THE JADE INDUSTRY OF NEOLITHIC TAIWAN

Chao-mei Lien

Department of Anthropology, National Taiwan University, Taipei, ROC

ABSTRACT

Archaeologists knew of jade from Taiwan archaeological contexts as early as 1931, long before the actual source region of nephrite was known to geologists. But knowledge of the remarkable wealth of this material was not gained until intensive excavations were conducted at Pei-nan between 1980 and 1988. This paper is focused on the prehistoric jade industry of Taiwan and deals with whole assemblages, especially those with contextual data. It begins with the Pei-nan jade assemblage then considers other discoveries of jades in Taiwan.

Implements made of jade were the most precious objects during Neolithic times in Taiwan. Archaeologists in Taiwan have conducted research on prehistoric jade implements both from Neolithic sites and from museum collections. My research has focused on jade implements since 1955, when I joined the excavation at the Li-yu-shan site in Taitung County conducted by Professor Wen-hsun Sung of the National Taiwan University. The intensive excavations at Pei-nan between 1980 and 1988, conducted by Professor Sung and myself, improved my knowledge of jade. Since then I have carried out a study of the significance of prehistoric jade and its contexts in Taiwan.

Based on the artifact assemblages found from hundreds of prehistoric sites, carbon-14 dating and stratigraphy, as well as comparative studies, archaeologists have divided Taiwan prehistory into cultural units which show significant temporal and spatial differences (Figure 1). This proposed scheme of prehistoric phases and cultures of Taiwan originally appeared in my 1991 paper in this journal (Lien 1991). I have recently made some corrections to this figure, such as the indication of the beginning of the "early Iron Age" at about 2000 years ago and I have added one more Iron Age local cultural unit (the Kuei-shan culture) in southwestern Taiwan, as indicated by newly excavated material (Lien 1998a). In this same paper I clarified the distinguishing cultural characteristics between the Iron Age and the Neolithic, covering techniques of pottery making and decorative patterns, the stone (and jade) inventory, burial methods and certain customs such as tooth extraction, the latter only occurring in the Neolithic. The Taiwan jade industry was evidently highly developed in the Neolithic and had a significant geographical distribution, whereas in the Iron Age a series of imported materials and artefacts of other materials have been found.

A NEW CONCEPT OF "JADE"

Scholars had knowledge of jade from archaeological contexts before the material was generally known in terms of its geological occurrence at Fung-tien, near Hualien in east-central Taiwan. As defined by geologists, the principle mineral of Fung-tien nephrite (also named Taiwan jade) is tremolite, that with increased iron concentration forms actinolite. Fung-tien nephrite has a magnesium rich composition and is most frequently found in the form of tremolite. Most nephrite minerals are monoclinic, with hardnesses between 6 and 7 and specific gravities between 2.96 and 3.1. Some Fung-tien jade co-exists with talc, distributed widely in the Fung-tien region, as a result of contact metamorphism (Tan *et al.* 1978).

The modern mining of jade as well as the lapidary industry began in the early 1960s. Based on geological studies supported by modern industrial companies and the National Science Council, most geologists today believe that the nephrite source in the Fung-tien area is the only productive one anywhere in Taiwan.

In order to study the quality of the jade implements found in archaeological sites, cooperation between archaeologists and geologists was initiated. Several Pei-nan jade artefacts were selected for scientific analysis. Eighteen with accurate provenience data were thin sectioned for petrographic analysis. Examination under a polarising microscope indicated a tremolite schist (or nephrite) origin for these

