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Juniper Bow-Stave Recovered from a High Elevation Glacial Setting, Central Sierra Nevada, California

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California recently experienced its first discovery of pre-contact ice-patch archaeology. In late 2014, a juniper bow stave was found partially embedded in remnant glacial ice at an elevation of over 3,700 meters. This stave is one of only a few juniper bow staves ever recovered from an archaeological context within the western Great Basin. The bow stave offers a unique insight into the bow manufacturing process, bow-stave tree selection, and variation in late-period bow technology. Combining the study of archaeologically recovered bow-staves with replicative studies, as well as a focused examination of bow-stave tree scarring, provides complementary data that could better detail the totality of pre-contact bow production. This should result in greater numbers of bow-stave trees being identified and a greater understanding of the human component, from tree selection to the patterning evident in remnant scarring.

In their assessment of Phil Wilke's (1988) foundational article on bow-stave trees, Millar and Smith scrutinize the hypothesized bow-stave removal process by incorporating tree physiology into their assessment. Their efforts advance our understanding of pre-contact juniper tree modification and focus attention on the need for additional studies. As they note, many of the challenges they raise to the Wilke model of stave removal are best addressed through replicative studies. They also suggest that an examination of recovered bows from the region could serve in a similar capacity.

In late 2014, California had its first discovery of pre-contact ice-patch archaeology. The recovered artifact, a juniper bow stave (Fig. 1), was found partially embedded in a meager strip of remnant glacial ice at an elevation of over 3,700 meters. The site is located just below the crest of the Sierra Nevada on a steep rock and ice-covered slope. Initially, the archaeological discovery was not widely reported, since the collector recovered it illegally. Following a lengthy criminal proceeding, the bow was returned to the possession of the United States Forest Service, where it is now curated for the benefit of everyone (accession number FS-14-05-7158017-1). Unfortunately, the associated archaeological and environmental data were lost when the bow stave was illegally removed.

Despite the loss of associated ecological data, the recovered bow stave still possesses many characteristics that could inform archaeologists about bow stave tree selection and perhaps the stave removal process. The stave consists of a single billet of juniper wood 100.2 cm. in length, 34.3 mm. in maximum width, and 15.3 mm. in maximum thickness. The bow stave weighs 118.2 grams.

Figure 1. Photo of bow stave, accession number FS-14-05-7158017-1.

During the criminal investigation, the Inyo National Forest Heritage Program Manager recovered a small fragment of the bow stave from the high-elevation location. That fragment was later matched and added to the bow stave. The fragment (Beta 398434) was then submitted to Beta Analytic for radiocarbon assay, which resulted in a conventional radiocarbon age of 100 ± 30 B.P., with a calibrated date of 270 to 215 cal B.P. (Hood 2014). Temporally, this places the bow in the late pre-contact era regionally.

The stave generally and gradually tapers from the center limb to the tip. Both stave tips are similarly nocked, with a semi-circular notch cut into one margin of the stave and an L-shaped notch cut into the opposite margin (Fig. 2). Interestingly, the notches were cut so that the semi-circular cut on one tip is on the opposite margin from the other. There does not appear to have been any real modification to the center of the stave to facilitate a handle, aside from the tapered shaping of the original billet. Most, if not all, of the shaping of the stave was done to the margins and belly of the bow.

Currently, the bow lacks congruity of taper from end to end; this is likely a result of differential taphonomy while the stave was *in situ* within the ice. The original photos of the discovery and removal (taken by a friend of the looter) reveal that the more weathered and asymmetrical portion of the stave (the distal end) was partially exposed at the time of discovery. It appears that the partial exposure resulted in some longitudinal warping. This asymmetry may also result from the presence of a large knot just a short distance from the proximal end. The uneven shaping on this end of the stave may have been an attempt by the stave manufacturer to adjust the amount of flex in the limb, by taking account of the knot's rigidity.

The over-all short length of the recovered stave and the material involved suggest that this was a backed bow. Backed bows utilize sinew placed on the back of the stave to increase limb rigidity. The increase in resistance provided by the sinew requires that greater force must be applied to the string to draw the bow. When fired, the added resistance is expressed as additional kinetic energy, which drives the arrow at a faster rate. For any given stave length of similar material, backed bows have greater casts than unbacked or self-bows. This allows bowyers to achieve casts of comparable distances while using shorter length bow-staves.

Figure 2. Close-up of bow stave tip, showing C-shaped and L-shaped string grooves.

Both Wilke (1988), and Millar and Smith (this issue) contend that stave quality was an important factor influencing tree selection, stave removal placement, and—in the case of Wilke—even the stave cutting sequence. The problem with this contention is that it is assumed that staves need to be straight grained, free of knots or other defects, and without warping in order to function effectively. This position is not supported by the handful of bow-staves from the Inyo-Mono Region. Juniper sinew-backed bow staves often contain many imperfections, including knots. The recovered bow stave from the Sierra Nevada has five knots. This selection of a "knotty" stave suggests that knots either had less of a detrimental effect on stave performance than thought, or that the sinew backing offset any loss of function caused by the knot.

