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REPORT

A Reanalysis of Four Northern Great Basin Atlatls

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This paper reports on the reanalysis of four atlatls from Plush Cave and Roaring Springs Cave in southeastern Oregon; three are effectively complete and one is a spur only. At present, no meaningful chronological data are available on these artifacts. However, based on comparisons with artifacts from site deposits of known age, it can be minimally stated that they are of Middle Archaic age.

MORE than fifty years ago, Cressman and Krieger (1940) excavated and described four atlatls recovered from Plush and Roaring Springs caves (Fig. 1). At Plush Cave, the proximal portion of an atlatl came from "looters back dirt" (Cressman and Krieger 1940:25). Cressman (personal communication 1978) stated the other fragment of the Plush Cave atlatl was given to him some time later. At Roaring Springs Cave, Cressman and Krieger (1940:21) indicated that the two essentially complete atlatls were found midway through the "straw bed," separated horizontally by 60 mm. The spur, also from Roaring Springs Cave, was in disturbed surface refuse, along with another fragment of an atlatl distal end (Cressman and Krieger 1940:23).

During re-examination of the atlatls, pervasive errors were discovered in the first documentation (Table 1). Cressman and Krieger's (1940:22) measurements for the two sub-

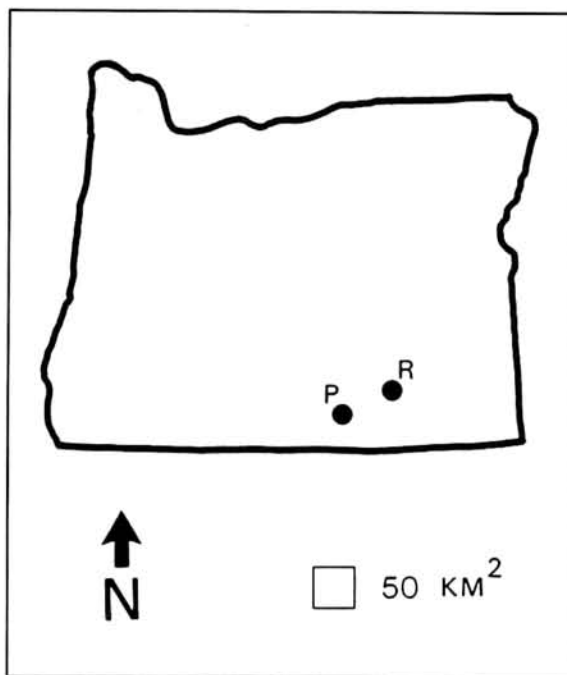


Fig. 1. Location of Roaring Springs (R) and Plush (P) caves in Oregon.

stantially complete atlatls from Roaring Springs Cave (Nos. 1-10,000 and 1-10,001) were described as 10% to 18% larger than the measurements recorded in the current analysis. These errors are now ensconced in the literature (cf. Mildner 1974:8). Additionally, the descriptions in this paper are more complete than was attempted by Cressman and Krieger (1940) and include dorsal, ventral, and lateral illustrations. Finally, this reevaluation was undertaken to present data that would allow a more accurate replication of these atlatls. The authors replicated all of the atlatls in various woods and used them, and data from these studies bearing on the analyses are presented as observations only.

The new data include flexibility of the atlatls (cf. Palter 1976) and the distance between the

Table 1
SELECTED CONTRASTING MEASUREMENTS^a
OF TWO ROARING SPRINGS ATLATLS

| | Cressman and Krieger (1940:22, Table 1) | | This Study | |
|----------------------------------|--|------------------|------------|----------|
| | RS1 ^b | RS2 ^b | RS1 | RS2 |
| overall length | 705 | 527 | 595 | 447 |
| maximum width | 72 | 50 | 61 | 42 |
| spur length | 54 | 32 | 45 | 29 |
| spur maximum height above groove | 20 | 9 | 17 | 8 |
| keel length | 240 | 230 | 207 | 208 |
| hole center DFDE ^c | 32 | 140 | 28 | 115, 120 |

^a all measurement are in millimeters.

^b RS1 = Roaring Springs No. 1-10,001; RS2 = Roaring Springs No. 1-10,000.

^c distance from the distal end.

center of the finger notching and the proximal end of the spur. This latter measure is the length of this simple machine's lever arm.

To avoid ambiguity, the position of certain measurements on the tools will be documented parenthetically as distance from the distal end (DFDE). The terms used herein for locating features on the atlatls (e.g., dorsal, ventral, left, right) assume the tool's distal (or spur) end is toward the top of the page. Most of the length, width, and thickness measures, as well as other data, are presented in Table 2.

PLUSH CAVE ATLATL (OSMA No. 1-10,002)

The atlatl from Plush Cave is a long, slender tool with a short, recessed spur, a relatively deep dorsal groove, and two finger notches that were once covered by loops of fiber, leather, or both (Fig. 2 and Table 2).

Spur

The spur is very short and does not project above the dorsal surface (cf. Mildner 1974:9); the dorsal surface slopes down slightly from the distal end to the tip of the spur (the slope is the

equivalent of 1.0 mm. per 10.0 mm.). The proximal tip of the spur is 7.0 mm. above the bottom of the groove (16.0 mm. DFDE), and the wood at the base of the groove is 2.0 mm. thick. At the proximal end of the spur—the part that engages inside the end of the dart—the tip angle is 80°. The atlatl thins by 2.0 mm. distal to the spur; effectively, the ventral side comes up toward the dorsal surface. This is a natural kink in the wood.

