semi-evergreen, limestone, and bamboo forest. According to the results of occurrence of mammalian evidence in both the Tham Lod rockshelter and Ban Rai supported the stability of both the forest and mammals in northwestern of Thailand through late Pleistocene to recent time (late Holocene).

According to the result of animal bone analysis from another early to middle Pleistocene sites in another regions of Thailand such as Tha Chang (Nakaya et al. 2003; Thasod and Ratanathien, 2005), Nakornsawan (Lekakul 1949; Koenigswald, 1959), Snake cave (Gigsberg et al. 1982; Chaimanee and Jaeger, 1993), and Kao Samngam (Chaimanee et al., 1993, 1996 ; Chaimanee, 2003); and late Pleistocene sites: Lang Kamnan (Shoocongdej, 1996), Moh khiew (Chaimanee, 1993), and Moh Khiew II (Auetrakulvit, 2004, 2005), the similarity of some mammalian taxa between the Tham Lod rockshelter and those sites can be observed. These are including *Macaca* sp. (macaque), *Rhizomys* sp. (hoary bamboo rat), *Cannomys badius* (bay bamboo rat), *Bandicota savilei* (lesser bandicoot rat), *Ursus thibetamus* (Asiantic black bear), *Arctonyx collaris* (hog badger), *Elephans* sp. (elephant), Rhinocerotidae (rhinoceros), *Sus scrofa* (common wild pig), *Muntiacus* sp., *Cervus unicolor* (sambar deer), and *Bubalus* sp. (water buffalo). According to these mammals, they adapted through glacial and interglacial from early Pleistocene to late Pleistocene which indicate a little change of their evolution in Thailand.

On consideration with recent zoogeography (Lekagul and McNeely, 1988), almost discovered mammals from the Tham Lod rockshelter are found in all part of Thailand. Many taxa including Colobinae (langur), *Ursus thibetanus* (sun bear*), Elephas* sp. (Asiatic elephant), and *Bubalus* sp. (water buffalo) are endemic species in the Oriental zoogeographic region which are common mammals ranging in South Asia, Southeast Asia, and South China. Only *Cannomys badius* (bay bamboo rat) is an endemic fauna of Indochina subregion which recently distributes only the northern part locating upon Kra isthmus including Mae Hong Son province. In late Pleistocene, there is no more evidence of these mammals distributed into other zoogeographic region. Thus, mammalian teeth from the Tham Lod rockshelter support that late Pleistocene zoogeography was similar to those of recent (see, Table 5.3).

In summary, some mammals found in the Tham Lod rockshelter are similar to those found from early to late Pleistocene sites in Thailand both in local and regional scale as well as the recent (the late Holocene). The evidence of their adaptation to the environmental changes can be seen from the existent of mammal taxa found in several regions of Thailand since early to late Pleistocene till recent. Almost discovered mammals are medium to large sized mammals including *Macaca* sp., *Elephans* sp., *Sus scrofa*, *Muntiacus* sp., *Cervus unicolor*, *Bubalus* sp. etc. which live in various types of forest. These mammals represent that they can adapted and maintained their species through climate and environmental changes in glacial and interglacial periods for example the hill evergreen forest are much distributed in the late Pleistocene even in the low elevation. It is replaced by the mixed deciduous forest in Holocene epoch (Penny, 2001; White et.al., 2004). Thus these mammals can be survived in both type of forests until present.

Table 5.3 Distribution of mammals found in the Tham Lod rockshelter during late Pleistocene.

Distribution / Kind of mammal	Tham Lod rockshelter*	Indochina subregion **	Sundaic subregion **
Cercopithecidae	✓	✓	✓
Macaca spp.	✓	✓	✓
Colobinae	✓	✓	✓
Rodentia	✓	✓	✓
Rhizomyidae		✓	✓
Rhizomys spp.		✓	✓
Cannomys badius		✓	
Bandicota spp.		✓	✓
Bandicota indica		✓	✓
Ursus thibetanus		✓	✓
Ursus spp.		✓	✓
Actonyx collaris		✓	✓
Carnivora 1			
Carnivora 2			
Elephas sp.	✓	✓	✓
Rhinocerotidae		✓***	✓***
Perisodactyla			
Sus scrofa	✓	✓	✓
Pecora	✓	✓	✓
Cervidae	✓	✓	✓
Muntiacus sp.	✓	✓	✓
Cervus unicolor	✓	✓	✓
Bovinae	✓	✓	✓

Table 5.3 Distribution of mammals found in the Tham Lod rockshelter during late Pleistocene (continued).

Distribution / Kind of mammal	Tham Lod rockshelter*	Indochina subregion **	Sundaic subregion **
Bubalus sp.			✓
Bos spp.	✓	✓	✓
Naemorhedus spp.	✓	✓	✓
Bovidae			
Incertae cedis			

Remark: * Srikosamart et. al. (1999), Lao Yi Pa and Tacumma (2000), and Wangwacharahul et. al. (2000)

** Lekagul and McNeely (1988), WWF Thailand programme office (2000), and Parr (2003)

*** Groves and Kurt (1972)

5.1.3 Paleoenvironment of Thailand and adjacent area.

Southeast Asian paleontologist and archaeologist have also concerned about questions of climatic and environmental changes during late Pleistocene (e.g. Medway, 1977; Kahlke, 1972; Chaimanee, 1993; Shoocongdej, 1996). Broadly speaking, various lines of paleoenviroment evidence from South China, and Southeast Asia indicate that mainland Southeast Asian environments including Northwestern of Thailand, were slightly affected by the sea level changes and cool climate during late Pleistocene (see Chapter I). The available information from the mammalian teeth, palynological and shell data can be reconstructed a more delicate scale of paleoenviromental interpretation, as follows:

In continental Southeast Asia, recent studies in North, Northeastern, and Western Thailand (e.g. Shoocongdej, 1996; Penny, 2001; Treekanchanawattana and Pumijumnong, 2005 etc.) and South China (e.g. Zheng, 2000) supports that the late Pleistocene environment of Thailand was tropical and subtropical vegetation, however, the hill evergreen forest extended and depress in low land. Marine sediment as Bangkok clay sediment in lower central of Thailand suggests that prior to 50,000-40,000 BP the entire Gulf of Thailand was an expanded land area under drier condition (Nutalaya and Rau, 1981; Dheeradilok, 1995; Choowong et. al., 2003; Department of mineral resources, 2001). Additionally, palynological data suggest that vegetation are similar to the recent, pine (*Pinus* spp.) indicate the spreading of the hill evergreen forest in response to cold and dry around 13,000 to 10,000 BP (Treekanchanawattana and Pumijumnong, 2005; Pumijumnong, 2007). Moreover, some kind of shell in Tham Lod rockshelter indicates limestone forest and small rapid river in ravines though late Pleistocene to Holocene (Krajaejun, 2007). The teeth of mammalian taxa which live in specialized habitat such as Rhizomyidae, *Bubalus* sp., *Cannomys badius*, *Ursus thibetanus*, Rhinocerotidae, *Bubalus* sp., and *Naemorhedus* spp. imply mixed deciduous forest, hill evergreen forest, bamboo forest, limestone forest, open forest/grass field, dense forest, low-lying forest, and swamp during 35,000 to 10,000 BP. This suggests that the majority of local environment in basin of Lang River was quite similar to the recent forest (in late Holocene) containing the mixed deciduous, dry dipterocarp, hill evergreen, semi-evergreen, bamboo, an limestone forest and limestone forest.

5.2 Conclusions

The result of this study can be concluded based on 2 main purposes: identifying mammalian species by teeth and analyzing the paleoenvironment at the Tham Lod rockshelter.

1. A total of 2,003 mammalian teeth (NISP) belonging to 30 taxa, 6 orders, 11 families, 13 genera, and 6 species were investigated from area 1, the Tham Lod rockshelter. It contained Cercopithecidae (old world monkeys), *Macaca* spp. (macaques), Colobinae (langurs), Rodentia (rodents), Rhizomyidae (bamboo rats), *Rhizomys* spp. (bamboo rats), *Cannomys badius* (bay bamboo rats), *Bandicota* spp. (bandicoot rat), *Bandicota indica* (greater bandicoot rat), Hystricidae 1 (large porcupines), Hystricidae 2 (small porcupines), Carnivora (carnivores), *Ursus thibetanus* (Asiatic black bears), *Ursus* spp. (bears), *Actonyx collaris* (hog badger), Carnivora 1 (unknown carnivore 1), Carnivora 2 (unknown carnivore 2), *Elephas* sp. (elephants), Rhinocerotidae (rhinoceroses), Perisodactyla (unknown Perisodactyla), *Sus scrofa* (Eurasian wild pigs), Pecora (ruminants), Cervidae (cervids), *Muntiacus* sp. (barking deer), *Cervus unicolor* (sambar deer), Bovinae (bovids), *Bubalus* sp. (water buffalo), *Bos* spp. (wild ox), *Naemorhedus* spp. (serow and goral), Bovindae (unknown bovid), and *incertae cedis* (unknown mammals).

Many mammals such as Cervidae , *Sus scrofa*, Bovinae , Pecora , Rodentia and *Naemorhedus* spp. represent extremely largest NISP, with more than 100 NISP. A total of 16 taxa, including Colobinae , *Rhizomys* spp., *Cannomys badius, Bandicota* spp., *Bandicota indica*, Hystricidae 2, Carnivora 1, Carnivora 2, *Elephas* sp., Rhinocerotidae , Perisodactyla , *Bubalus* sp., Bovidae , and *incertae cedis*, have less 10 NISP.

2. The diversity and distribution mammalian habitat of discovered mammals indicate a part local forest around the Tham Lod rockshelter during late Pleistocene which were fairly similar to those of the recent forest.

During late Pleistocene, occurring a greater number of mammal teeth imply that the rockshelter was probably visited highly frequent by the prehistoric hunter-gatherers.

During 35,000 to 22,000 BP, the occurring of Rhizomyidae, *Rhizomys* spp., *Cannomys badius, Bandicota* spp., *Bandicota indica*, *Ursus thibetanus*, *Bubalus* sp., and *Naemorhedus* spp. imply the mixed deciduous forest, hill evergreen forest, bamboo forest, lime stone forest, open forest/grass field, and swamp. Moreover, this period was represented large dental elements of *Naemorhedus* spp. which are larger than not only the teeth found in other periods but also in recent time. The size of teeth might be caused by the decreasing amount of food supply, the warmer climate (the relation between ventilate heat and element size; small-sized mammals prefer warm climate, large-sized mammals often found in cool temperature) and interspecific competition near the transition between late Pleistocene and Holocene.

Between 22,000 to10,000 BP, the diversity of mammals is quite stable which supported unchanged forest environment. Rhinocerotidae first appeared in this period showing the occurrence of dense forest.

Holocene period (less than 3,000 BP), the frequency of ancient human settlement is lower than the former period based on highly decreasing dental element. Appearing of *Ursus thibetanus* and *Naemorhedus* spp. in this period showed the majority forest such as mixed deciduous forest, hill evergreen forest, and limestone forest, (see Table 5.4).

Table 5.4 Showing number of mammalian teeth, mammalian diversity, specialized habitat mammals, and paleoenvironment in layer 1-7, area 1

Geological time scale	Layer	Age (Lab site)	Thickness (cm.)	NISP/MNI	Number of taxa (Order/Family/ Genus /Specie)	Specialized habitat mammals	Paleoenviroment
Holocene	1		10	5/3	2 (1/1/0/0)		
	2	2,933±83 (Akita-TL5 dated from area 2)	30-40	69/17	11 (4/5/5/3)	*Ursus thibetanus* and *Naemorhedus* spp.	Mixed deciduous forest, hill evergreen forest, and limestone forest
Late Pleistocene	3	10,582±49 BP (Akita-TL4 dated from area 3) to 13,640±80 (BetaAMS-168224)	40-100	355/50	20 (6/9/8/4)	Rhizomyidae, *Bubalus* sp., *Cannomys badius*, *Ursus thibetanus*, Rhinocerotidae, *Bubalus* sp., *Naemorhedus* spp.	Mixed deciduous forest, hill evergreen forest, bamboo forest, limestone forest, open forest/grass field, dense forest, low-lying forest, and swamp

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Table 5.4 Showing number of mammalian teeth, mammalian diversity, specialized habitat mammals, and palecology in layer 1-7, area 1 (continued).

Geological time scale	Layer	Age (Lab site)	Thickness (cm.)	NISP/MNI	Number of taxa (Order/Family/ Genus /Specie)	Specialized habitat mammals	Paleoenviroment
Late Pleistocene	4	22,190±160 (BetaAMS-172226) to 13,640±80 (BetaAMS-168224)	40-50	401/41	19 (6/9/9/4)	Rhizomyidae, *Bubalus* sp., *Cannomys badius*, *Ursus thibetanus*, Rhinocerotidae, *Bubalus* sp., and *Naemorhedus* spp.	Mixed deciduous forest, hill evergreen forest, bamboo forest, lime stone forest, open forest/grass field, dense forest, low-lying forest, and swamp
	5	22,190±160 (BetaAMS-172226) to 22,257±154 (Akita-TL12)	10-90	1,140/96	29 (6/10/12/6)	Rhizomyidae, *Rhizomys* spp., *Cannomys badius*, *Bandicota* spp., *Bandicota indica*, *Ursus thibetanus*, *Bubalus* sp., and *Naemorhedus* spp.	Mixed deciduous forest, hill evergreen forest, bamboo forest, lime stone forest, open forest/grass field, and swamp

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Table 5.4 Showing number of mammalian teeth, mammalian diversity, specialized habitat mammals, and palecology in layer 1-7, area 1 (continued).

Geological time scale	Layer	Age (Lab site)	Thickness (cm.)	NISP/MNI	Number of taxa (Order/Family/ Genus /Specie)	Specialized habitat mammals	Paleoenviroment
Late Pleistocene	6	32,380±292 (Akita-TL10) to 22,257±154 (Akita-TL12)	10-30	23/6	6 (2/4/2/1)	Rhizomyidae and *Naemorhedus* spp.	Mixed deciduous forest, hill evergreen forest, bamboo forest, and lime stone forest,
	7	35,782±266 BP (Akita-TL 1) to 32,380±292 (Akita-TL10 dated from area 3)	10-30	10/4	3 (1/2/1/1)		

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APPENDICES

APPENDIX A

PLATE 1-9

EXPANATION OF PLATE 1

PLATE 1

EXPANATION OF PLATE 2


PLATE 2
1a
1b
1c
2a
2b
3a
3b
4a
4b
5a
5b
6
7a
7b
8a
8b
1 cm

EXPANATION OF PLATE 3

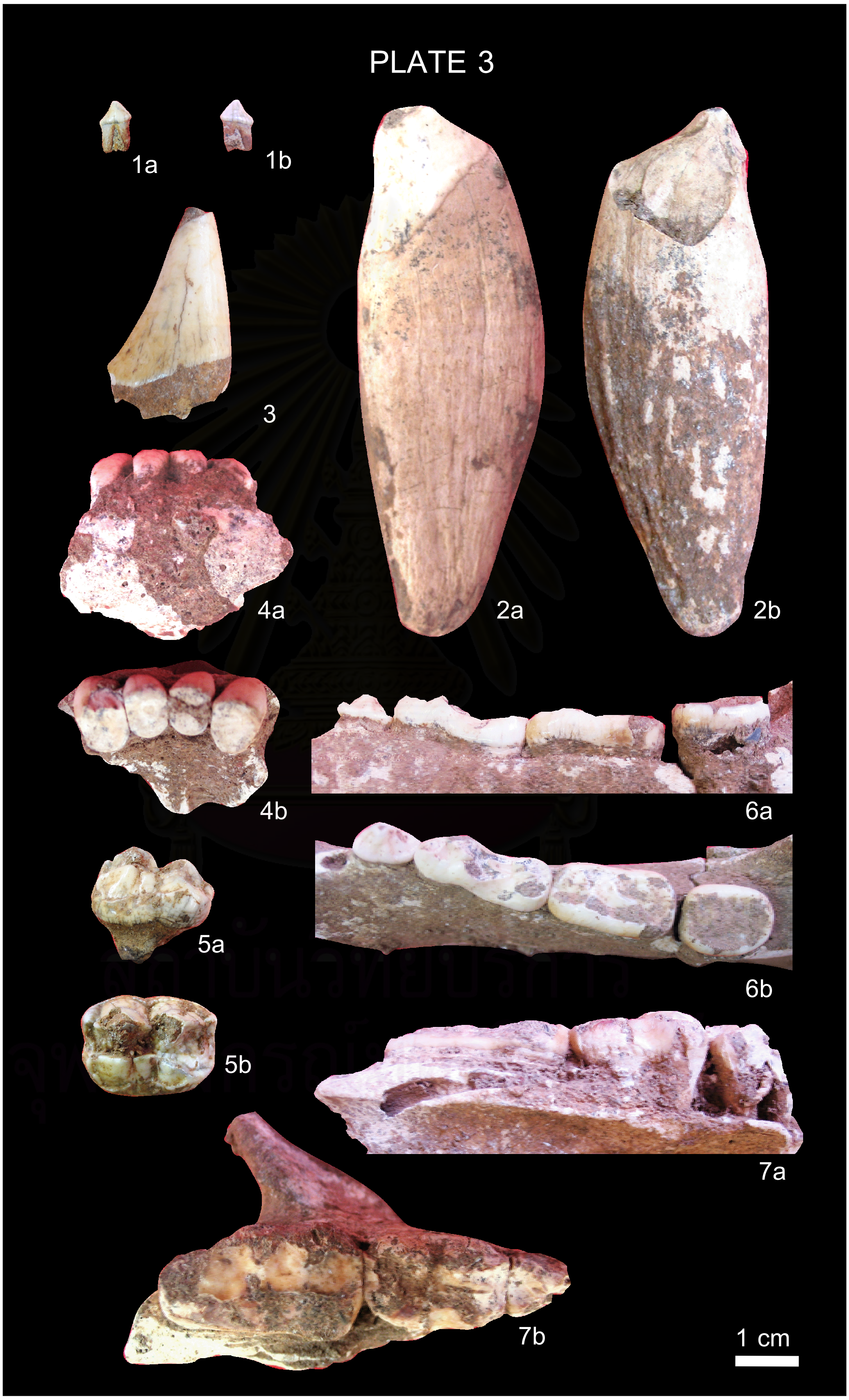
PLATE 3
1a
1b
3
2a
2b
4a
4b
6a
5a
6b
5b
7a
7b
1 cm

EXPANATION OF PLATE 4

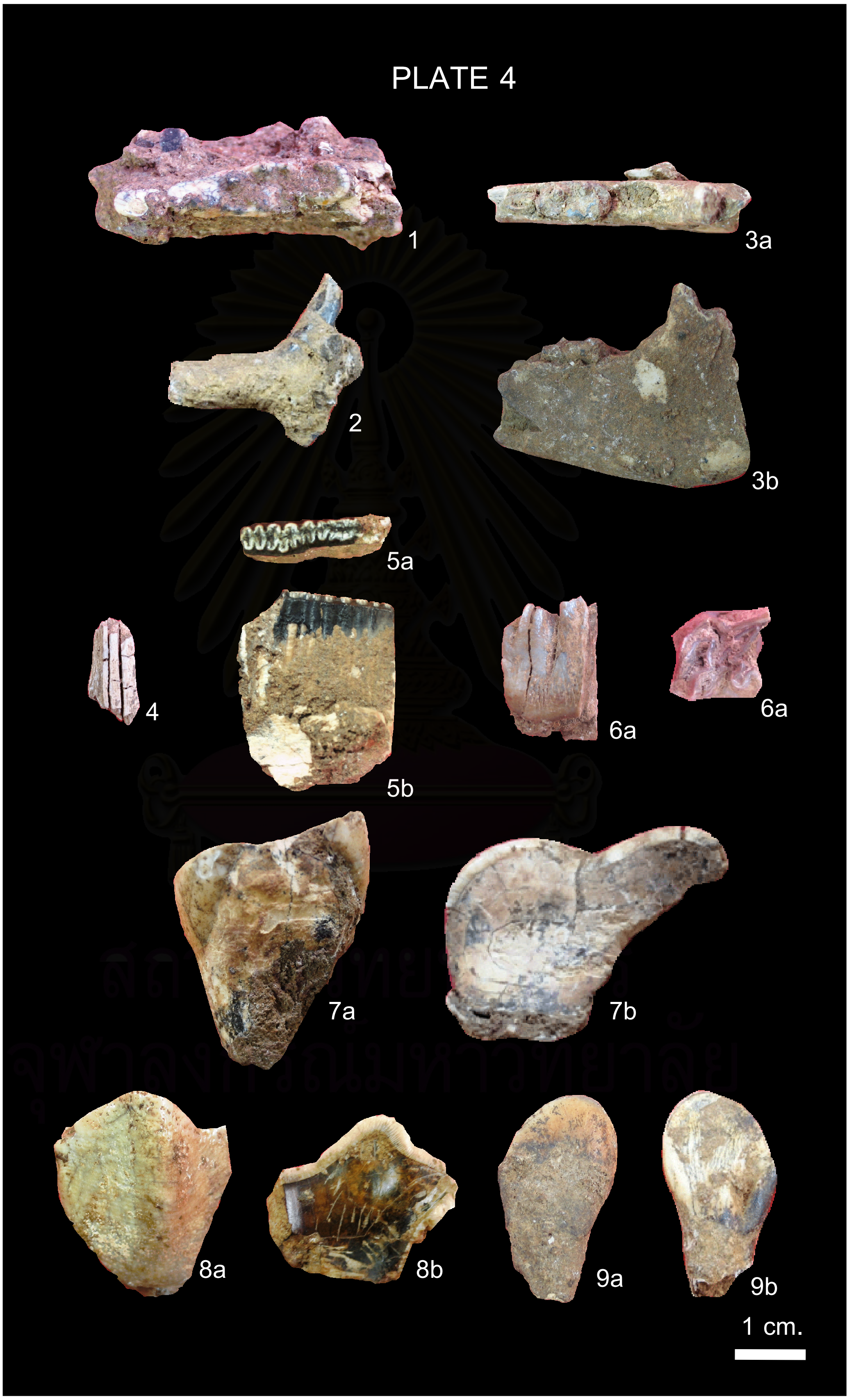
PLATE 4
1
3a
2
3b
5a
4
5b
6a
6a
7a
7b
8a
8b
9a
9b
1 cm.

EXPANATION OF PLATE 5

PLATE 5

EXPANATION OF PLATE 6

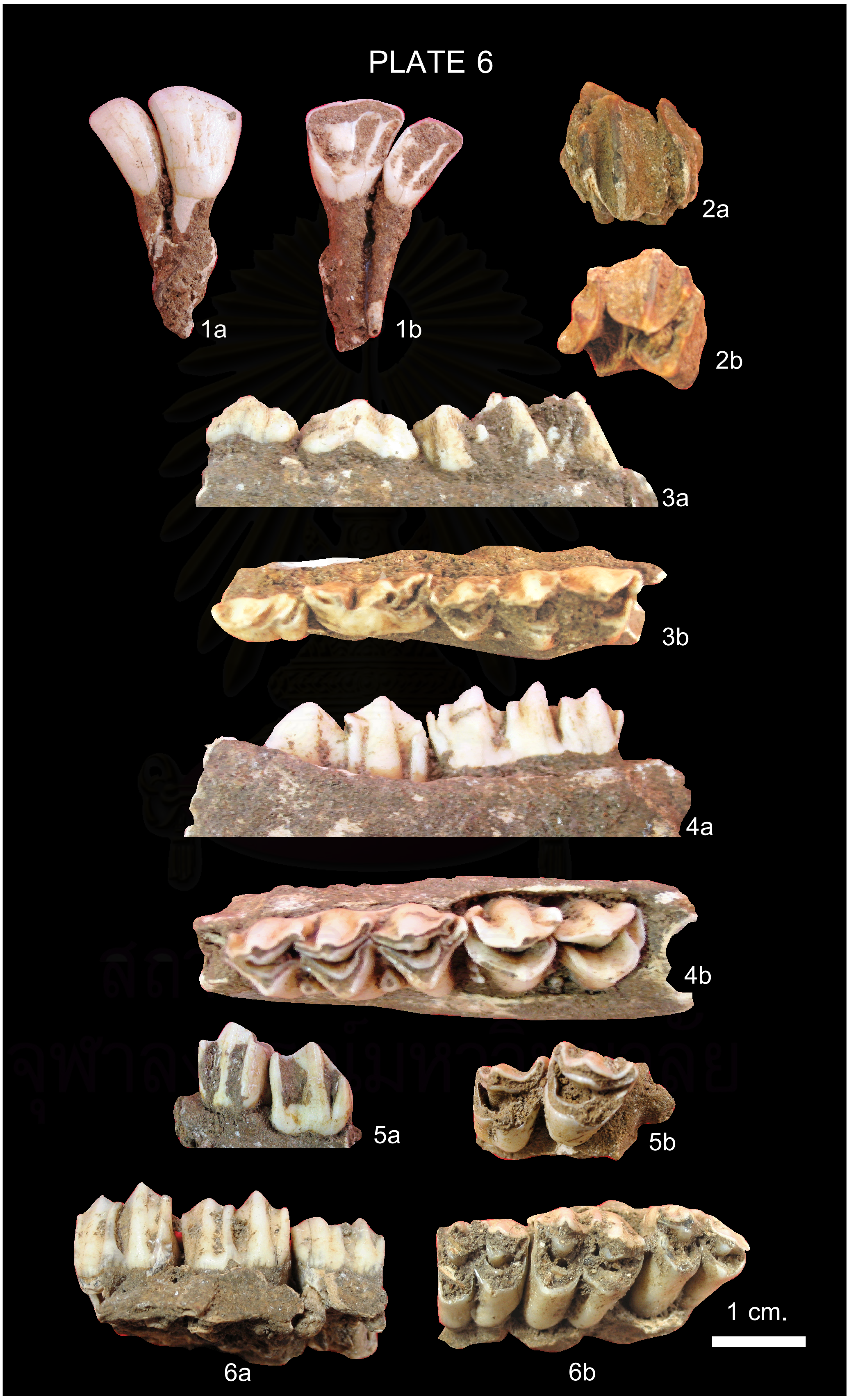
PLATE 6
1a
1b
2a
2b
3a
3b
4a
4b
5a
5b
6a
6b
1 cm.

EXPANATION OF PLATE 7

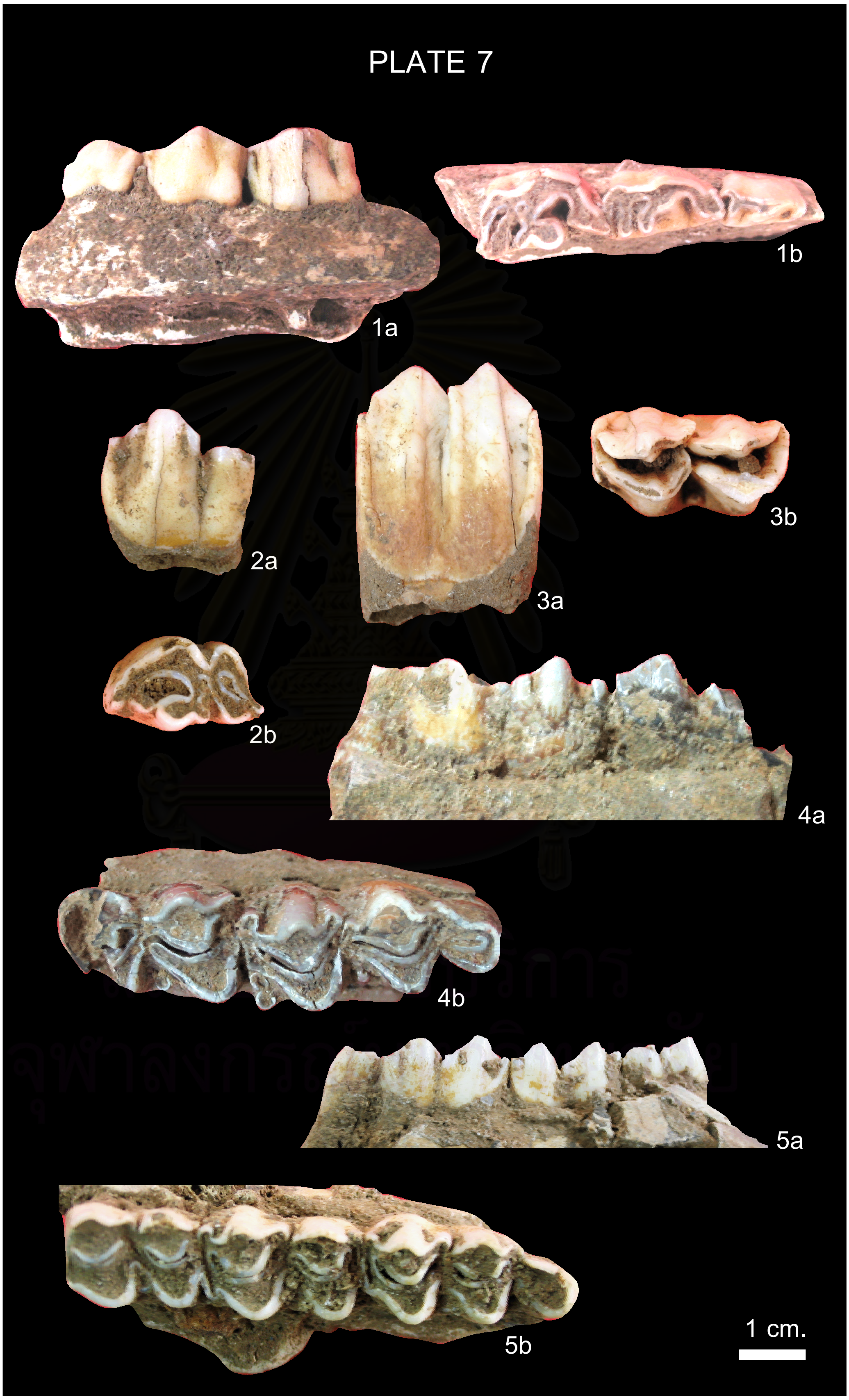
PLATE 7
1a
1b
2a
3a
3b
2b
4a
4b
5a
5b
1 cm.

EXPANATION OF PLATE 8

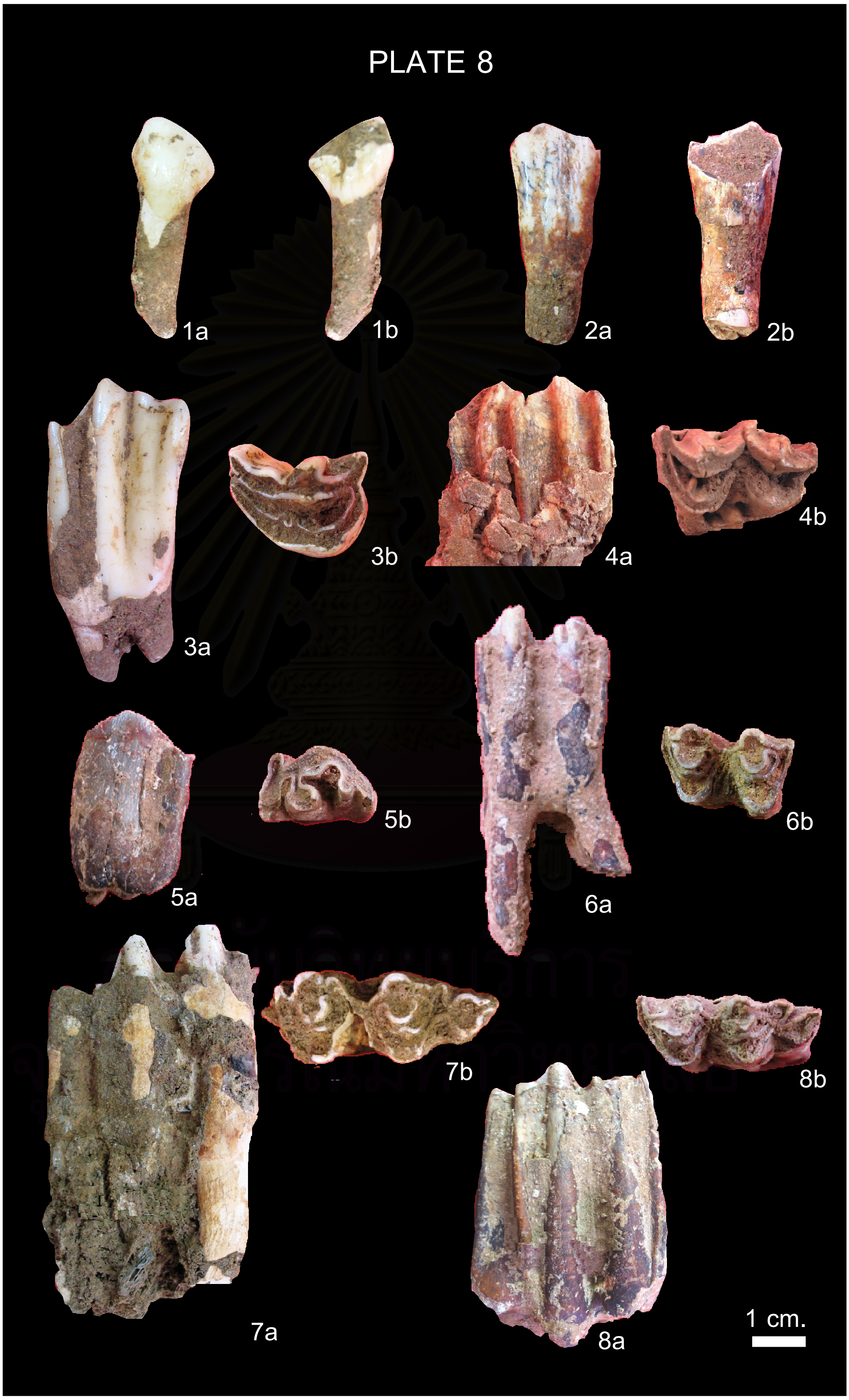
PLATE 8
1a
1b
2a
2b
3a
3b
4a
4b
5a
5b
6a
6b
7a
7b
8a
8b
1 cm.

