MORE THAN MEETS THE EYES: SLOTTED RINGS AND SOCIAL COMPLEXITY IN BRONZE AGE HONG KONG

Emily CHAN Ho Yee[1]

Abstract

Ear ornaments are not the monopoly of modern people. In the form of slotted rings, they have been found in various Neolithic and Bronze Age archaeological sites in East and Southeast Asia (Wong 2009). In 2008, a large amount of artefacts related to slotted ring production were found in a rescue excavation at So Kwun Wat, Tuen Mun. In the face of an increasing amount of slotted rings, this paper attempts to investigate the issue of standardisation and centralisation of slotted ring production in Bronze Age Hong Kong (circa 1,500 to 400 B.C.), and in turn shed light on the social complexity of the time.

[1] Emily CHAN Ho Yee is a graduate of the Department of Anthropology, The Chinese University of Hong Kong. She can be reached at her e-mail, chanemily.hy@gmail.com

Introduction

Slotted rings are generally circular ring with a slit opening. They are predominantly made of stone, but those of other materials including shell and pottery have also been found (Chen 1998). Slotted rings are referred to as "slit rings", "split rings" in English and "*jue* (玦)" in Chinese as well. The Chinese term was first used by Chinese scholar Wu Dacheng in 1889 based on the similarity between the excavated C-shaped rings and *jue* as "incomplete rings" in various Chinese classical texts (Chen 1998; Wong 2009). Regardless of their dubious link, the term has continued to be used by Chinese archaeologists and later extended to include slotted rings of various shapes. Different usages and functions of slotted rings have been suggested. It is generally agreed that slotted rings were originally used as earrings, supported by archaeological and ethnological evidence (Liu 2010). Some researchers have further suggested that slotted rings were given symbolic meanings. According to various Chinese classical texts, slotted rings had the meaning of farewell and banishment (Huang 1975). It also assumed the symbolic meaning of determination since the Spring and Autumn Period (771 – 476 B.C.) (Huang 1975). However, it would be hard to demonstrate if slotted rings found in Hong Kong assumed these symbolic meanings because of the geographical and temporal distance between slotted rings from Hong Kong and those from the Yellow River region described in classical texts.

Research Objectives and Methodology

Bronze Age slotted rings have been found in numerous archaeological sites in Hong Kong, but little study has been conducted on their social and cultural meanings. This study aims at investigating if standardisation and centralisation were present in slotted ring production, which in turn allows the social complexity of Bronze Age Hong Kong to be revealed.

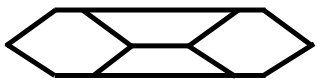
Typology, classification, and statistics are the main research methods of this study, in which slotted rings from four sites located in the southwestern part of Hong Kong are examined. They include So Kwun Wat (掃管笏 SKW) in Tuen Mun, Tung Wan Tsai (東灣仔 TWT) on Ma Wan, Hai Dei Wan (蟹地灣 HDW) on Lantau Island, and Kwo Lo Wan Lower (過路灣下區 KLW) on Chep Lap Kok. The slotted rings are classified into different types and subtypes, after which their qualitative and quantitative attributes are measured and recorded. Researchers generally classify slotted rings based on their differences in typological features (see Huang 1975, Chen 1998). Yet, there is currently no uniform classification because of the different criteria

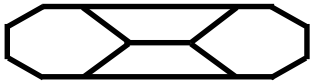
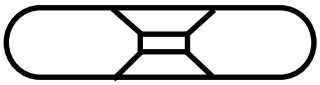
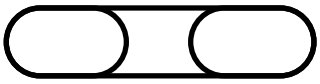
held by researchers. In order to facilitate the following analysis, slotted rings are first categorised into types based on their cross section, which are then further classified into subtypes based on their cross section of borehole.

Classification of Slotted Rings in Hong Kong

A total of 63 slotted rings dated to the Bronze Age have been examined. They include 28 slotted rings from So Kwun Wat, 12 from Tung Wan Tsai, 9 from Hai Dai Wan, and 14 from Hai Dei Wan. Only those from So Kwun Wat can be further identified as products from particular periods within Bronze Age. While 2 of them are dated to late Shang and Western Zhou period, 26 belong to Eastern Zhou period. Among all slotted rings, eight from So Kwun Wat cannot be subject to the typological classification because they are too fragmented for their attributes to be observed. In total, 55 of the slotted rings can be classified into five different types based on their typological differences. The following list (table 2) shows the types and subtypes identified from the slotted rings examined.

