

New discoveries from the classic Quaternary mammalian fossil area of Yanjinggou, Chongqing, and their chronological explanations

CHEN ShaoKun^{1,2,3*}, PANG LiBo¹, HE CunDing¹, WEI GuangBiao¹, HUANG WanBo^{1,2}, YUE ZongYing⁴, ZHANG XiaoHu⁵, ZHANG Hua⁶ & QIN Li¹

¹ Chongqing Three Gorges Institute of Paleoanthropology, China Three Gorges Museum, Chongqing 400015, China;

² Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences, Beijing 100044, China;

³ University of Chinese Academy of Sciences, Beijing 100049, China;

⁴ Wanzhou Museum, Wanzhou 404000, China;

⁵ Institute of Cultural Relics in Henan Province, Zhengzhou 450000, China;

⁶ Changzhou Museum, Changzhou 213022, China

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Yanjinggou in Wanzhou District of Chongqing is one of the earliest reported and most famous Quaternary mammalian fossil areas in China. The fauna from this area used to be taken as a benchmark for the biochronological comparison of Quaternary paleontology of South China, but the chronology of this fauna has many controversies for the lack of exact locational and stratigraphical records. The present article, on the basis of recent investigations and discoveries, discusses and explains the distribution and biochronology of the mammalian faunas in the Yanjinggou area. The newly discovered Dayakou fissure fauna, including *Rhizomys troglodytes*, *Homotherium* sp., *Panthera pardus*, *Stegodon orientalis*, *Dicerorhinus sumatrensis*, *Hesperotherium sinense*, *Sus* sp., *Cervavitus fenqii*, *Cervus* sp. and *Muntiacus* sp., is correlated to the middle Early Pleistocene. The presence of Early Pleistocene mammalian fauna in the Yanjinggou area is therefore confirmed. The “Wanhsien fauna” or “Yenchingkou (=Yanjinggou) fauna” as a Mid-Late Pleistocene biostratigraphical datum should be abandoned. The Dayakou fauna and the Upper Cave fauna of Pingba, both in the Yanjinggou area, are correlated to the middle Early Pleistocene and the early Middle Pleistocene in age, respectively.

Yanjinggou, Dayakou, Pleistocene, mammalian fauna, biostratigraphy

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Yanjinggou in Wanzhou District of Chongqing is a classic area for Quaternary mammalian fossils and is known by the world for its great number of well preserved specimens unearthed from the limestone fissures (commonly known as “pits”). Early in 1870, Owen [1] studied some fossils which were supposed to be from a locality near Chongqing, and named several common Pleistocene species of South China, such as *Stegodon orientalis*, *Rhinoceros sinensis* and *Ta-pirus sinensis*. He assumed those fossils were from Yanjinggou, but this remains unconfirmed. Matsumoto [2] described some Quaternary fossils from Szechuan (Sichuan

Province), which were probably from Yanjinggou, but his specimens were few and the study was relatively superficial. In 1921, Granger, a paleontologist of the Central Asiatic Expeditions of the American Museum of Natural History, visited Yanjinggou. During the 1920s, he collected a great number of mammalian fossils in this area and shipped them to the United States. The preliminary report about his collection was published in 1923, representing the first confirmed Quaternary mammalian fauna of South China [3].

As the typical “locality” of *Ailuropoda-Stegodon* fauna (strict sense), the geochronological position of Yanjinggou has perplexed Quaternary paleontologists for a long time. In the report of Matthew and Granger [3], this fauna was re-

*Corresponding author (email: cskesk2000@163.com)

