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Mid-Holocene Hunter-Gatherers 'Gaomiao' in Hunan, China: The First of the Two-layer Model in the Population History of East/Southeast Asia

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Gaomiao, the eponymous archaeological site of the Gaomiao Culture (ca. 7500–5500 BP) has produced evidence of a unique hunter-gatherer society in Hunan Province, China, that produced fine decorated pottery. The human remains unearthed from this site provided an excellent opportunity to assess phenotypic and biological relationships between the Gaomiao and prehistoric and modern human populations that have inhabited East/Southeast Asia over the past ca. 10,000 years through cranial morphometrics. The assessment of morphometric affinity presented here addresses the peopling of East Asia, particularly in the context of the 'two-layer' hypothesis describing the population history of this region. The results suggest that the Gaomiao skeletons inherited genetic signatures from early colonising populations of Late Pleistocene southern Eurasian origin to a certain extent, and might share a common ancestry with present-day Australian Aboriginal and Melanesian people.

Introduction

The study of the population history of East Asia remains complex due to various migration processes and intermixing of populations throughout prehistory, poor archaeological sample sizes and limited radiometric dating. In general terms, East Asia is thought to have been originally inhabited by (to use the classic term) 'Mongoloid' peoples from the Late Pleistocene onwards. In the Late Pleistocene and early Holocene of Southeast Asia, several sets of human remains exhibit Australo-Melanesian characteristics, and it has been argued that an indigenous population possessing this morphological form occupied Southeast Asia. These skeletal data demonstrated significant genetic discontinuity between pre- and post-agricultural populations, suggesting that dramatic agriculturally driven demic expansion occurred in Mainland Southeast Asia (MSEA) beginning in the Neolithic period (see Matsumura and Zuraina 1999; Matsumura and Hudson 2005; Matsumura 2006; Matsumura et al. 2008a, 2008b, 2011a, 2011b; Oxenham et al. 2011; Matsumura and Oxenham 2013a, 2013b, 2014, 2015). This population history scenario for Southeast Asia is known as the 'two-layer' or 'immigration' model, a scenario of human population movement that was first postulated in the middle of the last century (q.v., Jacob 1967).

Given this perspective overview in MSEA, problems have arisen as to whether pre-existing indigenous hunter-gatherers in more northerly East Asia, as well as early settlers of Southeast Asia, were genealogically akin to present-day Australian Aboriginal and Melanesian populations, whether there was an agriculturally driven mass population movement, and whether they were replaced by the migrating agriculturalists who shared a suite of features with Northeast Asians (archetypically referred as ‘Mongoloid’).

The discovery of human skeletal remains at the site of Gaomiao provides a rare opportunity to apply cranial morphometrics to compare the skeletal affinities of these hunter-gatherers with other prehistoric and modern human populations in the region, and to evaluate the strengths of the ‘two-layer’ hypothesis in Mainland East Asia. This paper introduces the skeletal morphology of Gaomiao and presents results pertaining to the cranial affinity, based on craniometric data, in comparison with early and modern population samples from the area covering East/Southeast Asia and the Western Pacific.