Table 2. Typology of Slotted Rings Types and Subtypes

Type	Subtype	Cross section
Type 1 • Straight outer rim	**Type 1A** Straight inner rim	
	Type 1B Downward sloping inner rim	
	Type 1C Bevelled inner rim on both sides	
Type 2 • Outer rim bevelled on one side and straight on the other	**Type 2A** Straight inner rim	
	Type 2B Upward sloping inner rim	
Type 3 • Outer rim bevelled on both sides	**Type 3A** Downward sloping inner rim	
	Type 3B Upward sloping inner rim	
	Type 3C Bevelled inner rim on both sides	

Type 4 • Outer rim bevelled on both sides, with flat surface instead of pointy end	**Type 4A** Straight inner rim	
	Type 4B Inner rim bevelled on both sides	
Type 5 • Round outer rim	**Type 5A** Straight inner rim	
	Type 5B Downward sloping inner rim	
	Type 5C Bevelled inner rim on both sides, with flat surface instead of pointy end	
	Type 5D Round inner rim	

Statistical Analysis of the Slotted Rings

It is followed by an analysis of standardisation level in slotted ring production, in which four types of standardisation are identified and examined. They are standardisation in

1. the production of certain type of slotted rings;
2. the choice of raw materials for producing slotted rings;
3. the use of manufacturing technique; and
4. the proportion between different parts of slotted rings.

These four types of standardisation are represented in the archaeological record as the following aspects.

1. Typological composition of slotted rings in each site;
2. Raw material composition of slotted rings in each site;
3. Percentage of hole boring methods used in slotted ring production;
4. Coefficient of variation (CV) values of proportions between different parts of slotted rings.

The above aspects are adopted as the criteria for the examination of slotted rings in which their typology, raw material, and borehole drilling technique are inspected. Using the quantitative measurements collected, coefficient of variation (CV) between different proportions of slotted rings is calculated. The various proportions are between 1) diameter and thickness; 2) diameter and borehole diameter; 3) borehole diameter and thickness; and 4) diameter and slit height. By comparing CV percentage, the level of variability among slotted rings of the same subtype can be revealed. Based on a research done by Eerkens and Bettinger (2001), the lower the CV, the lower the variability, and hence the higher the degree of standardisation. They also concluded that 1.7% CV represents the highest level of standardisation that is attainable in the human production of artefacts, while 57.7% CV represents the variation expected in a random artefact production with no concern of standardisation.

The results generated from the analysis fall into one of the four levels of standardisation set up for this study. Using the statistical concept of quartiles, four levels of standardisation are established for every assessment based on the four criteria. The ranges of percentage for each criterion are presented in the following.

Table 1. Four levels of standardisation and their corresponding range of percentage

Criteria	Level of Standardisation			
	High	Medium-High	Medium-Low	Low
1) Typological Composition	x[1] $\geq 75\%$	$75\% > x \geq 50\%$	$50\% > x \geq 25\%$	$x < 25\%$
2) Raw Material Composition				
3) Borehole Drilling Method	$x \geq 87.5\%$	$87.5\% > x \geq 75\%$	$75\% > x \geq 62.5\%$	$50\% \leq x < 62.5\%$
4) CV of Proportions of Slotted Ring	$1.7\% \leq x \leq 14\%$	$14\% < x \leq 28\%$	$28\% < x \leq 42\%$	$42\% < x \leq 57.7\%$

[1] x represents the percentage that falls into each level of standardisation.

Figure 1-4. Slotted rings from So Kwun Wat (upper left), Tung Wan Tsai (upper right), Kwo Lo Wan Lower (lower left), and Hai Dei Wan (lower right).

Discussion

With the results generated based on the above methodology, an inter-site comparison will be carried out in the hope of determining if standardisation and centralisation existed in the Bronze Age production of slotted rings. Four aspects of slotted rings will be compared, including typological composition, raw material composition, use of borehole drilling methods, and the result of correlation of variation of subtypes. For So Kwun Wat, only slotted rings dated to the Eastern Zhou period will be considered because there are only two slotted rings from the late Shang and Western Zhou period from which a statistically valid result cannot be drawn.

Was There Standardisation? Comparison and Analysis of Bronze Age Slotted Rings

Typological Composition

Table 3. Typological Composition (Type) of All Slotted Rings

	SKW	%	TWT	%	KLW	%	HDW	%	Total
Type 1	6	33.3	1	8.3	0	0	0	0	7
Type 2	4	22.2	0	0.0	0	0	8	88.9	12
Type 3	0	0	9	75.0	10	71.4	0	0.0	19
Type 4	4	22.2	0	0.0	0	0.0	1	11.1	5
Type 5	4	22.2	2	16.7	4	28.6	0	0	10
Total	18	100	12	100	14	100	9	100	53

