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CONSERVATION AND EXHIBIT OF AN ARCHAEOLOGICAL FISH TRAP

Ellen Carrlee

Abstract

In 1991, salvage archaeology rescued a 500-700 year old basketry fish trap in Juneau, Alaska. Preliminary treatment with polyethylene glycol (PEG) was done to prevent the collapse of the waterlogged wood, and the trap was held in conformation with an elaborate system of foam, mesh, Plexiglas, and slings that made study or exhibit impossible. The fragile spruce root lashings remained wrapped from salvage. The challenge was how to treat and exhibit an artifact that could not be set down on a flat surface, as it could not support its own weight. The conservator and mount maker worked as a team, each stabilizing areas to allow the other access. The materials used were Japanese tissue with a combination of wheat starch paste and PVA emulsion, bands of Tyvek attached with B-72 to secure lashings, and a three-part approach for overall support with Plexiglas, Mylar slings, and brass mounts.

1. Discovery

In 1989, Paul Kissner (retired from the Alaska Department of Fish and Game) was fishing in Montana Creek near its confluence with the Mendenhall River when he saw the top of an artifact eroding from the riverbank. He contacted Professor of Anthropology Wallace Olson (University of Alaska Southeast) and curator Steve Henrikson (Alaska State Museum) who removed the exposed section of what turned out to be a fish trap as an emergency measure to prevent its loss through erosion. Wallace Olson describes the discovery,

> When the remains of the Montana Creek fish trap were first discovered, I was called and went to the site. What I saw was portions of something that appeared to be a fish weir or trap, protruding out of the silt in the creek. It was drying and falling apart as it was exposed to the air and sun. I immediately went to a local hardware store and bought every plastic "tie" they had in stock. I secured the pieces as best I could in their original position. The next day, Steve Henrikson, of the Alaska State Museum, came out and helped secure the remains. All we knew was that it was the top part of a traditional fish trap. As we finished salvaging the remains, Steve saw, and realized that it was an entire fish trap, and that what we had saved was only the top half. It was a monumental archaeological find on the Northwest Coast (Olson 2005).

Ownership of the trap was complicated from the beginning. The area where the trap was found is the traditional fishing territory of the Auk Kwaan of the Tlingit people. (A kwaan is a region controlled by several clans.) Genealogical reckoning indicates these people arrived from the Stikine River area near modern Wrangell several hundred years ago. Montana Creek is a freshwater river, but also influenced by tidal action. It was therefore somewhat unclear if the location was today the property of the City of Juneau, or the State of Alaska. Non-navigable freshwater rivers are the jurisdiction of the City, while navigable freshwater rivers and intertidal areas are the jurisdiction of the state. At the time of excavation, the City formally declined ownership, although the waterway has some tidal influence and is only navigable by a canoe or kayak. The Alaska State Museum (ASM) has not accessioned the trap into its permanent collection, and local Native groups including the Sealaska Corporation, Tlingit-Haida Central Council, and the Auk Kwaan continue to take an active interest in the trap.

The trap was originally cylindrical in form with straight sides and an interior funnel lashed to the front end. The trap was crushed in burial. Materials were identified as spruce (*Picea sitchensis)* by Mary Lou Florian of the Royal British Columbia Museum (Florian 1992) and hemlock (*Tsuga heterophylla)* by Bruce Hoadley (Hoadley 2005). For descriptive purposes, the trap remains may be divided into five sections: the entrance funnel, the main body, the detached "top" body fragment, and the deformed tail. The funnel is now a lenticular flattened oval. Long, straight pieces of hemlock (referred to as "staves" in the excavation report) intersect hoops of spruce branch where they are lashed together by spruce root. This root is wrapped around the hoop continuously until the intersection with the stave, where it loops around, forms a double or triple "X" with a cinch loop to keep it tight, then continues to wrap around the hoop to the next intersection. Overhand wrapping holds the funnel, which was constructed separately, within the body of the trap. The main body includes a section of shorter staves with tool-worked ends and fragments of cordage that suggest a possible door on a rope hinge. The far back end of the trap does not survive, but measurements of the hoops indicate that the trap did not taper. The tail of the trap includes only 18 staves of the full cylinder (40 staves total) and is bent upwards at an angle of approximately 45 degrees.