ferred to the Late Pliocene for the appearance of *Hesperotherium* (*Chalicotherium* in the original paper) and *Stegodon*. Teilhard de Chardin et al. [4] discussed the cave deposits of Guangxi and correlated the Yanjinggou fauna with the yellow cave deposits of South China, which was thought to be of Early Pleistocene age. Colbert [5] considered the yellow cave deposits of South China and the Yanjinggou deposits as Middle Pleistocene. In 1953, Colbert and Hooijer [6] published a detailed study of Granger's collection from Yanjinggou, including 7 orders, 19 families and 28 species, commonly known as the "Wanhsien fauna" or "Yenchingkou (=Yanjinggou) fauna". Based on the fossilization of these specimens, they estimated the members of the Yanjinggou fauna, although mainly from the Middle Pleistocene, were not contemporaneous but a time-averaged assemblage from the early Middle Pleistocene to recent. Pei [7] and Chow [8] also placed this fauna in the Middle Pleistocene. Kahlke [9] divided the Yanjinggou fauna into two stages: the early Middle Pleistocene, which contains some archaic forms, and the late Middle Pleistocene. Li [10] followed the dichotomy of Kahlke but qualified the latter as the late Middle Pleistocene to the Late Pleistocene. Zheng [11] correlated the Yanjinggou fauna to the Upper Cave fauna of Pingba, which was thought to be the early Middle Pleistocene in age. A main reason for these different proposals is the complexity of Granger's collection. Most of the collection was dug out from Pingba but lacked exact locational and stratigraphical records, and mixed with some fossils of different ages from adjacent regions. Some specimens of this collection were poorly fossilized, and a few bones even preserve its original elasticity [6]. Moreover, previous work on the fauna always discussed the geochronology of the whole Yanjinggou fauna via either the mixed collection of Granger or fossils from just one fissure in this area.

In order to clarify the distribution of fossil localities in the Yanjinggou area and understand their ages, Chongqing Three Gorges Institute of Paleoanthropology made an investigation covering a large area during 2010–2011. A considerable amount of mammalian fossils, with exact locational and stratigraphical records, were also excavated from this project.

1 Geological setting

Yanjinggou is a wide valley in Yanjing Township, Wan County (now Yanjing Community, Xintian Town, Wanzhou District). Xintian Reservoir was built in this valley after the founding of the People's Republic of China, but fossils were rare within the valley. Actually, the real locations of the Yanjinggou localities are not in this valley, but in a range of high-altitude NE-SW struck karstic trough valleys on the anticline of Fangdou Mountain, the southeast side of Yanjinggou, represented by Pingba Valley. Figure 1 shows the geographic distribution of fossil localities and geomorphologic landscape of the Yanjinggou area. Pingba Valley appears to be higher in the north and lower in the south, with the average elevation higher than 800 m. This valley consists of many individual corroded limestone hills (the karstic peak clusters) and dissolved intermontane depressions, and the hilltops are the Shanyuan Planation Surface. Numerous limestone fissures, of various forms and different depths, are developed on these limestone hills and at the bottom of the valley. A great number of well preserved mammalian fossils of Yanjinggou are buried in the deposits of such fissures.

The fissures yielding fossils are distributed over tens of kilometers along the Pingba Valley trending northeast to southwest. Their northernmost extent is at the north terminal area of Fangdou Mountain (Hejiayuanzi Village, Yousha

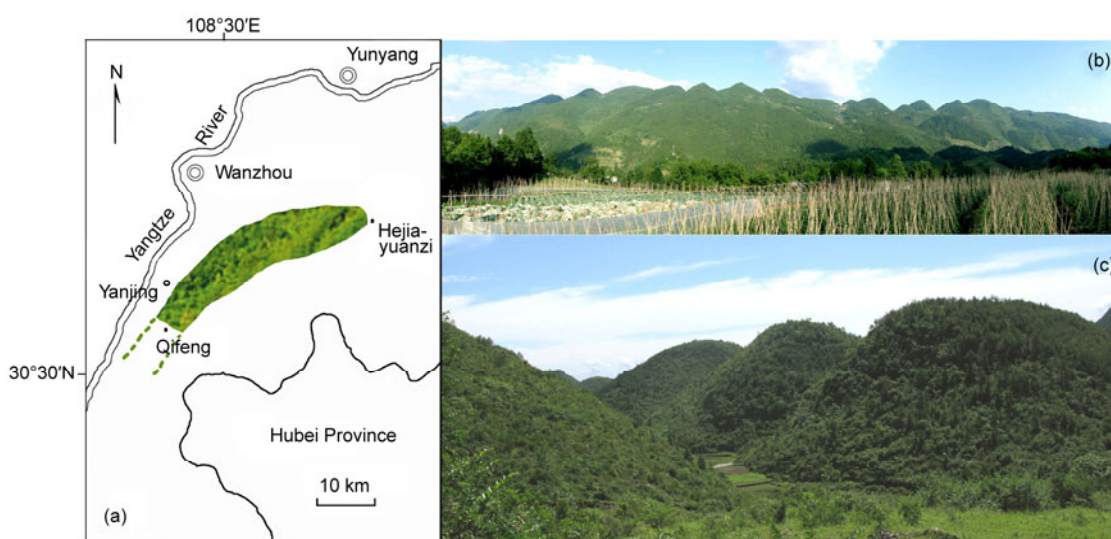


Figure 1 Distribution of fossil localities and geomorphologic landscape of the Yanjinggou area. (a) The distribution of fossil localities (green part); (b) geomorphologic landscape of the Fangdou Mountain (looking from the base of Yanjinggou Valley); (c) the corroded hills in the Pingba Valley.