EXPANATION OF PLATE 9

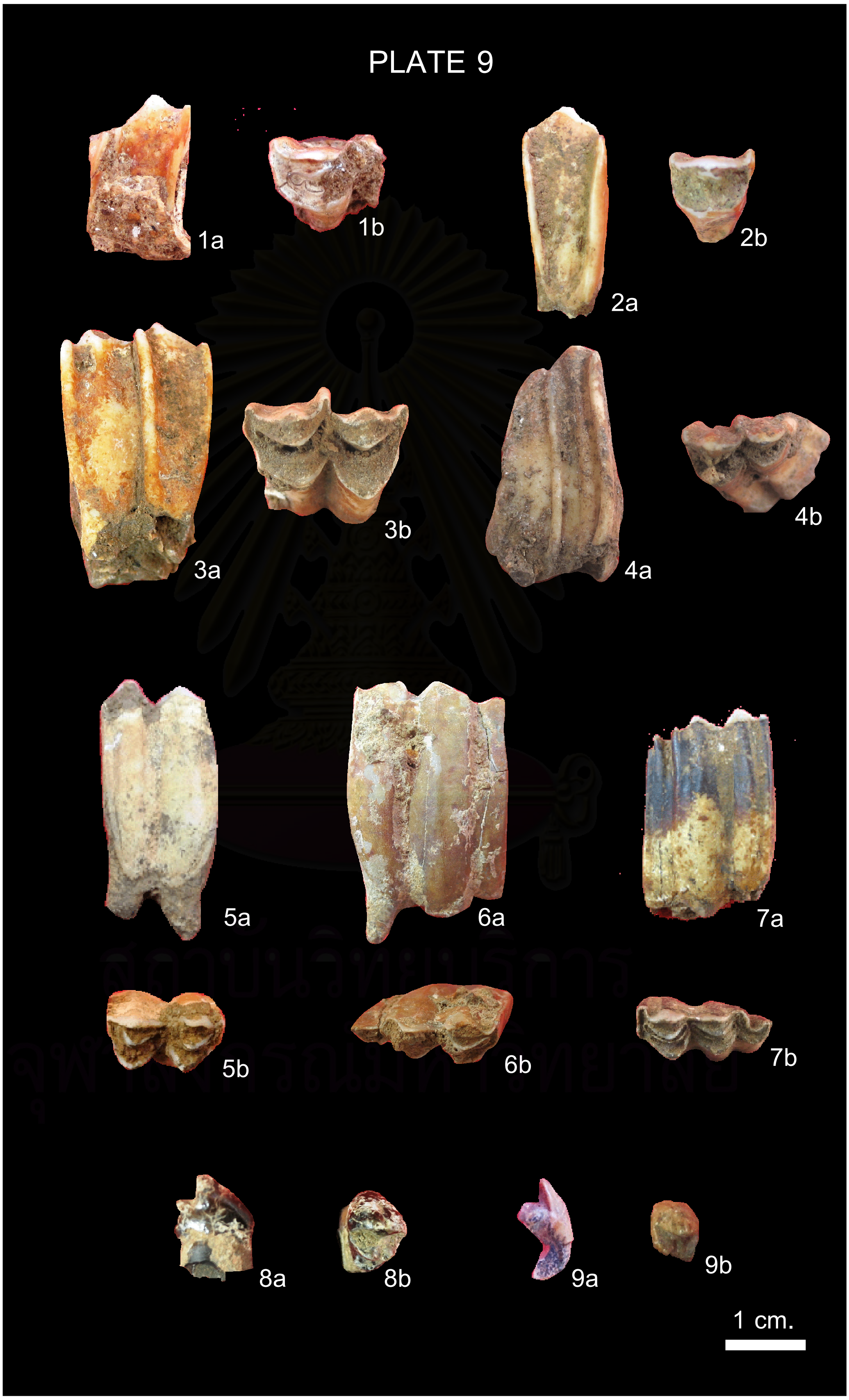
PLATE 9
1a
1b
2a
2b
3a
3b
4a
4b
5a
6a
7a
5b
6b
7b
8a
8b
9a
9b
1 cm.

APPENDIX B

TAXONOMIC DATA OF MAMMALS FROM AREA 1

THAM LOD ROCKSHELTER

Table 1 Taxonomic data of Cercopithecidae from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1999	4	L Pleis	Un	Un	I	Cercopithecidae	7.1	6.4	7.8			
A2084	4	L Pleis	Un	Un	I	Cercopithecidae		12.5	14.9			
A2654	4	L Pleis	Un	Un	I	Cercopithecidae	7.8	14.5	18.6			
A3425	5	L Pleis	L	Lo	I	Cercopithecidae	7.7	8.8	10.5			
A3426	5	L Pleis	Un	Un	I	Cercopithecidae	6.2	6.1				
A3533	5	L Pleis	Un	Un	Ch	Cercopithecidae						
A3536	5	L Pleis	Un	Un	Ch	Cercopithecidae						
A3543	5	L Pleis	Un	Un	M	Cercopithecidae	7.2	6.5	3.8			
A4102	5	L Pleis	Un	Un	I	Cercopithecidae	6.9	9.1	10.1			
A4232	5	L Pleis	Un	Un	C	Cercopithecidae	5.5	7.7	8.8			
A5035	5	L Pleis	L	Up	I 1	Cercopithecidae	5.1	6.1	11.6			
A5697	5	L Pleis	L	Lo	I 1	Cercopithecidae						
A5697	5	L Pleis	L	Lo	I 2	Cercopithecidae		5.5				
A5697	5	L Pleis	L	Lo	C	Cercopithecidae	6.1	7.9				
A5700	5	L Pleis	R	Lo	I 1	Cercopithecidae						
A5700	5	L Pleis	R	Lo	I 2	Cercopithecidae						
A5700	5	L Pleis	R	Lo	C	Cercopithecidae	5.2	7.4				
A5991	5	L Pleis	Un	Un	P	Cercopithecidae		6.2				
A6293	5	L Pleis	Un	Un	M	Cercopithecidae						
A7673	5	L Pleis	Un	Un	M	Cercopithecidae	4.9	6.6	4.0			
A7728	5	L Pleis	Un	Un	I	Cercopithecidae	6.1	5.5	9.1			

Table 2 Taxonomic data of Macaca spp. from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A2420	4	L Pleis	R	Lo	M 3	*Macaca* spp.	7.8	11.2	6.4			
A260	3	L Pleis	Un	Un	M	*Macaca* spp.	6.1	7.4	4.1			
A265	3	L Pleis	L	Lo	I 2	*Macaca* spp.	4.9	5.7	13.9			
A2889	4	L Pleis	L	Lo	M 3	*Macaca* spp.	6.3	9.5	3.7		24.6	
A3885	5	L Pleis	L	Lo	M 3	*Macaca* spp.	5.8	9.2	3.5			
A4293	2	Holo	L	Lo	M 1	*Macaca* spp.		4.4				
A4293	2	Holo	L	Lo	M 2	*Macaca* spp.	3.8	5.9	3.1			
A5350	5	L Pleis	R	Lo	M 3	*Macaca* spp.	7.5	11.9	6.2			
A5351	5	L Pleis	R	Lo	M 1	*Macaca* spp.	5.7		3.9			
A5351	5	L Pleis	R	Lo	M 2	*Macaca* spp.	7.8	9.3	6.3			
A5352	5	L Pleis	R	Lo	P 4	*Macaca* spp.	5.6	7.4	6.1			
A6096	5	L Pleis	L	Lo	P 2	*Macaca* spp.	4.9	6.1				
A6194	5	L Pleis	Un	Un	M	*Macaca* spp.		7.8	6.7			
A6209	5	L Pleis	R	Lo	M	*Macaca* spp.	8.1	10.4	7.7			
A6486	5	L Pleis	Un	Un	M	*Macaca* spp.	6.7	7.9	4.4			
A6487	5	L Pleis	Un	Un	M	*Macaca* spp.	7.9	10.2	5.2			

Table 3 Taxonomic data of Colobinae from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1592	3	L Pleis	R	Lo	M 1	Colobinae	5.1	5.2	3.1			
A1592	3	L Pleis	R	Lo	M 2	Colobinae	4.5	5.3	2.0			
A1593	3	L Pleis	L	Lo	P 2	Colobinae	4.1	6.3	3.9			
A3643	5	L Pleis	Un	Un	M	Colobinae	6.1	6.3	3.3			
A7482	5	L Pleis	R	Lo	M 1	Colobinae	4.5	5.4	3.8			
A7482	5	L Pleis	R	Lo	M 2	Colobinae	5.5	5.9	3.4			

Table 4 Taxonomic data of Rodentia from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A000	3	L Pleis	Un	Un	I 2	Rodentia						
A1017	3	L Pleis	R	Lo	I 2	Rodentia	1.7	2.1				
A1018	3	L Pleis	L	Up	I 2	Rodentia	6.9	6.1				
A1092	3	L Pleis	R	Lo	I 2	Rodentia	5.2					
A1160	3	L Pleis	Un	Lo	I 2	Rodentia	2.4	2.3				
A1167	3	L Pleis	Un	Un	I 2	Rodentia	5.6	4.8				
A1206	3	L Pleis	Un	Un	I 2	Rodentia						
A1223	3	L Pleis	L	Lo	I 2	Rodentia	2.5	2.9				
A1279	3	L Pleis	R	Up	I 2	Rodentia	8.2	6.1				
A1404	3	L Pleis	Un	Lo	I 2	Rodentia	2.8	4.1				
A1426	3	L Pleis	Un	Un	I 2	Rodentia		4.3				
A1556	3	L Pleis	Un	Un	I 2	Rodentia		1.5				
A1638	4	L Pleis	Un	Un	I 2	Rodentia	1.8	2.1				
A1667	4	L Pleis	L	Lo	I 2	Rodentia	5.5	3.7				
A1669	4	L Pleis	Un	Un	I 2	Rodentia		2.1				
A1670	4	L Pleis	Un	Un	I 2	Rodentia	2.7					
A1696	4	L Pleis	Un	Un	I 2	Rodentia	4.4	5.7				
A1697	4	L Pleis	Un	Un	I 2	Rodentia	6.0	6.2				
A1698	4	L Pleis	Un	Un	I 2	Rodentia	6.2	6.5				
A1699	4	L Pleis	Un	Un	I 2	Rodentia	7.3	6.1				
A1715	4	L Pleis	Un	Un	M	Rodentia	2.7	2.9				
A1743	4	L Pleis	R	Up	I 2	Rodentia	7.6	6.4				
A1877	4	L Pleis	R	Lo	I 2	Rodentia	6.6	6.8				
A1900	4	L Pleis	Un	Un	I 2	Rodentia	5.9	5.9				
A1904	4	L Pleis	R	Up	I 2	Rodentia	7.5	6.7				
A1943	4	L Pleis	Un	Un	M	Rodentia	6.5	7.7	6.3			
A2285	4	L Pleis	R	Up	I 2	Rodentia	6.4	5.0				
A2328	4	L Pleis	R	Up	I 2	Rodentia	7.9	5.9				
A2374	4	L Pleis	Un	Un	I 2	Rodentia	7.3					
A2375	4	L Pleis	Un	Un	I 2	Rodentia	4.9	4.6				
A2572	4	L Pleis	L	Lo	I 2	Rodentia	6.8	5.8				
A2713	4	L Pleis	Un	Un	I 2	Rodentia	7.1					

Table 4 Taxonomic data of Rodentia from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A278	3	L Pleis	R	Lo	I 2	Rodentia	2.5	2.4				
A281	3	L Pleis	Un	Un	I 2	Rodentia	4.5	5.4				
A2887	4	L Pleis	R	Up	I 2	Rodentia	4.5	5.3				
A2901	4	L Pleis	Un	Un	I 2	Rodentia	5.3	6.2				
A2972	4	L Pleis	Un	Un	M	Rodentia	1.9	2.5				
A3434	5	L Pleis	R	Up	I 2	Rodentia	6.3	5.1				
A3535	5	L Pleis	L	Lo	I 2	Rodentia	1.9	1.8				
A4174	5	L Pleis	Un	Un	I 2	Rodentia						
A42	2	Holo	Un	Un	I 2	Rodentia						
A4307	3	L Pleis	R	Up	I 2	Rodentia	5.6	4.7				
A4308	3	L Pleis	R	Lo	P 4	Rodentia	6.8	5.0	11.7			
A4308	3	L Pleis	R	Lo	M 1	Rodentia	6.7	5.4				
A4309	3	L Pleis	L	Up	I 2	Rodentia	7.6	6.1				
A4399	3	L Pleis	L	Up	I	Rodentia	3.6	1.4				
A4476	5	L Pleis	Un	Un	I 2	Rodentia	1.9	1.9				
A4477	5	L Pleis	Un	Un	I 2	Rodentia		4.4				
A4478	5	L Pleis	Un	Un	M	Rodentia	2.7					
A4640	5	L Pleis	Un	Un	I 2	Rodentia	4.1	3.9				
A4704	5	L Pleis	Un	Un	I 2	Rodentia	2.2	2.1				
A5095	5	L Pleis	Un	Un	I 2	Rodentia	2.0	2.5				
A5095	5	L Pleis	Un	Un	M	Rodentia	2.1					
A5095	5	L Pleis	Un	Un	M	Rodentia	2.4	0.9				
A5095	5	L Pleis	Un	Un	M	Rodentia	1.6	2.3				
A5096	5	L Pleis	Un	Un	I 2	Rodentia	1.2	1.3				
A5096	5	L Pleis	Un	Un	M	Rodentia	1.9	2.0				
A5096	5	L Pleis	Un	Un	M	Rodentia	2.3	1.1				
A5096	5	L Pleis	Un	Un	M	Rodentia	1.3	1.9				
A5097	5	L Pleis	Un	Un	I 2	Rodentia	1.3	1.9				
A5104	5	L Pleis	Un	Un	M	Rodentia	6.6	8.3	18.5			
A5137	5	L Pleis	Un	Un	I 2	Rodentia	6.7	5.8				
A517	3	L Pleis	Un	Up	I 2	Rodentia	5.5	4.3				
A5187	5	L Pleis	Un	Un	I 2	Rodentia	5.4	3.9				

Table 4 Taxonomic data of Rodentia from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A5284	5	L Pleis	Un	Un	I 2	Rodentia		5.8				
A5407	5	L Pleis	L	Lo	I 2	Rodentia						
A5440	5	L Pleis	R	Up	I 2	Rodentia	7.2	5.5				
A5441	5	L Pleis	Un	Un	I 2	Rodentia						
A5511	5	L Pleis	Un	Un	M	Rodentia	6.5	7.0	11.6			
A5588	5	L Pleis	Un	Un	Ch	Rodentia		5.2	12.7			
A5612	5	L Pleis	R	Up	I 2	Rodentia	7.7	6.3				
A5803	5	L Pleis	Un	Un	I 2	Rodentia	5.2	4.3				
A5807	5	L Pleis	Un	Un	I	Rodentia	2.3	1.5				
A5921	5	L Pleis	Un	Un	I 2	Rodentia						
A5922	5	L Pleis	Un	Un	I 2	Rodentia						
A6093	5	L Pleis	R	Lo	M 3	Rodentia		6.8				29.8
A6169	5	L Pleis	Un	Un	I 2	Rodentia		1.6				
A62	2	Holo	Un	Un	I 2	Rodentia						
A6244	5	L Pleis	Un	Un	I 2	Rodentia	5.1	4.4				
A6572	5	L Pleis	Un	Un	I 2	Rodentia						
A6681	5	L Pleis	Un	Un	M	Rodentia	2.1	1.7	2.7			
A6830	5	L Pleis	L	Lo	M 1	Rodentia	3.8	4.7				
A6875	5	L Pleis	Un	Un	I 2	Rodentia	1.6					
A6879	5	L Pleis	Un	Un	I 2	Rodentia	1.7					
A6902	5	L Pleis	Un	Un	I 2	Rodentia	6.0	4.6				
A6919	5	L Pleis	Un	Un	I 2	Rodentia	5.7	3.9				
A6942	5	L Pleis	Un	Un	Ch	Rodentia	5.6	8.1				
A6955	5	L Pleis	Un	Un	M	Rodentia	3.0	3.8				
A6956	5	L Pleis	Un	Un	I 2	Rodentia		1.9				
A7110	5	L Pleis	Un	Un	I 2	Rodentia	1.9	1.9				
A7180	5	L Pleis	Un	Un	I 2	Rodentia	2.3					
A7181	5	L Pleis	L	Up	I 2	Rodentia	4.1	4.2				
A7182	5	L Pleis	R	Lo	I 2	Rodentia	4.5	4.9				
A7200	5	L Pleis	Un	Un	M	Rodentia		8.3	5.4			
A7332	5	L Pleis	Un	Un	I 2	Rodentia	4.9	4.9				
A7393	5	L Pleis	Un	Un	I 2	Rodentia	3.9	4.1				

Table 4 Taxonomic data of Rodentia from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A7469	5	L Pleis	Un	Un	I 2	Rodentia	4.9	4.3				
A7471	5	L Pleis	Un	Un	I 2	Rodentia	5.7	4.5				
A7472	5	L Pleis	L	Up	I 2	Rodentia	5.9	4.6				
A7473	5	L Pleis	R	Up	I 2	Rodentia	4.9	4.3				
A751	3	L Pleis	Un	Lo	I 2	Rodentia	2.8	3.1				
A752a	3	L Pleis	L	Lo	I 2	Rodentia	1.9	1.6				
A752b	3	L Pleis	L	Lo	M	Rodentia		3.0				
A753	3	L Pleis	Un	Un	M	Rodentia	3.6	2.7	2.9			
A7532	5	L Pleis	Un	Un	M	Rodentia	3.6					
A7555	5	L Pleis	Un	Un	I 2	Rodentia	2.4	2.5				
A7556	5	L Pleis	Un	Un	I 2	Rodentia	1.4	1.3				
A7601	5	L Pleis	R	Lo	I 2	Rodentia	5.2	4.7				
A7602	5	L Pleis	L	Lo	I 2	Rodentia	3.2	2.5				
A7602	5	L Pleis	L	Lo	M	Rodentia	2.5	2.7				
A7628	5	L Pleis	Un	Un	I 2	Rodentia	1.1	1.1				
A7674	5	L Pleis	L	Up	I 2	Rodentia	2.7	1.7				
A7711	5	L Pleis	Un	Un	I 2	Rodentia	3.5	4.5				
A7759	5	L Pleis	L	Lo	M 1	Rodentia	2.9	4.0				
A7759	5	L Pleis	L	Lo	M 2	Rodentia	2.4	2.6				
A7760	5	L Pleis	L	Lo	I 2	Rodentia	6.1	6.6				
A7761	5	L Pleis	L	Up	I 2	Rodentia	6.6	5.5				
A7762	5	L Pleis	L	Lo	I 2	Rodentia		4.5				
A7762	5	L Pleis	L	Lo	M	Rodentia	5.2	5.4				
A7763	5	L Pleis	R	Lo	I 2	Rodentia		3.9				
A7763	5	L Pleis	R	Lo	M 1	Rodentia	3.0	4.1				
A7763	5	L Pleis	R	Lo	M 2	Rodentia	3.9	4.3				
A7763	5	L Pleis	R	Lo	M 3	Rodentia	4.5	5.1				
A7798	5	L Pleis	Un	Un	I 2	Rodentia	3.3	2.4				
A7799	5	L Pleis	R	Up	I 2	Rodentia	3.2	5.0				
A7800	5	L Pleis	Un	Lo	I 2	Rodentia	6.1	4.5				
A7801	5	L Pleis	Un	Un	I	Rodentia	5.8	4.8				
A7807	5	L Pleis	Un	Un	I 2	Rodentia	1.3	0.7				

Table 4 Taxonomic data of Rodentia from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A7857	6	L Pleis	Un	Un	I 2	Rodentia	2.2	2.0				
A7858	6	L Pleis	Un	Un	I 2	Rodentia	4.9	4.5				
A7868	6	L Pleis	L	Up	I 2	Rodentia	4.2	4.6				
A840	3	L Pleis	R	Lo	I 2	Rodentia	2.4	2.1				
A841	3	L Pleis	R	Lo	I 2	Rodentia	5.5	4.9				
A842	3	L Pleis	L	Lo	I 2	Rodentia	1.8	2.4				9.1
A911	3	L Pleis	R	Lo	I 2	Rodentia	6.1	6.0				

Table 5 Taxonomic data of Rhizomyidae from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1668	4	L Pleis	L	Lo	I 2	Rhizomyidae	1.9	2.3				
A1668	4	L Pleis	L	Lo	M 1	Rhizomyidae	2.9	2.9				
A1668	4	L Pleis	L	Lo	M 2	Rhizomyidae	2.5	3.4				
A1878	4	L Pleis	Un	Un	M	Rhizomyidae	2.1	2.5				
A3686	5	L Pleis	R	Up	M	Rhizomyidae	6.6	7.5				
A3887	5	L Pleis	R	Up	I 2	Rhizomyidae	5.4	2.9				
A3887	5	L Pleis	R	Up	M 1	Rhizomyidae	4.4	3.0	1.8			
A3887	5	L Pleis	R	Up	M 2	Rhizomyidae	3.9					
A4026	5	L Pleis	L	Lo	I 2	Rhizomyidae	3.9	3.4				
A4026	5	L Pleis	L	Lo	M 1	Rhizomyidae	3.9	3.6				
A4026	5	L Pleis	L	Lo	M 2	Rhizomyidae						
A4478	5	L Pleis	Un	Lo	M	Rhizomyidae	2.3					
A5094	5	L Pleis	Un	Un	I 2	Rhizomyidae	1.2	1.1				
A5094	5	L Pleis	Un	Un	M 3	Rhizomyidae	1.8	1.6				
A5094	5	L Pleis	Un	Un	M 3	Rhizomyidae	1.6	2.2				
A5100	5	L Pleis	Un	Un	P	Rhizomyidae	2.5	2.1	3.8			
A5108	5	L Pleis	Un	Un	M	Rhizomyidae	3.0	2.6	1.2			

Table 5 Taxonomic data of Rhizomyidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A5549	5	L Pleis	L	Lo	I 2	Rhizomyidae	3.7	3.2				
A5549	5	L Pleis	L	Lo	M 1	Rhizomyidae	2.7	4.9				
A5549	5	L Pleis	L	Lo	M 2	Rhizomyidae	3.7	4.4				
A5549	5	L Pleis	L	Lo	M 3	Rhizomyidae						
A6831	5	L Pleis	Un	Lo	M	Rhizomyidae	3.0	2.4				
A6831	5	L Pleis	Un	Lo	M	Rhizomyidae	2.1	1.9				
A6920	5	L Pleis	Un	Un	Ch	Rhizomyidae	1.8	2.6				
A7030	5	L Pleis	Un	Un	M	Rhizomyidae	5.1	4.7				
A7183	5	L Pleis	Un	Un	Ch	Rhizomyidae	4.9					
A7333	5	L Pleis	R	Lo	M 1	Rhizomyidae	3.4	4.6				
A7334	5	L Pleis	R	Lo	M 2	Rhizomyidae	4.4					
A7335	5	L Pleis	R	Lo	M 2	Rhizomyidae	4.4	5.3				
A7336	5	L Pleis	Un	Up	M	Rhizomyidae	4.7	5.0				
A7338	5	L Pleis	Un	Un	M	Rhizomyidae	2.1	4.6	2.1			
A7338	5	L Pleis	Un	Un	M	Rhizomyidae	2.6	4.3	3.7			
A7392	5	L Pleis	L	Lo	M 2	Rhizomyidae	4.9	4.8				
A7392	5	L Pleis	L	Lo	M 3	Rhizomyidae	4.9	5.1				
A7600	5	L Pleis	L	Lo	M 2	Rhizomyidae	3.5	1.6				5.9
A7600	5	L Pleis	L	Lo	M 3	Rhizomyidae	2.6	2.8				5.9
A7603	5	L Pleis	R	Lo	M 1	Rhizomyidae	4.6	4.2				
A7603	5	L Pleis	R	Lo	M 2	Rhizomyidae	4.2	3.9				
A7603	5	L Pleis	R	Lo	I 2	Rhizomyidae	4.1	3.7				
A7866	6	L Pleis	Un	Un	M 1	Rhizomyidae	4.0	5.1	2.6			
A7867	6	L Pleis	Un	Un	Ch	Rhizomyidae	4.1	4.6	5.3			

Table 6 Taxonomic data of Rhizomys spp. from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A3289	5	L Pleis	Un	Up	M 1	*Rhizomys* spp.	2.8	3.6				14.7
A3289	5	L Pleis	Un	Up	M 2	*Rhizomys* spp.	4.8	3.7				14.7
A3289	5	L Pleis	Un	Up	M 3	*Rhizomys* spp.	4.9	4.3				14.7
A5101	5	L Pleis	L	Lo	I 2	*Rhizomys* spp.	5.3	3.8				14.6
A5101	5	L Pleis	L	Lo	M 2	*Rhizomys* spp.		2.6	2.9			14.6
A5101	5	L Pleis	L	Lo	M 3	*Rhizomys* spp.		4.3	2.9			14.6
A5439	5	L Pleis	R	Lo	M 1	*Rhizomys* spp.	3.3	3.3				16.0
A5439	5	L Pleis	R	Lo	M 2	*Rhizomys* spp.	3.7	4.2				16.0
A5439	5	L Pleis	R	Lo	M 3	*Rhizomys* spp.	3.8	3.9				16.0
A7184	5	L Pleis	L	Lo	M 1	*Rhizomys* spp.	2.9	4.4				12.9
A7184	5	L Pleis	L	Lo	M 2	*Rhizomys* spp.	4.4	5.2				12.9
A7184	5	L Pleis	L	Lo	M 3	*Rhizomys* spp.	4.3	4.9				12.9
A7331	5	L Pleis	L	Up	M 2	*Rhizomys* spp.	3.7	3.9				13.4
A7331	5	L Pleis	L	Up	M 3	*Rhizomys* spp.	3.7	4.5				13.4
A7330	5	L Pleis	L	Lo	I 2	*Rhizomys* spp.	5.7	4.4				14.4
A7604	5	L Pleis	L	Up	M 1	*Rhizomys* spp.	2.1	4.9				14.1
A7604	5	L Pleis	L	Up	M 2	*Rhizomys* spp.	3.4	3.8				14.1
A7604	5	L Pleis	L	Up	M 3	*Rhizomys* spp.	3.9	1.9				14.1
A2570	4	L Pleis	L	Lo	I 2	*Rhizomys* spp.	4.3	2.7				15.2
A2570	4	L Pleis	L	Lo	M 1	*Rhizomys* spp.	3.9	3.0				15.2
A2570	4	L Pleis	L	Lo	M 2	*Rhizomys* spp.	3.4	3.4				15.2
A2570	4	L Pleis	L	Lo	M 3	*Rhizomys* spp.	2.0	2.1				15.2

Table 7 Taxonomic data of Canomys badius from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A2373	4	L Pleis	L	Lo	I 2	*Canomys badius*	2.2		1.2			9.4
A2373	4	L Pleis	L	Lo	M 3	*Canomys badius*	3.4	2.8				9.4
A3540	5	L Pleis	R	Up	I 2	*Canomys badius*		2.7				8.8
A3540	5	L Pleis	R	Up	M 1	*Canomys badius*	2.4	2.3				8.8
A3540	5	L Pleis	R	Up	M 2	*Canomys badius*	2.1	2.5				8.8
A3540	5	L Pleis	R	Up	M 3	*Canomys badius*	2.4	1.7				8.8

Table 7 Taxonomic data of Canomys badius from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A3540	5	L Pleis	L	Up	I 2	*Canomys badius*		2.2				8.9
A3540f	5	L Pleis	L	Up	M 1	*Canomys badius*	2.4	2.3				8.9
A3540	5	L Pleis	L	Up	M 2	*Canomys badius*	2.7	2.4				8.9
A3540	5	L Pleis	L	Up	M 3	*Canomys badius*	2.3	1.5				8.9
A4173	5	L Pleis	R	Lo	I 2	*Canomys badius*	1.7	1.4				9.0
A4173	5	L Pleis	R	Lo	M 1	*Canomys badius*	1.7	2.8				9.0
A4173	5	L Pleis	R	Lo	M 2	*Canomys badius*		2.1				9.0
A4173	5	L Pleis	R	Lo	M 3	*Canomys badius*		1.7				
A4173	5	L Pleis	L	Lo	I 2	*Canomys badius*	1.2	1.4				9.1
A4173f	5	L Pleis	L	Lo	M 1	*Canomys badius*	1.7	2.8				9.1
A4173	5	L Pleis	L	Lo	M 2	*Canomys badius*		2.1				9.1
A4173	5	L Pleis	L	Lo	M 3	*Canomys badius*		1.6	9.9			9.1
A5613	5	L Pleis	R	Lo	M 1	*Canomys badius*	2.5	2.9				11.1
A5613	5	L Pleis	R	Lo	M 2	*Canomys badius*	2.1	2.1	15.9			11.1
A6435	5	L Pleis	L	Lo	I 2	*Canomys badius*	3.0	2.2				11.1
A6435	5	L Pleis	L	Lo	M 1	*Canomys badius*	2.8	2.9				11.1
A6435	5	L Pleis	L	Lo	M 2	*Canomys badius*	2.6	2.7				11.1
A6435	5	L Pleis	L	Lo	M 3	*Canomys badius*	2.8	3.0				11.1
A6630	5	L Pleis	R	Lo	I 2	*Canomys badius*	3.3	2.5	14.6			9.4
A6630	5	L Pleis	R	Lo	M 1	*Canomys badius*	2.7	2.8	10.4			9.4
A6630	5	L Pleis	R	Lo	M 2	*Canomys badius*	2.4	2.4	17.8			9.4
A6630	5	L Pleis	R	Lo	M 1	*Canomys badius*						9.4
A6829	5	L Pleis	L	Up	M 1	*Canomys badius*	2.4	3.0				8.9
A6829	5	L Pleis	L	Up	M 2	*Canomys badius*	2.0	2.5				8.9
A6829	5	L Pleis	L	Up	M 3	*Canomys badius*	2.1	1.5	8.4			8.9
A7759	5	L Pleis	L	Lo	I 2	*Canomys badius*	1.9	1.3	11.4			8.9
A826a	3	L Pleis	L	Lo	I 2	*Canomys badius*		2.7				
A826b	3	L Pleis	L	Lo	M 1	*Canomys badius*	2.4	2.4				8.9
A826c	3	L Pleis	L	Lo	M 2	*Canomys badius*	2.1	0.9				8.9
A826d	3	L Pleis	L	Lo	M 3	*Canomys badius*	2.1	1.2				8.9
A968a	3	L Pleis	R	Lo	I 2	*Canomys badius*		2.5				9.6
A968b	3	L Pleis	R	Lo	M 1	*Canomys badius*	2.1		9.2			9.6
A968c	3	L Pleis	R	Lo	M 2	*Canomys badius*			6.2			9.6
A968d	3	L Pleis	R	Lo	M 3	*Canomys badius*	1.8		12.3			9.6

Table 8 Taxonomic data of Bandicota indica from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A4641	5	L Pleis	L	Up	M 1	*Bandicota* spp.	2.8	2.2	1.6			9.8
A4641	5	L Pleis	L	Up	M 2	*Bandicota* spp.	2.5	1.2	1.4			9.8
A4641	5	L Pleis	L	Up	M 3	*Bandicota* spp.	1.7	0.9	0.4			9.8

Table 9 Taxonomic data of Bandicota spp. from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A5611	5	L Pleis	R	Lo	I 2	*Bandicota indica*	2.5	2.5				10.3
A5611	5	L Pleis	R	Lo	M 1	*Bandicota indica*	2.9	3.8				10.3
A5611	5	L Pleis	R	Lo	M 2	*Bandicota indica*	2.7	2.2				10.3
A5611	5	L Pleis	R	Lo	M 3	*Bandicota indica*	2.5	2.0				10.3

