

PREHISTORIC SHELL ARTIFACTS FROM SOUTHERN CHINA: A REVIEW

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ABSTRACT

Shell was converted into a range of tools in southern China over a period of 30 millennia prior to the arrival of the first rice farmers into the region about 4500 years BP. The settlements under review comprise rock shelters, riverine and coastal settlements dominated by the accumulation of shell middens, and cemeteries containing individual, flexed burials. Much of this period comprised the Holocene climatic optimum, when affluent hunter-gatherers were able to harvest a wide range of wild plants and engage in fishing and hunting. In doing so, they developed a sophisticated repertoire of shell artifacts dominated by knives and spades, adzes and fishhooks. This paper summarizes their distribution, manufacture, and applications.

INTRODUCTION

Anatomically modern humans migrated from Africa into East and Southeast Asia at least 60,000 years ago, leading to a long and successful period of subsistence by hunting and gathering that was seriously modified when they met and interacted with the first intrusive rice farmers about 4500 years ago. Termed affluent hunter-gatherers, particularly during the warm and stable climatic optimum of the Holocene, they were innovative in terms of their technology, being responsible for some of the

earliest use of pottery vessels and the exploitation of the abundant shellfish not only for food, but also for the manufacture of tools. In Chinese archaeological terminology, the Neolithic in southern China began with the first use of pottery and ground stone tools, and is divided into three stages: early (12,000–8000 BP), middle (8000–5500 BP), and late (5500–3500 BP). It was during the early and middle Neolithic period that the development of shell tools reached a climax (Jiang 2006). The warm climate enabled human communities to settle more easily in open habitats, fully utilizing newly abundant natural resources, including shell (Lin 2004). Based on the available data, we here review the prehistoric shell tools in coastal and inland riverine habitats of Guangxi Province and northern Vietnam (Figure 1), with reference to production, function, and chronological changes in the abundance and diversity of shell implements.

DISTRIBUTION OF THE SHELL TOOLS

Prehistoric sites yielding shell tools are distributed in many parts of Guangxi, especially in the southwestern and northeastern regions. Most are situated near a river or lake, as at Yahuai cave. This preferred location gave easy access to aquatic resources including shellfish for food and tools. From the late Paleolithic period to the transition into the Neolithic, only two cave sites have been discovered: Yahuai and Miaoyan (Figure 1). These cover a significant time range

and are geographically distant. The shell tools are relatively similar, with limited types and simple

processing techniques, primarily shaped through percussion.