Township, Wanzhou District), where the karstic peak clusters turn into monoclinical mountains. The southernmost boundary is unclear, because the karstic peak clusters become lower and the fissures yielding fossils become fewer from north to south gradually, but at least the fissures yielding fossils can be found at Qifeng Village, Hezui Township, Shizhu County in our investigation. In the exploratory report of Granger [12], it was also mentioned that the farthest is fissures yielding fossils could be forty or fifty miles from Yanjinggou. A nonagenarian in Hejiayuanzi said that his elders had dug out a complete skeleton of cattle from a nearby fissure and sold it to an American in the 1920s. It is inferred that this skeleton should be *Bibos gaurus grangeri* (AMNH 18645) mentioned by Colbert and Hooijer [6]. This also demonstrates that the collection by Granger came from different localities of different formations and ages.

2 Mammalian fossils

The mammalian fossils from Yanjinggou have been known since the publication of the preliminary report of Matthew and Granger [3]. In 1934 and 1936, Young and Chia visited this area and collected a small quantity of fossils [13,14]. From then on, no other paleontologists came into the Yanjinggou area until Zheng and his colleagues restarted the excavation in Pingba Valley and made some investigations in restricted area during 1984 to 1986. Based on the published references, the mammalian species known in the Yanjinggou area are diverse, containing at least 8 orders and 46 species. During our own investigation, fossils were collected from several localities, and the specimens from level 2 of the Dayakou locality were the most representative.

The Dayakou locality is a vertical fissure developed on a SE-NW struck hillside of Triassic Jialingjiang limestone.

The top of this fissure is about 10 m above the valley floor, with the geographic coordinates 30°37'37.1"N, 108°26'56.9"E and an elevation of 910 m. The opening of this fissure is almost circular and its diameter is about 5 m. The deposits in this fissure are mainly breccias. According to the lithological characters and the occurrences, the deposits can be divided into 3 layers from top to bottom (Figure 2):

1. Brownish-red clay. *Rhinoceros sinensis* and *Bibos* sp. fossils were discovered from the lower part of this layer. Partial disturbance was caused by local farmers digging wells in the area. The thickness is variable. <1.5 m

2. Grey breccias. The brecciated deposit consists primarily of unworn medium-sized (diameters of 5–20 cm, 8–15 cm in the majority) limestones, along with brownish-yellow sandy clay. Some fragments of stalactite and several beds of carbonate with calcareous cement are mixed in the sandy clay. The majority of the mammalian fossils were found from this layer. ~2.5 m

3. Greyish-black huge breccias. The components are tabular limestones with diameters more than 100 cm. Not to the bottom. >1 m

2.1 Mammalian fossils of the Dayakou locality

The mammalian fossils from level 2 of the Dayakou locality contain 5 orders, 8 families and 12 species, including: *Rhizomys troglodytes* Matthew et Granger 1923, Muridae gen. et sp. indet., *Homotherium* sp., *Panthera pardus* Linnaeus 1875, Felidae gen. et sp. indet., *Stegodon orientalis* Owen 1870, *Dicerorhinus sumatrensis* Fischer 1814, *Hesperotherium sinense* (Owen 1870), *Sus* sp., *Cervavitus fenqii* Han 1987, *Cervus* sp. and *Muntiacus* sp.