The level of standardisation in the types of slotted rings produced or used will be discussed based on two criteria: 1) percentage of the type of slotted rings which has the highest number at the site; and 2) the range of slotted ring types. From table 3, slotted rings from Hai Dei Wan show the highest homogeneity, as 88.9% of them belong to type 2, which indicates a high level of standardisation. The site also yields the smallest range of slotted rings – two types only. As a result, Hai Dei Wan had the highest level of standardisation in terms of the types of slotted rings produced. On the other hand, So Kwun Wat had the least standardised slotted ring production in terms of the preference of slotted ring types. It has the largest range of slotted ring types – four types. The percentages of slotted rings are more evenly spread. The percentage of its most numerous slotted ring type (33.3%) indicates a medium-low level of standardisation. For Tung Wan Tsai and Kwo Lo Wan Lower, although their highest percentage found among different types of slotted rings is very close (75% and 71.4% respectively), the former indicates a high level of standardisation while the latter only indicates a medium-high level. However, Kwo Lo Wan Lower seems to have a smaller range of both slotted ring types and subtypes than Tung Wan Tsai (two types against three types; and four subtypes against five subtypes) (Table 4). As a result, it is possible that the level of standardisation in terms of typological composition in Kwo Lo Wan Lower was similar to Tung Wan Tsai. However, caution is required as the number of samples is limited.

Table 4. Typological Composition (Subtype) of All Slotted Rings

Subtype	SKW	%	TWT	%	KLW	%	HDW	%	Total
1A	3	16.6	1	8.3	0	0	0	0	4
1B	2	11.1	0	0	0	0	0	0	2
1C	1	5.6	0	0	0	0	0	0	1
2A	0	0	0	0	0	0	1	11.1	1
2B	4	22.2	0	0	0	0	7	77.8	11
3A	0	0	8	66.7	0	0	0	0	8
3B	0	0	0	0	7	50.0	0	0	7
3C	0	0	1	8.3	3	21.4	0	0	4
4A	2	11.1	0	0	0	0	1	11.1	3
4B	2	11.1	0	0	0	0	0	0	2
5A	2	11.1	0	0	3	21.4	0	0	5
5B	0	0	1	8.3	0	0	0	0	1
5C	1	5.6	1	8.3	0	0	0	0	2
5D	1	5.6	0	0	1	7.1	0	0	2
Total	18	100	12	100	14	100	9	100	53

Raw Material Composition

Table 5. Raw Material Composition of All Slotted Rings

Raw Material	SKW	%	TWT	%	KLW	%	HDW	%	Total
Basalt	5	19.2	0	0	0	0	0	0	5
Chalcedony	2	7.7	2	16.7	0	0	0	0	4
Felsite	0	0	4	33.3	0	0	0	0	4
Pryophyllite	12	46.2	0	0	0	0	0	0	12
Quartz	4	15.4	0	0	0	0	8	88.9	12
Shale	1	3.8	0	0	0	0	0	0	1
Shell	0	0	1	8.3	0	0	0	0	1
Tuff	3	11.5	4	33.3	10	71.4	0	0	17
Unknown	0	0	1	8.3	4	28.5	1	11.1	5
Total	26	100	12	100	14	100	9	100	61

Using the same criteria for the determination of standardisation level in producing particular types of slotted rings, the level of standardisation in the use of raw materials will be discussed. Slotted rings with indeterminate raw materials are referred to as unknown. They include four from Kwo Lo Wan, one from Tung Wan Tsai and another one from Hai Dei Wan. It is important to note that they are not necessarily the same type of raw material even they are all counted as "unknown" raw materials. From the above table (table 5), it is very clear that Hai Dei Wan had the highest level of standardisation in the choice of raw materials. It has the highest percentage of 88.8% and only consists of two types of raw material. Similarly, Kwo Lo Wan Lower also has two types of slotted rings only, but its highest percentage is lower than that of Hai Dei Wan (71.4%) and fall into the range of medium-high level of standardisation only. For So Kwun Wat, although its highest percentage is higher than that of Tung Wan Tsai (42.9% against 36.4%), its range of raw materials is larger (six types against four types) and their percentages are more evenly spread. As a result, even though both So Kwun Wat and Tung Wan Tsai have percentages which indicate a medium-low level of standardisation, the production of slotted rings at So Kwun Wat was probably less standardised.

Borehole Drilling Method

Table 6. Borehole Drilling Method Used in All Archaeological Sites

Drilling Method	SKW	%	TWT	%	KLW	%	HDW	%	Total
Unidirectional	12	50.0	9	75.0	7	50.0	7	77.8	35
Bidirectional	12	50.0	2	16.7	7	50.0	2	22.2	23
Unknown	0	0	1	8.3	0	0.0	0	0.0	1
Total	24	100	12	100	14	100	9	100	59

All slotted rings that can be identified for their borehole drilling methods are considered here. From table 6, it can be observed that both So Kwun Wat and Kwo Lo Wan Lower have an equal number of slotted rings bored with unidirectional (boring from one side only) and bidirectional (boring from both side) methods. As a result, it can be reasoned that there were no particular standards in terms of how slotted rings should be bored for slotted rings from both sites, especially when both methods were used for the same type of slotted rings within the same site. For Tung Wan Tsai and Hai Dei Wan, they both have a larger proportion of slotted rings bored with the unidirectional method (75% and 77.8% respectively). It can be argued that producers

of slotted rings found in both site favoured the use of unidirectional boring method, and hence a medium-high level of standardisation in the selection of borehole drilling method. However, there might not be strict control over what method to use in the production of slotted rings of the same type, as demonstrated by the use of both drilling methods for the same set of slotted rings excavated in Hai Dei Wan. As a result, the higher level of standardisation might be a result of the preference of the producers themselves.