The dimensions—length, width, and thickness—of the stave under consideration are consistent with the bow-stave billet removal scars reported by Wilke (1988). The recovered bow is just a few centimeters shorter than the average length of remnant stave scars. This is to be expected, since billets are shaped and modified after they are removed from their source trees in order to adjust limb flex and cast. Unfortunately, bow-stave shaping and nocking has obscured many of the remnant attributes from the stave removal process. A careful surface examination of the stave yielded no remnant evidence of the proposed cuts or their sequencing. Other questions raised by Millar and Smith, such as seasoning, cut placement/function, and timing cannot be adequately addressed by examining bow staves alone. It is likely that evidence of distinct stave removal processes may not be evident in the finished stave, due to the post-removal shaping and finishing of the stave. It is probable, therefore, that similarly shaped and sized staves may have been removed using completely different methods. This observation suggests that many of the questions raised about the stave removal process will likely need to be addressed through experimental archaeology.

This stave, recovered from the crest of the Sierra Nevada, is only the third bow stave recovered from an archaeological context in the region. Far Western Anthropological Research Group recovered two other archaeological specimens during large block survey on the Naval Air Weapons Station, China Lake (Hildebrandt and Ruby 2004). These extremely rare artifacts were found cached under boulders within site CA-INY-5491. These bow staves were also constructed from single juniper billets, and were very similar in dimension and shape to the Sierra specimen (Table 1) discussed here. All three specimens have bow backs that appear to have been shaped from the outer rings of sapwood. At least one of the Coso bow staves and the Sierra bow stave show multiple pinholes and at least one larger knot on their backs (Hildebrandt and Ruby 2004). This is additional support for the suggestion that sinew backing can alleviate the detrimental effects of at least minor knots and imperfections.

While all three artifacts date to the late pre-contact period, their forms differ in significant ways. Both of the Coso bow staves appear to utilize sinew nocks, rather than the string groove nocks cut into the tip margins of the Sierra specimen. Alternatively, the Coso bow staves could merely be unfinished. Unfortunately, similarities and differences in curvature cannot be fully assessed due to the post-depositional impacts of ice and water on the shape of the recovered Sierra bow.

The study of bow staves and the technology involved in their manufacture is a commendable investigation. On the surface, understanding the processes necessary to create a bow should help archaeologists working in juniper woodlands to identify the unique site type a bow-stave tree constitutes. Studies should also seek to answer larger questions about human behavior regionally, such as landscape use and resource acquisition, among other issues. The discovery of the high-elevation bow stave itself raises questions about the motivations involved in traveling to such a remote and treacherous alpine setting, the acquisition and importance of large-game hunting in the pre-contact era, and the circumstances under which one might lose a bow in such a setting. At the very basic level, the discovery of the stave

Table 1

EASTERN SIERRA ARCHAEOLOGICAL BOW-STAVE METRICS

Accession Number	Specimen	Material	Type	Length	Width (max.)	Thickness (max.)
758-3[a]	bow-stave	wood	juniper	99.0 cm.	31.43 mm.	13.33 mm.
758-4[a]	bow-stave	wood	juniper	103.5 cm.	32.82 mm.	14.61 mm.
FS-14-05-7158017-1	bow-stave	wood	juniper	100.2 cm.	34.30 mm.	15.30 mm.

[a]Metric derived from Hildebrandt and Ruby 2004.

suggests that sites once protected by adverse ecological factors (e.g., high elevation and glacial conditions) are now becoming susceptible to exposure, accelerated taphonomic processes, and looting. Additionally, as a gentle reminder, it is important to make certain that all archaeological fieldwork is conducted with permission from the appropriate authority.

ACKNOWLEDGMENTS

The photos of the bow stave shown here appear through the courtesy of the Archaeological Research Center, California State University, Sacramento, with permission from the United States Forest Service, Region 5.

REFERENCES

Hildebrandt, William R., and Allika Ruby
2004 Archaeological Discovery of Two Wooden Bows from the Coso Range, Inyo County, California. *Journal of California and Great Basin Anthropology* 24(2):183–92.

Hood, Darden
2014 *Beta Analytic, Report of Radiocarbon Dating Analyses Sample FS0515ARPA14*. Report on file at United States Department of the Interior, Bureau of Land Management, Bishop Field Office.

Wilke, Phillip J.
1988 Bow Staves Harvested from Juniper Trees by Indians of Nevada. *Journal of California and Great Basin Anthropology* 10(1):3–31.