**Response to Reviewers**

In our detailed reply below, we highlighted the actionable comments from you and the anonymous peer reviewers in red, and indicated our responses by these symbols >>>

**Reviewer 1**

This manuscript contains several basic problems:

1. The authors base their work on their own interpretation of "assigning artifacts" to specific time periods of "pre-European" through "Chinese" contexts, yet those assignments are questionable and in disagreement with the original site reporting. The two authors here did not join in those original site investigations, and their re-interpretation of the site would require much more detail of the primary data management and justification in the methodology. Given a very short western colonization period in northern Taiwan, most attentive readers would not believe that a site deposit like in this instance can be divided so clearly into separate components of pre-European, European, and Chinese periods. The authors proposed their own interpretation of the site chronology, and considerably more evidence would be necessary in order to entertain this new interpretation. This problem is quite serious, because the chronology is fundamental for allowing the authors to interpret the chronological change of more diverse and spatially clustered ornaments through time. In order to resolve this key issue, the authors would need first to demonstrate the full amount of details of the site stratigraphic layers, material contents per layer, and positions of radiocarbon dates. The authors claim that they have performed this work already, but they did not share any of it in this manuscript, with enough clarity to compare with the original excavation reports that the authors admit to show different results.

>>>> We have uploaded a greatly expanded set of Supplementary Online Materials that includes detailed data of the site stratigraphic layers, the layers where the radiocarbon dates from, and materials per layer we used for chronology assigning accompanied. This includes a document to guide the reading of data and justify our methods.

2. Another problem is the “assigned artifacts” for the pre-European, European, and the Chinese periods. Before the Spanish and Dutch colonized Taiwan, the Chinese merchants and maritime pirates already had been active in East Asia, and they continued the trading activities in northern Taiwan during the Dutch and Spanish periods. Thus, the result of “social inequality” in northern Taiwan, if it had occurred, was not necessarily as simple as the authors suggest to be related with Western entities, and the “Chinese artifacts” in this manuscript may not have belonged to the” Chinese period” as defined by the authors. These issues have been noted by other scholars working in the region and by Taiwan-based archaeologists in particular.

>>>> We have noted the issue of time indicators. In the excavation background section, we have clarified that we focus on the context where those indicators prevailed to avoid misleading by a single, and individual diagnostic artifact. We also examine stratigraphic data to double check our interpretation. We added an acknowledgement that the chronological resolution may be diminished by this potential movement of Chinese artifacts. Nevertheless, we believe our chronological analysis shows a clear and reliable signal of a Chinese period following the European period.

3. Ornaments are the major objects in this study, yet the authors missed a few key points about ornaments in general. Contrary to what the authors suggest, a few obvious factors could account for the result of seeing more abundant and diverse ornamental objects at the site through time. For example, ornaments tend to endure over long time periods, and many were inherited through multiple generations, at time scales that certainly could cause problems with the distinctions that the authors propose for pre-European, European, and Chinese Periods. If one generation was 20 years (or some would argue 25 or 35 years?), then how could the authors distinguish the time period, given that the Spanish period in Taiwan was about 16 years? Likewise, the Dutch/VOC period was about 38 years.

>>>> We have added some discussion of the issue of heirlooms in the personal ornaments section. We have explained that the amount in the archaeological records can reflect their frequency for each period, because we did not observe the accumulated increase over time. If heirloom behavior was significant at Kiwulan, we would see the highest amount of ornament in Chinese period, but we did not see this trend.

4. The authors propose that the degree of social status differential should be measurable through the diversity and spatial clustering of ornamental artifacts. This idea may be reasonable, but it would need to be introduced with reference to the established literature about reflections of social status in archaeological sites. The scholarly literature is full of relevant work in theory, methodology, and concrete examples in ethnography, archaeology, and ethnoarchaeology that the authors should already know.

>>>> We have updated the text to introduce the topic of social status that can be revealed by spatial clustering of artifacts with both classic references (Kintigh 1982; Orser 1988; Pearson 1993; Halstead 1993) and recent studies (Trubitt 2003; Wason 2004) to support our claims.

5. Furthermore, the population size likely increased through time, and accordingly more people would gain access to more ornaments. In this case, the number of residential houses and especially burial features at the site would reveal more clearly about what had happened, yet the authors have obfuscated this information or avoided it deliberately in the case of the burials.

>>>> We did consider the population issue by using local ceramics as an indicator for population dynamics. We have run a Poisson regression to model the relationship between ceramics and ornaments. We did not do the further research of population size directly based on burials and houses since the data is not available yet and it is beyond the scope of this paper.

**Reviewer 2**

In general it is proper for publication. However I could see some worth citing issues:

1)     A similar or proportional way of adopting western modern products like in trade ornaments from Kiwulan (1400-1900 AD) in northeastern Taiwan, has been noted elsewhere.

The impacts of European colonial activities on local societies see:

Kaltham Al- Ghanim, Andrew Gardner and Sherine El-Menshawy (2017) The relation between spaces and cultural change: supermalls and cultural change in qatari society. SCIENTIFIC CULTURE, Vol. 3, No 2,  pp. 21-32 DOI: 10.5281/zenodo.438184 ([www.sci-cult.com](http://www.sci-cult.com/))

Another issue imposed on traditional societies is the way they preserve conservation and preservation of historic monuments:

ZHENG Jie Jane (2015) the legal approach to historic preservation: a comparative study of historic preservation laws in new york and hong kong. SCIENTIFIC CULTURE, Vol. 1, No 3,  pp. 61-68. DOI: 10.5281/zenodo.18452

>>>> We have cited Ghanim et al (2017) and Zheng (2015) in texts and added them to the reference list.

2)     Concerning the jar shapes found at Kiwulan and their provenance it should be carried out a project on XRF analysis for characterization and provenance.