Table 10 Taxonomic data of Hystricidae 1 from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A2571	4	L Pleis	Un	Un	M	Hystricidae 1	6.8	7.6	8.0			
A3011	4	L Pleis	R	Lo	P 4	Hystricidae 1	6.7	8.4				31.8
A3011	4	L Pleis	R	Lo	M 1	Hystricidae 1	6.5	6.0				31.8
A3011	4	L Pleis	R	Lo	M 2	Hystricidae 1	6.7	7.3				31.8
A3886	5	L Pleis	Un	Un	M	Hystricidae 1	6.2	8.5	12.7			
A4209	5	L Pleis	Un	Un	M	Hystricidae 1	6.5	8.9				
A4299	1	Holo	Un	Un	Ch	Hystricidae 1	5.8	6.7	8.1			
A5105	5	L Pleis	Un	Un	M	Hystricidae 1	5.9	6.9	11.5			
A5214	5	L Pleis	Un	Un	M	Hystricidae 1	7.1	7.0				
A5214	5	L Pleis	Un	Un	M	Hystricidae 1	6.2	7.7	12.7			
A5283	5	L Pleis	Un	Lo	P 4	Hystricidae 1	5.1	7.4				
A5283	5	L Pleis	Un	Lo	M 1	Hystricidae 1	6.3	7.6				
A5805	5	L Pleis	Un	Un	M	Hystricidae 1	6.4	7.0	7.9			

Table 10 Taxonomic data of Hystricidae 1 from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A6093	5	L Pleis	R	Lo	M 2	Hystricidae 1	6.3	7.0			29.8	
A6242	5	L Pleis	L	Un	Ch	Hystricidae 1	6.1	7.9	14.5			
A6243	5	L Pleis	R	Un	Ch	Hystricidae 1	6.2	7.5	13.5			
A6315	5	L Pleis	Un	Un	Ch	Hystricidae 1	7.0	7.1	10.5			
A6758	5	L Pleis	R	Up	M 1	Hystricidae 1	6.8	7.2				
A6758	5	L Pleis	R	Up	M 2	Hystricidae 1	5.2	7.3				
A6758	5	L Pleis	L	Up	P 4	Hystricidae 1	5.2	6.7				
A6758	5	L Pleis	L	Up	M 1	Hystricidae 1	6.2	7.5				
A6989	5	L Pleis	Un	Un	P 4	Hystricidae 1	5.5	8.0	4.6			
A7199	5	L Pleis	Un	Un	M	Hystricidae 1	6.6	9.1				
A7397	5	L Pleis	Un	Un	M	Hystricidae 1	7.8	6.5	13.4			
A7448	5	L Pleis	Un	Un	M	Hystricidae 1	7.4	6.0	16.4			
A7449	5	L Pleis	Un	Un	M	Hystricidae 1	7.9	6.4	13.0			
A7470	5	L Pleis	Un	Un	P 4	Hystricidae 1	5.9	8.3				
A7481	5	L Pleis	R	Up	M 1	Hystricidae 1	4.5	6.6	15.8			
A7481	5	L Pleis	R	Up	M 2	Hystricidae 1	6.5	7.5	17.9			
A7486	5	L Pleis	Un	Un	P 4	Hystricidae 1	7.1	10.5	18.8			
A7720	5	L Pleis	Un	Un	M	Hystricidae 1	6.8	8.0	16.4			
A7803	5	L Pleis	Un	Un	M	Hystricidae 1	6.4	7.4	9.2			
A7804	5	L Pleis	Un	Un	M	Hystricidae 1	7.4	9.0	12.3			
A7805	5	L Pleis	Un	Un	M	Hystricidae 1	5.0	8.0	14.4			
A7806	5	L Pleis	Un	Lo	Ch	Hystricidae 1	6.5	7.2				
A7806	5	L Pleis	Un	Lo	Ch	Hystricidae 1	6.8	7.3				
A7827	5	L Pleis	Un	Un	M	Hystricidae 1	6.5	7.4	14.7			
A977	3	L Pleis	Un	Up	M	Hystricidae 1	6.6	6.6				

Table 11 Taxonomic data of Hystricidae 2 from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1905	4	L Pleis	L	Up	M 2	Hystricidae 2	3.8	2.7				
A1905	4	L Pleis	L	Up	M 3	Hystricidae 2	3.9	3.4				
A4398	3	L Pleis	R	Lo	I 2	Hystricidae 2		2.5				16.9
A4398	3	L Pleis	R	Lo	M 3	Hystricidae 2	4.4	4.3				16.9
A7329	5	L Pleis	L	Lo	M 3	Hystricidae 2	4.2	3.5				
A7337	5	L Pleis	L	Up	P	Hystricidae 2	4.4	4.4				
A7395	5	L Pleis	L	Lo	M 2	Hystricidae 2	3.9	3.6				
A7395	5	L Pleis	L	Lo	M 3	Hystricidae 2	3.3	3.0				
A7605	5	L Pleis	R	Up	P 4	Hystricidae 2	4.9	3.3				
A7605	5	L Pleis	R	Up	M 1	Hystricidae 2	4.0	4.3				
A7605	5	L Pleis	R	Up	M 2	Hystricidae 2	4.0	4.7				

Table 12 Taxonomic data of Carnivora from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A109	2	Holo	Un	Un	P	Carnivora	6.0	11.1				
A1182	3	L Pleis	Un	Un	C	Carnivora						
A134	2	Holo	Un	Un	C	Carnivora	13.2	20.9				
A1464	3	L Pleis	Un	Un	C	Carnivora	13.0	18.4				
A1853	4	L Pleis	Un	Un	C	Carnivora	7.4	6.1				
A2116	4	L Pleis	Un	Un	P	Carnivora	3.4	4.6				
A2571	4	L Pleis	R	Up	I 3	Carnivora	6.3	10.4				
A2571	4	L Pleis	R	Up	C	Carnivora	14.6	20.8				
A2739	4	L Pleis	Un	Un	C	Carnivora	18.1	25.4			57.1	
A2888	4	L Pleis	Un	Un	I	Carnivora	7.6	4.9				
A3079	4	L Pleis	Un	Un	P	Carnivora	4.2	8.2				
A3127	5	L Pleis	Un	Un	C	Carnivora	15.8	19.5				
A3416	5	L Pleis	Un	Un	C	Carnivora						
A4027	5	L Pleis	Un	Un	Ch	Carnivora	6.1		12.5			
A4236	2	Holo	R	Up	I 3	Carnivora	9.8	6.1		47.2		
A4241	2	Holo	L	Up	C	Carnivora	16.2	12.2				

Table 12 Taxonomic data of Carnivora from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A4242	2	Holo	Un	Un	C	Carnivora	21.1	14.7	5.3			
A4243	2	Holo	Un	Un	C	Carnivora	23.3	15.2				
A4287	2	Holo	Un	Un	I	Carnivora						
A4400	3	L Pleis	L	Lo	I 3	Carnivora	2.7	3.0				
A4400	3	L Pleis	L	Lo	I 2	Carnivora	1.4	2.7			62.2	
A4400	3	L Pleis	L	Lo	I 2	Carnivora	1.4	2.7	9.6			
A4400	3	L Pleis	R	Lo	I 1	Carnivora	1.0	1.2				
A520	3	L Pleis	Un	Un	I 3	Carnivora	8.1	6.8				
A5217	5	L Pleis	Un	Un	C	Carnivora	9.2	11.1				
A5233	5	L Pleis	Un	Un	C	Carnivora						
A5510	5	L Pleis	Un	Un	C	Carnivora	8.6	7.7				
A5625	5	L Pleis	Un	Un	C	Carnivora						
A5672	5	L Pleis	Un	Un	C	Carnivora	19.3	11.7				
A5676	5	L Pleis	R	Up	Ch	Carnivora	11.5					
A5681	5	L Pleis	Un	Un	I	Carnivora		5.0				
A5681	5	L Pleis	Un	Un	I	Carnivora		4.6				
A5685	5	L Pleis	Un	Un	Ch	Carnivora						
A5708	5	L Pleis	Un	Un	C	Carnivora						
A5806	5	L Pleis	Un	Un	P	Carnivora						
A5944	5	L Pleis	Un	Un	C	Carnivora			12.2			
A6482	5	L Pleis	Un	Un	I 3	Carnivora						
A6682	5	L Pleis	L	Up	P	Carnivora	7.0	9.3	8.2			
A6872	5	L Pleis	Un	Up	P	Carnivora						
A6954	5	L Pleis	Un	Un	P	Carnivora	2.6	4.8				
A7006	5	L Pleis	Un	Un	C	Carnivora						
A7060	5	L Pleis	Un	Un	C	Carnivora						
A7109	5	L Pleis	Un	Un	I	Carnivora	3.7	2.6				
A7538	5	L Pleis	Un	Un	C	Carnivora						
A7698	5	L Pleis	Un	Un	C	Carnivora						
A839	3	L Pleis	Un	Un	Ch	Carnivora	2.4	3.0	13.6			

Table 13 Taxonomic data of Ursus thibetanus from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A105a	2	Holo	L	Lo	M 1	*Ursus thibetanus*	8.3	20.6				
A105b	2	Holo	L	Lo	M 2	*Ursus thibetanus*	13.6	22.9				
A1266	3	L Pleis	L	Lo	M 3	*Ursus thibetanus*	12.0	14.3	4.4			
A2785	4	L Pleis	Un	Up	M 2	*Ursus thibetanus*	16.8	30.0	5.6			
A3122	5	L Pleis	L	Lo	C	*Ursus thibetanus*	8.4	20.1				
A3228	5	L Pleis	L	Lo	P 3	*Ursus thibetanus*	9.4	12.9	6.3			
A3230	5	L Pleis	L	Lo	M 2	*Ursus thibetanus*		19.9	5.6			
A4239	2	Holo	R	Up	M 1	*Ursus thibetanus*	13.9	19.7	5.9			
A4239	2	Holo	R	Up	M 2	*Ursus thibetanus*	15.9	27.4	5.8			
A4284	2	Holo	L	Lo	M 2	*Ursus thibetanus*	11.4	19.9	4.2		59.5	75.4
A4284	2	Holo	L	Lo	M 3	*Ursus thibetanus*	12.1	14.8	3.1			
A4285	2	Holo	R	Lo	P 4	*Ursus thibetanus*	5.4	8.9	5.1		57.3	67.9
A4285	2	Holo	R	Lo	M 1	*Ursus thibetanus*	8.5	19.7	6.0			
A4285	2	Holo	R	Lo	M 2	*Ursus thibetanus*	11.2	18.4	4.7			
A4285	2	Holo	R	Lo	M 3	*Ursus thibetanus*	11.1	14.9	2.8			
A4292	2	Holo	Un	Lo	M 3	*Ursus thibetanus*	12.8	16.6	4.8			
A498	3	L Pleis	L	Up	M 1	*Ursus thibetanus*	13.9	19.3	8.6			
A5028	5	L Pleis	Un	Un	M	*Ursus thibetanus*	16.0		14.6			
A516	3	L Pleis	L	Up	M 2	*Ursus thibetanus*	15.1	27.9	4.4			
A5174	5	L Pleis	R	Up	M 1	*Ursus thibetanus*	13.6	18.4				
A6203	5	L Pleis	R	Up	M 1	*Ursus thibetanus*	14.2	18.7				
A6852	5	L Pleis	R	Up	M 1	*Ursus thibetanus*	13.5	18.9				

Table 14 Taxonomic data of Ursus spp. from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A108	2	Holo	L	Up	M 1	*Ursus* spp.		8.0				
A268	3	L Pleis	R	Up	P 4	*Ursus* spp.	9.1	12.9	7.5			
A3122	5	L Pleis	L	Lo	I 3	*Ursus* spp.	8.6	8.4				
A3126	5	L Pleis	R	Lo	I 2	*Ursus* spp.	7.1	4.7				
A3224	5	L Pleis	Un	Up	P 4	*Ursus* spp.	9.5	13.0	6.6			
A3227	5	L Pleis	R	Lo	I 3	*Ursus* spp.	6.9	7.4	5.8			
A3232	5	L Pleis	L	Lo	I 2	*Ursus* spp.	6.9	5.4				
A3448	5	L Pleis	R	Up	I 3	*Ursus* spp.	7.3	8.4				
A3675	5	L Pleis	R	Up	M 1	*Ursus* spp.	18.9	18.3	8.8			
A38	2	Holo	Un	Un	C	*Ursus* spp.						
A4003	5	L Pleis	Un	Un	M	*Ursus* spp.	14.4		5.9			
A41	2	Holo	R	Un	I 3	*Ursus* spp.	8.5	10.1	16.6			
A4238	2	Holo	R	Up	M 1	*Ursus* spp.	10.0		6.1			
A4283	2	Holo	L	Lo	I 2	*Ursus* spp.	7.5	5.6	8.3			
A4283	2	Holo	L	Lo	I 1	*Ursus* spp.	5.9	4.9	5.2			
A4283	2	Holo	L	Lo	I 1	*Ursus* spp.	5.7	4.8	6.1			
A4283	2	Holo	L	Lo	I 2	*Ursus* spp.	7.6	5.2	8.5			
A4286	2	Holo	R	Lo	I 1	*Ursus* spp.	5.9	4.9	5.1			
A4286	2	Holo	R	Lo	I 2	*Ursus* spp.	7.3	5.1	6.9			
A4286	2	Holo	R	Lo	I 3	*Ursus* spp.	8.8	9.0	14.5			
A4288	2	Holo	R	Lo	I 2	*Ursus* spp.	7.2	6.9	9.7			
A4289	2	Holo	Un	Lo	I 1	*Ursus* spp.	8.0	4.1	7.4			
A5029	5	L Pleis	L	Up	P 4	*Ursus* spp.	11.1	10.6	4.5			
A5030	5	L Pleis	R	Up	M	*Ursus* spp.						
A5031	5	L Pleis	L	Up	C	*Ursus* spp.		25.3	12.2			
A5234	5	L Pleis	Un	Up	M	*Ursus* spp.			9.6			
A5235	5	L Pleis	Un	Un	C	*Ursus* spp.						
A5406	5	L Pleis	Un	Un	I	*Ursus* spp.	5.1	6.9	7.0			
A541	3	L Pleis	Un	Un	I	*Ursus* spp.	6.6	3.7	4.7			
A5628	5	L Pleis	Un	Un	Ch	*Ursus* spp.						
A5666	5	L Pleis	R	Lo	M 1	*Ursus* spp.	10.1	17.1	6.5			
A5666	5	L Pleis	R	Lo	M 2	*Ursus* spp.	14.5		5.2			
A5682	5	L Pleis	Un	Un	M	*Ursus* spp.			9.6			

Table 14 Taxonomic data of Ursus spp. from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A5684	5	L Pleis	Un	Lo	M	*Ursus* spp.			7.8			
A5686	5	L Pleis	R	Up	I 3	*Ursus* spp.	14.0	9.1				
A5707	5	L Pleis	L	Up	P 4	*Ursus* spp.	9.1	3.1	6.6			
A5983	5	L Pleis	R	Up	M 1	*Ursus* spp.	12.1	13.8	6.5			
A5993	5	L Pleis	L	Up	M 1	*Ursus* spp.	11.5	14.3	2.9			
A5993	5	L Pleis	L	Up	M 2	*Ursus* spp.						
A6208	5	L Pleis	Un	Lo	M	*Ursus* spp.	14.7		7.5			
A632	3	L Pleis	Un	Un	I	*Ursus* spp.	4.9	6.7	5.4			
A6380	5	L Pleis	L	Up	P 4	*Ursus* spp.	8.5		6.4			
A6380	5	L Pleis	L	Up	M 1	*Ursus* spp.	11.1	14.6	7.2			
A6385	5	L Pleis	Un	Un	C	*Ursus* spp.						
A6492	5	L Pleis	Un	Un	M	*Ursus* spp.			7.1			
A6850	5	L Pleis	Un	Lo	M	*Ursus* spp.	9.4					
A6851	5	L Pleis	L	Up	M 2	*Ursus* spp.						
A6936	5	L Pleis	L	Lo	M 3	*Ursus* spp.	7.9					
A6937	5	L Pleis	L	Lo	P 4	*Ursus* spp.	6.2	8.5	3.2			
A6937	5	L Pleis	L	Lo	M 1	*Ursus* spp.	11.6	13.9	2.6			
A7155	5	L Pleis	Un	Lo	M	*Ursus* spp.	10.3		6.4			
A7156	5	L Pleis	Un	Un	P 4	*Ursus* spp.						

Table 15 Taxonomic data of Actonyx collaris from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A6751	5	L Pleis	R	Lo	P 4	*Actonyx collaris*	2.9	5.7	9.3			
A6751	5	L Pleis	R	Lo	M 1	*Actonyx collaris*	6.8	15.3				
A6751	5	L Pleis	R	Lo	M 2	*Actonyx collaris*	4.9	4.9				

Table 16 Taxonomic data of Carnivora 1 from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A6094	5	L Pleis	Un	Lo	M	Carnivora 1	5.5	14.7	22.5			

Table 17 Taxonomic data of Carnivora 2 from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A3346	5	L Pleis	Un	Un	C	Carnivora 2						

Table 18 Taxonomic data of Elephas sp. from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1491	3	L Pleis	Un	Un	Dp	*Elephas* sp.	4.4					
A3155	5	L Pleis	Un	Un	T	*Elephas* sp.						
A3156	5	L Pleis	Un	Un	T	*Elephas* sp.						
A3157	5	L Pleis	Un	Un	T	*Elephas* sp.			10.1			
A3158	5	L Pleis	Un	Un	T	*Elephas* sp.			10.3			
A5943	5	L Pleis	Un	Un	T	*Elephas* sp.			11.9			

Table 19 Taxonomic data of Rhinocerotidae from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1896	4	L Pleis	Un	Un	Ch	Rhinocerotidae						
A2234	4	L Pleis	L	Up	P	Rhinocerotidae	10.3	13.7				
A505	3	L Pleis	Un	Up	P	Rhinocerotidae	8.8					
A731	3	L Pleis	Un	Lo	M	Rhinocerotidae	27.8	39.3				

Table 20 Taxonomic data of Perisodactyla from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A4987	5	L Pleis	Un	Lo	I	Perisodactyla	8.0	15.7				

Table 21 Taxonomic data of Sus scrofa from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A10	2	Holo	Un	Lo	I	*Sus scrofa*						
A116a	2	Holo	R	Up	M 2	*Sus scrofa*	8.8	12.2	12.7			
A116b	2	Holo	R	Up	M 3	*Sus scrofa*	9.5	13.0				
A1329	3	L Pleis	Un	Un	C	*Sus scrofa*						
A1330	3	L Pleis	Un	Un	C	*Sus scrofa*						
A136	2	Holo	Un	Un	M	*Sus scrofa*	11.5	15.5	13.7			
A1469	3	L Pleis	Un	Lo	M 3	*Sus scrofa*	17.1	40.8				
A1544	3	L Pleis	Un	Un	C	*Sus scrofa*			3.8			
A1603	4	L Pleis	Un	Lo	M	*Sus scrofa*						
A1650	4	L Pleis	Un	Un	C	*Sus scrofa*						
A1651	4	L Pleis	Un	Un	C	*Sus scrofa*						
A1739	4	L Pleis	Un	Un	M	*Sus scrofa*	14.9	23.9	12.3			
A1803	4	L Pleis	Un	Un	C	*Sus scrofa*	5.0	5.2				
A1848	4	L Pleis	Un	Un	M	*Sus scrofa*						
A2005	4	L Pleis	Un	Lo	M 3	*Sus scrofa*	17.2	33.0				
A2223	4	L Pleis	Un	Un	C	*Sus scrofa*						
A2235	4	L Pleis	R	Up	P	*Sus scrofa*	13.8	12.3				
A2236	4	L Pleis	Un	Un	M	*Sus scrofa*	15.5	25.4				
A2237	4	L Pleis	Un	Lo	M	*Sus scrofa*	11.5					
A2394	4	L Pleis	Un	Un	M	*Sus scrofa*	14.5		0.7		9.8	
A2403	4	L Pleis	Un	Un	C	*Sus scrofa*						9.5
A2423	4	L Pleis	Un	Un	M	*Sus scrofa*						
A2464	4	L Pleis	Un	Un	M	*Sus scrofa*	17.8					
A2486	4	L Pleis	Un	Lo	M	*Sus scrofa*	13.9		6.0			
A257	3	L Pleis	R	Up	P 3	*Sus scrofa*	10.6	15.9				
A2787	4	L Pleis	Un	Un	M	*Sus scrofa*						

Table 21 Taxonomic data of Sus scrofa from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A2788	4	L Pleis	Un	Un	M	*Sus scrofa*	12.3	18.1				
A2789	4	L Pleis	L	Lo	Dp 4	*Sus scrofa*	7.7		15.6			
A2789	4	L Pleis	L	Lo	M 1	*Sus scrofa*	12.3	16.7	19.9			
A2790	4	L Pleis	R	Lo	M 2	*Sus scrofa*	12.2	17.6				
A2790	4	L Pleis	R	Lo	M 2	*Sus scrofa*	9.2	16.0				
A2791	4	L Pleis	Un	Up	M	*Sus scrofa*	13.0	24.0				
A2792	4	L Pleis	Un	Up	M	*Sus scrofa*	24.5	15.6	6.1			
A2996	4	L Pleis	Un	Un	I	*Sus scrofa*	9.2	6.1				
A3029	4	L Pleis	L	Lo	P 3	*Sus scrofa*	8.3	14.4				
A3029	4	L Pleis	L	Lo	P 3	*Sus scrofa*	8.3	14.4				
A3052	4	L Pleis	Un	Un	C	*Sus scrofa*			11.7			
A3104	4	L Pleis	Un	Lo	M 3	*Sus scrofa*	17.5	45.5				
A3113	4	L Pleis	Un	Un	C	*Sus scrofa*			4.2			
A3114	4	L Pleis	Un	Un	C	*Sus scrofa*						
A3115	4	L Pleis	R	Up	M 3	*Sus scrofa*	17.4	44.1				
A3133	5	L Pleis	Un	Un	M	*Sus scrofa*						
A3159	5	L Pleis	R	Up	M	*Sus scrofa*	21.7	21.1				
A3213	5	L Pleis	R	Lo	M 3	*Sus scrofa*	18.9	45.1	4.9			
A3214	5	L Pleis	L	Lo	M 3	*Sus scrofa*	18.5	46.4				
A3215	5	L Pleis	Un	Un	M	*Sus scrofa*		14.9	6.2			
A3216	5	L Pleis	Un	Un	M	*Sus scrofa*	15.0	25.9	3.9			
A3218	5	L Pleis	R	Lo	P	*Sus scrofa*	10.2					
A3223	5	L Pleis	L	Lo	M 3	*Sus scrofa*	19.1	41.4				
A3224	5	L Pleis	Un	Un	M 3	*Sus scrofa*						
A3225	5	L Pleis	Un	Un	M	*Sus scrofa*			8.9			
A3226	5	L Pleis	Un	Un	M	*Sus scrofa*						
A3233	5	L Pleis	Un	Lo	P	*Sus scrofa*	5.5		11.2			
A3442	5	L Pleis	Un	Un	M	*Sus scrofa*	15.2					
A3454	5	L Pleis	Un	Un	M	*Sus scrofa*			16.0			
A3455	5	L Pleis	Un	Un	M	*Sus scrofa*	16.3					
A3965	5	L Pleis	Un	Un	M	*Sus scrofa*		14.0				
A4113	5	L Pleis	Un	Lo	I	*Sus scrofa*	7.4	7.6	15.5			
A4114	5	L Pleis	Un	Lo	I	*Sus scrofa*			5.7			

Table 21 Taxonomic data of Sus scrofa from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A4175	5	L Pleis	L	Lo	Dp 4	*Sus scrofa*	6.8	20.6				
A4211	5	L Pleis	L	Lo	M 3	*Sus scrofa*	20.2	49.0				
A4278	2	Holo	Un	Up	M	*Sus scrofa*	20.1	22.6	9.4			
A4375	3	L Pleis	Un	Un	M	*Sus scrofa*	11.6	14.8				
A4537	5	L Pleis	Un	Un	M 3	*Sus scrofa*	18.3					
A4538	5	L Pleis	Un	Un	M 3	*Sus scrofa*	20.2		15.0			
A4539	5	L Pleis	Un	Lo	M	*Sus scrofa*	14.2	23.3				
A4541	5	L Pleis	Un	Un	C	*Sus scrofa*			5.2			
A4542	5	L Pleis	Un	Un	Ch	*Sus scrofa*			6.1			
A4674	5	L Pleis	Un	Un	C	*Sus scrofa*			14.5			
A4725	5	L Pleis	Un	Un	C	*Sus scrofa*			7.6		86.0	
A4730	5	L Pleis	Un	Lo	P	*Sus scrofa*	8.0	12.9				
A4780	5	L Pleis	Un	Un	M	*Sus scrofa*	15.5	21.3				
A5026	5	L Pleis	L	Lo	M 3	*Sus scrofa*	16.6	25.0				
A5027	5	L Pleis	Un	Un	M	*Sus scrofa*	19.6		9.2			
A5149	5	L Pleis	Un	Un	Ch	*Sus scrofa*						
A5150	5	L Pleis	Un	Un	M 3	*Sus scrofa*	13.9					
A5218	5	L Pleis	Un	Un	M	*Sus scrofa*						
A5219	5	L Pleis	Un	Un	M	*Sus scrofa*						
A5220	5	L Pleis	Un	Un	M	*Sus scrofa*	13.9		21.2			
A5221	5	L Pleis	Un	Un	M	*Sus scrofa*			27.3			
A5222	5	L Pleis	Un	Un	M	*Sus scrofa*						
A5224	5	L Pleis	Un	Un	P	*Sus scrofa*						
A5226	5	L Pleis	R	Lo	I 1	*Sus scrofa*	9.4	4.7				
A5226	5	L Pleis	R	Lo	I 2	*Sus scrofa*	7.9					
A5227	5	L Pleis	R	Un	I	*Sus scrofa*	9.7	6.9	13.8			
A5228	5	L Pleis	Un	Un	P 4	*Sus scrofa*	10.9		13.3			
A5229	5	L Pleis	Un	Un	M	*Sus scrofa*	16.7					
A5230	5	L Pleis	Un	Un	M	*Sus scrofa*			6.4			
A5231	5	L Pleis	R	Lo	M 1	*Sus scrofa*	9.7					
A5231	5	L Pleis	R	Lo	M 2	*Sus scrofa*	13.0	16.1				
A5232	5	L Pleis	R	Up	I 3	*Sus scrofa*	4.0	7.1				
A5242	5	L Pleis	Un	Un	M	*Sus scrofa*	18.0					

Table 21 Taxonomic data of Sus scrofa from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A5299	5	L Pleis	Un	Un	M	*Sus scrofa*						
A5355	5	L Pleis	Un	Un	M	*Sus scrofa*	14.5					
A5379	5	L Pleis	Un	Un	M	*Sus scrofa*						
A5381	5	L Pleis	Un	Un	M 2	*Sus scrofa*	17.1	20.6	2.9			
A5408	5	L Pleis	Un	Un	I	*Sus scrofa*			4.6			15.8
A5410	5	L Pleis	Un	Un	M	*Sus scrofa*	15.1					
A5412	5	L Pleis	Un	Un	M 2	*Sus scrofa*	14.3					
A5585	5	L Pleis	Un	Un	I	*Sus scrofa*			15.1			
A5585	5	L Pleis	Un	Un	I	*Sus scrofa*			15.1			
A5667	5	L Pleis	Un	Up	M	*Sus scrofa*	20.2	14.9				
A5667	5	L Pleis	Un	Up	M	*Sus scrofa*			17.4			
A5668	5	L Pleis	Un	Un	M 3	*Sus scrofa*	17.5					
A5670	5	L Pleis	Un	Un	M	*Sus scrofa*	17.7	21.9				
A5671	5	L Pleis	Un	Un	M	*Sus scrofa*	13.2	16.8				
A5673	5	L Pleis	Un	Un	M	*Sus scrofa*	13.8	23.5				
A5674	5	L Pleis	R	Up	I	*Sus scrofa*	7.2	13.0	16.1			
A5675	5	L Pleis	Un	Un	M	*Sus scrofa*	19.1					
A5677	5	L Pleis	Un	Un	M	*Sus scrofa*	17.9					
A5679	5	L Pleis	Un	Un	M	*Sus scrofa*	16.3		8.3			
A5683	5	L Pleis	Un	Un	M	*Sus scrofa*	14.4		6.1			
A5687	5	L Pleis	L	Lo	M 3	*Sus scrofa*	20.3	46.2				
A5688	5	L Pleis	Un	Lo	M 3	*Sus scrofa*	15.6					
A5689	5	L Pleis	Un	Un	P	*Sus scrofa*	8.5					
A5690	5	L Pleis	L	Lo	M 2	*Sus scrofa*	12.7	18.1				
A5691	5	L Pleis	Un	Lo	M	*Sus scrofa*	17.4					
A5694	5	L Pleis	R	Lo	Dp 3	*Sus scrofa*	4.9	10.2				
A5694	5	L Pleis	R	Lo	Dp 4	*Sus scrofa*	7.4				48.4	
A5695	5	L Pleis	R	Lo	Dp 4	*Sus scrofa*	9.1	22.0				
A5696	5	L Pleis	Un	Lo	P 2	*Sus scrofa*	3.3	9.8				
A5696	5	L Pleis	Un	Lo	P 3	*Sus scrofa*	6.0	10.8				
A5699	5	L Pleis	L	Lo	Dp 4	*Sus scrofa*	1.0	19.4	3.2			
A5701	5	L Pleis	Un	Un	M	*Sus scrofa*	15.1	23.7	9.0			
A5704	5	L Pleis	Un	Un	M	*Sus scrofa*	16.0	23.8				

Table 21 Taxonomic data of Sus scrofa from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A5706	5	L Pleis	Un	Lo	P 2	*Sus scrofa*	4.6	11.9				
A5709	5	L Pleis	Un	Lo	P 3	*Sus scrofa*		9.2	23.0			
A5710	5	L Pleis	Un	Lo	P 4	*Sus scrofa*	10.5		3.0			
A5711	5	L Pleis	Un	Un	M	*Sus scrofa*						
A5713	5	L Pleis	Un	Un	P	*Sus scrofa*	4.2	10.0				
A5908	5	L Pleis	Un	Un	M	*Sus scrofa*			15.0			
A5984	5	L Pleis	Un	Un	M	*Sus scrofa*	16.0	24.2				
A5985	5	L Pleis	Un	Un	M	*Sus scrofa*	15.9	23.4				
A5987	5	L Pleis	Un	Un	M	*Sus scrofa*	16.1					
A5990	5	L Pleis	R	Lo	P	*Sus scrofa*	10.7	13.5				
A5990	5	L Pleis	R	Lo	M	*Sus scrofa*	12.9	16.9				
A5992	5	L Pleis	R	Lo	I 3	*Sus scrofa*	2.6	6.4	26.6			
A5992	5	L Pleis	L	Lo	I 3	*Sus scrofa*	1.9	6.7				
A6142	5	L Pleis	L	Lo	M 2	*Sus scrofa*	11.6	17.7				
A6190	5	L Pleis	Un	Un	M	*Sus scrofa*	15.6					
A6191	5	L Pleis	Un	Un	M	*Sus scrofa*						
A6193	5	L Pleis	Un	Un	M	*Sus scrofa*			2.0			
A6198	5	L Pleis	L	Lo	M 1	*Sus scrofa*	12.2	16.1				
A6198	5	L Pleis	L	Lo	M 2	*Sus scrofa*	15.5	21.6	10.5			
A6198	5	L Pleis	L	Lo	M 3	*Sus scrofa*	16.4	43.8				
A6205	5	L Pleis	Un	Up	P 3	*Sus scrofa*	11.2	15.8				
A6207	5	L Pleis	Un	Un	M	*Sus scrofa*						
A6255	5	L Pleis	Un	Un	M 1	*Sus scrofa*	10.9	17.1	18.9			
A6255	5	L Pleis	Un	Un	M 2	*Sus scrofa*	14.8	21.7	14.4			
A6480	5	L Pleis	Un	Un	I 3	*Sus scrofa*	6.6	9.8				
A6481	5	L Pleis	Un	Un	I 3	*Sus scrofa*	7.3	8.0				
A6483	5	L Pleis	Un	Un	M	*Sus scrofa*						
A6484	5	L Pleis	Un	Un	M 3	*Sus scrofa*	16.6	41.2				
A6490	5	L Pleis	Un	Un	M	*Sus scrofa*						
A6643	5	L Pleis	Un	Un	M	*Sus scrofa*	13.7	18.8				
A6714	5	L Pleis	L	Lo	P 4	*Sus scrofa*	9.6	15.1	14.6			
A6726	5	L Pleis	Un	Un	M	*Sus scrofa*	12.5	19.9				
A6747	5	L Pleis	Un	Un	M	*Sus scrofa*	16.3	24.1				