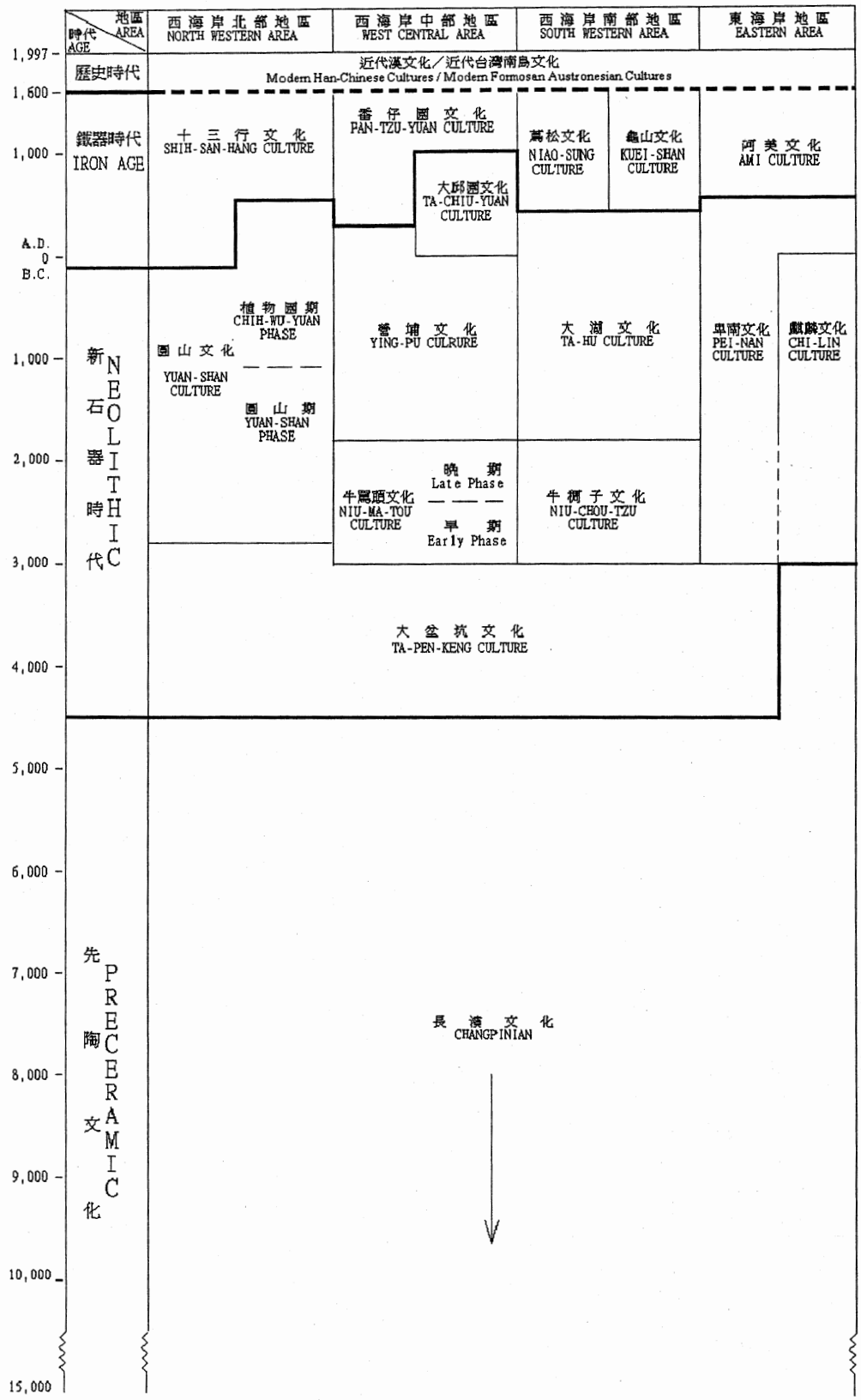


Figure 1: Prehistoric phases and cultures of Taiwan (revised).

samples, with tremolite as the major constituent mineral along with minor accessories such as diopside, serpentine, epidote and magnetite (Wang *et al.* 1996:14-15).

Nine thin sections were analysed by a JEOL 8900R electron microscope for their chemical compositions. Furthermore, twenty jade artefacts and/or fragments were selected for Raman spectroscopy and optical microscopy studies. In terms of colour and appearance, fresh unweathered Pei-nan jade displays a deep to medium yellowish green colour, while samples exposed to weathering develop a lighter greyish to white colour (Tan *et al.* 1996, 1997). The material used as "jade" during Neolithic times in Taiwan was not limited to Fung-tien nephrite, but also included associated rocks such as varieties of green schist, serpentine and talc.