Correlation of Variation Result of Different Subtypes

In this section, only the CV results of the same subtype will be compared across site, which will be followed by a comparison among the average CV percentages of all subtypes across different sites, and finally a comparison among subtypes that has the lowest average CV result (i.e. the most standardised subtypes) from each site.

Comparison between the Same Subtypes Across Sites

Since there are not many subtypes that can be found in more than one site, the comparison will only be conducted on subtypes 2B and 5A, so as to examine the level of standardisation between the same subtype found in different sites.

Type 2B

Table 7. Inter-site Comparison of Type 2B Slotted Rings

	Coefficient of Variation (%) of Proportions			
Slotted Ring Type	Diameter & Thickness	Diameter & Borehole Diameter	Borehole Diameter & Thickness	Diameter & Slit Height
So Kwun Wat: Type 2B	**5.56**	10.10	15.71	NA
Hai Dei Wan: Type 2B	8.31	**9.92**	**13.81**	**2.85**

Note: NA = Not available

The various CV results of type 2B slotted rings from So Kwun Wat and Hai Dei Wan are listed above. The bolded results indicate the lower CV percentage between slotted rings from the two sites. With three lower CV percentages, type 2B slotted rings are in general more standardised in Hai Dei Wan than in So Kwun Wat. In fact, both sets of slotted rings have low CV percentages. Apart from one CV percentage (15.71%), all the CV values are lower than 14%, which is the indicator for high level

of standardisation in this study.

Type 5A

Table 8. Inter-Site Comparison of Type 5A Slotted Rings

	Coefficient of Variation (%) of Proportions			
Slotted Ring Type	Diameter & Thickness	Diameter & Borehole Diameter	Borehole Diameter & Thickness	Diameter & Slit Height
So Kwun Wat: Type 5A	**31.58**	NA	NA	**14.30**
Kwo Lo Wan Lower: Type 5A	38.22	**8.85**	**48.45**	21.33

Note: NA = Not available

It is much harder to compare type 5A slotted rings found in So Kwun Wat and Kwo Lo Wan Lower, due to the absence of two results for those from So Kwun Wat. However, by comparing the available results, slotted rings from So Kwun Wat have a lower CV in the proportion between diameter and thickness, and between diameter and slit height. As a result, they are more standardised in these two proportions. On the other hand, those from Kwo Lo Wan Lower have a CV lower than 14% for the proportion between diameter and borehole diameter (8.85%), and hence they are highly standardised regarding this particular proportion.

Inter-Site Comparison Among Average CV of All Slotted Ring Types

Table 9. Inter-Site Comparison Among Average CV of All Slotted Ring Types

	Coefficient of Variation (%) of Proportions				
Sites	Diameter & Thickness	Diameter & Borehole Diameter	Borehole Diameter & Thickness	Diameter & Slit Height	Mean
So Kwun Wat	31.21	8.25	26.83	14.30	20.15
Tung Wan Tsai	43.73	16.94	52.68	12.04	31.35
Kwo Lo Wan Lower	24.45	**8.11**	28.75	14.86	19.04
Hai Dei Wan	**8.31**	9.92	**13.81**	**2.85**	**8.72**

The average CV values of each proportion of all slotted ring types from the same site is calculated and listed in table 9. It can be observed from the above average CV values that Hai Dei Wan had a high level of standardisation in terms of all four proportions, with all its CV values below 14%. For the other sites, each has a proportion that is highly standardised. An average CV that indicates a low level of standardisation for slotted ring proportions can only be found in Tung Wan Tsai. For So Kwun Wat and Kwo Lo Wan Lower, each of them have two CV values that fall into the medium-high level of standardisation and one CV value that belongs to medium-low level. Yet, based on the mean of all average CV, Kwo Lo Wan Lower had a slightly higher level of standardisation. As a result, it can be argued that Hai Dei Wan had the highest level of standardisation among all, followed by Kwo Lo Wan Lower, So Kwun Wat, and Tung Wan Tsai.

Inter-Site Comparison between the Subtypes with the Lowest CV

The subtype of slotted rings with the lowest average CV results are selected from each site and will be compared to determine which site had the most standardised slotted rings. They include type 2B slotted rings from So Kwun Wat, type 3A from Tung Wan Tsai, type 3C from Kwo Lo Wan Lower, and type 2B from Hai Dei Wan.