Table 21 Taxonomic data of Sus scrofa from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A6896	5	L Pleis	Un	Un	M	*Sus scrofa*						
A6897	5	L Pleis	Un	Up	P	*Sus scrofa*						14.4
A6981	5	L Pleis	Un	Un	M 3	*Sus scrofa*	18.9		8.9			
A7087	5	L Pleis	Un	Un	P	*Sus scrofa*	8.7	17.0				
A7157	5	L Pleis	L	Lo	M 3	*Sus scrofa*			11.2			
A7158	5	L Pleis	Un	Un	M	*Sus scrofa*	17.2		19.9			
A7159	5	L Pleis	Un	Un	Ch	*Sus scrofa*						
A730	3	L Pleis	Un	Un	M	*Sus scrofa*	13.7	16.9				
A7447	5	L Pleis	Un	Un	Ch	*Sus scrofa*						
A7454	5	L Pleis	Un	Un	M	*Sus scrofa*		14.9	4.5			
A7466	5	L Pleis	Un	Un	M 3	*Sus scrofa*						
A7467	5	L Pleis	R	Lo	M 3	*Sus scrofa*						
A7468	5	L Pleis	Un	Un	M 2	*Sus scrofa*	12.8					
A7571	5	L Pleis	Un	Un	M 1	*Sus scrofa*	14.4					
A7572	5	L Pleis	Un	Un	M	*Sus scrofa*			3.4			
A7699	5	L Pleis	L	Lo	M 1	*Sus scrofa*	9.3					
A7699	5	L Pleis	L	Lo	M 2	*Sus scrofa*	11.5	17.4				5.9
A7783	5	L Pleis	Un	Un	M	*Sus scrofa*	18.2					
A7839	6	L Pleis	L	Lo	P 3	*Sus scrofa*	7.8				8.9	
A7840	6	L Pleis	Un	Un	M	*Sus scrofa*					8.9	
A7845	6	L Pleis	Un	Un	M 3	*Sus scrofa*		17.1	15.2			
A7903	7	L Pleis	Un	Un	M	*Sus scrofa*			14.7			
A989	3	L Pleis	Un	Un	C	*Sus scrofa*						
A990	3	L Pleis	Un	Lo	C	*Sus scrofa*						

Table 22 Taxonomic data of Pecora from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1023	3	L Pleis	Un	Un	Ch	Pecora						
A1025	3	L Pleis	R	Un	P	Pecora	11.1	16.0				
A1041	3	L Pleis	R	Lo	M 3	Pecora	6.8	16.6				
A107	2	Holo	Un	Un	M	Pecora			16.3			
A1095	3	L Pleis	L	Up	M	Pecora		19.6				
A110	2	Holo	Un	Un	M	Pecora	8.4					
A1124	3	L Pleis	Un	Un	Ch	Pecora						
A113	2	Holo	Un	Lo	P	Pecora	6.7	13.9				
A1138	3	L Pleis	Un	Un	M	Pecora						
A1141	3	L Pleis	Un	Un	Ch	Pecora				49.6		
A115	2	Holo	Un	Un	P	Pecora	7.0	11.5				
A1179	3	L Pleis	R	Lo	I 1	Pecora	8.3	13.2	13.1			
A1180	3	L Pleis	L	Up	M	Pecora	11.9					
A119	2	Holo	Un	Un	M	Pecora			11.6			
A1225	3	L Pleis	L	Lo	I 1	Pecora	10.2	16.1	7.9			
A123	2	Holo	Un	Un	M	Pecora	8.1					
A1257	3	L Pleis	Un	Un	M	Pecora						
A1258	3	L Pleis	L	Lo	Dp 2	Pecora	4.4	10.6				
A1258	3	L Pleis	L	Lo	Dp 3	Pecora	5.6	14.9				
A1258	3	L Pleis	L	Lo	Dp 4	Pecora	7.8	24.0				
A1269	3	L Pleis	R	Up	P 2	Pecora	6.2	9.2	15.6			
A130	2	Holo	Un	Un	Ch	Pecora	9.9		12.6			
A133	2	Holo	L	Lo	M 2	Pecora	7.3	72.6				
A1332	3	L Pleis	Un	Un	M	Pecora	6.6					
A1362	3	L Pleis	Un	Un	M	Pecora	7.3		11.6			
A1365	3	L Pleis	R	Up	M	Pecora	9.3	16.1	12.2			
A1419	3	L Pleis	R	Lo	Dp 3	Pecora	8.4	17.3				
A1433	3	L Pleis	Un	Un	M	Pecora						
A1527	3	L Pleis	Un	Un	P	Pecora						8.8
A1559	3	L Pleis	Un	Up	M	Pecora	15.3					
A1598	4	L Pleis	Un	Un	Ch	Pecora						
A1725	4	L Pleis	Un	Un	Ch	Pecora						
A1745	4	L Pleis	R	Lo	Dp 4	Pecora	11.0	22.5				

Table 22 Taxonomic data of Pecora from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1747	4	L Pleis	Un	Un	Ch	Pecora						
A1751	4	L Pleis	Un	Un	Dp	Pecora	7.5	13.4				
A1850	4	L Pleis	Un	Un	M	Pecora						
A1852	4	L Pleis	Un	Un	Ch	Pecora						
A1854	4	L Pleis	Un	Un	Ch	Pecora	8.1					
A19	2	Holo	R	Un	M	Pecora	11.5	24.0	6.8			
A1911	4	L Pleis	Un	Un	M	Pecora			3.5			
A1917	4	L Pleis	R	Lo	M	Pecora	8.8					
A1918	4	L Pleis	L	Lo	Dp 2	Pecora						
A1918	4	L Pleis	L	Lo	Dp 3	Pecora	6.1	11.1				
A1918	4	L Pleis	L	Lo	Dp 4	Pecora	9.1	17.3				
A1930	4	L Pleis	Un	Up	Dp	Pecora	11.4					
A1932	4	L Pleis	L	Lo	M 3	Pecora						
A1936	4	L Pleis	Un	Un	C	Pecora	9.2	5.7				
A1981	4	L Pleis	Un	Un	Ch	Pecora						
A1983	4	L Pleis	R	Lo	M 3	Pecora			10.4			
A1985	4	L Pleis	R	Lo	Dp 4	Pecora	6.1	15.3				
A1985	4	L Pleis	R	Lo	M 1	Pecora	7.0					
A20	2	Holo	Un	Lo	M	Pecora	12.1	13.9				
A21	2	Holo	R	Lo	I 1	Pecora	11.8	12.7				
A2205	4	L Pleis	L	Lo	Dp 4	Pecora	10.6	26.1				
A2206	4	L Pleis	Un	Un	I	Pecora	10.3	14.3				
A2215	4	L Pleis	Un	Un	M	Pecora						
A2216	4	L Pleis	Un	Un	M	Pecora			9.3			
A2224	4	L Pleis	Un	Un	M	Pecora			21.5			
A2227	4	L Pleis	Un	Un	M	Pecora						
A2233	4	L Pleis	Un	Un	Ch	Pecora			19.9			
A2241	4	L Pleis	Un	Un	Ch	Pecora						
A2284	4	L Pleis	R	Lo	I	Pecora	3.0	4.2				
A2286	4	L Pleis	R	Lo	I	Pecora	4.3	6.5				
A23	2	Holo	Un	Up	M	Pecora	19.0	23.5				
A2334	4	L Pleis	Un	Up	Ch	Pecora						
A2373	4	L Pleis	R	Lo	P 2	Pecora	6.1	9.3				

Table 22 Taxonomic data of Pecora from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A2387	4	L Pleis	Un	Un	P	Pecora		17.5				
A2399	4	L Pleis	R	Lo	M 3	Pecora	12.7					
A24	2	Holo	Un	Up	P	Pecora	11.8	13.9				
A2411	4	L Pleis	Un	Un	Dp	Pecora	10.3					
A2469	4	L Pleis	Un	Un	M	Pecora						
A2470	4	L Pleis	Un	Un	Ch	Pecora						
A2474	4	L Pleis	Un	Un	M	Pecora						
A2479	4	L Pleis	R	Lo	M 3	Pecora						
A2584	4	L Pleis	Un	Un	M	Pecora						
A2714	4	L Pleis	L	Lo	P 2	Pecora	3.9	6.6				
A2733	4	L Pleis	Un	Un	M	Pecora						
A2772	4	L Pleis	Un	Un	Ch	Pecora						
A2773	4	L Pleis	Un	Un	Ch	Pecora			17.7			
A2775	4	L Pleis	Un	Lo	M 3	Pecora			9.1			
A2777	4	L Pleis	L	Lo	P	Pecora	6.5	10.5				
A278	3	L Pleis	Un	Up	M	Pecora	8.8	26.0				
A2793	4	L Pleis	Un	Un	Ch	Pecora						
A2886	4	L Pleis	Un	Un	Dp	Pecora	8.4					
A2945	4	L Pleis	L	Lo	M 3	Pecora						
A2948	4	L Pleis	L	Lo	M 3	Pecora	10.2					
A2992	4	L Pleis	Un	Un	M	Pecora						
A2995	4	L Pleis	Un	Un	Ch	Pecora						
A3093	4	L Pleis	Un	Un	M	Pecora						
A3094	4	L Pleis	R	Lo	M 3	Pecora						
A3108	4	L Pleis	R	Lo	P 2	Pecora	5.2	10.3				
A3125	5	L Pleis	Un	Un	Ch	Pecora						
A3150	5	L Pleis	Un	Un	Ch	Pecora						
A3234	5	L Pleis	Un	Lo	P	Pecora	7.9		16.6			
A3235	5	L Pleis	R	Lo	P 2	Pecora		8.8				
A3235	5	L Pleis	R	Lo	P 3	Pecora	7.8	11.2				
A3235	5	L Pleis	R	Lo	P 3	Pecora	8.9					
A3237	5	L Pleis	Un	Lo	Dp 4	Pecora	8.9	21.1				
A3238	5	L Pleis	Un	Un	M	Pecora						

Table 22 Taxonomic data of Pecora from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A3239	5	L Pleis	Un	Lo	M 3	Pecora						
A3247	5	L Pleis	R	Lo	Dp 4	Pecora	8.8	20.1	16.9			
A3331	5	L Pleis	Un	Un	Ch	Pecora					60.2	
A3333	5	L Pleis	R	Lo	C	Pecora	6.2	7.7				
A3417	5	L Pleis	Un	Un	P	Pecora						
A3636	5	L Pleis	L	Lo	M 3	Pecora	11.1		10.8			
A3656	5	L Pleis	Un	Un	Dp	Pecora		11.7	11.6			
A3659	5	L Pleis	L	Lo	Dp 4	Pecora	8.1	20.7				
A3669	5	L Pleis	Un	Up	P	Pecora	13.1	16.3				
A3811	5	L Pleis	R	Lo	Dp 4	Pecora	9.4					
A3821	5	L Pleis	Un	Up	P	Pecora	10.9	20.5				
A3826	5	L Pleis	R	Up	Dp	Pecora	9.7	12.6				
A40	2	Holo	Un	Un	P	Pecora			4.4			
A4002	5	L Pleis	Un	Un	P	Pecora	9.8	10.7	13.7			
A4269	2	Holo	R	Lo	I	Pecora	4.1	5.9				
A4346	3	L Pleis	L	Lo	I	Pecora	10.2	10.7				
A4347	3	L Pleis	R	Lo	I 2	Pecora		11.3				
A4349	3	L Pleis	R	Lo	C	Pecora	8.4	11.8				
A4350	3	L Pleis	L	Lo	I 2	Pecora		12.4				
A4351	3	L Pleis	L	Lo	I	Pecora	9.1	31.7				
A4352	3	L Pleis	L	Lo	C	Pecora	8.4	11.9	12.3			
A4432	5	L Pleis	L	Up	Dp 4	Pecora		15.5	6.7			
A469	3	Holo	Un	Un	Ch	Pecora						
A4990	5	L Pleis	Un	Un	P	Pecora		15.4	17.1			
A4990	5	L Pleis	Un	Un	M 3	Pecora	7.9	17.1	4.5			
A5	1	Rec	Un	Up	M	Pecora		22.2	10.1			
A5010	3	L Pleis	L	Lo	P 2	Pecora	5.1	7.7	22.3			
A5093	5	L Pleis	Un	Un	Ch	Pecora			12.1			
A5099	5	L Pleis	Un	Un	M	Pecora	3.4	4.3			15.2	
A51	2	Holo	Un	Un	dp	Pecora					15.2	
A5175	5	L Pleis	Un	Un	Ch	Pecora						
A5216	5	L Pleis	Un	Un	M	Pecora	9.9					
A5514	5	L Pleis	Un	Un	Ch	Pecora						

Table 22 Taxonomic data of Pecora from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A5584	5	L Pleis	Un	Un	P	Pecora	6.9					
A5669	5	L Pleis	R	Lo	Dp 4	Pecora	9.7	19.4				
A5692	5	L Pleis	Un	Lo	P	Pecora	7.2	12.2				
A5702	5	L Pleis	Un	Un	P	Pecora						
A5714	5	L Pleis	Un	Un	M	Pecora						
A61	2	Holo	Un	Un	I	Pecora						
A6147	5	L Pleis	R	Up	Dp	Pecora	6.5	12.6				
A6197	5	L Pleis	L	Lo	M 3	Pecora	9.4		9.0			
A6250	5	L Pleis	R	Lo	P	Pecora	6.0	11.5				
A6378	5	L Pleis	Un	Un	Ch	Pecora						
A6379	5	L Pleis	Un	Un	Ch	Pecora						
A6387	5	L Pleis	Un	Un	M	Pecora						
A6388	5	L Pleis	Un	Un	M	Pecora						
A6485	5	L Pleis	Un	Lo	P 2	Pecora	7.5	13.9				
A6594	5	L Pleis	R	Lo	M 3	Pecora			9.0			
A6612	5	L Pleis	Un	Un	Ch	Pecora						
A6735	5	L Pleis	Un	Lo	M 3	Pecora						
A6749	5	L Pleis	Un	Un	Dp	Pecora						
A6784	5	L Pleis	R	Lo	Dp 4	Pecora	11.7					
A67a	2	Holo	R	Up	M 1	Pecora	21.9	23.5				
A67b	2	Holo	R	Up	M 2	Pecora	24.7	24.8	7.7	39.1		
A67c	2	Holo	R	Up	M 3	Pecora	24.4	24.5		41.9		
A6846	5	L Pleis	L	Lo	M 3	Pecora						
A6847	5	L Pleis	Un	Lo	P	Pecora	4.9					
A6898	5	L Pleis	Un	Lo	M 3	Pecora						13.4
A6911	5	L Pleis	Un	Un	Ch	Pecora	5.3					
A6997	5	L Pleis	L	Lo	Dp	Pecora	9.9	17.7				
A7132	5	L Pleis	R	Lo	M	Pecora	15.8			35.8		
A7137	5	L Pleis	L	Lo	M 1	Pecora						
A7150	5	L Pleis	R	Up	Ch	Pecora			12.0			
A7364	5	L Pleis	Un	Lo	M	Pecora	9.2					
A7368	5	L Pleis	R	Lo	M 3	Pecora	13.9		16.9			

Table 22 Taxonomic data of Pecora from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A7394	5	L Pleis	L	Lo	M 1	Pecora	4.1	5.9	10.5			
A7394	5	L Pleis	L	Lo	M 2	Pecora	3.9	4.1	10.1			
A7394	5	L Pleis	L	Lo	M 3	Pecora	4.4	4.6	16.3			
A7429	5	L Pleis	R	Lo	P 2	Pecora	7.9	11.3			27.1	48.3
A7435	5	L Pleis	L	Up	Dp	Pecora	7.2	14.2	11.6			
A7437	5	L Pleis	R	Lo	M 3	Pecora			12.2			
A7444	5	L Pleis	L	Lo	M 3	Pecora	11.2					
A7476	5	L Pleis	R	Lo	M 3	Pecora						
A7629	5	L Pleis	R	Lo	M 3	Pecora						
A7740	5	L Pleis	R	Lo	I 1	Pecora	7.6	10.5				
A7908	7	L Pleis	R	Lo	M 3	Pecora						
A860	3	L Pleis	Un	Un	M	Pecora					58.8	
A935	3	L Pleis	R	Lo	M 3	Pecora	5.5	28.7	12.1			
A999a	3	L Pleis	L	Lo	Dp 2	Pecora	5.9	11.4				
A999b	3	L Pleis	L	Lo	Dp 3	Pecora	6.3					

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1000	3	L Pleis	Un	Lo	M	Cervidae	10.4					
A1007	3	L Pleis	Un	Lo	M 2	Cervidae	10.2					
A1007	3	L Pleis	Un	Lo	M 3	Cervidae	10.4	21.4				
A1008	3	L Pleis	R	Lo	M	Cervidae	19.9	22.7	16.0			
A1009	3	L Pleis	R	Lo	M	Cervidae	13.6			25.4		
A1010	3	L Pleis	L	Lo	M	Cervidae	9.1	24.5				
A1011	3	L Pleis	L	Up	M	Cervidae	14.1	22.0				
A1012	3	L Pleis	R	Up	Dp 4	Cervidae	9.1	25.2				
A1024	3	L Pleis	Un	Un	M	Cervidae						
A1026	3	L Pleis	R	Un	M	Cervidae	13.8	23.6	12.3			
A1027	3	L Pleis	Un	Un	M	Cervidae						
A1028	3	L Pleis	R	Lo	M	Cervidae	6.8	13.1	11.6	46.0		
A1029	3	L Pleis	L	Lo	M	Cervidae	8.0	21.5	15.7	46.0		
A1030	3	L Pleis	R	Lo	M	Cervidae	12.6					
A1030	3	L Pleis	R	Lo	M	Cervidae	13.1			49.6		
A1031	3	L Pleis	R	Lo	M 1	Cervidae	11.2	16.3				
A1031	3	L Pleis	R	Lo	M 2	Cervidae	11.4					
A1032	3	L Pleis	R	Lo	M 3	Cervidae	10.0	29.1	6.7			
A106	2	Holo	Un	Lo	M	Cervidae	14.9	22.2	12.7			
A1086	3	L Pleis	L	Lo	I 1	Cervidae	7.4	12.9				
A1094	3	L Pleis	R	Lo	M	Cervidae	21.7	22.5				
A1097	3	L Pleis	R	Un	M	Cervidae	9.1					
A1098	3	L Pleis	Un	Un	M	Cervidae	15.0					
A1099	3	L Pleis	L	Up	P	Cervidae	16.7	12.9				
A1101	3	L Pleis	L	Up	M	Cervidae	13.9	17.3				
A1111	3	L Pleis	L	Lo	P 4	Cervidae						
A1111	3	L Pleis	L	Lo	M 1	Cervidae	16.9	20.8				
A1111	3	L Pleis	L	Lo	M 2	Cervidae	17.1	29.3		49.6		
A1138	3	L Pleis	R	Up	M	Cervidae	21.3	19.5				
A1142	3	L Pleis	L	Lo	P 2	Cervidae	9.5	5.6				
A1143	3	L Pleis	R	Lo	P 4	Cervidae	9.1	14.3				
A1144	3	L Pleis	L	Lo	P 4	Cervidae	11.1	16.6				
A1145	3	L Pleis	L	Lo	P 3	Cervidae	8.9	15.0				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1146	3	L Pleis	L	Lo	P 2	Cervidae	4.9	11.3				
A1147	3	L Pleis	L	Lo	P 2	Cervidae	13.5	5.5				
A1164	3	L Pleis	L	Up	M	Cervidae	14.3					
A1165	3	L Pleis	Un	Lo	M	Cervidae	12.4		12.1			
A1169	3	L Pleis	L	Lo	M	Cervidae	9.9	20.7	16.2			
A1170	3	L Pleis	R	Up	Dp 2	Cervidae	5.7	8.6	10.6			
A1170	3	L Pleis	R	Up	Dp 3	Cervidae	4.5	9.7				
A1170	3	L Pleis	R	Up	Dp 4	Cervidae	8.6	11.6	16.6			
A1170	3	L Pleis	R	Up	M 1	Cervidae	8.5	12.5	15.4			
A1170	3	L Pleis	R	Up	M 2	Cervidae	8.2	14.6	15.7			
A1173	3	L Pleis	L	Lo	P 3	Cervidae	6.4	15.9				
A1173	3	L Pleis	L	Lo	P 4	Cervidae	8.2	12.7				
A1173	3	L Pleis	L	Lo	M 1	Cervidae	9.2	11.7				
A118	2	Holo	L	Up	P 4	Cervidae	13.8					
A1183	3	L Pleis	R	Lo	P 2	Cervidae	5.1	11.1	12.8			
A1183	3	L Pleis	R	Lo	P 3	Cervidae	7.2	14.9				
A1183	3	L Pleis	R	Lo	P 4	Cervidae	10.7	11.8	6.6			
A1183	3	L Pleis	R	Lo	M 1	Cervidae	12.9	17.1	12.3			
A1197	3	L Pleis	R	Up	M	Cervidae	23.7	23.0	12.3			
A1198	3	L Pleis	R	Up	M	Cervidae	21.2	23.2				
A120	2	Holo	R	Lo	M 3	Cervidae	7.6	20.6				
A1200	3	L Pleis	Un	Un	Ch	Cervidae						
A1202	3	L Pleis	Un	Up	M	Cervidae			13.2			
A121	2	Holo	Un	Un	M	Cervidae	14.1	17.2				
A1213	3	L Pleis	L	Lo	M	Cervidae	7.8	14.6	6.0			
A1214	3	L Pleis	Un	Up	Dp 3	Cervidae						
A1223	3	L Pleis	L	Lo	M	Cervidae	8.8	17.8	7.5			
A122a	2	Holo	L	Lo	M 2	Cervidae	9.9	17.8				
A122b	2	Holo	L	Lo	M 3	Cervidae	8.1	23.0				
A124	2	Holo	Un	Un	M	Cervidae	12.8		5.3			
A125	2	Holo	Un	Lo	M	Cervidae	12.7		14.9			
A126	2	Holo	Un	Un	P	Cervidae	15.2	14.5				
A1267	3	L Pleis	R	Up	P 2	Cervidae	10.6	11.2				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1268	3	L Pleis	R	Up	P 2	Cervidae	9.8	11.3				
A1270	3	L Pleis	L	Lo	P 2	Cervidae		8.9				
A128	2	Holo	Un	Lo	P 4	Cervidae	5.2	11.5				
A1281	3	L Pleis	R	Lo	M	Cervidae	7.8	14.9			14.7	
A1282	3	L Pleis	L	Up	M	Cervidae	17.6	22.3	12.1			
A1284	3	L Pleis	Un	Un	M	Cervidae					14.7	
A1289	3	L Pleis	L	Up	M	Cervidae	12.6	13.8	15.1			
A1293	3	L Pleis	L	Up	P	Cervidae	13.6	15.5				
A1303	3	L Pleis	Un	Un	M 3	Cervidae	8.7	22.3				
A1333	3	L Pleis	R	Lo	M	Cervidae	12.2	17.5	12.3			
A1346	3	L Pleis	Un	Un	M	Cervidae		7.9				
A1358	3	L Pleis	R	Up	M	Cervidae	20.7	23.2				
A1363	3	L Pleis	Un	Lo	M	Cervidae	6.5		10.8			
A1366	3	L Pleis	R	Lo	M	Cervidae	10.4	19.3	12.2			
A1368	3	L Pleis	Un	Lo	M	Cervidae	11.8	16.6				
A1369	3	L Pleis	Un	Up	M	Cervidae	12.9	17.7				
A137	2	Holo	L	Un	M	Cervidae	15.2	21.8	13.6			
A1411	3	L Pleis	Un	Un	M	Cervidae	7.8	12.4				
A1412	3	L Pleis	R	Lo	M 3	Cervidae	8.2	19.5	18.8			
A1414	3	L Pleis	Un	Lo	I	Cervidae	7.6	8.2	14.0			
A1415	3	L Pleis	Un	Lo	I	Cervidae	6.6	7.3				
A1416	3	L Pleis	Un	Lo	I	Cervidae	6.4	7.2				
A1422	3	L Pleis	L	Lo	M 3	Cervidae	12.8	28.6				
A1423	3	L Pleis	R	Up	M	Cervidae	22.9	18.9				
A1424	3	L Pleis	R	Up	M	Cervidae	16.1	23.0				
A1427	3	L Pleis	Un	Up	M	Cervidae	22.4	18.1				
A1427	3	L Pleis	Un	Up	M	Cervidae	23.0	16.1				
A1428	3	L Pleis	Un	Up	M	Cervidae						
A1430	3	L Pleis	Un	Lo	Dp 4	Cervidae	7.1	19.3				
A1430	3	L Pleis	Un	Lo	M 1	Cervidae	7.2	15.8	11.0			
A1435	3	L Pleis	R	Lo	P 3	Cervidae	5.8	12.0				
A1437	3	L Pleis	L	Lo	M	Cervidae	11.3	23.2				
A1447	3	L Pleis	R	Up	M	Cervidae		19.9				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1448	3	L Pleis	L	Lo	M	Cervidae	21.2	21.5				
A1453	3	L Pleis	Un	Up	M	Cervidae	14.5	16.9				
A1454	3	L Pleis	L	Lo	P 2	Cervidae	5.4	9.6				
A1468	3	L Pleis	R	Lo	I 1	Cervidae	6.4	12.1				
A1486	3	L Pleis	Un	Up	P	Cervidae	14.1	14.5	14.9			
A1488	3	L Pleis	L	Up	M	Cervidae	14.5	16.2				
A1489	3	L Pleis	L	Up	P 3	Cervidae	10.4	10.2				
A1489	3	L Pleis	L	Up	P 4	Cervidae	10.7	10.5				
A1499	3	L Pleis	Un	Lo	I	Cervidae	5.4	5.5				
A1502	3	L Pleis	Un	Up	M	Cervidae		9.9				
A1503	3	L Pleis	R	Up	P	Cervidae	16.1	14.8				
A1504	3	L Pleis	L	Lo	P 4	Cervidae	11.2	16.9				
A1505	3	L Pleis	R	Lo	M	Cervidae	10.8	20.5				
A1508	3	L Pleis	Un	Lo	P	Cervidae	5.1					8.8
A1511	3	L Pleis	L	Lo	P 4	Cervidae	11.9	18.1				
A1512	3	L Pleis	R	Up	M	Cervidae	8.5	16.9				
A1528	3	L Pleis	L	Up	P	Cervidae	14.3	17.4				
A1533	3	L Pleis	R	Lo	M	Cervidae	7.9	18.6				
A1535	3	L Pleis	Un	Lo	C	Cervidae	8.5	10.8				8.4
A1538	3	L Pleis	L	Up	P	Cervidae	15.7	18.6				8.4
A1541	3	L Pleis	Un	Un	M	Cervidae						8.4
A1543	3	L Pleis	R	Lo	Dp 2	Cervidae						
A1543	3	L Pleis	R	Lo	Dp 3	Cervidae		12.6				
A1543	3	L Pleis	R	Lo	Dp 4	Cervidae		12.2				
A1600	4	L Pleis	L	Lo	I	Cervidae	7.4	9.4				
A1601	4	L Pleis	R	Up	P	Cervidae	13.6	15.6				
A1609	4	L Pleis	L	Lo	P 4	Cervidae	12.1	19.2				
A1610	4	L Pleis	Un	Lo	M	Cervidae	10.7					
A1611	4	L Pleis	Un	Up	M	Cervidae	13.0					
A1616	4	L Pleis	R	Up	P	Cervidae	12.2	8.8				
A1617	4	L Pleis	R	Up	P	Cervidae	13.7	17.3				
A1618	4	L Pleis	L	Lo	M	Cervidae	14.1	23.2	22.5			
A1620	4	L Pleis	L	Lo	M 3	Cervidae	13.1	28.3				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1622	4	L Pleis	R	Lo	Dp 3	Cervidae	7.8	14.4	13.1			
A1622	4	L Pleis	R	Lo	Dp 4	Cervidae	10.5	22.2	14.1			
A1622	4	L Pleis	R	Lo	M 1	Cervidae	11.2	20.0	9.1			
A1634	4	L Pleis	Un	Lo	M	Cervidae						
A1654	4	L Pleis	L	Lo	M	Cervidae	6.7	15.4	21.1			
A1679	4	L Pleis	L	Lo	P	Cervidae	6.5					
A1680	4	L Pleis	L	Lo	P 2	Cervidae	8.0	13.3	12.9			
A1681	4	L Pleis	R	Lo	P 2	Cervidae	4.6	8.8	8.8			
A1681	4	L Pleis	R	Lo	P 3	Cervidae	7.3	11.3				
A1737	4	L Pleis	L	Lo	M	Cervidae		25.3				
A1738	4	L Pleis	L	Lo	P 2	Cervidae	7.9	14.7				
A1740	4	L Pleis	R	Up	M	Cervidae	14.7	25.1	15.6			
A1746	4	L Pleis	L	Lo	M 3	Cervidae	9.8	21.7	16.0			
A1752	4	L Pleis	Un	Lo	M	Cervidae	12.3					
A1791	4	L Pleis	R	Lo	M 3	Cervidae	14.3	4.6				
A1800	4	L Pleis	Un	Up	M	Cervidae	9.3		15.9			
A1802	4	L Pleis	L	Lo	I	Cervidae	5.4	5.1	14.3			
A1804	4	L Pleis	Un	Up	M	Cervidae						
A1806	4	L Pleis	R	Up	P	Cervidae	6.5	12.3				
A1847	4	L Pleis	Un	Un	M	Cervidae						
A1849	4	L Pleis	Un	Un	M	Cervidae			18.6			
A1856	4	L Pleis	L	Lo	M	Cervidae	8.3	17.5				
A1857	4	L Pleis	R	Lo	M 3	Cervidae	7.3					
A1858	4	L Pleis	R	Lo	M 3	Cervidae	8.0	17.0	22.3			
A1907	4	L Pleis	R	Lo	M	Cervidae		18.4				
A1908	4	L Pleis	R	Lo	M	Cervidae	11.2	21.1				
A1909	4	L Pleis	L	Lo	M	Cervidae		20.3				
A1910	4	L Pleis	R	Up	M	Cervidae	15.0	23.1				
A1910	4	L Pleis	R	Up	M	Cervidae	14.5	24.6				
A1913	4	L Pleis	Un	Up	M	Cervidae						
A1914	4	L Pleis	R	Up	M	Cervidae	17.1	22.3				
A1915	4	L Pleis	L	Up	M 1	Cervidae	9.8	10.0				
A1915	4	L Pleis	L	Up	M 2	Cervidae	9.3	11.3				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1915	4	L Pleis	L	Up	M 3	Cervidae	8.7	11.5	1.8			
A1916	4	L Pleis	L	Up	P 3	Cervidae	6.7	7.5				
A1916	4	L Pleis	L	Up	P 4	Cervidae	6.4	6.9				
A1919	4	L Pleis	L	Lo	P 4	Cervidae	6.9	14.3				
A1919	4	L Pleis	L	Lo	M 1	Cervidae	9.4					
A1934	4	L Pleis	R	Lo	P 2	Cervidae	5.3	10.7	20.2			
A1934	4	L Pleis	R	Lo	P 3	Cervidae	6.1	13.1				
A1934	4	L Pleis	R	Lo	P 4	Cervidae	6.6	14.5				
A1935	4	L Pleis	Un	Up	Dp 3	Cervidae			5.9			
A1938	4	L Pleis	L	Lo	M	Cervidae	11.7					
A1940	4	L Pleis	R	Lo	P 3	Cervidae	7.2	10.3				
A1941	4	L Pleis	R	Lo	P 3	Cervidae	7.5	16.9				
A1942	4	L Pleis	L	Lo	M 1	Cervidae	11.3	18.4				
A1942	4	L Pleis	L	Lo	M 2	Cervidae	11.2	20.7	9.7			
A1980	4	L Pleis	R	Up	M 1	Cervidae						
A1980	4	L Pleis	R	Up	M 2	Cervidae	15.0	16.1				
A1980	4	L Pleis	R	Up	M 3	Cervidae	15.8					
A1984	4	L Pleis	Un	Un	P	Cervidae	10.6	12.4				
A1986	4	L Pleis	R	Up	M	Cervidae	15.2	21.4				
A1987	4	L Pleis	R	Up	M	Cervidae	12.7	19.6				
A1988	4	L Pleis	L	Lo	M	Cervidae	12.7	24.8				
A1990	4	L Pleis	L	Lo	M	Cervidae	12.5		10.1			
A1991	4	L Pleis	L	Lo	P 2	Cervidae	5.5	9.5	8.5			
A1991	4	L Pleis	L	Lo	P 3	Cervidae	7.7	11.3	15.0			
A1991	4	L Pleis	L	Lo	P 4	Cervidae	9.3	13.4	15.0			
A1992	4	L Pleis	Un	Up	M	Cervidae						
A1993	4	L Pleis	L	Up	M	Cervidae	12.3	20.0				
A1997	4	L Pleis	R	Up	M	Cervidae	13.2	18.0				
A1998	4	L Pleis	R	Up	P 3	Cervidae	12.9	11.9				
A1998	4	L Pleis	R	Up	P 4	Cervidae	12.9	11.0				
A2000	4	L Pleis	Un	Un	Ch	Cervidae	9.7					
A2002	4	L Pleis	L	Lo	M	Cervidae	10.5	21.5				
A2003	4	L Pleis	R	Lo	M	Cervidae	9.5	17.5				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A2004	4	L Pleis	L	Lo	M 1	Cervidae	8.1	16.9				
A2004	4	L Pleis	L	Lo	M 2	Cervidae	8.0	15.4	15.7			
A2007	4	L Pleis	Un	Up	M	Cervidae	7.3					
A2088	4	L Pleis	R	Lo	P	Cervidae	7.7	13.9				
A2125	4	L Pleis	L	Up	P 3	Cervidae	14.5	11.6				
A2125	4	L Pleis	L	Up	P 4	Cervidae	14.1	13.6				
A2130	4	L Pleis	R	Lo	I 2	Cervidae	5.0	4.2				9.0
A2131	4	L Pleis	L	Lo	P 2	Cervidae	6.4	11.1	6.3			
A2199	4	L Pleis	L	Lo	P	Cervidae						
A2200	4	L Pleis	L	Lo	P	Cervidae	7.2	14.2				
A2202	4	L Pleis	L	Lo	M	Cervidae	12.3	21.5				
A2204	4	L Pleis	L	Lo	I 2	Cervidae	6.8	0.5				
A2211	4	L Pleis	Un	Un	Ch	Cervidae						
A2212	4	L Pleis	L	Lo	M 3	Cervidae	11.5	31.0	20.6			
A2225	4	L Pleis	Un	Un	M	Cervidae						
A2226	4	L Pleis	Un	Un	P	Cervidae						
A2229	4	L Pleis	Un	Un	Ch	Cervidae						
A2230	4	L Pleis	Un	Un	P	Cervidae						
A2232	4	L Pleis	R	Up	M	Cervidae	13.7		18.1			
A2238	4	L Pleis	Un	Up	M	Cervidae						
A2240	4	L Pleis	Un	Un	Ch	Cervidae			5.5			
A2242	4	L Pleis	Un	Un	P	Cervidae						
A2243	4	L Pleis	Un	Un	P	Cervidae						
A2244	4	L Pleis	Un	Lo	I	Cervidae			5.7			
A2245	4	L Pleis	Un	Un	M	Cervidae						
A2245	4	L Pleis	L	Lo	P 4	Cervidae	11.0	16.4				
A2246	4	L Pleis	L	Up	P	Cervidae		11.7	4.9			
A2248	4	L Pleis	L	Lo	M	Cervidae	12.4	20.2				
A2249	4	L Pleis	R	Lo	M	Cervidae	10.4	22.3				
A2250	4	L Pleis	R	Lo	M 3	Cervidae	8.3	20.0	15.2			
A2287	4	L Pleis	Un	Lo	C	Cervidae	5.5	4.3				
A2324	4	L Pleis	Un	Up	M	Cervidae						
A2325	4	L Pleis	Un	Lo	M	Cervidae						

