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Author(s): L. A. Schepartz, S. Miller-Antonio, D. A. Bakken
Source: *World Archaeology*, Vol. 32, No. 1, Archaeology in Southeast Asia (Jun., 2000), pp. 1-13
Published by: Taylor & Francis, Ltd.
Stable URL: http://www.jstor.org/stable/125044
Accessed: 14/10/2009 07:44

Upland resources and the early Palaeolithic occupation of Southern China, Vietnam, Laos, Thailand and Burma

L. A. Schepartz, S. Miller-Antonio and D. A. Bakken

Abstract

The southwestern Chinese provinces and neighbouring upland areas in Burma, Thailand, Laos and Vietnam form a geographical region with an expanding Palaeolithic record. The area was a gateway for the dispersion of populations into East Asia and Island Southeast Asia. It is therefore important to examine the diversity of environments and resources that the earliest inhabitants encountered, and to identify adaptations and technologies that may have shaped subsequent exploitations of Asian environments. This paper synthesizes the evidence for the early human occupations of the region, beginning over one million years ago and continuing through the Upper Pleistocene.

Keywords

Asia; Southeast Asia; Palaeolithic archaeology.

Introduction

The early expansion of humans into Asia is now documented for several localities across the continent. Although they remain hotly contested, early dates proposed for hominids and archaeological localities in Java (Swisher et al. 1994), southwest China (Zhang et al. 1994; Huang Wanpo et al. 1995), northern Thailand (Pope et al. 1986) and northern China (Tang et al. 1995) provide a framework for the investigation of early Asian migrations (Table 1). The route by which hominids expanded into SE and East Asia is largely unknown, but the discovery of early sites in neighbouring regions provides support for possible movements from northern Pakistan (Dennell et al. 1994) and subsequent rapid dispersal to the northeastern and southeastern edges of Asia. The specific geography of SE Asia was a key element in these dispersions, forming a corridor for hominid and mammalian movements. Consequently, recent research on the Pleistocene of SE Asia is focusing on the unique role of the environments and resources in shaping later Asian hominid adaptations.

World Archaeology Vol. 32(1): 1–13 *Archaeology in Southeast Asia*

Table 1 Earliest proposed dates for localities discussed in the text

Locality	*Approx. date (in Ma)**	*Materials found*
Java *Homo erectus*	1.81–1.66	Hominids
Longgupo, China	1.96–1.78	?Stone artefacts, ?Hominids
Yuanmou, China	1.7	Stone artefacts, Hominid
Nihewan basin, China	1.2	Stone artefacts
Bose, China	0.732	Stone artefacts
Panxian Dadong, China	0.35–0.12	Hominids, Stone artefacts
Guanyindong, China	0.23	Stone artefacts
Tongzi, China	0.2	Hominids
Bianbian, China	Middle Pleistocene	Stone artefacts
Tham Khuyen, Vietnam	0.475	Hominids
Lang Trang, Vietnam	0.48–0.146	Hominids
Tam Hang, Laos	?Middle Pleistocene	Hominids
Mae Tha, Thailand	0.8–0.6	Stone artefacts
Irrawaddy sites, Burma	?Middle Pleistocene	Stone artefacts
Riwat/Pabbi Hills, Pakistan	2.0	Stone artefacts
Kuldara, Tajikistan	0.85	Stone artefacts
Dimanisi, Georgia	1.6–1.2	Hominids
'Ubeidiya, Israel	1.4	Stone artefacts

* Dates from Klein (1999) and Wolpoff (1999)

The discovery of Plio-Pleistocene sites outside Africa is reshaping our ideas about hominid adaptations to environmental challenges. Previous ideas about early migrations reflect assumptions that hominids initially sought to maintain African adaptations to open savanna and grassland environments (Larick and Ciochon 1996). However, following hominid dispersions along the Rift Valley system into Southwest Asia, documented at 'Ubeidiya and in the Erq el-Ahmar formation (Bar-Yosef 1998), it is clear that they developed adaptations to upland, forested environments. For example, the environment of the Georgian Dmanisi site (1.6–1.2 Ma) where early *Homo* remains were recovered, was one of Alpine-zone mountains surrounding a woodland basin (c.f. discussion in Bar-Yosef 1998). Similarly, the discovery of artefacts along Indus River tributaries in the Siwaliks of northern Pakistan in association with a fauna that includes snow leopards (dated to 2 Ma, Dennell et al. 1994; Dennell personal communication 1999) and from the Kuldara site in Tajikistan (dated to 0.85 Ma, Ranov et al. 1995) confirms broad exploitation of higher altitude areas. While the actual setting of these sites may be at somewhat lower elevations along rivers or on valley slopes, the expansion of early hominids into upland areas attests to their use of a broad spectrum of resources. We suggest that this ability of early hominids to exploit upland environments was important for their expansion into SE and East Asia, where they encountered subtropical forested slopes, montane plateaux and cooler northern zones. An increasing number of sites found at higher elevations supports this view.