Archaeological background and context

Gaomiao is located on the northern bank of the Yuan River in Yanli Village of Chatou in Hongjiang City (formerly named as Qianyang County) in Hunan Province (Figure 4.1). The site was excavated three times (in 1991, 2004 and 2005) by the Cultural Relics and Archeological Research Institution in Hunan Province (He 2006a, 2006b). It consists of large shell mounds produced by the human discard of abundant freshwater molluscs, and aquatic and terrestrial fauna, including some pigs identified as domestic (He 2006a). Evidence for agriculture is currently sparse with no rice phytoliths or macrobotanicals having been identified so far. Rice grain impressions have been identified in three sherds and rice husk in another at Gaomiao, but the source of this pottery is unclear (Gu and Zhao 2009). Overall, it is considered that the site occupants were hunter-gatherers rather than agriculturalists (He 2006a). A unique feature of the Gaomiao site is its pottery decoration. Despite the deep antiquity, the early pottery forms exhibit very fine decoration, including cord impressions and dentate stamping, the latter forming animal faces, phoenixes, waves, trapezoids, circles and band-like motifs on the surfaces of vessels, jars, plates and bowls. Furthermore, it is noteworthy that the pottery with the phoenix motif probably embodied certain religious beliefs (He 2006a, 2006b). This finding has led archaeologists to realise the mutual and remote influences of cultural and artistic accomplishments from Gaomiao on various later regional cultures in ancient China. Gaomiao appears to have been a unique hunter-gatherer subsistence society associated with a well-developed material culture (Zhang and Hung 2012; Figure 4.2).

Figure 4.1 The locality of Gaomiao in southern China.

Source: H. Matsumura.

Figure 4.2 The representative pottery from Gaomiao.

Source: G. He.

From the Gaomiao site, two major burial assemblages were exposed, containing more than 30 burials. The earliest individuals were interred in a flexed position without grave goods (see Figure 4.3), whereas in the later-phase burials shifted to the extended type with abundant grave goods, including pottery and jade. The later burial sequence, though lacking *Oryza sativa* rice, was likely influenced by a neighbouring agricultural society; for example, the Daxi culture (ca. 6500–5000 BP) around the Dongting Lake area in Hunan Province. Nevertheless, only three inhumation burials produced well-preserved skeletal remains, all of which were found in the flexed position of the earlier sequence.

Figure 4.3 The human skeleton M-02 from Gaomiao.

Source: H. Matsumura.

These three individuals provided AMS carbon-14 dates based on tooth dentine collagen, of approximately 6500 BP (see Table 4.1, dated by the Beta Analytic laboratory in the USA).

Table 4.1 Gaomiao radiocarbon dating results gained from this study.

Beta Sample No.	Human remains	Measured radiocarbon age (years BP)	$^{13}\text{C}/^{12}\text{C}$ ratio (‰)	Conventional age (years BP)	Calibrated years BP (2-Sigma)
328354	Gaomiao M-01 child	5690±40	-20.8	5760±40	6659–6464 (94.6%) or 6459–6453 (0.8%)
328353	Gaomiao M-02 adult	5500±40	-19.2	5600±40	6452–6300 (95.4%)
333225	Gaomiao M-20 unknown age	5680±30	-12.6	5880±30	6777–6764 (3.1%) or 6752–6640 (92.3%)

Source: H.-c. Hung.

Cranial preservation and morphological remarks

Of the three skeletal individuals unearthed at Gaomiao, one (no. M-01) was a child around 12–14 years old, currently exhibited at the Haihua (懷化) City Museum. Another child specimen, numbered M-20, is very fragmentary and housed at the Cultural Relics and Archeological Research Institution in Changsha City (長沙市). The M-02 skeleton alone, currently displayed at the Hongjiang City (洪江市) Museum, is of an adult individual in a good state of preservation. In this study, we reconstructed only this adult cranium for morphometric analysis.

The M-02 individual was estimated to be a mature male over 60 years old based on the extent of tooth attrition, antemortem tooth loss, cranial suture closures, and severity of osteoarthritis. Figure 4.4 displays various aspects of his reconstructed skull. Although the cranium had fragmented through *in situ* crushing, almost all parts of the specimen could be reconstructed. The greater and lesser wings of the sphenoid bone are missing from the cranial vault.

Figure 4.4 The reconstructed skull of M-02 from Gaomiao.

Source: H. Matsumura.

The face of the skeleton lacks some parts of the maxilla, and the ethmoid and lachrymal bones, and the inferior conchae and vomer, which together form the inside of the orbits and the inner portion of the nasal cavity.