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A2353	4	L Pleis	Un	Up	M	Cervidae	13.4					
A2354	4	L Pleis	L	Up	M	Cervidae						
A2354	4	L Pleis	L	Up	M	Cervidae	19.9	17.1				
A2355	4	L Pleis	R	Up	M 1	Cervidae	10.9	16.2				
A2355	4	L Pleis	R	Up	M 2	Cervidae	13.0	19.3				
A2356	4	L Pleis	Un	Un	M	Cervidae						
A2358	4	L Pleis	Un	Up	M	Cervidae	13.6					
A2382	4	L Pleis	Un	Un	M	Cervidae						
A2383	4	L Pleis	Un	Un	M	Cervidae						
A2385	4	L Pleis	Un	Un	M	Cervidae						
A2386	4	L Pleis	Un	Up	P	Cervidae		15.1				
A2388	4	L Pleis	L	Lo	P 2	Cervidae	6.9	12.3				
A2389	4	L Pleis	R	Up	M	Cervidae	19.2					
A2390	4	L Pleis	R	Up	M	Cervidae	10.7	24.1	10.9			
A2391	4	L Pleis	R	Lo	M	Cervidae	12.1	21.5				
A2392	4	L Pleis	L	Lo	M	Cervidae	14.0	25.9	1.6		9.8	
A2393	4	L Pleis	R	Lo	M	Cervidae	13.6	23.1	1.4		9.8	
A2395	4	L Pleis	L	Lo	M	Cervidae	11.4	20.4				
A2397	4	L Pleis	L	Lo	M	Cervidae	12.3	22.3				
A2398	4	L Pleis	R	Lo	P 4	Cervidae	11.3	19.9				
A2400	4	L Pleis	R	Lo	Dp	Cervidae	12.5					
A2400	4	L Pleis	R	Lo	M 1	Cervidae	12.2					
A2401	4	L Pleis	R	Up	M	Cervidae	16.4	24.3				
A2402	4	L Pleis	L	Lo	M	Cervidae	13.8	24.2				
A2404	4	L Pleis	R	Lo	P	Cervidae	9.6					
A2405	4	L Pleis	Un	Up	P 4	Cervidae	12.9					
A2407	4	L Pleis	R	Lo	P 4	Cervidae	10.3	17.0				
A2408	4	L Pleis	Un	Un	M	Cervidae	12.1	23.0				
A2409	4	L Pleis	R	Up	M	Cervidae	18.4					
A2410	4	L Pleis	R	Up	M	Cervidae	28.2	21.3				
A2412	4	L Pleis	Un	Un	M	Cervidae						
A2413	4	L Pleis	Un	Un	M	Cervidae			16.6			
A2414	4	L Pleis	Un	Lo	P	Cervidae		10.1			57.2	

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A2414	4	L Pleis	Un	Lo	P	Cervidae	6.5	15.3			57.2	
A2415	4	L Pleis	L	Lo	P 4	Cervidae	8.6	16.8			57.2	
A2416	4	L Pleis	L	Lo	M	Cervidae	13.1				57.2	
A2417	4	L Pleis	L	Lo	M	Cervidae	14.5	22.3				
A2418	4	L Pleis	R	Up	P	Cervidae	3.5	14.5				
A2424	4	L Pleis	L	Up	M 2	Cervidae	16.2					
A2424	4	L Pleis	L	Up	M 3	Cervidae	15.1	20.3				
A2425	4	L Pleis	Un	Lo	P	Cervidae			21.5			
A2449	4	L Pleis	R	Up	M 1	Cervidae	21.1	19.9	18.0			
A2450	4	L Pleis	Un	Un	M	Cervidae						
A2451	4	L Pleis	Un	Un	M	Cervidae						
A2454	4	L Pleis	Un	Un	M	Cervidae						
A2455	4	L Pleis	Un	Lo	M	Cervidae	11.1					
A2457	4	L Pleis	R	Up	M	Cervidae		23.4				
A2458	4	L Pleis	Un	Up	M	Cervidae			20.7			
A2459	4	L Pleis	R	Up	Ch	Cervidae	18.9	16.2				
A2460	4	L Pleis	Un	Up	M	Cervidae	9.7					
A2461	4	L Pleis	Un	Up	P	Cervidae	7.9					
A2462	4	L Pleis	L	Up	P	Cervidae	7.3	9.4				
A2463	4	L Pleis	R	Up	Dp	Cervidae		15.2	15.1			
A2467	4	L Pleis	L	Lo	P 4	Cervidae	11.3	16.9				
A2467	4	L Pleis	L	Lo	M 1	Cervidae	15.3	19.1				
A2468	4	L Pleis	L	Lo	M 3	Cervidae	11.9					
A2471	4	L Pleis	Un	Un	M	Cervidae						
A2472	4	L Pleis	Un	Un	M	Cervidae	9.2					
A2473	4	L Pleis	Un	Un	M	Cervidae	9.9		12.0			
A2475	4	L Pleis	Un	Lo	P	Cervidae	5.8		15.8			
A2476	4	L Pleis	L	Up	P	Cervidae	10.7	16.6	5.9			
A2477	4	L Pleis	L	Lo	P 3	Cervidae	9.5	16.8	4.5			
A2478	4	L Pleis	R	Lo	P	Cervidae	16.8	15.2				
A2479	4	L Pleis	R	Up	M	Cervidae	18.0	19.5				
A2480	4	L Pleis	Un	Lo	M	Cervidae	11.3		11.2			
A2483	4	L Pleis	R	Lo	M 3	Cervidae	8.5	21.6	11.6			

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A2484	4	L Pleis	L	Lo	I	Cervidae	7.6	8.5				
A2485	4	L Pleis	L	Lo	I 2	Cervidae	6.4	5.6				
A2485	4	L Pleis	L	Lo	I 3	Cervidae	3.6					
A2499	4	L Pleis	R	Up	M 2	Cervidae	21.1	19.9				
A255	3	L Pleis	L	Lo	I 1	Cervidae	6.0	12.1				
A256a	3	L Pleis	R	Up	M 2	Cervidae	14.9					
A256b	3	L Pleis	R	Up	M 3	Cervidae	15.3	26.9				
A2608	4	L Pleis	Un	Un	Ch	Cervidae						
A2609	4	L Pleis	Un	Lo	M	Cervidae	12.4					
A266c	3	L Pleis	R	Lo	Dp 4	Cervidae	11.0	21.1	2.5			
A267	3		L	Lo	I 1	Cervidae	6.3	10.6	3.8			
A2675	4	L Pleis	Un	Up	P	Cervidae		14.2				
A2676	4	L Pleis	Un	Up	M	Cervidae		20.1				
A2677	4	L Pleis	Un	Up	P	Cervidae	12.5	14.5	2.9		14.6	
A269a	3	L Pleis	L	Up	M 1	Cervidae	9.1	15.3				
A269b	3	L Pleis	L	Up	M 2	Cervidae	10.6	14.6				
A269c	3	L Pleis	L	Up	M 3	Cervidae	11.7	18.1	16.4			
A271a	3	L Pleis	Un	Lo	M	Cervidae	11.2	15.7				
A271b	3	L Pleis	Un	Lo	M	Cervidae						
A276	3	L Pleis	R	Lo	Dp 4	Cervidae	7.8	25.1	12.2			
A2774	4	L Pleis	Un	Up	P	Cervidae		12.6				
A2779	4	L Pleis	R	Up	P	Cervidae	14.5	15.0	15.9			
A2780	4	L Pleis	R	Lo	M	Cervidae	11.2	20.4				
A2781	4	L Pleis	Un	Lo	M 2	Cervidae						
A2782	4	L Pleis	R	Up	M	Cervidae		14.6				
A2783	4	L Pleis	Un	Un	M	Cervidae	9.6	23.7				
A2784	4	L Pleis	R	Lo	M	Cervidae	9.6	20.3				
A2784	4	L Pleis	R	Lo	M	Cervidae	9.4	20.3				
A2785	4	L Pleis	L	Lo	P 2	Cervidae		10.5				
A2785	4	L Pleis	L	Lo	P 3	Cervidae		13.5				
A283	3	L Pleis	Un	Up	M	Cervidae	13.3	22.2	2.2			
A284	3	L Pleis	Un	Up	M	Cervidae						
A285a	3	L Pleis	R	Lo	P 2	Cervidae	6.1	12.9				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A285b	3	L Pleis	R	Lo	P 3	Cervidae	7.8	16.8	15.2			
A285c	3	L Pleis	R	Lo	P 4	Cervidae	9.8	15.8	16.5			
A289	3	L Pleis	L	Lo	P 3	Cervidae	13.1	16.7				
A290	3	L Pleis	Un	Lo	M	Cervidae	6.9	12.0				
A2907	4	L Pleis	Un	Un	M	Cervidae						
A2908	4	L Pleis	Un	Un	M	Cervidae						
A2909	4	L Pleis	Un	Up	P	Cervidae	9.1	15.6				
A2910	4	L Pleis	L	Up	P	Cervidae	17.0	4.7				
A2917	4	L Pleis	L	Up	M	Cervidae	23.3	22.9				
A2943	4	L Pleis	R	Lo	P	Cervidae	15.1	20.2				
A2944	4	L Pleis	Un	Un	M	Cervidae						
A2946	4	L Pleis	L	Up	M	Cervidae	13.1	21.3				
A2947	4	L Pleis	L	Lo	Dp 4	Cervidae	7.9	20.4				
A2947	4	L Pleis	L	Lo	M 1	Cervidae	8.1	17.6				
A2991	4	L Pleis	Un	Un	M	Cervidae			14.3			
A2992	4	L Pleis	L	Lo	P	Cervidae	10.6	18.8				
A2993	4	L Pleis	Un	Un	Ch	Cervidae			10.2			
A2999	4	L Pleis	R	Up	P	Cervidae	7.5	12.0				
A3049	4	L Pleis	Un	Lo	M	Cervidae	10.9		15.3			
A3050	4	L Pleis	Un	Un	M	Cervidae	9.5		14.8			
A3051	4	L Pleis	Un	Un	M	Cervidae						
A3055	4	L Pleis	L	Lo	I 1	Cervidae	11.6	11.5				
A3095	4	L Pleis	L	Lo	I	Cervidae	5.3	8.1				
A3097	4	L Pleis	R	Lo	M 3	Cervidae	9.8	26.3				
A3098	4	L Pleis	L	Lo	M	Cervidae						
A3099	4	L Pleis	R	Lo	M 3	Cervidae		11.1				
A3100	4	L Pleis	L	Lo	M	Cervidae	10.5	23.4				
A3102	4	L Pleis	L	Up	P	Cervidae		13.4				
A3103	4	L Pleis	R	Up	M	Cervidae	11.7	23.8				
A3105	4	L Pleis	Un	Un	M	Cervidae			14.9			
A3106	4	L Pleis	R	Lo	I 2	Cervidae	6.4	8.7	14.4			
A3107	4	L Pleis	Un	Lo	I	Cervidae	5.3	5.5	14.0			
A3109	4	L Pleis	Un	Up	P	Cervidae		12.7				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A3111	4	L Pleis	L	Lo	M	Cervidae	10.1	25.0				
A3112	4	L Pleis	L	Lo	M 3	Cervidae	10.7	39.8				
A3113	4	L Pleis	R	Lo	M	Cervidae	12.6	21.8	9.8			
A3116	4	L Pleis	Un	Up	M	Cervidae			9.6			
A3117	4	L Pleis	L	Lo	P 4	Cervidae	10.1	17.3				
A3118	4	L Pleis	R	Lo	M 3	Cervidae	12.8	29.1	31.2			
A3128	5	L Pleis	L	Lo	P 2	Cervidae	8.6	13.3				
A3129	5	L Pleis	R	Lo	P 2	Cervidae	6.2	11.6				
A3129	5	L Pleis	R	Lo	P 3	Cervidae	8.4	15.8	11.7			
A3130	5	L Pleis	Un	Un	M	Cervidae	12.3	22.5				
A3130	4	L Pleis	R	Lo	I 3	Cervidae	4.3	2.5				
A3132	5	L Pleis	L	Lo	Ch	Cervidae						
A3132	5	L Pleis	L	Lo	M	Cervidae	9.8	18.4	13.9			
A3134	5	L Pleis	L	Lo	Ch	Cervidae	20.1					
A3145	5	L Pleis	R	Up	M	Cervidae	22.2	22.4	3.4			
A3146	5	L Pleis	R	Up	M	Cervidae		21.5	9.9			
A3151	5	L Pleis	R	Up	M	Cervidae	21.3	21.4				
A3160	5	L Pleis	Un	Lo	M	Cervidae	11.5		23.2			
A3161	5	L Pleis	L	Up	M	Cervidae	18.3	18.9				
A3162	5	L Pleis	R	Up	M	Cervidae	25.8	25.6	2.2			
A3163	5	L Pleis	L	Up	M 2	Cervidae	19.1	18.1				
A3163	5	L Pleis	L	Up	M 3	Cervidae	18.6	19.2				
A317	3	L Pleis	Un	Up	M	Cervidae	12.9					
A3212	5	L Pleis	L	Up	M	Cervidae	10.8	12.7				
A3212	5	L Pleis	L	Up	M	Cervidae	11.2	13.3				
A3219	5	L Pleis	Un	Un	P	Cervidae	15.4	9.1	6.3			
A3220	5	L Pleis	L	Lo	P 3	Cervidae			1.4			
A3220	5	L Pleis	L	Lo	P 4	Cervidae						
A3221	5	L Pleis	Un	Lo	M	Cervidae	9.4		6.1			
A3222	5	L Pleis	Un	Un	Dp	Cervidae						
A3231	5	L Pleis	R	Up	M	Cervidae	13.0	21.0				
A3236	5	L Pleis	R	Lo	P	Cervidae	12.1	18.4				
A3240	5	L Pleis	R	Lo	M	Cervidae	8.5	18.9				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A3241	5	L Pleis	R	Lo	M	Cervidae	11.5	22.2				
A3242	5	L Pleis	L	Lo	M	Cervidae	8.4	18.4				
A3242	5	L Pleis	L	Lo	M	Cervidae						
A3243	5	L Pleis	R	Up	P	Cervidae	14.8	13.6				
A3244	5	L Pleis	L	Up	M	Cervidae	14.2					
A3245	5	L Pleis	L	Up	M	Cervidae	13.0	16.8				
A3246	5	L Pleis	L	Up	P 4	Cervidae		12.4				
A3246	5	L Pleis	L	Up	M 1	Cervidae	20.3	15.6	9.9			
A3248	5	L Pleis	R	Up	M	Cervidae	15.0		14.4			
A3332	5	L Pleis	Un	Un	M	Cervidae						
A3334	5	L Pleis	Un	Un	P	Cervidae	9.5	12.7				
A3335	5	L Pleis	Un	Lo	M	Cervidae		11.0				
A3422	5	L Pleis	R	Lo	I 1	Cervidae	7.2	7.7				
A3422	5	L Pleis	R	Lo	I 2	Cervidae	5.8	6.0				
A3424	5	L Pleis	L	Lo	I	Cervidae	7.3	7.8				
A3428	5	L Pleis	R	Lo	P 4	Cervidae	8.1	13.4				
A3429	5	L Pleis	L	Lo	P 3	Cervidae	7.5	15.9				
A3430	5	L Pleis	R	Lo	P 3	Cervidae	9.9	16.3	8.0			
A3431	5	L Pleis	R	Lo	P 4	Cervidae	10.5	18.8				
A3434	5	L Pleis	Un	Lo	M	Cervidae	13.0					
A3436	5	L Pleis	Un	Un	M	Cervidae	9.5	22.0				
A3437	5	L Pleis	L	Lo	M	Cervidae	11.1					
A3437	5	L Pleis	L	Lo	M 3	Cervidae	12.1					
A3443	5	L Pleis	Un	Lo	M 3	Cervidae						
A3444	5	L Pleis	Un	Un	M	Cervidae	11.8	17.7	17.2			
A3445	5	L Pleis	L	Lo	M	Cervidae	9.7	21.1	3.5			
A3446	5	L Pleis	R	Lo	M	Cervidae	29.3	11.1				
A3447	5	L Pleis	Un	Up	M	Cervidae	16.1	17.8	3.7			
A3449	5	L Pleis	L	Lo	P	Cervidae	7.8	15.0				
A3450	5	L Pleis	L	Lo	P	Cervidae	10.9	15.1				
A3451	5	L Pleis	L	Lo	M	Cervidae	15.2	22.5				
A3612	5	L Pleis	Un	Un	M	Cervidae			15.1			
A3614	5	L Pleis	R	Up	M	Cervidae		22.0				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A3615	5	L Pleis	Un	Up	M	Cervidae						
A3617	5	L Pleis	L	Up	M	Cervidae	15.8	16.7				
A3637	5	L Pleis	R	Up	M	Cervidae		17.8				
A3655	5	L Pleis	Un	Un	M	Cervidae			8.4			
A3657	5	L Pleis	Un	Lo	I	Cervidae	5.5					
A3658	5	L Pleis	L	Lo	P 3	Cervidae	7.4	15.1				
A3660	5	L Pleis	Un	Un	M	Cervidae	10.6					
A3662	5	L Pleis	L	Up	M	Cervidae	13.2	23.1				
A3663	5	L Pleis	R	Up	M	Cervidae	13.2	23.5				
A3664	5	L Pleis	L	Lo	M 3	Cervidae	12.1	27.0				
A3666	5	L Pleis	Un	Lo	M 3	Cervidae	8.0	19.9				
A3667	5	L Pleis	L	Up	P	Cervidae	12.5	14.9				
A3668	5	L Pleis	L	Up	P	Cervidae	9.5	11.5				
A3670	5	L Pleis	L	Up	M	Cervidae	9.1	12.8				
A3672	5	L Pleis	R	Up	M	Cervidae	11.3	21.0				
A3673	5	L Pleis	R	Up	M	Cervidae	11.6	13.8				
A3673	5	L Pleis	R	Up	M	Cervidae	11.7	17.1				
A3674	5	L Pleis	R	Up	M	Cervidae		16.4				
A3674	5	L Pleis	R	Up	M	Cervidae	13.6	19.2				
A3698	5	L Pleis	Un	Un	M	Cervidae						
A3700	5	L Pleis	L	Up	M	Cervidae						
A3701	5	L Pleis	L	Up	M 3	Cervidae		12.5				
A3703	5	L Pleis	Un	Un	M	Cervidae	14.4					
A3705	5	L Pleis	L	Lo	P 3	Cervidae	9.2	17.1				
A3717	5	L Pleis	Un	Un	M	Cervidae				61.6		
A3722	5	L Pleis	Un	Up	M	Cervidae	12.2			61.6		
A3723	5	L Pleis	L	Lo	M 1	Cervidae	10.9	19.9				
A3723	5	L Pleis	L	Lo	M 2	Cervidae	9.0	22.5				
A3725	5	L Pleis	R	Lo	P 4	Cervidae	10.9	18.1				
A3726	5	L Pleis	Un	Un	M	Cervidae	11.9	18.3				
A3727	5	L Pleis	Un	Un	P	Cervidae	16.3	16.3				
A3728	5	L Pleis	Un	Un	M	Cervidae	11.1	12.9				
A3810	5	L Pleis	Un	Un	M	Cervidae	12.8					10.3

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A3812	5	L Pleis	L	Lo	M 3	Cervidae	10.5		11.0			
A3814	5	L Pleis	Un	Un	M	Cervidae						10.3
A3815	5	L Pleis	Un	Un	M	Cervidae						
A3817	5	L Pleis	R	Lo	M	Cervidae	8.7	12.9				11.1
A3818	5	L Pleis	R	Up	M	Cervidae	10.5	23.3				
A3819	5	L Pleis	Un	Un	M	Cervidae	10.0	7.2				
A3820	5	L Pleis	R	Lo	M 3	Cervidae	8.7	21.2				
A3822	5	L Pleis	L	Lo	P	Cervidae	8.5	15.3				
A3824	5	L Pleis	R	Lo	P 2	Cervidae		18.9				
A3907	5	L Pleis	L	Up	M	Cervidae	10.3	16.0			9.6	
A3908	5	L Pleis	L	Lo	M 3	Cervidae	10.1				9.6	
A3963	5	L Pleis	R	Lo	I 2	Cervidae	6.0	6.5	5.2			
A3964	5	L Pleis	R	Up	M	Cervidae		20.8				
A3966	5	L Pleis	R	Lo	P 2	Cervidae	6.8	12.2	7.3			
A397	3	L Pleis	Un	Un	M	Cervidae	8.3					
A4004	5	L Pleis	R	Lo	I	Cervidae						
A4097	5	L Pleis	L	Lo	P 4	Cervidae	10.3	17.5				
A4098	5	L Pleis	L	Lo	M 1	Cervidae	8.2	14.7	12.3			
A4098	5	L Pleis	L	Lo	M 2	Cervidae	6.7	15.9				
A4099	5	L Pleis	L	Lo	Dp 4	Cervidae	11.6		11.7			
A4099	5	L Pleis	L	Lo	M 1	Cervidae	14.3	20.0				
A4100	5	L Pleis	Un	Up	M	Cervidae	15.6					
A4101	5	L Pleis	L	Lo	M 1	Cervidae	12.0	16.3	2.7			
A4101	5	L Pleis	L	Lo	M 2	Cervidae	12.8	20.9	9.6			
A4103	5	L Pleis	L	Lo	P 2	Cervidae	8.8	7.1	7.8			
A4104	5	L Pleis	L	Lo	P	Cervidae	12.2	21.1	6.3			
A4105	5	L Pleis	L	Lo	P	Cervidae	12.2	21.1				
A4106	5	L Pleis	R	Lo	M	Cervidae	9.5	16.2	8.5			
A4107	5	L Pleis	L	Lo	Dp 4	Cervidae	10.9		10.7			
A4107	5	L Pleis	L	Lo	M 1	Cervidae	10.4	18.1	7.2			
A4107	5	L Pleis	L	Lo	M 2	Cervidae	10.0	20.2	11.0			
A4108	5	L Pleis	R	Lo	M 3	Cervidae	10.6	25.3	38.6			
A4109	5	L Pleis	R	Lo	M 3	Cervidae	11.2	27.9				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A4110	5	L Pleis	R	Lo	M	Cervidae	12.4	20.9	5.7			
A4111	5	L Pleis	L	Lo	M	Cervidae	10.1		11.6			
A4112	5	L Pleis	Un	Lo	M	Cervidae	9.6					
A4116	5	L Pleis	L	Up	P	Cervidae	16.0	15.1	7.2			
A4117	5	L Pleis	R	Up	M	Cervidae	16.3	20.7	6.2			
A4118	5	L Pleis	L	Up	M	Cervidae	13.9	18.0				
A4119	5	L Pleis	L	Up	M	Cervidae			5.0			
A4136	5	L Pleis	L	Lo	M	Cervidae		18.3				
A4136	5	L Pleis	L	Lo	M	Cervidae	16.0	21.3				
A416	3	L Pleis	Un	Un	M	Cervidae						
A4197	5	L Pleis	R	Lo	M	Cervidae	11.0		9.1			
A4198	5	L Pleis	L	Up	M	Cervidae	10.9	18.3	6.6			
A4205	5	L Pleis	R	Up	M 1	Cervidae	16.7	21.1	12.9			
A4205	5	L Pleis	R	Up	M 2	Cervidae	18.9	23.0	10.1			
A4206	5	L Pleis	L	Lo	M	Cervidae	12.0	23.0	7.1			
A4212	5	L Pleis	R	Lo	M	Cervidae	13.5	20.6	7.9			
A4213	5	L Pleis	Un	Up	M	Cervidae	13.7					
A4215	5	L Pleis	L	Un	P 4	Cervidae	10.5	18.3				
A4216	5	L Pleis	L	Lo	M	Cervidae	14.6	19.7	9.3			
A4217	5	L Pleis	R	Lo	M	Cervidae	13.5	16.3				
A4218	5	L Pleis	L	Lo	M 3	Cervidae	8.9	28.5	9.1			
A4219	5	L Pleis	R	Lo	M 3	Cervidae	14.9	31.2				
A4222	5	L Pleis	Un	Un	Ch	Cervidae						
A4223	5	L Pleis	R	Up	P	Cervidae		16.1				
A4224	5	L Pleis	R	Up	P	Cervidae		15.2				
A4225	5	L Pleis	R	Up	P	Cervidae	11.7	14.6				
A4227	5	L Pleis	R	Up	M	Cervidae	12.5	22.1	4.5			
A4228	5	L Pleis	R	Up	M	Cervidae	12.0	22.8				
A4229	5	L Pleis	L	Up	M 3	Cervidae	12.6	19.9				
A4230	5	L Pleis	L	Up	M	Cervidae	18.5	20.1	16.9			
A4279	2	Holo	Un	Up	Ch	Cervidae			6.5			
A4290	2	Holo	L	Lo	P 2	Cervidae	3.2	8.0	15.4			
A4290	2	Holo	L	Lo	P 3	Cervidae	6.1	12.7	10.5			

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A4290	2	Holo	L	Lo	P 4	Cervidae	8.0	12.7	15.9			
A4291	2	Holo	L	Up	P 3	Cervidae	13.7	18.5				
A4296	1	Holo	L	Lo	M	Cervidae	12.6			35.8		
A4297	1	Holo	R	Up	P	Cervidae	6.9	8.5		35.6	54.2	88.9
A4298	1	Holo	R	Up	M	Cervidae	9.0	13.5				
A43	2	Holo	Un	Lo	M	Cervidae	10.5	16.4				
A4302	3	L Pleis	L	Lo	P	Cervidae	7.5	12.4	10.2			
A4303	3	L Pleis	Un	Un	Ch	Cervidae						
A4304	3	L Pleis	R	Lo	M	Cervidae	11.9					
A4305	3	L Pleis	Un	Up	M	Cervidae	12.9					
A4306	3	L Pleis	R	Up	P	Cervidae	10.5	16.9				
A4324	3	L Pleis	L	Lo	P	Cervidae	7.5	16.9				
A4353	3	L Pleis	Un	Lo	M	Cervidae						
A4354	3	L Pleis	L	Lo	M	Cervidae		18.9				
A4372	3	L Pleis	R	Up	M	Cervidae		13.9	15.1			
A4397	3	L Pleis	L	Up	I 3	Cervidae	2.3	1.9				
A4397	3	L Pleis	L	Lo	C	Cervidae	3.5	5.5				
A4412	5	L Pleis	R	Up	M	Cervidae	18.9	24.9				
A4413	5	L Pleis	R	Lo	P 2	Cervidae	3.7	8.3				
A4415	5	L Pleis	R	Up	P	Cervidae	14.9	15.2				
A4462	5	L Pleis	R	Up	M	Cervidae					62.0	
A4463	5	L Pleis	R	Lo	I 1	Cervidae	7.1	12.8			62.0	
A4464	5	L Pleis	Un	Up	M	Cervidae					62.0	
A4465	5	L Pleis	Un	Up	P	Cervidae	11.1					
A4466	5	L Pleis	L	Lo	M	Cervidae	9.6	25.1				
A4489	5	L Pleis	Un	Un	M	Cervidae			8.0			
A45	2	Holo	Un	Lo	M	Cervidae	10.2	18.2				
A4503	5	L Pleis	L	Up	P	Cervidae	10.5	15.5	13.1			
A4522	5	L Pleis	L	Up	M	Cervidae		19.0	5.8			
A4523	5	L Pleis	L	Up	M	Cervidae						
A4540	5	L Pleis	L	Lo	P 4	Cervidae	9.8	17.1				
A4540	5	L Pleis	L	Lo	M 1	Cervidae	10.5	20.6				
A4540	5	L Pleis	L	Lo	M 2	Cervidae	10.7	23.4	8.3			

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A4545	5	L Pleis	L	Up	M	Cervidae		14.5	3.1		59.5	75.4
A4546	5	L Pleis	Un	Un	M 3	Cervidae			10.5			
A4547	5	L Pleis	L	Lo	P 2	Cervidae	5.6	12.4				
A4645	5	L Pleis	L	Lo	P 3	Cervidae		12.9	5.1			
A4645	5	L Pleis	L	Lo	P 4	Cervidae			6.9			
A4676	5	L Pleis	Un	Un	P	Cervidae		15.0				
A471	3	L Pleis	Un	Up	M	Cervidae	7.5					
A471a	3	L Pleis	R	Un	P 2	Cervidae	5.6	8.7	3.1			
A471b	3	L Pleis	R	Un	P 3	Cervidae	7.4	11.5	9.7			21.6
A4731	5	L Pleis	R	Lo	M	Cervidae	12.0	23.5	12.3		86.0	
A4778	5	L Pleis	R	Lo	M 1	Cervidae						
A4778	5	L Pleis	R	Lo	M 2	Cervidae						
A4779	5	L Pleis	R	Lo	P 3	Cervidae	6.9	13.4	37.0			
A4779	5	L Pleis	R	Lo	P 4	Cervidae	7.5	16.5	14.9		86.0	
A4781	5	L Pleis	R	Lo	P 4	Cervidae						
A4781	5	L Pleis	R	Lo	M 1	Cervidae	10.9	13.7				
A4781	5	L Pleis	R	Lo	M 2	Cervidae	12.0	16.0				
A4781	5	L Pleis	R	Lo	M 3	Cervidae	10.7	22.4				
A4782	5	L Pleis	Un	Un	M	Cervidae			12.3			
A4782	5	L Pleis	L	Lo	M 3	Cervidae	9.4	30.4	9.7			
A4783	5	L Pleis	R	Up	M	Cervidae	13.9	19.0				
A4784	5	L Pleis	R	Lo	M 3	Cervidae	14.3	30.5	12.9			
A4785	5	L Pleis	R	Up	M	Cervidae	13.5	17.6	13.1			
A4786	5	L Pleis	R	Lo	P 4	Cervidae	10.1	17.2				
A4787	5	L Pleis	R	Lo	P 3	Cervidae	9.0	16.8				
A4788	5	L Pleis	L	Lo	P	Cervidae	7.0	16.2	16.2			
A4789	5	L Pleis	L	Lo	P	Cervidae						
A4789	5	L Pleis	R	Up	M	Cervidae		18.1				
A4789	5	L Pleis	R	Up	M	Cervidae	13.6	22.7				
A4790	5	L Pleis	L	Lo	P 2	Cervidae	5.2					
A489	3	L Pleis	L	Lo	I 2	Cervidae	5.8	6.1				
A490	3	L Pleis	Un	Up	M	Cervidae						
A492	3	L Pleis	R	Lo	M	Cervidae	8.0	18.6	34.0			