2.2 Brief description of representative species

Rhizomys troglodytes: Fossils of this species are very abundant in the Yanjinggou area, but rare from the Dayakou

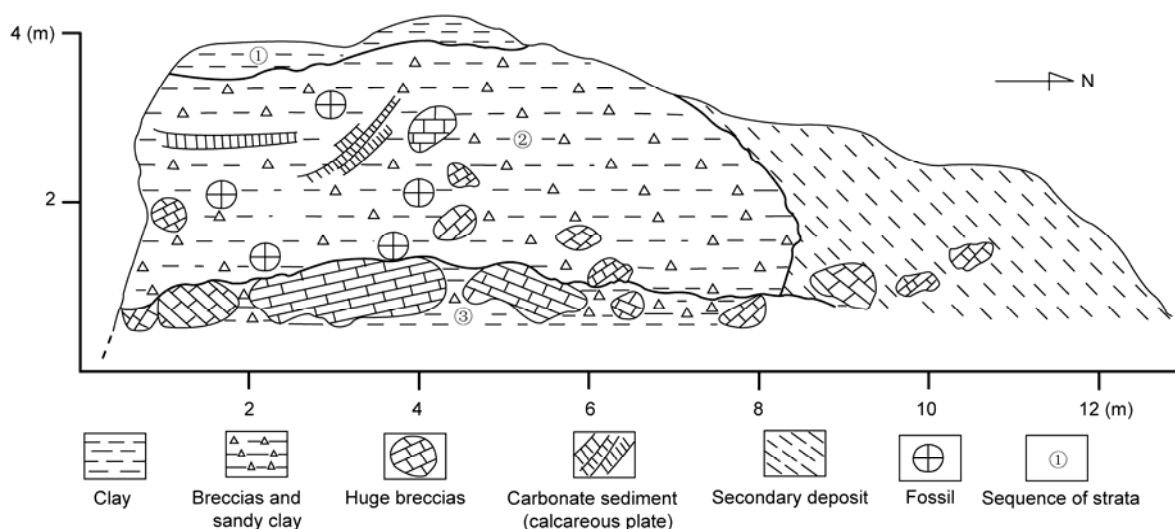


Figure 2 The stratigraphic section of Dayakou locality.

locality, only represented by several mandibles and isolated upper molars. The lower masseteric crest is stronger than the upper crest, and their intersection is at an acute angle under the anterior margin of m1. The mental foramen is minute and situated anteroventrally to the intersection. The length of the lower diastema is 9.6 mm. The length of the lower molar row is 14.5–15.5 mm. The height of the mandible under m1 is about 13.5 mm.

Homotherium sp.: Fossils of the saber-toothed cat from this locality contain only a broken upper canine (Figure 3a) and an upper incisor. The upper canine is thin and slightly curved with serrated anterior and posterior edges. By these characters, the specimens can be identified as *Homotherium*. But the limit of materials makes it impossible to conduct the in-depth study, and only demonstrates the existence of *Homotherium* in the Dayakou locality.

Panthera pardus: Fossils of this species are represented by a broken upper maxilla (Figure 3b), a lower first molar and several limb bones. The parastyle of P3 is very small, located towards the lingual side. The main cusp is strong and is situated just behind the middle point of the tooth. The metastyle is moderately developed and not very close to the posterior cingulum. The anterior cingulum is weak and the posterior cingulum is a little larger. The protocone of P4 is small, conical and low, located to the lingual side between the parastyle and paracone. The parastyle is larger than the protocone, with no supplementary cusplet on the anterolabial side. The paracone is high. The metastyle is blade-like and its length equal to the paracone. The cingulum is only developed weakly at the anterolabial side of the parastyle. The length of the P3 is 19.5 mm and the width is 10.5 mm. The length of the P4 is 29.3 mm and the width is 15.5 mm.

Stegodon orientalis: Materials of this species include three partial skeletons with different degrees of completeness and over ten isolated cheek teeth (Figure 3c,d). The well preserved M3 is lower crowned and its crown face is an irregular rectangle with the anterior part wider than the posterior. This tooth consists of the anterior cingulum, 9 plates and a talon. The length of this M3 is 235 mm; the width of the first plate is 90–95 mm; the width of the fourth plate is 92–95 mm; the width of the ninth plate is 52–54 mm. The frequency of plates is 3.3. The thickness of the enamel is about 5 mm, and the folds are weak. The first plate is moderately worn, the second slightly worn, and all other plates are unworn. The valleys of the tooth are wide and V-shaped; the cement in the valleys is moderately developed. There is no basal pillar at the labial or lingual side of the first valley. The first plate has well developed medium sulci, which separates this plate into two parts, lateral and medial. The lateral part consists of three cusps which form an enamel loop with wear. The medial part is loph-shaped, and is characteristic of gomphotheres after wear, e.g. forming the trefoil. The 2nd plate is in the transitional stage from loph-shaped to mammilla-shaped, which has connected mammillae and developed medium sulci. The 3rd to the 6th

plates are slightly curved in the middle. The 7th to the 9th plates gradually become narrower, and the mammillae on these plates also become fewer in number. The mammillae of the 3rd to the 9th plates are comparatively large, and their number varies from 7 to 11. The anterior cingulum and the talon also consist of mammillae.