2. Excavation

Salvage archaeology began in 1991 (permit 49-JUN-453,) mainly undertaken by excavator Jon Loring, geomorphologist Greg Chaney, and archaeologist Robert Betts. The permit was issued for a time period when fish activity in the river was low, unfortunately corresponding to the rainy cold weather of fall and winter, and excavation took place between tides with sandbags and pumps to fight the water. The trap was taken by skiff and then truck to the Alaska State Museum (ASM) where it was treated with mixed low and high molecular weight polyethylene glycol (PEG) for approximately one year. The treatment was done by Jon Loring, who had some direction from the staff at the Canadian Conservation Institute and ASM conservator Helen Alten. The major funding for the excavation of the trap came from Sealaska Corporation, the Southeast Alaska Regional Native Corporation owned and run by Tlingit, Haida, and Tsimshian shareholders and formed as a result of the 1971 Alaska Native Claims Settlement Act. Since ownership of the trap was unclear, most of the excavation documentation was kept by Jon Loring (Loring, 1995.) This is the first basketry-style fish trap known to be recovered from an archaeological context on the Northwest Coast. Traps were usually removed from the streams after the runs of fish ended each year. They were stored near the fishing site or returned to camp for repair (Henrikson, 2005.) According to the excavators, high iron content in the soil along with quick burial of the trap by an advancing river bar and tidal action are thought to have contributed to the survival of this trap. Interviews with Tlingit elders about fish traps were conducted in 1992 and included in the excavation report (Loring 1995.) Radiocarbon dating of fragments from the 1989 discovery sent to Washington State University indicated the trap is approximately 500 to 700 years old. Sample 1 (WSU-4140) gave a result of 500 +/-70 and Sample 2 (WSU-4141) gave a result of 700 +/- 60 using the computer calibration program developed by geoscientist Minze Stuiver of the University of Washington and run by anthropologist Jon Erlandson from the University of Oregon (Erlandson 1990.) In 2004, the Juneau-Douglas City Museum (JDCM) was awarded a grant from the Alaska State Museum Grant-in-Aid program to conserve, mount, and exhibit the fish trap.

3. Condition when excavated and initial treatment

Approximately 80% of the trap still exists. The trap was crushed in burial and the back end of the trap did not survive, resulting in a mystery about how the trap terminates at that end. The top section is separate from the larger bottom section, and there are perhaps 10 staves missing. Most of the spruce root lashing on the top section of the trap did not survive, but perhaps 60-70% of the lashing on the main section was still present during excavation. The funnel end is quite well-preserved, although crushed into a lentoid shape with pointed corners at each side of the trap. The back end of the trap was found bent upwards with staves broken, yet still connected to the main section by a badly distorted spruce root branch hoop.

The top section of the trap exposed by erosion was removed first. Most of its spruce root lashing was lost in burial and/or erosion from the river bank and the plastic "zip ties" used to hold the elements together for transport and salvage caused some additional damage from abrasion. ("Zip ties" are plastic strips available from the hardware store with a self-ratcheting action that allows them to be pulled tighter but not looser.) Storage in a fresh water tank before treatment flattened this section somewhat, although it appears that attempts were made to correct this curvature during subsequent treatment. The bottom section was more carefully supported during excavation with a frame of aluminum conduit (custom shaped in the field with a pipe bender), 1" nylon webbing straps, 3" plastic mesh straps, and polyethylene foam inserts to form a hammock and help maintain its shape during transport and treatment at the Alaska State Museum.