Palaeoanthropologists generally do not recognize the importance of Asian upland adaptations. Some researchers even suggested that early hominids moved into Java because the exposed areas of the Asian continental shelf (the Sundaland) were open grasslands similar to the savannas of Africa. While rejecting the evidence for major savanna developments in Pleistocene Asia, Pope (1995: 493) contends that 'premodern

Asian hominids seem to have been largely restricted to stable and relatively equitable lowland environments, which ranged from tropical SE Asia to seasonally cool (but not glacial), temperate northern China'. However, the lowlands were probably less stable environments. During the Quaternary glacials there were more pronounced dry seasons in SE Asia and lowland vegetation was especially susceptible to drought stress. In contrast, uplands had overall higher precipitation values (Verstappen 1980).

Geographical definition and features of the region

Southeast Asia, as examined here, encompasses portions of the Chinese provinces of Yunnan, Sichuan, Guizhou and Guangxi lying below the present course of the Yangtze River, and northern regions of Thailand, Burma, Laos and Vietnam (Fig. 1). This broader definition of SE Asia that includes areas of China (also used in Bellwood 1992) is based on topographic and environmental factors, as well as the consideration that it includes the first area of SE Asia that hominids encountered.

The role of the region as a conduit for human populations is closely tied to the great river systems that formed as a result of the uplift of the Qinghai-Tibet Plateau. This process began in the late Cenozoic and intensified two million years ago. By the Middle Pleistocene, the plateau reached an altitude of 4000m and the monsoonal weather pattern was well established (Tong and Shao 1991). To the east, the Yunnan-Guizhou Plateau also rose during the Middle Pleistocene, eventually reaching heights of over 1000m. Major river systems drained these plateaux, coursing southward and eastward through the region and creating diversified environments and paths for dispersion and movement. Principal among these rivers were the southward-flowing Irrawaddy, Salween, Chao Phraya and Mekong, and the more easterly Hong (Red) and Yangtze. The geomorphological setting of these rivers, which are bounded by upland regions throughout most of their courses through northern Mainland SE Asia, was undoubtedly key to early Asian hominid adaptations.

Upland/lowland diversification has a long history in SE Asia. It is the basis for many current ethnic group distinctions, and it also provides insight into earlier hunter-gatherer adaptations. A pattern of upland use is characteristic of much of the Palaeolithic occupation in some areas of SE Asia. For example, almost all terminal Pleistocene to Holocene sites in northern Vietnam and Thailand are at higher elevations. According to Higham (1989: 38) the 'characteristic Hoabinhian site is a small rock shelter where access to both the rugged limestone uplands and the resources of tributary stream valleys is possible'. It is not until later agricultural periods that sites are found on the lower river floodplains.

Palaeoenvironment of Pleistocene SE Asia

Climate

The current diversity of SE Asian environments provides insight into the Pleistocene biomes that early humans encountered. The present canopied rain forests sustain a rich arboreal fauna, including diverse primate species. Although ground cover is limited, the

