Object: Feathered Headdress

Object Number: X70.1840

Cultural attribution/provenance: Karajá tribe, Brazil

Dimensions (H x W x D, inches): 13 x 13 ½ x 14

Medium: Feather, vegetal fiber

Current/past owners: Fowler Museum at UCLA

Markings: One paper tag with accession number X70.1840 written in pencil, one piece of yellow tape labeled "113" wrapped around plant fiber net.

Date of examination: October 19, 2018

Conservator: Kasey Hamilton

Object Description

Feathered *lori lori* headdress with white, pink and black feathers attached to a plant fiber net.

Materials and techniques

The object is a feathered headdress, also referred to as a *lori-lori* headdress, made by the Karajá group of tribes in Brazil (Mekler et al., 2005). The headdress is comprised of five different feather types: 1) white with white rachis, 2) light red with light red rachis, 3) pink with pink rachis, 4) black with iridescent green coloration, black rachis and white calamus, and 5) brown with a brown rachis and white calamus. Preliminary investigations of the feather characteristics have allowed for tentative identification. The pink and light red feathers are believed to belong to the Roseate spoonbill (*Platalea ajaja,* see Appendix II), and the black/green iridescent feathers are thought to derive from the Helmeted Curassow (*Pauxi pauxi,* see Appendix II*)*. The white feathers, which include both open and closed vane pennaceous as well as semi-plumulaceous feathers, are believed to belong to the Western Great Egret (*Ardea alba,* see Appendix II*).*

The brown feathers have not been identified. There is evidence of both closed vane pennaceous and open vane pennaceous feathers (see Appendix II, Fig IIA), with plumulaceous barbs at the proximal end of the feather. These feathers have a brown rachis with white calamus, but also exhibit some white coloration on the outer edges of the rachis, primarily on the ventral side of the feather (see Appendix II, Fig IIB), reminiscent of color variation noted in birds of the order Galliformes. This could suggest that these may be chicken feathers, but an exact match has not been confirmed.

The feathers are attached to a plant fiber net in one of two ways. In the first attachment method, the calamus is folded, wrapped and tied with the plant fiber (Fig 1). This attachment method comprises ~75% of the attachments. In areas where two or more feathers are attached (forming a “rosette”, (Burr, 2017)), the feathers are arranged around a small monocot stem (possibly bamboo), wrapped and tied (Fig 2). These rosettes primarily occur toward the bottom half of the headdress, and comprise ~25% of the attachments.

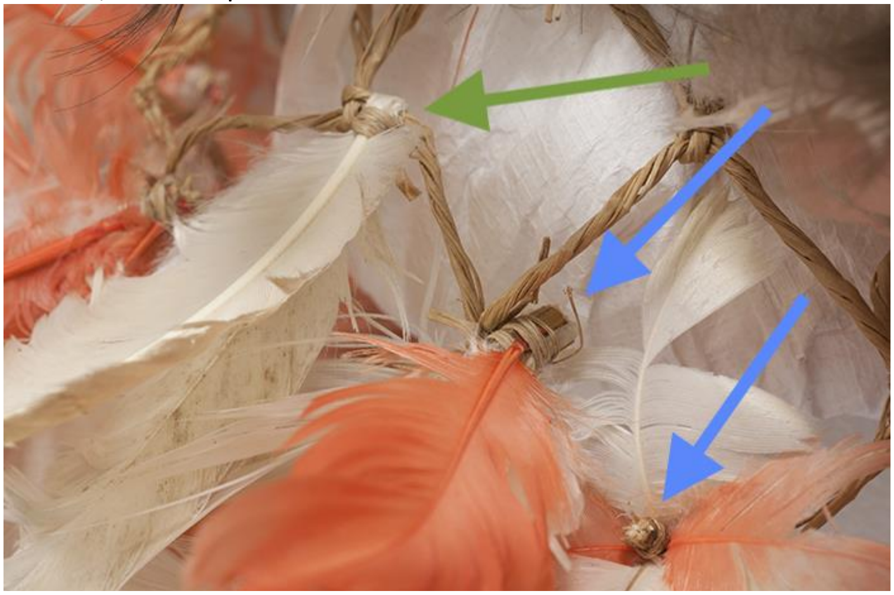


Figure 1. Detail illustrating both attachment methods: attachment method 1 (noted by the green arrow), in which the calamus is folded over the plant fiber, and attachment method 2 (noted by the two blue arrows), in which multiple feathers are arranged around a monocot stem, wrapped and tied.

Figure 2. Detail of attachment method 2, revealing a cross section of the monocot stem at the node as well as the presence of a black material surrounding the stem, possibly included to further secure/adhere the feathers in place.