Dorsal Groove

The dorsal groove is deepest just in front of the spur, 7.0 mm. (16.5 mm. DFDE); the spur forms the distal end of the groove. The distance from the proximal end of the groove to the distal end of the tool is 204.0 mm. The sides of the groove slope in, forming a rounded "V" shape in cross section. A small ridge of unremoved wood runs the length of the center of the groove to within 14.0 mm. of the spur. It is another 190.0 mm. from the proximal end of the groove to the handle area.

Handle Area

The handle of the atlatl consists of two

Table 2
COMPARATIVE MEASUREMENTS^a OF FOUR ATLATLS

| | P ^b (D) ^c | RS1 (D) | RS2 (D) | RS3 |
|-----------------------------|---------------------------------|----------|------------------------------|-----|
| overall length | 545 | 595 | 447+ | -- |
| overall maximum width | 21 (72) | 61 (151) | 42 (121) | -- |
| overall maximum thickness | 11 (282) | 18 (158) | 22 (180) | -- |
| spur length | 3 | 45 | 29 | 36 |
| spur maximum width | 8 (13) | 12 (17) | 8 (10) | 10 |
| spur maximum height | 7 (16) | 17 (45) | 8 (10) | 15+ |
| spur projection | 1 | 13.5 | 2 | 10+ |
| dorsal groove length | 188 | 266 | 442 | -- |
| dorsal groove maximum width | 13 (54) | 61 (151) | 41 (90 and 250) ^d | -- |
| dorsal groove maximum depth | 7 (16.5) | 5 (137) | 4 (127) | -- |
| handle length | 151 | 168 | 93 | -- |
| lever length | 408 | 414 | 334 | -- |
| lever length/overall length | 75% | 70% | 75% | -- |
| balance point DFDE | 280 | 256 | 197 | -- |
| dorsal concavity depth | 10 (197) | 12 (190) | 3 (124) | -- |

^a all measurement are in millimeters.

^b P = Plush Cave; RS1 = Roaring Springs No. 1-10,001; RS2 = Roaring Springs No. 1-10,000; RS3 = Roaring Springs No. 1-7391.

^c D = distance from the distal end (DFDE), given within parentheses.

^d the maximum width of RS2 (41.0 mm.) is found on two places.

shallow, long notches for finger and thumb, and two pairs of ligature notches, one above and one below the gripping notches. There is a flat dorsal surface of almost 100.0 mm. below the notches. The distal end of the handle area is 394.0 mm. from the distal end of the atlatl. The ventral (or bottom) center of the gripping notches is 10.0 mm., while the dorsal surface at the center is 7.0 mm. wide. The maximum thickness in the handle area is 11.0 mm. at the proximal end of the gripping notches (439.0 DFDE). Modification to the ventral surface of the atlatl consists of the removal of bark and cambium layers and the beveling of the final 22.0 mm. of the distal end (Fig. 2).

Analysis of the two gripping notches suggests that the dorsal-right notch is for the thumb and the dorsal-left notch is for the index finger of the right hand. While holding a dart engaged against the spur, there is commonly a slight distal angling of the thumb and proximal angling of the forefinger. This matches slight beveling noted within the two notches, dorsodistal for the right notch and dorsoproximal for the left notch. The dorsal-right notch is also beveled in toward the center more than the dorsal-left notch.

The ligature notches have a shallow groove connecting them around the ventral surface. No grooving is present on the dorsal surface. The interruption of the pigment coating (see below),