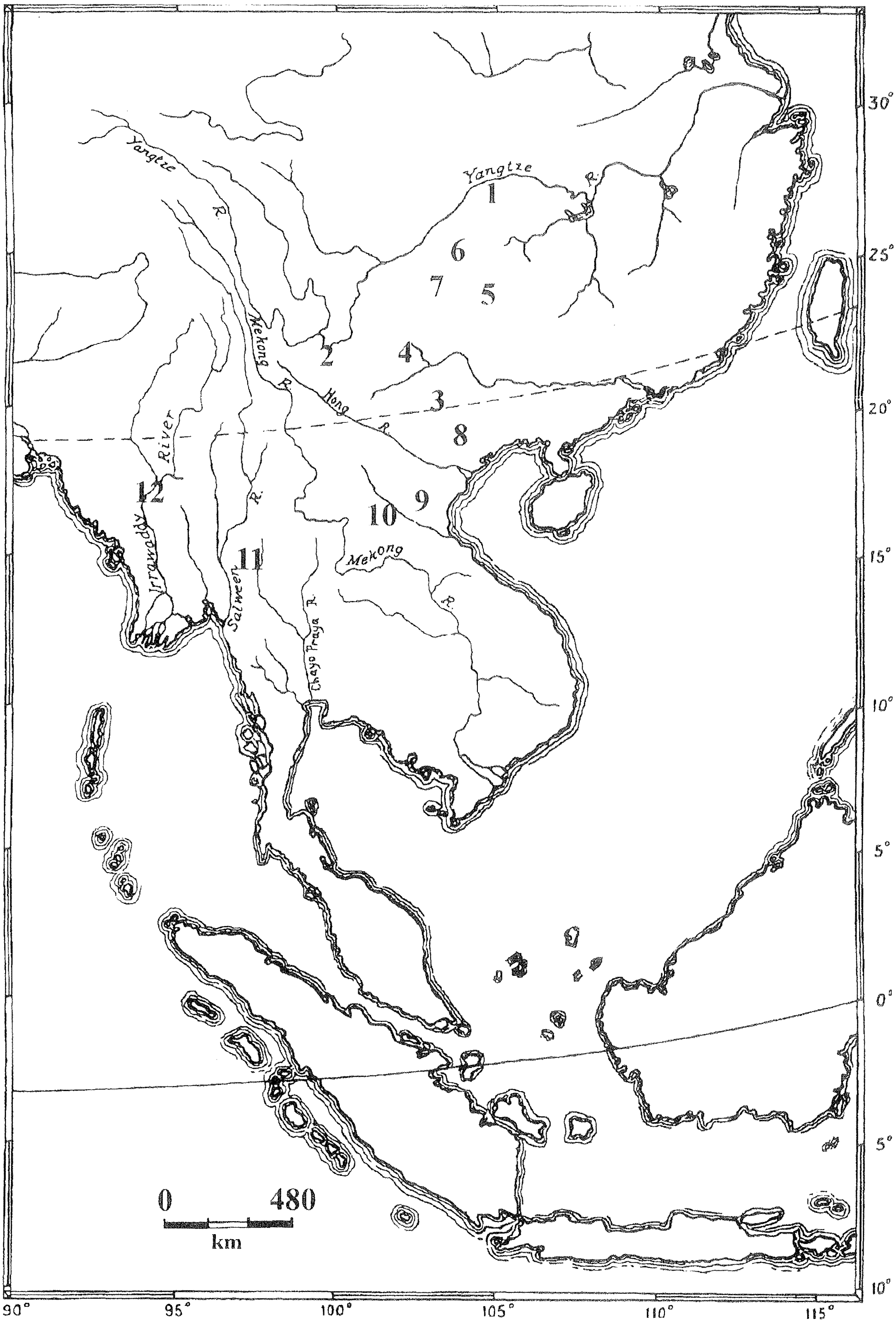

Figure 1 Localities: 1 Longgupo, 2 Yuanmou basin, 3 Bose localities, 4 Panxian Dadong, 5 Guanyin-dong, 6 Tongzi, 7 Bianbian, 8 Tham Khuyen, 9 Lang Trang, 10 Tam Hang, 11 Mae Tha, 12 Irrawaddy sites (after Movius 1944).

dense forest is a prime environment for wild pigs. Rhinoceros, gaur, elephants, sambar deer and other herbivores inhabit the more open forest clearings and stream or river margins of upland forests above 400m (Higham 1989). The intertropical zone of mainland SE Asia has pronounced wet and dry seasons that support open monsoonal forests where large browsers are found. The animal biomass of this zone is fairly high, especially relative to the southern equatorial zones (Bellwood 1992).