Consultation

A web conference on October 30th, 2018 permitted consultation with Manuel Ferreira Lima Filho, associate professor and director of the Museu Antropológico, UFG - Universidade

Federal de Goiás in Brazil. Through this consultation, Manuel shared his knowledge of Karajá artistic practices and provided suggestions for previously unidentified materials. He suggested the vegetal fiber may derive from buriti (*Mauritia flexuosa*), a native palm tree to Brazil, and that monocot stems may come from tucum (*Astrocaryum vulgare*). For both these materials, comparison between the object and reference samples would be necessary in order to confirm their use.

Regarding the feathers, Manuel confirmed the use of Roseate Spoonbill in Karajá cultural artifacts, and confirmed the use of heron or egret for white feathers. He was unable to identify the black and iridescent green feathers, and suggested that brown feathers could derive from chicken. Manuel was unable to comment on the application of anointing materials to these headdresses during use, however he did confirm that traditionally, the lori-lori are typically stored inside out.

<u>Testing and analysis</u>

Visual and UV analysis was undertaken in order to characterize the various feathers present and attempt species identification. These techniques were used to determine the origin of color (structural, bio-pigment, iridescence, or a combination). UV examination assisted in determining coloration and subsequently aided in species identification of the red and pink feathers. These feathers did not fluoresce under the UV light source, indicating that carotenoid bio-pigments are responsible for the color as opposed to psittacofulvins. Carotenoid bio-pigmentation, along with cultural context, object comparanda, and expert consultation, strongly support that the feathers belong to the Roseate Spoonbill.

UV examination assisted in better visualizing distribution of a yellow-appearing soiling or staining. These areas are apparent in visible light, but were somewhat enhanced under a UV light source, appearing much warmer in color than the unstained portions of the white feathers, which fluoresced a bright, cool white (Fig 3 and 4).

Figure 3. Overall photo in UV (λ_{exc}=365 nm). Note top white feather's yellow appearance.

Figure 4. Detail UV photo with yellow arrows pointing to areas on feathers that fluoresce warmly, associated with the yellow staining/soiling of white feathers.

Portable X-Ray Fluorescence

Portable X-Ray Fluorescence (pXRF), a nondestructive elemental analytical technique, was carried out to test for the presence of heavy metal pesticides. Readings were taken with a Bruker-Tracer III-SD instrument with a rhodium x-ray source and silicon drift detector. Readings were collected at 40 kV, 11 µA, 120 sec, using both lab rat mode as well as a Copper-Titanium-Aluminum (red) filter appropriate for use during the analysis of heavy metal pesticides. Spectral data was acquired and interpreted using S1PXRF software (v. 8.3) from Bruker AXS.

Readings were obtained from yellow-stained and unstained areas of the large white feather and pink stained feather at the crown of the headdress. XRF readings for all areas tested indicate the presence of bromine, which has been observed on a number of organic materials in the Fowler collection. This is believed to be related to the propensity for these organic materials to retain atmospheric bromine, which may be present as a result of nearby agricultural methyl bromide treatments (E. Pearlstein, personal communication).