Dicerorhinus sumatrensis: A well preserved juvenile skull (Figure 3e) and some postcranial bones were discovered from level 2 of the Dayakou locality. The cranial dorsal profile is almost straight. There is no trace of horn bosses on the juvenile skull. The anterior part of the nasal is declined and its tip is sharp. The nasal has concave ventral surface and rough dorsal surface. The frontal is flat. Based on the morphology of the skull, this skull belongs to *Dicerorhinus sumatrensis*. A couple of deciduous incisors are developed on both the upper jaw and the lower jaw; DP1 and dp1 are also present.

Hesperotherium sinense: This is a very rare and extinct perissodactyl species. However, the specimens of this species are relatively abundant in the Dayakou locality, containing two upper premolars, three lower molars and over ten toe bones (Figure 3f,g). The peculiarity of chalicotheres is the absence of hooves as other ungulates, but replaced by bifid claws. This is only the third occurrence of *Hesperotherium* phalanges in China, after the discoveries in Nihewan of Yangyuan in Hebei Province [15] and Renzi Cave of Fanchang in Anhui Province [16]; the quantity of specimens from Dayakou is by far the greatest.

Cervavitus fenqii: Only a well preserved left antler (Figure 3h) of this species was found, and the tip of the brow tine was broken when it was unearthed. This specimen is a typical three-tined antler of medium size. The antler's surface is smooth, and has shallow vertical grooves and ridges. The pedicle is short, and has a roughly circular cross section, with a transverse diameter of 29.2 mm. The burr leans towards the antero-medial side, well-developed at the anterior part but very weak at the posterior part. The main beam is straight, and forms an angle about 150° with the pedicle. The cross section of the main beam is almost round at the proximal part, but turns oval at the distal part. The brow tine is short and straight, forming an angle about 50° with the main beam. The second tine is thinner and shorter than the brow tine, forming an angle about 60° with the main beam. The terminal tine is slightly curved, and its surface is smooth.

2.3 Chronological analysis

Hesperotherium and *Cervavitus* from the Dayakou locality are relict genera of the Neogene. The last appearance datum of *Hesperotherium* is from Gongwangling of Lantian, Shaanxi Province [17]. *Cervavitus fenqii* has only been found from the early-middle Early Pleistocene localities, such as *Gigantopithecus* Cave [18], Mohui Cave and Sanhe Cave [19] in Guangxi Autonomous Region, Longgupo of Wushan in Chongqing City [20], Longgu Cave of Jianshi in Hubei