The Pleistocene environments of SE Asia provided new climatic conditions and challenges for early hominid populations. Fluctuating temperatures and levels of precipitation altered the distribution of subtropical forests and sea levels. Colder periods and episodes of low sea level led to seasonal forest expansion (Heaney 1991). Tree lines and vegetative zones shifted dramatically, falling by as much as 1500m (Bellwood 1992). Studies of speleothem formation in the karst mountains of Guizhou suggest that warm humid conditions prevailed from 240 to 180 ka and again between 130 and 100 ka. Under those conditions, the vegetation resembled present-day subtropical rain forest (Shen 1993). In the intervening cooler period, many warm-adapted species such as primates moved southward (Jablonski 1997). Levels from Panxian Dadong cave dating to this time, which have relatively impoverished primate representation, illustrate this faunal shift.

Faunas

In comparison with the more temporally diverse faunas of northern China beyond the Qinling range, the *Stegodon-Ailuropoda* (*Stegodon* = extinct proboscidian; *Ailuropoda* = panda) faunas of south China and the northern regions of mainland SE Asia show fewer changes. This interesting situation complicates the use of fauna for differentiating the different stages of the Pleistocene – few taxa are temporally or stratigraphically diagnostic as most persist throughout the Pleistocene (Xue and Zhang 1991).

Faunal assemblages from the region provide evidence for the persistence of forested, tropical niches and possible refugia throughout the Pleistocene. The development of grasslands or savanna, as earlier hypothesized for the expansion of hominids southward across the Sunda shelf into Island SE Asia, is not supported by a faunal record that is notably bereft of grazers (Pope 1995). The Plio-Pleistocene deposits from Longgupo Cave (Wushan) have an extremely diverse warm/subtropical fauna including *Gigantopithecus* and other primates, elephant-like forms such as Stegodon, deer, large bovids, several pig species and the panda (Bakken 1997). Early Pleistocene faunas of northern Burma share many elements with India, but, by the middle Pleistocene, Chinese elements exemplified by *Stegodon* predominate (Movius 1949). The middle Pleistocene fauna from the Yanjinggou fissures in Sichaan includes many of the same taxa, such as *Stegodon*, several monkeys, large bovids, muntjaks, pigs, the giant tapir and pandas. To the south, the middle Pleistocene age Lang Trang caves in northern Vietnam contain plentiful remains of humid tropical rain-forest species such as pigs, the muntjak and other deer, and various monkeys (Ciochon and Olsen 1991). Orangutans, gibbons, rhinoceros, water buffalo, *Stegodon* and elephants are also represented. Similar taxa are found in the Hang Hom, Phai Ve and Keo Leng caves from neighbouring provinces (Hoáng 1991). This faunal assemblage in northern Vietnam is similar to other SE Asian faunas, especially those from Lida Ayer cave in Sumatra, that are thought to date to the Upper Pleistocene (Vu et al. 1996). At the end of the Middle Pleistocene there was a cooling period and tropical Chinese faunas began to shift southward (Jablonski 1997; Vu et al. 1996). The late Middle Pleistocene levels from Dadong Cave in Guizhou, China, are characterized by the genera *Stegodon* and *Rhinoceros*. Orangutans, gibbons, several monkey species, pandas and the giant tapir are present, but not common. Further to the south, Snake Cave in northeastern Thailand has a wet tropical forest fauna including bats, pandas, the hyena *Crocuta*, rhizomyid rodents, orangutans, langurs and flying squirrels. The locality is dated to between 125 ka and 80 ka (interstadial 5) using U/Th (Chaimanee and Jaeger 1994). Many of the taxa found in the localities discussed here persist until the terminal Pleistocene, as documented from Nguomian and Son Vi archaeological sites in Vietnam. But, by the early Holocene, orangutans, pandas, *Stegodon* and tapirs are no longer present in the faunas associated with archaeological sites (Hoáng 1991).

Evidence for earliest occupations

The nature of the evidence for early hominids in SE Asia has shifted over the last few decades. While previously most of the evidence came from open-air localities, now many cave sites are under investigation. The time frame examined here begins at approximately 2 Ma and continues to 128 ka, the lower boundary of oxygen-isotope stage 5.

As numerous authors have pointed out, the archaeological evidence for the occupation of mainland SE Asia is sketchy until the terminal Pleistocene and early Holocene. Most of the questionable assemblages are from open-air, alluvial sites with good chances of secondary deposition or great potential for the creation of geofacts (Albrecht and Moser 1996).