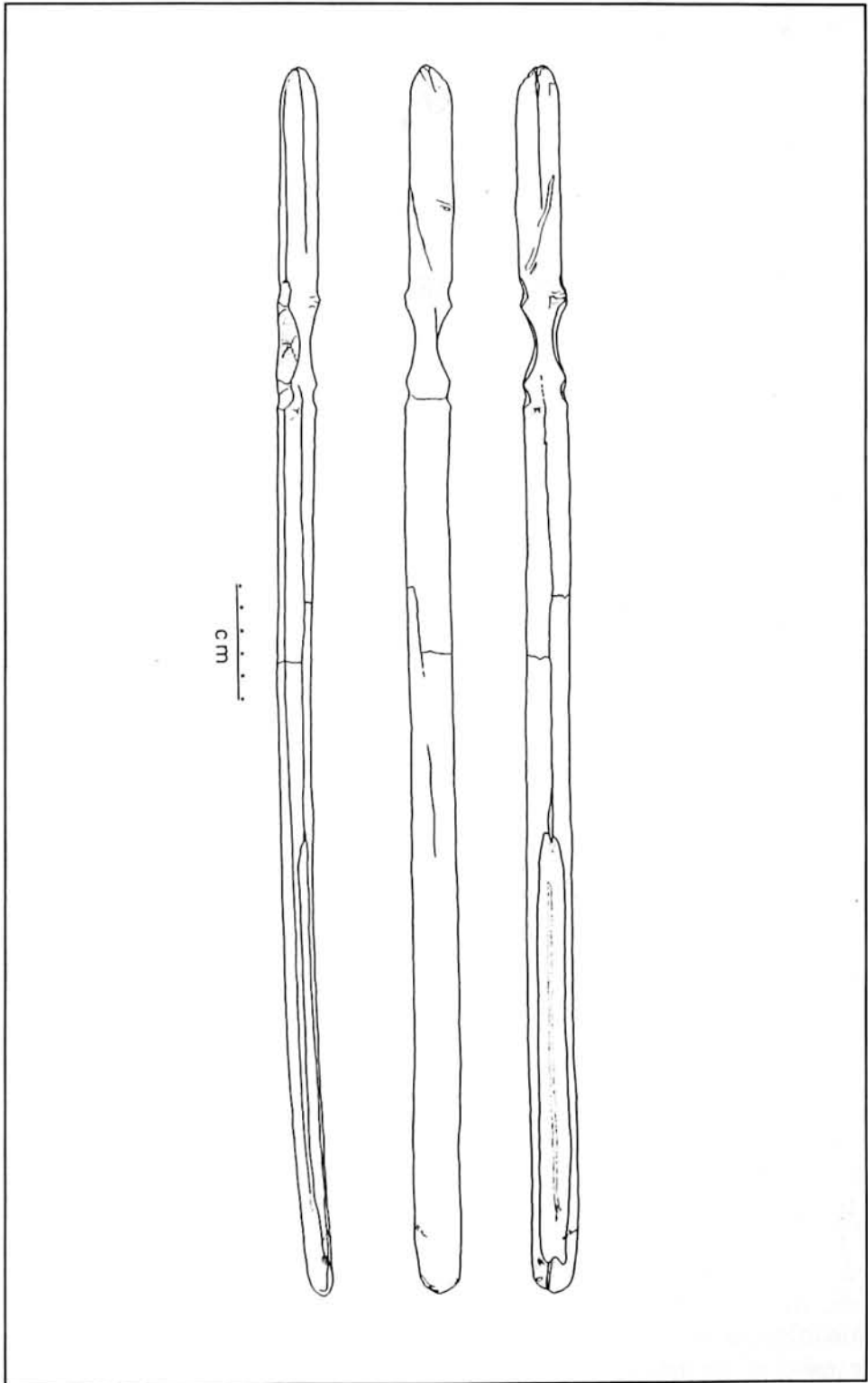


Fig. 2. Plush Cave atlatl (No. 1-10,002) showing dorsal, ventral, and lateral views.

particularly on the dorsal side between the two notches of each pair, indicates that at one time there were ligatures in these areas (Fig. 2). These notches are quite smoothed from use where they meet the dorsal edges of the atlatl.

Lever Length and Flexibility

The distance from finger notch center to the spur tip is 408.0 mm. or 75% of the length of the tool. There might have been a very slight flexure to this atlatl during use, but it would not constitute any significant energy storage. The average 10.0 mm. thickness of the tool suggests that it was not designed to flex.

Wood Description

There are six knots in the wood, two in proximity to the spur and four in proximity to the handle. A distance of 370.0 mm. separates the two clusters. There is not a distinct boundary between the knots and the surrounding wood. The heartwood is slightly softer than the sapwood and is somewhat pithy as well. This heartwood is visible in several places on the atlatl: at the extreme distal and proximal ends, at the proximal end of the groove, and at the distal end of the groove to the dorsal-right of the spur. The heartwood is 2.0 to 2.2 mm. in diameter. It was apparently about 2.0 to 3.0 mm. below the dorsal surface of the atlatl over most of its length based on where the heartwood is visible now. The heartwood was removed in the construction of the dorsal groove. Dorsally and centrally, a crack is apparent over most of the length of the atlatl proximal to the dorsal groove, though the area of the ligature and gripping notches is uncracked. Ventrally, there is a 50.0 mm. long crack below the proximal end of the groove. There is also a crack extending distally from the underside of the dorsal-right gripping notch center.

There is an irregularity on the dorsal and ventral surfaces proximal to the handle notches (Fig. 2). This irregularity is 44.0 mm. long and

is oriented diagonally to the long axis. It appears to be a natural characteristic of the wood, perhaps a crack that healed during the life of the wood. Eight growth rings are visible, particularly at the proximal end of the handle and within the gripping notches (Fig. 2).

Wear or Damage

The patterning of the cracks is a product of weathering and may indicate that the wood was worked in an unseasoned condition. There is some charring on the dorsal surface of the tool in the area of the spur and in the area of the break. This charring may have occurred post-depositionally; burning is common, if not ubiquitous, in the dry cave or rockshelter deposits (cf. Spencer 1991:55).

The atlatl has been broken in half and the two parts were recovered by different people at different times. This break incorporates the balance point of the artifact. It is not known whether the break was a by-product of use or whether it occurred postdepositionally.

There are two small (10.0 by 5.0 mm.), possibly complementary, areas of overlapping cut marks on two edges. These marks are oriented perpendicular to the edges running between the dorsal and the ventral surfaces. One of the cut areas is on the dorsal-left of the extreme distal end while the other is on the dorsal-right of the extreme proximal end. It is speculated herein that these areas may represent use of the ends of the atlatl as a hammer for flaking stone.

An informal experiment conducted by the senior author demonstrated that even a wood as soft as willow (*Salix* sp.) is serviceable for minimal rejuvenation of edges previously bifacially retouched. The flattened ends of willow and serviceberry (*Amelanchier* sp.) flakers readily acquired the overlapping cut marks similar to those on the Plush Cave atlatl. While certainly not proof, it does suggest that minimal edge retouch could account for the cut marks

observed on the distal and proximal ends of the Plush Cave atlatl.

Manufacturing Details

This is an expeditious, yet elegant, atlatl. The ventral surface of the tool is virtually unmodified. The wood has been split, or has been thinned, to within a few millimeters of the heartwood. Yellow willow (*Salix lasiandra*) will split in just this fashion, i.e., to a uniform width above the heartwood. Serviceberry has a very complex, almost braided grain, and does not split in this fashion; even with metal wedges and a sharp machete, serviceberry splitting is an ordeal.

The dorsal surface of the tool has been smoothed, but not dramatically so. Both the gripping and the ligature notches were constructed by cutting in from both sides of each notch to the center; evidence of this is still readily apparent. The inner edges of the dorsal groove have been rounded somewhat; however, the inner surfaces and the bottom of the groove are relatively rough. The groove in proximity to the spur is more finely finished than any area of the atlatl, even considering the two knots and the crack in the wood to the right of the spur. The outer edges of the last 45.0 mm. of the distal end of the groove are noticeably more rounded.