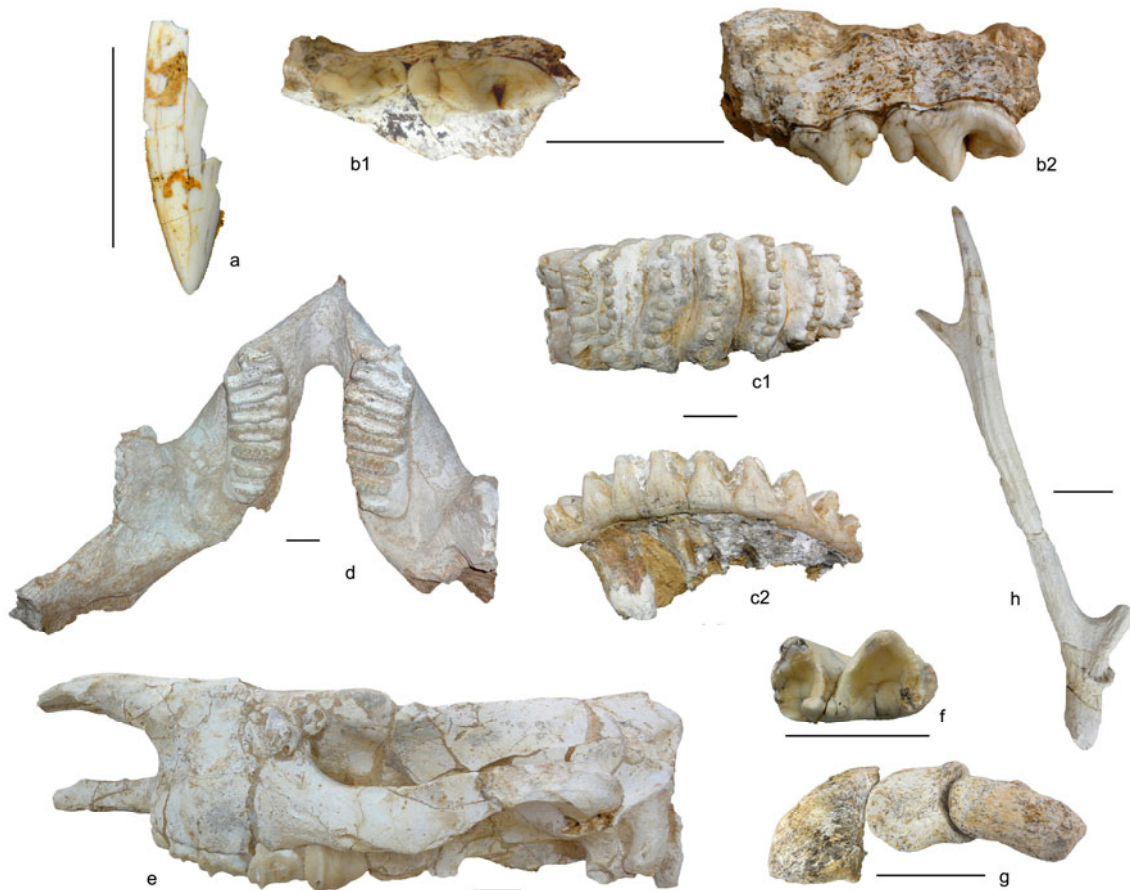


Figure 3 Part of mammalian fossils from Dayakou locality. a, *Homotherium* sp., left canine, lingual view; b, *Panthera pardus*, upper maxilla; b1, crown view; b2, lingual view; c, *Stegodon orientalis*, left M3; c1, crown view; c2, lingual view; d, *S. orientalis*, mandible, crown view; e, *Dicerorhinus sumatrensis*, skull, lateral view; f, *Hesperotherium sinense*, right m1, crown view; g, *H. sinense*, phalanges, lateral view; h, *Cervavitus fenqii*, left antler, lateral view. Scale bar: 4 cm.

Province [20] and Renzi Cave of Fanchang in Anhui Province [21]. Confirmed localities of *Homotherium* in South China are all not later than Early Pleistocene, which are Longgu Cave of Jianshi in Hubei Province [22], Longgupo of Wushan in Chongqing City [23], Renzi Cave of Fanchang in Anhui Province [24], Wangbuding of Dege in Sichuan Province [25], Liyang in Jiangsu Province [26] and the Yunxian Man Site in Hubei Province [27]. The first appearance datum of *Rhizomys troglodytes* is from the fissure deposits of Longgupo, which was dated to the Early or Middle Pleistocene, whereas the last appearance datum is from the Yanjinggou area, of the so-called “Yanjinggou I” which is the early Middle Pleistocene. *Stegodon orientalis* is a common species of the Mid-Late Pleistocene. The elephant fossils from the Dayakou locality are identified as *Stegodon orientalis*, however, its M3 preserves some characters which are more primitive than the later *S. orientalis* but more advanced than the earlier *S. huananensis*. For example, (1) the M3 consists of the anterior cingulum, 9 plates and a talon, compared to 10–11 plates and a talon on later *S. orientalis* and 7–8 plates on *S. huananensis*; (2) each plate consists of 7–11 large mammillae, while each plate of later

S. orientalis usually consists of over 10 small mammillae and each plate of *S. huananensis* usually consists of less than 10 mammillae (with more large ones than small ones); (3) the sulcus is obvious on the first two plates and its trace can be observed on the 3rd to 4th plates, whereas the sulcus only exists on the first plate of later *S. orientalis*, as well as the holotype of *S. huananensis*; and (4) the 1st to 2nd plates also show some more primitive characters than later *S. orientalis*. *Panthera pardus* and *Dicerorhinus sumatrensis* survived through the whole Pleistocene [23,28], therefore they are not very significant in the chronological analysis.