During excavation, the fragile spruce root lashings were covered with cotton gauze in the roll form typically used for bandages. Areas that were particularly deteriorated were not wrapped with the gauze but encapsulated in fine polyester netting with loose stitches of white cotton thread. One area on the main section where twined cordage survived was wrapped in roller gauze and then sandwiched between large stiff pieces of plastic mesh that were stitched together to give the area rigidity. In the field, the funnel of the trap was supported with individual balloons inflated to give needed support. These were later replaced with blue polyethylene foam inserts carved to shape. Following treatment of the two main sections in PEG, the trap was allowed to slowly air dry on the support frame and put into storage. This hammock/frame unit was suspended from a wooden exterior to hang free like a baby cradle (Fig. 1). Additional pieces of polyethylene foam were inserted to hold the interior curvature of the trap with the aid of adjustable Plexiglas rectangles or "fingers" to follow the contour. These pieces of Plexiglas were individually adjusted (like a feeler gauge) and screwed firmly between a sandwich of narrow plywood boards. The ends of these plywood boards were lashed to the conduit with yellow nylon cord. (Medex, a medium density fiberboard bonded with polyurea-isocyanate resin, was originally used instead of Plexiglas, but it reportedly grew thick fuzzy mold quickly and was replaced as per Loring 2005.) The cotton roller gauze was left covering the lashing throughout the PEG treatment and subsequent storage. While many additional detached fragments were treated, some were not treated but left wet and kept in plastic bags. Most of the notes from the field excavation and treatment could not be found in 2005, but the excavation report and many slides were available and Jon Loring (also on the mount making team for the 2005 project) was able to recount much of what happened (Loring 2005.) A label on the lid of the box where some cordage was stored reads: "PEG 20% u/v Reg 200 Start 6-9-97 12-11 to 26 Drying." The 1992 site overview plans indicated the proposed treatment as "25% solution of 10% PEG-200, 5% PEG-1000 and 10% Compound 20M in 500 gallons of water."

Figure 1. Fish trap in storage supports from initial treatment. Funnel at bottom and cylindrical main body are flattened, and the distorted tail section is visible at the top of the image.

4. Condition and treatment before exhibition

Examination in 2005 indicated the PEG treatment worked well. The wood was a slightly darkened reddish or yellowish brown color from the paler excavation color (Loring 2005,) but still had the feel and look of wood, and the weight also seemed normal, if slightly lighter than expected. The wood seemed stable and reasonably sturdy, although there were breaks through several staves. It is unclear if these breaks happened during excavation or subsequent treatment, but most do not contain sand or debris at the splintered break edges. These areas might also have been weakened in burial. Unwrapping a small test area indicated the roller gauze did not stick to the trap, but the spruce root lashings were very fragile, brittle, broken in many places, and were no longer providing any structural stability to the trap. There was significant dirt, sand, and small rocks between the lashings as well.

It was not possible to know exactly how difficult the treatment would be until work began. It was necessary to stabilize the spruce root lashing, stabilize the junctures, and make supportive mounts simultaneously, as each process facilitated access to the others. Working together, the conservator would stabilize the lashings enough to allow mount makers to support the trap and remove pieces of the cumbersome old support system, which in turn allowed the conservator access to additional areas to treat. Since the trap is basically a large cylindrical grid of staves and hoops attached at their junctures, maintaining attachment at these junctures was essential to the stability of the trap. The condition of the lashings did not allow them to perform this function. A combination of reinforcements for these individual points of connection, together with an externally supportive mount structure, would hold the trap in place without stressing the fragile lashings (Fig. 2).

Figure 2. Spring 2005 treatment in the lobby of the Alaska State Museum, with exhibit designer Robert Banghart (left) working on Mylar slings for the body of the trap. Dark strips below the body of the trap are plastic mesh and nylon webbing supports from the excavation. Ellen Carrlee (right) works on treatment of the lashings from the detached top section.

Figure 3. Corner of funnel before treatment, with cotton gauze wrapping from excavation covering spruce root lashings.

Figure 4. Corner of funnel during treatment, with spruce root lashings partially exposed, Japanese tissue repairs tucked under loose lashing fragments.