Table 10. Inter-site Comparison of Slotted Rings with the Lowest CV

	Coefficient of Variation (%) of Proportions				
Slotted Ring Types	Diameter & Thickness	Diameter & Borehole Diameter	Borehole Diameter & Thickness	Diameter & Slit Height	Average
So Kwun Wat: Type 2B	**5.56**	10.10	15.71	NA	10.46
Tung Wan Tsai: Type 3A	43.73	16.94	52.68	12.04	31.35
Kwo Lo Wan Lower: Type 3C	13.09	**4.11**	15.45	6.17	9.71
Hai Dei Wan: Type 2B	8.31	9.92	**13.81**	**2.85**	**8.72**

It can be observed from the above table that type 3A slotted rings from Tung Wan Tsai have the highest CV in average (31.35%) and for all proportions; thus they

are the least standardised slotted rings. While So Kwun Wat has the lowest CV for the proportion between diameter and thickness, it has the second highest average CV (10.46%). For Kwo Lo Wan Lower, its has the lowest CV in the proportion between diameter and borehole diameter, and its average CV is relatively higher than that of Hai Dei Wan (9.71%). Among all subtypes of slotted rings across the four sites, type 2B has the lowest CV in average (8.72%) and for two proportions. As a result, type 2B slotted rings from Hai Dei Wan are the most standardised among all subtypes found across the four archaeological sites. It should be noted that all slotted ring subtypes above except type 3A from Tung Wan Tsai have a CV lower than 14%, which means their proportions are highly standardised in average. It is also important to bear in mind that the above results are generated based on the current archaeological data from the four archaeological sites only. The generally lower level of standardisation in So Kwun Wat might have been contributed by its comparatively greater sample of slotted rings. As a result, caution is required.

Was There Centralisation?

After investigating the level of standardisation in the production of slotted rings found in various sites in the southwestern part of Hong Kong, one may wonder if the difference in standardisation level equates with the difference in technological development among groups living at the sites. However, a question arises: were slotted rings found in different sites produced locally? Based on current archaeological evidence, only burials were found at Tung Wan Tsai, Kwo Lo Wan Lower, and Hai Dei Wan; whereas a slotted ring workshop was found in So Kwun Wat (AMO n.d.; AMO and IA CASS 2010; Meacham 1994; Williams 1979). Are there possibilities that slotted rings found in the three burial sites were produced in So Kwun Wat? In other words, was there centralised slotted ring production in Bronze Age Hong Kong? In the following, various aspects of the slotted ring production will be examined to observe any patterns that might indicate the presence of centralisation.

Sources of Raw Materials

Firstly, raw materials of slotted rings can provide clues to where they were produced. Geochemical analyses, such as neutron activation analysis, allow the source of lithic raw materials to be pinpointed. However, they are not used in this study due to limited resources. Instead, this research attempts to evaluate the possibilities of centralised production through locating raw material sources in the catchment area of each site where inhabitants obtained their resources. According to the analysis of site

exploitation territory developed by Higgs and Vita-Finzi, catchment of a group of hunter-gatherers is normally an area of 10 km radius around their base, which is the equivalent of two hours' walk (Renfrew and Bahn 2006). For farming communities, their catchment is normally an area with a radius of 5 km or one hour's walk. As a result, in order to investigate if slotted rings could be produced locally or in So Kwun Wat, sources of raw materials that were used to make slotted rings will be located in the catchment of each site as marked by the 10 km radius using the geological maps produced by the Geotechnical Engineering Office. In the following table, raw materials used in producing slotted rings found in each site are shown.

Table 11. Raw Materials Used in Slotted Ring Production

	Basalt	Chalcedony	Felsite	Pryophyllite	Quartz	Shale	Shell	Tuff
SKW								
TWT								
KLW								
HDW								

From the above table, it can be seen that only three types of raw materials were used in making slotted rings from more than one site. They include chalcedony, quartz, and tuff. Therefore, there may be a higher probability for these slotted rings to be produced in So Kwun Wat than those made of raw materials that were not used in So Kwun Wat. Among all raw materials, two of them – felsite and shell – were used only in sites other than So Kwun Wat. Since shell is not lithic and can be found commonly at seashores, it is not possible to include it in this analysis. As a result, chalcedony, felsite, quartz, and tuff are raw materials that should be considered in this analysis. However, geological maps have posed difficulties in locating sources of some of these raw materials, including chalcedony and felsite, as they are not shown on the maps. Consequently, only the sources of quartz and tuff can be located.