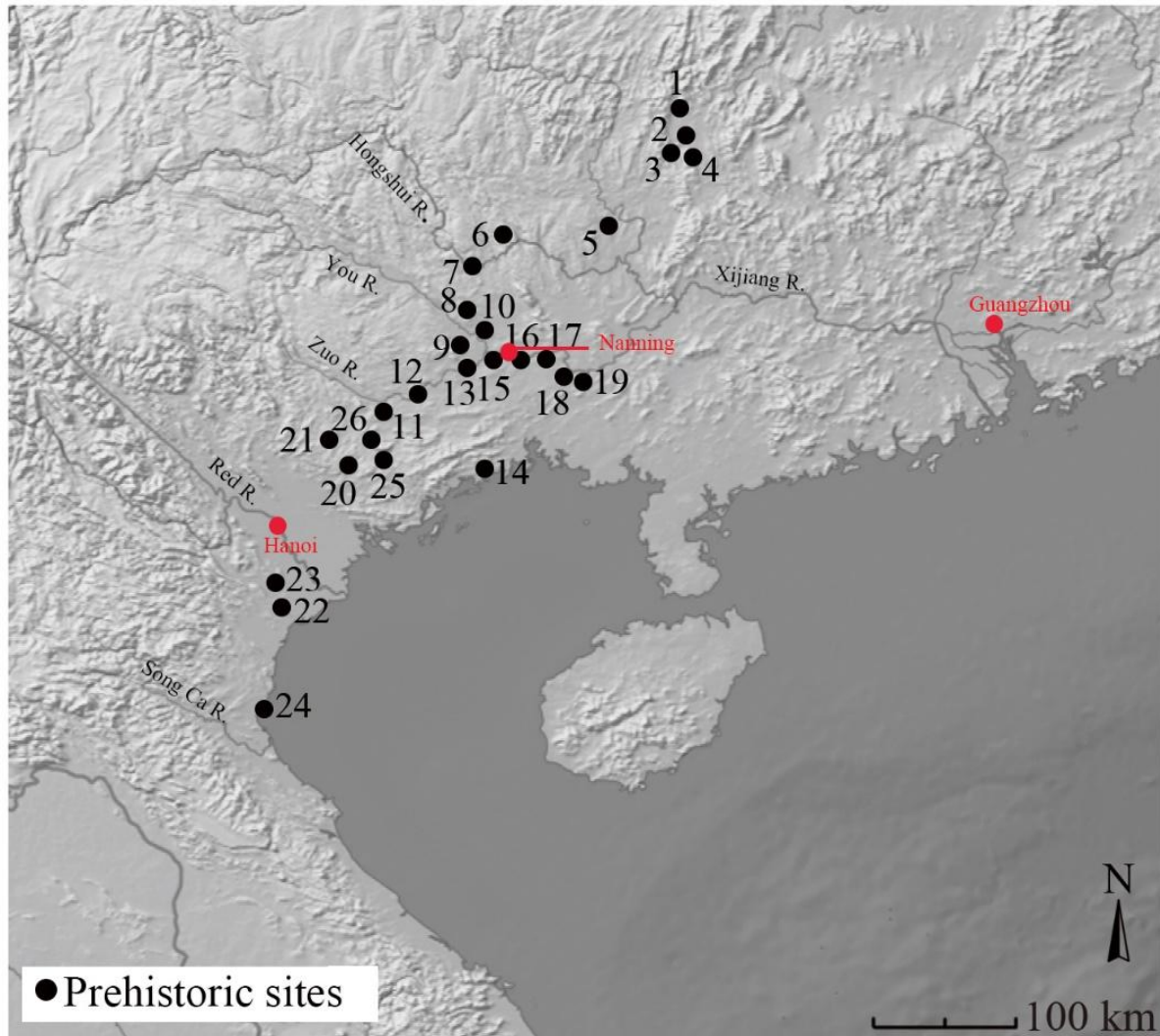


Figure 1. The location of the main prehistoric sites mentioned in the text. 1. Jiaozhiyan; 2. Zengpiyan; 3. Dayan; 4. Miaoyan; 5. Liyuzui; 6. Leishan; 7. Butundong; 8. Chengguan; 9. Yahuai; 10. Liyupo, Baxun, Nongshanyan; 11. Qiniaodong, Dawan, Pojiaohuan, Baojianshan Cave A, Wumingshan, Gencun; 12. Laocheng, Pohui, Tuozhu, Chongtang, Hecun; 13. Ganzao, Jiangxi'an; 14. Beijiaoshan, Yapushan; 15. Sanjiangkou, Longjing, Baozitou, Qingshan, Shichuantou; 16. Dingsishan, Huiyantian, Jiandaoxu, Nabeizu, Lingwu, Niulanshi; 17. Qinglongjiang, Changtang, Tianwo, Tuojiang, Nanshepo, Daozhuang; 18. Qiujiang, Huoyanjiao, Chongli; 19. Jiangkou, Xijin; 20. Đông Lai; 21. Bang Mo; 22. Hoàng Yến Hà; 23. Choong Binh I cave; 24. Quỳnh Vân; 25. Mai Pha; 26. Phi Diễm. Map by Liu Heng courtesy GeoMapApp (www.geomapapp.org).

During the early Neolithic period, shell tools appeared more frequently in the Li River basin, while only a few were found bordering the Liu River. This spatial distribution is similar to that of the late Paleolithic period to the transition into

the Neolithic. By the middle to late Neolithic, shell tools were distributed in the Yong, Zuo and the Yu river basins, as well as the lower reaches of the You River and along the Beibu Gulf (the Gulf of Tonkin). By the end of the Neolithic,

shell tools were also employed in the middle and upper reaches of the Zuo River and the lower reaches of the You River.

