The occurrence of tortoiseshell on a pre-Hispanic Maya mosaic mask

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The Dumbarton Oaks Maya mosaic mask is shown to have included tortoiseshell on an earlobe—remarkable since this is the only demonstrated use of this material in pre-Hispanic Mesoamerica. The authors present diagnostic evidence for the presence of tortoiseshell, account for its absence in pre-Hispanic artefacts because of decay, and propose its use (in the mask) as being symbolic of the ocean.

Keywords: Mesoamerica, Maya, K'inich Ajaw, Postclassic, thirteenth–fourteenth century AD, marine turtle, tortoiseshell, mask, sea symbolism, taphonomy, keratin

Appendix 1. Details of the ears, and other parts, of the pre-Hispanic Maya mosaic mask

On either side of the central, facial part of the mask is an elongated wooden shape, about 6cm high, these form the left and right ears. At the bottom of each ear a square-shaped process faces forward; this is more than 2cm high and wide, and more than 2cm deep, nearly twice the thickness of the upper part of the ear. Viewed from either the front or side, this square process stands out, and gives an appearance distinct from the upper part of the ear. Of particular interest to this paper is a square-shaped laminar ornament composed of a dark material that covers the front of the square-shaped process of the proper left ear (Figure 1).

Different adhesives and binders have been used on different places of the mask to secure the tesserae and model certain parts, such as the ears (Collas *et al*. 1995; Ishihara-Brito

& Taube 2012). An unpigmented adhesive secures the tesserae on the face, while brick-red- and black-pigmented adhesives were used on various other parts of the mask. Both of the ears, with the exception of the forward-facing surfaces of the bottom square process, show a brick-red coloured resin-like material, and a black resin-like material can be seen seeping through certain parts of the square processes. A chip on the right ear (Figure 2) shows that the brick-red coloured material is at least 1mm thick in some places. In the middle of the upper portion of the left ear are remnants of two arcs made of a black material that seems to have been pressed onto the brick-red resin (Figure 3); these may have formed a hollow circle about 1.4cm in diameter or they may have formed c-shaped curls, in which case, following Postclassic conventions, these black arcs would have indicated the curvature of the top of the ear. The right ear has only one remaining arc, in a different orientation from those on the left ear. For both left and right ears, these black arcs are located at the level of the top of the white stepped-fret scroll motif on the cheeks (Ishihara-Brito & Taube 2012: 473). The complexity of the ears, and particularly the square process of the bottom of each ear, indicates that they were of considerable significance.

An unpigmented binder is visible on the frontal surface of the square process of the proper right ear, which suggests that the laminar dark material extant on the bottom of the left ear is adhered by a similar material. Samples from the bottom of the right proper ear that Collas *et al*. (1995: 3, 4, 9) along with Hopwood (1995: 12–13) analysed using gas chromatography, Fourier transform infrared spectrometry, energy dispersive spectroscopy-scanning electron microscopy, and X-ray diffraction indicated: 1) an unpigmented adhesive/binder consistent with a natural triterpene resin and a possible minor wax component; 2) a black-pigmented binder that is probably from a source such as soot or charcoal; and 3) brick-red-pigmented binder consistent with natural resin or wax and iron oxide red. Hopwood found the unpigmented material to be consistent with gum mastic, perhaps the resin of a native tree, the American mastic or pepper tree (*Schinus* sp.), possibly *Schinus molle*.[i]