A strikingly low density of artefacts complicates the interpretation of the early SE Asian localities. This characteristic is often explained by suggesting that Asian tool kits relied heavily on bamboo and hardwoods for raw material (cf. Pope 1994; Hutterer 1985). The important implication of this view is that hominids had thorough knowledge of the functional properties of diverse resources in forested environments.

Burma

During the 1930s, de Terra and Movius (1943) studied the extensive terraces along the Irrawaddy River and adjacent upland areas in Upper Burma (Fig. 1). They discovered several localities with large pebble-tool artefacts that were designated as the Anyathian. The raw material included fossil wood and silicified tuff. Movius emphasized the chopper-chopping tool aspect of the assemblages (although flakes were also found) because he saw striking differences with Acheulean handaxe industries. He proposed a Middle Pleistocene age for the Anyathian based on correlations between terrace heights and their formation history, northern glacial sequences and the fauna assemblage (Movius 1944). In fact, the true age of the Anyathian remains undeterminable. The antiquity of the Anyathian is now questioned because other traditions included in Movius' chopper-chopping tool complex, such as the Pacitanian of Java, have been relegated to the terminal Pleistocene and Holocene (Bartstra 1982). However, the depositional environment and faunal record of the Irrawaddy valley does suggest that some of the materials labeled 'Anyathian' may be Lower

Palaeolithic. More work on the pebble-tool industries is warranted before the Lower Palaeo-lithic affinity of artefacts from Burma is completely discounted.

Recent archaeological research in Burma further complicates the Anyathian question. Ba Maw and his colleagues also apply the term 'Anyathian' to the entire late Pleistocene cultural sequence that includes blades, microliths and polished stone axes and rings (Ba Maw et al. 1998).

Fossilized human skeletal material is now known from Burma. This includes the 1981 discovery of a fragmentary human maxilla with a worn dentition (P4 and M1) from Nwe Gwe Hill in the central Chindwin Basin. Based on the extent of fossilization and the dental morphology, Ba Maw (1995) attributes it to *H. erectus*. A date of 200 ka is suggested. Both the attribution and the date are unlikely as associated material includes domesticated dog and 'Neolithic' tools. Toe Hla discovered a partial mandible with four incisors, also attributed to *H. erectus*, at Letpan-Chibaw, a junction of the Chindwin and Irrawaddy Rivers (Ba Maw et al. 1998).

Thailand

The earliest proposed archaeological evidence from Thailand comes from the Mae Tha (Fig. 1.), Mae Tha South and Ban Don sites in the intermontane basins of Lampang and Phrae provinces, northern Thailand. A small number of stone tools, manufactured mostly on quartzite river cobbles, were recovered. Potassium-argon and palaeomagnetic dates from associated basalts are in the range of 0.8–0.6 Ma (Pope and Keates 1994; Reynolds 1990). In addition, Pope and Keates (1994) suggest that Middle Pleistocene humans living at the Kao Pah Nam rockshelter (Wang River Valley, northern Thailand) showed considerable behavioural flexibility and innovation by selectively importing basalt cobbles to construct hearths. Discoveries at Sung Noen in Nakhorn Ratchasima province of northeastern Thailand include an assemblage of pebble tools, flakes and scrapers made on petrified wood that resemble the Anyathian of Burma (Subhavan et al. 1984, as cited in Reynolds 1990).

The next well-documented occupation of humans in Thailand is from much further south and much later in time (approximately 27–37 ka). Anderson (1990) reported a surprising assemblage of small flake tools with clear retouch as well as a few bone and antler artefacts from the deepest layers of Lang Rongrien rockshelter located in Krabi province, southern Thailand.

Laos

The only known Laotian Pleistocene locality is Tam Hang cave, located in the northern part of the country (Fig. 1). As most of the publications on this site are difficult to obtain, we rely on the comments of Olsen and Ciochon (1990). The site was investigated by Fromaget and Saurin, who described 'lower' and 'middle' Quaternary levels containing hominid remains, *Stegodon*, pandas, giant tapirs, orangutans and other members of the *Stegodon-Ailuropoda* fauna. No stone tools are reported. The hominids include two isolated molars and a temporal bone from the 'lower' deposits and a partial subadult skull from the 'middle' layers. Orangutan molars were particularly plentiful in the level yielding the skull. Fromaget concluded that the subadult resembled *H. erectus* finds from Zhoukoudian and Java, although Teilhard de Chardin (as cited in Movius 1948) thought the hominids and lithics were from more recent levels. It is difficult to assess the skull from the published photos (reproduced in Olsen and Ciochon 1990). While some of the described characteristics, such as the thickened cranial bones and posterior flattening, are commonly found in *H. erectus*, they are also seen in later *H. sapiens* crania. Tam Hang is potentially quite important and deserves further investigation. ESR dating of the mammalian dental sample could resolve the age questions.