THE TYPOLOGY OF THE SHELL TOOLS

Knives dominate numerically. Manufactured by percussion to create a sharp cutting edge, they often reveal use-wear. A sub-type resembles a fish's head and these were often perforated (Figures 2–4). Spade-shaped tools were first chipped to shape on both side of the shell, and then ground along the sides, especially on the

working edge. Some have shoulders at the butt. These will be termed spades, since digging seems to have been their principal application (Figure 5). Fishing involved the use of shell fishhooks and net sinkers, while based on experimental studies, tools with a serrated edge were used to scale the catch (Figure 6). There are also shell adzes and tools with a bored hole of unknown function. The sites in question concentrate in the karst uplands flanking the You, Zuo, Yong, Yu, Hongshui and Red rivers and on the coast. Their chronology and the artifacts identified at each are set out in Table 1.



Figure 2. Shell tools from Guangxi. 1-2. Knives from Yahuai; 3. Knife from Zengpiyan; 4. Fish-head-shaped shell knife from Dingsishan (Modified after Hu 2018; Hu et al. 2025).

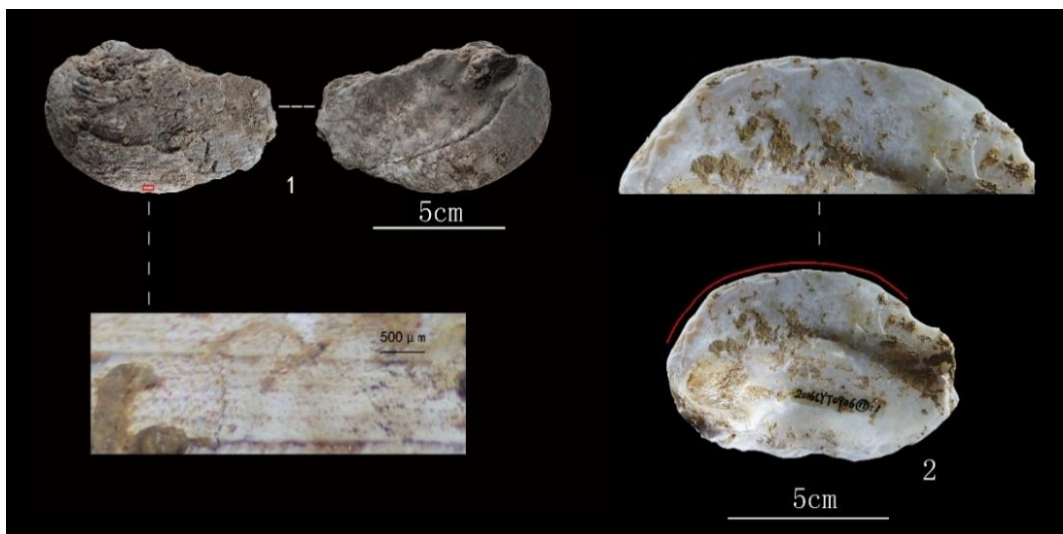


Figure 3. High magnification view of the edges of the shell tools from Yahuai. 1. Ground edge; 2. Trace of scraping use. (Photograph by M. Baillet).

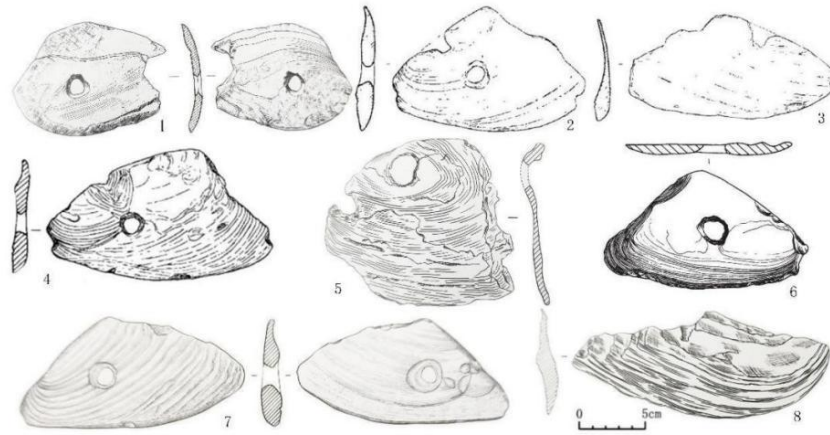


Figure 4. Shell knives and fish-head-shaped shell tools excavated from prehistoric sites in Guangxi (after Hu et al. 2025).