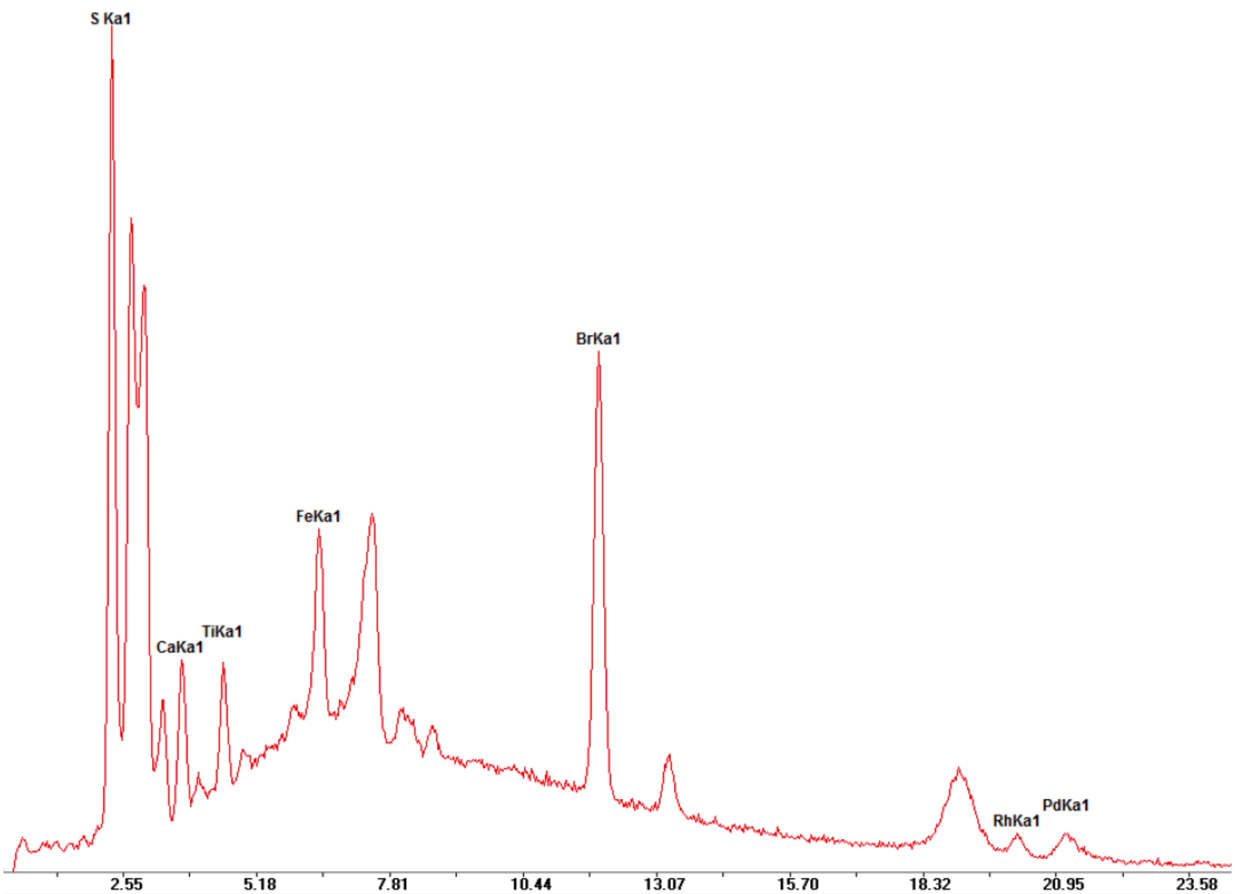


Figure 5. p-XRF spectra, taken from the stained portion of a white feather, lab rat mode at 40 kV, 11 µA, 120 sec.

<u>Condition</u>

The headdress is structurally stable overall. The attachment points are secure and no major losses of whole feathers have been noted. However, the distal end of at least four white feathers (with yellow discoloration) have been lost. There is also moderate evidence of barb loss throughout which may be related to previous insect activity. No evidence of an active infestation has been observed, nor have any insect casings or frass been found. This may suggest that the object had been cleaned following the most recent insect activity, however no associated treatment records were found to confirm. In some areas, the barb loss has occurred at the center of the vane, resulting in barbs with distal and proximal ends remaining integrated in the feather (Figs 6a and b). The distal ends, which are held in place only by the locking of the barbules, are at risk of complete loss and disassociation from the feather.

Figures 6a and b. Possible insect damage resulting in barb loss (visible as "holes" in the feather). Note that in these areas of barb loss, the distal ends of the vanes are held in place by surrounding barbules only.

In addition to grazing and barb loss, shaft bends have been noted on some white, light red, and one black/green iridescent feather. For the black/green iridescent feather, the thick rachis surrounding the bent area is split.

Figure 7. Detail of bent shaft on black/green iridescent feather and associated splitting of the rachis.

The fiber net appears to be in good condition and the majority of attachments are stable. There is one brown feather that is somewhat loosely attached to the substrate. The fiber is tied around the shaft, but the calamus is not folded and the shaft is able to slide up and down within the knot. Despite this loose attachment, the feather does not appear to be at risk of becoming disassociated with the rest of the object – attempts to gently slide the feather out of the knot have failed.

The feathers are moderately dusty and soiled overall. A number of the white feathers appear to be soiled with a material which has rendered their appearance more yellow. These yellowed areas also appear to be stiffened and brittle. A similar brittle and coated appearance can be seen on some of the light red feathers as well. This material could either be unintentional soiling/staining, possibly related to insect activity or may be the result of an anointing material applied during ritual use. Manuel Ferreira Lima Filho was unable to comment on whether or not this material could be related to ritual use.

Figure 8. Detail of yellow staining and soiling on white feather, also illustrating barb dislocation, insect damage, and embrittlement.

Condition Summary

The headdress is in fair condition overall. A number of feathers are soiled, stained, and embrittled, and exhibit some evidence of insect damage. The attachment points to the plant fiber substrate are stable.