Quartz was used in producing slotted rings found in Hai Dei Wan and So Kwun Wat. Unfortunately, quartz vein can be found in the catchment of both sites. For Hai Dei Wan, the nearest quartz vein is located 1.1 km to the south of the site. They can also be found within 5 km on northeastern Lantau Island and Ping Chau. For So Kwun Wat, the quartz veins are nearer to the site. The nearest one is located within the 200m radius of the site. A total of three quartz veins can also be found within the 500m radius. Similarly, tuff sources can be located around all sites where slotted rings made of tuff were found. They can be found all over Ma Wan, where Tung Wan Tsai is located. For Kwo Lo Wan Lower, they can be found within 5km to the south of

the site in the northern and north-western part of Lantau Island. Likewise, three sources are located within 5km to the east of the site.

Based on the analysis using geological maps, it can be seen that sources of some raw materials used in producing slotted rings used in Tung Wan Tsai, Kwo Lo Wan Lower, and Hai Dei Wan are located both locally at the sites or at So Kwun Wat where a slotted ring workshop was found. As a result, it is not possible to determine if slotted rings made of quartz or tuff were produced locally in the burial sites or in So Kwun Wat. On the other hand, the Tung Wan Tsai archaeological report suggests that the felsite slotted rings were not made with local raw material (Rogers et al. 1995). Unfortunately, the origin of felsite is not indicated in the report; hence, it is unknown if the origin is within the catchment of Tung Wan Tsai site or in So Kwun Wat.

Slotted Ring Typology

The range of slotted ring typology can also be used to reveal if centralisation existed in slotted ring production. It can be argued that if there were centralised production in So Kwun Wat, it would have the most diverse range of slotted ring typology; whereas there would be a lower diversity in the range of typology in sites where people used slotted rings produced and transported from So Kwun Wat. Based on table 12 which shows all slotted ring subtypes found in each site, it can be observed that So Kwun Wat indeed has the highest number of slotted ring subtypes (9 out of 14). On the other hand, Tung Wan Tsai, Kwo Lo Wan Lower, and Hai Dei Wan have a lower number of subtypes (i.e. 5, 4, and 3 subtypes respectively). In addition, it can be seen from the table that not all subtypes found in other sites can be found in So Kwun Wat, which should be the case if there were centralisation in slotted ring production.

Table 12. Slotted Ring Typology in the Four Archaeological Sites

	1A	**1B**	**1C**	**2A**	**2B**	**3A**	**3B**	**3C**	**4A**	**4B**	**5A**	**5B**	**5C**	**5D**	**Total**
SKW	3	2	1	0	4	0	0	0	2	2	2	0	1	1	18
TWT	1	0	0	0	0	8	0	1	0	0	0	1	1	0	12
KLW	0	0	0	0	0	0	7	3	0	0	3	0	0	1	14
HDW	0	0	0	1	7	0	0	0	1	0	0	0	0	0	9
Total	4	2	1	1	11	8	7	4	3	2	5	1	2	2	53

As highlighted in the table, type 2A, 3A, 3B, 3C, and 5B only existed in Tung Wan

Tsai, Kwo Lo Wan Lower, and Hai Dei Wan. For 2A and 5B, it can be argued that other than these two missing subtypes, other subtypes from the same types (type 2 and 5) could still be found in So Kwun Wat. However, it is notable that all subtypes of type 3 were absent in So Kwun Wat, while they take up a large proportion of the slotted ring sample from Tung Wan Tsai and Kwo Lo Wan Lower. Consequently, it might indicate that these slotted rings were produced locally but not in So Kwun Wat.

Use of Borehole Drilling Methods

Table 13. Use of Borehole Drilling Methods for Each Subtype

	1A	**1B**	**1C**	**2A**	**2B**	**3A**	**3B**	**3C**	**4A**	**4B**	**5A**	**5B**	**5C**	**5D**
SKW	UB	U	B	-	U	-	-	-	B	B	UB	-	B	U
TWT	?	-	-	-	-	U	-	B	-	-	-	U	B	-
KLW	-	-	-	-	-	-	U	B	-	-	B	-	-	B
HDW	-	-	-	B	U	-	-	-	B	-	-	-	-	-

Note: U = Unidirectional Drill; B = Bidirectional Drill; UB = Unidirectional and Bidirectional Drill; ? = Unknown

The above table shows the drilling methods used to produce boreholes for each subtype found in all the sites. It can be observed that among the six subtypes that can be found in both So Kwun Wat and any other site, namely type 1A, 2B, 4A, 5A, 5C, and 5D, four of them were bored using the same methods across different sites. Does that indicate the possibility of centralisation in slotted ring production, as most of the slotted ring boreholes were drilled with the same method? However, it brings out another question: could it be easier to produce certain slotted ring subtypes with certain drilling methods?