Vietnam

The earliest evidence for the Palaeolithic occupation of Vietnam comes from upland karstic caves: Tham Khuyen, Tham Hai, Tham Om, Hang Hum, Keo Leng (Olsen and Ciochon 1990) and the Lang Trang caves (Ciochon and Olsen 1991) (Fig. 1.). Each of these localities has yielded isolated teeth identified as hominid, although no stone tools or other remains of Pleistocene human activity are known. Recently, international teams have focused on dating the older, fossil-bearing sediments. Ciochon and Olsen (1991) report preliminary ESR dates ranging from 480 ± 40 ka to 146 ± 2 ka for the Lang Trang caves. Ciochon et al. (1996) re-investigated Tham Khuyen in Lang Son province near the Chinese border. The age of the main fossil-bearing levels is estimated on the basis of ESR and U/Th analyses to be 475 ± 125 ka. This Middle Pleistocene age is in agreement with the faunal assemblage that also includes *Gigantopithecus*, orangutans and other components of a *Stegodon-Ailuropoda* fauna. Elsewhere in SE Asia *Gigantopithecus*-bearing deposits are dated from the Lower Pleistocene up through the Middle Pleistocene, when they are known to co-occur with *H. erectus*.

Two issues complicate our understanding of these caves. First, the depositional environments are extremely complex and there is evidence for mixing and reworking at most sites. While it seems quite likely that some of the deposits date to the Middle Pleistocene, these caves also contain later materials, as demonstrated by Ciochon and Olsen's (1991) more detailed examination of the Lang Trang caves. A second complication is the difficulty in identifying and attributing the teeth to any hominid taxon: worn hominid teeth are easily confused with those of fossil orangutans, and it is rarely possible to distinguish *sapiens* from *erectus* teeth using metric criteria.

Nui (Mound) Do, Nui Nuong and Quan Yen in eastern Thanh Hoa province are the most controversial early sites in Vietnam. Materials surface-collected from these elevated open-air localities were argued to be the oldest Vietnamese stone tools. Pham Vin Kinh and Lun Tran Tieu (1978) proposed that they were Lower Palaeolithic artefacts, dating on the basis of typology to the Middle Pleistocene (as old as 500 ka). Subsequent excavations on Nui Do have failed to yield similar lithics *in situ*, although some were recovered from Nui Nuong (Olsen and Ciochon 1990). Opinion is still divided over the materials from these localities: while some archaeologists continue to accept them as Lower Palaeolithic artifacts, others view them as geofacts, and others think they are blanks for Neolithic or Bronze Age axes and adzes (Bui Vinh 1998). Olsen and Ciochon (1990) stress the composite nature of the collection and suggest that all of these explanations are partially correct. Interestingly, they also suggest that a small number of the large bifaces with cortex retained on their butts and careful flaking and trimming resemble Chinese artefacts from Bose (dated to 0.75 Ma) and Dingcun.

China

In southwestern China, evidence for early inhabitants again comes from upland sites (Fig. 1). Only a few key examples from the extensive Palaeolithic record (Olsen and Miller-Antonio 1992) are discussed here. The earliest reported locality is Longgupo cave that is just south of the Yangtze River in eastern Sichuan. Two modified pebbles, an isolated hominid incisor and a partial mandible are described in Huang Wanpo et al. (1995). Although the published date of 1.96 to 1.78 Ma generated great excitement and interest, the interpretation of these fossils as representing a pre-*erectus* form of hominid is strongly contested (Pope 1995; Wang 1996; Wolpoff 1999).

The Yuanmou Formation in the hills of northern Yunnan contains rich fossiliferous fluvial-lacustrine sediments with a rich faunal record. Two incisors assigned to *H. erectus* are surface finds, but a small number of flaked stone tools were excavated from nearby localities (Zhou and Zhang 1984). There is still no consensus on the absolute chronology of the Yuanmou archaeological materials. Most recently the early age of 1.7 Ma was supported by Zhang et al. (1994) through palaeomagnetic and lithostratigraphic studies.