The cranial shape is ovoid in superior view and the vault is mesocephalic (cranial index 79.1). The external occipital protuberance is well protruding, and the superior nuchal line is clearly defined with a well-developed nuchal plane, indicating that this person possessed strong neck muscles. The temporal line, to which the temporal muscles attach, is marked in the frontal region but becomes weak towards the posterior end of the temporal bones. The glabella region is large and prominently protruding compared with the majority of modern East Asian males, although the superciliary arch is relatively flat. The frontal bone leans well back, clearly exhibiting male characteristics. The facial skeleton is low and wide (upper facial index 47.1, upper facial height was estimated as described in the section on the recoding system for cranial measurements). The orbital margins are straight at the superior line, and the nasal root is moderately concave. The coronal, sagittal, and lambdoidal sutures are completely fused ecto- and endocranially. The mandible expresses alveolar prognathism. Frontal nerve incisures and superior orbital foramina are absent on both sides of the frontal bone. The supramastoid crest is weak, and the mastoid process is moderate in size.

The mandibular body is relatively small and low, while the muscle attachments are moderately developed. The mental eminence is weakly projecting. The mylohyoid line is well angulated. The mandibular ramus is wide with a weakly concave mandibular notch. The preangular *incisula* is shallow and the lateral prominence is small at the gonial angle. The attachment area of the medial pterygoid muscles is well developed.

The following teeth are present in the maxilla and mandible.

/	/	X	X	/	X	X	X		X	X	X	/	/	/	M2	/
X	X	X	X	0	0	I2	I1		I1	I2	C	X	X	X	X	X

X = tooth lost antemortem and alveolus remodelled

0 = tooth lost post-mortem and alveolus not remodelled

/ = tooth lost post-mortem and alveolus damaged

The maxilla lacked almost all teeth, and the mandible had also lost most posterior teeth antemortem. The occlusal surfaces of the remaining teeth were heavily worn, with enamel remaining only on the outer rim, the entire occlusal surface of the crown being lost and secondary dentine visible on every tooth. To carry out mitochondrial DNA analysis, the left maxillary second molar was taken out for sampling.

Recording system for cranial measurements and statistical procedures

Thirty-two cranial measurements and some representative cranial indices were recorded following Martin's definitions (Bräuer 1988), as given in Table 4.2. The upper facial height and the basion-prosthion length are estimated values, as the measurement landmark of the prosthion was missing due to the antemortem loss of maxillary incisors, which eroded the edge of the maxillary alveolar bone. In this study, the prosthion was estimated to be at the point extending 5 mm from the alveolar margin. This estimation was based on the average height of the missing portion in representative samples such as Jomon and Japanese crania.

Using the data sets of cranial metrics, multivariate statistical procedures were used to explore the population affinities between the Gaomiao sample and ethnically and chronologically different groups. The comparative samples are listed in Tables 4.3 and 4.4 and this summary also includes archaeological specimens from East/Southeast Asia, as well as modern samples from East/Southeast Asia and the Pacific. Similarities in cranial proportions were estimated by Q-mode correlation coefficients (Sneath and Sokal 1973) using the cranial measurements. The cranial data set selected for this calculation were a subset of 16 measurements (Martin's method number: M1, M8, M9, M17, M43(1), M43c, M45, M46b, M46c, M48, M51, M52, M54, M55, M57, M57a), as these were the most commonly available among the comparative samples. The neighbor-net split method (the software package 'Splits Tree Version 4.0' provided by Hudson and Bryant 2006) was applied to the distance matrix of the Q-mode correlation coefficients to aid in the interpretation of inter-sample phenotypic affinities.

Table 4.2 Cranial measurements (mm) and indices for the human skull from Gaomiao site.