Table 14. Relations between Inner Rim and Use of Borehole Drilling Methods

Inner Rim	**Subtypes**	**Drilling Methods Used**
Straight	1A, 2A, 4A, 5A	Unidirectional and Bidirectional
Sloping	1B, 2B, 3A, 3B, 5B	Unidirectional
Bevelled on both sides (pointy end)	1C, 3C, 4B	Bidirectional
Bevelled on both sides (flat/blunt end)	5C	Bidirectional

Round	5D	Unidirectional and Bidirectional

The above table shows that only one type of drilling method was used in the production of three categories of slotted ring subtypes with the same inner rim. For subtypes with straight inner rim, both unidirectional and bidirectional drilling methods were used. These two methods were both used in So Kwun Wat, whereas only bidirectional method was used for the production of those found in Hai Dei Wan and Kwo Lo Wan Lower. For type 5D with round inner rim, different methods were used in producing slotted rings found in So Kwun Wat and Kwo Lo Wan Lower. Based on the pattern of drilling methods used in the Bronze Age production of slotted rings, it seems there is a low possibility that centralised production existed. Although slotted rings subtypes produced with the same drilling method were found in both So Kwun Wat and other sites, it could be contributed by the ease of producing certain inner rims with certain drilling methods. Moreover, there are examples that slotted rings of the same subtype were bored differently across different sites.

All in all, the examination of various aspects of slotted ring production including source of raw material, slotted ring typology, and use of borehole drilling methods, have all indicated that there was probably no centralised slotted ring production in Hong Kong during Bronze Age. However, the possibility cannot be fully eliminated.

Implication on Social Complexity

Social complexity has been a major focus in social archaeology. It can be revealed through many aspects of a society, such as the presence of agriculture, settlement pattern, religious organisation, and et cetera. The aim of this study is to shed light on the social complexity of Bronze Age Hong Kong through analysing the level of standardisation and centralisation of slotted ring production at that time. Through the analysis of slotted rings from four archaeological sites located at the southwestern part of Hong Kong, it has been shown that there was standardisation in various aspects of slotted ring production, albeit in different levels (table 15).

Table 15. Level of Standardisation in Each Site

	Typology (Type)	Typology (Subtype)	Raw Material	Borehole Drilling Method	Proportions (Mean of Average CV)	Proportions (Mean of Lowest CV)
SKW	M-L (33.3%)	L (22.2%)	M-L (46.2%)	L (50%)	M-H (20.15%)	H (10.46%)
TWT	H (75%)	M-H (66.7%)	M-L (33.3%)	M-H (75%)	M-L (31.35%)	M-L (31.35%)
HDW	H (88.9%)	H (77.8%)	H (88.9%)	M-H (77.8%)	H (8.72%)	H (8.72%)
KLW	M-H (71.4%)	M-H (50%)	M-H (71.4%)	L (50%)	M-H (19.04%)	H (9.71%)

Note: H = High; M-H = Medium-high; M-L = Medium-low; L = Low

Among the four sites, slotted rings found in Hai Dei Wan have the highest level of standardisation. Apart from a medium-high level for the use of borehole drilling methods, all aspects of the slotted ring production exhibit a very high level of standardisation. The other sites also exhibit a high level of standardisation in various aspects of slotted rings, such as the typological composition and proportions between different dimensions of slotted rings. Many of their other aspects show a medium-high level of standardisation as well. Medium-low and low level of standardisation were only found in a few aspects and in certain sites. In general, slotted rings found in all sites have shown a certain degree of standardisation. Apart from the use of borehole drilling methods and subtype composition, all other aspects of slotted ring production found in all sites had at least a medium-low level of standardisation.

With the presence of standardised slotted ring production in Bronze Age Hong Kong, it can be deduced that there were probably labour division and specialisation in the society at the time. What have been found in the four archaeological sites are not one or two random slotted rings, but a large number of polished slotted rings with standardised proportions. Many of them belong to slotted ring sets of graded size. The low CV values of their proportions indicate that they could only be produced by highly skilled craftsmen. As a result, it can be argued that there were already professional craftsmen responsible for the production of slotted rings. There might have been a certain degree of professionalization along with specialisation. While

specialisation is to enforce labour division and systemise the society on the production side, professionalization is the measure for the "human" side (Lu 2011). According to Renfrew and Bahn (2006), labour division and independent specialisation could only arise with the intensification of food production. When food production was intensified to a certain level, the surplus food produced by the community would be enough to free certain individuals from food procurement and allowed them to pursue other activities, such as craft production. As a result, there would be an increase in the labour division in the society. With the production of surplus food, the society gradually became more specialised. There would be an increasing number of people who produced and provided certain kinds of goods and services only, and at the same time they had to depend on other members of the society to provide other kinds of goods and services in exchange of their own.