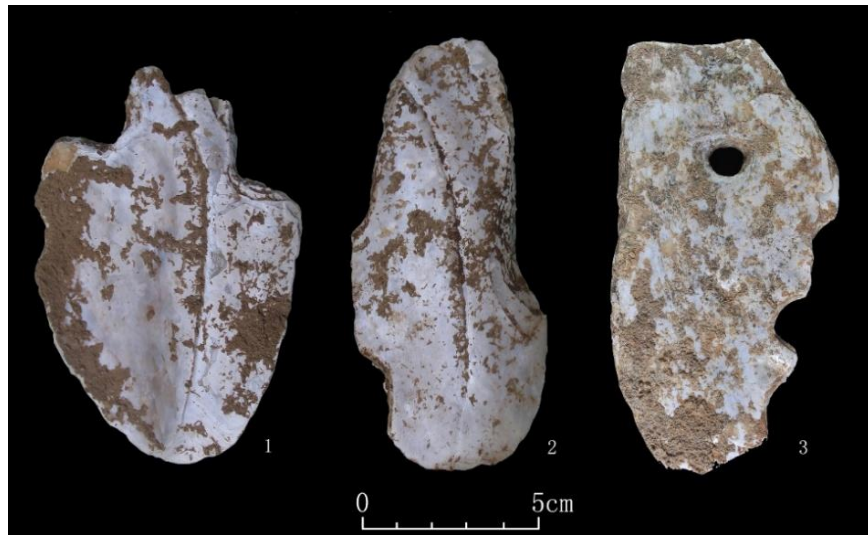


Figure 5. Spades and a perforated tool from Guangxi. 1–2. Hecun; 3. Ganzao (after Anon. 2023a, 2023b).

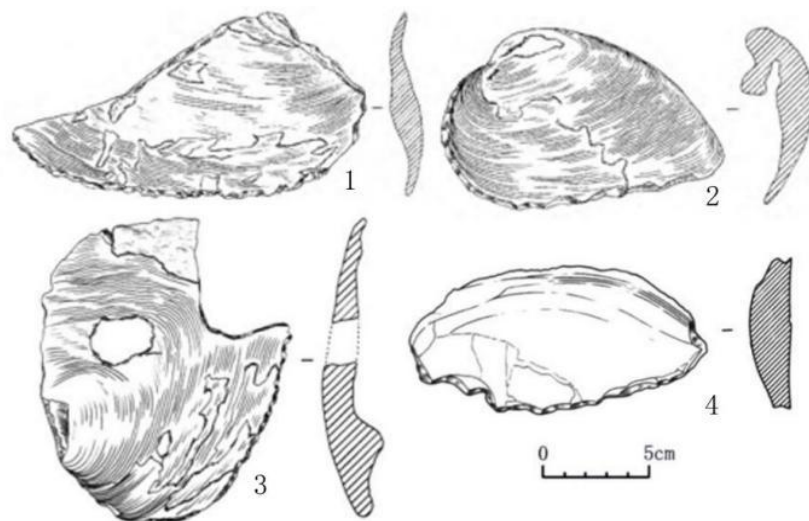


Figure 6. Serrated fish scalers excavated from prehistoric sites in Guangxi. 1–3. Baojianshan Cave A; 4. Dawan (after Hu et al. 2025).

Table 1. Prehistoric sites yielding shell implements in Guangxi.