To the east in Guangxi, the Bose Basin localities occur in sedimentary deposits along the Youjiang River. Excavations in 1988–9 and 1993 revealed a stone artefact assemblage of large flake and core tools fashioned on quartz, quartzite, sandstone and chert (Huang and Hou 1997; Hou et al. 2000). Huang and Hou (1997) describe some of the large core tools as handaxes with possible Acheulean affinities. No fauna or human fossils were recovered in association with the stone tools, but fission track dating on *in situ* tektites yields an age of 0.732 Ma for these deposits (Guo et al. 1996).

In the karstlands of mountainous Guizhou, the caves of Yanhui (Tongzi) (Shen and Jin 1991), Bianbian (Cai et al. 1991), Guanyindong, and Panxian Dadong have yielded abundant Middle Pleistocene archaeological remains and/or hominid fossils. The best described sites are Guanyindong and Panxian Dadong. While no human fossils have been found at Guanyindong, numerous stone tools and an associated *Stegodon-Ailuropoda* fauna were recovered from deposits dated to 230 ka by U-series. Leng (1992) interprets Guanyindong as a knapping area based on the distribution of debitage and stone artefacts. Chert nodules, collected at a distance of 4km from the cave, were selectively and intensively utilized. Recent excavations at Panxian Dadong yielded an abundant collection of fauna and stone tools as well as four human teeth. In contrast to Guanyindong, the Dadong inhabitants made tools from locally available limestone, chert and basalt (Huang et al. 1995). ESR dates on rhinoceros tooth enamel suggest that the upper levels range from 120 to 150 ka (Rink pers. comm. 2000), while U-series dates suggest the deeper cave deposits have an antiquity of greater than 300 ka (Shen et al. 1997).

Conclusions

Hutterer (1985) determined from his review of the SE Asian Palaeolithic that there was no conclusive evidence for artefacts prior to 50 ka. In the intervening fifteen years, several new sites have been investigated and dated. The question of the earliest sites remains problematic, and the quality of the data is not substantially improved. Although the application of radiometric dating has clarified the time period in question, new issues have emerged. Principal among these is the association between the reported dates and the hominid or artefactual evidence. This is certainly true for the earliest dates reported for Java (cf. Klein 1999). Further verification of the association of hominid remains with the sediments dated to 1.81 Ma is critical, because the rest of the evidence from SE Asia does not provide support for the Java determination.

There are three major conclusions regarding the earliest occupation of SE Asia:

1 Initial migrations into SE Asia probably took place between 1.5 and 1 Ma. At localities dating before 1.5 Ma the association between the artefactual or hominid materials and the dated sediments is not well documented. The evidence for early migrations comes from China, Thailand and Vietnam. The antiquity of sites in Burma and Laos remains to be verified.
2 Upland regions with mixed vegetational zones and river courses were important environments for the initial colonization of Mainland SE Asia and East Asia. Therefore, valley systems at higher elevations would be the most productive areas to investigate. Because caves and rockshelters are more likely to preserve associated artefacts and fauna, priority should be given to investigating those types of sites.
3 Patterns of human activity in SE Asia during the Lower and Middle Pleistocene exhibit technological heterogeneity. Lithic raw materials include fossil wood, chert, quartzite cobbles, silicified tuff, limestone and basalt. At some localities the raw material seems to be selectively chosen, while at other sites the choice appears to be more expedient. The persistence of upland occupations throughout the Pleistocene may be linked to the stability and versatility of the available resources, the relative richness of the animal biomass and the availability of non-lithic resources.

Acknowledgements

This work was supported by the National Science Foundation, The Leakey Foundation, Wenner-Gren, The Henry Luce Foundation, the University of Cincinnati Research Council and Charles P. Taft Fund, and California State University, Stanislaus.

Lynne A. Schepartz
Department of Anthropology, University of Cincinnati,
Cincinnati, OH 45221-0380
Fax: (513) 556-2778 E-mail: Lynne.Schepartz@uc.edu

S. Miller-Antonio
California State University, Stanislaus

D. A. Bakken
Field Museum of Natural History

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