The support strategy utilized five main materials: Japanese Kozo paper, Tyvek (spun bonded polyolefin fiber in sheet form grade 1020 smooth texture), Mylar (polyester film), Plexiglas acrylic sheet, and brass. The Japanese paper was used to stabilize the lashings, whose condition could not be assessed until the unwrapping began. Luckily, the gauze wrapping did not stick to the spruce root lashings as a result of the PEG treatment, although splinters and dirt caused some snagging between the cotton and the artifact (Figs. 3-4). In each area, the top surface of the gauze wrapping would be cut open with a small scissors, partially peeled back and the surface cleaned with puffs of air and a soft paintbrush until the loose lashing pieces indicated mobility. Small torn pieces of Japanese paper approximately 1 cm square were saturated with a wheat starch paste/PVA emulsion mixture and tucked into the interstices of the lashing wherever possible with a pointed tweezers. Saturated pieces of tissue could also be folded to serve as a gap-filler and adhesive for small detached fragments of the lashing. Points of good contact between the lashings and the hoops were sporadic, making a gap-filling measure necessary. The weakest adhesive possible was sought to ensure that any stress would cause the repair to fail instead of causing new damage to the artifact. Wheat starch paste alone was insufficient to support the weight of the fragments challenged by gravity. Methylcellulose was too weak as well, and not surprisingly, the two in combination were also too weak. The adhesive selected was wheat starch paste with a few drops of Jade 403 polyvinyl acetate (PVA) emulsion added to each batch. A batch size was the amount that conveniently fit into a large watch glass. Pieces of Japanese paper could be dragged through the adhesive and kept at the edge of the glass for application. Allowing them to dry slightly made them more tacky. These repairs reached full strength overnight, and the next day the underside of each lashing section could be unwrapped. More loss occurred as wrapping was removed since gravity pulled the exposed lashing fragments from the undersides of the hoops. To combat this problem, adhesive-soaked Japanese paper was tucked in before the fragments could fall. Cleaning these areas was not possible, and significant sand and dirt was consolidated into the paper. In some areas, there was no lashing under the gauze. In other areas, the lashings were badly crushed and could not be saved, or only partially saved. Approximately 30-40% of the main section of the trap had lashings that could be preserved to a degree that the wrapping technique could be studied. The Japanese paper could be tucked away out of view in many cases, but in others had the appearance of small white spitballs. The visibility of these was reduced by dotting acrylic emulsion paint on them with a tiny paintbrush to mimic the surround.

The trap was stabilized at junctures between the hoops and staves by narrow strips of Tyvek painted with acrylic paint in a brown, striated pattern on the top side only. One end of the Tyvek strip was attached underneath the juncture to either the hoop or the stave with Acryloid B-72 and allowed to dry. The strip was then pulled diagonally over the juncture to form a loop, snugged gently, and adhered to itself over the same area it was attached to the wood. Whenever possible, the Tyvek was slipped under the original lashing to help hide the Tyvek. Tyvek was chosen because it was lightweight, flexible, strong, and inert. All Tyvek strips were cut approximately the same width and painted a uniform color with acrylic emulsion paint (slightly distinct from the lashing color.) These strips were attached in the same diagonal direction as each other with the intent to have these stabilizing elements fully visible but camouflaged. They form a pattern with their regularity and can thus be easily distinguished from the real lashings by viewers studying the construction technique (Fig. 5). Determined viewers can also peek up from below and catch a glimpse of the unpainted white undersides of the Tyvek strips.

Mount making was designed and supervised by Robert Banghart of Banghart and Associates. The primary support for the main body of the trap was made from three 6” wide clear 10 mil Mylar straps used as a cradle (Fig. 6). Mylar was chosen because of its flexibility and strength. It was feared that flaws might cause the Mylar to split and quickly propagate a tear (stress razor) but testing of the material with heavy weights and punctures indicated the material would not fail in this manner. The Mylar slings were held with supports made from standard plumbing supplies. The end of each Mylar sling was rolled onto an uptake spool made from a tube of ½” rigid copper with mild steel reinforcement rod attached on the interior of the tube with Scotch-Weld epoxy adhesive. The tube could be rolled like an axle where it entered a right-angle elbow-shaped street 90° pipe and held with a stainless steel set screw (hex drive with a national fine thread pitch of 8/32.) The right angle pipes were connected to legs of steel-reinforced copper tube by a silver solder join, and set in a steel floor flange that was screwed to the deck. Strong gaffer's tape was initially used to hold the end of the Mylar to the uptake spool, but over time, the tape was not sufficient due to lack of compression strength on the uptake spool. To remedy the problem, clips were made from ¾" acrylonitrile butadiene styrene (ABS) plastic with a slot cut to create a "C" shape. In the future, use of these clips directly on the uptake spool to hold the end of the Mylar would be preferred. Curved sections of Plexiglas were added at the front and under the tail to prevent shifting of the trap. Additional 1/8" extruded Plexiglas rod stops were added to the tail support to prevent shifting of the slanted tail area. Extruded Plexiglas rod was used where possible to support the Plexiglas, with a brass pin holding the Plexiglas and rod together. Loctite cyanoacrylate adhesive with accelerant was used to adhere the pin and the rod.