On the basis of the ratio of extinct genera (4 genera, 40% of the identified genera), components of the fauna and the evolutionary degree of *Stegodon orientalis*, the Dayakou fauna should be of early or middle Early Pleistocene. Jin et al. [29] have made a detailed summary of the Early Pleistocene faunas of South China, which contains the early Early Pleistocene localities, such as *Gigantopithecus* Cave of Liucheng in Guangxi Autonomous Region and Longgupo of Wushan in Chongqing City, and the middle Early Pleistocene localities, such as Longgu Cave of Jianshi in Hubei Province, Bijiashan of Liuzhou in Guangxi Autonomous

Region, Yuanmou Man site and Xianggelila (Zhongdian) of Diqing in Yunnan Province. Figure 4 shows the geochronological distributions of the components of the Dayakou fauna and the comparisons with the related faunas. All the components identified to genus or species from Dayakou, except *Dicerorhinus sumatrensis*, can also be found from Longgu Cave of Jianshi (the *Stegodon* fossils should not be *Stegodon* cf. *S. preorientalis* as previously identified but the same species as from Dayakou), so these two localities have the highest similarity. Therefore, the age of the Dayakou fauna should be tentatively identified as the middle Early Pleistocene, correlating to Longgu Cave of Jianshi in Hubei Province.

3 Biochronology of mammalian faunas from the Yanjinggou area

In the 20th century, the mammalian faunas from the Yanjinggou area were mainly known for the “Wanhshien fauna” collected by Granger, the Upper Cave fauna and the Lower Cave fauna of Pingba excavated by the Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences and Natural History Museum of Chongqing. Fossils of these mammalian faunas were abundant both in quantity and variety, but the chronological position encompassed was always ambiguous. The main reason is because Granger’s collection has no record of locality or layer. It was mentioned by Zheng [11] that Granger’s collection came from the Shanwangmiao fissure; however, this judgment was not from the written record of Granger but the recollection of local farmers. In addition, the degree of fossilization is also unreliable for the chronological estimation, because yet unstudied taphonomic phenomena could bias or mislead interpretations. In some cases, bones sealed by the surrounding sediments in the cave or fissure show different degrees of fossilizations. Hence, it is impossible to give faunas from the Yanjinggou area accurate chronological positions by references, fossilization of specimens, or

retrospection of farmers. The only method to solve this problem is to explore new localities, record the three-dimensional data of fossils in strata by systematic and scientific excavations, followed by comprehensive study.

In recent years, via the investigation in the Yanjinggou area and the discovery of the Dayakou locality, the biochronology of the mammalian faunas in this classical area can be reevaluated. Admittedly, our investigation, excavations and research have just started; our knowledge about the fissure deposits in the Yanjinggou area is still limited; the number of the fossils collected is still small. But, via the finding of the Dayakou locality, combined with the work of former paleontologists, the chronology of the faunas in the Yanjinggou area can be explained as follows:

3.1 Early Pleistocene

Dayakou is the only confirmed Early Pleistocene locality in the Yanjinggou area so far. The Dayakou fauna is represented by *Homotherium* sp., *Hesperotherium sinense*, *Cervavitus fenqii*, *Rhizomys troglodytes* and relatively primitive *Stegodon orientalis*. It has high ratio of extinct genera and there are many Neogene archaic forms with a few extant species (only two extant species identified, *Panthera pardus* and *Dicerorhinus sumatrensis*). Furthermore, the chalicothere fossils in the collection of Granger is similar to the specimens from Dayakou in morphology, indicating the former are probably also from the same layer of Early Pleistocene as the latter. This also indicates that a small quantity of Early Pleistocene specimens was mixed in Granger’s collection.