The indigenous nature of the prehistoric jade industry in Taiwan is illustrated not only from the geological source of the material, but also can be demonstrated from manufacturing techniques. It is clear that most of the Neolithic sites located along the east coast of Taiwan, especially those with burials such as Pei-nan, have preserved very rich jade artefacts. These artefacts and their contexts carry significant messages concerning social, economic and religious aspects of prehistoric life.

THE PRECIOUSNESS OF JADE AS SEEN FROM THE HABITATION LAYERS OF THE PEI-NAN SITE

Several monographs and papers have been published in Chinese about the intensive excavations at Pei-nan from 1980 to 1988. In Lien 1991, I briefly described the site and the findings made during these eight seasons of excavation, but the stone inventory from the habitation layers of the site was not discussed. Based on form, shape and cutting edge, the stone and jade implements from the habitation layers at Pei-nan are classified into different types, as listed in Table 1. Among them, one type of flaked stone tool is called a "chipped stone axe", whereas the remainder are almost all well polished. A large number of grinding stones (mainly sandstone - Table 1, no. 13) were found as well.. Of the types of implements (as opposed to ornaments), we only find jade used for spear- and arrowheads, and adzes and chisels, as in Neolithic sites generally in eastern Taiwan.

Based on the knowledge obtained from the burial goods, we can recognise the existence of certain kinds of personal

Table 1: Frequencies of types of implements and manufacturing waste made of jade and ordinary stone from the habitation layers at Pei-nan

	Types of implements, ornaments and manufacturing waste	Material		Frequency
		Jade	*Ordinary stone*	
1	Chipped stone axes		52	0.83%
2	Stone knives		358	5.74%
3	Stone sickles		319	5.12%
4	Stone pestles		116	1.87%
5	Spear and arrow heads	36		0.58%
6			1166	18.69%
7	Slender slate points		586	9.40%
8	Net sinkers		14	0.22%
9	Adzes and chisels	110		1.76%
10			229	3.67%
11	"Barkcloth beaters"		13	0.21%
12	Stone hammers		11	0.18%
13	Grindstones		138	2.21%
14	Manufacturing waste—slate rings		2293	36.76%
15	Manufacturing waste—jade	253		4.06%
16	Personal ornaments, including earrings, necklace units, bracelets and pendants	244		3.91%
17			284	4.55%
18	Miscellaneous		15	0.24%
Total number		643	5594	
		6237		100.00%

Source: Lien and Sung 1986. Numbers include both complete and broken implements.

ornaments in the habitation layers. These include earrings, bracelets made of slate rings, tubular beads and irregular pendants of jade with perforations. But most of the specimens in this category are fragmentary. Only bracelets and the IIC type of earring (see below) are made of slate; almost all other personal ornaments, although mostly fragmentary, are in the jade category.

In addition to the artefacts there is also a great quantity of manufacturing waste at Pei-nan, as shown in Table 1 and Figure 2 (14, 15). These quantities include waste from making slate rings and jade ornaments.

Overall, the tools made of non-jade raw materials were mainly used in activities such as farming, hunting or manufacturing and these account for 89.69% of the total sample. The items of jade are mainly ornaments and their manufacturing waste and account for only 10.31% of the sample.

THE JADE ASSEMBLAGE FROM THE PEI-NAN BURIALS

The burial data from Pei-nan site are complicated and multiple in dimension. They include construction of the slab graves, the skeletal remains, the grave goods and burial positions and orientations. I always feel fortunate to have had the opportunity to study an archaeological site like Pei-nan where people used imperishable materials to enclose the dead, since the associations between skeletal remains and grave goods are not ambiguous (see Lien 2000a, 2000b). At Pei-nan, most of the jade objects are found in the slate lined graves and only a few come from the habitation layers in the site, as mentioned and discussed above.

Nearly four hundred jade objects occur as grave goods from a total of 700 burials. These grave goods have been classified according to typology and location in relation to each skeleton into five categories: personal ornaments, tools and implements, weapons and hunting implements, utensils and miscellaneous (Lien 1998b).