Miscellaneous

The balance point of the atlatl is close to the center of the section of blade between the dorsal groove and the handle area. There is a longitudinal dorsal curvature or concavity between the handle and the distal end of the atlatl that is centered 197.0 mm. DFDE; the maximum depth within the curvature is 10.0 mm.

A gradual twist exists along the length of the atlatl such that with the distal end held dorsal side up and horizontally, the dorsal-right edge of the handle angles down, or clockwise, 55°. This twist does not appear to be postdepositional

warping, and it is proposed that the twist is purposeful; either a retained natural wood curvature or a manufactured curvature. It is interpreted as compensation for the natural tendency of a flat surface to rotate during gripping across the palm of the hand; in this case, the right hand.

The surface of the tool is coated with some sealant that has either collected dirt, darkening in the process, or had a dark pigment added, despite Cressman and Krieger's assertion to the contrary (1940:25). There are five areas where the coating is thin to nonexistent: circumferentially at each pair of ligature notches; dorsally, proximal to the three pairs of handle notches, particularly on the dorsal-left; within the dorsal-right gripping notch; and on the upper edges at the center of the dorsal groove, especially the dorsal-left edge. Assuming the thinness of the coating signifies contact of some kind with the atlatl, the five areas imply the following: the presence of ligatures to bind down finger loops; the positioning of the second through fourth fingers below those used in the finger loops; that the thumb moved more in the gripping notches than the forefinger; and the rotation of the dart fletches, or where the fingers of the left hand came in contact with the tool during the dart engagement process. While the pigment coating the atlatl may also have been decorative, it was certainly a sealant for the wood.

Comments and Interpretations

The nature of the heartwood shows that this is clearly not mountain mahogany (*Cercocarpus ledifolius*) or any other *Cercocarpus* species (cf. Mildner 1974). Cressman and Krieger (1940: 25) suggested that the parent wood was willow or aspen (*Populus* sp.). The senior author's work with native hardwoods also suggests that it could be willow or serviceberry, all of which have heartwood similar to that of the atlatl. If the break observed on the atlatl occurred during use, then willow, aspen, or hazel are favored as

the material of manufacture. Comparatively speaking, serviceberry is too strong and resilient a wood to break in this fashion.

ROARING SPRINGS CAVE ATLATL (OSMA No. 1-10,001)

This is one of three atlatls from the cave and is a long, wide tool with a large projecting spur and an unusual handle (Fig. 3 and Table 2). The atlatl is 595.0 mm. long.

Spur

The distal end of the spur is the distal end of the atlatl. The proximal tip is the highest part of the spur; it is 17.0 mm. above the dorsal surface and 29.0 mm. above the ventral surface. The spur tip is 12.0 mm. above the outer edge of the dorsal groove, and has an angle of 35°.

There is a crack at the base of the spur on the dorsal-left side that is 23.0 mm. long. Although there is a generally nice finish on the surfaces of this atlatl, there is an irregularity on the dorsal surface of the spur, over the point where the spur and the dorsal groove meet and in line with a hole through the keel (see below) on the underside of the tool. There is faint evidence of ligature marks on the lateral edges in line with the above-mentioned features—particularly on the dorsal-right side.

Cressman and Krieger (1940:23-24) made the cogent observation that the "keel could be a practical means of abutting the hook, for in the act of throwing the 'dart' there is a strong force tending to pry the hook away from the body."

Dorsal Groove

The dorsal groove is a generalized trough rather than a centralized groove, and extends 270.0 mm. proximally from the distal end. This groove stretches from one edge of the dorsal surface to the other. The distal end of the groove terminates 3.0 to 4.0 mm. from the distal end of the atlatl, where there is a central projection of the joined distal ends of the spur

and keel (Fig. 3). Lateral breakage has shifted the maximum width position proximally. It is probable that the original maximum width was about 90.0 mm. closer to the distal end of the atlatl.

Handle Area

The distal end of the handle is 427.0 mm. DFDE. The handle is thicker and wider than the blade just distal to it (Fig. 3). The handle abruptly widens by about 5.0 mm. on both sides (one side is broken) at the proximal end of the blade and then very gradually tapers—exclusive of the finger notches—for approximately 70.0 mm., where there is a sudden narrowing to a leather-wrapped section of handle. The dorsal-right notch is wider and deeper than the dorsal-left notch, and is slightly beveled dorsodistally; the dorsal-left notch is just as slightly beveled dorsoproximally (see Plush Cave atlatl handle discussion above). The inside of the gripping notches is flattened rather than sharp-edged like the other substantially complete atlatl from the site.

Below the handle flare, the handle has been wrapped for 86.0 mm. with a strip of tanned leather which has been lashed down with sinew. The hide ranges between 18.0 and 30.0 mm. wide, is 1.0 mm. thick, and was wrapped with the hair side out. Most of the hair has been worn off. The hide is tucked under distally and bound with sinew. It is probable that there are notches or a circumferential groove below the proximal and distal end of the hide to serve as purchase for the sinew seizing and to keep the wrapping from sliding off during use.