Figure 5. Corner of funnel during treatment, with Tyvek strips attached. Tyvek gives physical support no longer provided by the original lashings. The Tyvek is painted a uniform color slightly distinct from the spruce root color to allow the viewer to distinguish repairs from the original lashing.

Figure 6. Mylar slings hang below the trap in preparation to replace the darker plastic mesh and nylon webbing straps supporting the underside of the trap. Mylar is temporarily clamped onto the uptake spool of metal supports made from basic plumbing supplies.

Padded brass mounts rising from the deck were added at various locations to provide individual support to detached or broken areas. Polyethylene felt with acrylic adhesive backing was used for padding. More than 30 detached pieces from the trap ranging in size from 10” to 55” were not reattached and exhibited with the trap. Most of these pieces were not attached to the trap when excavated and their exact placement cannot be determined easily because break edges were deteriorated. Some pieces whose locations were known were not reattached. Each piece would have required its own padded mount and the inner, empty cavity of the trap would then be filled with a forest of mounts, making the shape of the trap difficult for the viewer to read. The measurements of these pieces, however, helped confirm the original size of the trap. Janice Criswell (Tlingit-Haida basket maker and instructor, University of Alaska Southeast) and her husband Steve Henrikson (Curator of Collections, Alaska State Museum**)** were commissioned to construct a full-scale replica of the trap. The replica was completed in March of 2006 and suspended above the original artifact to help the viewer understand the archaeological remains (Fig. 7).

Figure 7. Montana Creek Fish Trap with repairs complete, undergoing final mount fittings. View looks into funnel of trap, with detached top section supported above the main body and bare sticks of distorted tail projecting upwards at the far end of the trap.

A 4 ½” thick box truss was attached to the underside of the plywood that formed the original base of the trap support system. The surface of the plywood was covered with three coats of latex acrylic paint. The deck was covered with well-washed gray river rock to cover the mounting hardware and mimic the river bed where the trap was found. The trap does not touch the deck or the rocks.

Wallace Olson described the finished exhibit:

> As an anthropologist and archaeologist, I was happy that at least we were able to salvage some remains. I never expected, or hoped that the entire trap would be preserved…I was convinced that there was no way that a six-hundred year old fish trap, partially exposed to the air, crushed in its burial, could ever be displayed or replicated. My hope was that at least we might save a few pieces and carbon-date them. In spite of my doubts, the staff at the Juneau-Douglas City Museum was able to design and build a beautiful non-obtrusive support system to display the trap. When one looks at the display model, it is exactly the same as what I, and the archaeologists found. Today, as someone who was "on the scene," from the beginning, I can walk into the Juneau-Douglas City Museum and honestly tell people, "Yes, that's the way it was found and recovered" (Olson 2005).

Figure 8 Trap in exhibit case with replica by Janice Criswell and Steve Henrikson suspended above. The archaeological trap remains are crushed but the replica suggests its original shape.

Suppliers

ABS plastic pipe, set screws, steel floor flange, street 90° pipe,
Plumbing supply stores or local hardware stores.

Acryloid-B72® ethyl methacrylate (70%) methyl acrylate (30) co-polymer in acetone and ethanol:
Conservation Resources International LLC. (www.conservationresources.com)

Jade 403 polyvinyl acetate emulsion, Kozo Japanese paper, Tyvek spun-bonded polyolefin fabric in grade 1020 smooth texture:
TALAS (www.talasonline.com)

Liquitex acrylic paint in burnt umber, red oxide, and yellow oxide:
Art supply stores such as Dick Blick (www.dickblick.com).

Loctite cyanoacrylate adhesive with accelerant, Maylar polyester film (10 mil), Scotch-Weld DP-100 Quick Set Epoxy:
McMaster Carr (www.mcmaster.com).

Padding of polyethylene felt with acrylic adhesive backing:
Benchmark (www.benchmarkcatalog.com).

Permacel Professional Grade Gaffer's Tape:
Theater or sound equipment supply stores, or at Uline (www.uline.com).

Wheat Starch Paste. Commercially available product made in Japan, from the supply at the Alaska State Museum conservation laboratory. Label in Japanese. Comparable product sold at TALAS as Zen Shofu Wheat Starch Paste (www.talasonline.com).

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