In addition, a white pigment or accretion on the lateral edge of the bottom of the proper left ear was determined to be probably calcium carbonate ($CaC0_3$) and calcium sulfate ($CaS0_4$), with some iron oxide (Fe_20_3) detected. It was observed that this was a loosely bound or unbound white pigment, and it was suggested that "its application may not have been intentional" (Collas *et al*. 1995: 3, 9). Moreover, it has been suggested that "the sampled white material may be post-depositional accretion that leached out of the limestone

environment in which the object was placed," which would support the report that the mask was found in a cave (Ishihara-Brito & Taube 2012: 474). The lateral surface of the proper right ear, particularly the bottom square process, shows irregular chalky white patches, which could be the same material. The back side of the right ear, near the top edge of the square process, shows a white curving line; and the back side of the left ear has a faint white trace that appears to have mirrored that on the right (Ishihara-Brito & Taube 2012: fig. 277). On the back of the mask are ten circles outlined in red and coloured with a pigment of Maya blues (Ishihara-Brito & Taube 2012: fig. 277), made by combining palygorskite clay and indigo dye (Collas *et al*. 1995: 7, 9; see also Ovarlez *et al*. in press). Both the top and bottom of the mask have remnants of what would have been hair pieces made of multiple mammal hair plugs, each bundled with a plant fibre (Collas *et al.* 1995: 3, 7–9). Both human and animal teeth are in the mask's mouth (Ishihara-Brito & Taube 2012: 474), and the fanged appearance was emphasised in the original description (Randel 1966: 20).

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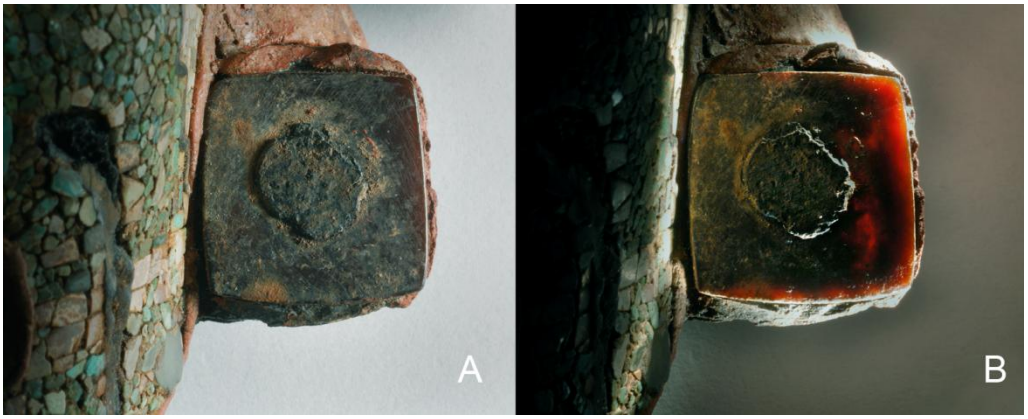

Figure 1. Close up of the left ear ornament on the Dumbarton Oaks mask: A) normal front lighting; B) back lighting through a crack between the ornament and the base of the ear foundation, showing translucence and variegated colouration. Photographs by Joe Mills. © Dumbarton Oaks Research Library and Collection, Washington, DC.

Figure 2. Close up of right proper ear of Dumbarton Oaks mosaic mask, showing a chip in the brick-red material on the upper part of the ear (enclosed within the yellow eclipse), and black material seeping through the brick-red material on the sides of the bottom square process (yellow arrows). Photograph by Reiko Ishihara-Brito.

Figure 3. Detail of left proper ear of Dumbarton Oaks mosaic mask, showing the tortoiseshell lamina and above it remaining arcs of dark material applied to the brick-red material. Photograph by Reiko Ishihara-Brito.

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[i] *A recent analysis was carried out on a sample of black-pigmented adhesive from the mask's forehead. Gas chromatography-mass spectrometry analysis was conducted on a GE 2010 Gas Chromatograph with a 30m × 0.25mm column coupled to a QP2010S Mass Spectrometer (m/z range of 30-750 AMU), carried out by Frances Berdan, Department of Anthropology, and David Maynard, Department of Chemistry and Biochemistry, California State University, San Bernardino. The results indicate that the adhesive in this part of the mask is not a resin, beeswax, or chapapote (native asphalt) (Frances Berdan and David Maynard,* pers. comm. *2010). It is unknown how these results relate to the adhesives on the ears.*