The sinew lashings are 1.5 to 3.0 mm. wide and are wrapped around the hide at least seven times and folded under. There are two pieces of very fine and resilient cordage that extend 2.0 to 3.0 mm. from beneath the hide wrappings on either side of the proximal end of the atlatl. The ends are frayed and at least 50 fibers are showing in each cord. Photos from the 1940s

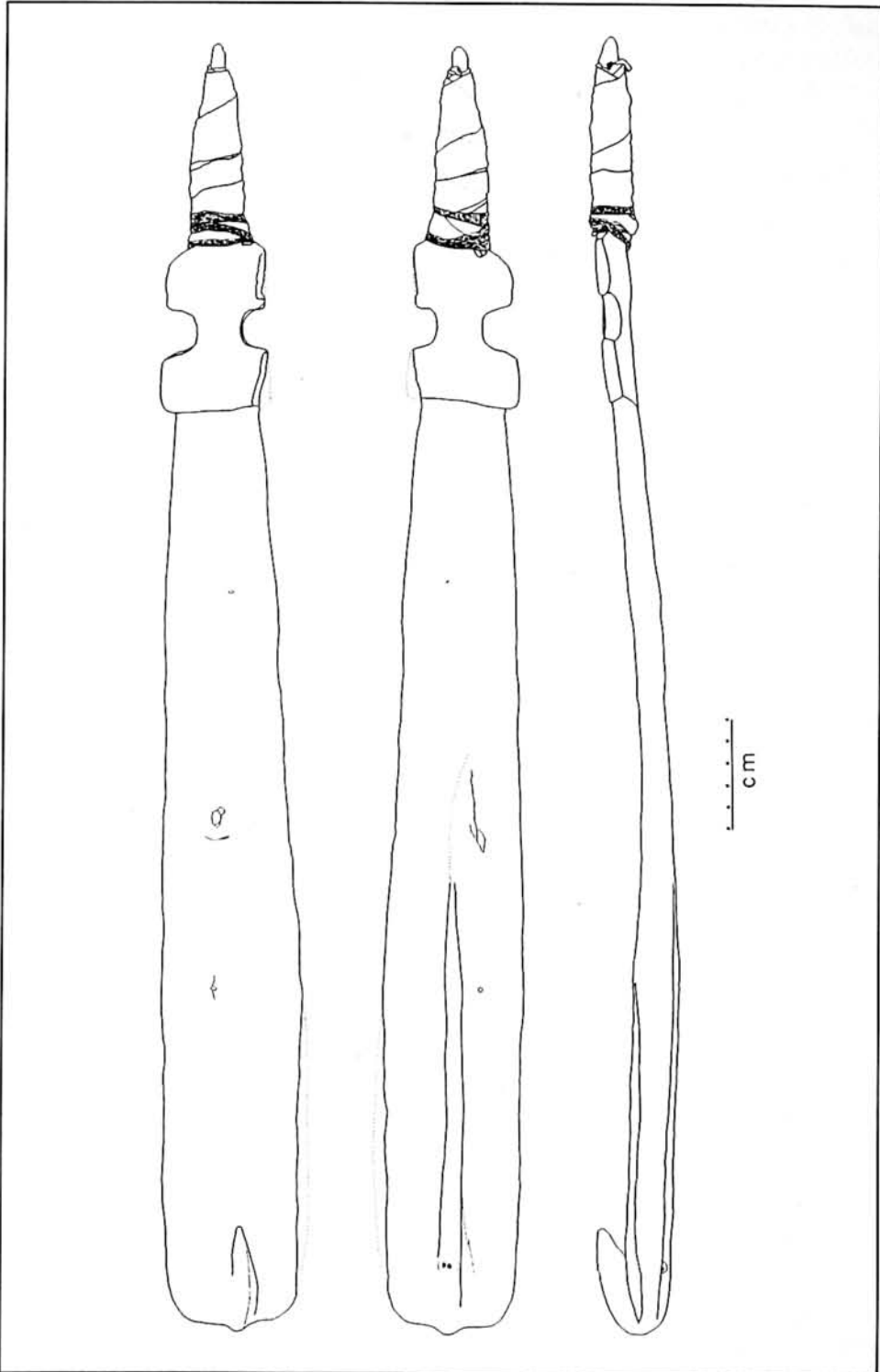


Fig. 3. Larger Roaring Springs Cave atlatl (No. 1-10,001) showing dorsal, ventral, and lateral views.

(Cressman and Krieger 1940:Plate VII) indicate that these pieces of cordage were longer when the tool was recovered, the dorsal-right cord being about 30.0 mm. long and the dorsal-left cord being about 25.0 mm. long. Although it is difficult to tell because of fraying, the cordage appears to have an S-twist. All of the wrappings and the cord are coated with the red pigment that covers the rest of the atlatl.

Keel

A keel is present on the ventral surface of this atlatl below the dorsal groove. The keel is not as long as the dorsal groove, extending 207.0 mm. from the distal end of the atlatl. The width of the keel varies from 6.0 to 7.0 mm., and its height above the ventral surface is between 3.5 to 4.0 mm. Along the edges of the ridge, two longitudinal grooves have been cut into the ventral surface to an average of approximately 1.0 mm. deep. From the bottom of these grooves, the keel rises 4.5 to 5.0 mm. One of these grooves has precipitated a split on the ventral left of the keel that does not go through to the dorsal side.

Hole

A biconical hole has been drilled very close to the base of the keel and is positioned 28.0 mm. from the distal end of the atlatl. The diameter of the hole is 2.5 mm. for the actual hole and 5.0 mm. for the top of the cones leading to the hole. The distance from one end of the biconical hole to the other is 8.5 mm. A hole with so small a diameter would have held only a small stone if, in fact, it served the purpose of anchoring a weight.

Lever Length and Flexibility

The distance from the center of the finger notches to the proximal spur tip is 414.0 mm., or 70% of the tool length. There may have been a very slight flexure during use. This flex would not have stored significant energy during

the throwing motion. The average blade thickness of ca. 10 mm. and the presence of a keel on the ventral side of the tool indicate that at least the distal 207.0 mm. was intended to be inflexible.

Wood Description

Three knots with diameters that are larger on the dorsal than on the ventral side are present on this tool. The boundary between these knots and the surrounding wood is distinct. There are 28 growth rings visible at the distal end of the atlatl.