Specialisation and the dependent exchanging relationship between members of the society probably made the society less egalitarian. This might be supported by the discovery of slotted ring sets in Tung Wan Tsai and Kwo Lo Wan Lower. As sets of four or more slotted rings of graded size, they probably were not used as earrings but produced as burial goods. According to ethnographic research done by anthropologists, the higher status of richer females of the Ha-Li group at Pan Yang was indicated by the larger amount of slotted rings that they wore (Tang 2008). Could the presence of slotted ring sets imply that the society was not entirely egalitarian?

Apart from evaluating the level of standardisation exhibited in slotted ring production, the earlier part of this study also investigates if there was centralised slotted ring production in So Kwun Wat. The inter-site analysis of raw material sources, typological composition, and use of borehole drilling methods has shown that centralisation in slotted ring production was unlikely. If there were centralisation, there had to be leaders with centralised political power who could arrange and organise the centralised production across different areas in Hong Kong. However, since centralised production of slotted rings probably did not exist in Bronze Age Hong Kong, it cannot be proven that there was any centralised authority. As a result, until new discovery is found to clearly indicate otherwise, it should be considered that there was no centralised authority in Hong Kong during Bronze Age. With the evidence of standardisation but not centralisation in slotted ring production, it can be deduced that the society was neither completely egalitarian nor ranked, thus it was probably a segmentary society in which people were generally equal but certain individuals might have more power due to their own talents and skills. However, the extent of how segmentary the society was cannot be determined.

In order to understand more about the social complexity of Bronze Age Hong Kong, other archaeological findings should also be considered. According to Renfrew

and Bahn (2006), intensive farming was a prerequisite for the appearance of full time craft specialists. Although no trace of farming has been found in the four sites that are examined in this study, evidence for plant cultivation was found in Sha Ha (Lu et al. 2005). While plant cultivation was only supplementary to the major subsistence strategy – hunting and gathering – in Sha Ha (ibid; Lu 2007), it shows that such knowledge and practice existed in Bronze Age and could have been spread to other places in Hong Kong, such as the southwestern part of Hong Kong where the four sites are located. Although Renfrew and Bahn (2006) argue that intensive farming was necessary, it could also have been possible for people living in the Bronze Age society to secure enough or even surplus food through hunting and gathering supplemented with plant cultivation, which was the basis for labour division and specialisation in the society. Apart from the evidence of plant cultivation, the discovery of *yazhang* scepter was also used to discuss the social complexity of Hong Kong during Bronze Age by archaeologists. Since *Yazhang* was given the function of commanding the army according to classical texts (Zhang 1994), many scholars consequently argue that *yazhang* found in Tai Wan is the evidence of ranked society. Although *yazhang* were symbol of power in other parts of China, did the one found in Hong Kong assume the same role? Moreover, since Bronze Age lasted for around 1,100 years, can it be certain that slotted rings from the four sites were contemporary with the *yazhang* found in Tai Wan? Although they are all dated to Bronze Age, *yazhang* could be dated to a later period. Additionally, while *yazhang* was found in Tai Wan on Lamma Island, the four chosen sites in this study are situated in the southwestern part of Hong Kong. There might be possibilities that the social complexity in the two regions was different. Yet, the presence of *yazhang* in Hong Kong could have indicated that the society was not entirely egalitarian during Bronze Age.

Apart from providing one more piece of jigsaw puzzle to the general picture of social complexity of Bronze Age Hong Kong, the study of slotted rings also sheds light on other issues, such as shared mindset in the Bronze Age society. The presence of standardised slotted ring production shows that people living at each site had a common idea in what slotted rings were and how they ought to be produced. The presence of slotted rings across the four sites also indicates that residents from each site probably exchanged and shared ideas about slotted rings and how they should look like, especially when the shape of slotted rings was relatively homogenous. Only circular slotted ring have been found in all the sites. In addition, the study of slotted rings allows people of today's generation to see how similar they are to the ancient inhabitants of Hong Kong. From Tung Wan Tsai, a pair of slotted earrings was excavated. While one of them is fully polished, the other has an unpolished borehole with a very rugged inner rim. Similar cases can be found in Tung Wan Tsai and Kwo

Lo Wan Lower. To consider it from a practical point of view, slotted rings with a rugged inner rim cannot be worn because they will hurt the earlobes. Since the two sites both consist of burials, it might be possible that the slotted rings were not intended to be worn as earrings, but buried as burial goods. However, if they were not intended to be used in daily life, why should the other slotted ring have its inner rim polished? Perhaps it can be explained with reference to the jade *bi* excavated at the Mausoleum of the Nanyue King in Guangzhou. While some of the *bi* were polished, some were not and their patterns were also crafted crudely, possibly due to the limited time craftsmen had in producing the burial goods (Lu 1990). Based on this example, it can be argued that some of the slotted rings were not fully polished probably because of the same reason. The study of slotted rings not only provides an insight into the past social complexity, but also shows how similar people from different generations behave.

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