Most personal ornaments are made of jade and can be classified into bell-shaped beads for head-dresses, four types of earrings, two types of necklaces, two types of bracelets and various forms of pendants. In addition, tools such as small chisels and larger adzes were also mainly made of jade. Spearheads and arrowheads in the burials were more commonly of jade than slate (see Figure 3). It can be seen that jade was used for 89.4% of all grave goods, whereas the ratio of jade to other stone in the habitation layers was the reverse (Figure 4).

A most significant feature is that the manufacturing waste of jade and/or small natural jade pebbles occurred in some graves. This clearly illustrates the value of jade. Almost all of the personal ornaments are made of jade, except for the bracelets, that were commonly of slate, perhaps because they become broken easily in such an exposed position on the body. Earrings were generally of jade; the great quantity and numerous varieties indicate high value. The slotted forms were worn through pierced ear lobes as precious belongings.

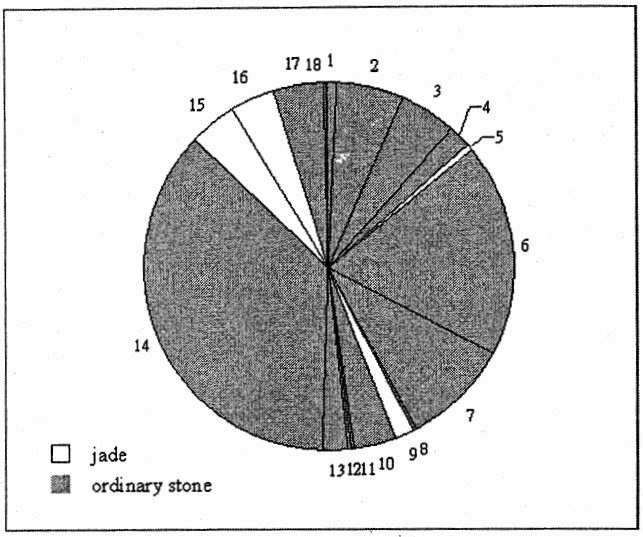
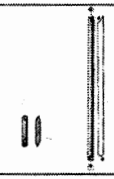


Figure 2: Occurrence frequency of implements made of jade and ordinary stone as shown in Table 1.

THE SIGNIFICANCE OF THE FUNG-TIEN NEPHRITE MINES, AND THE DISTRIBUTION OF ARCHAEOLOGICAL SITES IN TAIWAN WITH JADE IMPLEMENTS AND WASTE MATERIAL

With the experience and knowledge obtained from the Pei-nan excavations, as well as the increasing numbers of excavations and surveys conducted recently (Lien and Sung 1992; Sung *et al.* 1992), we can now analyse data from 61 archaeological sites (see Figure 5) that have yielded jade implements and/or waste material. A number of significant points can be made:

1. Pei-nan has yielded most of the jade artifact types recorded from Taiwan and only a few more varieties of personal ornaments, such as earring types ID and IID and various forms of pendants, need to be added from other sites. But jade artefacts different from those in Taiwan have reportedly been found from the two southeastern islands of Lu-tao and Lan-yu (Kano 1942a).
2. As shown in Figure 5, sites with jade artefacts associated with manufacturing waste are mainly clustered along the Taiwan east coast and generally belong to the Pei-nan Culture. Sites with similar but fewer jades have recently been found clustered in the Cho-shui and Pu-li basins. These sites are believed to belong to younger cultures, such as Yin-pu and Ta-chiu-yuan. The sites yielding jade implements in northern Taiwan belong to the Yuan-shan Culture of the Taipei Basin. The large western plain of

	Types					Material		Total number
						Jade	Ordinary Stone	
1	Personal Ornaments	head dress	bell-shaped beads			184		184
2		earrings	I	I A		568		584
				I B		14		
				I C		2		
3			II	II A		620		653
				II B		2		
4				II C			31	
5			III	III A 1		10		44
				III A 2		25		
				III B 1		6		
				III B 2		3		
6			IV	IV 1		1		6
				IV 2		1		
				IV 3		1		
				IV 4		3		
7		necklace	stick-shaped beads			283		283