3.2 Middle Pleistocene

The Middle Pleistocene localities in the Yanjinggou area may be numerous, but the Upper Cave of Pingba is the only locality confirmed and well-known, which was excavated and studied by Zheng [11] in the 1980s. Many fossils were found from this locality, but only rodents have been published,

Dayakou	Geological periods				Compsrisons with other fauna					
	Q1	Q2	Q3	Q4	GC	LGP	LGC	BJS	YM	ZD
<i>Rhizomys troglodytes</i>	—					+	+		—	
<i>Homotherium</i> sp.						—	+			
<i>Panthera pardus</i>					+	+	+		+	
<i>Stegodon orientalis</i>	—				—	—	+	+	—	
<i>Dicerorhinus sumatrensis</i>					+					
<i>Hesperotherium sinense</i>	—				+	+	+		+	
<i>Sus</i> sp.					+	+	+	+	+	
<i>Cervavitus fenqii</i>	—				+	+	+		—	—
<i>Cervus</i> sp.					+	+	+	+	+	—
<i>Muntiacus</i> sp.					+	+	+	+	+	+

Figure 4 Geochronological distributions of the components of the Dayakou fauna and the comparisons with the related faunas. GC, *Gigantopithecus* Cave fauna; LGP, Longgupo fauna; LGC, Longgu Cave fauna; BJS, Bijiashan fauna; YM, Yuanmou Man fauna; ZD, Xianggelila (Zhongdian) fauna; +, the same species; —, the same genus but different species; *, different species in the original identification.

in which the extinct species are rare, only *Rhizomys troglodytes* and *Vernaya wushanica*. Other taxa reported by Zheng [11] include Insectivora, Chiroptera, Lagomorpha, Primates (2 species), Proboscidea (1 species, *Stegodon orientalis*), Carnivora (6 species, including *Ailuropoda melano-leuca baconi*), Perissodactyla (1 species, *Megatapirus augustus*) and Artiodactyla (7–9 species). The large mammals from Upper Cave of Pingba did not exceed the “Wanhsien fauna”, and lacked the important *Hesperotherium* and *Rhinoceros sinensis*. On the basis of the rodents, it seems reasonable that the Upper Cave fauna of Pingba were thought to be later than the Tianqiaoan and earlier than the Geshanian [11]. But it seems not quite proper to bring the collection of Granger into the Upper Cave fauna of Pingba and correlate this fauna to Gongwangling fauna of Lantian in Shaanxi Province by the appearance of *Hesperotherium*. Because the collection of Granger was collected from different localities and ages, it should not be put into any single fauna. The Upper Cave fauna of Pingba should be of early Middle Pleistocene age.

3.3 Late Pleistocene

The Late Pleistocene fossil localities in the Yanjinggou area are mainly horizontal karstic caves. The vertical fissure localities are comparatively rare and only Lower Cave of Pingba excavated by Zheng [11] has been known so far. In our investigation, the horizontal karstic cave Meiren Cave (30°35'49.7"N, 108°25'47.5"E, and an elevation of 913 m) is the richest in mammalian fossils. The components of this locality are equivalent to the typical *Ailuropoda-Stegodon* fauna, such as *Macaca* sp., *Rhizomys sinensis*, *Hystrix sub-cristata*, *Canis* sp., *Ursus thibetanus*, *Ailuropoda melano-leuca baconi*, *Arctonyx collaris*, *Crocota crocota ultima*, *Stegodon orientalis*, *Megatapirus augustus*, *Rhinoceros sinensis*, *Sus scrofa*, *Rusa unicolor*, *Bubalus bubalis* and *Bibos gaurus*. On the basis of rodents which are all extant species and comparable to the Lower Cave fauna of Pingba, this fauna can be correlated to the late Late Pleistocene.

4 Summary

Fieldwork in the Yanjinggou area during 2010–2011 clarified the distribution and biochronology of the mammalian faunas in this karstic area. The mammalian faunas in the Yanjinggou area are mainly distributed in a range of NE-SW striated karst trough valleys on the anticline of Fangdou Mountain, where the fissures yielding fossils range tens kilometers along the valleys.

The newly discovered Dayakou fauna is correlated to the middle Early Pleistocene for its high ratio of Neogene archaic forms. The presence of the Early Pleistocene mammalian fauna in the Yanjinggou area is confirmed. Meanwhile, via our investigation, it is recognized that the collection of

Granger is mixed, having no record of locality or layer. Therefore, the “Wanhsien fauna” or “Yenchingkou (=Yanjinggou) fauna” as a Mid-Late Pleistocene biostratigraphical layer should be abandoned. It is suggested that the Dayakou fauna and the Upper Cave fauna of Pingba should be the middle Early Pleistocene and the early Middle Pleistocene biostratigraphical layers, respectively, in the Yanjinggou area.

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