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A493	3	L Pleis	L	Lo	M	Cervidae	8.7	19.5				
A494a	3	L Pleis	R	Up	M	Cervidae	18.4	23.9				
A494b	3	L Pleis	R	Up	M	Cervidae	20.9	21.4	14.5			
A496a	3	L Pleis	L	Lo	Dp 2	Cervidae	3.1	7.2				16.9
A496b	3	L Pleis	L	Lo	Dp 3	Cervidae	4.9	9.4	9.2			
A497a	3	L Pleis	L	Lo	P 3	Cervidae	6.1	10.5	7.0			
A497b	3	L Pleis	L	Lo	P 4	Cervidae	7.9	14.5	13.5			
A497c	3	L Pleis	L	Lo	M 1	Cervidae	9.4	13.3				
A4986	5	L Pleis	Un	Un	M	Cervidae						
A4988	5	L Pleis	Un	Up	P	Cervidae	11.2	11.9	21.8			
A50	2	Holo	Un	Un	Ch	Cervidae			14.0			
A5010	5	L Pleis	R	Lo	P 3	Cervidae	7.7	18.0	5.4			
A5010	5	L Pleis	R	Lo	P 4	Cervidae	9.1	19.1				
A5022	5	L Pleis	Un	Un	P	Cervidae	11.5	14.0	12.1			
A5024	5	L Pleis	R	Lo	M	Cervidae	14.9	21.2				
A5025	5	L Pleis	R	Lo	M	Cervidae	13.1	18.6	13.8			
A5033	5	L Pleis	L	Lo	I	Cervidae	6.5	6.0				
A5036	5	L Pleis	L	Lo	P 2	Cervidae		11.0				
A5036	5	L Pleis	L	Lo	P 3	Cervidae	7.7	17.0				
A5037	5	L Pleis	L	Lo	P	Cervidae	6.1	17.2				
A5038	5	L Pleis	L	Lo	P	Cervidae	8.3	17.2				
A5039	5	L Pleis	Un	Lo	P 3	Cervidae	9.1	16.7	11.9	35.6	54.2	88.9
A503a	3	L Pleis	L	Lo	P 2	Cervidae	4.5	9.3				
A503b	3	L Pleis	L	Lo	P 3	Cervidae	5.9	11.2				21.4
A503c	3	L Pleis	L	Lo	P 4	Cervidae	7.1	12.0				21.4
A503d	3	L Pleis	L	Lo	M 1	Cervidae	10.7	13.1				
A504	3	L Pleis	R	Lo	P	Cervidae	9.2	10.0	8.1			
A5041	5	L Pleis	L	Lo	M 3	Cervidae	11.5	25.6	34.6			
A5043	5	L Pleis	R	Up	M	Cervidae	13.8	19.1				
A5044	5	L Pleis	L	Up	M	Cervidae	22.8	20.5				
A5045	5	L Pleis	R	Up	M	Cervidae	12.5					
A5045	5	L Pleis	R	Up	M	Cervidae	12.6					
A5046	5	L Pleis	Un	Up	P	Cervidae	15.9					

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A5047	5	L Pleis	Un	Un	Ch	Cervidae			10.2			
A506	3	L Pleis	L	Lo	M	Cervidae	8.1					
A506	3	L Pleis	L	Lo	M	Cervidae	9.1					
A5102	5	L Pleis	R	Un	P	Cervidae	6.7	11.5				
A511	3	L Pleis	L	Lo	Dp 4	Cervidae	7.6	20.8				
A511	3	L Pleis	L	Lo	M 1	Cervidae	7.3	15.5				
A512	3	L Pleis	L	Lo	M 2	Cervidae	9.5	22.9				
A513	3	L Pleis	L	Lo	M 2	Cervidae	10.3	24.4	11.2			
A514	3	L Pleis	R	Up	M	Cervidae	14.5	24.5				
A5143	5	L Pleis	L	Up	M	Cervidae	23.5	22.0	20.1			
A5144	5	L Pleis	L	Up	M	Cervidae	13.1	23.6				
A5145	5	L Pleis	R	Up	M	Cervidae	14.9	23.1	6.4			
A5146	5	L Pleis	L	Up	M	Cervidae	12.5	19.7	7.2			
A515	3	L Pleis	R	Up	M 3	Cervidae	12.2	19.0				
A5151	5	L Pleis	Un	Lo	I	Cervidae	5.1	7.1				11.1
A5152	5	L Pleis	L	Lo	P 4	Cervidae	11.6	17.9				11.1
A5153	5	L Pleis	L	Up	M	Cervidae	10.7	18.1				11.1
A5155	5	L Pleis	R	Up	P	Cervidae	10.3	13.2				
A5156	5	L Pleis	L	Up	P 3	Cervidae	7.1	9.1				
A5156	5	L Pleis	L	Up	P 4	Cervidae	8.8	7.9				
A5158	5	L Pleis	Un	Un	M	Cervidae			17.7			
A5159	5	L Pleis	R	Up	P	Cervidae	12.3	16.8	10.1			
A5160	5	L Pleis	L	Lo	M	Cervidae	10.6	19.8	5.2			
A5162	5	L Pleis	R	Up	M	Cervidae	8.6	16.1				
A5163	5	L Pleis	L	Lo	M	Cervidae	8.5	19.4				
A5165	5	L Pleis	L	Up	M 3	Cervidae	17.2	22.3				
A5169	5	L Pleis	Un	Un	M 3	Cervidae			7.1			
A5170	5	L Pleis	Un	Lo	I	Cervidae	6.7	7.3				
A5171	5	L Pleis	Un	Up	P	Cervidae		13.9				
A5172	5	L Pleis	R	Lo	M 3	Cervidae		22.6				
A5173	5	L Pleis	L	Up	Dp 4	Cervidae	8.4					
A5176	5	L Pleis	Un	Un	M	Cervidae			15.5			
A5177	5	L Pleis	L	Lo	M	Cervidae	13.5	20.6	8.8			

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A5178	5	L Pleis	R	Up	M	Cervidae	8.8	23.1				
A5179	5	L Pleis	R	Lo	M 3	Cervidae		25.5				
A518	3	L Pleis	Un	Up	M	Cervidae						
A5181	5	L Pleis	Un	Up	M	Cervidae	10.0		8.0			
A5182	5	L Pleis	R	Up	P	Cervidae	11.6	18.9				
A5183	5	L Pleis	R	Up	M	Cervidae	11.3	21.2				9.4
A5184	5	L Pleis	L	Up	M	Cervidae	14.2	21.0				
A5185	5	L Pleis	R	Up	M	Cervidae		23.5				9.4
A5186	5	L Pleis	R	Up	M	Cervidae	14.0	22.3				9.4
A5189	5	L Pleis	L	Lo	M	Cervidae	10.4	23.1				
A519	3	L Pleis	L	Lo	P 2	Cervidae	7.9	14.2				
A5190	5	L Pleis	R	Lo	Ch	Cervidae	11.4		12.6			
A5190	5	L Pleis	R	Lo	M	Cervidae	11.9	14.1	2.7			
A5192	5	L Pleis	R	Up	P	Cervidae		13.7	3.2			
A5193	5	L Pleis	Un	Un	M	Cervidae						
A5195	5	L Pleis	L	Up	M	Cervidae	11.0	25.0				
A5196	5	L Pleis	L	Up	M	Cervidae	11.0	25.0				
A5197	5	L Pleis	L	Lo	P 2	Cervidae	6.9	12.4	16.6			
A5198	5	L Pleis	L	Lo	M 3	Cervidae	9.5	28.9	17.6			
A5215	5	L Pleis	L	Up	M	Cervidae	17.0	25.0				
A522	3	L Pleis	R	Lo	M	Cervidae	10.0					
A5223	5	L Pleis	Un	Lo	P	Cervidae	8.4		12.0			
A5225	5	L Pleis	R	Lo	M 2	Cervidae	12.1	21.1				
A5225	5	L Pleis	R	Lo	M 3	Cervidae	12.3	27.1				
A523	3	L Pleis	Un	Un	M	Cervidae						
A526	3	L Pleis	Un	Un	M	Cervidae						
A527	3	L Pleis	L	Lo	M	Cervidae	10.6	24.0				
A5274	5	L Pleis	Un	Up	M	Cervidae	11.4					
A5275	5	L Pleis	Un	Up	M	Cervidae	10.8					
A5276	5	L Pleis	Un	Un	M	Cervidae						
A5277	5	L Pleis	R	Lo	M 3	Cervidae	11.0					
A5278	5	L Pleis	Un	Un	P	Cervidae	15.7	16.0				
A5279	5	L Pleis	R	Up	M	Cervidae	13.1	23.5				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A5280	5	L Pleis	L	Up	M	Cervidae	10.6	16.5				
A5286	5	L Pleis	R	Lo	M 3	Cervidae	11.4	29.6	4.1			
A5287	5	L Pleis	R	Up	M	Cervidae	10.5	23.7	13.9			
A5288	5	L Pleis	L	Up	M	Cervidae	14.4	22.6	7.5			
A529	3	L Pleis	L	Up	P	Cervidae	12.7		4.4		22.5	
A5291	5	L Pleis	R	Lo	M 3	Cervidae	7.9	26.1	18.8			
A5294	5	L Pleis	R	Lo	P 2	Cervidae	7.5	11.9				
A5294	5	L Pleis	R	Lo	P 3	Cervidae	9.3	14.2				
A5294	5	L Pleis	R	Lo	P 4	Cervidae	9.9					
A5295	5	L Pleis	R	Lo	M 3	Cervidae	9.6	27.7				
A5296	5	L Pleis	L	Lo	M 3	Cervidae	11.7	27.5			22.5	
A5297	5	L Pleis	L	Up	P	Cervidae		15.0				
A5298	5	L Pleis	L	Up	M	Cervidae	11.6	19.6				
A532	3	L Pleis	Un	Un	M	Cervidae	20.4	23.3				
A533	3	L Pleis	Un	Un	M	Cervidae	14.3	22.9				
A535	3	L Pleis	Un	Lo	I	Cervidae	6.3	9.3	15.1			
A5353	5	L Pleis	L	Up	M	Cervidae		25.7				
A5354	5	L Pleis	R	Up	M	Cervidae	14.6	22.3				
A5356	5	L Pleis	L	Lo	P	Cervidae						
A5357	5	L Pleis	L	Lo	P	Cervidae	10.7	17.9				
A5358	5	L Pleis	R	Up	P	Cervidae	10.5	15.8				
A5359	5	L Pleis	L	Up	P	Cervidae	10.6	14.9				
A5360	5	L Pleis	L	Lo	M 3	Cervidae	10.8					
A5361	5	L Pleis	R	Un	P	Cervidae	12.9	14.5				
A5362	5	L Pleis	Un	Up	M	Cervidae						
A5363	5	L Pleis	Un	Un	M	Cervidae						
A5364	5	L Pleis	Un	Un	M	Cervidae						
A5365	5	L Pleis	Un	Un	M	Cervidae						
A5366	5	L Pleis	Un	Up	M	Cervidae	12.4					
A5367	5	L Pleis	R	Up	M	Cervidae	10.7	21.2	15.5			
A5368	5	L Pleis	R	Up	M	Cervidae	9.2	17.7				
A5369	5	L Pleis	L	Up	M	Cervidae	10.4	21.0				
A537	3	L Pleis	R	Up	M	Cervidae	17.7	25.3				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A5370	5	L Pleis	L	Up	P 2	Cervidae	4.9	9.0				
A5370	5	L Pleis	L	Up	P 3	Cervidae	7.4	15.5				
A5371	5	L Pleis	L	Lo	P	Cervidae	7.9	16.3				
A5372	5	L Pleis	L	Lo	M 1	Cervidae	11.0	11.1				
A5372	5	L Pleis	L	Lo	M 2	Cervidae	11.1	15.1				
A5372	5	L Pleis	L	Lo	M 3	Cervidae	11.1	24.7				
A5373	5	L Pleis	Un	Un	P	Cervidae	12.3					
A5374	5	L Pleis	R	Up	P 3	Cervidae	12.2	9.7				
A5374	5	L Pleis	R	Up	P 4	Cervidae	12.7	9.9			62.2	
A5375	5	L Pleis	R	Up	M	Cervidae		20.0				
A5376	5	L Pleis	L	Up	Ch	Cervidae	10.8	18.3				
A5377	5	L Pleis	L	Up	M	Cervidae	15.8	17.3				
A5377	5	L Pleis	Un	Up	M	Cervidae	15.4					
A5378	5	L Pleis	R	Up	M	Cervidae	21.4		11.9			
A5378	5	L Pleis	L	Up	M	Cervidae	20.3	18.5				
A5380	5	L Pleis	L	Up	M	Cervidae	9.6	16.5				
A5382	5	L Pleis	R	Up	M	Cervidae	15.2	21.0				
A5404	5	L Pleis	R	Up	M	Cervidae	14.2	16.9				
A5405	5	L Pleis	Un	Lo	M	Cervidae						15.8
A5409	5	L Pleis	L	Lo	P 3	Cervidae	11.6	13.3				
A5413	5	L Pleis	Un	Un	M	Cervidae	17.5					
A5414	5	L Pleis	Un	Un	M	Cervidae						
A5415	5	L Pleis	Un	Un	M	Cervidae						
A5416	5	L Pleis	R	Lo	P	Cervidae						
A542	3	L Pleis	R	Up	M	Cervidae	20.0	26.0				
A5499	5	L Pleis	L	Lo	P 3	Cervidae	7.2	8.6				
A5499	5	L Pleis	L	Lo	P 4	Cervidae	9.4	11.5				
A5500	5	L Pleis	Un	Lo	M	Cervidae						
A5502	5	L Pleis	L	Lo	P 4	Cervidae	9.1	14.7				
A5502	5	L Pleis	L	Lo	M 1	Cervidae	11.1	18.0				
A5503	5	L Pleis	R	Up	M	Cervidae	14.1	22.6	4.0			8.9
A5504	5	L Pleis	L	Up	P 4	Cervidae	12.8	13.4				
A5507	5	L Pleis	L	Up	P 3	Cervidae	10.4	14.9				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A5509	5	L Pleis	Un	Un	M 3	Cervidae						
A5512	5	L Pleis	Un	Un	M	Cervidae						
A5515	5	L Pleis	Un	Un	M	Cervidae						
A5517	5	L Pleis	Un	Un	Ch	Cervidae						
A5583	5	L Pleis	Un	Un	Ch	Cervidae			12.1			
A5586	5	L Pleis	Un	Un	M	Cervidae						
A5589	5	L Pleis	Un	Un	M	Cervidae			8.4			
A5590	5	L Pleis	Un	Un	M	Cervidae						
A5591	5	L Pleis	Un	Un	M	Cervidae						
A5678	5	L Pleis	Un	Lo	M	Cervidae	9.1		15.1			
A5680	5	L Pleis	Un	Lo	M	Cervidae	10.1					
A5693	5	L Pleis	R	Lo	P 2	Cervidae	5.7	11.3				
A5693	5	L Pleis	R	Lo	P 3	Cervidae	8.3	15.3				
A5703	5	L Pleis	Un	Un	M	Cervidae		15.2				
A5705	5	L Pleis	Un	Un	M	Cervidae						
A5712	5	L Pleis	Un	Lo	I	Cervidae	5.9	5.7				
A5804	5	L Pleis	Un	Un	C	Cervidae	6.1	8.4				
A5907	5	L Pleis	R	Lo	P	Cervidae	6.2	12.0			48.4	
A5939	5	L Pleis	L	Up	M	Cervidae	15.3		30.9			
A5941	5	L Pleis	Un	Lo	C	Cervidae			5.9			
A5986	5	L Pleis	R	Up	M	Cervidae						
A5988	5	L Pleis	Un	Up	P	Cervidae						
A5989	5	L Pleis	Un	Lo	I	Cervidae	6.3	11.0				
A5994	5	L Pleis	R	Lo	P 2	Cervidae	4.7	10.4				
A5995	5	L Pleis	Un	Un	M	Cervidae	12.1					
A5996	5	L Pleis	Un	Un	M	Cervidae			17.9			
A60	2	Holo	R	Lo	P 4	Cervidae	10.5	17.0				
A6141	5	L Pleis	L	Lo	M	Cervidae	12.3	21.5				
A6143	5	L Pleis	Un	Up	P 2	Cervidae	10.1	12.1				
A6145	5	L Pleis	R	Lo	P	Cervidae	8.5	16.6				
A6146	5	L Pleis	Un	Un	M	Cervidae						
A6148	5	L Pleis	Un	Un	M	Cervidae			14.0			
A6150	5	L Pleis	R	Lo	P 2	Cervidae	6.2	9.8	9.6			

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A6178	5	L Pleis	Un	Up	M	Cervidae	13.5					
A6179	5	L Pleis	R	Lo	M	Cervidae	7.0	17.2	9.5			
A6180	5	L Pleis	R	Lo	P 3	Cervidae	7.5	15.8				
A6181	5	L Pleis	L	Up	P	Cervidae	8.4	11.0				
A6182	5	L Pleis	Un	Un	M	Cervidae			18.1			
A6183	5	L Pleis	R	Lo	P 2	Cervidae	6.8	12.7	12.6			
A6185	5	L Pleis	R	Lo	M	Cervidae	9.6	20.8				
A6186	5	L Pleis	Un	Un	M	Cervidae						
A6188	5	L Pleis	L	Up	M	Cervidae	12.2	24.6				
A6189	5	L Pleis	Un	Up	M	Cervidae						
A6195	5	L Pleis	R	Lo	P 4	Cervidae	9.7	17.0				
A6195	5	L Pleis	R	Lo	M 1	Cervidae	12.0	16.5				
A6196	5	L Pleis	L	Lo	M	Cervidae	12.4	22.6				
A6199	5	L Pleis	R	Lo	M	Cervidae	12.7	21.7				
A6200	5	L Pleis	L	Lo	M 3	Cervidae	11.4		12.7			
A6201	5	L Pleis	Un	Lo	M	Cervidae	9.9					
A6202	5	L Pleis	R	Lo	P	Cervidae	8.9	18.0				
A6204	5	L Pleis	L	Lo	M	Cervidae	10.8	18.1				
A6206	5	L Pleis	R	Lo	I 2	Cervidae	7.7	11.6				
A6211	5	L Pleis	R	Un	P	Cervidae	13.9	15.4				
A6214	5	L Pleis	Un	Un	M	Cervidae			2.6			
A6248	5	L Pleis	R	Lo	P 4	Cervidae	10.4	18.2				
A6249	5	L Pleis	R	Lo	I 1	Cervidae	6.7	14.1				
A6252	5	L Pleis	Un	Un	M	Cervidae						
A6254	5	L Pleis	L	Up	M	Cervidae	7.3	24.9				
A6256	5	L Pleis	L	Lo	P	Cervidae	8.8	12.8				
A6257	5	L Pleis	R	Up	P	Cervidae	15.1	14.5				
A6258	5	L Pleis	L	Up	M	Cervidae	17.9	19.7				
A6259	5	L Pleis	L	Up	M	Cervidae						
A6265	5	L Pleis	L	Up	M	Cervidae	18.4	23.9				
A6266	5	L Pleis	R	Lo	M 3	Cervidae		10.1				
A6268	5	L Pleis	L	Lo	P 4	Cervidae	8.2	12.6	12.3			
A6269	5	L Pleis	Un	Up	P	Cervidae	14.8					

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A6271	5	L Pleis	Un	Up	M	Cervidae	9.2					
A6272	5	L Pleis	L	Lo	I 1	Cervidae	7.9	15.3	14.8			
A6275	5	L Pleis	L	Lo	I 1	Cervidae	7.9	12.9				
A6276	5	L Pleis	Un	Up	M	Cervidae	8.1				48.4	
A6277	5	L Pleis	Un	Un	M	Cervidae						
A6288	5	L Pleis	Un	Un	M	Cervidae						
A6289	5	L Pleis	Un	Up	M	Cervidae			15.6			
A6290	5	L Pleis	Un	Un	M	Cervidae						
A6291	5	L Pleis	L	Lo	P 2	Cervidae	6.4					
A6331	5	L Pleis	R	Up	M	Cervidae						
A6332	5	L Pleis	Un	Un	M	Cervidae						
A6381	5	L Pleis	R	Up	P	Cervidae						
A6382	5	L Pleis	Un	Un	M	Cervidae						
A6488	5	L Pleis	Un	Un	Ch	Cervidae						
A6489	5	L Pleis	Un	Up	M	Cervidae						
A6491	5	L Pleis	Un	Un	M	Cervidae						
A6596	5	L Pleis	L	Lo	M 3	Cervidae	9.2	20.5				
A6609	5	L Pleis	R	Lo	P	Cervidae	7.5	18.6				
A6610	5	L Pleis	L	Lo	P 4	Cervidae	8.4	16.2				
A6642	5	L Pleis	L	Lo	P	Cervidae	10.1	18.4				
A6644	5	L Pleis	Un	Lo	M	Cervidae			17.3			
A6645	5	L Pleis	R	Up	M	Cervidae	9.9	18.2				
A6646	5	L Pleis	Un	Lo	M	Cervidae						
A6647	5	L Pleis	Un	Lo	P 2	Cervidae	8.2		38.9			
A6706	5	L Pleis	L	Lo	M	Cervidae	10.7					
A6707	5	L Pleis	R	Lo	P	Cervidae	8.4	16.0				
A6708	5	L Pleis	R	Lo	M	Cervidae	11.4					
A6711	5	L Pleis	L	Lo	P 3	Cervidae	8.8	16.2				
A6711	5	L Pleis	L	Lo	P 4	Cervidae	10.5	16.3				
A6712	5	L Pleis	R	Lo	I	Cervidae	6.6	7.7				
A6715	5	L Pleis	R	Up	M	Cervidae	14.2	25.1				
A6716	5	L Pleis	R	Up	M	Cervidae	24.0					
A6717	5	L Pleis	R	Lo	M	Cervidae	14.0					

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A6718	5	L Pleis	L	Up	M	Cervidae		23.6				
A6719	5	L Pleis	R	Lo	M 3	Cervidae	12.5					
A6720	5	L Pleis	R	Up	M	Cervidae	21.8	23.9	5.2			
A6721	5	L Pleis	R	Un	M	Cervidae	12.0					
A6722	5	L Pleis	R	Lo	M	Cervidae	8.5	18.3				
A6723	5	L Pleis	Un	Up	P	Cervidae				49.6		
A6727	5	L Pleis	R	Lo	P 4	Cervidae	9.1	16.0				
A6727	5	L Pleis	R	Lo	M 1	Cervidae		17.6				
A6727	5	L Pleis	R	Lo	M 2	Cervidae	11.7	18.3				12.9
A6728	5	L Pleis	L	Lo	M 2	Cervidae		20.3				12.9
A6728	5	L Pleis	L	Lo	M 3	Cervidae	14.8	31.0				12.9
A6729	5	L Pleis	R	Lo	M 3	Cervidae	13.9	28.8	9.7			
A6730	5	L Pleis	L	Up	P 3	Cervidae		16.1	7.6	33.9		
A6730	5	L Pleis	L	Up	P 4	Cervidae	14.1	12.6	6.4	35.8		
A6731	5	L Pleis	R	Up	M	Cervidae	24.7	21.6				
A6732	5	L Pleis	L	Lo	M	Cervidae			13.1			
A6733	5	L Pleis	R	Up	P 3	Cervidae	12.5	15.3				
A6734	5	L Pleis	Un	Lo	M	Cervidae						
A6737	5	L Pleis	Un	Up	P	Cervidae	7.8	8.0	12.7			
A6740	5	L Pleis	L	Up	M	Cervidae	21.1		13.0			
A6741	5	L Pleis	L	Lo	P 4	Cervidae	9.5	16.7				
A6746	5	L Pleis	L	Lo	M	Cervidae	14.7	19.3	5.4			
A6746	5	L Pleis	L	Lo	M	Cervidae	10.9					
A6752	5	L Pleis	L	Lo	M	Cervidae	11.5					
A6753	5	L Pleis	L	Up	M	Cervidae	14.5	23.0	9.6	37.9		
A6754	5	L Pleis	Un	Lo	M	Cervidae	10.7					
A6755	5	L Pleis	Un	Lo	I	Cervidae	8.1	14.0	14.7			
A6756	5	L Pleis	Un	Lo	P	Cervidae						
A6757	5	L Pleis	Un	Un	M	Cervidae			26.1			
A6765	5	L Pleis	R	Up	P	Cervidae	15.8	15.2				
A6782	5	L Pleis	R	Lo	M	Cervidae	9.9	15.8				
A6783	5	L Pleis	R	Lo	M	Cervidae	8.8	16.2	8.0			
A6800	5	L Pleis	R	Lo	M	Cervidae	18.5	20.6	15.1			

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A6801	5	L Pleis	L	Lo	P 2	Cervidae	7.6	18.0				
A6802	5	L Pleis	Un	Lo	M	Cervidae	17.1		8.5			
A6848	5	L Pleis	Un	Lo	M	Cervidae	8.8		13.1			
A6849	5	L Pleis	L	Lo	M	Cervidae	11.6	23.6				
A6890	5	L Pleis	L	Up	P	Cervidae	12.8	15.0				
A6895	5	L Pleis	Un	Lo	M	Cervidae	15.7					
A6910	5	L Pleis	R	Lo	P 2	Cervidae	5.5	9.0				
A6912	5	L Pleis	Un	Lo	M	Cervidae	10.6					
A6913	5	L Pleis	Un	Un	M	Cervidae						
A6938	5	L Pleis	Un	Un	Ch	Cervidae						
A6941	5	L Pleis	Un	Un	M	Cervidae						
A6983	5	L Pleis	R	Up	P	Cervidae	13.6	14.9				
A6984	5	L Pleis	L	Up	P 3	Cervidae	10.1	12.5				
A6984	5	L Pleis	L	Up	P 4	Cervidae	10.1	10.5				
A6985	5	L Pleis	L	Up	Dp	Cervidae	9.2	14.6	2.1			
A6995	5	L Pleis	Un	Un	M	Cervidae				49.6		
A6996	5	L Pleis	Un	Un	M	Cervidae						
A6999	5	L Pleis	L	Lo	P 2	Cervidae	8.0	10.7				
A7000	5	L Pleis	Un	Lo	M	Cervidae	14.9	23.7	21.1			
A7001	5	L Pleis	R	Up	P	Cervidae	14.9					
A7002	5	L Pleis	L	Up	P	Cervidae						
A7003	5	L Pleis	L	Up	P	Cervidae	10.1	12.3				
A7004	5	L Pleis	R	Up	P	Cervidae		14.8	9.7			
A7049	5	L Pleis	L	Up	M	Cervidae		12.5				
A7052	5	L Pleis	Un	Lo	M	Cervidae						
A7053	5	L Pleis	L	Lo	M	Cervidae	14.1		17.4			
A7054	5	L Pleis	L	Lo	M	Cervidae	14.9					
A7055	5	L Pleis	R	Lo	P 4	Cervidae	12.3	20.8				
A7056	5	L Pleis	R	Lo	M	Cervidae	8.2	13.9				
A7057	5	L Pleis	Un	Up	P	Cervidae		14.8				
A7058	5	L Pleis	R	Up	P	Cervidae	14.4	14.3				
A7059	5	L Pleis	R	Up	M	Cervidae	14.7	23.0	5.8			
A7085	5	L Pleis	Un	Un	M	Cervidae						

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A7086	5	L Pleis	Un	Un	M	Cervidae	8.2					
A7088	5	L Pleis	R	Lo	P 4	Cervidae	10.0	15.5				
A7089	5	L Pleis	R	Lo	P 4	Cervidae	10.0	17.2				
A7089	5	L Pleis	R	Lo	M 1	Cervidae	12.0	16.6				
A7090	5	L Pleis	R	Lo	M 2	Cervidae	13.3	22.0				
A7090	5	L Pleis	R	Lo	M 3	Cervidae	12.5	27.6				
A7129	5	L Pleis	L	Lo	P 2	Cervidae	5.5	13.0				
A7130	5	L Pleis	L	Lo	P 4	Cervidae	11.1	16.3				
A7131	5	L Pleis	Un	Un	P 4	Cervidae	9.0	17.0				
A7134	5	L Pleis	R	Up	M	Cervidae	10.5			23.9		
A7135	5	L Pleis	L	Lo	M	Cervidae						
A7136	5	L Pleis	Un	Un	M	Cervidae						
A7138	5	L Pleis	R	Lo	M	Cervidae	10.2					
A7139	5	L Pleis	R	Lo	M	Cervidae	13.5	19.2	5.5	35.6	54.2	88.9
A7140	5	L Pleis	L	Lo	M	Cervidae	11.5	22.9				
A7141	5	L Pleis	L	Lo	P 4	Cervidae						19.3
A7141	5	L Pleis	L	Lo	M 1	Cervidae	11.4	21.5	11.8			
A7141	5	L Pleis	L	Lo	M 2	Cervidae	11.9	22.2				19.3
A7142	5	L Pleis	R	Lo	M	Cervidae	12.9	19.0	5.2			19.3
A7143	5	L Pleis	R	Lo	M 3	Cervidae	10.6	27.9				
A7144	5	L Pleis	R	Up	P	Cervidae						
A7145	5	L Pleis	R	Up	P	Cervidae		13.8	10.2	37.9		
A7146	5	L Pleis	L	Up	P 2	Cervidae	9.5	9.1				
A7147	5	L Pleis	L	Up	P	Cervidae	9.3	17.1	11.4			
A7148	5	L Pleis	L	Up	P 4	Cervidae	11.1	15.5				
A7149	5	L Pleis	R	Up	P	Cervidae	12.4	10.2		38.5		
A7151	5	L Pleis	R	Up	M	Cervidae		19.9				
A7152	5	L Pleis	R	Up	M	Cervidae	17.5	26.6	13.4			
A7196	5	L Pleis	L	Lo	P	Cervidae	8.5	9.2	11.6			
A7206	5	L Pleis	Un	Un	P	Cervidae						
A7207	5	L Pleis	Un	Lo	P	Cervidae	8.6					
A7208	5	L Pleis	L	Lo	P 4	Cervidae	10.9	17.9		41.9		
A7210	5	L Pleis	Un	Lo	M	Cervidae	10.6		8.1			