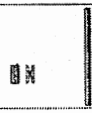
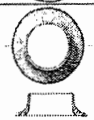
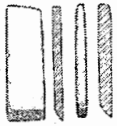
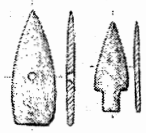
8			tubular beads and tubes		1563		1563
9		pendants			40		40
10		bracelets	rings		1		328
11			slate bracelets			327	
12			flaring bracelets		6		6
13	Tools		adzes and chisels		347		357
14						6	
15			adzes with perforations		1		
16						3	
17	Weapons		spear and arrow heads		166		269
18						103	
19	Others		Manufacturing material and waste		107		107
20			miscellaneous		9		9
Total number					3963	470	4433
Frequency					89.40%	10.60%	100%

Figure 3: Frequencies of types of grave goods made of jade and other kinds of stone from the burials at Pei-nan.

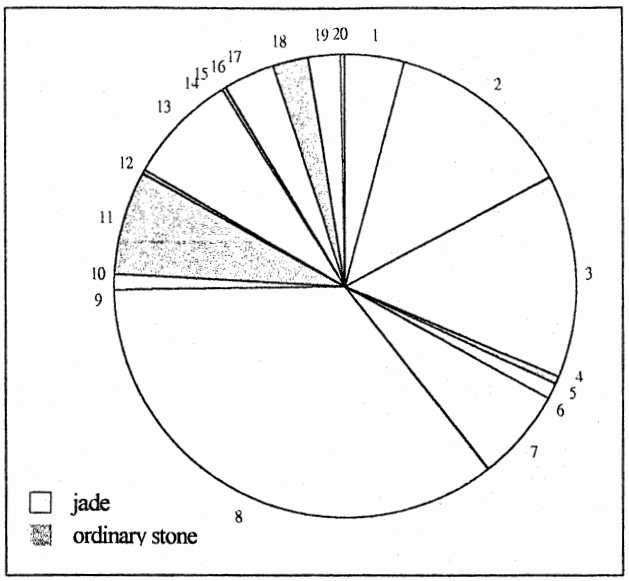


Figure 4: Pie diagram of occurrence frequency of implements made of jade and ordinary stone as shown in Figure 3.

Taiwan and the P'eng-hu Islands have so far yielded only a few scattered jade-bearing sites.

3. Certain rare types of jade object might serve usefully as horizon markers, especially the zoo-anthropomorphic earrings of type IV (Sung and Lien 1984) and the bell-shaped beads. Earrings of type ID only occur in northern Taiwan, in sites of the Yuan-shan Culture.

FINAL OBSERVATIONS

The study of jade artefacts now has to go beyond style to consider the jade industry itself, including procurement of the material, quarrying, transportation and distribution. These issues will require concerted interdisciplinary effort by archaeologists and geologists. Attention should also be focused on the use of serpentine and even other stones as another form of "jade".

The major purpose of this paper has been to present jade within the archaeological context of Taiwan. The jade industry is mainly characteristic of the Taiwan Neolithic and its origin may be associated in some way with the Pei-nan Culture. As for the end of the jade industry in prehistory, Kano's 1946 paper on the excavation of a single slate lined burial at Ma-wu-ku (also known as Tung-ho I) is often cited. Within the grave he found two earthenware pots, four tubular jade beads and one bronze bracelet, in a context that may belong to a later phase of the Pei-nan Culture. In Kano's opinion (Kano 1952), the bracelet was of Dong Son type. Also, bicephalous ornaments, slotted earrings with four protrusions and "earrings" without slots are found from jar burials in Lan-yu in association with bronze axes, or are still in the possession of Yami people (Kano 1946; Kokubu 1957; Sung 1980, 1989). These artefacts are similar to jades from the Tabon Caves, Palawan, Philippines (Fox 1970:Figure 39b, c).

There is no surviving oral history or lexicon in any Formosan languages relating to jade, a striking feature compared to the Maori of New Zealand, who can still identify nearly 20 varieties of nephrite based on colour and texture (Clark 1986:34). The Yami of Lan-yu have no memory of the use of jade or bronze objects or even of urn burial. The use of jade would appear to have ceased some time during the "early Iron Age" of the Taiwan prehistoric sequence.