Site	Phase	n	Types	Main associated materials	Age (BP)	Reference
Yahuai	1-4	102	Knife, spade	Human bone, stone tools, potsherds	43,000–12,000	Hu <i>et al.</i> 2025
Miaoyan	2	13	Knife, perforated tool	Chipped stone tools, bone tools, potsherds	19,000–12,000	Anon. 1999
Zengpiyan	3	79	Knife, spade	Burials, chipped stone tools, tools of bone and antler, potsherds	12,500–7000	Anon. 2003a
Dayan	3	Not stated	Knife, perforated tool	Burials, stone artifacts, bone tools, potsherds	Paleolithic to Neolithic	Jiang 2012
Jiaoziyan	3	1	Knife	Chipped stone tools	12,000–8000	Jiang 2012
Liyuzui	3	2	Knife	Burials, stone artifacts, bone tools, potsherds	9000	Fu <i>et al.</i> 2004; He <i>et al.</i> 1983
Dingsishan	4	16	Knife, spade	Burials, stone artifacts, bone tools, potsherds	10,000–6000	Anon. 1998
Ganzao	4	17	Knife, spade	Burials, stone artifacts, bone tools, potsherds	8500–7100	Anon. 2023a
Baozitou	4	>900	Knife, net sinker	Burials, stone artifacts, bone tools, potsherds	8000–7000	Anon. 2003b
Pojiaohuan	4	216	Spade, perforated tool	Stone artifacts, bone tools	8000	Anon. 2021
Qiujiang	4	55	Knife, spade, adze	Burials, tools, tools of bone and antler, potsherds	8000–7000	Anon. 2006b
Xijin	4	>190	Knife, spade, hook	Burials, stone artifacts, bone tools, potsherds	7000	Peng and Jiang 1991
Jiangkou	4	2	Shell tool	Stone artifacts, bone tools, potsherds	7000	Anon. 2000
Dawan	4	3	Spade, fish scaler	Chipped stone tools, ground stone tools	6000–5000	Anon. 2021
Chengguan	4	Not stated	Shell tool	Not stated	Neolithic	He and Qin 1986
Yapushan-Beijiaoshan	5	2	Spade, net sinker	Stone artifacts, pottery	12,000–5500	Mo and Chen 1961
Liyupo	5	>30	Knife, spade	Burials, stone artifacts, bone tools, potsherds	6000	Jiang 2012
Baojianshan	5	35	Spade, perforated tool, fish scaler	Stone artifacts, bone tools, potsherds	7000–4000	Anon. 2021
Wumingshan	5	82	Spade, knife, perforated tool, fish scaler	Stone artifacts, bone tools, potsherds	5000	Anon. 2021
Leishan	5	1	Perforated tool	Stone artifacts, bone tools	8000–3500	Anon. 1991
Butun	5	2	Knife	Stone artifacts, bone tools	5500–3500	Anon. 1992
Baxun	5	Not stated	Knife	Burials, stone artifacts, bone tools, potsherds	5500–3500	Anon. 1975
Chongtang	5	Not stated	Shell tool	Burials, stone artifacts, bone tools	5000–4000	He and Chen 2008
Gencun	5	3	Spade, perforated tool	Stone artifacts, bone tools	5000–4000	Anon. 2021
Hecun	5	13	Knife, spade	Burials, stone artifacts, bone tools, potsherds	5000–4000	Anon. 2023b
Nongshanyan	5	11	Shell tool	Ground stone tools, pottery, jade items	4300	Anon. 2006a

N.B.: **n** represents the number of shell implements. For an explanation of the phases, see text below.

THE CHRONOLOGY AND PERIODIZATION OF SHELL TOOLS

Based on their form, processing methods, and manufacturing techniques, combined with the chronology and periodization of the sites, there are five phases of shell tools. The first is dated to the late Paleolithic, the second phase is the transition from the Paleolithic to Neolithic, and the third to fifth phases fall within the Neolithic, defined here as the period characterized by the use of ceramics.

Phase 1: Shell tools were excavated only at Yahuai cave's first and second occupation phases, dating to ca. 34,000–21,000 BP. Knives were the only artifact, made of Unionid bivalves including *Lamprotula* (Song *et al.* 2020). These were made by processing a complete shell, not changing the shell form, or rarely, were made of part of a shell. Most knives were made by chipping and trimming.