Martin no. and measurement	(mm)	Martin no. and measurement	(mm)
1 Maximum cranial length	191	54 Nasal breadth	24
5 Basion-nasion length	107	55 Nasal height	55
8 Maximum cranial breadth	151	60 Upper alveolar length	-
9 Minimum frontal breadth	98	61 Upper alveolar breadth	-
10 Maximum frontal breadth	125	66 Bigonial breadth	105
12 Maximum occipital breadth	125	68 Mandibular length	81
17 Basion-bregma height	151	69 Symphyseal height	39
29 Frontal chord	117	70 Ramus height	60
30 Parietal chord	121	71 Ramus breadth	34
31 Occipital chord	107	8:1 Cranial index	79.1
40 Basion-prosthion length	98	48:45 upper facial index	47.1
43 Upper facial breadth	110	43(1) Frontal chord	104
45 Bizygomatic breadth	153	43c Frontal subtense	19.4
46 Bimaxillary breadth	117	57 Nasal cord	8.5
48 Upper facial height	72	57a Nasal subtense	1.5
51 Orbital breadth	44	46b Bimaxillary cord	119
52 Orbital height	35	46c Nasospinale sabutense	32.9

Source: H. Matsumura.

Table 4.3 Comparative prehistoric population samples from across East and Southeast Asia.

Sample	Locality	Period	Remarks	Data Source	Storage
Pre-Neolithic Samples					
Liujinag 柳江	China	Late Pleistocene	Individual, Site in Guangxi Prov. 广西壮族自治省	Woo 1959; measurements of M43(1), 43c, 46b, 46c by H.M. (cast).	
Lang Gao	Vietnam	Hoabinhian	Averages of two individuals (nos 17 and 19), Site in Hoa Binh Prov., N Vietnam (Cuong 2007)	H.M.	MHO
Lang Bon	Vietnam	Hoabinhian (ca. 7000 BP)	Individual, Site in Thanh Hoa Prov., N Vietnam (Cuong 2007)	H.M.	MHO
Mai Da Nuoc	Vietnam	Hoabinhian (ca. 8000 BP)	Individual, in Thanh Hoa Prov., N Vietnam (Cuong 1986, 2007)	H.M.	IAH
Hoabinhian (average)	Vietnam	Hoabinhian (ca. 11,000–8000 BP)	6 specimens including fragmental remains from above 4 sites and 1 from Mai Da Dieu site in Thanh Hoa Prov. (Cuong 2007)	H.M.	MHO, IAH
Bac Son	Vietnam	Epi-Hoabinhian (ca. 8000–7000 BP)	Sites of Pho Binh Gia, Cua Git, Lang Cuom, and Dong Thuoc in N Vietnam (Mansuy and Colani 1925)	H.M.	MHO
Con Co Ngua	Vietnam	Da But Culture (ca. 6000 BP)	Site in Thanh Hoa Prov., N Vietnam	Thuy 1990; Cuong 2003; measurements of M43(1), 43c, 46b, 46c by H.M.	IAH
Gua Cha	Malaysia	Hoabinhian (ca. 8000–6000 BP)	Individual Sample no. H12, Site in Kelantan Prov. (Sieveking 1954)	H.M.	CAM
Tam Hang	Laos	Early Holocene	Hua Pan Province, N Laos (Mansuy and Colani 1925; Huard and Saurin 1938; Demeter et al. 2009)	H.M.	MHO
Zengpiyan 甕皮岩	China	Mesolithic (ca. 8000 BP)	Site in Guangxi Prov. 广西壮族自治省	IACAS, ATGZM, ZM, and ATGC, 2003	
Neolithic Samples					
Man Bac	Vietnam	Late Neolithic (ca. 3800–3500 BP)	Site in Ninh Binh Prov., N Vietnam (Oxenham et al. 2011)	Matsumura 2011	
An Son	Vietnam	Late Neolithic (ca. 3800 BP)	Site in Long An Prov., S Vietnam (Nishimura and Dung 2002; Cuong 2006; Bellwood et al. 2013)	H.M.	LAPM
Ban Chiang	Thailand	Neolithic-Bronze Age (ca. 3500–1800 BP)	Site in Udon Thani Prov. (Gorman and Charoenwongsa 1976; Pietrusewsky and Douglas 2002)	Pietrusewsky and Douglas 2002; measurements of M43(1), 43c, 46b, 46c by H.M.	UHW, SAC
Non Nok Tha	Thailand	Neolithic-Bronze Age (ca. 3500–3000 BP)	Site in Khok Kaen Prov. (Bayard 1971)	H.M.	UNLV
Weidun 圩墩	China	Neolithic (ca. 7000–5000 BP, Majiabang Culture 马家浜文化)	Sites in Jiangsu Prov. 江苏省 Central China	Nakahashi and Li 2002	