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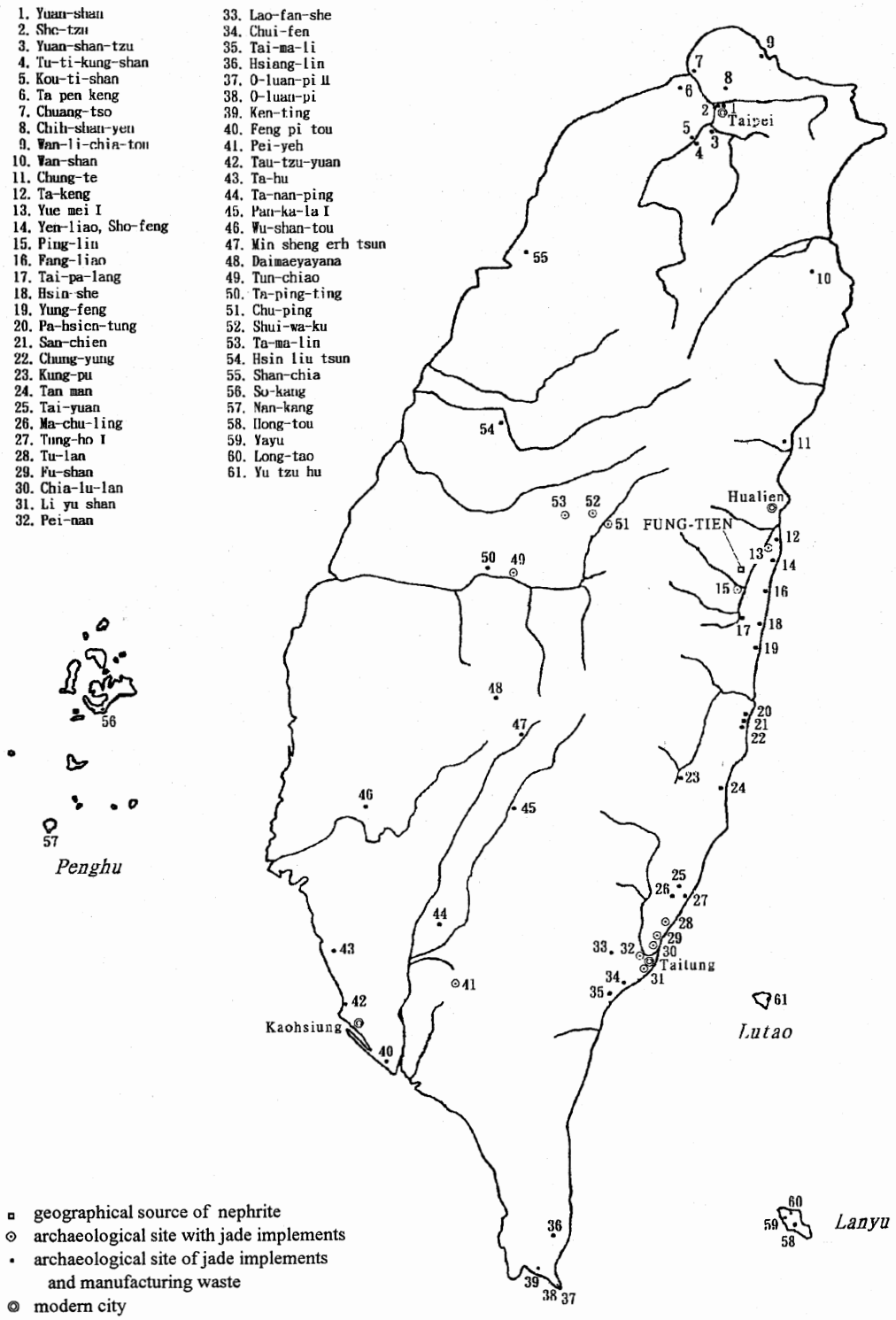

Figure 5: Fung-tien area of nephrite mines and archaeological sites yielding jade implements and manufacturing wastes.

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