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A7211	5	L Pleis	Un	Lo	M	Cervidae	10.8		16.5			
A7213	5	L Pleis	L	Lo	M	Cervidae	8.2	14.0	15.1			
A7314	5	L Pleis	L	Lo	M 3	Cervidae	7.3					
A7315	5	L Pleis	R	Up	P	Cervidae	12.7	12.9				
A7316	5	L Pleis	R	Up	P	Cervidae		16.2				
A7355	5	L Pleis	L	Up	M	Cervidae	20.9	23.0			9.4	
A7363	5	L Pleis	Un	Up	P	Cervidae						
A7365	5	L Pleis	R	Up	M	Cervidae	13.1		8.4			
A7367	5	L Pleis	R	Lo	P 4	Cervidae	11.6	17.4				
A7369	5	L Pleis	Un	Un	Ch	Cervidae	8.8	12.7				
A7370	5	L Pleis	R	Up	M	Cervidae		20.9				
A738	3	L Pleis	R	Up	M	Cervidae	17.0	29.7				
A739	3	L Pleis	L	Up	M	Cervidae						
A7432	5	L Pleis	R	Lo	P 4	Cervidae	12.0	16.9				
A7433	5	L Pleis	L	Lo	P	Cervidae	12.7	13.8				
A7434	5	L Pleis	R	Up	M	Cervidae	13.2	23.9				
A7436	5	L Pleis	L	Lo	I 1	Cervidae	8.5					
A7438	5	L Pleis	L	Lo	M 2	Cervidae	4.9	12.8	16.1			
A7439	5	L Pleis	R	Lo	M	Cervidae	8.4	16.5				
A7440	5	L Pleis	Un	Up	M	Cervidae	15.8	19.4				
A7441	5	L Pleis	L	Lo	M	Cervidae		17.1				
A7442	5	L Pleis	Un	Up	M	Cervidae						
A7443	5	L Pleis	Un	Lo	I	Cervidae	6.2	5.5				
A7445	5	L Pleis	R	Up	M	Cervidae	13.4	14.3				
A7446	5	L Pleis	R	Up	M	Cervidae	10.6	14.9				
A7450	5	L Pleis	Un	Lo	M	Cervidae			6.4			
A7451	5	L Pleis	L	Up	M	Cervidae	13.7	16.1				
A7452	5	L Pleis	R	Up	M	Cervidae	11.9	23.3				
A7453	5	L Pleis	L	Up	M	Cervidae	12.1	18.4				
A7456	5	L Pleis	Un	Up	M	Cervidae			10.5			
A7457	5	L Pleis	R	Lo	M 3	Cervidae	9.2					
A7458	5	L Pleis	R	Up	M	Cervidae	15.4	22.0	16.6			
A7459	5	L Pleis	R	Up	M	Cervidae	11.9	13.7				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A7460	5	L Pleis	R	Up	M 3	Cervidae	11.5	16.6				
A7474	5	L Pleis	Un	Un	Ch	Cervidae						
A7477	5	L Pleis	L	Lo	P 3	Cervidae	8.8	18.0				
A7478	5	L Pleis	Un	Un	M	Cervidae	13.6					
A7479	5	L Pleis	Un	Up	M	Cervidae	12.1					
A7483	5	L Pleis	L	Up	M	Cervidae	14.5	24.2	3.7		24.6	
A7484	5	L Pleis	Un	Lo	M	Cervidae						
A7485	5	L Pleis	Un	Lo	M	Cervidae						
A7525	5	L Pleis	Un	Un	Ch	Cervidae	10.0					
A7526	5	L Pleis	R	Lo	I 1	Cervidae	7.4	13.9				
A7539	5	L Pleis	L	Lo	M	Cervidae	12.1	20.0				
A7540	5	L Pleis	R	Lo	I	Cervidae	7.8	13.5				
A7541	5	L Pleis	L	Lo	M 1	Cervidae	9.6	16.5				
A7541	5	L Pleis	L	Lo	M 2	Cervidae		19.0				
A7573	5	L Pleis	Un	Lo	M	Cervidae	12.7					
A7574	5	L Pleis	R	Lo	P 4	Cervidae	12.6	17.4				
A7574	5	L Pleis	R	Lo	M 1	Cervidae	14.1	19.6	14.6			
A7575	5	L Pleis	L	Lo	P 4	Cervidae	8.6	15.6				
A7635	5	L Pleis	Un	Lo	M	Cervidae				49.6		
A7636	5	L Pleis	Un	Lo	M	Cervidae			16.6			
A7658	5	L Pleis	R	Lo	I 2	Cervidae	8.1	9.2				
A7659	5	L Pleis	Un	Lo	I 2	Cervidae	7.3	11.6				
A7660	5	L Pleis	Un	Up	M	Cervidae	13.8					
A7672	5	L Pleis	Un	Up	Ch	Cervidae						
A7691	5	L Pleis	Un	Up	M	Cervidae	16.2		14.4			
A7692	5	L Pleis	Un	Lo	I	Cervidae						
A7693	5	L Pleis	Un	Lo	M	Cervidae	10.9					
A7694	5	L Pleis	L	Lo	M	Cervidae	12.5	18.4	10.5			
A7696	5	L Pleis	L	Up	P	Cervidae	16.4	15.2				
A7697	5	L Pleis	R	Up	P	Cervidae	14.2	16.8				
A7701	5	L Pleis	Un	Lo	P 4	Cervidae	7.9	13.9				
A7702	5	L Pleis	L	Lo	M 3	Cervidae	7.9	13.9				
A7704	5	L Pleis	Un	Un	M	Cervidae						

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A7705	5	L Pleis	Un	Un	M 3	Cervidae						
A7706	5	L Pleis	Un	Un	P	Cervidae	19.0	15.2	16.3			
A7707	5	L Pleis	R	Lo	M 1	Cervidae	10.9	16.3				
A7707	5	L Pleis	R	Lo	M 2	Cervidae	9.6	19.7				
A7707	5	L Pleis	R	Lo	M 3	Cervidae	8.6	22.6				
A7709	5	L Pleis	R	Lo	M 3	Cervidae	8.1	18.7	14.2			
A7712	5	L Pleis	R	Lo	P 4	Cervidae	10.5	19.4				
A7713	5	L Pleis	Un	Lo	M	Cervidae						
A7714	5	L Pleis	L	Lo	M	Cervidae	9.5	19.4				
A7716	5	L Pleis	Un	Un	M	Cervidae	14.9					14.1
A7717	5	L Pleis	Un	Lo	P 3	Cervidae	9.2					14.1
A7718	5	L Pleis	R	Lo	I	Cervidae	6.4	5.9	8.6	33.9		
A7721	5	L Pleis	R	Up	M	Cervidae	19.2	22.8				
A7726	5	L Pleis	R	Lo	M	Cervidae						
A7727	5	L Pleis	Un	Un	M	Cervidae						
A7741	5	L Pleis	L	Lo	P 2	Cervidae	6.6	13.2		35.8		
A7742	5	L Pleis	R	Lo	P 3	Cervidae	5.9	9.9				
A7742	5	L Pleis	R	Lo	P 4	Cervidae	7.5	12.6	5.6	35.6	54.2	88.9
A7750	5	L Pleis	R	Lo	P 2	Cervidae	6.6	9.3				
A7755	5	L Pleis	R	Lo	P 3	Cervidae	7.7	12.5	14.1			
A7755	5	L Pleis	R	Lo	P 4	Cervidae	6.4		13.9			
A7784	5	L Pleis	Un	Un	M	Cervidae						
A7785	5	L Pleis	L	Lo	P 3	Cervidae	7.3	13.0	4.0			
A7820	5	L Pleis	Un	Up	P	Cervidae	14.8					
A7835	6	L Pleis	L	Up	M	Cervidae		20.0	18.0			
A7836	6	L Pleis	R	Lo	Ch	Cervidae						
A7837	6	L Pleis	L	Lo	P 2	Cervidae	5.6	12.8				
A7838	6	L Pleis	Un	Up	M	Cervidae	10.8					
A7844	6	L Pleis	R	Lo	P 4	Cervidae	10.1	19.0	15.4			
A7876	6	L Pleis	Un	Lo	I	Cervidae	10.5	13.9	19.9			
A7879	6	L Pleis	L	Lo	M	Cervidae	11.9	22.2				
A788	3	L Pleis	R	Lo	I 1	Cervidae	7.5	12.1	10.9			
A789	3	L Pleis	R	Lo	P 4	Cervidae	8.4	13.9				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A7894	6	L Pleis	R	Up	P	Cervidae	11.3	14.9				
A790	3	L Pleis	L	Lo	P 4	Cervidae	8.4	16.0	30.3			
A7904	7	L Pleis	Un	Un	M	Cervidae						
A7905	7	L Pleis	L	Lo	P	Cervidae	10.2			23.9		
A7906	7	L Pleis	L	Lo	P 4	Cervidae	10.5	18.0				
A7907	7	L Pleis	R	Lo	M	Cervidae	15.1	25.2				
A7909	7	L Pleis	Un	Up	P	Cervidae		15.3	7.2			
A7910	7	L Pleis	R	Up	M	Cervidae		20.8			63.8	
A7911	7	L Pleis	L	Up	M	Cervidae		16.5				
A7912	7	L Pleis	L	Up	Dp	Cervidae	10.7	12.8	10.5			
A8	2	Holo	Un	Lo	I	Cervidae						
A821	3	L Pleis	L	Up	M	Cervidae	18.4	25.2	17.4			
A830	3	L Pleis	R	Lo	M 3	Cervidae	9.9	27.1				
A846	3	L Pleis	R	Lo	I 1	Cervidae	8.8	14.0				
A861	3	L Pleis	L	Lo	M 1	Cervidae	15.0	18.6				
A881	3	L Pleis	Un	Up	M	Cervidae	18.5	22.2	18.0			
A895	3	L Pleis	Un	Up	M	Cervidae	9.3					
A895	3	L Pleis	L	Lo	P	Cervidae		10.3			58.8	
A910	3	L Pleis	L	Lo	M 3	Cervidae	9.9	22.5				
A912	3	L Pleis	L	Lo	P 4	Cervidae	21.5	23.0	9.1			
A913	3	L Pleis	Un	Un	M	Cervidae	1.3		10.5			
A914	3	L Pleis	Un	Up	M	Cervidae	12.6		14.8			
A915	3	L Pleis	R	Lo	M	Cervidae	13.9	23.2		32.0		
A916	3	L Pleis	Un	Up	M	Cervidae	13.0		7.8	36.7		
A917a	3	L Pleis	R	Up	P 2	Cervidae	10.7	10.5				
A917b	3	L Pleis	R	Up	P 3	Cervidae	12.4	9.4	10.5	36.7		
A917c	3	L Pleis	R	Up	P 4	Cervidae	13.1	9.2				
A919	3	L Pleis	R	Lo	M 3	Cervidae	10.1	27.6				
A923a	3	L Pleis	R	Up	M 1	Cervidae	14.5	19.5				10.6
A923b	3	L Pleis	R	Up	M 3	Cervidae	17.8	21.0				10.6
A923c	3	L Pleis	R	Up	M 2	Cervidae	18.2	19.6				
A926	3	L Pleis	R	Lo	I 1	Cervidae	8.0	13.8	11.1			
A929	3	L Pleis	R	Lo	M 3	Cervidae	11.2	30.0				

Table 23 Taxonomic data of Cervidae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A932	3	L Pleis	L	Lo	I	Cervidae	7.2	7.4	8.7			
A932a	3	L Pleis	Un	Lo	Dp 2	Cervidae	6.4	10.9	17.4			
A932b	3	L Pleis	Un	Lo	Dp 3	Cervidae	7.2	16.9				
A932c	3	L Pleis	Un	Lo	Dp 4	Cervidae	8.4	26.1				
A932d	3	L Pleis	Un	Lo	M 1	Cervidae	10.1	21.1				
A933	3	L Pleis	R	Lo	I	Cervidae	5.8	5.4				
A936a	3	L Pleis	L	Lo	P 2	Cervidae	6.1	10.0				
A936b	3	L Pleis	L	Lo	P 3	Cervidae	6.8	12.9	16.6			
A936c	3	L Pleis	L	Lo	P 4	Cervidae	7.7	14.3				
A936d	3	L Pleis	L	Lo	M 1	Cervidae	10.9	14.1				
A936e	3	L Pleis	L	Lo	M 2	Cervidae	10.7	18.3				
A936f	3	L Pleis	L	Lo	M 3	Cervidae	10.5	22.2				
A938a	3	L Pleis	Un	Un	Dp 2	Cervidae						
A938b	3	L Pleis	Un	Un	Dp 3	Cervidae	10.2	20.0				
A938c	3	L Pleis	Un	Un	Dp 4	Cervidae	10.3	18.6				
A938d	3	L Pleis	Un	Un	M 1	Cervidae	10.1	24.1				
A942	3	L Pleis	L	Lo	P 2	Cervidae	3.2	5.1				
A951a	3	L Pleis	R	Lo	P 2	Cervidae	8.7	13.4				
A951b	3	L Pleis	R	Lo	P 3	Cervidae	10.6	13.3				
A951c	3	L Pleis	R	Lo	P 4	Cervidae	14.2	16.7				
A972	3	L Pleis	Un	Un	Ch	Cervidae			14.4			
A974	3	L Pleis	L	Lo	M 1	Cervidae	8.6	19.0				
A995	3	L Pleis	Un	Up	M	Cervidae	12.5		14.7			
A996	3	L Pleis	R	Lo	P 3	Cervidae	9.0	16.2				
A998a	3	L Pleis	R	Lo	I 1	Cervidae	7.0	11.6				
A998b	3	L Pleis	R	Lo	I 2	Cervidae	6.3	6.6				

Table 24 Taxonomic data of Muntiacus spp. from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1915	4	L Pleis	L	Up	M 1	*Muntiacus* spp.	9.8	10.0	6.9		35.5	
A1915	4	L Pleis	L	Up	M 2	*Muntiacus* spp.	9.3	11.3	10.4		35.5	
A1915	4	L Pleis	L	Up	M 3	*Muntiacus* spp.	8.7	11.5	11.2		35.5	
A1916	4	L Pleis	L	Up	P 3	*Muntiacus* spp.	6.7	7.5	9.5			
A1916	4	L Pleis	L	Up	P 4	*Muntiacus* spp.	6.4	6.9	9.4			

Table 25 Taxonomic data of Cervus unicolor from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A132	2	Holo	L	Lo	M 3	*Cervus unicolor*	13.2	32.9				
A4280	2	Holo	R	Up	M 1	*Cervus unicolor*	16.9	18.9				
A4281	2	Holo	R	Up	M 2	*Cervus unicolor*	15.7	23.7				
A279a	3	L Pleis	L	Up	P 3	*Cervus unicolor*	14.9	14.4				
A279b	3	L Pleis	L	Up	P 4	*Cervus unicolor*		12.5				
A279c	3	L Pleis	L	Up	M 1	*Cervus unicolor*	19.0	16.4				
A280a	3	L Pleis	L	Up	M 2	*Cervus unicolor*	21.4	20				
A280b	3	L Pleis	L	Up	M 3	*Cervus unicolor*	21.6	22.3				
A1621	4	L Pleis	R	Lo	M 3	*Cervus unicolor*	14.7	29.1				
A4282	2	Holo	R	Up	M 3	*Cervus unicolor*	18.6	22.5				
A5147	5	L Pleis	L	Up	M 1	*Cervus unicolor*	17.0	17.2	9.4			
A5147	5	L Pleis	L	Up	M 2	*Cervus unicolor*	10.8	20.8				
A5147	5	L Pleis	L	Up	M 3	*Cervus unicolor*	12.4	20.8				
A6210	5	L Pleis	R	Lo	M 3	*Cervus unicolor*	11.8	28				

Table 26 Taxonomic data of Bovinae from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1014	3	L Pleis	L	Lo	M 3	Bovinae	14.5	37.8				
A1021	3	L Pleis	L	Lo	M	Bovinae	14.4	37.1				
A1121	3	L Pleis	Un	Un	P	Bovinae	6.8	8.6				
A1125	3	L Pleis	L	Lo	I 1	Bovinae	7.5	12.9				
A1126	3	L Pleis	R	Lo	M	Bovinae	5.7	14				
A1139	3	L Pleis	L	Up	P	Bovinae		16.9				
A1162	3	L Pleis	L	Lo	M 2	Bovinae	10.3	28.4				
A1166	3	L Pleis	L	Up	M	Bovinae	20.1	26.1	14.1			
A117	2	Holo	L	Lo	I 1	Bovinae	7.3	13.6				
A1174	3	L Pleis	L	Lo	M	Bovinae	14.5	28.5				
A1182	3	L Pleis	Un	Lo	M	Bovinae	12.7					
A1207	3	L Pleis	Un	Lo	M	Bovinae	13.7	24.4				
A1211	3	L Pleis	Un	Un	M	Bovinae						
A1212	3	L Pleis	Un	Un	M	Bovinae						
A1226	3	L Pleis	L	Lo	M	Bovinae	13.1	16.1	6.3			
A1245	3	L Pleis	L	Lo	M	Bovinae	12.2	21.6	13.5			
A1288	3	L Pleis	Un	Lo	M	Bovinae	14.5	33.4	13.7			
A1298	3	L Pleis	L	Up	P	Bovinae		14.4	13.3			
A1301	3	L Pleis	Un	Un	M	Bovinae			13.1			
A1302	3	L Pleis	Un	Lo	M	Bovinae	7.6					
A1357	3	L Pleis	R	Lo	P 4	Bovinae	11.9	21.7				
A1413	3	L Pleis	Un	Un	P	Bovinae	13.5	19.2				
A1418	3	L Pleis	L	Lo	P	Bovinae						
A1429	3	L Pleis	Un	Un	Ch	Bovinae						
A1431	3	L Pleis	L	Up	M	Bovinae	11.8	20.4				
A1436	3	L Pleis	R	Lo	M	Bovinae	14.4	28				
A1449	3	L Pleis	Un	Lo	P	Bovinae						
A1450	3	L Pleis	Un	Un	M	Bovinae			14.2			
A1462	3	L Pleis	Un	Un	Ch	Bovinae						
A1506	3	L Pleis	L	Lo	M	Bovinae	12.9	25.9				8.8
A1507	3	L Pleis	L	Up	P 2	Bovinae	13.5	19.9				
A1508	3	L Pleis	Un	Un	M	Bovinae	11.9	24.3				
A1513	3	L Pleis	R	Lo	P	Bovinae						

Table 26 Taxonomic data of Bovinae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1514	3	L Pleis	Un	Un	M	Bovinae						
A1529	3	L Pleis	Un	Un	M	Bovinae	11.0					
A1599	4	L Pleis	Un	Un	M	Bovinae	9.7	28.4				
A1602	4	L Pleis	Un	Un	M	Bovinae						
A1606	4	L Pleis	R	Lo	M	Bovinae	14.6	24.9				
A1607	4	L Pleis	R	Up	M	Bovinae	22.9	34				
A1612	4	L Pleis	L	Lo	M	Bovinae	11.6	25.8				
A1613	4	L Pleis	R	Lo	M 3	Bovinae	12.0	31.2				
A1655	4	L Pleis	L	Lo	M 3	Bovinae	6.6	19.4	11.8			
A1677	4	L Pleis	L	Lo	M	Bovinae	24.1	27.5	13.4			
A1720	4	L Pleis	L	Lo	M	Bovinae	12.2					
A1720	4	L Pleis	L	Lo	M	Bovinae	12.4	25				
A1748	4	L Pleis	Un	Lo	M	Bovinae	19.0					
A1773	4	L Pleis	Un	Un	M	Bovinae		7.7				
A1906	4	L Pleis	R	Lo	M	Bovinae	12.9	31				
A1920	4	L Pleis	L	Lo	M	Bovinae	7.3	14.7				
A1944	4	L Pleis	L	Up	M	Bovinae	17.1	28				
A1989	4	L Pleis	R	Lo	M	Bovinae	8.3	16.9				
A2112	4	L Pleis	Un	Un	M	Bovinae						
A2203	4	L Pleis	Un	Un	M	Bovinae	8.6					
A2203	4	L Pleis	L	Lo	M	Bovinae	10.0	18.2				
A2210	4	L Pleis	R	Up	P	Bovinae	16.2	19.1				
A2213	4	L Pleis	R	Up	M	Bovinae	32.2					
A2231	4	L Pleis	R	Lo	M	Bovinae	10.2	20.4	17.3			
A2396	4	L Pleis	R	Lo	M 1	Bovinae	11.7	20.5				
A2396	4	L Pleis	R	Lo	M 2	Bovinae	11.8	24.2				
A2452	4	L Pleis	Un	Un	M	Bovinae						
A2466	4	L Pleis	L	Lo	I 1	Bovinae	7.6	13.6	15.9			
A2481	4	L Pleis	Un	Un	M	Bovinae	9.2		14.8			
A2488	4	L Pleis	L	Up	P	Bovinae	13.6	17.7	16.1			
A2489	4	L Pleis	L	Up	M	Bovinae	14.3	19.2	7.4			
A263a	3	L Pleis	R	Lo	M 1	Bovinae	6.9	10.8				
A263b	3	L Pleis	R	Lo	M 2	Bovinae	6.8	12				

Table 26 Taxonomic data of Bovinae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A2730	4	L Pleis	Un	Un	M	Bovinae					57.1	
A2731	4	L Pleis	R	Lo	I 1	Bovinae	7.4	15.2			57.1	
A277	3	L Pleis	Un	Un	M	Bovinae		23.2				
A2776	4	L Pleis	Un	Lo	I	Bovinae	6.9	6.7	8.4			
A286	3	L Pleis	Un	Lo	M	Bovinae	13.1		16.6			
A2997	4	L Pleis	Un	Un	M	Bovinae						
A3035	4	L Pleis	R	Up	M	Bovinae	17.0	29.1	14.9			
A3054	4	L Pleis	R	Lo	M	Bovinae	7.8	15.8				
A3127	5	L Pleis	Un	Lo	I 1	Bovinae	7.8	14.5				
A3152	5	L Pleis	L	Up	P	Bovinae	12.6	20.9				
A3153	5	L Pleis	L	Lo	M	Bovinae	14.2	24.9				
A3154	5	L Pleis	L	Lo	M	Bovinae	14.5	38.1				
A3330	5	L Pleis	Un	Lo	I 1	Bovinae	7.7				60.2	
A3419	5	L Pleis	R	Lo	I 1	Bovinae	8.5	14.9				
A3420	5	L Pleis	L	Lo	I 1	Bovinae	7.9	12.8				
A3421	5	L Pleis	L	Lo	I 1	Bovinae	7.3	10.9				
A3423	5	L Pleis	L	Lo	I 1	Bovinae	7.1	9.9				
A3432	5	L Pleis	R	Lo	P	Bovinae	12.6	21				
A3435	5	L Pleis	Un	Un	M	Bovinae			16.7			
A3603	5	L Pleis	Un	Up	M	Bovinae	20.5		5.1			
A3604	5	L Pleis	Un	Lo	M	Bovinae	19.3		6.6			
A3605	5	L Pleis	L	Up	P 2	Bovinae	13.7	18.1				
A3606	5	L Pleis	L	Up	P 3	Bovinae	18.6	19				
A3606	5	L Pleis	L	Up	P 4	Bovinae	17.6	19.5	16.2			
A3607	5	L Pleis	L	Up	M 1	Bovinae	23.0	26.1				
A3608	5	L Pleis	L	Up	M 2	Bovinae	22.6	18.5				
A3613	5	L Pleis	Un	Lo	I 1	Bovinae	10.1	14				
A3648	5	L Pleis	Un	Lo	I 1	Bovinae						
A3696	5	L Pleis	R	Lo	M	Bovinae	13.0	30				
A3699	5	L Pleis	R	Up	P 2	Bovinae	16.7					
A3704	5	L Pleis	R	Lo	P	Bovinae		13				
A3707	5	L Pleis	L	Lo	M 3	Bovinae	7.2	20.5	12.7			
A3724	5	L Pleis	R	Lo	I 1	Bovinae	6.3	13.3				

Table 25 Taxonomic data of Bovinae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A3816	5	L Pleis	Un	Un	M	Bovinae						11.1
A3962	5	L Pleis	L	Lo	I 1	Bovinae	6.4	11.5			9.6	
A4204	5	L Pleis	L	Lo	M	Bovinae	12.7	29.1	13.3			
A4210	5	L Pleis	R	Lo	M	Bovinae		15.9				
A4214	5	L Pleis	Un	Lo	M	Bovinae	9.9					
A4294	2	Holo	Un	Lo	M	Bovinae	11.7					
A4344	3	L Pleis	R	Lo	M	Bovinae	14.2	27.9		38.5		
A4348	3	L Pleis	R	Lo	I	Bovinae	9.6	11.7	15.4			
A4374	3	L Pleis	Un	Un	M	Bovinae						
A4520	5	L Pleis	Un	Lo	M	Bovinae			10			
A4521	5	L Pleis	Un	Un	M	Bovinae			5.9			
A472	3	L Pleis	R	Lo	M 1	Bovinae	13.6	21.6				
A48	2	Holo	Un	Up	M	Bovinae			7.7			
A491	3	L Pleis	L	Lo	P	Bovinae	10.0	21.5				
A495	3	L Pleis	L	Lo	M 2	Bovinae	14.4					16.9
A499	3	L Pleis	R	Up	P	Bovinae	14.5	17.1				
A500	3	L Pleis	Un	Lo	M	Bovinae	16.7	25.7				
A501	3	L Pleis	Un	Un	M	Bovinae	8.6	21.5	4.7			
A502	3	L Pleis	R	Up	M	Bovinae		28				
A5032	5	L Pleis	R	Lo	I 1	Bovinae	7.7	14.4				
A507	3	L Pleis	L	Lo	M 3	Bovinae	11.6	26.5				
A507	3	L Pleis	L	Lo	M 2	Bovinae	11.1	16.5				
A5188	5	L Pleis	R	Lo	M 1	Bovinae	14.1	23.4				
A5188	5	L Pleis	R	Lo	M 2	Bovinae	12.0	28.2				
A521	3	L Pleis	R	Lo	M	Bovinae	7.2	14	14.9			
A536	3	L Pleis	Un	Un	M	Bovinae	6.7					
A5388	5	L Pleis	Un	Lo	M	Bovinae						
A5389	5	L Pleis	Un	Un	M	Bovinae						
A540	3	L Pleis	R	Up	M 1	Bovinae	20.0	26	15.1			
A540	3	L Pleis	R	Up	P 3	Bovinae	16.9	17.3				15.8
A5411	5	L Pleis	Un	Lo	M	Bovinae	7.7	15.8				
A6212	5	L Pleis	L	Lo	P 2	Bovinae	10.4	14.3				
A6246	5	L Pleis	Un	Lo	M	Bovinae	14.1					

Table 26 Taxonomic data of Bovinae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A6251	5	L Pleis	L	Lo	P 4	Bovinae	8.8	17.2	21.1			
A6253	5	L Pleis	Un	Un	M	Bovinae						
A6273	5	L Pleis	Un	Lo	I 1	Bovinae	7.8	10.4				
A6274	5	L Pleis	Un	Un	M	Bovinae						
A6710	5	L Pleis	R	Lo	M	Bovinae	13.9	29.9	6.4			
A6742	5	L Pleis	R	Up	M	Bovinae	23.1					
A6743	5	L Pleis	R	Up	M	Bovinae	23.0					
A6744	5	L Pleis	R	Up	M	Bovinae	19.9	31.6	19.1			
A6745	5	L Pleis	L	Lo	M	Bovinae	20.1	24.3	3.6	35.6	54.2	88.9
A6748	5	L Pleis	Un	Lo	M	Bovinae	12.3					
A6933	5	L Pleis	Un	Un	M	Bovinae						
A6934	5	L Pleis	Un	Un	M	Bovinae			27.9			
A6987	5	L Pleis	Un	Un	Ch	Bovinae						
A6988	5	L Pleis	Un	Lo	M	Bovinae	12.3					
A7153	5	L Pleis	R	Lo	M	Bovinae	14.9	25.7				
A7154	5	L Pleis	L	Lo	M	Bovinae	7.0	15.9	11.6			
A7360	5	L Pleis	R	Lo	M	Bovinae	7.9	14.3	7.9			
A7430	5	L Pleis	R	Lo	P	Bovinae	10.4	17.7				
A7455	5	L Pleis	Un	Lo	M	Bovinae	13.4					
A7462	5	L Pleis	Un	Un	M	Bovinae	7.2					
A7475	5	L Pleis	Un	Lo	M	Bovinae	9.8					
A7568	5	L Pleis	Un	Un	M	Bovinae	10.4					
A7569	5	L Pleis	Un	Lo	M	Bovinae			3.8			
A7570	5	L Pleis	Un	Lo	M	Bovinae						9.1
A7637	5	L Pleis	Un	Up	P	Bovinae	8.3	7.7				
A7695	5	L Pleis	L	Lo	M	Bovinae	11.2					
A770	3	L Pleis	L	Up	P	Bovinae	16.2	13.1		32		
A771	3	L Pleis	Un	Un	M	Bovinae						
A7710	5	L Pleis	Un	Un	M	Bovinae	6.1	14.6				
A772	3	L Pleis	L	Un	M	Bovinae	10.1					14.1
A773	3	L Pleis	Un	Un	M	Bovinae			11.9			
A774	3	L Pleis	Un	Un	M	Bovinae						
A7863	6	L Pleis	R	Lo	M 1	Bovinae	12.2	25.7		32		

Table 26 Taxonomic data of Bovinae from area 1, the Tham Lod rockshelter (continued).

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A7863	6	L Pleis	R	Lo	M 2	Bovinae	12.6	31.9			64.6	
A7893	6	L Pleis	Un	Up	P	Bovinae		15.8	8.5			
A7895	6	L Pleis	R	Up	M	Bovinae						
A832	3	L Pleis	Un	Un	P	Bovinae		15.5				
A895	3	L Pleis	Un	Up	M	Bovinae	9.3		16.4			
A918a	3	L Pleis	L	Lo	P 4	Bovinae			7.5			
A918b	3	L Pleis	L	Lo	M 1	Bovinae	8.8	19.3	9.2			
A920	3	L Pleis	L	Lo	M	Bovinae	13.0	26	7.1			
A927	3	L Pleis	R	Lo	M	Bovinae	14.9	33.1				
A931	3	L Pleis	Un	Un	M	Bovinae	11.1		6.9			
A934	3	L Pleis	L	Lo	M 2	Bovinae	14.5	26				
A966a	3	L Pleis	L	Up	M 1	Bovinae						
A966b	3	L Pleis	L	Up	M 2	Bovinae						
A966c	3	L Pleis	L	Up	M 3	Bovinae	7.5					
A973	3	L Pleis	R	Lo	M 3	Bovinae	7.4	19.9				
A979	3	L Pleis	R	Lo	P	Bovinae	10.3					
A997	3	L Pleis	Un	Un	M	Bovinae		9.4				

Table 27 Taxonomic data of Bubalus sp. from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A131	2	L Pleis	R	Lo	P 3	*Bubalus* sp.	10.4	20.9				
A282	3	L Pleis	R	Lo	M 3	*Bubalus* sp.	15.0	31.4				
A928a	3	L Pleis	R	Lo	P 2	*Bubalus* sp.	5.7	9	39.9			
A928b	3	L Pleis	R	Lo	P 3	*Bubalus* sp.	8.8	17.3				
A928c	3	L Pleis	R	Lo	P 2	*Bubalus* sp.	7.2					
A1292	3	L Pleis	L	Lo	M 3	*Bubalus* sp.	16.3	42.6				
A1605	4	L Pleis	L	Lo	P 2	*Bubalus* sp.	8.5	11.8	10.1			
A1605	4	L Pleis	L	Lo	P 3	*Bubalus* sp.	12.7	20.1	18.9			
A7358	5	L Pleis	R	Lo	P	*Bubalus* sp.	11.5	25.8	14.9	44.6		

Table 28 Taxonomic data of Bubalus sp. from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A921	3	L Pleis	L	Lo	M 3	*Bos* spp.	12.8	33.7	8.3			
A1434	3	L Pleis	L	Lo	M 3	*Bos* spp.	12.1	35.5				
A4300	3	L Pleis	R	Up	P 3	*Bos* spp.	16.6	21.7				
A4301	3	L Pleis	R	Up	P	*Bos* spp.	19.1	20.1				
A1939	4	L Pleis	L	Lo	M 3	*Bos* spp.	12.1	33.2				
A3119	4	L Pleis	R	Lo	M 3	*Bos* spp.	8.8	22.4	7.8			
A3694	5	L Pleis	L	Lo	P 3	*Bos* spp.	12.3					
A3695	5	L Pleis	L	Lo	P 4	*Bos* spp.	19.5					
A5236	5	L Pleis	L	Lo	P 3	*Bos* spp.	11.2	23	10			
A6739	5	L Pleis	R	Lo	M 3	*Bos* spp.	14.4					
A7703	5	L Pleis	L	Lo	P 4	*Bos* spp.	12.2	24.6				

Table 29 Taxonomic data of Naemorhedus spp. from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1013	3	L Pleis	L	Lo	M	*Naemorhedus* spp.	10.1	13.7				
A1015	3	L Pleis	L	Lo	M 2	*Naemorhedus* spp.	9.9	16.1				
A1015	3	L Pleis	L	Lo	M 3	*Naemorhedus* spp.	10.3	24	9.2			
A1019	3	L Pleis	L	Lo	M 3	*Naemorhedus* spp.						
A1020	3	L Pleis	L	Lo	M 3	*Naemorhedus* spp.			6.1			
A1102	3	L Pleis	L	Lo	P 3	*Naemorhedus* spp.	6.4	9				
A1102	3	L Pleis	L	Lo	P 4	*Naemorhedus* spp.	6.3	9.6				
A1172	3	L Pleis	Un	Lo	M 3	*Naemorhedus* spp.	6.6	19.2	14			
A1178	3	L Pleis	L	Lo	M	*Naemorhedus* spp.	4.7	12.5	12.6			
A1181	3	L Pleis	L	Up	M	*Naemorhedus* spp.	10.1	14.2				
A1285	3	L Pleis	Un	Lo	M 3	*Naemorhedus* spp.					14.7	
A129	2	Holo	Un	Lo	M	*Naemorhedus* spp.	11.1	12.9	13.9			
A1299	3	L Pleis	R	Lo	M 3	*Naemorhedus* spp.		14.1				
A1299	3	L Pleis	R	Lo	M 2	*Naemorhedus* spp.		12.3				