Sample	Locality	Period	Remarks	Data Source	Storage
Jiahu 賈湖	China	Neolithic (ca. 9000 BP)	Site in Henan Prov. 河南省 Central China (HPIAC 1989, 1998)	H.M.	HEPICA
Xipo 西坡	China	Neolithic (ca. 5300 BP, Yangshao Culture 仰韶文化)	Site in Henan Prov. 河南省 Central China (IACAS and HPIAC 2010)	H.M.	HEPICA
Hemudu 河姆渡	China	Neolithic (ca. 6300 BP, Hemudu Culture 河姆渡文化)	Site in Zhejiang Province 浙江省, Yangzi Delta region (ZCARI 2003)	H.M.	HEMSM
Baikal	Russia	Neolithic (ca. 8000–4000 BP)	Lake Baikal (Debets 1951).	Ishida 1997	
Jomon	Japan	Neolithic (ca. 5000–2300 BP)	Over almost the entire Japanese archipelago	Hanihara 1993, 2000	
Bronze – Iron Age Samples					
Anyang 安陽	China	Yin (Shan) Period (ca. 3500–3027 BP)	Site in Henan Prov. 河南省 Central China (IHIA and CASS 1982)	Han and Qi 1985; measurements of M43(1), 43c, 46b, 46c by H.M.	AST
Rach Rung	Vietnam	Bronze Age (ca. 2800 BP)	Site in Moc Hoa District, Laong An Prov., Sth Vietnam (The and Cong 2001)	H.M.	LAPM
Giong Ca Vo	Vietnam	Iron Age (ca. 2300–2000 BP)	Site in Ho Chi Minh (Dang and Vu 1997)	Cuong 2007; measurements of M43(1), 43c, 46b, 46c by H.M.	HCHM
Go O Chua	Vietnam	Iron Age (ca. 2300–2000 BP)	Site in Long An Prov., S Vietnam (Reinecke 2008)	Cuong in press	LAPM
Hoa Diem	Vietnam	Iron Age (Hoa Diem 2 = ca. 2150 BP; Hoa Diem 1 = ca. 2000–1700 BP)	Site of Hoa Diem in Khanh Hoa Prov., Central Vietnam (Yamagata 2013)	Matsumura et al. 2013	
Dong Son	Vietnam	Dong Son Period (ca. 3000–1700 BP)	Sites of Dong Son Culture in N Vietnam (Cuong 1996)	Cuong 1996, partially by H.M.	IAH, CSPH
Phum Snay	Cambodia	Iron Age (ca. 2350–1800 BP)	Site in Preah Neat Orey District, W Cambodia	Matsumura et al. 2010	
Yayoi	Japan	Yayoi Period (ca. 2800–1700 BP)	Sites of Doigahama, Nakanohama, Kanenokuma and others in Northern Kyushu and Yamaguchi Districts, W Japan	Nakahashi 1993	

Source: H. Matsumura

Table 4.4 Comparative population samples of historic and modern times.