The fact that no heartwood is apparent strongly suggests that the wood is not mountain mahogany (*Cercocarpus ledifolius*). A cinnamon brown heartwood makes up at least one-third of the thickness of a parent piece of mountain mahogany and is harder than the cream-colored sapwood, making it difficult to misidentify.

It is proposed that the parent wood of this tool is a softer wood like juniper (*Juniperus* sp.). The less distinctive heartwood of juniper or of other woods could be obscured by the pigment coating this tool. The obvious growth rings also suggest that the parent material is a softwood.

Wear or Damage

The most obvious damage is along the dorsal-left side where the distal 156.0 mm. of the blade and the outside edges of the handle flare are missing. These are not dysfunctional breaks and have been coated with red pigment. There is also a split on the dorsal-left side of the spur where it connects with the groove, as well as splits on the ventral side of the tool, mostly ventral-left. Twenty-one long scratches are distinctly visible within the dorsal surface. They are roughly parallel to the long axis and tend to the dorsal-left side of the groove. Almost all of them stop within 40.0 mm. of the spur. It is possible that the scratches were produced by sliding the darts up the atlatl toward a connection with the spur. The proximal end of the handle

extends 12.0 mm. past the end of the wrappings and is damaged, again particularly on the dorsal-left side. Wear on the extreme proximal end may be due to use as a flaker.

Manufacturing Details

This atlatl would have been time-consuming to make due to its raised projecting spur, the generalized dorsal groove, its overall size, the handle flaring, and the keel. The atlatl is finely finished and, with the exception of the keel, it is very well made.

Miscellaneous

There is a generalized longitudinal curvature on the dorsal side between the handle and the distal end of the atlatl. The maximum depth within the curvature is 12.0 mm. No twist is present in this atlatl.

As with the other two atlatls from Roaring Springs Cave, this tool is uniformly coated with red pigment. The pigment is composed of fine particles (perhaps ocher) in a medium of some kind. The distal end of the red coating is overlaid by a gray pigment, also composed of observable particles. This gray pigment has a very uneven proximal edge and coats the atlatl for 45.0 to 75.0 mm. The pigment on this tool appears to have been applied close to the time of abandonment; it is unworn and appears to have a uniformly thick coating. It also served the purpose of sealing the wood, and may have been decorative as well.

Comments and Interpretations

The irregularity on the dorsal surface of the spur over the biconical hole is interpreted as being purposeful to keep a binding from slipping. Faint evidence of ligature passage around the edges of the atlatl blade in line with the hole, the irregularity on top of the spur, the split in the base of the spur, and the cracks in the wood on the underside of the atlatl all suggest that this hole anchored a binding that passed around the

atlatl at its distal end. The purpose of this binding, if present, may have been reinforcement of the spur during use.

ROARING SPRINGS CAVE ATLATL (OSMA No. 1-10,000)

This is the smaller of the two substantially complete atlatls from the site. It is relatively short and thick and has a small spur (Fig. 4 and Table 2). The lateral base of the handle is broken; however, the length measurement does not appear to be dramatically affected (Fig. 4). It is believed that this damage has influenced the length measurement by less than 5.0 mm.

Spur

As with the previous Roaring Springs Cave atlatl, the distal end of the spur is the distal end of the atlatl. The height of the spur above the edges of the dorsal concavity is 7.0 mm. (10.0 mm. DFDE); the depth of the dorsal groove in proximity to the proximal base of the spur is 1.0 mm. As with the other atlatl from the site, the spur and the keel connect at the distal end, forming a projection of 5.0 mm. at the end of the blade. The angle formed by the spur tip is 70°. This spur is small with a minimal projection when compared with the other two spurs from Roaring Springs Cave.

Dorsal Groove

The groove is generalized, extending over the whole of the dorsal side of the atlatl. It is even present at the extreme proximal end, though minimally. The maximum depth of the groove is located roughly over the two holes piercing the ventral keel (127.0 mm. DFDE).

Handle Area

Maximum width for the handle is located on the flare between the two pairs of notches and is 37.0 mm. (375.0 mm. DFDE). The handle has four notches, two for gripping and two ligature notches below the former notches. The pair of