Table 29 Taxonomic data of Naemorhedus spp. from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1364	3	L Pleis	L	Lo	P 4	*Naemorhedus* spp.	9.3	16.7	8.7			
A1367	3	L Pleis	Un	Up	M	*Naemorhedus* spp.	10.4	14.1	10.5			
A1410	3	L Pleis	Un	Un	M	*Naemorhedus* spp.			20.7			
A1417	3	L Pleis	R	Lo	M	*Naemorhedus* spp.	14.4	13.6	13.3			
A1421	3	L Pleis	R	Lo	M 3	*Naemorhedus* spp.	6.4	14.7				
A1455	3	L Pleis	R	Lo	P	*Naemorhedus* spp.	6.0	11.5				
A1456	3	L Pleis	L	Lo	M	*Naemorhedus* spp.	7.7	13.1				
A1467	3	L Pleis	L	Lo	M 3	*Naemorhedus* spp.	9.9		8.7			
A1542	3	L Pleis	R	Lo	M	*Naemorhedus* spp.	8.6	11.9	16.1			
A1604	4	L Pleis	L	Lo	M 3	*Naemorhedus* spp.	7.1	12.6	5.6			
A1615	4	L Pleis	L	Lo	P 2	*Naemorhedus* spp.						
A1615	4	L Pleis	L	Lo	P 3	*Naemorhedus* spp.	5.7	8.9	3.3			
A1615	4	L Pleis	L	Lo	P 4	*Naemorhedus* spp.	5.7	8.9	6.4			
A1619	4	L Pleis	Un	Lo	M 3	*Naemorhedus* spp.						
A1741	4	L Pleis	R	Up	M 3	*Naemorhedus* spp.	7.7	15.6				
A1742	4	L Pleis	R	Up	M	*Naemorhedus* spp.	10.2	15.6				
A1744	4	L Pleis	R	Lo	M	*Naemorhedus* spp.	8.7	14.5				
A1753	4	L Pleis	L	Up	M 3	*Naemorhedus* spp.	9.6	15.2				
A1805	4	L Pleis	R	Lo	M	*Naemorhedus* spp.	8.4	14.2				
A1807	4	L Pleis	L	Lo	M	*Naemorhedus* spp.	6.3	15.3	10.1			
A1855	4	L Pleis	R	Up	M	*Naemorhedus* spp.	10.0	12.2				
A1921	4	L Pleis	L	Up	M 3	*Naemorhedus* spp.	8.7	13.3				
A1933	4	L Pleis	R	Up	M	*Naemorhedus* spp.	9.5	14.5				
A1937	4	L Pleis	Un	Lo	M	*Naemorhedus* spp.						
A1994	4	L Pleis	Un	Un	M	*Naemorhedus* spp.	10.7	20				
A1995	4	L Pleis	R	Up	M	*Naemorhedus* spp.	11.4	14.5				
A1996	4	L Pleis	R	Up	M	*Naemorhedus* spp.	12.0	13.8				
A2001	4	L Pleis	R	Lo	M	*Naemorhedus* spp.	7.8	13.8				
A2006	4	L Pleis	R	Up	M	*Naemorhedus* spp.	9.5	14.7				
A2132	4	L Pleis	R	Lo	P 3	*Naemorhedus* spp.	5.8	7.8				9.1
A2132	4	L Pleis	R	Lo	P 4	*Naemorhedus* spp.	10.9	16.1				9.1
A2133	4	L Pleis	Un	Un	P	*Naemorhedus* spp.	6.8	9.2				9.1

Table 29 Taxonomic data of Naemorhedus spp. from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A2208	4	L Pleis	L	Lo	M	*Naemorhedus* spp.	10.5	12				
A2209	4	L Pleis	L	Up	M 3	*Naemorhedus* spp.	7.3	14.3				
A2247	4	L Pleis	Un	Lo	M 3	*Naemorhedus* spp.						
A2482	4	L Pleis	L	Lo	M 3	*Naemorhedus* spp.	7.5					
A258	3	L Pleis	R	Lo	M	*Naemorhedus* spp.	5.0	13.9				
A2902	4	L Pleis	R	Lo	M 3	*Naemorhedus* spp.	11.8					
A2998	4	L Pleis	L	Lo	M 3	*Naemorhedus* spp.			12.7			
A3053	4	L Pleis	Un	Lo	M	*Naemorhedus* spp.	6.8					
A3427	5	L Pleis	L	Lo	P 4	*Naemorhedus* spp.	6.1	11.1				
A3438	5	L Pleis	Un	Lo	M	*Naemorhedus* spp.	6.6					
A3439	5	L Pleis	L	Lo	M	*Naemorhedus* spp.	8.1	13.3				
A3441	5	L Pleis	L	Up	M	*Naemorhedus* spp.	10.9	11.9	7			
A3452	5	L Pleis	R	Up	M 3	*Naemorhedus* spp.	7.6	16.8				
A3453	5	L Pleis	L	Lo	M	*Naemorhedus* spp.	7.6	13.1				
A3616	5	L Pleis	L	Up	M	*Naemorhedus* spp.	7.3	14.7				
A3661	5	L Pleis	L	Up	M	*Naemorhedus* spp.	8.4	16.1				
A3665	5	L Pleis	Un	Lo	M 3	*Naemorhedus* spp.	8.3	19.1				
A3702	5	L Pleis	L	Up	M	*Naemorhedus* spp.	8.9	14.3				
A3706	5	L Pleis	L	Up	M	*Naemorhedus* spp.	6.9					
A3708	5	L Pleis	R	Up	P	*Naemorhedus* spp.	17.6	15.1				
A3813	5	L Pleis	L	Lo	M	*Naemorhedus* spp.	11.6					10.3
A3823	5	L Pleis	L	Lo	P	*Naemorhedus* spp.	5.9	12.3				
A3961	5	L Pleis	R	Lo	M	*Naemorhedus* spp.	9.4	12.3			9.6	
A4208	5	L Pleis	R	Up	M	*Naemorhedus* spp.	14.1	20.6	6.3			
A4226	5	L Pleis	Un	Lo	M	*Naemorhedus* spp.	7.7					
A4414	5	L Pleis	Un	Lo	M	*Naemorhedus* spp.	6.3					
A4504	5	L Pleis	R	Up	M	*Naemorhedus* spp.	11.2	11.7				
A4543	5	L Pleis	Un	Up	M	*Naemorhedus* spp.	10.1	14	8.5			
A4544	5	L Pleis	R	Lo	M	*Naemorhedus* spp.	6.3		4.2		59.5	75.4
A473	3	L Pleis	L	Lo	M 3	*Naemorhedus* spp.	6.8					
A4791	5	L Pleis	L	Lo	M	*Naemorhedus* spp.	7.4	13.1				
A4792	5	L Pleis	R	Up	M	*Naemorhedus* spp.	8.4	12.7	7.5			
A508	3	L Pleis	L	Lo	M	*Naemorhedus* spp.	5.6	12.7	17.3			

Table 29 Taxonomic data of Naemorhedus spp. from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A5148	5	L Pleis	Un	Lo	M	*Naemorhedus* spp.	7.9	13				
A5154	5	L Pleis	L	Lo	M	*Naemorhedus* spp.	8.0	13.8				
A5164	5	L Pleis	R	Lo	M	*Naemorhedus* spp.	7.4	12.7				
A5194	5	L Pleis	Un	Un	M	*Naemorhedus* spp.	8.5	12.4	18.9			
A5282	5	L Pleis	L	Up	M	*Naemorhedus* spp.		13.2				
A530	3	L Pleis	R	Lo	P 4	*Naemorhedus* spp.	8.0	15.5				
A531	3	L Pleis	Un	Up	P	*Naemorhedus* spp.	7.3	9.6				
A6144	5	L Pleis	R	Up	M	*Naemorhedus* spp.	11.1	12.7	11.1			
A6192	5	L Pleis	Un	Lo	M	*Naemorhedus* spp.			3.1			
A6267	5	L Pleis	R	Up	M	*Naemorhedus* spp.	8.5	15.9				
A6270	5	L Pleis	R	Up	P	*Naemorhedus* spp.	8.5	9.5				
A6713	5	L Pleis	L	Up	M 3	*Naemorhedus* spp.	9.1	14	16.6			
A6750	5	L Pleis	L	Up	M	*Naemorhedus* spp.	10.7	19	16.5			
A6750	5	L Pleis	L	Up	M	*Naemorhedus* spp.		19.8	8.3			
A6939	5	L Pleis	L	Up	M 3	*Naemorhedus* spp.	10.3					
A6940	5	L Pleis	L	Up	M	*Naemorhedus* spp.	10.7	11.1				
A6986	5	L Pleis	R	Lo	M 3	*Naemorhedus* spp.	7.6	19.9	3.7			
A7029	5	L Pleis	Un	Lo	M	*Naemorhedus* spp.	8.6		16.7			
A7133	5	L Pleis	Un	Lo	M	*Naemorhedus* spp.	9.9					
A7195	5	L Pleis	Un	Lo	M	*Naemorhedus* spp.						
A7212	5	L Pleis	Un	Lo	M	*Naemorhedus* spp.	10.1					
A7359	5	L Pleis	Un	Lo	M	*Naemorhedus* spp.	6.3		14.2			
A7361	5	L Pleis	R	Up	M	*Naemorhedus* spp.	9.6	16.2				
A7362	5	L Pleis	R	Up	M	*Naemorhedus* spp.	11.4	13.7	12.2			
A7371	5	L Pleis	R	Up	M	*Naemorhedus* spp.	9.7	18.9				
A7372	5	L Pleis	Un	Lo	M	*Naemorhedus* spp.	8.8					
A7373	5	L Pleis	R	Lo	M	*Naemorhedus* spp.						
A7374	5	L Pleis	L	Lo	M 3	*Naemorhedus* spp.	8.5	20.8				
A7375	5	L Pleis	L	Up	M	*Naemorhedus* spp.	9.7	13.8				
A7376	5	L Pleis	L	Up	M	*Naemorhedus* spp.	9.6	14.4				
A7377	5	L Pleis	L	Up	M	*Naemorhedus* spp.	8.5	15.9				
A7431	5	L Pleis	L	Up	P	*Naemorhedus* spp.	6.9	8.1				
A7461	5	L Pleis	Un	Lo	M	*Naemorhedus* spp.	6.7					

Table 29 Taxonomic data of Naemorhedus spp. from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A7463	5	L Pleis	L	Lo	M 3	*Naemorhedus* spp.						
A7464	5	L Pleis	L	Lo	M	*Naemorhedus* spp.		17.7				
A7465	5	L Pleis	L	Up	M 3	*Naemorhedus* spp.	7.7	15.1				
A7480	5	L Pleis	R	Up	M 3	*Naemorhedus* spp.	7.1	14.4	5.6			
A7657	5	L Pleis	Un	Lo	M	*Naemorhedus* spp.						
A7661	5	L Pleis	Un	Lo	M	*Naemorhedus* spp.	7.5					
A7662	5	L Pleis	Un	Up	M	*Naemorhedus* spp.	8.9					
A7663	5	L Pleis	R	Lo	M	*Naemorhedus* spp.	10.7	15.3				
A7670	5	L Pleis	L	Lo	Ch	*Naemorhedus* spp.	7.6	11.6				
A7671	5	L Pleis	L	Lo	P 3	*Naemorhedus* spp.	4.9					
A7671	5	L Pleis	L	Lo	P 4	*Naemorhedus* spp.	4.9					
A7708	5	L Pleis	R	Up	M	*Naemorhedus* spp.	10.9	15.7				5.9
A7715	5	L Pleis	R	Lo	M 3	*Naemorhedus* spp.	9.3					
A7719	5	L Pleis	R	Up	M	*Naemorhedus* spp.	6.7	13.5				
A7743	5	L Pleis	R	Up	M	*Naemorhedus* spp.	11.9	16.9				
A7786	5	L Pleis	R	Lo	P 2	*Naemorhedus* spp.	6.2	9.3				
A7787	5	L Pleis	L	Lo	M 3	*Naemorhedus* spp.	6.2					
A7788	5	L Pleis	R	Lo	M 3	*Naemorhedus* spp.	8.1	21.5				
A7841	6	L Pleis	Un	Lo	M	*Naemorhedus* spp.	6.1					
A9	2	Holo	Un	Up	M	*Naemorhedus* spp.	8.5	15.2				
A791	3	L Pleis	R	Lo	M	*Naemorhedus* spp.	7.3	13.1			63.8	
A897	3	L Pleis	Un	Lo	M	*Naemorhedus* spp.	6.8				58.8	
A980	3	L Pleis	R	Lo	M	*Naemorhedus* spp.	10.2	17.7			8.9	
A7843	6	L Pleis	L	Lo	M	*Naemorhedus* spp.	8.3					
A7846	6	L Pleis	Un	Up	M	*Naemorhedus* spp.			15			
A7847	6	L Pleis	L	Up	M	*Naemorhedus* spp.	10.5	18.7	10.2	39.1		

Table 30 Taxonomic data of Bovidae from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A3440	5	L Pleis	L	Lo	M 3	Bovidae	7.8	18.5	9.7			

Table 31 Taxonomic data of incertae cedis. from area 1, the Tham Lod rockshelter.

Collection number	Layer	Stratigraphic Level	Side	Jaw	Kind	Identification	Width (mm)	Length (mm)	CH (mm)	LPR (mm)	LMR (mm)	LTR (mm)
A1501	3	L Pleis	Un	Un	Ch	*incertae cedis*	9.6	7				
A5592	5	L Pleis	Un	Un	I	*incertae cedis*	5.9	4.9				

APPENDIX C

DENTAL MEASUREMENT DATA OF THE RECENT SPECIMENS

Table 1 Dental size of cheek teeth of recent *Macaca* sp. in Thailand.

Collection number	Wide (mm)						Length(mm)						Height of crown (mm)					
	P2	P3	P4	M1	M2	M3	P2	P3	P4	M1	M2	M3	P2	P3	P4	M1	M2	M3
Upper jaw																		
M. mulata MNH_Chula_14 (P22)_Right		5.4	5.8	5.8	7.5			4.1	5.8	6.0	7.2			6.1	5.3	5.0	5.9	
M. mulata MNH_Chula_14 (P22)_Left		5.5	5.9	5.8	7.5			2.9	3.6	6.0	7.5			6.4	5.8	4.5	6.5	
M. fascicularis MNH_Chula_15_Right		5.5	5.5	5.6	7.0			4.3	4.1	5.3	7.0			5.4	5.6	3.4	4.0	
M. fascicularis MNH_Chula_15_Left		5.5	5.8	5.5	7.1			4.1	4.9	5.4	7.0			4.9	5.1	3.8	4.6	
M. assamensis MNH_Chula_16 (P5)_Right		5.1	5.6	6.3	7.5	7.3		3.6	4.4	5.6	7.4	7.6		4.4	4.9	4.2	4.9	4.2
*M. assamensis MNH_Chula_16 (P5)*_Left		5.3	5.6	6.5	7.5	7.4		4.0	4.4	5.6	7.4	7.4		4.3	4.1	3.9	4.4	4.7
Lower jaw																		
M. mulata MNH_Chula_14 (P22)_Right		4.9	4.6	4.7	6.0			5.9	4.2	5.8	7.3			6.9	6.1	4.8	6.8	
M. mulata MNH_Chula_14 (P22)_Left		5.1	4.1	4.6	5.6			6.0	4.2	6.1	7.5			6.6	5.5	4.4	5.6	
M. fascicularis MNH_Chula_15_Right		4.6	4.9	5.7	5.8			6.5	3.8	5.1	6.5				4.6	3.8	5.4	
M. fascicularis MNH_Chula_15_Left		5.1	4.5	5.0	6.1			6.9	4.1	5.8	6.7				5.2	3.4	5.2	

Table 2 Dental measurement of the recent specimens of Subfamily Colobinae (Autrakulvit, 2004).

Kind of teeth	Dental measurement (mm)			
	Presbytis femoralis		*Semnopithecus phayrei*	
	Wide	Length	Wide*	Length*
Upper jaw				
Molar 1	5.93	6.12	5.47±0.38 5.74-5.20	5.52±0.10 5.59-5.45
Molar 2	6.46	6.22	6.02±0.39 6.44-5.67	5.71±0.12 5.85-5.61
Molar 3	5.54	6.33	5.58±0.03 5.61-5.55	5.48±0.16 5.67-5.32
Lower jaw				
Molar 1	4.86	6.06	4.78±0.06 4.82-4.73	5.43±0.07 5.48-5.38
Molar 2	5.4	6.41	5.06±0.03 5.08-5.04	5.58±0.20 5.72-5.44
Molar 3	5.2	7.44	5.03±0.19 5.16-4.89	6.66±0.13 6.75-6.56

* Displaying in Average ± Standard deviation (Maximum number-Minimum number)

Table 3 Dental size of each cheekteeth of recent *Ursus* in Thailand (*Ursus thibetanus* and *U. malayanus*)

Collection number	Wide (mm)						Length (mm)						Height of crown (mm)					
	P2	P3	P4	M1	M2	M3	P2	P3	P4	M1	M2	M3	P2	P3	P4	M1	M2	M3
Upper jaw																		
U. thibetanus NHM_NSM_4 right			7.6	12	15				12	18	26							
U. thibetanus NHM_NSM_4 left			8.3	13	15				12	17	26							
U. thibetanus NHM_NSM_6 right			10	14	16				14	20	28							
U. thibetanus NHM_NSM_6 left			9.7	14	16				14	20	28							
U. malayanus MNH_Chula_C2 right			9	14	14				11	15	21				6.6	7.9	6.2	
U. malayanus MNH_Chula_C2 left			9.1	14	14				10	17	21				7.4	7.6	6.1	
U. malayanus NHM_NSM_15 right			8.2	14	15				11	17	20							
U. malayanus NHM_NSM_15 left			8.2	15	15				12	17	22							
Lower jaw																		
U. thibetanus NHM_NSM_6 right				9.3	13					21	21							
U. thibetanus NHM_NSM_6 left				10	13					23	22							
U. malayanus MNH_Chula_C2 right			6.5	8.3	11	10			8.2	17	16	9.2			5.3	8.2	6.6	3.3
U. malayanus MNH_Chula_C2 left			6.1	8.6	11	6.1			7.5	17	16	8			4.6	7.9	6.7	3.9
U. malayanus NHM_NSM_15 right			6.6	10	11				9.8	18	18							
U. malayanus NHM_NSM_15 left				9.6	12	10				18	17	11						

Table 4 Molar row length and teeth row length of recent *Ursus* in Thailand

Collection number	Dental measurement (mm)	
	Molar row length (M1-3)	Teeth row length (P4-M3)
Upper jaw		
U. thibetanus NHM_NSM_4 right	44	56.7
U. thibetanus NHM_NSM_4 left	43.1	57
U. thibetanus NHM_NSM_6 right	47.1	60.4
U. thibetanus NHM_NSM_6 left	47.28	60.78
U. malayanus MNH_Chula_C2 right	36.6	41.92
U. malayanus MNH_Chula_C2 left	36.2	41.4
U. malayanus NHM_NSM_15 right	37.6	48.5
U. malayanus NHM_NSM_15 left	36.08	48.78
Lower jaw		
U. thibetanus NHM_NSM_6 right	57.88	67.32
U. thibetanus NHM_NSM_6 left	57.3	66.78
U. malayanus MNH_Chula_C2 right	43.4	52.2
U. malayanus MNH_Chula_C2 left	41.9	52
U. malayanus NHM_NSM_15 right	46.08	55.1
U. malayanus NHM_NSM_15 left	46.21	56.1

Table 5 Dental size of each cheekteeth of recent *Arctonyx collaris* in Thailand

Collection number	Wide (mm)						Length (mm)						Height of crown (mm)					
	P1	P2	P3	P4	M1	M2	P1	P2	P3	P4	M1	M2	P1	P2	P3	P4	M1	M2
Lower jaw																		
A. collaris MNH_Chula_20 right			3.1	3.3	6.9	5.1			5.6	6.1	18.2	6.5			3.5	4.0	5.5	2.7
A. collaris MNH_Chula_20 left		2.2	3.0	3.4	7.6			3.6	6.0	6.6	18.7			1.9	3.5	4.3	5.9	
A. collaris MNH_Chula_C17 right									4.3	7.8	18.8				3.8	5.4		
A. collaris MNH_Chula_C17 left									4.9	8.0	18.9				3.8	5.2		

Table 6 Lower molar row length recent *Arctonyx collaris* in Thailand

Collection number	Molar row length (M1-3; mm)
Lower jaw	
A. collaris MNH_Chula_20 right	14.9
A. collaris MNH_Chula_20 left	13.1
A. collaris MNH_Chula_C17 right	20.3
A. collaris MNH_Chula_C17 left	21.4

Table 7 Dental size of each cheekteeth of recent wild pig (*Sus scrofa*) in Thailand

Collection number	Wide (mm)							Length (mm)							Height of crown (mm)						
	P1	P2	P3	P4	M1	M2	M3	P1	P2	P3	P4	M1	M2	M3	P1	P2	P3	P4	M1	M2	M3
Upper jaw																					
S. scrofa MNH_Chula_1_F_right		8.5	11.0	13.6	16.7	22.0	22.9		12.0	14.5	12.5	13.8	21.8	38.4		10.3	8.5	8.8	6.7	7.5	11.5
S. scrofa MNH_Chula_1_F_right		7.4	9.7	11.6	14.6	17.6	18.7		11.3	11.2	10.7	15.0	21.3	32.0		6.8	9.8	8.9	6.5	7.5	11.1
S. scrofa MNH_Chula_A8_right		6.8	10.0	12.9	14.7	19.3			12.1	12.0	11.0	17.0	22.3			10.5	12.9	10.5	8.6	11.9	
S. scrofa MNH_Chula_A8_left		6.9	10.2	12.9	14.2	18.3			11.6	12.0	11.1	16.3	22.5			9.2	12.5	16.7	8.4	11.3	
S. scrofa NHM_NSM_7_right					15	16						16	20								
S. scrofa NHM_NSM_7_left					14	16						15	20								
Lower jaw																					
S. scrofa MNH_Chula_1_F_right	3.5	6.4	7.7	10.0	12.0	15.6	18.6	6.8	10.6	11.4	13	13.5	19.4	38.0	4.4	9.4	9.4	10.8	5.0	8.8	7.9
S. scrofa MNH_Chula_1_F_right	3.4	5.6	8.5	10.6	12.2	16.1	17.5	6.6	10.4	12.9	13.4	16	19.9	32.0	5.3	8.5	9.9	9.1	6.3	4.9	7.4
S. scrofa MNH_Chula_A8_right		5.6	7.1	9.1	11.0	15.6			10.7	12.9	12.6	14.5	20.8			9.7	10.3	13.9	8.7	12.7	
S. scrofa MNH_Chula_A8_left	3.1	5.6	7.0	9.4	11.0	14.0		6.4	10.9	12.8	14.2	15.7	20.9		4.5	9.2	12.3	12.9	7.4	11.7	
S. scrofa NHM_NSM_7_right					13							20									
S. scrofa NHM_NSM_7_left					13							19									

Table 8 Molar row length and teeth row length of recent wild pig (Sus scrofa) in Thailand

Collection number	Dental measurement (mm)		
	Premolar row length (P2-4)	Molar row length (M1-3)	Teeth row length (P2-M3)
Upper jaw			
S. scrofa MNH_Chula_1_F_right		75.4	110.2
S. scrofa MNH_Chula_1_F_right		74.8	112.6
S. scrofa MNH_Chula_A8_right	46.6	57.4	98.6
S. scrofa MNH_Chula_A8_left	46.5	57.1	98.3
Lower jaw			
S. scrofa MNH_Chula_1_F_right	35.8	75.8	137.2
S. scrofa MNH_Chula_1_F_right	36.1	75.0	140.4
S. scrofa MNH_Chula_A8_right	37.2	56.9	97.3
S. scrofa MNH_Chula_A8_left	37.0	51.4	96.6

Table 9 Dental size of each cheekteeth of recent deer (genus *Cervus* and Muntiacus) in Thailand.

Collection number	Wide (mm)						Length (mm)						Height of crown (mm)					
	P2	P3	P4	M1	M2	M3	P2	P3	P4	M1	M2	M3	P2	P3	P4	M1	M2	M3
Upper jaw																		
C. unicolor MNH_Chula_31_right	15.0	18.8	17.2	22.9	23.0	23.1	17.5	15.4	13.9	18.9	23.0	23.0	8.0	8.8	8.0	8.2	12.0	13.3
C. unicolor MNH_Chula_31_left		18.6	17.3	22.4	22.7	22.6		16.4	14.1	19.5	23.4	23.2		8.3	9.1	7.2	12.4	13.6
C. unicolor NHM_NSM_1_right		14.9	15.6	19.4				14.7	14.0	16.0	20.5	21.4		11.0	11.2	8.4		11.7
C. unicolor NHM_NSM_1_left			17.9	19.7	21.2	19.9			14.5	15.4	20.2	21.2			10.2	7.1	10.6	12.3
C. eldi NHM_NSM_2_right			11.9	13.9	12.8	11.9			11.9	16.1	17.9	17.4			12.4	9.8	15.7	
C. eldi NHM_NSM_2-left			11.8	13.7	13.1	11.7			11.8	16.3	17.7	17.1			12.1	10.2	14.0	
M. muntijak MNH_Chula_19_M_right			8.1	10.3	10.7				9.2	10.3	14.1				9.9	7.1	10.6	
M. muntijak MNH_Chula_19_M_left			8.0	11.1	10.7				9.6	11.2	13.4				9.9	7.2	10.5	
M. muntijak MNH_Chula_30_M_right	9.9	10.3	9.6	12.1			7.4	6.7	5.7	9.2			4.4	5.3	6.7	4.4		
M. muntijak MNH_Chula_30_M_left	9.7	10.5	9.9	11.8	12.9	11.8	7.9	6.7	6.9	9.8	9.8	12.0	4.5	5.0	5.6	4.9	4.9	6.3
M. muntijak. NHM_NSM_5_M_right	7.6	8.5	8.6	11.8	10.8	9.9	9.2	9.2	8.4	11.6	13.9	13.8						
M. muntijak. NHM_NSM_5_M_left			8.8	11.6	10.1	10.4			9.0	12.3	14.0	13.9						
M. muntijak NHM_NSM_13_F_right	7.7	9.5	9.7	11.4	13.1	12.2	9.8	9.0	9.4	10.5	12.2	13.0						
M. muntijak NHM_NSM_13_F_left	7.7	9.4	9.5	12.2	13.2	12.2	9.8	8.6	9.3	9.8	11.7	13.2						
Muntiacus sp. MNH_Chula_34_M_right	5.8	6.5	6.3	7.7	9.0	7.5	7.4	6.0	7.4	10.7	12.4	11.5	11.4	12.3	11.7	9.6	11.2	

Table 9 Dental size of each cheekteeth of recent deer (genus *Cervus* and Muntiacus) in Thailand (continued)

Collection number	Wide (mm)						Length (mm)						Height of crown (mm)					
	P2	P3	P4	M1	M2	M3	P2	P3	P4	M1	M2	M3	P2	P3	P4	M1	M2	M3
Muntiacus sp. MNH_Chula_34_M_left	5.0	5.2	6.1	7.7	8.5	7.3	7.1	6.8	6.9	10.0	12.2	11.1	10.8	12.2	11.6	9.3	11.6	
Muntiacus sp. MNH_Chula_A3_F_right				9.0	8.1					11.6	14.0					11.1		
Muntiacus sp. MNH_Chula_A3_F_left				9.2	8.3					11.4	13.3					10.7		
Muntiacus sp. NHM_NSM_14_F_right	6.8	8.4	8.4	10.6	10.7	9.7	9.9	9.2	8.8	9.6	11.9	12.1						
Muntiacus sp. NHM_NSM_14_F_left	7.2	7.8	8.5	10.1	10.8	9.4	10.1	9.9	9.2	9.8	12.4	12.1						
Muntiacus sp. NHM_NSM_16_M_right	7.8	9.5	8.6	11.7	11.3	10.5	10.5	11.0	10.2	13.8	14.7	15.4						
Muntiacus sp. NHM_NSM_16_M_left	8.1	8.8	9.0	11.8	12.0	11.6	10.7	10.3	9.6	12.9	14.8	15.5						
Lower jaw																		
M. muntijak NHM_NSM_13_F_right	4.0	5.1	5.7	7.8	8.6	8.1	8.0	9.1	8.7	9.9	11.1	15.9						
M. muntijak NHM_NSM_13_F_left	3.7	5.0	5.7	7.7	8.9	8.2	8.6	9.1	9.2	10.0	10.6	15.5						
Muntiacus sp. MNH_Chula_34_M_right	2.2	3.3	4.7	6.7	7.3	7.2	10.0	10.6	10.4	12.5	13.3	15.5	7.6	10.1	9.5	8.7	11.4	
Muntiacus sp. MNH_Chula_34_M_left	2.0	3.6	5.0	6.6	7.1	7.2	9.6	11.1	10.3	11.5	13.3	14.9	7.9	10.1	9.7	9.1	11.5	
Muntiacus sp. MNH_Chula_A3_F_right				6.4	5.7					11.8	13.1					10.6		
Muntiacus sp. MNH_Chula_A3_F_left				5.9	5.9					11.8	12.8							
Muntiacus sp. NHM_NSM_14_F_right	4.5	5.2	6.4	8.1	8.8	8.2	8.6	8.9	9.3	10.1	12.1	17.1						
Muntiacus sp. NHM_NSM_14_F_left	3.9	5.0	6.9	7.6	8.5	8.2	8.7	9.5	9.6	9.9	11.1	17.3						

Table 10 Molar row length and teeth row length of recent deer(genus Cervus and Muntiacus) in Thailand

Collection number	Dental measurement (mm)		
	Premolar row length (P2-4)	Molar row length (M1-3)	Teeth row length (P2-M3)
Upper jaw			
C. unicolor MNH_Chula_31_right	51.1	68.7	117.6
C. unicolor MNH_Chula_31_left		66.7	
C. unicolor NHM_NSM_1_right	45.8	54.5	98.5
C. unicolor NHM_NSM_1_left	47.9	54.7	102.6
C. eldi NHM_NSM_2_right	37.2	48.3	82.6
C. eldi NHM_NSM_2-left	37.2	47.7	83.1
M. muntijak MNH_Chula_19_M_right	28.9	35.0	61.9
M. muntijak MNH_Chula_19_M_left	28.5	35.7	61.6
M. muntijak MNH_Chula_30_M_right	24.5		
M. muntijak MNH_Chula_30_M_left	23.0	29.7	53.6
M. muntijak. NHM_NSM_5_M_right	27.6	34.0	59.5
M. muntijak. NHM_NSM_5_M_left	27.2	34.6	60.7
M. muntijak NHM_NSM_13_F_right	26.7	30.5	57.5
M. muntijak NHM_NSM_13_F_left	26.8	31.5	57.3
Muntiacus sp. MNH_Chula_34_M_right	24.0	32.5	58.7

Table 10 Molar row length and teeth row length of recent deer(genus Cervus and Muntiacus) in Thailand (continued).

Collection number	Premolar row length (P2-4)	Molar row length (M1-3)	Teeth row length (P2-M3)
Muntiacus sp. MNH_Chula_34_M_left	24.9	32.3	57.8
Muntiacus sp. NHM_NSM_14_F_right	26.6	31.4	56.8
Muntiacus sp. NHM_NSM_14_F_left	26.3	31.3	57.1
Muntiacus sp. NHM_NSM_16_M_right	30.9	39.8	69.3
Muntiacus sp. NHM_NSM_16_M_left	30.6	40.1	69.6
Lower jaw			
M. muntijak NHM_NSM_13_F_right	26.7	30.5	57.5
M. muntijak NHM_NSM_13_F_left	26.8	31.5	77.3
Muntiacus sp. MNH_Chula_34_M_right	26.2	38.1	66.0
Muntiacus sp. MNH_Chula_34_M_left	26.4	37.1	66.6
Muntiacus sp. NHM_NSM_14_F_right	25.7	39.6	64.5
Muntiacus sp. NHM_NSM_14_F_left	26.0	39.6	65.8

Table 11 Dental size of each cheekteeth of recent Naemorhedus in Thailand (*N. sumatraensis* and *N. caudatus*)

Collection number	Width (mm)						Length (mm)						Height of crown (mm)					
	P2	P3	P4	M1	M2	M3	P2	P3	P4	M1	M2	M3	P2	P3	P4	M1	M2	M3
Upper jaw																		
*N. sumatraensis*_MNH_Chula_A9_right				9.7	9.9	8.3				15.9	16.1	16.8						
*N. sumatraensis*_MNH_Chula_A9_left				9.7	9.3	8.8				15.8	16.1	16.1						
*N. sumatraensis*_NHM_NSM_5_right	8.3	9.4	9.0	11.3	10.8	9.3	10.0	12.0	12.0	15.1	17.3	17.5						
*N. sumatraensis*_NHM_NSM_5_left		9.3	8.9	11.0	10.7	9.2		11.9	12.0	15.5	16.9	17.9						
*N. caudatus*_MNH_Chula_34_right			6.6	9.0	8.3	7.2		8.3	8.6	11.3	12.3	12.7						
*N. caudatus*_MNH_Chula_34_left			6.6	8.4	7.8	6.9			7.9	11.1	11.3	12.3						

Remark: The crown height cannot measure, the lower part of crown hide in the jaw.

BIOGRAPHY

Mr.Sawangpong Wattanapituksakul was born on March 14 ,1981, at Amphoe Maung, Roied Province. He has got Bachelor Degree of Science from Department of Biology, Faculty of Science, Konkaen University in 2003. He carried out further study Master program on Earth Science Department of Geology at Faculty of Science, Chulalongkorn University, in 2003. He has presented a paper concerning teeth size of mammal from Thamlod rockshelter, Amphoe Pang Ma Pha, Mae Hong Son Province in the Dynamic of Social, Culture, and Environment in highland area in Pang Ma Pha Distric, Mae Hong Son Province at Princess Maha Chahri Sirindhorn Anthropology Centre, Bangkok on 9-10 August 2006.