Sample	Remarks	Data Source	Storage
Oceania and Indian Sea			
Andaman		Howells 1989; M43(1),43c,46b,46c,48,51,55,57,57a by H.M.	BMNH, CAM
Australia		Hanihara 1993; M43(1),43c,46b,46c,57,57a by H.M.	BMNH
Melanesia		Hanihara 1993, 2000	
Loyalty Islands, New Britain, New Guinea Tolai, Veddah, Nicobal		H.M.	CAM, USYD, MHO
Southeast and East Asia			
Laos		Cuong 1996; M43(1),43c,46b,46c,57,57a by H.M.	MHO
La Lo Philippines	ca. 800 BP Site of La Lo in Northern Luzon island	H.M.	NMP
Aeta Negrito	Philippines	H.M.	MHO
Atayal, Bunun	Taiwan Aborigines	Pietrusewsky and Chang 2003; M43(1),43c,45,46b,46c,48,51,55,57,57a by H.M.	NTW
Cambodia, Vietnam		Matsumura et al. 2010	
Celebes, Java, Myanmar, South Moluccas, Sumatra		Pietrusewsky 1981; Hanihara 2000; M17,45,48,51 by H.M.	BMNH, CAM
Thailand	Residents in Bangkok	Sangvichien 1971; Hanihara 2000	
Philippines	Non-Negrito	Suzuki et al. 1993; M43(1),43c,46b,46c,57,57a by H.M.	NMP
Dayak	Sarawak in Borneo Island	Yokoh 1940; Hanihara 2000	
Semang Negrito	Malaysia	H.M.	BMNH
Wasi Yunnan 雲南	Ancient Yunnan, South China	Ji et al. 2005	
Hainan 海南	Hainan Island, South China	Howells 1989; M43(1),43c,46b,46c,48,51,55,57,57a by H.M.	
South China	Residents in Hong Kong	H.M.	CAM
Jiangnan 江南	Lower Basin of Yangtze River, Eastern Zhou - Former Han Periods (2770-1992 BP) in China	Nakahashi and Li 2002	

Sample	Remarks	Data Source	Storage
Northeast Asia			
Japan, North China, North China 2	North China from Manchuria (North China) and Kirin (North China 2)	Hanihara 1993, 2000	
Okhotsk	ca. 1600–1000 BP	Ishida 1996	
Aleut, Asian Eskimo, Buryat, Chukchi, Ekven, Evenki, Hokkaido Ainu, Mongol, Nanay, Negidal, Nivkh, Oroch, Sakhalin Ainu, Troitskoe, Ulch, Yakut, Yukagir	Siberia in Russia and N Japan	Ishida 1990, 1997	

H.M. = current author Hirofumi Matsumura, M = Martin’s measurement definition number.

Storage: institutions whose materials were studied by Matsumura for unpublished data: AST=Academia Sinica of the Republic of China in Taipei; BMNH=Department of Paleontology, Natural History Museum, London; CAM=Department of Biological Anthropology, University of Cambridge; CSPH=Center for South East Asian Prehistory, Hanoi; HCHM=Ho Chi Minh Historical Museum; HEMSM=Hemudu Site Museum; HEPICA=Henan Provincial Institute of Cultural Relics and Archaeology; IAH=Department of Anthropology, Institute of Archaeology, Hanoi; LAPM=Long An Provincial Museum, Vietnam; MHO=Laboratoire d’Anthropologie Biologique, Musée de l’Homme, Paris; NMP=Department of Archaeology, National Museum of the Philippines, Manila; NTW=Department of Anatomy, National Taiwan University; SAC=Princess Maha Chakri Sirindhorn Anthropology Centre, Bangkok; UHW=Department of Anthropology, University of Hawai’i, UNLV: Department of Anthropology, University of Nevada, USA.

Source: H. Matsumura.