Treatment proposal

1. Invert headdress and mount on an appropriate support.
2. Dry clean feathers using an appropriate method, avoiding further dislocation of barbs.
3. If the material staining the white and light red feathers is determined to be external soiling and not intentionally applied material during cultural use, the material may be removed with appropriate solvents. If the material is determined to be an artifact of cultural use, it will not be removed.
4. Reinforce bent rachides using an appropriate method.
5. Realign disengaged barbules using an appropriate method.
6. Support barbs vulnerable to further loss using a polyester envelope or other appropriate support.
7. Secure loose feather if necessary.

Treatment*:

A dome-shaped support for the headdress was made using Ethafoam and was padded out with polyester batting and covered with Tyvek. The headdress was inverted onto the support, and the net was secured to the mount at the crown using a T-pin.

Dry cleaning was conducted using a variable speed HEPA-vacuum at the lowest setting. A plastic pipette was repurposed to serve as a micro-attachment for the vacuum. This method allowed for targeting cleaning of feathers but also aided in realignment of barbs in some instances. By running the pipette parallel to the barbs, gentle suction aids in restoring contact between adjacent barbules. Individual feathers were vacuumed, taking care to avoid areas with loose barbules. In case of barbule loss, a Stabiltex screen was placed over the opening of the vacuum tube. Surrounding feathers were repositioned during cleaning in order to provide access to target areas either with hair clips (positioned at the base) or T-pins and small Ethafoam blocks. During cleaning several completely disassociated barbs were found and placed in a polyethylene bag.

Very soiled areas which were determined to be stable were vacuumed using the HEPA-vacuum with Surg-o-vac attachment covered with Vellux. This approach requires contact with the feathers, which were supported from behind with a blotter, and allowed for additional removal of engrained dirt. Cosmetic sponges were used for dry cleaning yellow stained areas, permitting targeted reduction of surface dirt (as evidenced by the grey appearance of the sponge following cleaning) without removing the yellow material. As the source of this material remains unknown, and may potentially derive from the object's cultural use, the staining was not removed in this treatment.

Structural repairs were made to two rachides requiring stabilization. The bent shaft on the black/green iridescent feather (shown in Figure 6) was relaxed using water heated to approximately 95° F. The hot water was applied locally to the bend using a small brush in order to gently warm the keratinaceous material. The shaft was repositioned (straightened) by hand and held in place for approximately 30 seconds. This procedure was repeated four times until the

*List of materials used can be on page 11.

feather was able to stand straight. A small (approximately 1 cm long) piece of brown polyester thread was dipped into a 30% B72 in acetone solution and placed within the split in the shaft to serve as a splint to keep the feather upright. Gentle pressure was applied to either side of the shaft for approximately 1 minute in order to close the gap and reduce the split appearance (Fig 9). A white feather with a bend in the rachis was reinforced with a thin strip of Japanese tissue, adhered to the dorsal side with a 20% solution of B72 in acetone.

Figure 9. Detail of rachis repair made to shaft on black/green iridescent feather.

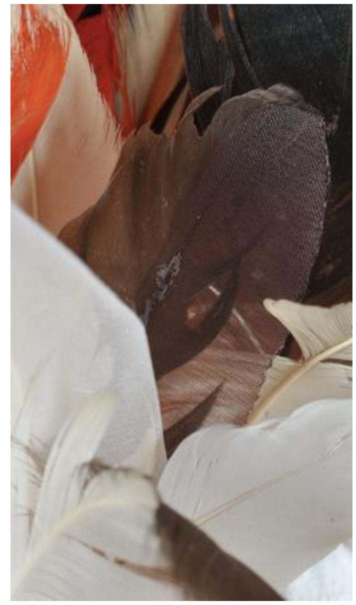
Two smaller bent rachides, located near the distal ends of the feather, were treated using hot water in order to relax the keratin, and were positioned back in to place (Fig 10a-d). These rachides were too thin to introduce a supportive splint material.

Figure 10a-d (left to right from top). During treatment, feathers before (left) and after (right) local humidification using heated water.

Protective enclosures were created from champagne/white colored polyester organza and brown Stabiltex in order to protect delicate feathers from further barb loss during handling and storage. Photographs were taken of individual feathers, and tracings were prepared on Mylar or Glassine. These tracings were used as templates to cut enclosures from the woven fabric. The enclosures are slightly oversized so as not to constrain the barbs. Depending on accessibility and condition of the feather, the enclosures were either designed to envelope the entire feather, or half of the feather. A white organza enclosure, encasing the whole feather, was designed in two halves (Fig 11a). When necessary, curved edges were heat sealed using a soldering iron before placing the enclosure onto the feather. A brown Stabiltex enclosure encasing a whole feather was designed in one piece, with one edge heat sealed (Fig 11b). A brown organza enclosure, covering only half of one smaller feather, was heat sealed along the curved edge and extends to the rachis on either side of the feather (Fig 11c).