Phase 2 is characterized by oval knives crafted from relatively intact shells, with a few notched-edge knives and an increase in the knives made of parts of a shell. These were mainly found at Miaoyan cave in the Li River basin and the third phase of Yahuai cave. The earliest perforated shell tools appeared at Miaoyan, dating to 18,000–12,000 BP. The third phase of Yahuai cave lies within this time range.

Phase 3 belongs to the early Neolithic period and mainly involves knives, with an increase in the number of perforated tools. Spades and net sinkers were first manufactured at this time. Tools of this phase were discovered at Zengpiyan and Jiaozhiyan in the Li River basin and Liyuzui in the Liu River basin, dating to ca. 12,000–9000 BP.

Phase 4, the middle Neolithic period, is distinguished by a variety of shell tools, which are numerous, significant in proportion to other raw materials, and exquisitely crafted. Knives remain the predominant type, with a small number of spades, adzes, fishhooks, and net sinkers. Most knives were triangular in form with a hole created by chipping, grinding and perforating that was probably to aid hafting. Among these, the fish-head knives and the fish scalers are the most distinctive, being extensively found in the upper reaches of the Yong and Yu

River basins, as well as in the lower Zuo River basin. Shell tools of this period are also from the coastal shell midden sites, and date to 8000–7000 BP.

Phase 5: The distribution range of shell tools sharply decreased during the late Neolithic. They are mainly found in the middle and upper reaches of the Zuo River and the lower reaches of the You River. In other river basins, they are rare or absent. Fish scalers are distinctive to the Zuo River basin sites. Shouldered spades were finely ground and found in considerable numbers. This period dates to approximately 6000–4000 BP.

MANUFACTURING CRAFTSMANSHIP OF SHELL TOOLS

Manufacturing shell tools included raw material collection, chipping, grinding, and drilling. In terms of specific processing methods and techniques, depending on the type of tool, some only entailed some of these steps, while others needed them all.

The shell knives from Yahuai were processed primarily through direct percussion. Some were chipped and trimmed on the thicker top and both sides, then retouched on the thinner ventral side to utilize the wide, thin, and sharp edge as a blade. Others had only a concave notch chipped on one side for use. Some knives underwent extensive chipping, forming a concave working surface. Shell tools made of partial shell also accounted for a certain proportion, being extensively chipped and trimmed, with the thinner edges serving as blades. The knives from Neolithic sites share many similarities in chipping techniques. Some were simply hammered into the form of a shell knife close to the original shell. Others were chipped and trimmed according to the shape of the shell, forming triangles or elongated strips, with the thinner and sharper edges of the shell being used as blades. Some of these tools had their bodies and blades ground further. More complex shell knives were shaped by chipping and perforating before being finely ground around the edges and blades.

Adzes were first hammered, then trimmed and ground into shape. The spades were formed through extensive hammering with the edges and

blades trimmed and the entire surface ground smooth. Except for drilling holes, net sinkers and some perforated tools were not further processed.

FUNCTIONS AND USES OF SHELL TOOLS

Shell knives dominate numerically. Experimental studies indicate that they were used not only for cutting and processing plant tubers but also possibly for obtaining plant seeds (Wan *et al.* 2012). Experiments on the use of shell tools were conducted for Zengpiyan, confirming functions such as sawing and chopping (Anonymous 2003a). Research has also shown that shell knives were used to harvest plants and cut meat. They are relatively convenient for cutting plants with slender stems, but less so for some underground plant tubers. For obtaining large roots and tubers, knives may have been less convenient than choppers and spades (Chen 2006).

The serrated-edge shell tool is a unique artifact form in the Zuo River basin. Its distribution is consistent with that of spades, primarily at Baojianshan Cave A, Wumingshan, Dawan, and Hecun. These tools were crafted by flaking the natural thin edge of a shell into a blade, with dense, regular, and evenly distributed flaking scars on the blade, resulting in a sharp edge (Anonymous 2021). The tool types are relatively uniform, and divided into two categories: perforated and non-perforated. According to zoological studies conducted on Baojianshan Cave A, Wumingshan, and Hecun, a large number of fish remains have been discovered at these sites (Anonymous 2021). Experimental tests suggest that these tools might have been used to scale fish (Wei *et al.* 2023). Spades and adzes dominated numerically in the Zuo River basin. In other river basins, except for Xijin, only a few have been discovered. In terms of shape and function, spades primarily were used for digging plants and roots (Hu 2018).