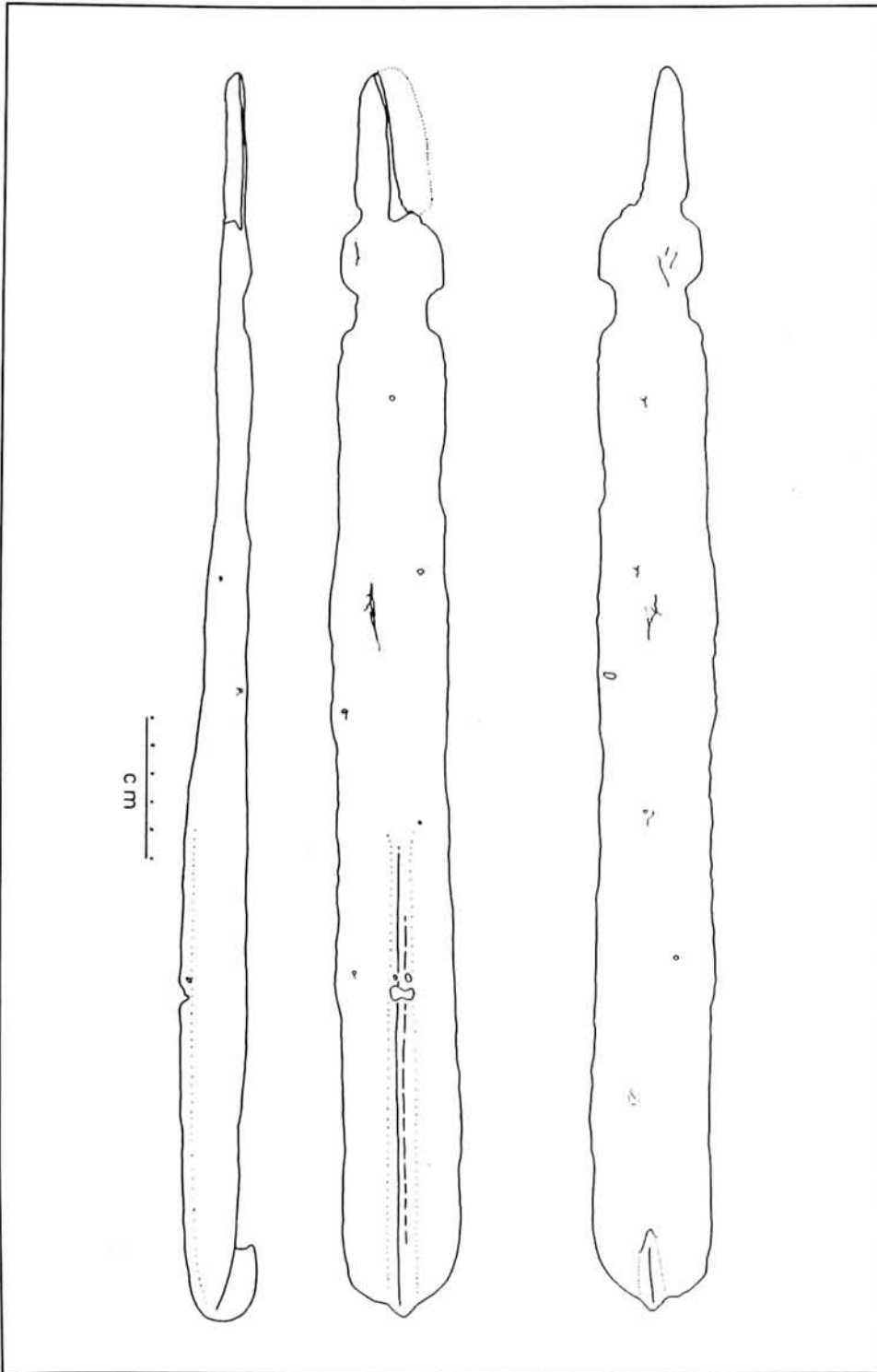


Fig. 4. Smaller Roaring Springs Cave atlatl (No. 1-10,000) showing dorsal, ventral, and lateral views.

proximal notches are interpreted as ligature notches by comparison with the other complete atlatl from the site. There are no ligatures or wrapping on this tool.

The gripping notches are unusual in that their inner edges have been beveled to a relatively sharp edge, unlike the other complete atlatl from the site. The cut marks that produced the sharp edge are clearly visible dorsally and ventrally, but are much more apparent ventrally. As a consequence of the sharp edges, it is not apparent which notch was for the thumb and which for the forefinger. This is the only atlatl of which the authors are aware that has had the inner edges of gripping notches beveled to a sharp edge. The insides of the ligature notches are similarly formed.

A large piece of the handle is missing and the break intersects the dorsal-right seizing notch. The edges and the inner surface of the break are very smooth, showing that the atlatl was used after the fracture and, thus, though broken, was probably viewed by its prehistoric users as still functional. The dorsal-left or outside of the break at the extremity of the handle appears battered. Whatever caused this battering may have influenced the larger fracture that splits the handle. It is possible that this battered appearance may also be due wholly or in part to use as a flaker.

While the proximal notches are interpreted as being for the ligatures that bound a handle wrap to the tool, there is no direct evidence that such a wrap existed. The pigment coating on the tool (see below) is thinner in the handle region, although it is relatively thin throughout.

Keel

Like the other complete atlatl from the site, this atlatl has a keel. It is 208.0 mm. long, 1.0 mm. longer than that of specimen No. 1-10,001. It is from 7.0 to 10.0 mm. wide and has a height of 5.0 mm. The keel has been smoothly raised from the ventral surface with no

grooves at its edge, as in specimen No. 1-10,001.

Holes

The keel of this atlatl contains two biconical holes that are 5.0 mm. apart (115.0 and 120.0 mm. DFDE). The distal hole is 2.0 mm. in diameter and has been broken outward, suggesting force applied away from the ventral side of the atlatl, either by something tied to it or by outward force on a ligature of some kind.

The unbroken keel hole is half a millimeter smaller in diameter (1.5 mm.). Neither hole could have passed enough ligature through to support a stone of enough weight to have affected the atlatl during use motion. These holes are more than 100.0 mm. proximal to the spur. Their purpose is unknown.

It is tempting to assume that the proximal hole was drilled after the distal hole became dysfunctional. No evidence of this was observed and both holes may have been drilled at the same time. Slight charring around these holes has obscured any signs of wear.

Lever Length and Flexibility

From the center of the gripping notches it is 334.0 mm. to the proximal end of the spur, or 75% of the length of the specimen. This is a totally inflexible atlatl.

Wood Description

Seven knots are present on the atlatl, averaging 50.0 mm. apart. The knots are larger on the dorsal than the ventral side. Most of the knots have a boundary that is clearly separable from the surrounding wood.

No heartwood is visible under the coating of pigment. Twenty-six growth rings are visible, particularly at the more weathered distal end of the tool. Given the lack of visible heartwood and the visibility of the growth rings, it is suggested that the wood is not mountain mahogany and may be juniper or another softer wood.

A large crack is visible in the wood (241.0 to 265.0 mm. DFDE). This is probably due to the presence of an invisible knot at this location. This feature, however, was not counted as a knot.

Wear or Damage

Other than the wear previously discussed, there is minor damage to the lateral edges of the blade at the distal end. This lateral damage may be postdepositional in origin. Additionally, there are numerous apparently unpatterned scratches concentrated ventrally in the handle region.