Results of cranial metric analysis

Figure 4.5 depicts the results from the neighbor-net split analysis applied to the distances of the Q-mode correlation coefficients based on 16 cranial measurements from Gaomiao and comparative population samples. The unrooted network tree diagram resulting from this analysis branches into two major clusters at the right and left sides. These include: 1) East Asians and many Southeast Asians ranging from the Neolithic to modern times; and 2) Australo-Melanesians and early Holocene Southeast Asians, including the Hoabinhian and Mesolithic (see Bellwood 2014 on the use of term ‘Mesolithic’ for Southern China and Northern Southeast Asian archaeology), respectively. The Gaomiao specimen branched out relatively close to the cluster consisting of Australo-Melanesian and Hoabinhian samples.

Figure 4.5 Net split tree generated from Q-mode correlation coefficients based on 16 cranial measurements.

Source: H. Matsumura.

Discussion and conclusion

In comparing the Gaomiao specimen with ethnically, chronologically and geographically different population samples, dissimilarities from the majority of comparative East and Northeast Asian samples, including other Neolithic samples from China such as those from Jiahu (賈湖), Xipo (西坡), Hemudu (河姆渡) and Weidun (圩墩), are apparent in the cranial morphology. The interpretation of this difference is a crucial issue in the discussion of the population history of this region. With regard to Hoabinhian/Mesolithic foragers, which were widely distributed over Mainland Southeast Asia during the Late Pleistocene and early Holocene, the majority of analyses of skeletal materials have demonstrated cranial morphology with Australo-Melanesian characteristics (Callenfels 1936; Mijsberg 1940; Jacob 1967). These skeletons of the preceramic period may represent some of the early indigenous settlers of Southeast Asia who were possibly the first modern human colonisers of MSEA, and the subcontinental Sahul, who were ancestral to present-day Australo-Melanesians in the region. Based on these findings, Southeast Asia is thought to have been initially occupied by such indigenous people who later exchanged or admixed genes with immigrants from North and/or East Asia, leading to the formation of present-day populations. This is known as the 'two-layer' hypothesis, and is a common hypothesis used to explain the population history of this region. Most recent studies based on the morphological analysis of new skeletal discoveries, as well as dental characteristics, strongly support the two-layer hypothesis (Matsumura and Hudson 2005; Matsumura 2006; Matsumura et al. 2008a, 2008b, 2011a, 2011b). This hypothesis has gained theoretical support from the fields of historical linguistics and archaeology, which have linked the dispersal of language families, including Austronesian, Austroasiatic, Daic, Tai-Kadai, Miao-Yao, etc., with the expansion of rice farming societies during the Neolithic period (Bellwood 1987, 1991, 2005; Higham 1998, 2001; Bellwood and Renfrew 2003; Diamond and Bellwood 2003; Zhang and Hung 2010). These studies of historical linguistics and archeology suggest that south China was a major center of linguistic diversification and appears to have been the ultimate source of the language families.

The morphometric analysis of this early phase Gaomiao individual suggests it has cranial features more closely aligned with Hoabinhian/Mesolithic groups of MSEA than with modern East Asian and Northeast Asian populations (so-called 'Mongoloid' samples). Taking this cranial affinity into consideration, it may be concluded that the early phase Gaomiao hunter-gatherers (*ca.* 6500 BP), who inhabited the region prior to major interaction with farming communities, were less affected by substantial gene flow via diffusion from northern and eastern peripheral areas than other contemporary Neolithic Chinese such as the Jiahu (賈湖), Xipo (西坡) and Hemudu (河姆渡) peoples. It may be worth mentioning in passing that the early Holocene Zengpiyan (甌皮岩) skull from Guangxi Province is also affiliated with early indigenous aggregation (see Figure 4.5), suggesting that the Gaomiao people had genetic material inherited from such early settlers of southern China. Thus far, the long debate concerning the two-layer hypothesis has targeted the population history of Southeast Asia. Our current morphometric analyses of the Gaomiao skeleton may expand adoption of the two-layer scenario to the area of inland China by elucidating the genealogical affinity of the early indigenous populations before diffusion of the rice farming peoples phenotypically possessing Northeast Asian features into the region.

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