COMPARISON WITH VIETNAMESE SITES

Guangxi and Vietnam are contiguous and have a similar physical environment. Bắc Sơn rock shelters are located in the karst limestone uplands of northern Vietnam, where the rivers flow into the Xi and Red river systems. Đông Lai has

yielded shell spades (Hà 2001). Đa Bút culture shell middens are distributed on the coastal plain bisected by the Mã River. Middle Neolithic shell tools and ornaments have been unearthed at Hoàng Yên Hà, while knives have been discovered at Choong Binh I cave (Bùi 2023). Quỳnh Vân shell middens are located in the narrow coastal areas of Nghệ An and Hà Tĩnh provinces (Piper *et al.* 2025). Settlements have yielded a small number of shell tools, typically made by grinding the edges of shells for use as knives. These shells generally measure 8–11 cm in length and 2.5–5.5 cm in width, with a small hole drilled at one end (Nguyễn 1998). The Mai Pha culture is located in caves or rock shelters in the Lạng Sơn region. Shouldered shell adzes were found at Mai Pha, and shell tools were discovered at Phi Diễm. The Mai Pha culture sites have yielded a limited number of tools, including spades, shouldered axes, knives, and perforated shells. These date from the late Neolithic period to the early Bronze Age (Nguyễn 2000, 2002).

Shell tools from Vietnam include knives, spades, and adzes. In Guangxi, there are knives, spades and adzes with knives most frequent and found in several forms. The Đa Bút and Dingsishan cultures in Guangxi are similar in terms of their burial customs, stone tools, and the shapes and decoration patterns of pottery. The spades of the Mai Pha culture of Vietnam are also quite similar in processing technology to those found in the Zuo River basin of Guangxi.

Shell tools in both Guangxi and Vietnam span the entire Neolithic period, and their developmental trajectories are similar. For example, during the early Neolithic, both regions had already developed grinding technique for shell tools. By the middle to late Neolithic period, the types of shell tools increased, and nearly the same types were employed. However, shell tools in Vietnam are fewer than in Guangxi and some types, such as perforated implements, while common in Guangxi, are absent in Vietnam. Overall, the shell tools in Guangxi and Vietnam share many characteristics. Both are located in a subtropical region with karst land forms backing the Gulf of Beibu. From the end of Pleistocene to the Holocene, the climate warmed and food resources were plentiful.

Communities followed broad-spectrum foraging strategies, including fishing and collecting shellfish. Shells were used as food and raw materials. Thus, shell proliferated and followed the same pattern in Guangxi and to the south in Vietnam. We have recognized a broad similarity, but also regional preferences.

CONCLUSIONS

During the Holocene climatic optimum, the broad-spectrum hunter-gatherer-fishers of the karst uplands behind the coast of the Gulf of Beibu built on and elaborated a long previous tradition of shell tool manufacture. Initially, their range was limited to knives, but over time, shell was employed to manufacture spades, adzes and fish scalers, net sinkers and fishhooks. Experimental archaeology has shown that the cutting tools were used to harvest plants and to scale fish, while the spades were almost certainly hafted and used to dig and turn the soil to collect root plants such as yams. As the variety of shapes increased, their manufacturing techniques and functions improved. Distinct regional characteristics emerged, exemplified by fish-head knives and fish scalers. These formed a diversified and essential toolkit.

Shell tools were also employed in river basins and along the coast of northern Vietnam. Sites there yielding shell implements are fewer than in Guangxi, and they all belong to the Neolithic period. Technologically and typologically, the tools found in Vietnam are similar to those in Guangxi as communities in a similar environment followed the same broad-spectrum foraging strategies. However, shell tools that were widely employed in Guangxi are absent in Vietnam indicating further regional specialization.

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