Manufacturing Details

This is a difficult atlatl form to make with the generalized groove, keel, raised spur, and notches. With the exception of the keel, this tool is not as well made as the other complete atlatl from the site (No. 1-10,001).

Miscellaneous

There is a slight longitudinal curvature which has a maximum depth of 3.0 mm. and a length of 290.0 mm. A slight twist of 10° is present throughout the length of the tool. Like the other two atlatls from Roaring Springs Cave, this one has a coating of red pigment with an overlay of gray at the distal end. This coating is much thinner than that on the other complete atlatl and most probably served as a sealant, and perhaps as decoration.

There are rows of poorly preserved white dots on the dorsal surface in the area of the blade. The dots are apparent in at least three to five roughly parallel rows in line with the long axis of the tool. The dots vary from 3.5 to 4.0 mm. in diameter and appear to have been pressed onto the surface without rotation of the tool used to apply them. While these dots are poorly preserved, examination with a 10X lens under incandescent light suggests that the color

is due to the presence of a pulverized substance that resembles volcanic tephra.

Comments and Interpretations

The sharp edges on the inside of the finger notches, the short distance between the handle and proximal spur, and the fact that the dorsal concavity extends over the whole of the tool (Fig. 4) suggests that this is a rejuvenated atlatl, perhaps for a smaller person or a child. Overlaid on the other atlatl from the site, this tool fits between the handle and distal end of the larger atlatl. The spur of this atlatl is smaller and fits within the spur of the other atlatl from the site; thus, it is possible that it may also have been rejuvenated.

The sharp-edged gripping notches would have made this a very uncomfortable atlatl to use. Even with rounded finger notches, a replicated specimen is not comfortable to use.

ROARING SPRINGS CAVE ATLATL SPUR (OSMA No. 1-7391)

This specimen is a spur that has been separated from an atlatl. It is 36.0 mm. long and has a maximum width and height above the groove of 10.0 and 15.0+ mm., respectively (Fig. 5 and Table 2). The spur has a projection of 10.0+ mm. (The plus signs [+] on the measurements presented above are due to the fragmentary nature of the specimen and indicate minimum distances.) The dorsal edge of the spur slopes down to the tip and has a tip angle of 65°.

Wood Description

The wood could not be identified on this specimen.

Miscellaneous

Like the other two atlatls, this fragment is coated with a red pigment overlain by a gray pigment.

Comments and Interpretations

It is assumed that this fragment was produced as a by-product of use. It is probable that projecting spurs of this type are prone to this kind of breakage. Atlatl No. 1-10,001 also has a projecting spur with a split on the dorsal-left of the spur where it intersects the dorsal groove.

This artifact is intermediate in size and shape between the other two atlatl spurs documented from Roaring Springs Cave, though it is closer to No. 1-10,001, the larger of the two. The breakage on this specimen suggests that, with projecting spurs like this one, separation was common.

GENERAL COMMENTS

Each of the four atlatls described was collected in the 1930s, and the paper by Cressman and Krieger (1940) can be considered an initial exploration and analysis of atlatls in the Northern Great Basin. Even by today's standards, there is much good information available in their article. Unfortunately, temporal information is lacking, which is not to say that it is unobtainable. As Aikens (1993:42) indicated, cross-referencing time diagnostic artifacts from the site clearly suggests a not surprising Middle Archaic age (7,000 to 2,000 B.P.) for the atlatls. It is suggested that more direct chronological data be obtained from AMS radiocarbon dating small plugs of wood from the atlatls themselves. While it is a destructive technique, careful placement of the plug on the atlatl would have a minimal effect when compared with the importance of the chronological information that would be obtained.

Examination of the data from the four atlatls suggests some general observations. The larger Roaring Springs Cave atlatl is significantly longer than the others, yet it has relatively the shortest lever arm (414.0 mm.); the distance between the finger notch center and spur tip being only 70% of the total length. The lever arms of the other Roaring Springs Cave atlatl

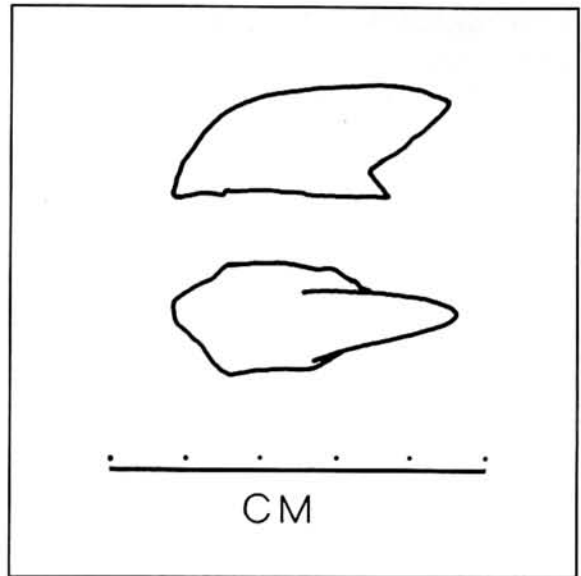


Fig. 5. Atlatl spur (No. 1-7391) showing dorsal and lateral views.

(334.0 mm.) and the Plush Cave specimen (408.0 mm.) are 75% of their lengths. One of the reasons for this discrepancy may be that the handle region of the larger Roaring Springs Cave specimen served another purpose and was therefore made longer.

The similarity in the gray pigment overlaying red pigment on the distal ends of all of the Roaring Springs Cave specimens, as well as their morphological similarities, suggest that they represent a stylistic as well as functional type. The validation of the type and an evaluation of its geographic and temporal significance awaits the recovery of more atlatls and better information on the age of the extant atlatls.

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