All enclosures were attached to rachides using a small dot of B72 near the base. The primary function of the enclosures is to protect the most vulnerable feathers during storage in an inside-out configuration, as was discovered is culturally appropriate after consultation with Manuel Ferreira Lima Filho. If the object is selected for display, and the enclosures are found to be too visually intrusive, they can easily be removed using acetone to reverse the small B72 anchors to the rachis.





Figures 11a, b, c (left to right). After treatment, feathers with protective enclosures applied.

A small sheet of polyester organza was applied to the ventral side of a white feather exhibiting a large area of loss. Because this feather is curling at the edges, and a very small number of barbs are preserved near this curled edge, it was extremely difficult to create an enclosure that would accommodate the curl without crushing the edge. Instead, a small piece of organza was cut roughly to shape in order to offer protection on the reverse from nearby feathers. The organza was heated over a curved copper-alloy mold in an attempt to form a curvature similar to that of the feather. A gentle curve was achieved, but not quite as severe as the feather. This support was attached to the back of the feather, tacked to the rachis using B72, and provides some protection from nearby feathers. In viewing from the front, the support moderately helps to visually integrate the large area of loss (Fig 12a,b).


Figure 12a and b. Front/dorsal side of feather (left) and back/ventral side (right) after treatment, showing organza support applied to the ventral side of the feather.

Once protective enclosures were created for the most vulnerable feathers, the headdress was returned to its inside out configuration. A temporary support was created from sandbags to cradle the conical form of the headdress. This support was covered with Teflon Relic Wrap film to prevent abrasion. The headdress will be kept in this support for approximately one month, allowing it to relax in this configuration before building housing. The proposed housing will be a closed box, to prevent the deposition of dust, which will support the headdress as it sits upright in its inside out position.

Figure 12. X70.1840 flipped inside out, housed within temporary support.

<u>Materials used</u>

- Ethafoam: flexible, closed-cell polyethylene foam
- Polyester batting: light weight polyester cushion of loosely matted fibers
- Tyvek: flash-spun high-density polyethylene (HDPE)
- Nilfisk HEPA Vacuum
- Surg-o-Vac microattachment: plastic surgical aspirator tips (https://www.pattersondental.com/Supplies/ProductFamilyDetails/PIF_71192)
- Cosmetic sponges: latex-free wedge shaped sponges
- Vellux: a hypoallergenic, non-woven synthetic product marketed as a blanket, consisting of a polyester membrane center sandwiched between layers of closed-cell polyurethane foam and flocked 100% nylon fiber
- Stabiltex: a sheer, lightweight open weave polyester fabric produced by the Swiss Silk Bolting Cloth Manufacturing Co, Zurich. Product discontinued in 2004.
- B72: ethyl methacrylate (70%) and methyl acrylate (30%) copolymer
- Japanese tissue: hand-made mulberry fiber paper

- Mylar: a clear, colorless polyester sheet
- Glassine: a thin, semi-transparent paper made from bleached sulfite wood
- Polyester organza: a sheer, plain weave fabric made from polyester.
- Teflon Relic Wrap – Polytetrafluoroethylene (PTFE) film

Works cited

Mekler, Adam., et al. *Vanishing Worlds : Art and Ritual in Amazonia*. Houston Museum of Natural Science, 2005.

Burr, Elizabeth. Conservation of a Karajá feathered headdress. 2017. In Pearlstein, Ellen J. *The Conservation of Featherwork from Central and South America*. 2017.

Appendix I. Before Treatment Photography

BT1. Overall, inverted for storage.

BT2. Overall, inverted for storage.

BT3. Overall from above.

BT4. Overall, underside.

BT5-8. Overall, after inverting the headdress and securing on a temporary mount.

Appendix II. Feather Identification

Table 1. Reference bird images.

Roseate spoonbill, *Platalea ajaja*

Helmeted curassow, *Pauxi pauxi*

Western Great Egret, *Ardea Alba*

F**igure IIA.** Detail of open vane pennaceous brown feather.

Figure IIB. Detail of brown feather ventral side rachis, with light colored stripes along length of brown rachis.

Appendix III. After Treatment Photography

AT1-4. Overall, after treatment.