>>>> We agree and have mentioned that we will conduct XRF analysis for ornaments in future analysis. But currently it is beyond the scope of this paper.

3)     Regarding pieces of locally made pipes and a few imported pipes were found at Kiwulan. Smoking is likely to have been introduced by Europeans…The authors should also consider the work in Turkey: 15th-8th c (Hasan Uçar (2019) ARCHAEOLOGICAL PROOF OF ENJOY AT TİRE KUTU HAN: CLAY PIPES, Mediterranean Archaeology and Archaeometry Vol. 19, No 2, pp. 119-134 DOI: 10.5281/zenodo.3340095 ([www.maajournal.com](http://www.maajournal.com/)).

>>>> We have cited Uçar (2019) in the excavation background section and added it to the reference list.

4)     The ornaments in archaeological sites. A) in these ornaments assign a date, b) mention which archaeological sites? Not the Kiwulan one? Others?

>>>> We have clarified that ornaments were commonly found in Yilan at other sites during the same period. And we have noted that there are no direct dates on ornaments in Kiwulan or other sites. The dating on ornaments relies on the stratigraphic context where the ornament from which is dated by imported diagnostic ceramics and C14 dates on charcoals.

5)     The dated ornaments and the C14 section (chronology) should be more explicit. How the dates in (which?) digs relate to which ornaments and define the pre and post European presence.

>>>> We prepared a much expanded set of Supplementary Online Materials that include extensive information and justification of the chronology we present. These data show the specific layers where the C14 samples are from and other time indicators including jars, pipes, stonewares, tiles, and bricks. The chronology of ornaments is determined by those layers, and our new SOM gives the full details of how we made these determinations for each unit.

Overall: Authors have introduced a model for understanding the dynamics of social inequality at Kiwulan, and have shown how remote indigenous groups were affected by major European colonial processes including Chinese influence as well.

The conclusion section should remain in the findings at this study and shorten considerably the intended future tests.

>>>> We have reorganized the conclusion with a stronger focus on the findings and shortened the intended future tests.

**Reviewer 3**

In this paper, the authors aim to compare the degrees of social inequity at Kiwulan, by estimating the numbers and spatial distributions of ornaments, in different time periods—before, during, and after the European encounters. They finally conclude that social inequity, displayed by the accumulation of ornaments (wealth) was especially prominent during the European colonial period. The competition to accumulate wealth among indigenous people was promoted by the presence of European colonists. Such aggrandizement of social status also became a means to resist the intrusion of Europeans. The goal is clearly stated and the research strategy well designed.

The authors suspect that the increasing number of ornaments was perhaps due to a growth of population during that time. They then examine both the diversity and the numbers of ornaments in each category for different periods. From this test, they can further indicate that the increase of diversity was because Kiwulan was involved in a larger trade network, which is an interesting finding (p.12). However, in comparison tests, such as chi-square, different ways of categorization may affect the comparison results. The authors need to justify their taxonomy. Why are different kinds of beads in the same level as different kinds of metal things, each of which is again divided into several sub-categories? Because of their shapes, outlooks, or raw materials? Whether each type of ornaments was attached the same social importance was mostly unknown, either. The authors also occasionally mention other kinds of ornaments, such as fish-shaped necklaces that were made of metal threads and also marked high social status (p.3). How these different kinds of ornaments related to or complimented each other can be further explored.

>>>> We have clarified that we used the well-established regional ornaments typology in this region for this study. The major type of ornament was classified based on their material and function, and the subtypes are classified based on the shapes. We focus on comparing the frequency of major types of ornaments relative to each other to ensure our sample size is adequate. We only briefly mentioned other kinds of ornament as a supplement since they are too few to robustly explore their relationships to each other.

Although the authors suggest that the presence of Europeans, making some types of ornaments more accessible, were responsible for the competitive accumulation and display of wealth among indigenous people, it is not clear that why the ownership of such wealth also became a way to resist the presence/intrusion of Europeans. It would be interesting to suggest more details about the role Europeans played in trading with local people. In other words, how the presence of Europeans might "simulate" the desire of ornaments needs more explication. By stating the European influence was "indirect", it might be useful to say something about the attitude of the Spanish and Dutch towards local people. Did they consider Kiwulan potential colony? It will also be interesting to compare Kiwulan with those under the direct control of Spanish and Dutch governance.

>>>> We have clarified in the discussion section how the European presence led to ornaments accumulation in the local society, which might be caused by the competition for trade goods and the image of European colonial power. We have mentioned that Kiwulan is included into the Dutch feudal system, but the colonial control is weak and flexible for which we define as an indirect influence. Regarding the attitude of Europeans toward Kiwulan, we have noted that we still need more evidence to discuss it. We agree that it will be interesting to compare Kiwulan with other local settlements in Taiwan under European governance, but we lack suitable sites for comparison currently.

The widespread of ornaments and their lack of pattern in the spatial distribution during European contact is intriguing (p.14). How this distribution might correspond to the distribution of social power is something worth thinking. It is valuable that the authors provide another view, the KDE hotspot, to suggest the distribution of social inequality in space. That can be useful to refer to certain social groups in their future research. Overall, this article to incorporate European contact and the assertion of social power by a small group of indigenous people is successful and convincing.

Some minor suggestions:

Fig.7-1 the x-axis of the topmost figure is better rendered as integral numbers to meet the unit of ornaments.

The English writing is easy to understand but some possible typos:

p.2, L22: "slightly" differences

p.3 L39: because of “to” a lack…

p.6 L18: bought-->brought

p.17 L25: resulted from; L30-33 better to rephrase

>>>> We have fixed the numbers on the figure. We have corrected all the typos and rephrased the sentences mentioned above.